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### STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION **DIVISION OF HIGHWAYS** GEOTECHNICAL ENGINEERING UNIT

## **STRUCTURE** SUBSURFACE INVESTIGATION

COUNTY ROCKINGHAM

PROJECT DESCRIPTION BRIDGE NO. 169 OVER CASCADE CREEK ON NC 770 (BERRY HILL RD.) STATE PROJECT REFERENCE NO. B-5343

### **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 (199) 707-6805. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA ARE NOT PART OF THE CONTRACT.

CENERAL 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 LABDRATORY SAMPLE DATA AND THE IN SITU (MIN-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 MICHIGANT OF THE INVESTIGATION. THE SUBSURFACE INVESTIGATION THE TUBERATURE DEPORTATION AND WANDAYS WELL AS OTHER MONCH HAVING CACTORS NCLUDING 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 DIES 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 THE DEPARTMENT AS TO THE TYPE THE SUBSURFACE INVESTIGATIONS AS HE DEEMS NECESSARY TO SATISTY HIMSELF AS TO CONDITIONS TO BE ENCOUNTERED ON THE PROJECT. THE CONTRACTOR IS ALL HAVE NO CLAIM FOR ADDITIONS TO BE ENCOUNTERED ON THE PROJECT. THE CONTRACTOR SHALL HAVE NO CLAIM FOR ADDITIONS TO BE ENCOUNTERED ON THE PROJECT. THE CONTRACTOR SHALL HAVE NO CLAIM FOR ADDITIONS TO BE ENCOUNTERED AT THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

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

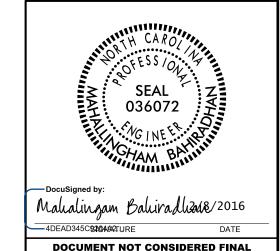
M. BAHIRADHAN C. BUTLER J. WHITT TRIGON EXP. INVESTIGATED BY \_M. BAHIRADHAN

PERSONNEL

DRAWN BY <u>C.</u> BUTLER CHECKED BY M. BAHIRADHAN

SUBMITTED BY SCHNABEL ENG.

