STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	38525.1.1 (B-4753)	1	16

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

STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. *38525.1.1 (B-4753)* F.A. PROJ. *BRSTP-2439(1)*

COUNTY *GASTON*

PROJECT DESCRIPTION *BRIDGE NO. 15 OVER DUHART'S CREEK ON SR 2439*

SITE DESCRIPTION

CONTENTS

CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING, AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES, AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT (919) 250-4088. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA ARE PART OF THE CONTRACT.

GENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND THE IN SITU (IN-PLACE) TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOIL MOISTURE CONDITIONS INDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS MAY VARY CONSIDERABLY WITH TIME ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION, AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

THE BIDDER OR CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE PLANS ARE PRELIMINARY ONLY AND IN MANY CASES THE FINAL DESIGN DETAILS ARE DIFFERENT. FOR BIDDING AND CONSTRUCTION PURPOSES, REFER TO THE CONSTRUCTION PLANS AND DOCUMENTS FOR FINAL DESIGN INFORMATION ON THIS PROJECT. THE DEPARTMENT DOES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOR THE INTERPRETATIONS MADE, OR OPINION OF THE DEPARTMENT AS TO THE TYPE OF MATERIALS AND CONDITIONS TO BE ENCOUNTERED. THE BIDDER OR CONTRACTOR IS CAUTIONED TO MAKE SUCH INDEPENDENT SUBSURFACE INVESTIGATIONS AS HE DEEMS NECESSARY TO SATISFY HIMSELF AS TO CONDITIONS TO BE ENCOUNTERED ON THIS PROJECT. THE CONTRACTOR SHALL HAVE NO CLAIM FOR ADDITIONAL COMPENSATION OR FOR AN EXTENSION OF TIME FOR ANY REASON RESULTING FROM THE ACTUAL CONDITIONS ENCOUNTERED AT THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

PERSONNEL

J. P. ROGERS

M. L. SMITH

J. K. STICKNEY

A. C. SMITH

INVESTIGATED BY *J. P. ROGERS*

CHECKED BY *C. B. LITTLE*

SUBMITTED BY *C. B. LITTLE*

DATE *SEPTEMBER 2010*

NORTH CAROLINA LICENSED SEAL 11049 GEOLOGIST CLINTON B. LITTLE

PROJECT: 38525.1.1

ID: B-4753

DRAWN BY: *C. E. BURRIS*

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

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

PROJECT REFERENCE NO.	SHEET NO.
38525.1.1 (B-4753)	2

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION

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

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

SOIL LEGEND AND AASHTO CLASSIFICATION

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

PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30

CONSISTENCY OR DENSENESS

PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTENCE (N-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH ($TONS/FT^2$)
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE	<4	N/A
	LOOSE	4 TO 10	
	MEDIUM DENSE	10 TO 30	
	DENSE	30 TO 50	
	VERY DENSE	>50	
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT	<2	<0.25
	SOFT	2 TO 4	0.25 TO 0.50
	MEDIUM STIFF	4 TO 8	0.5 TO 1.0
	STIFF	8 TO 15	1 TO 2
	VERY STIFF	15 TO 30	2 TO 4
	HARD	>30	>4

TEXTURE OR GRAIN SIZE

U.S. STD. SIEVE SIZE	4	10	40	60	200	270
OPENING (MM)	4.76	2.00	0.42	0.25	0.075	0.053

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

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

SOIL MOISTURE - CORRELATION OF TERMS

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

PLASTICITY

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

COLOR

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

GRADATION

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

ANGULARITY OF GRAINS

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

MINERALOGICAL COMPOSITION

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

COMPRESSIBILITY

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

PERCENTAGE OF MATERIAL

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

GROUND WATER

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

MISCELLANEOUS SYMBOLS

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

ABBREVIATIONS

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

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

EQUIPMENT USED ON SUBJECT PROJECT

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

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

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

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

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

ROCK DESCRIPTION

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

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

WEATHERING

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

ROCK HARDNESS

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

FRACTURE SPACING

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

BEDDING

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

INDURATION

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

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

TERMS AND DEFINITIONS

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

AQUIFER - A WATER BEARING FORMATION OR STRATA.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

BENCH MARK: RR SPIKE IN 14" PINE BM #2 -BL- STA. 13+96 169' LT

ELEVATION: 642.66 FT.

NOTES:
CAR = CASING ADVANCER REFUSAL

REVISED 09/23/09

PROJECT REFERENCE NO.	SHEET
38525.1.1 (B-4753)	3

SITE PLAN

0 50 100
FEET

BM #2
-BL- STA 13+96
169' LEFT
ELEV. 642.66'
RR SPIKE IN 14" PINE

HEIRS OF H. B. GASTON, SR.
DB 332 PG 144
DB 726 PG 446

KENNETH ROWE DILLARD
SHARON M. DILLARD
DB 3078 PG 456

ROGER YATES
JUDY YATES
DB 1178 PG 524

SHELDON GERNARD HARPER
ELYSE JAMES HARPER
DB 3007 PG 235

VINCENT LEGRAND GOSNELL
DB 2403 PG 784

TRIANGLE REAL ESTATE OF GASTONIA, INC.
DB 2525 PG 216

50' SANITARY SEWER EASEMENT
CITY OF GASTONIA
NB 38 PG 126

GASTONIA CITY LIMITS

BEGIN BRIDGE
-L- STA. 22+90.00

BEGIN TIP PROJECT B-4753
-L- STA. 20+75.00

BEGIN APPROACH SLAB
-L- STA. 22+79.00

END TIP PROJECT B-4753
-L- STA. 26+00.00

BL-4
-BL- PINC 13+96.22

END BRIDGE
-L- STA. 24+13.00

END APPROACH SLAB
-L- STA. 24+24.00

-L- PC Sta. 24+76.07

ISBK
LIFT STATION

ISFD

2SBKD

ALLUVIAL

RESIDUAL

ROADWAY EMBANKMENT

EXISTING R/W

14' GRAVEL

13' GRAVEL

DUHART'S CREEK

ESTIMATED LOCATION

CUSTOMER OWNED ACCESS

POSSIBLE ABD PHONE CABLE

FORCE MAIN CONFIGURATION IN THIS AREA MAPPED ACCORDING TO UTILITY RECORD. MULKEY MET 1 WITH CITY OF GASTONIA ASSISTANT CITY ENGINEER CURTIS C. BOST, PE ON SEPTEMBER 10, 2008. MR. BOST INDICATED THAT HE WOULD PREFER WE NOT ENTER THE PUMP STATION PROPERTY. HE ALSO STATED THAT THIS PUMP STATION WAS RESPONSIBLE FOR MANAGING 2/3 OF THE CITY'S WASTE WATER. MR. BOST ALSO STATED THAT HE WOULD PREFER NCDOT DO EVERYTHING IN THEIR POWER TO AVOID THIS PARTICULAR PUMP STATION.

