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CT: 35801.1.1

STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 35801.1.1 (U-3810) COUNTY ONSLOW	- Г.А. PROJ. STP-1406(4)
PROJECT DESCRIPTION BRIDGES ON SR 1406 AT 84+77 AND 234+34	Γ –L- STATIONS
SITE DESCRIPTION BRIDGE ON SR 1406 AT -L-	STATION 234+34

STATE STATE PROJECT REPETENCE NO. SERT TOTAL N.C. 35801.1.1.1 1 15

CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING, AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES, AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT (199) 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 RELED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVILS OR SOIL MOSITURE CONDITIONS INDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOSITURE CONDITIONS MAY VARY CONSIDEREDALLY 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 SATISTY HUMSELF 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 TO SECONDATION THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

For Letting

PERSONNEL

C. FREDETTE

T. HAHN

P. PITTS

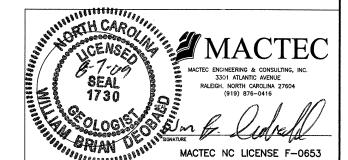
INVESTIGATED BY MACTEC

CHECKED BY B. DEOBALD

SUBMITTED BY S. JOHNSON

TE **JULY 10, 2009**

REVISED AUGUST 7, 2009



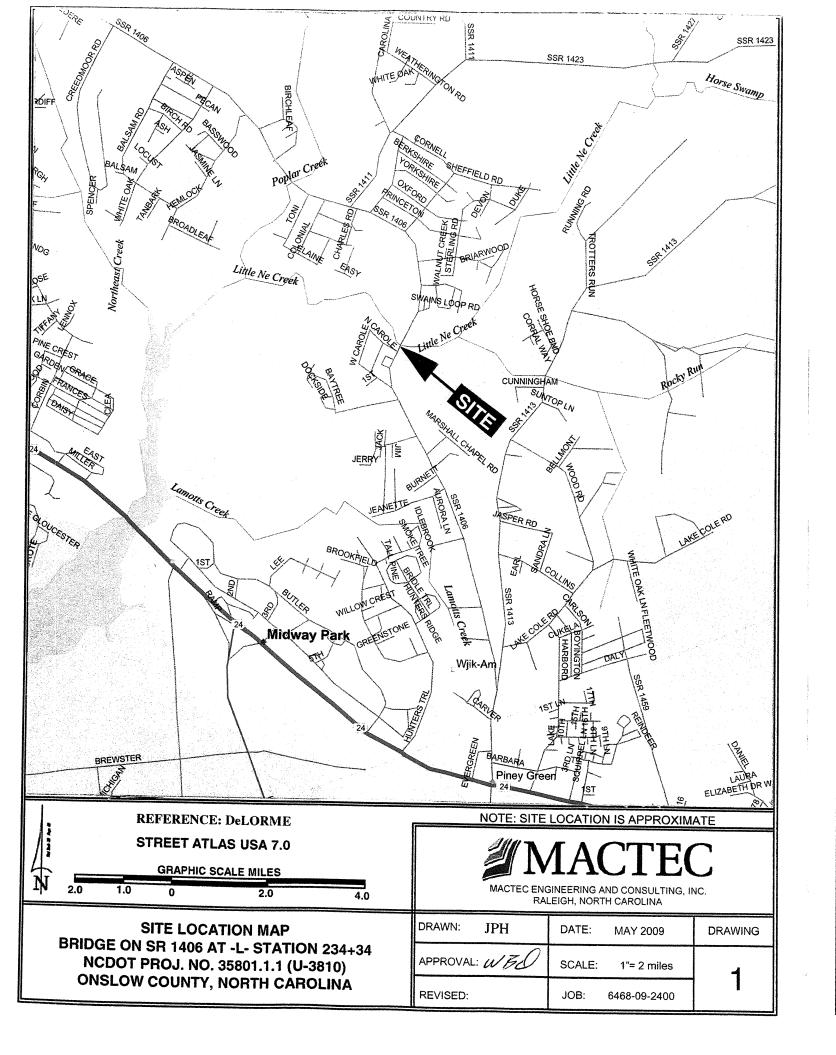
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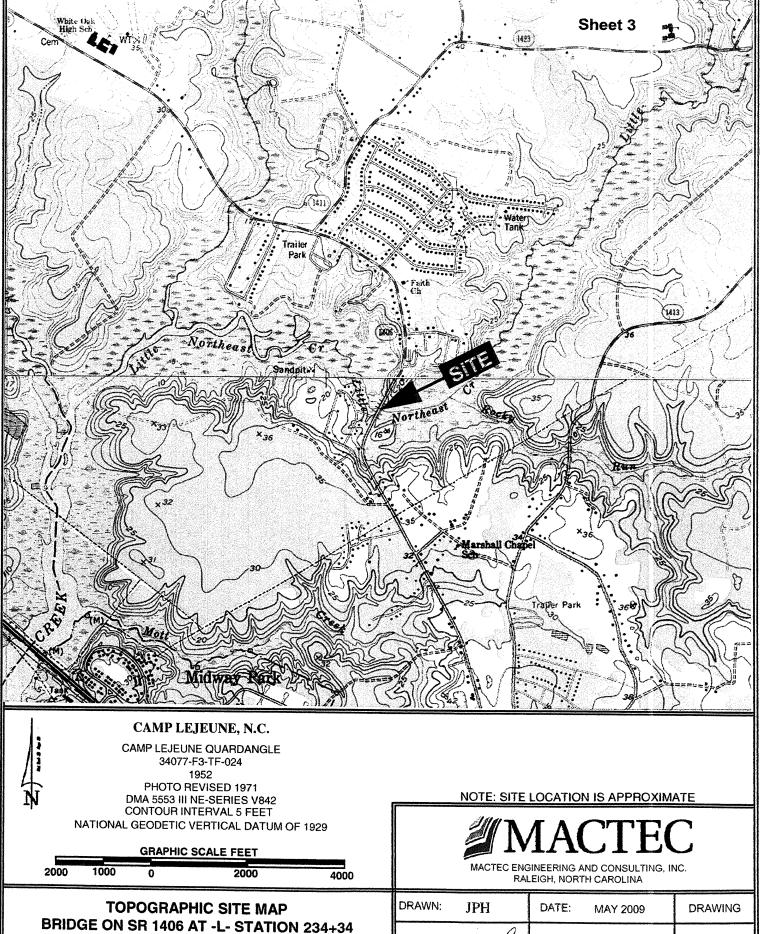
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS GEOTECHNICAL ENGINEERING UNIT

PROJECT REFERENCE NO. SHEET NO. 35801.1.1

SUBSURFACE INVESTIGATION

	SOIL AND ROCK LEGEND, TE	RMS, SYMBOLS, AND ABBREVIATIONS	
SOIL DESCRIPTION	GRADATION	ROCK DESCRIPTION	TERMS AND DEFINITIONS
SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AMD YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION IEST (AASHTO TZOE, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOSTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE:	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 ROUNDINGS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR.	HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD MELD SPT REFUSAL AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD MELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS: WEATHERED WEATHERED WEATHERED	ALLUVIUM (ALLUV.) — SOILS THAT HAVE BEEN TRANSPORTED BY WATER. AQUIFER — A WATER BEARING FORMATION OR STRATA. ARENACEOUS — APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND. ARGILLACEOUS — APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC.
VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDGED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6 SOIL LEGEND AND AASHTO CLASSIFICATION	SUBANGULAR, SUBROUNDED, OR ROUNDED. MINERALOGICAL COMPOSITION	ROCK (WR) BLOWS PER FOOT IF TESTED. CRYSTAILINE CRYSTAILINE CRYSTAILINE ROCK (WR) BLOWS PER FOOT IF TESTED.	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
GENERAL GRANULAR MATERIALS SILT—CLAY MATERIALS CLASS. (≤ 35% PASSING #200) (> 35% PASSING #200) ORGANIC MATERIALS	MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.	ROCK (CR) WOULD SET REPUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNESS, GABBRO, SCHIST, ETC.	GROUND SURFACE. <u>CALCAREOUS (CALC.)</u> — SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.
GROUP A-1 A-3 A-2 A-4 A-5 A-6 A-7 A-1, A-2 A-4, A-5 A-6 A-7 A-1, A-2 A-4, A-5 A-6 A-7 A-1, A-2 A-4, A-5 A-6 A-7 A-1, A-1 A-1 A-2 A-4, A-5 A-6 A-7 A-7-5 A-3 A-3 A-6 A-7 A-7-5	COMPRESSIBILITY SLIGHTLY COMPRESSIBLE LIQUID LIMIT LESS THAN 31 MODERATELY COMPRESSIBLE LIQUID LIMIT EQUAL TO 31–50	ROCK (NCR) SEDIMENTARY ROCK THAT WOULD YELD SPT REFUSAL IF TESTED. ROCK TYPE ROCK (NCR) INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC. COASTAL PLAIN COASTAL PL	COLLUNUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.
SYMBOL 000000000000000000000000000000000000	HIGHLY COMPRESSIBLE LIQUID LIMIT GREATER THAN 50 PERCENTAGE OF MATERIAL	SEDIMENTARY ROCK SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED (CP) SHELL BEDS, ETC.	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
# 10 50 MX GRANULAR CILAY GRANULAR CILAY GRANULAR CILAY GRANULAR GRANULAR GRANULAR GOLAY GOLAY	ORGANIC MATERIAL GRANULAR SILT — CLAY ORGANIC MATERIAL SOILS OTHER MATERIAL TRACE OF ORGANIC MATTER 2 — 3% 3 — 5% TRACE 1 — 10%	WEATHERING FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER	ROCKS OR CUTS MASSIVE ROCK. DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE
UQUID LIMIT 40 MX 41 MN 50 ILS WITH	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 ABOV	HAMMER IF CRYSTALLINE. VERY SLIGHT (V SLI.) CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF	HORIZONTAL. DIP DIRECTION (DIP AZIMUTH) — THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.
GROUP INDEX 0 0 0 4 MX 8 MX 12 MX 16 MX No MX MODERATE ORGANIC AMOUNTS OF SOILS	GROUND WATER WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING	OF A CRYSTALLINE NATURE. SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO (SLI.) 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR	FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.
OF MAJOR MATERIALS GRAVEL AND SAND GRAVEL AND SAND GRAVEL AND SAND SOILS SOILS MATTER	STATIC WATER LEVEL AFTER 24 HOURS	(SEL) CRYSTALS ARE DULL AND DISCOLORED. CRYSTALIB ROCKS RING UNDER HAMMER BLOWS. MODERATE SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN	FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM
GEN. RATING AS A EXCELLENT TO GOOD FAIR TO POOR POOR UNSUITABLE SUBGRADE	✓PW PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA	(MOD.) GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.	PARENT MATERIAL. FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY
PI OF A-7-5 SUBGROUP IS ≤ LL - 30; PI OF A-7-6 SUBGROUP IS> LL - 30 CONSISTENCY OR DENSENESS	O-MM- SPRING OR SEEP MISCELLANEOUS SYMBOLS	MODERATELY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL SEVERE AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH	THE STREAM. FORMATION (FM.) — A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN
PRIMARY SOIL TYPE COMPACTNESS OR CONSISTENCY RANGE OF STANDARD RANGE OF UNCONFINED PENETRATION RESISTENCE COMPRESSIVE STRENGTH (N-VALUE) (TONS/FT2)	ROADWAY EMBANKMENT (RE) POPT DATE TEST BORING WITH SOIL DESCRIPTION SEPT CPT DET DATE TEST BORING DESIGNATION DESIGNAT	(MOD. SEV.) AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. IF TESTED, WOULD YIELD SPT REFUSAL	THE FIELD. JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.
GENERALLY VERY LOOSE <4	S - BULK SAMPL	SEVERE ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED (SEV.) IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN.	LEDGE — A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.
ORANULAR MEDIUM DENSE 10 TO 30	ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT INFERRED SOIL BOUNDARY MW MONITORING WELL RS - ROCK SAMPLE MW MONITORING WELL RS - ROCK SAMPLE	## TESTED. YELDS 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	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.
SULT-CLAY SUFT 2 TO 4 0.25 TO 0.50	PIEZOMETER ALLUVIAL SOIL BOUNDARY DIP & DIP DIRECTION OF PIEZOMETER INSTALLATION RT - RECOMPACT SAMPLE SLOPE INDICATOR INSTALLATION CBR - CALIFORNI CBR - CALIFORNI	D TRIAXIAL 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.	RESIDUAL (RES.) SOIL — SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. ROCK QUALITY DESIGNATION (RQD) — A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.
TEXTURE OR GRAIN SIZE	RATIO SAME	ROCK HARDNESS VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES	SAPROLITE (SAP.) — RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE
U.S. STD. SIEVE SIZE 4 10 40 60 200 270 OPENING (MM) 4.76 2.00 0.42 0.25 0.075 0.053	SOUNDING ROD REF SPT REFUSAL ABBREVIATIONS	SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK. HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED	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
BOULDER COBBLE (BLDR.) COBBLE (COB.) GRAVEL (GR.) COARSE SAND SAND SAND (SL.) SILT (CLAY (CL.)	AR — AUGER REFUSAL HI. — HIGHLY W — MOISTURE CO BT — BORING TERMINATED MED. — MEDIUM V — VERY	MODERATELY CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE	TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS. SLICKENSIDE — POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR
GRAIN MM 305 75 2.0 0.25 0.05 0.005 SIZE IN. 12 3	CL CLAY MICA MICACEOUS VST - VANE SHE CPT - CONE PENETRATION TEST MOD MODERATELY WEA WEATHER CSE COARSE NP - NON PLASTIC 7 - UNIT WEIGH	BY MODERATE BLOWS. MEDIUM CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT.	SLIP PLANE." STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) — NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH
SOIL MOISTURE — CORRELATION OF TERMS SOIL MOISTURE SCALE FIELD MOISTURE (ATTERBERS LIMITS) GUIDE FOR FIELD MOISTURE DESCRIPTION	DMT DILATOMETER TEST ORG ORGANIC DPT DYNAMIC PENETRATION TEST B VOID RATIO SAP SAPROLITIC	CHT HARD CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK. SOFT CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS	A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.
- SATURATED - USUALLY LIQUID; VERY WET, USUALLY	F - FINE SD SAND, SANDY FOSS FOSSILIFEROUS SL SILT, SILTY FRAC FRACTURED, FRACTURES SL SLIGHTLY	FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.	STRATA CORE RECOVERY (SREC.) — TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIMDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. STRATA ROCK QUALITY DESIGNATION (SRQD) — A MEASURE OF ROCK QUALITY DESCRIBED BY
LL LIQUID LIMIT (SAT.) FROM BELOW THE GROUND WATER TABLE PLASTIC SEMISOLID: REQUIRES DRYING TO	FRAGS FRAGMENTS TCR - TRICONE REFUSAL	VERY CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH SOFT OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNALL.	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.
RANGE WET - (W) SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE PLASTIC LIMIT	EQUIPMENT USED ON SUBJECT PROJECT	FRACTURE SPACING BEDDING TERM SPACING TERM THICKNESS	TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
OM OPTIMUM MOISTURE - MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE SL SHRINKAGE LIMIT	DRILL UNITS: ADVANCING TOOLS: HAMMER TYPE: CLAY BITS CLAY BITS	MANUAL 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 THINKY BEDDED 0.16 - 1.5 FEET MODERATELY CLOSE 1 TO 3 FEET THINKY BEDDED 0.16 - 1.5 FEET	BENCH MARK: NCDOT REBAR AND CAP STAMPED BL-41 LOCATED AT STATION 235+14.12, 52.2 RT, -BL ELEVATION: 7.03 FT.
- DRY - (D) REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE	6" CONTINUOUS FLIGHT AUGER	VERY CLOSE LESS THAN 0.16 FEET THICKLY LAMINATED 0.008 - 0.03 FEET THINLY LAMINATED < 0.008 FEET	NOTES: BOLD CIRCLE INDICATES TESTED SAMPLE
PLASTICITY PLASTICITY INDEX (PI) DRY STRENGTH	CME-45C HARD FACED FINGER BITSN	INDURATION FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.	FIAD — FILLED IMMEDIATELY AFTER DRILLING
NONPLASTIC 0-5 VERY LOW		FRIABLE RUBBING WITH FINGER FREES NUMEROUS GRAINS;	
LOW PLASTICITY 6-15 SLIGHT MED. PLASTICITY 16-25 MEDIUM HIGH PLASTICITY 26 OR MORE HIGH	A CASING _ W/ ADVANCER HAND TOOLS: - PORTABLE HOIST X TRICONE 2 7/8" STEEL TEETH POST HOLE DIG	GENILE BLOW BY HAMMER DISINTEGRATES SAMPLE. GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE;	
COLOR	X TRICONE 3 7/8" STEEL TEETH HAND AUGER	BREAKS EASILY WHEN HIT WITH HAMMER.	
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.	CORE BIT SOUNDING ROD VANE SHEAR TI	DIFFICULT TO BREAK WITH HAMMER. T EXTREMELY INDURATED SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE;	
		SAMPLE BREAKS ACROSS GRAINS.	





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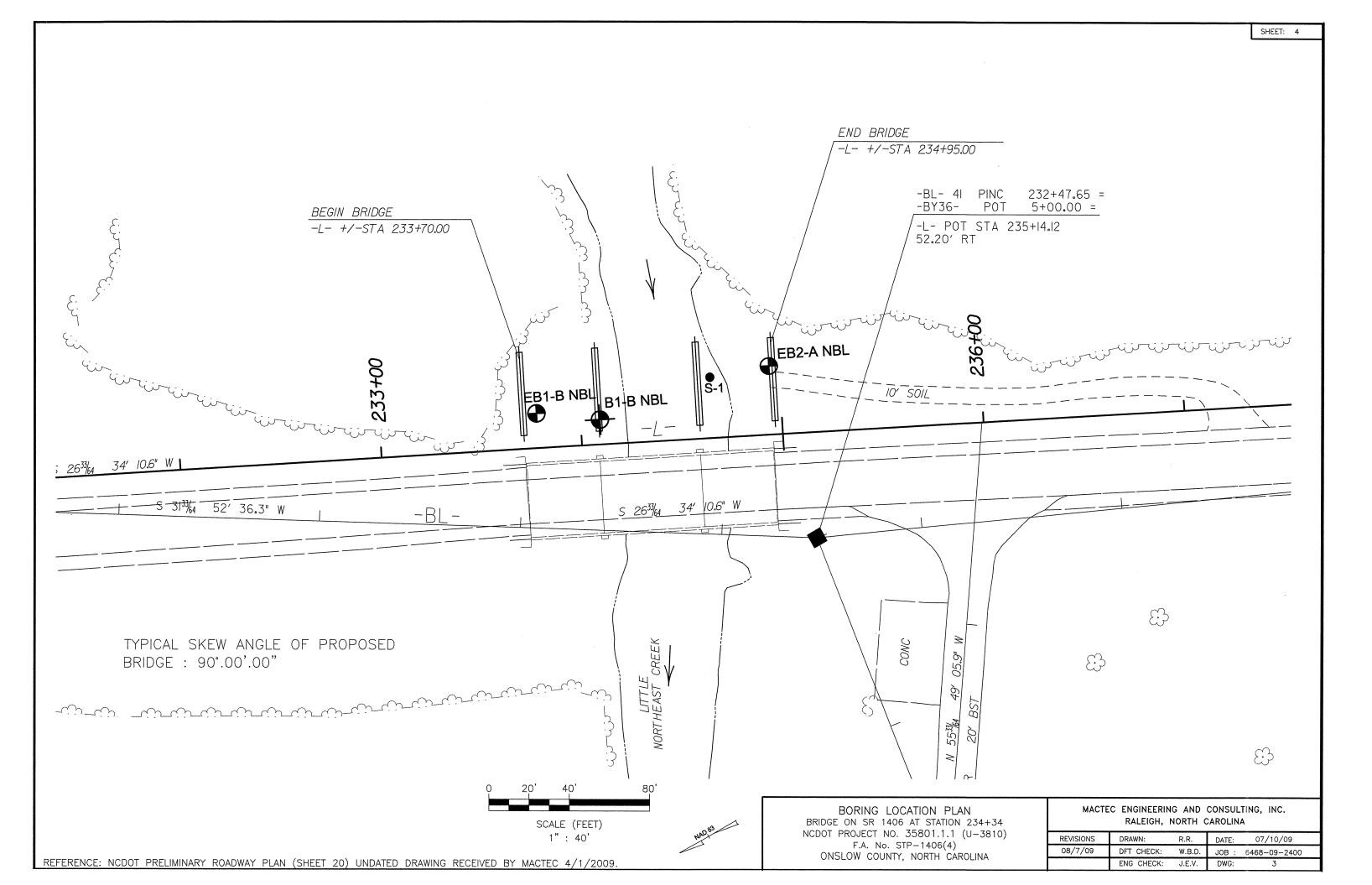
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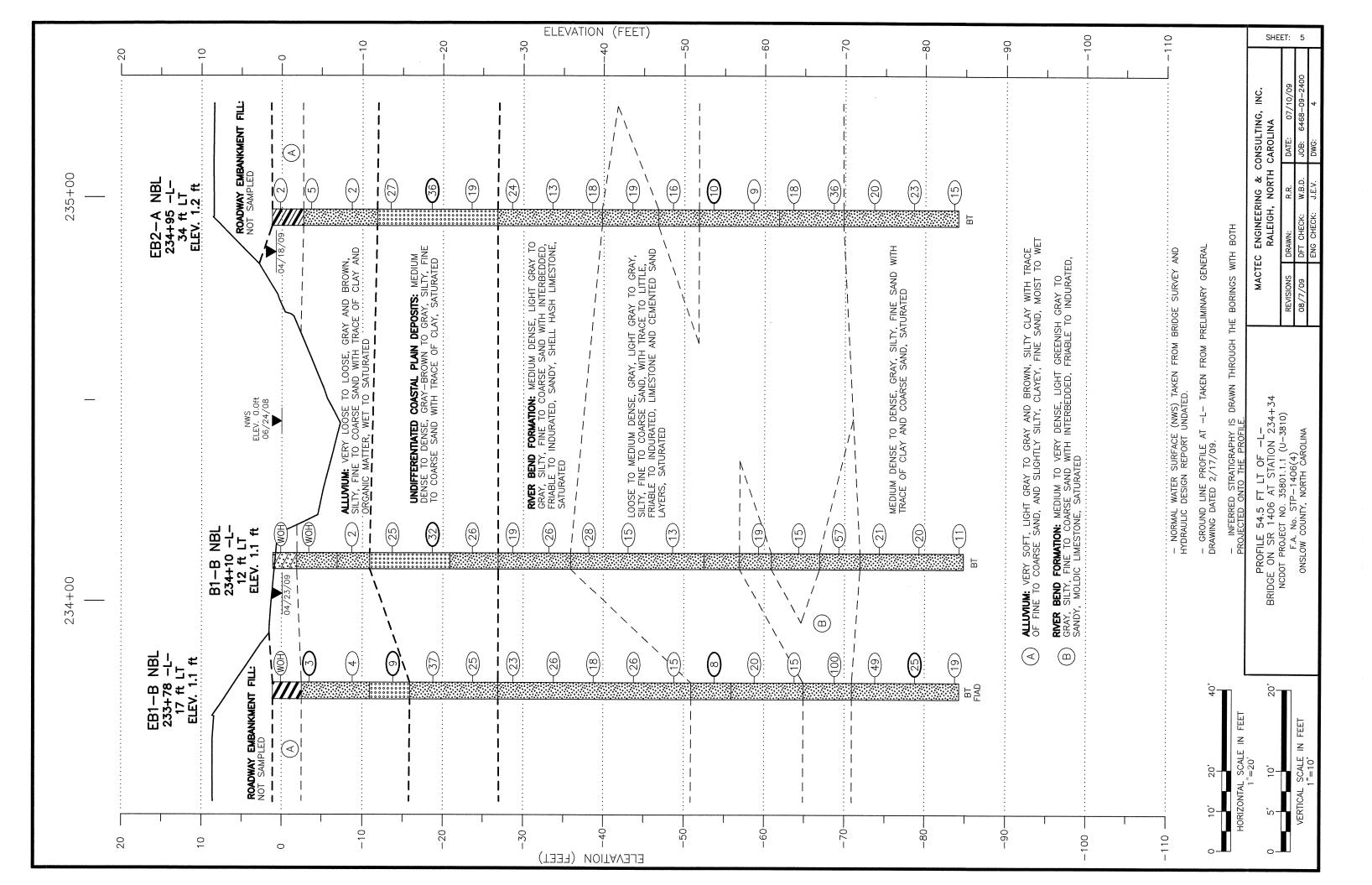
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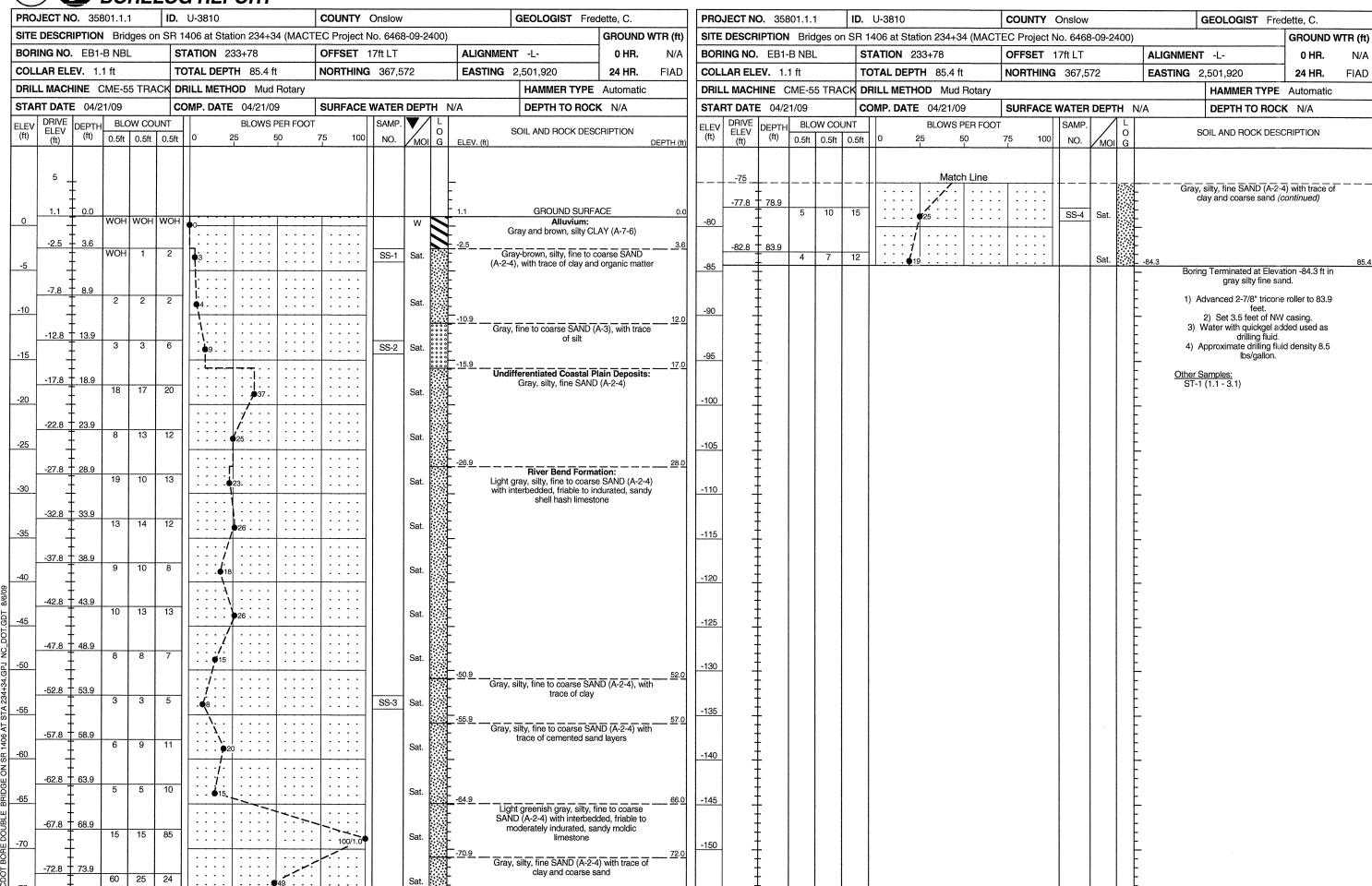
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NCDOT PROJ. NO. 35801.1.1 (U-3810)

