CONTRACT: ID: R-0609IA

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	34345.1.1(R-0609IA)	1	15
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
34345.1.1	MAF-F-119-1(1)	P.E.	
		CONST.	

CONTENTS:

STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

GEOTECHNICAL ENGINEERING UNIT

STRUCTURE SUBSURFACE INVESTIGATION

STATE PROJECT 34345.1.1 I.D. NO. R-0609IA

F.A. PROJECT MAF-F-119-1(1)

COUNTY GUILFORD

PROJECT DESCRIPTION US 311 HIGH POINT EAST BELTWAY FROM US 29-70 TO I-85 NORTH OF ARCHDALE

SITE DESCRIPTION STRUCTURE NO. 1 ON SR 1193 (BAKER RD.) OVER PROPOSED US 311 AT STATION -Y1- 12+66.293

CAUTION NOTICE

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INVESTIGATED BY J.B. BARFIELD PERSONNEL J.L. LOVE

CHECKED BY D.N. ARGENBRIGHT B. SCHULL

SUBMITTED BY D.N. ARGENBRIGHT D. BOGGS

DATE AUGUST 2004

DRAWN BY: TTW, JBB

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NORTH CAROLINA SEAL 19611 GEOLOGIST JEFFREY BRIAN BARFIELD

ID	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
R-0609IA	34345.1.1	2	15

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION

SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED OR WEATHERED EARTH MATERIALS WHICH CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND WHICH YIELDS LESS THAN 100 BLOWS PER 30 cm 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 PLASTIC INDEX	6 MX		N.P.	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS
GROUP INDEX	0		0	0		4 MX		8 MX	12 MX	16 MX	No MX			
USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS. GRAVEL AND SAND		FINE SAND	SILTY OR CLAYEY GRAVEL AND SAND				SILTY SOILS		CLAYEY SOILS				
GEN. RATING AS A SUBGRADE	EXCELLENT TO GOOD							FAIR TO POOR				FAIR TO POOR	POOR	UNSUITABLE

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

CONSISTENCY OR DENSENESS

PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTENCE (N-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH (kN/m^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	<25
	SOFT	2 TO 4	25 TO 50
	MEDIUM STIFF	4 TO 8	50 TO 100
	STIFF	8 TO 15	100 TO 200
	VERY STIFF	15 TO 30	200 TO 400
	HARD	>30	>400

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

GROUND WATER

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

MISCELLANEOUS SYMBOLS

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

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

ABBREVIATIONS

AR - AUGER REFUSAL
BT - BORING TERMINATED
CL. - CLAY
CPT - CONE PENETRATION TEST
CSE. - COARSE
DMT - DILATOMETER TEST
DPT - DYNAMIC PENETRATION TEST
e - VOID RATIO
F. - FINE
FOSS. - FOSSILIFEROUS
FRAC. - FRACTURED
FRAGS. - FRAGMENTS
MED. - MEDIUM
PMT - PRESSUREMETER TEST
SD. - SAND, SANDY
SL. - SILT, SILTY
SLI. - SLIGHTLY
TCR - TRICONE REFUSAL
γ - UNIT WEIGHT
γ_d - DRY UNIT WEIGHT
W - MOISTURE CONTENT
V. - VERY
VST - VANE SHEAR TEST

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [X] MOBILE B-55
- [ ] BK-51
- [X] CME-45C
- [ ] CME-550
- [ ] PORTABLE HOIST
- [ ] OTHER _____
- [ ] OTHER _____

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 152 mm CONTINUOUS FLIGHT AUGER
- [X] 203 mm HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [X] CASING [ ] W/ ADVANCER
- [ ] TRICONE _____ mm STEEL TEETH
- [ ] TRICONE _____ mm TUNG.-CARB.
- [ ] CORE BIT
- [ ] OTHER _____

HAMMER TYPE:
- [ ] AUTOMATIC [X] MANUAL

CORE SIZE:
- [ ] -B_____
- [X] -NXWL___
- [ ] -H_____

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

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WHEN TESTED, WOULD YIELD SPT REFUSAL. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 2.5 cm PER 50 BLOWS. IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK.
ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLOWS:

WEATHERED ROCK (WR)	NON-COASTAL PLAIN MATERIAL THAT YIELDS SPT N VALUES > 100 BLOWS PER 30 cm.
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 2.5 cm. 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 BLOWS PER 30 cm.*
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 BLOWS PER 30 cm.*
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 6 mm 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 1 mm DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PIECES 25 mm 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 CENTIMETERS 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 25 mm OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.

FRACTURE SPACING

TERM	SPACING
VERY WIDE	MORE THAN 3 m
WIDE	1 TO 3 m
MODERATELY CLOSE	30 TO 100 cm
CLOSE	5 TO 30 cm
VERY CLOSE	LESS THAN 5 cm

BEDDING

TERM	THICKNESS
VERY THICKLY BEDDED	> 1 m
THICKLY BEDDED	0.5 - 1 m
THINLY BEDDED	0.05 - 0.5 m
VERY THINLY BEDDED	10 - 50 mm
THICKLY LAMINATED	2.5 - 10 mm
THINLY LAMINATED	< 2.5 mm

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 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 10 CENTIMETERS 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) OF A 63.5 kg HAMMER FALLING 0.76 METERS REQUIRED TO PRODUCE A PENETRATION OF 30 cm INTO SOIL WITH A 5 cm OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS LESS THAN 2.5 cm PENETRATION WITH 50 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 10 CENTIMETERS DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.

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

BENCH MARK: BL-21 BL-PINC 6+14.813, 49.05m RT OF -Y1-

ELEVATION: 254.425m

NOTES:

REVISED 09/15/00

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

Michael F. Easley
GOVERNOR

P.O. BOX 25201, RALEIGH, N.C. 27611-5201

Lyndo Tippett
SECRETARY

August 17, 2004

STATE PROJECT: 34345.1.1 (R-0609IA)
F.A. PROJECT: MAF-F-119-1 (1)
COUNTY: Guilford

DESCRIPTION: US 311 High Point East Beltway from US 29-70 to I-85 north of Archdale

SUBJECT: Geotechnical Report – Structure No. 1 on -Y1- at Sta. 12+66.293 over US 311

Project Description

A three span bridge, 77 meters in length, is proposed on -Y1- (SR 1193) over proposed US 311. The project is located in Southwest Guilford County near High Point. The skew is 62° 33' 16".

The subsurface investigation was conducted during June of 2004 using an ATV-mounted CME 45C and B-55 drill machine. Two Standard Penetration Test borings were performed at each of the three proposed bent locations. All borings were advanced until weathered rock or crystalline rock was encountered. B1-A and EB2-A were cored using NXWL to recover samples from crystalline rock. Representative soil samples were obtained for visual classification in the field and selected samples were sent to the Materials and Test Unit for laboratory analysis.

Physiography and Geology

The project is located in gently rolling terrain of the Piedmont Physiographic Province. Geologically, the site is located within the Carolina Slate Belt and is underlain by meta-granite and Meta-diorite. The area consists of a mixture of wooded, homes and businesses.

Soil Properties

Soils encountered on the project site include roadway embankment and residual soils.

Roadway embankment soils were encountered in all but one of the borings (EB2-B) and range in thickness from 0.45 to 1.65 meters. These soils consist primarily of tan-orange, moist, very loose to medium dense, silty sand (A-2-4) and red-orange, moist, medium stiff, silty clay (A-7-5).

Residual soils were encountered in all of the borings and range in thickness from 0.57 to 3.48 meters. These soils consist primarily of brown to white, dry to moist, loose to medium dense, saprolitic, micaceous , silty sand (A-2-4). Cohesive soils consisted tan-orange, moist, medium stiff to stiff, micaceous, sandy silt (A-4) and tan-orange and orange, black and brown, moist, medium stiff to very stiff, micaceous, sandy and silty clay (A-6, A-7). Residual soils are derived from the underlying weathered rock.

Rock Properties

Weathered rock was derived from the underlying meta-granite and meta-diorite and ranges in thickness from 0.23 to 1.10 meters. The top of weathered rock was encountered at elevations ranging from 255.86 to 254.32 meters.

Crystalline rock was encountered at each boring location. The top of the crystalline rock ranges from 254.77 in B1-A to 253.13 in B1-B. Rock core was obtained from B1-A and EB2-A. The crystalline rock in B1-A consisted of a white, pink to gray, slightly to very severely weathered, fresh to moderately hard, closely fractured, meta-granite and a white to dark gray, fresh, hard to very hard, meta-diorite. The crystalline rock encountered in EB2-A consisted of an orange to white, fresh to slightly weathered, hard, moderate to closely fractured, meta-granite. Core recovery (REC) for the meta-granite ranged from 32 to 92 percent and rock quality designation (RQD) ranged from 9 to 61 percent. The core recovery for the meta-diorite was 76 percent and 63 percent rock quality designation (RQD).

Groundwater

Groundwater was encountered in three of the six borings. Groundwater elevations ranged from 255.12 to 254.86 meters.

Notice

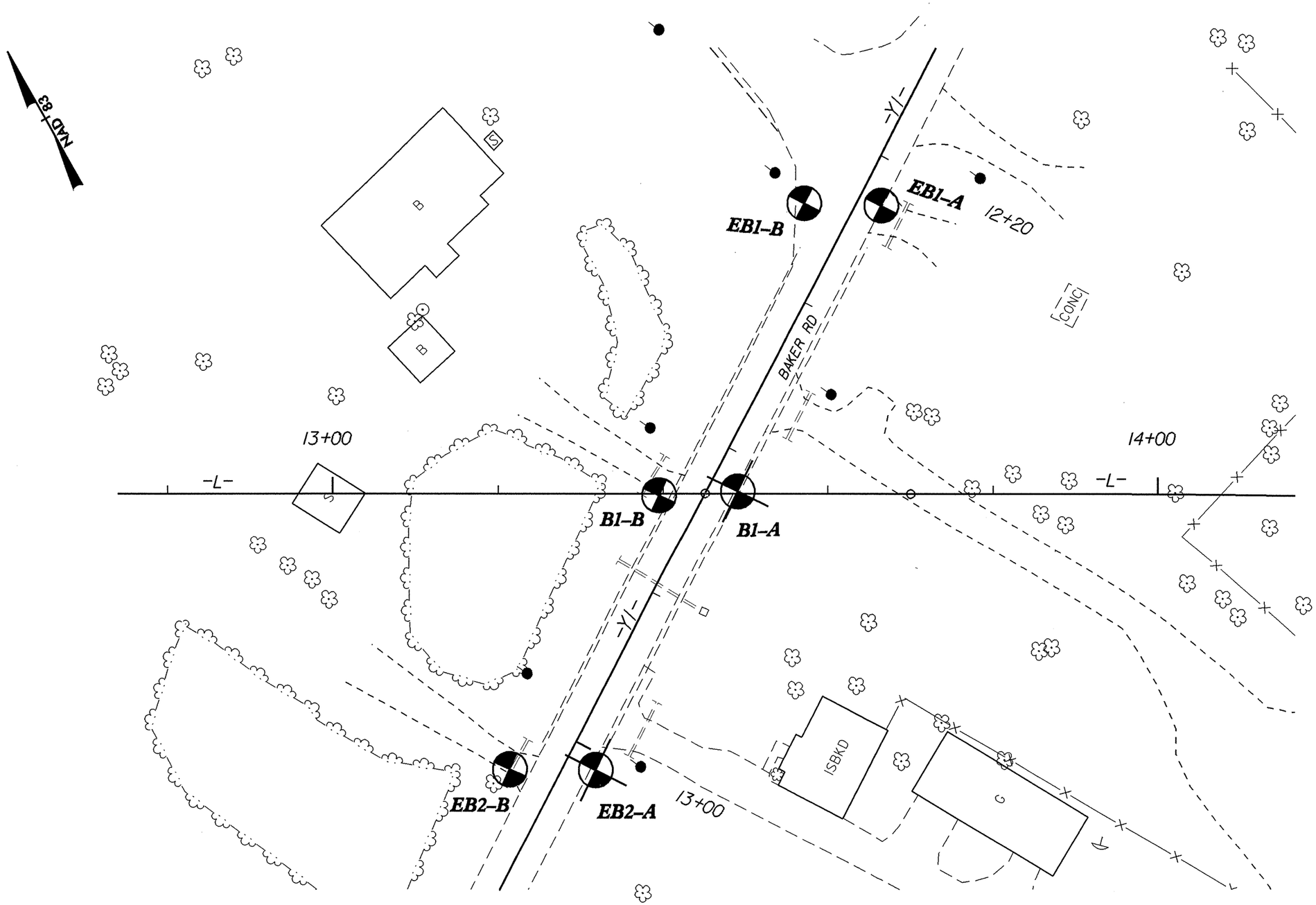
This Geotechnical foundation report is based on the Preliminary General Drawing for Structure No. 1, dated January 14, 2004. If significant changes are made in the design or location of the proposed structure, the subsurface information should be reviewed and modified as necessary.

Respectfully submitted,

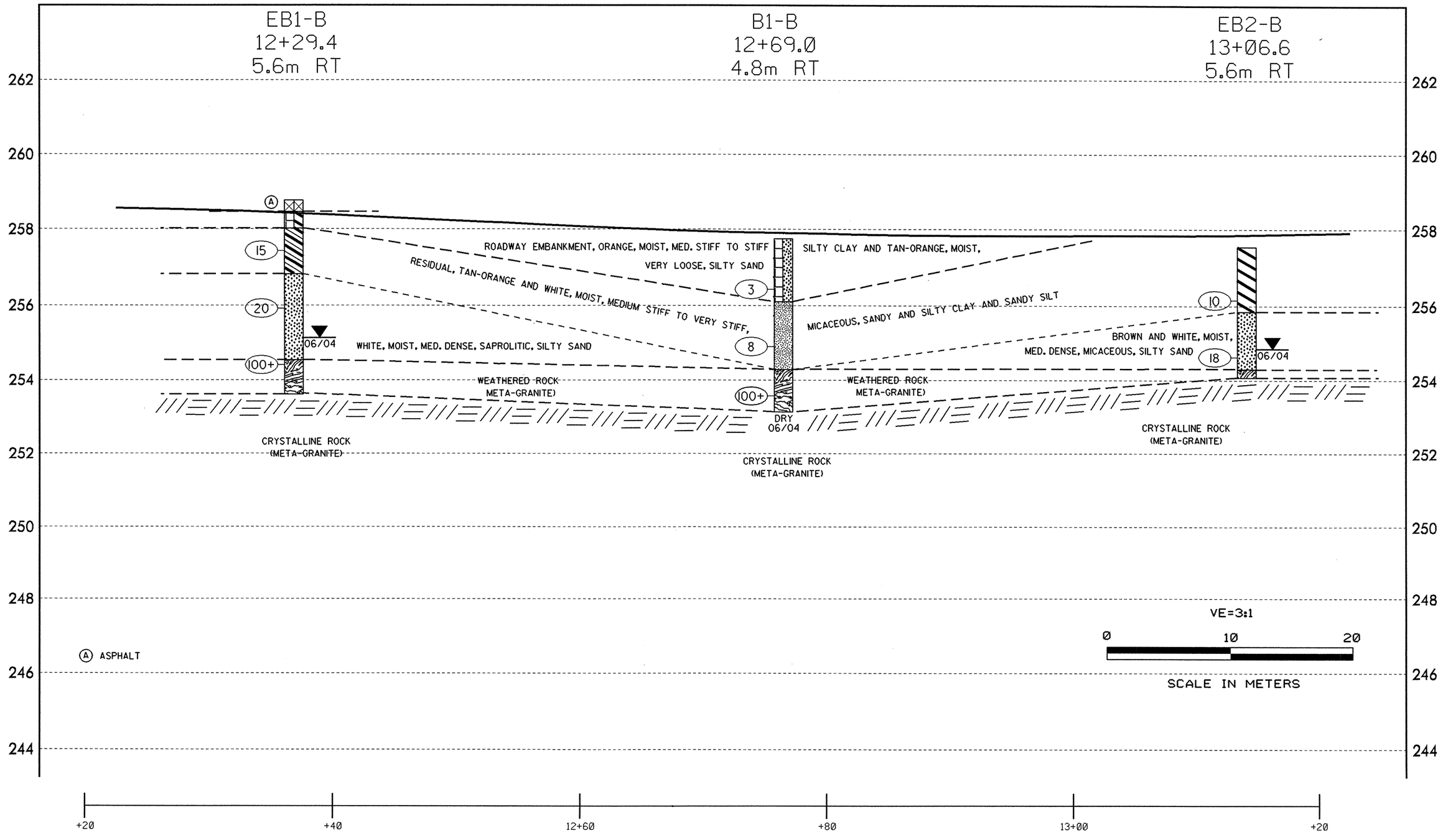
Jeffrey B. Barfield, LG
Project Geologist

METRIC	PROJECT REF. NO.	SHEET NO.	TOTAL SHEETS
	34345.1.1	4	15

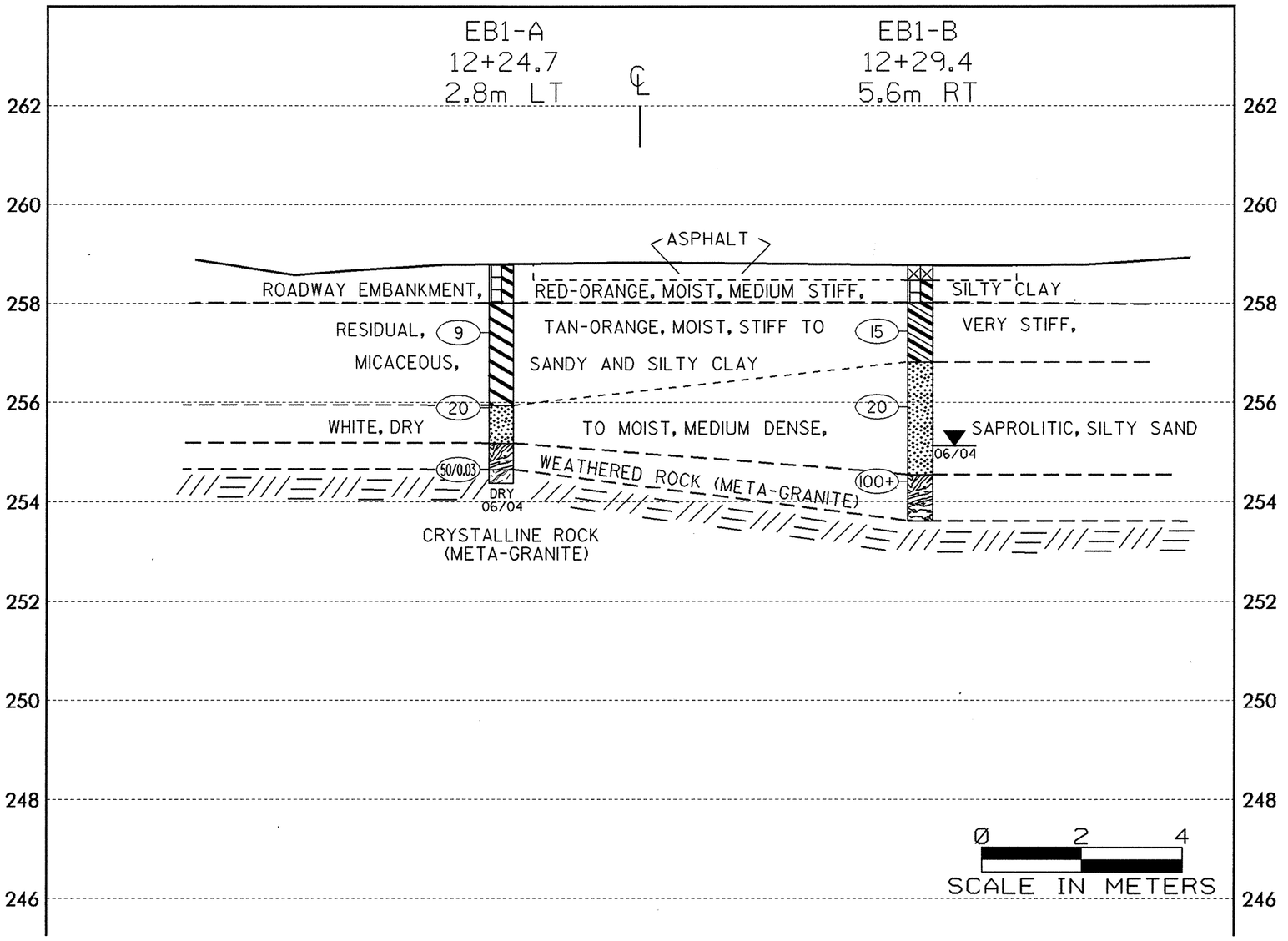
TEST SITE PLAN



PROFILE THROUGH BORINGS PROJECTED ALONG -YI-



CROSS SECTION THROUGH END BENT 1 STRUCTURE NO. 1, 34345.1.1 (R-0609IA)



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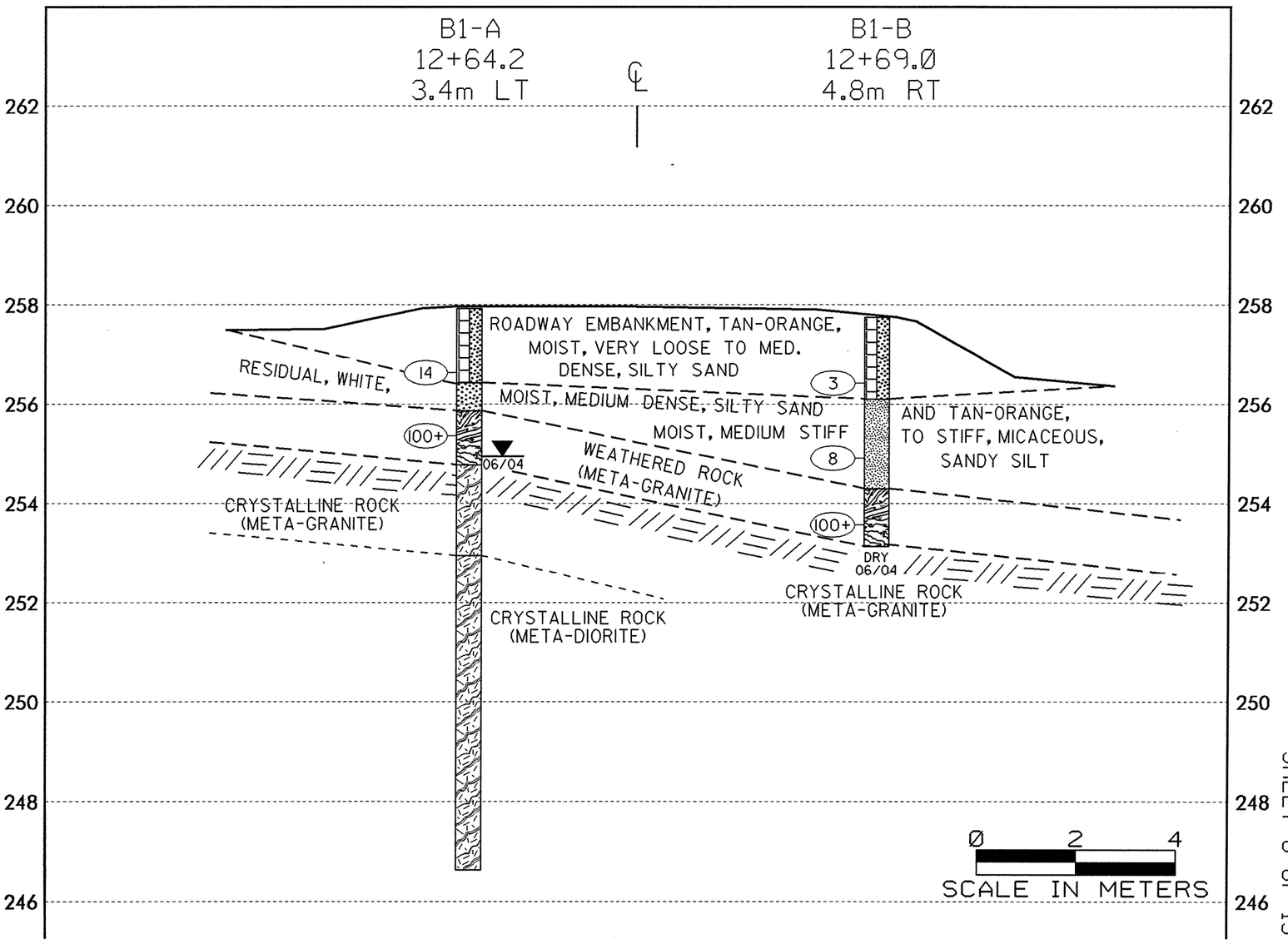
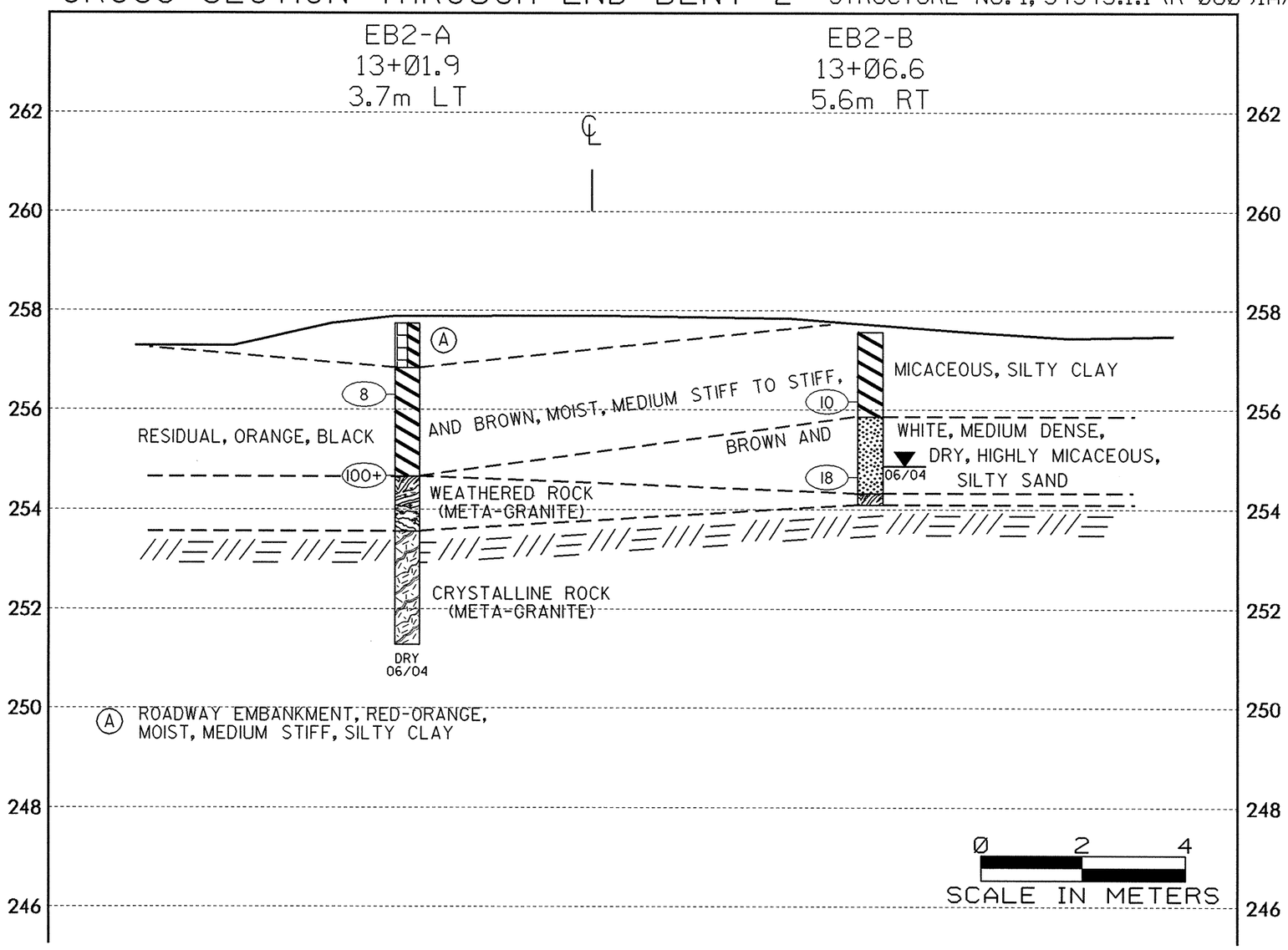


CROSS SECTION THROUGH END BENT 2

STRUCTURE NO. 1, 34345.1.1 (R-Ø6Ø9IA)



NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO. 34345.1.1	**ID.** R-0609IA	**COUNTY** GUILFORD	**GEOLOGIST** J.L. LOVE
SITE DESCRIPTION STRUCTURE NO. 1ON -Y1- SR 1193 (BAKER RD.) OVER -L- PROPOSED US 311			**GROUND WATER**
BORING NO. EBI-A	**BORING LOCATION** 12+24.7	**OFFSET** 2.8m LT	**ALIGNMENT** -Y1-	**0 HR.** DRY
COLLAR ELEV. 258.78m	**NORTHING** 243365.2	**EASTING** 522737.8		**24 HR.** DRY
TOTAL DEPTH 4.4Im	**DRILL MACHINE** CME-45	**DRILL METHOD** H. S. AUGERS	**HAMMER TYPE** MANUAL	
START DATE 6/8/04	**COMPLETION DATE** 6/8/04	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 4.4Im	

ELEV.	DEPTH	BLOW COUNT 15cm	15cm	15cm	PEN. (m)	BLOWS PER 30cm 0 25 50 75 100	SAMPLE NUMBER	MOI.	LOG	SOIL AND ROCK DESCRIPTION
258.78										
							S-5	M		ROADWAY EMBANKMENT, RED-ORANGE, SILTY CLAY
258.00	1.07	2	4	5	0.30	X 9	SS-6	M		
										RESIDUAL, TAN, SAPROLITIC, SILTY CLAY
						20 X				
256.00	2.59	9	11	9	0.30		SS-7			WHITE, SILTY SAND
	4.11	60			0.03	60/0.03 X				WEATHERED ROCK (META-GRANITE)
254.00						AUGER REFUSAL AT ELEVATION 254.37 METERS IN CRYSTALLINE ROCK (META-GRANITE)				CRYSTALLINE ROCK (META-GRANITE)
252.00										
250.00										
248.00										
246.00										
244.00										
242.00										
240.00										

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO. 34345.1.1	**ID.** R-0609IA	**COUNTY** GUILFORD	**GEOLOGIST** J.L. LOVE
SITE DESCRIPTION STRUCTURE NO. 1ON -Y1- SR 1193 (BAKER RD.) OVER -L- PROPOSED US 311			**GROUND WATER**
BORING NO. EBI-B	**BORING LOCATION** 12+29.4	**OFFSET** 5.6m RT	**ALIGNMENT** -Y1-	**0 HR.** DRY
COLLAR ELEV. 258.77m	**NORTHING** 243369.8	**EASTING** 522729.4		**24 HR.** 3.65m
TOTAL DEPTH 5.16m	**DRILL MACHINE** CME-45	**DRILL METHOD** H.S. AUGERS	**HAMMER TYPE** MANUAL	
START DATE 6/8/04	**COMPLETION DATE** 6/8/04	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 5.16m	

ELEV.	DEPTH	BLOW COUNT 15cm	15cm	15cm	PEN. (m)	BLOWS PER 30cm 0 25 50 75 100	SAMPLE NUMBER	MOI.	LOG	SOIL AND ROCK DESCRIPTION
258.77										
258.00	1.04	4	7	8	0.30	X 15	SS-8	M		ASPHALT
								M		ROADWAY EMBANKMENT, ORANGE, SILTY CLAY
										RESIDUAL, TAN-ORANGE, MICACEOUS SANDY CLAY
256.00	2.56	9	10	10	0.30	20 X		M		
								▼		WHITE, SAPROLITIC, SILTY SAND
	4.08	20	40	60	0.27	100+ X				WEATHERED ROCK (META-GRANITE)
254.00						AUGER REFUSAL AT ELEVATION 253.61 METERS ON CRYSTALLINE ROCK (META-GRANITE)				
252.00										
250.00										
248.00										
246.00										
244.00										
242.00										
240.00										

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO. 34345.1.1	**ID.** R-0609IA	**COUNTY** GUILFORD	**GEOLOGIST** J.L. LOVE
SITE DESCRIPTION STRUCTURE NO. 1 ON -Y1- SR 1193 (BAKER RD.) OVER -L- PROPOSED US 311			**GROUND WATER**
BORING NO. B1-A	**BORING LOCATION** 12+64.2	**OFFSET** 3.4m LT	**ALIGNMENT** -Y1-	**0 HR.** N/A
COLLAR ELEV. 257.93m	**NORTHING** 243343.4	**EASTING** 522705.0		**24 HR.** 2.99m
TOTAL DEPTH 11.30m	**DRILL MACHINE** CME-45	**DRILL METHOD** HSA/NW-CASING/NXWL	**HAMMER TYPE** MANUAL	
START DATE 6/8/04	**COMPLETION DATE** 6/9/04	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 3.16m	

ELEV.	DEPTH	BLOW COUNT 15cm 15cm 15cm	PEN. (m)	BLOWS PER 30cm (0 25 50 75 100)	SAMPLE NUMBER	MOI.	LOG	SOIL AND ROCK DESCRIPTION
257.93								
	1.00	10 7 7	0.30	14	M			ROADWAY EMBANKMENT, TAN-ORANGE, SILTY SAND WITH SOME GRAVEL
256.00					M			RESIDUAL, WHITE, SILTY SAND
	2.52	100	0.12	100+		▼		WEATHERED ROCK (META-GRANITE)
254.00								CRYSTALLINE ROCK (META-GRANITE)
								REC=32%, RQD=9%
252.00								(META-DIORITE)
250.00					RS-4			REC=76%, RQD=63%
248.00								
246.00				CORING TERMINATED AT ELEVATION 246.63 METERS IN CRYSTALLINE ROCK (META-DIORITE)				
244.00								
242.00								
240.00								
238.00								

CORE BORING REPORT

PROJECT: **34345.1.1** ID: **R-0609IA** COUNTY: **GUILFORD** BORING NO: **B1-A**

DESCRIPTION: STRUCTURE NO. 1 ON -Y1- SR 1193 OVER -L- PROPOSED US 311

LOCATION OF BORING: -Y1-, 12+64.2, 3.4m LT COMPLETION DATE: 6/9/04

COLLAR or GROUND ELEVATION: 257.93 m CORE SIZE: NXWL GEOLOGIST: J.L. LOVE

CORE EQUIPMENT: CME-45, NXWL, DRILLER: BRYAN SCHULL

ELEV (m)	DEPTH (m)	DRILL RATE (min/0.3m)	RUN (m)	REC (m) (%)	RQD (m) (%)	SAMPLE NUMBER	FIELD CLASSIFICATION and REMARKS
254.77	3.16	1:59					WHITE, SLIGHTLY WEATHERED, MODERATELY HARD, META-GRANITE
		1:17		0.11	0.00		ALL BUT 0.11m WASHED AWAY
		1:24	0.91				
				(12%)	(0%)		
253.86	4.07						
253.86	4.07	1:47					PINK-GRAY, FRESH, HARD, CLOSE FRACTURED, META-GRANITE,
		4:15		0.47	0.16		(4.55-4.98) SEVERELY WEATHERED, HIGHLY MICACEOUS
		4:52	0.91				
				(52%)	(18%)		
252.95	4.98						
252.95	4.98	20:00					DARK GRAY TO WHITE, FRESH, HARD, META-DIORITE
		8:30		0.77	0.27		
		14:50	1.52				
		13:55		(51%)	(18%)		
251.43	6.50	17:39					
251.43	6.50	20:00					WHITE, FRESH, HARD, META-DIORITE
		8:30		1.16	0.88		
		14:50	1.52				
		13:55		(76%)	(58%)		
249.91	8.02	17:39					
249.91	8.02	15:10					WHITE, FRESH, HARD, VERY THICKLY BEDDED, META-DIORITE
		12:15		1.40	1.40		
		8:22	1.52			RS-4	
		14:23		(92%)	(92%)		
248.39	9.54	21:20					
248.39	9.54	9:40					WHITE AND DARK GRAY, FRESH, VERY HARD, VERY THICKLY BEDDED, META-DIORITE
		10:32		1.40	1.40		
		18:29	1.52				
		19:38		(92%)	(92%)		
246.87	11.06	29:42					
246.87	11.06	45:49/0.24					WHITE, FRESH, VERY HARD, META-DIORITE
				0.10	0.00		
			0.24				
				(42%)	(0%)		
246.63	11.30						
							BOREHOLE TERMINATED AT ELEVATION OF 246.63 METERS, IN META-DIORITE.

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO. 34345.1.1	**ID.** R-0609IA	**COUNTY** GUILFORD	**GEOLOGIST** J.L. LOVE
SITE DESCRIPTION STRUCTURE NO.1 ON -Yl- SR 1193 (BAKER RD.) OVER -L- PROPOSED US 311			**GROUND WATER**
BORING NO. BI-B	**BORING LOCATION** 12+69.0	**OFFSET** 4.8m RT	**ALIGNMENT** -Yl-	**0 HR.** DRY
COLLAR ELEV. 257.75m	**NORTHING** 243347.7	**EASTING** 522696.5		**24 HR.** DRY
TOTAL DEPTH 4.62m	**DRILL MACHINE** CME-45	**DRILL METHOD** H.S. AUGERS	**HAMMER TYPE** MANUAL	
START DATE 6/7/04	**COMPLETION DATE** 6/7/04	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 4.62m	

ELEV.	DEPTH	BLOW COUNT 15cm	15cm	15cm	PEN. (m)	BLOWS PER 30cm 0 25 50 75 100	SAMPLE NUMBER	▼ MOI.	LOG	SOIL AND ROCK DESCRIPTION
257.75										
	1.03	2	2	1	0.30	X 3	SS-3	M		ROADWAY EMBANKMENT, TAN-ORANGE, SILTY SAND
256.00										
	2.55	4	4	4	0.30	X 8	SS-4	M		RESIDUAL, TAN-ORANGE, MICACEOUS, SANDY SILT
254.00										
	4.07	14	86		0.23	100+ X				WEATHERED ROCK (META-DIORITE)
252.00						AUGER REFUSAL AT ELEVATION 253.13 METERS ON CRYSTALLINE ROCK (META-DIORITE)				
250.00										
248.00										
246.00										
244.00										
242.00										
240.00										
238.00										

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO. 34345.1.1	**ID.** R-0609IA	**COUNTY** GUILFORD	**GEOLOGIST** J.L. LOVE
SITE DESCRIPTION STRUCTURE NO. 1 ON -Y1- SR 1193 (BAKER RD.) OVER -L- PROPOSED US 311			**GROUND WATER**
BORING NO. EB2-A	**BORING LOCATION** 13+01.9	**OFFSET** 3.7m LT	**ALIGNMENT** -Y1- / **0 HR.** N/A
COLLAR ELEV. 257.74m	**NORTHING** 243322.8	**EASTING** 522673.4	**24 HR.** FIAD
TOTAL DEPTH 6.46m	**DRILL MACHINE** MOBILE 55	**DRILL METHOD** HSA/NW-CASING/NXWL	**HAMMER TYPE** MANUAL
START DATE 6/10/04	**COMPLETION DATE** 6/10/04	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 4.18m

ELEV.	DEPTH	BLOW COUNT 15cm	15cm	15cm	PEN. (m)	BLOWS PER 30cm (0 25 50 75 100)	SAMPLE NUMBER	MOI.	SOIL AND ROCK DESCRIPTION
257.74								M	ROADWAY EMBANKMENT, RED-ORANGE, SILTY CLAY
	1.14	4	4	4	0.30	8	SS-9	M	RESIDUAL, ORANGE AND BLACK AND BROWN, SAPROLITIC, MICACEOUS, SILTY CLAY
256.00									
	2.78	8	8	92	0.29	100+		M	
254.00									WEATHERED ROCK (META-GRANITE)
							RS-5		CRYSTALLINE ROCK (META-GRANITE) REC=92%, RQD=61%
252.00									
250.00						CORING TERMINATED AT ELEVATION 251.28 METERS IN CRYSTALLINE ROCK (META-GRANITE)			
248.00									
246.00									
244.00									
242.00									
240.00									
238.00									

CORE BORING REPORT

PROJECT: 34345.1.1 ID: R-0609IA COUNTY: GUILFORD BORING NO: EB2-A

DESCRIPTION:

LOCATION OF BORING: -Y1-, 13+01.9, 3.7m LT COMPLETION DATE: 6/10/04

COLLAR or GROUND ELEVATION: 257.74 m CORE SIZE: NXWL GEOLOGIST: J.L. LOVE

CORE EQUIPMENT: CME-45, NXWL, DRILLER: BRYAN SCHULL

ELEV (m)	DEPTH (m)	DRILL RATE (min/0.3m)	RUN (m)	REC (m) (%)	RQD (m) (%)	SAMPLE NUMBER	FIELD CLASSIFICATION and REMARKS
253.56	4.18	7:47					ORANGE AND WHITE, FRESH TO SLIGHTLY WEATHERED, HARD, CLOSELY FRACTURED,
		3:14		0.60	0.00		THICKLY BEDDED, META-GRANITE, SEVERELY WEATHERED ZONE WASHED AWAY (4.70-4.79m)
		2:50/0.15	0.76			RS-5	ONE HORIZONTAL FRACTURE, THREE @ 50 DEGREES,
				(79%)	(0%)		
252.80	4.94						
252.80	4.94	1:38					WHITE, FRESH, HARD, MODERATELY CLOSE FRACTURES, THICKLY BEDDED META-GRANITE
		4:50		1.49	1.01		
		4:34	1.52				
		4:38		(98%)	(66%)		
251.28	6.46	4:27					

BOREHOLE TERMINATED AT ELEVATION OF 251.28 METERS, IN META-GRANITE.

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO. 34345.1.1	**ID.** R-0609IA	**COUNTY** GUILFORD	**GEOLOGIST** J.L. LOVE
SITE DESCRIPTION STRUCTURE NO.1ON -Y1- SR 1193 (BAKER RD.) OVER -L- PROPOSED US 311			**GROUND WATER**
BORING NO. EB2-B	**BORING LOCATION** 13+06.6	**OFFSET** 5.6m RT	**ALIGNMENT** -Y1-	**0 HR.** 2.20m
COLLAR ELEV. 257.56m	**NORTHING** 243328.1	**EASTING** 522664.4		**24 HR.** 2.70m
TOTAL DEPTH 3.47m	**DRILL MACHINE** CME-45	**DRILL METHOD** H. S. Augers	**HAMMER TYPE** MANUAL	
START DATE 6/7/04	**COMPLETION DATE** 6/7/04	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 3.47m	

ELEV.	DEPTH	BLOW COUNT 15cm	15cm	15cm	PEN. (m)	BLOWS PER 30cm 0 25 50 75 100	SAMPLE NUMBER	MOI.	LOG	SOIL AND ROCK DESCRIPTION
257.56										
	1.10	3	4	6	0.30	X 10	SS-1	M		RESIDUAL, ORANGE AND WHITE, SILTY CLAY WITH SOME MICA
256.00	2.62	9	12	6	0.30	X 18	SS-2	D		BROWN AND WHITE, SILTY SAND HIGHLY MICACEOUS
254.00						AUGER REFUSAL AT ELEVATION 254.09 METERS ON CRYSTALLINE ROCK (META-GRANITE)				WEATHERED ROCK (META-GRANITE)
252.00										
250.00										
248.00										
246.00										
244.00										
242.00										
240.00										
238.00										

PROJ. NO. - 34345.1.1
ID NO. -R-0609IA
COUNTY - GUILFORD
STRUCTURE NO. 1

EB1-A

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			%	%
							C.SAND	F.SAND	SILT	CLAY	10	40	200	MOISTURE	ORGANIC
S-5	**2.8m LT**	**12+24.7**	**0.00-0.77**	**A-7-5(66)**	**91**	**57**	**1.6**	**3.7**	**23.6**	**71.1**	**100**	**99**	**96**	**-**	**-**
SS-6	**2.8m LT**	**12+24.7**	**1.07-1.52**	**A-7-5(22)**	**57**	**18**	**0.6**	**14.6**	**50.2**	**34.6**	**100**	**100**	**92**	**-**	**-**
SS-7	**2.8m LT**	**12+24.7**	**2.84-3.04**	**A-2-4(0)**	**26**	**NP**	**41.3**	**29.7**	**2.6**	**26.4**	**97**	**71**	**34**	**-**	**-**

EB1-B

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			%	%
							C.SAND	F.SAND	SILT	CLAY	10	40	200	MOISTURE	ORGANIC
SS-8	**5.6m RT**	**12+29.4**	**1.04-1.49**	**A-6(4)**	**36**	**14**	**18.9**	**37.0**	**15.7**	**28.5**	**100**	**92**	**50**	**-**	**-**

B1-B

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			%	%
							C.SAND	F.SAND	SILT	CLAY	10	40	200	MOISTURE	ORGANIC
SS-3	**4.8m RT**	**12+69.0**	**1.03-1.48**	**A-2-4(0)**	**22**	**5**	**29.1**	**40.7**	**10.0**	**20.3**	**93**	**81**	**34**	**-**	**-**
SS-4	**4.8m RT**	**12+69.0**	**2.55-3.00**	**A-4(2)**	**36**	**4**	**11.4**	**37.4**	**28.9**	**22.4**	**100**	**96**	**61**	**-**	**-**

EB2-A

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			%	%
							C.SAND	F.SAND	SILT	CLAY	10	40	200	MOISTURE	ORGANIC
SS-9	**3.7m LT**	**13+01.9**	**1.14-1.59**	**A-7-5(15)**	**51**	**17**	**0.8**	**30.7**	**40.2**	**28.3**	**100**	**100**	**77**	**-**	**-**

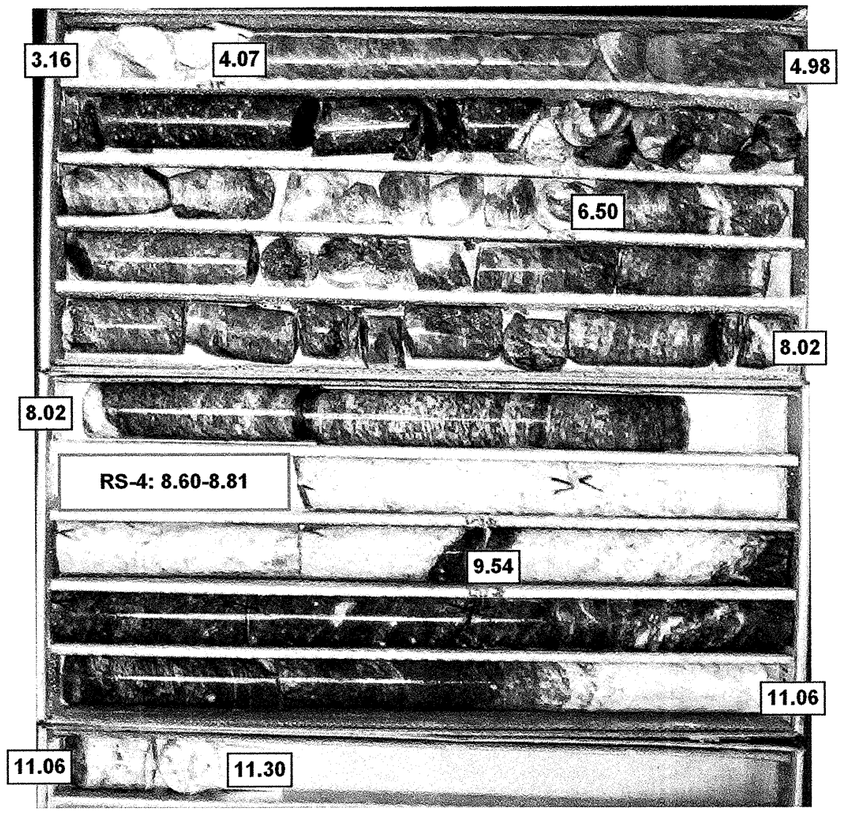
EB2-B

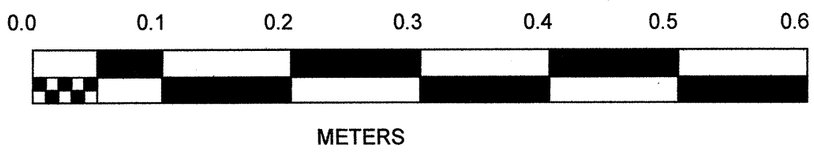
SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			%	%
							C.SAND	F.SAND	SILT	CLAY	10	40	200	MOISTURE	ORGANIC
SS-1	**5.6m RT**	**13+06.6**	**1.10-1.55**	**A-7-6(13)**	**49**	**20**	**13.8**	**28.7**	**27.0**	**30.5**	**100**	**92**	**66**	**-**	**-**
SS-2	**5.6m RT**	**13+06.6**	**2.62-3.07**	**A-2-4(0)**	**27**	**NP**	**39.8**	**33.9**	**16.1**	**10.2**	**98**	**75**	**32**	**-**	**-**

CORE PHOTOGRAPHS
B1-A

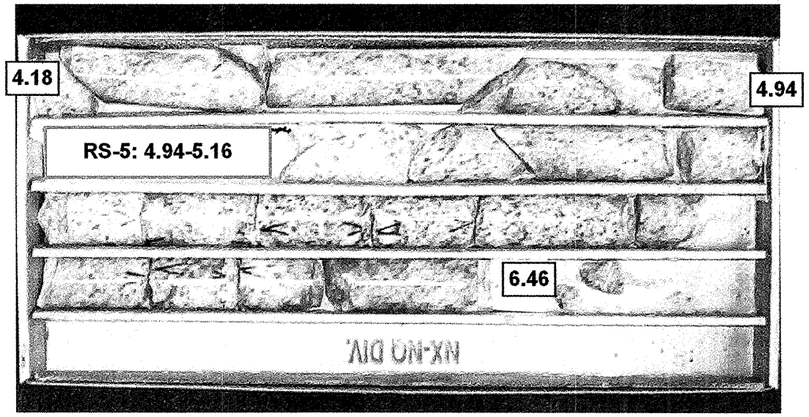
BOXES 1, 2 & 3: 3.16 - 11.30 METERS

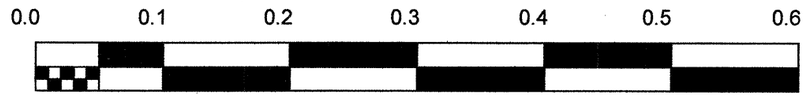




CORE PHOTOGRAPHS
EB2-A

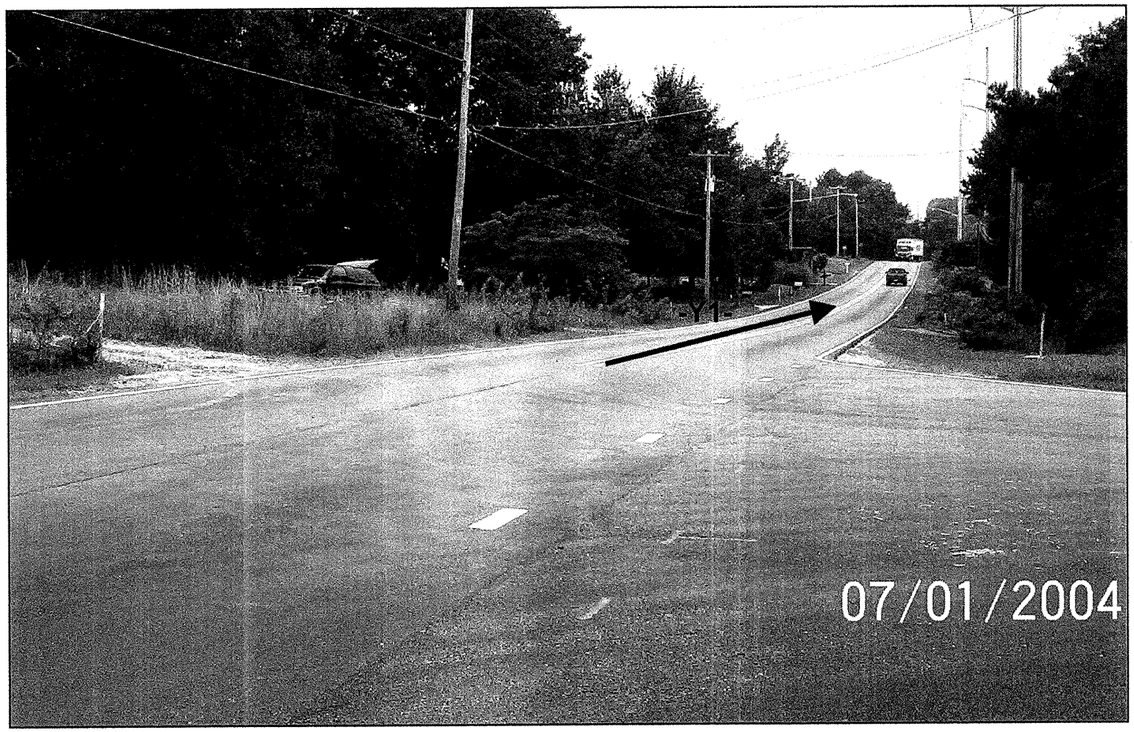
BOX 1: 4.18 - 6.46 METERS





STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	34345.1.1(R-0609IA)	15	15

SITE PHOTOGRAPH



PROJECT: 34345.1.1 ID. R-0609IA

STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

GEOTECHNICAL UNIT

STRUCTURE SUBSURFACE INVESTIGATION

STATE PROJECT 34345.1.1 I.D. NO. R-0609IA

F.A. PROJECT

COUNTY GUILFORD

PROJECT DESCRIPTION US 311 HIGH POINT EAST BELTWAY FROM US 29-70 TO NORTH OF NC 62 NORTH OF ARCHDALE

SITE DESCRIPTION BRIDGE ON SR 1158 (-Y2-) OVER US 311 AND MILE BRANCH

INVENTORY

METRIC

ALL DIMENSIONS ARE IN METERS AND /OR MILLIMETERS UNLESS OTHERWISE NOTED

STATE	STATE PROJECT REFERENCE NO.		SHEET NO.	TOTAL SHEETS
N.C.	R-0609IA		1	19
STATE PROJ. NO.	P.A. PROJ. NO.		DESCRIPTION	
34345.1.1			P.E.	
			CONST.	

CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WAS 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 UNIT @ (919) 250-4088. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA IS PART OF THE CONTRACT.

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THE BIDDER OR CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE PLANS ARE PRELIMINARY ONLY AND IN MANY CASES THE FINAL DESIGN DETAILS ARE DIFFERENT. FOR BIDDING AND CONSTRUCTION PURPOSES, REFER TO THE CONSTRUCTION PLANS AND DOCUMENTS FOR FINAL DESIGN INFORMATION ON THIS PROJECT. THE DEPARTMENT DOES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOR THE INTERPRETATIONS MADE OR OPINION OF THE DEPARTMENT AS TO THE TYPE OF MATERIALS AND CONDITIONS TO BE ENCOUNTERED. THE BIDDER OR CONTRACTOR IS CAUTIONED TO MAKE SUCH INDEPENDENT SUBSURFACE INVESTIGATIONS AS HE DEEMS NECESSARY TO SATISFY HIMSELF AS TO CONDITIONS TO BE ENCOUNTERED ON 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.

INVESTIGATED BY J.E. BEVERLY PERSONNEL R.W. TODD

CHECKED BY C.B. LITTLE R.S. HINSON

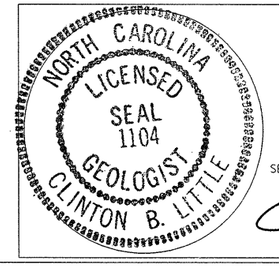
SUBMITTED BY C.B. LITTLE M.L. SMITH

DATE OCTOBER 2004

DRAWN BY: J.K. McCLURE

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.



SEAL 10-20-04

SIGNATURE

ID	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
R-0609IA	34345.1.1	2	19

METRIC

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

GEOTECHNICAL UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION

SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED OR WEATHERED EARTH MATERIALS WHICH CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND WHICH YIELDS LESS THAN 100 BLOWS PER 30 cm 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 PLASTIC INDEX	6 MX		N.P.	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS
GROUP INDEX	0		0	0		4 MX		8 MX	12 MX	16 MX	No MX			
USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS. GRAVEL AND SAND		FINE SAND	SILTY OR CLAYEY GRAVEL AND SAND				SILTY SOILS		CLAYEY SOILS				
GEN. RATING AS A SUBGRADE	EXCELLENT TO GOOD							FAIR TO POOR				FAIR TO POOR	POOR	UNSUITABLE

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

CONSISTENCY OR DENSENESS

PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTENCE (N-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH (kN/m^2)
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE	<4 4 TO 10 10 TO 30 30 TO 50 >50	N/A
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD	<2 2 TO 4 4 TO 8 8 TO 15 15 TO 30 >30	<25 25 TO 50 50 TO 100 100 TO 200 200 TO 400 >400

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 CPT DPT DMT VST PMT - TEST BORING
- AUGER BORING
- CORE BORING
- MW - MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- SPT N-VALUE
- (REF) - SPT REFUSAL

SAMPLE DESIGNATIONS

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

ABBREVIATIONS

AR - AUGER REFUSAL
BT - BORING TERMINATED
CL. - CLAY
CPT - CONE PENETRATION TEST
CSE. - COARSE
DMT - DILATOMETER TEST
DPT - DYNAMIC PENETRATION TEST
e - VOID RATIO
F. - FINE
FOSS. - FOSSILIFEROUS
FRAC. - FRACTURED
FRAGS. - FRAGMENTS
MED. - MEDIUM
PMT - PRESSUREMETER TEST
SD. - SAND, SANDY
SL. - SILT, SILTY
SLI. - SLIGHTLY
TCR - TRICONE REFUSAL
γ - UNIT WEIGHT
γ_d - DRY UNIT WEIGHT
W - MOISTURE CONTENT
V. - VERY
VST - VANE SHEAR TEST

EQUIPMENT USED ON SUBJECT PROJECT

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

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 152 mm CONTINUOUS FLIGHT AUGER
- [X] 203 mm HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [X] TUNG.-CARBIDE INSERTS
- [X] CASING [X] W/ ADVANCER
- [ ] TRICONE _____ mm STEEL TEETH
- [X] TRICONE 74.613 mm TUNG.-CARB.
- [ ] CORE BIT
- [ ] OTHER _____

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

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

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

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WHEN TESTED, WOULD YIELD SPT REFUSAL. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 2.5 cm PER 50 BLOWS. IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK.
ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLOWS:

WEATHERED ROCK (WR)	NON-COASTAL PLAIN MATERIAL THAT YIELDS SPT N VALUES > 100 BLOWS PER 30 cm.
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 2.5 cm. 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 BLOWS PER 30 cm,*
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 BLOWS PER 30 cm.*
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 6 mm 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 1 mm DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PIECES 25 mm 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 CENTIMETERS 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 25 mm OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.

FRACTURE SPACING

TERM	SPACING
VERY WIDE	MORE THAN 3 m
WIDE	1 TO 3 m
MODERATELY CLOSE	30 TO 100 cm
CLOSE	5 TO 30 cm
VERY CLOSE	LESS THAN 5 cm

BEDDING

TERM	THICKNESS
VERY THICKLY BEDDED	> 1 m
THICKLY BEDDED	0.5 - 1 m
THINLY BEDDED	0.05 - 0.5 m
VERY THINLY BEDDED	10 - 50 mm
THICKLY LAMINATED	2.5 - 10 mm
THINLY LAMINATED	< 2.5 mm

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 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 10 CENTIMETERS 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) OF A 63.5 kg HAMMER FALLING 0.76 METERS REQUIRED TO PRODUCE A PENETRATION OF 30 cm INTO SOIL WITH A 5 cm OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS LESS THAN 2.5 cm PENETRATION WITH 50 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 10 CENTIMETERS DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.

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

BENCH MARK: BL-36
BL-PINC 22+41.117
ELEVATION: 236.102

NOTES:

REVISED 09/15/00

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

MICHAEL F. EASLEY
GOVERNOR

P.O. BOX 25201, RALEIGH, N.C. 27611-5201

LYNDO TIPPETT
SECRETARY

October 13, 2004

STATE PROJECT: 34345.1.1 (R-0609IA)
COUNTY: Guilford
DESCRIPTION: Bridge on SR 1158 (-Y2-) over US 311 and Mile Branch

SUBJECT: Geotechnical Report – Bridge Foundation Investigation

This is a proposed 2 lane structure on new location over US 311 and Mile Branch. The proposed structure is a 3 span 7.2 meter wide steel girder bridge on a 95° skew angle. Span lengths are proposed at 31.484, 38.516, and 40.00 meters respectfully.

Foundation test borings were advanced with a CME-550X drill machine utilizing hollow stem augers, NW Casing, NXWL, and Tri-cone roller bit. This drill machine is equipped with an automatic drop hammer. The field investigation for this project was conducted the latter part of July through first of August 2004.

Physiography/Geology

The project area is located in Guilford County in the northern-central piedmont region of North Carolina. The site topography in the vicinity of Mile Branch is flat to gently sloping and the area is surrounded by a combination of woods and residential structures.

Geologically this site is part of the Carolina Slate Belt and is underlain by granitic and meta-granitic rock types.

Site specific soils encountered during this investigation consist mostly of residual soils, however roadway fill associated with Jackson Lake Rd. (SR 1158) was encountered at End Bent 2. Residual soils consist predominantly of sandy silt (A-4), but clay (A-7-6), and sand (A-2-4) are also present. Roadway fill soil is made up of sandy silt (A-4). Weathered and/or hard rock was encountered below residual soil at all boring locations.

Foundation Materials

End Bent 1:
This bent location lies to the north of the proposed -L- alignment. Only one boring was performed for this bent location due to utilities at a property owner's home. The boring encountered 4.0 meters of residual brown-tan-gray hard clayey sandy silt (A-4) overlying 1.5 meters of weathered rock. The weathered rock horizon occurs at approximate elevation 230.7 meters with hard rock occurring below weathered rock at elevation 229.3 meters.

Bent 1:
The two borings performed for this bent location fall on or very near the proposed -L- centerline. Borings encountered 5.5 to 5.7 meters of residual brown-tan-gray hard clayey sandy silt (A-4) overlying weathered rock and then hard rock. Hard rock was cored at each boring location for evaluation purposes and determined to be meta-granite. Weathered and hard rock elevations for this bent are as follows:

Boring Location	Weathered Rock (meters)	Hard Rock (meters)
B1-A	227.25	226.45
B1-B	227.63	224.46

Bent 2:
Each of the two boring performed at this bent location fall north of Mile Branch and south of proposed -L-. Borings encountered approximately 1 to 2.8 meters of residual tan-brown-white hard sandy silt (A-4) overlying weathered and / or hard rock. Hard rock was cored at each boring location for evaluation purposes and determined to be meta-granite. Weathered and hard rock elevations for this bent are as follows:

Boring Location	Weathered Rock (meters)	Hard Rock (meters)
B2-A	N/A	225.47
B2-B	224.20	224.17

End Bent 2:
Two borings performed for this bent location are south of Mile Branch. Boring EB2-A encountered 2.65 meters of residual soil overlying weathered rock. Residual soil at this boring location consists of red-brown medium stiff silty sandy clay (A-7-6) and gray-white medium stiff to hard clayey sandy silt (A-4). Boring EB2-B encountered 2.5 meters of roadway fill soil overlying 0.66 meters of residual soil, followed by weathered rock. Roadway fill consists of 2.5 meters of brown medium stiff clayey sandy silt (A-4) and residual soil consists of gray-brown-tan very dense silty sand (A-2-4). Each boring for this bent location achieved auger refusal on hard rock. Weathered and hard rock elevations for this bent are as follows:

Boring Location	Weathered Rock (meters)	Hard Rock (meters)
EB2-A	225.13	224.47
EB2-B	224.69	223.70

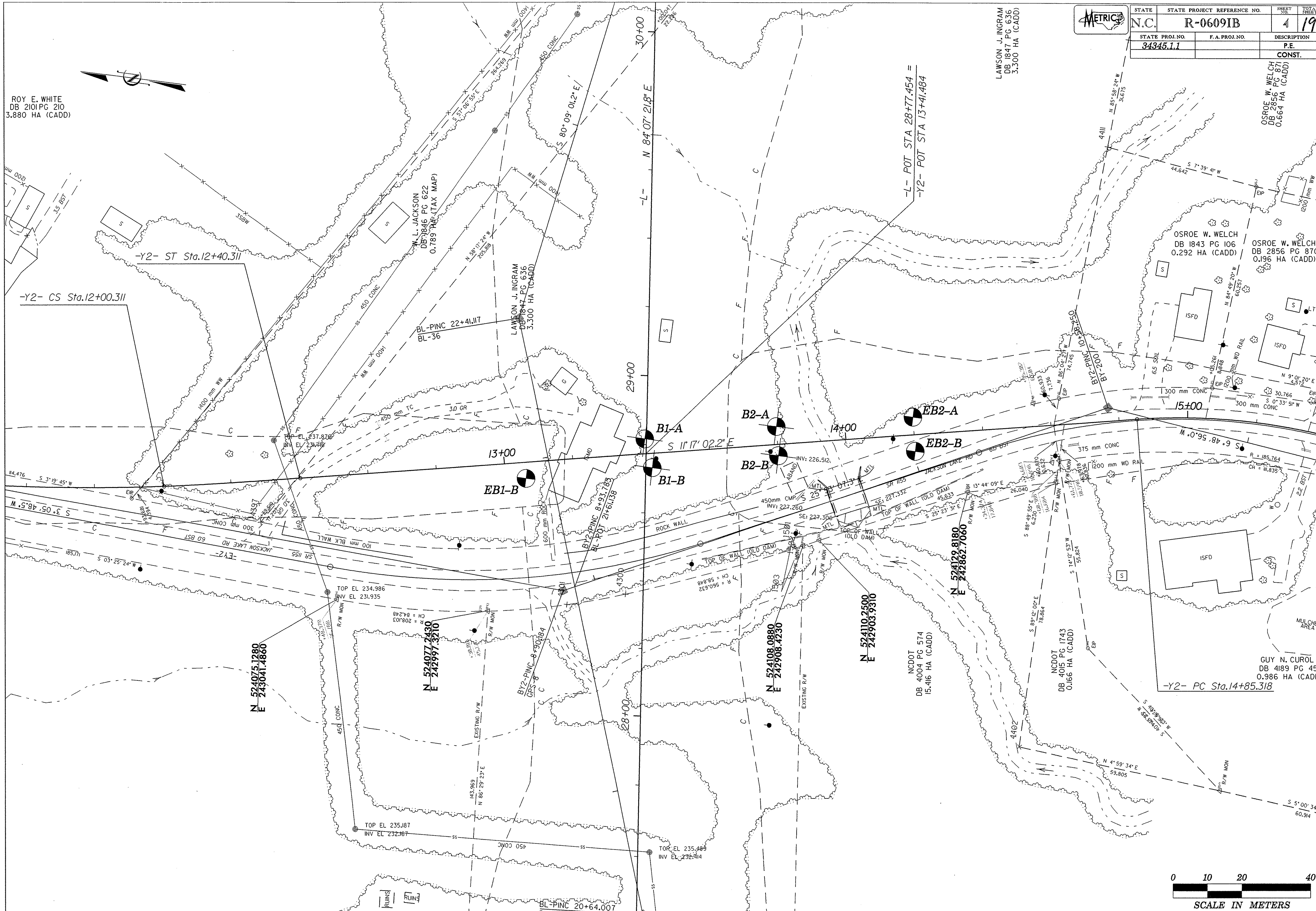
Groundwater

Groundwater measurements taken more than 24 hours after each boring was performed indicate a static groundwater table between elevation 223.4 and 226.9 meters.

Respectfully submitted,

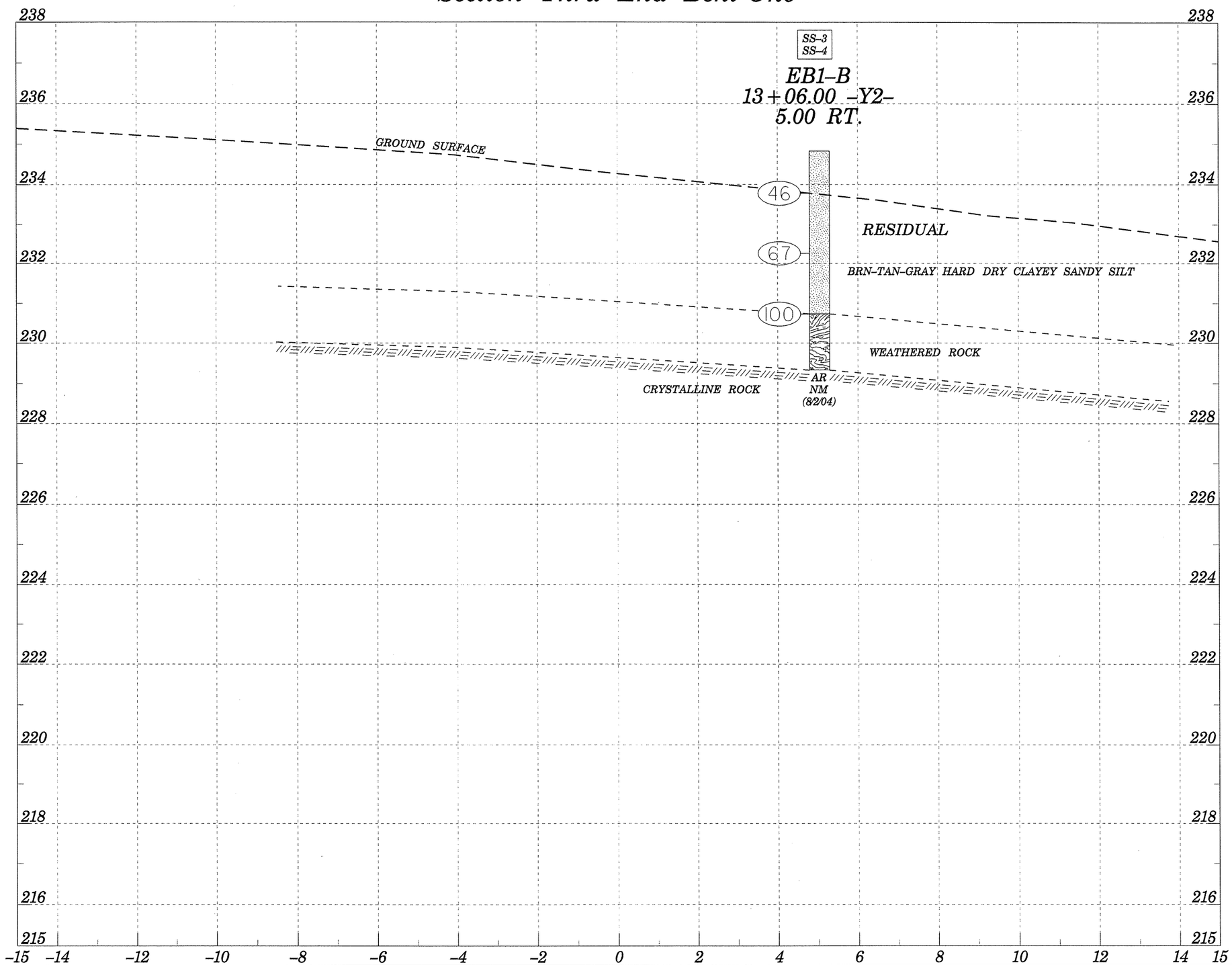
J.E. Beverly, Project Geologist

J E Beverly


STATE
N.C.
STATE PROJECT REFERENCE NO.
R-0609IB
SHEET NO. 4
TOTAL SHEETS 19
STATE PROJ. NO.
34345.1.1
F. A. PROJ. NO.
DESCRIPTION
P.E.
CONST.
METRIC
ROY E. WHITE
DB 2101 PG 210
3.880 HA (CADD)
W. L. JACKSON
DB 1846 PG 622
0.789 HA (TAX MAP)
LAWSON J. INGRAM
DB 1847 PG 636
3.300 HA (CADD)
OSROE W. WELCH
DB 2856 PG 871
0.664 HA (CADD)
OSROE W. WELCH
DB 1843 PG 106
0.292 HA (CADD)
OSROE W. WELCH
DB 2856 PG 870
0.196 HA (CADD)
NCDOT
DB 4004 PG 574
15.416 HA (CADD)
NCDOT
DB 4015 PG 1743
0.166 HA (CADD)
GUY N. CUROL
DB 4189 PG 457
0.986 HA (CADD)
-Y2- ST Sta.12+40.311
-Y2- CS Sta.12+00.311
-Y2- PC Sta.14+85.318
-L- POT STA 28+77.454 =
-Y2- POT STA 13+41.484
-L- N 84° 07' 21.8" E
S 80° 09' 01.2" E
S 11° 17' 02.2" E
BL-PINC 22+41.117
BL-36
BL-PINC 20+64.007
BL-35
BY2-PINC 8+93.783
BL-POT 21+61.138
BY2-PINC 8+90.384
BY2-PINC 10+58.250
BY2-200
B1-A
B1-B
B2-A
B2-B
EB1-B
EB2-A
EB2-B
13+00
14+00
15+00
28+00
29+00
30+00
JACKSON LAKE RD
SR 1155
-EY2-
ROCK WALL
TOP OF WALL (OLD DAM)
100 mm BLK WALL
450mm CMP
TOP EL 237.876
INV EL 234.917
TOP EL 234.986
INV EL 231.935
TOP EL 235.187
INV EL 232.167
TOP EL 235.489
INV EL 232.414
N 524075.1280
E 243041.4860
N 524077.2430
E 242997.3210
N 524108.0880
E 242908.4230
N 524110.2500
E 242903.9310
N 524129.8180
E 242862.7060
EXISTING R/W
R/W MON
450 CONC
1400 mm WW
1200 mm WD RAIL
375 mm CONC
300 mm CONC
ISFD
MULCHED AREA
RUINS
0 10 20 40
SCALE IN METERS

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-0609IA	5	19
STATE PROJ. NO.	F. A. PROJ. NO.	DESCRIPTION	
34345.1.1		P.E.	
		CONST.	

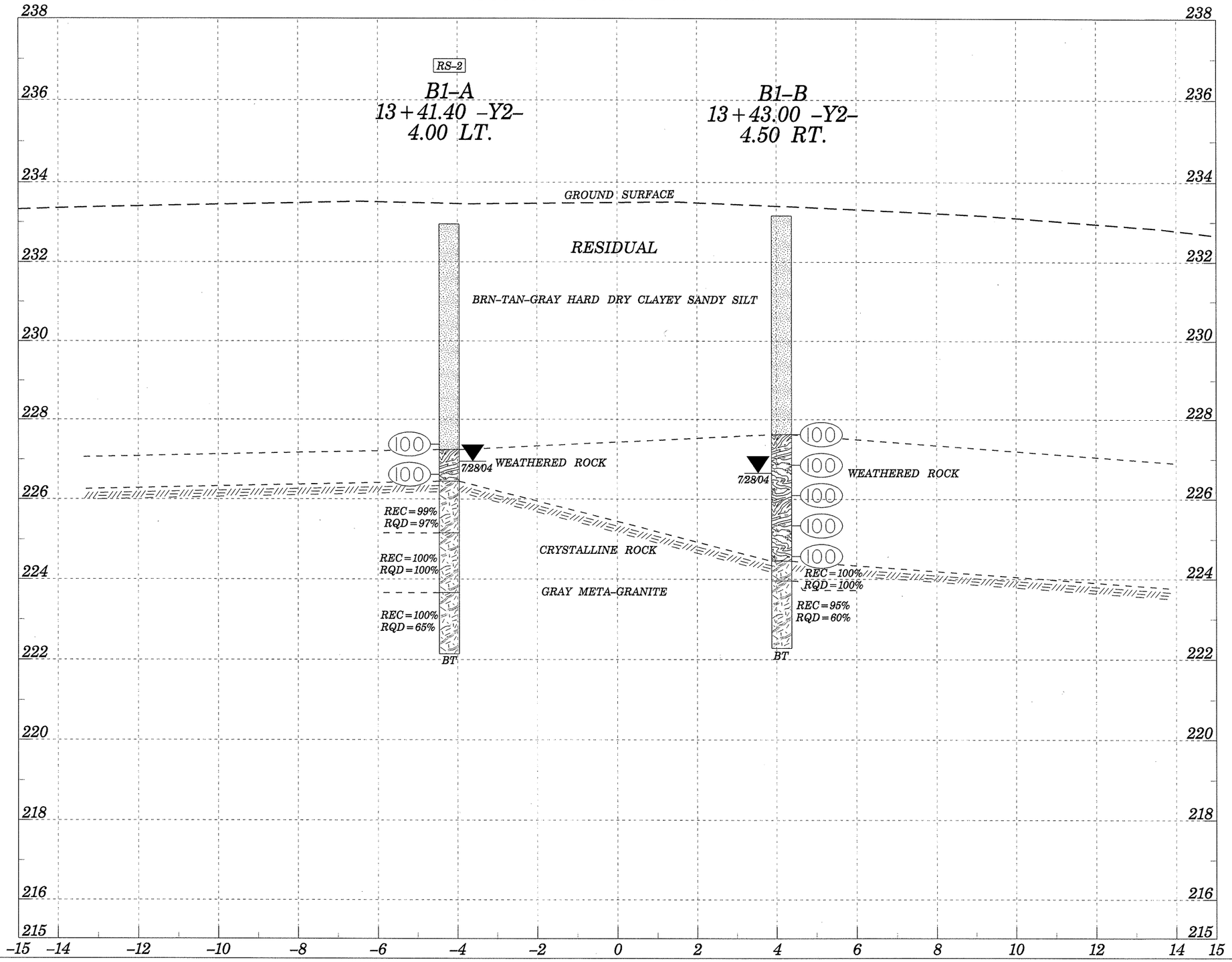
Section Thru End Bent One



STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-0609IA	6	19

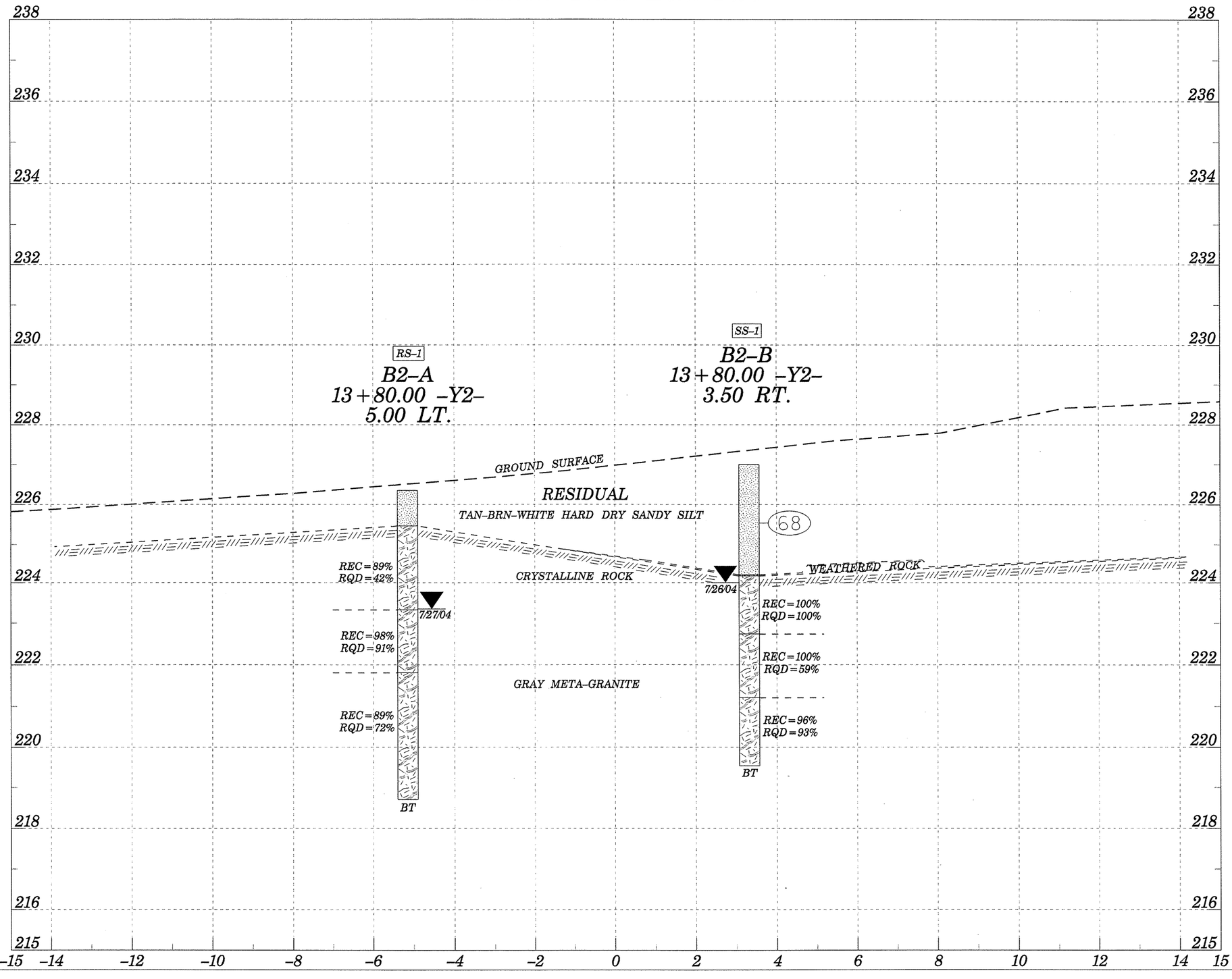
STATE PROJ. NO.	F. A. PROJ. NO.	DESCRIPTION
34545.1.1		P.E.
		CONST.

Section Thru Bent One



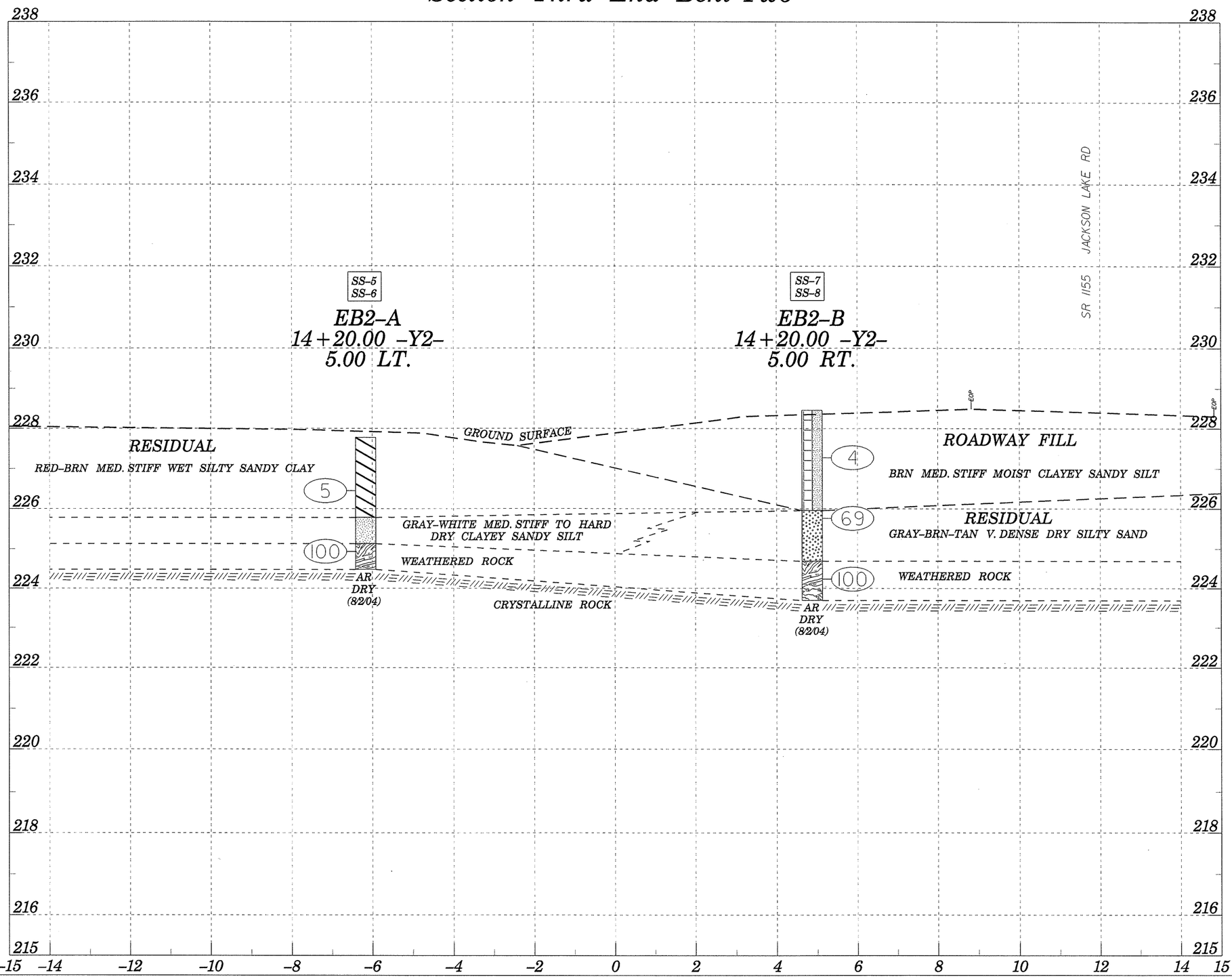
STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-0609IA	7	19
STATE PROJ. NO.	F. A. PROJ. NO.	DESCRIPTION	
34345.1.1		P.E.	
		CONST.	

Section Thru Bent Two



STATE	STATE PROJECT REFERENCE NO.		SHEET NO.	TOTAL SHEETS
N.C.	R-0609IA		8	19
STATE PROJ. NO.	F. A. PROJ. NO.	DESCRIPTION		
34345.1.1		P.E.		
		CONST.		

Section Thru End Bent Two



METRIC	PROJECT REFERENCE NO.	SHEET NO.
	R-0609IA	9
	ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER
CONST.REV.	INCOMPLETE PLANS DO NOT USE FOR R/W ACQUISITION	
R/W REV.	PRELIMINARY PLANS DO NOT USE FOR CONSTRUCTION	

-Y2-

JACKSON LAKE RD. (SR 1158)

PI = 14+84.830
EL = 235.925 m
VC = 92 m
K = 17

-0.8149%

+4.6066%

SS-3
SS-4

EB1-B
13+06.00 -Y2-
5.00 RT.

B1-B
13+43.00 -Y2-
4.50 RT.

SS-1

B2-B
13+80.00 -Y2-
3.50 RT.

SS-7
SS-8

EB2-B
14+20.00 -Y2
5.00 RT.

GROUND SURFACE

EXISTING SR 1155 JACKSON LAKE RD 60 RT

RESIDUAL

BRN-TAN-GRAY HARD DRY CLAYEY SANDY SILT

ROADWAY FILL

BRN MED STIFF MOIST CLAYEY SANDY SILT

RESIDUAL

GRAY-BRN-TAN V. DENSE DRY SILTY SAND

WEATHERED ROCK

CRYSTALLINE ROCK

TAN-BRN-WHITE HARD DRY SANDY SILT

ALLUVIUM

WEATHERED ROCK

CRYSTALLINE ROCK

GRAY META-GRANITE

46 67 100 AR NM (8204)

100 100 100 100 100 73804

REC=100% RQD=100%

REC=95% RQD=60%

BT

68 A 73804

REC=100% RQD=100%

REC=100% RQD=59%

REC=96% RQD=93%

BT

4 69 100 AR NM (8204)

A BRN AND GRAY SOFT TO MED STIFF MOIST TO WET SILTY SANDY CLAY (ALLUVIUM)

246 244 242 240 238 236 234 232 230 228 226 224 222 220 218 216 214 212 210

12 +20 +40 +60 +80 13 +20 +40 +60 +80 14 +20 +40 +60 +80 15

USERNAME=
TIME=

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO 34345.1.1	**ID** R-0609IA	**COUNTY** GUILFORD	**GEOLOGIST** R.W. TODD	
SITE DESCRIPTION BRIDGE ON SR 1158 (-Y2-) OVER US 311 AND MILE BRANCH				**GND WATER**
BORING NO EB1-B	**NORTHING** 0.00	**EASTING** 0.00		**0 HR** N/A
ALIGNMENT Y2	**BORING LOCATION** 13+06.000	**OFFSET** 5.00m RT		**24 HR** N/A
COLLAR ELEV 234.83m	**TOTAL DEPTH** 5.50m	**START DATE** 8/02/04	**COMPLETION DATE** 08/02/04	
DRILL MACHINE CME-550	**DRILL METHOD** H.S. AUGERS		**HAMMER TYPE** AUTOMATIC	
SURFACE WATER DEPTH N/A	**DEPTH TO ROCK** 5.50m		**Log EB1-B, Page 1 of 1**	

ELEV	DEPTH	BLOW CT 15cm	15cm	15cm	PEN (m)	BLOWS PER 30cm 0 25 50 75 100	SAMPLE NO	MOI	LOG	SOIL AND ROCK DESCRIPTION
234.83						Ground Surface				
234.00	1.05	13	21	25	0.30	46	SS-3	DRY		RESIDUAL - HARD BROWN-TAN-GRAY CLAYEY SANDY SILT
232.00	2.57	12	25	42	0.30	67	SS-4	DRY		
	4.10	53	47		0.30	100				WEATHERED ROCK
230.00										
229.33						HOLLOW STEM REFUSAL AT ELEVATION 229.33 METERS ON HARD ROCK				

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO 34345.1.1	**ID** R-0609IA	**COUNTY** GUILFORD	**GEOLOGIST** R.W. TODD
SITE DESCRIPTION BRIDGE ON SR 1158 (-Y2-) OVER US 311 AND MILE BRANCH			**GND WATER**
BORING NO B1-A	**NORTHING** 0.00	**EASTING** 0.00	**0 HR** N/A
ALIGNMENT Y2	**BORING LOCATION** 13+41.400	**OFFSET** 4.00m LT	**24 HR** 6.00m
COLLAR ELEV 232.95m	**TOTAL DEPTH** 10.81m	**START DATE** 7/28/04	**COMPLETION DATE** 07/28/04
DRILL MACHINE CME-550	**DRILL METHOD** NWCAS/NXWL		**HAMMER TYPE** AUTOMATIC
SURFACE WATER DEPTH	**DEPTH TO ROCK** 6.50m		Log B1-A, Page 1 of 1

ELEV	DEPTH	BLOW CT 15cm	15cm	15cm	PEN (m)	BLOWS PER 30cm 0 25 50 75 100	SAMPLE NO	MOI	LOG	SOIL AND ROCK DESCRIPTION
232.95						Ground Surface				
232.00								DRY		RESIDUAL - HARD BROWN-TAN-GRAY CLAYEY SANDY SILT
230.00										
228.00										
	5.57	100			0.09	100				
	6.33	100			0.06	100				WEATHERED ROCK
226.00							RUN #1			HARD ROCK - GRAY META-GRANITE REC=99% RQD=97%
							RS-2			
							RUN #2			GRAY META-GRANITE REC=100% RQD=100%
224.00										
							RUN #3			GRAY META-GRANITE REC=100% RQD=65%
222.14						CORING TERMINATED AT ELEVATION 222.14 METERS IN HARD ROCK (META-GRANITE)				

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL UNIT CORE BORING REPORT

PROJECT NO: 34345.1.1 **PROJECT ID:** R-0609IA **COUNTY:** GUILFORD **GEOLOGIST:** R.W. TODD
SITE DESCRPTION: BRIDGE ON SR 1158 (-Y2-) OVER US 311 AND MILE BRANCH **DRILLER:** C.L. SMITH
BORING NO: B1-A **BORING LOCATION (STA):** 13+41.5 -Y2- **OFFSET:** 4.0 LT
COLLAR ELEV: 232.95 **PERSONNEL:** D.K. BRATTON **CORE SIZE:** NXWL
TOTAL DEPTH: 10.81 **DRILL MACHINE:** CME-550 **DATE STARTED:** 7-28-04
TOTAL RUN: 4.31 **DRILL EQUIP:** NWCAS/NWXL, TRI-CONE **DATE COMPLETED:** 7-28-04

ELEV. (M)	DEPTH (M)	DRILL RATE (MIN/.3 m)	RUN NO.	REC % (M)	RQD % (M)	SAMPLE NO.	FIELD CLASSIFICATION AND REMARKS
226.45	6.5		1	99	97	RS-2	GRAY SLIGHTLY WEATHERED TO FRESH, VERY HARD, META-GRANITE WITH MODERATELY CLOSE TO WIDE FRACTURE SPACING
225.16	7.79		2	100	100		GRAY, FRESH, VERY HARD META-GRANITE WITH WIDE FRACTURE SPACING TO 9.06 METERS, THEN BLACK-GRAY, FRESH, VERY HARD, META-DIORITE
223.66	9.29		3	100	65		RUN IS MIXTURE OF GRAY, WHITE, AND BLACK-GRAY META-GRANITE AND META-DIORITE. RUN IS GENERALLY FRESH AND VERY HARD EXCEPT BETWEEN 10.19 - 10.54 WHERE META-DIORITE IS SEVERE TO MODERATELY SEVERELY WEATHERED AND MEDIUM TO MODERATELY HARD
222.14	10.81						

NOTES

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO 34345.1.1	**ID** R-0609IA	**COUNTY** GUILFORD	**GEOLOGIST** R.W. TODD	
SITE DESCRIPTION BRIDGE ON SR 1158 (-Y2-) OVER US 311 AND MILE BRANCH				**GND WATER**
BORING NO B1-B	**NORTHING** 0.00	**EASTING** 0.00		**0 HR** N/A
ALIGNMENT Y2	**BORING LOCATION** 13+43.000	**OFFSET** 4.50m RT		**24 HR** 6.50m
COLLAR ELEV 233.16m	**TOTAL DEPTH** 10.88m	**START DATE** 7/28/04	**COMPLETION DATE** 07/28/04	
DRILL MACHINE CME-550	**DRILL METHOD** NWCAS/NXWL		**HAMMER TYPE** AUTOMATIC	
SURFACE WATER DEPTH	**DEPTH TO ROCK** 8.70m		**Log B1-B, Page 1 of 1**	

ELEV	DEPTH	BLOW CT 15cm	15cm	15cm	PEN (m)	BLOWS PER 30cm 0 25 50 75 100	SAMPLE NO	MOI	LOG	SOIL AND ROCK DESCRIPTION
233.16						Ground Surface				
232.00								DRY		RESIDUAL - HARD BROWN-TAN-GRAY CLAYEY SANDY SILT
230.00										
228.00	5.53	100			0.07	100				WEATHERED ROCK
	6.30	43	57		0.30	100		▼		
226.00	7.06	100			0.08	100				
	7.82	100			0.09	100				
	8.58	100			0.08	100	RUN #1			
224.00							RUN #2			HARD ROCK - GRAY META-GRANITE REC=100% RQD=100%
										GRAY META-GRANITE REC=95% RQD=60%
222.28						CORING TERMINATED AT ELEVATION 222.28 METERS IN HARD ROCK (META-GRANITE)				

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL UNIT CORE BORING REPORT

PROJECT NO: 34345.1.1 **PROJECT ID:** R-0609IA **COUNTY:** GUILFORD **GEOLOGIST:** R.W. TODD
SITE DESCRIPTION: BRIDGE ON SR 1158 (-Y2) OVER US 311 AND MILE BRANCH **DRILLER:** C.L. SMITH
BORING NO: B1-B **BORING LOCATION (STA):** 13+43 -Y2- **OFFSET:** 4.50 RT.
COLLAR ELEV: 233.16 **PERSONNEL:** D.K. BRATTON **CORE SIZE:** NXWL
TOTAL DEPTH: 10.88 **DRILL MACHINE:** CME-550 **DATE STARTED:** 7-28-04
TOTAL RUN: 2.18 **DRILL EQUIP:** NWCAS/NXWL, TRI-CONE **DATE COMPLETED:** 7-28-04

ELEV. (M)	DEPTH (M)	DRILL RATE (MIN/.3 m)	RUN NO.	REC % (M)	RQD % (M)	SAMPLE NO.	FIELD CLASSIFICATION AND REMARKS
224.46	8.7		1	100	100		GRAY FRESH V. HARD META-GRANITE (1 SOLID PIECE)
223.96	9.2		2	95	60		AS ABOVE TO 10.6, THEN DARK GRAY SLI. WEATH. HARD TO V. HARD META-DIORITE W/ V. CLOSE FRACTURE SPACING
222.28	10.88						