PROJECT REFERENCE NO.	SHEET
38525.1.1 (B-4753)	4

PROFILE ALONG -L-
VE=5:1
STRATA SHOWN THROUGH BORINGS

0 50 100
FEET

-L-

BEGIN GRADE
-L- STA. 20+75.00
EL = 667.87

PI = 21+90.00
EL = 658.90'
VC = 190'
K = 27
V = 25 mph

BRIDGE ℄ STA. 23+51.50
ELEV. = 657.61'
SKEW = 90°
PROPOSED SPANS 1@ 45', 1@ 78'
2 SPAN 54" REINFORCED CONCRETE GIRDERS

-L- STA 23+51.50
EL: 657.61'
2 SPAN, 54" RC GIRDER
1@45', 1@78'
OVERALL LENGTH: 123'
SKEW: 90°

END GRADE
-L- STA. 26+00.00
EL = 662.72

PI = 25+00.00
EL = 656.42'
VC = 190'
K = 27
V = 25 mph

SS-4
EB1-A
22+88 -L-
8.0 LT
ELEV. = 653.4'

RS-1
RS-2
B1-A
23+35 -L-
8.3 LT
ELEV. = 639.2'

EB2-A
24+13 -L-
8.0 LT
ELEV. = 653.1'

SAG
-L- STA 24+26.41
ELEV: 657.09

(-)7.8000%
(-)0.8000%
(-)0.8000%
(+)6.3000%

500 YR 655.9'
100 YR 651.4'
25 YR 648.9'
10 YR 647.5'

ROADWAY EMBANKMENT
RED-BROWN MED. STIFF TO SOFT MOIST LOW PLASTIC SANDY SILTY CLAY (A-6)

ROADWAY EMBANKMENT
RED-BROWN MEDIUM STIFF MOIST LOW PLASTIC SANDY SILTY CLAY (A-6)

15' min
GREENWAY
GREENWAY ELEV 644.0'
ALLUVIAL
NWS 636.8'
RESIDUAL
OLIVE STIFF TO HARD MOIST SANDY SILT (A-4)
WEATH. ROCK (D)
RESIDUAL (E)
WEATHERED ROCK (D)
100/.5
100/.5
CAR DRY 07/2010
CAR DRY 07/2010
REC. = 96% RQD. = 40%
100 YR SCOUR
500 YR SCOUR
CRYSTALLINE ROCK
GRAY /GREEN HARD SLIGHTLY WEATHERED TO FRESH METAVOLCANIC
REC. = 96%
RQD. = 72%
BT
NM
07/2010

BM #2 -BL- STA 13+96 169' LEFT
-L- STA 22+89.10 190.65' LEFT
RR SPIKE IN 14" PINE ELEV. = 642.66'

BORING DESCRIPTIONS

(A) ALLUVIAL, TAN VERY LOOSE MOIST SAND (A-1-b) WITH RIP/RAP
(B) RESIDUAL, GRAY VERY STIFF TO HARD MOIST CLAYEY SILTY SAND (A-2)
(C) CRYSTALLINE ROCK, GRAY /GREEN HARD SLIGHTLY WEATHERED METAVOLCANIC
(D) WEATHERED ROCK, SEVERELY WEATHERED CRYSTALLINE ROCK
(E) RESIDUAL, OLIVE HARD MOIST CLAYEY SANDY SILT (A-4)

BRIDGE HYDRAULIC DATA

DESIGN DISCHARGE	= 3,717	CFS
DESIGN FREQUENCY	= 25	YRS
DESIGN HW ELEVATION	= 648.9	FT
BASE DISCHARGE	= 5,864	CFS
BASE FREQUENCY	= 100	YRS
BASE HW ELEVATION	= 651.4	FT
OVERTOPPING DISCHARGE	= >9,598	CFS
OVERTOPPING FREQUENCY	= >500	YRS
OVERTOPPING ELEVATION	= 657.1	FT
NORMAL WATER SURFACE ELEVATION	=	FT
DATE OF SURVEY	= 3/17/10	
W.S. ELEVATION AT DATE OF SURVEY	= 636.8	FT

STRUCTURE HYDRAULIC DATA

DESIGN DISCHARGE	=	CFS
DESIGN FREQUENCY	=	YRS
DESIGN HW ELEVATION	=	FT
BASE DISCHARGE	=	CFS
BASE FREQUENCY	=	YRS
BASE HW ELEVATION	=	FT
OVERTOPPING DISCHARGE	=	CFS
OVERTOPPING FREQUENCY	=	YRS
OVERTOPPING ELEVATION	=	FT

PIPE HYDRAULIC DATA
DRAINAGE STRUCTURE NO.

DRAINAGE AREA	=	AC
DESIGN FREQUENCY	=	YRS
DESIGN DISCHARGE	=	CFS
DESIGN HW ELEVATION	=	FT
100 YEAR DISCHARGE	=	CFS
100 YEAR HW ELEVATION	=	FT
OVERTOPPING FREQUENCY	=	YRS
OVERTOPPING DISCHARGE	=	CFS
OVERTOPPING ELEVATION	=	FT

690 680 670 660 650 640 630 620 610

21+00 22+00 23+00 24+00 25+00 26+00 27+00

PROJECT REFERENCE NO.	SHEET
38525.1.1 (B-4753)	5
SECTION THROUGH END BENT 1 STA. 22+90 -L- SKEW = 90°	

0 10 20
FEET

-L-

690 680 670 660 650 640 630 620 610 600

SS-4

EB1-A
22+88 -L-
8.0 LT
ELEV. = 653.4'

SS-3

EB1-B
22+85 -L-
9.0 RT
ELEV. = 653.5'

