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REFERENCE

DESCRIPTION TITLE SHEET LEGEND (SOIL & ROCK) SITE PLAN CROSS SECTIONS BORE LOGS

STATE OF NORTH CAROLINA

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

STRUCTURE SUBSURFACE INVESTIGATION

RUTHERFORD COUNTY_

PROJECT DESCRIPTION

US 22I SOUTH OF US 74 BUSINESS (CHARLOTTE RD) TO SR 1366 (ROPER LOOP RD)

SITE DESCRIPTION

DUAL STRUCTURES ON -L3- OVER -Y2-

BRIDGES 800660 AND 800661

34400 PROJEC

I	STATE	STATE PROJECT REFE	RENCE NO.	SHEET NO.	TOTAL SHEETS
	N.C.	R-2233BB	34400	1	9

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 REVEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N.C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT 1991 707-6800. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA ARE NOT 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 UNPELACED TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOLI MOISTURE CONDITIONS INDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOLI MOISTURE CONDITIONS MAY YARY 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 UBSURFACE 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 WARANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOR THE INTERPRETATIONS MADE, OR OPHIONO OF THE DEPARTMENT AS TO THE TYPE OF MATERIALS AND CONSTRUCTIONS 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 THE PROJECT. THE CONTRACTOR SHALL HAVE NO CLAIM FOR ADDITIONAL COMPENSATION OF FOR ANY EXTENSION OF TIME FOR ANY REASON RESULTING FROM THE ACTUAL CONTENS ENCOUNTERED AT THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

NOTES:

- FES: THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N.C. DEPARTMENT OF TRANSPORTATION AS ACCURATE NOR IS IT CONSIDERED PART OF THE PLANS, SPECIFICATIONS OR CONTRACT FOR THE PROJECT. BY HAVING REDUESTED 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. 2.

	PERSONNEL
_	CD JOHNSON
_	DO CHEEK
_	CJ COFFEY
	F&R CONSULTANTS
_	DEREK RACEY
_	
INVESTIGATED B	yJC KUHNE
DRAWN BY	JC KUHNE
CHECKED BY	
SUBMITTED BY _	
DATE	



SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

			SOIL C	ESCRIPT	ION						GRADATI	ON						ROCK	DESCRI	PTION
SOIL IS C BE PENETF ACCORDIN IS BA CONSISTEN AS	ONSIDERED ATED WITH G TO THE SED ON TH ICY, COLOR, MINERALOO	UNCONSOLID A CONTINUO STANDARD PE E AASHTO S TEXTURE, MO GICAL COMPOS	TED, SEMI-CON US FLIGHT POV NETRATION TE STEM, BASIC I STURE, AASHTC SITION, ANGULA	SOLIDATED, (VER AUGER 4 ST (AASHTO DESCRIPTIONS CLASSIFICA RITY, STRUCT	R WEATHERED ND YIELD LESS T 206,ASTM D GENERALLY II TION,AND OTHE URE,PLASTICIT	EARTH MAT THAN 100 586). SOIL NCLUDE THE R PERTINE (.ETC. FOR	ERIALS TH BLOWS PE CLASSIFIC FOLLOWIN NT FACTOR EXAMPLE,	AT CAN R FOOT CATION NG: S SUCH	WELL GRADED - INDICAT UNIFORMLY GRADED - IN GAP-GRADED - INDICATE	ES A C IDICATE	COOD REPRESENTATION S THAT SOIL PARTICLI XTURE OF UNIFORM PA ANGULARITY O	OF PARTICLI ES ARE ALL RTICLE SIZE F GRAINS	E SIZES FR APPROXIMA S OF TWO S	OM FINE TO COARSE. TELY THE SAME SIZE. OR MORE SIZES.	HARD ROCK I ROCK LINE IN SPT REFUSAL BLOWS IN NO REPRESENTEI ROCK MATER	S NON-(NDICATE - IS PE ON-COAS - BY A IALS AF	COASTAL PLA S THE LEVE NETRATION & STAL PLAIN ZONE OF WE RE TYPICALL	AIN MATERIAL TH L AT WHICH NON- BY A SPLIT SPOO MATERIAL, THE EATHERED ROCK. Y DIVIDED AS FOL	AT WOULD -COASTAL N SAMPLEF TRANSITI -LOWS:	YIELD SPT REFUSAL IF TEST PLAIN MATERIAL WOULD VIELD REQUAL TO OR LESS THAN Ø, ON BETWEEN SOIL AND ROCK
VE	RY STIFF.G	RAY, SILTY CLAY	MOIST WITH INT	ERBEDDED FI	VE SAND LAYERS	HIGHLY PLAS	STIC, A-7-6		THE ANGULARITY ANGULAR, SUBAN	Y OR R <u>NGULAR</u> ,	OUNDNESS OF SOIL GR SUBROUNDED, OR ROUNI	AINS IS DES <u>DED</u> .	IGNATED BY	THE TERMS:	WEATHERED		1000	NON-COASTAL	PLAIN MAT	ERIAL THAT WOULD YIELD SP
GENERAL	SU	SRANII AR MATE	<u>NU ANU</u>			CATION				MI	NERALOGICAL C	OMPOSIT	ION		ROCK (WR)		12.12	FINE TO COAR	R FOOT IF	TESTED.
CLASS.		≤ 35% PASSING	*200)	(> 35% F	ASSING 200)	ORG	anic materi	ALS	MINERAL NAM		CH AS QUARTZ, FELDSP	AR, MICA, TAL	_C, KAOLIN, E	ETC.	CRYSTALLINE ROCK (CR)			WOULD YIELD	SPT REFUS	SAL IF TESTED. ROCK TYPE IN
GROUP CLASS. A	A-1	A-3 A-2-4 (A-2 -2-5 A-2-6 A-2-	A-4 A-5	A-6 A-7	A-1, A-2 A-3	A-4, A-5 A-6, A-7				COMPRESSIE	BILITY	120 01 010		NON-CRYSTAL	LINE		FINE TO COAR	SE GRAIN	METAMORPHIC AND NON-COAST
SYMBOL									SLIGH MODE				LL < 31	50	ROCK (NCR)		<u> </u>	ROCK TYPE IN	CLUDES PH	YLLITE, SLATE, SANDSTONE, ET
% PASSING	00000000;		ana an	N HIGHER			SILT-		HIGHL	Y COM	PRESSIBLE		LL > 50		SEDIMENTARY (CP)	ROCK		SPT REFUSAL.	ROCK TYP	E INCLUDES LIMESTONE, SAND
■10 50 ■40 30	MX 50 MX	51 MN				GRANULAR SOILS	CLAY	MUCK, PEAT		<u> </u>	GRANULAR STLT -		AL					WE	ATHERI	NG
*200 15 MATERIAL	MX 25 MX 1	10 MX 35 MX 3	5 MX 35 MX 35 M	1X 36 MN 36 M	IN 36 MN 36 MN		50125		ORGANIC MATERIAL TRACE OF ORGANIC M	IATTER	<u>SOILS</u> <u>SOI</u> 2 - 3% 3 -	<u>LS</u> 5%	OTHER TRACE	MATERIAL 1 - 10%	FRESH	ROCK F	FRESH, CRYST	ALS BRIGHT, FEW 、	JOINTS MAY	SHOW SLIGHT STAINING. ROCK
PASSING #40	-	- 40 MX	11 MN 40 MX 41 M	N 40 MX 41 M	N 40 MX 41 MN	SOILS LITTL	WITH E OR		LITTLE ORGANIC MATT MODERATELY ORGANIC HIGHLY ORGANIC	TER	3 - 5% 5 - 5 - 10% 12 - > 10% > 2	12% 20% 0%	LITTLE SOME HIGHLY	10 - 20% 20 - 35% 35% AND ABOVE	VERY SLIGHT (V SLI.)	ROCK (CRYST	GENERALLY F ALS ON A BR	RESH, JOINTS STAI	NED, SOME	JOINTS MAY SHOW THIN CLAY (BRIGHTLY. ROCK RINGS UNDER H
GROUP INDEX	0	0 0	4 MX	8 MX 12 M	IX 16 MX NO MX	MODEF AMOUN	rate TS of	ORGANIC			GROUND W	ATER			SLIGHT	ROCK	GENERALLY F	RESH. JOINTS STAL	NED AND D	ISCOLORATION EXTENDS INTO R
usual types st of major g	ONE FRAGS. RAVEL, AND	FINE SIL	TY OR CLAYEY VEL AND SAND	SILTY SOILS	CLAYEY SOILS	ORGA MATI	NIC TER	SUILS	∇	WATE	ER LEVEL IN BORE HOL	E IMMEDIATI	ELY AFTER	DRILLING	(SLI.)	1 INCH. CRYST	. OPEN JOINT ALS ARE DUL	S MAY CONTAIN CL L AND DISCOLORED	AY. IN GR	ANITOID ROCKS SOME OCCASIONALINE ROCKS RING UNDER HAMME
MATERIALS	SANU			+		FAIR TO			- <u>▼</u>	PERC	CHED WATER, SATURATE	D ZONE, OR N	WATER BEAR	ING STRATA	(MOD.)	GRANIT	TOID ROCKS.	UNS UF RUCK SHUW 10ST FELDSPARS A	RE DULL A	ND DISCOLORED, SOME SHOW CL
AS SUBGRADE	E	EXCELLENT TO	500D	FAIR	TO POOR	POOR	POOR	UNSUITABLE		SPRI	NG OR SEEP					DULL S WITH F	SOUND UNDER FRESH ROCK.	HAMMER BLOWS A	ND SHOWS	SIGNIFICANT LOSS OF STRENGT
	P	1 OF A-7-5 SUE	IGROUP IS ≤ LL	- 30; PIOF A-	7-6 SUBGROUP IS	> LL - 30						SYMBOL	5		MODERATELY			QUARTZ DISCOLORE	D OR STAL	NED. IN GRANITOID ROCKS, ALL
				RANGE (F STANDARD	RANG	E OF UNC	ONFINED			25/025	0111002			(MOD. SEV.)	AND C	AN BE EXCAV	ATED WITH A GEOL	OGIST'S PI	ICK. ROCK GIVES "CLUNK" SOUND
PRIMARY SC	IL TYPE	CONSI	STENCY	PENETRATI (N·	DN RESISTENCE VALUE)	COMPF	RESSIVE S (TONS/FT	TRENGTH 2)		SCRIPT		& DIP DIREC		SLOPE INDICATOR	SEVERE (SEV.)	ALL R	OCK EXCEPT	QUARTZ DISCOLORE	⊑ D OR STAI NL. IN GRA	NED. ROCK FABRIC CLEAR AND I NITOID ROCKS ALL FELDSPARS
GRANULAR	_ Y ?		OSE 1 DENSE	4 10	TO 10 TO 30		N/A					IESI BURI		INSTALLATION		to som <u>IF TE</u> :	ME EXTENT. S STED. WOULD	SOME FRAGMENTS (<u>YIELD SPT N VALU</u>)F STRONG 1 <u>ES > 100 E</u>	ROCK USUALLY REMAIN. <u>BPF</u>
MATERIAL (NON-COH	ESIVE)	DE	NSE DENSE	30	TO 50		(0.25			Y EMBA		ER BORING		TEST	VERY SEVERE (V SEV.)	ALL RO BUT M- REMAII	OCK EXCEPT ASS IS EFFE NING. SAPROL	QUARTZ DISCOLORE CTIVELY REDUCED ITE IS AN EXAMPL	D OR STAI TO SOIL S E OF ROCK	NED. ROCK FABRIC ELEMENTS A TATUS, WITH ONLY FRAGMENTS C WEATHERED TO A DEGREE THA
GENERALL SILT-CLA MATERIAL	_Y Y	S MEDIU	DFT 4 STIFF TFF	2 4 8	TO 4 TO 8 TO 15		0.25 TO 0 0.5 TO 1 1 TO 2	0.5 .0		CK LINE		ITORING WEL	L 🔶	TEST BORING WITH CORE	COMPLETE	VESTIG ROCK F SCATT	SES OF ORIGINAL REDUCED TO ERED CONCEN	NAL ROCK FABRIC SOIL. ROCK FABRIC ITRATIONS. QUARTZ	REMAIN. <u>IF</u> NOT DISC MAY BE P	<u>F TESTED, WOULD YIELD SPT N</u> ERNIBLE, OR DISCERNIBLE ONLY RESENT AS DIKES OR STRINGER
COHESIVE	=)	VERY H	STIFF ARD	15	TO 30 > 30		2 TO 4 > 4		TTTTT ALLUVIAL SOI	L BOUN		ALLATION	\bigcirc	- SPT N-VALUE	L	ALSO 4	AN EXAMPLE.	DOCK		1500
			TEXTURE	OR GRAI	N SIZE					F	RECOMMENDATIO	N SYMBO	LS		VERY HARD			HED BY KNIFE OR	SHARP PIC	NESS K. BREAKING OF HAND SPECIMEN
U.S. STD. SIEV	E SIZE		4 10 4 76 2 00	40	60 200 0 25 0 075	270					CLASSIFIED EXCAVATIO SUITABLE WASTE	N - 👫		SIFIED EXCAVATION - BLE, BUT NOT TO BE		SEVER	AL HARD BLO	WS OF THE GEOLO	GIST'S PICK	ζ.
BOULDER	COE		GRAVEL	COARSE	FINE	s		CLAY	SHALLOW UNDERCUT		CLASSIFIED EXCAVATIO CEPTABLE DEGRADABLE	N - ROCK	USED IN EMBANKN	THE TOP 3 FEET OF MENT OR BACKFILL	MODERATELY	TO DE	E SCRATCHED TACH HAND S	BY KNIFE OR PIC PECIMEN. BY KNIFE OR PIC	K UNLY WI	OR GROOVES TO 0.25 INCHES D
GRAIN MM	305	75	2.0	(CSE. SD.)	(F SD. 0.25	0.05	0.005	102.7	AR - AUGER REFUSAL		ABBREVIAT MED MEDIUM	IONS	vst -	VANE SHEAR TEST	HARD	EXCAVA BY MO	ATED BY HAR DERATE BLOW	D BLOW OF A GEO /S.	LOGIST'S P	ICK. HAND SPECIMENS CAN BE [
SIZE IN.	12					TEDMO			CL CLAY	J	MOD MODERAT	JUS ELY	wea 2-υ	NIT WEIGHT	HARD	can Be Can Bi	E GROOVED O E EXCAVATED	R GOUGED 0.05 IN IN SMALL CHIPS	TO PEICES	1 INCH MAXIMUM SIZE BY HARD
SOIL M	IOISTURE S RBERG LIM	OIL MOI SCALE IITS)	FIELD MO	JUNNEL DISTURE PTION	GUIDE FOR F	IELD MOIS	TURE DES	CRIPTION	. CPT - CONE PENETRATION CSE COARSE DMT - DILATOMETER TES	N TEST	NP - NON PLAS ORG ORGANIC PMT - PRESSUR	TIC EMETER TES	7 _d - D т <u>SAM</u>	IRY UNIT WEIGHT IPLE ABBREVIATIONS	SOFT	POINT CAN BI	OF A GEOLO	GIST'S PICK. GOUGED READILY	BY KNIFE	OR PICK. CAN BE EXCAVATED IN
			- SATURA (SAT.	TED -	USUALLY LIC	UID: VERY	WET.USU4	ALLY R TABLE	DPT - DYNAMIC PENETRAT e - VOID RATIO F - FINF	TION TE	EST SAP SAPROLI SD SAND, SAN SL SILT, SILT	FIC DY Y	S - BU SS - S	JLK SPLIT SPOON SHELBY TUBE	VERY	PIECES CAN BI	S CAN BE BRO	DKEN BY FINGER P TH KNIFE. CAN BE	RESSURE.	D READILY WITH POINT OF PICK
LL LIQUID LIMIT PLASTIC SEMISOLID; REQUIRES DRYING TO RANGE SEMISOLID; REQUIRES DRYING TO									FOSS FOSSILIFEROUS FRAC FRACTURED, FRAC	TURES	SLI SLIGHTLY TCR - TRICONE	REFUSAL	RS - F RT - F	ROCK RECOMPACTED TRIAXIAL	SOFT	FINGEF	RE IN THICKN	ACTNC	EN BY FIN	GER PRESSURE. CAN BE SCRATC
(PI) PL	PLASTIC	LIMIT			ATTAIN OPTI	MUM MOIS	TURE		HI HIGHLY		V - VERY	CONTENT	LBR -	RATIO	TERM		TUNE SI	SPACING		
0M _		MOISTURE	- MOIST	- (M)	SOLID; AT OF	NEAR OP	TIMUM MO	ISTURE	DRILL UNITS:		ENT USED ON S	UBJECT	PROJEC	T YPE:	VERY WID WIDE MODERATE	E Ely clc	MORI 3 DSE	E THAN 10 FEET 3 TO 10 FEET 1 TO 3 FEET		VERY THICKLY BEDDED THICKLY BEDDED THINLY BEDDED 0.
36 -			- DRY -	(D)	REQUIRES AL	DITIONAL MUM MOIS	WATER TO)	CME-45C		CLAY BITS 6"CONTINUOUS FLIGHT	AUGER			CLOSE VERY CLO	SE	Ø. LESS	.16 TO 1 FOOT THAN 0.16 FEET		VERY THINLY BEDDED 0.0 THICKLY LAMINATED 0.0 THINLY LAMINATED
			PLA	STICITY					LME-55	\mathbb{X}	8 HOLLOW AUGERS		в					IN	JURATI	ON
			PLAST	CITY INDEX	(PI)	DR	Y STRENG	тн	СМЕ-550		HARD FACED FINGER B	ITS	□-N		FOR SEDIMEN	ITARY R	ROCKS, INDUR	ATION IS THE HAP	RDENING O	F MATERIAL BY CEMENTING, H
NON SLIGH	PLASTIC HTLY PLAS	TIC		0-5 6-15			VERY LOW SLIGHT		VANE SHEAR TEST		TUNGCARBIDE INSERT	S	HAND TOO	LS:	FRIABI	_E		GENTLE BL	OW BY HA	MMER DISINTEGRATES SAMPLE
MODE HIGHL	RATELY PL Y PLASTIC	ASTIC C	2	16-25 6 OR MORE			MEDIUM HIGH		PORTABLE HOIST			EL TEETH		T HOLE DIGGER D AUGER	MODER	ATELY	INDURATED	GRAINS CA BREAKS EA	N BE SEPA SILY WHEN	RATED FROM SAMPLE WITH S N HIT WITH HAMMER.
			(TRICONE TUN	IGCARB.	SOUM	NDING ROD	INDUR	ATED		GRAINS AR DIFFICULT	E DIFFICU TO BREAK	LT TO SEPARATE WITH STEEL
DESCRIPTI	ONS MAY I IFIERS SU	NCLUDE COL CH AS LIGH	OR OR COLOR , DARK, STREA	COMBINATIO KED, ETC. AF	INS (TAN, RED, E USED TO DE	YELLOW-BF	PPEARANCE	-GRAY).			LOKE BII			SHEAR TEST	EXTRE	MELY I	NDURATED	SHARP HAM SAMPLE BF	IMER BLOW EAKS ACR	S REQUIRED TO BREAK SAMPL OSS GRAINS.