ONSLOW COUNTY, NORTH CAROLINA







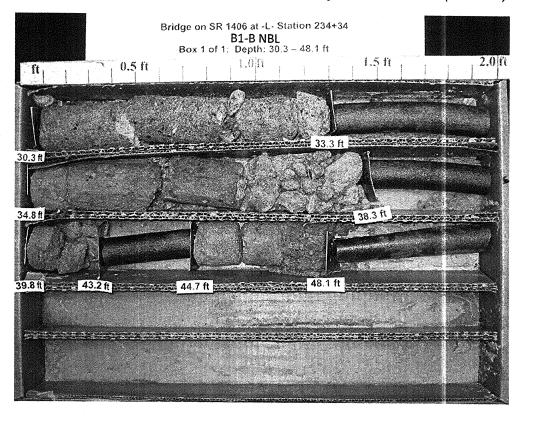
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PROJEC	T NO.	35801	1.1.1	ID.	U-3810			COUNTY	Onslow	/		GEOLOGIST	Fredette, C.		PRO	DJECT N	IO . 358	301.1.1	ID) . U-3810		COUNTY	' Onsio	w			GEOLOGIST Fr	edette, C.	
SITE DE	SCRIP	TION	Bridges	on SR	1406 at Sta	tion 234	+34 (MAC	TEC Project	No. 646	8-09-24	400)		GROUND	WTR (ft)	SITI	E DESC	RIPTION	Bridge	s on SF	R 1406 at S	tation 234+34	(MACTEC Project	t No. 64	68-09-2	2400)			GROUND V	VTR (ft
BORING	NO.	B1-B N	BL	S	TATION 2	234+10		OFFSET	12ft LT		ALIC	GNMENT -L-	0 HR.	N/A	BOF	RING NO). B1-B	NBL		STATION	234+10	OFFSET	12ft LT	•	Α	ALIGNMEI	NT -L-	0 HR.	N/A
COLLA	RELEV	. 1.1 ft	t	Т	OTAL DEP	TH 85.9	ft	NORTHIN	G 367,5	546	EAS	STING 2,501,902	24 HR.	1.2	COL	LLAR EL	.EV. 1.	1 ft		TOTAL DE	PTH 85.9 ft	NORTHI	VG 367	,546	E	ASTING	2,501,902	24 HR.	1.2
DRILL N	IACHIN	IE CM	E-55 TR	ACK D	RILL METH	HOD Mu	d Rotary	****			······································	HAMMER TY	PE Automatic		DRI	LL MAC	HINE (ME-55	TRACK	DRILL ME	THOD Mud F	Rotary					HAMMER TYPE	Automatic	
START	DATE	04/21/0	09	С	OMP. DATI	E 04/22/	' 09	SURFACE	WATER	R DEPT	H N/A	DEPTH TO R	OCK N/A		STA	ART DAT	E 04/2	1/09		COMP. DA	TE 04/22/09	SURFAC	E WATE	R DEP	TH N/A		DEPTH TO RO	CK N/A	***************************************
ELEV DF	RIVE LEV (ft)	EPTH	BLOW C	TAUC		BLOW	S PER FOO	т	SAMP.	. 🔻	L O	SOIL AND ROCK D	DESCRIPTION		ELEV	/ DRIVE ELEV	DEPTH	BLOW	COUNT		BLOWS PI	ER FOOT	SAMI	P. /	11		OOU AND DOOK DE	CODIDTION	
(ft)	ft)	(ft) O	.5ft 0.5f	0.5ft	0	25	50	75 100	NO.	МОІ	G ELEV.		DESCRIPTION	DEPTH (ft)	(ft)	(ft)	(ft)	0.5ft 0	.5ft 0.5	ift 0	25 50	75 10	00 NO.	МО	O G		SOIL AND ROCK DE	SCHIPTION	
	5 📗		l												L	75					Match	Line		_L					
	‡																‡		1							Gr	ray, silty, fine sand (A-2	-4) (continued)	
	.1	0.0	(0) 100	1111011	<u> </u>				Ц		1.1	GROUND SU		0.0			79.4	8	9 11		1		.	Sat.					
0	+	1	OH WO	HOWIF	•	 			+	_M_	6.00	Alluviu Gray, slighlty silty, clayey	m: v, fine SAND (A-2-1	7)	-80	-	\pm) 20			Sal.					
	2.4		OH WO	1 WOH	: : : :	1 : : :	.			l w	1.9	Gray, silty, fine SAND (A	A-2-4) with trace o	f 3.0		-83.3	84.4						.						
-5	<u> </u>	"		1	0					"		clay			-85		1	3	4 7	· •11				Sat.	-84				85
	7.7	9.9			::::	: : :	: : : :				-6.9			8.0			1								I E	Bo	ring Terminated at Elev gray silty fine s		
	' '' 		1 1	1	•2	1:::	: : : :			Sat.		Gray, silty, fine to coarse trace of organ	e SAND (A-2-4) wit iic matter	th			ł								F	1)	Advanced 3-7/8" trico	ne roller to 84.4	
-10	\pm				 	 	+	. 	-		-10.9			12.0	-90	-	\pm								F	·	feet. 2) Set 3.5 feet of 4 in		
-1	2.7 🛨 1		7 11	1	::::	1:::	: : : :					Undifferentiated Coast Gray, fine to coarse SANI	al Plain Deposits D (A-3) with trace	of			Ī								F	3)	Advanced HQ core ba 53.6 feet.	rrel from30.3 to	
-15	土		7 11	14		25				Sat.	00000	silt			-95		<u> </u>			ľ					1 F	4) Water with quickgel a drilling fluid	added used as	
	7.7 7.7 1				: : : :	12:::	.				0000						Ŧ								1 F	5)	Approximate drilling flus	uid density 8.5	
	'.'		10 14	18)		-	SS-5	4	0000						Ŧ								1 F		ibs/gailon.		
-20	Ŧ					+ ;			-	1	-20.9			22.0	-100	Ч •	Ŧ		ĺ						F				
-2	2.7 🕇 2	23.8				f		-				Gray, silty, fine SAND (A	A-2-4) with trace o	f			Ŧ								F				
-25	Ŧ		9 12	14		26				Sat.	-	July			-105		‡												
	Ŧ										-26.9			28.0	100	1 .	‡								-				
-2	7.7 † 2		8 10	9						Sat.	-	River Bend Fo	ormation:	4)			‡												
-30	‡					,				J	_	Light gray, silty, fine to co with interbedded, friable t shell hash lim	to indurated, sand	y,	-110	닉 -	‡												
3	2.2 📘 3		7 12	14		\ : : : <i>\</i>					_	Sileli Hasii IIII	iesione				‡												
-35	‡		1 12	14		26				Sat.	-				-115		‡												
	7.2	28.3									-35.9	Light gray, silty, fine to co	parse SAND (A-2-	37.0	1.0	1 -	†								F				
	''' 	,0.0	7 10	18		28.				Sat.	_	with trace to little, friab indurated, limestone an	ole to moderately	ŀ			‡												
-40	‡				· · · · ·	/		1	41			layers			-120	닉 .	‡												
-4	2.1 ‡ 4		5 6	9	::::/	: : :											‡												
-45	‡		Ĭ °		15	: : :				Sat.					-125	.	Ŧ								F				
	Ţ, Ŧ,	10.7				1]		₩F					1 -	Ŧ								F				
-50	7.6 + 4		4 4	9	13					Sat.	#						Ŧ								F				
-50	‡					1					:::: -				-130	4 -	Ŧ								F				
	Ŧ				::;:	: : :					52.5			53.6			Ŧ								F				
-55	Ŧ				::4:	: : :						Light gray, silty, fine to co with trace to little, friab	ole to moderately		-135		Ŧ								 				
	‡					1			11		-56.9	indurated, limestone an layers	3	58.0	1.00] -	Ŧ								F				
-5	8.3 🕇 5		6 7	1	:::: :							Gray, silty, fine to coarse interbedded, friable to	SAND (A-2-4) wit	h			Ŧ								F				
-60 -65 -70	‡		6 7	12	1	9		- • • • • •	4	Sat.	-60.9	limestor	ne	62.0	-140	니 -	‡												
	3.3 ‡ 6				::::/:						-	Gray, silty, fine to coarse trace of friable to	SAND (A-2-4) wit	h =====			‡												
-65	+		5 7	8	15					Sat.		limestone/cemente			-145		Ŧ												
	‡					\. : .			11		-66.9			68.0	1,43	1 -	‡								-				
-6	8.3 ‡ 6			<u> </u>		: ```						Gray, silty, fine to coarse interbedded, friable to		h 30.5			‡												
-70	‡	1	17 30	27			3 57		41	Sat.	<u> </u>	limestor			-150	┧ .	‡												
	<u>,</u> ,‡_	.,				1: //					-71.9	Gray, silty, fine s	and (A-2-4)	73.0			‡												
-75	3.3 <u>†</u> 7		11 10	11	: : : :	21				Sat.	<u>-</u>	Gray, Sitty, fille Si	ana (7-2-4)		-155		‡												
					T	-ti					· · · · · · · ·				1 -100	1		l						1	1 1				



	JECT N				D. U						UNTY Onslow		GEOLOGIST	
SITE	DESCR	IPTION	l Brid	dges on S					MACT		Project No. 6468-09-2400)			GROUND WTR
BOR	NG NO	. B1-E	NBL		STA	TION	234+10			OF	FSET 12ft LT	ALIGNMEN	IT -L-	0 HR. N
COLI	AR ELI	EV. 1.	1 ft		TOT	AL DE	PTH 85	5.9 ft		NO	RTHING 367,546	EASTING	2,501,902	24 HR . 1
DRIL	L MACH	INE (CME-5	5 TRACK	DRIL	L MET	THOD N	/lud Ro	tary				HAMMER T	PE Automatic
STAF	RT DATE	E 04/2	21/09		COM	P. DA	TE 04/2	2/09		su	RFACE WATER DEPTH N	I/A	DEPTH TO F	ROCK N/A
COR	E SIZE	HQ			1		N 16.7			DR	ILLER Hahn, T.			
ELEV	RUN ELEV	DEPTH		DRILL RATE	REC.	RQD	SAMP.	REC.	RQD	L		DESCRIPTION	AND REMARKS	
(ft)	(ft)	(ft)	(ft)	(Min/ft)	(ft) %	(ft) %	NO.	(ft) %	(ft) %	Ğ	ELEV. (ft)			DEPTH
-30	-29.2 -29.2 _	30.3	100	0.00	(4.0)	1		(0.7)	NIA.				ng @ 30.3 ft d Formation:	
	-32.2	33.3	3.0	0:23	(1.2)	NA		(2.7) 52%	NA		Light gray, silty, fin	e to coarse SAN	ND (A-2-4) with inte	
	-32.2	34.8	<u> </u>	0:25 N=26							- in	durated, sandy,	shell hash limestor	ne
-35	_	ļ	3.5	0:38 0:55	(1.5) 43%	NA					-35.9			3
	-37.2	38.3		0:48	1070			(0.0)	NA		Light gray, silty, fin		ND (A-2-4) with trac	e to little, friable to
-40	-38.7	39.8	3.4	N=28 0:42	(0.2)	NA NA		0%				ndurated, imiest	one and cemented	i sand layers
-40	40.4	+	0.1	0:41 0:24	6%									
	-42.1 -43.6	43.2 44.7	-	0:12/0.4 N=15	 									
-45	-		3.4	0:46 0:40	(0.6)	NA					_			
	-47.0	48.1	<u> </u>	0:36	1.0%									
E0.	-49.1	50.2	ļ.,	N=13										
-50	-	ţ	3.4	0:36 0:35	(0.0)	NA					·			
	-52.5	53.6		0:33 0:06/0.4	}			-	ļ		52.5 Light Gray silty fin	e to coarse SAN	ND (A-2-4) with trac	ce to little, friable to
-55		ţ											one and cemented	
	-	<u> </u>							<u> </u>		-56.9		-	
	-	t	ŀ	N=19							_ Gray, silty, fine t		(A-2-4) with interb oldic limestone	edded, friable to
-60	-	<u> </u>							<u> </u>		-60.9		-	
	-	t									Gray, silty, fine to o	coarse SAND (A limestone/ceme	i-2-4) with trace of ented sand layers	friable to indurated
-6 5	-	Ł		N=15										
	-	ł									<u>-66.9</u>			
	-	ŀ		N=57							Gray, silty, fine t		(A-2-4) with interb	edded, friable to
-70	_	F		14-07										
	-	Ŧ							-		-71.9	Gray, silty, fir	ne sand (A-2-4)	
-75	-	-		N=21							-	• •	, ,	
	-	F									-			
	-	‡												
-80	-	Ŧ.		N=20							_			
		‡									-			
-85		Ŧ	1	N=11							- -84.8			
UU		ļ	1									nated at Elevatio	on -84.8 ft in gray s	
		‡									1) Ac		ricone roller to 84.4 t of 4 inch casing.	4 feet.
-90		‡						1			3) Adva	inced HQ core b	parrel from30.3 to 5	53.6 feet.
		‡									4) Wate 5) Appi	er with quickgel a roximate drilling	added used as drill fluid density 8.5 lb	s/gallon.
0E		‡									-			
- 95	-	‡						-			<u> </u>			
		‡												
-100		‡									_			
		‡									-			
		t						-			_			
<u>-105</u>	_	t									-			
		Ī												
		<u> </u>		<u></u>	<u> </u>		<u> </u>	<u></u>	<u></u>	1				

Sheet 8

Bridge on SR 1406 at -L- Station 234+34 NCDOT Proj. No. 35801.1.1(U-3810)



PROJEC					U-3810	OIII		COUNTY	Onelow			GEOLOGIST F	Fradatta C	1	PPC	IECT	NO 31	5801.1.	4	Tin	U-381			I	COUNTY	Onolo				GEOLOGIS	er Erad		
						tion 234+	34 (MAC	TEC Project			00)	GEOLOGIST	GROUND W	TD (#1)									234+34		EC Projec			00)	······································	GEOLOGIS		GROUND V	
BORING	·····			—————	STATION 2		-34 (IVIAC	OFFSET		0-03-24	ALIGNMI	ENT -I-	0 HR.	N/A				2-A NBI				N 234+9			OFFSET				ALIGNME	ENIT I		O HR.	
COLLAR					OTAL DEP		ft	NORTHIN		60		3 2,501,883	24 HR.	0.5	 		LEV.		<u>L</u>			DEPTH			NORTHI					2,501,883		0 nn. 24 HR.	N/A
					RILL METH			NONTHIN	G 507,4		LASTING		PE Automatic	0.5					E TDA			IETHOD		1	NONTHI	307	400		EASTING		TVDE	Automatic	0.5
START D					OMP. DATI			SURFACI	= WATED	DEDT	J NI/A	DEPTH TO RO					TE 04		o Ina			DATE 04		<u>-</u> ,	CUDEAC	CMATE	D DEDT	LI NI/	Λ				
			BLOW C		OWF. DATI		PER FOO		SAMP.	·	L	DEPIN TO NO	OCK N/A			DDIVI	-		OW COL		JIVIP. L		-/17/09 		SURFAC	SAM		N//		DEPTH T	O HOCK	IN/A	
ELEV EL	IVE DEF EV (ff	′′′′	5ft 0.5f		0	25	50	75 10	11	моі	O G ELEV. (ft)	SOIL AND ROCK DI		EPTH (ft)	ELEV (ft)	ELEV (ft)	DEPT (ft)	' '	0.5ft		0	25	50		75 10	NO.	1/1	O G		SOIL AND RO	OCK DESC	RIPTION	
0 1.	.2 - 0.	W	OH 1 1 2		\$2 \$5				-	-W-	.27	GROUND SUI Alluviun ght Gray, silty clay (A-6 to coarse s Gray-brown, silty, fine S trace of organic	n:) with trace of fine and AND (A-2-4) with	0.0 3.9	-80	-82.6	78.8	7	10	13		23.	Match	Line			Sat.		-84.1	oring Terminated	d at Elevati	on -84.1 ft in	85.
-10	7.7 + 8.	9	1 1	1	 					Sat.	- - - - -				-90		† † †											-			lty fine san /8" tricone feet.	d. roller to 83.8	
-15	2.5 + 13 + + + +	1	2 13	14		1 · · · · · · · · · · · · · · · · · · ·				Sat.	-11.8 U	Indifferentiated Coast Gray-brown to gray, fine (A-3) with trac	to coarse SAND	13.0	-95		+ + + + + +													 Water with quality drill Approximate of 	uickgel add ling fluid.	ed used as	
-20	7.6 + 18. - - 2.6 + 23.	.8		18		36			SS-6	Sat.					-100		‡ + + + +																
-25	7.6 - 28.	.8		10	<u> </u>	9				Sat.	-26.8	River Bend For	rmation:	28.0	-105		 											-					
	2.6 + 33.			6	/.					Sat.	inte	ray, silty, fine to coarse erbedded, friable to indu hash limest	urated, sandy, shell tone		-110		‡ † †											- - - -					
-35 -37	7.6 - 38.	.8	6 9	9		8			-	Sat.	— - - - - - - - - -39.8			41.0	-115 -120		+ + + + + + + + + + + + + + + + + + + +											- - - -					
-42	2.6 + 43.	.8	3 10	9	•	9				Sat.	G in	ray, silty, fine SAND (A durated limestone/cem	-2-4) with trace of ented sand layers		-125		† † † † †											-		·			
2	7.6 + 48.	.8	3 7	9	- 16 - 16					Sat.		ay, silty, fine to coarse erbedded, friable to indu hash limest	urated, sandy, shell	48.0	-130		† † † †											 - - -					
-55	2.6 - 53.	3	3 3	7	10.				SS-7	Sat.	-51.8 Gr	ay, silty, fine to coarse trace of cl	SAND (A-2-4) with ay	53.0	-135		+ + + +											F - - -					
-57	7.6 + 58.	3	3 4	5	9					Sat.	-61.8			<u>63</u> .0	-140		† † † †											- - -					
	2.6 + 63. - - 7.6 + 68.	7	7 11	7	1	3				Sat.	in	aray, silty, fine sand (A- durated limestone/cem	2-4) with trace of ented sand layers		-145		‡ ‡																
-70	2.6 + 73.	7	7 11	25		36				Sat.	-69.8 — G	ray, silty, fine SAND (A	-2-4) with trace of	71.0	-150		<u> </u>											E					
-75	+ '3.	7	7 9	11	1 : : : •	' 20				Sat.					-155		‡											<u> </u>					



MACTEC ENGINEERING AND CONSULTING, INC. 3301 ATLANTIC AVENUE RALEIGH, NORTH CAROLINA 27604

N.C.D.O.T./AASHTO CLASSIFICATIONS

REPORT ON SAMPLES OF: SOILS FOR QUALITY

MACTEC PROJECT NAME/ NUMBER: Bridge over Little Northeast Creek on SR 1406 Located at -L- Station 234+34

MACTEC Job No.: 6468-09-2400

NCDOT PROJ. NO.: 35801.1.1 (U-3810)

COUNTY: Onslow

5/7/2009

OWNER: N.C.D.O.T.

