JITHORE

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STATE	STATE PROJ	ECT REFERENCE NO.	SHEET NO.	TOTAL
N.C.	34542.1	.1 R-3421A	1	14

STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

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STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 34542.1.1 R-3421A F.A. PROJ. NHF-220(4)

COUNTY RICHMOND

PROJECT DESCRIPTION US-220 BYPASS FROM US-74 BYPASS WEST

OF ROCKINGHAM AT SR 1109 INTERCHANGE TO 0.3 MILES

SOUTH OF SR 1140

SITE DESCRIPTION LEFT & RIGHT LANE BRIDGES OVER US-74 BUS.

WEST COLLECTOR ON I-73/US-220 BYPASS BETWEEN SR 1244

AND US-74 BUS. (STA. 88+35.81 -I73-/27+16.54 -FLY-)

CAUTION NOTICE

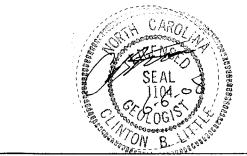
THE SUBSURFACE NFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING, AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES, AND SOIL TEST DATA ANALIABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT 1991 253-0408. NEITHER THE SUBSURFACE PLANS AND REPORTS, NOR THE FIELD BORING LOGS, ROCK CORES, OR SOIL TEST DATA ARE PART OF THE CONTRACT.

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

THE BIDDER OR CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN DN THE SUBSURFACE PLANS ARE PRELIMINATY ONLY AND IN MANY CASES THE FINAL DESIGN DETAILS ARE DIFFERENT. FOR BIDDING AND CONSENSES, RECER TO THE CONSTRUCTION PLANS AND OCCULENTS OR FINAL DESIGN INFORMATION ON THIS PROJECT. THE DEPARTMENT DOES NOT WARRANT OR CULARANTEE THE SUFFICIENCY OR ACCURACY OF THE WYESTIGATION MADE, NOR THE INTERPRETATIONS MADE, OR PORNING OF THE OF PROPERTY OF THE WYESTIGATION AS TO THE TYPE OF MATERIALS AND CONDITIONS TO BE ENCOUNTERED. THE BIDDER OR CONTRACTOR IS CAUTIONED TO MAKE SUCH INDEPENDENT SUBSURFACE INVESTIGATIONS AS HE DEEMS NECESSARY TO SATISFY HIMSELF AS TO CONDITIONS TO BE ENCOUNTEDED ON THIS PROJECT. THE FOR ANY REASON RESULTANT FROM THE ACTION THE SUBSURFACE INFORMATION.

	C.C. MURRAY
_	J.E. ESTEP
_	
	
_	
_	
-	
INVESTIGATED BY	C.C. MURRAY
CHECKED BY	C.B. LITTLE
SUBMITTED BY	C.B. LITTLE
DATE	
VR / L	

PERSONNEL



DRAWN BY: J.K. McCLURE /R.Q. CALLAWAY

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

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

PROJECT REFERENCE NO. 34542.I.I R-342IA

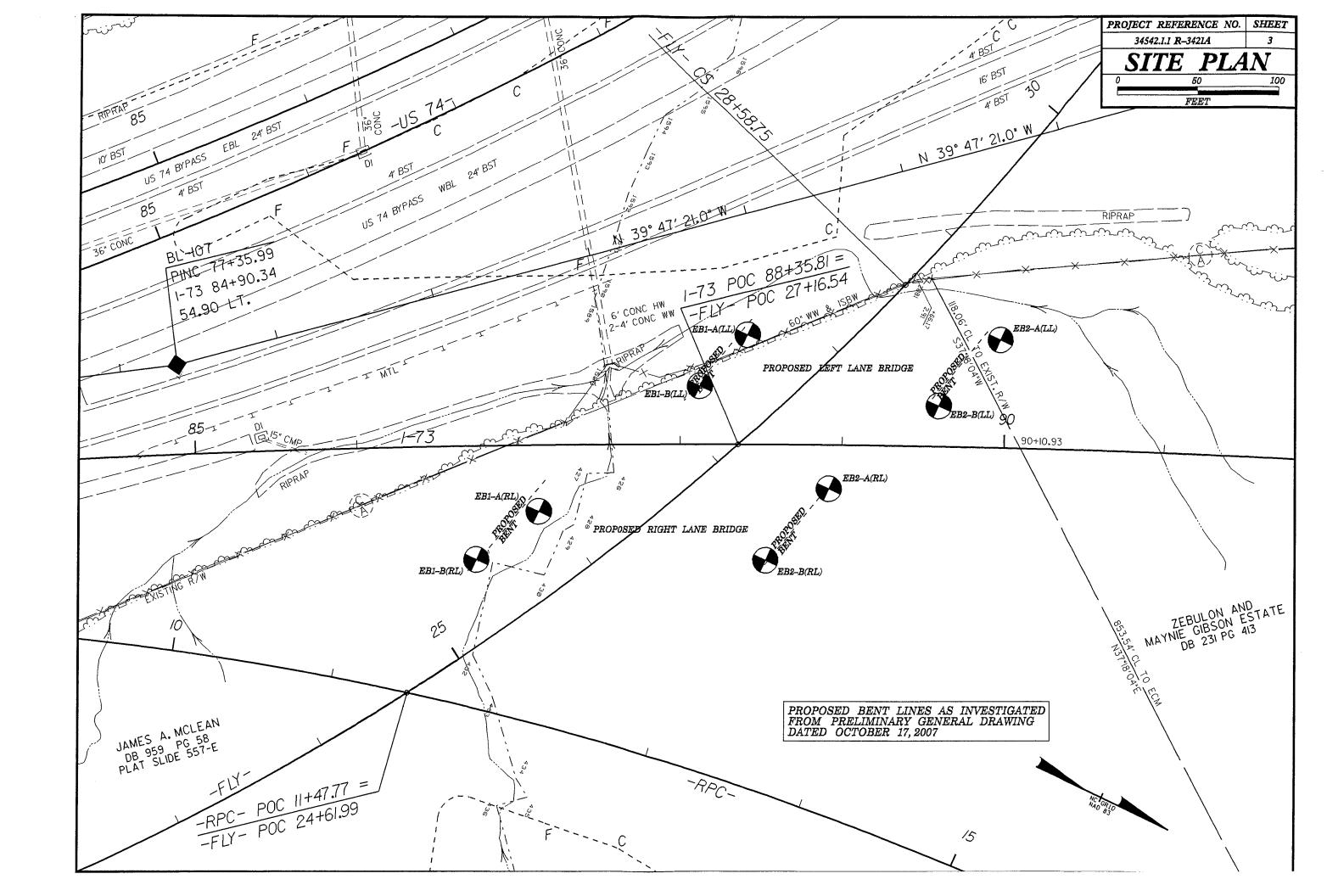
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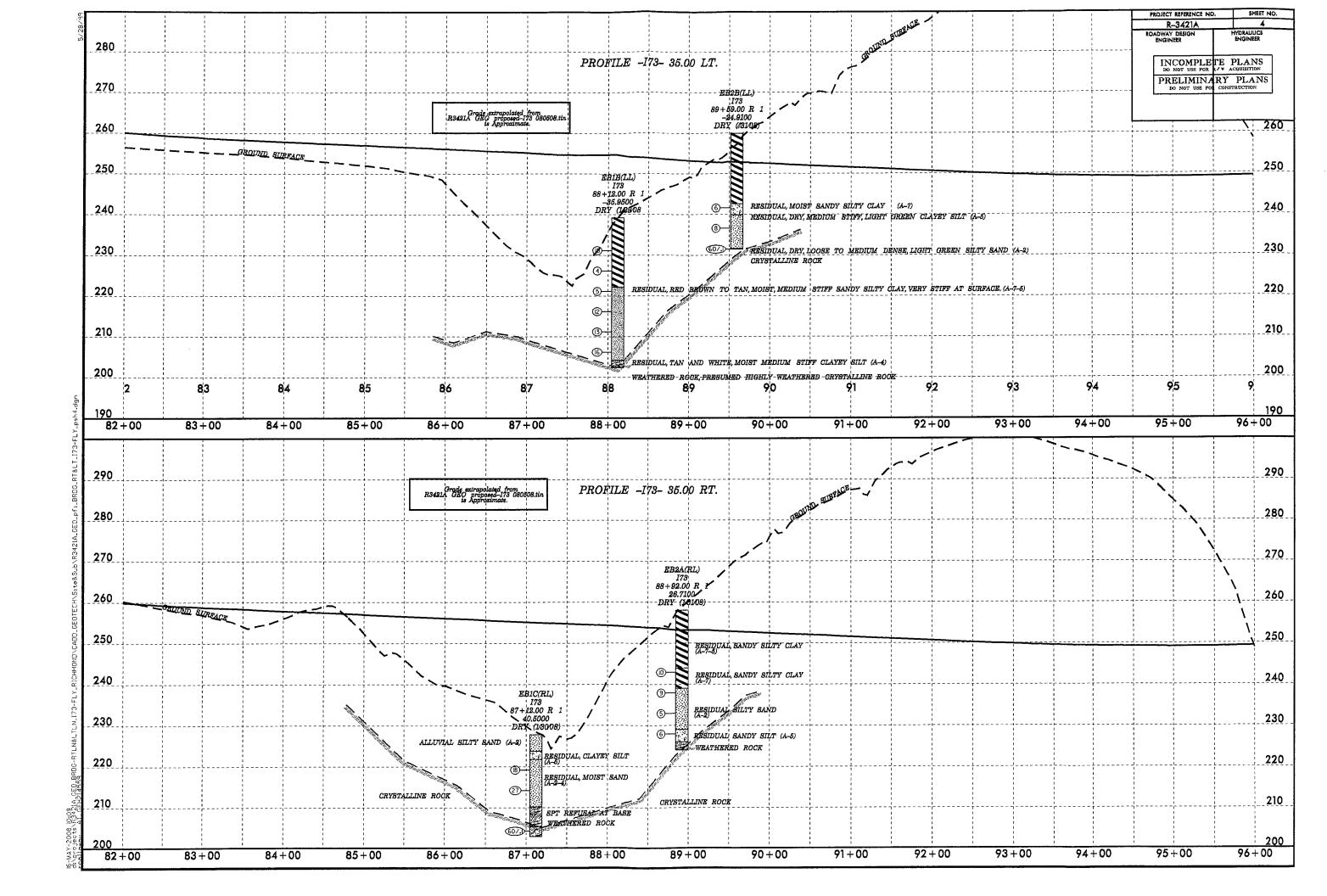
DIVISION OF HIGHWAYS