PROJECT REPERENCE NO. R-2233BB 34400

	TERMS AND DEFINITIONS
D. AN INFERRED	ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.
FOOT PER 60	ADUIFER - A WATER BEARING FORMATION OR STRATA.
IS UFTEN	ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.
N VALUES >	ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, SUCH AS SHALE, SLATE, ETC.
	ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.
	CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.
L PLAIN F TESTED.	COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.
MAY NOT YIELD TONE, CEMENTED	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.
	$\underline{\text{DIKE}}$ - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.
NATINGS IF OPEN	<u>DIP</u> - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.
MMER BLOWS IF	DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.
CK UP TO FELDSPAR	FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.
BLOWS.	FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM
AS COMPARED	FRIENT PRIENTED.
ELDSPARS DULL	FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.
HEN STRUCK.	JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.
IDENT BUT	ITS LATERAL EXTENT.
RE KAULINIZED	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
E DISCERNIBLE	USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.
STRONG ROCK	<u>PERCHED WATER</u> - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.
N SMALL AND	RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.
. SAPROLITE IS	RUCK UDALITY DESIGNATION (RUD) - A MEASURE OF RUCK UDALIT DESCRIBED BY TOTAL LENGTH OF RCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.
	SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT
REQUIRES	ROCK.
OWS REQUIRED	RELATIVE THIN COMPARED WITH ITS LATERAL EXTENT. THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.
EP CAN BE TACHED	$\underline{\text{SLICKENSIDE}}$ - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.
R PICK POINT. 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 I FOOT INTO SOLL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.
FRAGMENTS . SMALL, THIN	<u>STRATA CORE RECOVERY (SREC.)</u> - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.
PIECES 1 INCH	STRATA ROCK QUALITY DESIGNATION (SRQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.
	TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
	BENCH MARK: ELEVATIONS FROM PROJECT TIN
THICKNESS 4 FEET	ELEVATION: FEET
6 - 1.5 FEET	NOTES:
3 - 0.16 FEET 8 - 0.03 FEET	
0.008 FEET	
T. PRESSURE, ETC.	
EEL PROBE:	
PROBE;	
:	
	DATE: 8-15-14





20	40	PROJECT	REFERENCE	NO.	SHEET NO.
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WB	S 34	4400.	1.S5			ТІ	P R-2233	BBB	COUNT	Y RUTHEF	RFORD			GEO	LOGIST Jo	ohnson, C	. D.			WBS	34400).1.S5			TIF	R-2233	3B	COUNTY
SITE DESCRIPTION US 221 South of Business (Charlotte Rd.) to SR 1366 (1366 (Roper	Loop Rd	.)						GROUND WTR	(ft)	SITE	DESCR		US 2	221 So	uth of E	usiness (C	harlotte R	d.) to SR 1		
BO	ring	NO.	EB1A	_BR66	60	S	TATION	773+85		OFFSET	64 ft LT			ALIG	NMENT -L	.3-		0 HR. 1	3.6	BOR	ING NO.	EB1E	BR66	61	ST	ATION 7	73+65	
со	LLAR		V . 98	0.3 ft		т	OTAL DEF	TH 51.7 f		NORTHING	G 600,5	82		EAS	FING 1,121	,543	:	24 HR.	N/A	COL	LAR EL	EV. 99	0.7 ft		тс	TAL DEP	ГН 31.5 f	t
DRI	LL RIG) HAMN	/IER EF	F./DATI	E AFC	8963 C	ME-550X 7	7% 07/31/201	7	•	DRILL	IETHO	D H.:	S. Augers		H	HAMME	R TYPE Automat	ic	DRILL	. RIG/HAM	MMER EF	F./DATE	E AFC	08963 CN	/E-550X 77	% 07/31/201	7
DRI	ILLEF	R Ch	eek, D	. O.		S	TART DAT	E 05/16/1	9	COMP. DA	TE 05/	16/19		SURF			H N/A			DRIL	LER C	offey, J	r., C.		ST	ART DATI	E 05/16/1	9
ELE			DEPTH	BLC	ow co	UNT		BLOWS	PER FOO	г Г	SAMP.	▼/			SOIL A					ELEV	DRIVE	DEPTH	BLO	W CO	UNT		BLOWS	PER FOOT
(ft)	((ft)	(ft)	0.5ft	0.5ft	0.5ft	0	25	50	75 100	NO.	Имо	G	ELEV. (1	ft)		(DL00	DEP	ΓH (ft)	(ft)	(ft)	(ft)	0.5ft	0.5ft	0.5ft	0 :	25	50
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	95	56 7 ±	23.6											_							967.2	23.5				\ <u>`</u> ·	+	1
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	95	51.7 +	28.6	0	2	7	.l							-		ROCKS	SEAMS				962.2	28.5	100	-				
950)	+					9							-						960	959.2	31.5				<u> </u>	<u> </u>	<u> </u>
	94	16 7 ±	33.6				::)::							-								ŧ	60					
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5/17/1	93	31.7 +	48.6	100	-									_								ŧ						
930 10	02	» e +	517											 928.6					51.7		-	ŧ						
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FORI	D			GEO	LOGIST	Johnson, (C. D.		
Loop	Rd.)						GROUN	D WTR (ft)
63 ft	RT			ALIG	NMENT	-L3-		0 HR.	N/A
60	0,58	80		EAS	TING 1,1	21,672		24 HR.	12.2
DRII	LLM	ETHOD	H.S	. Augers			HAMME	R TYPE	Automatic
TE	05/1	6/19		SUR	FACE WA	TER DEPT	TH N/A	<i>۱</i>	
SA	MP.		L O	-1	SOI	L AND ROC	K DESC	RIPTION	I
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				990.7			SURFA	.CE L	0.0
				- - - - - - - - - - - - - - - - - - -	BRN S	SANDY SILT FR	Γ W/ MIC AGS	a and f	₹ K 12.0
		•			GRA	ALL Y/BRN SAN TRACE	UVIAL DY SILT ORGAN	W/ MICA IC	Α,
				968.9		RES			21.8
					GI	RAY, SAND	Y SILT V	// MICA	
			34776	_964.7	-				26.0
				•	WEAT	HERED AM	PHIBOL	TE GNE	ISS
				- 959.2					31.5
				959.2	Boring 1	erminated v	with Cas	ing Adva	
		- ORD Loop Rd. 33 ft RT 600,58 DRILL M SAMP. NO.	Loop Rd.) 33 ft RT 600,580 DRILL METHOD SAMP. NO. MOI	Loop Rd.) 33 ft RT 600,580 DRILL METHOD SAMP. NO. MOI G	URD GEO Loop Rd.) 33 ft RT ALIG 600,580 EAS' DRILL METHOD H.S. Augers SAMP. L NO. MOI G 990.7 SAMP. - NO. MOI G - 990.7 - 990.7 - 990.7 - 990.7 - 990.7 - 990.7 - 990.7 - 990.7 - 990.7 - 990.7 - 990.7 - 990.7 - 990.7 - 990.7 <	CRD GEOLOGIST Loop Rd.) 33 ft RT ALIGNMENT 600,580 EASTING 1,1 DRILL METHOD H.S. Augers TE 05/16/19 SURFACE WA SAMP. L 0 SOII NO. MOI G SOII MOI G SOII 990.7 - BRN S - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -	ORD GEOLOGIST Johnson, I. Loop Rd.) 33 ft RT ALIGNMENT -L3- 600,580 EASTING 1,121,672 DRILL METHOD H.S. Augers Image: Comparison of the state of the st	CRU CRU CONTROL CONTROL	CPUC COUNTSON, C. D. COOP Rd.) GROUN Sit RT ALIGNMENT -L3- O HR GO0,580 EASTING 1,121,672 24 HR ORILLMETHOD H.S. Augers HAMMER TYPE C5/16/19 SURFACE WATER DEPTH N/A SOIL AND ROCK DESCRIPTION NO. O G GOUND SURFACE BRN SANDY SILT W/ MICA AND F FRAGS GRAY/BRN SANDY SILT W/ MICA GRAY/BRN SANDY SILT W/ MICA GRAY, SANDY SILT W/ MICA 968.9 GRAY, SANDY SILT W/ MICA 968.9 GRAY, SANDY SILT W/ MICA 964.7 WEATHERED ROCK WEATHERED ROCK WEATHERED ROCK GRAY, SANDY SILT W/ MICA 969.2 Boring Terminated with Casing Adva Refusal at Elevation 959.2 ft

	0 1 1 1	4.05													
WBS	34400	.1.S5		04.0-	T	IP R-2233	3B		Y RU	THER	-ORD	<u> </u>		GEOLOGIST M. Arnold	
SILE	DESCR		052	221 50				a.) to SR		Koper I	_оор ка	.)			
BOR	NG NO.	L3_7	7400			TATION 7	74+00		OFF						Dry
COL		:V. 98	4.3 ft				H 25.6 f	t	NOR	THING	600,6	05		EASTING 1,121,604	24 HR. 19.8
DRILL	. RIG/HAM		F./DATI	E F&F	21/5 (CME-55 86%	02/16/2016) Н.	S. Augers HAMM	IER IYPE Automatic
DRIL	LER S.	Davis					= 11/20/1			P. DA		20/16	11		Ά
ELEV (ft)	ELEV	DEPTH (ft)	0.5ft	0.5ft			25	50	75	100	NO		0	SOIL AND ROCK DES	
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075	- 975.8 -	- 8.5] :::::			.	: :			×.	-	
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970	970.8 -	- 13.5	4	4	4							М	X	-	
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	965.8	185											XL		<u>17.0</u>
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960	960.8 -	23.5	30	10	50									RESIDUAL	
	958.7 -	25.6	60/0 0					4 60		60/0.0	\mathbf{H}			958.9 958.7_/\CRYSTALLINE R	25.4 ROCK / 25.6
	-	F												- Boring Terminated at Ele	vation 958.7 ft
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WBS 34400.1.S5 TIP R-2233BB COUNTY										Y RUTH	IERF	FORD				GEOLOG	IST M. A	Arnold			WBS	34400).1.S5			TI	P R-22	3BB		COUNT		
SITE DESCRIPTION US 221 South of Business (Charlotte Rd.) to SR) to SR	1366 (Ro	per l	Loop Ro	.)						GROL	JND WTR (ft)	SITE	DESCR		US 2	221 So	uth of I	Business	(Charle	otte Rd.) to SR	
в	ORIN	g no.	L3_7	7480R		S	TATI	ON 77	74+53	3		OFFSE	T 5	58 ft RT				ALIGNME	NT -L3-	-	0 HR	. Dry	BOR	ING NO.	L3_7	7500L		S	ATION	774+6	64	
CC) DLL/	AR EL	EV. 98	38.2 ft		т	ΟΤΑΙ	DEPT	H 17	7.1 ft		NORTH	IING	600,6	67			EASTING	1,121,6	653	24 HR	. FIAD	COL	LAR EL	EV . 98	3.3 ft		т	DTAL DE	PTH	12.1 ft	
DR	RILL R	RIG/HAN	IMER EI	F./DAT	E F&F	2175 0	CME-5	5 86% (02/16/2	2016				DRILL	NETHO	DD H	I.S. /	Augers		HAM	MER TYPE	Automatic	DRIL	RIG/HAN	IMER EF	F./DAT	E F&F	R2175 C	ME-55 86	% 02/16	6/2016	
DF	RILL	ER S	. Davis			S	TAR		01/	/04/17		COMP.	DA	TE 01/	04/17			SURFACE			I/A		DRIL	.LER S	. Davis			S	ART DA	TE 0	1/04/17	
ELI	EV		DEPTH	BLC	ow co	UNT			BLO	WS PI	ER FOO	T		SAMP			Γ				SCRIPTIC	N	ELEV	DRIVE	DEPTH	BLC	ow co	UNT		BL	OWS P	ER FOO
(f	t)	(ft)	(ft)	0.5ft	0.5ft	0.5ft	0	2	25	50)	75	100	NO.	Имо	DI G	1	ELEV. (ft)		DINOONDE		DEPTH (ft)	(ft)	(ft)	(ft)	0.5ft	0.5ft	0.5ft	0	25	50)
98 98 98	RILLI EV [30 35 30 	ER S DRIVE ELEV (ft) 987.0 984.7- 979.7- 974.7- 971.1 - - - -	Depth (ft) 1.2 3.5 13.5 17.1	 BLC 0.5ft 3 25 39 12 60/0.0 	00 CO 0.5ft 3 90 61/0.3	UNT 0.5ft 3 10/0.1		2	01// BLO 25	/04/17 WS PI 50 	ER FOO			re 01/ SAMP NO.	04/17 MC M			SURFACI ELEV. (ft) 988.2 987.0 984.2 976.2 971.4 971.4 B	SOIL AN GF ROAL	ROUND SUR ROUND SUR WAY EMBAI EATHERED F RESIDUAL	I/A SCRIPTIC FACE VKMENT ROCK ROCK	DEPTH (ft) 0.0 1.2 4.0 12.0 12.0 11.1 ft	DRIL ELEV (ft) 985 980 975	LER S DRIVE ELEV (ft) 982 1 979 8- 979 8- 971 3 971 3 - 971 3 - 971 3 - 971 3 - 971 3 - 971 3 - 971 3 - 971 3 - 971 4 - 971 - 971	Depth (ft)	BLC 0.5ft	0.5ft	UNT 0.5ft 14 7	0	TE 0 BL 25 	1/04/17 OWS P 50	ER FOO"
NCDOT BORE DOUBLE R2233BB_GEO_BH.GPJ NC_DOT.GDT 5/17/19																																



WBS 34400.1.S5 TIP R-2233BB CO										COUNTY	Y RUTH	HERF	ORD			GEOLOGIST	M. Arnold			
s	ITE	DESCR	IPTION	US 2	221 So	uth of	Βι	usiness (Cl	harlotte Ro	d.) to SR 1	1366 (Rc	per L	.oop Rd.)					GROUN	D WTR (ft)
в	ORII	NG NO.	L3 7	7506L		s	TA	ATION 77	4+79		OFFSE	T 7	'3 ft LT			ALIGNMENT	-L3-		0 HR.	17.2
С	OLL	AR ELE	EV. 97	'8.8 ft		т	0	TAL DEPT	H 27.3 ft		NORTH	HING	600,67	72		EASTING 1,1	21,520		24 HR.	FIAD
D	RILL	RIG/HAM	IMER EF	F./DAT	E F&F	2175 (СМ	/E-55 86% (02/16/2016				DRILL M	ETHO) Н.:	S. Augers		НАММЕ	R TYPE	Automatic
D	RILL	ER S.	Davis			s	TA	ART DATE	01/04/1	7	COMP.	. DA	TE 01/0)4/17		SURFACE WA	TER DEP	TH N/A	4	
EL	EV	DRIVE	DEPTH	BLC	ow co	UNT			BLOWS	PER FOOT	-		SAMP.	▼/						
(ft)	ELEV (ft)	(ft)	0.5ft	0.5ft	0.5ft		0 2	5 5	50	75	100	NO.	мо	G	ELEV. (ft)	L AND RUC	K DESU	RIPTION	DEPTH (ft)
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		977.8 -														_ 978.8 _ 977.8	GROUNE) SURFA	ACE	0.0
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9	75	9/5.3	3.5	67	33/0.4					<u> </u>	- 100]					WEATHE	RED RC	CK	
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9	70	970.3	8.5	22	17	11			`							-	RES	IDUAL		
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9	65 -	965.3	13.5	2	2	4		• 6. • •		<u> </u>				w	N V N V					
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		-	L		4	0				· · · · ·				W	N V N N	-				
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9	55	955.3	23.5	100/0.3	3						100)/0.3 •								
		- 051 6	27.2						 							951.9				26.9
	Ī			60/0.1							60)/0.1 [●]	1			<u>951.5</u> Boring	CRYSTAL Terminated	LINE RO	OCK ation 951.	<u>27.3</u> 5 ft
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REFERENCE

<u>SHEET NO.</u>	DESCRIPTION
I	TITLE SHEET
2	LEGEND (SOIL & ROCK)
3	SITE PLAN
4,5	CROSS SECTIONS
6	PROFILE
7-9	BORE LOGS

DESCRIPTION

STATE OF NORTH CAROLINA

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

STRUCTURE SUBSURFACE INVESTIGATION

RUTHERFORD COUNTY_

PROJECT DESCRIPTION US 22I SOUTH OF US 74 BUSINESS (CHARLOTTE RD) TO

SR I366 (ROPER LOOP RD)

SITE DESCRIPTION

BRIDGE NO. 800662

ON - Y19- OVER - L3-

STATE	STATE PROJECT REFERE	INCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-2233BB	34400	1	9

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 REVEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N.C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT 1991 707-6800. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA ARE NOT 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 UNPELACED TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOLI MOISTURE CONDITIONS INDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOLI MOISTURE CONDITIONS MAY YARY 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 OPHIONO OF THE DEPARTMENT AS TO THE TYPE OF MATERIALS AND CONSTRUCTIONS 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 THE PROJECT. THE CONTRACTOR SHALL HAVE NO CLAIM FOR ADDITIONAL COMPENSATION OR FOR ANN EXTENSION OF TIME FOR ANY REASON RESULTING FROM THE ACTUAL CONTENS ENCOUNTERED AT THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

NOTES:

- TES: THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N.C. DEPARTMENT OF TRANSPORTATION AS ACCURATE NOR IS IT CONSIDERED PART OF THE PLANS, SPECIFICATIONS OR CONTRACT FOR THE PROJECT. BY HAVING REQUESTED THIS INFORMATION, THE CONTRACTOR SPECIFICALLY WAVES 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. 2.

	PERSONNEL
	CD JOHNSON
	CJ COFFEY
	DO CHEEK
F	&R CONSULTANTS
	DEREK RACEY
INVESTIGATED BY _	JC KUHNE
DRAWN BY	JC KUHNE
CHECKED BY	
SUBMITTED BY	
DATE	



SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

	SOIL DESCRIPTION	GRADATION	ROCK DESCRIPTION	TERMS AND DEFINITIONS
	SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN	WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE.	HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED, AN INFERRED	ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.
	ACCORDING TO THE STANDARD PENETRATION TEST (AASHTO T 206, ASTM DI586), SOIL CLASSIFICATION	UNIFORMLY GRADED - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE.	SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60	AQUIFER - A WATER BEARING FORMATION OR STRATA.
	IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH		REPRESENTED BY A ZONE OF WEATHERED ROCK.	ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.
	AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE,	THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS:	ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:	ARGILLACEDUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING
	SOUL FREND AND AASHTO CLASSIFICATION	ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.	WEATHERED NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES >	A NUTABLE PROPORTION OF CLAT IN THEIR COMPOSITION, SUCH AS SHALE, SLATE, ETC.
	GENERAL GRANULAR MATERIALS SILT-CLAY MATERIALS	MINERALOGICAL COMPOSITION	FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT	WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND
	CLASS. (≤ 35% PASSING 200) (> 35% PASSING 200) URGANIC MATERIALS	MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC.	ROCK (CR) WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE,	SURFACE.
	CROUP A-1 A-3 A-2 A-4 A-5 A-6 A-7 A-1, A-2 A-4, A-5 CLASS A-1 A-3 A-2 A-4 A-5 A-6 A-7 A-1, A-2 A-4, A-5	ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.	NON-CRYSTALLINE FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN	CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.
	ULASS. A-1-a A-1-b A-2-4 A-2-5 A-2-6 A-2-7 A-3 A-5, A-7		ROCK (NCR) SPT REFUSAL IF TESTED.	CULLUVIUM - RUCK FRAGMENTS MIXED WITH SUIL DEPUSITED BY GRAVITY ON SLOPE OF AT BUTTOM OF SLOPE.
	SYMBOL DOGOODOOD	MODERATELY COMPRESSIBLE LL = 31 - 50	COASTAL PLAIN COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD	CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED
	7. PASSING SALVY SILT- MICK		(CP)	BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.
	40 30 MX 50 MX 51 MN S0 LS SOILS	GRANULAR SILT - CLAY	WEATHERING	DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.
	*200 15 MX 25 MX 10 MX 35 MX 35 MX 35 MX 35 MX 36 MN 36 MN 36 MN 36 MN	ORGANIC MATERIAL SOILS OTHER MATERIAL	FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER	DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE
	PASSING #40	LITTLE ORGANIC MATTER 3 - 5% 5 - 12% LITTLE 10 - 20%	VERY SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN.	HORIZONTAL.
	LL – – – 40 MX 41 MN 50L5 W111 PT 6 MY NP 10 MY 10 MY 11 MN 10 MY 10 MY 10 MY 11 MN LITTLE OR HIGH Y	MODERATELY ORGANIC 5 - 10% 12 - 20% SOME 20 - 35% HIGHLY ORGANIC > 10% > 20% HIGHLY 35% AND ABOVE	(V SLI.) CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF	DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.
	GROUP INDEX Ø Ø Ø 4 MX 8 MX 12 MX 16 MX IN MX AMININTS OF	GROUND WATER		FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE
	USUAL TYPES STONE FRAGS, and an	WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING	(SLI.) 1 INCH, OPEN JOINTS MAY CONTAIN CLAY, IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR	SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.
	OF MAJOR GRAVEL, AND FINE SILTY OR CLAYEY SILTY CLAYEY MATTER	▼ STATIC WATER LEVEL AFTER 24 HOURS	CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.	FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.
		∇ PW PERCHED WATER SATURATED ZONE OR WATER REARING STRATA	MOD.) GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY, ROCK HAS	FLUAT - MULK FRAGMENTS UN SURFALE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL.
Import Lange of	AS SUBGRADE EXCELLENT TO GOOD FAIR TO POOR POOR UNSUITABLE		DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED	FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.
CONSIDERY OF DEVElocy of Eveloperation MISCILLANDUS STRATES MISCILLANDUS STRATES Constraint of the second strate second stra	PI OF A-7-5 SUBCROUP IS ≤ LL - 30 ;PI OF A-7-6 SUBCROUP IS > LL - 30		MODERATELY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DUIL	FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE
	CONSISTENCY OR DENSENESS	MISCELLANEOUS SYMBOLS	SEVERE AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH	
Computer	PRIMARY SOLI TYPE COMPACTNESS OR RANGE OF STANDARD RANGE OF UNCONFINED		(MOD. SEV.) AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES 'CLUNK' SOUND WHEN STRUCK. IF TESTED, WOULD YIELD SPT REFUSAL	JUINI - FRACIURE IN RUCK ALUNG WHICH NU APPRELIABLE MUVEMENT HAS ULCURRED.
CVER_LIN CVER_LINK CVER_LINK <th< td=""><td>CONSISTENCY (N-VALUE) (TONS/FT²)</td><td>WITH SOIL DESCRIPTION OF ROCK STRUCTURES</td><td>SEVERE ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT</td><td>ITS LATERAL EXTENT.</td></th<>	CONSISTENCY (N-VALUE) (TONS/FT ²)	WITH SOIL DESCRIPTION OF ROCK STRUCTURES	SEVERE ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT	ITS LATERAL EXTENT.
Product Product <t< td=""><td>GENERALLY VERY LOOSE < 4</td><td></td><td>(SEV.) REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT, SOME FRAGMENTS OF STRONG ROCK LISUALLY REMAIN.</td><td>LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.</td></t<>	GENERALLY VERY LOOSE < 4		(SEV.) REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT, SOME FRAGMENTS OF STRONG ROCK LISUALLY REMAIN.	LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.
Image: description of the second biological processing of the second biological procesecond biological processing of the second biological processing o	GRANULAR LUUSE 4 10 10 MATERIAL MEDIUM DENSE 10 TO 30 N/A		IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF	MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS
Normality Normality Column 2014 <	(NON-COHESIVE) VERY DENSE 30 TO 50		VERY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE	USUALLY INDICATES YOUR AERALIUN AND LACK OF GUUD DRAINAGE.
State State <th< td=""><td>VERY SOFT < 2 < 0.25</td><td>→ → INFERRED SOIL BOUNDARY - → CORE BORING ● SOUNDING ROD</td><td>(V SEV.) REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR</td><td>OF AN INTERVENING IMPERVIOUS STRATUM.</td></th<>	VERY SOFT < 2 < 0.25	→ → INFERRED SOIL BOUNDARY - → CORE BORING ● SOUNDING ROD	(V SEV.) REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR	OF AN INTERVENING IMPERVIOUS STRATUM.
Number Number<	GENERALLY SOFT 2 TO 4 0.25 TO 0.5		VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. <u>IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF</u>	RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.
OUTBOND VIDT NUT 10 MIT 10 MIT 10 MIT 10 MIT 4.0 MIT 4	MATERIAL STIFF 8 TO 15 1 TO 2	THE INFERRED RUCK LINE O MUNITURING WELL THE WITH CORE	COMPLETE ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS, QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS, SAPROLITE IS	ROCK QUALITY DESIGNATION (ROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF
Image: Note of the state of the st	(COHESIVE) VERY STIFF 15 TO 30 2 TO 4	TTREAST ALLUVIAL SOIL BOUNDARY A PIEZOMETER - SPT N-VALUE	ALSO AN EXAMPLE.	RUN AND EXPRESSED AS A PERCENTAGE.
No. 10. For 10.00 Image: 10.00		BECOMMENDATION SYMBOLS	ROCK HARDNESS	SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT
Display Display <t< td=""><td></td><td></td><td>VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES</td><td></td></t<>			VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES	
Example can be and the state of the sta	OPENING (MM) 4.76 2.00 0.42 0.25 0.075 0.053	UNULHLUI UNSUITABLE WASTE	HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY, HARD HAMMER BLOWS REQUIRED	RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO
BUD COD COD <td>BOULDER COBBLE GRAVEL COARSE FINE SILT CLAY</td> <td>SHALLOW UNCLASSIFIED EXCAVATION - USED IN THE TUP 3 FEET OF ACCEPTABLE DEGRADABLE ROCK EMBANKMENT OR BACKFILL</td> <td>TO DETACH HAND SPECIMEN.</td> <td>THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.</td>	BOULDER COBBLE GRAVEL COARSE FINE SILT CLAY	SHALLOW UNCLASSIFIED EXCAVATION - USED IN THE TUP 3 FEET OF ACCEPTABLE DEGRADABLE ROCK EMBANKMENT OR BACKFILL	TO DETACH HAND SPECIMEN.	THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.
Min Min <td>(BLDR.) (COB.) (GR.) SAND SAND (BLDR.) (COB.) (GR.) (CSE. SD.) (F SD.) (SL.)</td> <td>ABBREVIATIONS</td> <td>MODERATELY CAN BE SCRATCHED BY KNIFE OR PICK, GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE HARD EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK, HAND SPECIMENS CAN BE DETACHED</td> <td>SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.</td>	(BLDR.) (COB.) (GR.) SAND SAND (BLDR.) (COB.) (GR.) (CSE. SD.) (F SD.) (SL.)	ABBREVIATIONS	MODERATELY CAN BE SCRATCHED BY KNIFE OR PICK, GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE HARD EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK, HAND SPECIMENS CAN BE DETACHED	SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.
Diff. N: V:	GRAIN MM 305 75 2.0 0.25 0.05 0.005	AR - AUGER REFUSAL MED MEDIUM VST - VANE SHEAR TEST	BY MODERATE BLOWS.	STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF
SOLL MOISTURE - CORRELATION OF TERMS OP - Too. PREMEMATION EST	SIZE IN. 12 3	I BI - BURING IERMINATED MICA MICACEOUS WEA WEATHERED CL CLAY MOD MODERATELY γ - UNIT WEIGHT	MEDIUM CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. HARD CAN BE EXCAVATED IN SMALL CHIPS TO PEICES I INCH MAXIMUM SIZE BY HARD BLOWS OF THE	WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL
Since Such Wilstere Such Wilstere Such Wilstere Sock Wilstere Wilstere Sock Wilstere Wilstere Sock Wilstere Wilstere Wilstere Sock Wilstere Wilstere Wilstere Wilstere Sock Wilstere Wilst	SOIL MOISTURE - CORRELATION OF TERMS	CPT - CONE PENETRATION TEST NP - NON PLASTIC γ_{3} - DRY UNIT WEIGHT	POINT OF A GEOLOGIST'S PICK.	TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.
Prestic P	SUIL MUISTURE SCALE FIELD MOISTURE (ATTERBERG LIMITS) DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION	DMT - DILATOMETER TEST PMT - PRESSUREMETER TEST SAMPLE ABBREVIATIONS	SOFT CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS	STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.
LL LL LL SR3 Substrate Lumit Substrate Substrate <td></td> <td>DPT - DYNAMIC PENETRATION TEST SAP SAPROLITIC S - BULK</td> <td>PIECES CAN BE BROKEN BY FINGER PRESSURE.</td> <td>STRATA ROCK QUALITY DESIGNATION (SROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL</td>		DPT - DYNAMIC PENETRATION TEST SAP SAPROLITIC S - BULK	PIECES CAN BE BROKEN BY FINGER PRESSURE.	STRATA ROCK QUALITY DESIGNATION (SROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL
Putter - VET Settion/Link - VET Settion/Link - VET	(SAT.) FROM BELOW THE GROUND WATER TABLE	F - FINE SL - SHIND SUL	VERY CAN BE CARVED WITH KNIFE, CAN BE EXCAVATED READILY WITH POINT OF PICK, PIECES 1 INCH	LENGTH UF HUCK 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 - IW SMISSL DIR-DUNKS DUFING TO ATTON VISIONES DUFING TO THOM MOISTURE - WET - IW SMISSL DIR-DUNKS DUFING TO ATTON VISIONES DUF ATTON VISIONES DUF ATTON VISIONES DUF		- FOSS FOSSILIFEROUS SLI SLIGHTLY RS - ROCK	FINGERNAIL.	TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
Image: Non PLASTIC PLASTIC PLASTIC PLASTIC PLASTIC PLASTIC PLASTIC PLASTIC PLASTIC PLASTIC PLASTIC PROJECT TINK PROCES THORK PC PROVINCE PLASTIC PROJECT TINK PROCES PROJECT TINK PROSES PROJECT TINK PROCES PROJECT TINK PROSES	RANGE C - WET - (W) ATTAIN OPTIMUM MOISTURE	FRAGS FRAGMENTS W - MOISTURE CONTENT CBR - CALIFORNIA BEARING	FRACTURE SPACING BEDDING	BENCH MARK:
OP OPTIMUM MOISTURE - MOIST - M0 SOLDA TO R NEAR OPTIMUM MOISTURE CUMPMENT VSED MANUALING TOUS US MANUARING TOUS MANUARING TOUS <th< td=""><td></td><td>HI HIGHLY V - VERY RATIO</td><td>TERM SPACING TERM THICKNESS</td><td>ELEVATIONS FROM PROJECT TIN FOR R-2233BB</td></th<>		HI HIGHLY V - VERY RATIO	TERM SPACING TERM THICKNESS	ELEVATIONS FROM PROJECT TIN FOR R-2233BB
SL SHRINKAGE LIMIT OHLC WITS	OM _ OPTIMUM MOISTURE - MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE		WIDE 3 TO 10 FEET THICKLY BEDDED 1.5 - 4 FEET	ELEVATION: FEET
PRY - (D) REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTREE CME -55	SL SHRINKAGE LIMIT		MODERATELY CLOSE 1 TO 3 FEET THINLY BEDDED 0.16 - 1.5 FEET CLOSE 0.16 TO 1 FOOT VERY THINLY BEDDED 0.03 - 0.16 FEET	NOTES:
PLASTICITY DRY STRENTH CWE-55 # POLLOW AUCERS CORE SIZE: INDURATION CORE SIZE: MON PLASTIC 0:5 VERY LOW DRY STRENTH W POLLOW AUCERS FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC. NON PLASTIC 0:5 VERY LOW VANE SHEAR TEST FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC. NON PLASTIC 0:5 SLIGHT, PLASTIC 6:15 SLIGHT VANE SHEAR TEST FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC. NODERATELY PLASTIC 6:15 SLIGHT VANE SHEAR TEST FOR SEDIMENTARY ROCKS, INDURATED GRAINS CAN BE SEPARATE DISINTEGRAMES, EASHLE, WITH STEEL PROBE; MODERATELY PLASTIC 2:6 OR MORE HIGH PORTABLE HOIST TRICONE Stelle TETH HAND AUGER MODERATELY PLASTIC 2:6 OR MORE HIGH PORTABLE HOIST TRICONE Stelle TETH HAND AUGER MODERATELY PLASTIC 2:6 OR MORE HIGH ORTABLE COLOR OR COLOR COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-CRAY), ORTABLE COLOR OR<	- DRY - (D) REQUIRES ADDITIONAL WATER TO		VERY CLOSE LESS THAN 0.16 FEET THICKLY LAMINATED 0.008 - 0.03 FEET	
PLASTICITY Dry Strength ModerateLy Plastic Dry Strength Non Plastic Dry Strength VERV LOW Dry Strength Wake Stear Test Madd Faced Finder Bits Indic-CarBide Inserts Indic-CarBide Inserts Indic-CarBide Inserts Friable Friable Friable Friable Gains Can Bes Spring finder Nito Gr Matterial By Cementing, Heat, Pressure, Etc. NON Plastic 6-15 SLIGHT Vane Shear Test Indic-CarBide Inserts Indic-CarBide Inserts Friable Gentle BLOW By Hammer Disintegrates Sample. MODERATELY Plastic 16-25 MeDIUM Portable Hoist Inticone 'steel teeth Post Hole Didger Moderately INDURAteD Grains Can Be Spring with Inder Fries Sumerous Grains; HIGHLY Plastic 26 OR MORE HIGH Portable Hoist Inticone 'steel teeth Post Hole Didger Moderately INDURAteD Grains Can Be Spring with Intiger Fries Sumerous Grains; Bescriptions May Include Color or color combinations (tan, red, yelfanations) Inticone 'steel teeth Indic-CarBide Brands can Be Spring with Indicer Fries Sumerous Grains; Brands can Be Spring with Indicer Fries Sumerous Grains; Modifiers such as Light, Dark streaked, etc., are used to bescribe Appearance. Inticone 'steel teeth Hand Augeer				4
PLASTICITY PLASTIC 0-5 VERV LOW			FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.	1
SLIGHTLY PLASTIC 6-15 SLIGHT I vane shear test I vane shear sacross grains. I vane shear sacross grains. I vane shear sacross grains.	NON PLASTIC 0-5 DRY STRENGTH		EBIARUE RUBBING WITH FINGER FREES NUMEROUS GRAINS;	
Inductive Labor or the low of the l	SLIGHTLY PLASTIC 6-15 SLIGHT		GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.	
COLOR Index	HIGHLY PLASTIC 26 OR MORE HIGH		MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE 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. MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE. D	COLOR		GRAINS ARE DIFFICULT TO SEPARATE WITH STEFL PRORE.	
Descriptions man include color on complexitions than, key, tellow-brown, bloc-okary, MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE. Image: Conc of the complexition of the conc of the complexitient of the conc of the complexitient of the conc of the complexitient of the conc of the conc of the complexitient of the conc of the complexitient of the conc of			INDURATED DIFFICULT TO BREAK WITH HAMMER.	
Light	MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.		EXTREMELY INDURATED SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE;	
			SAMMLE BREAKS ACHUSS GRAINS.	DATE: 8-15-14

PROJECT REFERENCE NO.

R–2233**BB** 34400

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(FEET)		20		10	VE =	1:1	SE	ECTION ALC	ONG EB	82							



١	VBS	34400	.1.S5			Т	IP R-223	3BB		COUNTY	RUTI	HERF				GEOLOGIST M. Arnold	
5	SITE	DESCRI	IPTION	US 2	221 So	uth of	Business	Charlot	te Rd	l.) to SR 1	366 (Ro	oper L	.oop Rd.))			GROUND WTR (f
E	BORII	NG NO.	L3_8′	1249L		s	TATION	812+49			OFFSE	T 8	3 ft LT			ALIGNMENT -L3-	0 HR. 41.
C	OLL	AR ELE	V . 97	7.6 ft		т	OTAL DE	PTH 5	7.8 ft		NORTH	HING	604,35	57		EASTING 1,120,744	24 HR. 39.
C	RILL	RIG/HAM	IMER EF	F./DATE	E F&R	2175	CME-55 869	% 02/16/2	2016	•			DRILL M	ethoi	D H.S	S. Augers HAMM	ER TYPE Automatic
0	RILL	LER S.	Davis			s	TART DA	FE 12/	15/16	6	COMP	. DAT	E 12/1	5/16		SURFACE WATER DEPTH N/	۹.
E	LEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLC 0.5ft	OW CO 0.5ft	UNT 0.5ft	0	BLC 25	WS F 5	PER FOOT	75	100	SAMP. NO.	мо	L O I G	SOIL AND ROCK DES	CRIPTION
	900		-														
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u v	920	919.9	- 57.7	60/0.1							<u>+</u>	D/0.1				= 920.4 = 919.8 CRYSTALLINE R	оск ⁵⁷
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WBS	3 4400).1.S5			Т	IP R-2233BB	COUNT	Y RUTHER	FORD			GEOLOGIS	T Johnson,	C. D.		WBS	3 34400).1.S5			TIP	• R-2233	BB	COUNTY
SITE	DESCR	IPTION	US 2	221 So	uth of	Business (Charlotte R	d.) to SR [·]	1366 (Roper	Loop Rd	l.)					GROUND WTR (ft)	SITE	DESCR	RIPTION	US 2	21 Sout	th of B	Susiness ((Charlotte R	d.) to SR 1
BOR	ING NO.	BRDO	G662_	B1A	S	TATION 812+72		OFFSET	3 ft RT			ALIGNME	NT -L3-		0 HR. 4.0	BOR	ING NO.	BRDC	6662_E	31A	ST	ATION 8	312+72	
COL	LAR EL	EV. 98	1.9 ft		Т	OTAL DEPTH 78.8 f	t	NORTHING	604,3	98		EASTING	1,120,823		24 HR. FIAD	COL	LAR EL	EV. 98	1.9 ft		то	TAL DEP	TH 78.8 f	t
DRIL	RIG/HAN	/MER EF	F./DAT	E AFC	08963 C	CME-550X 77% 07/31/201	7	•	DRILL	NETHO	о н.:	S. Augers		HAMM	ER TYPE Automatic	DRIL	L RIG/HAN	MMER EF	F./DATE	AF08	963 CN	/IE-550X 77	% 07/31/201	7
DRIL	LER C	heek, D	. O.		S	TART DATE 05/08/1	9	COMP. DA	TE 05/	09/19		SURFACE	WATER DEP	TH N//	Ά	DRIL	LER C	heek, D	. 0.		ST	ART DAT	E 05/08/1	9
ELEV	DRIVE	DEPTH	BLC	ow co	UNT	BLOWS	PER FOOT	Г	SAMP.							ELEV	DRIVE	DEPTH	BLO	W COUI	NT		BLOWS	PER FOOT
(ft)	(ft)	(ft)	0.5ft	0.5ft	0.5ft	0 25	50	75 100	NO.	мо	G	ELEV. (ft)		ONDEO	DEPTH (ft)	(ft)	(ft)	(ft)	0.5ft	0.5ft (0.5ft	0	25	50
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		‡										- 081.0					903.2	78.7	60/1			· · · ·		
000		<u>+</u>							_	<u> </u>		901.9	ROADWAY	EMBAN	KMENT			‡	00,111					
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١	VBS	34400	.1.S5			Т	TIP R-2233BB COUNT	Y RUTHER	FORD			GEOLOG	IST M. Arnold			WBS	34400).1.S5			TIP	R-223	3BB COUN	IL)
S	SITE I	DESCR	IPTION	US 2	221 So	outh of	Business (Charlotte Rd.) to SR	1366 (Roper	Loop Rd	.)				GROUN	ND WTR (ft)	SITE	DESCR	IPTION	US 2	21 Sou	uth of B	usiness (Charlotte Rd.) to SR	R 1
E	BORIN	NG NO.	L3_8 ⁻	1255R	1	s	STATION 812+55	OFFSET	94 ft RT			ALIGNME	NT -L3-	0 HR.	62.1	BOR	ING NO.	L3_8′	255R		ST	ATION	812+55	
C	OLL	AR ELE	EV. 98	9.9 ft		Т	OTAL DEPTH 81.4 ft	NORTHING	604,4	00		EASTING	1,120,915	24 HR.	43.3	COL	LAR EL	EV. 98	9.9 ft		то	TAL DEF	PTH 81.4 ft	
0	RILL	RIG/HAN	IMER EF	F./DAT	E F&F	R2175 (CME-55 86% 02/16/2016		DRILLN	IETHO	DH.	S. Augers	HAN	MER TYPE	Automatic	DRILI	RIG/HAN	IMER EF	F./DATE	F&R	2175 CN	ME-55 86%	6 02/16/2016	
ſ	RILL	ER S	. Davis			S	TART DATE 12/13/16	COMP. DA	TE 12/	13/16		SURFACE	E WATER DEPTH	N/A		DRIL	.LER S	. Davis			ST.	ART DAT	TE 12/13/16	
E	LEV	DRIVE ELEV	DEPTH	BLC	ow co	UNT	BLOWS PER FOO	т	SAMP.	▼⁄			SOIL AND ROCK DE	ESCRIPTION	1	ELEV	DRIVE	DEPTH	BLO	w cou	JNT		BLOWS PER FOO	OT
	(π)	(ft)	(π)	0.5ft	0.5ft	0.5ft	0 25 50	75 100	NO.	Имо	I G	ELEV. (ft)			DEPTH (ft)	(π)	(ft)	(π)	0.5ft	0.5ft	0.5ft	0	25 50	
	990	989.9	0.0		1	2				N4		989.9	GROUND SUF		0.0	910	+				+		Match Line	
		-	ŧ									987.9	RESIDUA		2.0		908.5	<u>+ 81.4</u> 	60/0.0					<u> </u>
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	915	-	F	25	100/0.	2		100/0.5	•									Ŧ						
DT BC		-	F									912.9	CRYSTALLINE	ROCK	77.0			Ŧ						
NCD(910	911.4	78.5	60/0.1				60/0.1										Ŧ						