DATE SAMPLED: April 2009

RECEIVED:

REPORTED BY: MACTEC

SAMPLED FROM: EB1-A, B1-A, EB2-A

SUBMITTED BY: MACTEC ENGINEERING AND CONSULTING, INC.

1992 STANDARD SPECIFICATIONS

TEST RESULTS

Lab Sample No.		SS-1	SS-2	SS-3	SS-4	SS-5	SS-6
Retained No. 4 Sieve	(%)	0.0	0.0	0.2	0.0	0.0	0.0
Passing No. 10 Sieve	(%)	100.0	99.8	98.5	100.0	99.9	100.0
Passing No. 40 Sieve	(%)	99.6	91.0	92.7	99.7	98.7	99.7
Passing No. 200 Sieve	(%)	21.3	2.6	27.7	11.8	5.2	8.8

MINUS 2.00mm FRACTION

SOIL MORTAR - 100%							
Coarse Sand	(%)	2.4	31.5	9.9	3.0	16.2	6.9
Fine Sand	(%)	81.7	66.8	66.5	86.2	79.7	86.0
Silt	(%)	10.8	1.7	14.5	6.3	4.1	7.1
Clay	(%)	5.1	0.0	9.0	4.5	0.0	0.0

Moisture Content	(%)	ND	ND	ND	ND	ND	ND
Liquid Limit, L.L.		NV	NV	20	NV	NV	NV
Plasticity Index, P.I.		NP	NP	1	NP	NP	NP
AASHTO Classification		A-2-4(0)	A-3(0)	A-2-4(0)	A-2-4(0)	A-3(0)	A-3(0)
Organic Content	(%)	ND	ND	ND	ND	ND	ND

Boring No.		EB1-B NBL	EB1-B NBL	EB1-B NBL	EB1-B NBL	B1-B NBL	EB2-A NBL
Station		233+78	233+78	233+78	233+78	234+10	234+95
Offset		17 LT	17 LT	17 LT	17 LT	12 LT	34 LT
Alignment		-L-	-L-	-L-	-L-	-L-	-L-
Depth (FT)	From	3.6	13.9	53.9	78.9	18.8	18.8
	to	5.1	15.4	55.4	80.4	20.3	20.3

REMARKS: ND=Not Determined, NP=Non-Plastic, NV=No Value



MACTEC ENGINEERING AND CONSULTING, INC. 3301 ATLANTIC AVENUE RALEIGH, NORTH CAROLINA 27604

N.C.D.O.T./AASHTO CLASSIFICATIONS

REPORT ON SAMPLES OF: SOILS FOR QUALITY

MACTEC PROJECT NAME/ NUMBER: Bridge over Little Northeast Creek Located at Station 234+34

MACTEC Job No.: 6468-09-2400

NCDOT PROJ. NO.: 35801.1.1 (U-3810)

COUNTY: Onslow

OWNER: N.C.D.O.T.

DATE SAMPLED: April 2009

RECEIVED:

5/6/2009

REPORTED BY: MACTEC

SAMPLED FROM: EB2-A and Channel

SUBMITTED BY: MACTEC ENGINEERING AND CONSULTING, INC.

1992 STANDARD SPECIFICATIONS

TEST RESULTS

Lab Sample No.		SS-7	S-1		
Retained No. 4 Sieve	(%)	0.3	0.1		
Passing No. 10 Sieve	(%)	99.0	99.3		
Passing No. 40 Sieve	(%)	93.0	84.1		
Passing No. 200 Sieve	(%)	24.9	3.1		

MINUS 2.00mm FRACTION

SOIL MORTAR - 100%					
Coarse Sand	(%)	9.8	38.8		T T
Fine Sand	(%)	70.4	58.5		
Silt	(%)	10.3	2.0		
Clay	(%)	9.5	0.0		

Moisture Content	(%)	ND	ND			
Liquid Limit, L.L.		18	NV			
Plasticity Index, P.I.		1	NP		<u> </u>	
AASHTO Classification		A-2-4(0)	A-3(0)			
Organic Content	(%)	ND	ND			

Boring No.		EB2-A NBL	Channel			
Station		234+95	234+65			
Offset		34 LT	30 LT			
Alignment		-L-	-L-			
Depth (FT)	From	53.8	0.0		***************************************	
	to	55.3	1.0			

REMARKS: ND=Not Determined, NP=Non-Plastic, NV=No Value

Tested By Chana Savanapridi; Cert. No. 104-04-0504

Tested By Chana Savanapridi; Cert. No. 104-04-0504



FIELD SCOUR REPORT

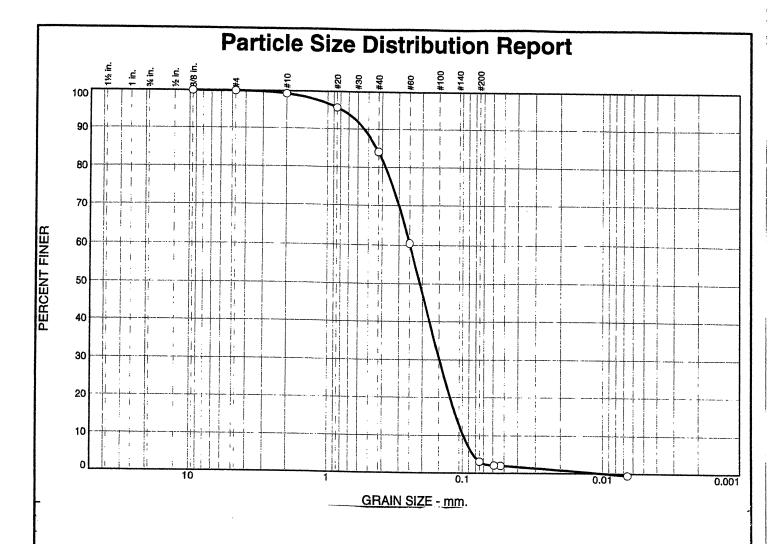
WBS: 35801.1.1 TIP: U-3810 COUNTY: Onslow	
DESCRIPTION(1): Bridge 121 on SR 1406 over Little Northeast Creek (at Station 234+34)	
EXISTING BRIDGE	•
Information from: Field Inspection X Microfilm (reel pos:) Other (explain)	
Bridge No.: 121 Length: 125' Total Bents: 4 Bents in Channel: 2 Bents in Floodplain: 2 Foundation Type: Cored slab supported on concrete cap and piles	·
EVIDENCE OF SCOUR(2) Abutments or End Bent Slopes: Stream widens at the bridge, but no apparent evidence of scour	
Interior Bents: Not apparent. Bed not visible through the water.	
Channel Bed: Not apparent. Bed not visible through the water.	
Channel Bank: Not apparent. Banks are mostly covered by vegetation.	
EXISTING SCOUR PROTECTION Type(3): Rip rap	
Extent(4): Across entire width of embankment at both end bents.	
Effectiveness(5): Mostly effective.	
Obstructions(6): None	

INSTRUCTIONS

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

			<u>DESIGN II</u>	VFORM.	<u>ATION</u>				• .	
Channe	l Bed Material	(7): Slightly sil	ty fine to coars	se sand		•				
		` '								***************************************
								······································		
Channel	Bank Material	(8): Surficial la	yer of silty clay	y, underla	n by sil	ty fine to	coarse s	and		
		· .								
Chann	ol Book Cover	(O): Grasses h	vichos oot toil	s small to	lorgo i	roop			•	
Chann	ei bank Coven	(9): Grasses, b	Justies, cat tail	S, Sman to) large t	1662		• •	 	•
Floo	dplain Width(1	0): 400 feet								
00	apian. Wati	100 1001							· .	
Floo	dplain Cover(1	1): Grasses, b	ushes, small t	o large tre	es, soil	road ap	oroachin	g end be	nt 2	•
*	Stream is(1	2): Aggr	ading	Degra	ading		Sta	atic X		
inel Migratio	on Tendency(1	3): Southward	toward End B	ent 2						
haanuationa	and Other Co	mmonta: Laur	flavy any iranna	ant at time	of inve	atiantian	000000	o rotolni	م الحديدة	lana
JSEI VALIONS	and Other Co	mments: Low	stream from e			sugation	, concre	e retainii	ng wan a	iong
	•	Dank GOW	isticani nom e	nd bent 2				***************************************	· · · · · · · · · · · · · · · · · · ·	
		Reported by:	James Hov	vard			•	Date:	4/24/2	2009
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		*								
SIGN SCC	OUR ELEVATI	ONS(14)			Feet	:_X_	Met	ers		
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	BEN B1									
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			·							
•		aulics Unit the								
e Geotechr	nical Engineeri	ng Unit agrees	with the Hydr	aulic Unit'	s theore	etical sco	ur elevat	ions as r	noted abo	ove.
										
	DSE de	etermined by:	PII. M	1 (11)	lely			Date:	7/22/2	2009
			Care 17	1 000.				20.0.		
				•						
IL ANALY	SIS RESULTS	FROM CHAN	INEL BED AN	D BANK	MATER	IAL				
ed or Bank		Bank	Bank			• •				
ample No.	S-1	SS-1	SS-2						ļ	
etained #4	0.1	0	0	·						
assed #10	99.3	100	99.8	<u> </u>						
assed #40 ssed #200	84.1 3.1	99.6 21.3	91 2.6							
arse Sand	38.8	2.4	31.5				_	············	 	
Fine Sand	58.5	81.7	66.8	l ·					-	
Silt	2	10.8	1.7	<u> </u>					 	
Clay	. 0 .	5.1	0							.
LĽ	No Value	No Value	No Value					•		
· .PI	Non Plastic	Non Plastic	Non Plastic		. `					
AASHTO	A-3(0)	A-2-4(0)	A-3(0)							
Station	234+65	233+78	233+78							
Offset	30 LT	17 LT	17 LT							
Depth	0.0-1.0	3:6-5.1 →	13.9-15.4	<u> </u>					<u> </u>	

Template Revised 02/07/06



SIEVE	PERCENT	SPEC.*	PASS?
SIZE	FINER	PERCENT	(X=NO)
3/8 #4 #10	100.0 99.9		
#20 #40	99.3 95.6 84.1		
#60 #200	60.5 3,1		
#270	2.0		

Fine to Coarse SA	AND with Trace of Sile	İ.
PL= NP	Atterberg Limits	PI= NP
D ₉₀ = 0.5375 D ₅₀ = 0.2087 D ₁₀ = 0.0987	Coefficients D ₈₅ = 0.4376 D ₃₀ = 0.1491 C _u = 2.51	D ₆₀ = 0.2479 D ₁₅ = 0.1115 C _C = 0.91
USCS= SP	Classification AASHT	O= A-3
ND N. D.	Remarks	
ND = Not Determ	uned	
Spatula Method		
Specific Gravity i	s assume	

Material Description

* (no specification provided)

Source of Sample: Channel Bed Sample Number: S-1

Depth: 0.0-1.0'

MACTEC Engineering and Consulting, Inc.

Client: NC DEPARTMENT OF TRANSPORTATION
Project: Bridge on SR 1406 @ Station 234+34

Raleigh, North Carolina

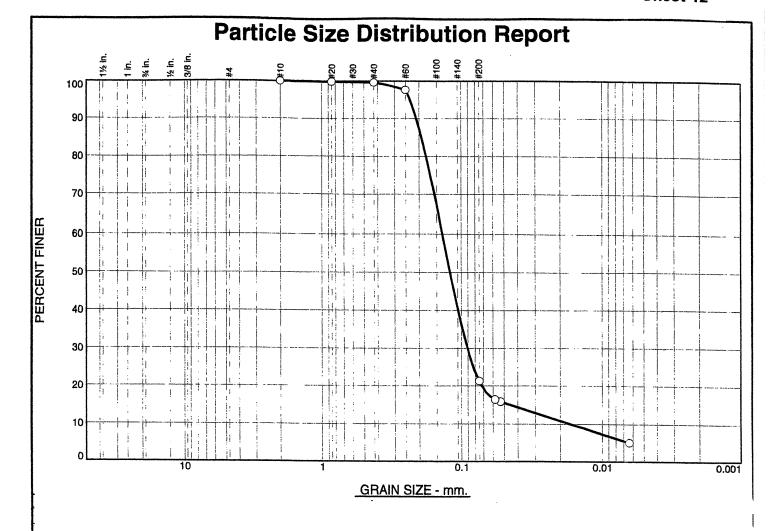
Project No: 6468092400

Figure

Date: 5/7/09

Tested By: CS (Cert# 104-04-0504) Checked

Checked By: MDC (Lab Manager)



	SIEVE	PERCENT	SPEC.*	PASS?
	SIZE	FINER	PERCENT	(X=NO)
	#10	100.0		
	#20	99.9		
1	#40	99.6		
	#60	97.6		
	#20 0	21.3		
	#270	15.9		

	<u> Material Description</u>	<u>1</u>
Gray-Brown Silty	Fine to Coarse SAND	with Trace of Clay &
Organic Matter		
PL= NP	Atterberg Limits LL= NV	PI= NP
	Onefficients	
D ₉₀ = 0.2091	Coefficients D ₈₅ = 0.1920	Doo= 0.1367
D ₅₀ = 0.1204 D ₁₀ = 0.0168	D ₃₀ = 0.0903 C _U = 8.16	D ₆₀ = 0.1367 D ₁₅ = 0.0444 C _C = 3.56
$D_{10}^{-} = 0.0168$	$C_{u}^{00} = 8.16$	$C_{c}^{13} = 3.56$
	Classification	
USCS= SM	AASHTO	O = A-2-4(0)
	Remarks	
ND = Not Detern	nined	
Spatula Method		
Specific Gravity	is assumed	

* (no specification provided)

Source of Sample: Boring EB1-B NBL Depth: 3.6-5.1' Sample Number: SS-1

MACTEC Engineering and Consulting, Inc.

Raleigh, North Carolina

Client: NC DEPARTMENT OF TRANSPORTATION

Project: Bridge on SR 1406 @ Station 234+34

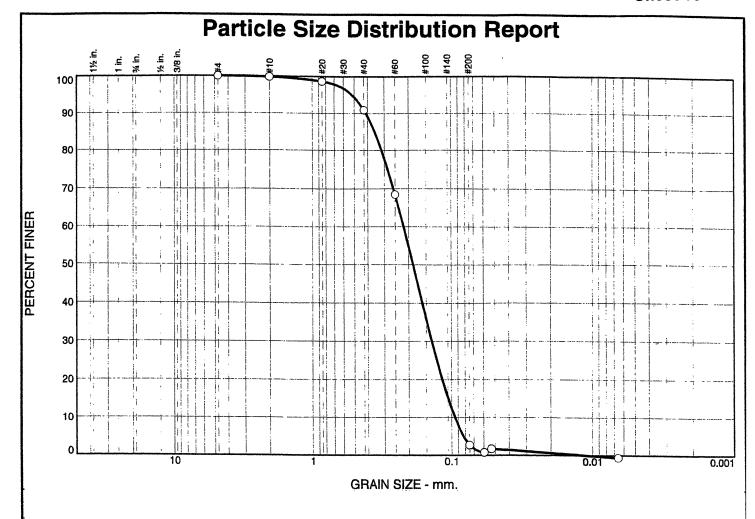
a Pr

Project No: 6468092400

Figure

Date: 5/7/09

Tested By: CS (Cert# 104-04-0504)



SIEVE	PERCENT	SPEC.*	PASS?
SIZE	FINER	PERCENT	(X=NO)
#4	100.0		
#10	99.8		
#20	98.7		
#40	91.0		
#60	68.4		
#200	2.6		
#270	1.7		
			T-1
* (no en	acification provide	<u> </u>	I

Gray, Fine to Coa	rse SAND with Trace	of Silt
PL= NP	Atterberg Limits LL= NV	PI= NP
D ₉₀ = 0.4107 D ₅₀ = 0.1859 D ₁₀ = 0.0944	Coefficients D ₈₅ = 0.3537 D ₃₀ = 0.1368 C _U = 2.30	D ₆₀ = 0.2171 D ₁₅ = 0.1052 C _c = 0.91
USCS= SP	Classification AASHT	O= A-3
ND = Not Determ	<u>Remarks</u>	
Specific Gravity		

(no specification provided)

Source of Sample: Boring EB1-B NBL Depth: 13.9-15.4' Sample Number: SS-2

Date: 5/7/09

MACTEC Engineering and Consulting, Inc.

Client: NC DEPARTMENT OF TRANSPORTATION

Project: Bridge on SR 1406 @ Station 234+34

Raleigh, North Carolina

Project No: 6468092400

Figure

Tested By: CS (Cert# 104-04-0504)



View Looking Up Station from End Bent No. 1



View Looking Down Station from End Bent No. 2



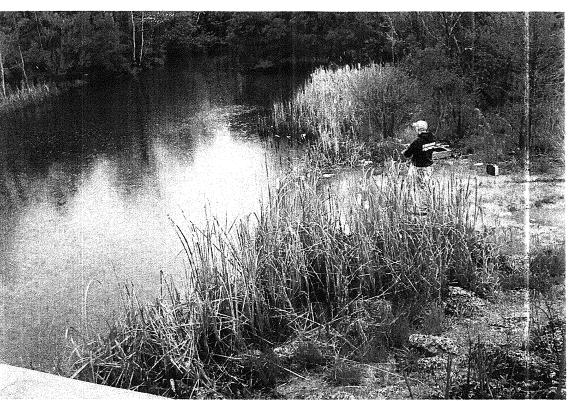
View looking right to left of End Bent No. 1



View looking right to left of Bent No. 1

SITE PHOTOS Mactec Proj. No. 6468-09-2400

SHEET 15 BRIDGE ON SR 1406 AT -L- STATION 234+34 NCDOT Project No. 35801.1.1 (U-3810)



View looking right to left of Interior Bent No 2 (located in water)



View looking right to left of End Bent No. 2

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DESCRIPTION

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SCOUR REPORTS

SITE PHOTOS

GRAIN SIZE CURVES

SITE LOCATION/TOPO MAP (DWG I & 2)

PROFILE 27.4 FT RT OF -L- (DWG 4 & 5)

BORING LOGS, CORE REPORTS, CORE PHOTOGRAPHS

TITLE SHEET

LEGEND

SHEET

2

3

4

5-6

7-14

15-16

17-18

19-21

22-24

CT: 35801.1.1

STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS GEOTECHNICAL ENGINEERING UNIT

STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 35801.1.1 (U-3810) F.A. PROJ. STP-1406(4) COUNTY ONSLOW
PROJECT DESCRIPTION BRIDGES ON SR 1406 AT -L- STATIONS 84+77 AND 234+34
SITE DESCRIPTION BRIDGE ON SR 1406 AT -L- STATION 84+77

N.C. 35801.1.1 1 24

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 LOSS, 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 (9)9) 250-4088, NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOSS, 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 SUBSUPFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS OR BETWEEN SAMPLED STRATA WITHIN THE BORENOLE. 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 INCTHOD. THE DISSEPTEM 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 NO GENERATION OF THE SPROMETON OF THE INVESTIGATION MADE, NOR THE INTERPRETATIONS MADE, OR OPINION OF THE DEPARTMENT AS TO THE TYPE OF MARKETIALS 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 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.