NOTES

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO 34345.1.1	**ID** R-0609IA	**COUNTY** GUILFORD	**GEOLOGIST** R.W. TODD	
SITE DESCRIPTION BRIDGE ON SR 1158 (-Y2-) OVER US 311 AND MILE BRANCH				**GND WATER**
BORING NO B2-A	**NORTHING** 0.00	**EASTING** 0.00		**0 HR** N/A
ALIGNMENT Y2	**BORING LOCATION** 13+80.000	**OFFSET** 5.00m LT		**24 HR** 3.00m
COLLAR ELEV 226.35m	**TOTAL DEPTH** 7.64m	**START DATE** 7/27/04	**COMPLETION DATE** 07/27/04	
DRILL MACHINE CME-550	**DRILL METHOD** NWCAS/NXWL		**HAMMER TYPE** AUTOMATIC	
SURFACE WATER DEPTH	**DEPTH TO ROCK** 0.88m		Log B2-A, Page 1 of 1	

ELEV	DEPTH	BLOW CT 15cm	15cm	15cm	PEN (m)	BLOWS PER 30cm 0 25 50 75 100	SAMPLE NO	MOI	LOG	SOIL AND ROCK DESCRIPTION
226.35						Ground Surface				
										RESIDUAL - HARD TAN-BROWN-WHITE SANDY SILT
225.00							RUN #1			HARD GRANITIC ROCK REC=89% RQD=42%
223.00							RS-1 RUN #2	▼		GRANITIC ROCK REC=98% RQD=91%
221.00							RUN #3			GRANITIC ROCK REC=89% RQD=72%
219.00										
218.71						CORING TERMINATED AT ELEVATION 218.71 METERS IN HARD ROCK				

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL UNIT CORE BORING REPORT

PROJECT NO: 34345.1.1 **PROJECT ID:** R-0609IA **COUNTY:** GUILFORD **GEOLOGIST:** R.W. TODD
SITE DESCRIPTION: BRIDGE ON SR 1158 (-Y2) OVER US 311 AND MILE BRANCH **DRILLER:** C.L. SMITH
BORING NO: B2-A **BORING LOCATION (STA):** 13+80 -Y2- **OFFSET:** 5.0 LT.
COLLAR ELEV: 226.35 **PERSONNEL:** D.K. BRATTON **CORE SIZE:** NXWL
TOTAL DEPTH: 7.64 **DRILL MACHINE:** CME-550 **DATE STARTED:** 7-27-04
TOTAL RUN: 6.76 **DRILL EQUIP:** NWCAS/NXWL **DATE COMPLETED:** 7-27-04

ELEV. (M)	DEPTH (M)	DRILL RATE (MIN/.3 m)	RUN NO.	REC % (M)	RQD % (M)	SAMPLE NO.	FIELD CLASSIFICATION AND REMARKS
225.47	0.88		1	89	35	RS-1 (2.82-3.00)	FIRST 0.47 OF RUN IS WHITE SLI. WEATH. HARD FINE GRAINED META-GRANITE W/ V. CLOSE FRACTURE SPACING, THEN @ 1.35 ROCK IS GRAY MOD. WEATH. TO FRESH HARD TO V. HARD META-GRANITE W/ V. CLOSE FRACTURE SPACING
223.33	3.02		2	98	90		GRAY FRESH V. HARD META-GRANITE W/ CLOSE TO MOD. CLOSE FRACTURE SPACING
221.81	4.54		3	89	72		GRAY FRESH V. HARD META-GRANITE W/ CLOSE TO MOD. CLOSE FRACTURE SPACING
218.71	7.64						

NOTES

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO 34345.1.1	**ID** R-0609IA	**COUNTY** GUILFORD	**GEOLOGIST** R.W. TODD	
SITE DESCRIPTION BRIDGE ON SR 1158 (-Y2-) OVER US 311 AND MILE BRANCH				**GND WATER**
BORING NO B2-B	**NORTHING** 0.00	**EASTING** 0.00		**0 HR** N/A
ALIGNMENT Y2	**BORING LOCATION** 13+80.000	**OFFSET** 3.50m RT		**24 HR** 3.00m
COLLAR ELEV 227.00m	**TOTAL DEPTH** 7.46m	**START DATE** 7/26/04	**COMPLETION DATE** 07/26/04	
DRILL MACHINE CME-550	**DRILL METHOD** NWCAS/NXWL		**HAMMER TYPE** AUTOMATIC	
SURFACE WATER DEPTH	**DEPTH TO ROCK** 2.83m		Log B2-B, Page 1 of 1	

ELEV	DEPTH	BLOW CT 15cm	15cm	15cm	PEN (m)	BLOWS PER 30cm 0 25 50 75 100	SAMPLE NO	MOI	LOG	SOIL AND ROCK DESCRIPTION
227.00						Ground Surface				
226.00	1.46	20	31	37	0.30	68	SS-1	DRY		RESIDUAL - HARD TAN-BROWN-WHITE SANDY SILT
224.00							RUN #1	▼		WEATHERED ROCK HARD GRANITIC ROCK - REC=100% RQD=100%
222.00							RUN #2			HARD GRANITIC ROCK - REC=100% RQD=59%
220.00							RUN #3			HARD GRANITIC ROCK - REC=96% RQD=93%
219.54						CORING TERMINATED AT ELEVATION 219.54 METERS IN HARD ROCK				

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL UNIT CORE BORING REPORT

PROJECT NO: 34345.1.1 **PROJECT ID:** R-0609IA **COUNTY:** GUILFORD **GEOLOGIST:** R.W. TODD
SITE DESCRIPTION: BRIDGE ON SR 1158 (-Y2) OVER US 311 AND MILE BRANCH **DRILLER:** C.L. SMITH
BORING NO: B2-B **BORING LOCATION (STA):** 13+80 -Y2- **OFFSET:** 3.50 RT.
COLLAR ELEV: 227.00 **PERSONNEL:** D.K. BRATTON **CORE SIZE:** NXWL
TOTAL DEPTH: 7.46 **DRILL MACHINE:** CME-550 **DATE STARTED:** 7-26-04
TOTAL RUN: 4.63 **DRILL EQUIP:** NWCAS/NXWL **DATE COMPLETED:** 7-26-04

ELEV. (M)	DEPTH (M)	DRILL RATE (MIN/.3 m)	RUN NO.	REC % (M)	RQD % (M)	SAMPLE NO.	FIELD CLASSIFICATION AND REMARKS
224.17	2.83		1	100	87		GRAY V. SLI. WEATH. TO FRESH V. HARD META-GRANITE W/ MOD. CLOSE TO WIDE FRACTURE SPACING
222.74	4.26		2	100	50		GRAY V. SLI. WEATH. TO FRESH V. HARD META-GRANITE W/ V. CLOSE TO CLOSE FRACTURE SPACING
221.21	5.79		3	96	94		GRAY FRESH V. HARD META-GRANITE W/ CLOSE TO WIDE FRACTURE SPACING
219.54	7.46						

NOTES

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO 34345.1.1	**ID** R-0609IA	**COUNTY** GUILFORD	**GEOLOGIST** R.W. TODD	
SITE DESCRIPTION BRIDGE ON SR 1158 (-Y2-) OVER US 311 AND MILE BRANCH				**GND WATER**
BORING NO EB2-A	**NORTHING** 0.00	**EASTING** 0.00		**0 HR** N/A
ALIGNMENT Y2	**BORING LOCATION** 14+20.000	**OFFSET** 5.00m LT		**24 HR** N/A
COLLAR ELEV 227.78m	**TOTAL DEPTH** 3.31m	**START DATE** 8/02/04	**COMPLETION DATE** 08/02/04	
DRILL MACHINE CME-550	**DRILL METHOD** H.S. AUGERS		**HAMMER TYPE** AUTOMATIC	
SURFACE WATER DEPTH	**DEPTH TO ROCK** 3.31m		Log EB2-A, Page 1 of 1	

ELEV	DEPTH	BLOW CT 15cm	15cm	15cm	PEN (m)	BLOWS PER 30cm 0 25 50 75 100	SAMPLE NO	MOI	LOG	SOIL AND ROCK DESCRIPTION
227.78						Ground Surface				
227.00	1.33	2	3	2	0.30	5	SS-5	WET		RESIDUAL - MEDIUM STIFF RED-BROWN SILTY SANDY CLAY
225.00	2.85	2	13	100	0.21	100	SS-6	DRY		MEDIUM STIFF TO HARD GRAY WHITE CLAYEY SANDY SILT
224.47						HOLLOW STEM REFUSAL AT ELEVATION 224.47 FEET ON HARD ROCK				WEATHERED ROCK

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO 34345.1.1	**ID** R-0609IA	**COUNTY** GUILFORD	**GEOLOGIST** R.W. TODD	
SITE DESCRIPTION BRIDGE ON SR 1158 (-Y2-) OVER US 311 AND MILE BRANCH				**GND WATER**
BORING NO EB2-B	**NORTHING** 0.00	**EASTING** 0.00		**0 HR** N/A
ALIGNMENT Y2	**BORING LOCATION** 14+20.000	**OFFSET** 5.00m RT		**24 HR** N/A
COLLAR ELEV 228.46m	**TOTAL DEPTH** 4.76m	**START DATE** 8/02/04	**COMPLETION DATE** 08/02/04	
DRILL MACHINE CME-550	**DRILL METHOD** H.S. AUGERS		**HAMMER TYPE** AUTOMATIC	
SURFACE WATER DEPTH N/A	**DEPTH TO ROCK** N/A		Log EB2-B, Page 1 of 1	

ELEV	DEPTH	BLOW CT 15cm	15cm	15cm	PEN (m)	BLOWS PER 30cm 0 25 50 75 100	SAMPLE NO	MOI	LOG	SOIL AND ROCK DESCRIPTION
228.46						Ground Surface				
228.00	1.18	1	2	2	0.30	4	SS-7	MOIST		ROADWAY FILL - MEDIUM STIFF BROWN CLAYEY SANDY SILT
226.00	2.70	16	29	40	0.30	69	SS-8	DRY		RESIDUAL - VERY DENSE GRAY-BROWN-TAN SILTY SAND
224.00	4.23	100			0.05	100				WEATHERED ROCK
223.70						HOLLOW STEM REFUSAL AT ELEVATION 223.70 METERS ON HARD ROCK				

TEST RESULTS

PROJECT: 34345.1.1 R-0609IA
COUNTY: GUILFORD
SITE DESCRIPTION: BRIDGE ON SR 1158 (-Y2-) OVER US 311 AND MILE BRANCH

SOIL SAMPLE RESULTS

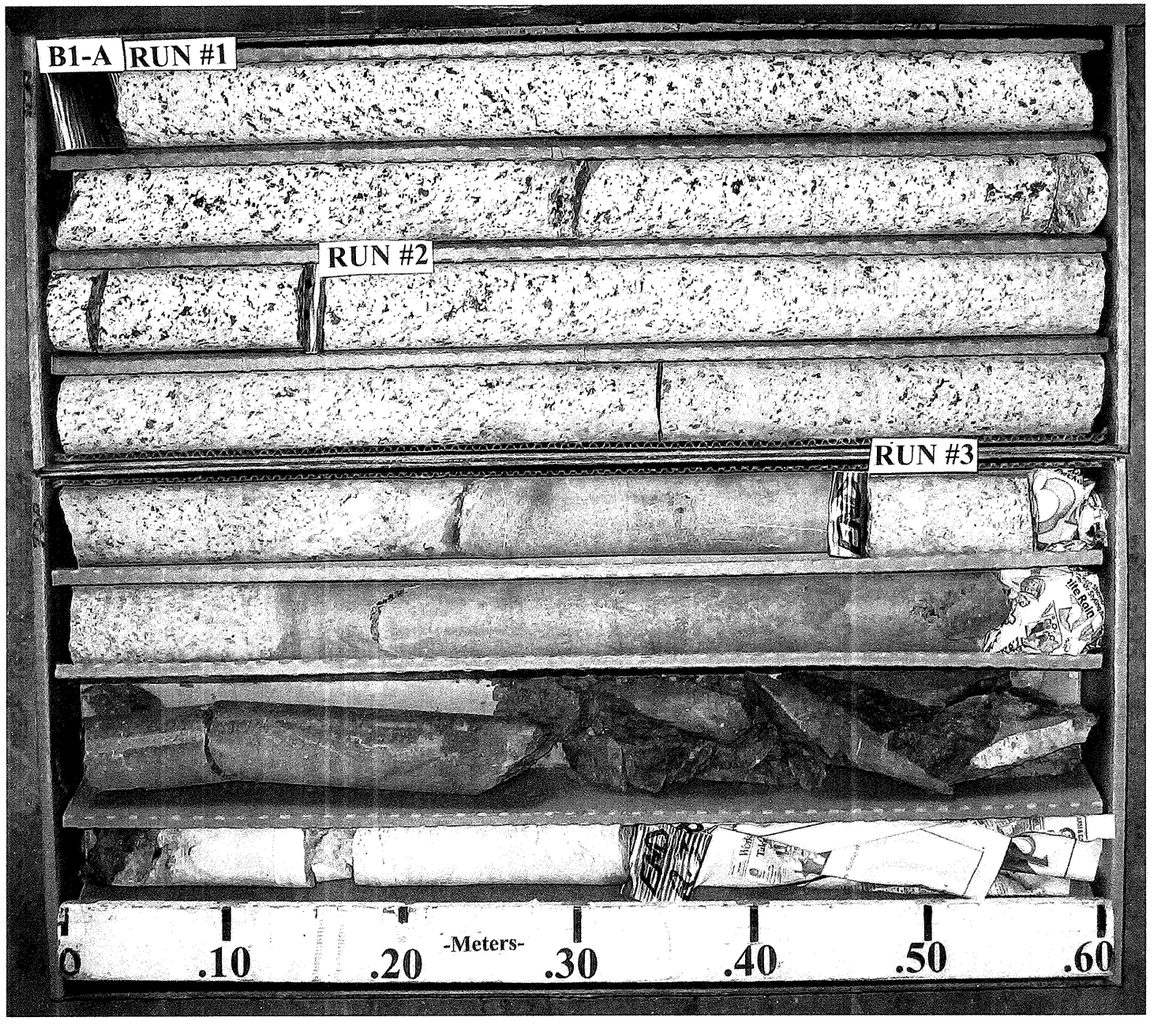
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS	N	L.L.	P.I.	% BY WEIGHT C. SAND	% BY WEIGHT F. SAND	% BY WEIGHT SILT	% BY WEIGHT CLAY	% PASSING SIEVES 10	% PASSING SIEVES 40	% PASSING SIEVES 200	% MOISTURE	% ORGANIC	UNIT WT. (d)	VOID RATIO
		EB1-B																
SS-3	5.00m RT.	13+06.00	1.05-1.50	A-4(0)	46	29	4	27.6	29.8	26.4	16.2	100	86	48				
SS-4			2.57-3.02	A-4(2)	67	35	5	14.4	30.2	43.2	12.2	98	90	62				
		B1-B																
SS-2	4.50m RT.	13+43.00	6.30-6.49	A-1-b(0)	100	23	NP	57.2	26.2	12.6	4.1	71	41	14				
		B2-B																
SS-1	3.50m RT.	13+80.00	1.46-1.91	A-4(0)	68	25	NP	31.2	26.8	31.8	10.1	98	78	46				
		EB2-A																
SS-5	5.00m LT.	14+20.00	1.33-1.78	A-7-6(13)	5	52	23	15.6	28.2	29.8	26.4	100	91	62				
SS-6			2.85-3.21	A-4(0)	100	31	5	28.2	29.4	24.1	18.3	97	79	47				
		EB2-B																
SS-7	5.00m RT.	14+20.00	1.18-1.63	A-4(0)	4	23	6	28.6	28.6	22.5	20.3	90	76	43				
SS-8			2.70-3.15	A-2-4(0)	69	25	NP	41.8	31.2	18.9	8.1	94	71	30				

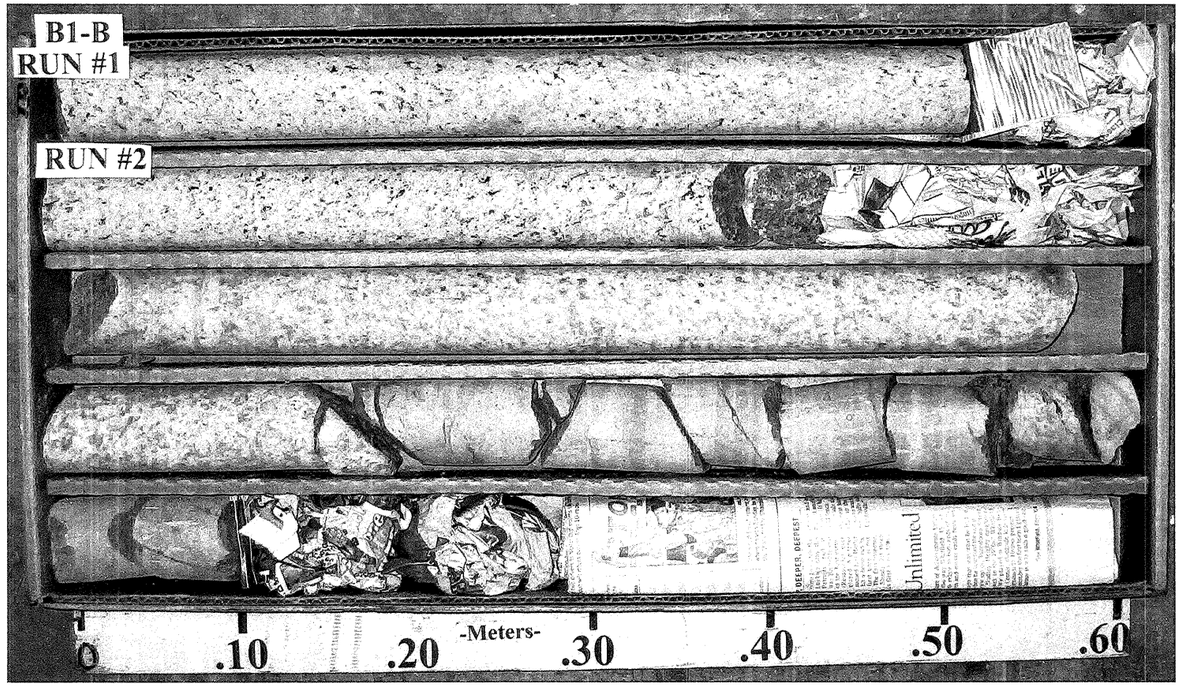
ROCK SAMPLE RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	RQD	UNIT WT	Q(MPa) (MPsi)	E(MPa) (MPsi)
		B1-A					
RS-2	4.00m LT.	13+41.40	7.30-7.50	97%	CURRENTLY BEING TESTED		
		B2-A					
RS-1	5.00m LT.	13+80.00	2.82-3.00	35%	CURRENTLY BEING TESTED		

34345.1.1 R-0609IA
GUILFORD COUNTY
BRIDGE ON SR 1158 (-Y2-) OVER US 311 AND MILE BRANCH

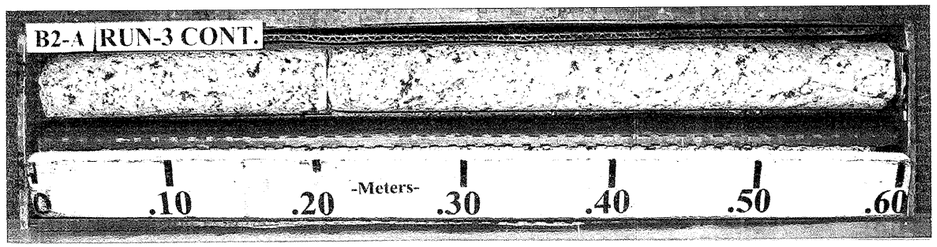
CORE PHOTOS





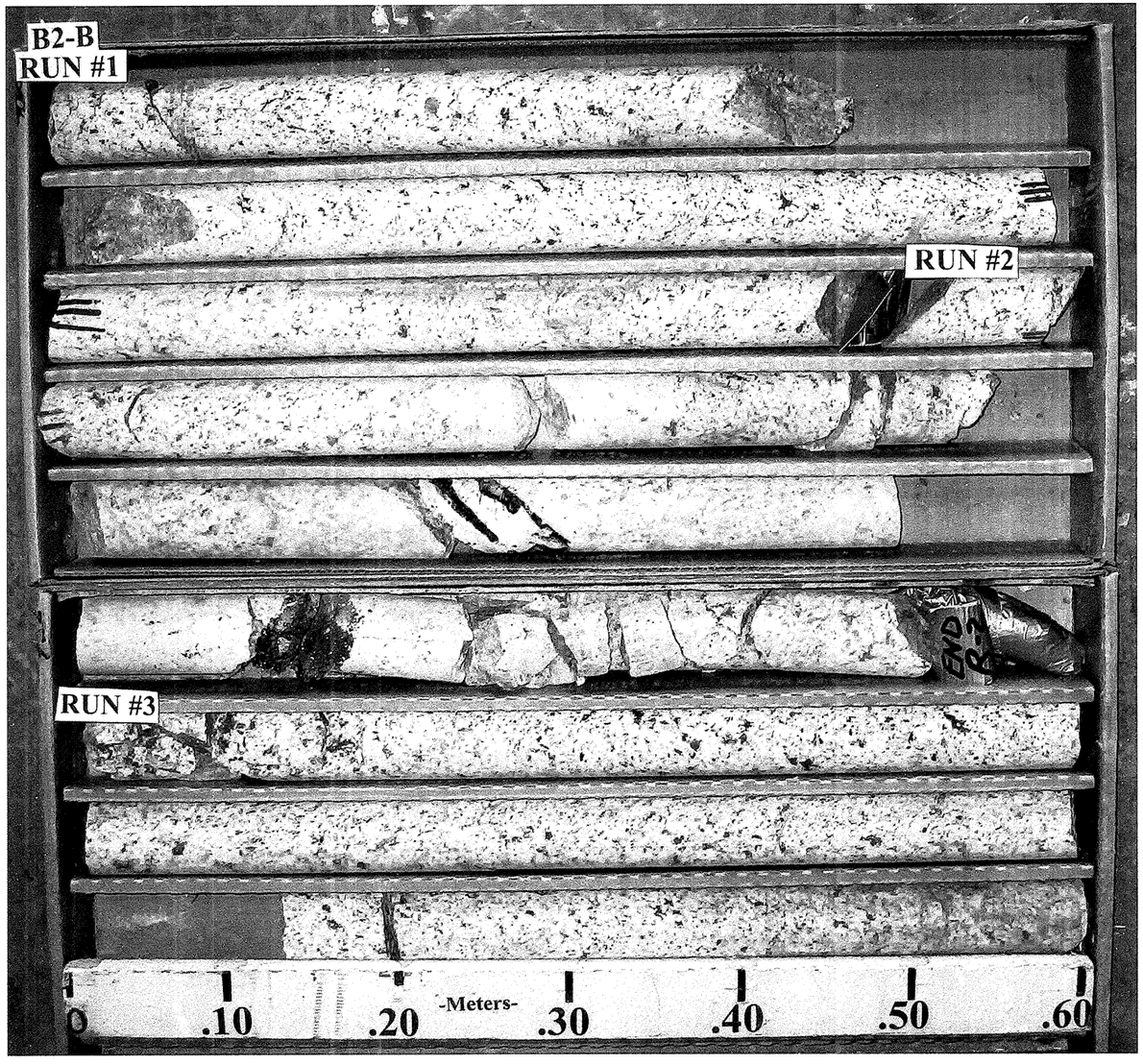
34345.1.1 R-0609IA
GUILFORD COUNTY
BRIDGE ON SR 1158 (-Y2-) OVER US 311 AND MILE BRANCH

CORE PHOTOS



34345.1.1 R-0609IA
GUILFORD COUNTY
BRIDGE ON SR 1158 (-Y2-) OVER US 311 AND MILE BRANCH

CORE PHOTOS



CONTRACT: ID: R-0609IA

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	34345.1.1 (R-0609IA)	1	15

STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION
34345.1.1	MAF-F-119-1(1)	P.E.
		CONST.

METRIC

STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

GEOTECHNICAL ENGINEERING UNIT

STRUCTURE SUBSURFACE INVESTIGATION

STATE PROJECT *34345.1.1* I.D. NO. *R-0609IA*

F.A. PROJECT *MAF-F-119-1(1)*

COUNTY *GUILFORD*

PROJECT DESCRIPTION *US 311 HIGH POINT EAST BELTWAY FROM US 29-70 TO I-85 NORTH OF ARCHDALE*

SITE DESCRIPTION *STRUCTURE NO. 3 ON SR 1154 (KERSEY VALLEY RD.) OVER PROPOSED US 311 AT STATION -Y3- 12+61.464*

CONTENTS:

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INVESTIGATED BY *J.B. BARFIELD* PERSONNEL *J.L. LOVE*

CHECKED BY *D.N. ARGENBRIGHT* *B. SCHULL*

SUBMITTED BY *D.N. ARGENBRIGHT* *D. BOGGS*

DATE *AUGUST 2004*

DRAWN BY: *TTW, JBB, DWF, CDC*

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NORTH CAROLINA LICENSED GEOLOGIST SEAL 1961 JEFFREY BRIAN BARFIELD

[illegible]

8/18/04

ID	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
R-0609IA	34345.1.1	2	15

METRIC

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION

SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED OR WEATHERED EARTH MATERIALS WHICH CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND WHICH YIELDS LESS THAN 100 BLOWS PER 30 cm 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	50 MX											GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT
#40	30 MX	50 MX	51 MN											
#200	15 MX	25 MX	10 MX	35 MX	35 MX	35 MX	35 MX	35 MX	36 MN	36 MN	36 MN	36 MN		
LIQUID LIMIT				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	6 MX		N.P.	10 MX	10 MX	11 MN	11 MN	10 MX	10 MX	11 MN	11 MN			
GROUP INDEX	0		0	0		4 MX		8 MX	12 MX	16 MX	No MX			
USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS. GRAVEL AND SAND		FINE SAND	SILTY OR CLAYEY GRAVEL AND SAND				SILTY SOILS		CLAYEY SOILS				
GEN. RATING AS A SUBGRADE	EXCELLENT TO GOOD							FAIR TO POOR				FAIR TO POOR	POOR	UNSUITABLE

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

CONSISTENCY OR DENSENESS

PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTENCE (N-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH (kN/m^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	<25
	SOFT	2 TO 4	25 TO 50
	MEDIUM STIFF	4 TO 8	50 TO 100
	STIFF	8 TO 15	100 TO 200
	VERY STIFF	15 TO 30	200 TO 400
	HARD	>30	>400

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 CPT DPT DMT VST PMT — TEST BORING
- AUGER BORING
- CORE BORING
- MW — MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- SPT N-VALUE
- REF — SPT REFUSAL

SAMPLE DESIGNATIONS

S- BULK SAMPLE

SS- SPLIT SPOON SAMPLE

ST- SHELBY TUBE SAMPLE

RS- ROCK SAMPLE

RT- RECOMPACTED TRIAXIAL SAMPLE

CBR - CBR SAMPLE

ABBREVIATIONS

AR - AUGER REFUSAL
BT - BORING TERMINATED
CL. - CLAY
CPT - CONE PENETRATION TEST
CSE. - COARSE
DMT - DILATOMETER TEST
DPT - DYNAMIC PENETRATION TEST
e - VOID RATIO
F. - FINE
FOSS. - FOSSILIFEROUS
FRAC. - FRACTURED
FRAGS. - FRAGMENTS
MED. - MEDIUM
PMT - PRESSUREMETER TEST
SD. - SAND, SANDY
SL. - SILT, SILTY
SLI. - SLIGHTLY
TCR - TRICONE REFUSAL
γ - UNIT WEIGHT
γ_d - DRY UNIT WEIGHT
W - MOISTURE CONTENT
V. - VERY
VST - VANE SHEAR TEST

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- ☐ MOBILE B-___
- ☐ BK-51
- ☒ CME-45C
- ☐ CME-550
- ☐ PORTABLE HOIST
- ☐ OTHER_____
- ☐ OTHER_____

ADVANCING TOOLS:
- ☐ CLAY BITS
- ☐ 152 mm CONTINUOUS FLIGHT AUGER
- ☒ 203 mm HOLLOW AUGERS
- ☐ HARD FACED FINGER BITS
- ☐ TUNG.-CARBIDE INSERTS
- ☐ CASING ☐ W/ ADVANCER
- ☐ TRICONE _____ mm STEEL TEETH
- ☐ TRICONE _____ mm TUNG.-CARB.
- ☐ CORE BIT
- ☐ OTHER _____

HAMMER TYPE:
- ☐ AUTOMATIC ☒ MANUAL

CORE SIZE:
- ☐ -B_____
- ☒ -NXWL___
- ☐ -H_____

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

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WHEN TESTED, WOULD YIELD SPT REFUSAL. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 2.5 cm PER 50 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 30 cm.
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 2.5 cm. 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 BLOWS PER 30 cm.*
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 BLOWS PER 30 cm.*
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 6 mm 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 1 mm DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PIECES 25 mm 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 CENTIMETERS 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 25 mm OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.

FRACTURE SPACING

TERM	SPACING
VERY WIDE	MORE THAN 3 m
WIDE	1 TO 3 m
MODERATELY CLOSE	30 TO 100 cm
CLOSE	5 TO 30 cm
VERY CLOSE	LESS THAN 5 cm

BEDDING

TERM	THICKNESS
VERY THICKLY BEDDED	> 1 m
THICKLY BEDDED	0.5 - 1 m
THINLY BEDDED	0.05 - 0.5 m
VERY THINLY BEDDED	10 - 50 mm
THICKLY LAMINATED	2.5 - 10 mm
THINLY LAMINATED	< 2.5 mm

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 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 10 CENTIMETERS 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) OF A 63.5 kg HAMMER FALLING 0.76 METERS REQUIRED TO PRODUCE A PENETRATION OF 30 cm INTO SOIL WITH A 5 cm OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS LESS THAN 2.5 cm PENETRATION WITH 50 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 10 CENTIMETERS DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.

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

BENCH MARK: BL-45 CAP @ 31+62.878 PINC 11.94M RIGHT OF -Y3-

ELEVATION: 245.675

NOTES:

REVISED 09/15/00

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

Michael F. Easley
GOVERNOR

P.O. BOX 25201, RALEIGH, N.C. 27611-5201

Lyndo Tippett
SECRETARY

August 18, 2004

STATE PROJECT: 34345.1.1 (R-0609IA)
F.A. PROJECT: MAF-F-119-1 (1)
COUNTY: Guilford

DESCRIPTION: US 311 High Point East Beltway from US 29-70 to I-85 north of Archdale

SUBJECT: Geotechnical Report – Structure No. 3 on -Y3- at Sta. 12+61.464 over US 311

Project Description

A three span bridge, 75 meters in length, is proposed on -Y3- (SR 1154) over proposed US 311. The project is located in Southwest Guilford County near High Point. The skew varies at each bent from 86° 24' 43" to 90° 06' 00"

The subsurface investigation was conducted during June of 2004 using an ATV-mounted CME 45 drill machine. Two Standard Penetration Test borings were performed at each of the three proposed bent locations. All borings were advanced until weathered rock or crystalline rock was encountered. EB1-A and B1-B were cored using NXWL to recover samples from crystalline rock. Representative soil samples were obtained for visual classification in the field and selected samples were sent to the Materials and Test Unit for laboratory analysis.

Physiography and Geology

The project is located in gently rolling terrain of the Piedmont Physiographic Province. Geologically, the site is located within the Carolina Slate Belt and is underlain by meta-granite. The area consists of a mixture of wooded land and homes.

Soil Properties

Residual soils were the only soils encountered at the project site during this investigation.

Residual soils were encountered in all of the borings and range in thickness from 1.22 to 2.35 meters. These soils consist primarily of green, gray, white and tan, dry to moist, hard, sandy silt (A-4) and orange-tan, moist, stiff, sandy clay (A-6). Residual soils are derived from the underlying weathered rock.

Rock Properties

Weathered rock was derived from the underlying metamorphosed granitic rock, and ranges in thickness from 0.66 to 3.77 meters. The top of weathered rock was encountered at elevations ranging from 244.35 to 242.61 meters.

Crystalline rock was encountered at each boring location. The top of the crystalline rock ranges from 243.18 in EB2-B to 238.29 in EB1-A. Rock core was obtained from EB1-A and B1-B. Crystalline rock in both borings was white to gray, pink to gray, fresh to severely weathered, moderately close to very closely fractured and moderately to very hard meta-granite. Two thin lenses (0.18-0.44m) of green to brown, slightly weathered, very close to moderately close fractures, moderately hard diabase was encountered in EB1-A at elevations 238.83 and 232.71 meters. Core recovery (REC) ranged from 89 to 95 percent and rock quality designation (RQD) ranged from 65 to 81 percent.

Groundwater

Groundwater was encountered in four of the six borings. Groundwater elevations ranged from 242.84 to 240.27 meters.

Notice

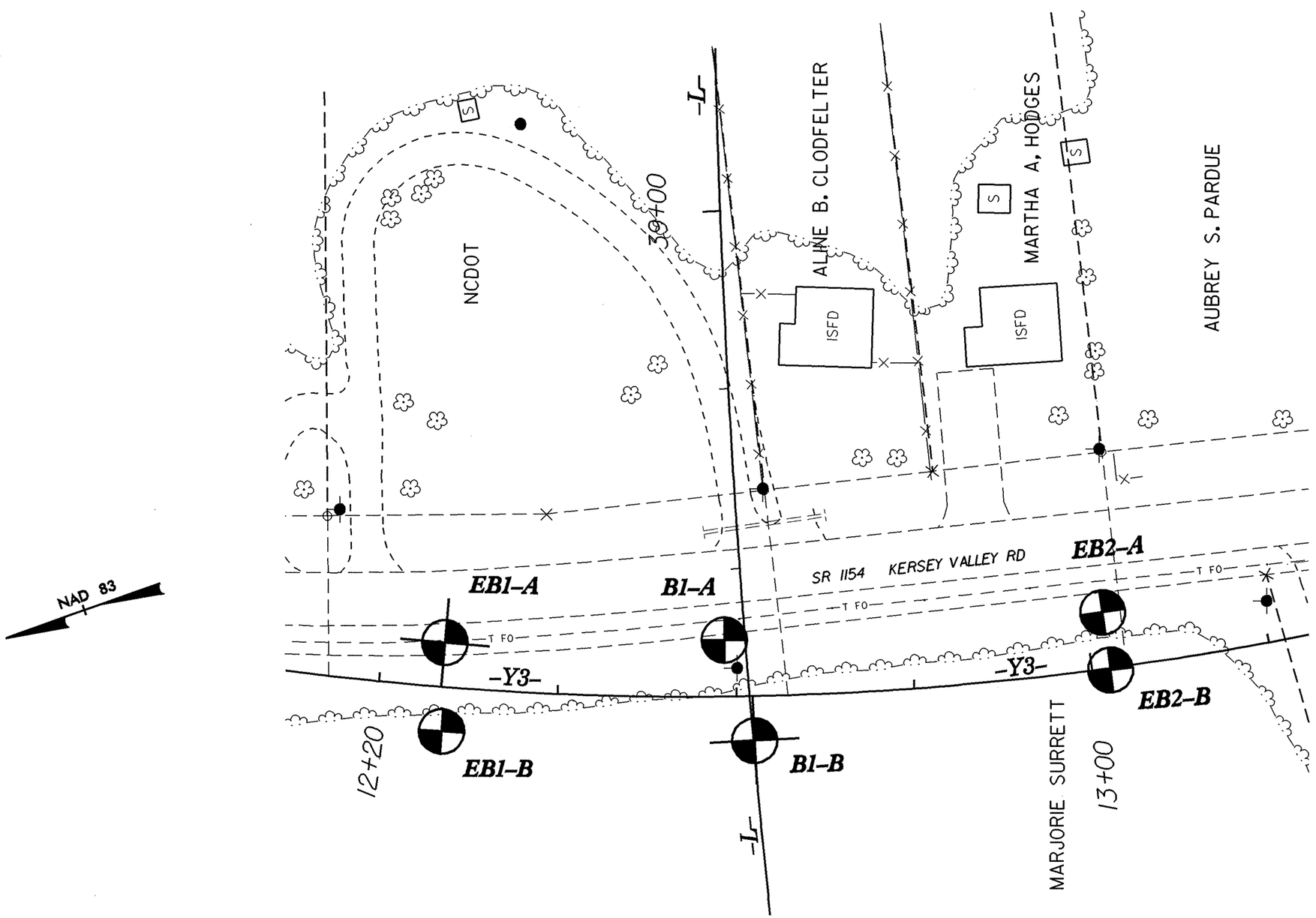
This Geotechnical foundation report is based on the Preliminary General Drawing for Structure No. 3, dated April 7, 2004. If significant changes are made in the design or location of the proposed structure, the subsurface information should be reviewed and modified as necessary.

Respectfully submitted,

Jeffrey B. Barfield, LG
Project Geologist

PROJECT REF. NO.	SHEET NO.	TOTAL SHEETS
34345.1.1	4	15

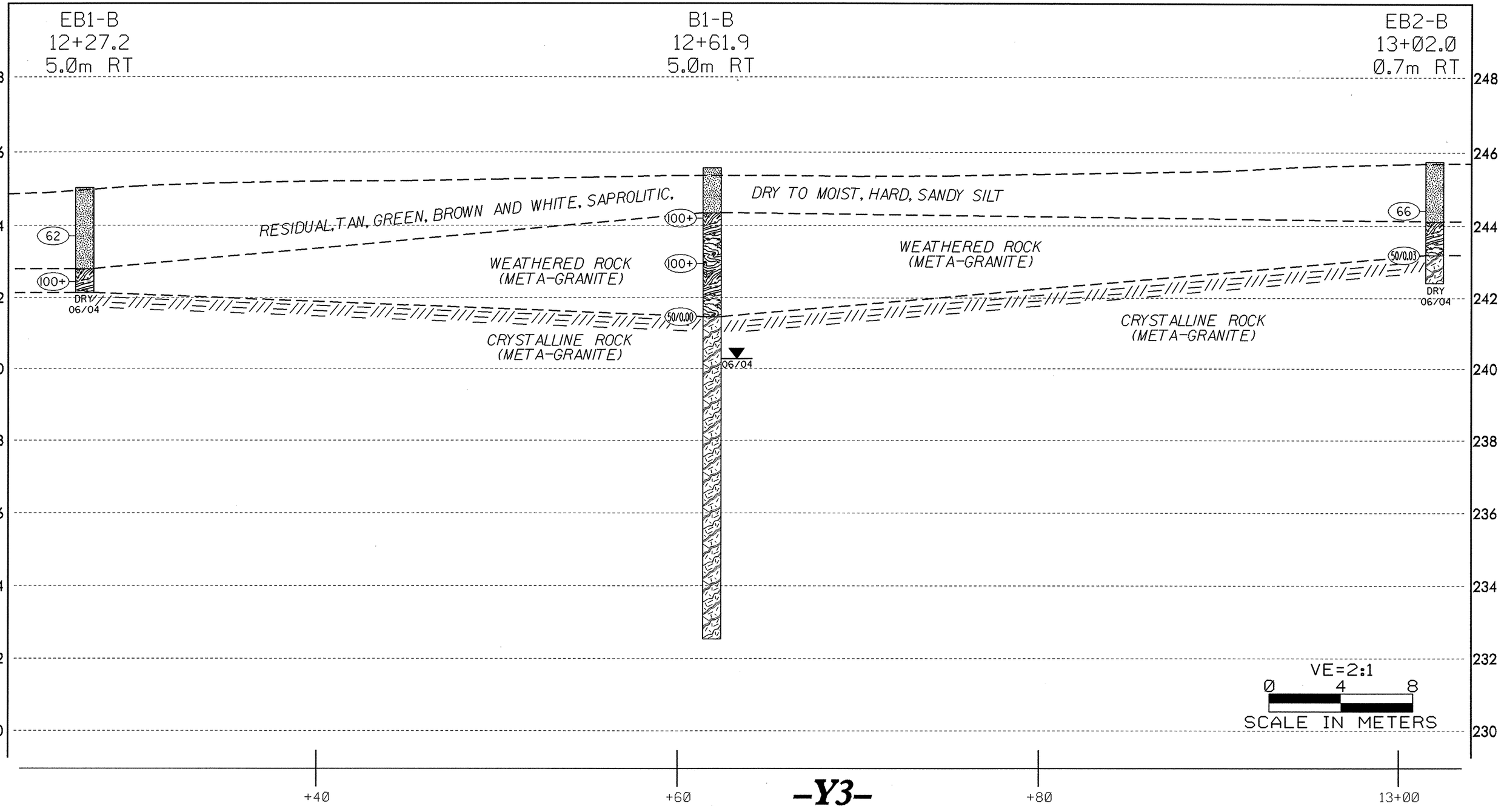
TEST SITE PLAN



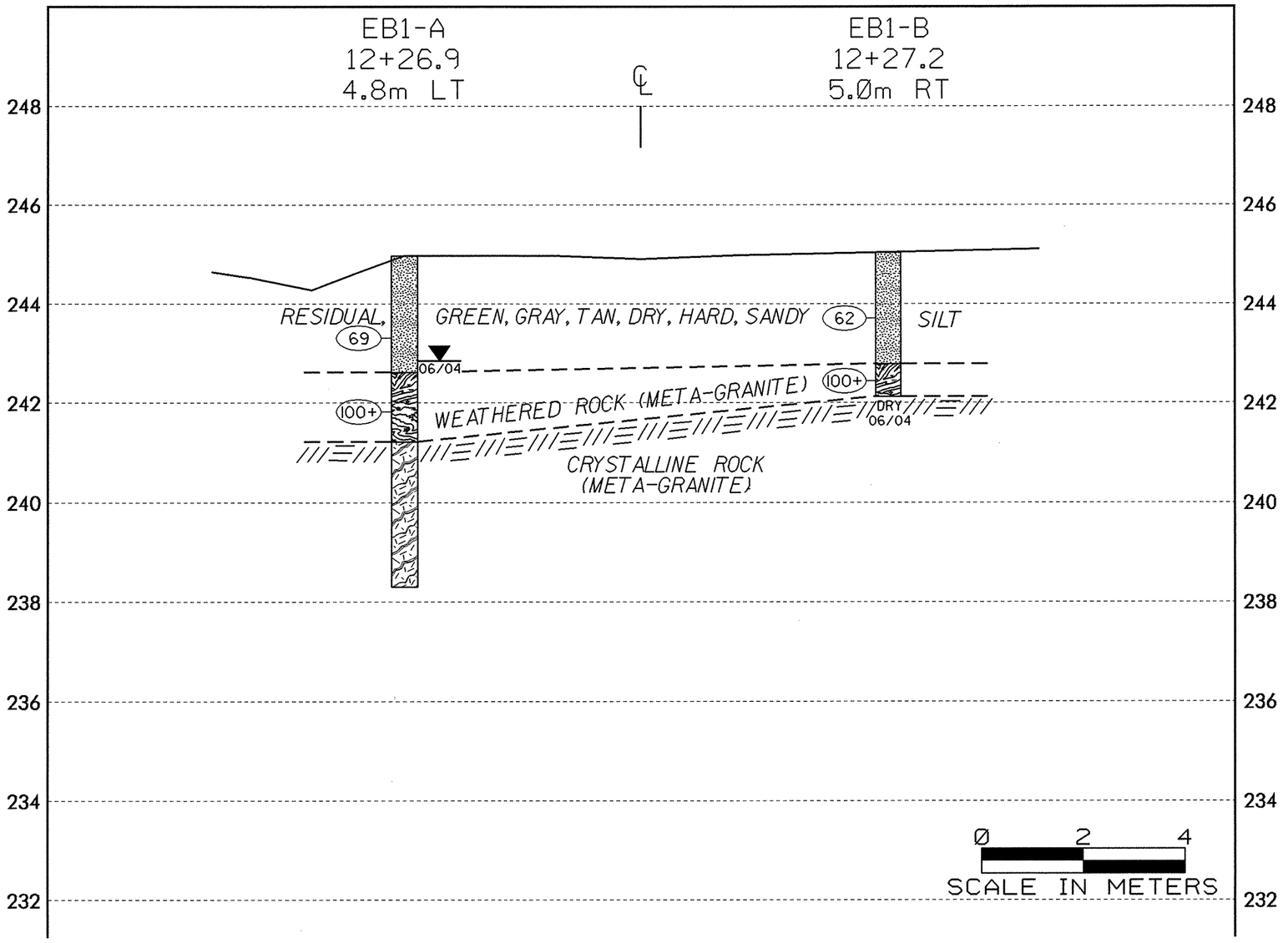
0 10 20

SCALE IN METER

PROFILE THROUGH BORINGS PROJECTED ALONG -Y3-



CROSS SECTION THROUGH END BENT 1 STRUCTURE NO. 3, 34345.1.1 (R-0609IA)