RUTHERF	ORD			GEOLOGIST M. Arnold			
366 (Roper L	oop Rd.)				GROUN	D WTR (ft)
OFFSET 94	4 ft RT			ALIGNMENT -L3-		0 HR.	62.1
NORTHING	604,40)0		EASTING 1,120,915		24 HR.	43.3
	DRILL M	ETHOD	H.S	S. Augers	HAMME	RTYPE	Automatic
COMP. DAT	E 12/1	3/16		SURFACE WATER DEPT	TH N/A	A Contraction	
75 100	SAMP.		L O	SOIL AND ROC	K DESC	RIPTION	
	NO.		G				
T <u> </u>		┝ ─ ┥		908.5 CRYSTALLINE	ROCK (continued	81.4
				Boring Terminated	at Eleva	ation 908.	5 ft
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STATE		STATE PROJECT REFE	ABNUE NO.		NO.	SHEETS
N.C.	<u>R-2</u>	2233BB	34	400	1	<u>6</u>
		CAUTION	ΝΟΤΙ	CE		
E SUBSURFAC		ION AND THE SUBSURFACE	E INVESTIGAT	ON ON WHICH	IT IS BASED	WERE
NUE FOR THE JRPOSES. THE REVIEWED O COTECHNICAL DRING LOGS, R	PURPOSE OF VARIOUS FI IN INSPECTED ENGINEERING ROCK CORES	- STUDY, PLANNING AND D ELD BORING LOGS, ROCK () IN RALEIGH BY CONTACT UNIT AT (919) 707-6850, AND SOIL TEST DATA AR	DESIGN, AND N CORES AND S TING THE N. C THE SUBSUR E NOT PART	DI FUR CON DIL TEST DA DEPARTMEN FACE PLANS OF THE CON	TA AVAILABLE TOF TRANSPO AND REPORTS, TRACT.	MAY RTATION, FIELD
NERAL SOIL	AND ROCK S	TRATA DESCRIPTIONS AND	INDICATED E	OUNDARIES A	RE BASED ON	A SARIL Y
THIN THE BOP	REHOLE. THE	LABORATORY SAMPLE DA 0 THE DEGREE OF RELIAB	TA AND THE	IN SITU (IN-	PLACE) TEST D	ATA METHOD.
VESTIGATIONS	ARE AS RE CONDITIONS	CORDED AT THE TIME OF	THE INVESTING	ATION. THES	E WATER LEVE	LS OR NDITIONS
LUUING TEMP	CONTRACTO	R IS CAUTIONED THAT DE	TAILS SHOWN	ON THE SU	BSURFACE PLAN	NS ARE
SIGN INFORM	TION PURPOS	ES. REFER TO THE CONST S PROJECT. THE DEPART	RUCTION PLA	NS AND DOC	UMENTS FOR F	INAL EE THE
PINION OF THE	CONTRACT	AT AS TO THE INVESTIGATION M AT AS TO THE TYPE OF I R IS CAUTIONED TO MAKE	AUL, NOR THE MATERIALS A SUCH INDEP	INTERPRETA 10 CONDITION ENDENT SUB	STO BE ENCO	UNTERED. TIGATIONS
ROJECT. THE	CONTRACTOR TIME FOR A	IN SHALL HAVE NO CLAIM	FOR ADDITION	AL COMPENS	ATION OR FOR	AN ED AT
		TAINED HEREIN IS NOT ILL	PLIED OR CIT	RANTEED BY		ARTMENT
OF TRANS OR CONTR BY HAVING	PORTATION A	AS ACCURATE NOR IS IT (E PROJECT.		ART OF THE	PLANS, SPECIF	ICATIONS CLAIMS
FOR INCRE	S INDICATED	HEREIN AND THE ACTUAL	CONDITIONS	D ON DIFFER	ENCES BETWEE	N THE
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SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION	GRADATION	ROCK DESCRIPTION	TERMS AND DEFINITIONS
SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN	WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE.	HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED, AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL.	ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.
ACCORDING TO THE STANDARD PENETRATION TEST (AASHTO T 206, ASTM D1586). SOIL CLASSIFICATION	GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.	SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60	AQUIFER - A WATER BEARING FORMATION OR STRATA.
IS BASED ON THE AASHTO SYSTEM, BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH		REPRESENTED BY A ZONE OF WEATHERED ROCK.	ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.
AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE,	THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS:	ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:	ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING
VERT STIFF, GRAF, SILT CLAF, MUIST WITH INTERBEDDED FINE SAND LATERS, HIGHLT PLASTIC, A-7-6	ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.	WEATHERED NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES >	A NUTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, SOCH AS SHALE, SLATE, ETC.
	MINERALOGICAL COMPOSITION		WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE LEVEL AT
CLASS. (≤ 35% PASSING *200) (> 35% PASSING *200) ORGANIC MATERIALS	MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC.	CRYSTALLINE WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE,	SURFACE.
GROUP A-1 A-3 A-2 A-4 A-5 A-6 A-7 A-1, A-2 A-4, A-5	ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.	FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN	CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.
CLASS. A-1-6 A-1-6 A-2-4 A-2-5 A-2-6 A-2-7 A-7.6 A-3 A-6 A-7		ROCK (NCR)	COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM
	MODERATELY COMPRESSIBLE LL < 31 MODERATELY COMPRESSIBLE LL = 31 - 50	COASTAL PLAIN COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD	CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED.
X PASSING SII T-	HIGHLY COMPRESSIBLE LL > 50	SEDIMENTARY ROCK SANDSTONE, CEMENTED SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS. ETC.	BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.
*10 50 MX GRANULAR CLAY MUCK, *40 30 MX 50 MX 51 MN PEAT		WEATHERING	DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT
200 15 MX 25 MX 10 MX 35 MX 35 MX 35 MX 35 MX 36 MN 36 MN 36 MN 36 MN	ORGANIC MATERIAL SOILS OTHER MATERIAL	FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER	NULKS UN LUIS MASSIVE NULK.
MATERIAL	TRACE OF ORGANIC MATTER 2 - 3% 3 - 5% TRACE 1 - 10% LITTLE ORGANIC MATTER 3 - 5% 5 - 12% LITTLE 10 - 20%	HAMMER IF CRYSTALLINE.	UP - THE ANGLE AT WHICH A STRATOM OR ANT PLANAR FEATORE IS INCLINED FROM THE HORIZONTAL.
PASSING *40	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,	DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE
PI 6 MX NP 10 MX 10 MX 11 MN 11 MN 10 MX 10 MX 11 MN 11 MN LITTLE OR HIGHLY	HIGHLY ORGANIC > 10% > 20% HIGHLY 35% AND ABOVE	OF A CRYSTALLINE NATURE.	LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.
GROUP INDEX Ø Ø Ø 4 MX 8 MX 12 MX 16 MX NO MX AMOUNTS OF SOILS	GROUND WATER	SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO	FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE
USUAL TYPES STONE FRAGS. FINE SILTY OR CLAYEY SILTY CLAYEY MATTER	WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING	(SLI.) 1 INCH, OPEN JOINTS MAY CONTAIN CLAY, IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR	
OF MAJOR GRAVEL, AND SAND GRAVEL AND SAND SOILS SOILS	▼STATIC WATER LEVEL AFTER <u>24</u> HOURS	MODERATE SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING FEFECTS. IN	FI DAT - ROCK FRACMENTS ON SUBFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM
	✓PW PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA	(MOD.) GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS	PARENT MATERIAL.
AS SUBGRADE EXCELLENT TO GOOD FAIR TO POOR POOR UNSUITABLE		DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.	FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.
PI OF A-7-5 SUBGROUP IS \leq LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30		MODERATELY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL	FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE
CONSISTENCY OR DENSENESS	MISCELLANEOUS SYMBOLS	SEVERE AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH	
PRIMARY SOUL TYPE COMPACTNESS OR RANGE OF STANDARD RANGE OF UNCONFINED		(MUU, SEV.) AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. RUCK GIVES 'CLUNK' SUUND WHEN STRUCK. IF TESTED, WOULD YIELD SPT REFUSAL	JUINI - FRACTURE IN RUCK ALUNG WHICH NU APPRECIABLE MUVEMENT HAS UCCURRED.
CONSISTENCY (N-VALUE) (TONS/FT ²)	WITH SOIL DESCRIPTION OF ROCK STRUCTURES	SEVERE ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT	ITS LATERAL EXTENT.
GENERALLY VERY LOOSE < 4		(SEV.) REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED	LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.
GRANULAR LOOSE 4 TO 10 MEDIUM DENSE 10 TO 30 N/A		IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF	MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS
MATERIAL DENSE 30 TO 50		VERY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE	USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.
VERY DENSE > 50		SEVERE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK	PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE
GENERALLY SOFT 2 TO 4 0.25		VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF	RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.
SILT-CLAY MEDIUM STIFF 4 TO 8 0.5 TO 1.0	TEST BORING WITH CORE	COMPLETE ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND	ROCK QUALITY DESIGNATION (ROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF
MATERIAL STIFF 8 TO 15 1 TO 2 (COHESIVE) VERY STIFF 15 TO 30 2 TO 4		SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.	ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE
HARD > 30 > 4			RUN AND EXPRESSED AS A PERCENTAGE.
TEXTURE OR GRAIN SIZE	RECOMMENDATION SYMBOLS	VERY HARD CANNOT RE SCRATCHED BY KNIEF OR SHARP PICK BREAKING OF HAND SPECIMENS REQUIRES	ROCK.
U.S. STD. SIEVE SIZE 4 10 40 60 200 270	UNCLASSIFIED EXCAVATION -	SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.	SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND
OPENING (MM) 4.76 2.00 0.42 0.25 0.075 0.053	SHALLOW SITUALS WASTE USED IN THE TOP 3 FEET OF	HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED	RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO
BOULDER COBBLE GRAVEL COARSE FINE SAND SAND SILT CLAY	UNDERCUT ACCEPTABLE DEGRADABLE ROCK EMBANKMENT OR BACKFILL	TO DETACH HAND SPECIMEN.	SI ICKENSIDE - POLISHED AND STRIATED SUBFACE THAT RESULTS FROM FRICTION ALONG A FAULT
(BLDR.) (COB.) (GR.) (CSE. SD.) (F SD.) (SL.) (CL.)	ABBREVIATIONS	HARD EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED	OR SLIP PLANE.
GRAIN MM 305 75 2.0 0.25 0.05 0.005	AR - AUGER REFUSAL MED MEDIUM VST - VANE SHEAR TEST	BY MODERATE BLOWS.	STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF
SIZE IN. 12 3	BT - BORING TERMINATED MICA MICACEOUS WEA WEATHERED	MEDIUM CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT.	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
SOIL MOISTURE - CORRELATION OF TERMS	CPT - CONE PENETRATION TEST NP - NON PLASTIC $\gamma_{\rm c}$ - DRY UNIT WEIGHT	POINT OF A GEOLOGIST'S PICK.	TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.
SOIL MOISTURE SCALE FIELD MOISTURE GUIDE FOR FIELD MOISTURE DESCRIPTION	CSE COARSE ORG ORGANIC	SOFT CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS	STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY
	DPT - DYNAMIC PENETRATION TEST SAP SAPROLITIC S - BULK	FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY EINGER PRESSURE.	
- SATURATED - USUALLY LIQUID; VERY WET, USUALLY	e - VOID RATIO SD SAND, SANDY SS - SPLIT SPOON	VERY CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH	LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY
	F F FINE SL - SILI, SILIT SI - SHELBY IUBE	SOFT OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE, CAN BE SCRATCHED READILY BY	THE TUTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.
PLASTIC SEMISOLID; REQUIRES DRYING TO	FRAC FRACTURED, FRACTURES TCR - TRICONE REFUSAL RT - RECOMPACTED TRIAXIAL		TOPSOLE (15,) - SURFICE SULS USUALLY CONTAINING UNDANIC MATTER.
	HIGHLY V - VERY RATIO	TERM SPACING TERM THICKNESS	BENCH MARK: ELEVATIONS FROM PROJECT TIN
	EQUIPMENT USED ON SUBJECT PROJECT	VERY WIDE MORE THAN 10 FEET VERY THICKLY BEDDED 4 FEET	ELEVATION. FEET
OM _ OPTIMUM MOISTURE - MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE	DRILL UNITS: ADVANCING TOOLS: HAMMER TYPE:	WIDE 3 TO 10 FEET THICKLY BEDDED 1.5 - 4 FEET	
SL SHRINKAGE LIMIT		CLOSE 0.16 TO 1 FOOT VERY THINLY BEDDED 0.03 - 0.16 FEET	NOTES:
- DRY - (D) REQUIRES ADDITIONAL WATER TO		VERY CLOSE LESS THAN 0.16 FEET THICKLY LAMINATED 0.008 - 0.03 FEET	
			1
PLASTICITY		FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING HEAT. PRESSURE FTC	1
NON PLASTIC 0-5 DRY STRENGTH		RUBBING WITH FINGER FREES NUMEROUS GRAINS;	
SLIGHTLY PLASTIC 6-15 SLIGHT		GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.	
MODERATELY PLASTIC 16-25 MEDIUM		MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE;	
		BREAKS EASILY WHEN HIT WITH HAMMER.	
		INDURATED GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.	
DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY).			
MUDIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.		EXTREMELY INDURATED SAMPLE BREAKS ACROSS GRAINS.	DATE: 8-15-14
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					SAMPLE NO.	OFFSET	STATIO	N L IN)EPTH TERVAL	AASHTC CLASS.	L.L. P	I.I.	% BY W	VEIGHT SILT CLAY	% PASSING 10 40	(SIEVES) % 200 MOISTU	JRE ORGANIC	
					SS-511	105' RT	873+9	1 3.	5-5.0	A-7-6(3) 41	14 42.0	14.6	18.3 25.1 29.0 36.4	98.3 70	.0 44.2 39.	9 -	
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			· — ·					PROX. B	OTTOM OF	CULV 3	<u>+</u>			<u>and chayey</u>	Fine SAND (A-2-7) with Trac	e_ <u>Mica</u>	· — — —
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9 10						Very-Soft	to Stiff. Bi	own-Whit	e-Gray, Mo	ist, Fine-S	andy SILT	(A=4)	3-	with_Tro	ce MicaMang	ganese Deposits, a	nd -Rock-Frage	nents
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880		1	 	(A) Artificial Fill:	Soft to Med	ium Stiff,	Reddish B	rown, Moi	st, Fine Sa	ndy Silty (CLAY (A-7	-5) with Tr	ace Organ	ics (Roots, Leave	s) aṇd Mica			1
				B Residual: Very	Dense, Bro	wn-White,	Moist. Silty	Fine to (Coarse SAN	ψ (A-2-4	ψ with Tro	ce Mica an	d Rock F	ragments				
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	GROUNDLINI	E TAKEN FI	ROM TIN FIL	LE RECIEVED BY NC. THROUGH THE BO	DAT DATED	10/5/2015. H BOTH		; ; ; ;			; ; ;			7		- -	·+	
	PROJECTED	ONTO THE	CROSS SECT	ION	1								-L	С —				
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WB	3 34400).1.S5			T	I P R-2	233B	В	C	COUNT	YRU	THER	FORD			(GEOLOGIST J. Cransto	on		WBS	3 34400).1.S5			TI	P R-223	3BB	COUNTY
SITE	DESCR	IPTION	US 2	221 So	uth of	Busines	ss (Cl	narlotte	Rd.)	to SR '	1366 (F	Roper	Loop Ro	l.)					GROUND WTR (ft)	SITE	DESCR	IPTION	US 2	221 So	uth of I	3usiness (Charlotte	Rd.) to SR 1
BOR	Ring No.	L3_8	7400R		S	TATION	N 87	3+91			OFFS	SET '	105 ft R	Т			ALIGNMENT -L3-		0 HR. 18.0	BOR	ing no.	L3_8	7420		S	ATION	874+20	
COL	LAR EL	EV. 92	5.7 ft		Т	OTAL D	DEPT	H 40.0) ft		NOR	THING	610,3	808		1	EASTING 1,119,855		24 HR. 5.8	COL	LAR EL	EV. 93	30.7 ft		т	JTAL DEF	PTH 40.0	ft
DRIL	L RIG/HAN	IMER EF	F./DATI	E F&R	85785 0	CME-55	85% 2	2/17/2016	6				DRILL I	NETHO	D H	I.S. A	ugers	НАММ	IER TYPE Automatic	DRIL	RIG/HAN	MMER EF	F./DAT	E F&F	R5785 C	ME-55 85%	6 2/17/2016	
DRI	LER D	. Aiello			S	TART [DATE	01/03	8/17		СОМ	P. DA	TE 01/	03/17		:	SURFACE WATER DEP	TH N/	/Α	DRIL	LER D	. Aiello			ST	ART DAT	FE 01/04	/17
ELEV	DRIVE	DEPTH	BLC	W CO	UNT]		BLOW	S PE	R FOO	Г		SAMP	- 🔨			SOIL AND ROCK DESCRIPTION			ELEV	DRIVE	DEPTH	BLC	w co	UNT	NT BLOWS PER F		
(π)	(ft)	(π)	0.5ft	0.5ft	0.5ft	0	2	5	50		75	100	NO.	Имо) G	EI	LEV. (ft)		DEPTH (ft)	(π)	(ft)	(π)	0.5ft	0.5ft	0.5ft	0	25	50
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RUTHERFORD	GEOLOGIST J. Cranston					
866 (Roper Loop Rd.)		GROUND WTR (ft)				
OFFSET CL	ALIGNMENT -L3-	0 HR. 13.7				
NORTHING 610,284	EASTING 1,119,749	24 HR. 3.3				
DRILL METHOD H.S.	Augers HAMM	ER TYPE Automatic				
COMP. DATE 01/04/17	SURFACE WATER DEPTH N/	A				
SAMP.						
75 100 NO. MOI G	SUIL AND RUCK DES	JRIPTION				
	930.7 GROUND SURF.	ACE 0.0				
35%	ARTIFICIAL FII	L SILTY CLAY				
	ALLUVIAL	2.5				
││	DK GRAY SILTY FINE TO C W/ CLAYEY FINE	SAND				
	923.2 RESIDUAL	7.5				
M						
м						
м	898.2	32.5				
€4. М	RESIDUAL BRN/WHT SITLY FINE T	O COARSE				
	893.7	37.0				
	RESIDUAL DK GRAY SILTY FINE TO C	COARSE SAND				
	890.7 W/ CLAYEY FINE Boring Terminated at Elev	SAND 40.0 ration 890.7 ft				