For Letting

J. HOWARD

D. RHODES

D. WHITE

K. GUY

INVESTIGATED BY MACTEC

CHECKED BY B. DEOBALD

SUBMITTED BY S. JOHNSON

DATE JULY 10, 2009

REVISED AUGUST 7, 2009

PERSONNEL

MACTEC DOSIDERING & CONSULTING, INC.
3301 ATLANTIC AVENUE
RALEIGH. NORTH CAROLINA 27604
(919) 876-0416

MACTEC NC LICENSE F-0653

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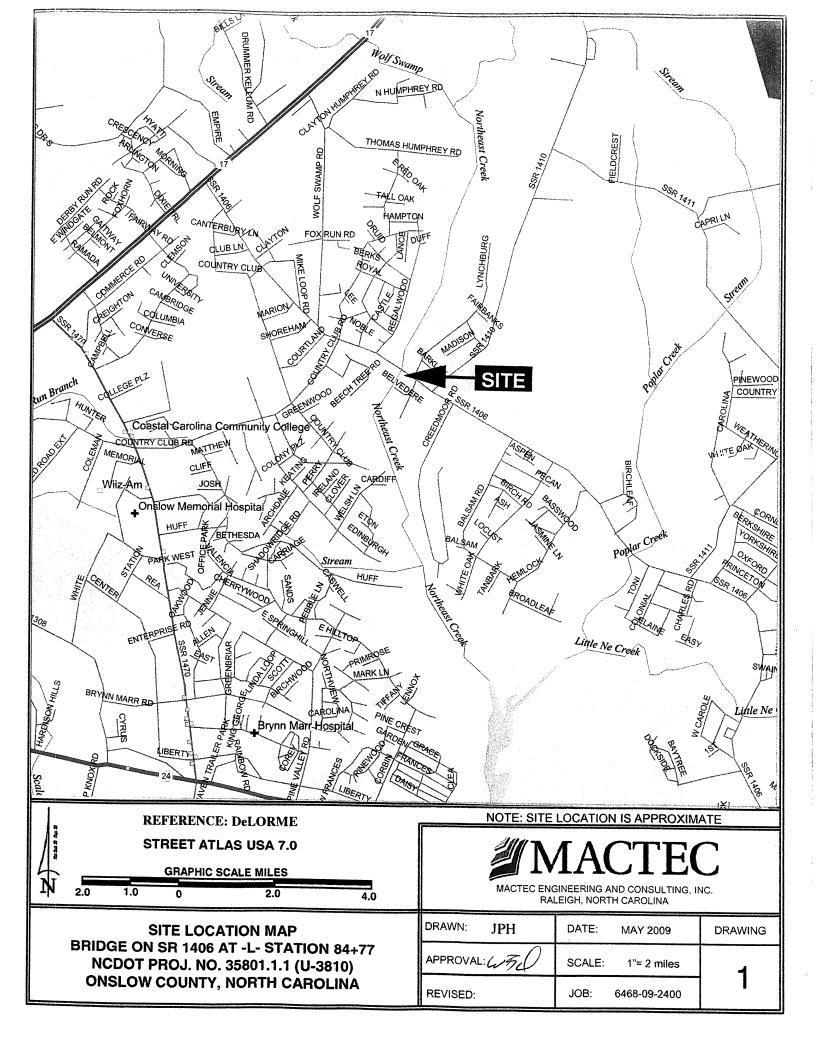
NOTE - BY HAVING REQUESTED THIS INFORMATION THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS
FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE
CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

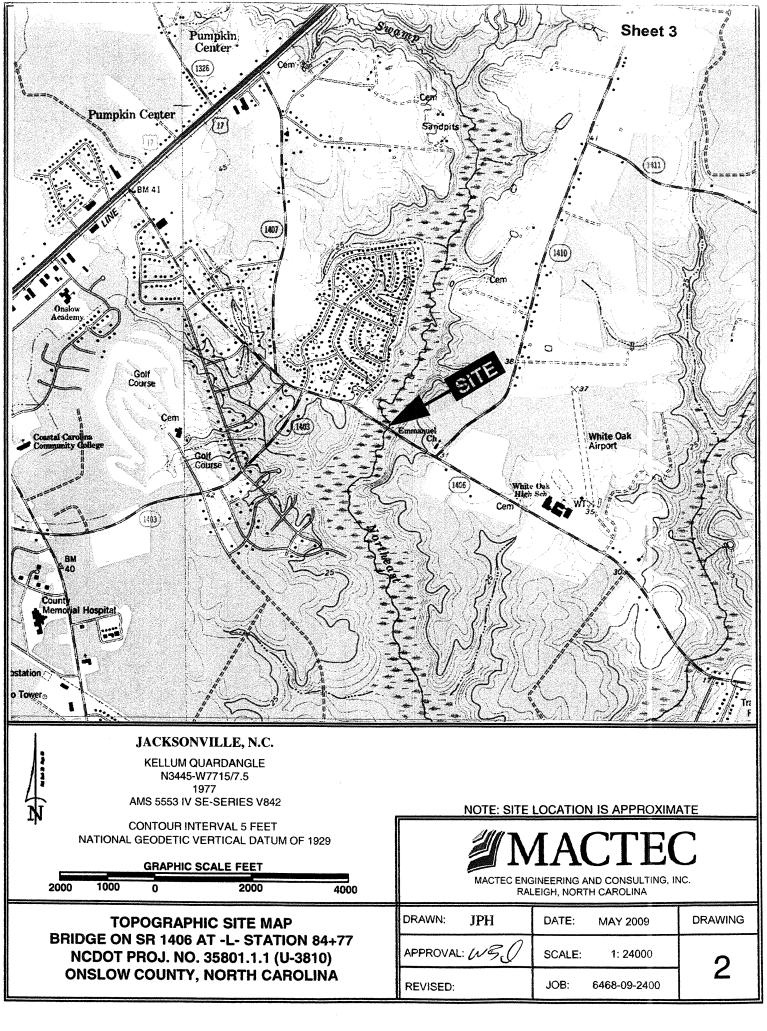
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS GEOTECHNICAL ENGINEERING UNIT

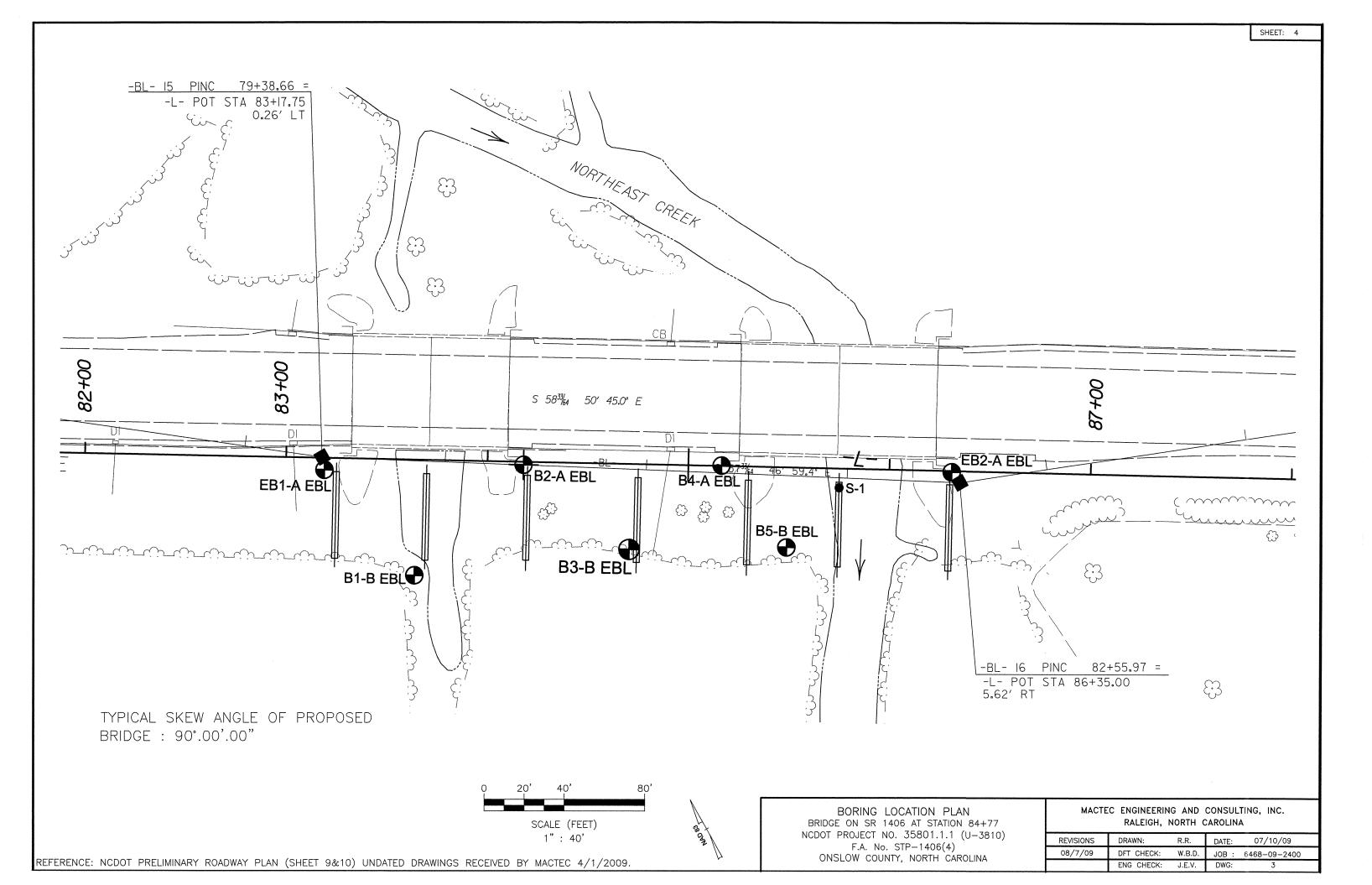
PROJECT REFERENCE NO. 35801.1.1

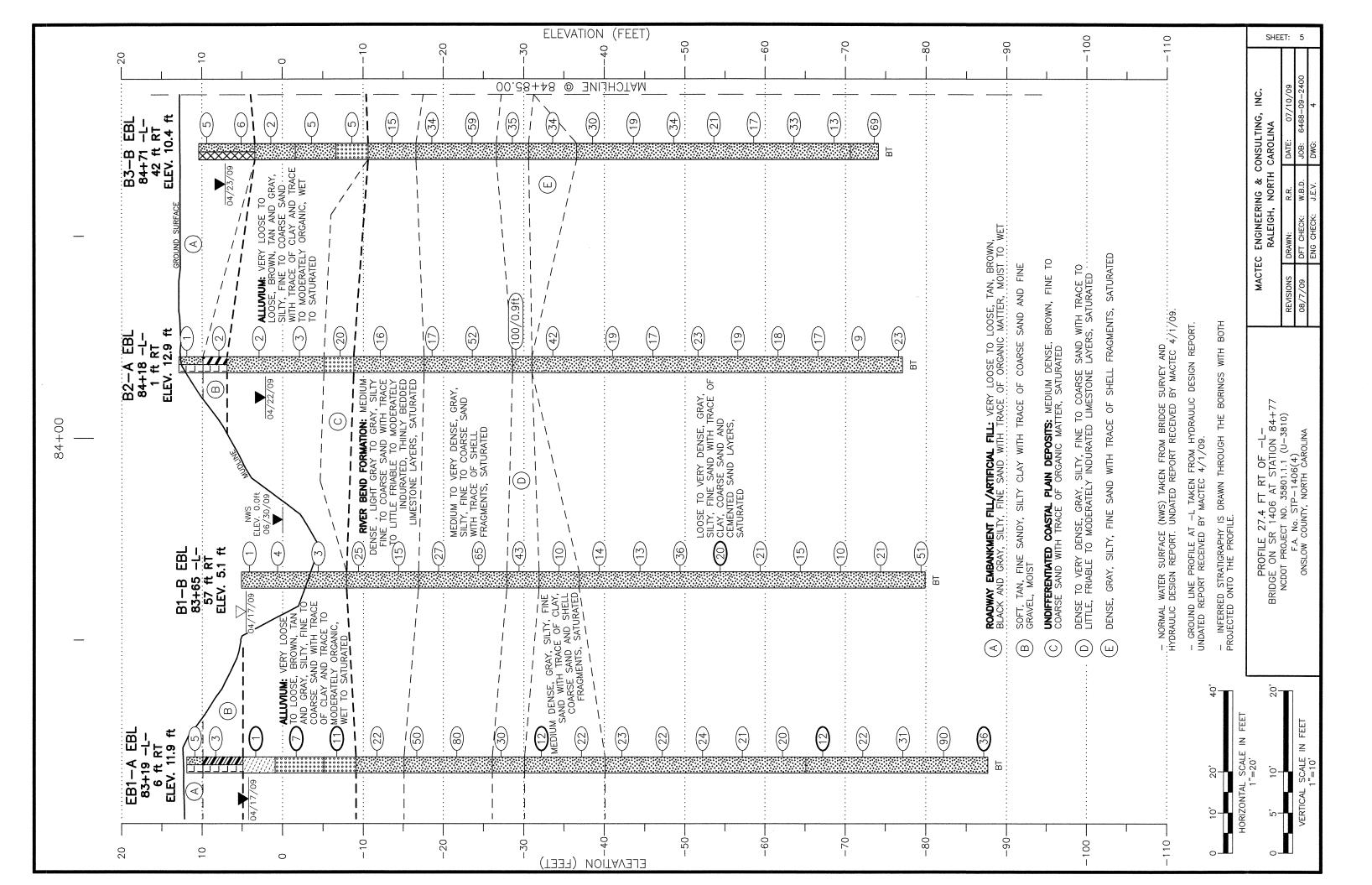
SUBSURFACE INVESTIGATION

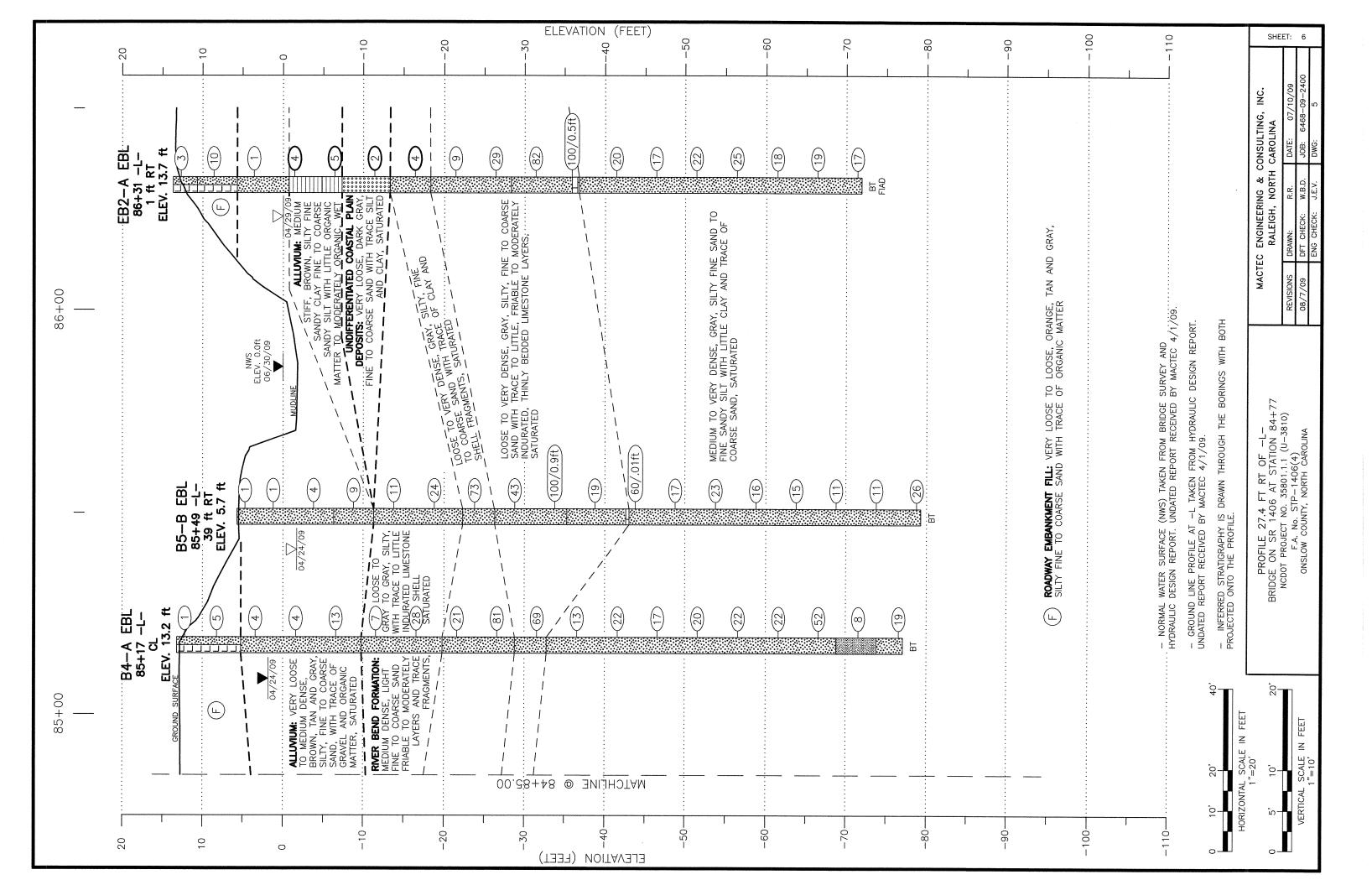
	SOIL AND ROCK LEGEND, TERMS	S, SYMBOLS, AND ABBREVIATIONS	
SOIL DESCRIPTION	GRADATION	ROCK DESCRIPTION	TERMS AND DEFINITIONS
SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (AASHTO 7206, 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	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		ALLUVIUM (ALLUV.) — SOILS THAT HAVE BEEN TRANSPORTED BY WATER. AQUIFER — A WATER BEARING FORMATION OR STRATA. ARENACEOUS — APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.
AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE: VERY STIFF, GRAY, SLITY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6 SOIL LEGEND AND AASHTO CLASSIFICATION	THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBROUNDED, OR ROUNDED. MINERALOGICAL COMPOSITION MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS	ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS: WEATHERED ROCK (WR) ROUN-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED. CRYSTALLINE FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRAINITE,	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.
GENERAL GRANULAR MATERIALS SILT-CLAY MATERIALS CLASS. C 35% PASSING #200 ORGANIC MATERIALS	WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE. COMPRESSIBILITY SLIGHTLY COMPRESSIBLE MODERATELY COMPRESSIBLE HIGHLY COMPRESSIBLE HIGHLY COMPRESSIBLE LIQUID LIMIT EQUAL TO 31–50 HIGHLY COMPRESSIBLE LIQUID LIMIT EQUAL TO 31–50 HIGHLY COMPRESSIBLE LIQUID LIMIT EREATER THAN 50	NON-CRYSTALLINE ROCK (NCR) NON-CRYSTALLINE ROCK (NCR) COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YELLD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC. COASTAL PLAIN SEDIMENTARY ROCK	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 DIMDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.
% PASSING # 10 50 MX 50 MX 51 MN 25 MX 10 MX 35 MX 35 MX 35 MX 36 MN 36 MN	PERCENTAGE OF MATERIAL ORGANIC MATERIAL GRANULAR 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%	WEATHERING FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER HAMMER IF CRYSTALLINE.	 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.
USUAL TYPES STONE FRACE. FINE SILTY OR CLAYEY SILTY CLAYEY CRGANIC CR	MODERATELY ORGANIC 5 − 10% 12 − 20% SOME 20 − 35%	VERY SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, V SLI.) CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE. SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO (SLI.) 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR	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.
OF MAJOR MATERIALS GEN. RATING AS A AS A SUBGRADE SUBGRADE SILTY OR CLAYEY SILTY SILTY CLAYEY ORGANIC ORGANIC MATTER SILTY ORGANIC ORGANIC ORGANIC FAIR TO POOR FAIR TO POOR FAIR TO POOR POOR UNSUITABLE	STATIC WATER LEVEL AFTER 24 HOURS PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA	CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS. MODERATE 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	FISSILE — A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. FLOAT — ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL. FLOOD PLAIN (FP) — LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY
PI OF A-7-5 SUBGROUP IS ≤ LL - 30; PI OF A-7-6 SUBGROUP IS> LL - 30 CONSISTENCY OR DENSENESS PRIMARY SOIL TYPE COMPACTNESS OR CONSISTENCY COMPACTNESS OR COMPACTNESS OR COMPACTNESS OR CONSISTENCY COMPACTNESS OR COMPACTNESS O	SPRING OR SEEP MISCELLANEOUS SYMBOLS MISCELLANEOUS SYMBOLS Proper capt capt capt capt capt capt capt capt	MODERATELY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL SEVERE 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	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.
GENERALLY	S - BULK SAMPLE SOIL SYMBOL AUGER BORING ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT S - BULK SAMPLE SS - SPLIT SPOON SAMPLE SAMPLE ST - SHELBY TUBE	SEVERE ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED (SEV.) 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 ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT	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
VERY DENSE >50	INFERRED SOIL BOUNDARY MONITORING WELL RS — ROCK SAMPLE PIEZOMETER A PIEZOMETER NET — RECOMPACTED TRIAXIA	(V SEV.) 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, WELDS SPT N. VALUES < 100 BPF AL COMPLETE ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND	SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE. <u>PERCHED WATER</u> — WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM. <u>RESIDUAL (RES.) SOIL</u> — SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.
MATERIAL SIII-F B IO 15 1 TO 2	25/025 DIP & DIP DIRECTION OF STATUS INSTALLATION CBR — CALIFORNIA BEARING RATIO SAMPLE SPT N-VALUE	SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE. ROCK HARDNESS VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES	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
U.S. STD. SIEVE SIZE 4 10 40 60 200 270 OPENING (MM) 4.76 2.00 0.42 0.25 0.075 0.053 BOULDER COBBLE GRAVEL SAND SAND SILT CLAY (BLDR.) (COB.) (GR.) (GR.) (COB.) (GR.) (COB.) (GR.) (COB.) (COB.) (GR.) (COB.) (CO	SOUNDING ROD REF SPT REFUSAL ABBREVIATIONS AR - AUGER REFUSAL HI HIGHLY W - MOISTURE CONTENT	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 CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE	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.
(BLDR.) (COB.) (GR.) (CSE. SD.) (F SD.) (SL.) (CL.) GRAIN MM 305 75 SIZE IN. 12 3 2.0 0.25 0.05 0.005 0.005 0.005 SOIL MOISTURE — CORRELATION OF TERMS	BT BORING TERMINATED MED MEDIUM V VERY CL CLAY MICA MICACEOUS VST VANE SHEAR TEST CPT CONE PENETRATION TEST MOD MODERATELY WEA WEATHERED CSE COARSE NP NON PLASTIC 7 UNIT WEIGHT DMT DILATOMETER TEST ORG ORGANIC 7 DRY UNIT WEIGHT	HARD EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS. MEDIUM CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. HARD CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE	SUCRENSIDE — POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SUPPLANE. STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) — NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS
SOIL MOISTURE SCALE (ATTERBERG LIMITS) FIELD MOISTURE DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION - SATURATED - USUALLY LIQUID; VERY WET, USUALLY	DPT — DYNAMIC PENETRATION TEST	POINT OF A GEOLOGIST'S PICK. SOFT CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.	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.
LL LIQUID LIMIT CSAT.) FROM BELOW THE GROUND WATER TABLE	FRAC FRACTURES, FRACTURES SU SLIGHTLY FRAGS FRAGMENTS TCR - TRICONE REFUSAL EQUIPMENT USED ON SUBJECT PROJECT	VERY CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH SOFT OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAL. FRACTURE SPACING BEDDING	STRATA ROCK QUALITY DESIGNATION (SRQD) — A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. TOPSOIL (TS.) — SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
OM OPTIMUM MOISTURE SL SHRINKAGE LIMIT OM OPTIMUM MOISTURE SL SHRINKAGE LIMIT ORY - (D) REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE	DRILL UNITS: ADVANCING TOOLS: L CLAY BITS COLE SIZE: ADVANCING TOOLS: L AUTOMATIC L MANUAL CORE SIZE:	TERM SPACING TERM THICKIESS VERY THICKLY BEDDED > 4 FEET	BENCH MARK: NCDOT REBAR AND CAP STAMPED BL-16 LOCATED AT -BL- STATION 86+35, 5.6 RT ELEVATION: 12.05 FT. NOTES: BOLD CIRCLE INDICATES TESTED SAMPLE
PLASTICITY PLASTICITY INDEX (PI) DRY STRENGTH NONPLASTIC 0-5 VERY LOW LOW PLASTICITY 6-15 SLIGHT	X CME-45C	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.	FIAD — FILLED IMMEDIATELY AFTER DRILLING
MED. PLASTICITY 16-25 MEDIUM HIGH PLASTICITY 26 OR MORE HIGH COLOR	PORTABLE HOIST X TRICONE 2 7/8" STEEL TEETH HAND TOOLS: X TRICONE 3 7/8" STEEL TEETH HAND AUGER CORE BIT SOUNDING ROD	MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER. (NDURATED GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE;	
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.	UANE SHEAR TEST	DIFFICULT TO BREAK WITH HAMMER. EXTREMELY INDURATED SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.	