EXISTING GROUND

ROADWAY EMBANKMENT
RED-BROWN MEDIUM STIFF TO SOFT MOIST LOW PLASTIC SANDY SILTY CLAY (A-6)

(PI = 13)

ROADWAY EMBANKMENT
RED-BROWN MEDIUM STIFF TO STIFF MOIST LOW PLASTIC SANDY SILTY CLAY (A-6)

4
2
34
6
9
100/.7
50/.0

RESIDUAL
OLIVE STIFF TO HARD MOIST SANDY SILT (A-4)

RESIDUAL
OLIVE HARD MOIST CLAYEY SANDY SILT (A-4)

CRYSTALLINE ROCK

WEATHERED ROCK
SEVERELY WEATHERED CRYSTALLINE ROCK

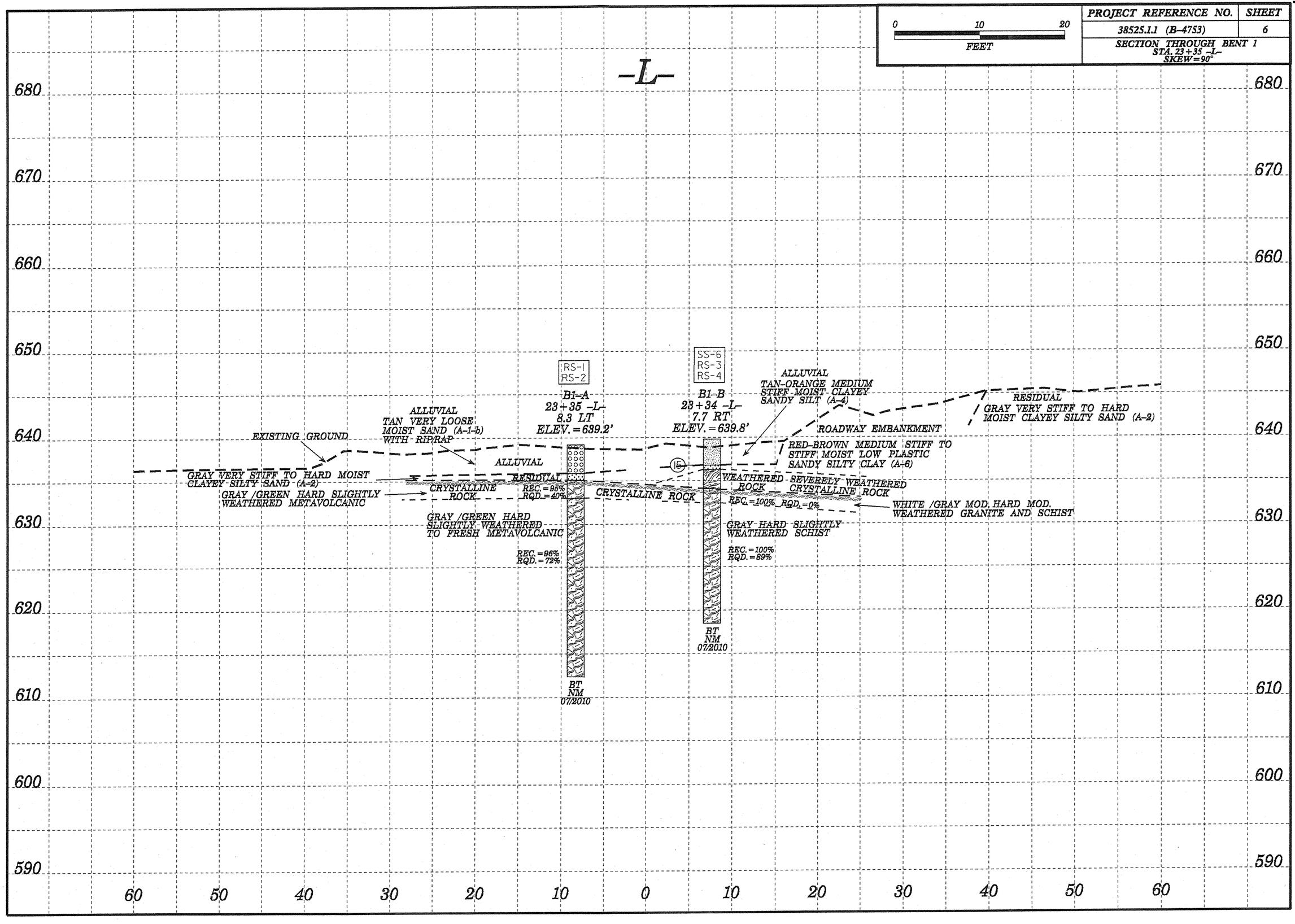
CRYSTALLINE ROCK

CAR
DRY
07/2010

CAR
DRY
07/2010

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

0 10 20 FEET	PROJECT REFERENCE NO.	SHEET
	38525.1.1 (B-4753)	6
	SECTION THROUGH BENT 1 STA. 23+35 -L- SKEW=90°	



0	10	20
FEET		

PROJECT REFERENCE NO.	SHEET
38525.1.1 (B-4753)	7
SECTION THROUGH END BENT 2 STA. 24+13 -L- SKEW=90°	

-L-

EB2-A
24+13 -L-
8.0 LT
ELEV. = 653.1'

SS-1
SS-2

EB2-B
24+13 -L-
9.0 RT
ELEV. = 652.9'

EXISTING GROUND

ROADWAY EMBANKMENT
RED-BROWN MEDIUM STIFF MOIST LOW PLASTIC SANDY SILTY CLAY (A-6)

7

WEATHERED ROCK
SEVERELY WEATHERED CRYSTALLINE ROCK

100/.5

RESIDUAL
OLIVE HARD MOIST CLAYEY SANDY SILT (A-4)

WEATHERED ROCK
SEVERELY WEATHERED CRYSTALLINE ROCK

100/.5

CRYSTALLINE ROCK

CAB
DRY
07/2010

(PI=15)

5

ROADWAY EMBANKMENT
RED-BROWN MEDIUM STIFF MOIST LOW PLASTIC SANDY SILTY CLAY (A-6)

35

RESIDUAL
OLIVE HARD TO VERY STIFF MOIST CLAYEY SANDY SILT (A-4)