DATE \_\_DECEMBER 2015



**UNLESS ALL SIGNATURES COMPLETED** 

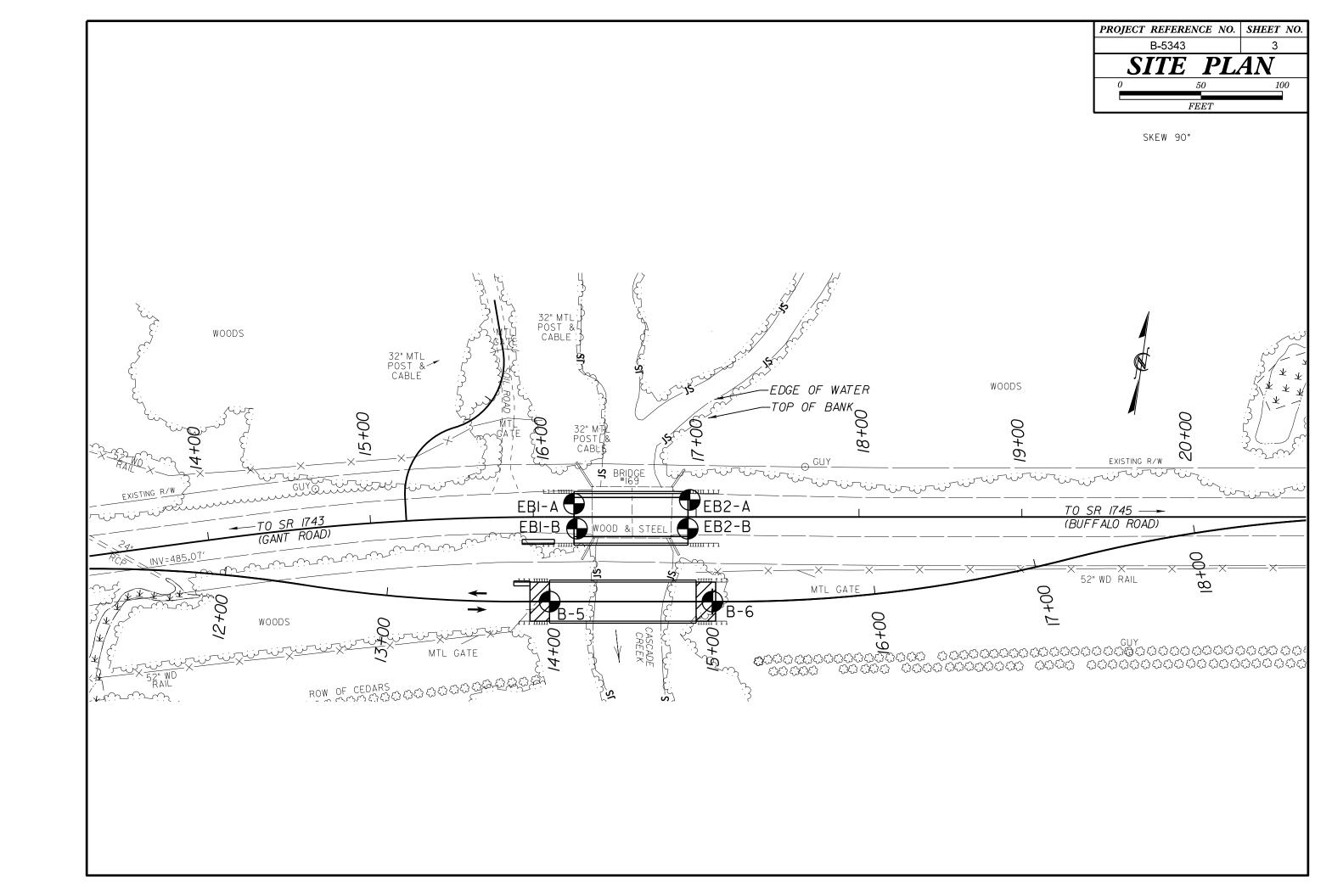
PROJECT REPERENCE NO. SHEET NO. 2

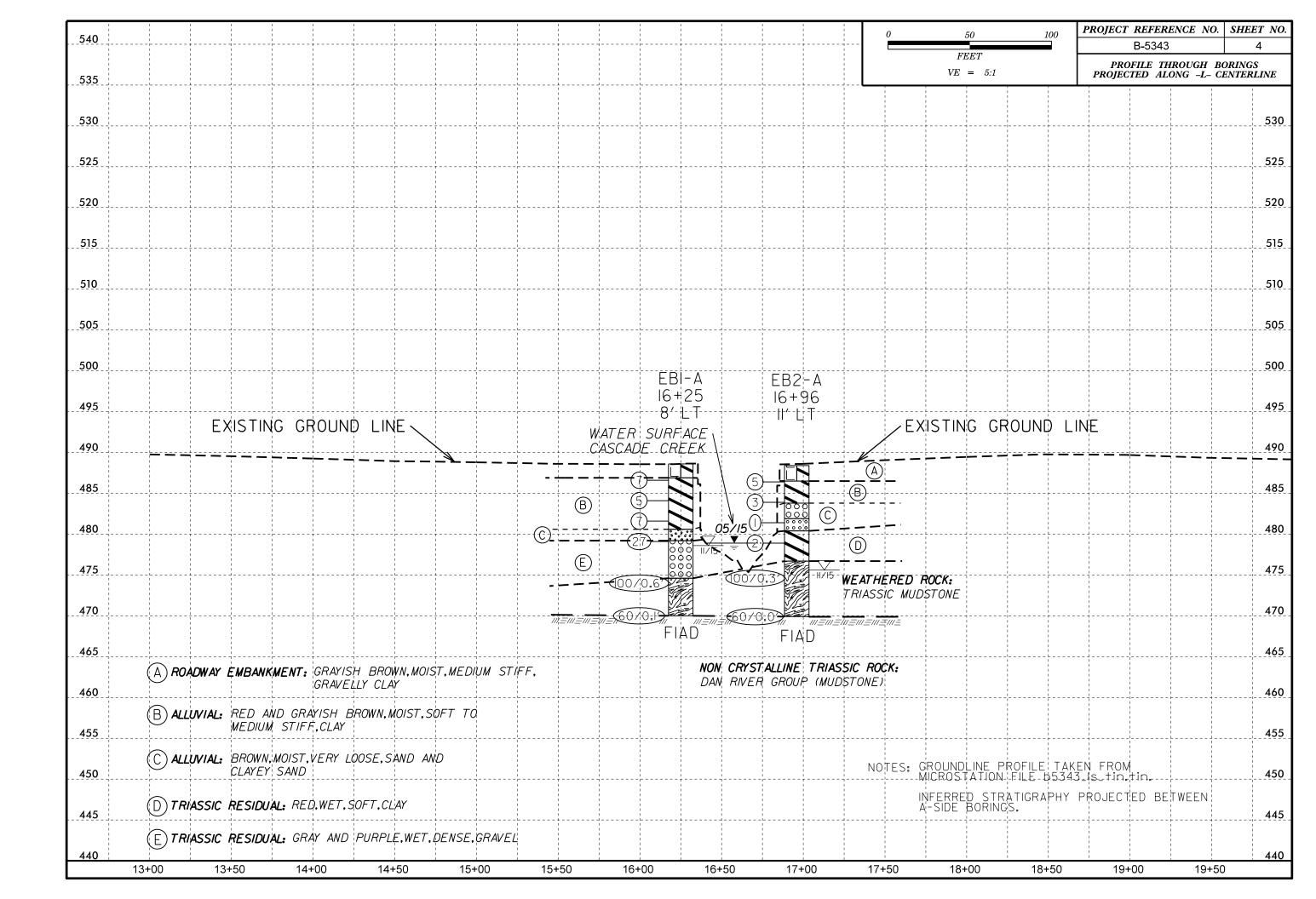
# NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS GEOTECHNICAL ENGINEERING UNIT