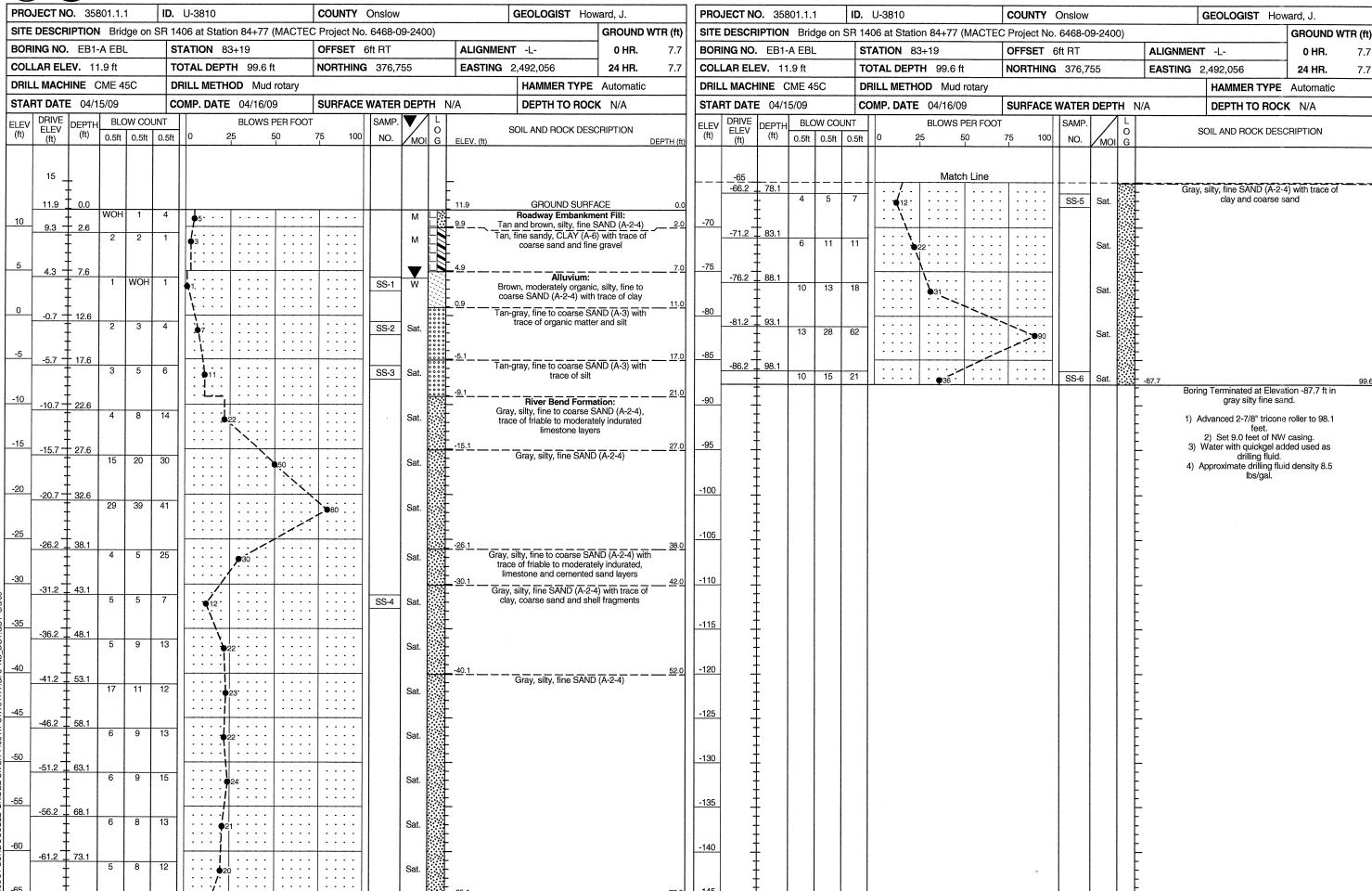


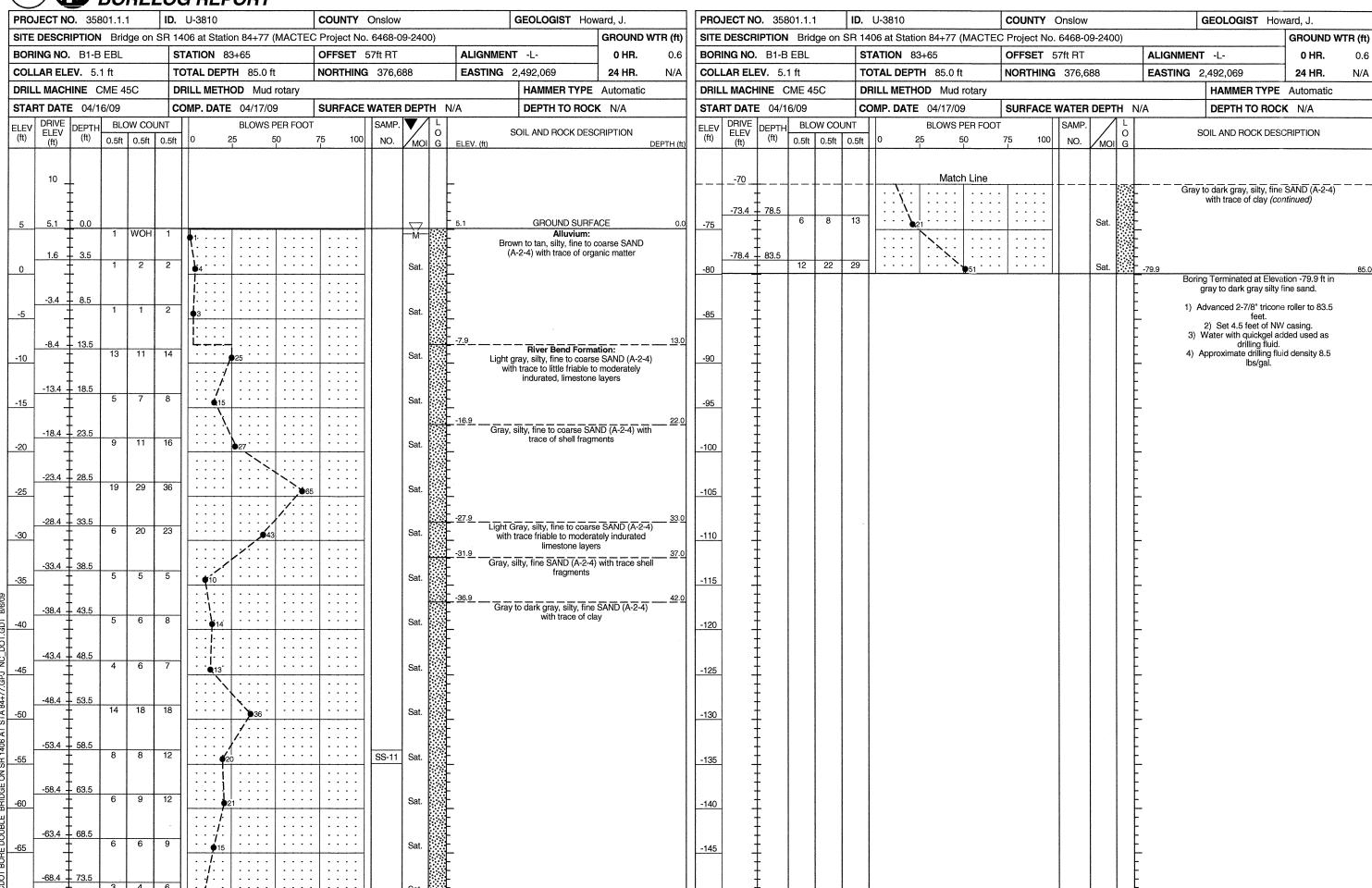


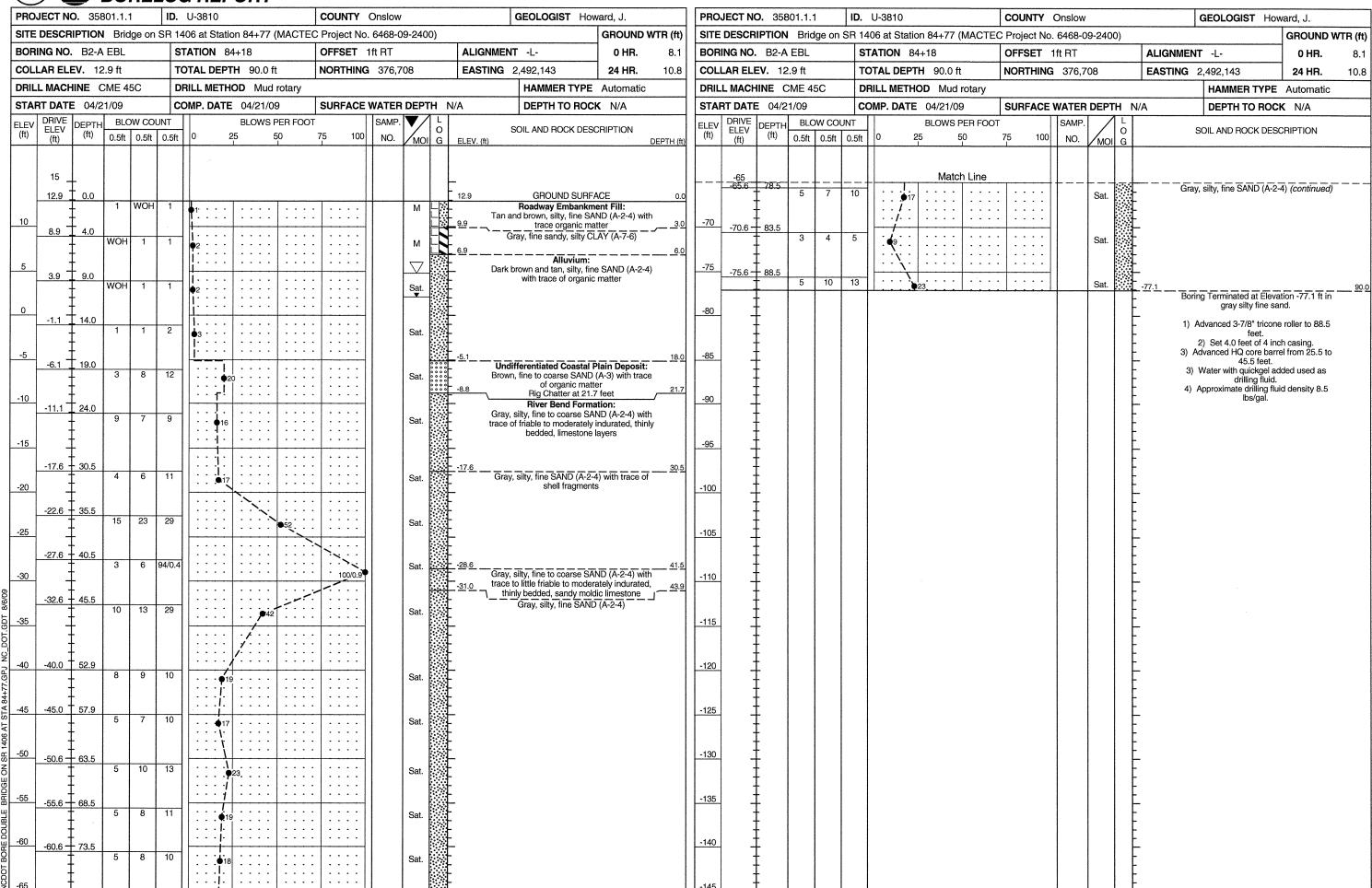








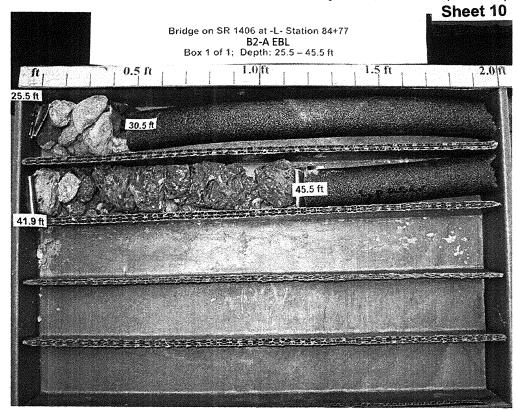






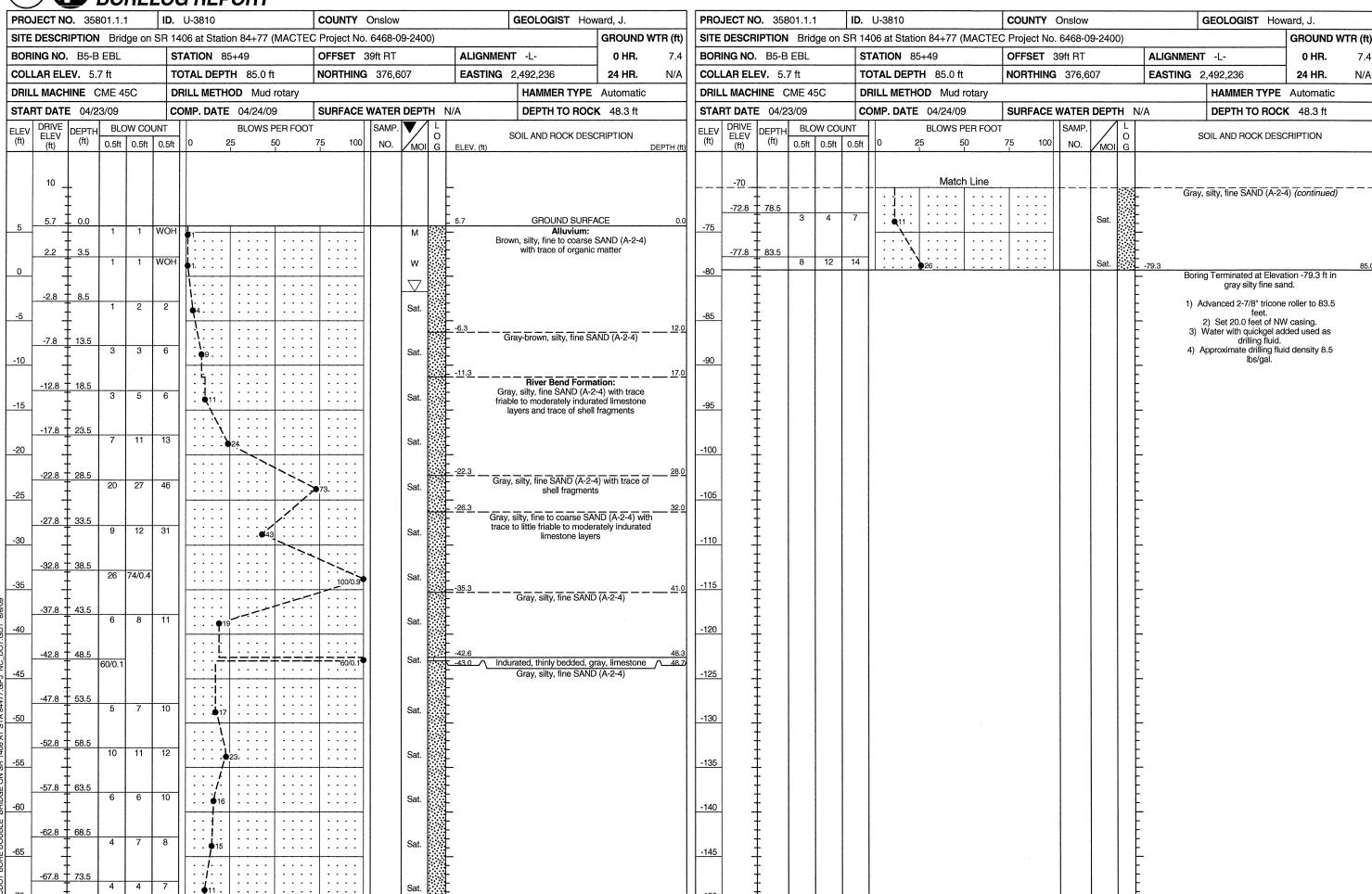
PRO	JECT N	O . 35	801.1.	1 1	D. U-	-3810		i		CC	DUNTY Onslow GEOLOGIST Howard, J.
SITE	DESCR	IPTION	N Brid	dge on SF	R 1406	at Sta	ation 84+	77 (M/	ACTE	C Pr	oject No. 6468-09-2400) GROUND WTR (ft)
BOR	ING NO.	B2-A	EBL		STA	TION	84+18			OF	FFSET 1ft RT ALIGNMENT -L- 0 HR. 8.1
COL	LAR ELI	EV. 12	2.9 ft		TOT	AL DE	PTH 90	.0 ft		NO	PRTHING 376,708 EASTING 2,492,143 24 HR . 10.8
ORIL	L MACH	IINE (CME 4	5C	DRIL	L MET	THOD N	/lud rot	ary		HAMMER TYPE Automatic
STAF	RT DATE	04/2	21/09	· .	COM	P. DA	TE 04/2	1/09		su	RFACE WATER DEPTH N/A DEPTH TO ROCK N/A
OR	E SIZE	HQ			TOTA	AL RU	N 15.6			DR	RILLER Rhodes, D.
LEV	RUN ELEV	DEPTH		DRILL RATE	REC.	JN RQD	SAMP.	REC.	RATA RQD	P	DESCRIPTION AND REMARKS
(ft)	(ft)	(ft)	(ft)	(Min/ft)	(ft) %	(ft) %	NO.	(ft) %	(ft) %	Ğ	ELEV. (ft) DEPTH (ft
	-12.6 -12.6 -	25.5	<u> </u>		10.0			<u> </u>	<u> </u>		Begin Coring @ 25.5 ft
-15	-12.0	- 25.5 -	5.0	0:15/1.0 0:15/1.0	(0.3) 6%	NA		(0.3) 6%	NA		River Bend Formation: Gray, silty, fine to coarse SAND (A-2-4) with trace of friable to moderately
	47.			0:15/1.0 0:15/1.0 0:15/1.0							indurated, thinly bedded, limestone layers
	-17.6 - -19.1 _	30.5 32.0	-	0:15/1.0 N=17	<u> </u>			(0.0)	NA		-17.6 Gray, silty, fine SAND (A-2-4) with trace of shell fragments
20			3.5	0:15/1.0 0:15/1.0	(0.0)	NA		0%			
	-22.6 -	35.5		0:15/1.0 0:15/1.0 0:07/0.5	U%						
25	-24.1	37.0	2.5	N=52	(0.0)	816					
-5-	-	<u> </u>	3.5	0:15/1.0 0:15/1.0	(0.0)	NA					 - -
	-27.6 - -29.0	40.5	<u> </u>	0:15/1.0 0:10/0.5							
30	-29.0	- 41.9	3.6	N=100/0.9 1:15/1.0	(1.3)	NA		(1.3) 54%	NA		Gray, silty, fine to coarse SAND (A-2-4) with trace to little friable to
	-32.6 -	45.5		1:15/1.0 0:15/1.0	36%			(0.0)	NA		Gray, silty, fine SAND (A-2-4)
ا م		-		0:07/0.6 N=42				0%			
35	-	-									 -
]	_									
0	_	-									
	-	_		N=19							
5		_		N=17							<u></u>
]	_									
0											<u> </u>
	-			N=23							
	1										
55_		_									
	1	_		N=19							
30	1							ŀ			
	7	-		N=18							F
	1	-									
35	4	-									
	1	-		N=17							
0	1										
\dashv	7	-		N=9							 - -
Ì	‡	-									<u> </u>
75		-									<u></u>
ļ		<u>-</u>		N=23							-77.1 90.
,	1	-									Boring Terminated at Elevation -77.1 ft in gray silty fine sand.
30	-	-									1) Advanced 3-7/8" tricone roller to 88.5 feet. 2) Set 4.0 feet of 4 inch casing.
	1										3) Advanced HQ core barrel from 25.5 to 45.5 feet. 3) Water with quickgel added used as drilling fluid.
35	_	. .									4) Approximate drilling fluid density 8.5 lbs/gal.
	3	<u>.</u> -									
_	- 1	-									
90	4	-									<u>-</u>
.	1	-									

Bridge on SR 1406 at -L- Station 84+77 NCDOT Proj. No. 35801.1.1(U-3810)



PROJECT NO. 35801.1.1	ID. U-3810	COUNTY Onslow	GEOLOGIST Howard, J.		PROJ	JECT NO	. 35801.1	.1	ID.	U-3810	COUNTY Onslov	v	GEOL	.OGIST Hov	ard, J.
SITE DESCRIPTION Bridge on S	R 1406 at Station 84+77 (MACTI	EC Project No. 6468-09-2400)	GROUND W	TR (ft)	SITE I	DESCRI	PTION Bri	idge on S	SR 14	06 at Station 84+77 (MACTE	C Project No. 6468-	09-2400)			GROUND WTR (
BORING NO. B3-B EBL	STATION 84+71	OFFSET 42ft RT	ALIGNMENT -L- 0 HR.	3.1	BORII	NG NO.	B3-B EBL	-	ST	FATION 84+71	OFFSET 42ft RT	ALI	GNMENT -L-		0 HR. 3
COLLAR ELEV. 10.4 ft	TOTAL DEPTH 84.5 ft	NORTHING 376,645	EASTING 2,492,168 24 HR.	3.3	COLL	AR ELE	V. 10.4 ft		то	OTAL DEPTH 84.5 ft	NORTHING 376,	645 EA S	STING 2,492,	168	24 HR. 3
DRILL MACHINE CME 45C	DRILL METHOD Mud rotary		HAMMER TYPE Automatic		DRILL	L MACH	NE CME	45C	DF	RILL METHOD Mud rotary			HAI	MMER TYPE	Automatic
START DATE 04/22/09	COMP. DATE 04/22/09	SURFACE WATER DEPTH N	A DEPTH TO ROCK N/A		L		04/22/09		CO	OMP. DATE 04/22/09	SURFACE WATER	R DEPTH N/A	DEF	TH TO ROC	N/A
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		75 100 SAMP. V L O NO. MOI G	SOIL AND ROCK DESCRIPTION ELEV. (ft)	EPTH (ft)	ELEV (ft)	DRIVE ELEV (ft)	DEPTH BL (ft) 0.5ft	OW COU		BLOWS PER FOO	T SAMP 75 100 NO.	. L O MOI G	SOIL AN	ND ROCK DESC	CRIPTION
15						-65 -67.6				Match Line			Gray, silty, fi	ine SAND (A-2-	(continued)
10 10.4 0.0		k_z: d-	10.4 GROUND SURFACE	0.0	-70	\pm	4	5	8	13.		Sat.			
6.1 4.3	3		Artificial Fill: Black and gray, silty, fine SAND (A-2-4)		75	-72.6	83.0	21	48			Sat74.1	се	ne SAND (A-2-4 mented sand la	ers 8
2.4 + 8.0	\$\\ \begin{array}{c ccccccccccccccccccccccccccccccccccc	- w w w w w w w w w	3.4		-75	‡							Boring Term g	ninated at Eleva gray silty fine sa	ion -74.1 ft in nd.
	1 2	Sat.	Alluvium: Gray, silty, fine SAND (A-2-4)		-80	-								ed 2-7/8" tricone feet. t 9.0 feet of NW with quickgel ad	-
-2.6 13.0 2 1	4 5	· · · · · Sat	Tan-brown, silty, fine SAND (A-2-4) with trace of organic matter	12.0	-85	1								with quickgel ad drilling fluid. mate drilling flui lbs/gal.	
-7.6 + 18.0 6 3	2 •5	Sat.	Brown-gray, fine to coarse SAND (A-3) with trace of silt	17.0	00	1									
-12.6 - 23.0	10	Sat.	River Bend Formation: Light gray, silty, fine to coarse SAND (A-2-4) with trace of friable to moderately indurated	21.0	-90	† 									
-15 -17.6 - 28.0 -10 15	19		limestone layers -16.6 Gray, silty, fine SAND (A-2-4) with trace of shell fragments	27.0	-95	1									
-22.6 + 33.0			o.cneg.nene		-100	‡									
-25 15 24 -27.6 38.0	35	Sat.	-26.6 Gray, silty, fine SAND (A-2-4) with trace to	<u>37.0</u>	-105	1									
	22	Sat. Sat.	little friable to moderately indurated limestone layers Gray, silty, fine SAND (A-2-4) with trace of	41.0	-110	+									
-32.6 + 43.0 23 22 -35 23 22	12	Sat.	shell fragments		-115	‡ +									
-37.6 + 48.0 8 15 -40	15	Sat.	Gray, silty, fine SAND (A-2-4)	47.0	-120	<u> </u>									
-42.6 + 53.0 15 8	11 19	Sat.			-125	‡ ‡									
1 1 1 1 1	19	Sat.				1									
	12				-130	+									
-55 -57.6 68.0 4 5	12				-135	‡									
<u>-60</u>	12	Sat. Sat.			-140	Ŧ									
-65		[Sat. Sat.			-145	Ŧ									