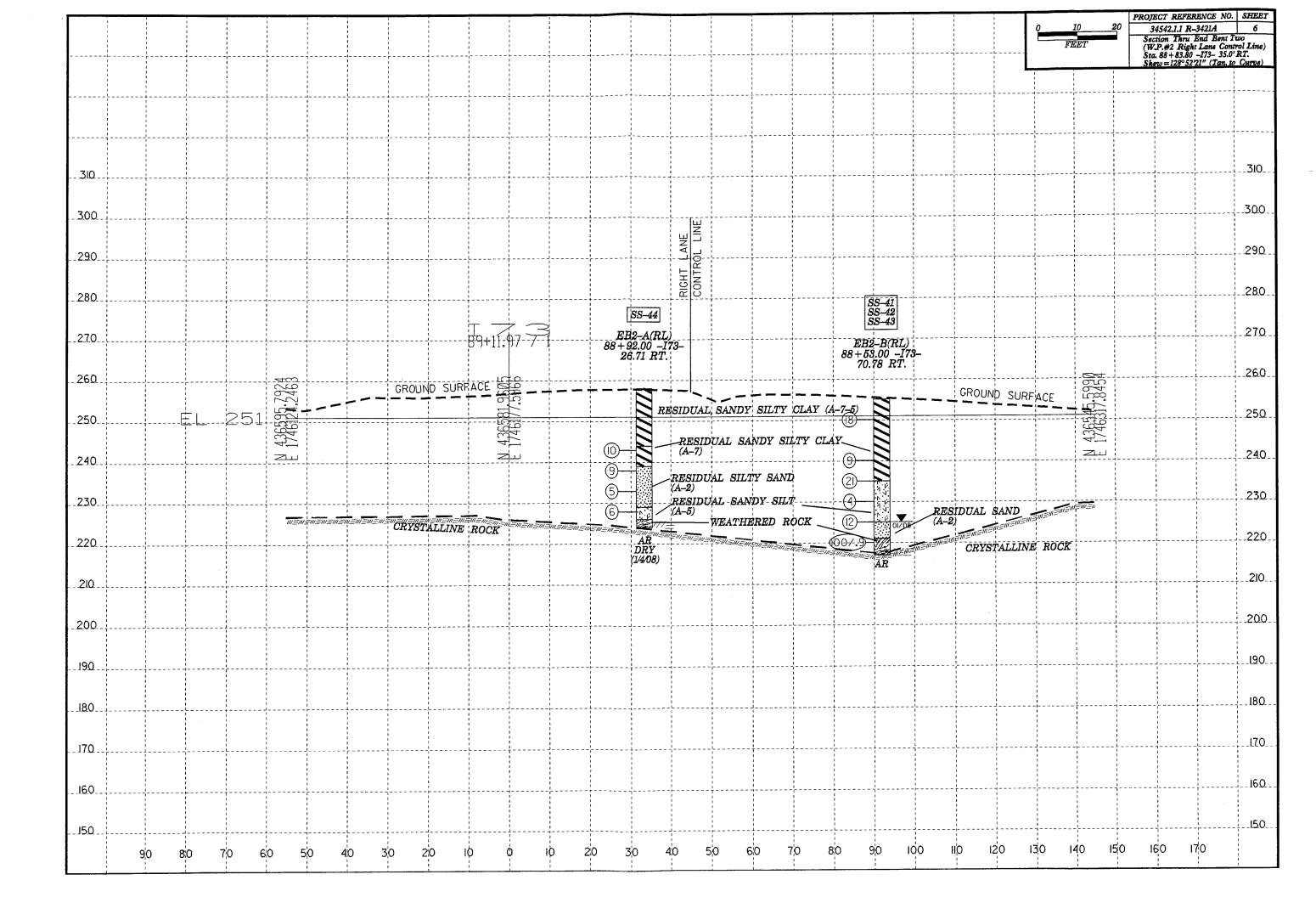
GEOTECHNICAL ENGINEERING UNIT

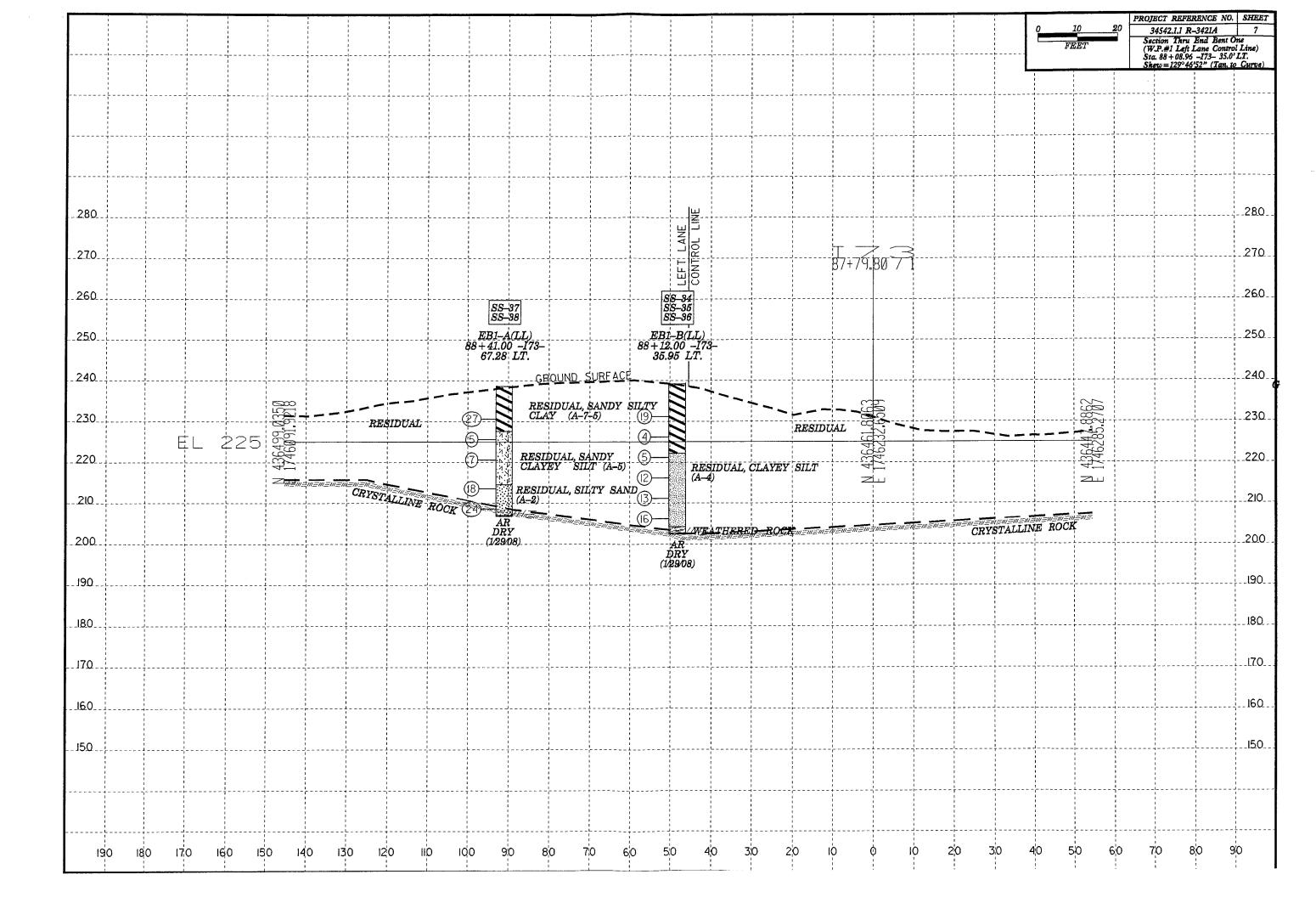
SUBSURFACE INVESTIGATION

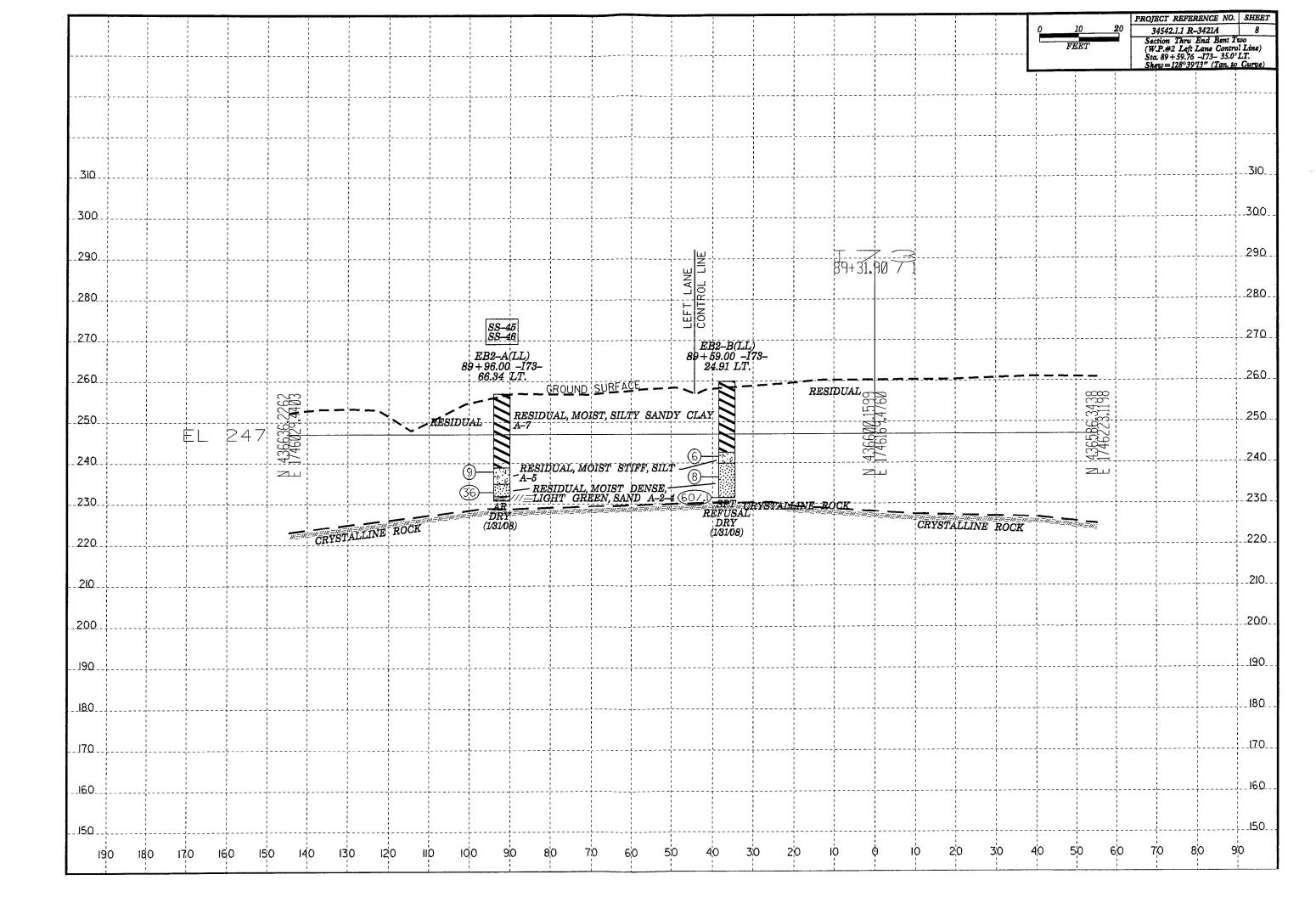
					CK LEGEND, TERM	is, symbols				
	SOIL DESCRIPTION		WELL GRADED - INDICATES A	GRADATION GOOD REPRESENTATION OF PARTICLE SIZES	EDDM EINE TO COAPEE	HODD BOOK TO HO		DESCRIPTION	ICAL AN INCEPDED	TERMS AND DEFINITIONS
SOIL IS CONSIDERED TO BE THE UNCONS THAT CAN BE PENETRATED WITH A CONT				GOOD REPRESENTATION OF PARTICLE SIZES I DIL PARTICLES ARE ALL APPROXIMATELY TH		ROCK LINE INDICA	TES THE LEVEL AT WHICH NON	HAT IF TESTED, WOULD YIELD SPT REFU IN-COASTAL PLAIN MATERIAL WOULD YIEL	LD SPT REFUSAL.	ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.
180 BLOWS PER FOOT ACCORDING TO STA CLASSIFICATION IS BASED ON THE AASH	ANDARD PENETRATION TEST (AASHT	TO T206, ASTM D-1586), SDIL		EXTURE OF UNIFORM PARTICLES OF TWO OR		IN NON-COASTAL I	LAIN MATERIAL, THE TRANSIT	OON SAMPLER EOUAL TO OR LESS THAN ' TION BETWEEN SOIL AND ROCK IS OFTEI		ACQUIFER - A WATER BEARING FORMATION OR STRATA. ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.
CONSISTENCY, COLOR, TEXTURE, MOISTURE, AS MINERALOGICAL COMPOSITION, ANGULA	AASHTO CLASSIFICATION AND OTH	HER PERTINENT FACTORS SUCH	THE ANCIH ARITY OF POSITIONS	ANGULARITY OF GRAINS SS OF SOIL GRAINS IS DESIGNATED BY THE		OF WEATHERED RO ROCK MATERIALS	ARE TYPICALLY DIVIDED AS FO	DLLOWS:		ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS,
	RTIT, STRUCTURE, PLASTICITY, ETC. W, MOST WITH INTERBEDDED FINE SAID LIVERS.		SUBANGULAR, SUBROUNDED, OR		IERTES ANGULAK	WEATHERED DOCK (MP)		PLAIN MATERIAL THAT WOULD YIELD S	PT N VALUES > 100	OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC.
	AND AASHTO CLASS			MINERALOGICAL COMPOSITION		ROCK (WR)	BLOWS FER FI	FOOT 1F TESTED. RSE GRAIN IGNEOUS AND METAMORPHIC F	ROCK THAT	ARTIESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE
GENERAL GRANULAR MATERIA CLASS. (≤35% PASSING *2			MINERAL NAMES SUCH AS DUAM WHENEVER THEY ARE CONSIDER	RTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE	USED IN DESCRIPTIONS	CRYSTALLINE RDCK (CR)		SPT REFUSAL IF TESTED, ROCK TYPE I		GROUND SURFACE.
		A-7 A-1, A-2 A-4, A-5	WHENEVER THE TAKE CONSIDER	COMPRESSIBILITY		NON-CRYSTALLINE	FINE TO COAR	RSE GRAIN METAMORPHIC AND NON-COAST		CALCAREOUS CCALC.: - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE. COLLUVIUM - ROCK FRACMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM
CLASS. A-1-0 A-1-b A-2-4 A-2	-5 A-2-6 A-2-7	A-7-5 A-3 A-6, A-7	SLIGHTLY COMPRESS		LESS THAN 31	ROCK (NCR)	INCLUDES PHY	ROCK THAT WOULD YEILD SPT REFUSAL YLLITE, SLATE, SANDSTONE, ETC.		OF SLOPE.
SYMBOL DOOGGOOG			MODERATELY COMPR HIGHLY COMPRESSIB	ESSIBLE L10UID L1MIT LE L10UID L1MIT	EDUAL TO 31-50 GREATER THAN 50	COASTAL PLAIN SEDIMENTARY ROCK	COASTAL PLAN	IN SEDIMENTS CEMENTED INTO ROCK, BU' . ROCK TYPE INCLUDES LIMESTONE, SAND	T MAY NOT YIELD ISTONE, CEMENTED	CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RLIN AND EXPRESSED AS A PERCENTAGE.
% PASSING		SILT- MURY		PERCENTAGE OF MATERIA		(CP)	SHELL BEDS, E	ETC.		DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT
* 10 58 MX * 40 38 HX 58 MX 51 MN		CLAY PEAT	ORGANIC MATERIAL	GRANULAR SILT - CLAY SOILS SOILS	OTHER MATERIAL] 		EATHERING		ROCKS OR CUTS MASSIVE ROCK.
= 200 15 MX 25 MX 10 MX 35 MX 35	HX 35 HX 35 HX 36 HN 36 HN 36 HN	N 36 MN SOILS SOILS	TRACE OF ORGANIC MATTER	2 - 3% 3 - 5% TR/	ACE 1 - 10%		RESH, CRYSTALS BRIGHT, FEW	JOINTS MAY SHOW SLIGHT STAINING. RO	DCK RINGS UNDER	DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.
LIDUID LIMIT 48 MX 41 M PLASTIC INDEX 6 MX NP 18 MX 18 I	N 40 MX 41 MN 40 MX 41 MN 46 MX 4X 11 MN 11 MN 10 MX 10 MX 11 MN	STATE SOILS WITH	MODERATELY DRGANIC	5 - 10% 12 - 20% SON				AINED, SOME JOINTS MAY SHOW THIN CL		DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF
GROUP INDEX 8 8 8	4 MX 8 MX 12 MX 16 MX	HIGHLY	HIGHLY ORGANIC		GHLY 35% AND ABOVE		RYSTALLINE NATURE.	FACE SHINE BRIGHTLY, ROCK RINGS UNDI	EK HAMMEK BLUWS IF	THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.