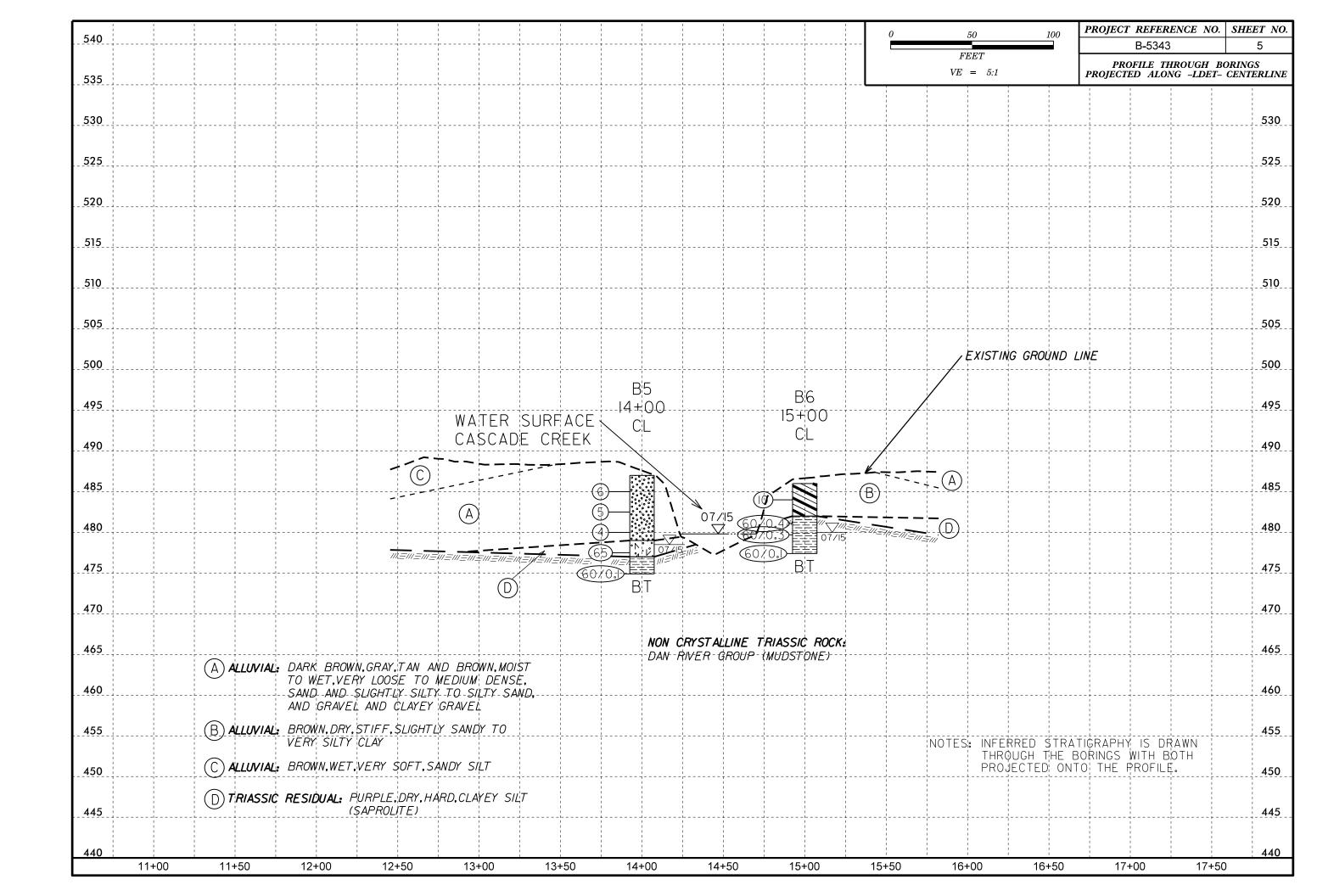
# SUBSURFACE INVESTIGATION

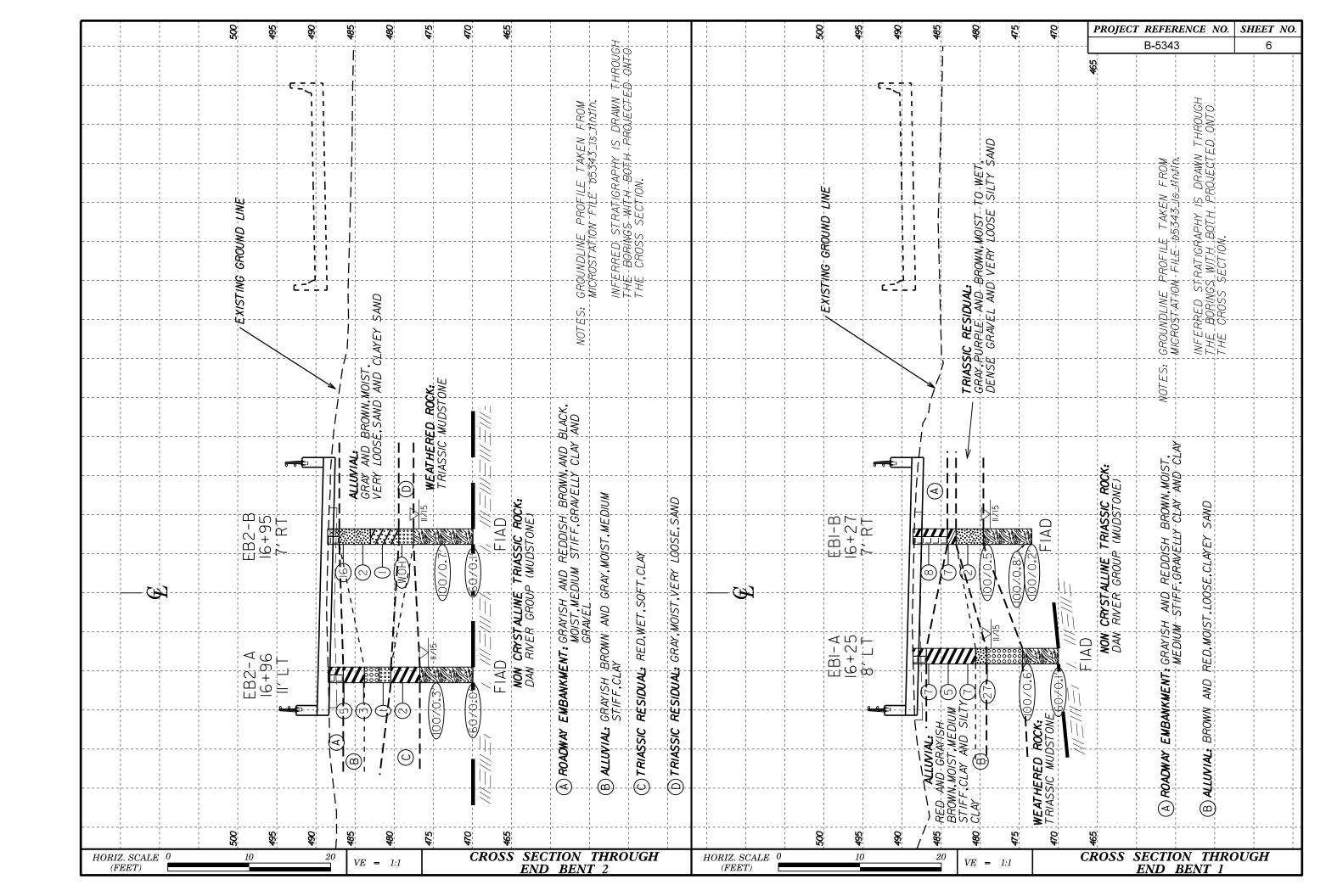
SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION	GRADATION	ROCK DESCRIPTION  HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED, AN INFERRED	TERMS AND DEFINITIONS	
SOIL IS CONSIDERED 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	WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE, UNIFORMLY GRADED - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE.	ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL.	ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.	
ACCORDING TO THE STANDARD PENETRATION TEST (AASHTO T 206, ASTM D1586), SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING:	GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.	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	AQUIFER - A WATER BEARING FORMATION OR STRATA.	
CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH	ANGULARITY OF GRAINS	REPRESENTED BY A ZONE OF WEATHERED ROCK.	ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.	
AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE, VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6	THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS:	ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:	ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, SUCH AS SHALE, SLATE, ETC.	
SOIL LEGEND AND AASHTO CLASSIFICATION	ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.	WEATHERED NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > ROCK (WR) 100 BLOWS PER FOOT IF TESTED.	ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT	
GENERAL GRANULAR MATERIALS SILT-CLAY MATERIALS ORGANIC MATERIALS	MINERALOGICAL COMPOSITION	CRYSTALLINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT	WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND	
LLASS. (5.30% PASSING "2000) (>.30% PASSING "2000)	MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC.  ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.	ROCK (CR) WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.	SURFACE.	
CROUP A-1 A-3 A-2 A-4 A-5 A-6 A-7 A-1, A-2 A-4, A-5 CLASS. A-1-a A-1-b A-2-4 A-2-5 A-2-6 A-2-7 A-3 A-6, A-7	COMPRESSIBILITY	FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN	CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.	
000000000000000000000000000000000000000	SLIGHTLY COMPRESSIBLE LL < 31	ROCK (NCR)  SEDIMENTARY ROCK THAT WOULD YEILD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.	COLLUYIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.	
SYMBOL 0000000000	MODERATELY COMPRESSIBLE LL = 31 - 50 HIGHLY COMPRESSIBLE LL > 50	COASTAL PLAIN COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SEDIMENTARY ROCK SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED	CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED	
7. PASSING   GRANULAR SILT- MUCK,	PERCENTAGE OF MATERIAL	(CP) SHELL BEDS, ETC.	BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.	
■ 40 30 MX 50 MX 51 MN SOILS COILS PEAT		WEATHERING	DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.	
*200   15 MX   25 MX   10 MX   35 MX   35 MX   35 MX   35 MX   36 MN   36 MN   36 MN   36 MN	ORGANIC MATERIAL SOILS SOILS OTHER MATERIAL	FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER	DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE	
MATERIAL PASSING *40	TRACE OF ORGANIC MATTER 2 - 3%, 3 - 5%, TRACE 1 - 10%, LITTLE ORGANIC MATTER 3 - 5%, 5 - 12%, LITTLE 10 - 20%	HAMMER IF CRYSTALLINE.	HORIZONTAL.	
LL - 40 MX 41 MN 40 MX 41 MN 40 MX 41 MN 40 MX 41 MN 501L5 WITH	MODERATELY ORGANIC 5 - 10% 12 - 20% SOME 20 - 35%	VERY SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, (V SLI.) CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF	DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE	
PI 6 MX NP IW MX II MN II MN II MN II MN II MN II MN MODERATE	HIGHLY ORGANIC > 10% > 20% HIGHLY 35% AND ABOVE	OF A CRYSTALLINE NATURE.	LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.	