PROJECT NO. 35801.1.1	ID. U-3810	COUNTY Onslow	GEOLOGIST Ho			DJECT N				U-3810	COUNTY Onslow		GEOLOGIST Ho	
SITE DESCRIPTION Bridge on S	SR 1406 at Station 84+77 (MACTE			GROUND WTR (ft)	SITE	E DESCR	IPTION	Bridge on S	SR 14	406 at Station 84+77 (MACTEO	C Project No. 6468-09-2400)		GROUND WTR (f
BORING NO. B4-A EBL	STATION 85+17	OFFSET CL	ALIGNMENT -L-	0 HR. 3.3	BOF	RING NO.	. B4-A	EBL	ST	TATION 85+17	OFFSET CL	ALIGNME	NT -L-	0 HR. 3.
COLLAR ELEV. 13.2 ft	TOTAL DEPTH 90.3 ft	NORTHING 376,658	EASTING 2,492,228	24 HR. 11.4	COL	LLAR ELI	EV. 13	3.2 ft	TC	OTAL DEPTH 90.3 ft	NORTHING 376,658	EASTING	2,492,228	24 HR. 11.
DRILL MACHINE CME 45C	DRILL METHOD Mud rotary		HAMMER TYPE	Automatic	DRII	LL MACH	IINE C	ME 45C	DF	RILL METHOD Mud rotary			HAMMER TYPE	Automatic
START DATE 04/22/09	COMP. DATE 04/23/09	SURFACE WATER DEPTH N	A DEPTH TO ROC	CK N/A	STA	RT DATE				OMP. DATE 04/23/09	SURFACE WATER DEPTH	I N/A	DEPTH TO ROC	CK N/A
ELEV CHI	I !	75 100 100	SOIL AND ROCK DES	SCRIPTION DEPTH (ft)	ELEV (ft)	/ DRIVE ELEV (ft)	DEPTH (ft)	BLOW COU		BLOWS PER FOOT 0 25 50	75 100 100	L O G	SOIL AND ROCK DES	SCRIPTION
(ft) ELEV (ft) 0.5ft 0.5ft	0.5ft 0 25 50 1 1	75 100 NO. MOI G M		DEPTH (ft) FACE 0.0 ment Fill: ND (A-2-4) with latter 8.0 ne SAND (A-2-4) ic matter 23.0 nation: se SAND (A-2-4) to moderately e layers 33.0 -4) with trace of	-70 -75 -80		78.8	0.5ft 0.5ft 6 19 4 4		∮ [75 100 NO. MOI	G G G G G G G G G G G G G G G G G G G	ay, silty, fine SAND (A-2 ay, fine sandy, SILT (A-2 and trace of coars Gray, silty, fine SAN oring Terminated at Elev gray silty fine san Advanced 2-7/8" tricon feet. 2) Set 14.0 feet of N Water with quickgel a drilling fluid. bs/gal.	2-4) (continued) 4) with little clay e sand D (A-2-4) gation -77.1 ft in and. he roller to 88.8 W casing, dided used as
-30 -30.6 + 43.8	8	69	Gray, silty, fine to coarse S/ trace of friable to modera limestone lays Gray, silty, fine SANi	ately indurated ers	-110 -115							- - - - - - - -		
-40 -40.6 - 53.8 5 7 -45.6 - 58.8	15	Sat.			-120 -125		-					- - - - - -		
-50 -50.6 - 63.8 9 10 -55 -55.6 - 68.8 6 9	10	Sat. Sat. Sat. Sat. Sat. Sat. Sat. Sat.			-130 -135		-					- - - - - - - - - - - -		
-60.6 + 73.8 6 9 -65 + 65 73.8 6 9 6 9 6 9 6 6 6 6	13	Sat.			-140	-	- - -					- - - - -		



BUREL	UG REPUR I						
PROJECT NO. 35801.1.1	ID. U-3810	COUNTY Onslow	GEOLOGIST Howard, J.	PROJECT NO. 35801.1.1	ID. U-3810	COUNTY Onslow	GEOLOGIST Howard, J.
SITE DESCRIPTION Bridge on SI	R 1406 at Station 84+77 (MACTEO	C Project No. 6468-09-2400)	GROUND WTR (ft)	SITE DESCRIPTION Bridge on S	SR 1406 at Station 84+77 (MACTE	EC Project No. 6468-09-2400)	GROUND WTR (ft)
BORING NO. EB2-A EBL	STATION 86+31	OFFSET 1ft RT ALIGNM	ENT -L- 0 HR. 13.7	BORING NO. EB2-A EBL	STATION 86+31	OFFSET 1ft RT	ALIGNMENT -L- 0 HR. 13.7
COLLAR ELEV. 13.7 ft	TOTAL DEPTH 85.6 ft	NORTHING 376,598 EASTING	2,492,326 24 HR. FIAD	COLLAR ELEV. 13.7 ft	TOTAL DEPTH 85.6 ft	NORTHING 376,598	EASTING 2,492,326 24 HR. FIAD
DRILL MACHINE CME 45C	DRILL METHOD Mud rotary		HAMMER TYPE Automatic	DRILL MACHINE CME 45C	DRILL METHOD Mud rotary		HAMMER TYPE Automatic
START DATE 04/27/09	COMP. DATE 04/29/09	SURFACE WATER DEPTH N/A	DEPTH TO ROCK 49.6 ft	START DATE 04/27/09	COMP. DATE 04/29/09	SURFACE WATER DEPTH N	I/A DEPTH TO ROCK 49.6 ft
ELEV CHIP (ft) DEPTH BLOW COUNT (ft) 0.5ft 0.5ft 0		75 100 SAMP. V L O G ELEV. (ft)	SOIL AND ROCK DESCRIPTION DEPTH (ft)	ELEV CHI DRIVE CHI BLOW COU		OT SAMP. L O O O O O O O O O O O O O O O O O O	SOIL AND ROCK DESCRIPTION
		, , , , , , , , , , , , , , , , , , , ,	· · · (v)				
15			ODOLIND SUDFACE	-65 -65.4 79.1 7 0	Match Line		
13.7 + 0.0 2 1	2 3	13.7 M L	GROUND SURFACE 0.0 Roadway Embankment Fill:	7 8	11 19	Sat.	Gray, silty, fine SAND (A-2-4) (continued)
10 96 741		· · · · · <u> 10.7</u> _	an, silty, fine SAND (A-2-4) with trace of organic matter	-70 -704 -841			
3.0 7 7.1	6		n-gray, silty, fine to coarse SAND (A-2-4) with trace of gravel	-70 -70.4 - 84.1 5 8	9	· · · · · · · · Sat.	– 71.9 85.6
		W — — — — — — — — — — — — — — — — — — —	mar trade of graver	<u> </u>	<u> </u>		Boring Terminated at Elevation -71.9 ft in
5 4.6 + 9.1		 		-75			gray silty fine sand.
1 1 W	⁷ OH	· · · · · · · Sat Ta	n-brown silty fine SAND (A-2-4) with trace of organic matter				1) Advanced 2-7/8" or 3-7/8" tricone roller to 84.1 feet.
			Č ,				2) Set 14.0 feet of NW casing.3) Water with quickgel added used as
0 -0.4 - 14.1 5 3	1		rown, silty, fine sandy CLAY (A-7-6) with	-80			urilling fluid. 4) Approximate drilling fluid density 8.5
		tra	ce of coarse sand and little organic matter	1 1 1 1			lbs/gal.
-5 -5.4 + 19.1			Organic content = 7.8% 18.5 rown, moderately organic, fine to coarse	-85			Other Samples: - ST-1 (15.3 - 17.3)
+ 1 1	4 5	.	sandy SIL1 (A-5) with trace of clay				31-1 (10.5-17.5)
		: : : : :	Organic content = 19.9% Indifferentiated Coastal Plain Deposits:				
-10 -10.4 - 24.1 1 WOH	2		ark gray, fine to coarse SAND (A-3) with trace of silt and clay	-90			_
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1			27.0				
-15 -15.4 29.1]		River Bend Formation: ay, silty, fine to coarse SAND (A-2-4) with	-95 +			
	3 4	SS-10 Sat.	trace of shell fragments and clay	T I I			-
		-18.3	Gray, silty, fine SAND (A-2-4)				
-20 -20.4 34.1 3 4	5	 	Gray, Silty, fine SAND (A-2-4)	<u>-100</u> <u>T</u>			- -
		Sat.					
-25 -25.4 39.1				-105			
9 12	17	Sat.		T			-
		-28.3	ay, silty, fine to coarse SAND (A-2-4) with				
-30 -30.4 -30.4 44.1 31 30 5	E0	- 	ace to little friable to indurated limestone	<u>-110</u>			- -
	52	•82	layers				, ,
8 -35 -35.4 49.1				-115			
-35 -35.4 49.1 20 80/0.0		-100/0.5 Sat35.9 -36.8	49.6 ndurated, thinly bedded, gray, limestone 50.5	T			-
일			Gray, silty, fine SAND (A-2-4)				
a -40 -40.4 - 54.1	10			-120			- -
<u> </u>	20	Sat.		‡			
**************************************				-125			
G -45.4 - 58.1	10	Sat.					- ·
406 1406 1406				‡			
-50 -50.4 + 64.1	10	 <u> </u>		-130			- -
	13	: : :		‡			
00 -55 -55 4 + 60 1							
30.4 - 00.1	15	Sat.					-
-60 -60.4 + 74.1	<u></u>	 		-140			-
	10	: : :					
OOD + + + + + + + + + + + + + + + + + +				-145			
- 		1 8.234					



MACTEC ENGINEERING AND CONSULTING, INC.

3301 ATLANTIC AVENUE **RALEIGH, NORTH CAROLINA 27604**

N.C.D.O.T./AASHTO CLASSIFICATIONS

REPORT ON SAMPLES OF: SOILS FOR QUALITY

MACTEC PROJECT NAME/ NUMBER: Bridge over Northeast Creek on SR 1406 located at Station 84+77

MACTEC Job No.: 6468-09-2400

NCDOT PROJ. NO.: 35801.1.1 (U-3810)

COUNTY: Onslow

5/7/2009

OWNER: N.C.D.O.T.

DATE SAMPLED: April 2009

RECEIVED:

REPORTED BY: MACTEC

SAMPLED FROM: EB1-B

SUBMITTED BY: MACTEC ENGINEERING AND CONSULTING, INC.

1992 STANDARD SPECIFICATIONS

TEST RESULTS

Lab Sample No.		SS-1	SS-2	SS-3	SS-4	SS-5	SS-6
Retained No. 4 Sieve	(%)	0.0	1.6	1.2	0.1	0.0	0.0
Passing No. 10 Sieve	(%)	99.9	97.6	96.7	99.7	100.0	100.0
Passing No. 40 Sieve	(%)	97.7	96.2	84.4	99.1	99.8	99.9
Passing No 200 Sieve	(%)	31.4	4.8	3.9	12.0	21.8	16.2

MINUS 2.00mm FRACTION

SOIL MORTAR - 100%							
Coarse Sand	(%)	5.3	13.2	37.4	3.4	3.0	0.3
Fine Sand	(%)	70.4	83.0	59.3	85.9	77.2	86.5
Silt	(%)	20.1	3.8	3.3	5.5	10.2	8.8
Clay	(%)	4.1	0.0	0.0	5.2	9.6	4.4

Moisture Content	(%)	ND	ND	ND	ND	ND	ND
Liquid Limit, L.L.		26	NV	NV	NV	NV	NV
Plasticity Index, P.I.		2	NP	NP	NP	NP	NP
AASHTO Classification		A-2-4(0)	A-3(0)	A-3(0)	A-2-4(0)	A-2-4(0)	A-2-4(0)
Organic Content	(%)	5.5	1.4	ND	ND	ND	ND

Boring No.	,	EB1-A EBL					
Station		83+19	83+19	83+19	83+19	83+19	83+19
Offset		6 RT					
Alignment		-L-	-L-	-L-	-L-	-L-	-L-
Depth (FT)	From	7.6	12.6	17.6	43.1	78.1	98.1
	to	9.1	14.1	19.1	44.6	79.6	99.6

REMARKS: ND=Not Determined, NP=Non-Plastic, NV=No Value



MACTEC ENGINEERING AND CONSULTING, INC.

3301 ATLANTIC AVENUE **RALEIGH, NORTH CAROLINA 27604**

N.C.D.O.T./AASHTO CLASSIFICATIONS

REPORT ON SAMPLES OF: SOILS FOR QUALITY

MACTEC PROJECT NAME/ NUMBER: Bridge over Northeast Creek on SR 1406 located at Station 84+77

MACTEC Job No.: 6468-09-2400

NCDOT PROJ. NO.: 35801.1.1 (U-3810)

COUNTY: Onslow

OWNER: N.C.D.O.T.

DATE SAMPLED: April 2009

RECEIVED:

5/7/2009

REPORTED BY: MACTEC

SAMPLED FROM: EB2-B, B1-B, B4-C

SUBMITTED BY: MACTEC ENGINEERING AND CONSULTING, INC.

1992 STANDARD SPECIFICATIONS

TEST RESULTS

Lab Sample No.		SS-7	SS-8	SS-9	SS-10	SS-11	SS-12
Retained No. 4 Sieve	(%)	0.0	0.0	0.0	0.6	0.0	0.0
Passing No. 10 Sieve	(%)	100.0	100.0	100.0	98.5	100.0	100.0
Passing No. 40 Sieve	(%)	98.2	68.8	97.6	92.0	99.8	99.8
Passing No. 200 Sieve	(%)	66.3	38.2	7.7	25.0	12.2	41.2

MINUS 2.00mm FRACTION

SOIL MORTAR - 100%							
Coarse Sand	(%)	4.6	39.1	18.2	11.0	0.7	4.6
Fine Sand	(%)	37.3	30.1	74.8	67.4	88.4	64.0
Silt	(%)	24.0	20.8	4.7	13.2	8.3	19.1
Clay	(%)	34.1	10.0	2.3	8.4	2.6	12.3

Moisture Content	(%)	6.6	49.7	ND	ND	ND	12.5
Liquid Limit, L.L.		41	53	NV	NV	NV	19
Plasticity Index, P.I.		22	2	NP	NP	NP	3
AASHTO Classification		A-7-6(12)	A-5(0)	A-3(0)	A-2-4(0)	A-2-4(0)	A-4(0)
Organic Content	(%)	7.8	19.9	ND	ND	ND	ND

Boring No.		EB2-A EBL	EB2-A EBL	EB2-A EBL	EB2-A EBL	B1-B EBL	B4-A EBL
Station		86+31	86+31	86+31	86+31	83+65	85+17
Offset		1 RT	1 RT	1 RT	1 RT	57 RT	0
Alignment		-L-	-L-	-L-	-L-	-L-	-L-
Depth (FT)	From	14.1	19.1	24.1	29.1	58.5	83.8
	to	15.6	20.6	25.6	30.6	60.0	85.3

REMARKS: ND=Not Determined, NP=Non-Plastic, NV=No Value

Tested By Chana Savanapridi; Cert. No. 104-04-0504 (hana X) cwangout

Tested By Chana Savanapridi; Cert. No. 104-04-0504

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MACTEC ENGINEERING AND CONSULTING, INC. 3301 ATLANTIC AVENUE RALEIGH, NORTH CAROLINA 27604

N.C.D.O.T./AASHTO CLASSIFICATIONS

REPORT ON SAMPLES OF: SOILS FOR QUALITY

MACTEC PROJECT NAME/ NUMBER: Bridge over Northeast Creek on SR 1406 located at Station 84+77

MACTEC Job No.: 6468-09-2400

NCDOT PROJ. NO.: 35801.1.1 (U-3810)

COUNTY: Onslow

OWNER: N.C.D.O.T.

DATE SAMPLED: April 2009

RECEIVED:

5/7/2009

REPORTED BY: MACTEC

SAMPLED FROM: Channel Bed, EB2-B

SUBMITTED BY: MACTEC ENGINEERING AND CONSULTING, INC.

1992 STANDARD SPECIFICATIONS

TEST RESULTS

Lab Sample No.		S-1	ST-1		
Retained No 4 Sieve	(%)	0.4	0.0		
Passing No. 10 Sieve	(%)	99.2	100.0		
Passing No. 40 Sieve	(%)	95.7	64.5		
Passing No. 200 Sieve	(%)	32.3	5.2		

MINUS 2.00mm FRACTION

SOIL MORTAR - 100%					
Coarse Sand	(%)	11.2	5.2		
Fine Sand	(%)	61.2	38.0		
Silt	(%)	17.9	21.8		
Clay	(%)	9.7	35.0		

Moisture Content	(%)	ND	37.9			
Liquid Limit, L.L.		31	43			
Plasticity Index, P.I.		8	23			
AASHTO Classification		A-2-4(0)	A-7-6(13)			
Dry Density	pcf	ND	62.1			
P _c	ksf	ND	5.70			
C _c		ND	0.48			

Boring No.		Channel	EB2-A EBL		
Station		85+75	86+31		
Offset		9 RT	1 RT		
Alignment		-L-	-L-		
Depth (FT)	From	0.0	15.3		
	to	1.0	17.3		

REMARKS: ND=Not Determined, NP=Non-Plastic, NV=No Value

Tested By Chana Savanapridi; Cert. No. 104-04-0504





FIELD SCOUR REPORT

WBS:3	5801.1.1 TIP: <u>U-3810</u> COUNTY:	Onslow
DESCRIPTION(1): Bridge	ge on SR 1406 over Northeast Creek (near Station 84+7	77)
	EXISTING BRIDGE	
Information from:	Field Inspection X Microfilm (reel Other (explain))
Bridge No.: 118 Foundation Type: Core	Length: Apx 75' Total Bents: 3 Bents in Chard slab supported on concrete cap piles	nnel: 1 Bents in Floodplain: 2
EVIDENCE OF SCOU Abutments or End B	JR(2) Bent Slopes: Not apparent	
Interior Bents: Not	apparent. Bed not visible through the water.	
Channel Bed: Not	apparent. Bed not visible through the water.	
	ne cutting of banks under bridge. Banks mostly vegetate arently stable.	
EXISTING SCOUR P Type(3): Rip		
Extent(4): Acro	ess entire width of embankment at both end bents.	
Effectiveness(5): Mos		
Obstructions(6): Non	e	

INSTRUCTIONS

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

			DES	<u>SIGN IN</u>	IFORM.	ATION					
Channel Bed Materia	ıl(7): <u>S</u>	Silty, fine	e to coar	se sand						***************************************	
Channel Bank Materia	- 2_:(8)	Silty, fine	e to coar	se sand							-
Channel Bank Cove	r(9): <u> </u>	Grasses	and bus	shes							
Floodplain Width	(10): <u>{</u>	500 feet									
Floodplain Cover	(11): (Grasses	, bushes	s, small to	o large tre	ees		· · · · · · · · · · · · · · · · · · ·			
Stream is	(12):	Ag	grading		Degra	ading		St	atic X		
Channel Migration Tendency((13): <u>I</u>	Not appa	arent. M	linor dep	osition of	sedime	nt in bed	at locat	on of pr	oposed b	ridge
Observations and Other C	<u>i</u>	n grass-	covered	nvironme Lutility ea James H	sement	e of inve	stigation	n, propos	ed bridg		ted /2009
DESIGN SCOUR ELEVAT					,	Feet	_X_	Me			
	<u>NTS</u> 31	B2	В3	В4	B 5					•	
	7.9	-8.8	-8.1	-8.5	-11.3						
,								1			
		·							-		-
Comparison of DSE to Hyd	draulio	s Unit tl	heoretica	al scour:	L		L				

The Geotechnical Engineering Unit agrees with the theoretical scour elevations for Bents 3 and 4 as reported in the Bridge Survey and Hydraulic Design Report dated 2/28/09. The GEU has determined that the scour elevations for Bents 1, 2, and 5 should be adjusted to the elavations as noted in the above table.

DSE determined by: Club m while

Date: 7/15/2009

SOIL ANALYSIS RESULTS FROM CHANNEL BED AND BANK MATERIAL

JOIL WINT I		1 140111 01 17-11					
Bed or Bank	Bed	Bank	Bank	Bank	Bank	Bank	
Sample No.	S-1	SS-1	SS-2	SS-3	SS-7	SS-8	
Retained #4	0.4	. 0	1.6	1.2	0	0	
Passed #10	99.2	99.9	97.6	96.7	100	100	
Passed #40	95.7	97.7	96.2	84.4	98.2	68.8	
Passed #200		31.4	4.8	3.9	66.3	38.2	
Coarse Sand	11.2	5.3	13.2	37.4	4.6	39.1	
Fine Sand	61.2	70.4	83	59.3	37.3	30.1	
Silt	17.9	20.1	3.8	3.3	24	20.8	
Clay	9.7	· 4.1	0	. 0 ,	34.1	- 10	
· LĹ	31	26	No Value	No Value	41	53	
. PI	8	2	Non Plastic	Non Plastic	22	2	
AASHTO	A-2-4(0)	A-2-4(0)	A-3(0)	A-3(0)	A-7-6(12)	A-5(0)	
Station	85+75	83+19	83+19	83+19	86+31	86+31	
Offset	9 RT	6 RT	6 RT	6 RT	1 RT	1 RT	
Depth	0.0-1.0	7.6-9.1	12.6-14.1	17.6-19.1	14.1-15.6	19.1-20.6	
		<u> </u>					



FIELD SCOUR REPORT

WBS:	35801.1.1	_ TIP:	U-3810	COUNTY: Onslow	
DESCRIPTION(1):	Bridge on SR 1	406 over No	ortheast Creek	(near Station 84+77)	
			EXISTING	BRIDGE	
Information from:	Field I Other	nspection _ (explain) _	X Mic	rofilm (reel po	s:)
Bridge No.: Foundation Type:	119 Length Cored slab sup	: Apx 90' ported on co	Total Bents: oncrete cap and	3 Bents in Channel: 1 piles	Bents in Floodplain: 2
EVIDENCE OF SAbutments or	End Bent Slopes	: Not appar	ent.		
Interior Bents:	Not apparent. I	Bed not visil			
Channel Bed:				er.	
Channel Bank:	Some cutting of apparently stab			s mostly vegetated up and do	
EXISTING SCO Type(3):		N			
Extent(4):	Across entire w	idth of emba	ankment at both	n end bents.	
Effectiveness(5):	Mostly effective	•			
Obstructions(6):	Minor debris at	up stream-s	side.		