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WBS	34400	.1.S5			TI	IP R-2233E	BB	COUNT	Y RU	THERF	ORD			GEOLOGIST J. Cranston	1					
SITE	DESCR	IPTION	US 2	221 So	uth of	Business (C	harlotte Ro	d.) to SR ²	1366 (Roper L	_oop Rd.)		1						
BOR	ing no.	L3_8	7445L		S	TATION 87	4+45		OFF	SET 9	90 ft LT			ALIGNMENT -L3-	0 HR. 8.					
COLI	LAR ELE	EV. 93	30.8 ft		Т	OTAL DEPT	H 35.0 ft	:	NOR	THING	610,26	63		EASTING 1,119,658	24 HR. 3.					
DRILL	. RIG/HAM	IMER EF	F./DAT	E F&F	R5785 C	CME-55 85%	2/17/2016					IETHOD) H.S	S. Augers HAMMER TYPE Automatic						
DRIL	LER D.	. Aiello			S	TART DATE	01/04/1	7	COM	IP. DA	FE 01/0	04/17		SURFACE WATER DEPTH N/A						
ELEV	DRIVE	DEPTH	BLC				BLOWS	PER FOOT	Г 	100	SAMP.			SOIL AND ROCK DES	CRIPTION					
(11)	(ft)	(11)	0.5ft	0.5ft	0.5ft			50	/5	100	NO.	/моі	G	ELEV. (ft)	DEPTH					
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REFERENCE

<u>SHEET NO.</u>	DESCRIPTION
I	TITLE SHEET
2	LEGEND (SOIL & ROCK)
3	SITE PLAN
4-5	PROFILE
6-7	BORE LOGS

STATE OF NORTH CAROLINA

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

STRUCTURE SUBSURFACE INVESTIGATION

RUTHERFORD COUNTY

PROJECT DESCRIPTION

US 221 SOUTH OF US 74 BUSINESS

(CHARLOTTE ROAD) TO NORTH OF SR 1366 (ROPER LOOP)

SITE DESCRIPTION

CULVERT 2, STATION 831+00

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-2233BB 3440	00 1	7

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 REVEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N.C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT 1991 707-6800. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA ARE NOT 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 UNPELACED TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOLI MOISTURE CONDITIONS INDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOLI MOISTURE CONDITIONS MAY YARY 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 OPHIONO OF THE DEPARTMENT AS TO THE TYPE OF MATERIALS AND CONSTRUCTIONS 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 THE REVIENT OF TIME FOR ANY REASON RESULTING FROM THE ACTUAL COMPENSATION OF FOR AN EXTENSION OF TIME FOR ANY REASON RESULTIONS FOR ACTUAL COMPENSATION.

NOTES:

- TES: THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N.C. DEPARTMENT OF TRANSPORTATION AS ACCURATE NOR IS IT CONSIDERED PART OF THE PLANS, SPECIFICATIONS OR CONTRACT FOR THE PROJECT. BY HAVING REQUESTED THIS INFORMATION, THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE. 2.

PERSUNNEL

_	F&R CONSULTANTS
_	DERICK RACEY
	MEREDITH ARNOLD
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SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION	GRADATION	ROCK DESCRIPTION	TERMS AND DEFINITIONS			
SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN	WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE.	HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED, AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL.	ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.			
ACCORDING TO THE STANDARD PENETRATION TEST (AASHTO T 206, ASTM D1586). SOIL CLASSIFICATION	GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.	SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60	AQUIFER - A WATER BEARING FORMATION OR STRATA.			
IS BASED ON THE AASHTO SYSTEM, BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH		REPRESENTED BY A ZONE OF WEATHERED ROCK.	ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.			
AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE,	THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS:	ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:	ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING			
VERT STIFF, GRAF, SILT CLAF, MUIST WITH INTERBEDDED FINE SAND LATERS, HIGHLT PLASTIC, A-7-6	ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.	WEATHERED NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES >	A NUTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, SOCH AS SHALE, SLATE, ETC.			
	MINERALOGICAL COMPOSITION		WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE LEVEL AT			
CLASS. (≤ 35% PASSING *200) (> 35% PASSING *200) ORGANIC MATERIALS	MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC.	CRYSTALLINE WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE,	SURFACE.			
GROUP A-1 A-3 A-2 A-4 A-5 A-6 A-7 A-1, A-2 A-4, A-5	ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.	FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN	CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.			
CLASS. A-1-6 A-1-6 A-2-4 A-2-5 A-2-6 A-2-7 A-7.6 A-3 A-6 A-7		ROCK (NCR)	COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM			
	MODERATELY COMPRESSIBLE LL < 31 MODERATELY COMPRESSIBLE LL = 31 - 50	COASTAL PLAIN COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD	CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED.			
X PASSING SII T-	HIGHLY COMPRESSIBLE LL > 50	SEDIMENTARY ROCK SANDSTONE, CEMENTED SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS. ETC.	BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.			
*10 50 MX GRANULAR CLAY MUCK, *40 30 MX 50 MX 51 MN PEAT		WEATHERING	DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT			
200 15 MX 25 MX 10 MX 35 MX 35 MX 35 MX 35 MX 36 MN 36 MN 36 MN 36 MN	ORGANIC MATERIAL SOILS OTHER MATERIAL	FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER	NULKS UN LUIS MASSIVE NULK.			
MATERIAL	TRACE OF ORGANIC MATTER 2 - 3% 3 - 5% TRACE 1 - 10% LITTLE ORGANIC MATTER 3 - 5% 5 - 12% LITTLE 10 - 20%	HAMMER IF CRYSTALLINE.	UP - THE ANGLE AT WHICH A STRATOM OR ANT PLANAR FEATORE IS INCLINED FROM THE HORIZONTAL.			
PASSING *40	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,	DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE			
PI 6 MX NP 10 MX 10 MX 11 MN 11 MN 10 MX 10 MX 11 MN 11 MN LITTLE OR HIGHLY	HIGHLY ORGANIC > 10% > 20% HIGHLY 35% AND ABOVE	OF A CRYSTALLINE NATURE.	LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.			
GROUP INDEX Ø Ø Ø 4 MX 8 MX 12 MX 16 MX NO MX AMOUNTS OF SOILS	GROUND WATER	SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO	FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE			
USUAL TYPES STONE FRAGS. FINE SILTY OR CLAYEY SILTY CLAYEY MATTER	WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING	(SLI.) 1 INCH, OPEN JOINTS MAY CONTAIN CLAY, IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR				
OF MAJOR GRAVEL, AND SAND GRAVEL AND SAND SOILS SOILS	▼STATIC WATER LEVEL AFTER <u>24</u> HOURS	MODERATE SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING FEFECTS. IN	FI DAT - ROCK FRACMENTS ON SUBFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM			
	✓PW PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA	(MOD.) GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS	PARENT MATERIAL.			
AS SUBGRADE EXCELLENT TO GOOD FAIR TO POOR POOR UNSUITABLE		DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.	FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.			
PI OF A-7-5 SUBGROUP IS \leq LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30		MODERATELY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL	FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE			
CONSISTENCY OR DENSENESS	MISCELLANEOUS SYMBOLS	SEVERE AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH				
PRIMARY SOUL TYPE COMPACTNESS OR RANGE OF STANDARD RANGE OF UNCONFINED		(MUU, SEV.) AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. RUCK GIVES 'CLUNK' SUUND WHEN STRUCK. IF TESTED, WOULD YIELD SPT REFUSAL	JUINI - FRACTURE IN RUCK ALUNG WHICH NU APPRECIABLE MUVEMENT HAS UCCURRED.			
CONSISTENCY (N-VALUE) (TONS/FT ²)	WITH SOIL DESCRIPTION OF ROCK STRUCTURES	SEVERE ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT	ITS LATERAL EXTENT.			
GENERALLY VERY LOOSE < 4		(SEV.) REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED	LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.			
GRANULAR LOOSE 4 TO 10 MEDIUM DENSE 10 TO 30 N/A		IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF	MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS			
MATERIAL DENSE 30 TO 50		VERY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE	USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.			
VERY DENSE > 50		SEVERE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK	PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE			
GENERALLY SOFT 2 TO 4 0.25		VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF	RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.			
SILT-CLAY MEDIUM STIFF 4 TO 8 0.5 TO 1.0	TEST BORING WITH CORE	COMPLETE ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND	ROCK QUALITY DESIGNATION (ROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF			
MATERIAL STIFF 8 TO 15 1 TO 2 (COHESIVE) VERY STIFF 15 TO 30 2 TO 4		SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.	ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE			
HARD > 30 > 4			RUN AND EXPRESSED AS A PERCENTAGE.			
TEXTURE OR GRAIN SIZE	RECOMMENDATION SYMBOLS	VERY HARD CANNOT RE SCRATCHED BY KNIEF OR SHARP PICK BREAKING OF HAND SPECIMENS REQUIRES	ROCK.			
U.S. STD. SIEVE SIZE 4 10 40 60 200 270	UNCLASSIFIED EXCAVATION -	SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.	SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND			
OPENING (MM) 4.76 2.00 0.42 0.25 0.075 0.053	SHALLOW SITUALS WASTE USED IN THE TOP 3 FEET OF	HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED	RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO			
BOULDER COBBLE GRAVEL COARSE FINE SAND SAND SILT CLAY	UNDERCUT ACCEPTABLE DEGRADABLE ROCK EMBANKMENT OR BACKFILL	TO DETACH HAND SPECIMEN.	SI ICKENSIDE - POLISHED AND STRIATED SUBFACE THAT RESULTS FROM FRICTION ALONG A FAULT			
(BLDR.) (COB.) (GR.) (CSE. SD.) (F SD.) (SL.) (CL.)	ABBREVIATIONS	HARD EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED	OR SLIP PLANE.			
GRAIN MM 305 75 2.0 0.25 0.05 0.005	AR - AUGER REFUSAL MED MEDIUM VST - VANE SHEAR TEST	BY MODERATE BLOWS.	STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF			
SIZE IN. 12 3	BT - BORING TERMINATED MICA MICACEOUS WEA WEATHERED	MEDIUM CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT.	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			
SOIL MOISTURE - CORRELATION OF TERMS	CPT - CONE PENETRATION TEST NP - NON PLASTIC $\gamma_{\rm c}$ - DRY UNIT WEIGHT	POINT OF A GEOLOGIST'S PICK.	TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.			
SOIL MOISTURE SCALE FIELD MOISTURE GUIDE FOR FIELD MOISTURE DESCRIPTION	CSE COARSE ORG ORGANIC	SOFT CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS	STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY			
	DPT - DYNAMIC PENETRATION TEST SAP SAPROLITIC S - BULK	FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY EINGER PRESSURE.				
- SATURATED - USUALLY LIQUID; VERY WET, USUALLY	e - VOID RATIO SD SAND, SANDY SS - SPLIT SPOON	VERY CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH	LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY			
	F F FINE SL - SILI, SILIT SI - SHELBY IUBE	SOFT OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE, CAN BE SCRATCHED READILY BY	THE TUTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.			
PLASTIC SEMISOLID; REQUIRES DRYING TO	FRAC FRACTURED, FRACTURES TCR - TRICONE REFUSAL RT - RECOMPACTED TRIAXIAL		TOPSOLE (15,) - SURFICE SULS USUALLY CONTAINING UNDANIC MATTER.			
	HIGHLY V - VERY RATIO	TERM SPACING TERM THICKNESS	BENCH MARK: ELEVATIONS FROM PROJECT TIN			
	EQUIPMENT USED ON SUBJECT PROJECT	VERY WIDE MORE THAN 10 FEET VERY THICKLY BEDDED 4 FEET	ELEVATION. EEET			
OM _ OPTIMUM MOISTURE - MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE	DRILL UNITS: ADVANCING TOOLS: HAMMER TYPE:	WIDE 3 TO 10 FEET THICKLY BEDDED 1.5 - 4 FEET				
SL SHRINKAGE LIMIT		CLOSE 0.16 TO 1 FOOT VERY THINLY BEDDED 0.03 - 0.16 FEET	NOTES:			
- DRY - (D) REQUIRES ADDITIONAL WATER TO		VERY CLOSE LESS THAN 0.16 FEET THICKLY LAMINATED 0.008 - 0.03 FEET				
			1			
PLASTICITY		FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING HEAT. PRESSURE FTC	1			
NON PLASTIC 0-5 DRY STRENGTH		RUBBING WITH FINGER FREES NUMEROUS GRAINS;				
SLIGHTLY PLASTIC 6-15 SLIGHT		GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.				
MODERATELY PLASTIC 16-25 MEDIUM		MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE;				
		BREAKS EASILY WHEN HIT WITH HAMMER.				
		INDURATED GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.				
DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY).						
MUDIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.		EXTREMELY INDURATED SAMPLE BREAKS ACROSS GRAINS.	DATE: 8-15-14			
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SITI	E DESCF	RIPTION	US 2	21 So	uth of	Business (Charlotte I	d.) to SR	1366 (Roper	Loop Rd	.)					GROUND WTR (ft)	SITE	DESCR	IPTION	US 2	221 So	uth of E	Business (Cl	narlotte Re	d.) to SR 1
BOF	ring no	. L3_82	2900L		S	TATION 829+00		OFFSET	140 ft LT	Г		ALIGN	IENT -L3-		0 HR. 13	.0	BOR	ing no.	L3_8	3100		ST	ATION 83	1+00	
COL	LAR EL	EV. 94	6.9 ft		т	OTAL DEPTH 54.5	ft	NORTHING	606,0	25		EASTIN	G 1,120,540		24 HR . 6	.9	COLI	LAR ELI	EV. 95	51.7 ft		тс	TAL DEPT	H 53.8 f	t
DRIL	L RIG/HAI	MMER EF	F./DATI	E F&F	R5785 C	CME-55 85% 2/17/2016			DRILL	IETHO	DH.	S. Augers		HAMM	ER TYPE Automatic		DRILL	. RIG/HAN	MMER EF	F./DATI	E F&R	5785 C	ME-55 85% 2	2/17/2016	· · · ·
DRI). Aiello			S	TART DATE 12/14/	16	COMP. DA	TE 12/	14/16		SURFA	CE WATER DEP	TH N//	A		DRIL	LER D	. Aiello			ST	ART DATE	12/14/1	6
ELE\	/ DRIVE ELEV	DEPTH	BLC	w co	UNT	BLOWS	PER FOO	т	SAMP.	▼∕			SOIL AND ROO	CK DESC	CRIPTION	E	ELEV	DRIVE ELEV	DEPTH	BLC		JNT		BLOWS	PER FOOT
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STATE OF NORTH CAROLINA DEPARTMENT OF TRANSPORTATION **DIVISION OF HIGHWAYS** GEOTECHNICAL ENGINEERING UNIT

STRUCTURE SUBSURFACE INVESTIGATION

RUTHERFORD COUNTY.

PROJECT DESCRIPTION _

US 22I SOUTH OF US 74 BUSINESS

(CHARLOTTE ROAD) TO NORTH OF SR 1366 (ROPER LOOP)

SITE DESCRIPTION _

CULVERT 000, STATION 797+65



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 FILLD BORING LOGS, ROCK CORES AND SOLI TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEICH BY CONTACTING THE N.C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT (199) 707-6850. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA ARE NOT PART OF THE CONTRACT.

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

THE BIDDER OR CONTRACTOR IS CALUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE PLANS ARE PRELIMINARY ONLY AND IN MANY CASES THE FINAL DETAILS SHOWN ON THE SUBSURFACE PLANS ARE DESION INFORMATION ON THIS PROJECT. THE CONSTRUCTION PLANS AND DOCUMENTS FOR FINAL DESION INFORMATION ON THIS PROJECT. THE CHARTMENT DES 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 INVESTIGATION AS HE DEEMS NECESSARY TO SATISFY HIMSELF AS TO CONDITIONS TO BE ENCOUNTERED ON THE 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.

- NOTES: I. THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N.C. DEPARTMENT OF TRANSPORTATION AS ACCURATE NOR IS IT CONSIDERED PART OF THE PLANS, SPECIFICATIONS OR CONTRACT FOR THE PROJECT. 2. 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.

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_	F&R CONSULTANTS
-	DERICK RACEY
_	MEREDITH ARNOLD
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DRAWN BY	JC KUHNE
CHECKED BY	
SUBMITTED BY	_ JC KUHNE
DATE	



SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION	GRADATION	ROCK DESCRIPTION				
SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER AND VIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO THE STANDARD PENETRATION TEST (AASTIO 1 206, ASTM DI586), SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM, BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO LLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOCICAL COMPOSITION, ANDULARITY, STRUCTURE, PLASTICITY, ETC, FOR EXAMPLE,	WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE. UNIFORMLY GRADED - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES. ANGULARITY OF GRAINS	HARU HULK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TES ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIEL SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN (BLOWS IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCI REPRESENTED BY A ZONE OF WEATHERED ROCK. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:				
VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6	ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.	WEATHERED NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD S				
GENERAL GRANULAR MATERIALS SILT-CLAY MATERIALS	MINERALOGICAL COMPOSITION	RUCK (WH) 100 BLUWS PER FUUT IF TESTED.				
CLASS. (≤ 35% PASSING *200) (> 35% PASSING *200) UHUANIL MATERIALS	MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC.	ROCK (CR) WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE				
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-b A-2-4 A-2-5 A-2-6 A-2-7 A-7, A-3 A-6, A-7	COMPRESSIBILITY	NON-CRYSTALLINE FINE TO COARSE GRAIN METAMORPHIC AND NON-COAS				
SYMBOL STATES	SLIGHTLY COMPRESSIBLE LL < 31	RUCK (NCR) ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, E				
2 PASSING SILT-	HIGHLY COMPRESSIBLE LL > 50	SEDIMENTARY ROCK SPT REFUSAL, ROCK TYPE INCLUDES LIMESTONE, SAN				
10 50 MX GRANULAR SILT MUCK. 40 30 MX 50 MX 51 MN SOLS CLAY PEAT		- WEATHERING				
2000 15 MX 25 MX 10 MX 35 MX 35 MX 35 MX 35 MX 36 MN 36 MN 36 MN 36 MN 36 MN		FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK				
MATERIAL PASSING #40	LITTLE ORGANIC MATTER 3 - 5% 5 - 12% LITTLE 10 - 20%	VERY SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY				
LL – – 40 MX 41 MN 50153 M111 PI 6 MX NP 10 MX 10 MX 11 MN 11 MN 10 MX 10 MX 11 MN 11 MN LUDROTE	MODERATELY ORGANIC 5 - 10% 12 - 20% SOME 20 - 35% HIGHLY ORGANIC > 10% > 20% HIGHLY 35% AND ABOVE	(V SLI.) CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER OF A CRYSTALLINE NATURE.				
GROUP INDEX Ø Ø Ø 4 MX 8 MX 12 MX 16 MX NO MX AMOUNTS OF SOILS	GROUND WATER	SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO F				
USUAL TYPES STONE FRACS. FINE SILTY OR CLAYEY SILTY CLAYEY MATTER OF MAJOR GRAVEL, AND SANN SPANE SANN SANN SONIS SONIS	WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING	(SLI.) I INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASION CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMM				
MATERIALS SAND CHARLEN CARD COLO COLO	∇ PW PERCHED WATER SATURATED ZONE, OR WATER BEARING STRATA	MODERATE SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFEC (MOD.) GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CI				
AS SUBGRADE EXCELLENT TO GOOD FAIR TO POOR POOR UNSUITABL		DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENG WITH FRESH ROCK.				
PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ;PI OF A-7-6 SUBGROUP IS > LL - 30		MODERATELY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL				
CONSISTENCE OF DEINSENESS		(MOD. SEV.) AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES 'CLUNK' SOUND				
PRIMARY SOIL TYPE CONSISTENCY PENETRATION RESISTENCE COMPRESSIVE STRENGTH CONSISTENCY (N-VALUE) (TONS/FT ²)	ROADWAY EMBANKMENT (RE) 25/025 DIP & DIP DIRECTION WITH SOIL DESCRIPTION OF ROCK STRUCTURES	IF TESTED, WOULD YIELD SPT REFUSAL SEVERE ALL BOCK EXCEPT QUARTZ DISCOLORED OR STAINED BOCK FARBUC CLEAR AND				
GENERALLY VERY LOOSE < 4		(SEV.) REDUCED IN STRENGTH TO STRENG SOIL. IN GRANITOID ROCKS ALL FELDSPARS				
GRANULAR LOOSE 4 TO 10 GRANULAR MEDIUM DENSE 10 TO 30 N/A		ID SUME EXTENT. SUME FRAGMENTS OF STRUND ROLK USUALLY REMAIN. IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF				
(NON-COHESIVE) DENSE 30 TO 50 VERY DENSE > 50	THAN ROADWAY EMBANKMENT CAUGER BORING	VERY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS				
VERY SOFT < 2 < 0.25	INFERRED SOIL BOUNDARY - CORE BORING • SOUNDING ROD	(V SEV.) REMAINING, SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE TH				
GENERALLY SOFT 2 TO 4 0.25 TO 0.5 SILT-CLAY MEDIUM STIFF 4 TO 8 0.5 TO 1.0		COMPLETE ROCK REDUCED TO SOIL, ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONL'				
MATERIAL STIFF 8 TO 15 1 TO 2 (COHESIVE) VERY STIFF 15 TO 30 2 TO 4	ALLUVIAL SOIL BOUNDARY A PIEZOMETER SPI N-VALUE	SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGE ALSO AN EXAMPLE.				
		ROCK HARDNESS				
		VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIME				
OPENING (MM) 4.76 2.00 0.42 0.25 0.075 0.053	UNDERCUT UNSUITABLE WASTE ACCEPTABLE, BUT NOT TO BE USED IN THE TOP 3 FEET OF	HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER				
BOULDER COBBLE GRAVEL COARSE FINE SILT CLAY	UNDERCUT ACCEPTABLE DEGRADABLE ROCK EMBANKMENT OR BACKFILL	TO DETACH HAND SPECIMEN.				
(BLDR.) (CUB.) (GR.) (CSE. SD.) (F SD.) (SL.) (CL.)	ABBREVIATIONS	HARD EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE				
GRAIN MM 305 75 2.0 0.25 0.05 0.005 SIZE IN. 12 3	AR - AUGER REFUSAL MED MEDIUM VST - VANE SHEAR TEST BT - BORING TERMINATED MICA MICACEOUS WEA WEATHERED	MEDIUM CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE				
SOIL MOISTURE - CORRELATION OF TERMS	CL CLAY MOD MODERATELY γ - UNIT WEIGHT CPT - CONE PENETRATION TEST NP - NON PLASTIC γ_{-} - DRY UNIT WEIGHT	HARD CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HAR POINT OF A GEOLOGIST'S PICK.				
SOIL MOISTURE SCALE FIELD MOISTURE GUIDE FOR FIELD MOISTURE DESCRIPTION	CSE COARSE ORG ORGANIC	SOFT CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED I				
	DPT - DYNAMIC PENETRATION TEST SAP SAPROLITIC S - BULK	PIECES CAN BE BROKEN BY FINGER PRESSURE.				
(SAT.) FROM BELOW THE GROUND WATER TABLE	F - FINE SL - SHID, SHIDT SS - SFLT SPOIN F - FINE SL - SILT, SILTY ST - SHELBY TUBE	VERY CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PIC SOFT OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRAT				
PLASTIC SEMISOLID: REQUIRES DRYING TO	FOSS FOSSILIFEROUS SLI SLIGHTLY RS - ROCK FRAC FRACTURED, FRACTURES TCR - TRICONE REFUSAL RT - RECOMPACTED TRIAXIAL	FINGERNAIL.				
PI PLASTIC LIMIT	FRAGS FRAGMENTS W - MOISTURE CONTENT CBR - CALIFORNIA BEARING HI HIGHLY V - VERY RATIO	FRACTURE SPACING BEDDING				
	EQUIPMENT USED ON SUBJECT PROJECT	VERY WIDE MORE THAN 10 FEET VERY THICKLY BEDDED				
	DRILL UNITS: ADVANCING TOOLS: HAMMER TYPE:	MODERATELY CLOSE 1 TO 3 FEET THINLY BEDDED				
- DRY - (D) REQUIRES ADDITIONAL WATER TO	CME-45C	CLOSE 0.16 TO 1 FOOT VERY THINLY BEDDED 0 VERY CLOSE LESS THAN 0.16 FEET THICKLY LAMINATED 0.				
ATTAIN OPTIMUM MOISTURE						
		FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING.				
PLASTICITY INDEX (PI) DRY STRENGTH NON PLASTIC 0-5 VERY LOW		FRIABLE RUBBING WITH FINGER FREES NUMEROUS GRAINS:				
SLIGHTLY PLASTIC 6-15 SLIGHT MODERATELY PLASTIC 16-25 MEDIUM	AND TOOLS:	GRAINS CAN BE SERARATED FORM CANOLS WITH				
HIGHLY PLASTIC 26 OR MORE HIGH		MODERATELY INDURATED ORMINS CAN BE SEPARATED FROM SAMPLE WITH S BREAKS EASILY WHEN HIT WITH HAMMER.				
COLOR		INDURATED GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL				
DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY),	VANE SHEAR TEST	SHARP HAMMER BLOWS REQUIRED TO BREAK SAMP				
HUDIFIERS SUCH HS LIGHT, DHRK, STREHKEU, ETL, AKE USED TU DESCKIBE APPEAKANLE.		EXIMEMELY INDUKATED SAMPLE BREAKS ACROSS GRAINS.				

PROJECT REFERENCE NO. SHEET NO. R-2233BB 34400

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	TERMS AND DEFINITIONS
TED. AN INFERRED	ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.
0.1 FOOT PER 60	ADUIFER - A WATER BEARING FORMATION OR STRATA.
K IS UFIEN	ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.
PT N VALUES >	ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, SUCH AS SHALE, SLATE, ETC.
ROCK THAT	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.
INCEODES ON MITE,	CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.
TAL PLAIN _ IF TESTED. TC.	COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.
IT MAY NOT YIELD DSTONE, CEMENTED	CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.
	DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.
K RINGS UNDER	$\underline{\text{DIP}}$ - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.
COATINGS IF OPEN, HAMMER BLOWS IF	DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.
ROCK UP TO NAL FELDSPAR	FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.
ER BLOWS.	FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.
CTS. IN LAY. ROCK HAS	FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL.
TH AS COMPARED	FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.
FELDSPARS DULL	FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.
WHEN STRUCK.	JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.
	LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO
ARE KAOLINIZED	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
ARE DISCERNIBLE	USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.
OF STRONG ROCK AT ONLY MINOR	PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.
VALUES < 100 BPF	RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.
Y IN SMALL AND RS. SAPROLITE IS	ROCK QUALITY DESIGNATION (RQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.
	SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT
BLOWS REQUIRED	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.
DEEP CAN BE DETACHED	SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.
OR PICK POINT. D 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 A 2 INCH OUTSIDE DIAMETER SPLIT SPON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO DE LESS TANA ALT FOOT PED FOR PROTOK
IN FRAGMENTS	STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY
INT. SMALL, THIN	STRATA ROCK QUALITY DESIGNATION (SROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY
CHED READILY BY	THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
THICKNESS	
4 FEET 1.5 - 4 FFFT	ELEVATION: FEET
0.16 - 1.5 FEET	NOTES:
008 - 0.03 FEET	
< 0.008 FEET	
HEAT, PRESSURE, ETC.	
E.	
STEEL PROBE;	
L PROBE;	
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	4







	WBS	34400).1.S5			TI	P R-223	3BB	COUNT	Y RUTHEF	RFORD			GEC	LOGIST C. Wang	l		WBS	34400).1.S5			TI	P R-2233	BB	COUNT
SITE DESCRIPTION US 221 South of Business (Charlotte Rd.) to SR 1366 (Roper Loop Rd.) GROUND W								GROUND WTR (ft)	SITE	DESCR	IPTION	US 2	221 So	uth of I	Business ((Charlotte R	d.) to SR 1									
	BORII	NG NO	L3_7	9757L		S	TATION	797+47		OFFSET	252 ft L ⁻	Г	ALIGNMENT -L3- 0 HR. 16.0			BORING NO. L3_79760L						STATION 797+60				
	COLL	AR EL	EV. 9	27.5 ft		т	OTAL DEI	PTH 18.0	ft	NORTHING	G 602,8	353		EAS	TING 1,120,897		24 HR. 5.9	COL	LAR EL	EV. 92	25.4 ft		т	OTAL DEP	TH 28.9 f	t
	DRILL RIG/HAMVER EFF./DATE F&R5785 CIVE-55 85% 2/17/2016							1	DRILL	VIETHO	ЮH	I.S. Augers	;	HAMIN	ERTYPE Automatic	DRILL RIG/HAMMER EFF./DATE F&R5785 CME-55 85% 2/17/2016										
	DRILL	ER D	. Aiello			S		TE 12/13/	16	COMP. DA	ATE 12/	/13/16		SUR	FACE WATER DEP	TH N	/Α	DRI	LER D	. Aiello			S	FART DAT	E 12/05/1	6
E	ELEV	DRIVE	DEPTH	BLC	ow co	UNT		BLOWS	PER FOO	T	SAMP	. 🔻	L					ELEV		DEPTH	BLC	ow co	UNT		BLOWS	PER FOOT
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W	SS :	34400	.1.S5			ТІ	P R-2233	BBB	COUNTY	/ RUTHER	FORD			GEOL	OGIST J. Crans	ton		WBS 34400.					ТІ	P R-2233E	COUNTY		
SITE DESCRIPTION US 221 South of Business (Charlotte Rd.) to SR 1366 (Roper Loop								Loop Ro	Rd.) GROUND WTR (SITE DESCRIPTION US 221 South of Business (Charlotte Rd.) to SR 1												
BC	RING	g no.	L3_7	9770F	2	S	TATION 7	797+70		OFFSET	120 ft R	Т		ALIG	MENT -L3-		0 HR. 3.0	BORING NO. L3_79775R					ST	STATION 797+75			
cc	ILLA		EV. 93	32.4 ft		т	OTAL DEP	TH 26.5 f	t	NORTHING	602,9	954		EAST	ING 1,121,256		24 HR. 2.1		COLLAR ELEV. 929.7 ft			тс	TOTAL DEPTH 12.3 ft				
DR	DRILL RIG/HAMMER EFF./DATE F&R5785 CWE-55 85% 2/17/2016									DRILLI	VIETHO	DН	I.S. Augers		HAMIN	RITYPE Automatic	DRILL RIG/HAMMER EFF./DATE F&R57						ME-55 85%	2/17/2016	I		
DF		ER D	. Aiello			S	TART DAT	E 12/05/1	6	COMP. DA	TE 12/	05/16		SURF	SURFACE WATER DEPTH N/A			DR	ILLER	D. Aiello)		ST	ART DATE	12/07/16	6	
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IT	RUTH	IERI	FORD			GEOLOGI	ST J. Cransto	n		
२ 1	366 (Ro	per l	_oop Rd	.)		•			GROUN	ID WTR (ft)
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	COMP.	DA.	TE 12/	07/16		SURFACE	WATER DEPT	TH N/A	٩	
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WBS	34400	.1.S5			T	IP F	R-2233	BB		COUNT	YR	UTHER	FORD			GEOLOGIST J. Cransto	n		
SITE	DESCR	IPTION	US 2	221 So	uth of	Busi	ness (C	Charlott	te Rd.) to SR	1366	(Roper	Loop Rd	.)				GROUN	D WTR (ft)
BOR	ing no.	L3_79	9795R		S	TAT	ION 7	97+95			OFI	SET	235 ft R	Γ		ALIGNMENT -L3-		0 HR.	3.5
COL	LAR ELE	EV. 93	87.3 ft		Т	ΟΤΑ	L DEP	FH 26	6.0 ft		NO	RTHING	603,0	03		EASTING 1,121,363		24 HR.	2.5
DRILL	RIG/HAN	IMER EF	F./DAT	E F&F	R5785 (CME-	55 85%	2/17/20)16				DRILL	IETHO	рн	S. Augers	HAMM	ER TYPE	Automatic
DRIL	LER D.	Aiello			S	TAR	T DATI	E 12/0	05/16	1	co	MP. DA	TE 12/	05/16		SURFACE WATER DEP	FH N/#	Ą	
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLC 0.5ft	OW CO 0.5ft	UNT 0.5ft	0		BLO' 25	WS P 50	ER FOO ⁻	Г 75	100	SAMP. NO.	мо	L O G	SOIL AND ROO ELEV. (ft)	CK DESC	CRIPTION	l DEPTH (ft)
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SHEET NO. 2-2A 3 4-6 7-9 10-13

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REFERENCE

DESCRIPTION TITLE SHEET LEGEND (SOIL & ROCK) SITE PLAN PROFILE CROSS SECTIONS BORE & CORE LOGS CORE PHOTOGRAPHS

STATE OF NORTH CAROLINA

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

STRUCTURE SUBSURFACE INVESTIGATION

RUTHERFORD

COUNTY _

PROPOSED BRDG #0663 ON PROJECT DESCRIPTION US-64 (-Y3-) OVER PROPOSED US-22I BYPASS (-L3-)

S 5 34400.1 PROJEC

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-2233BB	-	16

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 (99) 707-6850. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA AVAIL

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 UNPELACED TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOLI MOISTURE CONDITIONS INDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOLI MOISTURE CONDITIONS MAY YARY 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 OPHIONO OF THE DEPARTMENT AS TO THE TYPE OF MATERIALS AND CONSTRUCTIONS 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 THE REVIENT OF TIME FOR ANY REASON RESULTING FROM THE ACTUAL COMPENSATION OF FOR AN EXTENSION OF TIME FOR ANY REASON RESULTIONS FOR ACTUAL COMPENSATION.

- NOTES: I. THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N.C. DEPARTMENT OF TRANSPORTATION AS ACCURATE NOR IS IT CONSIDERED PART OF THE PLANS, SPECIFICATIONS OR CONTRACT FOR THE PROJECT. 2. 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.

DEDCOMMEN

PERSUNNEL
- <u>F&R, INC</u>
M. ARNOLD
S. DAVIS
- <u>NCDOT-</u>
DC CHEEK
CJ COFFEY
CD JOHNSON
INVESTIGATED BY MCDOT GEU/F&R, INC.
DRAWN BY <u>DC ELLIOTT /T.T. WALKER</u>
CHECKED BYJC_KUHNE /P.ALTON
SUBMITTED BY <u>JC KUHNE</u>
DATE



SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION	GRADATION	ROCK DESCRIPTION
SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLICHT POWER AUGER AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO THE STANDARD PENETRATION TEST (AASHTO T 206, ASTM DIS66). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM, BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING: CONSISTENCY, COLOR, TEXTURE, MONISTURE, AASHTO LCASSIFICATION, AND OTHER PERTINENT FACTORS SUCH	WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE. UNIFORMLY GRADED - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES. ANGLI ARITY OF GRAINS	HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED. AN INFERMED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS IN NON-COASTAL PLAIN MATERIAL. THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK.
AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE,	THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS:	ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:
SOIL LEGEND AND AASHTO CLASSIFICATION	ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.	WEATHERED NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES >
GENERAL GRANULAR MATERIALS SILT-CLAY MATERIALS ORGANIC MATERIALS	MINERALOGICAL COMPOSITION	CRYSTALLINE FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT
CLASS. (≤ 35% PASSING *200) (> 35% PASSING *200) (> 35% PASSING *200)	MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.	ROCK (CR) WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.
CLASS. A-1-b A-2-4 A-2-5 A-2-6 A-2-7 A-75 A-3 A-6 A-7	COMPRESSIBILITY	NON-CRYSTALLINE FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YEILD SPT REFUSAL IF TESTED.
SYMBOL	SLIGHTLY COMPRESSIBLE LL < 31 MODERATELY COMPRESSIBLE LL = 31 - 50	COASTAL PLAIN COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD
X PASSING SII T-	HIGHLY COMPRESSIBLE LL > 50	SEDIMENTARY ROCK SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED
*10 50 MX GRANULAR CLAY MUCK, *40 30 MX 50 MX 51 MN S0 LS CLAY PEAT		WEATHERING
*200 15 MX 25 MX 10 MX 35 MX 35 MX 35 MX 35 MX 36 MN 36 MN 36 MN 36 MN 36 MN	ORGANIC MATERIAL SOILS SOILS OTHER MATERIAL	FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER
MATERIAL PASSING *40 LL – – 40 MX 41 MN 40 MX 41 MN 40 MX 41 MN 40 MX 41 MN 50LS WITH LL – – – 40 MX 11 MN	LITTLE ORGANIC MATTER 2 - 3% 3 - 5% 1 RALE 1 - 10% LITTLE ORGANIC MATTER 3 - 5% 5 - 12% LITTLE 10 - 20% MODERATELY ORGANIC 5 - 10% 12 - 20% SOME 20 - 35% HIGHLY ORGANIC > 10% > 20% HIGHLY 35% AND ABOVE	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
GROUP INDEX Ø Ø Ø 4 MX 8 MX 12 MX 16 MX NO MX AMOUNTS OF	GROUND WATER	SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO
USUAL TYPES STONE FRAGS. FINE SILTY OR CLAYEY SILTY CLAYEY MATTER OF MAJOR GRAVEL AND SAND GRAVEL AND SAND SOILS SOILS	✓ WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING ▼ STATIC WATER LEVEL AFTER 24 HOURS	(SLI.) 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.
CEN.RATING SHRU CEN.RATING EXCELLENT TO GOOD FAIR TO POOR FAIR TO POOR UNSUITABL	E PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA	(MOD.) GRANITOD ROCKS, MORT FELDS FAR DULL AND DISCULLANTION AND WEHTHERING EFFELTS. IN LAND DISCULARY ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED
PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30	→ OJUUL→ SPRING OR SEEP	WITH FRESH RUCK.
CONSISTENCY OR DENSENESS	MISCELLANEOUS SYMBOLS	SEVERE AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH
PRIMARY SOIL TYPE COMPACTNESS OR PENETRATION RESISTENCE COMPRESSIVE STRENGTH	ROADWAY EMBANKMENT (RE) 25/025 DIP & DIP DIRECTION	(MUD. SEV.) AND LAN BE EXCAVATED WITH A GEOLOGIST'S PICK. RUCK GIVES "CLUNK" SUUND WHEN STRUCK.
CENSISTENCI (N-VALUE) (TONS/FT ²) GENERALLY VERY LOOSE < 4	GF ROCK STRUCTURES SOIL SYMBOL → OF ROCK STRUCTURES SLOPE INDICATOR UST PMT TEST BORING → SLOPE INDICATOR INSTALLATION	SEVERE ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED, ROCK FABRIC CLEAR AND EVIDENT BUT (SEV.) REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN.
MATERIAL MEDIUM DENSE 10 TO 300 N/A (NDN-COHESIVE) DENSE 30 TO 50 50	ARTIFICIAL FILL (AF) OTHER HUGER BORING CONE PENETROMETER	VERY ALL ROCK EXCEPT QUARTZ DISCOLORED TO STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE
VERY SOFT < 2 < 0.25	- INFERRED SOIL BOUNDARY CORE BORING • SOUNDING ROD	V SEV.) REMAINING, SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR VESTICES OF ORDINAL ROCK SARDID FROM IN IF TESTED WILL OF YOUR OF A VALUES (100 RPC
GENERALLY SUFI 2 10 4 0.25 10 0.5 SILT-CLAY MEDIUM STIFF 4 T0 8 0.5 T0 1.0 MATERIAL CLIFF 0 10 16 1 10 2	TEST BORING WITH CORE	COMPLETE ROCK REDUCED TO SOIL ROCK FABRIC NOT DISCERNIBLE OR DISCERNIBLE ONLY IN SMALL AND
MATERIAL STIFF 8 10 15 1 10 2 (COHESIVE) VERY STIFF 15 TO 30 2 TO 4	TTTTT ALLUVIAL SOIL BOUNDARY A PIEZOMETER - SPT N-VALUE	SLATTERED CUNCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.
	RECOMMENDATION SYMBOLS	ROCK HARDNESS
ILS. STD. SIEVE SIZE 4 10 40 60 200 270		VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.
OPENING (MM) 4.76 2.00 0.42 0.25 0.075 0.053	ACCEPTABLE, BUT NOT TO BE	HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED
BOULDER COBBLE GRAVEL COARSE FINE SILT CLAY	UNDERCUT ACCEPTABLE DEGRADABLE ROCK EMBANKMENT OR BACKFILL	TO DETACH HAND SPECIMEN. MODERATELY CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE
CEDIA COLD COLD CEDIA C		HARD EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.
SIZE IN. 12 3	BT - BORING TERMINATED MICA MICACEOUS WEA WEATHERED	MEDIUM CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT.
SOIL MOISTURE - CORRELATION OF TERMS	CLCLAY MODMODERATELY γ -UNIT WEIGHT CPT - CONE PENETRATION TEST NP - NON PLASTIC γ_{2} - DRY UNIT WEIGHT	HARD CAN BE EXCAVATED IN SMALL CHIPS TO PEICES I INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.
SOIL MOISTURE SCALE FIELD MOISTURE (ATTERBERG LIMITS) DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION	CSE COARSE ORG ORGANIC DMT - DILATOMETER TEST PMT - PRESSUREMETER TEST <u>SAMPLE ABBREVIATIONS</u> DDT - DUNUMUE OFFICIATION TEST SAMPLE	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
- SATURATED - USUALLY LIQUID; VERY WET, USUALLY (SAT.) FROM BELOW THE CROUND WATER TABLE	e - VOID RATIO SD SANDY SS - SPLIT SPON	VERY CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH
	FOSS FOSSILIFEROUS SLI SLIGHTLY RS - ROCK	SOFT OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.
RANGE C - WET - (W) SEMISOLID; REQUIRES DRYING TO	FRAC FRACTURED, FRACTURES FRACTURE STORE - TRICUNE REFUSAL RT - RECOMPACIED TRIAXIAL FRAGS FRAGMENTS w - MOISTURE CONTENT CBR - CALIFORNIA BEARING	FRACTURE SPACING BEDDING
	HI HIGHLY V - VERY RATIO	TERM SPACING TERM THICKNESS
OM _ OPTIMUM MOISTURE - MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE		WIDE 3 TO 10 FEET THICKLY BEDDED 1.5 - 4 FEET
SL SHRINKAGE LIMIT	CME-45C CLAY BITS X AUTOMATIC MANUAL	CLOSE 0.16 TO 1 FOOT VERY THINLY BEDDED 0.03 - 0.16 FEET
- DRY - (D) REUDITES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE	6' CONTINUOUS FLIGHT AUGER CORE SIZE:	VERY CLUSE LESS THAN 0.16 FEET THICKLY LAMINATED 0.008 - 0.03 FEET THINLY LAMINATED < 0.008 FEET
PLASTICITY	□ □	INDURATION
PLASTICITY INDEX (PI) DRY STRENGTH	X CME-550 HARD FACED FINGER BITS X - N NXWL	FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ET
NON PLASTIC Ø-5 VERY LOW SLIGHTLY PLASTIC 6-15 SLIGHT	VANE SHEAR TEST	FRIABLE RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.
MODERATELY PLASTIC 16-25 MEDIUM HIGHLY PLASTIC 26 OR MORE HIGH		MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE;
COLOR		GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE:
DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN. RED. YELLOW-BROWN, RELIF-GRAY).		DIFFICULT TO BREAK WITH HAMMER.
MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.		EXTREMELY INDURATED SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.