26

100/.4

WEATHERED ROCK
SEVERELY WEATHERED CRYSTALLINE ROCK

CRYSTALLINE ROCK

60/0

BT
CAVED
07/2010

690 680 670 660 650 640 630 620 610 600

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

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

PROJECT NO. 38525.1.1	**ID.** B-4753	**COUNTY** GASTON	**GEOLOGIST** Rogers, J. P.	
SITE DESCRIPTION Bridge 15 on SR 2439 over Duhart's Creek				**GROUND WTR (ft)**
BORING NO. EB1-A	**STATION** 22+88	**OFFSET** 8 ft LT	**ALIGNMENT** -L-	**0 HR.** NM
COLLAR ELEV. 653.4 ft	**TOTAL DEPTH** 17.1 ft	**NORTHING** 551,650	**EASTING** 1,373,709	**24 HR.** Dry
DRILL MACHINE CME-550X	**DRILL METHOD** NW Casing w/ Advancer		**HAMMER TYPE** Automatic	
DRILLER Smith, M. L.	**START DATE** 07/27/10	**COMP. DATE** 07/27/10	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
										ELEV. (ft) DEPTH (ft)
655										653.4 GROUND SURFACE 0.0
										ROADWAY EMBANKMENT RED-BROWN MEDIUM STIFF TO SOFT MOIST LOW PLASTIC SANDY SILTY CLAY (A-6)
650	648.3	5.1	1	1	3	4				
645	643.3	10.1	0	1	1	2				639.4 14.0
640	638.3	15.1	1	4	30	34	SS-4			**RESIDUAL** OLIVE STIFF TO HARD MOIST SANDY SILT (A-4) 636.3 17.1
635										Boring Terminated with Casing Advancer Refusal at Elevation 636.3 ft on crystalline rock
630										
625										
620										
615										
610										
605										
600										
595										
590										
585										
580										
575										

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

PROJECT NO. 38525.1.1	**ID.** B-4753	**COUNTY** GASTON	**GEOLOGIST** Rogers, J. P.	
SITE DESCRIPTION Bridge 15 on SR 2439 over Duhart's Creek				**GROUND WTR (ft)**
BORING NO. EB1-B	**STATION** 22+85	**OFFSET** 9 ft RT	**ALIGNMENT** -L-	**0 HR.** Caved@14
COLLAR ELEV. 653.5 ft	**TOTAL DEPTH** 17.6 ft	**NORTHING** 551,648	**EASTING** 1,373,726	**24 HR.** Dry
DRILL MACHINE CME-550X	**DRILL METHOD** NW Casing w/ Advancer		**HAMMER TYPE** Automatic	
DRILLER Smith, M. L.	**START DATE** 07/26/10	**COMP. DATE** 07/26/10	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
										ELEV. (ft) DEPTH (ft)
655										653.5 GROUND SURFACE 0.0
										ROADWAY EMBANKMENT RED-BROWN MEDIUM STIFF TO STIFF MOIST LOW PLASTIC (PI=13) SANDY SILTY CLAY (A-6)
650	648.5	5.0	2	2	4	6	SS-3			
645	643.5	10.0	2	3	6	9				639.5 14.0
640	638.5	15.0	42	100/.2		100/.7				**RESIDUAL** OLIVE HARD MOIST CLAYEY SANDY SILT (A-4) 638.0 15.5
635	635.9	17.6	60/0			60/0 REF				**WEATHERED ROCK** SEVERELY WEATHERED CRYSTALLINE ROCK 635.9 17.6
630										Boring Terminated with Casing Advancer Refusal at Elevation 635.9 ft on crystalline rock
625										
620										
615										
610										
605										
600										
595										
590										
585										
580										
575										

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 38525.1.1	**ID.** B-4753	**COUNTY** GASTON	**GEOLOGIST** Stickney, J. K.	
SITE DESCRIPTION Bridge 15 on SR 2439 over Duhart's Creek				**GROUND WTR (ft)**
BORING NO. B1-A	**STATION** 23+35	**OFFSET** 8 ft LT	**ALIGNMENT** -L-	**0 HR.** NM
COLLAR ELEV. 639.2 ft	**TOTAL DEPTH** 26.8 ft	**NORTHING** 551,697	**EASTING** 1,373,706	**24 HR.** NM
DRILL MACHINE CME-550X	**DRILL METHOD** NW Casing w/ Core		**HAMMER TYPE** Automatic	
DRILLER Smith, M. L.	**START DATE** 07/28/10	**COMP. DATE** 07/28/10	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
										ELEV. (ft) DEPTH (ft)
640										639.2 GROUND SURFACE 0.0
										ALLUVIAL TAN VERY LOOSE MOIST SAND (A-1-b) WITH RIP/RAP
635										635.9 3.3
										635.1 **RESIDUAL** GRAY VERY STIFF TO HARD MOIST CLAYEY SILTY SAND (A-2) 4.1
										633.0 6.2
630							RS-1			**CRYSTALLINE ROCK** GRAY / GREEN HARD SLIGHTLY WEATHERED METAVOLCANIC
										CRYSTALLINE ROCK GRAY / GREEN HARD SLIGHTLY WEATHERED TO FRESH METAVOLCANIC
625							RS-2			
620										
615										
										612.4 26.8
610										Boring Terminated at Elevation 612.4 ft in metavolcanic
605										
600										
595										
590										
585										
580										
575										
570										
565										
560										

NCDOT GEOTECHNICAL ENGINEERING UNIT
CORE BORING REPORT

PROJECT NO. 38525.1.1	**ID.** B-4753	**COUNTY** GASTON	**GEOLOGIST** Stickney, J. K.	
SITE DESCRIPTION Bridge 15 on SR 2439 over Duhart's Creek				**GROUND WTR (ft)**
BORING NO. B1-A	**STATION** 23+35	**OFFSET** 8 ft LT	**ALIGNMENT** -L-	**0 HR.** NM
COLLAR ELEV. 639.2 ft	**TOTAL DEPTH** 26.8 ft	**NORTHING** 551,697	**EASTING** 1,373,706	**24 HR.** NM
DRILL MACHINE CME-550X	**DRILL METHOD** NW Casing w/ Core		**HAMMER TYPE** Automatic	
DRILLER Smith, M. L.	**START DATE** 07/28/10	**COMP. DATE** 07/28/10	**SURFACE WATER DEPTH** N/A	
CORE SIZE NXB	**TOTAL RUN** 22.7 ft			