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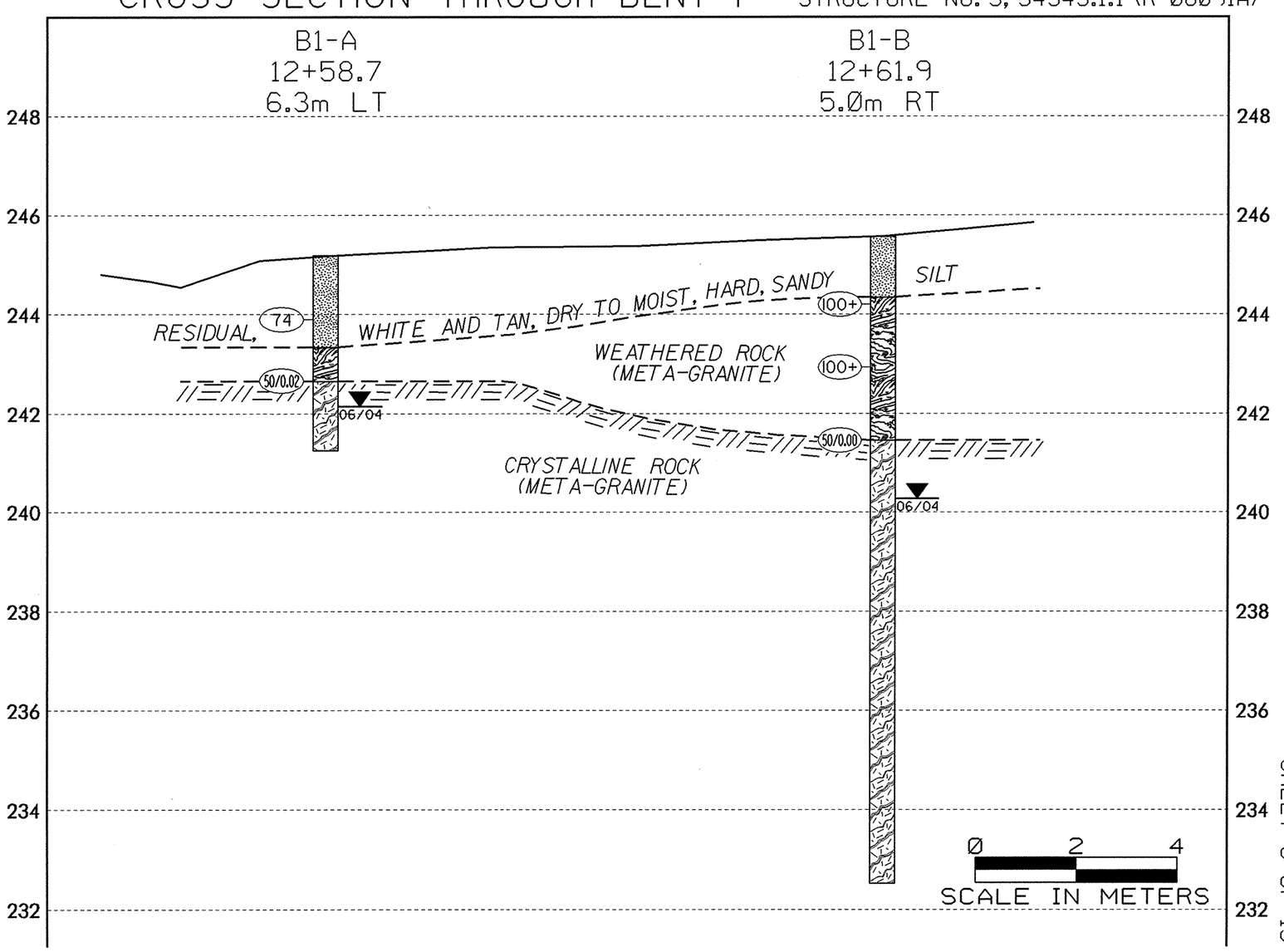
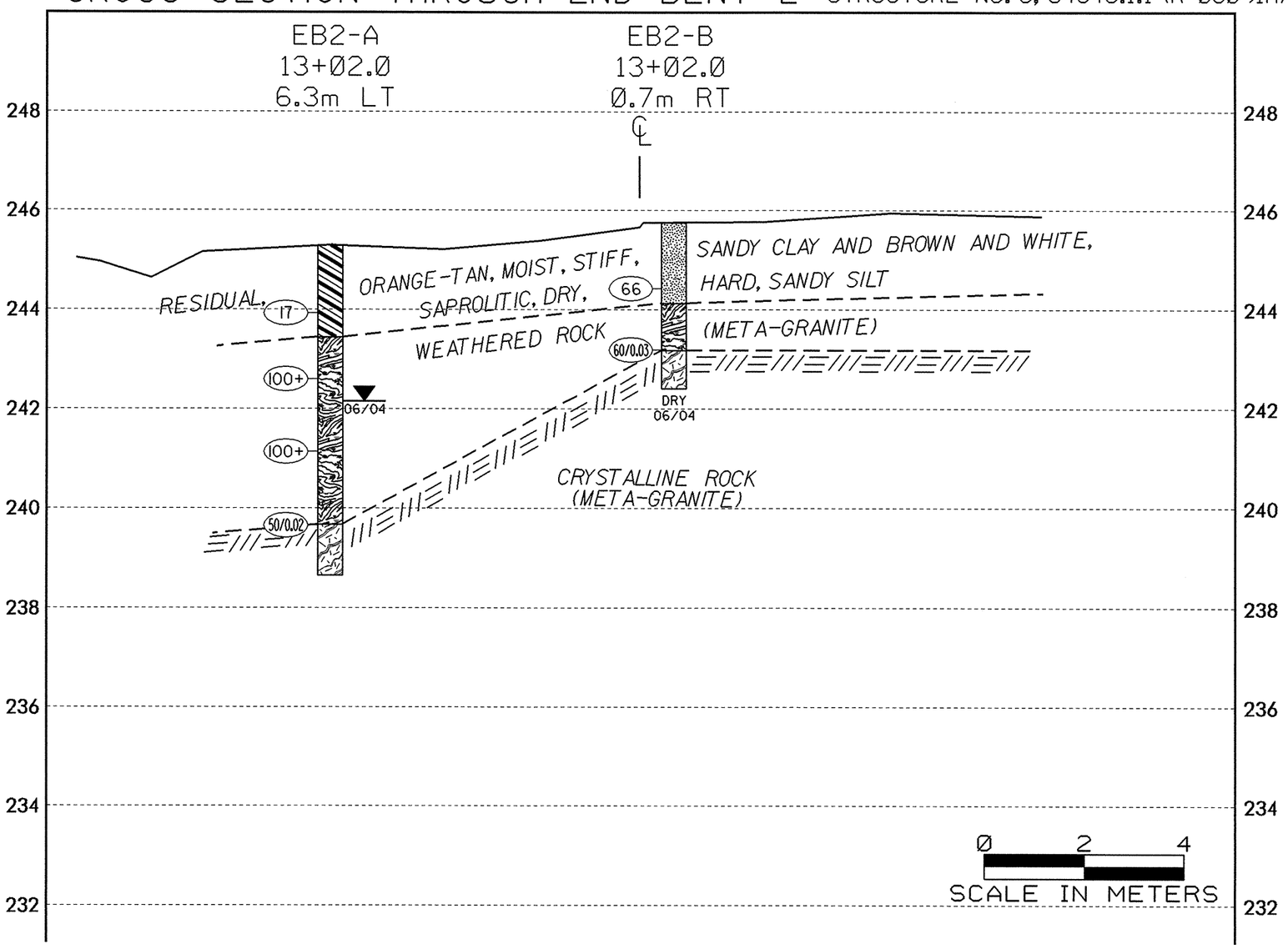


CROSS SECTION THROUGH END BENT 2 STRUCTURE NO. 3, 34345.1.1 (R-0609IA)



NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO. 34345.1.1	**ID.** R-0609IA	**COUNTY** GUILFORD	**GEOLOGIST** J.L. LOVE
SITE DESCRIPTION STRUCTURE NO. 3 ON -Y3- SR 1154 (KERSEY VALLEY RD.) OVER -L- PROPOSED US 311			**GROUND WATER**
BORING NO. EB1-A	**BORING LOCATION** 12+26.9	**OFFSET** 4.8m LT	**ALIGNMENT** -Y3-	**0 HR.** N/A
COLLAR ELEV. 244.96m	**NORTHING** 243008.0	**EASTING** 525107.7		**24 HR.** 2.12m
TOTAL DEPTH 6.67m	**DRILL MACHINE** CME-45	**DRILL METHOD** NW CASING/NXWL	**HAMMER TYPE** MANUAL	
START DATE 6/2/04	**COMPLETION DATE** 6/2/04	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 3.75m	

ELEV.	DEPTH	BLOW COUNT 15cm	15cm	15cm	PEN. (m)	BLOWS PER 30cm. Ø 25 50 75 100	SAMPLE NUMBER	MOI.	LOG	SOIL AND ROCK DESCRIPTION
244.96										
244.00	1.36	12	26	43	0.30	69	SS-3	D		RESIDUAL, GREEN, GRAY, AND TAN, SANDY SILT
242.00	2.88	23	48	52	0.24	100+				WEATHERED ROCK (META-GRANITE)
240.00							RS-2			CRYSTALLINE ROCK (META-GRANITE)
							RS-3			REC=95%, RQD=81%
238.00						CORING TERMINATED AT ELEVATION 238.29 METERS IN CRYSTALLINE ROCK (META-GRANITE)				
236.00										
234.00										
232.00										
230.00										
228.00										
226.00										

CORE BORING REPORT

PROJECT: 34345.1.1 ID: R-0609IA COUNTY: GUILFORD BORING NO: EB1-A

DESCRIPTION: STRUCTURE NO. 3 ON -Y3- SR 1154 OVER -L- PROPOSED US 311

LOCATION OF BORING: -Y3-, 12+26.9, 4.8m LT COMPLETION DATE: 6/2/04

COLLAR or GROUND ELEVATION: 244.96 m CORE SIZE: NXWL GEOLOGIST: J.L. LOVE/J.B. BARFIELD

CORE EQUIPMENT: CME-45, NXWL, DRILLER: BRYAN SCHULL

ELEV (m)	DEPTH (m)	DRILL RATE (min/0.3m)	RUN (m)	REC (m) (%)	RQD (m) (%)	SAMPLE NUMBER	FIELD CLASSIFICATION and REMARKS
241.21	3.75	4:10					WHITE TO GRAY, SLIGHTLY TO FRESHLY WEATHERED, VERY HARD, MODERATELY CLOSE
		10;20		1.25	0.84		FRACTURES, MASSIVE META-GRANITE, THREE FRACTURES @ 50 DEGREES, AND
		7:41	1.40				ONE @ 70 DEGREES
		5:55		(89%)	(60%)	RS-2	
239.81	5.15	5:52/0.18					
239.81	5.15	8:21					PINK-GRAY, FRESHLY WEATHERED, VERY HARD, MASSIVE, META-GRANITE
		9:15		1.52	1.52		
		12:02	1.52				
		12:58		(100%)	(100%)	RS-3	
238.29	6.67	9:58					

BOREHOLE TERMINATED AT ELEVATION OF 238.29 METERS, IN META-GRANITE.

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO. 34345.1.1	**ID.** R-0609IA	**COUNTY** GUILFORD	**GEOLOGIST** J.L. LOVE
SITE DESCRIPTION STRUCTURE NO. 3 ON -Y3- SR 1154 (KERSEY VALLEY RD.) OVER -L- PROPOSED US 311			**GROUND WATER**
BORING NO. EBI-B	**BORING LOCATION** 12+27.2	**OFFSET** 5.0m RT	**ALIGNMENT** -Y3-	**0 HR.** DRY
COLLAR ELEV. 245.04m	**NORTHING** 243011.8	**EASTING** 525098.7		**24 HR.** DRY
TOTAL DEPTH 2.91m	**DRILL MACHINE** CME-45	**DRILL METHOD** H.S. AUGERS	**HAMMER TYPE** MANUAL	
START DATE 6/1/04	**COMPLETION DATE** 6/1/04	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 2.91m	

ELEV.	DEPTH	BLOW COUNT 15cm 15cm 15cm	PEN. (m)	BLOWS PER 30cm (Ø 25 50 75 100)	SAMPLE NUMBER	▼ MOI.	LOG	SOIL AND ROCK DESCRIPTION
245.04								
244.00	1.03	13 28 34	0.30	62	SS-2	D		RESIDUAL, GREEN, SANDY SILT
	2.55	100	0.10	100+X				WEATHERED ROCK (META-GRANITE)
242.00				AUGER REFUSAL AT ELEVATION 242.13 METERS ON CRYSTALLINE ROCK (META-GRANITE)				
240.00								
238.00								
236.00								
234.00								
232.00								
230.00								
228.00								
226.00								

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO. 34345.1.1	**ID.** R-0609IA	**COUNTY** GUILFORD	**GEOLOGIST** J.L. LOVE/J.B. BARFIELD
SITE DESCRIPTION STRUCTURE NO. 3 ON -Y3- SR 1154 (KERSEY VALLEY RD.) OVER -L- PROPOSED US 311			**GROUND WATER**
BORING NO. BI-A	**BORING LOCATION** 12+58.7	**OFFSET** 6.3m LT	**ALIGNMENT** -Y3-	**0 HR.** DRY
COLLAR ELEV. 245.19m	**NORTHING** 242978.4	**EASTING** 525097.5		**24 HR.** 3.05
TOTAL DEPTH 3.94m	**DRILL MACHINE** CME-45	**DRILL METHOD** H.S. AUGERS	**HAMMER TYPE** MANUAL	
START DATE 6/3/04	**COMPLETION DATE** 6/3/04	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 2.54m	

ELEV.	DEPTH	BLOW COUNT 15cm	15cm	15cm	PEN. (m)	BLOWS PER 30cm 0 25 50 75 100	SAMPLE NUMBER	▼/MOI.	LOG	SOIL AND ROCK DESCRIPTION
245.19										
	1.00	26	39	35	0.30	X 74	SS-5	D		RESIDUAL, WHITE AND TAN, SAPROLITIC, SANDY SILT
244.00										
	2.52	50			0.02	507.02 X		▼		WEATHERED ROCK (META-GRANITE)
242.00										CRYSTALLINE ROCK (META-GRANITE)
						AUGER REFUSAL AT ELEVATION 241.25 METERS IN CRYSTALLINE ROCK (META-GRANITE)				
240.00										
238.00										
236.00										
234.00										
232.00										
230.00										
228.00										
226.00										

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO. 34345.1.1	**ID.** R-0609IA	**COUNTY** GUILFORD	**GEOLOGIST** J.L. LOVE/J.B. BARFIELD
SITE DESCRIPTION STRUCTURE NO. 3 ON -Y3- SR 1154 (KERSEY VALLEY RD.) OVER -L- PROPOSED US 311			**GROUND WATER**
BORING NO. BI-B	**BORING LOCATION** 12+61.9	**OFFSET** 5.0m RT	**ALIGNMENT** -Y3-	**0 HR.** N/A
COLLAR ELEV. 245.57m	**NORTHING** 242979.5	**EASTING** 525085.9		**24 HR.** 5.30m
TOTAL DEPTH 13.04m	**DRILL MACHINE** CME-45	**DRILL METHOD** NW CASING/NXWL	**HAMMER TYPE** MANUAL	
START DATE 6/3/04	**COMPLETION DATE** 6/3/04	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 4.11m	

ELEV.	DEPTH	BLOW COUNT 15cm	15cm	15cm	PEN. (m)	BLOWS PER 30cm (0 25 50 75 100)	SAMPLE NUMBER	MOI.	LOG	SOIL AND ROCK DESCRIPTION
245.57										
	1.07	34	42	58	0.28	100+	SS-4	M		RESIDUAL, TAN, SANDY SILT
244.00										
	2.59	100			0.09	100+				WEATHERED ROCK (META-GRANITE)
242.00										
	4.11	50			0.00	50/0.00				
240.00										
238.00										CRYSTALLINE ROCK (META-GRANITE)
236.00							RS-1			
234.00										REC=89%, RQD=65%
232.00						CORING TERMINATED AT ELEVATION 232.53 METERS IN CRYSTALLINE ROCK (META-GRANITE)				
230.00										
228.00										
226.00										

CORE BORING REPORT

PROJECT: 34345.1.1 ID: R-0609IA COUNTY: GUILFORD BORING NO: B1-B

DESCRIPTION: STRUCTURE NO. 3 ON -Y3- SR 1154 OVER -L- PROPOSED US 311

LOCATION OF BORING: -Y3-, 12+61.9, 5.0m RT COMPLETION DATE: 6/3/04

COLLAR or GROUND ELEVATION: 245.57 m CORE SIZE: NXWL GEOLOGIST: J.L. LOVE/J.B. BARFIELD

CORE EQUIPMENT: CME-45, NXWL, DRILLER: BRYAN SCHULL

ELEV (m)	DEPTH (m)	DRILL RATE (min/0.3m)	RUN (m)	REC (m) (%)	RQD (m) (%)	SAMPLE NUMBER	FIELD CLASSIFICATION and REMARKS
241.19	4.38	9:26					WHITE, VERY SLIGHTLY WEATHERED, VERY HARD, MODERATELY CLOSE FRACTURES,
		13:40		0.64	0.64		MASSIVE META-GRANITE, TWO FRACTURES @ 20 DEGREES
		1:16/0.06	0.66				
				(97%)	(97%)		
240.53	5.04						
240.53	5.04	6:57					WHITE TO GRAY, SLIGHTLY TO FRESHLY WEATHERED, MODERATELY TO VERY HARD,
		4:44		1.35	0.78		MASSIVE META-GRANITE, THREE HORIZONTAL FRACTURES, TWO @ 25 DEGREES
		4:35	1.52				AND THREE @ 50 DEGREES
		3:44		(89%)	(51%)		
239.01	6.56	4:00					
239.01	6.56	3:29					(6.56-6.74m) WHITE TO GRAY, SLIGHTLY TO FRESHLY WEATHERED, MODERATELY TO VERY
		5:58		1.10	0.44		HARD, (6.74-7.18m) BROWN, SLIGHTLY WEATHERED, MOD. HARD, MOD. CLOSE FRACTURES,
		2:45	1.52				THICKLY BEDDED, DIABASE (7.18-8.08m), WHITE TO GRAY, SLIGHTLY TO FRESHLY WEATHERED,
		3:15		(72%)	(29%)		MODERATELY TO VERY HARD, MASSIVE, META-GRANITE, THREE HORIZONTAL FRACTURES,
237.49	8.08	3:18					THREE @ 30 DEGREES, AND ONE VERTICAL FRACTURE
237.49	8.08	4:13					(8.08-8.40m) WHITE AND GRAY, SEVERELY WEATHERED, HARD, VERY CLOSE FRACTURES,
		3:50		1.27	0.73		META-GRANITE, (8.40-9.60m) WHITE TO GRAY, SLIGHTLY WEATHERED, VERY HARD, CLOSE
		4:36	1.52				FRACTURES, MASSIVE META-GRANITE, ONE HORZONTAL FRACTURE, TWO @ 35 DEGREES
		5:11		(84%)	(48%)		AND TWO @ 70 DEGREES
235.97	9.60	7:08					
235.97	9.60	6:15					WHITE TO GRAY, FRESHLY WEATHERED, VERY HARD, CLOSE FRACTURES, MASSIVE,
		4:12		1.22	1.22		META-GRANITE, ONE FRACTURE @ 10 DEGREES
		4:12	1.22			RS-1	
		8:30		(100%)	(100%)		
234.75	10.82						
234.75	10.82	1:57/0.09					WHITE TO GRAY, FRESHLY WEATHERED, VERY HARD, CLOSE FRACTURES, MASSIVE,
		6:15		0.96	0.88		META-GRANITE, ONE FRACTURE @ 25 DEGREES
		7:24	1.00				
		7:35		(96%)	(88%)		
233.75	11.82						
233.75	11.82	5:17					(11.82-12.86m) WHITE TO GRAY, FRESHLY WEATHERED, VERY HARD, CLOSE FRACTURES,
		4:58		1.18	0.95		MASSIVE, META-GRANITE, (12.86-13.04m) GREEN, SLIGHTLY WEATHERED, MODERATELY HARD,
		7:27	1.22				VERY CLOSE FRACTURES, DIABASE, ONE FRACTURE @ 80 DEGREES
		5:10		(97%)	(78%)		
232.53	13.04						
							BOREHOLE TERMINATED AT ELEVATION OF 232.53 METERS, IN META-GRANITE.

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO. 34345.1.1	**ID.** R-0609IA	**COUNTY** GUILFORD		**GEOLOGIST** J.L. LOVE/J.B. BARFIELD
SITE DESCRIPTION STRUCTURE NO. 3 ON -Y3- SR 1154 (KERSEY VALLEY RD.) OVER -L- PROPOSED US 311				**GROUND WATER**
BORING NO. EB2-A	**BORING LOCATION** 13+02.0	**OFFSET** 6.3m LT	**ALIGNMENT** -Y3-	**0 HR.** DRY
COLLAR ELEV. 245.29m	**NORTHING** 242937.5	**EASTING** 525086.0		**24 HR.** 3.15
TOTAL DEPTH 6.64m	**DRILL MACHINE** CME-45	**DRILL METHOD** H.S. AUGERS	**HAMMER TYPE** MANUAL	
START DATE 6/3/04	**COMPLETION DATE** 6/3/04	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 5.63m	

ELEV.	DEPTH	BLOW COUNT 15cm	15cm	15cm	PEN. (m)	BLOWS PER 30cm 0 25 50 75 100	SAMPLE NUMBER	MOI.	LOG	SOIL AND ROCK DESCRIPTION
245.29										
	1.07	5	5	12	0.30	17	SS-6	M		RESIDUAL, ORANGE-TAN, SANDY CLAY
244.00										
	2.59	40	60		0.23	100+/0.23		▼		WEATHERED ROCK (META-GRANITE)
242.00										
	4.11	100			0.11	100+/0.11				
240.00										
	5.63	50			0.02	50/0.02				CRYSTALLINE ROCK (META-GRANITE)
238.00						AUGER REFUSAL AT ELEVATION 238.65 METERS IN CRYSTALLINE ROCK (META-GRANITE)				
236.00										
234.00										
232.00										
230.00										
228.00										
226.00										

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO. 34345.1.1	**ID.** R-0609IA	**COUNTY** GUILFORD		**GEOLOGIST** J.L. LOVE/J.B. BARFIELD
SITE DESCRIPTION STRUCTURE NO. 3 ON -Y3- SR 1154 (KERSEY VALLEY RD.) OVER -L- PROPOSED US 311				**GROUND WATER**
BORING NO. EB2-B	**BORING LOCATION** 13+02.0	**OFFSET** 0.7m RT	**ALIGNMENT** -Y3-	**0 HR.** DRY
COLLAR ELEV. 245.75m	**NORTHING** 242939.0	**EASTING** 252079.2		**24 HR.** DRY
TOTAL DEPTH 3.34m	**DRILL MACHINE** CME-45	**DRILL METHOD** H.S. AUGERS	**HAMMER TYPE** MANUAL	
START DATE 6/3/04	**COMPLETION DATE** 6/3/04	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 3.34m	

ELEV.	DEPTH	BLOW COUNT 15cm	15cm	15cm	PEN. (m)	BLOWS PER 30cm 0 25 50 75 100	SAMPLE NUMBER	MOI.	LOG	SOIL AND ROCK DESCRIPTION
245.75										
	1.02	15	30	36	0.30	66	SS-1	D		RESIDUAL, BROWN AND WHITE, SAPROLITIC SILTY SAND
244.00										
	2.54	60			0.03	60/0.03				WEATHERED ROCK (META-GRANITE)
242.00						AUGER REFUSAL AT ELEVATION 242.41 METERS IN CRYSTALLINE ROCK (META-GRANITE)				CRYSTALLINE ROCK (META-GRANITE)
240.00										
238.00										
236.00										
234.00										
232.00										
230.00										
228.00										
226.00										

PROJ. NO. - 34345.1.1
ID NO. - R-0609IA
COUNTY - GUILFORD

EB1-A

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-3	**4.8m LT**	**12+26.9**	**1.36-1.81**	**A-4(4)**	**38**	**6**	**9.6**	**30.9**	**47.4**	**12.2**	**100**	**95**	**68**	**-**	**-**

EB1-B

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-2	**5.0m RT**	**12+27.2**	**1.03-1.48**	**A-4(0)**	**26**	**3**	**20.7**	**29.3**	**35.8**	**14.2**	**78**	**68**	**45**	**-**	**-**

B1-A

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-5	**6.3m LT**	**12+58.7**	**1.00-1.27**	**A-4(2)**	**31**	**4**	**18.3**	**25.8**	**43.7**	**12.2**	**100**	**89**	**64**	**-**	**-**

B1-B

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-4	**5.0m RT**	**12+61.9**	**1.07-1.22**	**A-4(0)**	**22**	**NP**	**30.1**	**27.2**	**28.5**	**14.2**	**100**	**84**	**47**	**-**	**-**

EB2-A

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-6	**6.3m LT**	**13+02.0**	**1.07-1.52**	**A-6(7)**	**36**	**13**	**16.3**	**24.8**	**36.6**	**22.4**	**99**	**91**	**65**	**-**	**-**

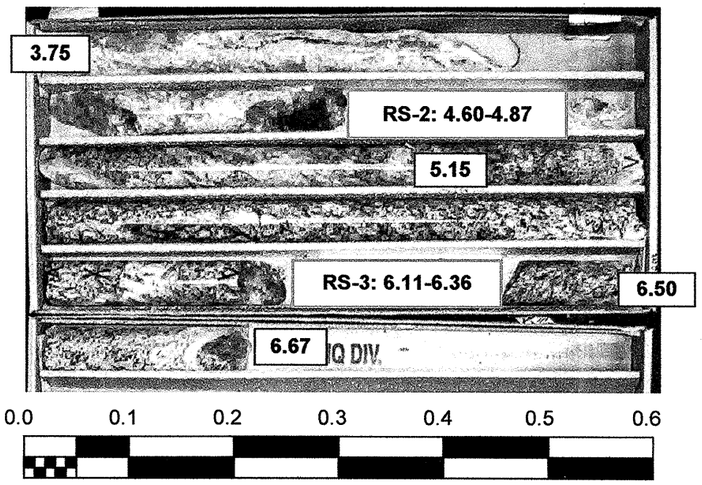
EB2-B

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-1	**0.7m RT**	**13+02.0**	**1.02-1.47**	**A-4(0)**	**23**	**NP**	**35.8**	**29.1**	**20.9**	**14.2**	**95**	**75**	**39**	**-**	**-**

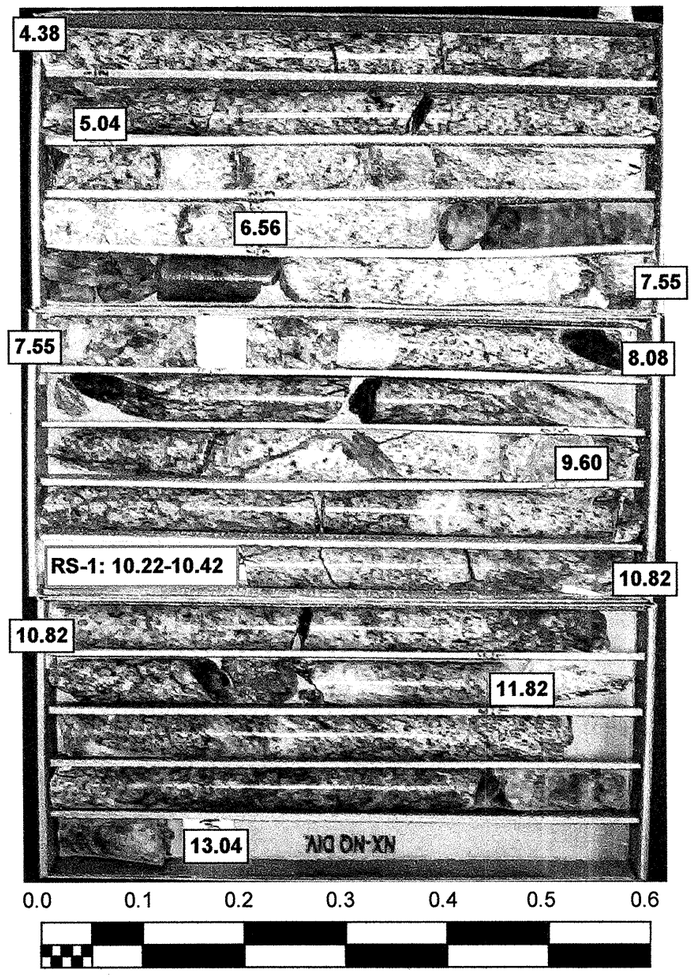
CORE PHOTOGRAPHS
EB1-A

BOXES 1& 2: 3.75 - 6.67 METERS



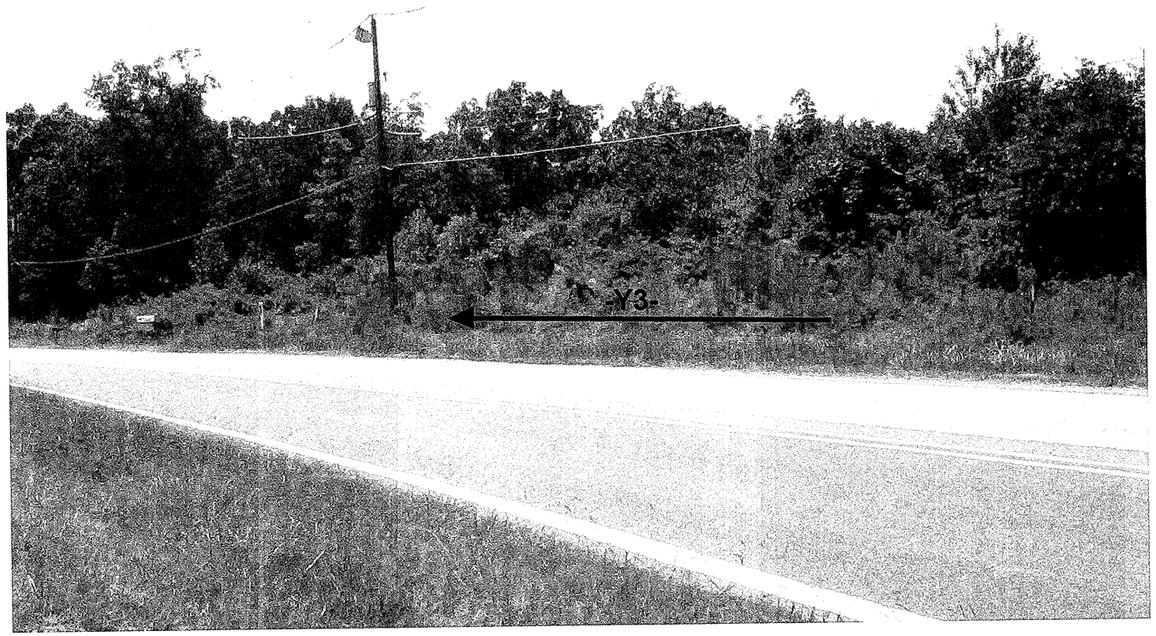
CORE PHOTOGRAPHS
B1-B

BOX 1, 2 & 3: 4.38 - 13.04 METERS



STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	34345.1.1(R-0609IA)	15	15

SITE PHOTOGRAPH



ID: R-0609IA

CONTRACT:

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	34345.1.1 (R-0609IA)	1	17
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
		P.E.	
		CONST.	

CONTENTS:

SHEET	DESCRIPTION
1	TITLE SHEET
2	LEGEND
3	STRUCTURE INVENTORY REPORT
4	TEST SITE PLAN
5-6	PROFILES
7-9	CROSS SECTIONS
10-14	BORE LOG & CORE REPORTS
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16	CORE PHOTOGRAPHS
17	SITE PHOTOGRAPH

STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

GEOTECHNICAL UNIT

STRUCTURE SUBSURFACE INVESTIGATION

STATE PROJECT 34345.1.1 I.D. NO. R-0609IA

F.A. PROJECT MAF-F-119-1 (1)

COUNTY GUILFORD

PROJECT DESCRIPTION US 311 (HIGH POINT EAST BELTWAY) FROM US 29-70 TO I-85 NORTH OF ARCHDALE

SITE DESCRIPTION STRUCTURE NO. 4 ON -SBCD- AT STA. 21+25.6 AND STRUCTURE NO. 5 ON -Y6SB- (SB I-85) AT STA. 27+12.1 OVER US 311

CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WAS 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 UNIT @ (919) 250-4088. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA IS 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.

INVESTIGATED BY C. D. CZAJKA PERSONNEL CDC

CHECKED BY N. T. ROBERSON DCB

SUBMITTED BY D. N. ARGENBRIGHT RMB

DATE AUGUST, 2004 REM

DRAWN BY: WDF

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.

NORTH CAROLINA LICENSED GEOLOGIST SEAL 1912 NEIL T. ROBERSON 8-13-04

ID	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
R-0609IA	34345.1.1	2	17

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION

SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED OR WEATHERED EARTH MATERIALS WHICH CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND WHICH YIELDS LESS THAN 100 BLOWS PER 30 cm 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 PLASTIC INDEX	6 MX		N.P.	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS
GROUP INDEX	0		0	0		4 MX		8 MX	12 MX	16 MX	No MX			
USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS. GRAVEL AND SAND		FINE SAND	SILTY OR CLAYEY GRAVEL AND SAND				SILTY SOILS		CLAYEY SOILS				
GEN. RATING AS A SUBGRADE	EXCELLENT TO GOOD							FAIR TO POOR				FAIR TO POOR	POOR	UNSUITABLE

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

CONSISTENCY OR DENSENESS

PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTENCE (N-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH (kN/m^2)
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE	<4 4 TO 10 10 TO 30 30 TO 50 >50	N/A
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD	<2 2 TO 4 4 TO 8 8 TO 15 15 TO 30 >30	<25 25 TO 50 50 TO 100 100 TO 200 200 TO 400 >400

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

GROUND WATER

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

MISCELLANEOUS SYMBOLS

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

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

ABBREVIATIONS

AR - AUGER REFUSAL
BT - BORING TERMINATED
CL. - CLAY
CPT - CONE PENETRATION TEST
CSE. - COARSE
DMT - DILATOMETER TEST
DPT - DYNAMIC PENETRATION TEST
e - VOID RATIO
F. - FINE
FOSS. - FOSSILIFEROUS
FRAC. - FRACTURED
FRAGS. - FRAGMENTS
MED. - MEDIUM
PMT - PRESSUREMETER TEST
SD. - SAND, SANDY
SL. - SILT, SILTY
SLI. - SLIGHTLY
TCR - TRICONE REFUSAL
γ - UNIT WEIGHT
γ_d - DRY UNIT WEIGHT
W - MOISTURE CONTENT
V. - VERY
VST - VANE SHEAR TEST

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [X] MOBILE B-57
- [ ] BK-51
- [ ] CME-45C
- [ ] CME-550
- [ ] PORTABLE HOIST
- [ ] OTHER _____
- [ ] OTHER _____

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 152 mm CONTINUOUS FLIGHT AUGER
- [X] 203 mm HOLLOW AUGERS
- [X] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [ ] CASING [ ] W/ ADVANCER
- [ ] TRICONE _____ mm STEEL TEETH
- [ ] TRICONE _____ mm TUNG.-CARB.
- [ ] CORE BIT
- [ ] OTHER _____

HAMMER TYPE:
- [ ] AUTOMATIC [X] MANUAL

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

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

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WHEN TESTED, WOULD YIELD SPT REFUSAL. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 2.5 cm PER 50 BLOWS. IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK.
ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLOWS:

WEATHERED ROCK (WR)	NON-COASTAL PLAIN MATERIAL THAT YIELDS SPT N VALUES > 100 BLOWS PER 30 cm.
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 2.5 cm. 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 BLOWS PER 30 cm.*
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 BLOWS PER 30 cm.*
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 6 mm 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 1 mm DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PIECES 25 mm 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 CENTIMETERS 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 25 mm OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.

FRACTURE SPACING

TERM	SPACING
VERY WIDE	MORE THAN 3 m
WIDE	1 TO 3 m
MODERATELY CLOSE	30 TO 100 cm
CLOSE	5 TO 30 cm
VERY CLOSE	LESS THAN 5 cm

BEDDING

TERM	THICKNESS
VERY THICKLY BEDDED	> 1 m
THICKLY BEDDED	0.5 - 1 m
THINLY BEDDED	0.05 - 0.5 m
VERY THINLY BEDDED	10 - 50 mm
THICKLY LAMINATED	2.5 - 10 mm
THINLY LAMINATED	< 2.5 mm

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 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 10 CENTIMETERS 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) OF A 63.5 kg HAMMER FALLING 0.76 METERS REQUIRED TO PRODUCE A PENETRATION OF 30 cm INTO SOIL WITH A 5 cm OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS LESS THAN 2.5 cm PENETRATION WITH 50 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 10 CENTIMETERS DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.

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

BENCH MARK: TRAVERSE STATION CAP BL-55, -L- STA. 51+96.5, 14.7m RT

ELEVATION: 240.00m

NOTES:

REVISED 09/15/00

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

Michael F. Easley
GOVERNOR

P.O. BOX 25201, RALEIGH, N.C. 27611-5201

Lyndo Tippett
SECRETARY

August 12, 2004

STATE PROJECT: 34345.1.1 (R-0609IA)
F.A. PROJECT: MAF-F-119-1 (1)
COUNTY: Guilford

DESCRIPTION: US 311 (High Point East Beltway) from US 29-70 to I-85 North of Archdale

SUBJECT: Structure No. 4 on -SBCD- at Sta. 21+25.6 and Structure No. 5 on -Y6SB- (SB I-85) at Sta. 27+12.1 over US 311

Project Description

Two bridges with two spans each, 83.6-meters in length with a 90° skew, are proposed on -Y6SB- (SB I-85) and -SBCD- over proposed US 311. The project is located in Guilford County about two miles northeast of Archdale.

The subsurface investigation was conducted during June of 2004 using an ATV-mounted Mobile B-57 drill machine. One Standard Penetration Test boring was performed at each of the six proposed bent locations. All borings were advanced into crystalline or weathered rock. Borings B1-B and EB2-A were cored using NQWL rock coring equipment. Representative soil and rock samples were obtained for visual classification in the field and selected samples were submitted to the Materials and Test Unit for laboratory analysis.

Physiography and Geology

The project is located in the gently rolling terrain of the Piedmont Physiographic Province. Geologically, the site is located within the Carolina Slate Belt and is underlain by crystalline meta-granite and diabase dikes. The area consists of a mixture of wooded land, sparse homes and agricultural fields.

Soil Properties

Soils encountered at the project site include roadway embankment and residual soils.

Roadway embankment soils are present along existing southbound I-85 at structure no. 5. These soils consist primarily of brown, dry, dense, silty sand (A-2-4) and orange-brown and gray, very stiff, moist, sandy and silty clay (A-6, A-7-6). Numerous weathered rock boulders are also present in the roadway embankment. These soils are 3.44 to 4.13 meters thick and are underlain by weathered and crystalline rock.

Residual soils are present at along structure no. 4 and range in thickness from 1.03 to 3.60 meters. These soils consist primarily of orange-brown, dry, medium dense to dense, clayey and silty sand (A-2-4, A-2-6). Residual soils are derived from weathering of the underlying weathered and crystalline rock.

Rock Properties

Weathered rock is present in each boring except EB1-A and EB2-A of structure no. 5. Weathered rock is derived from the underlying meta-granite and diabase and ranges in thickness from 1.19 to over 9.77 meters. The top of weathered rock was encountered at elevations ranging from 229.74 to 236.08 meters.

Crystalline rock was encountered at each boring location except B1-A of structure no. 5. The top of crystalline rock ranges in elevation from 226.76 to 236.49 meters. Rock core was obtained from B1-B on structure no. 4 and EB2-A on structure no. 5. Crystalline rock consists of black and white, fresh, hard, moderately closely to widely fractured, meta-granite and gray, moderately severely to moderately weathered, soft to hard, very closely to closely fractured, diabase. Core recovery (REC) ranged from 94 to 95% in borings B1-B and EB2-A respectively. Rock Quality Designation (RQD) ranges from 63% in EB2-A to 92% in B1-B. More detailed rock descriptions can be found in the Core Boring Reports.

Groundwater

Groundwater was encountered at two of the boring locations along structure no. 4 with elevations ranging from 227.70 to 231.62 meters.

Notice

This Geotechnical foundation report is based on the Preliminary General Drawings dated April 6, 2004. If significant changes are made in the design or location of the proposed structure, the subsurface information should be reviewed and modified as necessary.

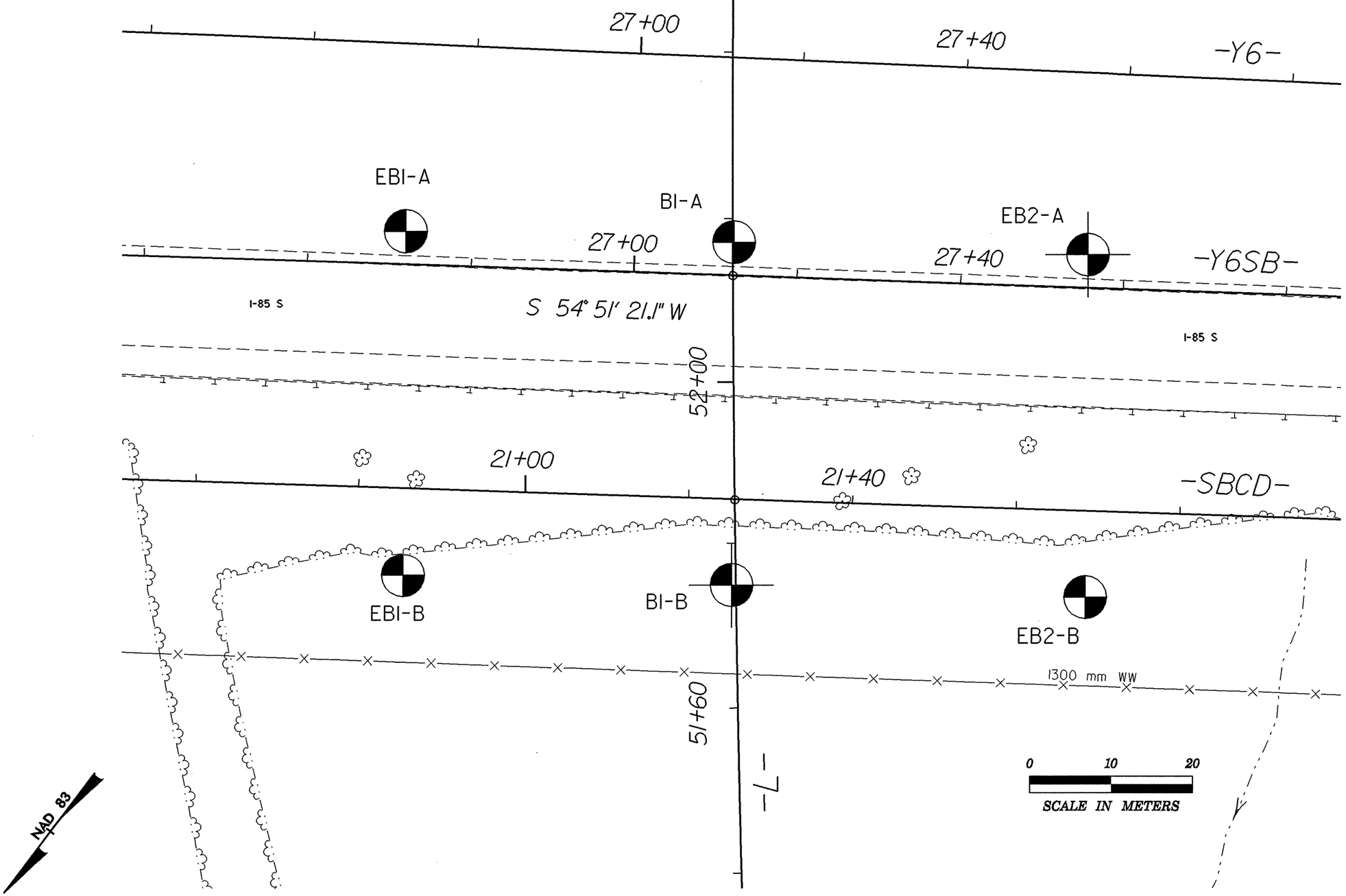
Respectfully submitted,

Neil T. Roberson

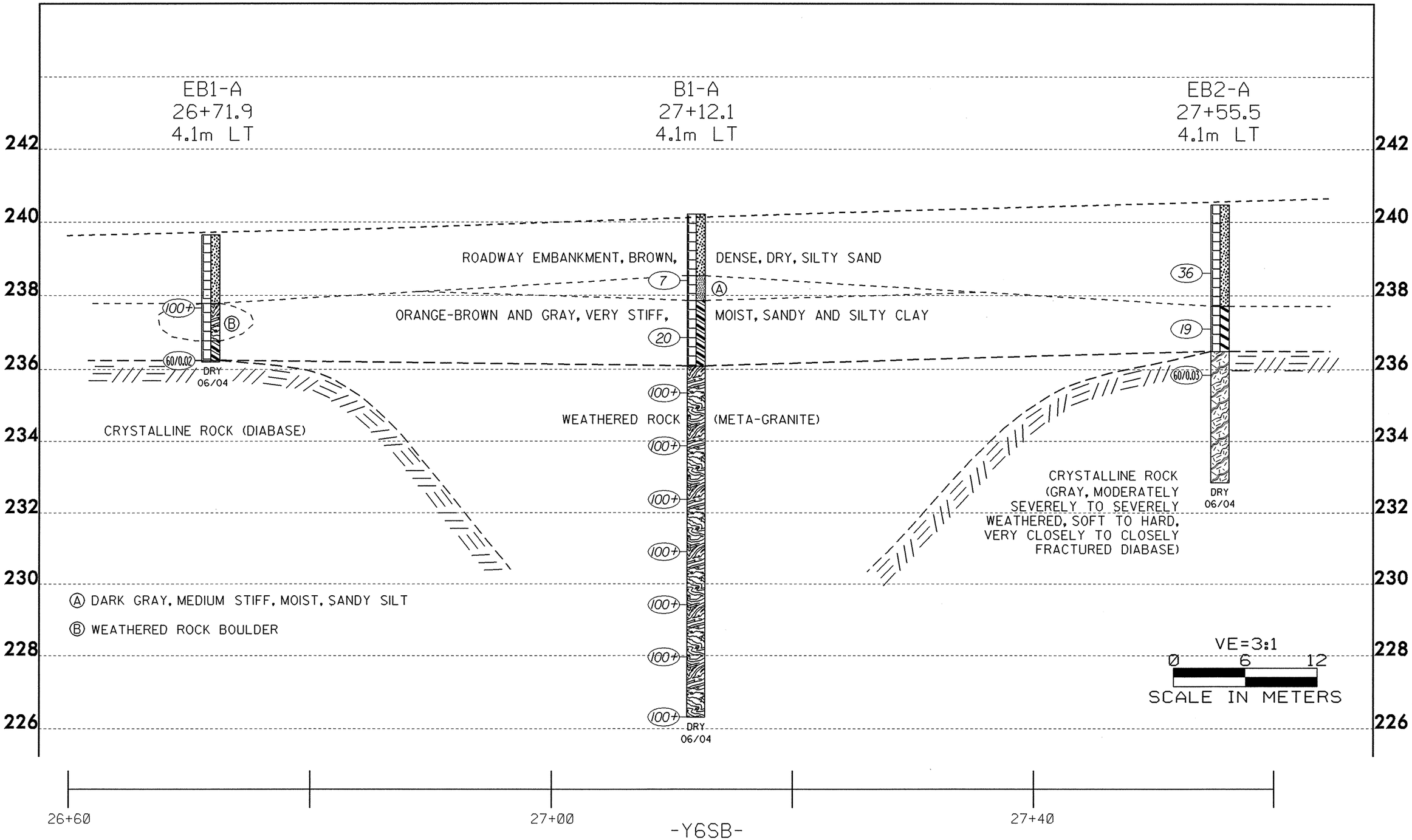
Neil T. Roberson
Project Geologist

METRIC	STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
	N.C.	34345.1.1 (R-0609IA)	4	17
	STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
			P.E.	
			CONST.	

