

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

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-2710	1	9
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
34499.1.1	STP - 194(4)	P.E.	
34499.2.2	STP - 194(4)	RW	
34499.3.STI	STM - 194(13)	CONST.	

CONTENTS

ROADWAY SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 34499.1.1 R-2710 F.A. PROJ. STP-194(4)
 COUNTY WATAUGA
 PROJECT DESCRIPTION NC 194 FROM BANNER ELK IN AVERY COUNTY TO VALLE CRUCIS IN WATAUGA COUNTY

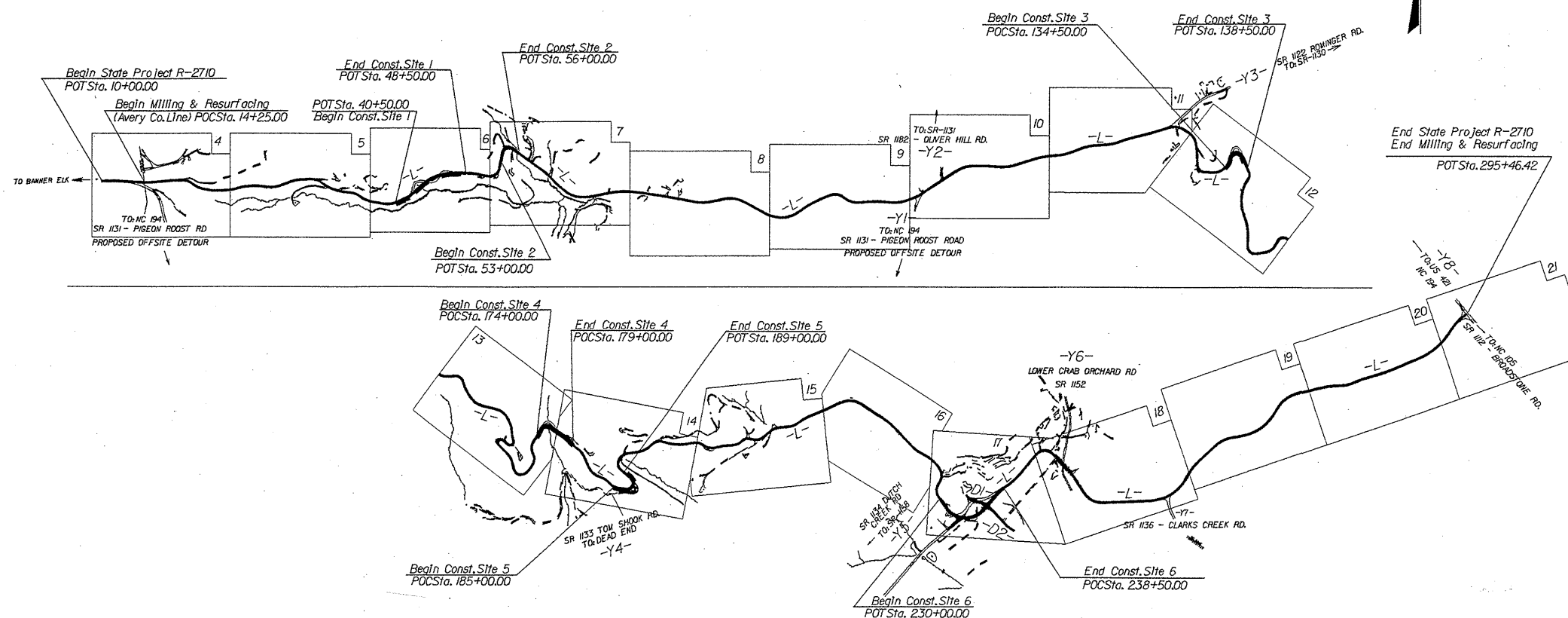
CAUTION NOTICE

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 1919 250-4088. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA ARE PART OF THE CONTRACT.

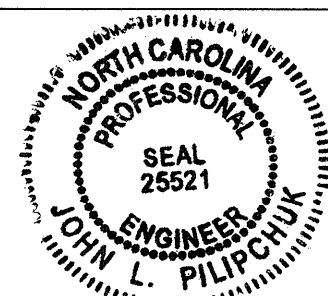
GENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND 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.

INVENTORY



INVESTIGATED BY J.C. KUHNE
 CHECKED BY W.D. FRYE
 SUBMITTED BY W.D. FRYE
 DATE OCTOBER 24, 2007



NOTE - THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N.C. DEPARTMENT OF TRANSPORTATION AS BEING ACCURATE NOR IS IT 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.

CONTRACT: C202339 ID: R-2710

EARTHWORK BALANCE SHEET

PROJECT: R-2710

COUNTY: Watauga

Volumes in Cubic Yards

DATE: 7/14/2010

COMPILED BY: PJS

SHEET 1 OF 1 SHEETS

STATION	STATION	EXCAVATION					EMBANKMENT				BORROW	WASTE			
		TOTAL UNCLASS.	ROCK	UNDERCUT	UNSUIT. UNCLASS.	SUITABLE UNCLASS.	TOTAL	ROCK	EARTH	EMBANK. +15%		ROCK	SUITABLE	UNSUIT.	TOTAL
-L- 40+00	-L- 49+00	12,347				12,347	4,535		4,535	5,215			7,132		7,132
-L- 53+00	-L- 56+00	1,181				1,181	195		195	224			957		957
	SUBTOTAL	13,528				13,528	4,730		4,730	5,440			8,089		8,089
-L- 134+00	-L- 138+50	5,138				5,138	2,101		2,101	2,416			2,722		2,722
	SUBTOTAL	5,138				5,138	2,101		2,101	2,416			2,722		2,722
-L- 174+00	-L- 179+00	9,759				9,759	2,201		2,201	2,531			7,228		7,228
-L- 185+00	-L- 189+00	8,250				8,250	299		299	344			7,906		7,906
	SUBTOTAL	18,009				18,009	2,500		2,500	2,875			15,134		15,134
-L- 231+50	-L- 238+50	292				292	10,064		10,064	11,574	11,282				
-D1- 11+00	-D1- 12+00	67				67	284		284	327	260				
-D2- 10+50	-D2- 13+00						4,250		4,250	4,888	4,888				
-Y5- 10+50	-Y5- 10+75	5				5	49		49	56	51				
	SUBTOTAL	364				364	14,647		14,647	16,844	16,480				
TOTAL		37,039				37,039	23,978		23,978	27,575	16,480		25,944		25,944
MATERIAL FOR SHOULDER CONSTRUCTION LOSS DUE TO CLEARING & GRUBBING		-200				-200							-200		-200
ROCK WASTE TO REPLACE BORROW ADJUST FOR ROCK WASTE WASTE IN LIEU OF BORROW											-16,480		-16,480		-16,480
PROJECT TOTAL		36,839				36,839	23,978		23,978	27,575			9,264		9,264
EST. 5% TO REPLACE TOP SOIL ON BORROW PIT															
GRAND TOTAL		36,839				36,839	23,978		23,978	27,575			9,264		9,264
SAY		36,900								27,600			9,300		
SHALLOW UNDERCUT CONTINGENCY		200 CY													

NOTE: EARTHWORK QUANTITIES ARE CALCULATED BY THE DIVISION DESIGN UNIT. THESE EARTHWORK QUANTITIES ARE BASED IN PART ON SUBSURFACE DATA PROVIDED BY THE GEOTECHNICAL ENGINEERING UNIT.

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

PROJECT REFERENCE NO. R-2710	SHEET NO. 2
---------------------------------	----------------

SOIL DESCRIPTION				GRADATION				ROCK DESCRIPTION				TERMS AND DEFINITIONS																																																																																				
<p>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 (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: <i>VERY STIFF, GRAY, SILTY CLAY, MOST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6</i></p>				<p>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.</p> <p>THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.</p>				<p>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:</p> <p>WEATHERED ROCK (WR) CRYSTALLINE ROCK (CR) NON-CRYSTALLINE ROCK (NCR) COASTAL PLAIN SEDIMENTARY ROCK (CP)</p>				<p>ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER. ADJUFER - 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 DISLOGGED 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, MOTTLED 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 (ROD) - 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 IN 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 (SROD) - 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.</p>																																																																																				
<p>SOIL LEGEND AND AASHTO CLASSIFICATION</p> <table border="1"><thead><tr><th>GENERAL CLASS.</th><th>GRANULAR MATERIALS (<= 35% PASSING #200)</th><th>SILT-CLAY MATERIALS (> 35% PASSING #200)</th><th>ORGANIC MATERIALS</th></tr></thead><tbody><tr><td>GROUP CLASS.</td><td>A-1, A-1-b, A-3, A-2-4, A-2-5, A-2-7, A-4, A-5, A-6, A-7</td><td>A-1, A-2, A-3, A-4, A-5, A-6, A-7</td><td>A-1, A-2, A-3, A-4, A-5, A-6, A-7</td></tr><tr><td>SYMBOL</td><td>[Pattern]</td><td>[Pattern]</td><td>[Pattern]</td></tr><tr><td>% PASSING</td><td>10, 20, 40, 60, 75, 100</td><td>10, 20, 40, 60, 75, 100</td><td>10, 20, 40, 60, 75, 100</td></tr><tr><td>LIQUID LIMIT</td><td>6, 10, 15, 20, 25, 30, 40</td><td>10, 15, 20, 25, 30, 40</td><td>10, 15, 20, 25, 30, 40</td></tr><tr><td>PLASTIC INDEX</td><td>0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50</td><td>0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50</td><td>0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50</td></tr><tr><td>GROUP INDEX</td><td>0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50</td><td>0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50</td><td>0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50</td></tr><tr><td>USUAL TYPES OF MAJOR MATERIALS</td><td>STONE FRAGS, GRAVEL, SAND</td><td>FINE SAND, SILTY OR CLAYEY GRAVEL AND SAND</td><td>SILTY SOILS, CLAYEY SOILS</td></tr><tr><td>GEN. RATING AS A SUBGRADE</td><td>EXCELLENT TO GOOD</td><td>FAIR TO POOR</td><td>POOR, UNSUITABLE</td></tr></tbody></table>				GENERAL CLASS.	GRANULAR MATERIALS (<= 35% PASSING #200)	SILT-CLAY MATERIALS (> 35% PASSING #200)	ORGANIC MATERIALS	GROUP CLASS.	A-1, A-1-b, A-3, A-2-4, A-2-5, A-2-7, 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-2, A-3, A-4, A-5, A-6, A-7	SYMBOL	[Pattern]	[Pattern]	[Pattern]	% PASSING	10, 20, 40, 60, 75, 100	10, 20, 40, 60, 75, 100	10, 20, 40, 60, 75, 100	LIQUID LIMIT	6, 10, 15, 20, 25, 30, 40	10, 15, 20, 25, 30, 40	10, 15, 20, 25, 30, 40	PLASTIC INDEX	0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50	0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50	0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50	GROUP INDEX	0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50	0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50	0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50	USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS, GRAVEL, SAND	FINE SAND, SILTY OR CLAYEY GRAVEL AND SAND	SILTY SOILS, CLAYEY SOILS	GEN. RATING AS A SUBGRADE	EXCELLENT TO GOOD	FAIR TO POOR	POOR, UNSUITABLE	<p>MINERALOGICAL COMPOSITION</p> <p>MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.</p> <p>COMPRESSIBILITY</p> <table border="1"><thead><tr><th>ORGANIC MATERIAL</th><th>GRANULAR SOILS</th><th>SILT - CLAY SOILS</th><th>OTHER MATERIAL</th></tr></thead><tbody><tr><td>TRACE OF ORGANIC MATTER</td><td>2 - 3%</td><td>3 - 5%</td><td>TRACE</td></tr><tr><td>LITTLE ORGANIC MATTER</td><td>3 - 5%</td><td>5 - 12%</td><td>LITTLE</td></tr><tr><td>MODERATELY ORGANIC</td><td>5 - 10%</td><td>12 - 20%</td><td>SOME</td></tr><tr><td>HIGHLY ORGANIC</td><td>> 10%</td><td>> 20%</td><td>HIGHLY</td></tr></tbody></table>				ORGANIC MATERIAL	GRANULAR SOILS	SILT - CLAY SOILS	OTHER MATERIAL	TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%	TRACE	LITTLE ORGANIC MATTER	3 - 5%	5 - 12%	LITTLE	MODERATELY ORGANIC	5 - 10%	12 - 20%	SOME	HIGHLY ORGANIC	> 10%	> 20%	HIGHLY	<p>GROUND WATER</p> <p>WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING STATIC WATER LEVEL AFTER 24 HOURS PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA SPRING OR SEEP</p>				<p>MISCELLANEOUS SYMBOLS</p> <p>ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION SOIL SYMBOL ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT INFERRED SOIL BOUNDARY INFERRED ROCK LINE ALLUVIAL SOIL BOUNDARY DIP & DIP DIRECTION OF ROCK STRUCTURES</p> <p>SPT TEST BORING AUGER BORING CORE BORING MONITORING WELL PIEZOMETER INSTALLATION SLOPE INDICATOR INSTALLATION CONE PENETROMETER TEST SOUNDING ROD</p> <p>SPT N-VALUE SPT REFUSAL TEST W/ CORE BORING</p>																												
GENERAL CLASS.	GRANULAR MATERIALS (<= 35% PASSING #200)	SILT-CLAY MATERIALS (> 35% PASSING #200)	ORGANIC MATERIALS																																																																																													
GROUP CLASS.	A-1, A-1-b, A-3, A-2-4, A-2-5, A-2-7, 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-2, A-3, A-4, A-5, A-6, A-7																																																																																													
SYMBOL	[Pattern]	[Pattern]	[Pattern]																																																																																													
% PASSING	10, 20, 40, 60, 75, 100	10, 20, 40, 60, 75, 100	10, 20, 40, 60, 75, 100																																																																																													
LIQUID LIMIT	6, 10, 15, 20, 25, 30, 40	10, 15, 20, 25, 30, 40	10, 15, 20, 25, 30, 40																																																																																													
PLASTIC INDEX	0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50	0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50	0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50																																																																																													
GROUP INDEX	0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50	0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50	0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50																																																																																													
USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS, GRAVEL, SAND	FINE SAND, SILTY OR CLAYEY GRAVEL AND SAND	SILTY SOILS, CLAYEY SOILS																																																																																													
GEN. RATING AS A SUBGRADE	EXCELLENT TO GOOD	FAIR TO POOR	POOR, UNSUITABLE																																																																																													
ORGANIC MATERIAL	GRANULAR SOILS	SILT - CLAY SOILS	OTHER MATERIAL																																																																																													
TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%	TRACE																																																																																													
LITTLE ORGANIC MATTER	3 - 5%	5 - 12%	LITTLE																																																																																													
MODERATELY ORGANIC	5 - 10%	12 - 20%	SOME																																																																																													
HIGHLY ORGANIC	> 10%	> 20%	HIGHLY																																																																																													
<p>CONSISTENCY OR DENSENESS</p> <table border="1"><thead><tr><th>PRIMARY SOIL TYPE</th><th>COMPACTNESS OR CONSISTENCY</th><th>RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE)</th><th>RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT²)</th></tr></thead><tbody><tr><td>GENERALLY GRANULAR MATERIAL (NON-COHESIVE)</td><td>VERY LOOSE, LOOSE, MEDIUM DENSE, DENSE, VERY DENSE</td><td>< 4, 4 TO 10, 10 TO 30, 30 TO 50, > 50</td><td>N/A</td></tr><tr><td>GENERALLY SILT-CLAY MATERIAL (COHESIVE)</td><td>VERY SOFT, SOFT, MEDIUM STIFF, STIFF, VERY STIFF, HARD</td><td>< 2, 2 TO 4, 4 TO 8, 8 TO 15, 15 TO 30, > 30</td><td>< 0.25, 0.25 TO 0.50, 0.5 TO 1.0, 1 TO 2, 2 TO 4, > 4</td></tr></tbody></table>				PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT 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	< 0.25, 0.25 TO 0.50, 0.5 TO 1.0, 1 TO 2, 2 TO 4, > 4	<p>TEXTURE OR GRAIN SIZE</p> <table border="1"><thead><tr><th>U.S. STD. SIEVE SIZE OPENING (MM)</th><th>4</th><th>10</th><th>40</th><th>60</th><th>200</th><th>270</th></tr></thead><tbody><tr><td></td><td>4.76</td><td>2.00</td><td>0.42</td><td>0.25</td><td>0.075</td><td>0.053</td></tr></tbody></table> <table border="1"><thead><tr><th>BOULDER (BLDR)</th><th>COBBLE (COB)</th><th>GRAVEL (GR)</th><th>COARSE SAND (CSE, SD)</th><th>FINE SAND (F SD)</th><th>SILT (SL)</th><th>CLAY (CL)</th></tr></thead><tbody><tr><td>GRAIN MM</td><td>305</td><td>75</td><td>2.0</td><td>0.25</td><td>0.05</td><td>0.005</td></tr><tr><td>SIZE IN.</td><td>12</td><td>3</td><td></td><td></td><td></td><td></td></tr></tbody></table>				U.S. STD. SIEVE SIZE OPENING (MM)	4	10	40	60	200	270		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 MM	305	75	2.0	0.25	0.05	0.005	SIZE IN.	12	3					<p>SOIL MOISTURE - CORRELATION OF TERMS</p> <table border="1"><thead><tr><th>SOIL MOISTURE SCALE (ATTERBERG LIMITS)</th><th>FIELD MOISTURE DESCRIPTION</th><th>GUIDE FOR FIELD MOISTURE DESCRIPTION</th></tr></thead><tbody><tr><td>LL - LIQUID LIMIT</td><td>- SATURATED - (SAT.)</td><td>USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE</td></tr><tr><td>PL - PLASTIC LIMIT</td><td>- WET - (W)</td><td>SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE</td></tr><tr><td>OM - OPTIMUM MOISTURE</td><td>- MOIST - (M)</td><td>SOLID; AT OR NEAR OPTIMUM MOISTURE</td></tr><tr><td>SL - SHRINKAGE LIMIT</td><td>- DRY - (D)</td><td>REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE</td></tr></tbody></table>				SOIL MOISTURE SCALE (ATTERBERG LIMITS)	FIELD MOISTURE DESCRIPTION	GUIDE FOR FIELD MOISTURE DESCRIPTION	LL - LIQUID LIMIT	- SATURATED - (SAT.)	USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE	PL - PLASTIC LIMIT	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE	OM - OPTIMUM MOISTURE	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE	SL - SHRINKAGE LIMIT	- DRY - (D)	REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE	<p>PLASTICITY</p> <table border="1"><thead><tr><th>NONPLASTIC</th><th>PLASTICITY INDEX (PI)</th><th>DRY STRENGTH</th></tr></thead><tbody><tr><td>LOW PLASTICITY</td><td>0-5</td><td>VERY LOW</td></tr><tr><td>MED. PLASTICITY</td><td>6-15</td><td>SLIGHT</td></tr><tr><td>HIGH PLASTICITY</td><td>16-25</td><td>MEDIUM</td></tr><tr><td></td><td>26 OR MORE</td><td>HIGH</td></tr></tbody></table>				NONPLASTIC	PLASTICITY INDEX (PI)	DRY STRENGTH	LOW PLASTICITY	0-5	VERY LOW	MED. PLASTICITY	6-15	SLIGHT	HIGH PLASTICITY	16-25	MEDIUM		26 OR MORE	HIGH	<p>COLOR</p> <p>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.</p>			
PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT 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	< 0.25, 0.25 TO 0.50, 0.5 TO 1.0, 1 TO 2, 2 TO 4, > 4																																																																																													
U.S. STD. SIEVE SIZE OPENING (MM)	4	10	40	60	200	270																																																																																										
	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 MM	305	75	2.0	0.25	0.05	0.005																																																																																										
SIZE IN.	12	3																																																																																														
SOIL MOISTURE SCALE (ATTERBERG LIMITS)	FIELD MOISTURE DESCRIPTION	GUIDE FOR FIELD MOISTURE DESCRIPTION																																																																																														
LL - LIQUID LIMIT	- SATURATED - (SAT.)	USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE																																																																																														
PL - PLASTIC LIMIT	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE																																																																																														
OM - OPTIMUM MOISTURE	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE																																																																																														
SL - SHRINKAGE LIMIT	- DRY - (D)	REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE																																																																																														
NONPLASTIC	PLASTICITY INDEX (PI)	DRY STRENGTH																																																																																														
LOW PLASTICITY	0-5	VERY LOW																																																																																														
MED. PLASTICITY	6-15	SLIGHT																																																																																														
HIGH PLASTICITY	16-25	MEDIUM																																																																																														
	26 OR MORE	HIGH																																																																																														
<p>EQUIPMENT USED ON SUBJECT PROJECT</p> <p>DRILL UNITS: <input type="checkbox"/> MOBILE B- <input type="checkbox"/> BK-51 <input type="checkbox"/> CME-45C <input checked="" type="checkbox"/> CME-550 <input type="checkbox"/> PORTABLE HOIST</p> <p>ADVANCING TOOLS: <input type="checkbox"/> CLAY BITS <input type="checkbox"/> 6" CONTINUOUS FLIGHT AUGER <input type="checkbox"/> 8" HOLLOW AUGERS <input type="checkbox"/> HARD FACED FINGER BITS <input type="checkbox"/> TUNG-CARBIDE INSERTS <input checked="" type="checkbox"/> CASING <input checked="" type="checkbox"/> W/ ADVANCER <input type="checkbox"/> TRICONE <input type="checkbox"/> STEEL TEETH <input type="checkbox"/> TRICONE <input type="checkbox"/> TUNG-CARB. <input type="checkbox"/> CORE BIT</p> <p>HAMMER TYPE: <input checked="" type="checkbox"/> AUTOMATIC <input type="checkbox"/> MANUAL</p> <p>CORE SIZE: <input type="checkbox"/> B <input type="checkbox"/> N <input type="checkbox"/> H</p> <p>HAND TOOLS: <input type="checkbox"/> POST HOLE DIGGER <input type="checkbox"/> HAND AUGER <input type="checkbox"/> SOUNDING ROD <input type="checkbox"/> VANE SHEAR TEST</p>				<p>ROCK HARDNESS</p> <table border="1"><thead><tr><th>VERY HARD</th><th>HARD</th><th>MODERATELY HARD</th><th>MEDIUM HARD</th><th>SOFT</th><th>VERY SOFT</th></tr></thead><tbody><tr><td>CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.</td><td>CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.</td><td>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.</td><td>CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PIECES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.</td><td>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.</td><td>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 FINGER NAIL.</td></tr></tbody></table>				VERY HARD	HARD	MODERATELY HARD	MEDIUM HARD	SOFT	VERY SOFT	CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.	CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.	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.	CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PIECES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.	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.	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 FINGER NAIL.	<p>FRACTURE SPACING</p> <table border="1"><thead><tr><th>TERM</th><th>SPACING</th></tr></thead><tbody><tr><td>VERY WIDE</td><td>MORE THAN 10 FEET</td></tr><tr><td>WIDE</td><td>3 TO 10 FEET</td></tr><tr><td>MODERATELY CLOSE</td><td>1 TO 3 FEET</td></tr><tr><td>CLOSE</td><td>0.16 TO 1 FEET</td></tr><tr><td>VERY CLOSE</td><td>LESS THAN 0.16 FEET</td></tr></tbody></table>				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	<p>BEDDING</p> <table border="1"><thead><tr><th>TERM</th><th>THICKNESS</th></tr></thead><tbody><tr><td>VERY THICKLY BEDDED</td><td>> 4 FEET</td></tr><tr><td>THICKLY BEDDED</td><td>1.5 - 4 FEET</td></tr><tr><td>THINLY BEDDED</td><td>0.16 - 1.5 FEET</td></tr><tr><td>VERY THINLY BEDDED</td><td>0.03 - 0.16 FEET</td></tr><tr><td>THICKLY LAMINATED</td><td>0.008 - 0.03 FEET</td></tr><tr><td>THINLY LAMINATED</td><td>< 0.008 FEET</td></tr></tbody></table>				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	<p>INDURATION</p> <p>FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.</p> <table border="1"><thead><tr><th>FRIABLE</th><th>MODERATELY INDURATED</th><th>INDURATED</th><th>EXTREMELY INDURATED</th></tr></thead><tbody><tr><td>RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.</td><td>GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.</td><td>GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.</td><td>SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.</td></tr></tbody></table>				FRIABLE	MODERATELY INDURATED	INDURATED	EXTREMELY INDURATED	RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.	GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.	GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.	SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.	<p>BENCH MARK: ELEVATION: _____ FT.</p> <p>NOTES:</p>																														
VERY HARD	HARD	MODERATELY HARD	MEDIUM HARD	SOFT	VERY SOFT																																																																																											
CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.	CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.	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.	CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PIECES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.	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.	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 FINGER NAIL.																																																																																											
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																																																																																															
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																																																																																															
FRIABLE	MODERATELY INDURATED	INDURATED	EXTREMELY INDURATED																																																																																													
RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.	GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.	GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.	SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.																																																																																													

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-2710	1	
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
34499.1.1	STP - 194(4)	P.E.	
34499.2.2	STP - 194(4)	RW	
34499.3.STI	STM - 194(13)	CONST.	