GROUP INDEX 0 0 0 4 MX 8 MX 12 MX 16 MX NO MX AMOUNTS OF SOILS	GROUND WATER	SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO	FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.	
OF MAIOR CRAYEL AND FINE SILTY OR CLAYEY SILTY CLAYEY MATTER	▼ WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING	(SLI.) 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.	FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.	
MATERIALS SAND SAND GRAVEL AND SAND SOILS SOILS	▼ STATIC WATER LEVEL AFTER 24 HOURS	MODERATE SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN	FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM	
GEN.RATING EXCELLENT TO GOOD FAIR TO POOR POOR UNSUITABLE		(MOD.) 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	PARENT MATERIAL.	
AS SUBBRADE POUR	O-MG SPRING OR SEEP	WITH FRESH ROCK.	FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.	
PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ;PI OF A-7-6 SUBGROUP IS > LL - 30	<u> </u>	MODERATELY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL	FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.	
CONSISTENCY OR DENSENESS	MISCELLANEOUS SYMBOLS	SEVERE AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH (MOD. SEV.) AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES 'CLUNK' SOUND WHEN STRUCK.	JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.	
PRIMARY SOIL TYPE COMPACTNESS OR COM	ROADWAY EMBANKMENT (RE) 25/025 DIP & DIP DIRECTION	IF TESTED, WOULD YIELD SPT REFUSAL	LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO	
CUNSISTENCY (N-VALUE) (TONS/FT <sup>2</sup> )	₩ITH SOIL DESCRIPTION → OF ROCK STRUCTURES	SEVERE ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED, ROCK FABRIC CLEAR AND EVIDENT BUT	ITS LATERAL EXTENT.	
GENERALLY VERY LOOSE < 4  CONTROL LOOSE	SOIL SYMBOL  SOIL SYMBOL  SUPPLIMIT TEST BORING  SLOPE INDICATOR INSTALLATION	(SEV.) REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN.	LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.	
MATERIAI MEDIUM DENSE 10 TO 30 N/A	I M	IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF	MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.	
DENSE   30 TO 50	ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT AUGER BORING  COME PENETROMETER TEST	VERY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE SEVERE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK	PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE	
VERY SOFT < 2 < 0.25	INFERRED SOIL BOUNDARY CORE BORING SOUNDING ROD	(V SEV.) REMAINING SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR	OF AN INTERVENING IMPERVIOUS STRATUM.	
GENERALLY SOFT 2 TO 4 0.25 TO 0.5	MW - TECT BODING	VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. <u>IF TESTED, WOULD YIELD SPT N VALUES &lt; 100 BPF</u>	RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.	
SILT-CLAY         MEDIUM STIFF         4 TO 8         0.5 TO 1.0           MATERIAL         STIFF         8 TO 15         1 TO 2	MONITORING WELL WITH CORE	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	ROCK QUALITY DESIGNATION (ROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF	
(COHESIVE) VERY STIFF 15 TO 30 2 TO 4	TTTTT ALLUVIAL SOIL BOUNDARY A PIEZOMETER INSTALLATION - SPT N-VALUE	ALSO AN EXAMPLE.	ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.	
HARD > 30 > 4	INSTRUCTION	ROCK HARDNESS	SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT	
TEXTURE OR GRAIN SIZE	RECOMMENDATION SYMBOLS	VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES	ROCK.	
U.S. STD. SIEVE SIZE 4 10 40 60 200 270	UNDERCUT UNCLASSIFIED EXCAVATION - UNCLASSIF	SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.	SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND	
OPENING (MM) 4.76 2.00 0.42 0.25 0.075 0.053	HEED IN THE TOP 2 EEET OF	HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.	RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.	