DOLLA TARTE CTORE ERACE		AMOUNTS OF SOILS	✓ WATER LE	GROUND WATER VEL IN BORE HOLE IMMEDIATELY AFTER I	DOTI L THE			AINED AND DISCOLORATION EXTENDS INT CLAY, IN GRANITOID ROCKS SOME OCCAS		FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.
DE MATOR CRAVEL AND FINE SILIT	OR CLAYEY SILTY CLA AND SAND SOILS SOI		l <u></u>	ATER LEVEL AFTER 24 HOURS	DRILLING			ED. CRYSTALLINE ROCKS RING UNDER HA		FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.
GEN. RATING		FAID TO	√n	 -				DW DISCOLORATION AND WEATHERING EFF ARE DULL AND DISCOLORED, SOME SHOW		FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM
AS A EXCELLENT TO GOO	DD FAIR TO POO	OR FAIR TO POOR UNSUITABLE		WATER, SATURATED ZONE, OR WATER BEARI	ING SIRAIR	DULL 9	DUND UNDER HAMMER BLOWS A	AND SHOWS SIGNIFICANT LOSS OF STRE		PARENT MATERIAL. FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY
PI OF A-7-5 SUBGROUP IS	≤ LL - 30 ; PI OF A-7-6 S	SUBGROUP IS > LL - 30	OM- SPRING DI	R SEEP		1	RESH ROCK. ICK EXCEPT QUARTZ DISCOLORI	RED OR STAINED. IN GRANITOID ROCKS, A	ALL FELDSPARS DULL	THE STREAM.
	ISTENCY OR DENSEN			MISCELLANEOUS SYMBOLS		SEVERE AND DI	SCOLORED AND A MAJORITY SI	SHOW KAOLINIZATION. ROCK SHOWS SEVER DLOGIST'S PICK, ROCK GIVES "CLUNK" SOL	RE LOSS OF STRENGTH	FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.
PRIMARY SOIL TYPE COMPACTNE	ENCY PENETRATION RESISTS	ENCE COMPRESSIVE STRENGTH	ROADWAY EMBANKI WITH SOIL DESCR		NG SAMPLE DESIGNATIONS	IF TES	TED. NOULD YIELD SPT. REFUSA		UND WHEN STRUCK,	JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.
VEDV LOC	(K-VALUE)	(TONS/FT ²)	H H		S - BULK SAMPLE	00.00.0		RED OR STAINED. ROCK FABRIC CLEAR AN GRANITOID ROCKS ALL FELDSPARS ARE K		LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO
GRANII AR LOOSE	4 TD 10	N/A	SOIL SYMBOL	AUGER BORING	SS - SPLIT SPOON	EXTEN.	. SOME FRAGMENTS OF STRON	NG ROCK USUALLY REMAIN.	MADEINIZED TO SOME	ITS LATERAL EXTENT.
MATERIAL MEDIUM (MON-COHESIVE) DENSE	30 TO 50	100	ARTIFICIAL FILL THAN ROADWAY EN		SAMPLE	1	TED. YIELDS SPT N VALUES >	<u>1990 BPF</u> RED OR STAINED, ROCK FABRIC ELEMENT:	e and nighthamble but	LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS. MOTTLED (MOT.) - BREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS, MOTTLING IN
VERY DEN			- INFERRED SOIL BO	Y	ST - SHELBY TUBE SAMPLE	(V SEV.) THE MA	ASS IS EFFECTIVELY REDUCED	TO SOIL STATUS, WITH ONLY FRAGMENT	IS OF STRONG ROCK	SDILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.
GENERALLY SOFT	T <2 2 TO 4	<0.25 0.25 TD 0.50	INFERRED ROCK L	"" MONITORING WE	LL RS - RDCK SAMPLE			LE OF ROCK WEATHERED TO A DEGREE : ABRIC REMAIN. <i>IF TESTED YIELDS SPT</i>		<u>PERCHED WATER</u> - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.
SILT-CLAY MEDIUM S MATERIAL STIFF	STIFF 4 TO 8 8 TO 15	0.5 TO 1.0 1 TO 2	_	A PIEZUMETER	RT - RECOMPACTED TRIAXIAL	COMPLETE ROCK R		IC NOT DISCERNIBLE, OR DISCERNIBLE OF		RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.
(COHESIVE) VERY STI		2 TO 4	TTT## ALLUVIAL SOIL BO	SLOPE INDICATE			RED CONCENTRATIONS. DUARTZ N EXAMPLE,	Z MAY BE PRESENT AS DIKES OR STRIN	GERS, SAPROLITE IS	ROCK QUALITY DESIGNATION (ROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND
	XTURE OR GRAIN SIZ	75	26/026 DIP & DIP DIRECT ROCK STRUCTURES		CBR - CALIFORNIA BEARING RATIO SAMPLE		ROCI	K HARDNESS		EXPRESSED AS A PERCENTAGE.
			SOUNDING ROD	SPT N-VALUE				OR SHARP PICK. BREAKING OF HAND SPEC	CIMENS REQUIRES	SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.
U.S. STD. SIEVE SIZE OPENING (MM) 4.	4 10 40 60 .76 2.00 0.42 0.25	200 270 9.075 9.053	South Hop	REF SPT REFUSAL			AL HARD BLOWS OF THE GEOL	LOGIST'S PICK. YICK ONLY WITH DIFFICULTY. HARD HAMM	AED DI ONE DECITOED	SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND
BOULDER COBBLE GRA	COARSE COARSE	FINE SILT CLAY	AR - AUGER REFUSAL	ABBREVIATIONS	w - MOISTURE CONTENT		TACH HAND SPECIMEN.	TEK ORET WITH DIFFICUETT. HAND HAND	TEN BEOWS REGULARD	RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.