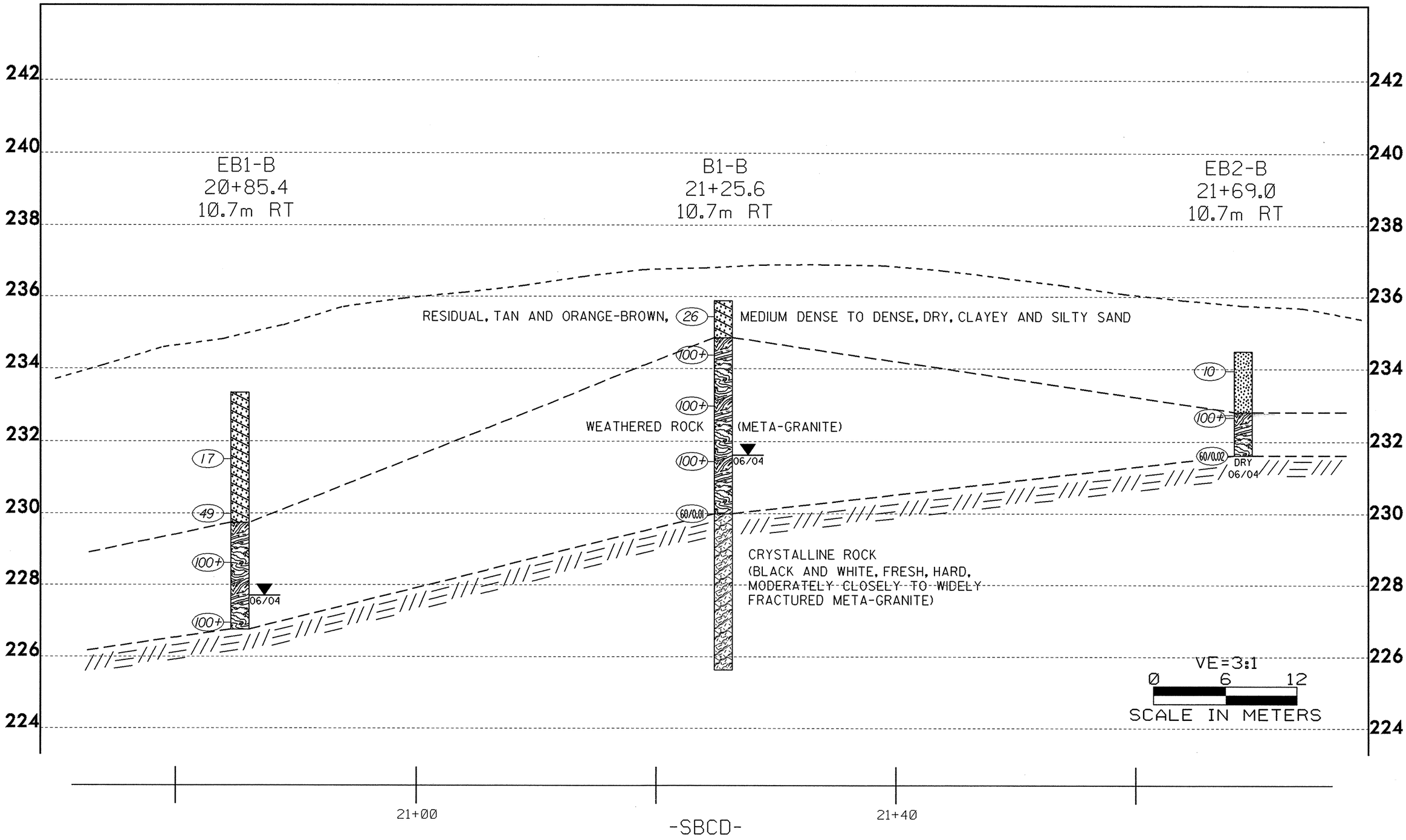
TEST SITE PLAN



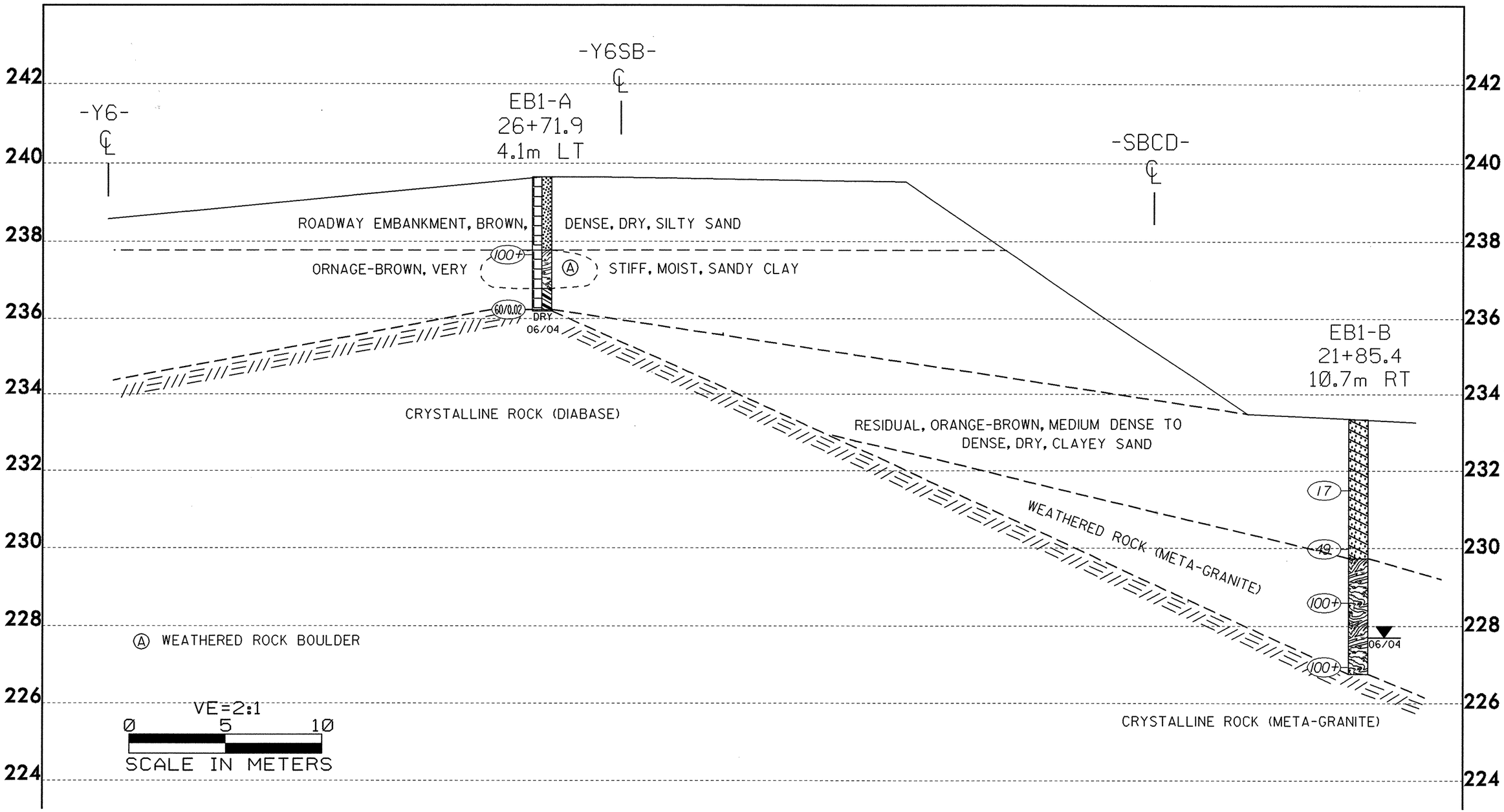
PROFILE THROUGH BORINGS PROJECTED ALONG -Y6SB-



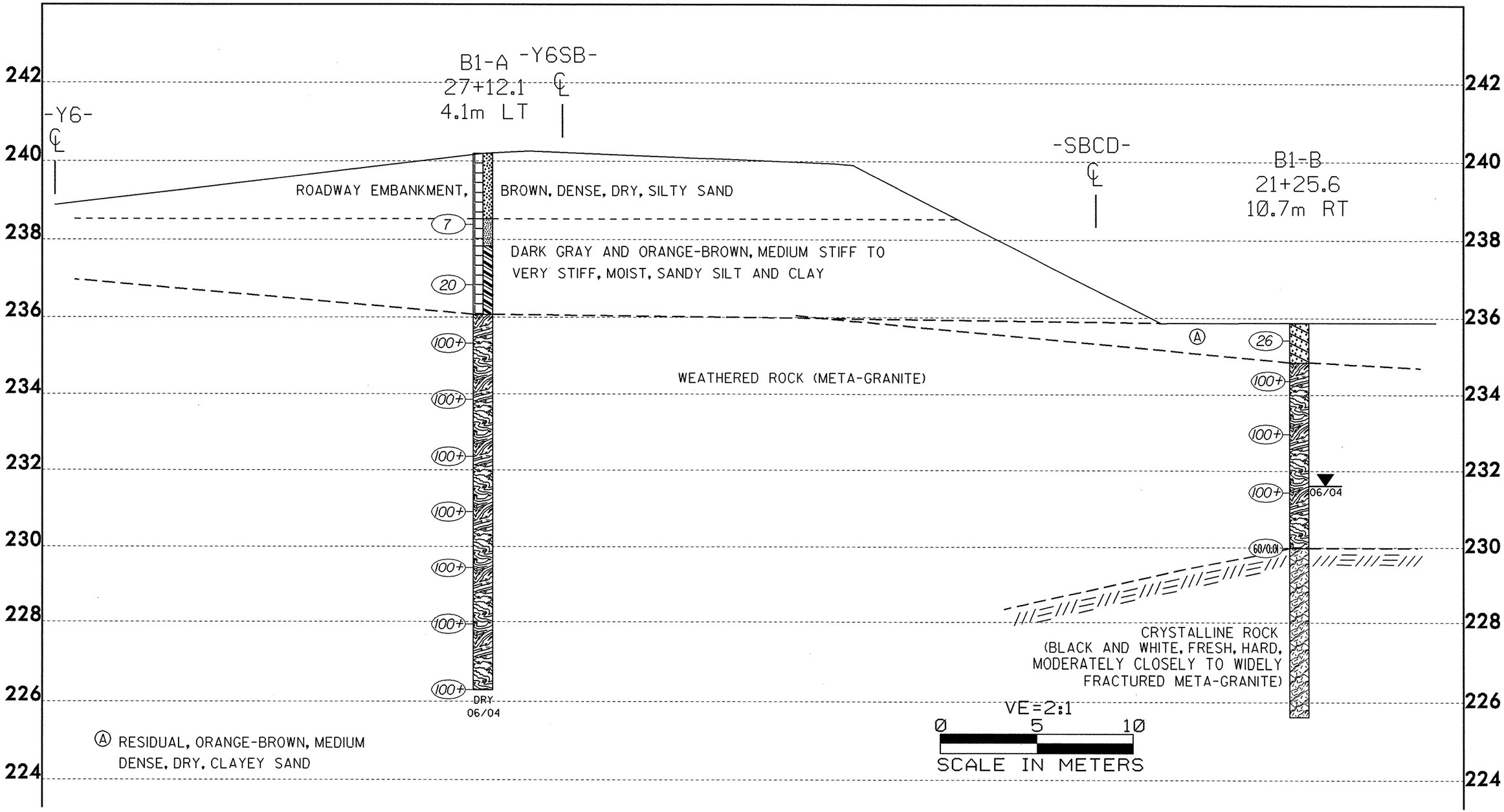
PROFILE THROUGH BORINGS PROJECTED ALONG -SBCD-



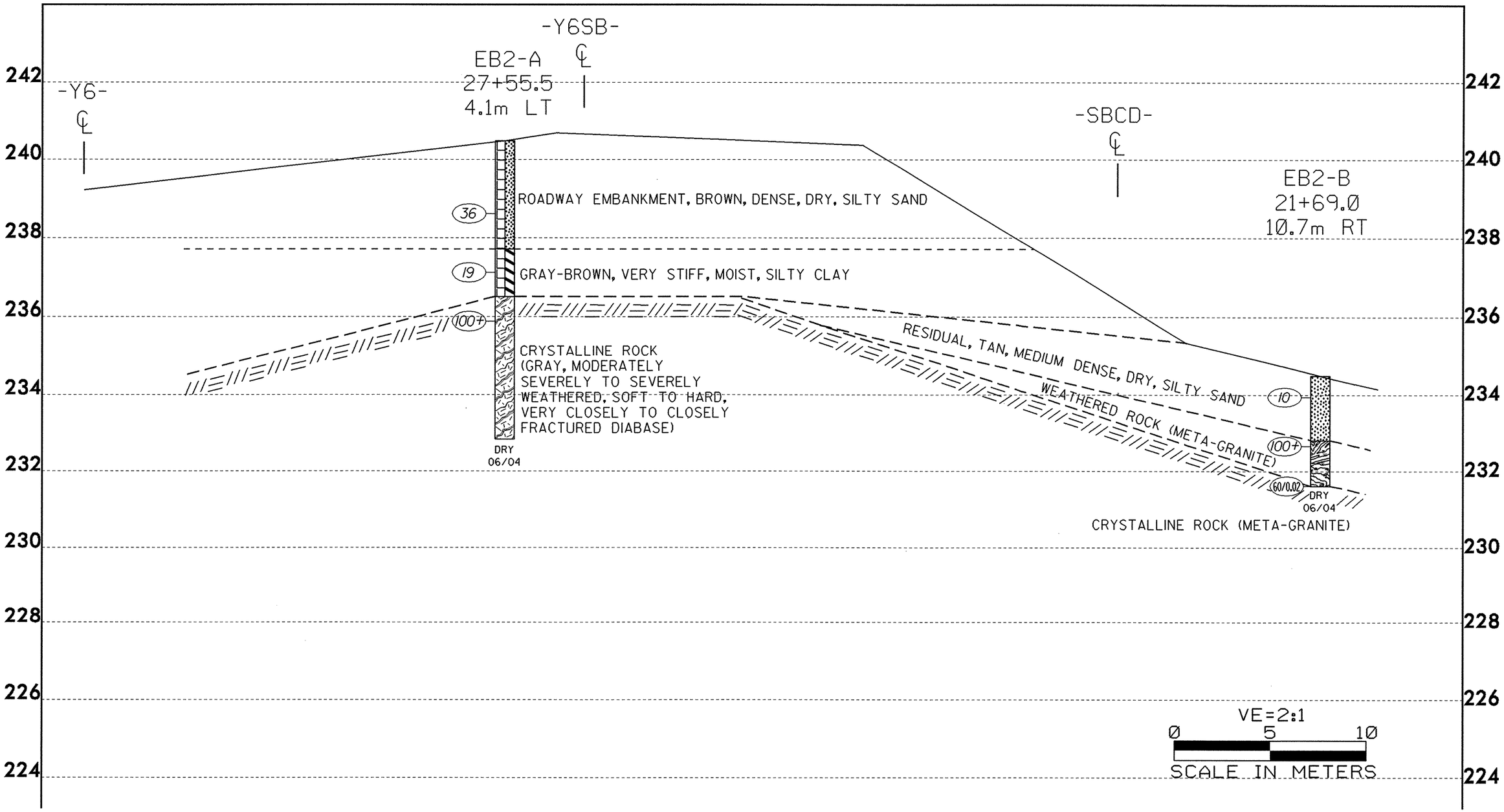
CROSS SECTION THROUGH END BENT 1



CROSS SECTION THROUGH BENT 1



CROSS SECTION THROUGH END BENT 2



NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO. 34345.1.1	**ID.** R-0609IA	**COUNTY** GUILFORD	**GEOLOGIST** C.D. CZAJKA
SITE DESCRIPTION STRUCTURE NO. 5 ON -Y6SB- (SB 1-85) OVER US 311			**GROUND WATER**
BORING NO. EBI-A	**BORING LOCATION** 26+71.9	**OFFSET** 4.1m LT	**ALIGNMENT** -Y6SB-	**0 HR.** N/A
COLLAR ELEV. 239.66m	**NORTHING** 242152.2	**EASTING** 526172.8		**24 HR.** DRY
TOTAL DEPTH 3.46m	**DRILL MACHINE** MOBILE B-57	**DRILL METHOD** H.S. AUGERS	**HAMMER TYPE** MANUAL	
START DATE 06/15/04	**COMPLETION DATE** 06/16/04	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 3.44m	

ELEV.	DEPTH	BLOW COUNT 15cm | 15cm | 15cm	PEN. (m)	BLOWS PER 30cm (0 25 50 75 100)	SAMPLE NUMBER	MOI.	LOG	SOIL AND ROCK DESCRIPTION
239.66								
	1.92	100	0.09	100+		D		ROADWAY EMBANKMENT BROWN, SILTY SAND
238.00								WEATHERED ROCK BOULDER
	3.44	60	0.02	60/.02		M		ORANGE-BROWN, SANDY CLAY
236.00				SPT REFUSAL AT ELEVATION 236.20 METERS ON CRYSTALLINE ROCK (DIABASE)				CRYSTALLINE ROCK (DIABASE)
234.00								
232.00								
230.00								
228.00								
226.00								
224.00								
222.00								
220.00								

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO. 34345.1.1	**ID.** R-0609IA	**COUNTY** GUILFORD	**GEOLOGIST** C.D. CZAJKA
SITE DESCRIPTION STRUCTURE NO. 4 ON -SBCD- OVER US 311			**GROUND WATER**
BORING NO. EBI-B	**BORING LOCATION** 21+85.4	**OFFSET** 10.7m RT	**ALIGNMENT** -SBCD-	**0 HR.** DRY
COLLAR ELEV. 233.34m	**NORTHING** 242186.2	**EASTING** 526147.5		**24 HR.** 5.64m
TOTAL DEPTH 6.58m	**DRILL MACHINE** MOBILE B-57	**DRILL METHOD** H.S. AUGERS	**HAMMER TYPE** MANUAL	
START DATE 06/11/04	**COMPLETION DATE** 06/11/04	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 6.58m	

ELEV.	DEPTH	BLOW COUNT 15cm | 15cm | 15cm	PEN. (m)	BLOWS PER 30cm (0 25 50 75 100)	SAMPLE NUMBER	MOI.	LOG	SOIL AND ROCK DESCRIPTION
233.34								
	1.54	6 7 10	0.3	17		D		RESIDUAL, ORANGE-BROWN, CLAYEY SAND
232.00								
	3.06	10 17 32	0.3	49		D		
230.00								
	4.58	89 11	0.16	100+				WEATHERED ROCK (META-GRANITE)
228.00								
	6.10	24 42 58	0.11	100+				
226.00				AUGER REFUSAL AT ELEVATION 226.76 METERS ON CRYSTALLINE ROCK (META-GRANITE)				
224.00								
222.00								
220.00								
218.00								
216.00								
214.00								

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO. 34345.1.1	**ID.** R-0609IA	**COUNTY** GUILFORD	**GEOLOGIST** C.D. CZAJKA
SITE DESCRIPTION STRUCTURE NO. 5 ON -Y6SB- (SB 1-85) OVER US 311			**GROUND WATER**
BORING NO. BI-A	**BORING LOCATION** 27+12.1	**OFFSET** 4.1m LT	**ALIGNMENT** -Y6SB-	**0 HR.** DRY
COLLAR ELEV. 240.21m	**NORTHING** 242129.0	**EASTING** 526139.9		**24 HR.** DRY
TOTAL DEPTH 13.90m	**DRILL MACHINE** MOBILE B-57	**DRILL METHOD** H.S. AUGERS	**HAMMER TYPE** MANUAL	
START DATE 06/16/04	**COMPLETION DATE** 06/16/04	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

ELEV.	DEPTH	BLOW COUNT 15cm	15cm	15cm	PEN. (m)	BLOWS PER 30cm 0 25 50 75 100	SAMPLE NUMBER	MOI.	LOG	SOIL AND ROCK DESCRIPTION
240.21										
240.00										
	1.54	5	4	3	0.3	7	SS-7	M		ROADWAY EMBANKMENT, BROWN, SILTY SAND
238.00								D		DARK GRAY, SANDY SILT
	3.06	5	7	13	0.3	20	SS-8	M		ORANGE-BROWN, SANDY CLAY
236.00										
	4.58	15	47	53	0.27	100+				
234.00	6.10	44	56		0.25	100+				
	7.62	53	47		0.23	100+				WEATHERED ROCK (META-GRANITE)
232.00										
	9.14	93	7		0.16	100+				
230.00	10.66	100			0.13	100+				
	12.18	100			0.08	100+				
228.00	13.70	82	18		0.20	100+				
226.00						BORING TERMINATED AT ELEVATION 226.31 METERS IN WEATHERED ROCK (META-GRANITE)				
224.00										
222.00										

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO. 34345.1.1	**ID.** R-0609IA	**COUNTY** GUILFORD	**GEOLOGIST** C.D. CZAJKA
SITE DESCRIPTION STRUCTURE NO. 4 ON -SBCD- OVER US 311			**GROUND WATER**
BORING NO. BI-B	**BORING LOCATION** 21+25.6	**OFFSET** 10.7m RT	**ALIGNMENT** -SBCD-	**0 HR.** DRY
COLLAR ELEV. 235.88m	**NORTHING** 242163.1	**EASTING** 526114.6		**24 HR.** 4.26m
TOTAL DEPTH 10.25m	**DRILL MACHINE** MOBILE B-57	**DRILL METHOD** H.S. AUGERS	**HAMMER TYPE** MANUAL	
START DATE 06/11/04	**COMPLETION DATE** 06/14/04	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 5.89m	

ELEV.	DEPTH	BLOW COUNT 15cm | 15cm | 15cm	PEN. (m)	BLOWS PER 30cm (Ø 25 50 75 100)	SAMPLE NUMBER	MOI.	LOG	SOIL AND ROCK DESCRIPTION
235.88	0.15	5 | 11 | 15	0.3	26		D		RESIDUAL, ORANGE-BROWN, CLAYEY SAND
	1.33	68 | 32	0.18	100+				
234.00	2.85	100	0.06	100+				WEATHERED ROCK (META-GRANITE)
232.00	4.37	100	0.07	100+				
230.00	5.89	60	0.01	60/.0ft				
228.00					RS-1			CRYSTALLINE ROCK, BLACK AND WHITE, FRESH, HARD, MODERATELY CLOSELY TO WIDELY FRACTURED, META-GRANITE
226.00					RS-2			REC=94% RQD=92%
				CORING TERMINATED AT ELEVATION 225.63 METERS IN CRYSTALLINE ROCK (META-GRANITE)				
224.00								
222.00								
220.00								
218.00								
216.00								

CORE BORING REPORT

PROJECT: **34345.1.1** ID: **R-0609IA** COUNTY: **GUILFORD** BORING NO: **B1-B**

DESCRIPTION: STRUCTURE NO. 4 ON -SBCD- OVER US 311

LOCATION OF BORING: -SBCD-, 21+25.6, 10.7m RT COMPLETION DATE: 6/14/04

COLLAR or GROUND ELEVATION: 235.88 m CORE SIZE: NQWL GEOLOGIST: C.D. CZAJKA

CORE EQUIPMENT: B-57, NQWL,HSA DRILLER: D.C. BARRON

ELEV (m)	DEPTH (m)	DRILL RATE (min/0.5m)	RUN (m)	REC (m) (%)	RQD (m) (%)	SAMPLE NUMBER	FIELD CLASSIFICATION and REMARKS
229.94	5.94	10:11					BLACK AND WHITE, FRESH, HARD, WIDELY FRACTURED, META-GRANITE
		20:16		1.12	1.12		
		39:56/0.37	1.37				
				(82%)	(82%)		
228.57	7.31						
228.57	7.31	7:29				RS-1	BLACK AND WHITE, FRESH, HARD, MODERATELY CLOSELY FRACTURED, META-GRANITE
		10:33		1.52	1.44	7.87-8.05	
		17:19	1.52				
				(100%)	(95%)		
227.05	8.83						
227.05	8.83	17:12				RS-2	BLACK AND WHITE, FRESH, HARD, WIDELY FRACTURED, META-GRANITE
		22:41		1.42	1.42	8.83-9.00	
		34:56/.42	1.42				
				(100%)	(100%)		
225.63	10.25						
							BOREHOLE TERMINATED AT ELEVATION OF 225.63 METERS, IN META-GRANITE.

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO. 34345.1.1	ID. R-0609IA	COUNTY GUILFORD	GEOLOGIST C.D. CZAJKA
SITE DESCRIPTION STRUCTURE NO. 5 ON -Y6SB- (SB I-85) OVER US 311			GROUND WATER
BORING NO. EB2-A	BORING LOCATION 27+55.5	OFFSET 4.1m LT	ALIGNMENT -Y6SB-	0 HR. N/A
COLLAR ELEV. 240.48m	NORTHING 242104.0	EASTING 526104.4		24 HR. DRY
TOTAL DEPTH 7.64m	DRILL MACHINE MOBILE B-57	DRILL METHOD H.S. AUGERS		HAMMER TYPE MANUAL
START DATE 06/15/04	COMPLETION DATE 06/15/04	SURFACE WATER DEPTH N/A		DEPTH TO ROCK 3.99m

ELEV.	DEPTH	BLOW COUNT 15cm 15cm 15cm	PEN. (m)	BLOWS PER 30cm (0 25 50 75 100)	SAMPLE NUMBER	MOI.	LOG	SOIL AND ROCK DESCRIPTION
240.48								
240.00	1.56	4 11 25	0.3	X 36	SS-5	D		ROADWAY EMBANKMENT, BROWN, SILTY SAND
238.00	3.08	5 8 11	0.3	X 19	SS-6	M		GRAY-BROWN, SILTY CLAY
236.00	4.60	60	0.03	60/.03X	RS-3 RS-4			CRYSTALLINE ROCK, GRAY, MODERATELY SEVERE TO MODERATELY WEATHERED, SOFT TO HARD, VERY CLOSE TO CLOSELY FRACTURED DIABASE REC=95% RQD=63%
234.00								
232.00				CORING TERMINATED AT ELEVATION 232.84 METERS IN CRYSTALLINE ROCK (DIABASE)				
230.00								
228.00								
226.00								
224.00								
222.00								

CORE BORING REPORT

PROJECT: 34345.1.1 ID: R-0609IA COUNTY: GUILFORD BORING NO: EB2-A

DESCRIPTION: STRUCTURE NO. 5 ON -Y6SB- (SB I-85) OVER US 311

LOCATION OF BORING: -Y6SB-, 27+55.5, 4.1m LT COMPLETION DATE: 6/15/04

COLLAR or GROUND ELEVATION: 240.48 m CORE SIZE: NQWL GEOLOGIST: C.D. CZAJKA

CORE EQUIPMENT: B-57, NQWL, HSA DRILLER: D.C. BARRON

ELEV (m)	DEPTH (m)	DRILL RATE (min/0.5m)	RUN (m)	REC (m) (%)	RQD (m) (%)	SAMPLE NUMBER	FIELD CLASSIFICATION and REMARKS
235.88	4.60	4:28					GRAY, MODERATELY SEVERE TO MODERATELY WEATHERED, SOFT TO MODERATELY
		4:57		1.38	0.67		HARD, VERY CLOSELY TO CLOSELY FRACTURED, DIABASE
		3:42	1.52				
				(91%)	(44%)		
234.36	6.12						
234.36	6.12	4:16				RS-3	GRAY, MODERATELY WEATHERED, HARD, CLOSELY FRACTURED, DIABASE
		4:53		1.52	1.26	6.57-6.77	
		5:37	1.52				
				(100%)	(83%)	RS-4	
232.84	7.64					7.43-7.58	

BOREHOLE TERMINATED AT ELEVATION OF 232.84 METERS, IN DIABASE.

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO. 34345.1.1	**ID.** R-0609IA	**COUNTY** GUILFORD	**GEOLOGIST** C.D. CZAJKA
SITE DESCRIPTION STRUCTURE NO. 4 ON -SBCD- OVER US 311			**GROUND WATER**
BORING NO. EB2-B	**BORING LOCATION** 21+69.0	**OFFSET** 10.7m RT **ALIGNMENT** -SBCD-	**0 HR.** DRY
COLLAR ELEV. 234.49m	**NORTHING** 242138.1	**EASTING** 526079.1	**24 HR.** DRY
TOTAL DEPTH 2.87m	**DRILL MACHINE** MOBILE B-57	**DRILL METHOD** H.S. AUGERS	**HAMMER TYPE** MANUAL
START DATE 06/11/04	**COMPLETION DATE** 06/11/04	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 2.87m

ELEV.	DEPTH	BLOW COUNT 15cm	15cm	15cm	PEN. (m)	BLOWS PER 30cm 0 25 50 75 100	SAMPLE NUMBER	MOI.	LOG	SOIL AND ROCK DESCRIPTION
234.49								▼		
234.00	0.15	2	4	6	0.3	10	SS-4	D		RESIDUAL, TAN, SILTY SAND
	1.53	18	48	52	0.19	100+				WEATHERED ROCK (META-GRANITE)
232.00	2.87	60			0.02	60/.02				
230.00						AUGER REFUSAL AT ELEVATION 231.60 METERS ON CRYSTALLINE ROCK (META-GRANITE)				
228.00										
226.00										
224.00										
222.00										
220.00										
218.00										
216.00										

PROJ. NO. - 34345.1.1
ID NO. - R-0609IA
COUNTY - GUILFORD

B1-A

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-7	**4.1 LT**	**27+12.1**	**1.67-1.99**	**A-4(0)**	**22**	**5**	**34.0**	**28.0**	**15.7**	**22.3**	**98**	**80**	**41**	**-**	**-**
SS-8	**4.1 LT**	**27+12.1**	**3.06-3.51**	**A-6(2)**	**26**	**11**	**30.2**	**25.7**	**19.8**	**24.3**	**99**	**81**	**48**	**-**	**-**

EB2-A

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-5	**4.1 LT**	**27+55.5**	**1.56-2.01**	**A-2-4(0)**	**30**	**10**	**41.7**	**23.9**	**18.1**	**16.2**	**84**	**61**	**32**	**-**	**-**
SS-6	**4.1 LT**	**27+55.5**	**3.08-3.53**	**A-7-6(26)**	**56**	**32**	**7.7**	**14.4**	**29.3**	**48.6**	**96**	**91**	**78**	**-**	**-**

EB2-B

SOIL TEST RESULTS

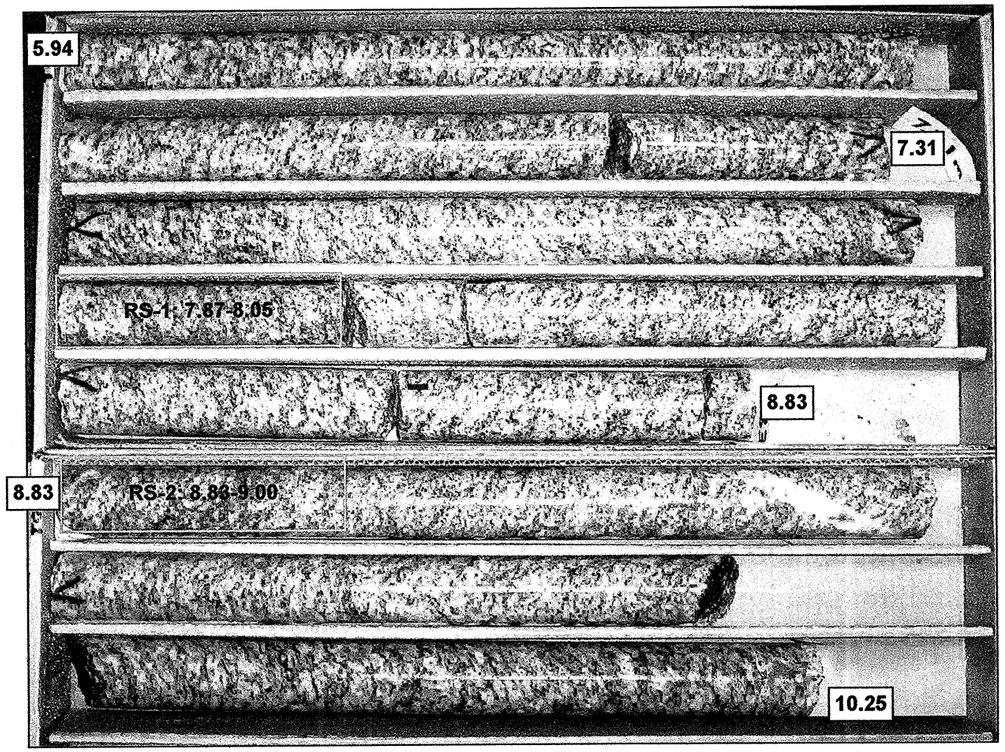
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-4	**10.7 RT**	**21+69.0**	**0.15-0.60**	**A-2-4(0)**	**21**	**NP**	**43.6**	**27.2**	**15.1**	**14.2**	**94**	**67**	**32**	**-**	**-**

34345.1.1 (R-0509IA)/STRUCTURE NO. 4

CORE PHOTOGRAPHS

B1-B

BOXES 1 & 2: 5.94 - 10.25 METERS

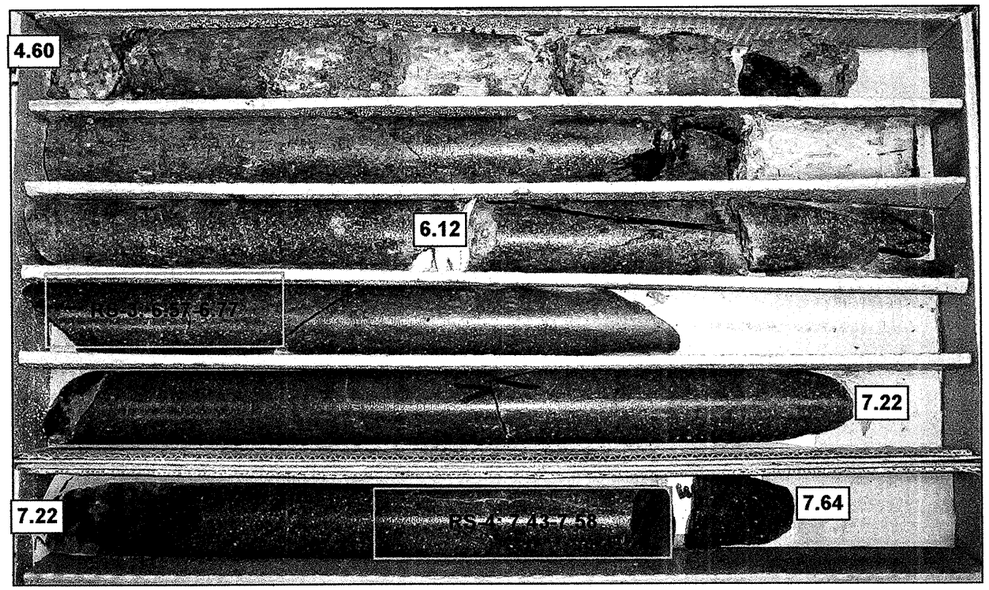


34345.1.1 (R-0609IA)/STRUCTURE NO. 5

CORE PHOTOGRAPHS

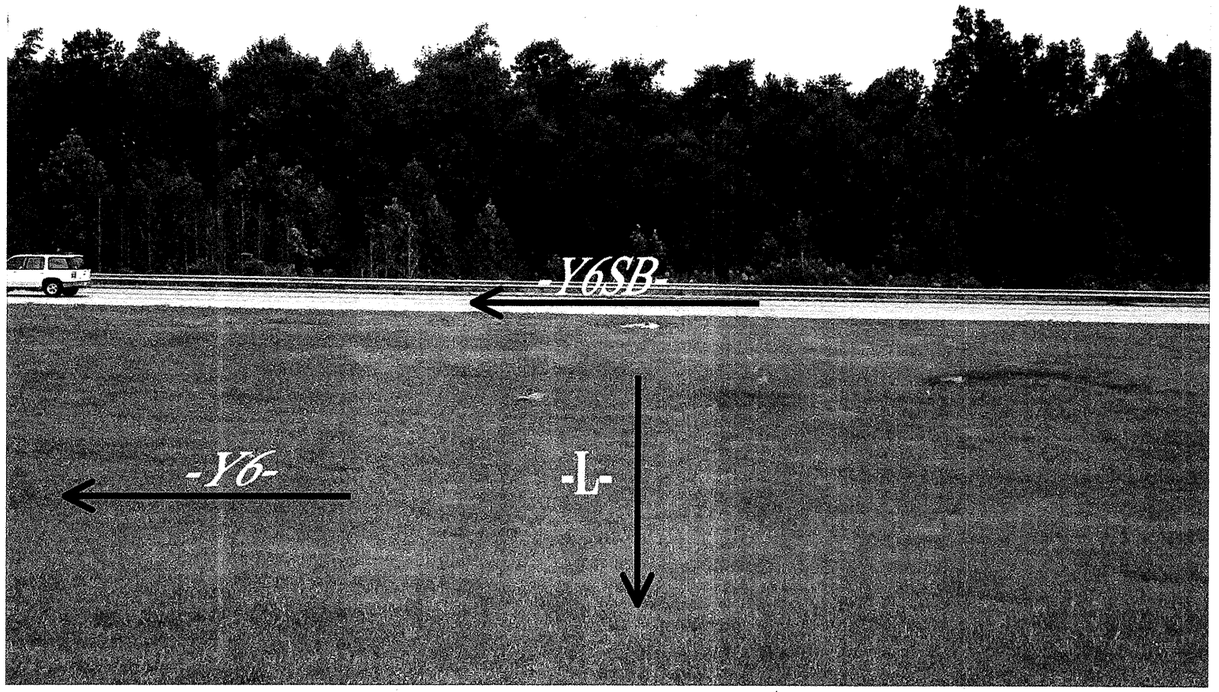
EB2-A

BOXES 1 & 2: 4.60 - 7.64 METERS



STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	34345.1.1(R-0609IA)	17	17

SITE PHOTOGRAPH



CONTRACT: ID: R-0609IA

CONTENTS:

SHEET	DESCRIPTION
1	TITLE SHEET
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4	TEST SITE PLAN
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STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

GEOTECHNICAL UNIT

STRUCTURE SUBSURFACE INVESTIGATION

STATE PROJECT 34345.1.1 I.D. NO. R-0609IA

F.A. PROJECT MAF-F-119(1)

COUNTY GUILFORD

PROJECT DESCRIPTION US 311 (HIGH POINT EAST BELTWAY) FROM US 29-70 TO I-85 NORTH OF ARCHDALE

SITE DESCRIPTION STRUCTURE NO.6 ON -Y6NB- (NB I-85) AT STA. 27+10.2 AND STRUCTURE NO.7 ON -NBCD- AT STA. 21+32.4 OVER US 311

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	34345.1.1 (R-0609IA)	1	16

STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION
		P.E.
		CONST.

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INVESTIGATED BY N.T. ROBERSON PERSONNEL C.D. CZAJKA

CHECKED BY D.N. ARGENBRIGHT D.C. B

SUBMITTED BY D.N. ARGENBRIGHT R.E. M

DATE AUGUST 2004 R.M. B

DRAWN BY: T.T. WALKER

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NORTH CAROLINA LICENSED SEAL 1912 GEOLOGIST NEIL T. ROBERSON 06/12/04

ID	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
R-0609IA	34345.1.1	2	16

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION

SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED OR WEATHERED EARTH MATERIALS WHICH CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND WHICH YIELDS LESS THAN 100 BLOWS PER 30 cm ACCORDING TO STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM AND BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE:

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

SOIL LEGEND AND AASHTO CLASSIFICATION

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

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

CONSISTENCY OR DENSENESS

PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTENCE (N-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH (kN/m^2)
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE	<4 4 TO 10 10 TO 30 30 TO 50 >50	N/A
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD	<2 2 TO 4 4 TO 8 8 TO 15 15 TO 30 >30	<25 25 TO 50 50 TO 100 100 TO 200 200 TO 400 >400

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 (COBJ.)	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	OTHER MATERIAL	
TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%	TRACE	1 - 10%
LITTLE ORGANIC MATTER	3 - 5%	5 - 12%	LITTLE	10 - 20%
MODERATELY ORGANIC	5 - 10%	12 - 20%	SOME	20 - 35%
HIGHLY ORGANIC	>10%	>20%	HIGHLY	35% AND ABOVE

GROUND WATER

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

MISCELLANEOUS SYMBOLS

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

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

ABBREVIATIONS

AR - AUGER REFUSAL
BT - BORING TERMINATED
CL. - CLAY
CPT - CONE PENETRATION TEST
CSE. - COARSE
DMT - DILATOMETER TEST
DPT - DYNAMIC PENETRATION TEST
e - VOID RATIO
F. - FINE
FOSS. - FOSSILIFEROUS
FRAC. - FRACTURED
FRAGS. - FRAGMENTS
MED. - MEDIUM
PMT - PRESSUREMETER TEST
SD. - SAND, SANDY
SL. - SILT, SILTY
SLI. - SLIGHTLY
TCR - TRICONE REFUSAL
γ - UNIT WEIGHT
γ_d - DRY UNIT WEIGHT
W - MOISTURE CONTENT
V. - VERY
VST - VANE SHEAR TEST

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [X] MOBILE B-57
- [ ] BK-51
- [ ] CME-45C
- [ ] CME-550
- [ ] PORTABLE HOIST
- [ ] OTHER _____
- [ ] OTHER _____

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 152 mm CONTINUOUS FLIGHT AUGER
- [X] 203 mm HOLLOW AUGERS
- [X] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [ ] CASING [ ] W/ ADVANCER
- [ ] TRICONE _____ mm STEEL TEETH
- [ ] TRICONE _____ mm TUNG.-CARB.
- [ ] CORE BIT
- [ ] OTHER _____

HAMMER TYPE:
- [ ] AUTOMATIC [X] MANUAL

CORE SIZE:
- [ ] -B_____
- [X] -NQWL___
- [ ] -H_____

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

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WHEN TESTED, WOULD YIELD SPT REFUSAL. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 2.5 cm PER 50 BLOWS. IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK.
ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLOWS:

WEATHERED ROCK (WR)	NON-COASTAL PLAIN MATERIAL THAT YIELDS SPT N VALUES > 100 BLOWS PER 30 cm.
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 2.5 cm. 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 BLOWS PER 30 cm.*
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 BLOWS PER 30 cm.*
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 6 mm 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 1 mm DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PIECES 25 mm 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 CENTIMETERS 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 25 mm OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.

FRACTURE SPACING

TERM	SPACING
VERY WIDE	MORE THAN 3 m
WIDE	1 TO 3 m
MODERATELY CLOSE	30 TO 100 cm
CLOSE	5 TO 30 cm
VERY CLOSE	LESS THAN 5 cm

BEDDING

TERM	THICKNESS
VERY THICKLY BEDDED	> 1 m
THICKLY BEDDED	0.5 - 1 m
THINLY BEDDED	0.05 - 0.5 m
VERY THINLY BEDDED	10 - 50 mm
THICKLY LAMINATED	2.5 - 10 mm
THINLY LAMINATED	< 2.5 mm

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 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 10 CENTIMETERS 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) OF A 63.5 kg HAMMER FALLING 0.76 METERS REQUIRED TO PRODUCE A PENETRATION OF 30 cm INTO SOIL WITH A 5 cm OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS LESS THAN 2.5 cm PENETRATION WITH 50 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 10 CENTIMETERS DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.

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

BENCH MARK: TRAVERSE STATION CAP BL-55, -L- STATION 51+96.5, 14.7m RT

ELEVATION: 240.00m

NOTES:

REVISED 09/15/00

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

Michael F. Easley
GOVERNOR

P.O. BOX 25201, RALEIGH, N.C. 27611-5201

Lyndo Tippett
SECRETARY

August 12, 2004

STATE PROJECT: 34345.1.1 (R-0609IA)
F.A. PROJECT: MAF-F-119-1 (1)
COUNTY: Guilford

DESCRIPTION: US 311 (High Point East Beltway) from US 29-70 to I-85 North of Archdale

SUBJECT: Structure No. 6 on -Y6NB- (NB I-85) at Sta. 21+25.6 and Structure No. 7 on -NBCD- at Sta. 27+12.1 over US 311

Project Description

Two bridges with two spans each, 83.6-meters in length with a 90° skew, are proposed on -Y6NB- (NB I-85) and -NBCD- over proposed US 311. The project is located in Guilford County about two miles northeast of Archdale.

The subsurface investigation was conducted during June of 2004 using an ATV-mounted Mobile B-57 drill machine. One Standard Penetration Test boring was performed at each of the six proposed bent locations. All borings were advanced into crystalline or weathered rock. Boring B1-A was cored using NQWL rock coring equipment. Representative soil and rock samples were obtained for visual classification in the field and selected samples were submitted to the Materials and Test Unit for laboratory analysis.

Physiography and Geology

The project is located in the gently rolling terrain of the Piedmont Physiographic Province. Geologically, the site is located within the Carolina Slate Belt and is underlain by crystalline meta-granite and diabase dikes. The area consists of a mixture of wooded land, sparse homes and agricultural fields.

Soil Properties

Soils encountered at the project site include roadway embankment and residual soils.

Roadway embankment soils are present along existing northbound I-85 at structure no. 6. These soils consist primarily of brown, dry, medium dense to dense, silty sand (A-2-4). Numerous weathered rock boulders are also present in the roadway embankment. These soils are 2.43 to 6.82 meters thick and are underlain by residual soil and weathered rock.

Residual soils are present at each boring except for B1-B of structure no. 6, and range in thickness from 0.91 to 4.72 meters. These soils consist primarily of orange and tan-brown, dry to moist, loose to very dense, silty and clayey sand (A-2-4, A-2-6). Residual soils are derived from weathering of the underlying weathered and crystalline rock.

Rock Properties

Weathered rock is present at each boring location. Weathered rock is derived from the underlying crystalline meta-granite and diabase and ranges in thickness from 4.30 to 5.42 meters. The top of weathered rock was encountered at elevations ranging from 233.05 to 241.51 meters.

Crystalline rock was encountered at borings B1-A and EB2-A of structure no. 7 and B1-B of structure no. 6. The top of crystalline rock ranges in elevation from 229.90 to 237.21 meters. Rock core was obtained from the interior bent boring of structure no. 7. Crystalline rock consists of light to dark gray, very slightly to slightly weathered, hard, moderately closely to closely fractured diabase. Core recovery (REC) ranges from 94% to 100% and Rock Quality Designation (RQD) ranges from 54% to 94% in B1-A. More detailed rock descriptions can be found in the Core Boring Reports.

Groundwater

Groundwater was encountered at two of the boring locations. Groundwater elevations ranged from 233.65 to 238.47 meters.

Notice

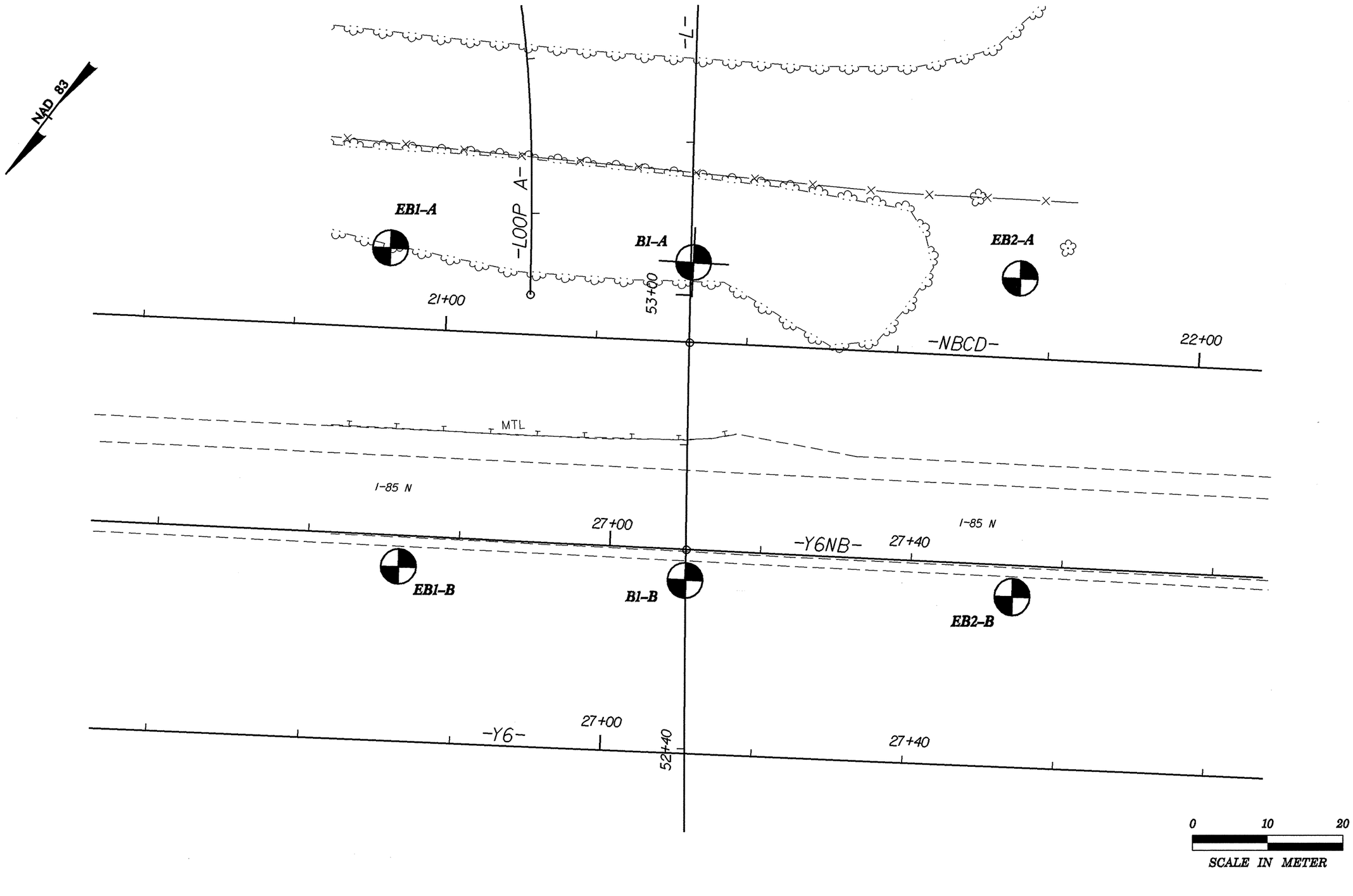
This Geotechnical foundation report is based on the Preliminary General Drawings dated April 6, 2004. If significant changes are made in the design or location of the proposed structure, the subsurface information should be reviewed and modified as necessary.