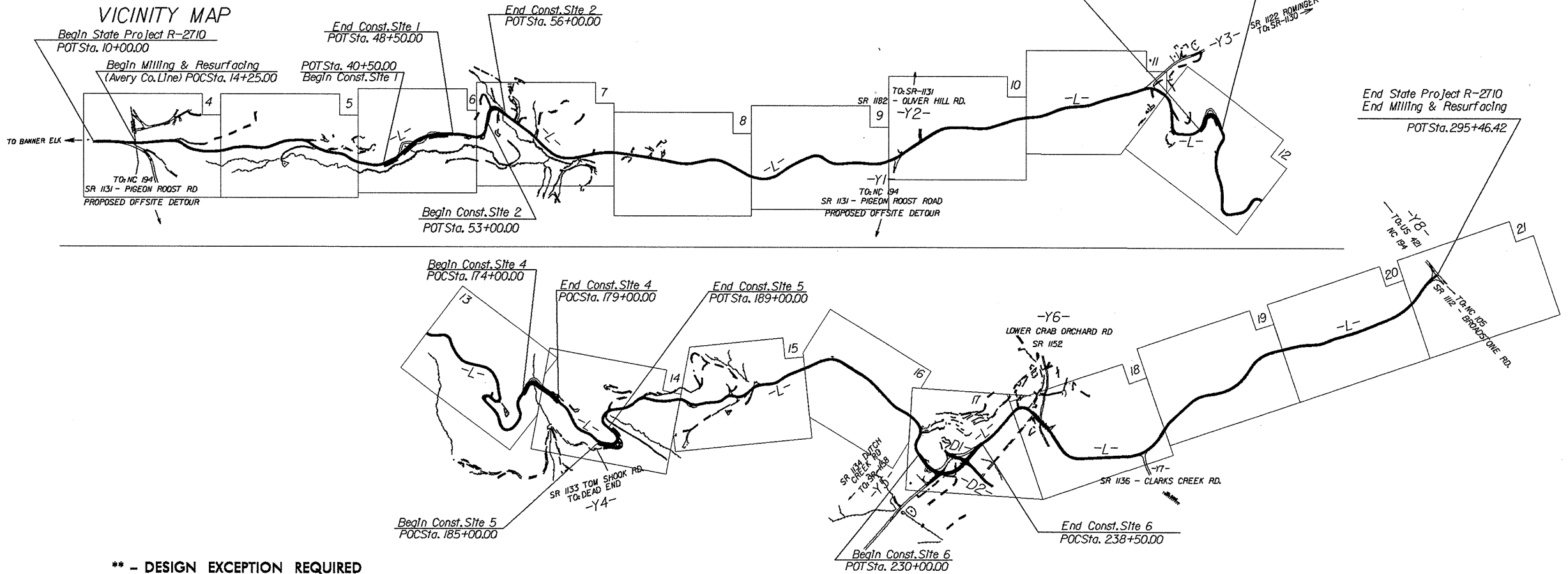
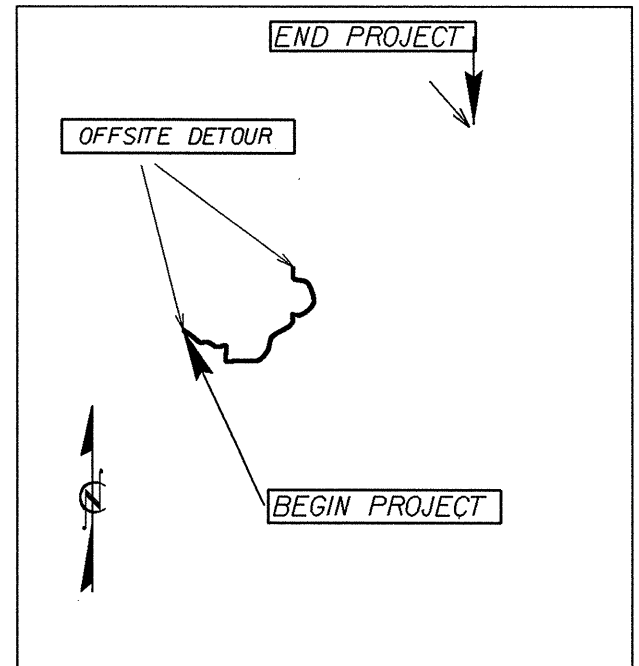
STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

WATAUGA

LOCATION: NC 194 FROM THE AVERY COUNTY LINE
TO SR 1112 (BROADSTONE ROAD) IN VALLE CRUCIS

TYPE OF WORK: GRADING, DRAINAGE, PAVING, AND RETAINING WALLS

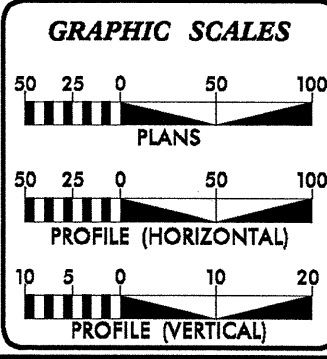
See Sheet 1-A For Index of Sheets



** - DESIGN EXCEPTION REQUIRED

TIP PROJECT: R-2710

CONTRACT: C202339



DESIGN DATA

REGIONAL TIER DESIGN

ADT 2001 =	2200
ADT 2030 =	5200
DHV =	14 %
D =	55 %
T =	5 % *
V _{max} =	35 MPH**
V _{min} =	15 MPH**
* TTST 2	DUAL 3

PROJECT LENGTH

LENGTH ROADWAY STATE PROJECT R-2710 = 5.41 MILES

Prepared In the Office of:
DIVISION OF HIGHWAYS
801 Statesville Road, North Wilkesboro, NC, 28659

2006 STANDARD SPECIFICATIONS

DIVISION ENGINEER
M.A. PETTYJOHN, PE

RIGHT OF WAY DATE:
MARCH 16, 2010

LETTING DATE:
SEPTEMBER 21, 2010

SIGNATURE: _____ P.E.
DATE: _____

HYDRAULICS ENGINEER
J. W. TWISDALE JR., PE

SIGNATURE: _____ P.E.
DATE: _____

DIVISION DESIGN ENGINEER
PHILIP J. SHEPHERD, PE

SIGNATURE: _____ P.E.
DATE: _____

21-JUL-2010 08:06 c:\documents_and_settings\jplipchuk\desktop\r2710\r2710_ddc_tsh_091104.dgn jplipchuk AT GC24832



STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

Michael F. Easley
GOVERNOR

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

Lyndo Tippett
SECRETARY

September 16, 2007

MEMORANDUM TO: Kevin Whittington, District Maintenance Engineer, Div. 11

FROM: John Pilipchuk, PG, PE
Western Region Geotechnical Engineer

STATE PROJECT: 34499.1.1, R-2710
FEDERAL PROJECT: STP - 194(4)
COUNTY: Watauga

DESCRIPTION: NC 194 from Avery/Watauga County line East 5.41 miles to Broadstone Road (SR 1112)

SUBJECT: Geotechnical Report - Additional Inventory information

The majority of subsurface investigation conducted at the six Sites on this project concerns information applicable to retaining wall design and construction. In addition, five borings were taken at areas that were perceived to have Geotechnical interest. Attached to this cover letter are the five boring logs. They pertain to the following two sites:

SITE TWO

Three borings were taken at Site 2; S2-B1, S2-B2 and S2-B3. These are showing stable material for the small fill section with B2 and B3 showing subsurface material related to extending the existing culvert at that location.

SITE SIX

Borings S6-B1 and S6-B2 were done to show that decent intact soil was present to construct the requested 1.5:1.0 fill slope proposed for this location.

Respectfully submitted,

Jody C. Kuhne

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34499.1.1		ID. R-2710		COUNTY WATAUGA		GEOLOGIST Kuhne, J. C.									
SITE DESCRIPTION NC 194 FROM AVERY/WATAUGA LINE TO SR 1112 (BROADSTONE ROAD)															
BORING NO. SITE2-B1		STATION 54+50		OFFSET 5ft RT		ALIGNMENT -L-									
COLLAR ELEV. N/A		TOTAL DEPTH 18.9 ft		NORTHING N/A		EASTING N/A									
DRILL MACHINE N/A		DRILL METHOD NW Casing w/ SPT				HAMMER TYPE Manua									
START DATE 08/01/07		COMP. DATE 08/01/07		SURFACE WATER DEPTH N/A		DEPTH TO ROCK N/A									
ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	L O G ELEV. (ft)	SOIL AND ROCK DESCRIPTION		
		0.5ft	0.5ft	0.5ft	0	25	50	75	100						
	1.0														GROUND SURFACE
	3.5	5	5	6											ROADWAY EMBANKMENT BRN SILTY SAND W/ RK FRAGMEN
	6.0	19	22	21											RESIDUAL TAN/BRN DENSE SILTY SAND
	8.5	20	25	35											
		55	45												
	13.5														WEATHERED ROCK WHITE/TAN/BRN SAND
		60/0.3													
	18.5														
		100/0.4													Boring Terminated at Depth 18.9 f WEATHERED ROCK

NCDOT BORE DOUBLE R2710.GPJ NC_DOT.GDT 10/24/07

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34499.1.1	ID. R-2710	COUNTY WATAUGA	GEOLOGIST Kuhne, J. C
SITE DESCRIPTION NC 194 FROM AVERY/WATAUGA LINE TO SR 1112 (BROADSTONE ROAD)			GROU
BORING NO. SITE2-B2	STATION 55+40	OFFSET 10ft LT	ALIGNMENT -L-
COLLAR ELEV. N/A	TOTAL DEPTH 28.6 ft	NORTHING N/A	EASTING N/A
DRILL MACHINE N/A	DRILL METHOD NW Casing w/ SPT	HAMMER TYPE Manua	
START DATE 08/02/07	COMP. DATE 08/02/07	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A

ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION
		0.5ft	0.5ft	0.5ft	0	25	50	75	100			
	1.0											GROUND SURFACE
	3.5	5	3	3								ROADWAY EMBANKMENT GRAY/BRN SANDY SILT W/ GRAV
	6.0	16	7	4								
	8.5	5	5	4								
	13.5	4	7	18								SAPROLITE WHITE/TAN/BRN SILTY SAND
	18.5	50	50/2									WEATHERED ROCK GRAY/TAN SILTY SAND W/ SAPROL SEAMS
	23.5	25	9	17								WEATHERED ROCK VERY HARD WEATHERED ROCK
	28.5	60/1										

Boring Terminated with Standard Penet Test Refusal at Depth 28.6 ft CRYST. R GRANITIC GNEISS

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34499.1.1	ID. R-2710	COUNTY WATAUGA	GEOLOGIST Kuhne, J. C
SITE DESCRIPTION NC 194 FROM AVERY/WATAUGA LINE TO SR 1112 (BROADSTONE ROAD)			GROU
BORING NO. SITE2-B3	STATION 55+85	OFFSET 5ft RT	ALIGNMENT -L-
COLLAR ELEV. N/A	TOTAL DEPTH 34.3 ft	NORTHING N/A	EASTING N/A
DRILL MACHINE N/A	DRILL METHOD NW Casing w/ SPT	HAMMER TYPE Manua	
START DATE 08/02/07	COMP. DATE 08/02/07	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A

ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION
		0.5ft	0.5ft	0.5ft	0	25	50	75	100			
	1.0											GROUND SURFACE
	3.5	5	7	11								ROADWAY EMBANKMENT WHITE/TAN/BRN SANDY CLAYEY SIL GRAVEL
	6.0	7	20	25								
	8.5	10	11	11								
	13.5	15	9	7								SAPROLITE TAN/BRN SILTY SAND W/ RK FRAGM
	18.5	6	12	12								
	23.5	9	22	61								WEATHERED ROCK GRAY/TAN GRANITIC GNEISS
	28.5	45	55/3									
	33.5	30	45	35								SAPROLITE WHITE/GRAY/BRN DENSE SILTY SA WEATHERED ROCK TAN/BRN/WHITE GRANITIC GNEIS
		44	56/3									

Boring Terminated at Depth 34.3 f WEATHERED ROCK

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34499.1.1		ID. R-2710		COUNTY WATAUGA		GEOLOGIST Kuhne, J. C								
SITE DESCRIPTION NC 194 FROM AVERY/WATAUGA LINE TO SR 1112 (BROADSTONE ROAD)							GROU							
BORING NO. SITE6-B1		STATION 234+45		OFFSET 16ft LT		ALIGNMENT -L-								
COLLAR ELEV. N/A		TOTAL DEPTH 15.0 ft		NORTHING N/A		EASTING N/A								
DRILL MACHINE N/A		DRILL METHOD NW Casing w/ SPT				HAMMER TYPE Manua								
START DATE 08/03/07		COMP. DATE 08/03/07		SURFACE WATER DEPTH N/A		DEPTH TO ROCK N/A								
ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	LOG G	SOIL AND ROCK DESCRIPTION	
		0.5ft	0.5ft	0.5ft	0	25	50	75	100					ELEV. (ft)
	1.0													GROUND SURFACE
	3.5	3	3	5										RESIDUAL TAN/BRN MED. STIFF SANDY SIL
	6.0	2	2	3										SAPROLITE TAN/BRN, TRACE MICA, SANDY SI
	8.5	5	7	9										
	13.5	4	5	7										
Boring Terminated at Depth 15.0 f SAPROLITE														

NCDOT BORE DOUBLE R2710.GPJ NC_DOT.GDT 10/24/07

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34499.1.1		ID. R-2710		COUNTY WATAUGA		GEOLOGIST Kuhne, J. C								
SITE DESCRIPTION NC 194 FROM AVERY/WATAUGA LINE TO SR 1112 (BROADSTONE ROAD)							GROU							
BORING NO. SITE6-B2		STATION 235+90		OFFSET 11ft LT		ALIGNMENT -L-								
COLLAR ELEV. N/A		TOTAL DEPTH 15.0 ft		NORTHING N/A		EASTING N/A								
DRILL MACHINE N/A		DRILL METHOD NW Casing w/ SPT				HAMMER TYPE Manua								
START DATE 08/03/07		COMP. DATE 08/03/07		SURFACE WATER DEPTH N/A		DEPTH TO ROCK N/A								
ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	LOG G	SOIL AND ROCK DESCRIPTION	
		0.5ft	0.5ft	0.5ft	0	25	50	75	100					ELEV. (ft)
	1.0													GROUND SURFACE
	3.5	3	5	5										RESIDUAL ORANGE/BRN STIFF SANDY, SILTY (
	6.0	9	9	12										SAPROLITE BRN/TAN CLAYEY SANDY SILT
	8.5	6	9	16										
	13.5	9	10	13										
		12	14	10										
Boring Terminated at Depth 15.0 f SAPROLITE														

NCDOT BORE DOUBLE R2710.GPJ NC_DOT.GDT 10/24/07



STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

Michael F. Easley
GOVERNOR

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

Lyndo Tippett
SECRETARY

3 April, 2007

MEMO TO: John Twisdale, Jr., PE, Project Engineer, Hydraulics

FROM: Jody Kuhne, PG, PE, Project Geological Engineer

STATE PROJECT: 34499.1.1, R-2710

COUNTY: Watauga

DESCRIPTION: NC 194 from Banner Elk to Valle Crucis

SUBJECT: Culvert investigation, Sta. 17+50

Two boring logs are attached for Stations 70+17 and 70+88 on the subject project. The proposed culvert does not have bedrock with 5' of the ground surface in the footprint.

Please contact me if I may be of further assistance.

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

PROJECT NO. 34499.1.1		ID. R2710		COUNTY WATAUGA		GEOLOGIST Daniel, T. B.									
SITE DESCRIPTION NC 194 FROM BANNER ELK TO VALLE CRUCIS							GROUND WTR (ft)								
BORING NO. R2710-1		STATION 70+88		OFFSET 40 ft LT		ALIGNMENT -L-									
COLLAR ELEV. N/A		TOTAL DEPTH 25.2 ft		NORTHING N/A		EASTING N/A									
DRILL MACHINE CME-550		DRILL METHOD NW Casing w/ SPT				HAMMER TYPE Automatic									
START DATE 03/29/07		COMP. DATE 03/29/07		SURFACE WATER DEPTH N/A		DEPTH TO ROCK N/A									
ELEV. (ft)	ELEV. DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	L O G	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
		0.5ft	0.5ft	0.5ft	0	25	50	75	100						ELEV. (ft)
														GROUND SURFACE	0.0
														ALLUVIAL BRN SILTY COARSE SAND AND GRAVEL W/ COBBLES AND BOULDERS	
	3.8	15	7	10									Sat.		
	6.3	8	6	25									W		
	8.8	1	7	5									W		
	11.3	3	5	4									Sat.		11.0
	13.8	5	10	13									W		
	15.3	4	7	16									M		
	18.8	11	14	13									M		
	23.8	6	8	8									M		25.2
														Boring Terminated at Depth 25.2 ft SAPROLITE	

NCDOT BORE SINGLE B4675_GEO_BH.GPJ NC_DOT.GDT_04/03/07

PROJECT NO. 34499.1.1	ID. R2710	COUNTY WATAUGA	GEOLOGIST Daniel, T. B.
SITE DESCRIPTION NC 194 FROM BANNER ELK TO VALLE CRUCIS			GROUND WTR (ft)
BORING NO. R2710-2	STATION 70+17	OFFSET 17 ft RT	ALIGNMENT -L-
COLLAR ELEV. N/A	TOTAL DEPTH 25.1 ft	NORTHING N/A	EASTING N/A
DRILL MACHINE CME-550	DRILL METHOD NW Casing w/ SPT	HAMMER TYPE Automatic	
START DATE 03/30/07	COMP. DATE 03/30/07	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A

ELEV. (ft)	ELEV. DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)
		0.5ft	0.5ft	0.5ft	0	25	50	75	100					
													GROUND SURFACE	0.0
													ALLUVIAL GRAY/BRN SILTY COARSE SAND W/ GRAVEL	
	3.6	1	1	1								W		
	6.1	1	1	2								Sat.		
	8.6	8	10	4								Sat.		
	11.1	13	16	15								Sat.		
	13.6	12	2	2								M		14.0
	16.1	3	6	11								M	SAPROLITE YELL/BRN SILTY SAND/SANDY SILT	
	18.6	8	16	21								M		
	23.6	12	18	23								M		25.1
Boring Terminated at Depth 25.1 ft SAPROLITE														

STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

GEOTECHNICAL ENGINEERING UNIT

STRUCTURE SUBSURFACE INVESTIGATION

STATE PROJECT 34499.1.1 I.D. NO. R-2710

F.A. PROJECT STP-194(4)

COUNTY WATAUGA

PROJECT DESCRIPTION NC 194 FROM BANNER

ELK IN AVERY COUNTY TO VALLE CRUCIS IN

WATAUGA COUNTY

SITE DESCRIPTION SITE 5: TWO RETAINING WALLS

FROM -L- STATIONS 185+00 TO 189+00

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-2710	1	11
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
34499.1.1	STP - 194(4)	P.E.	
34499.2.2	STP - 194(4)	RW	
34499.3.STI	STM - 194(13)	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.

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 T WELLS PERSONNEL D KITCHEN

CHECKED BY J VINSON A HAYES

SUBMITTED BY P WEAVER T WELLS

DATE 9/27/07 R TOOTHMAN

B DUNCAN

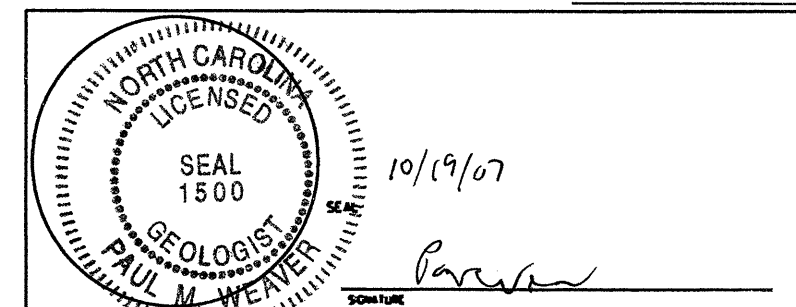
CONTENTS:

- 1) NCDOT LEGEND SHEET (SHEET 2)
- 2) SITE VICINITY MAP (DRAWING No. 1, SHEET 3)
- 3) BORING IDENTIFICATION DIAGRAM (DRAWING No. 2, SHEET 4)
- 4) SUBSURFACE PROFILE (DRAWING No. 3, SHEET 5)
- 5) FINAL BORING LOGS (SHEETS 6-9)
- 6) SUMMARY OF SOIL LABORATORY TEST DATA (SHEET 10)
- 7) SITE PHOTOGRAPHS (SHEET 11)

DRAWN BY: DRK

NOTE - THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N.C. DEPARTMENT OF TRANSPORTATION AS BEING ACCURATE NOR IS IT 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.