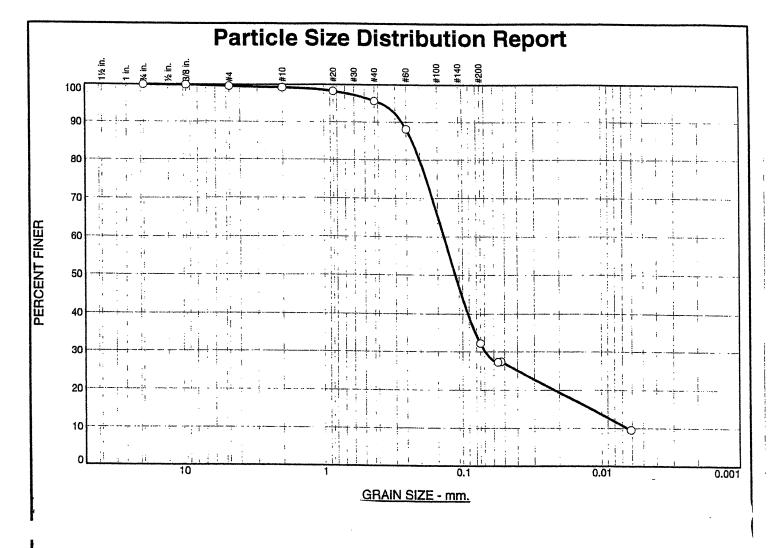
INSTRUCTIONS

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

			DE	SIGN II	NFORMA	TION		,		
Channel	Bed Material(7): Silty, fin	e to coa	rse sand						
÷		>		·····		 				
Channel E	Bank Material(8): Silty, find	e to coa	rse sand	, and silty c	lay, sandy s	ilt with littl	e to some	organics	
		-					····			· ·
Channe	l Bank Cover(9): <u>Grasses</u>	and bu	shes						
Flood	dplain Width(1	0): <u>500 feet</u>								
Flood	lplain Cover(1	1): Grasses	. bushe	s. small t	o large tree	s				
							ALIPARENT .			
	Stream is(1	2): Ag	grading		Degrad	ing	5	Static X		
Channel Migration	n Tendency(1	3): Eastwar	d toward	d end ber	nt 2.					·····
Observations :	and Other Cor	nments: Lo	w flow e	environme	ent at time	of investigat	on, propo	osed bridg	ge is locat	ed in
						or deposition				
		Reported b	у:	James H	loward			Date	: 4/27/2	:009
	•								4	
DESIGN SCO	UR ELEVATION	ONS(14)	•			Feet X	Me	eters		
÷ .	BEN ⁻	re								
•	B1		В3	B4	B5					
	-7.9	-8.8	-8.1	-8.5	-11.3					
				<u> </u>				_		
					l					·
										/ ·
Comparison of	DSE to Hydr	aulics Unit th	neoretic	al scour.	LL	· · · · · · · · · · · · · · · · · · ·				L
The Geotechni					etical scou	elevations	for Bents	3 and 4 as	s reported	l in
the Bridge Sur			·····			·····				
for Bents 1, 2,	and 5 should	ne adjusted	to the e	lavations	as noted in	the above	table.			
, , , , , , , , , , , , , , , , , , , ,	DSE de	termined b	y: Plu	1 am	willer			Date:	7/15/2	009
					Covery.	7				
			*							
SOIL ANALYS	SIS RESULTS	FROM CHA	ANNEL	BED AN	D BANK M	ATERIAL				
Bed or Bank	Bed	Bank		3ank	Bank	Ban	k	Bank		
Sample No.	S-1	SS-1		SS-2	SS-3	SS-		SS-8		
Retained #4	0.4	0		1.6	1.2	0		0		
Passed #10	99.2	99.9		97.6	96.7	100)	100		
Passed #40	95.7	97.7		96.2	84.4	98.2	2	68.8		
Passed #200	32.3	31.4		4.8	3.9	66.3	3	38.2		
Coarse Sand	11 2	53	1	13.2	37.4	4.6		39.1	1	

SOIL ANAL I	SIS RESULTS	LICOM CUM	HAFF DED WIA	D DAM MAI	LIVIAL		
Bed or Bank	Bed	Bank	Bank	Bank	Bank	Bank	
Sample No.	S-1	SS-1	SS-2	SS-3	SS-7	SS-8	·
Retained #4	0.4	0	1.6	1.2	0	0	
Passed #10	99.2	99.9	97.6	96.7	100	100	
Passed #40	95.7	97.7	96.2	84.4	98.2	68.8	
Passed #200	32.3	31.4	4.8	3.9	66.3	38.2	
Coarse Sand	11.2	5.3	13.2	37.4	4.6	39.1	
Fine Sand	61.2	70.4	83	59.3	37.3	30.1	
Silt	17.9	20.1	3.8	3.3	24	20.8	
Clay	9.7	4.1	0	0	34.1	10	
LL	31	26	No Value	No Value	41	53	
PI	8	2	Non Plastic	Non Plastic	22	2	
AASHTO	A-2-4(0)	A-2-4(0)	A-3(0)	A-3(0)	A-7-6(12)	A-5(0)	
Station	85+75	83+19	83+19	83+19	86+31	86+31	
Offset	9 RT	6 RT	6 RT	6 RT	1 RT	1 RT	
Depth	0.0-1.0	7.6-9.1	12.6-14.1	17.6-19.1	14.1-15.6	19.1-20.6	
-			,				

Template Revised 02/07/06



-	SIEVE	PERCENT	SPEC.*	PASS?
	SIZE	FINER	PERCENT	(X=NO)
	3/4	100.0		
	3/8	100.0		
	#4	99.6		
	#10	99.2		
	#20	98.3		
	#40	95.7		
	#60	88.1		
	#200	32.3		
	#270	27.4		

(no specification provided)

Source of Sample: Channel Bed Sample Number: S-1

Depth: 0.0-1.0'

Client: NC DEPARTMENT OF TRANSPORTATION

Raleigh, North Carolina

MACTEC Engineering and Consulting, Inc.

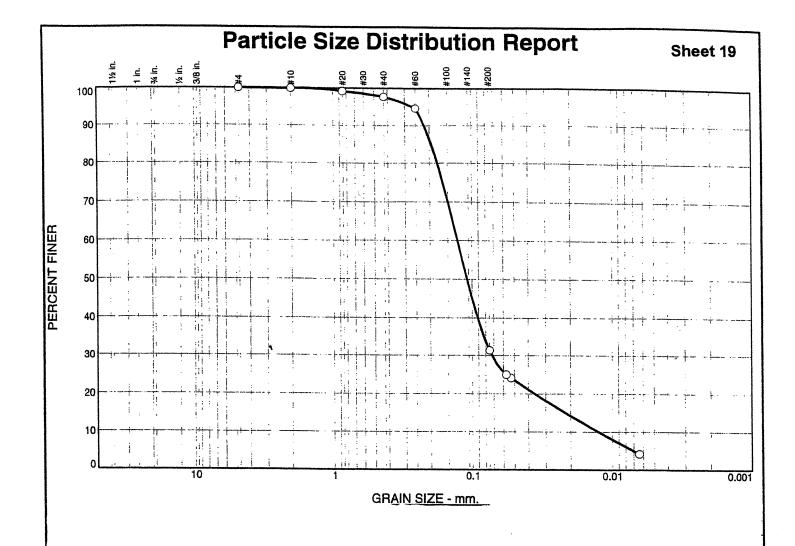
Project: Bridge on SR 1406 @ Station 84+77

Project No: 6468092400

Figure NA

Date: 5/7/09

Tested By: CS (Cert# 104-04-0504) (C) Checked By: MDC (Lab Manager)



SIEVE	PERCENT	SPEC.*	PASS?
SIZE	FINER	PERCENT	(X=NO)
#4	100.0		
#10	99.9		
#20	99.2		
#40	97.7		
#60	94.6		
#200	31.4		
#270	24.2		
	,		
	1		1

	Material Description	<u>on</u>
Brown, Moderatel Trace of Clay	y Organic, Silty Fine	to Coarse SAND with
PL= 24	Atterberg Limits LL= 26	PI= 2
D ₉₀ = 0.2174 D ₅₀ = 0.1086 D ₁₀ = 0.0125	Coefficients D ₈₅ = 0.1944 D ₃₀ = 0.0718 C _U = 10.17	D ₆₀ = 0.1275 D ₁₅ = 0.0216 C _c = 3.23
USCS= SM	Classification AASHT	O= A-2-4(0)
Organic Content = Specific Gravity is	Remarks = 5.5% as Per AASH s assumed	ГО Т 267-86

(no specification provided)

Source of Sample: Boring EB1-A EBL Depth: 7.6-9.1' Sample Number: SS-1

Client: NC DEPARTMENT OF TRANSPORTATION

Project: Bridge on SR 1406 @ Station 84+77

Project No: 6468092400

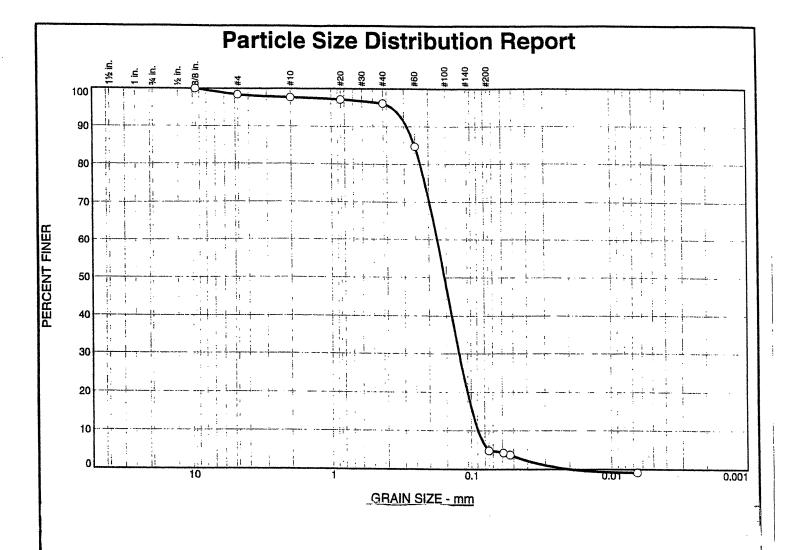
Figure NA

Date: 5/7/09

Tested By: <u>CS (Cert# 104-04-0504)</u>

MACTEC Engineering and Consulting, Inc.

Raleigh, North Carolina



SIEVE	PERCENT	SPEC.*	PASS?
SIZE	FINER	PERCENT	(X=NO)
3/8 #4 #10 #20 #40	98.4 97.6 97.1 96.2		
#60 #200 #270	84.7 4.8 3.7		

Material Description Tan-Gray, Fine to Coarse SAND with Trace of Organic Matter & Silt Atterberg Limits LL= NV PL= NP PI= NP Coefficients D₉₀= 0.2856 D₅₀= 0.1548 D₁₀= 0.0890 D₆₀= 0.1744 D₁₅= 0.0980 C_c= 0.95 $D_{85} = 0.2516$ $D_{30} = 0.1217$ $C_{u} = 1.96$ Classification AASHTO= A-3 USCS= SP **Remarks** ND = Not Determined Spatular Method Specific Gravity is assumed Organic Content = 1.4% as Per AASHTO T 267-86

(no specification provided)

Source of Sample: Boring EB1-A EBL Depth: 12.6-14.1' Sample Number: SS-2

Date: 5/7/09

Figure

MACTEC Engineering and Consulting, Inc.

Client: NC DEPARTMENT OF TRANSPORTATION

Project: Bridge on SP 1406 @ Station 844.77

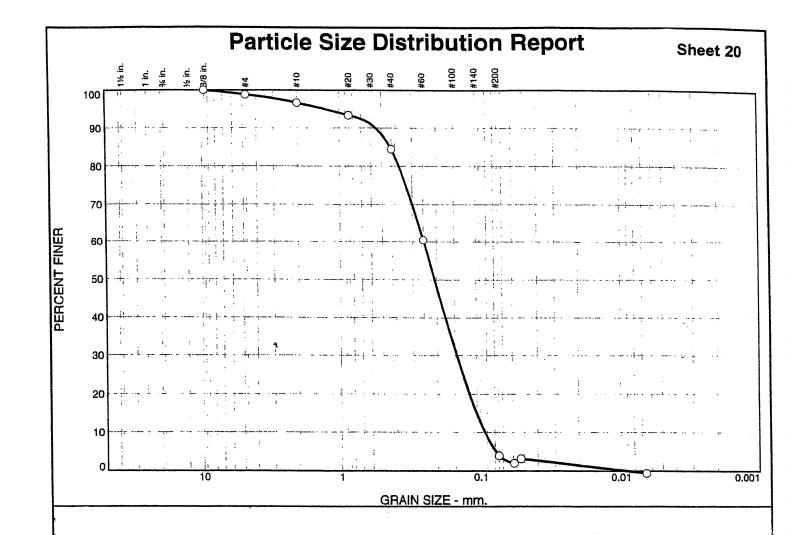
Project: Bridge on SR 1406 @ Station 84+77

Raleigh, North Carolina

Project No: 6468092400

NA

Tested By: CS (Cert# 104-04-0504) Checked By: MDC (Lab Manager)



SIEVE	PERCENT	SPEC.*	PASS?
SIZE	FINER	PERCENT	(X=NO)
3/8	100.0		
#4	98.8		
#10	96.7		
#20	93.4		
#40	84.4		
#60	60.5		
#200	3.9		
#270	3.2		

_	Material Description Coarse SAND with T	
ran-Gray, rine to	Coarse SAND with I	race of Sift
PL= NP	Atterberg Limits LL= NV	PI= NP
D ₉₀ = 0.5497 D ₅₀ = 0.2075 D ₁₀ = 0.0935	Coefficients D ₈₅ = 0.4339 D ₃₀ = 0.1453 C _U = 2.65	D ₆₀ = 0.2478 D ₁₅ = 0.1065 C _c = 0.91
USCS= SP	Classification AASHT	O= A-3
	<u>Remarks</u>	
ND = Not Determ	nined	
Spatula Method	a aggregad	
Specific Gravity	s assumed	

(no specification provided)

Source of Sample: Boring EB1-A EBL Depth: 17.6-19.1' Sample Number: SS-3

Client: NC DEPARTMENT OF TRANSPORTATION

Project: Bridge on SR 1406 @ Station 84+77

Project No: 6468092400

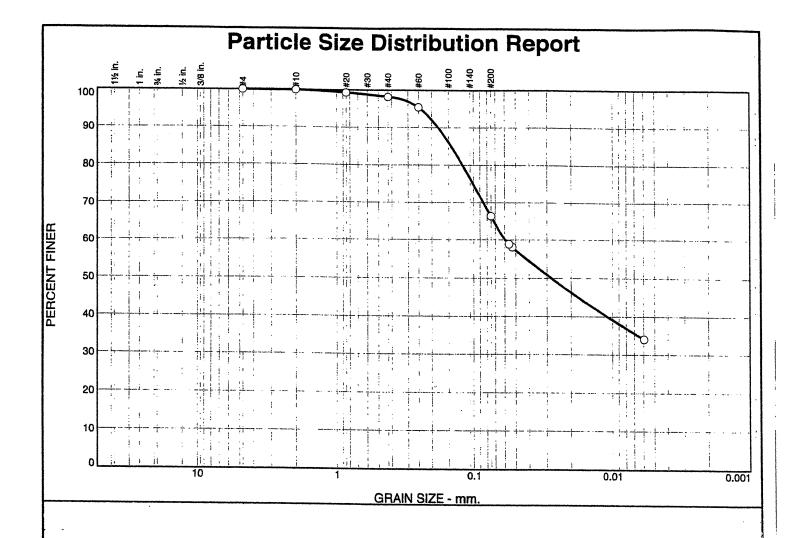
Figure NA

Date: 5/7/09

Tested By: <u>CS (Cert# 104-04-0504)</u>

MACTEC Engineering and Consulting, Inc.

Raleigh, North Carolina



	1 4 - 14-14-14-14-14-14-14-14-14-14-14-14-14-1		
SIEVE	PERCENT	SPEC.*	PASS?
SIZE	FINER	PERCENT	(X=NO)
#4	100.0		
#10	100.0		
#20	99.3		
#40	98.2		
#60	95.4		
#200	66.3		
#270	58.1		

Material Description Brown, Silty, Fine Sandy CLAY with Little Organic Matter Atterberg Limits
LL= 41 PL= 19 PI= 22 Coefficients D₉₀= 0.1792 D₅₀= 0.0277 D₁₀= D₆₀= 0.0594 D₁₅= C_c= $D_{85} = 0.1442$ D30= Cu= Classification
AASHTO= A-7-6(12) USCS= CL **Remarks** Specific Gravity is assumed Organic Content = 7.8% as Per AASHTO T267-86

(no specification provided)

Source of Sample: Boring EB2-A EBL Depth: 14.1-15.6' Sample Number: SS-7

Date: 5/7/09

MACTEC Engineering and Consulting, Inc. Client: NC DEPARTMENT OF TRANSPORTATION **Project:** Bridge on SR 1406 @ Station 84+77

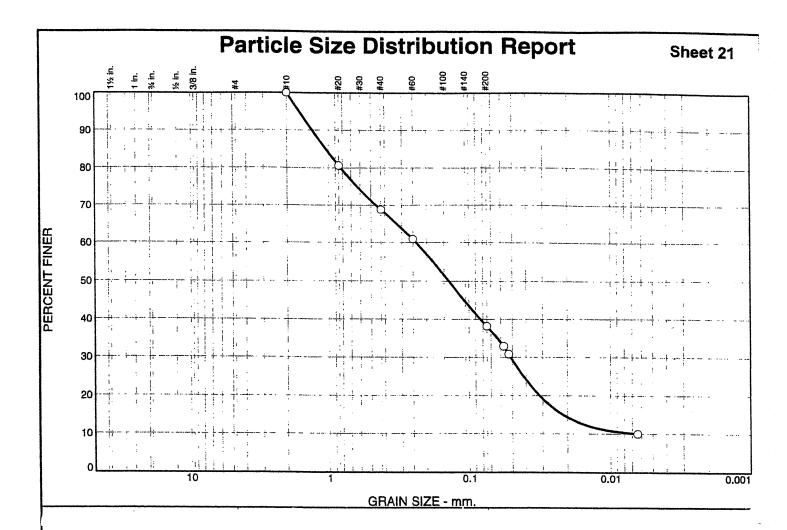
Project No: 6468092400

Figure NA

Tested By: CS (Cert# 104-04-0504)

Raleigh, North Carolina

Checked By: MDC (Lab Manager)



SIEVE	PERCENT	SPEC.*	PASS?
SIZE	FINER	PERCENT	(X=NO)
#10	100.0		
#20	80.7		
#40	68.8		
#60	60.9		
#200	38.2		
#270	30.8		
			1

_	Material Description y Organic, Fine to Co	on parse Sandy SILT with
PL= 51	Atterberg Limits LL= 53	PI= 2
D ₉₀ = 1.3091 D ₅₀ = 0.1387 D ₁₀ = 0.0064	Coefficients D ₈₅ = 1.0464 D ₃₀ = 0.0514 C _U = 36.85	D ₆₀ = 0.2362 D ₁₅ = 0.0213 C _c = 1.74
USCS= SM	Classification AASHT	O= A-5(0)
Organic Content : Specific Gravity i	Remarks = 19.9% as Per AASF s assumed	-TTO T267-86

(no specification provided)

Source of Sample: Boring EB2-A EBL Depth: 19.1-20.6' Sample Number: SS-8

Client: NC DEPARTMENT OF TRANSPORTATION

Project: Bridge on SR 1406 @ Station 84+77

Raleigh, North Carolina

MACTEC Engineering and Consulting, Inc.

Project No: 6468092400

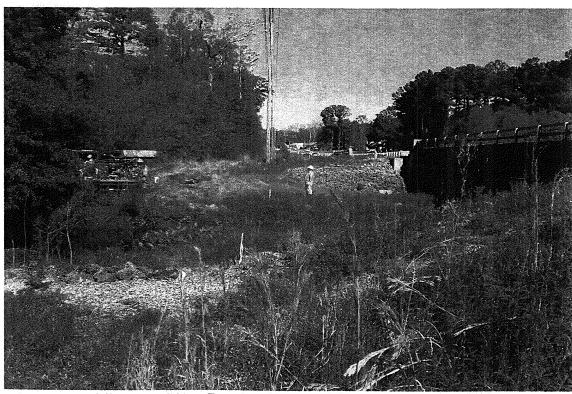
Figure NA

Date: 5/7/09

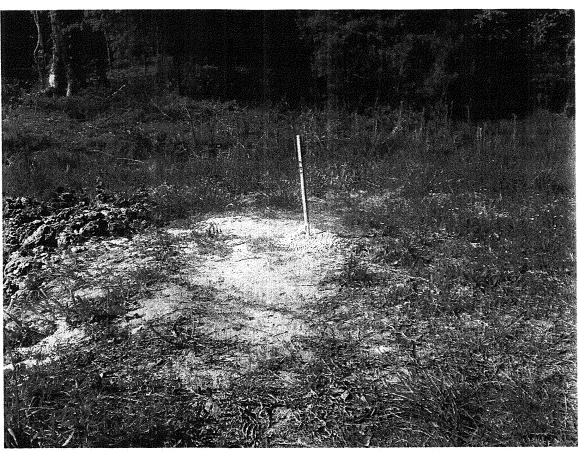
Tested By: CS (Cert# 104-04-0504)



View looking Up Station from End Bent No. 1



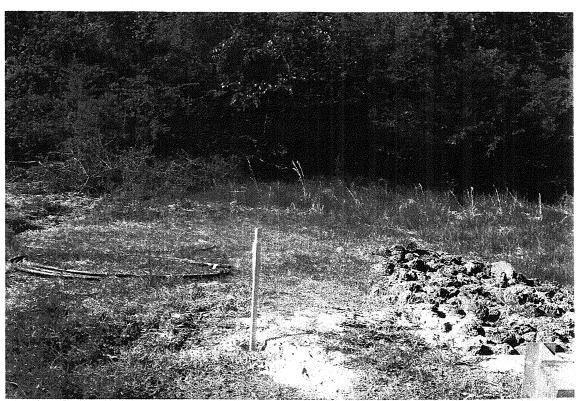
View looking Down Station from End Bent No. 2



View looking left to right of End Bent No. 1



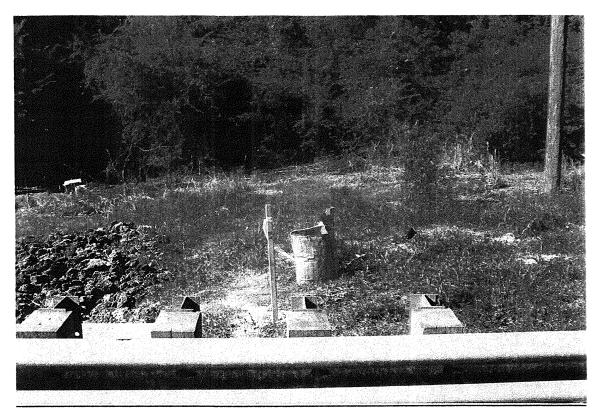
View looking left to right of Interior Bent No. 1



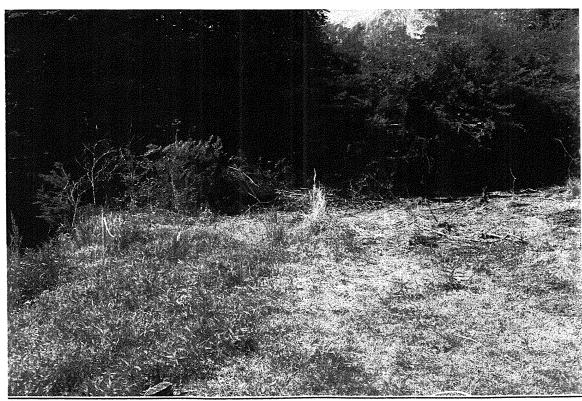
View looking left to right of Interior Bent No. 2



View looking left to right of Interior Bent No. 3



View looking left to right of Interior Bent No. 4



View looking left to right of Interior Bent No. 5

SITE PHOTOS Mactec Proj. No. 6468-09-2400

SHEET 24 BRIDGE ON SR 1406 AT -L- STATION 84+77 NCDOT Project No. 35801.1.1 (U-3810)



View looking left to right of End Bent No. 2

CONTENTS:

3810

 SHEET
 DESCRIPTION

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 TITLE SHEET

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 LEGEND

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 SITE PLAN

 3
 PROFILE

 4
 SAMPLE RESULTS

STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 35801.1.1 (U-3810)

COUNTY ONSLOW

PROJECT DESCRIPTION SR 1406 (PINEY GREEN ROAD) FROM US 17

(MARINE BOULEVARD) TO NC 24 (FREEDOM WAY)

SITE DESCRIPTION RETAINING WALL AT -L- STA. 201+50, 50'RT.