	D. SAND	SAND (SL.) (CL.)	BT - BORING TERMINATED	MED MEDIUM	V - VERY			ICK, GOUGES OR GRODVES TO 0.25 INCH		SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR
GRAIN MM 305 75	2.0 0.25	0.05 0.005	CL CLAY CPT - CONE PENETRATION T	MICA MICACEOUS IEST MOD MODERATELY	VST - VANE SHEAR TEST WEA WEATHERED	BY MO	DERATE BLOWS.			SLIP PLANE,
SIZE IN. 12 3	IDE CODDEL ATTOM	OF TERMS	CSE CDARSE DMT - DILATOMETER TEST	NP - NON PLASTIC ORG ORGANIC	7 - UNIT WEIGHT 7 - DRY UNIT WEIGHT			INCHES DEEP BY FIRM PRESSURE OF KN S TO PEICES I INCH MAXIMUM SIZE BY		STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (6PT) - NUMBER OF BLOWS (N OR BPF) OF A 148 LB. HAMMER FALLING 38 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH
SOIL MOISTURE SCALE	FIELD MOISTURE CHIPS		DPT - DYNAMIC PENETRATIO	N TEST PMT - PRESSUREMETER TEST	\d om om #cion	POINT	OF A GEOLOGIST'S PICK.			A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER, SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.
(ATTERBERG LIMITS)	DESCRIPTION	FOR FIELD MOISTURE DESCRIPTION	• - VOID RATIO F - FINE	SAP SAPROLITIC SD SAND, SANDY				.Y BY KNIFE OR PICK. CAN BE EXCAVATE N SIZE BY MODERATE BLOWS OF A PICK		STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH
		LLY LIQUID; VERY WET, USUALLY	FDSS FDSSILIFEROUS FRAC FRACTURED, FRACTU	SL SILT, SILTY		PIECE	S CAN BE BROKEN BY FINGER	PRESSURE.		OF STRATUM AND EXPRESSED AS A PERCENTAGE. STRATA ROCK QUALITY DESIGNATION (SROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY
בנ בוסטוס בואוד	(SAT.) FROM	1 BELDW THE GROUND WATER TABLE	FRAGS FRAGMENTS	TCR - TRICONE REFUSAL				BE EXCAVATED READILY WITH POINT OF OKEN BY FINGER PRESSURE. CAN BE SCF		TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM COUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.
PLASTIC RANGE		SOLID; REQUIRES DRYING TO	EOLI	PMENT USED ON SUBJECT P	PROTECT	FINGE	RNAIL.	BEDDING		TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
(P)) PL PLASTIC LIMIT _	ATTAI	NIN OPTIMUM MOISTURE			HAMMER TYPE:	IERM	RE SPACING SPACING	IERM BEDUING	THICKNESS	BENCH MARK:
OM OPTIMUM MOISTURE	- MOIST - (M) SOLI	.ID, AT OR NEAR OPTIMUM MOISTURE	DRILL UNITS:	ADVANCING TOOLS:	X AUTOMATIC MANUAL	VERY WIDE	MORE THAN 10 FEET	VERY THICKLY BEDDED THICKLY BEDDED	> 4 FEET 1.5 - 4 FEET	оснот гидих.
OM _ DPTIMUM MDISTURE SL _ SHRINKAGE LIMIT	110101 1/11 0001		MOBILE B	CLAY BITS		WIDE MODERATELY CLOS	3 TO 10 FEET E 1 TO 3 FEET	THINLY BEDDED	0.16 - 1.5 FEET	ELEVATION: FT.
		IRES ADDITIONAL WATER TO		6' CONTINUOUS FLIGHT AUGER	CORE SIZE:	CLOSE VERY CLOSE	0.16 TO 1 FEET LESS THAN 0.16 FEET	THICKLY LAMINATED		NOTES:
	нин	IN OPTIMUM MOISTURE	BK-51	X 8 HOLLOW AUGERS		VEITI CEUSE		THINLY LAMINATED	< 0.008 FEET	
	PLASTICITY		CME-45C	HARD FACED FINGER BITS		FOR SEDIMENTARY BOT		DURATION ENING OF THE MATERIAL BY CEMENTING,	HEAT, PRESSURE, FTC.	
NONPLASTIC	PLASTICITY INDEX (PI) 0-5	DRY STRENGTH VERY LOW	X CME-550	X TUNGCARBIDE INSERTS				NG WITH FINGER FREES NUMEROUS GRAIN		
LOW PLASTICITY	6-15	SLIGHT	□ CME-33W	X CASING X W/ ADVANCER	HAND TODLS:	FRIABLE		E BLOW BY HAMMER DISINTEGRATES SAN		
MED. PLASTICITY HIGH PLASTICITY	16-25 26 OR MORE	MEDIUM H1GH	PORTABLE HOIST	TRICONE STEEL TEETH	POST HOLE DIGGER	MODERATEL		S CAN BE SEPARATED FROM SAMPLE WIT S EASILY WHEN HIT WITH HAMMER.	TH STEEL PROBE;	
	COLOR			X TRICONE 215/6 TUNGCARB.	HAND AUGER	tunun.		5 EASILT WHEN HI! WITH HAMMEN. 5 ARE DIFFICULT TO SEPARATE WITH ST	TEEL PROBE.	
DESCRIPTIONS MAY INCLUDE COLOR O	R COLOR COMBINATIONS (TAN, F	RED, YELLOW-BROWN, BLUE-GRAY).		CORE BIT	SOUNDING ROD	INDURATED		CULT TO BREAK WITH HAMMER.	ILLE I NODE;	
MODIFIERS SUCH AS LIGHT, DARK,	STREAKED, ETC. ARE USED TO D	DESCRIBE APPEARANCE.	□		VANE SHEAR TEST	EXTREMELY		HAMMER BLOWS REQUIRED TO BREAK SEE BREAKS ACROSS GRAINS.	AMPLE;	
· · · · · · · · · · · · · · · · · · ·						1	SAMPLE	C BUTHLO HOUGO OUHINO.		