R-2710

ID:

PROJECT: C202339

PROJECT: C202339

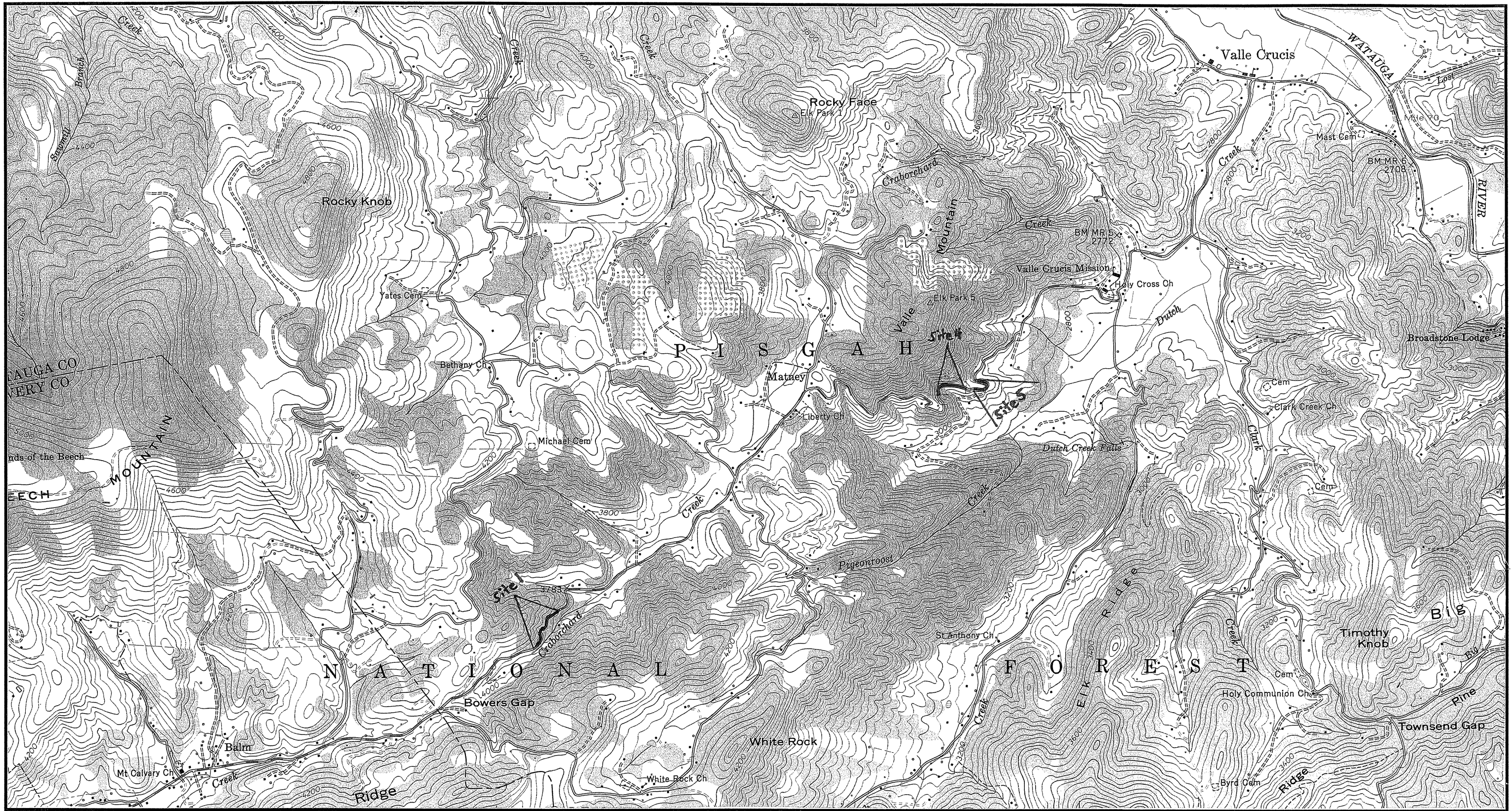
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

ID	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
R-2710	34499.1	2	11

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION				GRADATION				ROCK DESCRIPTION				TERMS AND DEFINITIONS							
<p>SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED OR WEATHERED EARTH MATERIALS WHICH CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND WHICH YIELDS LESS THAN 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM AND BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE:</p> <p>VERY STIFF, GRAY SILTY CLAY, MOST WITH INTERBEDDED FINE SAND LENS, HIGH PLASTIC, A-7-6</p>				<p>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.</p> <p>ANGULARITY OF GRAINS THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS ARE DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUND, OR ROUNDED.</p>				<p>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 8.1 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:</p>				<p>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 IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE. CALCRETEOUS (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 DISLOGGED FROM PARENT MATERIAL. FLOOD PLAIN (F.P.) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM. FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD. JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED. LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT. LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS. MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS, MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE. PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM. RESIDUAL SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. ROCK QUALITY DESIGNATION (R.Q.D.) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. SAPROLITE (SAP.) - RESIDUAL SOIL WHICH RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK. SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, WHICH HAS BEEN EMPLOYED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDING 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 IN OR B.P.F. OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS LESS THAN 8.1 FOOT PENETRATION WITH 60 BLOWS. STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. STRATA ROCK QUALITY DESIGNATION (S.R.Q.D.) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. TOPSOIL (T.S.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.</p>							
SOIL LEGEND AND AASHTO CLASSIFICATION				MINERALOGICAL COMPOSITION				WEATHERING											
<p>GENERAL CLASS. GRANULAR MATERIALS (1-5% PASSING #200) SILT-CLAY MATERIALS (1-85% PASSING #200) ORGANIC MATERIALS</p> <p>GROUP CLASS. A-1 A-3 A-2 A-4 A-5 A-6 A-7 A-1, A-2 A-4, A-5 A-5, A-7</p> <p>SYMBOL</p> <p>% PASSING</p> <p>LIQUID LIMIT</p> <p>PLASTIC INDEX</p> <p>GROUP INDEX</p> <p>USUAL TYPES OF MAJOR MATERIALS</p> <p>GENERAL AS A SUBGRADE</p>				<p>MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.</p> <p>COMPRESSIBILITY</p> <p>SLIGHTLY COMPRESSIBLE LIQUID LIMIT LESS THAN 30 MODERATELY COMPRESSIBLE LIQUID LIMIT 31-50 HIGHLY COMPRESSIBLE LIQUID LIMIT GREATER THAN 50</p> <p>PERCENTAGE OF MATERIAL</p> <p>ORGANIC MATERIAL GRANULAR SOILS SILT-CLAY SOILS OTHER MATERIAL</p> <p>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</p> <p>GROUND WATER</p> <p>WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING. STATIC WATER LEVEL AFTER 24 HOURS. PERCHED WATER, SATURATED ZONE OR WATER BEARING STRATA SPRING OR SEEPAGE</p>				<p>WEATHERED ROCK (WR)</p> <p>CRYSTALLINE ROCK (CR)</p> <p>NON-CRYSTALLINE ROCK (NCR)</p> <p>COASTAL PLAIN SEDIMENTARY ROCK (CPI)</p> <p>FRESH - ROCK FRESH, CRYSTALLINE BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER HAMMER IF CRYSTALLINE. VERY SLIGHT (V.SL.) - 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 (SL.) - ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH, OPEN JOINTS MAY CONTAIN CLAY, IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED, CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS. MODERATE (MOD.) - SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS, IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY, ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK. MODERATELY SEVERE (MOD. SEV.) - ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED, IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION, ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK, ROCK GIVES "CLUNK" SOUND WHEN STRUCK, IF TESTED WOULD YIELD SPT REFUSAL. SEVERE (SEV.) - ALL ROCKS EXCEPT QUARTZ DISCOLORED OR STAINED, ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL, IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT, SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN, IF TESTED YIELDS SPT N VALUES > 100 BPF. VERY SEVERE (V. SEV.) - ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED, ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING, SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN, IF TESTED YIELDS SPT N VALUES < 100 BPF. COMPLETE - ROCK REDUCED TO SOIL, ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS, QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS, SAPROLITE IS ALSO AN EXAMPLE.</p>											
CONSISTENCY OR DENSENESS				MISCELLANEOUS SYMBOLS				ROCK HARDNESS											
<p>PRIMARY SOIL TYPE COMPACTNESS OR CONSISTENCY RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE) RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/SQ. FT.)</p> <p>GENERALLY GRANULAR MATERIAL (NON-COHESIVE) VERY LOOSE 4 10 TO 18 N/A MEDIUM DENSE 10 TO 30 DENSE 30 TO 50 VERY DENSE >50</p> <p>GENERALLY SILT-CLAY MATERIAL (COHESIVE) VERY SOFT 2 0.25 0.25 TO 0.5 SOFT 2 TO 4 0.5 TO 1 MEDIUM STIFF 4 TO 8 1 TO 2 STIFF 8 TO 15 2 TO 4 VERY STIFF 15 TO 30 >4 HARD >30</p>				<p>ROADWAY EMBANKMENT WITH SOIL DESCRIPTION</p> <p>SOIL SYMBOL</p> <p>ARTIFICIAL FILL OTHER THAN ROADWAY EMBANKMENTS</p> <p>INFERRED SOIL BOUNDARIES</p> <p>INFERRED ROCK LINE</p> <p>ALLUVIAL SOIL BOUNDARY</p> <p>DIP/DIP DIRECTION OF ROCK STRUCTURES</p> <p>SOUNDING ROD</p> <p>TEST BORING</p> <p>AUGER BORING 5 - BULK SAMPLE</p> <p>CORE BORING SS - SPLIT SPOON SAMPLE</p> <p>MONITORING WELL RS - ROCK SAMPLE</p> <p>PIEZOMETER INSTALLATION RT - RECOMPACTED TRIAXIAL SAMPLE</p> <p>SLOPE INDICATOR INSTALLATION CBR - CBR SAMPLE</p> <p>SPT N-VALUE</p> <p>SPT REFUSAL</p>				<p>VERY HARD - CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK, BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.</p> <p>HARD - CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY, HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.</p> <p>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.</p> <p>MEDIUM HARD - CAN BE GROUVED OR GOUGED 0.85 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT, CAN BE EXCAVATED IN SMALL CHIPS TO PIECES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.</p> <p>SOFT - CAN BE GROUVED OR GOUGED EASILY 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.</p> <p>VERY SOFT - CAN BE CARVED WITH KNIFE, CAN BE EXCAVATED EASILY WITH POINT OF PICK, PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE, CAN BE SCRATCHED EASILY BY FINGER NAIL.</p>											
TEXTURE OR GRAIN SIZE				ABBREVIATIONS				FRACTURE SPACING				BEDDING							
<p>U.S. STD. SIEVE SIZE 4 10 40 60 200 270</p> <p>OPENING (MM) 4.75 2.0 0.42 0.25 0.075 0.053</p> <p>BOULDER (BLDR.) COBBLE (COB.) GRAVEL (GR.) COARSE SAND (CSE. SD.) FINE SAND (F. SD.) SILT (SL.) CLAY (CL.)</p> <p>GRAIN SIZE MM 305 75 2.0 0.25 0.05 0.005</p>				<p>AR - AUGER REFUSAL BT - BORING TERMINATED CL - CLAY IN CL. - CLAY CPT - CONE PENETRATION TEST CSE. - COARSE C.T. - CORING TERMINATED DHT - DILATOMETER TEST DPT - DYNAMIC PENETRATION TEST e - VOID RATIO F. - FINE FOSS. - FOSSILIFEROUS FRAC. - FRACTURED</p> <p>FRAGS. - FRAGMENTS MED. - MEDIUM N/A - NOT APPLICABLE NM - NOT MEASURED 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</p>				<p>VERY WIDE - MORE THAN 18 FEET</p> <p>WIDE - 3 TO 18 FEET</p> <p>MODERATELY CLOSE - 1 TO 3 FEET</p> <p>CLOSE - 0.16 TO 1 FEET</p> <p>VERY CLOSE - LESS THAN 0.16 FEET</p>				<p>VERY THICKLY BEDDED - > 4 FEET</p> <p>THICKLY BEDDED - 1.5 - 4 FEET</p> <p>THINLY BEDDED - 0.16 - 1.5 FEET</p> <p>VERY THINLY BEDDED - 0.03 - 0.16 FEET</p> <p>THICKLY LAMINATED - 0.008 - 0.03 FEET</p> <p>THINLY LAMINATED - < 0.008 FEET</p>							
SOIL MOISTURE - CORRELATION OF TERMS				EQUIPMENT USED ON SUBJECT PROJECT				INDURATION				NOTES							
<p>SOIL MOISTURE SCALE (ATTERBERG LIMITS) FIELD MOISTURE DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION</p> <p>LL - LIQUID LIMIT</p> <p>PL - PLASTIC LIMIT</p> <p>OM - OPTIMUM MOISTURE</p> <p>SL - SHRINKAGE LIMIT</p> <p>- SATURATED - (SAT.) USUALLY LIQUID, VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE</p> <p>- WET - (W) SEMISOLID, REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE</p> <p>- MOIST - (M) SOLID, AT OR NEAR OPTIMUM MOISTURE</p> <p>- DRY - (D) REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE</p>				<p>DRILL UNITS:</p> <p><input checked="" type="checkbox"/> MOBILE 8-57</p> <p><input type="checkbox"/> BK-51</p> <p><input type="checkbox"/> CME-45</p> <p><input type="checkbox"/> CME-55</p> <p><input type="checkbox"/> PORTABLE HOIST</p> <p><input type="checkbox"/> OTHER CME 850</p> <p><input checked="" type="checkbox"/> OTHER ACKER MARK II</p> <p>ADVANCING TOOLS:</p> <p><input type="checkbox"/> CLAY BITS</p> <p><input checked="" type="checkbox"/> 6" CONTINUOUS FLIGHT AUGER</p> <p><input type="checkbox"/> 8" HOLLOW AUGERS</p> <p><input type="checkbox"/> HARD FACED FINGER BITS</p> <p><input type="checkbox"/> TUNG-CARBIDE INSERTS</p> <p><input checked="" type="checkbox"/> CASING <input type="checkbox"/> W/ ADVANCER</p> <p><input type="checkbox"/> TRICONE - STEEL TEETH</p> <p><input checked="" type="checkbox"/> TRICONE 3 3/8" - TUNG-CARB.</p> <p><input type="checkbox"/> CORE BIT</p> <p><input type="checkbox"/> OTHER _____</p>				<p>HAMMER TYPE:</p> <p><input type="checkbox"/> AUTOMATIC <input checked="" type="checkbox"/> MANUAL</p> <p>CORE SIZE:</p> <p><input type="checkbox"/> B _____</p> <p><input checked="" type="checkbox"/> N D _____</p> <p><input type="checkbox"/> H D _____</p> <p>HAND TOOLS:</p> <p><input type="checkbox"/> POST HOLE DIGGER</p> <p><input type="checkbox"/> HAND AUGER</p> <p><input type="checkbox"/> SOUNDING ROD</p> <p><input type="checkbox"/> VANE SHEAR TEST</p> <p><input type="checkbox"/> OTHER _____</p>				<p>FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.</p> <p>FRIABLE - RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.</p> <p>MODERATELY INDURATED - GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.</p> <p>INDURATED - GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.</p> <p>EXTREMELY INDURATED - SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.</p>				<p>BENCH MARK: BM #18" SPIKE IN BASE OF 10" BIRCH TREE - BL - STA. 34+33.147 - RT</p> <p>ELEVATION: 3905.36'</p> <p>NOTES:</p>			
PLASTICITY																			
<p>NONPLASTIC PLASTICITY INDEX (PI) DRY STRENGTH</p> <p>LOW PLASTICITY 0-5 VERY LOW</p> <p>MED. PLASTICITY 6-15 SLIGHT</p> <p>HIGH PLASTICITY 16-25 MEDIUM</p> <p> 26 OR MORE HIGH</p>																			
COLOR																			
<p>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.</p>																			



Trigon Engineering Consultants, Inc.
Greensboro North Carolina

SCALE:
1" = 24,000'

DATE:
09/04/07

STATE PROJECT NO.
34499.1.1

TIP NO.:
R-2710

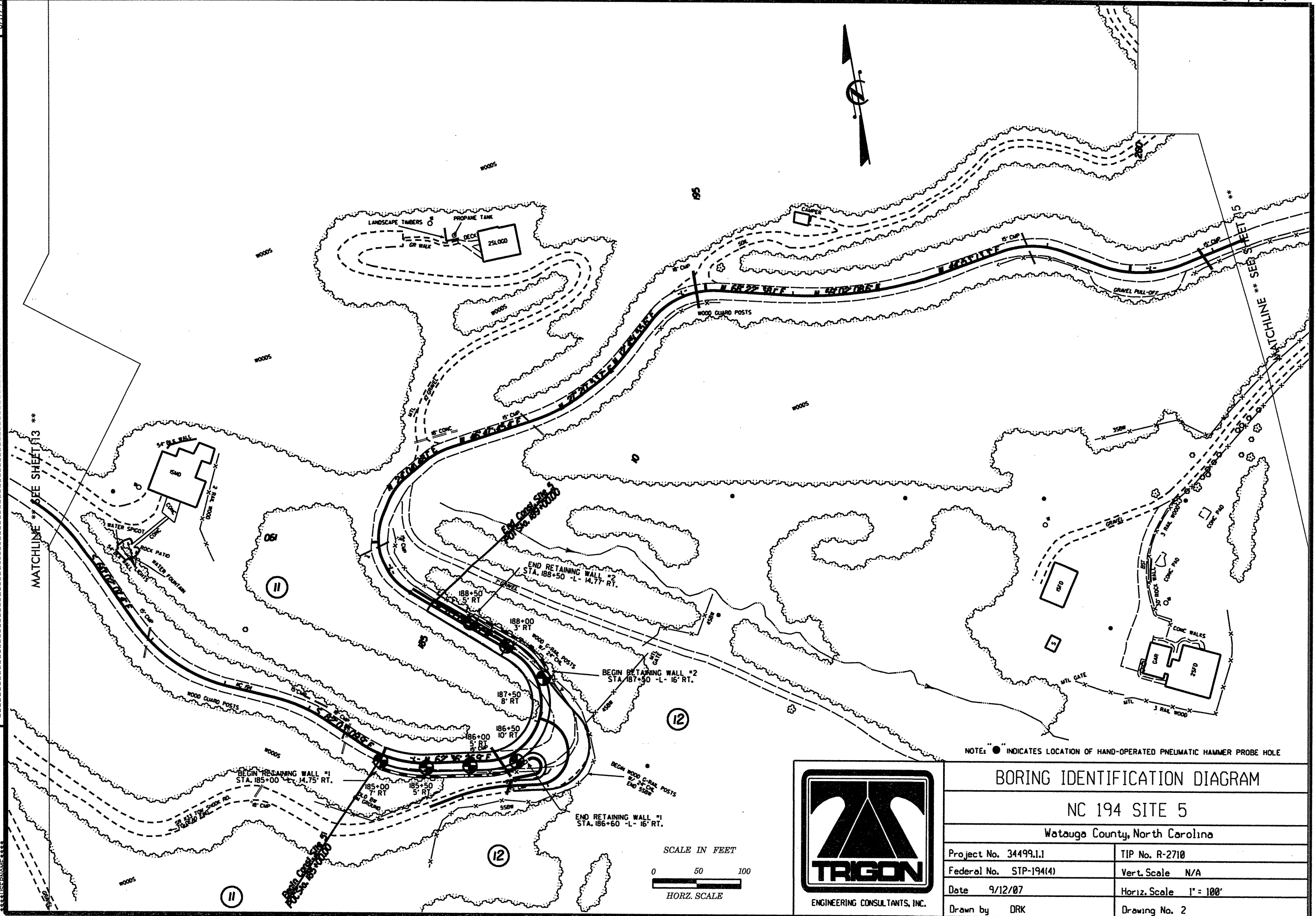
SITE VICINITY MAP
NC 194 Retaining Walls at Sites 1, 4, and 5, Watauga County, North Carolina

USGS Valle Crucis Quadrangle

DRAWING NUMBER:
1

8/17/09

REVISIONS



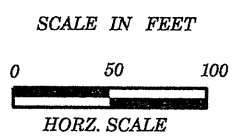
NOTE: ● INDICATES LOCATION OF HAND-OPERATED PNEUMATIC HAMMER PROBE HOLE

BORING IDENTIFICATION DIAGRAM

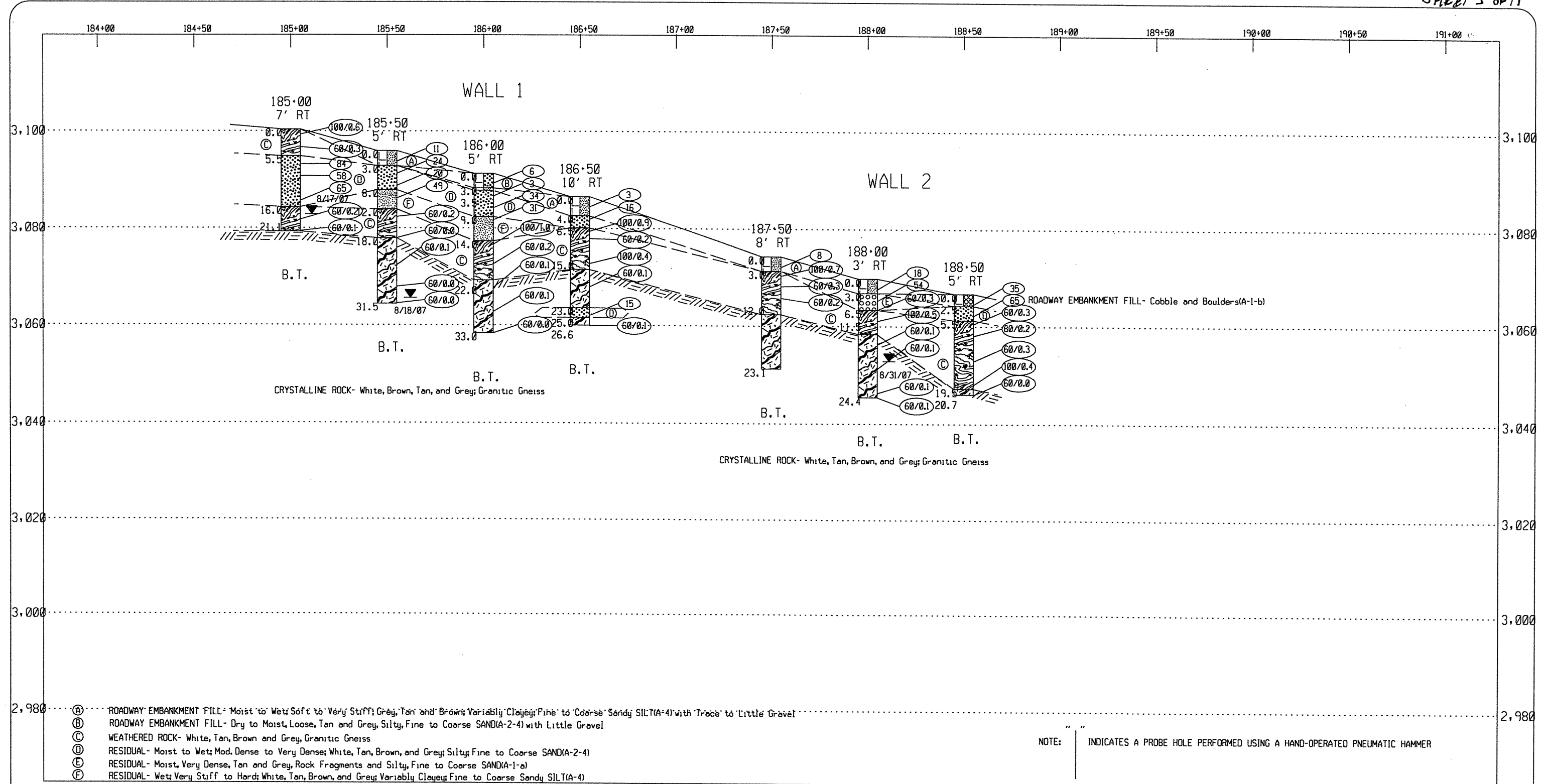
NC 194 SITE 5

Watauga County, North Carolina

Project No. 34499.1.1	TIP No. R-2710
Federal No. STP-19414)	Vert. Scale N/A
Date 9/12/07	Horiz. Scale 1" = 100'
Drawn by DRK	Drawing No. 2

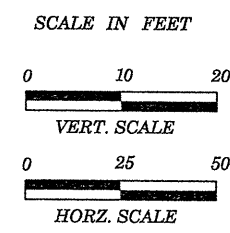


***** SYSTEMS *****
***** DONOR *****
***** IDENTIFIED *****



- (A) ROADWAY EMBANKMENT FILL- Moist to Wet; Soft to Very Stiff; Grey, Tan and Brown; Variably Clayey; Fine to Coarse Sandy SILT(A-4) with Trace to Little Gravel
- (B) ROADWAY EMBANKMENT FILL- Dry to Moist, Loose, Tan and Grey, Silty, Fine to Coarse SAND(A-2-4) with Little Gravel
- (C) WEATHERED ROCK- White, Tan, Brown and Grey, Granitic Gneiss
- (D) RESIDUAL- Moist to Wet; Mod. Dense to Very Dense; White, Tan, Brown, and Grey; Silty; Fine to Coarse SAND(A-2-4)
- (E) RESIDUAL- Moist, Very Dense, Tan and Grey, Rock Fragments and Silty, Fine to Coarse SAND(A-1-a)
- (F) RESIDUAL- Wet; Very Stiff to Hard; White, Tan, Brown, and Grey; Variably Clayey; Fine to Coarse Sandy SILT(A-4)