BOULDER COBBLE GRAVEL SAND SAND (CL.)	SHALLOW UNDERCUT UNCLASSIFIED EXCAVATION - BACKFILL  GRADABLE DEGRADABLE ROCK  SHBANKMENT OR BACKFILL	MODERATELY CAN BE SCRATCHED BY KNIFE OR PICK, GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE	SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT	
(BLDR.) (COB.) (GR.) (CSE. SD.) (F SD.) (SL.) (CL.)	ABBREVIATIONS	HARD EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED	OR SLIP PLANE.	
GRAIN MM 305 75 2.0 0.25 0.05 0.005	AR - AUGER REFUSAL MED MEDIUM VST - VANE SHEAR TEST	BY MODERATE BLOWS.	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	
SIZE IN. 12 3	BT - BORING TERMINATED MICA MICACEOUS WEA WEATHERED CL CLAY MOD MODERATELY 7 - UNIT WEIGHT	MEDIUM CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT.  HARD CAN BE EXCAVATED IN SMALL CHIPS TO PEICES I INCH MAXIMUM SIZE BY HARD BLOWS OF THE	WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL	
SOIL MOISTURE - CORRELATION OF TERMS	Let $\gamma_{ m d}$ cpt - cone penetration test - NP - NON PLASTIC - $\gamma_{ m d}$ - DRY UNIT WEIGHT	POINT OF A GEOLOGIST'S PICK.	TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.	
SOIL MOISTURE SCALE FIELD MOISTURE GUIDE FOR FIELD MOISTURE DESCRIPTION  GUIDE FOR FIELD MOISTURE DESCRIPTION	CSE COARSE ORG ORGANIC  DMT - DILATOMETER TEST PMT - PRESSUREMETER TEST SAMPLE ABBREVIATIONS	SOFT CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS	STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.	
	DPT - DYNAMIC PENETRATION TEST SAP SAPROLITIC S - BULK	FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.	STRATA ROCK QUALITY DESIGNATION (SROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL	
- SATURATED - USUALLY LIQUID; VERY WET, USUALLY (SAT.) FROM BELOW THE GROUND WATER TABLE	e - VOID RATIO   SD SAND, SANDY   SS - SPLIT SPOON   F - FINE   SL SILT, SILTY   ST - SHELBY TUBE	VERY CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH	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.	
LL _ LIOUID LIMIT	FOSS FOSSILIFEROUS SLI SLIGHTLY RS - ROCK	SOFT OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE, CAN BE SCRATCHED READILY BY FINGERNAIL.	TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.	
PLASTIC   SEMISOLID: REQUIRES DRYING TO   SEMISOLID: REQUIRES	FRAC FRACTURED, FRACTURES TO TRICONE REFUSAL RT - RECOMPACTED TRIAXIAL FRAGS FRAGMENTS W - MOISTURE CONTENT CBR - CALIFORNIA BEARING	FRACTURE SPACING BEDDING		
(PI) PL PLASTIC LIMITATTAIN OPTIMUM MOISTURE	FRAGS FRAGMENTS	TERM SPACING BEDDING  TERM SPACING TERM THICKNESS	BORING LOCATIONS WERE SURVEYED USING THE BENCH MARK:	
	EQUIPMENT USED ON SUBJECT PROJECT	VERY WIDE MORE THAN 10 FEET VERY THICKLY BEDDED 4 FEET	BL-3 ELEV. 487.78 FT.	
	DRILL UNITS: ADVANCING TOOLS: HAMMER TYPE:	WIDE 3 TO 10 FEET THICKLY BEDDED 1.5 - 4 FEET MODERATELY CLOSE 1 TO 3 FEET THINLY BEDDED 0.16 - 1.5 FEET		
OM _ OPTIMUM MOISTURE - MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE			NOTES:	
OM OFTIMUM MOISTURE SL SHRINKAGE LIMIT	CME-45C CLAY BITS X AUTOMATIC MANUAL	CLOSE 0.16 TO 1 FOOT VERY THINLY BEDDED 0.03 - 0.16 FEET		
SL SHRINKAGE LIMIT REQUIRES ADDITIONAL WATER TO	CME-45C CLAY BITS X AUTOMATIC MANUAL	VERY CLOSE LESS THAN 0.16 FEET THICKLY LAMINATED 0.008 - 0.03 FEET	FIAD = FILLED IN AFTER DRILLING	
SHRINKAGE LIMIT  - DRY - (D)  REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE	CME-45C CLAY BITS X AUTOMATIC MANUAL  CORE SIZE:	VERY CLOSE LESS THAN 0.16 FEET THICKLY LAMINATED 0.008 - 0.03 FEET THINLY LAMINATED < 0.008 FEET	FIAD = FILLED IN AFTER DRILLING	
SHRINKAGE LIMIT  - DRY - (D)  REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE  PLASTICITY	CME-45C         ☐ CLAY BITS         ☐ MANUAL           X         CME-55         ☐ 6° CONTINUOUS FLIGHT AUGER         CORE SIZE:           B° HOLLOW AUGERS         ☐ -B         ☐ -H	VERY CLOSE LESS THAN 0.16 FEET THICKLY LAMINATED 0.008 - 0.03 FEET THINLY LAMINATED < 0.008 FEET INDURATION	FIAD = FILLED IN AFTER DRILLING	