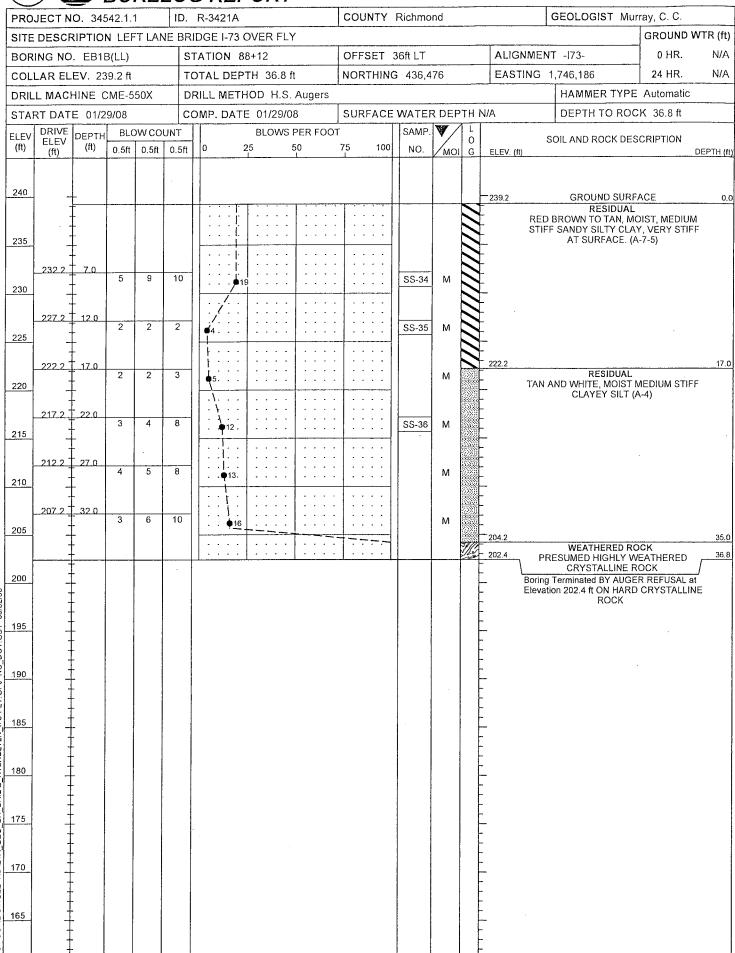




PRO	JECT	NO. 34	1542.1	.1	10). —	R-3421A	COUNTY	Richmo	nd			GEOLOGIST Mu	rray, C. C.	
SITE	DESC	RIPTIC	ON LE	FT LA	NE E	3RI	IDGE I-73 OVER FLY							GROUND W	/TR (f
BOR	ing N	O. EB	1A(LL)			ST	TATION 88+41	OFFSET 6	7ft LT			ALIGNMEN	T -173-	0 HR.	N/A
COL	LAR E	LEV. 2	238.6 f	t		TC	OTAL DEPTH 31.8 ft	NORTHING	436,4	89		EASTING	1,746,146	24 HR.	N//
DRIL	L MA	CHINE	CME-	550X		DF	RILL METHOD H.S. Augers						HAMMER TYPE	E Automatic	
STA	RT DA	TE 01/	29/08			CC	OMP. DATE 01/29/08	SURFACE	WATER	R DE	PTH I	N/A	DEPTH TO ROO	CK 31.8 ft	
ELEV	DRIVE ELEV	, ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	H BL	ow cc	UNT		BLOWS PER FOOT		SAMP.	V	0 7	ç	SOIL AND ROCK DES	SCRIPTION	
(ft)	(ft)	(ft)	0.5ft	0.5ft	0.5	ift	0 25 50	75 100	NO.	MC		ELEV. (ft)			EPTH (
										E					
240		+													
				-		+				 		- 238.6 -	GROUND SURF RESIDUAL		
235		‡				ł						- RED	BROWN, VERY STI SANDY SILTY CLA	IFF RESIDUAL Y (A-7-5)	
		4	ŀ									- -			
	231.6	7.0		10	45				<u></u>			-			
230		Ŧ	7	12	15	,	27	 	SS-37	М		-			
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225	_226_6	<u>+ 12.0</u>	3	2	3	-	•5· · · · · · · · · · · · · · · ·			м	7 7	- TAN	MEDIUM STIFF SA	NDY CLAYEY	
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	221.6	17.0	2	3	4	_			00.00		2, 1	-			
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		Ŧ	1								1	_			
215	_214.6	24.0									12.7	- 214.6			24.
	2.14.0.	1	4	6	12		18			М		-	RESIDUAL IUM DENSE 'OLIVE'	GREEN SILTY	
		<u> </u>				İ						- -	SAND(A-2)	ONEEN GIET	
210	209.6	29.0	4	7	17	\dashv				М		 -			
		<u> </u>	<u> </u>				<u> </u>	· · · · ·		144		207.0			31.
205		‡											WEATHERED RO ESUMED HIGHLY W	/EATHERED	\31.
		‡										- L Boring	CRYSTALLINE R Terminated BY AUGE	R REFUSAL at	
200		‡										- Elevati -	on 206.8 ft ON HARD ROCK) CRYSTALLINE	=
200	•	‡										 -			
		‡										.			
195		‡				ı						-			
		‡										-			
190		‡										•			
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185		‡										-			
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180		Ŧ										· ·			
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175	-	Ŧ										<u></u>			
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170		Ī									F	· ·			
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165	-	\pm									F	-			
		$\frac{1}{1}$									E				
160		Į									1 [









PRO.	JECT N	0. 34	542.1.1		ID.	R-3421A		COUNTY	Richmo	na			SEOLOGIST Mu		
SITE	DESC	RIPTIO	N LEF	T LAN	IE BRI	IDGE I-73 OVER FL	Y							GROUND W	/TR (f
BOR	ING NO	. EB2	A(LL)		s ⁻	TATION 89+96		OFFSET	66ft LT			ALIGNMENT	-173-	0 HR.	N/.
COLI	LAR EL	EV. 25	6.9 ft		TO	OTAL DEPTH 26.1	ft	NORTHING	3 436,6	32		EASTING 1	,746,083	24 HR.	N/.
DRIL	L MAC	HINE (CME-5	50X	DI	RILL METHOD H.S.	Augers						HAMMER TYPE	Automatic	
STAF	RT DAT	E 01/3	1/08		C	OMP. DATE 01/31/0)8	SURFACE	WATE	R DEPT	H N	/A	DEPTH TO RO	CK 26.1 ft	
ELEV	DRIVE	DEPTH	BLC	W COI	JNT	BLOWS	PER FOOT		SAMP.	V	L	S	DIL AND ROCK DE	SCRIPTION	
(ft)	ELEV (ft)	(ft)	0.5ft	0.5ft	0.5ft	0 25	50	75 100	NO.		G	ELEV. (ft)			DEPTH
260	-											256.9	GROUND SURI		
255		-									7	М	RESIDUAL OIST, SILTY SAND		
250	-								-			-	001, 0111 0 110		
240_	238.9	18.0	5	5	4				SS-45	м		238.9	RESIDUAL		1
235	233.9	23.0	7	6	30				SS-46	M		_234.9 	MOIST STIFF, SI RESIDUAL ST DENSE, LIGHT (2
230	-	 						† <u>-</u>		M		Boring	A-2-4 WEATHERED R ESUMED HIGHLY N CRYSTALLINE Terminated BY AUG on 230.8 ft ON HAR	NEATHERED ROCK FR REFUSAL at	
225	-	† - -									- - -	Elevatii	on 230.8 ft ON HAR ROCK	D CR15 IALLIN	IC.
220	-	† † + + +									-	- -			•
215	_	+ - - - -									- - - -	· · - ·			
210	_	 										· - ·			
205	-	 									- - - -	-			
200	-	† †									- - - -	· - - ·			
195	-	† + + 1									<u> </u>	• • • •			
190_	_	<u> </u> 										· · -			
185	_	<u> </u>										- - -			



						G REPC)	1					T		
	JECT N					R-3421A		COUNTY	Richmo	nd			GEOLOGIST M		
SITE	DESCR	RIPTIOI	N LEF	TLAN		DGE I-73 OVI		1				T		GROUND W	
BOR	ING NO	. EB2	3(LL)			TATION 89+5		OFFSET				ALIGNME		0 HR.	N/A
	LAR EL					OTAL DEPTH		NORTHIN	G 436,6	15		EASTING		24 HR.	N/A
DRIL	L MACI	HINE C	ME-5	50X			D H.S. Augers	 _					HAMMER TYP		
STAF	RT DAT		1/08		C	OMP. DATE (SURFACE			4	/A	DEPTH TO RO	OCK 28.3 ft	
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (fl)	BLC 0.5ft	0.5ft		0 25	SLOWS PER FOO	75 100	SAMP. NO.	MOI	O G	ELEV. (ft)	SOIL AND ROCK DE		DEPTH (ft
260	-											259.9	GROUND SUF RESIDUA		0.0
	-	+									1		MOIST SANDY SI (A-7)		
255		+											(()		
233	-	+				1						-			
		+													
250	-	+										-			
	-	‡													
245	-	+													
245	-	<u> </u>				1						242.6			17.3
	242 6 -	17.3	2	3	3	1				М	17		RESIDUA RY, MEDIUM STIFF,		17.0
240	_	+									11	239.9	CLAYEY SILT	(A-5)	
	237.6	22.3										DRY	RESIDUA , LOOSE TO MEDIU	M DENSE, LIGH	T
235	-	-	4	4	4	. •8				М			GREEN SILTY SA	AND (A-2)	
233	-	+		,								-			
	232.6	27.3	2	33	60/.1		\:+	60/.1	,	М		231.6	CRYSTALLINE	POCK	28.3
230	-	_						our. i				- В	oring Terminated WIT	H STANDARD] (_20.4
		‡			:						F	Elev	PENETRATION TEST vation 231.5 ft IN HAR	FREFUSAL at RD CRYSTALLIN	E .
225	-	‡											ROCK		
223	-	‡										-			
	-	+													
220	-	‡										_			
		‡													
245		-													
215	-	‡										-			
	-	‡													
210	-	_							ŀ			-			
	-	‡										•			
	-	‡										•			
205	-	<u> </u>										-			
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200	-	Ł													
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195	-	<u> </u>										_ ,			
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190]	<u> </u>													
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185	_	-													
	-	†									F	•			
190	-	‡										· ·			