Respectfully submitted,

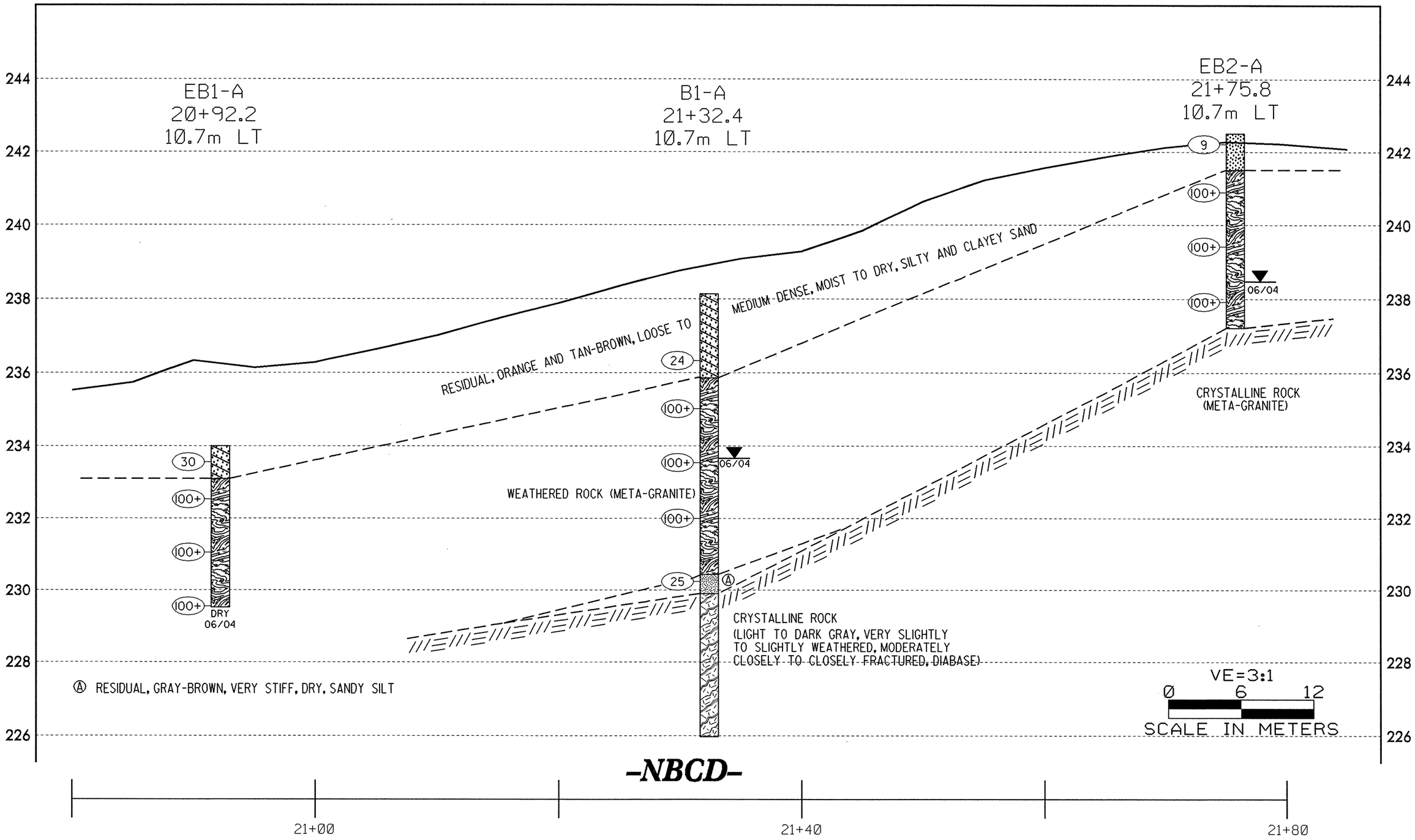
Neil T. Roberson
Project Geologist

METRIC	STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
	N.C.	34345.1.1(R-0609IA)	4	16

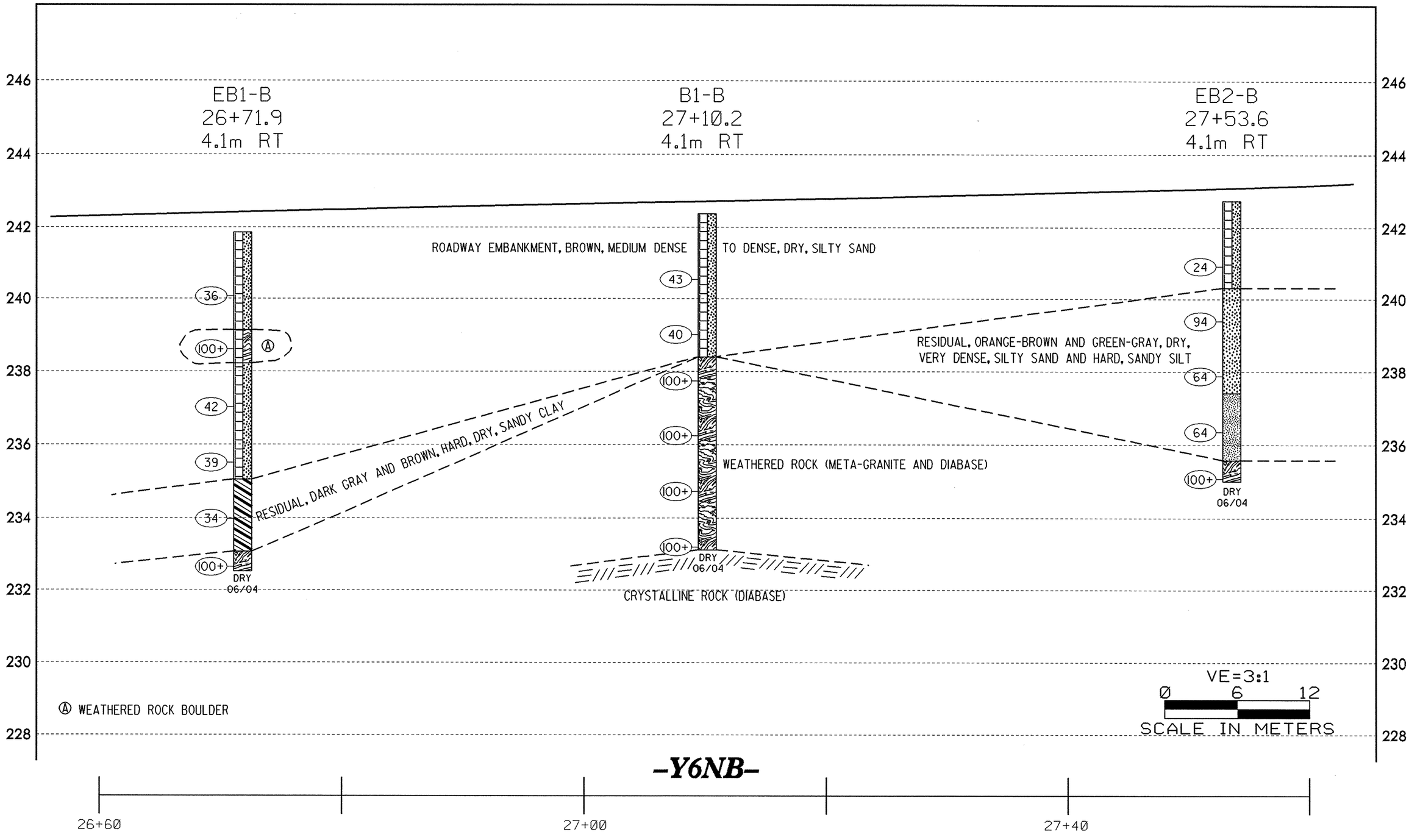
TEST SITE PLAN



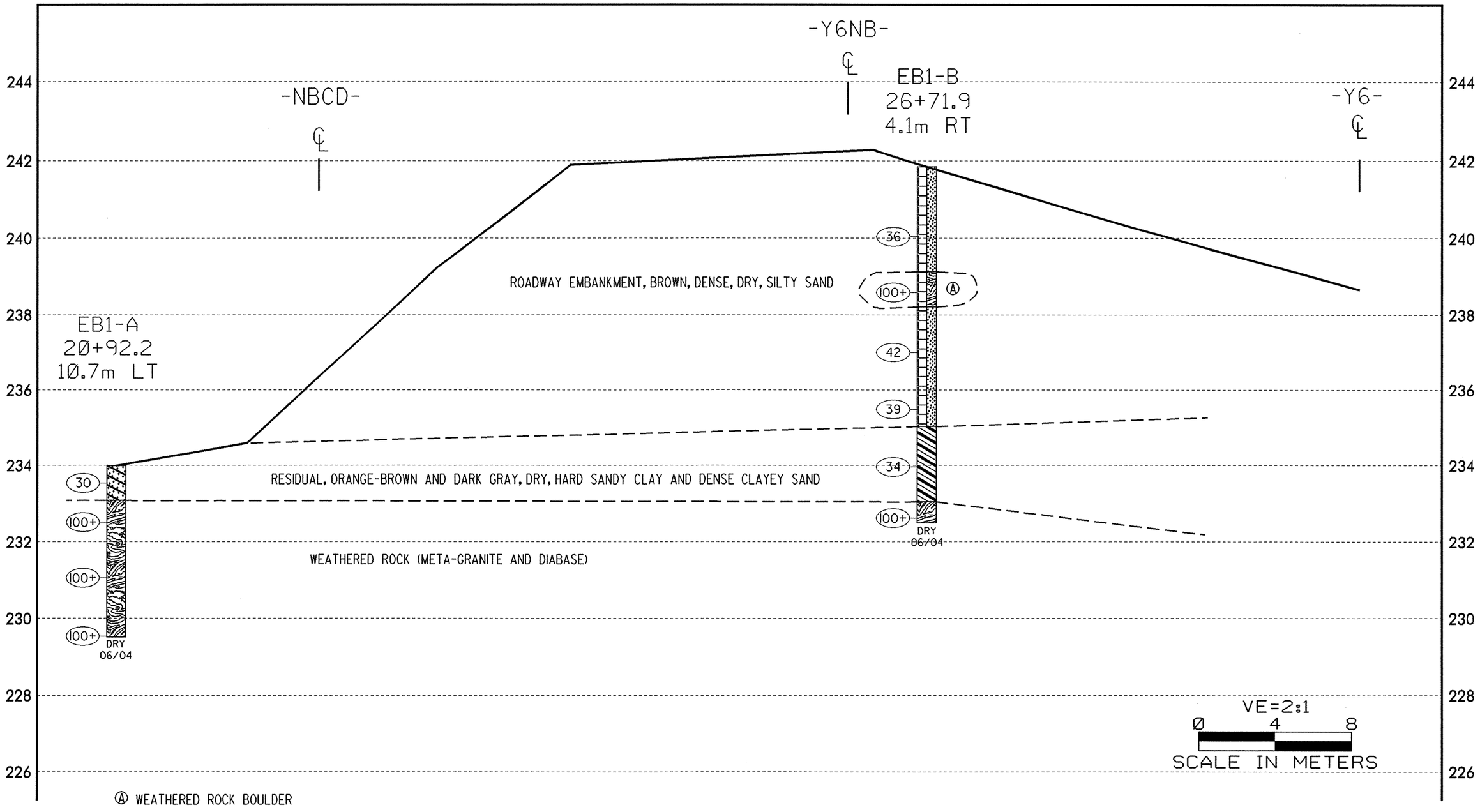
PROFILE THROUGH BORINGS PROJECTED ALONG -NBCD-



PROFILE THROUGH BORINGS PROJECTED ALONG -Y6NB-

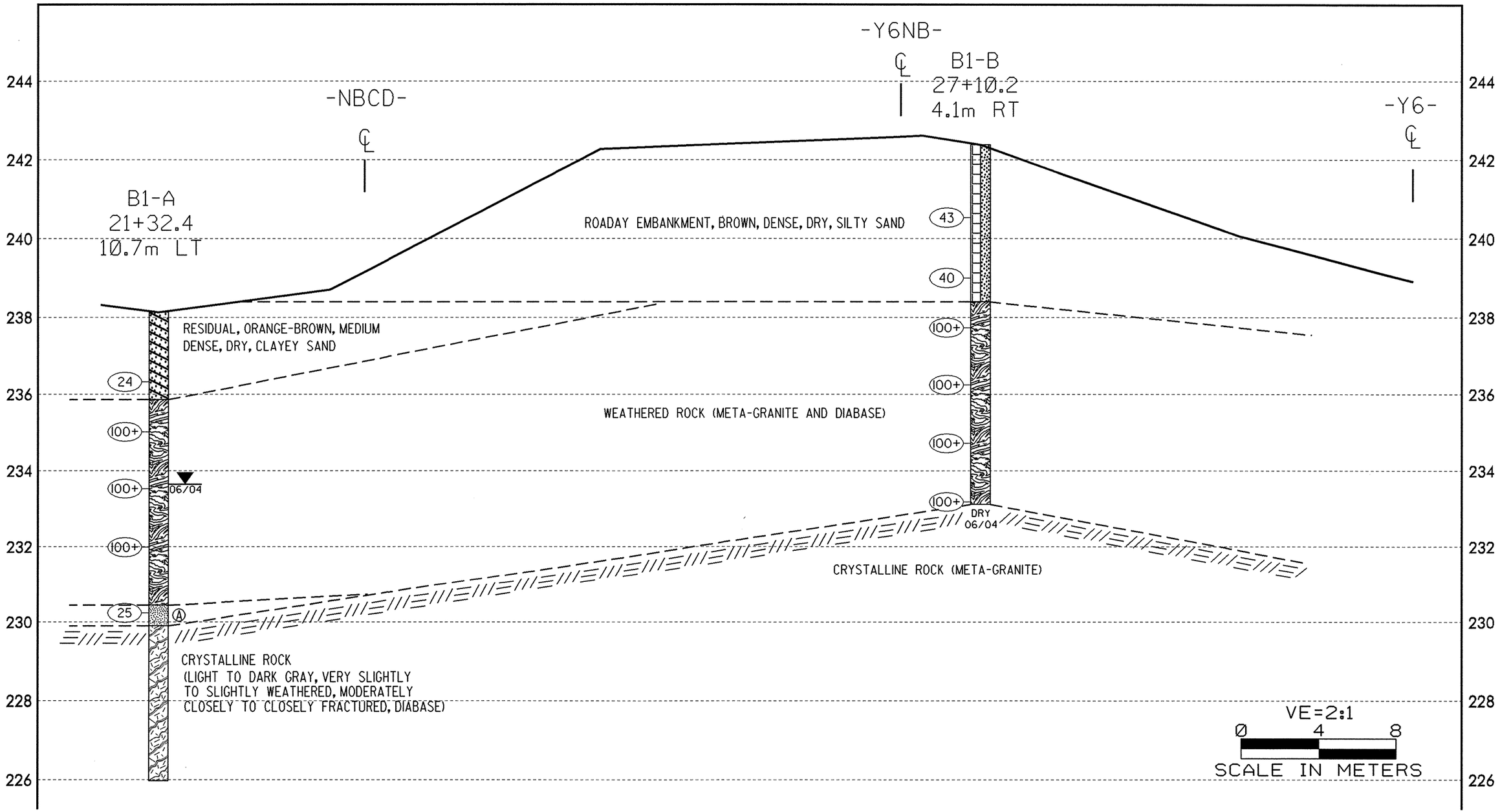


CROSS SECTION THROUGH END BENT 1



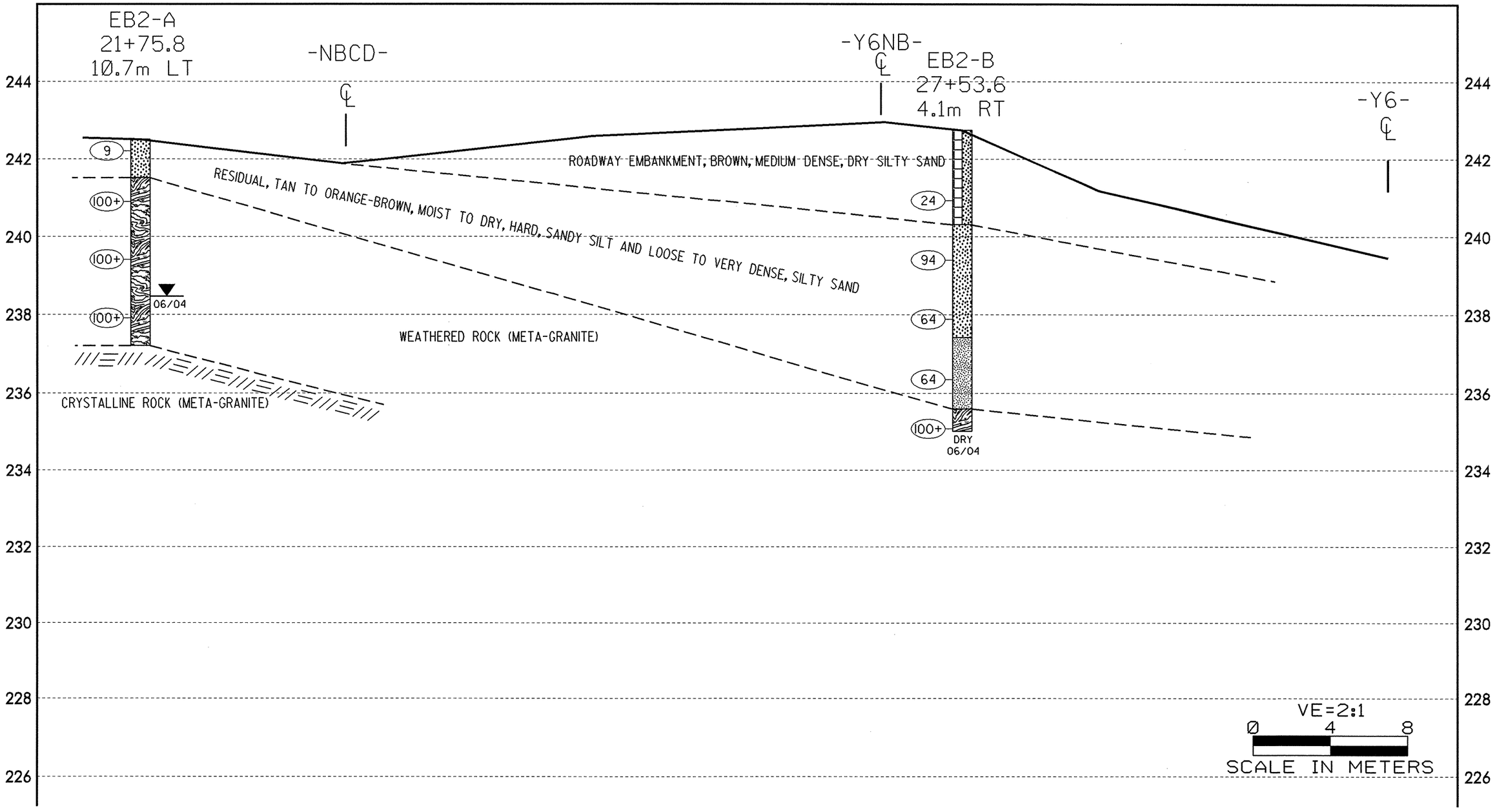
Ⓐ WEATHERED ROCK BOULDER

CROSS SECTION THROUGH BENT 1



ⒶRESIDUAL, GRAY-BROWN, VERY STIFF, SANDY SILT

CROSS SECTION THROUGH END BENT 2



NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO. 34345.1.1	**ID.** R-0609IA	**COUNTY** GUILFORD		**GEOLOGIST** C.D. CZAJKA
SITE DESCRIPTION STRUCTURE NO. 7 ON -NBCD- OVER US 311				**GROUND WATER**
BORING NO. EBI-A	**BORING LOCATION** 20+92.2	**OFFSET** 10.7m LT	**ALIGNMENT** -NBCD-	**0 HR.** DRY
COLLAR ELEV. 234.00m	**NORTHING** 242081.6	**EASTING** 526225.0		**24 HR.** DRY
TOTAL DEPTH 4.48m	**DRILL MACHINE** MOBILE B-57	**DRILL METHOD** H.S. AUGERS		**HAMMER TYPE** MANUAL
START DATE 6/10/04	**COMPLETION DATE** 6/10/04	**SURFACE WATER DEPTH** N/A		**DEPTH TO ROCK** N/A

ELEV.	DEPTH	BLOW COUNT 15cm	15cm	15cm	PEN. (m)	BLOWS PER 30cm 0 25 50 75 100	SAMPLE NUMBER	MOI.	LOG	SOIL AND ROCK DESCRIPTION
234.00	0.15	5	13	17	0.30	30		D		RESIDUAL, ORANGE-BROWN, CLAYEY SAND
232.00	1.39	58	42		0.18	100+				WEATHERED ROCK (META-GRANITE)
230.00	2.91	100			0.07	100+				
	4.43	100			0.05	100+				
228.00						BORING TERMINATED AT ELEVATION 229.52 METERS IN WEATHERED ROCK (META-GRANITE)				
226.00										
224.00										
222.00										
220.00										
218.00										
216.00										

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO. 34345.1.1	**ID.** R-0609IA	**COUNTY** GUILFORD		**GEOLOGIST** C.D. CZAJKA
SITE DESCRIPTION STRUCTURE NO. 6 ON -Y6NB- (NB I-85) OVER US 311				**GROUND WATER**
BORING NO. EBI-B	**BORING LOCATION** 26+71.9	**OFFSET** 4.1m RT	**ALIGNMENT** -Y6NB-	**0 HR.** N/A
COLLAR ELEV. 241.85m	**NORTHING** 242116.2	**EASTING** 526200.1		**24 HR.** DRY
TOTAL DEPTH 9.35m	**DRILL MACHINE** MOBILE B-57	**DRILL METHOD** H.S. AUGERS		**HAMMER TYPE** MANUAL
START DATE 6/16/04	**COMPLETION DATE** 6/16/04	**SURFACE WATER DEPTH** N/A		**DEPTH TO ROCK** N/A

ELEV.	DEPTH	BLOW COUNT 15cm	15cm	15cm	PEN. (m)	BLOWS PER 30cm 0 25 50 75 100	SAMPLE NUMBER	MOI.	LOG	SOIL AND ROCK DESCRIPTION
241.85										
240.00	1.50	11	16	20	0.30	36		D		ROADWAY EMBANKMENT, BROWN, SILTY SAND
238.00	3.02	23	48	52	0.18	100+				WEATHERED ROCK BOULDER
	4.54	28	28	14	0.30	42		D		
236.00	6.06	16	20	19	0.30	39		D		
234.00	7.58	5	13	21	0.30	34	SS-9	D		RESIDUAL, DARK GRAY AND BROWN, SANDY CLAY
	9.10	42	58		0.25	100+				WEATHERED ROCK (DIABASE)
232.00						BORING TERMINATED AT ELEVATION 232.50 METERS IN WEATHERED ROCK (DIABASE)				
230.00										
228.00										
226.00										
224.00										
222.00										

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO. 34345.1.1	**ID.** R-0609IA	**COUNTY** GUILFORD	**GEOLOGIST** C.D. CZAJKA
SITE DESCRIPTION STRUCTURE NO. 7 ON -NBCD- OVER US 311			**GROUND WATER**
BORING NO. BI-A	**BORING LOCATION** 21+32.4	**OFFSET** 10.7m LT	**ALIGNMENT** -NBCD-	**0 HR.** N/A
COLLAR ELEV. 238.13m	**NORTHING** 242058.9	**EASTING** 526191.8		**24 HR.** 4.48m
TOTAL DEPTH 12.16m	**DRILL MACHINE** MOBILE B-57	**DRILL METHOD** H.S. AUGERS	**HAMMER TYPE** MANUAL	
START DATE 6/16/04	**COMPLETION DATE** 6/16/04	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 8.23m	

ELEV.	DEPTH	BLOW COUNT 15cm	15cm	15cm	PEN. (m)	BLOWS PER 30cm (0 25 50 75 100)	SAMPLE NUMBER	MOI.	LOG	SOIL AND ROCK DESCRIPTION
238.13										
238.00										
	1.51	8	12	12	0.30	24	SS-2	D		RESIDUAL, ORANGE-BROWN, CLAYEY SAND
236.00										
	3.03	86	14		0.16	100+X				
234.00										
	4.55	100			0.09	100+X		▼		WEATHERED ROCK (META-GRANITE)
	6.07	100			0.14	100+X				
232.00										
	7.59	8	10	15	0.30	25	SS-3	D		RESIDUAL, GRAY-BROWN, SANDY SILT
230.00										
228.00							RS-5			CRYSTALLINE ROCK, LIGHT TO DARK GRAY, VERY SLIGHTLY TO SLIGHTLY WEATHERED, HARD, MODERATELY CLOSELY TO CLOSELY FRACTURED DIABASE
							RS-6			REC=99% RQD=76%
226.00						CORING TERMINATED AT ELEVATION 225.97 METERS IN CRYSTALLINE ROCK (DIABASE)				
224.00										
222.00										
220.00										

CORE BORING REPORT

PROJECT: 34345.1.1 ID: R-0609IA COUNTY: GUILFORD BORING NO: B1-A

DESCRIPTION: STRUCTURE NO. 7 ON -NBCD- OVER US-311

LOCATION OF BORING: -NBCD-, 21+32.4, 10.7m LT COMPLETION DATE: 06/10/04

COLLAR or GROUND ELEVATION: 238.13 m CORE SIZE: NQWL GEOLOGIST: C.D. CZAJKA

CORE EQUIPMENT: B-57, NQWL, HSA DRILLER: D.C. BARRON

ELEV (m)	DEPTH (m)	DRILL RATE (min/0.5m)	RUN (m)	REC (m) (%)	RQD (m) (%)	SAMPLE NUMBER	FIELD CLASSIFICATION and REMARKS
229.77	8.36	6:13	0.76	0.76 (100%)	0.41 (54%)		LIGHT TO DARK GRAY, VERY SLIGHTLY WEATHERED, HARD, CLOSELY FRACTURED, DIABASE
		2:02/0.26					
229.01	9.12						
229.01	9.12	3:58	1.52	1.47 (97%)	1.04 (68%)	RS-5 (10.16-10.32m)	LIGHT TO DARK GRAY, VERY SLIGHTLY WEATHERED, HARD, CLOSELY FRACTURED, DIABASE
		3:27					
		3:42					
227.49	10.64						
227.49	10.64	4:16	1.52	1.52 (100%)	1.43 (94%)	RS-6 (11.04-11.17m)	LIGHT TO DARK GRAY, SLIGHTLY WEATHERED, HARD, MODERATELY CLOSELY FRACTURED, DIABASE
		4:43					
		5:07					
225.97	12.16						
							BOREHOLE TERMINATED AT ELEVATION OF 225.97 METERS, IN DIABASE.

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO. 34345.1.1	**ID.** R-0609IA	**COUNTY** GUILFORD	**GEOLOGIST** C.D. CZAJKA
SITE DESCRIPTION STRUCTURE NO. 6 ON -Y6NB- (NB I-85) OVER US 311			**GROUND WATER**
BORING NO. BI-B	**BORING LOCATION** 27+10.2	**OFFSET** 4.1m RT	**ALIGNMENT** -Y6NB-	**0 HR.** DRY
COLLAR ELEV. 242.38m	**NORTHING** 242093.6	**EASTING** 526167.0		**24 HR.** DRY
TOTAL DEPTH 9.27m	**DRILL MACHINE** MOBILE B-57	**DRILL METHOD** H.S. AUGERS	**HAMMER TYPE** MANUAL	
START DATE 6/17/04	**COMPLETION DATE** 6/17/04	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 9.27m	

ELEV.	DEPTH	BLOW COUNT 15cm	15cm	15cm	PEN. (m)	BLOWS PER 30cm 0 25 50 75 100	SAMPLE NUMBER	MOI.	LOG	SOIL AND ROCK DESCRIPTION
242.38										
242.00										
	1.55	10	21	22	0.30	43		D		ROADWAY EMBANKMENT, BROWN, SILTY SAND
240.00	3.07	7	16	24	0.30	40		D		
238.00	4.59	100			0.12	100+				WEATHERED ROCK (META-GRANITE AND DIABASE)
236.00	6.11	100			0.06	100+				
	7.63	100			0.07	100+				
234.00	9.15	100			0.09	100+				
232.00						AUGER REFUSAL AT ELEVATION 233.1 METERS IN CRYSTALLINE ROCK (DIABASE)				
230.00										
228.00										
226.00										
224.00										

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO. 34345.1.1	**ID.** R-0609IA	**COUNTY** GUILFORD		**GEOLOGIST** C.D. CZAJKA
SITE DESCRIPTION STRUCTURE NO. 7 ON -NBCD- OVER US 311				**GROUND WATER**
BORING NO. EB2-A	**BORING LOCATION** 21+75.8	**OFFSET** 10.7m LT	**ALIGNMENT** -NBCD-	**0 HR.** DRY
COLLAR ELEV. 242.51m	**NORTHING** 242034.5	**EASTING** 526156.0		**24 HR.** 4.04m
TOTAL DEPTH 5.30m	**DRILL MACHINE** MOBILE B-57	**DRILL METHOD** H.S. AUGERS	**HAMMER TYPE** MANUAL	
START DATE 6/10/04	**COMPLETION DATE** 6/10/04	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 5.30m	

ELEV.	DEPTH	BLOW COUNT 15cm	15cm	15cm	PEN. (m)	BLOWS PER 30cm 0 25 50 75 100	SAMPLE NUMBER	MOI.	LOG	SOIL AND ROCK DESCRIPTION
242.51										
242.00	0.00	4	3	6	0.30	9	SS-1	M		RESIDUAL, TAN-BROWN, SILTY SAND
	1.52	65	35		0.20	100+		D		
240.00	3.04	100			0.10	100+		D		WEATHERED ROCK (META-GRANITE)
238.00	4.56	100			0.08	100+		D		
236.00						AUGER REFUSAL AT ELEVATION 237.21 METERS ON CRYSTALINE ROCK (META-GRANITE)				
234.00										
232.00										
230.00										
228.00										
226.00										
224.00										

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO. 34345.1.1	**ID.** R-0609IA	**COUNTY** GUILFORD		**GEOLOGIST** C.D. CZAJKA
SITE DESCRIPTION STRUCTURE NO. 6 ON -Y6NB- (NB I-85) OVER US 311				**GROUND WATER**
BORING NO. EB2-B	**BORING LOCATION** 27+53.6	**OFFSET** 4.1m RT	**ALIGNMENT** -Y6NB-	**0 HR.** DRY
COLLAR ELEV. 242.74m	**NORTHING** 242069.1	**EASTING** 526131.1		**24 HR.** DRY
TOTAL DEPTH 7.73m	**DRILL MACHINE** MOBILE B-57	**DRILL METHOD** H.S. AUGERS	**HAMMER TYPE** MANUAL	
START DATE 6/17/04	**COMPLETION DATE** 6/17/04	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

ELEV.	DEPTH	BLOW COUNT 15cm	15cm	15cm	PEN. (m)	BLOWS PER 30cm 0 25 50 75 100	SAMPLE NUMBER	MOI.	LOG	SOIL AND ROCK DESCRIPTION
242.74										
242.00	1.52	9	11	13	0.30	24		D		ROADWAY EMBANKMENT, BROWN, SILTY SAND
240.00	3.04	47	52	42	0.30	94	SS-10	D		RESIDUAL, ORANGE-BROWN, SILTY SAND
238.00	4.56	25	31	33	0.30	64		D		
	6.08	14	20	44	0.30	64	SS-11	D		GREEN-GRAY, SANDY SILT
236.00	7.60	100			0.13	100+				WEATHERED ROCK (META-GRANITE)
234.00						BORING TERMINATED AT ELEVATION 235.01 METERS IN WEATHERED ROCK (META-GRANITE)				
232.00										
230.00										
228.00										
226.00										
224.00										

PROJ. NO. -34345.1.1
ID NO. - R-0609IA
COUNTY - GUILFORD

EB1-B

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-9	4.1m RT	26+71.9	7.58-8.03	A-6(7)	37	13	7.7	23.9	46.1	22.3	89	85	65	-	-

B1-A

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-2	10.7m LT	21+32.4	1.51-1.96	A-2-6(2)	35	18	40.7	21.1	15.9	22.3	83	61	35	-	-
SS-3	10.7m LT	21+32.4	7.59-8.04	A-4(1)	31	4	10.7	35.9	39.2	14.2	100	96	62	-	-

EB2-A

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-1	10.7m LT	21+75.8	0.00-0.45	A-2-4(0)	22	5	46.2	21.7	17.9	14.2	89	59	32	-	-

EB2-B

SOIL TEST RESULTS

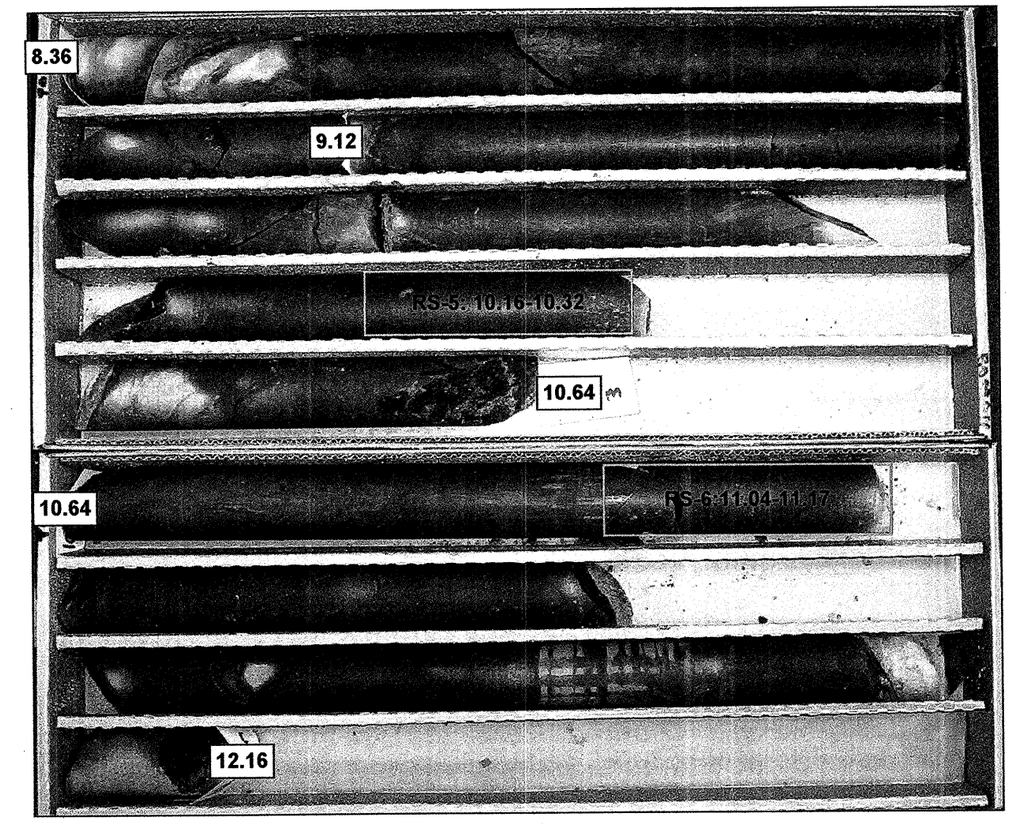
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-10	4.1m RT	27+53.6	3.04-3.49	A-2-4(0)	25	NP	56.1	25.1	10.6	8.1	100	62	23	-	-
SS-11	4.1m RT	27+53.6	6.08-6.53	A-4(7)	40	9	2.4	33.6	49.7	14.2	100	99	75	-	-

34345.1.1 (R-0609IA)/STRUCTURE NO. 7

CORE PHOTOGRAPHS

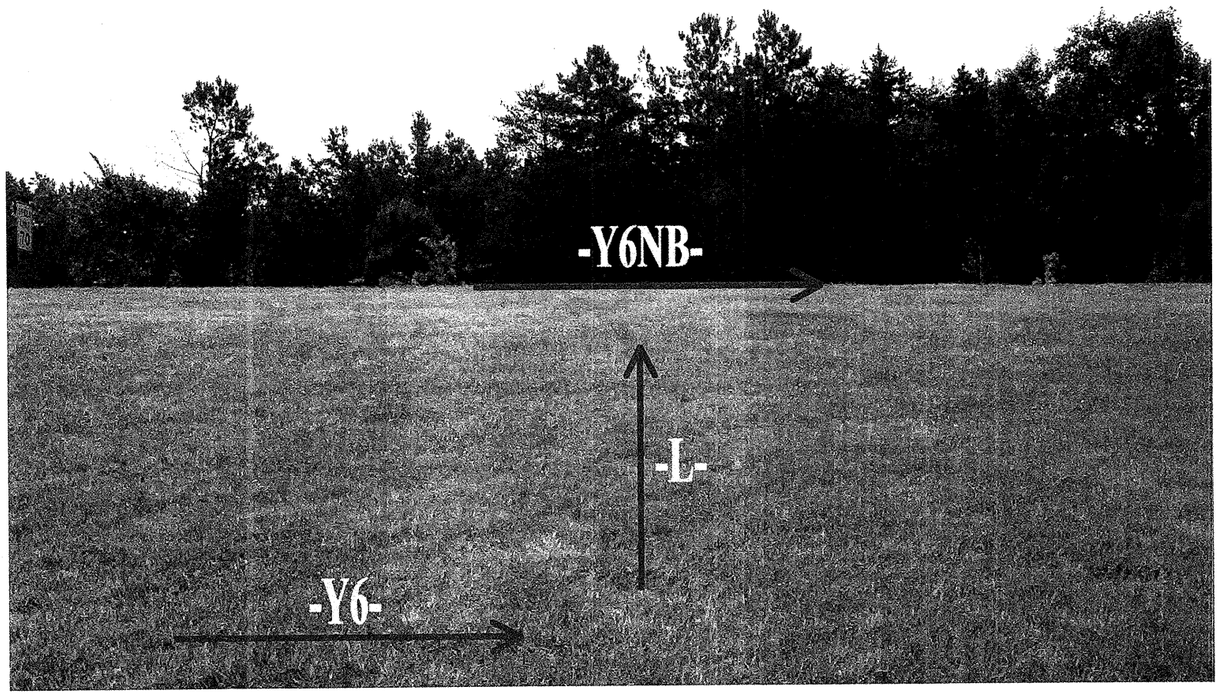
B1-A

BOXES 1 & 2: 8.36 - 12.16 METERS



STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	34345.1.1(R-0609IA)	16	16

SITE PHOTOGRAPH



ID: 34345.1.1

CONTRACT:

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SHEET	DESCRIPTION
1	TITLE SHEET
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3	STRUCTURE INVENTORY REPORT
4	SITE PLAN
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STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

GEOTECHNICAL UNIT

STRUCTURE SUBSURFACE INVESTIGATION

STATE PROJECT 34345.1.1 I.D. NO. R-0609IA

F.A. PROJECT MAF-F-119-1(1)

COUNTY GUILFORD

PROJECT DESCRIPTION US 311 HIGH POINT EAST BELTWAY FROM US 29-70 TO I-85 NORTH OF ARCHDALE

SITE DESCRIPTION STRUCTURE NO. 8 ON -FLY- AT STA. 22+01.8 OVER -L-

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	34345.1.1 (R-0609IA)	1	14
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
		P.E.	
		CONST.	

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INVESTIGATED BY T.P. MOOREFIELD PERSONNEL O.B. OTI

CHECKED BY D.N. ARGENBRIGHT C.A. HENU

SUBMITTED BY D.N. ARGENBRIGHT R.A. BRITTIAN

DATE AUGUST 2004

DRAWN BY: C.D.C.

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NORTH CAROLINA LICENSED SEAL 1301 GEOLOGIST THOMAS P. MOOREFIELD

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

ID	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
R-0609IA	34345.1.1 STRUCTURE NO. 8	2	14

METRIC

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 30 cm 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		51 MN 25 MX	50 MX 10 MX				35 MX	35 MX	35 MX	35 MX	36 MN	36 MN	36 MN	36 MN	GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT
LIQUID LIMIT PLASTIC INDEX	6 MX		N.P.	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS
GROUP INDEX	0		0	0		4 MX		8 MX	12 MX	16 MX	No MX			
USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS. GRAVEL AND SAND		FINE SAND	SILTY OR CLAYEY GRAVEL AND SAND				SILTY SOILS		CLAYEY SOILS				
GEN. RATING AS A SUBGRADE	EXCELLENT TO GOOD							FAIR TO POOR				FAIR TO POOR	POOR	UNSUITABLE

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

CONSISTENCY OR DENSENESS

PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTENCE (N-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH (kN/m^2)
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE	<4	
	LOOSE	4 TO 10	
	MEDIUM DENSE	10 TO 30	N/A
	DENSE	30 TO 50	
	VERY DENSE	>50	
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT	<2	<25
	SOFT	2 TO 4	25 TO 50
	MEDIUM STIFF	4 TO 8	50 TO 100
	STIFF	8 TO 15	100 TO 200
	VERY STIFF	15 TO 30	200 TO 400
	HARD	>30	>400

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

GROUND WATER

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

MISCELLANEOUS SYMBOLS

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

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

ABBREVIATIONS

AR - AUGER REFUSAL
BT - BORING TERMINATED
CL. - CLAY
CPT - CONE PENETRATION TEST
CSE. - COARSE
DMT - DILATOMETER TEST
DPT - DYNAMIC PENETRATION TEST
e - VOID RATIO
F. - FINE
FOSS. - FOSSILIFEROUS
FRAC. - FRACTURED
FRAGS. - FRAGMENTS
MED. - MEDIUM
PMT - PRESSUREMETER TEST
SD. - SAND, SANDY
SL. - SILT, SILTY
SLI. - SLIGHTLY
TCR - TRICONE REFUSAL
γ - UNIT WEIGHT
γ_d - DRY UNIT WEIGHT
W - MOISTURE CONTENT
V. - VERY
VST - VANE SHEAR TEST

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [X] MOBILE B-57
- [ ] BK-51
- [ ] CME-45C
- [ ] CME-550
- [ ] PORTABLE HOIST
- [ ] OTHER _____
- [ ] OTHER _____

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 152 mm CONTINUOUS FLIGHT AUGER
- [X] 203 mm HOLLOW AUGERS
- [X] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [N] CASING [ ] W/ ADVANCER
- [ ] TRICONE _____ mm STEEL TEETH
- [ ] TRICONE _____ mm TUNG.-CARB.
- [X] CORE BIT
- [ ] OTHER _____

HAMMER TYPE:
- [ ] AUTOMATIC [X] MANUAL

CORE SIZE:
- [ ] -B_____
- [X] -NXWL
- [ ] -H_____

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

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WHEN TESTED, WOULD YIELD SPT REFUSAL. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 2.5 cm PER 50 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 30 cm.
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 2.5 cm. 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 BLOWS PER 30 cm.*
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 BLOWS PER 30 cm.*
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 6 mm 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 1 mm DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PIECES 25 mm 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 CENTIMETERS 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 25 mm OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.

FRACTURE SPACING

TERM	SPACING
VERY WIDE	MORE THAN 3 m
WIDE	1 TO 3 m
MODERATELY CLOSE	30 TO 100 cm
CLOSE	5 TO 30 cm
VERY CLOSE	LESS THAN 5 cm

BEDDING

TERM	THICKNESS
VERY THICKLY BEDDED	> 1 m
THICKLY BEDDED	0.5 - 1 m
THINLY BEDDED	0.05 - 0.5 m
VERY THINLY BEDDED	10 - 50 mm
THICKLY LAMINATED	2.5 - 10 mm
THINLY LAMINATED	< 2.5 mm

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 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 10 CENTIMETERS 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) OF A 63.5 kg HAMMER FALLING 0.76 METERS REQUIRED TO PRODUCE A PENETRATION OF 30 cm INTO SOIL WITH A 5 cm OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS LESS THAN 2.5 cm PENETRATION WITH 50 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 10 CENTIMETERS DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.

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

BENCH MARK: BL-57, BL-PINC 47+36.2, -L- STA. 54+16.4, 9.9m RT
ELEVATION: 237.65

BENCH MARK: BY-7, POT 5+64.7 = BL-58, BL-PINC 48+42.8 -L- STA. 55+23.2, 7.4m RT
ELEVATION: 234.40

NOTES:

REVISED 09/15/00

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

Michael F. Easley
GOVERNOR

P.O. BOX 25201, RALEIGH, N.C. 27611-5201

Lyndo Tippett
SECRETARY

August 26, 2004

STATE PROJECT: 34345.1.1 (R-0609IA)
F.A. PROJECT: MAF-F-119-1 (1)
COUNTY: Guilford

DESCRIPTION: US 311 (High Point East Beltway) from US 29-70 to I-85 north of Archdale

SUBJECT: Geotechnical Report – Foundation Investigation for Structure No. 8 on -FLY- at Sta. 22+01.8 over -L-

Project Description

A two-span bridge, 100 meters in length, is proposed on -FLY- over the proposed -L- (US 311). The project is located in Guilford County about two miles northeast of Archdale. The skew ranges from 70° 26' 58" at the interior bent to 90° at the end bents.

The subsurface investigation was conducted during June of 2004 using an ATV-mounted Mobile B-57 drill machine with a manual hammer. Standard Penetration Test borings were performed at each of the three proposed bent locations. All borings were advanced into crystalline or weathered rock. Boring B1-B was cored using NXWL rock coring equipment. Representative soil samples were obtained for visual classification in the field and selected samples were submitted to the Materials and Test Unit for laboratory analysis. A rock core sample was also sent to the Materials and Test Unit to determine Unit Weight, Compressive Strength and Young's Modulus.

Physiography and Geology

The project is located in the gently rolling terrain of the Piedmont Physiographic Province. Geologically, the site is located within the Carolina Slate Belt and is underlain by metamorphosed granite and gabbro intrusions. The area consists of a mixture of wooded land, sparse homes and agricultural fields.

Soil Properties

Residual soil was the only soil type encountered in each boring. The residual soil ranged in thickness from 0.5 to 2.2 meters. These soils consist primarily of tan-brown, hard, dry to moist sandy silt (AASHTO classification of A-4) and tan-brown, loose to very dense, dry to moist coarse sand (A-2-4 and A-1-b). The residual soils are derived from weathering of the underlying weathered and crystalline rock.

Rock Properties

Weathered rock is present in each boring except for EB2-A. Weathered rock is derived from the underlying crystalline metamorphosed granite (referred to in this report as meta-granite). The weather rock ranged in thickness from 2.2 meters at End Bent Two to as much as 6.2 meters at End Bent One.

Crystalline rock, consisting of meta-granite and meta-gabbro, was encountered at borings B1-B, EB2-A, and EB2-B. Meta-gabbro rock core was obtained from the B1-B boring. The rock consists of gray, very slightly weathered, hard, moderately closely to closely fractured metamorphosed gabbro (meta-gabbro). Core recovery (REC) ranged from 46% to 100%. Rock Quality Designation (RQD) was highly variable, ranging from 0% to 95%. A more detailed rock description can be found in the B1-B Core Boring Report.

Groundwater

Groundwater was encountered at each bent location. Groundwater elevations ranged from 229.5 to 237.0 meters.

Notice

This Geotechnical foundation report is based on the Preliminary General Drawings dated March 24, 2004 which were attached to the "Request for Foundation Recommendations" dated April 2, 2004. If significant changes are made in the design or location of the proposed structure, the subsurface information should be reviewed and modified as necessary.

Prepared by,
Thos P. Moorefield

Thomas P. Moorefield, LG
Project Geologist

TEST SITE PLAN

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	34345.1.1(R-0609IA) STRUCTURE 8	4	14

NAD 83

-L- 54+00

BL-57
BL-PINC 47+36.187
-L- STA 54+16.424
OFF 9.925(32.56)RT

-FLY- POC STA. 22+01.765
-L- POC STA. 54+36.375

21+40

22+00

23+00

EBI-A

BI-A

EB2-A

-FLY-

EBI-B

BI-B

EB2-B

RUINS

BARN

SR 1148 CHECKER RD.