SHINKAGE LIMIT  - DRY - (D)  REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE  PLASTICITY  PLASTICITY INDEX (PI)  DRY STRENGTH	CME-45C       CLAY BITS       X AUTOMATIC       MANUAL         X CME-55       6* CONTINUOUS FLIGHT AUGER       CORE SIZE:       -B	VERY CLOSE LESS THAN 0.16 FEET THICKLY LAMINATED 0.008 - 0.03 FEET THINLY LAMINATED C 0.008 - 0.03 FEET THINLY LAMINATED C 0.008 FEET T	FIAD = FILLED IN AFTER DRILLING	
DPTIMM MUSTURE   SHRINKAGE LIMIT   - DRY - (D)   REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE	CME-45C       CLAY BITS       X AUTOMATIC       MANUAL         X CME-55       6' CONTINUOUS FLIGHT AUGER       CORE SIZE:       -B       -H         CME-55Ø       HARD FACED FINGER BITS       -N       -N       -N         VANE SHEAR TEST       TUNG,-CARBIDE INSERTS       HAND TOOLS•	VERY CLOSE LESS THAN 0.16 FEET THICKLY LAMINATED 0.008 - 0.03 FEET THINLY LAMINATED < 0.008 FEET   INDURATION  FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.	FIAD = FILLED IN AFTER DRILLING	
OF THIMM MOISTURE SL SHRINKAGE LIMIT  - DRY - (D)  REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE  PLASTICITY  NON PLASTIC  SLIGHTLY PLASTIC  MODERATELY PLASTIC  16-25  MEDIUM	CME-45C CLAY BITS X AUTOMATIC MANUAL  CME-55 B' HOLLOW AUGERS CORE SIZE:  CME-550 HARD FACED FINGER BITS  VANE SHEAR TEST X CASING W/ ADVANCER  CME-45C X AUTOMATIC MANUAL  CORE SIZE:	VERY CLOSE  LESS THAN 0.16 FEET THICKLY LAMINATED C 0.008 - 0.03 FEET THINLY LAMINATED C 0.008 FEET  INDURATION  FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC. RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.  MODERATELY INDURATED  GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE;	FIAD = FILLED IN AFTER DRILLING	
DEFINITION MOISTURE SL SHRINKAGE LIMIT  - DRY - (D)  REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE  - DRY - (D)  REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE  - DRY - (D)  REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE  - DRY - (D)  REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE  - DRY - (D)  REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE  - DRY - (D)  REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE  - DRY - (D)  REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE  - DRY - (D)  REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE  - DRY - (D)  REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE  - DRY - (D)  REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE  - DRY - (D)  REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE  - DRY - (D)  - DRY - (D)  REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE  - DRY - (D)  - DRY - (D)  - DRY - (D)  - DRY STRENGTH  - DRY - (D)  - DRY STRENGTH  -	CME-45C CLAY BITS X AUTOMATIC MANUAL  X CME-55 B'HOLLOW AUGERS CME-550 HARD FACED FINGER BITS TUNG,-CARBIDE INSERTS VANE SHEAR TEST X CASING WAS ADVANCER  CME-45C X AUTOMATIC MANUAL  CORE SIZE:  -B -HNN HAND TOOLS:	VERY CLOSE  LESS THAN 0.16 FEET THICKLY LAMINATED C 0.008 - 0.03 FEET THINLY LAMINATED C 0.008 FEET  INDURATION  FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC. 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.	FIAD = FILLED IN AFTER DRILLING	
OPTIMUM MOISTURE SL SHRINKAGE LIMIT  - DRY - (D)  REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE  - DRY - (D)  REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE  - PLASTICITY  NON PLASTIC  SLIGHTLY PLASTIC  MODERATELY PLASTIC  16-25  MEDIUM	CME-45C CLAY BITS X AUTOMATIC MANUAL  X CME-55 B'HOLLOW AUGERS CME-550 HARD FACED FINGER BITS TUNGCARBIDE INSERTS  YANE SHEAR TEST X CASING W/ ADVANCER  POSTABLE HOLE X TEICHER  TEICHER 2 93 STEEL TEETH	VERY CLOSE  LESS THAN 0.16 FEET  THICKLY LAMINATED 0.008 - 0.03 FEET THINLY LAMINATED C 0.008 FEET  INDURATION  FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.  RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISTINTEGRATES 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;	FIAD = FILLED IN AFTER DRILLING	