NOTE: " " INDICATES A PROBE HOLE PERFORMED USING A HAND-OPERATED PNEUMATIC HAMMER



PROFILE RIGHT OF -L-	
NC 194 SITE 5	
Watauga County, North Carolina	
Project No. 34499.1.1	TIP No. R-2710
Federal No. STP-194(4)	Vert. Scale 1" = 20'
Date 9/12/07	Horiz. Scale 1" = 50'
Drawn by DRK	Drawing No. 3

PROJECT NO. 34499.1.1		ID. R-2710		COUNTY Watauga		GEOLOGIST T.Wells/P.Weaver								
SITE DESCRIPTION NC 194 Site 5							GROUND WTR (ft)							
BORING NO. 185+00		STATION 185+00		OFFSET 7ft RT		ALIGNMENT -L-								
COLLAR ELEV. 3,100.4 ft		TOTAL DEPTH 21.1 ft		NORTHING 900,154		EASTING 1,174,397								
DRILL MACHINE Acker ADII		DRILL METHOD Wash Rotary		HAMMER TYPE 140 lb. Manual										
START DATE 08/16/07		COMP. DATE 08/16/07		SURFACE WATER DEPTH N/A		DEPTH TO ROCK N/A								
ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
		0.5ft	0.5ft	0.5ft	0	25	50	75	100					
3105														
3,099.4	1.0	69	31/0.1						100/0.6				WEATHERED ROCK: Tan and Grey, Granitic Gneiss	0.0
3,096.9	3.5	60/0.3							60/0.3					
3,094.4	6.0	24	38	46									RESIDUAL: Very Dense; White, Grey and Brown; Silty, Fine to Coarse SAND	5.5
3,091.9	8.5	5	14	44										
3,086.9	13.5	22	30	35										
3,081.9	18.5	60/0.2							60/0.2				WEATHERED ROCK: Brown and Grey, Granitic Gneiss	16.0
3,079.4	21.0	60/0.1							60/0.1				Boring Terminated at Elevation 3,079.3 ft	21.1

NCDOT BORE SINGLE 071-07-036.GPJ NC_DOT.GDT 10/18/07

PROJECT NO. 34499.1.1		ID. R-2710		COUNTY Watauga		GEOLOGIST T.Wells/P.Weaver								
SITE DESCRIPTION NC 194 Site 5							GROUND WTR (ft)							
BORING NO. 185+50		STATION 185+50		OFFSET 5ft RT		ALIGNMENT -L-								
COLLAR ELEV. 3,095.9 ft		TOTAL DEPTH 31.5 ft		NORTHING 900,170		EASTING 1,174,448								
DRILL MACHINE Acker ADII		DRILL METHOD Wash Rotary		HAMMER TYPE 140 lb. Manual										
START DATE 08/16/07		COMP. DATE 08/17/07		SURFACE WATER DEPTH N/A		DEPTH TO ROCK 18.0 ft								
ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
		0.5ft	0.5ft	0.5ft	0	25	50	75	100					
3100														
3,094.9	1.0	47	5	6									ROADWAY EMBANKMENT FILL: Stiff, Tannish Brown, Clayey, Fine to Coarse Sandy SILT with Trace Gravel	0.0
3,092.4	3.5	6	10	14									RESIDUAL: Medium Dense, Grey and Tan, Silty, Fine to Coarse SAND with Trace Rock Fragments	3.0
3,089.9	6.0	7	6	14									Hard; White, Tan and Grey; Fine to Coarse Sandy SILT	8.0
3,087.4	8.5	21	25	24									WEATHERED ROCK: Granitic Gneiss	12.0
3,082.4	13.5	60/0.2							60/0.2				CRYSTALLINE ROCK: Granitic Gneiss	18.0
3,077.4	18.5	60/0.0							60/0.0					
3,072.4	23.5	60/0.1							60/0.1					
3,067.4	28.5	60/0.0							60/0.0					
3,064.4	31.5	60/0.0							60/0.0				Boring Terminated at Elevation 3,064.4 ft	31.5

NCDOT BORE SINGLE 071-07-036.GPJ NC_DOT.GDT 10/18/07

PROJECT NO. 34499.1.1		ID. R-2710		COUNTY Watauga		GEOLOGIST T.Wells/P.Weaver								
SITE DESCRIPTION NC 194 Site 5							GROUND WTR (ft)							
BORING NO. 186+00		STATION 186+00		OFFSET 5ft RT		ALIGNMENT -L-								
COLLAR ELEV. 3,091.4 ft		TOTAL DEPTH 33.0 ft		NORTHING 900,193		EASTING 1,174,493								
DRILL MACHINE B-57		DRILL METHOD Wash Rotary		HAMMER TYPE 140 lb. Manual										
START DATE 08/23/07		COMP. DATE 08/24/07		SURFACE WATER DEPTH N/A		DEPTH TO ROCK 22.0 ft								
ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	L O G	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
		0.5ft	0.5ft	0.5ft	0	25	50	75	100					
3095														
3,090.4	1.0													0.0
3,087.9	3.5	4	3	3										3.0
3,085.4	6.0	1	1	2										3.9
3,082.9	8.5	2	19	15										9.0
3,077.9	13.5	22	20	11										14.0
3,072.9	18.5	8	20	80										14.0
3,067.9	23.5													22.0
3,062.9	28.5													22.0
3,058.4	33.0													33.0

PROJECT NO. 34499.1.1		ID. R-2710		COUNTY Watauga		GEOLOGIST T.Wells/P.Weaver								
SITE DESCRIPTION NC 194 Site 5							GROUND WTR (ft)							
BORING NO. 186+50		STATION 186+50		OFFSET 10ft RT		ALIGNMENT -L-								
COLLAR ELEV. 3,086.6 ft		TOTAL DEPTH 26.6 ft		NORTHING 900,221		EASTING 1,174,540								
DRILL MACHINE B-57		DRILL METHOD Wash Rotary		HAMMER TYPE 140 lb. Manual										
START DATE 08/27/07		COMP. DATE 08/28/07		SURFACE WATER DEPTH N/A		DEPTH TO ROCK 15.0 ft								
ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	L O G	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
		0.5ft	0.5ft	0.5ft	0	25	50	75	100					
3090														
3,085.6	1.0													0.0
3,083.1	3.5	4	1	2										4.0
3,080.6	6.0	1	6	10										6.5
3,078.1	8.5													6.5
3,073.1	13.5													15.0
3,068.1	18.5													15.0
3,063.1	23.5													23.0
3,060.1	26.5													26.6

PROJECT NO. 34499.1.1	ID. R-2710	COUNTY Watauga	GEOLOGIST T.Wells/P.Weaver	
SITE DESCRIPTION NC 194 Site 5				GROUND WTR (ft)
BORING NO. 187+50	STATION 187+50	OFFSET 8ft RT	ALIGNMENT -L-	0 HR. C.I. @ 6.0'
COLLAR ELEV. 3,074.4 ft	TOTAL DEPTH 23.1 ft	NORTHING 900,319	EASTING 1,174,528	24 HR. C.I. @ 6.0
DRILL MACHINE B-57	DRILL METHOD Wash Rotary	HAMMER TYPE 140 lb. Manual		
START DATE 08/28/07	COMP. DATE 08/29/07	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 12.0 ft	

ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)
		0.5ft	0.5ft	0.5ft	0	25	50	75	100					
3075														
3,073.4	1.0	18	6	2						SS-12	22.5%		ROADWAY EMBANKMENT FILL: Medium Stiff, Tannish Brown, Clayey, Fine to Coarse Sandy SILT with Little Gravel	0.0
3,070.9	3.5	60	40/0.2										WEATHERED ROCK: White, Tan and Grey, Granitic Gneiss	3.0
3,068.4	6.0	60/0.3												
3,065.9	8.5	60/0.2												
3,060.9	13.5	60/0.1											CRYSTALLINE ROCK: White, Brown and Grey, Granitic Gneiss	12.0
3,055.9	18.5	60/0.1												
3,051.4	23.0	60/0.1												23.1

Boring Terminated at Elevation 3,051.3 ft

PROJECT NO. 34499.1.1	ID. R-2710	COUNTY Watauga	GEOLOGIST T.Wells/P.Weaver	
SITE DESCRIPTION NC 194 Site 5				GROUND WTR (ft)
BORING NO. 188+00	STATION 188+00	OFFSET 3ft RT	ALIGNMENT -L-	0 HR. 15.1
COLLAR ELEV. 3,069.9 ft	TOTAL DEPTH 24.4 ft	NORTHING 900,319	EASTING 1,174,528	24 HR. 16.9
DRILL MACHINE B-57	DRILL METHOD Wash Rotary	HAMMER TYPE 140 lb. Manual		
START DATE 08/29/07	COMP. DATE 08/30/07	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 11.5 ft	

ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)
		0.5ft	0.5ft	0.5ft	0	25	50	75	100					
3070														
3,068.9	1.0	13	7	11									ROADWAY EMBANKMENT FILL: Very Stiff, Grey and Tan, Fine to Coarse Sandy SILT with Little Gravel	0.0
3,066.4	3.5	7	15	39						SS-13			RESIDUAL: Very Dense, Tan and Grey, Rock Fragments and Silty, Fine to Coarse SAND	3.0
3,063.9	6.0	17	60/0.3										WEATHERED ROCK: White, Tan and Grey, Granitic Gneiss	6.5
3,061.4	8.5	100/0.5												
3,056.4	13.5	60/0.1											CRYSTALLINE ROCK: White and Grey, Granitic Gneiss	11.5
3,051.4	18.5	60/0.1												
3,046.4	23.5	60/0.1												
3,045.6	24.3	60/0.1												24.4

Boring Terminated at Elevation 3,045.5 ft



NCDOT GEOTECHNICAL ENGINEERING UNIT BORELOG REPORT

PROJECT NO. 34499.1.1		ID. R-2710		COUNTY Watauga		GEOLOGIST T.Wells/P.Weaver								
SITE DESCRIPTION NC 194 Site 5							GROUND WTR (ft)							
BORING NO. 188+50		STATION 188+50		OFFSET 5ft RT		ALIGNMENT -L-								
COLLAR ELEV. 3,066.8 ft		TOTAL DEPTH 20.7 ft		NORTHING 900,340		EASTING 1,174,424								
DRILL MACHINE B-57		DRILL METHOD Wash Rotary				HAMMER TYPE 140 lb. Manual								
START DATE 08/30/07		COMP. DATE 08/31/07		SURFACE WATER DEPTH N/A		DEPTH TO ROCK 19.5 ft								
ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
		0.5ft	0.5ft	0.5ft	0	25	50	75	100					
3070														
3,065.8	1.0												3,066.8	0.0
3,063.3	3.5	36	21	14									3,064.3	2.5
3,060.8	6.0	26	28	37									3,061.3	5.5
3,058.3	8.5	60/0.3												
3,053.3	13.5	60/0.2												
3,048.3	18.5	60/0.3												
3,046.1	20.7	100/0.4											3,047.3	19.5
		60/0.0											3,046.1	20.7
													CRISTALLINE ROCK: Granitic Gneiss	
													Boring Terminated at Elevation 3,046.1 ft	

NCDOT BORE SINGLE 071-07-036.GPJ NC_DOT.GDT 10/18/07

State Project No. 34499.1.1
TIP No. R-2710 F.A. No. STP-194(4)
NC 194 from Banner Elk in Avery County to Valle Crucis in Watauga County
Site 5: Two Retaining Walls from -L- Stations 185+00 to 189+00
Watauga County, North Carolina
SUMMARY OF LABORATORY TEST DATA

Boring Number	Sample Depth (ft.)	Sample No.*	Natural Moisture Content (%)	AASHTO Class (Group Index)	N-Value (blows/ft.)	Atterberg Limits			Gradation Results							
						L.L.	P.L.	P.I.	Pass #10 Sieve	Pass #40 Sieve	Pass #200 Sieve	Retained #270 Sieve	Coarse Sand (%)	Fine Sand (%)	Silt (%)	Clay (%)
185+50	1.0-2.5	SS-11	16.5	A-4 (0)	11	25	21	4	90	69	51	53	30	18	28	24
187+50	1.0-2.5	SS-12	22.5	A-4 (2)	8	33	23	10	89	70	51	53	29	18	42	11
188+00	3.5-5.0	SS-13	-	A-1-a (0)	54	25	NP	NP	49	18	9	92	71	12	13	4

* SS = Split-Barrel Sample (ASTM-D-1586)

** G = Grab Sample

***ST=Shelby Tube (Undisturbed) Sample

NP -- Non Plastic NA-- Non Applicable

TRIGON ENGINEERING CONSULTANTS, INC.

GREENSBORO, NORTH CAROLINA

Trigon Job Number: 071-07-036

Page: 1 of 1

SITE PHOTOGRAPHS
State Project No. 34499.1.1 TIP No. R-2710
NC 194 from Banner Elk to Valle Crucis
Site 5: Two Retaining Walls from -L- Sta. 185+00 to 189+00
Watauga County, North Carolina
Page 1 of 1



Photograph 1 – View Along Retaining Wall 1, Site 5 Looking Upstation



Photograph 2 – View Along Retaining Wall 2, Site 5 Looking Upstation

R-2710

ID:

C202339

PROJECT:

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

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-2710	1	12
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
34499.1.1	STP - 194(4)	P.E.	
34499.2.2	STP - 194(4)	RW	
34499.3.ST	STM - 194(13)	CONST.	

STRUCTURE
SUBSURFACE INVESTIGATION

STATE PROJECT 34499.1.1 I.D. NO. R-2710
 F.A. PROJECT STP-194(4)
 COUNTY WATAUGA
 PROJECT DESCRIPTION NC 194 FROM BANNER
ELK IN AVERY COUNTY TO VALLE CRUCIS IN
WATAUGA COUNTY
 SITE DESCRIPTION SITE 4: ONE RETAINING WALL
FROM -L- STATIONS 174+00 TO 179+00

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 (ON-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.

CONTENTS:

- 1) NCDOT LEGEND SHEET(SHEET 2)
- 2) SITE VICINITY MAP (DRAWING No. 1, SHEET 3)
- 3) BORING IDENTIFICATION DIAGRAM (DRAWING No. 2, SHEET 4)
- 4) SUBSURFACE PROFILE (DRAWING No. 3, SHEET 5)
- 5) FINAL BORING LOGS (SHEETS 6-10)
- 6) SUMMARY OF SOIL LABORATORY TEST DATA (SHEET 11)
- 7) SITE PHOTOGRAPHS (SHEET 12)

INVESTIGATED BY T WELLS PERSONNEL D KITCHEN
 CHECKED BY J VINSON A HAYES
 SUBMITTED BY P WEAVER T WELLS
 DATE 9/12/07 R TOOTHMAN
B DUNCAN

DRAWN BY: DRK

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.