RETAINING WALL INVENTORY

STATE	STATE PR	COLECT REPERENCE NO	NO.	SHEET
N.C.		U-3810	1	4
STATE	PROJ. NO.	F. A. PROJ. NO.	DESCRI	PTION
358	01.1.1	STP-1406(4)	P.	E.
			RW 8	UTIL,

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 FELD BORING LOGS, ROCK CORES, AND SOLI 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. NETHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA ARE PART OF THE CONTRACT.

CENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORNOS 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 RELIABLITY INVERSET 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 AND 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 RESON RESULTING FROM THE ACTUAL CONDITIONS ENCOUNTERED AT THE SITE DIFFERING FROM THE ACTUAL CONDITIONS.

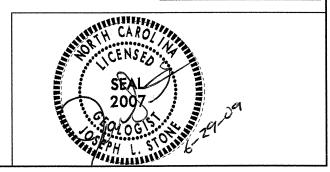
	PERSONNEL MIW
R	ES
J	ME

INVESTIGATED BY J.L. STONE

CHECKED BY ______ D.N. ARGENBIRGHT

SUBMITTED BY _____ D.N. ARGENBRIGHT

DATE **JUNE, 2009**



.....

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

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

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAYS

GEOTECHNICAL ENGINEERING UNIT

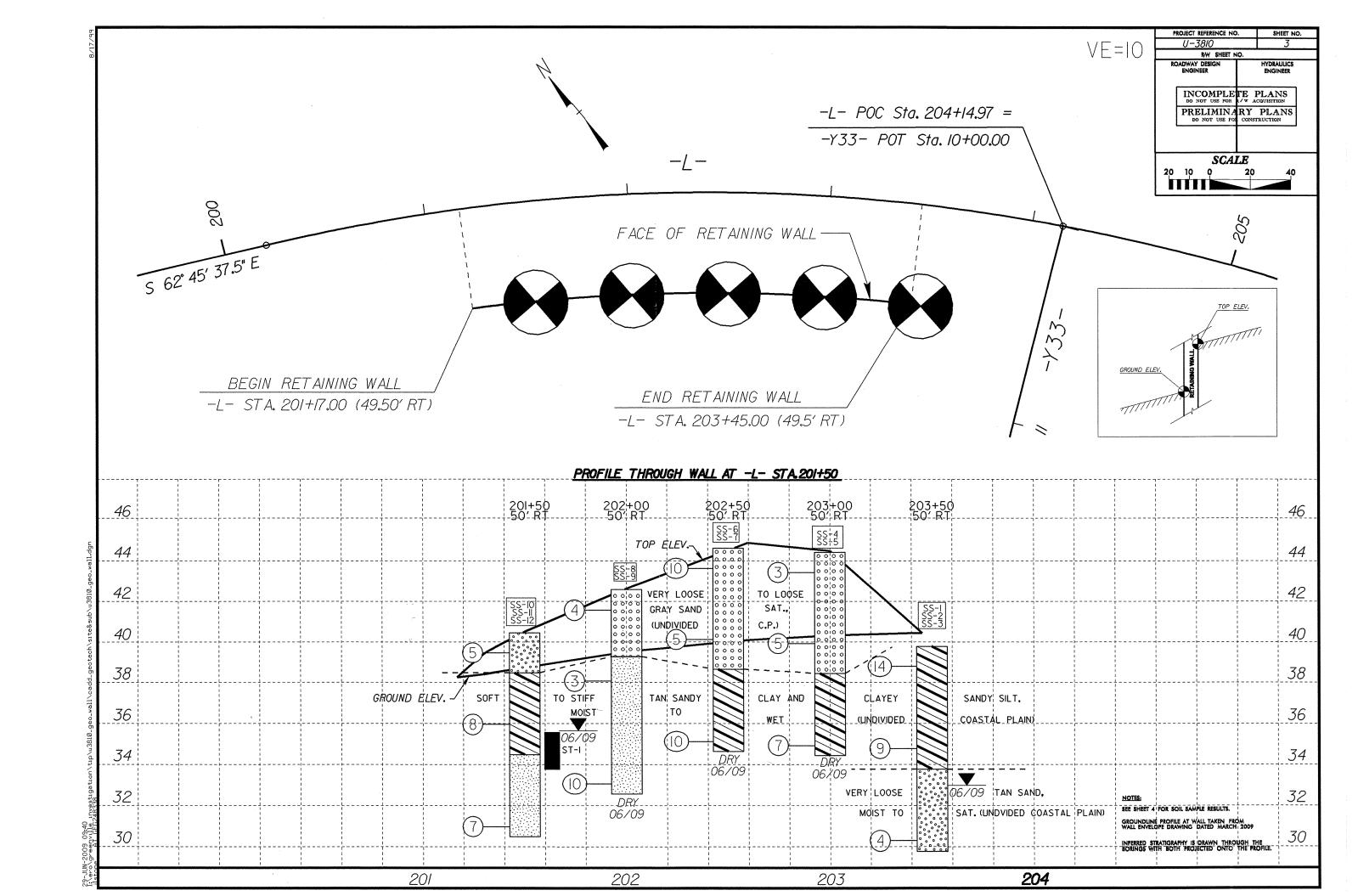
SUBSURFACE INVESTIGATION

	SOIL AND ROCK	LEGEND, TERMS, S	SYMBOLS, AND ABBREVI	ATIONS				
SOIL DESCRIPTION GRADATION				DESCRIPTION	TERMS AND DEFINITIONS			
SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS	<u>WELL GRADED</u> - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FI <u>UNIFORM</u> - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME	E SIZE. (ALSO RO	OCK LINE INDICATES THE LEVEL AT WHICH NON-C	T IF TESTED, WOULD YIELD SPT REFUSAL. AN INFERRED COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL.	ALLUYIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.			
THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL	PODRLY GRADED) GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SI	SIZES. SP	PT REFUSAL IS PENETRATION BY A SPLIT SPOON N NON-COASTAL PLAIN MATERIAL. THE TRANSITIO	SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. ON BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE	NIE CONTROL CO			
CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH	ANGULARITY OF GRAINS	OF BC	F WEATHERED ROCK. OCK MATERIALS ARE TYPICALLY DIVIDED AS FOLL		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.			
AS MINERALOGICAL COMPOSITION, ANDULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE: VERY SIEF, SPAN, SITY ON, NOST WITH INTERPROPOSED FIRE SAND LINERS, MENUL PLASTIC, 4-7-6 SUBANGULAR, SUBROUNDED, OR ROUNDED.		St ANGULAR,	SUZAUZA	LAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100	OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC.			
SOIL LEGEND AND AASHTO CLASSIFICATION			K (WR) BLOWS PER FOOT	T IF TESTED.	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			
CENTERAL CRANIII AR MATERIAL C CLITTICI AV MATERIAL C	MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN	IN DESCRIPTIONS CRYS	WOULD YIELD SP	GRAIN IGNEOUS AND METAMORPHIC ROCK THAT PT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE.	GROUND SURFACE.			
CLASS. (≤ 35% PASSING *200) (> 35% PASSING *200) URGANIC MATERIALS	WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.		EINE TO COADE	SCHIST, ETC. GRAIN METAMORPHIC AND NON-CDASTAL PLAIN	CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.			
GROUP A-1 A-3 A-2 A-4 A-5 A-6 A-7 A-1, A-2 A-4, A-5 CLASS, A-1-a A-1-b A-2-4 A-2-5 A-2-6 A-7 A-1, A-2 A-4, A-5 A-6, A-7	COMPRESSIBILITY	BULK	CRTSTALLINE SEDIMENTARY RO	OCK THAT WOULD YEILD SPT REFUSAL IF TESTED. ROCK TYPE	COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.			
CLASS. A-1-b A-1-b A-2-4 A-2-5 A-2-7 A-3 A-6, A-7	SLIGHTLY COMPRESSIBLE LIQUID LIMIT LESS * MODERATELY COMPRESSIBLE LIQUID LIMIT EQUAL	L TO 31-50 COAS	STAL PLAIN COASTAL PLAIN S	ITE, SLATE, SANDSTONE, ETC. SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD	CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL			
555555555	HIGHLY COMPRESSIBLE LIQUID LIMIT GREATI PERCENTAGE OF MATERIAL	TER THAN 50 SEDIN		OCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED	LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.			
X PASSING * 10 58 MX GRANULAR CLAY CLAY	ODCANIC MATERIAL GRANULAR SILT - CLAY	D. MATERIAL	WEA	ATHERING	DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.			
* 40 38 MX 58 MX 51 MN S01LS PEAT 200 15 MX 25 MX 110 MX 35 MX 35 MX 35 MX 35 MX 36	TRACE OF ORGANIC MATTER 2 - 3% 3 - 5% TRACE	R MATERIAL 1 - 10%	SH ROCK FRESH, CRYSTALS BRIGHT, FEW JO HAMMER IF CRYSTALLINE.	DINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER	DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE			
LIDUJO LIMIT 48 MX 41 MN 48 MX 41 MN 48 MX 41 MN 48 MX 41 MN 80 JLS WITH	LITTLE ORGANIC MATTER 3 - 5% 5 - 12% LITTLE MODERATELY ORGANIC 5 - 10% 12 - 20% SOME	10 - 202		ED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN,	HORIZONTAL. DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF			
PLASTIC INDEX 6 MX NP 18 MX 12 MX 11 MN 11 MN 12 MX 10 MX 11 MN 11 MN LITTLE OR HIGHLY	HIGHLY ORGANIC >10% >20% HIGHLY	35% AND ABOVE (V SL		CE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF	THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.			
GROUP INDEX 6 0 0 4 MX 8 MX 12 MX 36 MX No MX MODERATE AMOUNTS OF SOILS		SLIGH		ED AND DISCOLORATION EXTENDS INTO ROCK UP TO	FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.			
OF MODE CONTENSION FINE SILTY OR CLAYEY SILTY CLAYEY ORGANIC	water level in bore hole immediately after drilling	(SLI.)		AY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.	FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.			
MATERIALS SAND SHIP SHIPE THE SHIPE STATES	STATIC WATER LEVEL AFTER 24 HOURS	MODE	ERATE SIGNIFICANT PORTIONS OF ROCK SHOW	DISCOLORATION AND WEATHERING EFFECTS. IN	FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM			
GEN.RATING AS A EXCELLENT TO GOOD FAIR TO POOR POOR UNSUITAB	E PERCHED WATER, SATURATED ZONE, OR WATER BEARING STE	TRATA (MOD.		E DULL AND DISCOLORED, SOME SHOW CLAY, ROCK HAS D SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED	PARENT MATERIAL.			
SUBGRADE	SPRING OR SEEP		WITH FRESH ROCK.		FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.			
CONSISTENCY OR DENSENESS	MISCELLANEOUS SYMBOLS	MODE SEVE	ERE AND DISCOLORED AND A MAJORITY SHOW	DR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL W KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH	FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN			
PRIMARY SOIL TYPE COMPACTNESS OR PENETRATION RESISTENCE COMPRESSIVE STRENGTH	ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION SPPT OPT THAT TEST BORING ST PPT ST PPT WITH SOIL DESCRIPTION	SAMPLE	AND CAN BE EXCAVATED WITH A GEOLO IF TESTED, WOULD YIELD SPT REFUSAL	DGIST'S PICK. ROCK GIVES "CLUNK" SDUND WHEN STRUCK.	THE FIELD. JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.			
CONSISTENCY (N-VALUE) (TONS/FT2)		DESIGNATIONS S - BULK SAMPLE SEVE	ERE ALL ROCK EXCEPT QUARTZ DISCOLORED	OR STAINED ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED	LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO			
GENERALLY VERY LODSE 4 COOSE 4 TO 10	T- SOIL SYMBOL (+) AUGER BORING	SS - SPLIT SPOON (SEV.	 IN STRENGTH TO STRONG SOIL. IN GRAI EXTENT. SOME FRAGMENTS OF STRONG 	INITOID ROCKS ALL FELDSPARS ARE KADLINIZED TO SOME ROCK USUALLY REMAIN.	ITS LATERAL EXTENT.			
GRANULAR MEDIUM DENSE 10 TO 30 N/A MATERIAL MONACOMETRY DENSE 30 TO 50	ARTIFICIAL FILL (AF) DTHER THAN ROADWAY EMBANKMENT - CORE BORING	\$AMPLE	IF TESTED, YIELDS SPT N VALUES > 10		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			
(NON-COHESIVE) VERY DENSE SØ 10 50	I MI MARK TORONTO	ST - SHELBY TUBE VERY SAMPLE (V SE		O OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT O SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK	SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.			
VERY SOFT <2 <0.25 GENERALLY SOFT 2 TO 4 0.25 TO 0.50	INFERRED SOIL BOUNDARY MONITORING WELL	RS - ROCK SAMPLE		OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINDR RIC REMAIN. <i>IF TESTED, YIELDS SPT N VALUES < 100 BPF</i>	PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.			
SILT-CLAY MEDIUM STIFF 4 TO 8 0.5 TO 1.0	INFERRED ROCK LINE A PIEZOMETER	RT - RECOMPACTED TRIAXIAL COMP		NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND	RESIDUAL (RES.) SOIL - SDIL FORMED IN PLACE BY THE WEATHERING OF ROCK.			
MATERIAL STIFF 8 TO 15 1 TO 2 (COHESIVE) VERY STIFF 15 TO 30 2 TO 4	ALLUVIAL SOIL BOUNDARY SLOPE INDICATOR	SAMPLE	SCATTERED CONCENTRATIONS. QUARTZ M ALSO AN EXAMPLE.	MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS	ROCK QUALITY DESIGNATION (ROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF			
HARD >30 >4	25/825 DIP & DIP DIRECTION OF INSTALLATION ROCK STRUCTURES	CBR - CALIFORNIA BEARING RATIO SAMPLE		HARDNESS	ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUI EXPRESSED AS A PERCENTAGE.			
TEXTURE OR GRAIN SIZE			RY HARD CANNOT BE SCRATCHED BY KNIFE OR	SHARP PICK, BREAKING OF HAND SPECIMENS REQUIRES	SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE			
U.S. STD. SIEVE SIZE 4 10 40 60 200 270 OPENING (MM) 4.76 2.00 0.42 0.25 0.075 0.053	SOUNDING ROD REF SPT REFUSAL		SEVERAL HARD BLOWS OF THE GEOLOG		PARENT ROCK. SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND			
COARSE FINE	ABBREVIATIONS	HAF	IRD CAN BE SCRATCHED BY KNIFE OR PICK TO DETACH HAND SPECIMEN.	K ONLY WITH DIFFICULTY. HARD HAMMER BLDWS REQUIRED	RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.			
BOULDER COBBLE GRAVEL SAND SAND SILT CLAY (BLDR.) (COB.) (GR.) (CSE. SD.) (F SD.) (SL.) (CL.)	BT - BORING TERMINATED MED MEDIUM	V - VERT		K. GOUGES OR GRODVES TO 04.25 INCHES DEEP CAN BE LOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED	SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR			
GRAIN MM 305 75 2.0 0.25 0.05 0.005		VST - VANE SHEAR TEST HAR WEA WEATHERED	BY MODERATE BLOWS.	LUGISIS FICK. NAME SPECIMENS CAN BE DETACHED	SLIP PLANE.			
SIZE IN. 12 3		7 - UNIT WEIGHT MEI		CHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE	STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH			
SOIL MOISTURE - CORRELATION OF TERMS SOIL MOISTURE SCALE FIELD MOISTURE COLUMN FOR THE PROPERTY OF THE PROPER	DPT - DYNAMIC PENETRATION TEST PMT - PRESSUREMETER TEST	Na pri ovii welou	POINT OF A GEOLOGIST'S PICK.		A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.			
SOIL MOISTURE SCALE FIELD MOISTURE GUIDE FOR FIELD MOISTURE DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION	F - FINE SD SAPROLITIC SD SAND, SANDY	SOF		BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN	STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH			
- SATURATED - USUALLY LIQUID; VERY WET, USUALLY	FOSS FOSSILIFEROUS SL SILT, SILTY FRAC FRACTURED, FRACTURES SLI SLIGHTLY		PIECES CAN BE BROKEN BY FINGER PI		OF STRATUM AND EXPRESSED AS A PERCENTAGE. STRATA ROCK QUALITY DESIGNATION (SROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY			
(SAT.) FROM BELOW THE GROUND WATER TABLE	FRAGS FRAGMENTS TCR - TRICONE REFUSAL	VEF SOI		EXCAVATED READILY WITH POINT OF PICK, PIECES 1 INCH EN BY FINGER PRESSURE, CAN BE SCRATCHED READILY BY	TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE			
PLASTIC SEMISOLID: REQUIRES DRYING TO	EQUIPMENT USED ON SUBJECT PROJ	IECT	FINGERNAIL.	BEDDING	TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.			
(PI) PLASTIC LIMITATTAIN OPTIMUM MOISTURE			FRACTURE SPACING TERM SPACING	TERM THICKNESS				
CONTINUE MOTOTUDE - MOTST - (M) SOLIDEAT OR NEAR OPTIMUM MOISTURE	DRILL DATES HDVANCING TODES	AMMER TYPE: AUTOMATIC MANUAL	TERM SPACING VERY WIDE MORE THAN 10 FEET	VERY THICKLY BEDDED > 4 FEET	BENCH MARK:			
OM OPTIMUM MOISTURE - MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE SL SHRINKAGE LIMIT	MOBILE B-	,	WIDE 3 TO 10 FEET MODERATELY CLOSE 1 TO 3 FEET	THICKLY BEDDED 1.5 - 4 FEET THINLY BEDDED 0.16 - 1.5 FEET	ELEVATION: FT.			
REQUIRES ADDITIONAL WATER TO	X 6° CONTINUOUS FLIGHT AUGER COR	ORE SIZE:	CLOSE 0.16 TO 1 FEET	VERY THINLY BEDDED 0.03 - 0.16 FEET THICKLY LAMINATED 0.008 - 0.03 FEET	NOTES:			
- DRY - (D) ATTAIN OPTIMUM MOISTURE	BK-51 8' HOLLOW AUGERS]-B\	VERY CLOSE LESS THAN 0.16 FEET	THINLY LAMINATED < 0.008 FEET				
PLASTICITY	X CME-45B HARD FACED FINGER BITS]-N		URATION ING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.	UNDIVIDED C.P. = UNDIVIDED COASTAL PLAIN			
PLASTICITY INDEX (PI) DRY STRENGTH NONPLASTIC 0-5 VERY LOW	TUNGCARBIDE INSERTS		DUDDIAG	WITH FINGER FREES NUMEROUS GRAINS:				
LOW PLASTICITY 6-15 SLIGHT	COLE SOE	AND TOOLS:		BLOW BY HAMMER DISINTEGRATES SAMPLE.				
MED. PLASTICITY 16-25 MEDIUM HIGH PLASTICITY 26 OR MORE HIGH	PORTABLE HOIST TRICONESTEEL TEETH	POST HOLE DIGGER		CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; EASILY WHEN HIT WITH HAMMER.				
COLOR	TRICONE TUNG,-CARB.	HAND AUGER						
DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY).	CORE BIT	SOUNDING ROD		ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; LT TO BREAK WITH HAMMER.				
MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.		VANE SHEAR TEST		HAMMER BLOWS REQUIRED TO BREAK SAMPLE; BREAKS ACROSS GRAINS.				
			SAMPLE	DUCHUS HOUGS BUILDING	1			

SHEET NO. 2 OF 4

PROJECT REFERENCE NO.

U-38I0



U–3810 35801.1.1

RETAINING WALL AT -L- STA. 201+50, 50' RT

SOIL TEST RESULTS															
SAMPLE NO. OFFSET		DEPTH	AASHTO		. P.I.	% BY WEIGHT			% PASSING (SIEVES)			%	%		
		INTERVAL	CLASS.			C.SAND	F.SAND	SILT	CLAY	10	40	200	MOISTURE	ORGANIC	
SS- 1	50 RT	203+50	1. 0- 1. 5	A-6(3)	28	12	4. 4	53.6	17.7	24. 3	100	99	51	-	-
SS- 2	50 RT	203+50	<i>4</i> . 0- 5. 5	A-6(6)	34	17	4. 2	51.2	16. 3	28.3	100	99	53	19.9	-
SS- 3	50 RT	203+50	8.5-10.0	A-2-4(0)	21	NP	<i>3. 2</i>	75.4	13. 2	8. 1	100	99	29	-	-
SS- 4	50 RT	203+00	1. 0- 1. 5	A- 3(0)	23	NP	25.7	72.6	1. 7	0.0	100	96	3	-	-
SS- 5	50 RT	203+00	8. 5- 10. 0	A-6(6)	35	18	3.6	51.6	18.5	26. 3	100	99	54	-	-
SS- 6	50 RT	202+50	1. 0- 1. 5	A- 3(0)	24	NP	20. 2	78.4	1. 4	0.0	100	97	3	-	-
SS-7	50 RT	202+50	8.5-10.0	A-6(5)	32	15	4. 1	52.7	17.9	25. 3	100	99	53	-	-
SS-8	50 RT	202+00	1. 0- 1. 5	A- 3(0)	23	NP	16. 1	80.0	<i>3.</i> 9	0.0	100	97	7	-	-
SS- 9	50 RT	202+00	<i>3</i> . 5- 5. 0	A- 4(0)	22	6	4.7	56.6	18. 5	20. 2	100	99	48	17.0	-
SS- 10	50 RT	201+50	1. 0- 1. 5	A- 2- 4(0)	23	NP	10.2	80.0	6.8	3.0	100	98	15	-	
SS- 11	50 RT	201+50	<i>3</i> . 5- 5. 0	A-6(6)	38	18	4.0	51.2	16. 5	28. 3	100	100	53	-	-
SS- 12	50 RT	201+50	8.5-10.0	A- 4(0)	22	2	8.7	57.0	18. 1	16. 2	100	98	50	-	-