RO.	JECT NO	0. 345	542.1.	1	ID.	R-3421A	\		COUNTY	Richmo	nd		GEOLO	GIST Murray, C. C.	
SITE	DESCR	IPTIO	N RIC	SHT LA	NE B	RIDGE I-	73 OVER F	LY						GROUND WT	ľR (f
BORI	NG NO.	EB1	B(RL)		S.	TÄTION	86+73		OFFSET	69ft RT			ALIGNMENT -I-73-	0 HR.	N/A
OLL	AR ELE	EV. 23	31.5 ft		T	OTAL DE	PTH 27.2	ft	NORTHIN	G 436,3	96		EASTING 1,746,34	1 24 HR.	4.6
RIL	L MACH	IINE (ME-5	50X	D	RILL ME	THOD NW	Casing wa	Advancer				HAMM	MER TYPE Automatic	
TAF	RT DATE	E 01/3	80/08		C	OMP. DA	TE 01/30/0	08	SURFACE	WATE	R DEP	TH N	/A DEPT	H TO ROCK 27.2 ft	
LEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	0.5ft	0.5ft	·	0	BLOWS	PER FOOT	75 100	SAMP.	моі	L O G	SOIL AND	ROCK DESCRIPTION DE	EPTH (
235	1	<u>-</u> -								-					
	1	- - -				1 1		T	· · · · · ·					UND SURFACE ALLUVIAL	(
230	4	-				1		 	 					SE COARSE SAND (A-2) RESIDUAL	2
	†	-				<u> </u>		1::::						RED BROWN CLAY (A-7)	
225	_	-													
-	223.3	8.2			2	HI::::				00.40			223.3	RESIDUAL	8
	1		0	1	2	∮3				SS-40	M			RED BROWN CLAYEY SILT	
20	1	-				1 1		+	 		İ			(A-5)	
ŀ	218.3	13.2_	4	5	5	. 10		: : : :			М				
15												1,让			
-	1	-				: : : `			1						
	Ŧ	-	:				<u> </u>								
10	210.4	21_1	6	15	22		37				М	以上			
	Ŧ						.	†							
05	205.4	26.1							`\~· ·		м		204.4		2
-		-	7	58	100/.1				100/.1	•	IVI	7	204.3./ WEA	THERED ROCK SEVERELY WEATHERED	_2
	Ŧ					•							CRY:	STALLINE ROCK	
00	7	-										1 E	Boring Ter Penetration Tes	minated with Standard t Refusal at Elevation 204.3	
	Ŧ	-										E	ft ON HARI	CRYSTALLINE ROCK	
95	‡										:	E			
	7	-										E			
	Ŧ											l			
90	‡	-										F			
	‡											F			
85	‡											F			
	1											F			
	‡											F			
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	‡									1		-			
7.5	‡														
75	+	-										-			
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	7											<u> </u>			
65	‡	-										[
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	+														
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SHEF

PRO	JECT N	O. 34	542.1.	1	ID.	R-3	3421A				COU	NTY	Rich	mon	nd			G	EOLOGIST Mu		
SITE	DESCF	RIPTIO	N RIC	SHT LA	NE B	RID	GE I-73	OVER	FLY				······							GROUND W	
3OR	ING NO	. EB1	C(RL)		s	TAT	ION 8	7+12			OFF	SET	41ft F	₹T			ALIGNME			0 HR.	N/A
COL	LAR EL	EV. 22	27.8 ft		Т	ОТА	L DEP	TH 24.	9 ft		NOR	THIN	G 43	6,41	18		EASTING	1,		24 HR.	N//
DRIL	L MAC	HINE (CME-5	50X	D	RILI	MET	HOD N	N Ca	asing w/	Adva	ncer							HAMMER TYPE	E Automatic	
STAI	RT DAT	E 01/3	80/08		С	ОМЕ	P. DAT	E 01/30	0/08		SUR	FACE	WA.	TER	DEF	РΤΗ	N/A		DEPTH TO RO	CK 22.5 ft	
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	0.5ft	0.5ft		0		BLOW 25	/S PE 50	R FOOT	75 	100	SAI N	- 1	MO	0 1 G	ELEV. (ft)	sc	DIL AND ROCK DE		ĖPTH (
230	- - -	-						1								3000	227.8		GROUND SURI		(
225	-	-					: : : -				1	• •					LOC 223.8	SE	MOIST CLAYEY S		?) 4
220	220.2	7.6							-							7 2		EDI	RESIDUAL UM STIFF, MOIST, (A-5)	CLAYEY SILT	6
	-		8	9	9		• 18		-				SS-	-39	М		М	ΞDI	RESIDUAL JM DENSE, MOIS	SAND (A-2-4)	
215	215.2	12.6	6	12	15			27				· ·			M						
210	- - -					: -				- · · · ·							210.2 SEV	/EF	WEATHERED R		17.
205	205.2	22.6	80	60/.1											М		205.3	RC	CRYSTALLINE F		22
			ļ	· .		Ш:	· · ·			· · · ·		60/.1				بتحصير	202.9	Boi	ing Terminated WIT	H CASING	24
200	-	-															E ADV	/AN	CER REFUSAL at HARD CRYSTALL	Elevation 202.9	ft
195	-																-				
190	-																-				
	-																-				
185	- - -	-															-				
180	- - -	-															- - - -				
175	- - -	-				*											- - - -				
170	-	-															-				
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165	-	- - -															 - -				
160	- - -	- - -								÷			:				- - -				
155	- - -	 -															- - -				
	-	- -															-				



PRO.	JECT N	IO. 34	542.1.	.1	ال).	R-3421A	COUNTY Richmond GEOLOGIST						rray, C. C.	
SITE	DESC	RIPTIO	N RIC	GHT L	ANE	BR	RIDGE 1-73 OVER FLY							GROUND W	/TR (1
BOR	NG NO	. EB2	B(RL)			ST	ATION 88+53	OFFSET 7	1ft RT			ALIGNMEN	Г -1-73-	0 HR.	N/A
COLI	AR EL	EV. 2	55.1 ft			то	OTAL DEPTH 38,0 ft	NORTHING	436,5	58		EASTING 1	,746,266	24 HR.	30.0
DRIL	L MACI	HINE (CME-5	550X		DR	RILL METHOD H.S. Augers						HAMMER TYPE	Automatic	
STAF	RT DAT	E 01/3	80/08			СО	OMP. DATE 01/30/08	SURFACE	WATE	R DEF	1 HT	I/A	DEPTH TO ROC	CK 38.0 ft	
LEV	DRIVE ELEV	DEPTH	BL	ow cc	UNT		BLOWS PER FOO	r	SAMP.	V	L	S	OIL AND ROCK DES	SCRIPTION	
(ft)	(ft)	(ft)	0.5ft	0.5ft	0.5	ft	0 25 50	75 100	NO.	МО		ELEV. (ft)			EPTH (
260	_	_												,	
	-	+										-			
	_	-										255.1	GROUND SURF	ΔCE	(
255	3									-			RESIDUAL		
	_											VERY	STIFF MOIST RED CLAY (A-7-5		
250	251.1	4.0	4	7	11	-].			м		-	·		
	-	<u> </u>													
	-	Ī					: :] : : : : : : : : :					•			
45	-	ļ	l					-				-			
	-	_										•			
40	_241_1_	14.0	7	4	5	4			SS-41			•			
40	-	<u> </u>	'	"			. %		35-41	M		-			
												•			
35	_236_1	19.0	4	7	14	1	■ 21			w		235.1	DECIDIAL		20
											1,1	SO	RESIDUAL FT WET TAN CLAYE	Y SILT (A-5)	
	231.1	24.0					:/:: :::: ::::				1, 1				
30	_	_	1	2	2		4	 	SS-42	W	1, 1	-			
	-	F					1.7				1 1				
25	226.1	29.0	3	3	9	-	1. 1		SS-43	V	1, 2,	225.1			30
	7											- '	RESIDUAL OOSE WET TAN SA	ND (A-2)	
	221.1	34.0										221.1			34
20	_		5	29	71/.4	4		100/.9				_	WEATHERED RO	OCK	
	-	-										217.1			38
15	-	-				Ī					F	Boring Elevati	Terminated BY AUGE	R REFUSAL at CRYSTALLINE	
	-	-		1									on 217.1 ft ON HARD ROCK		
	-									:					
10	_										-	-			
	_	_									-				
05	-											-			
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00	1										F	-			
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95	_‡]			_			
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185	7	_										_			
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	JECT N					R-3421A		COUNTY	Richmo	nd			GEOLOGIST N		
				HT LA			OVER FLY	T				1.1.0.1745		GROUND W	
· · · · · · · · · · · · · · · · · · ·	ING NO					TATION 8		OFFSET				ALIGNME		0 HR. 24 HR.	N/A
	LAR EL						TH 34.0 ft	NORTHING	436,5 ن	1/5		EASTING	1,746,210 HAMMER TY		N/A
	L MAC			50X			HOD H.S. Augers	SURFACE	1A/A T.T.		TU 6		DEPTH TO R		
	RT DAT		т-	ow co		JMP. DAT	E 01/31/08 BLOWS PER FOC	<u> </u>	SAMP.		11	N/A			
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	0.5ft		0.5ft	0	25 50	75 100	NO.	/	0 1 G	ELEV. (ft)	SOIL AND ROCK D		EPTH (ft)
	(11)														
260															
	-	-										258.0	GROUND SU		0.0
	-											-	RESIDUA SANDY SILTY C		
255	-	E										<u> </u>			
	-							-				<u>.</u>	-		
250	_					1 . 1						- 			
	_											<u>.</u> -			
0.45	-											- -			
245	_243.9	14.1	<u> </u>								N N	243.9	RESIDUA	NI	14.1
	-		4	4	6	10 .				М		STI	F, MOIST, SANDY		
240	-	-										- 239.0			19.0
	238.9	19 1	3	4	5	- 9				М			RESIDUA NUM STIFF, MOIST		
235	-	-				;;; ; ;						•			
	233 9	24.1	1	.2	3	1				М		- -			
	-	_	'			1				101					
230	228 9	29.1										229.0		··	29.0
	-		1	2	4	6		:	SS-44	М		MED	RESIDUA NUM STIFF MOIST		20.0
225	-	_				7775				1		226.0	WEATHERED	ROCK	32.0 34.0
		-							<u> </u>			Borin	g Terminated BY AU ation 224.0 ft ON HA	GER REFUSAL at	
220	-											- : :	ROCK		
	-	-								:		-			
	-	-								:		• •			
215												- -			
												- -			
210												-			
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205	-	_										- -			
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105	-	-									-				
195	-	-										- -			
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M & T Form 503