10/19/07
 SEAL
 1500
 GEOLOGIST
 PAUL M. WEAVER
 Signature: Paul M. Weaver

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

ID	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
R-2710	34499.1.1	2	12

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION	GRADATION	ROCK DESCRIPTION	TERMS AND DEFINITIONS																																																																																																																																																																																																																																																																																																																										
<p>SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED OR WEATHERED EARTH MATERIALS WHICH CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND WHICH YIELDS LESS THAN 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM AND BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE:</p> <p style="text-align: center;"><i>VERY STIFF, GRAY SILTY CLAY, MOST WITH INTERBEDDED FINE SAND LENS, LIGHT PLASTIC, A-7-6</i></p>	<p>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)</p> <p>POORLY GRADED: INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES.</p> <p>ANGULARITY OF GRAINS</p> <p>THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS ARE DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.</p>	<p>HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WHEN TESTED, WOULD YIELD SPT REFUSAL. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK.</p> <p>ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:</p>	<p>ALLUVIUM (ALLUV.) - SOILS WHICH HAVE BEEN TRANSPORTED BY WATER.</p> <p>AQUIFER - A WATER BEARING FORMATION OR STRATA.</p> <p>ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.</p> <p>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.</p> <p>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.</p> <p>CALCAREOUS (CALC.) - SOILS WHICH CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.</p> <p>COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.</p> <p>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.</p> <p>DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.</p> <p>DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.</p> <p>DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.</p> <p>FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.</p> <p>FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.</p> <p>FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLOGGED FROM PARENT MATERIAL.</p> <p>FLOOD PLAIN (F.P.) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.</p> <p>FORMATION (FM) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.</p> <p>JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.</p> <p>LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.</p> <p>LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.</p> <p>MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.</p> <p>PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.</p> <p>RESIDUAL SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.</p> <p>ROCK QUALITY DESIGNATION (R.Q.D.) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.</p> <p>SAPROLITE (SAP.) - RESIDUAL SOIL WHICH RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.</p> <p>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.</p> <p>SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.</p> <p>STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR B.P.F.) OF A 148 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS LESS THAN 0.1 FOOT PENETRATION WITH 60 BLOWS.</p> <p>STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.</p> <p>STRATA ROCK QUALITY DESIGNATION (S.R.Q.D.) - A MEASURE OF ROCK QUALITY DESCRIBED BY: TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.</p> <p>TOPSOIL (T.S.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.</p>																																																																																																																																																																																																																																																																																																																										
<p>SOIL LEGEND AND AASHTO CLASSIFICATION</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th rowspan="2">GENERAL CLASS.</th> <th colspan="7">GRANULAR MATERIALS (100% PASSING #200)</th> <th colspan="7">SILT-CLAY MATERIALS (100% PASSING #200)</th> <th colspan="2">ORGANIC MATERIALS</th> </tr> <tr> <th>A-1</th> <th>A-3</th> <th colspan="2">A-2</th> <th>A-4</th> <th>A-5</th> <th>A-6</th> <th>A-7</th> <th>A-1, A-2</th> <th>A-3</th> <th>A-4, A-5</th> <th>A-6, A-7</th> <th></th> <th></th> </tr> <tr> <td>GROUP CLASS.</td> <td>A-1-a</td> <td>A-1-b</td> <td>A-2-4</td> <td>A-2-5</td> <td>A-2-6</td> <td>A-2-7</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>SYMBOL</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>% PASSING</td> <td>50</td> <td>30</td> <td>10</td> <td>10</td> <td>10</td> <td>10</td> <td>10</td> <td>10</td> <td>10</td> <td>10</td> <td>10</td> <td>10</td> <td>10</td> <td>10</td> </tr> <tr> <td>LIQUID LIMIT</td> <td>6</td> <td>10</td> <td>10</td> <td>10</td> <td>10</td> <td>10</td> <td>10</td> <td>10</td> <td>10</td> <td>10</td> <td>10</td> <td>10</td> <td>10</td> <td>10</td> </tr> <tr> <td>PLASTIC INDEX</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>USUAL TYPES OF MAJOR MATERIALS</td> <td>STONE FRAGS. GRAVEL AND SAND</td> <td>FINE SAND</td> <td colspan="2">SILTY OR CLAYEY GRAVEL AND SAND</td> <td colspan="2">SILTY SOILS</td> <td colspan="2">CLAYEY SOILS</td> <td colspan="2">SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER</td> <td colspan="2">HIGHLY ORGANIC SOILS</td> <td colspan="2">MUCK, PEAT</td> </tr> <tr> <td>GENERATING AS A SUBGRADE</td> <td colspan="3">EXCELLENT TO GOOD</td> <td colspan="3">FAIR TO POOR</td> <td>FAIR TO POOR</td> <td>POOR</td> <td colspan="2">UNSATURATED</td> <td colspan="4"></td> </tr> </table> <p style="text-align: center;">P.I. OF A-7-5 ≤ L.L. - 30 + P.I. OF A-7-6 ≥ L.L. - 30</p>	GENERAL CLASS.	GRANULAR MATERIALS (100% PASSING #200)							SILT-CLAY MATERIALS (100% PASSING #200)							ORGANIC MATERIALS		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			GROUP CLASS.	A-1-a	A-1-b	A-2-4	A-2-5	A-2-6	A-2-7									SYMBOL															% PASSING	50	30	10	10	10	10	10	10	10	10	10	10	10	10	LIQUID LIMIT	6	10	10	10	10	10	10	10	10	10	10	10	10	10	PLASTIC INDEX	0	0	0	0	0	0	0	0	0	0	0	0	0	0	USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS. GRAVEL AND SAND	FINE SAND	SILTY OR CLAYEY GRAVEL AND SAND		SILTY SOILS		CLAYEY SOILS		SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS		MUCK, PEAT		GENERATING AS A SUBGRADE	EXCELLENT TO GOOD			FAIR TO POOR			FAIR TO POOR	POOR	UNSATURATED						<p>MINERALOGICAL COMPOSITION</p> <p>MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.</p> <p>COMPRESSIBILITY</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>SLIGHTLY COMPRESSIBLE</td> <td>LIQUID LIMIT LESS THAN 30</td> </tr> <tr> <td>MODERATELY COMPRESSIBLE</td> <td>LIQUID LIMIT 31-50</td> </tr> <tr> <td>HIGHLY COMPRESSIBLE</td> <td>LIQUID LIMIT GREATER THAN 50</td> </tr> </table> <p>PERCENTAGE OF MATERIAL</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>ORGANIC MATERIAL</th> <th>GRANULAR SOILS</th> <th>SILT-CLAY SOILS</th> <th>OTHER MATERIAL</th> </tr> <tr> <td>TRACE OF ORGANIC MATTER</td> <td>2 - 3%</td> <td>3 - 5%</td> <td>TRACE</td> </tr> <tr> <td>LITTLE ORGANIC MATTER</td> <td>3 - 5%</td> <td>5 - 12%</td> <td>LITTLE</td> </tr> <tr> <td>MODERATELY ORGANIC</td> <td>5 - 10%</td> <td>12 - 20%</td> <td>SOME</td> </tr> <tr> <td>HIGHLY ORGANIC</td> <td>>10%</td> <td>>20%</td> <td>HIGHLY</td> </tr> <tr> <td></td> <td></td> <td></td> <td>25% AND ABOVE</td> </tr> </table> <p>GROUND WATER</p> <p> WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING.</p> <p> STATIC WATER LEVEL AFTER 24 HOURS.</p> <p> PERCHED WATER, SATURATED ZONE OR WATER BEARING STRATA</p> <p> SPRING OR SEEPAGE</p>	SLIGHTLY COMPRESSIBLE	LIQUID LIMIT LESS THAN 30	MODERATELY COMPRESSIBLE	LIQUID LIMIT 31-50	HIGHLY COMPRESSIBLE	LIQUID LIMIT GREATER THAN 50	ORGANIC MATERIAL	GRANULAR SOILS	SILT-CLAY SOILS	OTHER MATERIAL	TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%	TRACE	LITTLE ORGANIC MATTER	3 - 5%	5 - 12%	LITTLE	MODERATELY ORGANIC	5 - 10%	12 - 20%	SOME	HIGHLY ORGANIC	>10%	>20%	HIGHLY				25% AND ABOVE	<p>WEATHERED ROCK (WR)</p> <p>NON-COASTAL PLAIN MATERIAL THAT YIELDS SPT N VALUES > 100 BLOWS PER FOOT.</p> <p>CRYSTALLINE ROCK (CR)</p> <p>FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.</p> <p>NON-CRYSTALLINE ROCK (NCR)</p> <p>FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.</p> <p>COASTAL PLAIN SEDIMENTARY ROCK (CP)</p> <p>COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.</p> <p>WEATHERING</p> <p>FRESH - ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER HAMMER IF CRYSTALLINE.</p> <p>VERY SLIGHT (V. SL.) - 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.</p> <p>SLIGHT (SL.) - 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.</p> <p>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.</p> <p>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. <i>IF TESTED, WOULD YIELD SPT REFUSAL.</i></p> <p>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. <i>IF TESTED, YIELDS SPT N VALUES > 100 B.P.F.</i></p> <p>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. <i>IF TESTED, YIELDS SPT N VALUES < 100 B.P.F.</i></p> <p>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.</p> <p>ROCK HARDNESS</p> <p>VERY HARD - CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.</p> <p>HARD - CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.</p> <p>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.</p> <p>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 PIECES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.</p> <p>SOFT - CAN BE GROOVED 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.</p> <p>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 FINGER NAIL.</p>	<p>CONSISTENCY OR DENSENESS</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>PRIMARY SOIL TYPE</th> <th>COMPACTNESS OR CONSISTENCY</th> <th>RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE)</th> <th>RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT²)</th> </tr> <tr> <td rowspan="3">GENERALLY GRANULAR MATERIAL (NON-COHESIVE)</td> <td>VERY LOOSE</td> <td>< 4</td> <td>< 0.25</td> </tr> <tr> <td>LOOSE</td> <td>4 TO 10</td> <td>0.25 TO 0.5</td> </tr> <tr> <td>MEDIUM DENSE</td> <td>10 TO 30</td> <td>0.5 TO 1</td> </tr> <tr> <td rowspan="3">GENERALLY SILT-CLAY MATERIAL (COHESIVE)</td> <td>DENSE</td> <td>30 TO 50</td> <td>1 TO 2</td> </tr> <tr> <td>VERY DENSE</td> <td>> 50</td> <td>2 TO 4</td> </tr> <tr> <td>VERY SOFT</td> <td>< 2</td> <td>> 4</td> </tr> <tr> <td rowspan="3">SOFT</td> <td>MEDIUM STIFF</td> <td>2 TO 4</td> <td>0.25 TO 0.5</td> </tr> <tr> <td>STIFF</td> <td>4 TO 8</td> <td>0.5 TO 1</td> </tr> <tr> <td>VERY STIFF</td> <td>8 TO 15</td> <td>1 TO 2</td> </tr> <tr> <td rowspan="2">HARD</td> <td></td> <td>15 TO 30</td> <td>2 TO 4</td> </tr> <tr> <td></td> <td>> 30</td> <td>> 4</td> </tr> </table> <p>TEXTURE OR GRAIN SIZE</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>U.S. STD. SIEVE SIZE OPENING (MM)</th> <th>4</th> <th>10</th> <th>40</th> <th>60</th> <th>200</th> <th>270</th> </tr> <tr> <td></td> <td>4.75</td> <td>2.0</td> <td>0.42</td> <td>0.25</td> <td>0.075</td> <td>0.053</td> </tr> <tr> <td>BOULDER (BLDR.)</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>COBBLE (COB.)</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>GRAVEL (GRV.)</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>COARSE SAND (CS, SO.)</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>FINE SAND (F, SO.)</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>SILT (SL.)</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>CLAY (CL.)</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>GRAIN SIZE</td> <td>305</td> <td>75</td> <td>2.0</td> <td>0.25</td> <td>0.05</td> <td>0.005</td> </tr> <tr> <td>SIZE</td> <td>12"</td> <td>3"</td> <td></td> <td></td> <td></td> <td></td> </tr> </table> <p>SOIL MOISTURE - CORRELATION OF TERMS</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>SOIL MOISTURE SCALE (ATTERBERG LIMITS)</th> <th>FIELD MOISTURE DESCRIPTION</th> <th>GUIDE FOR FIELD MOISTURE DESCRIPTION</th> </tr> <tr> <td>LL - LIQUID LIMIT</td> <td>- SATURATED - (SAT.)</td> <td>USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE</td> </tr> <tr> <td>PL - PLASTIC LIMIT</td> <td>- WET - (W)</td> <td>SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE</td> </tr> <tr> <td>OM - OPTIMUM MOISTURE</td> <td>- MOIST - (M)</td> <td>SOLID; AT OR NEAR OPTIMUM MOISTURE</td> </tr> <tr> <td>SL - SHRINKAGE LIMIT</td> <td>- DRY - (D)</td> <td>REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE</td> </tr> </table> <p>PLASTICITY</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>NONPLASTIC</th> <th>PLASTICITY INDEX (PI)</th> <th>DRY STRENGTH</th> </tr> <tr> <td>LOW PLASTICITY</td> <td>0-5</td> <td>VERY LOW</td> </tr> <tr> <td>MED. PLASTICITY</td> <td>6-15</td> <td>SLIGHT</td> </tr> <tr> <td>HIGH PLASTICITY</td> <td>16-25</td> <td>MEDIUM</td> </tr> <tr> <td></td> <td>26 OR MORE</td> <td>HIGH</td> </tr> </table> <p>COLOR</p> <p>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.</p>	PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT ²)	GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE	< 4	< 0.25	LOOSE	4 TO 10	0.25 TO 0.5	MEDIUM DENSE	10 TO 30	0.5 TO 1	GENERALLY SILT-CLAY MATERIAL (COHESIVE)	DENSE	30 TO 50	1 TO 2	VERY DENSE	> 50	2 TO 4	VERY SOFT	< 2	> 4	SOFT	MEDIUM STIFF	2 TO 4	0.25 TO 0.5	STIFF	4 TO 8	0.5 TO 1	VERY STIFF	8 TO 15	1 TO 2	HARD		15 TO 30	2 TO 4		> 30	> 4	U.S. STD. SIEVE SIZE OPENING (MM)	4	10	40	60	200	270		4.75	2.0	0.42	0.25	0.075	0.053	BOULDER (BLDR.)							COBBLE (COB.)							GRAVEL (GRV.)							COARSE SAND (CS, SO.)							FINE SAND (F, SO.)							SILT (SL.)							CLAY (CL.)							GRAIN SIZE	305	75	2.0	0.25	0.05	0.005	SIZE	12"	3"					SOIL MOISTURE SCALE (ATTERBERG LIMITS)	FIELD MOISTURE DESCRIPTION	GUIDE FOR FIELD MOISTURE DESCRIPTION	LL - LIQUID LIMIT	- SATURATED - (SAT.)	USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE	PL - PLASTIC LIMIT	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE	OM - OPTIMUM MOISTURE	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE	SL - SHRINKAGE LIMIT	- DRY - (D)	REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE	NONPLASTIC	PLASTICITY INDEX (PI)	DRY STRENGTH	LOW PLASTICITY	0-5	VERY LOW	MED. PLASTICITY	6-15	SLIGHT	HIGH PLASTICITY	16-25	MEDIUM		26 OR MORE	HIGH
GENERAL CLASS.		GRANULAR MATERIALS (100% PASSING #200)							SILT-CLAY MATERIALS (100% PASSING #200)							ORGANIC MATERIALS																																																																																																																																																																																																																																																																																																													
	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																																																																																																																																																																																																																																																																																																																	
GROUP CLASS.	A-1-a	A-1-b	A-2-4	A-2-5	A-2-6	A-2-7																																																																																																																																																																																																																																																																																																																							
SYMBOL																																																																																																																																																																																																																																																																																																																													
% PASSING	50	30	10	10	10	10	10	10	10	10	10	10	10	10																																																																																																																																																																																																																																																																																																															
LIQUID LIMIT	6	10	10	10	10	10	10	10	10	10	10	10	10	10																																																																																																																																																																																																																																																																																																															
PLASTIC INDEX	0	0	0	0	0	0	0	0	0	0	0	0	0	0																																																																																																																																																																																																																																																																																																															
USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS. GRAVEL AND SAND	FINE SAND	SILTY OR CLAYEY GRAVEL AND SAND		SILTY SOILS		CLAYEY SOILS		SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS		MUCK, PEAT																																																																																																																																																																																																																																																																																																																
GENERATING AS A SUBGRADE	EXCELLENT TO GOOD			FAIR TO POOR			FAIR TO POOR	POOR	UNSATURATED																																																																																																																																																																																																																																																																																																																				
SLIGHTLY COMPRESSIBLE	LIQUID LIMIT LESS THAN 30																																																																																																																																																																																																																																																																																																																												
MODERATELY COMPRESSIBLE	LIQUID LIMIT 31-50																																																																																																																																																																																																																																																																																																																												
HIGHLY COMPRESSIBLE	LIQUID LIMIT GREATER THAN 50																																																																																																																																																																																																																																																																																																																												
ORGANIC MATERIAL	GRANULAR SOILS	SILT-CLAY SOILS	OTHER MATERIAL																																																																																																																																																																																																																																																																																																																										
TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%	TRACE																																																																																																																																																																																																																																																																																																																										
LITTLE ORGANIC MATTER	3 - 5%	5 - 12%	LITTLE																																																																																																																																																																																																																																																																																																																										
MODERATELY ORGANIC	5 - 10%	12 - 20%	SOME																																																																																																																																																																																																																																																																																																																										
HIGHLY ORGANIC	>10%	>20%	HIGHLY																																																																																																																																																																																																																																																																																																																										
			25% AND ABOVE																																																																																																																																																																																																																																																																																																																										
PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT ²)																																																																																																																																																																																																																																																																																																																										
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE	< 4	< 0.25																																																																																																																																																																																																																																																																																																																										
	LOOSE	4 TO 10	0.25 TO 0.5																																																																																																																																																																																																																																																																																																																										
	MEDIUM DENSE	10 TO 30	0.5 TO 1																																																																																																																																																																																																																																																																																																																										
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	DENSE	30 TO 50	1 TO 2																																																																																																																																																																																																																																																																																																																										
	VERY DENSE	> 50	2 TO 4																																																																																																																																																																																																																																																																																																																										
	VERY SOFT	< 2	> 4																																																																																																																																																																																																																																																																																																																										
SOFT	MEDIUM STIFF	2 TO 4	0.25 TO 0.5																																																																																																																																																																																																																																																																																																																										
	STIFF	4 TO 8	0.5 TO 1																																																																																																																																																																																																																																																																																																																										
	VERY STIFF	8 TO 15	1 TO 2																																																																																																																																																																																																																																																																																																																										
HARD		15 TO 30	2 TO 4																																																																																																																																																																																																																																																																																																																										
		> 30	> 4																																																																																																																																																																																																																																																																																																																										
U.S. STD. SIEVE SIZE OPENING (MM)	4	10	40	60	200	270																																																																																																																																																																																																																																																																																																																							
	4.75	2.0	0.42	0.25	0.075	0.053																																																																																																																																																																																																																																																																																																																							
BOULDER (BLDR.)																																																																																																																																																																																																																																																																																																																													
COBBLE (COB.)																																																																																																																																																																																																																																																																																																																													
GRAVEL (GRV.)																																																																																																																																																																																																																																																																																																																													
COARSE SAND (CS, SO.)																																																																																																																																																																																																																																																																																																																													
FINE SAND (F, SO.)																																																																																																																																																																																																																																																																																																																													
SILT (SL.)																																																																																																																																																																																																																																																																																																																													
CLAY (CL.)																																																																																																																																																																																																																																																																																																																													
GRAIN SIZE	305	75	2.0	0.25	0.05	0.005																																																																																																																																																																																																																																																																																																																							
SIZE	12"	3"																																																																																																																																																																																																																																																																																																																											
SOIL MOISTURE SCALE (ATTERBERG LIMITS)	FIELD MOISTURE DESCRIPTION	GUIDE FOR FIELD MOISTURE DESCRIPTION																																																																																																																																																																																																																																																																																																																											
LL - LIQUID LIMIT	- SATURATED - (SAT.)	USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE																																																																																																																																																																																																																																																																																																																											
PL - PLASTIC LIMIT	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE																																																																																																																																																																																																																																																																																																																											
OM - OPTIMUM MOISTURE	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE																																																																																																																																																																																																																																																																																																																											
SL - SHRINKAGE LIMIT	- DRY - (D)	REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE																																																																																																																																																																																																																																																																																																																											
NONPLASTIC	PLASTICITY INDEX (PI)	DRY STRENGTH																																																																																																																																																																																																																																																																																																																											
LOW PLASTICITY	0-5	VERY LOW																																																																																																																																																																																																																																																																																																																											
MED. PLASTICITY	6-15	SLIGHT																																																																																																																																																																																																																																																																																																																											
HIGH PLASTICITY	16-25	MEDIUM																																																																																																																																																																																																																																																																																																																											
	26 OR MORE	HIGH																																																																																																																																																																																																																																																																																																																											
<p>MISCELLANEOUS SYMBOLS</p> <p> ROADWAY EMBANKMENT WITH SOIL DESCRIPTION</p> <p> SOIL SYMBOL</p> <p> ARTIFICIAL FILL OTHER THAN ROADWAY EMBANKMENTS</p> <p> INFERRED SOIL BOUNDARIES</p> <p> INFERRED ROCK LINE</p> <p> ALLUVIAL SOIL BOUNDARY</p> <p> DIP/DIP DIRECTION OF ROCK STRUCTURES</p> <p> SOUNDING ROD</p> <p> TEST BORING</p> <p> AUGER BORING</p> <p> CORE BORING</p> <p> MONITORING WELL</p> <p> PIEZOMETER INSTALLATION</p> <p> SLOPE INDICATOR INSTALLATION</p> <p> SPT N-VALUE</p> <p> SPT REFUSAL</p>	<p>ABBREVIATIONS</p> <p>AR - AUGER REFUSAL BT - BORING TERMINATED CL - CAVE IN CL - CLAY CPT - CONE PENETRATION TEST CSE - COARSE C.T. - CORING TERMINATED DMT - DILATOMETER TEST DPT - DYNAMIC PENETRATION TEST e - VOID RATIO F - FINE FOSS. - FOSSILIFEROUS FRAC. - FRACTURED</p> <p>FRAGS. - FRAGMENTS MED. - MEDIUM N/A - NOT APPLICABLE NM - NOT MEASURED SO. - SAND, SANDY SL. - SILT, SILTY SL. - SLIGHTLY TCR - TRICONE REFUSAL γ - UNIT WEIGHT γ_d - DRY UNIT WEIGHT W - MOISTURE CONTENT V - VERY VST - VANE SHEAR TEST</p>	<p>EQUIPMENT USED ON SUBJECT PROJECT</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>DRILL UNITS:</th> <th>ADVANCING TOOLS:</th> <th>HAMMER TYPE:</th> </tr> <tr> <td><input checked="" type="checkbox"/> MOBILE B-57</td> <td><input type="checkbox"/> CLAY BITS</td> <td><input type="checkbox"/> AUTOMATIC <input checked="" type="checkbox"/> MANUAL</td> </tr> <tr> <td><input type="checkbox"/> BK-51</td> <td><input checked="" type="checkbox"/> 6" CONTINUOUS FLIGHT AUGER</td> <td>CORE SIZE:</td> </tr> <tr> <td><input type="checkbox"/> CME-45</td> <td><input type="checkbox"/> 6" HOLLOW AUGERS</td> <td><input type="checkbox"/> 8</td> </tr> <tr> <td><input type="checkbox"/> CME-55</td> <td><input type="checkbox"/> HARD FACED FINGER BITS</td> <td><input checked="" type="checkbox"/> N-O</td> </tr> <tr> <td><input type="checkbox"/> PORTABLE HOIST</td> <td><input type="checkbox"/> TUNG-CARBIDE INSERTS</td> <td><input type="checkbox"/> H-O</td> </tr> <tr> <td><input type="checkbox"/> OTHER CME 850</td> <td><input type="checkbox"/> CASING w/ ADVANCER</td> <td>HAND TOOLS:</td> </tr> <tr> <td><input checked="" type="checkbox"/> OTHER ACKER MARK J1</td> <td><input type="checkbox"/> TRICONE - STEEL TEETH</td> <td><input type="checkbox"/> POST HOLE DIGGER</td> </tr> <tr> <td></td> <td><input checked="" type="checkbox"/> TRICONE 3/8" - TUNG-CARB.</td> <td><input type="checkbox"/> HAND AUGER</td> </tr> <tr> <td></td> <td><input checked="" type="checkbox"/> CORE BIT</td> <td><input type="checkbox"/> SOUNDING ROD</td> </tr> <tr> <td></td> <td><input type="checkbox"/> OTHER</td> <td><input type="checkbox"/> VANE SHEAR TEST</td> </tr> <tr> <td></td> <td></td> <td><input type="checkbox"/> OTHER</td> </tr> </table>	DRILL UNITS:	ADVANCING TOOLS:	HAMMER TYPE:	<input checked="" type="checkbox"/> MOBILE B-57	<input type="checkbox"/> CLAY BITS	<input type="checkbox"/> AUTOMATIC <input checked="" type="checkbox"/> MANUAL	<input type="checkbox"/> BK-51	<input checked="" type="checkbox"/> 6" CONTINUOUS FLIGHT AUGER	CORE SIZE:	<input type="checkbox"/> CME-45	<input type="checkbox"/> 6" HOLLOW AUGERS	<input type="checkbox"/> 8	<input type="checkbox"/> CME-55	<input type="checkbox"/> HARD FACED FINGER BITS	<input checked="" type="checkbox"/> N-O	<input type="checkbox"/> PORTABLE HOIST	<input type="checkbox"/> TUNG-CARBIDE INSERTS	<input type="checkbox"/> H-O	<input type="checkbox"/> OTHER CME 850	<input type="checkbox"/> CASING w/ ADVANCER	HAND TOOLS:	<input checked="" type="checkbox"/> OTHER ACKER MARK J1	<input type="checkbox"/> TRICONE - STEEL TEETH	<input type="checkbox"/> POST HOLE DIGGER		<input checked="" type="checkbox"/> TRICONE 3/8" - TUNG-CARB.	<input type="checkbox"/> HAND AUGER		<input checked="" type="checkbox"/> CORE BIT	<input type="checkbox"/> SOUNDING ROD		<input type="checkbox"/> OTHER	<input type="checkbox"/> VANE SHEAR TEST			<input type="checkbox"/> OTHER	<p>FRACTURE SPACING</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>TERM</th> <th>SPACING</th> <th>TERM</th> <th>THICKNESS</th> </tr> <tr> <td>VERY WIDE</td> <td>MORE THAN 10 FEET</td> <td>VERY THICKLY BEDDED</td> <td>> 4 FEET</td> </tr> <tr> <td>WIDE</td> <td>3 TO 10 FEET</td> <td>THICKLY BEDDED</td> <td>1.5 - 4 FEET</td> </tr> <tr> <td>MODERATELY CLOSE</td> <td>1 TO 3 FEET</td> <td>THINLY BEDDED</td> <td>0.16 - 1.5 FEET</td> </tr> <tr> <td>CLOSE</td> <td>0.16 TO 1 FEET</td> <td>VERY THINLY BEDDED</td> <td>0.03 - 0.16 FEET</td> </tr> <tr> <td>VERY CLOSE</td> <td>LESS THAN 0.16 FEET</td> <td>THICKLY LAMINATED</td> <td>0.008 - 0.03 FEET</td> </tr> <tr> <td></td> <td></td> <td>THINLY LAMINATED</td> <td>< 0.008 FEET</td> </tr> </table> <p>BEDDING</p> <p>FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.</p> <p>FRIABLE - RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.</p> <p>MODERATELY INDURATED - GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.</p> <p>INDURATED - GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.</p> <p>EXTREMELY INDURATED - SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.</p>	TERM	SPACING	TERM	THICKNESS	VERY WIDE	MORE THAN 10 FEET	VERY THICKLY BEDDED	> 4 FEET	WIDE	3 TO 10 FEET	THICKLY BEDDED	1.5 - 4 FEET	MODERATELY CLOSE	1 TO 3 FEET	THINLY BEDDED	0.16 - 1.5 FEET	CLOSE	0.16 TO 1 FEET	VERY THINLY BEDDED	0.03 - 0.16 FEET	VERY CLOSE	LESS THAN 0.16 FEET	THICKLY LAMINATED	0.008 - 0.03 FEET			THINLY LAMINATED	< 0.008 FEET																																																																																																																																																																																																																																																										
DRILL UNITS:	ADVANCING TOOLS:	HAMMER TYPE:																																																																																																																																																																																																																																																																																																																											
<input checked="" type="checkbox"/> MOBILE B-57	<input type="checkbox"/> CLAY BITS	<input type="checkbox"/> AUTOMATIC <input checked="" type="checkbox"/> MANUAL																																																																																																																																																																																																																																																																																																																											
<input type="checkbox"/> BK-51	<input checked="" type="checkbox"/> 6" CONTINUOUS FLIGHT AUGER	CORE SIZE:																																																																																																																																																																																																																																																																																																																											
<input type="checkbox"/> CME-45	<input type="checkbox"/> 6" HOLLOW AUGERS	<input type="checkbox"/> 8																																																																																																																																																																																																																																																																																																																											
<input type="checkbox"/> CME-55	<input type="checkbox"/> HARD FACED FINGER BITS	<input checked="" type="checkbox"/> N-O																																																																																																																																																																																																																																																																																																																											
<input type="checkbox"/> PORTABLE HOIST	<input type="checkbox"/> TUNG-CARBIDE INSERTS	<input type="checkbox"/> H-O																																																																																																																																																																																																																																																																																																																											
<input type="checkbox"/> OTHER CME 850	<input type="checkbox"/> CASING w/ ADVANCER	HAND TOOLS:																																																																																																																																																																																																																																																																																																																											
<input checked="" type="checkbox"/> OTHER ACKER MARK J1	<input type="checkbox"/> TRICONE - STEEL TEETH	<input type="checkbox"/> POST HOLE DIGGER																																																																																																																																																																																																																																																																																																																											
	<input checked="" type="checkbox"/> TRICONE 3/8" - TUNG-CARB.	<input type="checkbox"/> HAND AUGER																																																																																																																																																																																																																																																																																																																											
	<input checked="" type="checkbox"/> CORE BIT	<input type="checkbox"/> SOUNDING ROD																																																																																																																																																																																																																																																																																																																											
	<input type="checkbox"/> OTHER	<input type="checkbox"/> VANE SHEAR TEST																																																																																																																																																																																																																																																																																																																											
		<input type="checkbox"/> OTHER																																																																																																																																																																																																																																																																																																																											
TERM	SPACING	TERM	THICKNESS																																																																																																																																																																																																																																																																																																																										
VERY WIDE	MORE THAN 10 FEET	VERY THICKLY BEDDED	> 4 FEET																																																																																																																																																																																																																																																																																																																										
WIDE	3 TO 10 FEET	THICKLY BEDDED	1.5 - 4 FEET																																																																																																																																																																																																																																																																																																																										
MODERATELY CLOSE	1 TO 3 FEET	THINLY BEDDED	0.16 - 1.5 FEET																																																																																																																																																																																																																																																																																																																										
CLOSE	0.16 TO 1 FEET	VERY THINLY BEDDED	0.03 - 0.16 FEET																																																																																																																																																																																																																																																																																																																										
VERY CLOSE	LESS THAN 0.16 FEET	THICKLY LAMINATED	0.008 - 0.03 FEET																																																																																																																																																																																																																																																																																																																										
		THINLY LAMINATED	< 0.008 FEET																																																																																																																																																																																																																																																																																																																										
<p>NOTES:</p> <p>BENCH MARK: BM #1; 8" SPIKE IN BASE OF 10" BIRCH TREE - BL - STA. 34+33, 147' RT</p> <p style="text-align: right;">ELEVATION: 3905.36'</p>																																																																																																																																																																																																																																																																																																																													



Trigon Engineering Consultants, Inc.
Greensboro North Carolina

SCALE:
1" = 24,000'