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS
											ELEV. (ft) DEPTH (ft)
635.1											Begin Coring @ 4.1 ft
	635.1	4.1	2.1	2.13/1.0	(2.0) 95%	(0.9) 40%		(2.0) 95%	(0.9) 40%		635.1 **CRYSTALLINE ROCK** 4.1
	633.0	6.2									633.0 GRAY / GREEN HARD SLIGHTLY WEATHERED METAVOLCANIC WITH 6.2
			4.8	1.93/1.0	(4.4) 92%	(3.5) 73%		(19.7) 96%	(14.8) 72%		CLOSE FRACTURE SPACING R1=12, R2=8, R3=10, R4=20, R5=7 RMR=57
630							RS-1				**CRYSTALLINE ROCK** GRAY / GREEN HARD SLIGHTLY WEATHERED TO FRESH METAVOLCANIC WITH CLOSE TO MODERATELY CLOSE FRACTURE SPACING R1=12, R2=13, R3=20, R4=20, R5=7 RMR=72
	628.2	11.0									
			4.8	2.3/1.0	(4.4) 92%	(3.4) 71%					
625											
	623.4	15.8					RS-2				
			6.2	2.81/1.0	(6.2) 100%	(4.2) 68%					
620											
	617.2	22.0									
			4.8	2.58/1.0	(4.7) 98%	(3.7) 77%					
615											
	612.4	26.8									612.4 26.8
610											Boring Terminated at Elevation 612.4 ft in metavolcanic
605											
600											
595											
590											
585											
580											
575											
570											
565											
560											

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 38525.1.1	**ID.** B-4753	**COUNTY** GASTON	**GEOLOGIST** Stickney, J. K.	
SITE DESCRIPTION Bridge 15 on SR 2439 over Duhart's Creek				**GROUND WTR (ft)**
BORING NO. B1-B	**STATION** 23+34	**OFFSET** 8 ft RT	**ALIGNMENT** -L-	**0 HR.** NM
COLLAR ELEV. 639.8 ft	**TOTAL DEPTH** 21.3 ft	**NORTHING** 551,697	**EASTING** 1,373,722	**24 HR.** NM
DRILL MACHINE CME-550X	**DRILL METHOD** NW Casing W/SPT & Core		**HAMMER TYPE** Automatic	
DRILLER Smith, M. L.	**START DATE** 07/29/10	**COMP. DATE** 07/29/10	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
										ELEV. (ft) DEPTH (ft)
640										639.8 GROUND SURFACE 0.0
	637.8	2.0	0	3	12	15	SS-6			**ALLUVIAL** TAN-ORANGE MEDIUM STIFF MOIST CLAYEY SANDY SILT (A-4) 636.8 3.0
635										**RESIDUAL** GRAY VERY STIFF TO HARD MOIST CLAYEY SILTY SAND (A-2) 636.3 3.5
										634.0 5.8
630										**WEATHERED ROCK** SEVERELY WEATHERED CRYSTALLINE ROCK 632.4 7.4
							RS-3			**CRYSTALLINE ROCK** WHITE / GRAY MODERATELY HARD MODERATELY WEATHERED GRANITE AND SCHIST
625										
							RS-4			**CRYSTALLINE ROCK** GRAY HARD SLIGHTLY WEATHERED SCHIST
620										618.5 21.3
										Boring Terminated at Elevation 618.5 ft in schist
615										
610										
605										
600										
595										
590										
585										
580										
575										
570										
565										
560										

NCDOT GEOTECHNICAL ENGINEERING UNIT
CORE BORING REPORT

PROJECT NO. 38525.1.1	**ID.** B-4753	**COUNTY** GASTON	**GEOLOGIST** Stickney, J. K.	
SITE DESCRIPTION Bridge 15 on SR 2439 over Duhart's Creek				**GROUND WTR (ft)**
BORING NO. B1-B	**STATION** 23+34	**OFFSET** 8 ft RT	**ALIGNMENT** -L-	**0 HR.** NM
COLLAR ELEV. 639.8 ft	**TOTAL DEPTH** 21.3 ft	**NORTHING** 551,697	**EASTING** 1,373,722	**24 HR.** NM
DRILL MACHINE CME-550X	**DRILL METHOD** NW Casing W/SPT & Core		**HAMMER TYPE** Automatic	
DRILLER Smith, M. L.	**START DATE** 07/29/10	**COMP. DATE** 07/29/10	**SURFACE WATER DEPTH** N/A	
CORE SIZE NXB	**TOTAL RUN** 15.5 ft			

ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN REC. (ft) %	RUN RQD (ft) %	SAMP. NO.	STRATA REC. (ft) %	STRATA RQD (ft) %	LOG	DESCRIPTION AND REMARKS
											ELEV. (ft) DEPTH (ft)
634											Begin Coring @ 5.8 ft
	634.0	5.8	1.0	1.79/1.0	(1.0)	(0.0)		(1.6)	(0.0)		634.0 **CRYSTALLINE ROCK** 5.8
	633.0	6.8	4.7	2.24/1.0	100%	0%		100%	0%		632.4 WHITE / GRAY MODERATELY HARD MODERATELY WEATHERED 7.4
630					(4.6)	(3.8)		(13.9)	(12.4)		GRANITE AND SCHIST WITH VERY CLOSE TO CLOSE FRACTURE SPACING
					98%	81%		100%	89%		R1=12, R2=3, R3=7, R4=20, R5=7
	628.3	11.5									RMR=49
			4.9	2.18/1.0	(4.7)	(4.1)	RS-3				**CRYSTALLINE ROCK**
625					96%	84%					GRAY HARD SLIGHTLY WEATHERED SCHIST WITH CLOSE FRACTURE SPACING
	623.4	16.4									R1=12, R2=17, R3=10, R4=20, R5=7
			4.9	2.03/1.0	(4.7)	(4.3)	RS-4				RMR=66
620					96%	88%					
	618.5	21.3									618.5 21.3
											Boring Terminated at Elevation 618.5 ft in schist
615											
610											
605											
600											
595											
590											
585											
580											
575											
570											
565											
560											
555											