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAY MATERIALS & TESTS UNIT

SOILS LABORATORY

T. I. P. No.	R-3421A	nettrain			
	REPORT ON SAM	PLES OF	SOILS FOR	QUAL	JTY
Project	3454211	County	RICHMOND		Owner
Date: Sampled	1/28/08	Received	2/8/08		Reported 2/13/08
Sampled from				Ву	C C MURRAY
Submitted by	N WAINAINA				1995 Standard Specifications

743680 TO 743697 6/3/08

TEST RESULTS

Proj. Sample No.		SS-30	SS-31	SS-32	SS-33	SS-34	SS-35
Lab. Sample No.		743680	743681	743682	743683	743684	743685
Retained #4 Sieve	%	-		_	*	-	-
Passing #10 Sieve	%	100	99	100	100	100	100
Passing #40 Sieve	%	81	84	83	96	92	96
Passing #200 Sieve	%	27	28	33	60	- 77	65

MINUS NO. 10 FRACTION

SOIL MORTAR - 100%							
Coarse Sand Ret - #60	%	35.5	33.4	32.6	12.5	10.6	11.0
Fine Sand Ret - #270	%	43.6	46.5	41.8	33.9	17.1	32,8
Silt 0.05 - 0.005 mm	%	16.8	18.0	17.4	27.3	27.4	35.8
Clay < 0.005 mm	%	4.1	2.0	8.2	26.2	44.9	20.4
Passing #40 Sieve	%	-	-	, -	_	-	-
Passing #200 Sieve	%	-	-	-	-	-	-

L. L.	37	30	38	43	57	47
P. I.	NP	NP	5	15	22	13
AASHTO Classification	A-2-4(0)	A-2-4(0)	A-2-4(0)	A-7-6(8)	A-7-5(19)	A-7-5 (9)
Station	88+50	88+50	88±80	86+20	89+40	89+40
OFFSET	75 LT	75 LT	29 RT	69 RT	19 LT	19 LT
ALIGNMENT	L REV	L REV	L REV	L REV	L REV	L REV
Depth (Ft)	7.20	22.20	11.50	7.90	7.00	12.00
to	8.70	23.70	13.00	9.40	8.50	13.50

cc: CCMURRAY Soils File

Soils	Engineer

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAY MATERIALS & TESTS UNIT SOILS LABORATORY

R-3421A T. I. P. No. REPORT ON SAMPLES OF SOILS FOR QUALITY County RICHMOND 3454211 Owner Project Reported <u>2/13/08</u> Received 2/8/08 Date: Sampled 1/28/08 C C MURRAY $\mathbf{B}\mathbf{y}$ Sampled from 1995 Standard Specifications Submitted by N WAINAINA 743680 TO 743697 6/3/08 TEST RESULTS Proj. Sample No

Proj. Sample No.		SS-36	SS-37	SS-38	SS-39	SS-40	SS-41
Lab. Sample No.		743686	743687	743688	743689	743690	743691
Retained #4 Sieve	%			-	-	-	5
Passing #10 Sieve	%	100	100	100	100	100	93
Passing #40 Sieve	%	95	98	91	82	80	89
Passing #200 Sieve	%	59	73	45	27	37	76

MINUS NO. 10 FRACTION

SOIL MORTAR - 100%					· · · · · · · · · · · · · · · · · · ·		
Coarse Sand Ret - #60	%	12.6	7.3	21.8	33.6	32.2	8.2
Fine Sand Ret - #270	%	38.3	24.9	40.8	46.3	37.7	15.5
Silt 0.05 - 0.005 mm	%	36.8	29.1	29.3	16.0	21.9	27.4
Clay < 0.005 mm	%	12.2	38.7	8.2	4.1	8.2	48.9
Passing #40 Sieve	%		-	-	_	_	_
Passing #200 Sieve	%		-	-	_	-	-

L.L.	المستقدي وموا	39	53	42	36	44	56
P. I.		10	21	4	NP	6	19
AASHTO Classification		A-4(5)	A-7-5(16)	A-5(0)	A-2-4(0)	A-5(0)	A-7-5(17)
Station	3400	89+40	87+55	87+55	86+74	86+74	88+50
OFFSET		19 LT	25 LT	25 LT	20 RT	70 RT	75 RT
ALIGNMENT	······································	L REV	LREV	L REV	L REV	L REV	L REV
Depth (Ft)		22.00	7.00	17.00	7.60	8.20	14.00
	to	23.50	8.50	18.50	9.10	9.70	15.50
	, , , , , , , , , , , , , , , , , , , ,						

Soi	ls E	ngineer

M & T Form 503

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAY MATERIALS & TESTS UNIT SOILS LABORATORY

T. I. P. No.	R-3421A				
	REPORT ON SAM	IPLES OF	SOILS FOR	QUAL	JTY
Project	3454211	County	RICHMOND		Owner
Date: Sampled	1/28/08	Received	2/8/08		Reported 2/13/08
Sampled from				Ву	C C MURRAY
Submitted by	N WAINAINA				1995 Standard Specifications
743680 TO 7436 6/3/08	597				

TEST RESULTS

Proj. Sample No.		SS-42	SS-43	SS-44	SS-45	SS-46	SS-47
Lab. Sample No.		743692	743693	743694	743695	743696	743697
Retained #4 Sieve	. %	4	14	-	-	-	1
Passing #10 Sieve	%	93	83	100	100	97	92
Passing #40 Sieve	%	88	73	79	95	60	65
Passing #200 Sieve	%	52	47	38	61	20	20

MINUS NO. 10 FRACTION

SOIL MORTAR - 100%		2000 10 20 20 20 20 20 20 20 20 20 20 20 20 20					
Coarse Sand Ret - #60	%	15.5	21.8	32.8	13.7	52.6	46.3
Fine Sand Ret - #270	%	33.4	34.9	37.5	35,3	32.6	38.6
Silt 0.05 - 0.005 mm	%	30.7	20.9	21.5	38.8	10.7	12.0
Clay < 0.005 mm	%	20.4	22.4	8.2	12.2	4.1	3.1
Passing #40 Sieve	%	-	-	<u>-</u>	-		-
Passing #200 Sieve	%	-	-	-	-		-

L. L.	43	47	44	47	33	22
P. I.	9	9	3	8	NP	NP
AASHTO Classification	A-5(3)	A-5(3)	A-5(0)	A-5(5)	A-2-4(0)	A-2-4(0)
Station	88+50	88+50	88+74	89+87	89+87	10+80
OFFSET	75 RT	75 RT	70 RT	70 LT	70 LT	10 LT
ALIGNMENT	L REV	L REV	L REV	L REV	LREV	RPC
Depth (Ft)	24.00	29.00	29.10	18.00	23.00	13.50
to	25.50	30.50	30.60	19.50	24.50	15.00

Soils Engineer

D: R-3421A

CONTENTS

DESCRIPTION

BORE LOG & CORE REPORT(S)

SOIL TEST RESULTS

CORE PHOTOGRAPH(S)

TITLE SHEET

LEGEND

PROFILE(S)
CROSS SECTION(S)

SHEET

5-10

11-18

19-20

21-23

ROJECT: 34542.1.1

STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 34542.1.1 R-3421A F.A. PROJ. NHF-220(4)

COUNTY RICHMOND

PROJECT DESCRIPTION US-220 BYPASS FROM US-74 BYPASS WEST

OF ROCKINGHAM AT SR 1109 INTERCHANGE TO 0.3 MILES

SOUTH OF SR 1140

SITE DESCRIPTION LEFT & RIGHT LANE BRIDGES OVER US-74 BUS.

ON 1-73/US-220 BYPASS BETWEEN SR 1244 AND SR 1140

(STA. 101+31.22 -173-/20+99.74 -L2-)

g. Fargher

STATE STATE PROJECT REFERENCE NO. SHEET SHEETS N.C. 34542.1.1 R-3421A 1

CAUTION NOTICE

THE SUBSURFACE REFORMATION 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 VARBOUS FELD BORNING LOOS, ROCK CORES, AND SOLI TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, NOR THE FIELD BORNING LOOS, ROCK CORES, OR SOIL TEST DATA ARE PART OF THE CONTRACT.