DATE:
09/04/07

STATE PROJECT NO.
34499.1.1

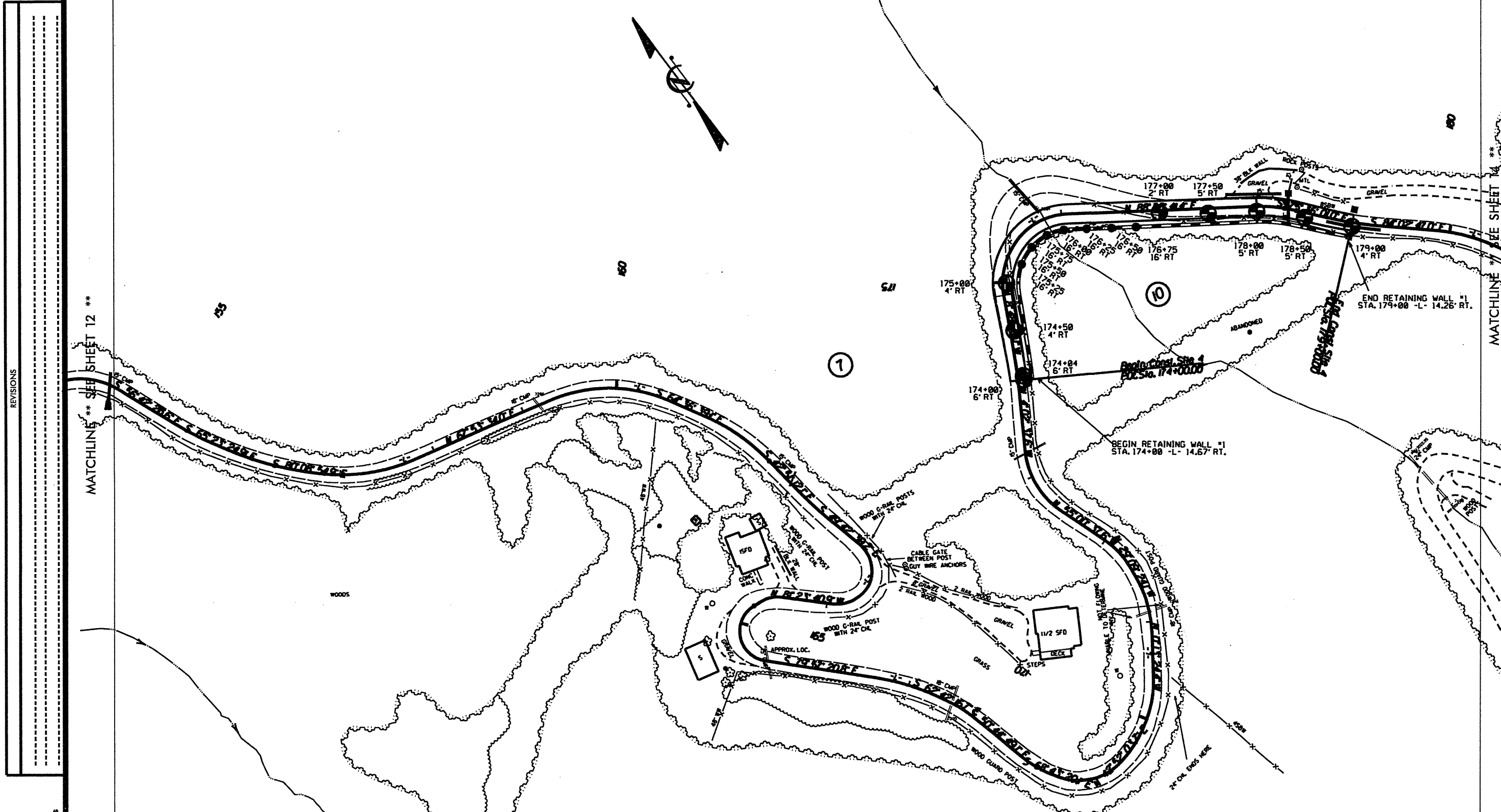
TIP NO.:
R-2710

SITE VICINITY MAP
NC 194 Retaining Walls at Sites 1, 4, and 5, Watauga County, North Carolina

USGS Valle Crucis Quadrangle

DRAWING NUMBER:
1

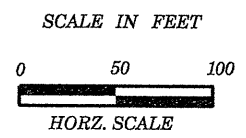
8/17/99



REVISIONS
MATCHLINE ** SEE SHEET 12 **

MATCHLINE ** SEE SHEET 14 **

NOTE: ● INDICATES LOCATION OF HAND-OPERATED PNEUMATIC HAMMER PROBE HOLE



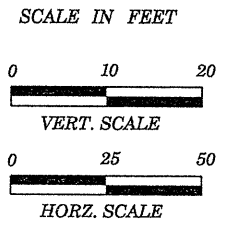
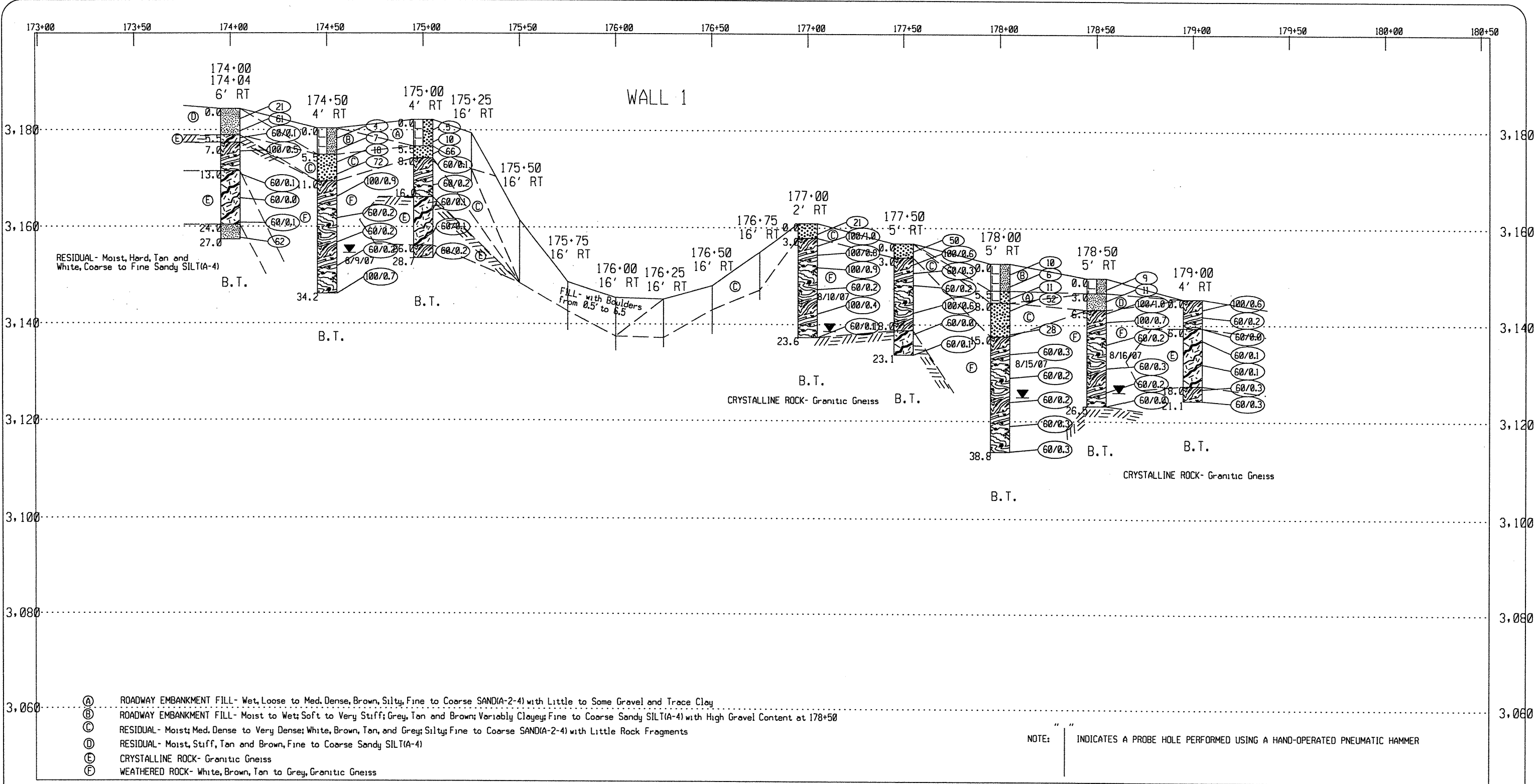
BORING IDENTIFICATION DIAGRAM

NC 194 SITE 4

Watauga County, North Carolina

Project No. 34499.1.1	TIP No. R-2710
Federal No. STP-194(4)	Vert. Scale N/A
Date 9/12/07	Horiz. Scale 1" = 100'
Drawn by DRK	Drawing No. 2

*****SYSTEMS*****
*****PRINTING*****
*****DATE*****



PROFILE RIGHT OF -L-	
NC 194 SITE 4	
Watauga County, North Carolina	
Project No. 34499.1.1	TIP No. R-2710
Federal No. STP-194(4)	Vert. Scale 1" = 20'
Date 9/12/07	Horiz. Scale 1" = 50'
Drawn by DRK	Drawing No. 3

PROJECT NO. 34499.1.1		ID. R-2710		COUNTY Watauga		GEOLOGIST T.Wells/P.Weaver									
SITE DESCRIPTION NC 194 Site 4							GROUND WTR (ft)								
BORING NO. 174+00		STATION 174+00		OFFSET 6ft RT		ALIGNMENT -L-									
COLLAR ELEV. 3,184.4 ft		TOTAL DEPTH 18.5 ft		NORTHING 900,113		EASTING 1,173,482									
DRILL MACHINE Acker ADII		DRILL METHOD HSA		HAMMER TYPE 140 lb. Manual											
START DATE 08/06/07		COMP. DATE 08/06/07		SURFACE WATER DEPTH N/A		DEPTH TO ROCK 5.5 ft									
ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
		0.5ft	0.5ft	0.5ft	0	25	50	75	100						
3185														3,184.4	0.0
3,183.4	1.0													3,178.9	5.5
3,180.9	3.5	14	12	9										3,177.4	7.0
3,178.4	6.0	33	40	21										3,171.4	13.0
3,175.9	8.5	60/0.1												3,165.9	18.5
3,170.9	13.5	100/0.5													
3,165.9	18.5	60/0.1													
		60/0.0													

NCDOT BORE SINGLE 071-07-036.GPJ NC_DOT.GDT 10/18/07

PROJECT NO. 34499.1.1		ID. R-2710		COUNTY Watauga		GEOLOGIST T.Wells/P.Weaver									
SITE DESCRIPTION NC 194 Site 4							GROUND WTR (ft)								
BORING NO. 174+04		STATION 174+04		OFFSET 6ft RT		ALIGNMENT -L-									
COLLAR ELEV. 3,184.2 ft		TOTAL DEPTH 27.0 ft		NORTHING 900,117		EASTING 1,173,482									
DRILL MACHINE Acker ADII		DRILL METHOD Wash Rotary		HAMMER TYPE 140 lb. Manual											
START DATE 08/06/07		COMP. DATE 08/08/07		SURFACE WATER DEPTH N/A		DEPTH TO ROCK 5.5 ft									
ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
		0.5ft	0.5ft	0.5ft	0	25	50	75	100						
3185														3,184.2	0.0
														3,178.7	5.5
														3,177.2	7.0
														3,171.2	13.0
														3,160.2	24.0
3,160.7	23.5													3,157.2	27.0
3,158.7	25.5	20	15	47											

NCDOT BORE SINGLE 071-07-036.GPJ NC_DOT.GDT 10/19/07

PROJECT NO. 34499.1.1	ID. R-2710	COUNTY Watauga	GEOLOGIST T.Wells/P.Weaver
SITE DESCRIPTION NC 194 Site 4			GROUND WTR (ft)
BORING NO. 174+50	STATION 174+50	OFFSET 4ft RT	ALIGNMENT -L-
COLLAR ELEV. 3,180.4 ft	TOTAL DEPTH 34.2 ft	NORTHING 900,162	EASTING 1,173,473
DRILL MACHINE Acker ADII	DRILL METHOD Wash Rotary	HAMMER TYPE 140 lb. Manual	
START DATE 08/08/07	COMP. DATE 08/08/07	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A

ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	L O G ELEV. (ft)	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
		0.5ft	0.5ft	0.5ft	0	25	50	75	100						
3185															
3,179.4	1.0	3	2	2						SS-8	21.3%	3,180.4	ROADWAY EMBANKMENT FILL: Soft to Medium Stiff, Brown, Clayey, Fine to Coarse Sandy SILT with Little Gravel	0.0	
3,176.9	3.5	3	3	4								3,174.9	RESIDUAL: Medium Dense to Very Dense, Tan and Grey, Silty, Fine to Coarse SAND with Little Rock Fragments	5.5	
3,174.4	6.0	3	6	12								3,169.4	WEATHERED ROCK: White, Brown and Grey, Granitic Gneiss	11.0	
3,171.9	8.5	13	40	32											
3,166.9	13.5	32	68/0.4												
3,161.9	18.5	60/0.2													
3,156.9	23.5	60/0.2													
3,151.9	28.5	60/0.2													
3,146.9	33.5	65	35/0.2												

NCDOT BORE SINGLE 071-07-036.GPJ NC_DOT.GDT 10/19/07

PROJECT NO. 34499.1.1	ID. R-2710	COUNTY Watauga	GEOLOGIST T.Wells/P.Weaver
SITE DESCRIPTION NC 194 Site 4			GROUND WTR (ft)
BORING NO. 175+00	STATION 175+00	OFFSET 4ft RT	ALIGNMENT -L-
COLLAR ELEV. 3,182.2 ft	TOTAL DEPTH 28.7 ft	NORTHING 900,211	EASTING 1,173,467
DRILL MACHINE Acker ADII	DRILL METHOD Wash Rotary	HAMMER TYPE 140 lb. Manual	
START DATE 08/09/07	COMP. DATE 08/09/07	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 16.0 ft

ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	L O G ELEV. (ft)	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
		0.5ft	0.5ft	0.5ft	0	25	50	75	100						
3185															
3,181.2	1.0	3	2	3						SS-9		3,182.2	ROADWAY EMBANKMENT FILL: Loose to Medium Dense, Brown, Silty, Fine to Coarse SAND with Some Gravel and Trace CLAY	0.0	
3,178.7	3.5	4	5	5								3,176.7	RESIDUAL: Very Dense, Tan and Grey, Silty, Fine to Coarse SAND	5.5	
3,176.2	6.0	14	33	33								3,174.2	WEATHERED ROCK: Grey, Granitic Gneiss	8.0	
3,173.7	8.5	60/0.1													
3,168.7	13.5	60/0.2													
3,163.7	18.5	60/0.1													
3,158.7	23.5	60/0.1													
3,153.7	28.5	60/0.2													

NCDOT BORE SINGLE 071-07-036.GPJ NC_DOT.GDT 10/19/07

PROJECT NO. 34499.1.1		ID. R-2710		COUNTY Watauga		GEOLOGIST T.Wells/P.Weaver	
SITE DESCRIPTION NC 194 Site 4							GROUND WTR (ft)
BORING NO. 177+00		STATION 177+00		OFFSET 2ft RT		ALIGNMENT -L-	
COLLAR ELEV. 3,160.9 ft		TOTAL DEPTH 23.6 ft		NORTHING 900,279		EASTING 1,173,625	
DRILL MACHINE Acker ADII		DRILL METHOD Wash Rotary		HAMMER TYPE 140 lb. Manual			
START DATE 08/09/07		COMP. DATE 08/10/07		SURFACE WATER DEPTH N/A		DEPTH TO ROCK N/A	

ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
		0.5ft	0.5ft	0.5ft	0	25	50	75	100						
3165															
3,159.9	1.0	10	12	9									RESIDUAL: Medium Dense, White and Brown, Silty, Fine to Coarse SAND with Little Rock Fragments	3.0	
3,157.4	3.5	32	46	54									WEATHERED ROCK: Grey and Tan, Granitic Gneiss		
3,154.9	6.0	75	25/0.3												
3,152.4	8.5	46	54/0.4												
3,147.4	13.5	60/0.2													
3,142.4	18.5	100/0.4													
3,137.4	23.5	60/0.1												23.6	

Boring Terminated at Elevation 3,137.3 ft

NCDOT BORE SINGLE 071-07-036.GPJ NC_DOT_GDT 10/18/07

PROJECT NO. 34499.1.1		ID. R-2710		COUNTY Watauga		GEOLOGIST T.Wells/P.Weaver	
SITE DESCRIPTION NC 194 Site 4							GROUND WTR (ft)
BORING NO. 177+50		STATION 177+50		OFFSET 5ft RT		ALIGNMENT -L-	
COLLAR ELEV. 3,156.8 ft		TOTAL DEPTH 23.1 ft		NORTHING 900,276		EASTING 1,173,675	
DRILL MACHINE Acker ADII		DRILL METHOD Wash Rotary		HAMMER TYPE 140 lb. Manual			
START DATE 08/10/07		COMP. DATE 08/14/07		SURFACE WATER DEPTH N/A		DEPTH TO ROCK 18.0 ft	

ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
		0.5ft	0.5ft	0.5ft	0	25	50	75	100						
3160															
3,155.8	1.0	13	27	23									RESIDUAL: Dense, Tan and Grey, Silty, Fine to Coarse SAND with Little Rock Fragments	3.0	
3,153.3	3.5	22	75	25/0.1									WEATHERED ROCK: Grey and Tan, Granitic Gneiss		
3,150.8	6.0	60/0.3													
3,148.3	8.5	60/0.2													
3,143.3	13.5	19	56	44/0.1											
3,138.3	18.5	60/0.0											CRYSTALLINE ROCK: Granitic Gneiss	18.0	
3,133.8	23.0	60/0.1												23.1	

Boring Terminated at Elevation 3,133.7 ft

NCDOT BORE SINGLE 071-07-036.GPJ NC_DOT_GDT 10/18/07

PROJECT NO. 34499.1.1	ID. R-2710	COUNTY Watauga	GEOLOGIST T.Wells/P.Weaver
SITE DESCRIPTION NC 194 Site 4			GROUND WTR (ft)
BORING NO. 178+00	STATION 178+00	OFFSET 5ft RT	ALIGNMENT -L-
COLLAR ELEV. 3,152.6 ft	TOTAL DEPTH 38.8 ft	NORTHING 900,277	EASTING 1,173,725
DRILL MACHINE Acker ADII	DRILL METHOD Wash Rotary	HAMMER TYPE 140 lb. Manual	
START DATE 08/14/07	COMP. DATE 08/14/07	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A

ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)
		0.5ft	0.5ft	0.5ft	0	25	50	75	100				
3155													
3,151.6	1.0	12	6	4								ROADWAY EMBANKMENT FILL: Stiff to Medium Stiff; Grey, Tan and Brown; Fine to Coarse Sandy SILT	0.0
3,149.1	3.5	3	3	3									
3,146.6	6.0	3	4	7								ROADWAY EMBANKMENT FILL: Medium Dense, Orangish Brown, Silty, Fine to Coarse SAND with Little Gravel	5.5
3,144.1	8.5	22	26	26								RESIDUAL: Very Dense to Medium Dense, Brown and Grey, Silty, Fine to Coarse SAND with Little Rock Fragments	8.0
3,139.1	13.5	19	14	14								WEATHERED ROCK: Tan and Grey, Granitic Gneiss	15.0
3,134.1	18.5	60/0.3											
3,129.1	23.5	60/0.2											
3,124.1	28.5	60/0.2											
3,119.1	33.5	60/0.3											
3,114.1	38.5	60/0.3											

NCDOT BORE SINGLE 071-07-036.GPJ NC_DOT.GDT 10/19/07

PROJECT NO. 34499.1.1	ID. R-2710	COUNTY Watauga	GEOLOGIST T.Wells/P.Weaver
SITE DESCRIPTION NC 194 Site 4			GROUND WTR (ft)
BORING NO. 178+50	STATION 178+50	OFFSET 5ft RT	ALIGNMENT -L-
COLLAR ELEV. 3,149.6 ft	TOTAL DEPTH 26.5 ft	NORTHING 900,270	EASTING 1,173,774
DRILL MACHINE Acker ADII	DRILL METHOD Wash Rotary	HAMMER TYPE 140 lb. Manual	
START DATE 08/14/07	COMP. DATE 08/15/07	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A

ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)
		0.5ft	0.5ft	0.5ft	0	25	50	75	100				
3150													
3,148.6	1.0	3	4	5								ROADWAY EMBANKMENT FILL: Stiff, Brown, Clayey, Fine to Coarse Sandy SILT with High Gravel Content	0.0
3,146.1	3.5	3	5	6								RESIDUAL: Stiff, Tan and Brown, Fine to Coarse Sandy SILT	3.0
3,143.6	6.0	14	26	74								WEATHERED ROCK: White, Tan to Brown and Grey, Granitic Gneiss	6.5
3,141.1	8.5	45	55/0.2										
3,136.1	13.5	60/0.2											
3,131.1	18.5	60/0.3											
3,126.1	23.5	60/0.2											
3,123.1	26.5	60/0.0											

NCDOT BORE SINGLE 071-07-036.GPJ NC_DOT.GDT 10/19/07

PROJECT NO. 34499.1.1		ID. R-2710		COUNTY Watauga		GEOLOGIST T.Wells/P.Weaver								
SITE DESCRIPTION NC 194 Site 4						GROUND WTR (ft)								
BORING NO. 179+00		STATION 179+00		OFFSET 4ft RT		ALIGNMENT -L-								
COLLAR ELEV. 3,145.4 ft		TOTAL DEPTH 21.1 ft		NORTHING 900,259		EASTING 1,173,822								
DRILL MACHINE Acker ADII		DRILL METHOD Wash Rotary		HAMMER TYPE 140 lb. Manual										
START DATE 08/15/07		COMP. DATE 08/15/07		SURFACE WATER DEPTH N/A		DEPTH TO ROCK 6.0 ft								
ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
		0.5ft	0.5ft	0.5ft	0	25	50	75	100					
3150														
3,144.4	1.0	21	60	40/0.1									WEATHERED ROCK: Brown and Grey, Granitic Gneiss	0.0
3,141.9	3.5	60/0.2												
3,139.4	6.0	60/0.0											CRYSTALLINE ROCK: Granitic Gneiss	6.0
3,136.9	8.5	60/0.1												
3,131.9	13.5	60/0.1												
3,126.9	18.5	60/0.3											WEATHERED ROCK: Tan and Brown, Granitic Gneiss	18.0
3,124.6	20.8	60/0.3											Boring Terminated at Elevation 3,124.3 ft	21.1

NC 194 Retaining Walls Investigation
 NCDOT Project No. 34499.1.1
 NCDOT TIP No. R-2710
 Trigon Project No. 071-07-036

LOCATIONS FOR HAND DRILLED BORINGS AT SITE 4

Site	Station	Offset	Elev.	Northing	Easting	Depth of Overburden	Depth to Boulder	Boulder Thickness	Depth to Weathered Rock	Termination Depth (ft.)	**Notes
4	175+25	16' RT	3179.39	900229.34	1173482.93	10'	7.5'	6"		10	no rock
4	175+50	15' RT	3161.54	900246.08	1173493.71	10'	4.5/7'	6"/6"		10	no rock/ bouldery fill
4	175+75	16' RT	3148.66	900257.63	1173509.56	0'	0'	4'	6'	10	6-10' weathered rock
4	176+00	16' RT	3145.53	900262.61	1173527.08	1.5'	1.5'	6.5'	8'	10	large boulder then weathered rock
4	176+25	16' RT	3145.19	900263.24	1173550.57	8'			8'	10	soft weathered at 8'
4	176+50	16' RT	3147.98	900263.69	1173575.71	5'			5'	10	weathered rock 5-10' (no seams)
4	176+75	16' RT	3154.86	900264.14	1173600.85	7.75'			7.75'	10	hard weathered rock after 8'

State Project No. 34499.1.1
TIP No. R-2710 F.A. No. STP-194(4)
NC 194 from Banner Elk in Avery County to Valle Crucis in Watauga County
Site 4: One Retaining Wall from -L- Stations 174+00 to 179+00
Watauga County, North Carolina
SUMMARY OF LABORATORY TEST DATA

Boring Number	Sample Depth (ft.)	Sample No.*	Natural Moisture Content (%)	AASHTO Class (Group Index)	N-Value (blows/ft.)	Atterberg Limits			Gradation Results							
						L.L.	P.L.	P.I.	Pass #10 Sieve	Pass #40 Sieve	Pass #200 Sieve	Retained #270 Sieve	Coarse Sand (%)	Fine Sand (%)	Silt (%)	Clay (%)
174+00	1.0-2.5	SS-7	14.0	A-4 (0)	21	22	21	1	96	73	47	60	31	27	27	15
174+50	1.0-2.5	SS-8	21.3	A-4 (0)	4	25	17	8	82	56	43	59	38	12	30	20
175+00	1.0-2.5	SS-9	-	A-2-4 (0)	5	32	26	6	70	47	35	67	40	14	38	8
178+50	1.0-2.5	SS-10	18.1	A-4 (0)	9	27	18	9	69	53	40	63	29	19	37	15

* SS = Split-Barrel Sample (ASTM-D-1586)
 ** G = Grab Sample
 ***ST=Shelby Tube (Undisturbed) Sample
 NP -- Non Plastic NA-- Non Applicable

TRIGON ENGINEERING CONSULTANTS, INC.
GREENSBORO, NORTH CAROLINA
Trigon Job Number: 071-07-036
Page: 1 of 1

SITE PHOTOGRAPHS
State Project No. 34499.1.1 TIP No. R-2710
NC 194 from Banner Elk to Valle Crucis
Site 4: One Retaining Wall from -L- Sta. 174+00 to 179+00
Watauga County, North Carolina
Page 1 of 1



Photograph 1 – View Along Retaining Wall at Site 4 Looking Upstation



Photograph 2 – View of Rock Outcrop at Sta. 178+50 Left of Existing Roadway

ID: R-2710
 PROJECT: C202339

STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

GEOTECHNICAL ENGINEERING UNIT

STRUCTURE SUBSURFACE INVESTIGATION

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-2710	1	14
STATE PROJ. NO.	F.A. PROJ. NO.	DESCRIPTION	
34499.1.1	STP - 194(4)	P.E.	
34499.2.2	STP - 194(4)	RW	
34499.3.ST1	STM - 194(13)	CONST.	