OPTIMUM MOISTURE  SHRINKAGE LIMIT  - DRY - (D)  REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE  PLASTICITY  NON PLASTIC  SLIGHTLY PLASTIC  G-15  SLIGHTLY PLASTIC  HIGHLY PLASTIC  26 OR MORE  DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY).	CME-45C  CLAY BITS  G*CONTINUOUS FLIGHT AUGER  B*HOLLOW AUGERS  CME-550  HARD FACED FINGER BITS  TUNGCARBIDE INSERTS  VANE SHEAR TEST  PORTABLE HOIST  CLAY BITS  MANUAL  CORE SIZE:  B-B -H  N-N  HAND TOOLS:  POST HOLE DIGGER  HAND TOOLS:  POST HOLE DIGGER  HAND AUGER	VERY CLOSE  LESS THAN 0.16 FEET  THICKLY LAMINATED 0.008 - 0.03 FEET THINLY LAMINATED C.0.008 FEET  INDURATION  FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.  FRIABLE  RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISTINTEGRATES 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.	FIAD = FILLED IN AFTER DRILLING	
SHRINKAGE LIMIT  - DRY - (D)  REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE  - DRY - (D)  REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE  - DRY - (D)  REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE  - DRY - (D)  REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE  - DRY - (D)  REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE  - DRY - (D)  REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE  - DRY - (D)  REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE  - DRY - (D)  REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE  - DRY - (D)  REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE  - DRY - (D)  REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE  - DRY - (D)  REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE  - DRY - (D)  REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE  - DRY - (D)  REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE  - DRY - (D)  REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE  - DRY - (D)  REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE  - DRY - (D)  REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE  - DRY - (D)  REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE  - DRY - (D)  REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE  - DRY - (D)  REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE  - DRY - (D)  REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE  - DRY - (D)  REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE  - DRY - (D)  REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE  - DRY - (D)  REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE  - DRY - (D)  REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE  - DRY - (D)  REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE  - DRY - (D)  REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE  - DRY - (D)  REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE  - DRY - (D)  REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE  - DRY - (D)  REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE  - DRY - (D)  REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE  - DRY - (D)  REQUIR	CME-45C  CLAY BITS  G*CONTINUOUS FLIGHT AUGER  B*HOLLOW AUGERS  CME-550  HARD FACED FINGER BITS  TUNGCARBIDE INSERTS  VANE SHEAR TEST  PORTABLE HOIST  TRICONE  TRICONE  TRICONE  TRICONE  AUTOMATIC  MANUAL  CORE SIZE:  B H-H  N HAD TOOLS:  POST HOLE DIGGER HAND TOOLS:  POST HOLE DIGGER HAND AUGER SOUNDING ROD	VERY CLOSE  LESS THAN 0.16 FEET  THICKLY LAMINATED 0.008 - 0.03 FEET THINLY LAMINATED C 0.008 FEET  INDURATION  FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.  RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISTINTEGRATES 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;	FIAD = FILLED IN AFTER DRILLING  DATE: 8-15-14	