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RINGS UNDER DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL . NATINGS IF OPEN. DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH. AMMER BLOWS IF FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE ICK UP TO SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE. FELDSPAR FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. BLOWS. $\underline{\mathsf{FLOAT}}$ - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL. Y. ROCK HAS AS COMPARED FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM. FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD. ELDSPARS DULL OSS OF STRENGTH WHEN STRUCK. JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED. LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT. VIDENT BUT ARE KAOLINIZED 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. RE DISCERNIBLE PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE STRONG ROCK T ONLY MINOR VALUES < 100 BPF OF AN INTERVENING IMPERVIOUS STRATUM. RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. ROCK OUALITY DESIGNATION (ROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SECMENTS EQUAL TO OR CREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE IN SMALL AND SAPROLITE IS RUN AND EXPRESSED AS A PERCENTAGE. SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT S REQUIRES 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 LOWS REQUIRED THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS. $\underline{\text{SLICKENSIDE}}$ - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE. EEP CAN BE ETACHED 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 R PICK POINT WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL BLOWS OF THE TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. FRAGMENTS $\underline{STRATA CORE RECOVERY (SREC.)}$ - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. IT. SMALL. THIN STRATA ROCK QUALITY DESIGNATION (SROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. PIECES 1 INCH ED READILY BY TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER. BENCH MARK: BL-200 : SURVEY DISK IN GROUND THICKNESS @ -BL- STA 288+13.77 : N: 607298.958, E: 1120968.72 4 FEET ELEVATION: 1044.46 FEET .5 - 4 FEET 16 - 1.5 FEET NOTES: 3 - Ø.16 FEET 08 - 0.03 FEET 0.008 FEET FIAD - FILLED IMMEDIATELY AFTER DRILLING AT, PRESSURE, ETC. TEEL PROBE: DATE: 8-15-14

SUPPLEMENTAL LEGEND, GEOLOGICAL STRENGTH INDEX (GSI) TABLES FROM AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS

AASHTO LRFD Figure 10.4.6.4–1 — Determination of GSI for Jointed	Rock Mass (Marı	nos and Hoek,2	2000)			AASHTO LRFD Figure 10.4.6.4–2 $-$ Determination of GSI for T
GEOLOGICAL STRENGTH INDEX (GSI) FOR JOINTED ROCKS (Hoek and Marinos, 2000) From the lithology, structure and surface conditions of the discontinuities, estimate the average value of GSI. Do not try to be too precise. Quoting a range from 33 to 37 is more realistic than stating that GSI = 35. Note that the table does not apply to structurally controlled failures. Where weak planar structural planes are present in an unfavorable orientation with respect to the excavation face, these will dominate the rock mass behaviour. The shear strength of surfaces in rocks that are prone to deterioration as a result of changes in moisture content will be reduced if water is present. When working with rocks in the fair to very poor categories, a shift to the right may be made for wet conditions. Water pressure is dealt with by effective stress analysis.	VERY GOOD Very rough, fresh unweathered surfaces	COOD Rough, slightly weathered, iron stained surfaces	FAIR Smooth, moderately weathered and altered surfaces	POOR Slickensided, highly weathered surfaces with compact coatings or fillings or angular fragments	VERY POOR Slickensided, highly weathered surfaces with soft clay coatings or fillings	GSI FOR HETEROGENEOUS ROCK MASSES SUCH AS FLYSCH (Marinos.P and Hoek E., 2000) From a description of the lithology, structure and surface conditions (particularly of the bedding planes), choose a box in the chart. Locate the position in the box that corresponds to the condition of the discontinuities and estimate the average value of GSI from the contours. Do not attempt to be too precise. Quoting a range from 33 to 37 is more realistic than giving GSI = 35. Note that the Hoek-Brown criterion does not apply to structurally controlled failures. Where unfavourably oriented continuous weak planar discontinuities are present, these will dominate the behaviour of the rock mass. The strength of some rock masses is reduced by the presence of groundwater and this can be allowed for by a slight shift to the right in the columns for fail poor and very poor conditions. Water pressure does not change the value of GSI and it is dealt with by using effective stress analysis.
STRUCTURE	DEC	REASING SU	JRFACE QUA	ALITY ┏━━		COMPOSITION AND STRUCTURE
INTACT OR MASSIVE - intact rock specimens or massive in situ rock with few widely spaced discontinuities	90			N/A	N/A	A. Thick bedded, very blocky sandstone The effect of pelitic coatings on the bedding planes is minimized by the confinement of the rock mass. In shallow tunnels or slopes these bedding planes may cause structurally controlled instability.
disturbed rock mass consisting of cubical blocks formed by three intersecting discontinuity sets		70 [°] 60				B. Sand- stone with stone with siltstone fauers of
VERY BLOCKY - interlocked, partially disturbed mass with multi-faceted angular blocks formed by 4 or more joint sets		5	0			siltstone amounts
BLOCKY/DISTURBED/SEAMY - folded with angular blocks formed by many intersecting discontinuity sets. Persistence of bedding planes or schistosity			40	30		C. D. E. and G - may be more or less folded than illustrated but this does not change the strength. Tectonic deformation, faulting and loss of continuity moves these categories to F and H.
DISINTEGRATED - poorly inter- locked, heavily broken rock mass with mixture of angular and rounded rock pieces				20		G. Undisturbed silty or clayey shale with or without a few very thin sandstone layers
LAMINATED/SHEARED - Lack of blockiness due to close spacing of weak schistosity or shear planes	N/A	N/A			10	Means deformation after tectonic disturbance

ectonically Defo	ormed Heteroc	geneous Rock	Masses (Marıı	nos and Hoek	, 2000)
SURFACE CONDITIONS OF DISCONTINUITIES (Predominantly bedding planes)	VERY GOOD - Very Rough, fresh unweathered surfaces	GOOD - Rough, slightly weathered surfaces	FAIR - Smooth, moderately weathered and altered surfaces	POOR - Very smooth, occasionally slickensided surfaces with compact coatings or fillings with angular fragments	VERY POOR - Very smooth, slicken- sided or highly weathered surfaces with soft clay coatings or fillings
E. Weak siltstone or clayey shale with sandstone layers	70 60	A 50 B 40	c	DE	
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						+		¹ ¹		· J			
1070						+	 	·					1070
			(A) Weathered Rock: Biotite G	neiss									
1060									 				1060
1050 -		Eviation	L3_84427R			3 943400							1050
1030		LXISIING Ground		· · · · · · · · · · · · · · · · · · ·		BI-B							1050
								Existing	Ground				
1040	i i i		8 - KE SIDUAL: Sandy-SILT- (A	of to Med Stiff. Red/Orange/Br -4),w/-a-little Clay Mich Trace		RESIDU	AL: Soft sandy-	SILT (A-4),					1040
							тпе ста у.м іса.т 						
1030			57- SAPROLITE: Me	d Stiff to Very Stiff.variably Wi	hile/Tan/Brown								1030
	+		(00/0.7) (A)	w/ a little Clay, Mica, Trace Mr	0	5	++ 						
1000		· <u>····</u> ·······························	0/0.0			-5							1000
1020			Crystow										1020
			Poromine Rock:	White-to-Change and the second		59m - 55							
1010				Gray, Black, Biotif			(A)			·			1010
					Gneiss								
1000			B.T. @ 39.1'			c/ye	stalline Rock						1000
1000	+		BIOTITE GNEISS			+	+ 	·				++	
					IN CR	BIT. @ 44.4' YSTALLINE ROCK:							
990	i 4	·		· · · · · · · · · · · · · · · · · · ·		DTITE GNEISS		·					990
980							· · · · · · · · · · · · · · · · · · ·						980
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	 				_∠/+ψ0.00	+	 +						
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							, I I I I I I I						
14	40 130 1	20 110 100 90	80 70 60 50	40 30 20	10 0 -	10 20 3	0 40	50 6	0 70	80 90	100 110	120 130	140



20		40	PROJ	ECT RE	FERENCI	E NO.	SHEET NO.
FEET				<i>R–22</i>	33BB		9
VE = 1	:1		C.	ROSS-SI	ECTION	ALON	IG –Y3–
				1			
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			·			<u>+</u>	1080
RE ORGAN							
	<u> </u>						1070
							1060
2.1							1050
	>						
							1040
							4000
				 			1030
idy SILI (i	α <i>−4)</i>						1020
anese Dep	osits.						1020
							1010
							1000
7			+ 	 ! !		+	
	= / //	///					990
						1	980
			 	1	 	1	
			, , , , ,			+	
70	80	90	100	110	120	130	140

							1																		1	
WBS 34	400.1.S5			TI	P R-2233E	3B	COUNT	Y RUTHEF	RFORD			GEOLO	DGIST M. Arno	old	1		WBS	34400).1.S5			TI	P R-2233	BB	COUNTY	1
SITE DES	SCRIPTIO	N US	221 S	outh o	f Business (Charlotte	Rd.) to S	R 1366 (Ro	per Loop	o Rd.)					GROUND	OWTR (ft)	SITE	DESCR	IPTION	US	221 S	outh of	Business	(Charlotte	Rd.) to S	R 1
BORING	NO. L3_8	4369L	(EB1-	-A) S	TATION 84	13+69		OFFSET	132 ft L1			ALIGN	MENT -L3-		0 HR.	33.2	BOR		. L3_84	1274L	(EB1-	-B) S1	ATION 8	42+74		OF
	HAMMER	,067.9 FFF/DA	TE ES	TC		H 36.01	t 6	NORTHING		44 ИЕТНО	ם חר		NG 1,120,744		24 HR. FR TYPE	FIAD			EV. 1,	060.1 1	TE ES	TC		FH 30.8 f	t	NC
				x1/21/3		12/10/201	6		TE 12/	10/16									Dovio					= 12/10/1	6	<u> </u>
				JNT		BLOWS			SAMP.		, 1 L		CE WATER DE		A			DRIVE		BLC	W COI			BLOWS		
(ft) ELE	EV DEPT	0.5ft	0.5ft	0.5ft	0 2	5	50	75 100	NO.	MO	O I G	ELEV. (ft)	SOIL AND RO	OCK DESC	CRIPTION	DEPTH (ft)	(ft)	ELEV (ft)	(ft)	0.5ft	0.5ft	0.5ft	0	25	50	75
						•	•	1																•	•	
1070																	1065									
1.06	57.9 0.0											1,067.9	GROUN	ND SURFA	ACE	0.0		-	E							
	1	2	2	3	• <u>5</u> ••••					М		_	Red/Brown, Me	ESIDUAL D STIFF te	o VERY STI	FF,		-								
1065 1,06	34.4 3.5	8	10	13			<u> </u>					-	SILTY-CLAY	w/ trace O	RGANICS	,	1060	1,060.1	0.0	2	3	1	4			T
	±		10	10	. •	23	· · · ·					-						- 1.056.6-	- 3.5					· · · · ·		
1060	94+ 85				· · / ·								SA	PROLITE		7.0	1055		-	4	9	11	· · · · •	20		
		3	3	4	i ∳7 ∶ ∶	· · · · ·				м		-	BLACK/RED/B FINE-to-COURSE	Rown, N Sandy-	1ED STIFF, SILT, w/ som	ne		-	ł				:: <i>i</i> :			
1055	ţ					· · · · ·						1,055.9			NGANESE	<u>12.0</u>	1050	1,051.6-	8.5	2	4	3			· · · · ·	
1,05	54.4 <u>+ 13.5</u> +	2	2	4						м		μ - ι	OOSE, SILTY, FI	VE-to-COL	JRSE SAND	=,), w/	1000	-	+							+
	Ŧ				¶ ° · · ·							-	MANGA	INESE & IN	AICA			- 1,046.6-	13.5							
1050	19.4 18.5											-					1045		F	5	4	4	. • 8			+
	Ŧ	4	5	8						M		F						-	10.5							
1045	L I											1,045.9	RED/BROWN, DE	NSE, FINE	SANDY-SI	LT, <u>22.0</u>	1040	-1,041.0-	L 10.5	15	12	8		20		
1,04	14.4 <u>+ 23.5</u>	5	4	27		3 1				м		1,043.2	w/ trace MAI		& MICA	<u>24.7</u>		-	E							
	Ŧ					.\						L	GRAY/BROV FINE-to-COURSE	SANDY, N	E, SILTY, w/ trace MIC	A,		1,036.6-	23.5	3	8	21		$\sum_{i=1}^{n}$		
1040 1,03	39.4 28.5	7	10	26		<u> </u>	<u> </u>	· · · · ·				-	some R several V HARD LA	OCK FRA	.GS: .wn 28.5' - 33	3.5'	1035	-	F		-		<u></u>	■29 Ⅰ	+	+
	±	'	10	20		. ● ³⁶ .						<u> </u>						- 1 031 6-	- 28.5					L	+	-
1035	4 4 33 5					·				\Box		-					1030	-	30.8	100/0.3						
1,00		15	13	100/0.4		: ! <u>-</u> -	┝┼┽┽				471	- 1,033.4	WEATH	IERED RO	оск	34.5		-1,029.0	- 50.0	60/0.0			1			
1,03	<u>31.9 _ 36.0</u> +	60/0.0			<u> </u>			60/0.0	┝┤		122		GRAY (I Boring Termi	MICA SCH	IIST) Standard			-	ł							
	Ŧ											 -	Penetration Tes	st Refusal	at Elevation				F							
	Ŧ											F	1,001.911 014 0					-	÷							
0	Ŧ											F						-	F							
5/30/1	Ŧ											F						-	F							
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00T.G	Ŧ											E						-	E							
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00663	+											L						-	L							
BRDG	±											Ł						-	L							
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GEO	+											F						-	F							
3BB_ (±											F						-	L							
R223	1											F						-	ŧ							
BLE	ŧ											F						-	ŧ							
INDI	ŧ											F						-	ŧ							
ORE	+											F						-	ŧ							
DOT B	‡											F						-	ł							
NCL	+	1										F						-	ł							

GEOTECHNICAL BORING REPORT BORE LOG

RUTHER	FORD			GEOL	LOGIST M. A	rnold			
R 1366 (Rop	er Loop	Rd.)						GROUN	D WTR (ft)
OFFSET 1	31 ft LT	-		ALIG	NMENT -L3-			0 HR.	Dry
NORTHING	607,3	56		EAST	ING 1,120,7	52		24 HR.	FIAD
	DRILL	IETHO	рң	S. Augers	5		HAMME	ER TYPE	Automatic
COMP. DAT	TE 12/*	19/16		SURF	ACE WATER	DEPT	TH N//	4	
75 100	SAMP. NO.	моі	L O G		SOIL AND	D ROC	K DESC	RIPTION	
				1,060.1	GR		SURFA	CE	0.0
· · · · ·		м		1,058.1	BROWN, SOF	T, SILT	TY-CLA	/, w/ little F	INE
· · · · ·		Μ		-		e of OI FR/ WN, V SAND	RGANIC AGS. /ERY ST Y-CLAY	IFF, FINE	^I 7.0
		М		-	BLACK/RE FINE-to-COU CLAY, trace M F	SAPR ED/BRC IRSE S ANGAI ROCK	OUTE OWN, M SANDY-S NESE D FRAGS	ED STIFF, BILT, w/ tra EPOSITS	ace & w/
		M		- 1,043.1	WHITE/GR	AY, VE	ERY STI		, <u>17.0</u> , AGS:
		M		-	several V HAI	RD lay	ers b/twi	n 23.5' - 28	3.5'
			-	-					27.0
· · · · ·				1,030.1	WE DAI	ATHEI RK GR	RED RO AY/WH	CK TE	30.0
60/0.0				- 1,029.3 - - - - -	CRY Boring Tenetration Penetration 1,029.3 ft I	/STAL GRAY// arminat Test F IN CR	LINE RC BROWN ted with Refusal a STALLI	DCK I Standard at Elevation NE ROCK	 n