STATE PROJECT 34499.1.1 I.D. NO. R-2710
 F.A. PROJECT STP-194(4)
 COUNTY WATAUGA
 PROJECT DESCRIPTION NC 194 FROM BANNER
ELK IN AVERY COUNTY TO VALLE CRUCIS IN
WATAUGA COUNTY
 SITE DESCRIPTION SITE 1: THREE RETAINING WALLS
FROM -L- STATIONS 40+50 TO 48+50

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 (ON-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.

CONTENTS:

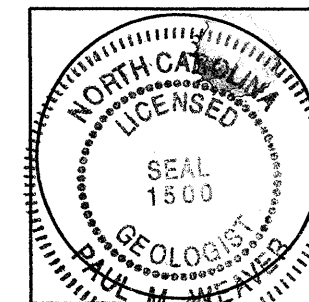
- 1) NCDOT LEGEND SHEET(SHEET 2)
- 2) SITE VICINITY MAP (DRAWING No. 1, SHEET 3)
- 3) BORING IDENTIFICATION DIAGRAM (DRAWING No. 2, SHEET 4)
- 4) SUBSURFACE PROFILE (DRAWING Nos. 3-4, SHEETS 5-6)
- 5) FINAL BORING LOGS, CORING LOGS, AND CORE PHOTOGRAPHS (SHEETS 7-12)
- 6) SUMMARY OF SOIL LABORATORY TEST DATA (SHEET 13)
- 7) SITE PHOTOGRAPHS (SHEET 14)

INVESTIGATED BY T WELLS PERSONNEL D KITCHEN
 CHECKED BY J VINSON A HAYES
 SUBMITTED BY P WEAVER T WELLS
 DATE 9/12/07 R TOOTHMAN
B DUNCAN

DRAWN BY: DRK

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.



10/14/07

SIGNATURE Paul M. Weaver

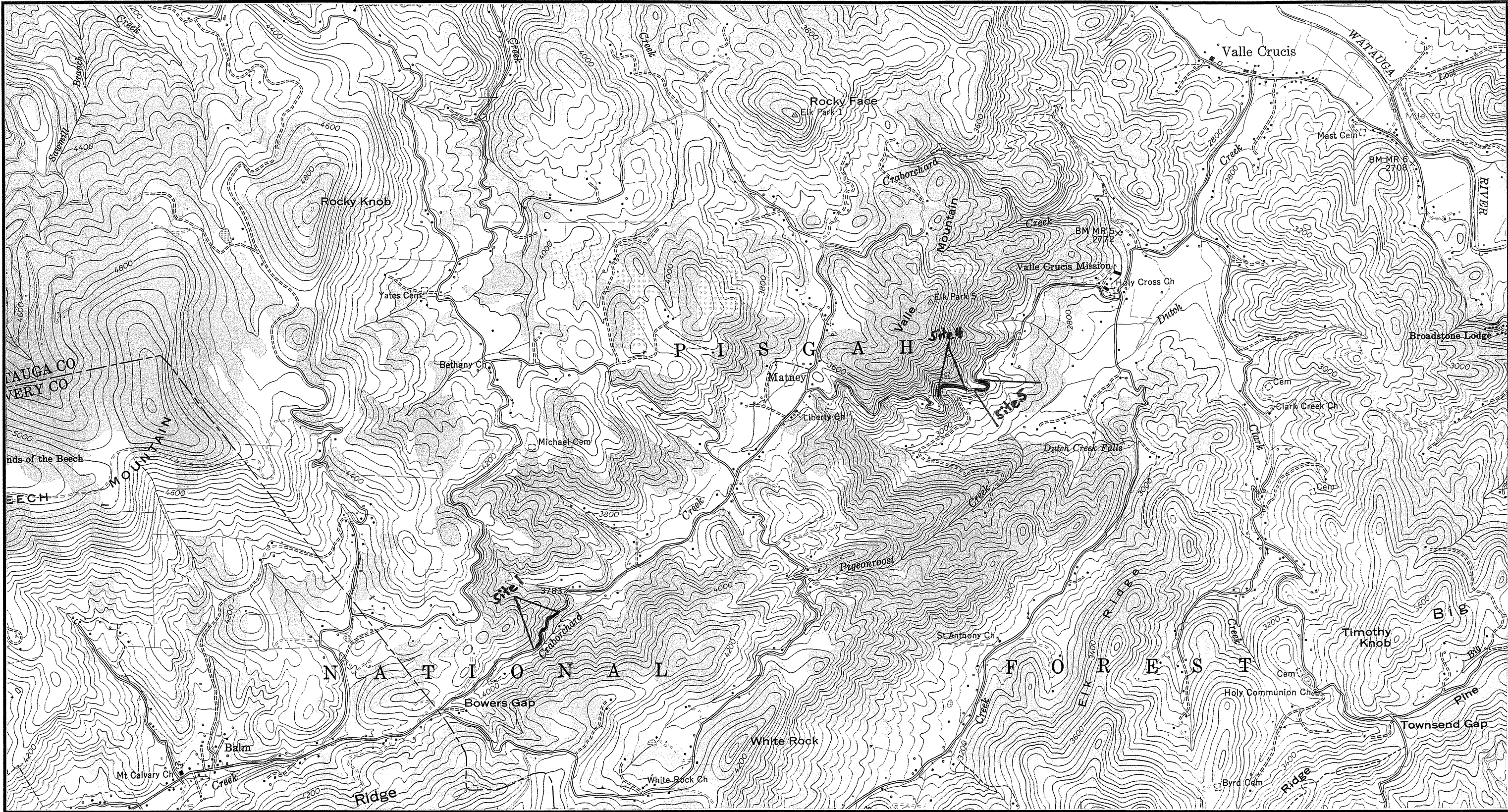
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

ID	STATE PROJECT NO.	SHEET NO.	TOTAL SHEETS
R-2710	34499.1.1	2	14

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION	GRADATION	ROCK DESCRIPTION	TERMS AND DEFINITIONS	
SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED OR WEATHERED EARTH MATERIALS WHICH CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND WHICH YIELDS LESS THAN 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM AND BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE: <i>VERY STIFF, GRAY SOIL CLAY, MOST WITH INTERBEDDED FINE SAND LENS, HIGH PLASTIC, A-7-6</i>	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.	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 8.1 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) CRYSTALLINE ROCK (CR) NON-CRYSTALLINE ROCK (NCR) COASTAL PLAIN SEDIMENTARY ROCK (CP)	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 DIKES 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 DISLOCATED FROM PARENT MATERIAL. FLOOD PLAIN (F.P.) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM. FORMATION (F.M.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD. JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED. LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT. LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS. MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE. PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM. RESIDUAL SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. ROCK QUALITY DESIGNATION (R.Q.D.) - A MEASURE OF ROCK QUALITY DESCRIBED BY: TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. SAPROLITE (SAP.) - RESIDUAL SOIL WHICH RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK. SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, WHICH HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS. SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE. STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS IN OR B.P.F. OF A 148 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER, SPT REFUSAL IS LESS THAN 8.1 FOOT PENETRATION WITH 60 BLOWS. STRATA CORE RECOVERY (SCREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. STRATA ROCK QUALITY DESIGNATION (S.R.Q.D.) - A MEASURE OF ROCK QUALITY DESCRIBED BY: TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. TOPSOIL (T.S.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.	
SOIL LEGEND AND AASHTO CLASSIFICATION	MINERALOGICAL COMPOSITION	WEATHERING		
GENERAL CLASS. GRANULAR MATERIALS (100% PASSING #200) SILT-CLAY MATERIALS (100% PASSING #200) ORGANIC MATERIALS	MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.	FRESH - ROCK FRESH, CRYSTALLINE BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER HAMMER IF CRYSTALLINE. VERY SLIGHT (V.SL.) - 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 (SL.) - 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. <i>IF TESTED, WOULD YIELD SPT REFUSAL</i> 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. <i>IF TESTED, YIELDS SPT N VALUES > 100 BPF</i> 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. <i>IF TESTED, YIELDS SPT N VALUES < 100 BPF</i> 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.		
SOIL LEGEND AND AASHTO CLASSIFICATION (Detailed table with columns for Group Class, Symbol, % Passing, Liquid Limit, Plastic Index, etc.)	COMPRESSION SLIGHTLY COMPRESSIBLE LIQUID LIMIT LESS THAN 30 MODERATELY COMPRESSIBLE LIQUID LIMIT 31-50 HIGHLY COMPRESSIBLE LIQUID LIMIT GREATER THAN 50	WEATHERING (Detailed table with columns for Fresh, Very Slight, Slight, Moderate, etc.)		
	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% MODERATE 20 - 25% HIGHLY ORGANIC >10% >20% HIGHLY 35% AND ABOVE			
	GROUND WATER WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING. STATIC WATER LEVEL AFTER 24 HOURS. PERCHED WATER, SATURATED ZONE OR WATER BEARING STRATA SPRING OR SEEPAGE			
	MISCELLANEOUS SYMBOLS (List of symbols for roadway embankment, soil symbol, artificial fill, etc.)			
	ABBREVIATIONS (List of abbreviations for AR, BT, CI, etc.)			
	EQUIPMENT USED ON SUBJECT PROJECT (List of equipment like Drill Units, Advancing Tools, Hammer Type, etc.)			
		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 0.85 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 GROOVED OR GOUGED EASILY 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 FINGER NAIL.		
		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.		
			TEXTURE OR GRAIN SIZE U.S. STD. SIEVE SIZE OPENING (MM) 4 10 40 60 200 270 4.75 2.0 0.42 0.25 0.075 0.053	
			CONSISTENCY OR DENSENESS PRIMARY SOIL TYPE COMPACTNESS OR CONSISTENCY RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE) RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT ²)	
			SOIL MOISTURE - CORRELATION OF TERMS SOIL MOISTURE SCALE (ATTERBERG LIMITS) FIELD MOISTURE DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION	
			PLASTICITY NONPLASTIC LOW PLASTICITY MED. PLASTICITY HIGH PLASTICITY PLASTICITY INDEX (PI) DRY STRENGTH VERY LOW SLIGHT MEDIUM 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.	
			FRAC. - BENCH MARK: BM "1": 8" SPIKE IN BASE OF 10" BIRCH TREE - BL - STA. 34+33.147 - RT ELEVATION: 3905.36'	
			NOTES:	



Trigon Engineering Consultants, Inc.
Greensboro North Carolina

SCALE:
1" = 24,000'

DATE:
09/04/07

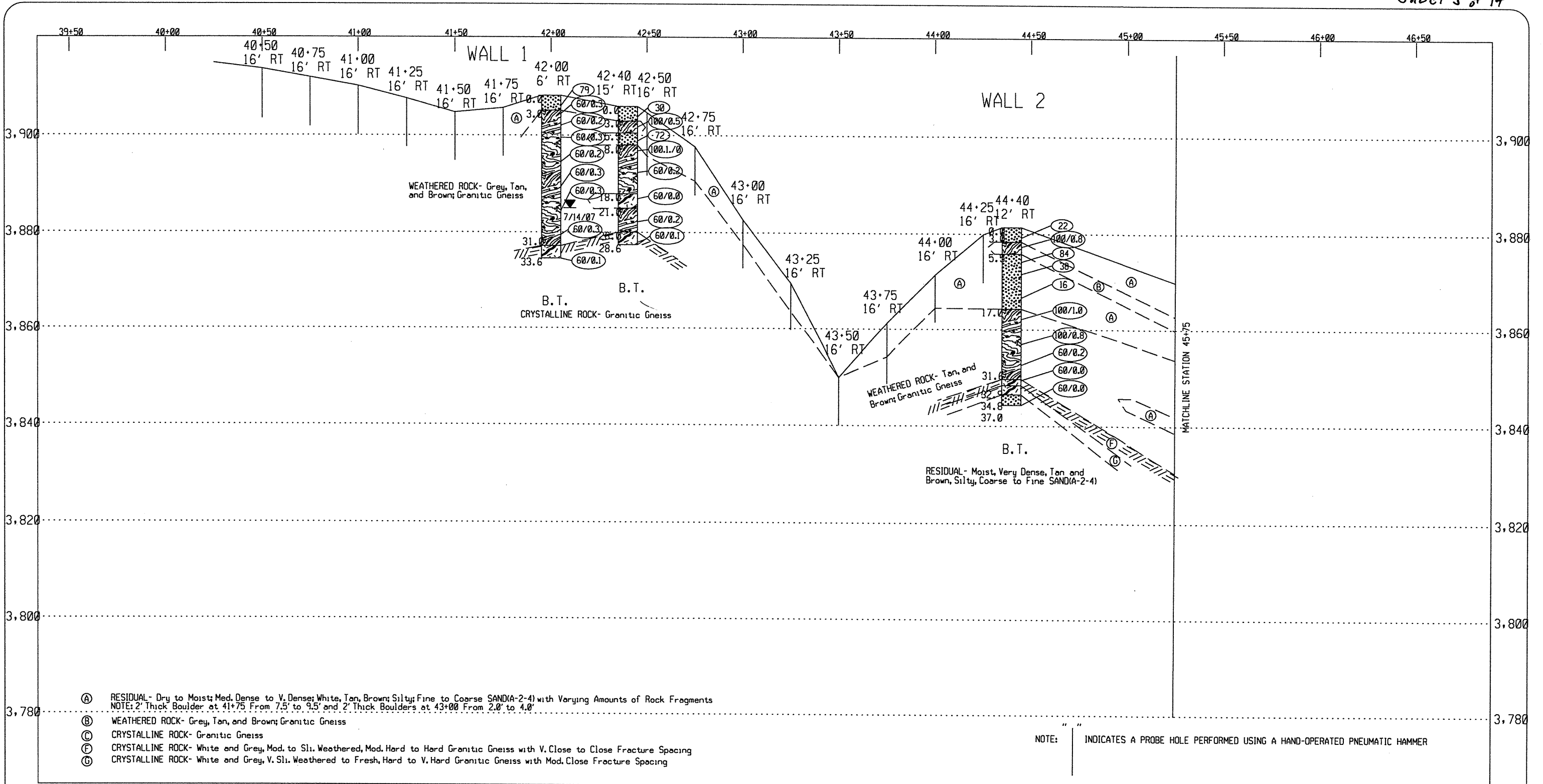
STATE PROJECT NO.
34499.1.1

TIP NO.:
R-2710

SITE VICINITY MAP
NC 194 Retaining Walls at Sites 1, 4, and 5, Watauga County, North Carolina

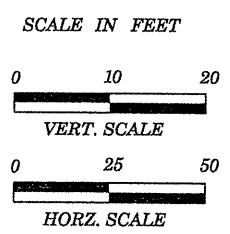
USGS Valle Crucis Quadrangle

DRAWING NUMBER:
1



- (A) RESIDUAL- Dry to Moist; Med. Dense to V. Dense; White, Tan, Brown; Silty; Fine to Coarse SAND(A-2-4) with Varying Amounts of Rock Fragments
NOTE: 2' Thick Boulder at 41+75 From 7.5' to 9.5' and 2' Thick Boulders at 43+00 From 2.0' to 4.0'
- (B) WEATHERED ROCK- Grey, Tan, and Brown; Granitic Gneiss
- (C) CRYSTALLINE ROCK- Granitic Gneiss
- (D) CRYSTALLINE ROCK- White and Grey, Mod. to Sl. Weathered, Mod. Hard to Hard Granitic Gneiss with V. Close to Close Fracture Spacing
- (E) CRYSTALLINE ROCK- White and Grey, V. Sl. Weathered to Fresh, Hard to V. Hard Granitic Gneiss with Mod. Close Fracture Spacing

NOTE: " " INDICATES A PROBE HOLE PERFORMED USING A HAND-OPERATED PNEUMATIC HAMMER



PROFILE RIGHT OF -L-	
NC 194 SITE 1	
Watauga County, North Carolina	
Project No. 34499.1.1	TIP No. R-2710
Federal No. STP-194(4)	Vert. Scale 1" = 20'
Date 9/12/07	Horiz. Scale 1" = 50'
Drawn by DRK	Drawing No. 3

PROJECT NO. 34499.1.1		ID. R-2710		COUNTY Watauga		GEOLOGIST T.Wells/P.Weaver								
SITE DESCRIPTION NC 194 Site 1							GROUND WTR (ft)							
BORING NO. 42+00		STATION 42+00		OFFSET 6ft RT		ALIGNMENT -L-								
COLLAR ELEV. 3,908.1 ft		TOTAL DEPTH 33.6 ft		NORTHING 895,239		EASTING 1,164,918								
DRILL MACHINE Acker ADII		DRILL METHOD Wash Rotary		HAMMER TYPE 140 lb. Manual										
START DATE 07/12/07		COMP. DATE 07/13/07		SURFACE WATER DEPTH N/A		DEPTH TO ROCK 31.0 ft								
ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
		0.5ft	0.5ft	0.5ft	0	25	50	75	100					
3910														
3,907.1	1.0	15	30	49						79	SS-1	D	RESIDUAL: Very Dense, Brown and Tan, Silty, Fine to Coarse SAND and Rock Fragments	3.0
3,904.6	3.5	60/0.3								60/0.3			WEATHERED ROCK: Tan and Brown, Granitic Gneiss	
3,902.1	6.0	60/0.2								60/0.2				
3,899.6	8.5	60/0.3								60/0.3				
3,894.6	13.5	60/0.2								60/0.2				
3,889.6	18.5	60/0.3								60/0.3				
3,884.6	23.5	60/0.3								60/0.3				
3,879.6	28.5	60/0.3								60/0.3				
3,874.6	33.5	60/0.1								60/0.1			CRYSTALLINE ROCK: Granitic Gneiss	31.0
														3,877.1
														3,874.5
														Boring Terminated at Elevation 3,874.5 ft

NCDOT BORE SINGLE 071-07-036.GPJ NC_DOT_GDT 10/18/07

PROJECT NO. 34499.1.1		ID. R-2710		COUNTY Watauga		GEOLOGIST T.Wells/P.Weaver								
SITE DESCRIPTION NC 194 Site 1							GROUND WTR (ft)							
BORING NO. 42+40		STATION 42+40		OFFSET 15ft RT		ALIGNMENT -L-								
COLLAR ELEV. 3,906.0 ft		TOTAL DEPTH 28.6 ft		NORTHING 895,277		EASTING 1,164,937								
DRILL MACHINE Acker ADII		DRILL METHOD HSA		HAMMER TYPE 140 lb. Manual										
START DATE 07/13/07		COMP. DATE 07/16/07		SURFACE WATER DEPTH N/A		DEPTH TO ROCK 18.0 ft								
ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
		0.5ft	0.5ft	0.5ft	0	25	50	75	100					
3910														
3,905.0	1.0	7	8	22						30	M		RESIDUAL: Medium Dense to Dense, Brown, Silty, Fine to Coarse SAND with Little Rock Fragments	3.0
3,902.5	3.5	13	100/0.5										WEATHERED ROCK: Grey and Tan, Granitic Gneiss	5.5
3,900.0	6.0	33	44	28						72	D		RESIDUAL: Very Dense, Grey and Tan, Silty, Fine to Coarse SAND	8.0
3,897.5	8.5	41	59										WEATHERED ROCK: Grey and Tan, Granitic Gneiss	
3,892.5	13.5	60/0.2								60/0.2				
3,887.5	18.5	60/0.0								60/0.0			CRYSTALLINE ROCK: Granitic Gneiss	18.0
3,882.5	23.5	60/0.2								60/0.2			WEATHERED ROCK: Granitic Gneiss	21.0
3,880.0	26.0												CRYSTALLINE ROCK: Granitic Gneiss	26.0
3,877.5	28.5	60/0.1								60/0.1				3,877.4
														Boring Terminated at Elevation 3,877.4 ft

NCDOT BORE SINGLE 071-07-036.GPJ NC_DOT_GDT 10/18/07

PROJECT NO. 34499.1.1		ID. R-2710		COUNTY Watauga		GEOLOGIST T.Wells/P.Weaver								
SITE DESCRIPTION NC 194 Site 1							GROUND WTR (ft)							
BORING NO. 44+40		STATION 44+40		OFFSET 12ft RT		ALIGNMENT -L-								
COLLAR ELEV. 3,881.4 ft		TOTAL DEPTH 37.0 ft		NORTHING 895,470		EASTING 1,164,980								
DRILL MACHINE Acker ADII		DRILL METHOD HSA/Wash Rotary/NQ Core		HAMMER TYPE 140 lb. Manual										
START DATE 07/16/07		COMP. DATE 07/18/07		SURFACE WATER DEPTH N/A		DEPTH TO ROCK 31.6 ft								
ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
		0.5ft	0.5ft	0.5ft	0	25	50	75	100					
3885														
3,880.4	1.0													
3,877.9	3.5	5	9	13										
3,875.4	6.0	50	50/0.3											
3,872.9	8.5	24	49	35										
3,867.9	13.5	9	16	22										
3,862.9	18.5	9	8	8										
3,857.9	23.5	24	76											
3,852.9	28.5	27	47	53/0.3										
3,849.8	31.6	60/0.2												
3,844.4	37.0	60/0.0												