55+00

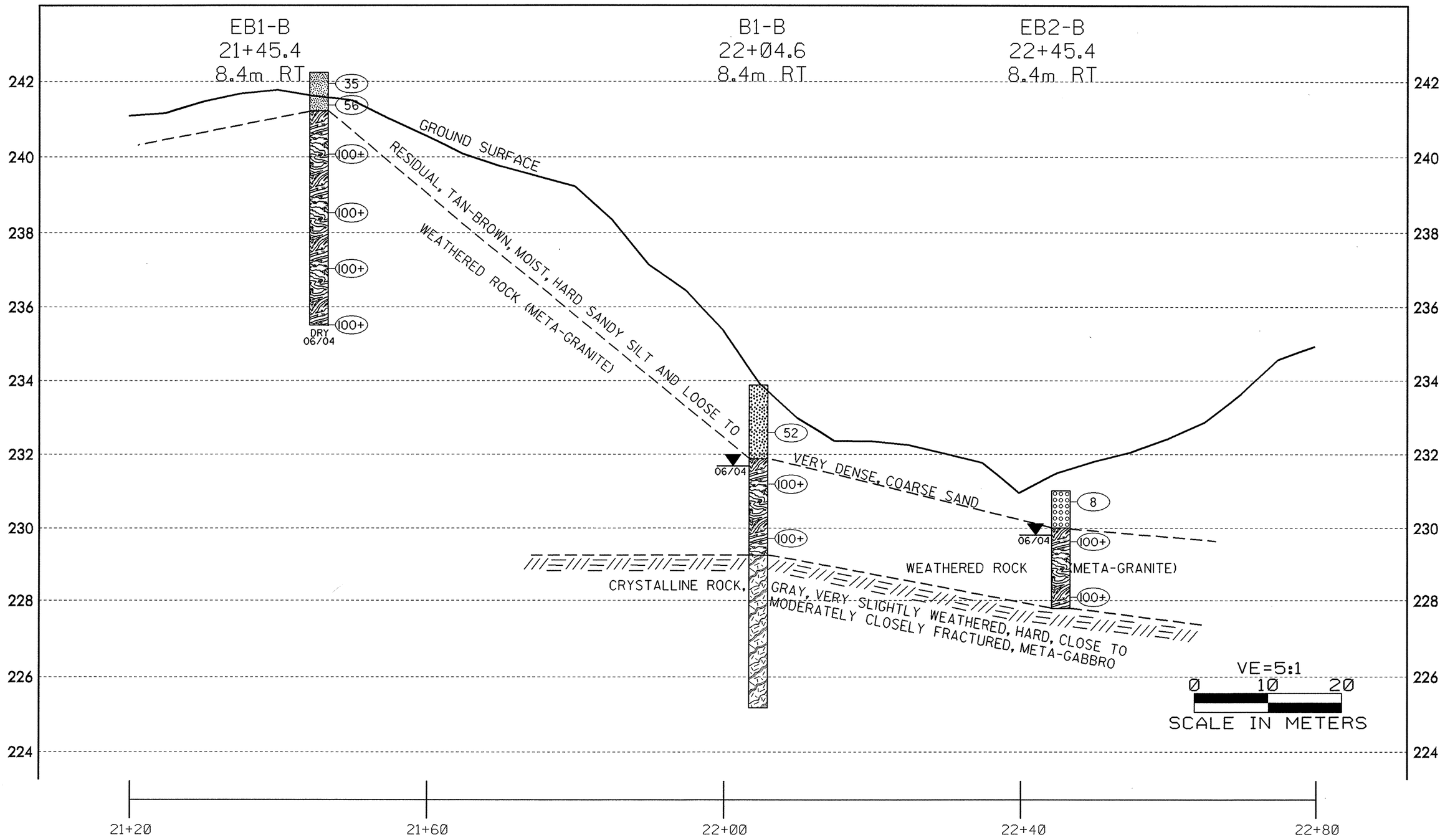
BY7-PINC 5+00.000
-FLY- STA 22+42.624
OFF 27.468(90.12)RT

20 SQU.

0 10 20

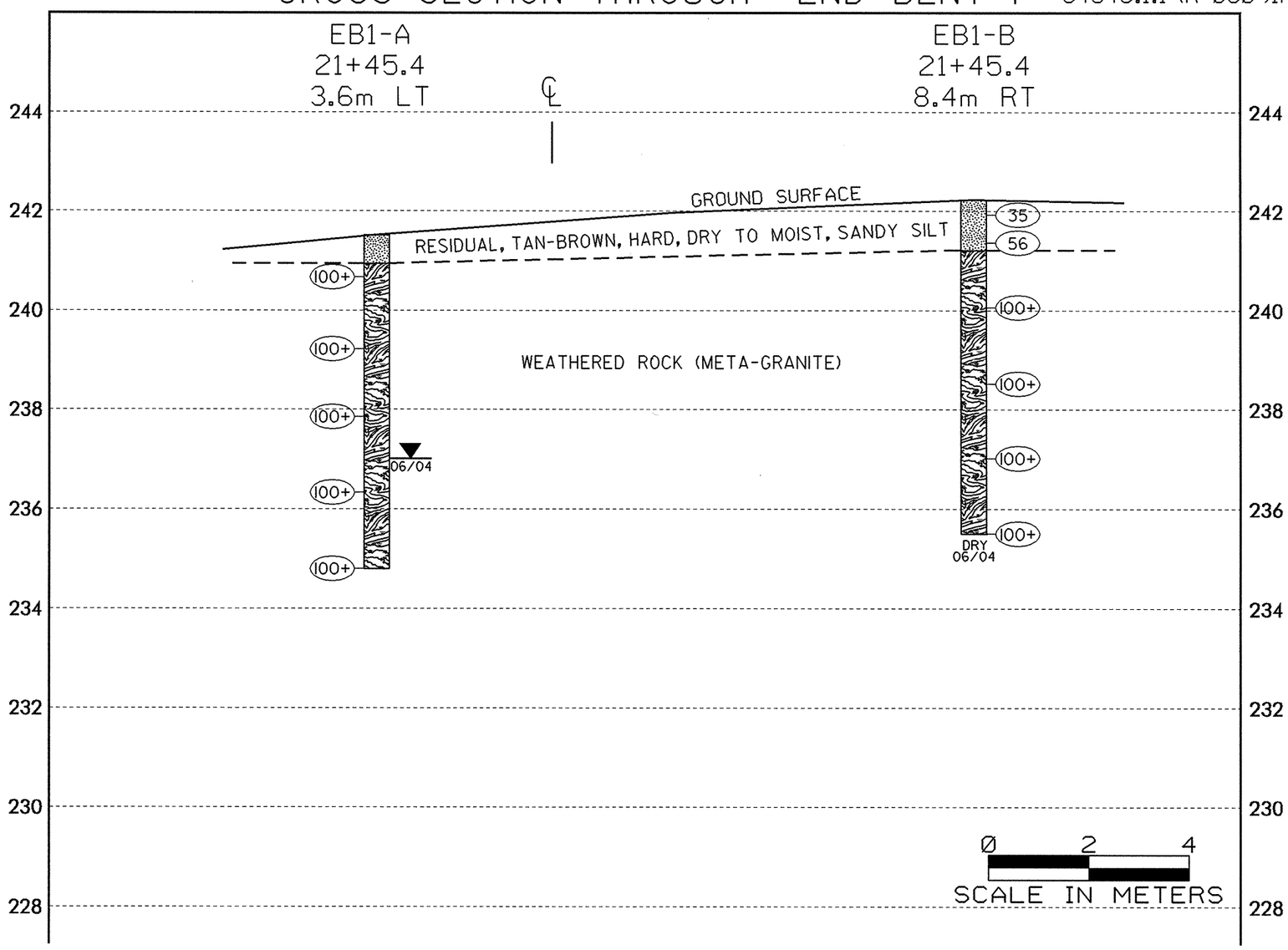
SCALE IN METERS

PROFILE THROUGH BORINGS PROJECTED ALONG -FLY-



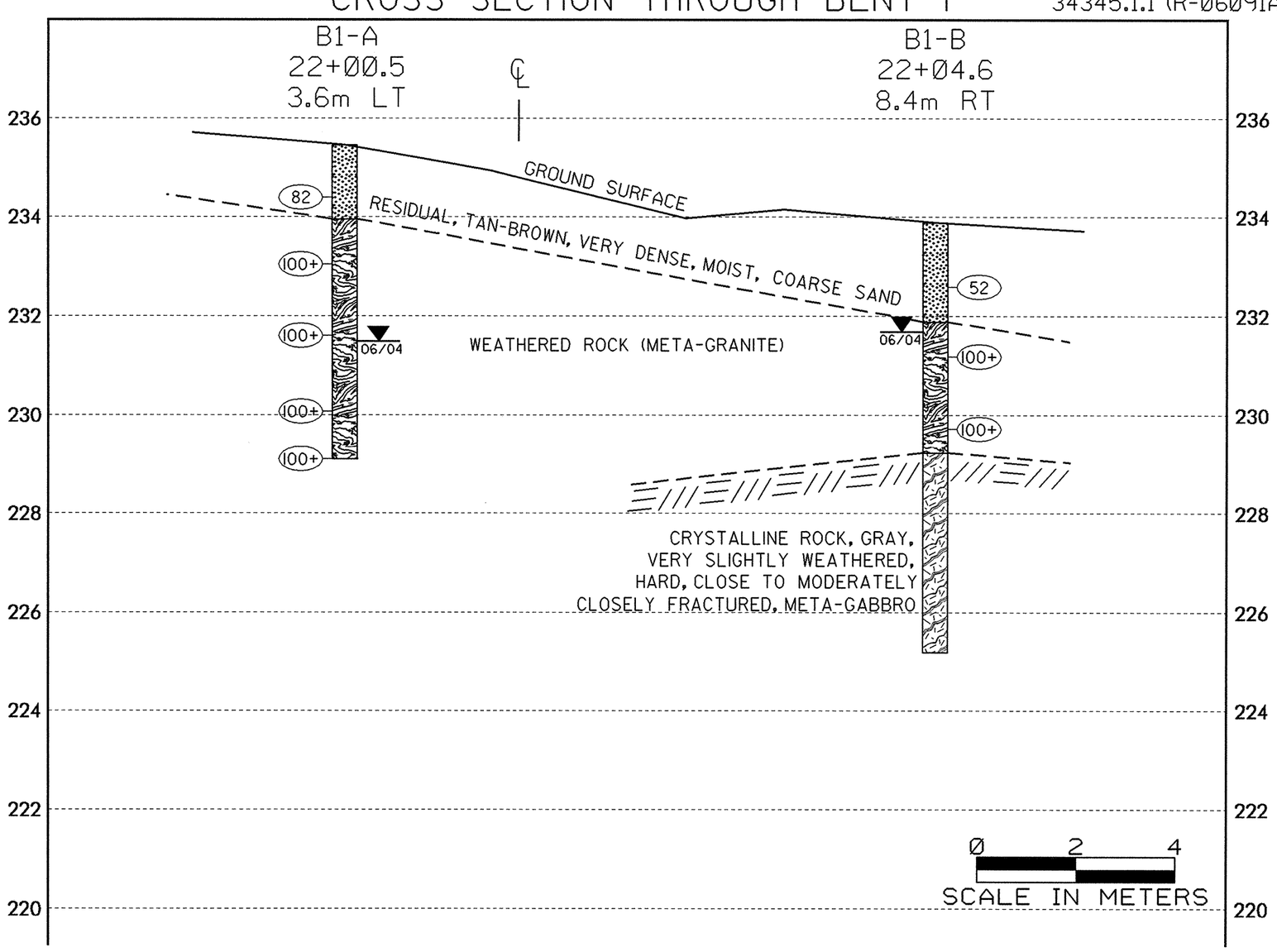
CROSS SECTION THROUGH END BENT 1

STRUCTURE NO. 8
34345.1.1 (R-0609IA)



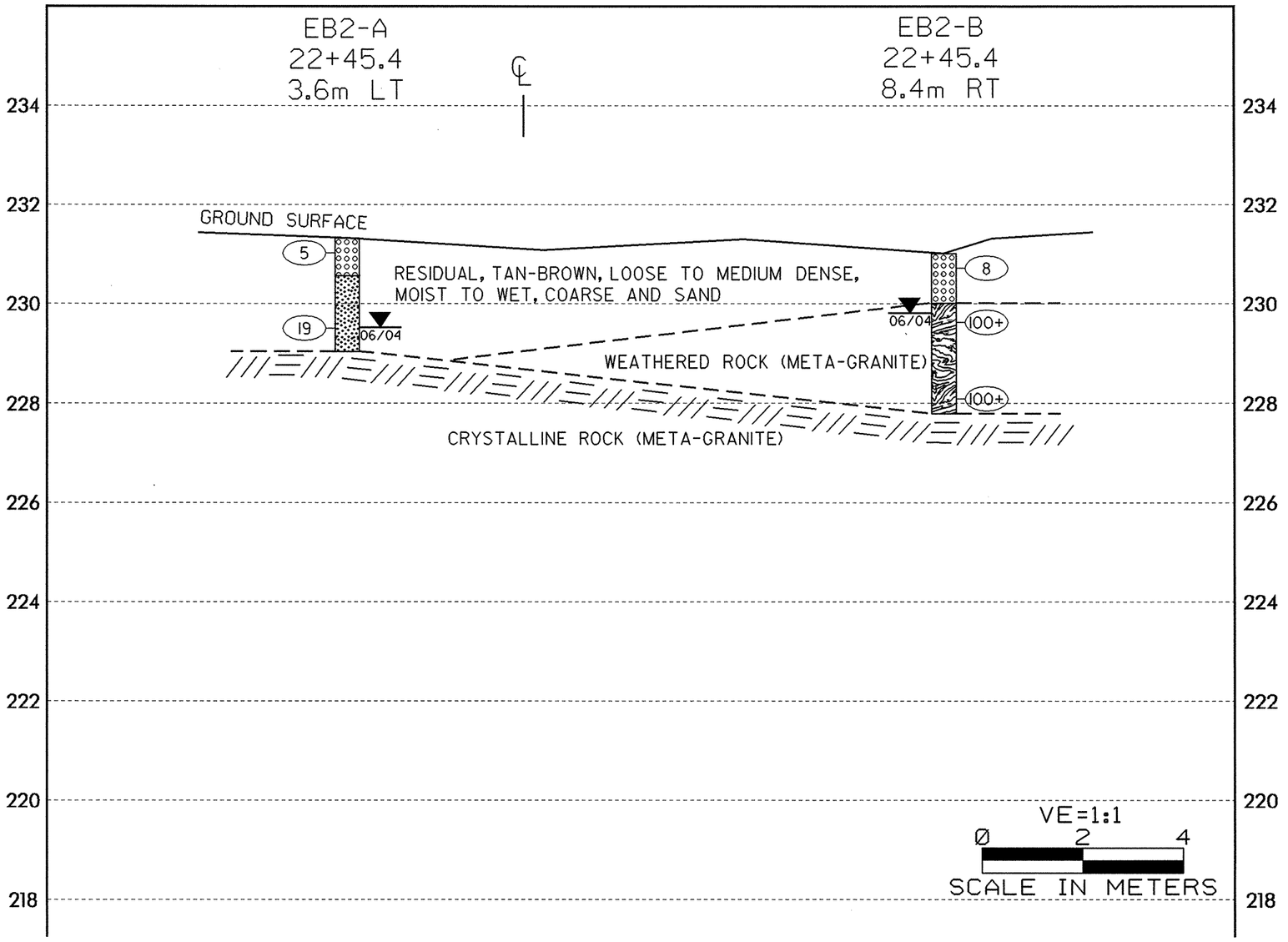
CROSS SECTION THROUGH BENT 1

STRUCTURE NO. 8
34345.1.1 (R-0609IA)



CROSS SECTION THROUGH END BENT 2

STRUCTURE NO. 8
34345.1.1 (R-0609IA)



NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO. 34345.1.1	**ID.** R-0609IA	**COUNTY** GUILFORD		**GEOLOGIST** O. B. OTI
SITE DESCRIPTION STRUCTURE NO. 8 -FLY- OVER -L- (US 311)				**GROUND WATER**
BORING NO. EBI-A	**BORING LOCATION** 21+45.4	**OFFSET** 3.6m LT	**ALIGNMENT** -FLY-	**0 HR.** DRY
COLLAR ELEV. 241.50m	**NORTHING** 241946.0	**EASTING** 526211.5		**24 HR.** 4.50m
TOTAL DEPTH 6.71m	**DRILL MACHINE** MOBILE B-57	**DRILL METHOD** H.S. AUGERS	**HAMMER TYPE** MANUAL	
START DATE 6/14/04	**COMPLETION DATE** 6/14/04	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

ELEV.	DEPTH	BLOW COUNT 15cm	15cm	15cm	PEN. (m)	BLOWS PER 30cm 0 25 50 75 100	SAMPLE NUMBER	MOI.	LOG	SOIL AND ROCK DESCRIPTION
241.50										
	0.57	21	89		0.27	100+		D		RESIDUAL, TAN-BROWN, SANDY SILT
240.00										
	2.09	50	50		0.20	100+		D		
238.00	3.61	100			0.05	100+		D		WEATHERED ROCK (META-GRANITE)
	5.13	100			0.05	100+		D		
236.00										
	6.65	100			0.06	100+		D		
						BORING TERMINATED AT ELEVATION 234.79M IN WEATHERED ROCK (META-GRANITE)				
234.00										
232.00										
230.00										
228.00										
226.00										
224.00										
222.00										

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO. 34345.1.1	**ID.** R-0609IA	**COUNTY** GUILFORD		**GEOLOGIST** O. B. OTI
SITE DESCRIPTION STRUCTURE NO. 8 -FLY- OVER -L- (US 311)				**GROUND WATER**
BORING NO. EBI-B	**BORING LOCATION** 21+45.4	**OFFSET** 8.4m RT	**ALIGNMENT** -FLY-	**0 HR.** DRY
COLLAR ELEV. 242.23m	**NORTHING** 241934.0	**EASTING** 526212.1		**24 HR.** DRY
TOTAL DEPTH 6.73m	**DRILL MACHINE** MOBILE B-57	**DRILL METHOD** H.S. AUGERS	**HAMMER TYPE** MANUAL	
START DATE 6/14/04	**COMPLETION DATE** 6/14/04	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

ELEV.	DEPTH	BLOW COUNT 15cm	15cm	15cm	PEN. (m)	BLOWS PER 30cm 0 25 50 75 100	SAMPLE NUMBER	MOI.	LOG	SOIL AND ROCK DESCRIPTION
242.23						35				
242.00	0.00	5	10	25	0.30	56	SS-1	M		RESIDUAL, TAN-BROWN SANDY SILT, SAPROLITIC
	0.57	6	16	40	0.30		SS-2	M		
240.00	2.09	100			0.08	100+		D		
	3.61	100			0.10	100+		D		WEATHERED ROCK (META-GRANITE)
238.00										
	5.13	100			0.08	100+		D		
236.00										
	6.65	100			0.08	100+		D		
						BORING TERMINATED AT ELEVATION 235.50M IN WEATHERED ROCK (META-GRANITE)				
234.00										
232.00										
230.00										
228.00										
226.00										
224.00										

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO. 34345.1.1	**ID.** R-0609IA	**COUNTY** GUILFORD	**GEOLOGIST** O. B. OTI
SITE DESCRIPTION STRUCTURE NO. 8 -FLY- OVER -L- (US 311)			**GROUND WATER**
BORING NO. BI-A	**BORING LOCATION** 22+00.5	**OFFSET** 3.6m LT	**ALIGNMENT** -FLY-	**0 HR.** N/A
COLLAR ELEV. 235.45m	**NORTHING** 241953.8	**EASTING** 526265.2		**24 HR.** 3.97m
TOTAL DEPTH 6.35m	**DRILL MACHINE** MOBILE B-57	**DRILL METHOD** H.S. AUGERS	**HAMMER TYPE** MANUAL	
START DATE 6/15/04	**COMPLETION DATE** 6/15/04	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

ELEV.	DEPTH	BLOW COUNT 15cm	15cm	15cm	PEN. (m)	BLOWS PER 30cm 0 25 50 75 100	SAMPLE NUMBER	MOI.	LOG	SOIL AND ROCK DESCRIPTION
235.45										
	0.76	25	32	50	0.30	82	SS-3	M		RESIDUAL, TAN-BROWN, COARSE SAND
234.00										
	2.28	100			0.13	100+		D		WEATHERED ROCK (META-GRANITE)
232.00										
	3.80	100			0.05	100+		D		
230.00										
	5.32	100			0.06	100+		D		
	6.30	100			0.05	100+		D		
228.00						BORING TERMINATED AT ELEVATION 229.10m IN WEATHERED ROCK (META-GRANITE)				
226.00										
224.00										
222.00										
220.00										
218.00										
216.00										

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO. 34345.1.1	**ID.** R-0609IA	**COUNTY** GUILFORD	**GEOLOGIST** O. B. OTI
SITE DESCRIPTION STRUCTURE NO. 8 -FLY- OVER -L- (US 311)			**GROUND WATER**
BORING NO. B1-B	**BORING LOCATION** 22+04.6	**OFFSET** 8.4m RT / **ALIGNMENT** -FLY-	**0 HR.** N/A
COLLAR ELEV. 233.88m	**NORTHING** 241943.2	**EASTING** 526272.2	**24 HR.** 2.20m
TOTAL DEPTH 8.70m	**DRILL MACHINE** MOBILE B-57	**DRILL METHOD** WASH BORING	**HAMMER TYPE** MANUAL
START DATE 6/15/04	**COMPLETION DATE** 6/16/04	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 4.65m

ELEV.	DEPTH	BLOW COUNT 15cm	15cm	15cm	PEN. (m)	BLOWS PER 30cm (0 25 50 75 100)	SAMPLE NUMBER	▼/MOI.	SOIL AND ROCK DESCRIPTION
233.88									RESIDUAL, TAN-BROWN, COARSE SAND
	1.00	16	20	32	0.30	52		M	
232.00								▼	WEATHERED ROCK (META-GRANITE)
	2.52	70	30		0.18	100+		D	
230.00	4.08	100			0.13	100+		D	
228.00							RS-1		CRYSTALLINE ROCK (GRAY, VERY SLIGHTLY WEATHERED, HARD, CLOSE TO MODERATELY CLOSELY FRACTURED, META-GABBRO) REC= 80% RQD= 12%
226.00									
224.00						CORING TERMINATED AT ELEVATION 225.18M IN CRYSTALLINE ROCK			
222.00									
220.00									
218.00									
216.00									
214.00									

CORE BORING REPORT

PROJECT: **34345.1.1** ID: **R-0609IA** COUNTY: **GUILFORD** BORING NO: **B1-B**

DESCRIPTION: STRUCTURE NO. 8 ON -FLY- OVER -L- (US 311)

LOCATION OF BORING: -FLY-, 22+04.6, 8.4m RT COMPLETION DATE: 6/16/04

COLLAR or GROUND ELEVATION: 233.88 m CORE SIZE: NXWL GEOLOGIST: O. B. OTI

CORE EQUIPMENT: B-57, N-casing, NXWL DRILLER: C. A. HENU

ELEV (m)	DEPTH (m)	DRILL RATE (min/0.5m)	RUN (m)	REC (m) (%)	RQD (m) (%)	SAMPLE NUMBER	FIELD CLASSIFICATION and REMARKS
229.23 227.71	4.65 6.17	12:00 40:00 90:00	1.52	0.70 (46%)	0.20 (13%)		GRAY, VERY SLIGHTLY WEATHERED, HARD, MODERATELY CLOSELY FRACTURED, FINE-GRAINED META-GABBRO, FRACTURES AT 75 DEG., HEAVY IRON-STAINING ON FRACTURE SURFACES
227.71 226.19	6.17 7.69	11:00 9:00 10:00	1.52	1.52 (100%)	0.29 (19%)	RS-1 6.64-6.83	GRAY, VERY SLIGHTLY WEATHERED, HARD, MODERATELY CLOSE TO CLOSELY FRACTURED, FINE-GRAINED META-GABBRO, FRACTURES AT 10, 55, AND 85 DEG., HEAVY IRON-STAINING ON 85 DEGREE FRACTURES
226.19 225.18	7.69 8.70	13:15 15:21	1.01	1.01 (100%)	0.00 (0%)		GRAY, VERY SLIGHTLY WEATHERED, HARD, CLOSELY FRACTURED, FINE-GRAINED META-GABBRO, NEAR-VERTICAL FRACTURES ARE HEAVILY IRON-STAINED

BOREHOLE TERMINATED AT ELEVATION OF 225.18 METERS, IN META-GABBRO.

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO. 34345.1.1	**ID.** R-0609IA	**COUNTY** GUILFORD		**GEOLOGIST** O. B. OTI
SITE DESCRIPTION STRUCTURE NO. 8 -FLY- OVER -L- (US 311)				**GROUND WATER**
BORING NO. EB2-A	**BORING LOCATION** 22+45.4	**OFFSET** 3.6m LT	**ALIGNMENT** -FLY-	**0 HR.** 2.00m
COLLAR ELEV. 231.32m	**NORTHING** 241967.8	**EASTING** 526307.3		**24 HR.** 1.80m
TOTAL DEPTH 2.28m	**DRILL MACHINE** MOBILE B-57	**DRILL METHOD** H.S. AUGERS		**HAMMER TYPE** MANUAL
START DATE 6/17/04	**COMPLETION DATE** 6/17/04	**SURFACE WATER DEPTH** N/A		**DEPTH TO ROCK** 2.28m

ELEV.	DEPTH	BLOW COUNT 15cm | 15cm | 15cm	PEN. (m)	BLOWS PER 30cm (0 25 50 75 100)	SAMPLE NUMBER	MOI.	LOG	SOIL AND ROCK DESCRIPTION
231.32	0.00	2 | 2 | 3	0.30	X 5		W		RESIDUAL, TAN-BROWN, COARSE SAND
230.00	1.52	8 | 5 | 14	0.30	X 19	SS-5	W ▼		TAN-BROWN, COARSE SAND
				AUGER REFUSAL AT ELEVATION 229.04M ON CRYSTALLINE ROCK (META-GRANITE)				

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO. 34345.1.1	**ID.** R-0609IA	**COUNTY** GUILFORD		**GEOLOGIST** O.B. OTI
SITE DESCRIPTION STRUCTURE NO. 8 -FLY- OVER -L- (US 311)				**GROUND WATER**
BORING NO. EB2-B	**BORING LOCATION** 22+45.4	**OFFSET** 8.4m RT	**ALIGNMENT** -FLY-	**0 HR.** 1.50m
COLLAR ELEV. 231.01m	**NORTHING** 241956.8	**EASTING** 526311.9		**24 HR.** 1.20m
TOTAL DEPTH 3.22m	**DRILL MACHINE** MOBILE B-57	**DRILL METHOD** H.S. AUGERS		**HAMMER TYPE** MANUAL
START DATE 6/16/04	**COMPLETION DATE** 6/17/04	**SURFACE WATER DEPTH** N/A		**DEPTH TO ROCK** 3.22m

ELEV.	DEPTH	BLOW COUNT 15cm | 15cm | 15cm	PEN. (m)	BLOWS PER 30cm (0 25 50 75 100)	SAMPLE NUMBER	MOI.	LOG	SOIL AND ROCK DESCRIPTION
231.01	0.00	3 | 4 | 4	0.30	X 8	SS-4	M		RESIDUAL, TAN-BROWN COARSE SAND
230.00	1.20	60	0.19	100+X		▼ W		WEATHERED ROCK (META-GRANITE)
228.00	2.72	60	0.20	100+X		W		
				AUGER REFUSAL AT ELEVATION 227.79M ON CRYSTALLINE ROCK (META-GRANITE)				

PROJ. NO. - 34345.1.1
ID NO. - R-0609IA
COUNTY - GUILFORD

EB1-B

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-1	8.4m RT	21+45.4	0.00-0.45	A-4(5)	32	9	6.6	31.2	49.9	12.3	100	96	72	-	-
SS-2	8.4m RT	21+45.4	0.57-1.02	A-4(2)	28	5	9.0	32.0	46.6	12.3	100	95	69	-	-

B1-A

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-3	3.6m LT	22+00.5	0.76-1.21	A-2-4(0)	21	NP	54.4	29.0	10.5	6.2	96	64	20	-	-

EB2-A

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-5	3.6m LT	22+45.4	1.52-1.97	A-2-4(0)	28	7	60.0	20.9	10.9	8.2	69	39	15	-	-

EB2-B

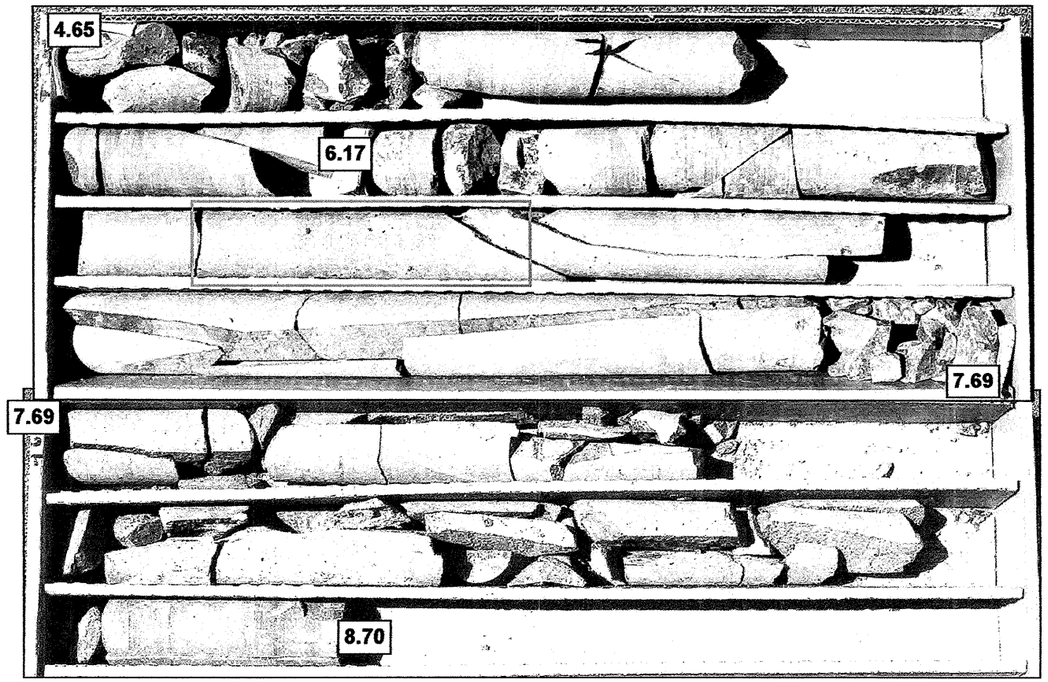
SOIL TEST RESULTS

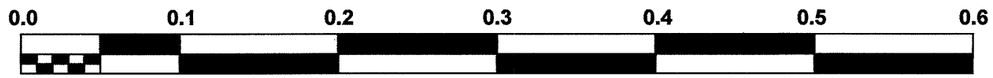
SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-4	8.4m RT	22+45.4	0.00-0.45	A-1-b(0)	21	NP	78.0	13.8	4.1	4.1	86	34	8	-	-

CORE PHOTOGRAPHS

B1-B

BOXES 1 & 2: 4.65-8.70 METERS





METRIC	PROJECT REF. NO.	SHEET NO.	TOTAL SHEETS
	34345.1.1 (R-0609LA)	14	14

SITE PHOTOGRAPH

CONTRACT: ID: R-0609IA

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	34345.1.1 (R-0609IA)	1	18

STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION
		P.E.
		CONST.

CONTENTS:

STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

GEOTECHNICAL UNIT

STRUCTURE SUBSURFACE INVESTIGATION

STATE PROJECT 34345.1.1 I.D. NO. R-0609IA

F.A. PROJECT MAF-F-119-1(1)

COUNTY GUILFORD

PROJECT DESCRIPTION US 311 HIGH POINT EAST BELTWAY FROM US 29-70 TO I-85 NORTH OF ARCHDALE

SITE DESCRIPTION STRUCTURE NO. 9 ON -FLY- (HIGH POINT EAST BELTWAY) OVER -Y6- (I-85) AT STA. 19+26.763 -FLY-

INVENTORY

CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WAS 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 UNIT @ (919) 250-4088. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA IS 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.

INVESTIGATED BY J.I. MILKOVITS, JR

N.C. DOT PERSONNEL O.B. OTT

CHECKED BY D.N. ARGENBRIGHT

SUBMITTED BY D.N. ARGENBRIGHT

DATE AUGUST 2004

ENGINEERING TECTONICS, P.A. PERSONNEL

R.F. BAYRON

D.C. BAYRON

DRAWN BY: T.T. WALKER

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.

NORTH CAROLINA LICENSED SEAL 1050 GEOLOGIST D.N. ARGENBRIGHT

8-24-04

ID	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
R-0609IA	34345.1.1	2	18

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION

SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED OR WEATHERED EARTH MATERIALS WHICH CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND WHICH YIELDS LESS THAN 100 BLOWS PER 30 cm ACCORDING TO STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM AND BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE:

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

SOIL LEGEND AND AASHTO CLASSIFICATION

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

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

CONSISTENCY OR DENSENESS

PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTENCE (N-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH (kN/m^2)
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE	<4 4 TO 10 10 TO 30 30 TO 50 >50	N/A
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD	<2 2 TO 4 4 TO 8 8 TO 15 15 TO 30 >30	<25 25 TO 50 50 TO 100 100 TO 200 200 TO 400 >400

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 CPT DPT DMT VST PMT — TEST BORING
- AUGER BORING
- CORE BORING
- MW — MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- SPT N-VALUE
- REF — SPT REFUSAL

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

ABBREVIATIONS

AR - AUGER REFUSAL
BT - BORING TERMINATED
CL. - CLAY
CPT - CONE PENETRATION TEST
CSE. - COARSE
DMT - DILATOMETER TEST
DPT - DYNAMIC PENETRATION TEST
e - VOID RATIO
F. - FINE
FOSS. - FOSSILIFEROUS
FRAC. - FRACTURED
FRAGS. - FRAGMENTS
MED. - MEDIUM
PMT - PRESSUREMETER TEST
SD. - SAND, SANDY
SL. - SILT, SILTY
SLI. - SLIGHTLY
TCR - TRICONE REFUSAL
γ - UNIT WEIGHT
γ_d - DRY UNIT WEIGHT
W - MOISTURE CONTENT
V. - VERY
VST - VANE SHEAR TEST

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [X] MOBILE B-57
- [ ] BK-51
- [ ] CME-45C
- [ ] CME-550
- [ ] PORTABLE HOIST
- [ ] OTHER _____
- [ ] OTHER _____

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 152 mm CONTINUOUS FLIGHT AUGER
- [X] 203 mm HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [ ] CASING [ ] W/ ADVANCER
- [ ] TRICONE _____ mm STEEL TEETH
- [ ] TRICONE _____ mm TUNG.-CARB.
- [X] CORE BIT
- [ ] OTHER _____

HAMMER TYPE:
- [ ] AUTOMATIC [X] MANUAL

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

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

ROCK DESCRIPTION

HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WHEN TESTED, WOULD YIELD SPT REFUSAL. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 2.5 cm PER 50 BLOWS. IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK.
ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLOWS:

WEATHERED ROCK (WR)	NON-COASTAL PLAIN MATERIAL THAT YIELDS SPT N VALUES > 100 BLOWS PER 30 cm.
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 2.5 cm. 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 BLOWS PER 30 cm.*
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 BLOWS PER 30 cm.*
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 6 mm 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 1 mm DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PIECES 25 mm 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 CENTIMETERS 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 25 mm OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.

FRACTURE SPACING

TERM	SPACING
VERY WIDE	MORE THAN 3 m
WIDE	1 TO 3 m
MODERATELY CLOSE	30 TO 100 cm
CLOSE	5 TO 30 cm
VERY CLOSE	LESS THAN 5 cm

BEDDING

TERM	THICKNESS
VERY THICKLY BEDDED	> 1 m
THICKLY BEDDED	0.5 - 1 m
THINLY BEDDED	0.05 - 0.5 m
VERY THINLY BEDDED	10 - 50 mm
THICKLY LAMINATED	2.5 - 10 mm
THINLY LAMINATED	< 2.5 mm

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 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 10 CENTIMETERS 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) OF A 63.5 kg HAMMER FALLING 0.76 METERS REQUIRED TO PRODUCE A PENETRATION OF 30 cm INTO SOIL WITH A 5 cm OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS LESS THAN 2.5 cm PENETRATION WITH 50 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 10 CENTIMETERS DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.

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

BENCH MARK: BL 55, -L- STA 51+96.5, 14.7m RT.

ELEVATION: 240.003m

NOTES:

REVISED 09/15/00

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

Michael F. Easley
GOVERNOR

P.O. BOX 25201, RALEIGH, N.C. 27611-5201

Lyndo Tippett
SECRETARY

August 17, 2004

STATE PROJECT: 34345.1.1 (R-0609IA)
F.A. PROJECT: MAF-F-119-1 (1)
COUNTY: Guilford

DESCRIPTION: US 311 High Point East Beltway from US 29-70 to I-85 north of Archdale

SUBJECT: Geotechnical Report - Structure Inventory for Structure No. 9 on -FLY- (High Point East Beltway) over -Y6- (I-85) at Station 19+26.763 -FLY-

Project Description

A four-span bridge, 161.7 meters in length with variable skew bents, is proposed on -FLY- (High Point East Beltway) over -Y6- (I-85). The project is located in Guilford County about 3.2 kilometers northeast of Archdale.

The subsurface investigation was conducted during June of 2004 using a B-57 drill machine with a manual hammer. Standard Penetration Test borings were performed at each of the five bent locations. All borings were advanced using hollow stem augers until weathered rock and/or crystalline rock was encountered. Interior bent borings B1-B and B2-A were cored using NQWL core equipment to recover rock samples from crystalline rock. Representative soil samples were obtained for visual classification in the field and selected samples were sent to the Materials and Test Unit for laboratory analysis. Three rock core samples were also sent to the Material and Test Unit to determine Unit Weight, Compressive Strength and Young's Modulus.

Physiography and Geology

The project is located in the gently rolling terrain of the Piedmont Physiographic Province. The site is located within the Carolina Slate Geologic Belt and is underlain by metamorphosed granitic rock and diabase dikes.

Soil Properties

Soils encountered at the project site include roadway embankment and residual soils.

Roadway embankment soils are present at bent 1 and 2 and ranged in thickness from 2.72 to 6.00 meters. These soils consist predominantly of tan-brown-gray, moist, loose to very dense, coarse and silty sand (A-1-b, A-2-4). Residual soils and/or weathered rock underlie embankment soils.

Residual soils were encountered in all borings except at the B1-A location and range in thickness from 0.56 to 5.00 meters. Residual soils consist of tan-brown-gray, moist, medium stiff to hard, sandy clay (A-6) and silty clay (A-7-5). Tan-brown, moist, medium dense to very dense, saprolitic, silty sand (A-2-4) and tan-brown, moist, very stiff to hard, saprolitic, sandy and clayey silt (A-4 and A-5) are also present. Weathered rock underlies residual soils.

Rock Properties

Weathered rock was derived from the underlying metamorphosed granite and diabase and ranges in thickness from 0.38 to 5.30 meters. The top of weathered rock was encountered at elevations ranging from 243.28 at EB2-B to 230.40 meters at EB1-B.

Crystalline rock was encountered at each boring location except bent 3 and end bent 2. The top of crystalline rock ranges in elevation from 237.85 at B1-A to 230.02 meters at EB1-B. Rock core was obtained from two of the interior bent borings. Crystalline rock consists of gray-white to brown and dark gray, moderately severe weathered to fresh, moderately hard to very hard, closely to very closely fractured, granite and diabase. Core recovery (REC) ranged from 40% in boring B1-B to 100% in boring B2-A. Rock Quality Designation (RQD) ranges from 0% in B1-B to 100% in B2-A. More detailed rock descriptions can be found in the Core Boring Reports.

Goundwater

Groundwater was encountered at two of the boring locations. Groundwater elevations ranged from 238.08 at B1-B to 233.33 meters at B2-A.

Notice

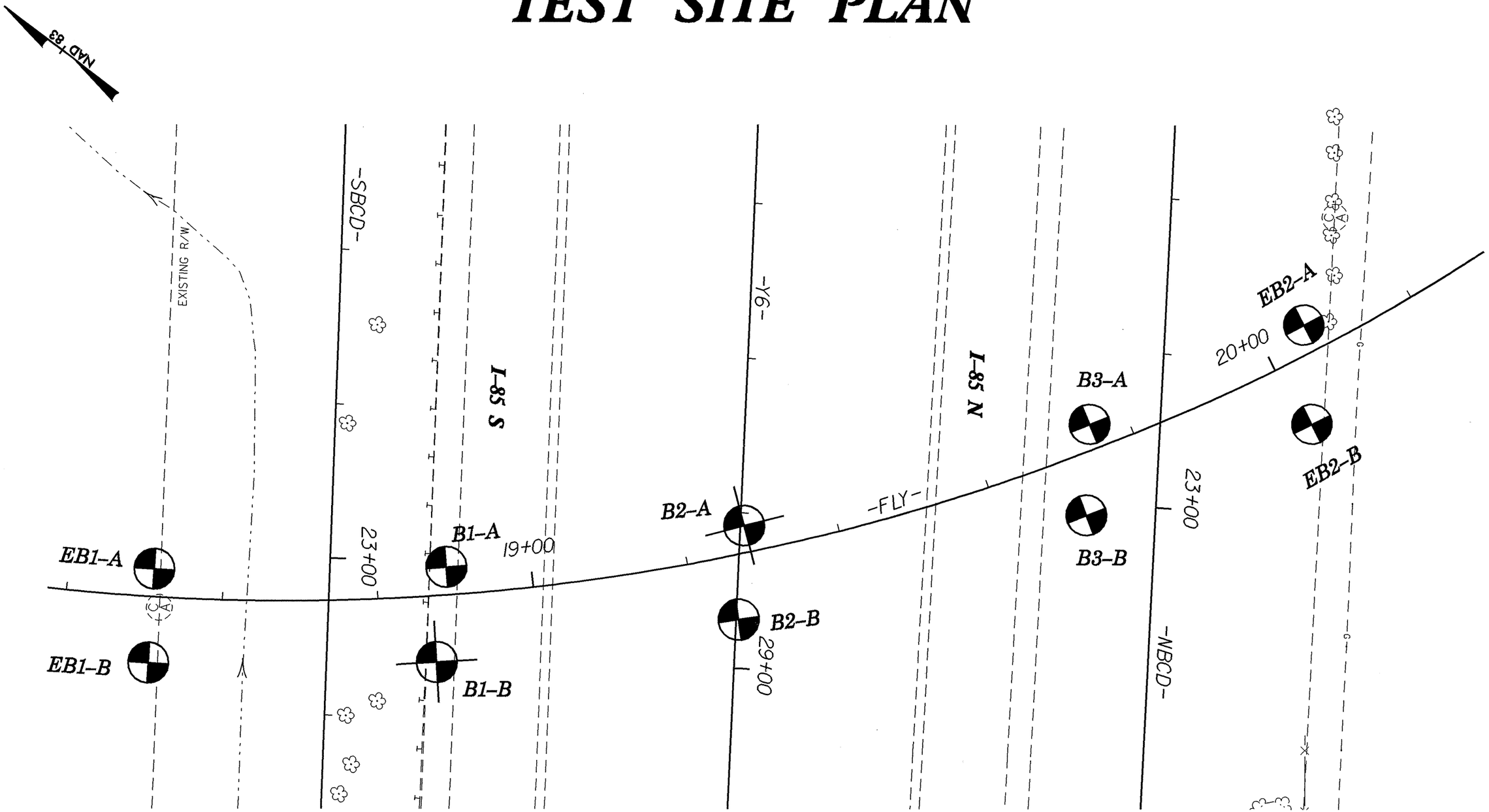
This Geotechnical foundation report is based on the Preliminary General Drawing for Bridge no. 9 on -FLY- (High Point East Beltway) over -Y6- (I-85) dated March 19, 2004. If significant changes are made in the design or location of the proposed structure, the subsurface information should be reviewed and modified as necessary.