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

PROJECT NO. 38525.1.1	**ID.** B-4753	**COUNTY** GASTON	**GEOLOGIST** Rogers, J. P.	
SITE DESCRIPTION Bridge 15 on SR 2439 over Duhart's Creek				**GROUND WTR (ft)**
BORING NO. EB2-A	**STATION** 24+13	**OFFSET** 8 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 653.1 ft	**TOTAL DEPTH** 17.2 ft	**NORTHING** 551,775	**EASTING** 1,373,702	**24 HR.** Dry
DRILL MACHINE CME-550X	**DRILL METHOD** NW Casing w/ Advancer		**HAMMER TYPE** Automatic	
DRILLER Smith, M. L.	**START DATE** 07/27/10	**COMP. DATE** 07/27/10	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	ELEV. (ft)	DEPTH (ft)
										GROUND SURFACE	653.1	0.0
										ROADWAY EMBANKMENT RED-BROWN MEDIUM STIFF MOIST LOW PLASTIC SANDY SILTY CLAY (A-6)		
	648.1	5.0	1	4	3	7						
	643.1	10.0	4	100/.5		100/.5					642.6	10.5
										WEATHERED ROCK SEVERELY WEATHERED CRYSTALLINE ROCK	641.1	12.0
	638.1	15.0	20	100/.5		100/.5				**RESIDUAL** OLIVE HARD MOIST CLAYEY SANDY SILT (A-4)	639.1	14.0
										WEATHERED ROCK SEVERELY WEATHERED CRYSTALLINE ROCK	635.9	17.2
										Boring Terminated with Casing Advancer Refusal at Elevation 635.9 ft on crystalline rock		

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

PROJECT NO. 38525.1.1	**ID.** B-4753	**COUNTY** GASTON	**GEOLOGIST** Rogers, J. P.	
SITE DESCRIPTION Bridge 15 on SR 2439 over Duhart's Creek				**GROUND WTR (ft)**
BORING NO. EB2-B	**STATION** 24+13	**OFFSET** 9 ft RT	**ALIGNMENT** -L-	**0 HR.** Caved@14
COLLAR ELEV. 652.9 ft	**TOTAL DEPTH** 25.3 ft	**NORTHING** 551,776	**EASTING** 1,373,719	**24 HR.** Dry
DRILL MACHINE CME-550X	**DRILL METHOD** NW Casing w/ Advancer		**HAMMER TYPE** Automatic	
DRILLER Smith, M. L.	**START DATE** 07/26/10	**COMP. DATE** 07/26/10	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	ELEV. (ft)	DEPTH (ft)
										GROUND SURFACE	652.9	0.0
										ROADWAY EMBANKMENT RED-BROWN MEDIUM STIFF MOIST LOW PLASTIC (PI=15) SANDY SILTY CLAY (A-6)		
	647.6	5.3	0	2	3	5	SS-1					
	642.6	10.3	4	14	21	35	SS-2				643.9	9.0
										RESIDUAL OLIVE HARD TO VERY STIFF MOIST CLAYEY SANDY SILT (A-4)		
	637.6	15.3	14	6	20	26					633.9	19.0
	632.6	20.3	100/.4			100/.4				**WEATHERED ROCK** SEVERELY WEATHERED CRYSTALLINE ROCK	629.9	23.0
	627.6	25.3	60/0			60/0 REF				**CRYSTALLINE ROCK**	627.6	25.3
										Boring Terminated with Standard Penetration Test Refusal at Elevation 627.6 ft in crystalline rock		

TEST RESULTS

PROJECT: 38525.1.1 B-4753
COUNTY: GASTON
SITE DESCRIPTION: BRIDGE NO. 15 OVER DUHART'S CREEK ON SR 2439

SOIL SAMPLE RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS	N	L.L.	P.I.	% BY WEIGHT C. SAND	F. SAND	SILT	CLAY	% PASSING SIEVES 10	40	200	% MOISTURE	% ORGANIC	UNIT WT. (d)	VOID RATIO
		EB1-A																
SS-4	8.0 LT	27+88	15.10-16.60	A-4(3)	34	36	5	10.8	34.7	46.5	8.1	99	93	66				
		EB1-B																
SS-3	9.0 RT	22+85	5.00-6.50	A-6(7)	6	35	13	13.2	19.5	32.9	34.5	92	85	67				
		B1-B																
SS-6	7.7 RT	23+34	2.00-3.00	A-4(0)	3	21	3	16.4	37.5	29.8	16.2	92	84	51				
		EB2-B																
SS-1	9.0 RT	24+13	5.30-6.80	A-6(11)	5	39	15	11.6	15.4	32.5	40.6	96	88	75				
SS-2	9.0 RT	24+13	10.30-11.80	A-4(0)	35	27	2	17.6	26.4	39.8	16.2	93	84	61				
		CHANNEL BANK																
SS-5			0.00-1.00	A-1-b(0)		24	NP	80.3	13.2	5.5	1.0	71	23	6				

ROCK SAMPLE RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	RQD	UNIT WT lb/ft3	Q (ksf)	E (MPsi)
		B1-A					
RS-1	8.3 LT	23+35	8.7-9.3	72%	185.4	2504	13.65
RS-2	8.3 LT	23+35	15.25-15.8	72%	179.4	2687	11.99
		B1-B					
RS-3	7.7 RT	23+34	12.2-12.9	89%	174.1	2389	13.75
RS-4	7.7 RT	23+34	16.4-16.95	89%	177.3	2183	12.65

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
GEOTECHNICAL ENGINEERING UNIT

FIELD SCOUR REPORT

WBS: 38525.1.1 TIP: B-4753 COUNTY: GASTON

DESCRIPTION(1): BRIDGE NO. 15 ON SR 2439 OVER DUHARTS CREEK.

EXISTING BRIDGE

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

Bridge No.: 15 Length: 90' Total Bents: 3 Bents in Channel: 1 Bents in Floodplain: 1
Foundation Type: END BENTS - PILES(?) ON ABUT. WALLS. INTERIOR BENT - TIMBER PILES IN FOOTING.

EVIDENCE OF SCOUR(2)

Abutments or End Bent Slopes: NONE

Interior Bents: NONE

Channel Bed: NONE

Channel Bank: NONE

EXISTING SCOUR PROTECTION

Type(3): ABUTMENT WALLS.