PROJECT NO. 34499.1.1		ID. R-2710		COUNTY Watauga		GEOLOGIST T.Wells/P.Weaver					
SITE DESCRIPTION NC 194 Site 1							GROUND WTR (ft)				
BORING NO. 44+40		STATION 44+40		OFFSET 12ft RT		ALIGNMENT -L-					
COLLAR ELEV. 3,881.4 ft		TOTAL DEPTH 37.0 ft		NORTHING 895,470		EASTING 1,164,980					
DRILL MACHINE Acker ADII		DRILL METHOD HSA/Wash Rotary/NQ Core		HAMMER TYPE 140 lb. Manual							
START DATE 07/16/07		COMP. DATE 07/18/07		SURFACE WATER DEPTH N/A		DEPTH TO ROCK 31.6 ft					
CORE SIZE NQ		TOTAL RUN 3.2 ft		DRILLER R. Toothman							
ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	RUN		SAMP. NO.	STRATA		LOG	DESCRIPTION AND REMARKS	DEPTH (ft)
				REC. (ft) %	RQD (ft) %		REC. (ft) %	RQD (ft) %			
3849.8											
3,849.8	31.6	3.2	3:42	(3.2)	(1.9)		(1.3)	(0.3)		Begin Coring @ 31.6 ft	31.6
3,846.6	34.8		4:10	100%	59%		100%	23%		CRYSTALLINE ROCK: White and Grey, Moderately to Slightly Weathered, Moderately Hard to Hard, Granitic Gneiss with Very Close to Close Fracture Spacing	32.9
			4:15				(1.9)	(1.6)		Very Broken 31.6 ft. to 31.8 ft.	34.8
			1:05/0.2				100%	84%		1 Joint at 80°	37.0
										4 Joints at 20° with Light Iron Staining	
										Several Partially Healed Moderately to High Angle Fractures	
										CRYSTALLINE ROCK: White and Grey, Very Slightly Weathered to Fresh, Hard to Very Hard, Granitic Gneiss with Moderately Close Fracture Spacing	
										1 Joint at 34.5 ft.	
										Moderately Weathered at 34.5 ft. to 34.8 ft.	
										RESIDUAL: Very Dense, Tan and Brown, Silty, Coarse to Fine SAND	
										Boring Terminated at Elevation 3,844.4 ft	

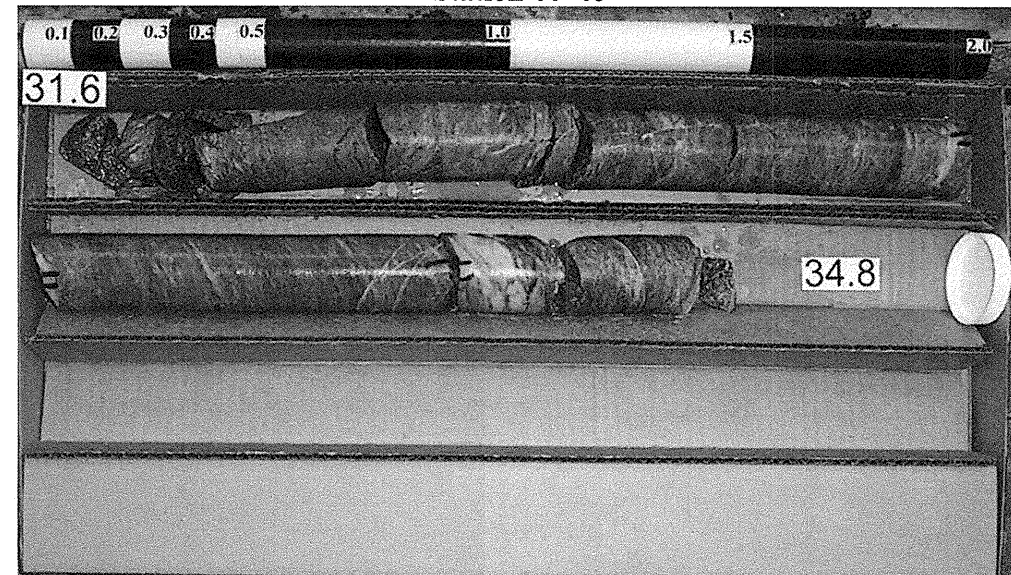
NCDOT BORE SINGLE 071-07-036.GPJ NC_DOT.GDT 10/18/07

NCDOT CORE SINGLE 071-07-036C.GPJ NC_DOT.GDT 9/12/07

CORE PHOTOGRAPH

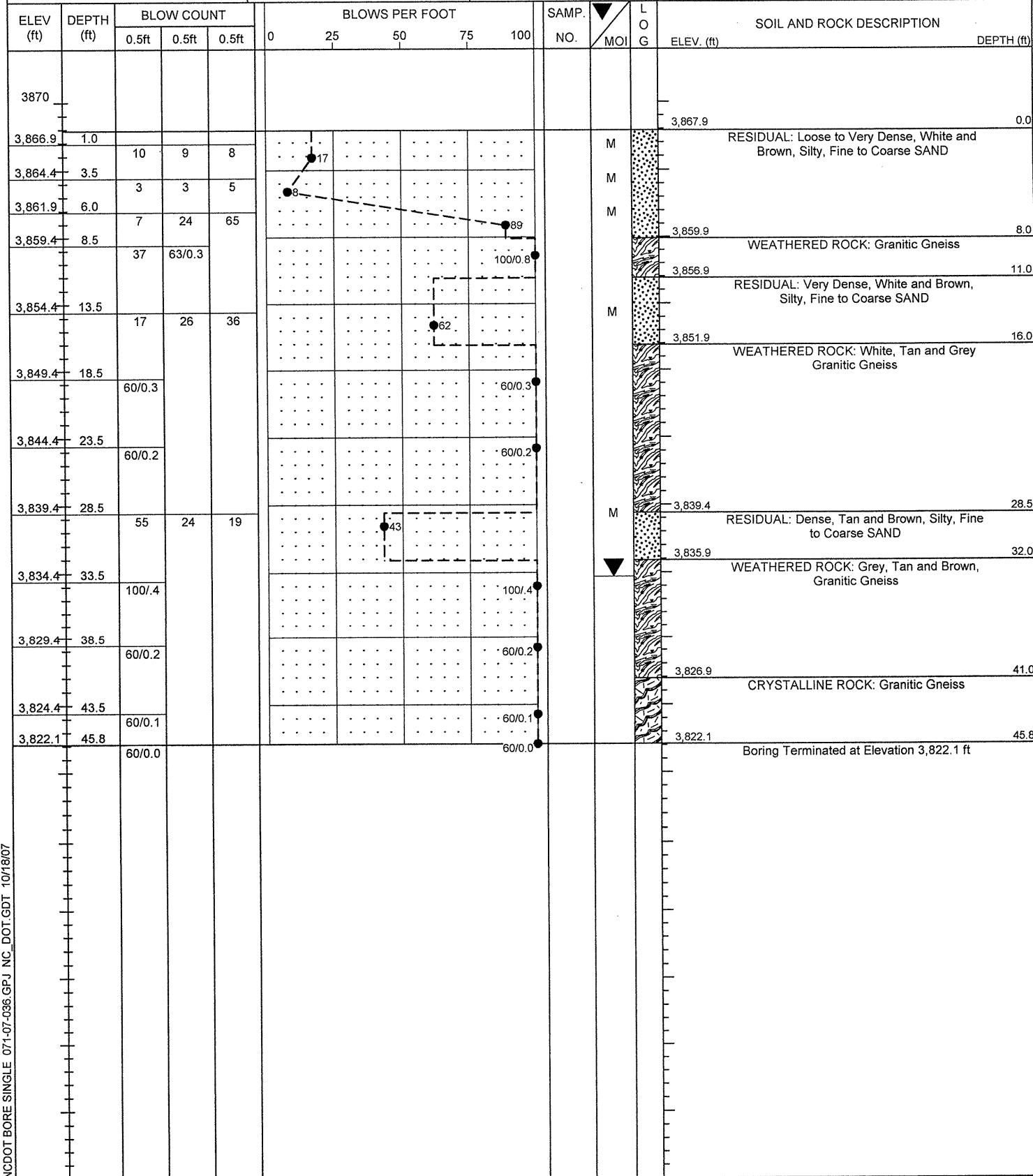
NCDOT Project No. 34499.1.1 TIP No. R-2710
NC 194 Site 1

Station 44+40

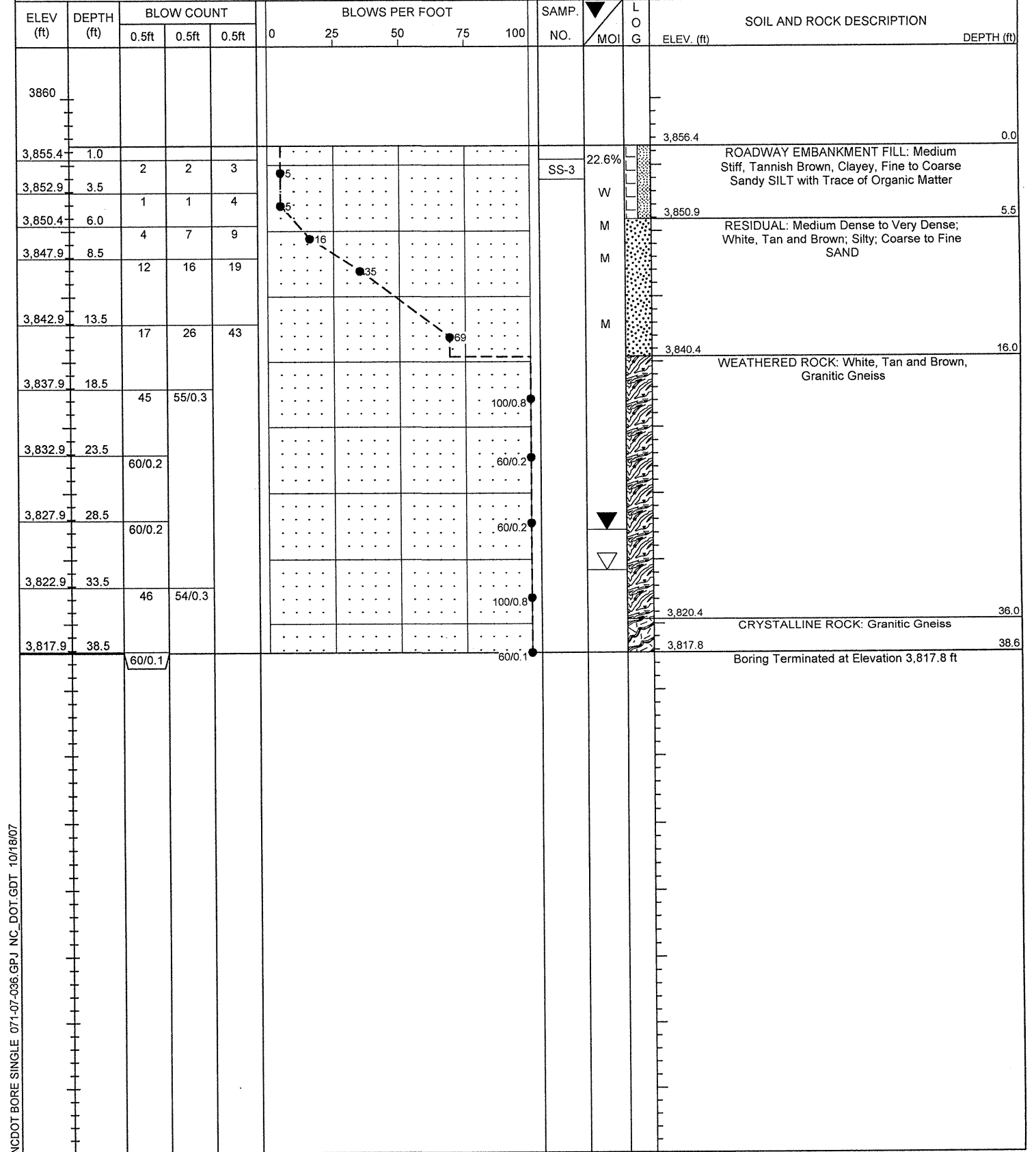


Box 1 of 1
(SCALE = 1:4)

PROJECT NO. 34499.1.1	ID. R-2710	COUNTY Watauga	GEOLOGIST T.Wells/P.Weaver
SITE DESCRIPTION NC 194 Site 1			GROUND WTR (ft)
BORING NO. 45+90	STATION 45+90	OFFSET 5ft RT	ALIGNMENT -L-
COLLAR ELEV. 3,867.9 ft	TOTAL DEPTH 45.8 ft	NORTHING 895,601	EASTING 1,165,046
DRILL MACHINE Acker ADII	DRILL METHOD Wash Rotary	HAMMER TYPE 140 lb. Manual	
START DATE 07/19/07	COMP. DATE 07/20/07	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 41.0 ft



PROJECT NO. 34499.1.1	ID. R-2710	COUNTY Watauga	GEOLOGIST T.Wells/P.Weaver
SITE DESCRIPTION NC 194 Site 1			GROUND WTR (ft)
BORING NO. 47+00	STATION 47+00	OFFSET 4ft RT	ALIGNMENT -L-
COLLAR ELEV. 3,856.4 ft	TOTAL DEPTH 38.6 ft	NORTHING 895,679	EASTING 1,165,122
DRILL MACHINE Acker ADII	DRILL METHOD Wash Rotary	HAMMER TYPE 140 lb. Manual	
START DATE 07/23/07	COMP. DATE 07/31/07	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 36.0 ft



PROJECT NO. 34499.1.1	ID. R-2710	COUNTY Watauga	GEOLOGIST T.Wells/P.Weaver
SITE DESCRIPTION NC 194 Site 1			GROUND WTR (ft)
BORING NO. 47+50	STATION 47+50	OFFSET 1ft RT	ALIGNMENT -L-
COLLAR ELEV. 3,853.8 ft	TOTAL DEPTH 38.8 ft	NORTHING 895,711	EASTING 1,165,160
DRILL MACHINE Acker ADII	DRILL METHOD Wash Rotary	HAMMER TYPE 140 lb. Manual	
START DATE 07/31/07	COMP. DATE 07/31/07	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A

ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)
		0.5ft	0.5ft	0.5ft	0	25	50	75	100				
3855													0.0
3,852.8	1.0	6	7	9						SS-4	22.6%	ROADWAY EMBANKMENT FILL: Very Stiff, Tannish Brown, Clayey, Coarse to Fine Sandy SILT	0.0
3,850.3	3.5	7	24	31						M		RESIDUAL: Hard, Tannish Brown, Clayey, Coarse to Fine Sandy, SILT with Trace of Mica	4.0
3,847.8	6.0	7	7	9						M		RESIDUAL: Very Dense; White, Tan and Brown; Silty; Coarse to Fine SAND with Trace Mica	5.5
3,845.3	8.5	9	18	44						W			
3,840.3	13.5	15	15	32						W			
3,835.3	18.5	35	65/0.3									WEATHERED ROCK: Tan, Brown and Grey, Granitic Gneiss	17.0
3,830.3	23.5	10	100/0.4										
3,825.3	28.5	64	36/0.3										
3,821.3	32.5	23	60/0.2										
3,815.3	38.5	60/0.3											38.8

NCDOT BORE SINGLE 071-07-036.GPJ NC_DOT.GDT 10/18/07

PROJECT NO. 34499.1.1	ID. R-2710	COUNTY Watauga	GEOLOGIST T.Wells/P.Weaver
SITE DESCRIPTION NC 194 Site 1			GROUND WTR (ft)
BORING NO. 48+00	STATION 48+00	OFFSET 4ft RT	ALIGNMENT -L-
COLLAR ELEV. 3,849.8 ft	TOTAL DEPTH 23.8 ft	NORTHING 895,738	EASTING 1,165,202
DRILL MACHINE Acker ADII	DRILL METHOD Wash Rotary	HAMMER TYPE 140 lb. Manual	
START DATE 07/31/07	COMP. DATE 07/31/07	SURFACE WATER DEPTH N/A	DEPTH TO ROCK N/A

ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)
		0.5ft	0.5ft	0.5ft	0	25	50	75	100				
3850													0.0
3,848.8	1.0	5	3	4								ROADWAY EMBANKMENT FILL: Loose, Tannish Brown, Silty, Fine to Coarse SAND	0.0
3,846.3	3.5	10	100									RESIDUAL: Very Dense; White, Tan and Brown Granitic Gneiss	4.0
3,843.8	6.0	34	28	36						SS-5		RESIDUAL: Very Dense; White, Tan and Brown; Silty; Fine to Coarse SAND with Trace Clay	5.5
3,841.3	8.5	36	27	24						W			
3,836.3	13.5	49	51/0.3									WEATHERED ROCK: Tan, White and Brown, Granitic Gneiss	12.0
3,831.3	18.5	60/0.2											
3,826.3	23.5	60/0.3											23.8

NCDOT BORE SINGLE 071-07-036.GPJ NC_DOT.GDT 10/18/07

Boring Terminated at Elevation 3,826.0 ft

PROJECT NO. 34499.1.1	ID. R-2710	COUNTY Watauga	GEOLOGIST T.Wells/P.Weaver
SITE DESCRIPTION NC 194 Site 1			GROUND WTR (ft)
BORING NO. 48+50	STATION 48+50	OFFSET 5ft RT	ALIGNMENT -L-
COLLAR ELEV. 3,845.5 ft	TOTAL DEPTH 23.6 ft	NORTHING 895,767	EASTING 1,165,243
DRILL MACHINE Acker ADII	DRILL METHOD Wash Rotary	HAMMER TYPE 140 lb. Manual	
START DATE 08/01/07	COMP. DATE 08/01/07	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 21.0 ft

ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)
		0.5ft	0.5ft	0.5ft	0	25	50	75	100					
3850														
3,844.5	1.0	19	30	46								M	RESIDUAL: Very Dense, White and Tan, Silty Coarse to Fine SAND	0.0
3,842.0	3.5	40	55	45/0.4								W	WEATHERED ROCK: Tannish Brown, Granitic Gneiss	3.0
3,839.5	6.0	40	57	43								W	RESIDUAL: Very Dense; White, Tan and Brown; Variably Clayey, Silty, Fine to Coarse SAND	8.0
3,837.0	8.5	14	22	30								W	WEATHERED ROCK: Granitic Gneiss	17.0
3,832.0	13.5	4	28	36								W	CRYSTALLINE ROCK: Granitic Gneiss	21.0
3,827.0	18.5	60/0.3												23.6
3,822.0	23.5	60/0.1												

NC 194 Retaining Walls Investigation
 NCDOT Project No. 34499.1.1
 NCDOT TIP No. R-2710
 Trigon Project No. 071-07-036

LOCATIONS FOR HAND DRILLED BORINGS AT SITE 1

Site Station	Offset	Elev.	Northing	Easting	Depth of Overburden	Depth to Boulder	Boulder Thickness	Depth to Weathered Rock	Termination Depth (ft.)	**Notes
1 40+50	15' RT	3913.15	895102.86	1164848.81	10'				10	cobbly overburden/ full depth
1 40+75	16' RT	3911.77	895124.54	1164862.72	10'				10	cobbly overburden/ clay like material after 6'
1 41+00	15' RT	3910.06	895145.73	1164876.01	10'				10	clay like seam at 5.5' (1' thick)
1 41+25	15' RT	3907.56	895166.90	1164889.29	10'				10	cobbly overburden full depth
1 41+50	15' RT	3904.82	895188.04	1164902.55	10'				10	cobbly overburden full depth
1 41+75	15' RT	3905.74	895210.40	1164916.09	7.5'	2'			10	hit 2' boulder at 7.5'
1 42+50	15' RT	no stake	895286.27	1164939.70	9'		9'		10	weathered rock at 9'
1 42+75	15' RT	3897.74	895310.44	1164944.72	7'		7'		10	good weathered rock at 7'
1 43+00	16' RT	3882.71	895335.04	1164949.83	5'	2'	2'		10	good weathered rock at 5'
1 43+25	15' RT	3869.68	895359.46	1164954.90	6'				10	good weathered rock at 6'
1 43+50	16' RT	3849.99	895383.94	1164959.99	6"				10	good weathered rock full depth/ in creek bed
1 43+75	15' RT	3861.27	895407.82	1164965.16	7'				10	hit clay like seam at 4' (2' thick)
1 44+00	15' RT	3871.48	895431.04	1164971.32	7'				10	hit clay like seam at 6' (1.5' thick)
1 44+25	15' RT	3879.85	895454.48	1164978.81	10'				10	no rock/ clay seam at 9'
1 46+00	16' RT	3862.47	895601.36	1165061.18	10'				10	straight dirt full depth
1 46+25	16' RT	3850.81	895619.42	1165077.28	10'				10	straight dirt full depth
1 46+50	15' RT	3845.19	895637.33	1165093.67	9'		9'		10	weathered rock at 9'
1 46+75	16' RT	3848.76	895653.77	1165111.73	8'		8'		10	no boulders/ competent dirt before rock

State Project No. 34499.1.1
TIP No. R-2710 F.A. No. STP-194(4)
NC 194 from Banner Elk in Avery County to Valle Crucis in Watauga County
Site 1: Three Retaining Walls from -L- Stations 40+50 to 48+50
Watauga County, North Carolina
SUMMARY OF LABORATORY TEST DATA

Boring Number	Sample Depth (ft.)	Sample No.*	Natural Moisture Content (%)	AASHTO Class (Group Index)	N-Value (blows/ft.)	Atterberg Limits			Gradation Results							
						L.L.	P.L.	P.I.	Pass #10 Sieve	Pass #40 Sieve	Pass #200 Sieve	Retained #270 Sieve	Coarse Sand (%)	Fine Sand (%)	Silt (%)	Clay (%)
42+00	1.0-2.5	SS-1	-	A-1-b (0)	79	25	NP	NP	55	26	15	88	59	18	19	4
44+40	6.0-7.5	SS-2	-	A-2-4 (0)	84	27	NP	NP	99	63	25	79	47	32	13	8
47+00	1.0-2.5	SS-3	22.6	A-4 (0)	5	26	21	5	97	74	49	55	29	25	25	21
47+50	1.0-2.5	SS-4	22.6	A-4 (2)	16	24	16	8	95	81	59	43	20	21	29	30
48+00	6.0-7.5	SS-5	-	A-2-4 (0)	74	27	NP	NP	90	54	26	77	50	24	16	10
48+50	8.5-10.0	SS-6	-	A-2-4 (0)	52	25	NP	NP	98	65	29	75	46	29	13	12

* SS = Split-Barrel Sample (ASTM-D-1586)

** G = Grab Sample

***ST=Shelby Tube (Undisturbed) Sample

NP -- Non Plastic NA-- Non Applicable

TRIGON ENGINEERING CONSULTANTS, INC.

GREENSBORO, NORTH CAROLINA

Trigon Job Number: 071-07-036

Page: 1 of 1

SITE PHOTOGRAPHS
State Project No. 34499.1.1 TIP No. R-2710
NC 194 from Banner Elk to Valle Crucis
Sites 1: Three Retaining Walls from -L- Sta. 40+50 to 48+50
Watauga County, North Carolina
Page 1 of 2



Photograph 1 – View Along Retaining Wall 1, Site 1 Looking Upstation

SITE PHOTOGRAPHS
State Project No. 34499.1.1 TIP No. R-2710
NC 194 from Banner Elk to Valle Crucis
Sites 1: Three Retaining Walls from -L- Sta. 40+50 to 48+50
Watauga County, North Carolina
Page 2 of 2



Photograph 3 – View Along Retaining Wall 3, Site 1 Looking Upstation



Photograph 2 – View Along Retaining Wall 2, Site 1 Looking Upstation