GEOTECHNICAL BORING REPORT PODEIOC

								D		UG					
WBS	3440	0.1.S5			Т	IP R-2233	3B	COUNT	RUTHER	RFORD			GEOLOGIST Johnson, C. D.		
SITE	DESCF	RIPTION	US	221 S	outh c	of Business	Charlotte F	Rd.) to S	R 1366 (Ro	per Loop	Rd.)			GROUND WTF	R (ft)
BOR	ING NO	. L3_8	34427F	R (B1-	A) S	TATION 84	13+87		OFFSET	50 ft RT			ALIGNMENT -L3-	0 HR. F	-IAD
COL	LAR EL	. EV . 1	,045.2	? ft	T	OTAL DEPT	H 39.1 ft		NORTHING	607,5	523		EASTING 1,120,917	24 HR.	N/A
DRIL	RIG/HA	MMER E	FF./DA	TE A	-08963	3 CME-550X 7	7% 07/31/20	17		DRILL	VETHOD	D N	VCasing W/SPT & Core HAMIV	J JER TYPE Autom	natic
DRII		beek l			s		05/14/10			TE 05/	14/10			/Δ	
			BIC				BLOWS P			SAMP		L	JOR ACE WATER DEF IT IN	~	
(ft)	ELEV (ft)	(ft)	0.5ft	0.5ft	0.5ft	0 2	25 50)	75 100 I	NO.	моі	O G	SOIL AND ROCK DESC ELEV. (ft)	CRIPTION DEP	PTH (ft
1050		+											-		
1045		+ - - 						<u> </u>					1,045.2 GROUND SURF/ - RESIDUAL	ACE	0.0
	1 0/2 3	+ 32						· · · · ·				- -	LIGHT BROWN/ORANGE SANDY-SILT, w/ little CLA	/RED, STIFF, /. MICA. trace	
1040	1,042.0	- 0.2	3	3	5			· · · ·	· · · · ·			-	MANGANESE, ROCK	FRAGS	
1040		ŧ							<u> </u>			<u> </u>	1,038.8		6.7
	1,037.3	8.2	4	5	7	$\left \left \begin{array}{c} \cdot & i \\ \cdot & 1 \end{array} \right \right $						E	SAPROLITE RED/ORANGE/BLAC	K. STIFF.	
1035		Ł	4	5		12.						<u> </u>	SANDY-SILT, w/ trace C	LAY, MICA	
		ł										E	1,033.5		12.0
	1,032.3	<u> 13.2</u>	10	24	33	$\left \left \begin{array}{c} \cdot \cdot \cdot \cdot \cdot \\ \cdot \cdot \cdot \cdot \end{array} \right \right $: : :	57				F	HARD, SANDY-SILT, w/	trace MICA	
1030	-	Ŧ										F	-		
	1 027 3	+ + 18.2						· · · · · ·				ant -	1,027.8	201/	17.7
1025	1.025.6	- 19.9	54	46/0.2	1		· · · · ·	· · · ·		2			1,025.6 DARK GREY/BL	ACK	19.9
1025	-	ŧ	60/0.0						60/0.0				- CRYSTALLINE R	OCK WHITE/TAN	
		ŧ						· · · ·					(BIOTITE GNES	SS)	
1020		ł													
	1 -	Ŧ										-	-		
		ŧ						· · · · ·							
1015		‡											_		
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		ŧ													
1010	- 1	Ŧ											-		
		Ŧ													
		+								-			1,006.4 Boring Terminated at Elevati	on 1 006 4 ft IN	39.1
	-	+											- CRYSTALLINE R	OCK	
	-	ŧ										F	-		
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WBS	34400).1.S5			TIP	R-223	3BB	C	OUNT	ΥF	UTHER	FORD		GEOLOGIST Johnson	, C. D.		
SITE	DESCR	IPTION	US	221 Sout	h of B	usines	s (Charlo	tte Rd	.) to S	SR 13	866 (Rop	er Loop Rd.	.)			GROUN	D WTR (ft)
BOR	ING NO.	L3_8	4427F	R (B1-A)	STA	ΓΙΟΝ	843+87			OF	FSET 5	50 ft RT		ALIGNMENT -L3-		0 HR.	FIAD
COL	LAR EL	EV. 1	,045.2	ft	тот	AL DE	PTH 39	1 ft		NO	RTHING	607,523		EASTING 1,120,917		24 HR.	N/A
DRILL	. RIG/HAI	MMER E	FF./DA	TE AFO8	963 CIV	1E-550X	77% 07/3	31/2017				DRILL METH	IOD NV	V Casing W/SPT & Core	Hamm	ER TYPE	Automatic
DRIL	LER C	heek, D	D. O.		STA	rt da	TE 05/1	4/19		со	MP. DA	FE 05/14/1	9	SURFACE WATER DEP	TH N/	A	
COR	E SIZE	NXWL			тот	AL RU	N 19.2 f	t									
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	REC. (ft) %	JN RQD (ft) %	SAMP. NO.	STR REC. (ft) %	ATA RQD (ft) %	L O G	ELEV. (f	t)	C	DESCRIPTION AND REMARK	S		DEPTH (ft)
1025.59	1 025 6	10.0		NL 00/0 0	(0.7)	(0.5)								Begin Coring @ 19.9 ft			
1020	1,025.6 - - 1,021.4	- 19.9 - - 24.1	4.2 5.0	N=60/0.0 1:15/0.2 2:45/1.0 2:57/1.0 2:51/1.0 2:50/1.0 2:41/1.0	(3.7) 88% (5.0)	(0.5) 12% (4.5)					- 1,025.6 - - - -			CRYSTALLINE ROCK			19.9
	- 1,016.4	- - <u>29.1</u>	5.0	3:14/1.0 2:16/1.0 2:01/1.0 1:43/1.0	100%	90%					-						
1015		-	5.0	2:45/1.0 2:42/1.0 3:58/1.0 2:44/1.0	(5.0) 100%	(4.7) 94%					- - -						
1010		-	5.0	3:07/1.0 3:11/1.0 3:20/1.0 1:40/1.0	(5.0) 100%	(5.0) 100%					- -						
	1,006.4-	- 39.1		2:15/1.0							1,006.4	Borina T	Ferminate	ed at Elevation 1,006.4 ft IN CF	YSTALL	INE ROCK	39.1
	-	-									-	Ū		(BIOTITÉ GNEISS)			
	-	-									-						
	-	-									-						
	-	-									-		GSI	19 1' - 21 9' ⁻ 45 - 55			
	-	F									-		2	21.9' - 29.1' : 75 - 85			
	-	E									-		2	29.1 - 39.1 : 80 - 90			
	-	-									-						
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GEOTECHNICAL BORING REPORT CORE LOG

WBS	34400	.1.S5			Т	ΠP	R-2233BB	COUNT	Y RUTHER	FORD			GEOLOGIST Johnson, C. D.	
SITE	DESCR	IPTION	US	221 S	outh c	of B	Business (Char	rlotte Rd.) to S	R 1366 (Rop	er Loop	Rd.)		1	GROUND WTR (ft)
BOR	ING NO.	L3_8	4340F	R (B1-	B) S	STA	TION 842+97	7	OFFSET 4	2 ft RT			ALIGNMENT -L3-	0 HR. N/A
COLI	LAR ELE	EV. 1,0	043.3	ft	Т	от	AL DEPTH 4	4.4 ft	NORTHING	607,4	33		EASTING 1,120,919	24 HR. 27
DRILL	_ RIG/HAN	MMER E	FF./DA	TE AF	-0896	3 CN	VIE-550X 77% 0	7/31/2017		DRILL	/IETHO	D NM	V Casing W/SPT & Core HAMM	ER TYPE Automatic
DRIL		heek, D	D. O.		S	STA	RT DATE 05	/15/19			15/19		SURFACE WATER DEPTH N	A
ELEV (ft)	ELEV (ft)	DEPTH (ft)	BLC 0.5ft	0.5ft	UNT 0.5ft		BLC 0 25	50 50	75 100	NO.	моі	O G	SOIL AND ROCK DESC ELEV. (ft)	CRIPTION DEPTH (ft)
1045		-												
		-				╫	<u> </u>		· · · · ·			-	1,043.3 GROUND SURFA	ACE 0.0
1040	-	_										E	RED/ORANGE, SOFT, SANE CLAY, trace Mi	0Y-SILT, w/ little CA
	1,039.1	4.2	1	1	2	+	I				м	E		
005		-					$\left \begin{array}{c} \mathbf{F} \\ \mathbf{F} \\$	· · · · · · ·					1 035 2	8.1
1035	1,034.1	9.2	4	4	4	┨┠	<u></u>					-	SAPROLITE	
		-	4	-	4		$\begin{array}{c c c c c c c c c c c c c c c c c c c $	· · · · · · ·			M	<u> </u>	<u>1,031.6</u> EPACS trace MANGANES	CA & ROCK
1030	1 020 1	-					· · · · · · · · · · · · · · · · · · ·	· · · · · ·	· · · ·				- RED/BROWN/BLACK, N	ED STIFF,
	-1,023.1	<u>1'4.</u> ∠	1	2	3	11	• · · · · · · · · · · · · · · · · · · ·	· · · · · · ·			м	 	SANDY-SILT, W/ trace MANGANESE SE	AMS
1025	4	-						· · · · · ·				Į į		
	1,024.1	19.2	2	2	3	┨┞			· · · ·		м	F		
		-										F		
020	1,019.1	24.2				┨┝						E		
		[4	3	4		•7				w	E	1 0 1 0 0	0.50
015		-										Ē	BLACK/DARK BROW	N, HARD,
	1,014.1	29.2	3	5	50	-					м	Ŀ	SANDY-SILT, W/ ROCH	CFRAGS
		-		AUG RE	F @ 3 ⁻	1 1	NO DRIVE; BEGIN	CORE 55					1,012.3 WEATHERED RO	CK / 31.1/
010		-							+				DARK GREY/BLACK to V	DCK VHITE/TAN
		-					· · · · · ·	· · · · · · ·					(BIOTITE GNEIS	SS)
005		-					· · · · · ·	· · · · · ·	· · · · ·					
	4	-					· · · · · ·							
000		-					· · · · · ·	· · · · · · ·						
500						ļŀ			+	-			998.9 Roring Termineted at Floyed	44.4
	1	-											CRYSTALLINE ROCK (BIO	TITE GNEISS)
		-												
		-												
		-												
		-												
		-												
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WBS	34400).1.S5			TIP	R-223	33BB	C	OUNTY
SITE	DESCR	IPTION	US	221 Sout	h of B	usines	s (Charlo	otte Ro	d.) to SF
BOR	ING NO.	L3_8	4340F	R (B1-B)	STA	ΓΙΟΝ	842+97		
COL	LAR ELE	EV. 1,0	043.3	ft	тот	AL DE	PTH 44	.4 ft	
DRILI	L RIG/HAI	MIMER E	FF./DA	TE AFO8	963 CIV	1E-550X	C 77% 07/S	31/2017	/
DRIL	LER C	heek, [0. 0.		STA	RT DA	TE 05/1	5/19	
COR		NXWL	I		TOT		N 13.3 f	t otr	
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	REC. (ft) %	JN RQD (ft) %	SAMP. NO.	811 REC. (ft) %	RQD (ft) %
1012.19		- 01 1							
1010	1,012.2	31.1	3.3	0:45/0.3 1:37/1.0 2:30/1.0 2:12/1.0	(3.1) 94%	(2.7) 82%			
	-	-	5.0	1:12/1.0 1:45/1.0 2:09/1.0	(4.8) 96%	(4.6) 92%			
1005	1,003.9	39.4	5.0	2:07/1.0 3:37/1.0	(1.0)	(4.5)			
1000	-	+ + +	5.0	2:44/1.0 1:57/1.0 1:54/1.0 1:55/1.0	(4.9) 98%	(4.5) 90%			
	998.9	44.4		3:28/1.0					
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GEOTECHNICAL BORING REPORT CORE LOG

RUTHERFORD GEOLOGIST Johnson, C. D. R 1366 (Roper Loop Rd.) GROUND WTR (ft) OFFSET 42 ft RT ALIGNMENT -L3-0 HR. N/A **NORTHING** 607,433 **EASTING** 1,120,919 24 HR. 27 DRILL METHOD NW Casing W/SPT & Core HAMMER TYPE Automatic COMP. DATE 05/15/19 SURFACE WATER DEPTH N/A L O G ELEV. (ft) DESCRIPTION AND REMARKS DEPTH (ft) Begin Coring @ 31.1 ft CRYSTALLINE ROCK 31.1 44.4 Boring Terminated at Elevation 998.9 ft IN CRYSTALLINE ROCK (BIOTITE GNEISS) GSI : 31.1' - 44.4 ' : 80 - 90

GEOTECHNICAL BORING REPORT BORE LOG

10/5	26 2	1100 1	S E			.		2201	B	CO!!!		RIITUET						old.				2//00	1 95			-		2222	 BB		
SIT	ივ ე. ინინ	900.1.		119.1	221 5		of Busine	233DI	D Darlotte			1366 (Ro		o Rd)		SEOLOGIST M. Amo	JIC	GROUNI		SITE				221 9	South (of Rusi	2233E	OD (Charlo		
BC			3 8/	106R	(EB2			84/	1+06	; Nu.) ii			107 ft P	л. т)						BOE			1320P	2210) (ER	2_B)			13+20		
			1.0	4001	(LDZ	-// 3		-044	+++-00 J 10.2	£4							ACTING 1 120 077						- L3_0	042.00		Z-D) 3					
			. 1,0 IFR FF	43.7 Ι Έ/ΠΔΙ		2R2175		86%	n 19.3	16				METH		<u> </u> но			JZ4 FIK.	Automatic	DRI		MMERF	042.0				55 86º	Π 44.0 	2016	
-					- 10			ATE	40/45/	10						1.0.7			/^		DDU		Devie								
DR			avis)		AIE	12/15/			OIVIP. DA		15/10) И L	1	SURFACE WATER DE	PIH N	/A		DRIL		. Davis						= 12/15		
ELE (ft			EPTH (ft)	0.5ft	0 5ft			25	BLUWS	50 PER FU	75	100	NO		Ó		SOIL AND R	OCK DES	CRIPTION		ELEV (ft)	ELEV	DEPTH (ft)				-	2	вLOW 25	5 PER FU	75
	· (0.011	0.011	0.011				<u> </u>			110.		JG		.EV. (ft)			DEPTH (ff)		(11)		0.010	0.01	0.01			ĩ		
104	15	42.7														\vdash_1	GROU	ND SURE	ACE	0.0	1045		+								
	,0	43./ <u>+</u>	0.0	3	3	2	● 5 [•] •	•			•••			М		F	SA TAN/DDOWNLLO					1,042.8	0.0	3	4	4	<u> </u>				
104	0 1.0	40.2	3.5													F	W/ t	race MICA	A A	ND,	1040		Ŧ	ľ	· ·		• •	3 • •			.
		Ŧ		3	3	3	6			1				М		F						1,039.3	3.5	2	4	4			<u> </u>		
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103	35 1,0	35.2	8.5	3	2	2		•		· ·	•••					F					1035	1 034 3	+ 95					· · ·	· · ·	· · · ·	· · ·
		±		Ĵ	2	2	•4 .~		· · · · ·			· · · ·		M		Ł						1,004.0	- 0.5	3	4	5	1 :∳	9.		: : : :	· · ·
		<u>†</u>						1	1423	· ·	· ·	· · · ·				<u> </u>	<u>031.7 </u>			<u> </u>			ŧ				:	· · ·			· · ·
103	80 1,0	30.2 <u>1</u> 1	13.5	6	22	41	1	_			63.			м		F	WHITE/ORANGE,		VERY DEN	ISE,	1030	1,029.3	13.5						+	+	
		ł						•		ī					Ŧ	<u>1,</u>	D28.0 FRAGS & a	few HARD	LAYERS				ł		4	5		9			.
102	25 1.0	25.2 ⁺ 1	18.5													¥.	WEATI TAN/DARK G	Hered R Ray (Mic	OCK A SCHIST)	10.0	1025		Ŧ					1			.
	1:0	<u>24.5 1</u> 1	19.2	45 60/0.1	55/0.2							100/0.7			<u></u>		024.5 024.4/ CRYST	ALLINE R	OCK	19.2		1,024.3	<u> </u>	3	6	7	$\left \left[\cdot \right] \right $	13	· · ·		.
		Ŧ	F									00,011				F	WHITE/DARK	GRAY (MI nated with	CA SCHIST))			Ŧ					· [· · ·			.
		+														F	Penetration Te	st Refusal	at Elevation		1020	1 019 3	+ 23.5					+	· · ·		
		‡														Ę	1,024.4 11 11 0						+	4	5	7	1.	• 12			.
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/19		‡														F					1000	999.3	43.5	66	34/0.3	3		-	+		
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RUTHER	FORD			GEOLOGIST M. Arnold			
R 1366 (Roper Loop Rd.)						GROUN	D WTR (ft)
OFFSET 1	06 ft R1	Г		ALIGNMENT -L3-		0 HR.	43.0
NORTHING	607,4	18		EASTING 1,120,985		24 HR.	41.9
	DRILL N	IETHO	DН	I.S. Augers	HAMME	ER TYPE	Automatic
COMP. DAT	E 12/ ⁻	15/16		SURFACE WATER DEPT	TH N//	٩	
75 100	SAMP.		L O G	SOIL AND ROC	K DESC	RIPTION	
) SURFA	CE	0.0
		М					0.0
				- $1,040.0$ RED/BROWN, MED 3 - trace G	STIFF, S RAVELS	S	Y, W/2.0
		М		- Res - Red/brown, M	IDUAL MED STI	FF, FINE	
				SANDY-SILT, w/ tra	ace MICA FRAGS	A & QUAR	TZ 7.0
	SS-399	28%	ћ. И		Rolite F/BROW	'N STIFF	
		2070	N V	CLAYEY-SILT, & hig	ghly FINE	-to-COUR	RSE
			N V		ui, a w/ i		`
		М	N V	-			
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		м	N V N V	-			
				-			
				- 999.8 WEATHE		CK	43.0
100/0.8			<i>مزار</i> ر	998.1 TAN/BROWN	(MICA S	CHIST)	44.7
				- CRYSTAL - ORANGE/I	DARK G	RAY	
				Boring Termina Penetration Test Ref	ted with usal at E	Standard levation 99	98.0
				ft IN CRYST	ALLINE	ROCK	
				-			
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CORE PHOTOGRAPHS

B1-A BOX 1 of 3: 19.9 - 29.1 FEET **B1-A**



GEOLOGICAL STRENGTH INDEX: GSI 19.1' - 21.9' : 45 - 55 21.9' - 29.1' : 75 - 85



GEOLOGICAL STRENGTH INDEX: GSI

SHEET 14 R-2233BB / RUTHERFORD PROPOSED BRIDGE NO. 0663

BOX 2 of 3 : 29.1 - 38.3 FEET

29.1' - 38.3' : 80 - 90

CORE PHOTOGRAPHS

B1-A BOX 3 of 3 : 38.3 - 39.1 FEET

38.3	39.1
	'AID N
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GEOLOGICAL STRENGTH INDEX: GSI 38.3' - 39.1' : 80 - 90 SHEET 15 R-2233BB / RUTHERFORD PROPOSED BRIDGE NO. 0663

CORE PHOTOGRAPHS

B1-B BOX 1 of 2: 31.1 - 39.4 FEET

B1-B BOX 2 of 2: 39.4 - 44.4 FEET



GEOLOGICAL STRENGTH INDEX: GSI 80 - 90



GEOLOGICAL STRENGTH INDEX: GSI 80 - 90

SHEET 16 R-2233BB / RUTHERFORD PROPOSED BRIDGE NO. 0663