Respectfully submitted,

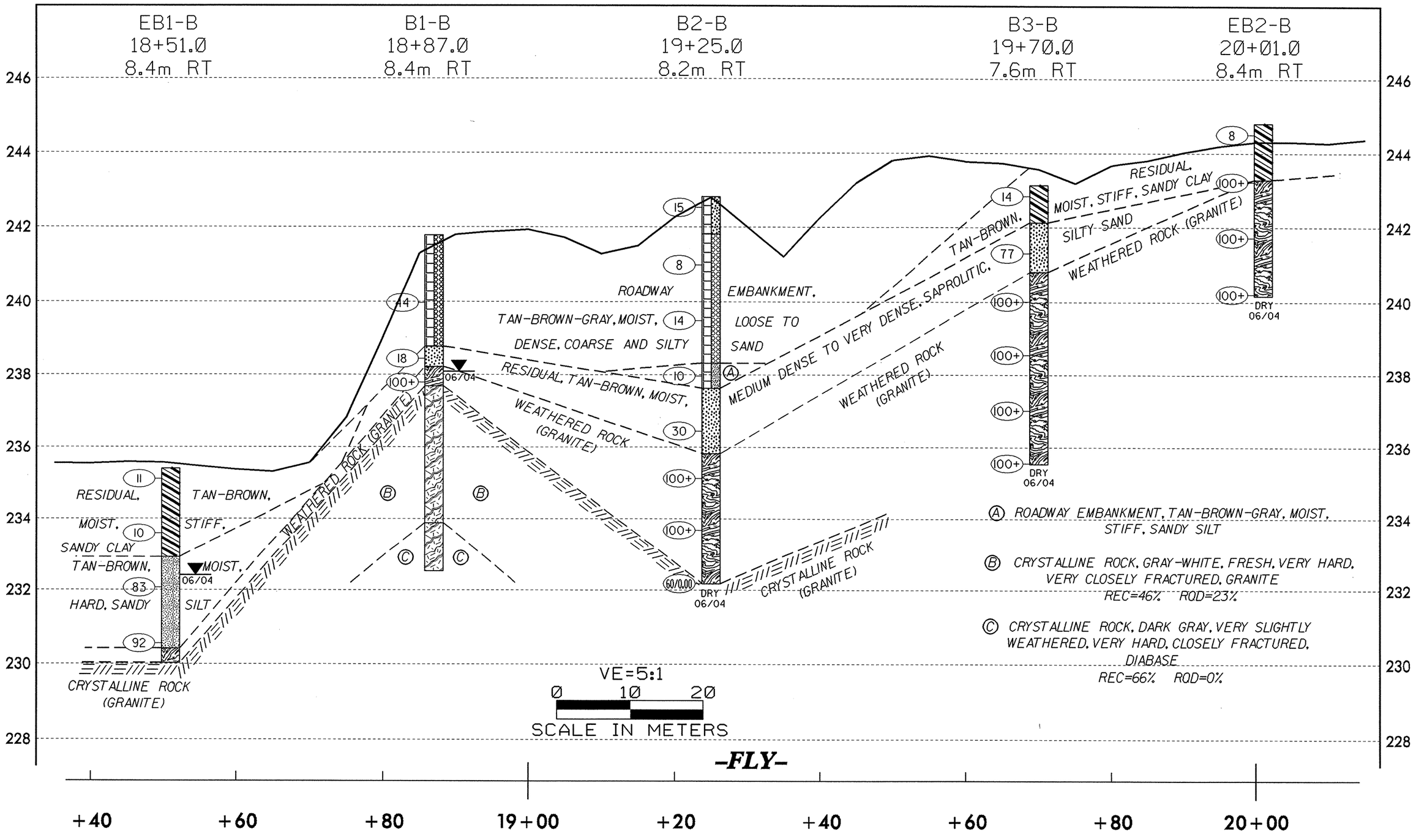
Joseph I. Milkovits, Jr.
Project Geologist

PROJECT REF. NO.	SHEET NO.	TOTAL SHEETS
34345.1.1	4	18

TEST SITE PLAN



PROFILE THROUGH BORINGS PROJECTED ALONG -FLY-



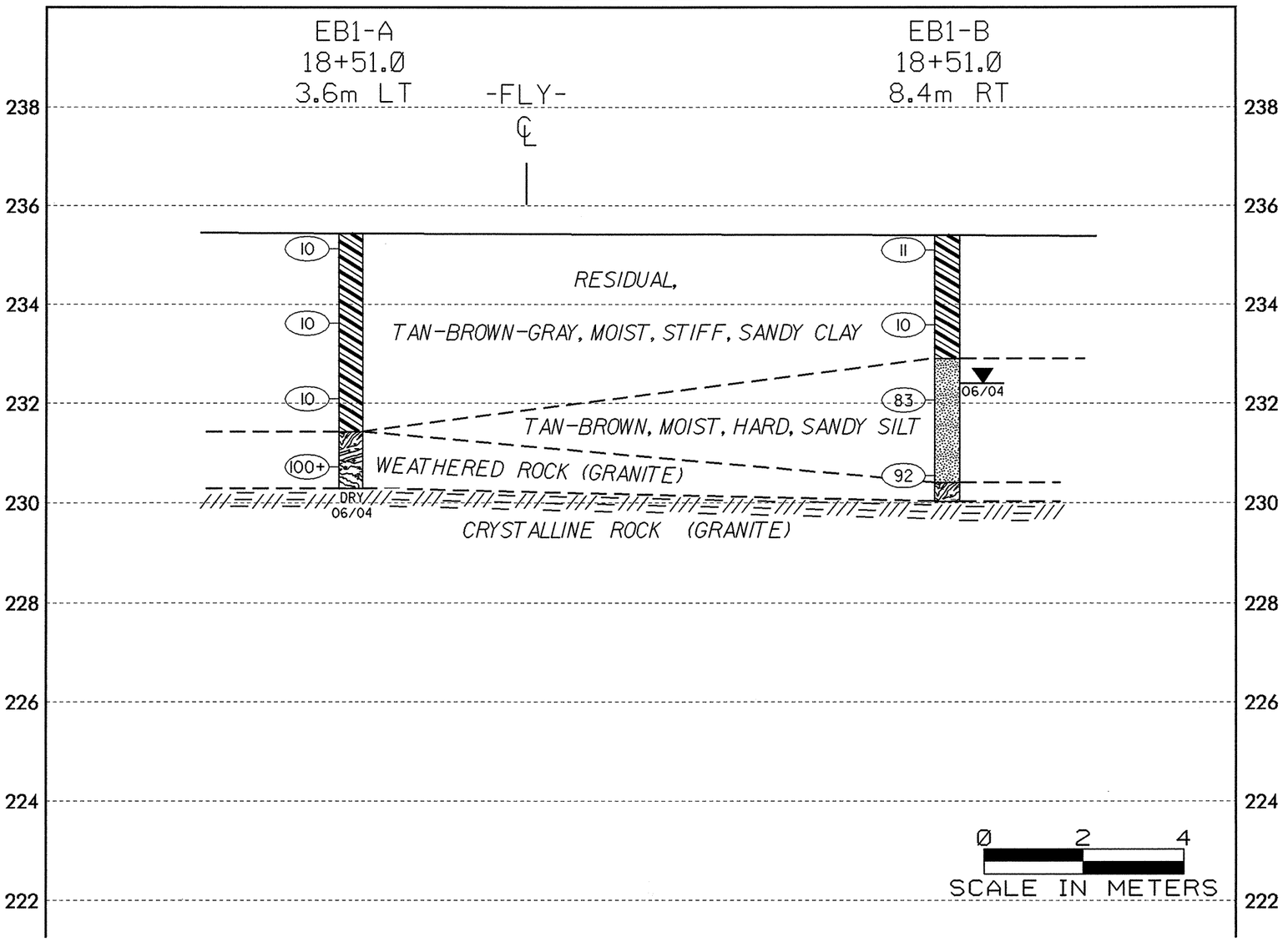
Ⓐ ROADWAY EMBANKMENT, TAN-BROWN-GRAY, MOIST, STIFF, SANDY SILT

Ⓑ CRYSTALLINE ROCK, GRAY-WHITE, FRESH, VERY HARD, VERY CLOSELY FRACTURED, GRANITE
REC=46% ROD=23%

Ⓒ CRYSTALLINE ROCK, DARK GRAY, VERY SLIGHTLY WEATHERED, VERY HARD, CLOSELY FRACTURED, DIABASE
REC=66% ROD=0%

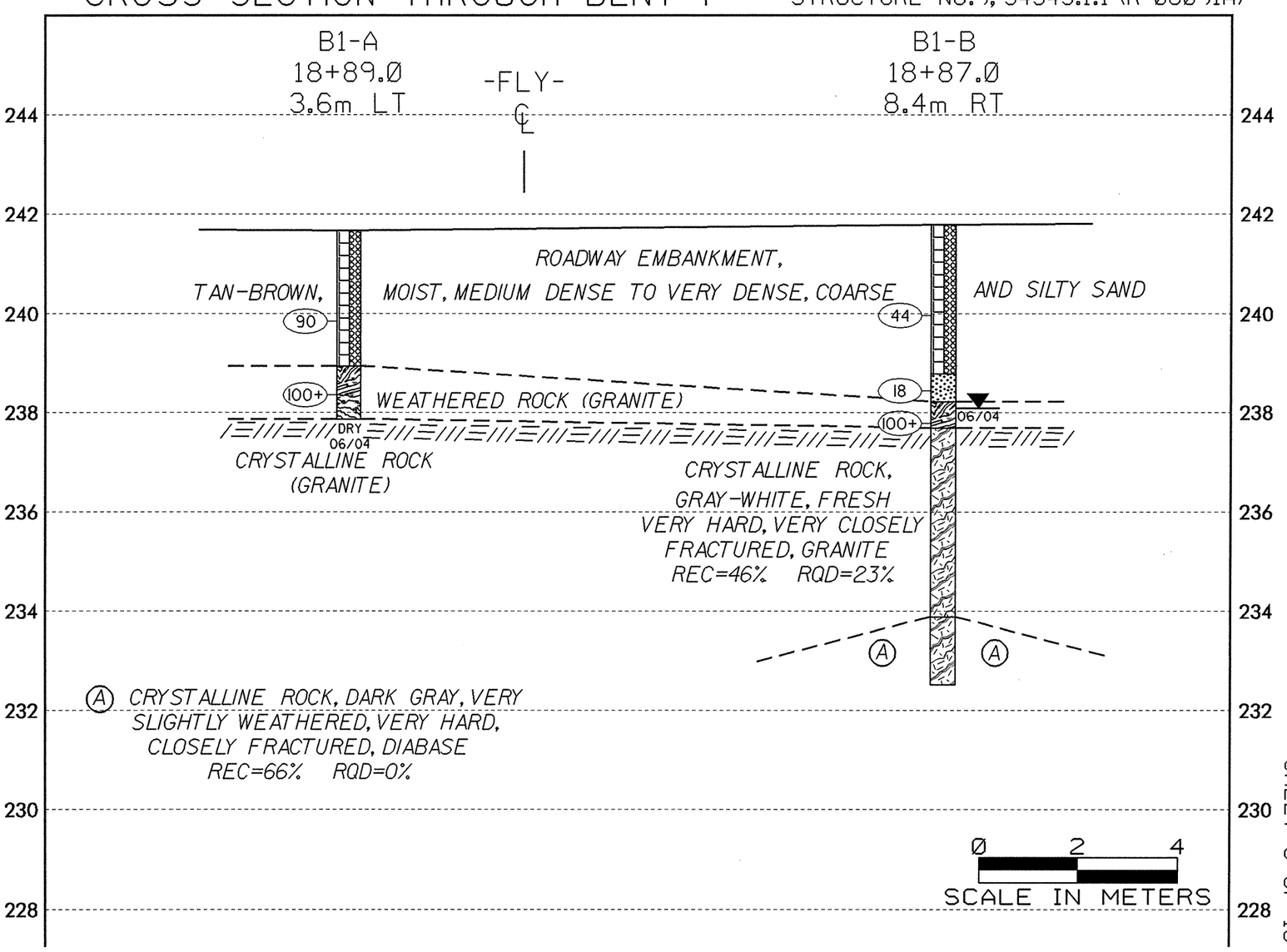
CROSS SECTION THROUGH END BENT 1

STRUCTURE NO. 9, 34345.1.1 (R-0609IA)



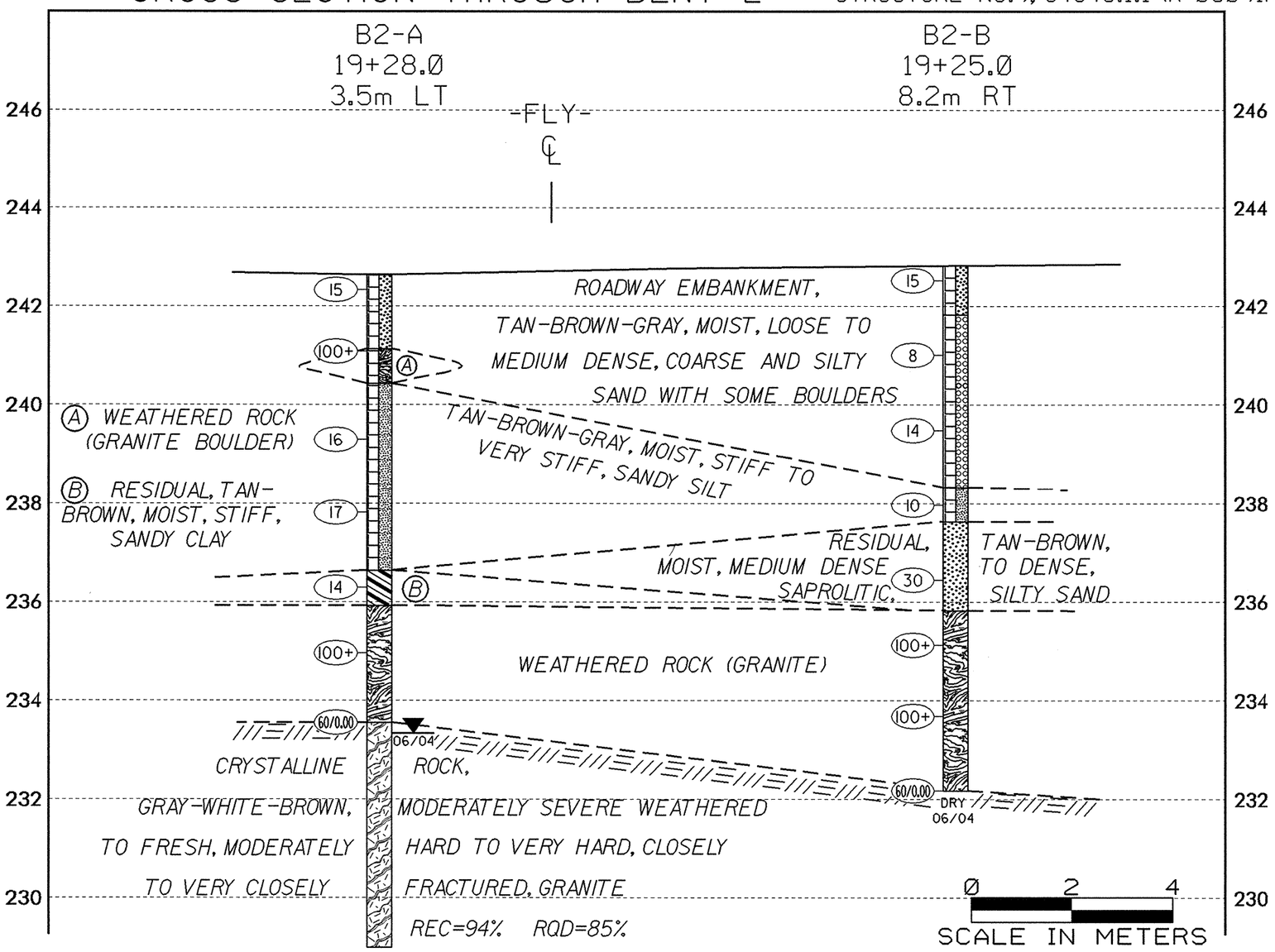
CROSS SECTION THROUGH BENT 1

STRUCTURE NO.9, 34345.1.1 (R-0609IA)



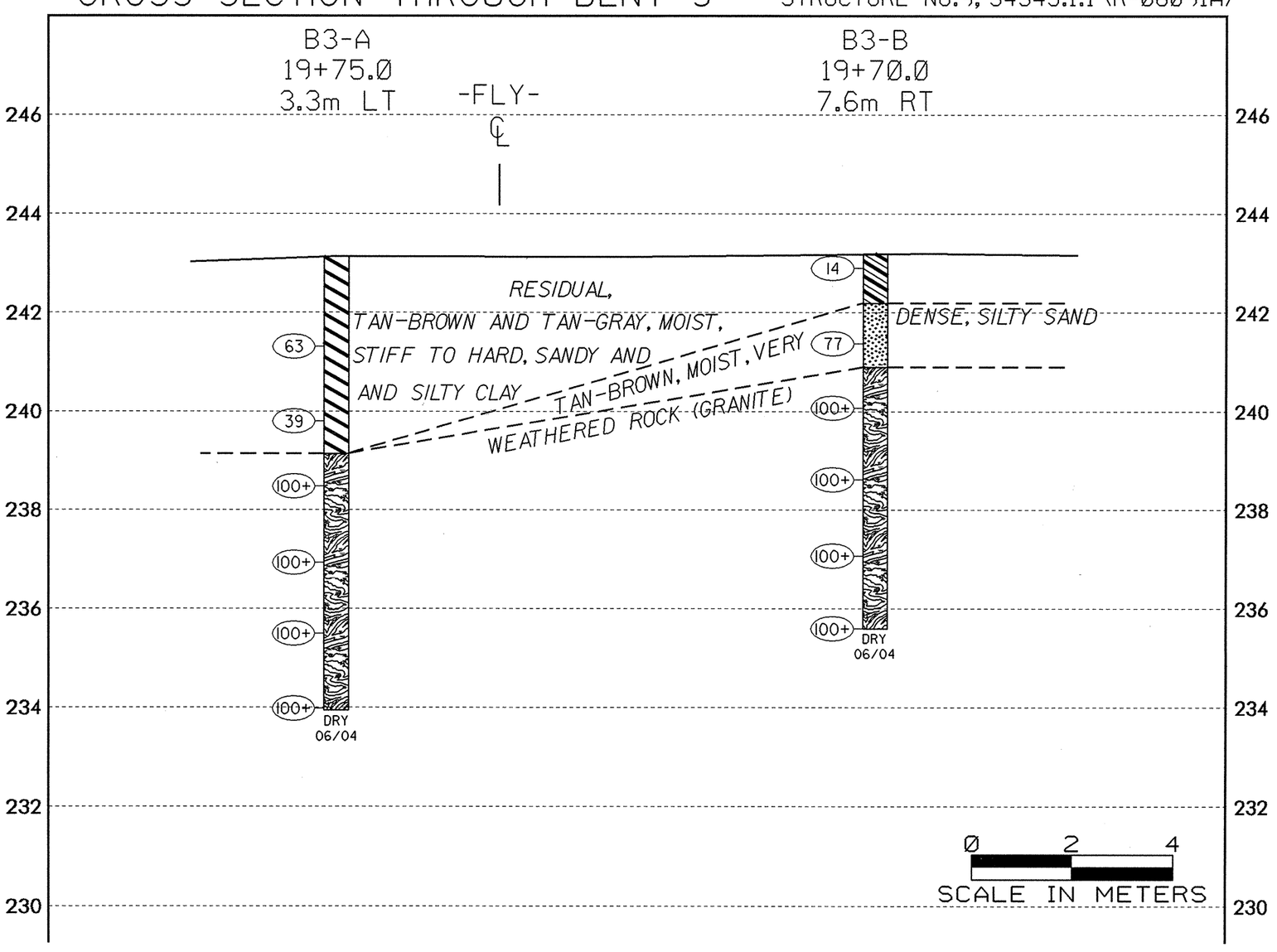
CROSS SECTION THROUGH BENT 2

STRUCTURE NO.9, 34345.1.1 (R-0609IA)

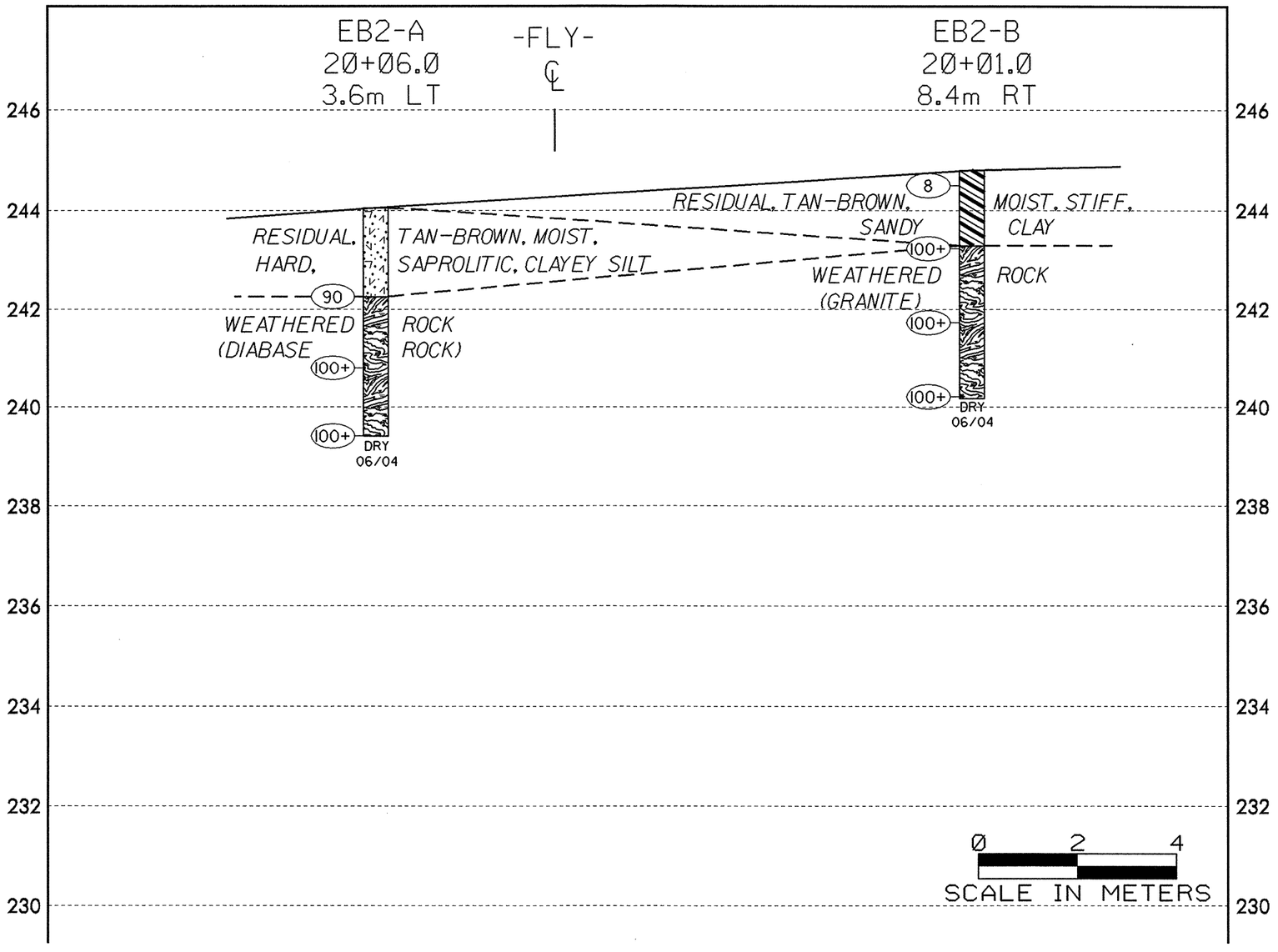


CROSS SECTION THROUGH BENT 3

STRUCTURE NO.9, 34345.1.1 (R-0609IA)



CROSS SECTION THROUGH END BENT 2 STRUCTURE NO. 9, 34345.1.1 (R-0609IA)



NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO. 34345.1.1	**ID.** R-0609IA	**COUNTY** GUILFORD	**GEOLOGIST** O.B. OTI
SITE DESCRIPTION STRUCTURE NO. 9 ON -FLY- (HIGH POINT EAST BELTWAY) OVER -Y6- (I-85)			**GROUND WATER**
BORING NO. EBI-A	**BORING LOCATION** 18+51.0	**OFFSET** 3.6m LT	**ALIGNMENT** -FLY-	**0 HR.** 3.00m
COLLAR ELEV. 235.43m	**NORTHING** 242071.2	**EASTING** 525963.4		**24 HR.** FILLED
TOTAL DEPTH 5.15m	**DRILL MACHINE** MOBILE B-57	**DRILL METHOD** H.S. AUGERS	**HAMMER TYPE** MANUAL	
START DATE 6/9/04	**COMPLETION DATE** 6/9/04	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 5.15m	

ELEV.	DEPTH	BLOW COUNT 15cm	15cm	15cm	PEN. (m)	BLOWS PER 30cm 0 25 50 75 100	SAMPLE NUMBER	MOI.	LOG	SOIL AND ROCK DESCRIPTION
235.43	0.00	5	4	6	0.30	10		M		RESIDUAL, TAN-BROWN-GRAY, SANDY CLAY
234.00	1.52	7	6	4	0.30	10		M		
232.00	3.04	1	2	8	0.30	10	SS-19	56%		
	4.56	60	40		0.30	100+				WEATHERED ROCK (GRANITE)
230.00						AUGER REFUSAL AT ELEVATION 230.28 METERS ON CRYSTALLINE ROCK (GRANITE)				
228.00										
226.00										
224.00										
222.00										
220.00										
218.00										
216.00										

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

SHEET 9

PROJECT NO. 34345.1.1	**ID.** R-0609IA	**COUNTY** GUILFORD	**GEOLOGIST** O.B. OTI
SITE DESCRIPTION STRUCTURE NO. 9 ON -FLY- (HIGH POINT EAST BELTWAY) OVER -Y6- (I-85)			**GROUND WATER**
BORING NO. EBI-B	**BORING LOCATION** 18+51.0	**OFFSET** 8.4m RT	**ALIGNMENT** -FLY-	**0 HR.** N/A
COLLAR ELEV. 235.40m	**NORTHING** 242064.5	**EASTING** 525953.4		**24 HR.** 3.00m
TOTAL DEPTH 5.38m	**DRILL MACHINE** MOBILE B-57	**DRILL METHOD** H.S. AUGERS	**HAMMER TYPE** MANUAL	
START DATE 6/9/04	**COMPLETION DATE** 6/9/04	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 5.38m	

ELEV.	DEPTH	BLOW COUNT 15cm	15cm	15cm	PEN. (m)	BLOWS PER 30cm 0 25 50 75 100	SAMPLE NUMBER	MOI.	LOG	SOIL AND ROCK DESCRIPTION
235.40	0.00	5	5	6	0.30	11	SS-17	M		RESIDUAL, TAN-BROWN, SANDY CLAY
234.00	1.52	5	5	5	0.30	10		M		
232.00	3.04	28	17	66	0.30	83	SS-18			TAN-BROWN, SANDY SILT
	4.56	38	57	35	0.30	92		M		WEATHERED ROCK (GRANITE)
230.00						AUGER REFUSAL AT ELEVATION 230.02 METERS ON CRYSTALLINE ROCK (GRANITE)				
228.00										
226.00										
224.00										
222.00										
220.00										
218.00										
216.00										

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO. 34345.1.1	**ID.** R-0609IA	**COUNTY** GUILFORD	**GEOLOGIST** O.B. OTI
SITE DESCRIPTION STRUCTURE NO. 9 ON -FLY- (HIGH POINT EAST BELTWAY) OVER -Y6- (I-85)			**GROUND WATER**
BORING NO. BI-A	**BORING LOCATION** 18+89.0	**OFFSET** 3.6m LT	**ALIGNMENT** -FLY-	**0 HR.** DRY
COLLAR ELEV. 241.66m	**NORTHING** 242046.6	**EASTING** 525981.7		**24 HR.** FILLED
TOTAL DEPTH 3.8Im	**DRILL MACHINE** MOBILE B-57	**DRILL METHOD** H.S. AUGERS	**HAMMER TYPE** MANUAL	
START DATE 6/3/04	**COMPLETION DATE** 6/3/04	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 3.8Im	

ELEV.	DEPTH	BLOW COUNT 15cm	15cm	15cm	PEN. (m)	BLOWS PER 30cm 0 25 50 75 100	SAMPLE NUMBER	MOI.	LOG	SOIL AND ROCK DESCRIPTION
241.66										
240.00	1.52	14	25	65	0.30	90/X	SS-1	M		ROADWAY EMBANKMENT, TAN-BROWN, COARSE SAND
	3.04	20	58	42	0.23	100+/X				WEATHERED ROCK (GRANITE)
238.00						AUGER REFUSAL AT ELEVATION 237.85 METERS ON CRYSTALLINE ROCK (GRANITE)				
236.00										
234.00										
232.00										
230.00										
228.00										
226.00										
224.00										
222.00										

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO. 34345.1.1	**ID.** R-0609IA	**COUNTY** GUILFORD	**GEOLOGIST** O.B. OTI
SITE DESCRIPTION STRUCTURE NO. 9 ON -FLY- (HIGH POINT EAST BELTWAY) OVER -Y6- (I-85)			**GROUND WATER**
BORING NO. BI-B	**BORING LOCATION** 18+87.0	**OFFSET** 8.4m RT	**ALIGNMENT** -FLY-	**0 HR.** N/A
COLLAR ELEV. 241.78m	**NORTHING** 242039.7	**EASTING** 525971.9		**24 HR.** 3.70m
TOTAL DEPTH 9.26m	**DRILL MACHINE** MOBILE B-57	**DRILL METHOD** H.S. AUGERS	**HAMMER TYPE** MANUAL	
START DATE 6/3/04	**COMPLETION DATE** 6/3/04	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 4.10m	

ELEV.	DEPTH	BLOW COUNT 15cm | 15cm | 15cm	PEN. (m)	BLOWS PER 30cm (Ø 25 50 75 100)	SAMPLE NUMBER	MOI.	LOG	SOIL AND ROCK DESCRIPTION
241.78								
	1.52	9 | 18 | 26	0.30	X 44	SS-2	M		ROADWAY EMBANKMENT, TAN-BROWN, COARSE SAND
240.00								
	3.04	14 | 9 | 9	0.30	X 18	SS-3	M ▼		RESIDUAL, TAN-BROWN, SILTY SAND
238.00	4.00	100	0.01	100± X	RS-1			WEATHERED ROCK (GRANITE)
								CRYSTALLINE ROCK, GRAY-WHITE, FRESH, VERY HARD, VERY CLOSELY FRACTURED, GRANITE
236.00								REC=46% RQD=23%
								DARK GRAY, VERY SLIGHTLY WEATHERED, VERY HARD, CLOSELY FRACTURED, DIABASE
234.00								REC=66% RQD=0%
232.00				CORING TERMINATED AT ELEVATION 232.52 METERS IN CRYSTALLINE ROCK (DIABASE)				
230.00								
228.00								
226.00								
224.00								
222.00								

CORE BORING REPORT

PROJECT: **34345.1.1** ID: **R-0609IA** COUNTY: **GUILFORD** BORING NO: **B1-B**

DESCRIPTION: Structure No. 9 on -FLY- (High Point East Beltway) over -Y6- (I-85)

LOCATION OF BORING: -FLY-, Sta. 18+87, 8.4 m RT COMPLETION DATE: 06/03/04

COLLAR or GROUND ELEVATION: 241.78 m CORE SIZE: NQWL GEOLOGIST: O.B. OTI

CORE EQUIPMENT: B-57, NQWL, H.S. Augers DRILLER: R.F. BAYRON

ELEV (m)	DEPTH (m)	DRILL RATE (min/0.5m)	RUN (m)	REC (m) (%)	RQD (m) (%)	SAMPLE NUMBER	FIELD CLASSIFICATION and REMARKS
237.58	4.20	2:50	0.50	0.20 (40%)	0.20 (40%)	RS-1 4.2-4.7m	Gray-white, fresh, very hard, very closely fractured, granite
237.08	4.70						
237.08	4.70	3:10 3:11 4:01	1.52	0.80 (53%)	0.30 (20%)		Gray-white, fresh, very hard, very closely fractured, granite
235.56	6.22						
235.56	6.22	2:56 3:21 3:30	1.52	0.63 (41%)	0.30 (20%)		Gray-white, fresh, very hard, very closely fractured, granite
234.04	7.74						
234.04	7.74	3:42 4:01 4:21	1.52	1.00 (66%)	0.00 (0%)		Dark-gray, very slightly weathered, very hard, closely fractured, diabase
232.52	9.26						
							BOREHOLE TERMINATED AT ELEVATION OF 232.52 METERS, IN DIABASIC ROCK.

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO. 34345.1.1	**ID.** R-0609IA	**COUNTY** GUILFORD	**GEOLOGIST** O.B. OTI
SITE DESCRIPTION STRUCTURE NO. 9 ON -FLY- (HIGH POINT EAST BELTWAY) OVER -Y6- (I-85)			**GROUND WATER**
BORING NO. B2-A	**BORING LOCATION** 19+28.0	**OFFSET** 3.5m LT	**ALIGNMENT** -FLY-	**0 HR.** N/A
COLLAR ELEV. 242.63m	**NORTHING** 242014.4	**EASTING** 526013.1		**24 HR.** 9.30m
TOTAL DEPTH 13.64m	**DRILL MACHINE** MOBILE B-57	**DRILL METHOD** H.S. AUGERS	**HAMMER TYPE** MANUAL	
START DATE 6/8/04	**COMPLETION DATE** 6/8/04	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 9.08m	

ELEV.	DEPTH	BLOW COUNT 15cm	15cm	15cm	PEN. (m)	BLOWS PER 30cm (0 25 50 75 100)	SAMPLE NUMBER	MOI.	LOG	SOIL AND ROCK DESCRIPTION
242.65	0.00	3	5	10	0.30	X 15				ROADWAY EMBANKMENT, TAN-BROWN, SILTY SAND
242.00	1.52	100			0.07	100+ X				WEATHERED ROCK (GRANITE BOULDER)
240.00	3.04	8	8	8	0.30	X 16	SS-10	D		ROADWAY EMBANKMENT, TAN-BROWN, SANDY SILT
238.00	4.52	5	8	9	0.30	X 17	SS-11	M		
	6.04	4	5	9	0.30	X 14	SS-12	M		RESIDUAL, TAN-BROWN, SANDY CLAY
236.00	7.56	26	74		0.22	100+ X				WEATHERED ROCK (GRANITE)
234.00	9.08	60			0.00	60/0.00 X				CRYSTALLINE ROCK, GRAY-WHITE-BROWN, MODERATELY SEVERE WEATHERED TO FRESH, MODERATELY HARD TO VERY HARD, CLOSELY TO VERY CLOSELY FRACTURED, GRANITE REC=94% RQD=85%
232.00							RS-2			
230.00							RS-3			
228.00						CORING TERMINATED AT ELEVATION 228.99 METERS IN CRYSTALLINE ROCK (GRANITE)				
226.00										
224.00										

CORE BORING REPORT

PROJECT: **34345.1.1** ID: **R-0609IA** COUNTY: **GUILFORD** BORING NO: **B2-A**

DESCRIPTION: Structure No. 9 on -FLY- (High Point East Beltway) over -Y6- (I-85)

LOCATION OF BORING: -FLY-, Sta. 19+28, 3.5m LT COMPLETION DATE: 06/08/04

COLLAR or GROUND ELEVATION: 242.63 m CORE SIZE: NQWL GEOLOGIST: O.B. OTI

CORE EQUIPMENT: B-57, NQWL, H. S. Augers DRILLER: R.F. BAYRON

ELEV (m)	DEPTH (m)	DRILL RATE (min/0.5m)	RUN (m)	REC (m) (%)	RQD (m) (%)	SAMPLE NUMBER	FIELD CLASSIFICATION and REMARKS
240.93	1.70	4:50					Gray- white, fresh, very hard, very closely fractured, granite boulder
		7:45		0.50	0.50		
		4:00	1.30				
				(38%)	(38%)		
239.63	3.00						
239.63	3.00						Material not cored. Material logged as soil and weathered rock on boring log.
			4.56	N/A	N/A		
235.07	7.56						
235.07	7.56	2:10					Gray-tan-brown, very severe weathered, weathered rock (diabase)
		1:50		1.00	0.00		
		2:00	1.52				
				(66%)	(0%)		
233.55	9.08						
233.55	9.08	8:12					Gray- white, fresh, very hard, very closely fractured, granite (9.08-9.44)
		7:56		1.26	0.84		White-brown, moderately severe weathered, moderately hard, closely fractured, granite (9.44-9.54)
		10:46	1.52				Gray- white, fresh, very hard, very closely fractured, granite (9.54-9.79)
				(83%)	(55%)		White-brown, moderately severe weathered, moderately hard, closely fractured, granite (9.79-10.60)
232.03	10.60						
232.03	10.60	10:56					Gray- white, fresh, very hard, very closely fractured, granite
		11:02		1.52	1.52	RS-2	
		8:45	1.52			11.18-11.32	
				(100%)	(100%)		
230.51	12.12						
230.51	12.12	11:02					Gray- white, fresh, very hard, very closely fractured, granite
		9:22		1.52	1.52	RS-3	
		10:11	1.52			12.57-12.69	
				(100%)	(100%)		
228.99	13.64						
							BOREHOLE TERMINATED AT ELEVATION OF 228.99 METERS, IN GRANITE.

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

SHEET 13

PROJECT NO. 34345.1.1	**ID.** R-0609IA	**COUNTY** GUILFORD	**GEOLOGIST** O.B. OTI
SITE DESCRIPTION STRUCTURE NO. 9 ON -FLY- (HIGH POINT EAST BELTWAY) OVER -Y6- (I-85)			**GROUND WATER**
BORING NO. B2-B	**BORING LOCATION** 19+25.0	**OFFSET** 8.2m RT	**ALIGNMENT** -FLY-	**0 HR.** DRY
COLLAR ELEV. 242.82m	**NORTHING** 242007.6	**EASTING** 526003.3		**24 HR.** DRY
TOTAL DEPTH 10.64m	**DRILL MACHINE** MOBILE B-57	**DRILL METHOD** H.S. AUGERS	**HAMMER TYPE** MANUAL	
START DATE 6/9/04	**COMPLETION DATE** 6/9/04	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** 10.64m	

ELEV.	DEPTH	BLOW COUNT 15cm	15cm	15cm	PEN. (m)	BLOWS PER 30cm 0 25 50 75 100	SAMPLE NUMBER	MOI.	LOG	SOIL AND ROCK DESCRIPTION
242.82	0.00	2	6	9	0.30	X 15	SS-13	M		ROADWAY EMBANKMENT, TAN-BROWN, SILTY SAND
242.00	1.52	3	5	3	0.30	X 8	SS-14	M		TAN-BROWN-GRAY, COARSE SAND
240.00	3.04	10	8	6	0.30	X 14		M		
238.00	4.56	5	5	5	0.30	X 10	SS-15	M		TAN-BROWN-GRAY, SANDY SILT
	6.08	10	13	17	0.30	X 30	SS-16	M		RESIDUAL, TAN-BROWN, SAPROLITIC, SILTY SAND
236.00	7.68	60	40		0.20	100+ X				WEATHERED ROCK (GRANITE)
234.00	9.12	100			0.05	100+ X				
	10.64	60			0.00	60/0.00 X				
232.00						SPT REFUSAL AT ELEVATION 232.18 METERS ON CRYSTALLINE ROCK (GRANITE)				
230.00										
228.00										
226.00										
224.00										

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO. 34345.1.1	**ID.** R-0609IA	**COUNTY** GUILFORD		**GEOLOGIST** O.B. OTI
SITE DESCRIPTION STRUCTURE NO. 9 ON -FLY- (HIGH POINT EAST BELTWAY) OVER -Y6- (I-85)				**GROUND WATER**
BORING NO. B3-A	**BORING LOCATION** 19+75.0	**OFFSET** 3.3m LT	**ALIGNMENT** -FLY-	**0 HR.** DRY
COLLAR ELEV. 243.13m	**NORTHING** 241986.5	**EASTING** 526051.0		**24 HR.** DRY
TOTAL DEPTH 9.19m	**DRILL MACHINE** MOBILE B-57	**DRILL METHOD** H.S. AUGERS		**HAMMER TYPE** MANUAL
START DATE 6/7/04	**COMPLETION DATE** 6/7/04	**SURFACE WATER DEPTH** N/A		**DEPTH TO ROCK** N/A

ELEV.	DEPTH	BLOW COUNT 15cm	15cm	15cm	PEN. (m)	BLOWS PER 30cm 0 25 50 75 100	SAMPLE NUMBER	MOI.	LOG	SOIL AND ROCK DESCRIPTION
243.13										
	0.00									RESIDUAL, TAN-BROWN AND TAN-GRAY, SILTY CLAY
242.00	1.52	8	30	33	0.30	X 63	SS-6	M		
240.00	3.04	11	16	23	0.30	X 39	SS-7	M		
	4.56	32	68		0.20	100+ X				WEATHERED ROCK (GRANITIC ROCK INTERBEDDED WITH DIABASE ROCK)
238.00	6.08	40	60		0.23	100+ X				
236.00	7.60	100			0.08	100+ X				
234.00	9.12	100			0.07	100+ X				BORING TERMINATED AT ELEVATION 233.94 METERS IN WEATHERED ROCK (GRANITE)
232.00										
230.00										
228.00										
226.00										
224.00										

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO. 34345.1.1	**ID.** R-0609IA	**COUNTY** GUILFORD		**GEOLOGIST** O.B. OTI
SITE DESCRIPTION STRUCTURE NO. 9 ON -FLY- (HIGH POINT EAST BELTWAY) OVER -Y6- (I-85)				**GROUND WATER**
BORING NO. B3-B	**BORING LOCATION** 19+70.0	**OFFSET** 7.6m RT	**ALIGNMENT** -FLY-	**0 HR.** DRY
COLLAR ELEV. 243.19m	**NORTHING** 241980.0	**EASTING** 526040.9		**24 HR.** DRY
TOTAL DEPTH 7.60m	**DRILL MACHINE** MOBILE B-57	**DRILL METHOD** H.S. AUGERS		**HAMMER TYPE** MANUAL
START DATE 6/4/04	**COMPLETION DATE** 6/4/04	**SURFACE WATER DEPTH** N/A		**DEPTH TO ROCK** N/A

ELEV.	DEPTH	BLOW COUNT 15cm	15cm	15cm	PEN. (m)	BLOWS PER 30cm 0 25 50 75 100	SAMPLE NUMBER	MOI.	LOG	SOIL AND ROCK DESCRIPTION
243.19										
	0.00	4	6	8	0.30	14 X	SS-4	M		RESIDUAL, TAN-BROWN, SANDY CLAY
242.00	1.52	29	37	40	0.30	77 X	SS-5	M		TAN-BROWN, SILTY SAND
240.00	3.04	70	30		0.17	100+ X				WEATHERED ROCK (GRANITE)
	4.56	100			0.04	100+ X				
238.00	6.08	100			0.08	100+ X				
236.00	7.60	100			0.04	100+ X				BORING TERMINATED AT ELEVATION 235.59 METERS IN WEATHERED ROCK (GRANITE)
234.00										
232.00										
230.00										
228.00										
226.00										
224.00										

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

PROJECT NO. 34345.1.1	**ID.** R-0609IA	**COUNTY** GUILFORD	**GEOLOGIST** O.B. OTI
SITE DESCRIPTION STRUCTURE NO. 9 ON -FLY- (HIGH POINT EAST BELTWAY) OVER -Y6- (I-85)			**GROUND WATER**
BORING NO. EB2-A	**BORING LOCATION** 20+06.0	**OFFSET** 3.6m LT	**ALIGNMENT** -FLY-	**0 HR.** DRY
COLLAR ELEV. 244.05m	**NORTHING** 241969.7	**EASTING** 526083.8		**24 HR.** DRY
TOTAL DEPTH 4.74m	**DRILL MACHINE** MOBILE B-57	**DRILL METHOD** H.S. AUGERS	**HAMMER TYPE** MANUAL	
START DATE 6/7/04	**COMPLETION DATE** 6/7/04	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

ELEV.	DEPTH	BLOW COUNT 15cm | 15cm | 15cm	PEN. (m)	BLOWS PER 30cm (0 25 50 75 100)	SAMPLE NUMBER	MOI.	LOG	SOIL AND ROCK DESCRIPTION
244.05								
244.00								RESIDUAL, TAN-BROWN, SAPROLITIC, CLAYEY SILT
	1.52	16 | 35 | 55	0.30	90/X	SS-8	M		
242.00								WEATHERED ROCK (DIABASE ROCK)
	3.04	33 | 67 |	0.25	100+/X				
240.00	4.56	70 | 30 |	0.18	100+/X				
				BORING TERMINATED AT ELEVATION 239.31 METERS IN WEATHERED ROCK (METAVOLCANIC ROCK)				
238.00								
236.00								
234.00								
232.00								
230.00								
228.00								
226.00								

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL UNIT BORING LOG

SHEET 15

PROJECT NO. 34345.1.1	**ID.** R-0609IA	**COUNTY** GUILFORD	**GEOLOGIST** O.B. OTI
SITE DESCRIPTION STRUCTURE NO. 9 ON -FLY- (HIGH POINT EAST BELTWAY) OVER -Y6- (I-85)			**GROUND WATER**
BORING NO. EB2-B	**BORING LOCATION** 20+01.0	**OFFSET** 8.4m RT	**ALIGNMENT** -FLY-	**0 HR.** DRY
COLLAR ELEV. 244.80m	**NORTHING** 241958.7	**EASTING** 526079.0		**24 HR.** DRY
TOTAL DEPTH 4.63m	**DRILL MACHINE** MOBILE B-57	**DRILL METHOD** H.S. AUGERS	**HAMMER TYPE** MANUAL	
START DATE 6/7/04	**COMPLETION DATE** 6/7/04	**SURFACE WATER DEPTH** N/A	**DEPTH TO ROCK** N/A	

ELEV.	DEPTH	BLOW COUNT 15cm | 15cm | 15cm	PEN. (m)	BLOWS PER 30cm (0 25 50 75 100)	SAMPLE NUMBER	MOI.	LOG	SOIL AND ROCK DESCRIPTION
244.80	0.00	3 | 4 | 4	0.30	8/X	SS-9	M		RESIDUAL, TAN-BROWN, SANDY CLAY
244.00	1.52	100 |	0.28	100+/X				WEATHERED ROCK (GRANITE)
242.00	3.04	100 |	0.07	100+/X				
	4.56	100 |	0.07	100+/X				
240.00				BORING TERMINATED AT ELEVATION 240.17 METERS IN WEATHERED ROCK (GRANITE)				
238.00								
236.00								
234.00								
232.00								
230.00								
228.00								
226.00								

PROJ. NO. - 34345.1.1
ID NO. - R-0609IA
COUNTY - GUILFORD

EB1-A

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-19	3.6m LT	18+51.0	3.04-3.49	A-6(9)	37	18	20.1	17.6	29.9	32.4	94	81	63	56.2	-

EB1-B

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-17	8.4m RT	18+51.0	0.00-0.45	A-6(5)	34	19	31.8	23.1	16.7	28.4	98	81	48	-	-
SS-18	8.4m RT	18+51.0	3.04-3.49	A-4(4)	36	7	12.0	32.4	43.5	12.2	100	93	66	-	-

B1-A

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-1	3.6m LT	18+89.0	1.52-1.97	A-1-b(0)	22	NP	52.9	25.3	13.7	8.1	70	42	18	-	-

B1-B

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-2	8.4m RT	18+87.0	1.52-1.97	A-1-b(0)	22	NP	49.2	25.5	15.1	10.1	73	48	22	-	-
SS-3	8.4m RT	18+87.0	3.04-3.49	A-2-4(0)	25	NP	54.7	27.0	8.2	10.1	98	60	22	-	-

B2-A

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-10	3.5m LT	19+28.0	3.04-3.49	A-4(0)	26	NP	54.3	20.5	17.1	8.1	74	42	37	-	-
SS-11	3.5m LT	19+28.0	4.52-4.46	A-4(0)	24	4	38.1	28.8	18.9	14.2	97	74	36	-	-
SS-12	3.5m LT	19+28.0	6.04-6.49	A-6(3)	32	16	35.1	22.1	18.5	24.3	93	73	43	-	-

B2-B

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-13	8.2m RT	19+25.0	0.00-0.45	A-2-4(0)	28	6	51.9	21.7	14.3	12.2	89	56	27	-	-
SS-14	8.2m RT	19+25.0	1.52-1.97	A-1-b(0)	23	NP	56.7	20.9	14.3	8.1	75	43	20	-	-
SS-15	8.2m RT	19+25.0	4.56-5.01	A-4(2)	29	10	30.2	24.9	22.6	22.3	97	78	48	-	-
SS-16	8.2m RT	19+25.0	6.08-6.53	A-2-4(0)	30	NP	48.8	27.2	13.9	10.1	100	67	28	-	-

B3-A

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-6	3.3m LT	19+75.0	1.52-1.97	A-7-5(7)	44	11	17.4	26.3	44.1	12.2	100	89	64	-	-
SS-7	3.3m LT	19+75.0	3.04-3.49	A-7-5(10)	48	14	12.2	27.6	46.1	14.2	100	95	69	-	-

B3-B

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-4	7.6m RT	19+70.0	0.00-0.45	A-6(3)	30	13	32.8	24.1	16.7	26.3	100	82	48	-	-
SS-5	7.6m RT	19+70.0	1.52-1.97	A-2-4(0)	27	NP	46.1	30.7	13.1	10.1	100	71	28	-	-

EB2-A

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-8	3.6m LT	20+06.0	1.52-1.97	A-5(2)	44	7	13.0	38.1	38.8	10.1	83	77	50	-	-

EB2-B

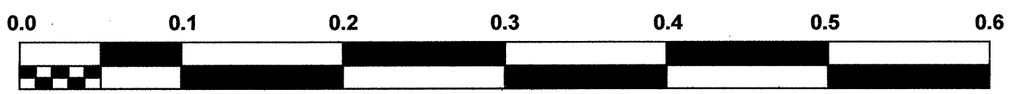
SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)			% MOISTURE	% ORGANIC
							C.SAND	F.SAND	SILT	CLAY	10	40	200		
SS-9	8.4m RT	20+01.0	0.00-0.45	A-6(2)	30	15	37.1	25.9	10.6	26.3	96	75	39	-	-

CORE PHOTOGRAPHS

B1-B

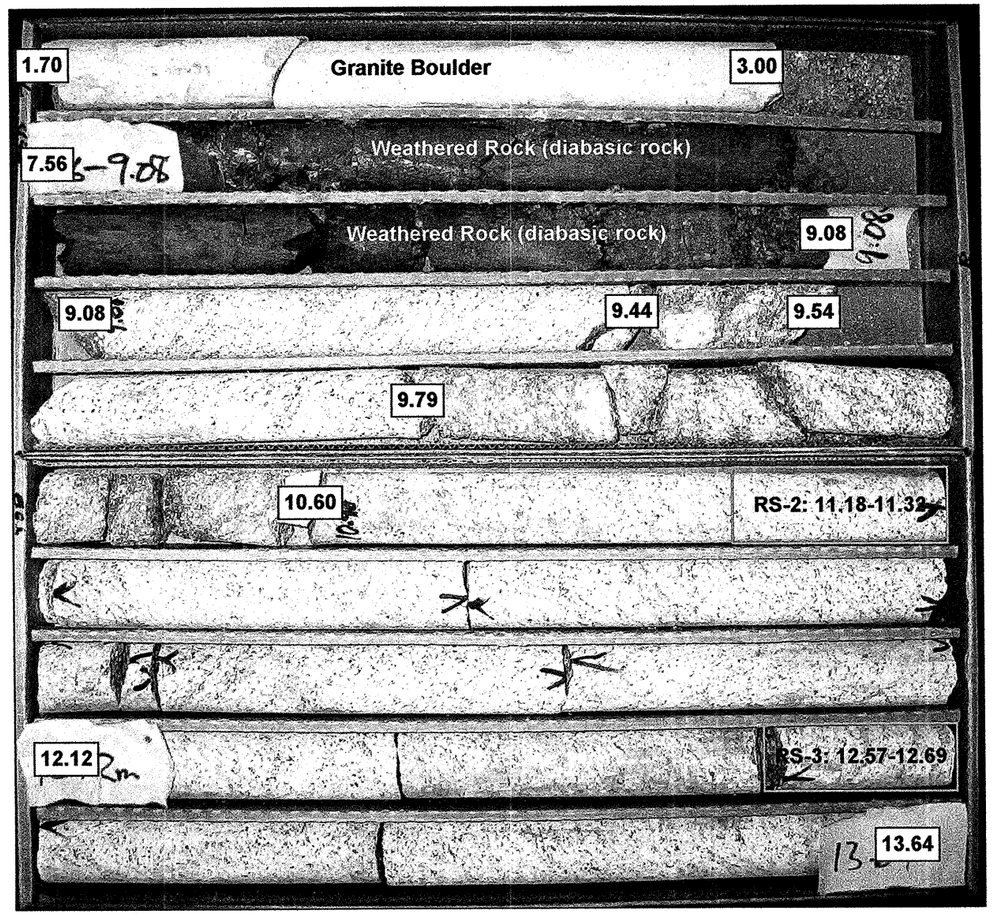
BOX 1 : 4.20 - 9.26 METERS

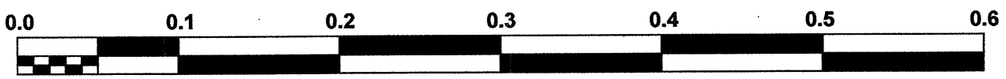


CORE PHOTOGRAPHS

B2-A

BOXES 1 & 2: 1.70 - 3.00 & 7.56 - 13.64 METERS





SITE PHOTOGRAPH

Structure No. 9 on -FLY- (High Point East Beltway) over -Y6- (I-85)