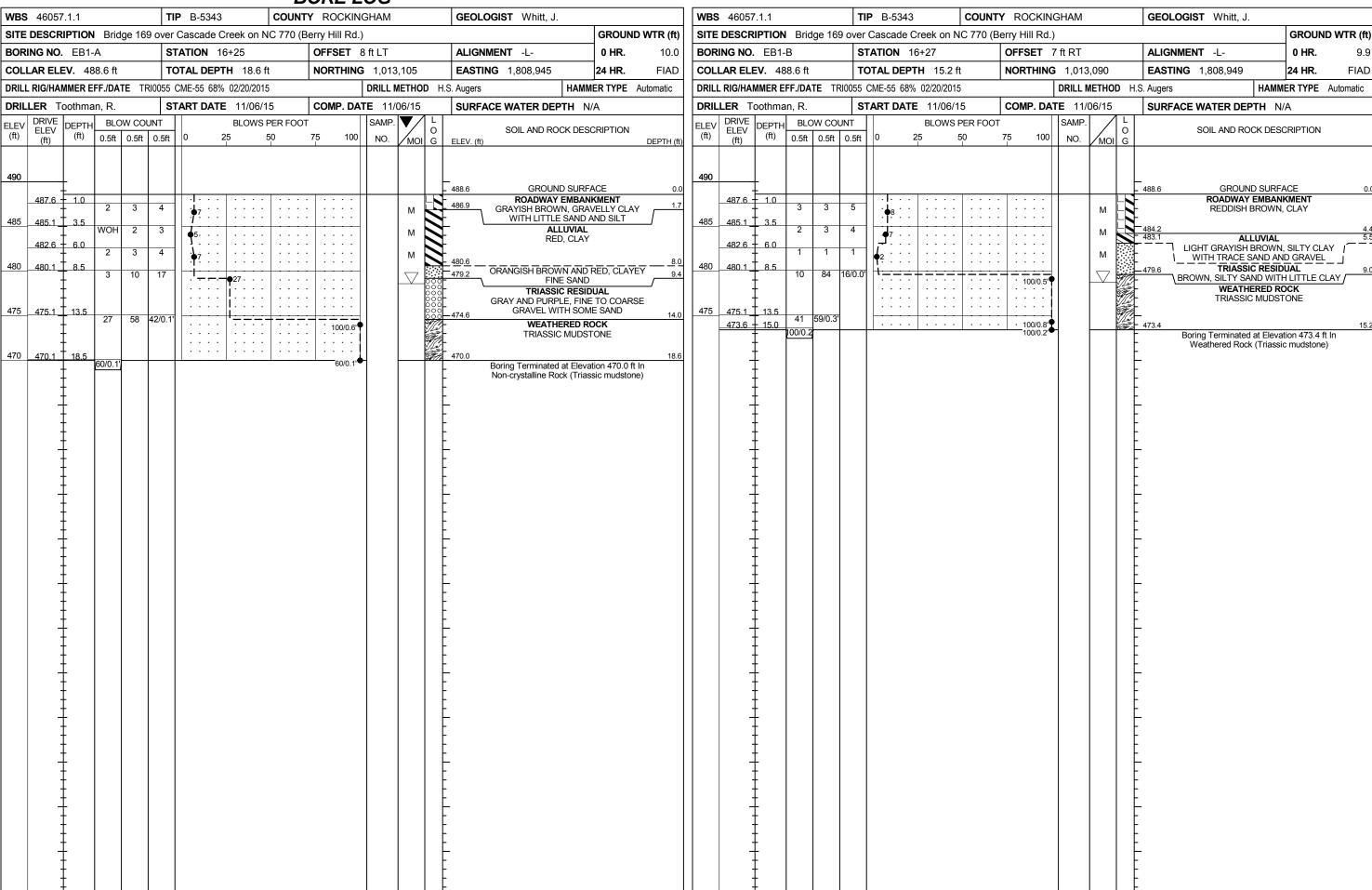




### GEOTECHNICAL BORING REPORT BORE LOG

BORE LOG									
<b>WBS</b> 42263		TY ROCKINGHAM	GEOLOGIST R. Rivenbark		<b>WBS</b> 42263		NTY ROCKINGHAM	GEOLOGIST R. Rivenbark	
SITE DESCRIPTION Bridge No.	169 on NC 770 over Cascade Cree			GROUND WTR (ft)	SITE DESCRIPTION Bridge No.	169 on NC 770 over Cascade Cre		GF	ROUND WTR (ft)
BORING NO. B5	STATION 14+00	OFFSET CL	ALIGNMENT -LDET-	<b>0 HR.</b> 8.5	BORING NO. B6	STATION 15+00	OFFSET CL	ALIGNMENT -LDET- 0	<b>HR.</b> 6.0
COLLAR ELEV. 487.0 ft	TOTAL DEPTH 12.1 ft	NORTHING 1,013,044	<b>EASTING</b> 1,808,938	24 HR. FIAD	COLLAR ELEV. 486.0 ft	TOTAL DEPTH 8.6 ft	NORTHING 1,013,057	<b>EASTING</b> 1,809,037 <b>24</b>	<b>HR.</b> FIAD
DRILL RIG/HAMMER EFF./DATE TRI8	016 MOBILE B-57 90% 02/20/2015	DRILL METHOD	H.S. Augers HAM	IMER TYPE Automatic	DRILL RIG/HAMMER EFF./DATE TRI8	8016 MOBILE B-57 90% 02/20/2015	DRILL METHOD	H.S. Augers HAMMER 1	TYPE Automatic
DRILLER R. Toothman	<b>START DATE</b> 07/06/15	COMP. DATE 07/06/15	SURFACE WATER DEPTH	N/A	DRILLER R. Toothman	<b>START DATE</b> 07/06/15	COMP. DATE 07/06/15	SURFACE WATER DEPTH N/A	
BORING NO. B5  COLLAR ELEV. 487.0 ft  DRILL RIG/HAMMER EFF./DATE TRI8	STATION 14+00   TOTAL DEPTH 12.1 ft	OFFSET CL  NORTHING 1,013,044    DRILL METHOD	SURFACE WATER DEPTH N  SOIL AND ROCK DE ELEV. (ft)  487.0 GROUND SUR ALLUVIA BROWN, SILTY MED GRAINED SA	24 HR. FIAD  IMER TYPE Automatic  N/A  ESCRIPTION  DEPTH (ft)  RFACE 0.0  AL  IUM TO FINE AND  AND  AND  10.0  PROLITE) INE ROCK (MUDSTONE) Ivith Standard at Elevation 474.9	DRILL RIG/HAMMER EFF./DATE TRI8   DRILLER R. Toothman	8016 MOBILE B-57 90% 02/20/2015  START DATE 07/06/15  UNT BLOWS PER FO	DRILL METHOD   COMP. DATE   07/06/15   OT   SAMP.   MOI   O	# EASTING 1,809,037 24  H.S. Augers HAMMER 1  SURFACE WATER DEPTH N/A  SOIL AND ROCK DESCRI	HR. FIAD TYPE Automatic  PTION  E. 8.9 ELAY 4.0  OCK STONE)  8.6 andard ration 477.4
NCDOT BORE DOUBLE B5343_GEO_BRDG0169,GPJ NC_DOT.GDT									

### GEOTECHNICAL BORING REPORT BORE LOG



### GEOTECHNICAL BORING REPORT BORE LOG