Extent(4): END BENTS

Effectiveness(5): GOOD

Obstructions(6): NONE. CLEAN CHANNEL

DESIGN INFORMATION

Channel Bed Material(7): COBBLES, ROCK, AND SAND (A-1-b) AS S-5.

Channel Bank Material(8): SANDY SILT (A-4) AS SS-6.

Channel Bank Cover(9): SHORT GRASSES.

Floodplain Width(10): APP. 100'

Floodplain Cover(11): SHORT GRASSES AND TREES.

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

Channel Migration Tendency(13): SLIGHT TO MODERATE TENDENCY FOR NORTHWARD MIGRATION.

Observations and Other Comments: ____

DESIGN SCOUR ELEVATIONS(14) Feet X Meters ____

	BENTS B1	B2	B3	B4							
100 YR.	634										

Comparison of DSE to Hydraulics Unit theoretical scour:
DUE TO THE PRESENCE OF WEATHERED ROCK, OUR DSE IS THREE FEET HIGHER THAN HYDRAULICS' THEORETICAL SCOUR.

SOIL ANALYSIS RESULTS FROM CHANNEL BED AND BANK MATERIAL

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

Template Revised 02/07/06

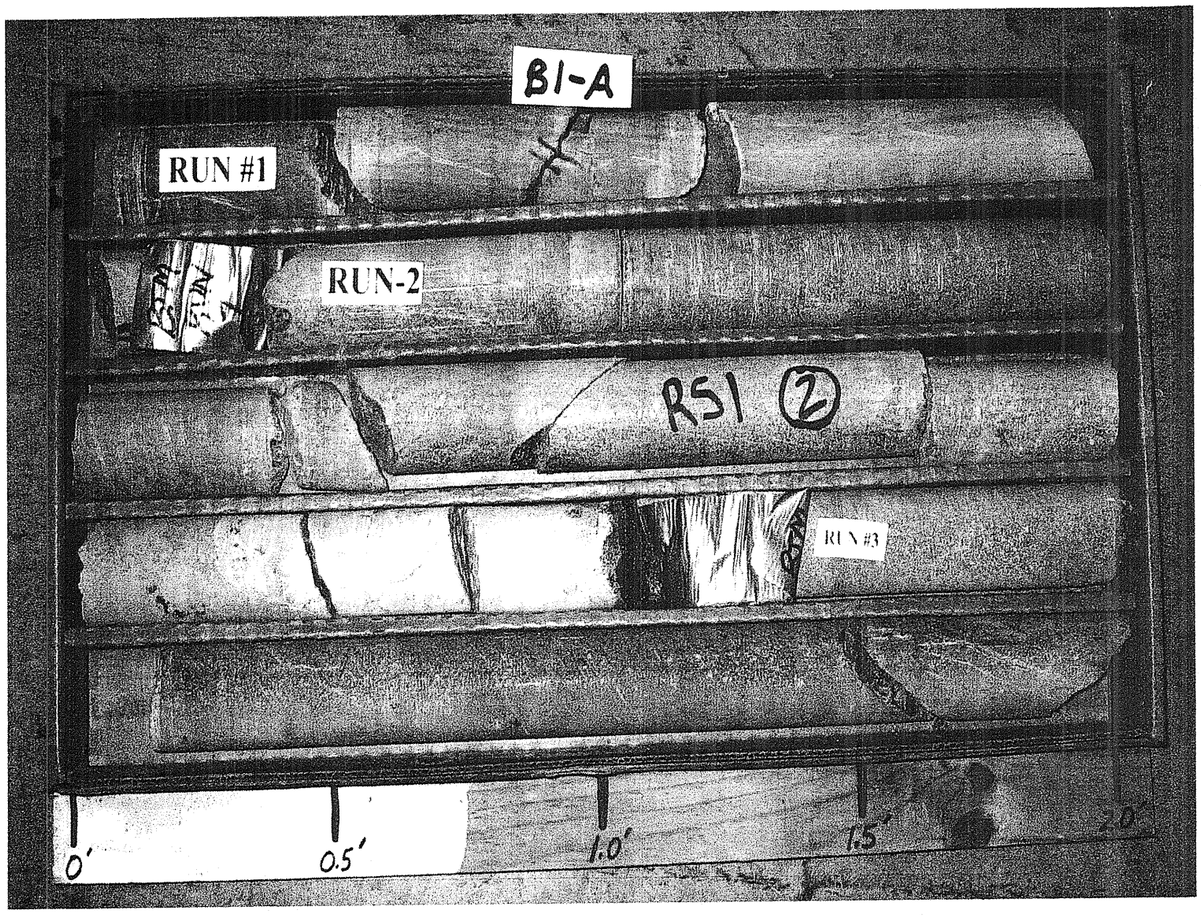
Reported by: JP ROGERS **Date:** 7/28/2010

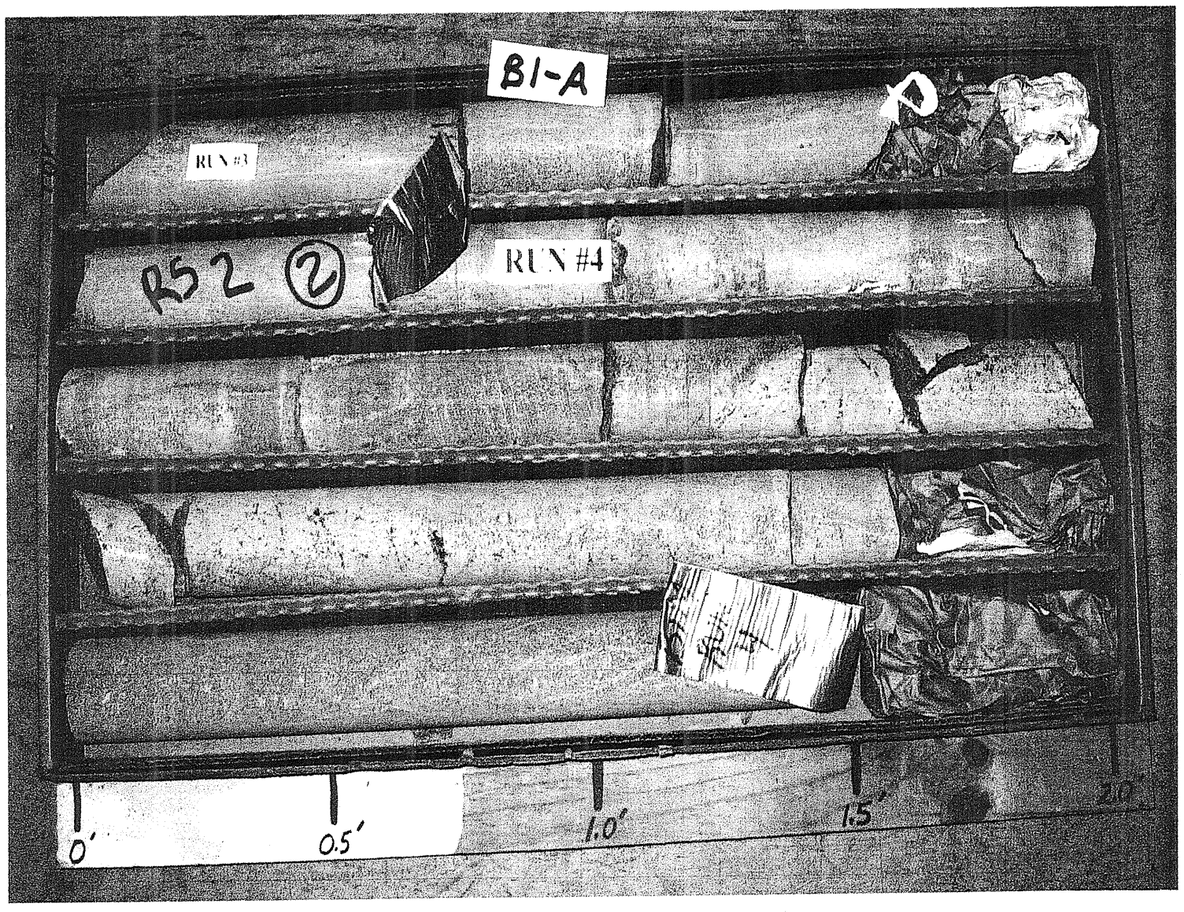
INSTRUCTIONS

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

38525.1.1 (B-4753)
GASTON COUNTY
BRIDGE NO. 15 OVER DUHART'S CREEK ON SR 2439

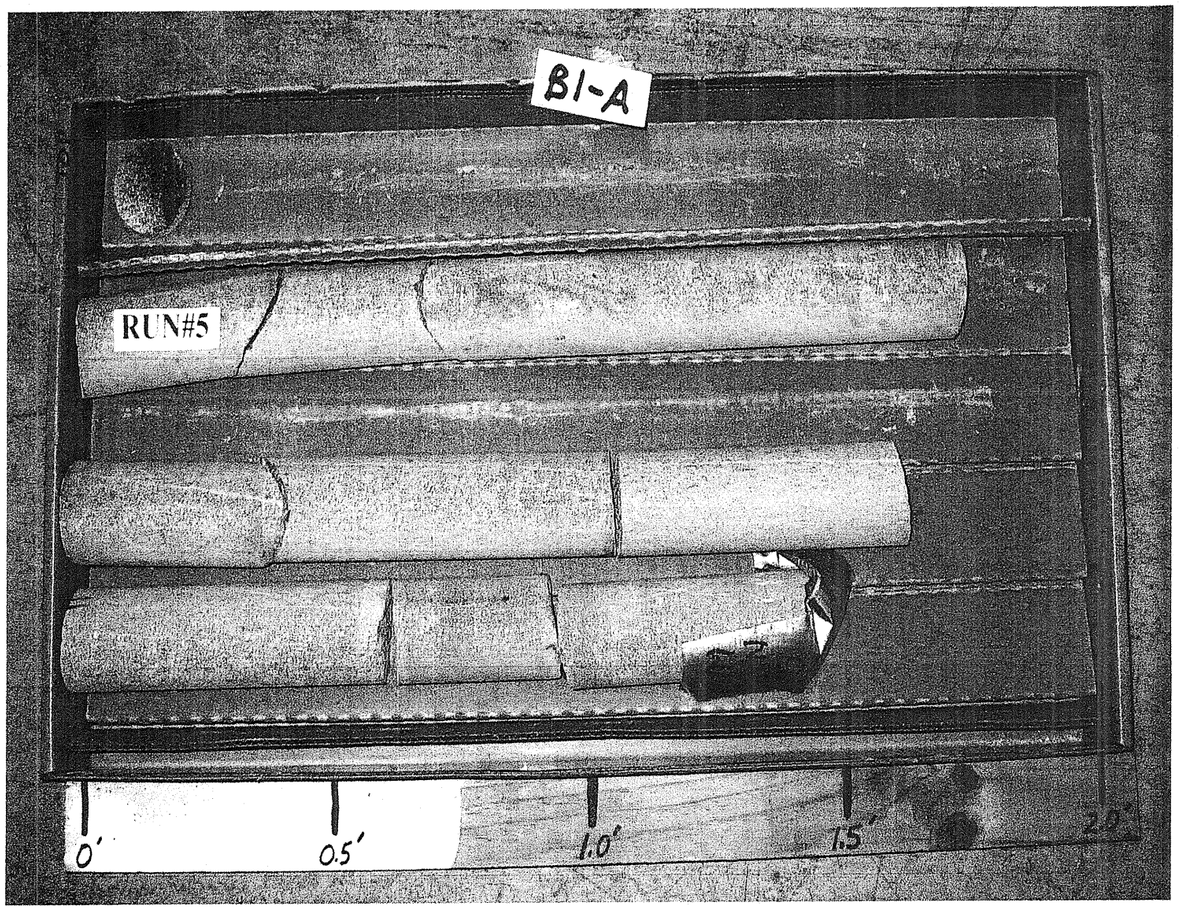
B1-A (RUNS 1 THROUGH 4)





38525.1.1 (B-4753)
GASTON COUNTY
BRIDGE NO. 15 OVER DUHART'S CREEK ON SR 2439

B1-A (RUN 5) & B1-B (RUNS 1, 2, & 3)



38525.1.1 (B-4753)
GASTON COUNTY
BRIDGE NO. 15 OVER DUHART'S CREEK ON SR 2439

B1-B (RUN 3 CONT & RUN 4)