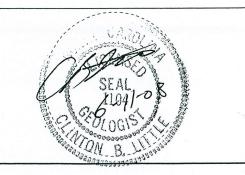
GENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORNES OR BETWEEN SAMPLED STRATA WITHIN THE BOREHOLE. THE LABORATORY SAMPLE DATA AND THE IN SITU WIN-PLACEITEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABLITY INHERENT IN THE STRADARD 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 COMONITIONS INCLUDING TEMPERATURES, PRECIPITATION, AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

THE BODER 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 ANDE, OR DRINNION OF THE OPPARTMENT AS TO THE TYPE OF MATERIALS AND CONDITIONS TO BE ENCOUNTERED. THE BIDDER OR CONTRACTOR IS CAUTIONED TO MAKE SUCH INDEPENDENT SUBSURFACE INVESTIGATIONS AS HE DEEMS NECESSARY TO SATISFY HIMSELF AS TO CONDITIONS TO BE ENCOUNTERED ON THIS PROJECT. THE CONTRACTOR SHALL HAVE NO CLAMA 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.

	J.E. ESLER
_	
	CC MIPPAY
	C.C. MURRAY
CHECKED BY	C.B. LITTLE
	C.B. LITTLE
SORWILLED RA	01201 221 222

PERSONNEL

C.C. MURRAY



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

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

PROJECT REFERENCE NO. 34542.I.I R-342IA

SHEET NO.

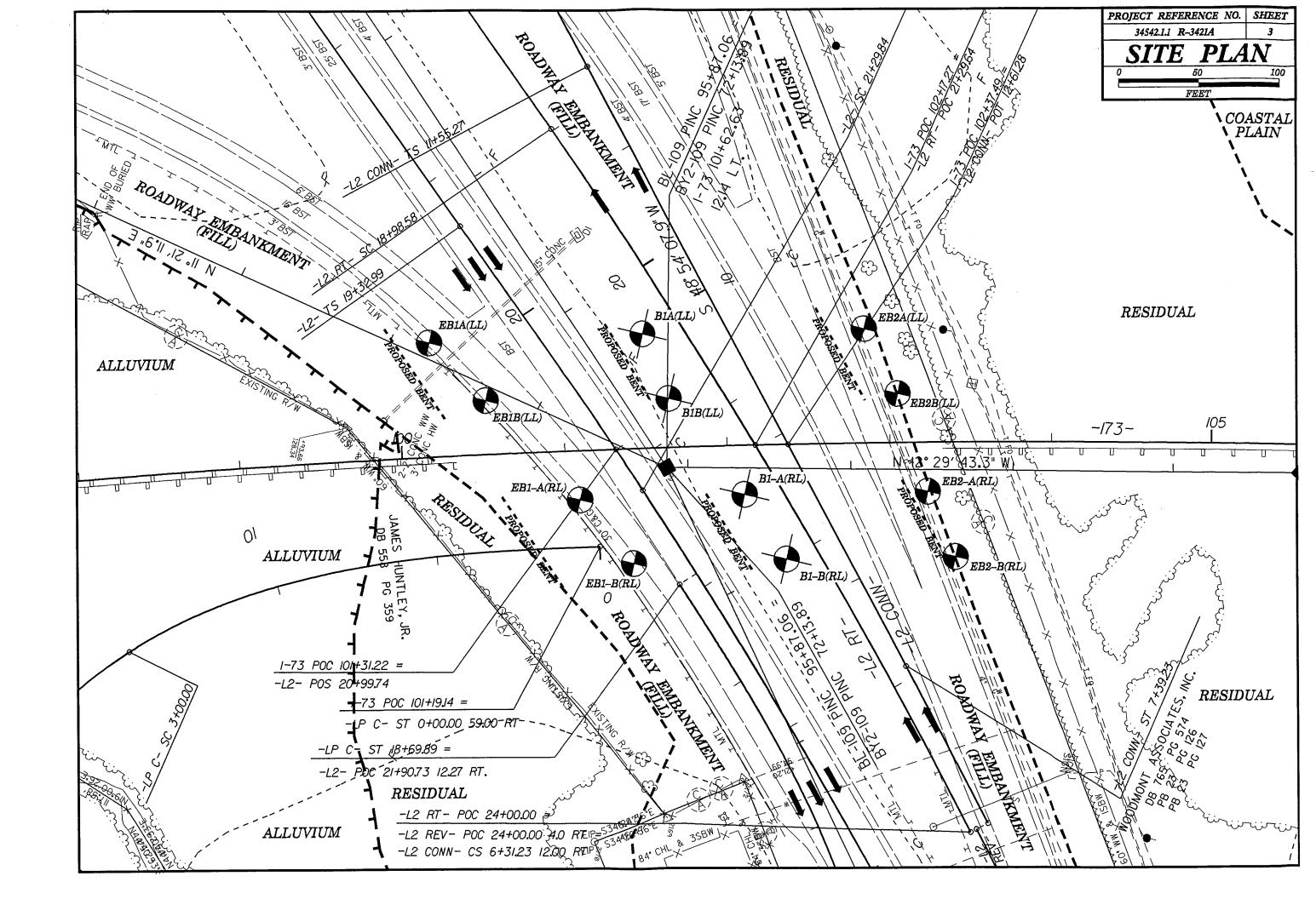
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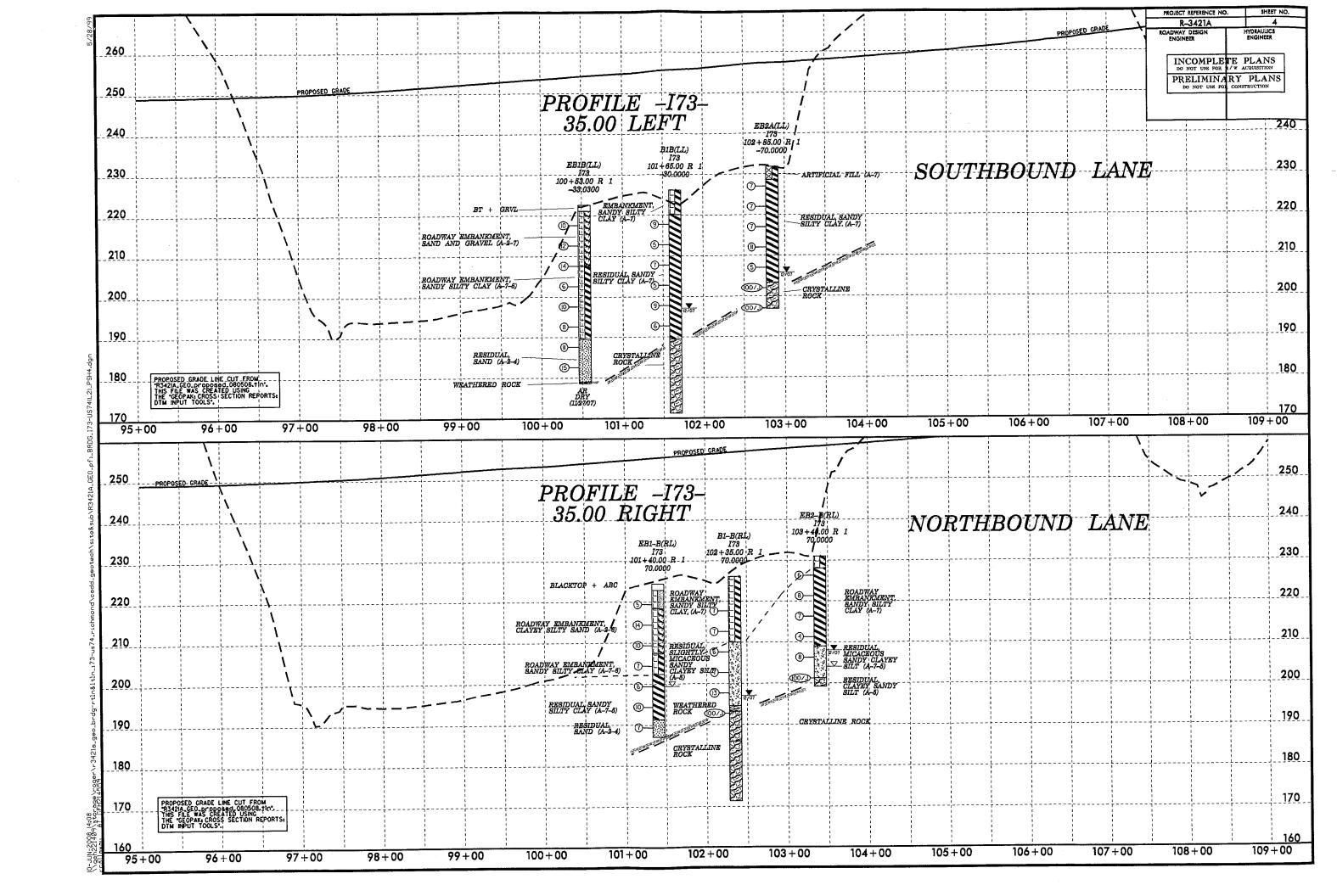
DIVISION OF HIGHWAYS

GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

	SOIL AND ROCK	LEGEND, TERMS,	SYMBOLS, AND ABBR	EVIATIONS	
SOIL DESCRIPTION	GRADATION			OCK DESCRIPTION	TERMS AND DEFINITIONS
SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PERETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND YIELD LESS THAN 180 BLOWS PER FOOT ACCORDING TO STANDARD PERITRATION TEST (MASHTO TZDE, ASTIM D-1586). SOIL CLASSIFICATION IS BASED ON THE ARSHTO SYSTEM, BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, ARSHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLES	WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM UNIFORM - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SY PODRLY GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE ANOULARITY OF GRAINS THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TER	E SIZES.	ROCK LINE INDICATES THE LEVEL AT WHICH SPT REFUSAL IS PENETRATION BY A SPLIT IN NON-COASTAL PLAIN MATERIAL, THE TRACF WEATHERED ROCK. ROCK MATERIALS ARE TYPICALLY DIVIDED A		ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER. AQUIFER - A WATER BEARING FORMATION OR STRATA. ARENGECOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND. ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC.
VERY STIFF, GRAN, SATT CLAN, MOST WITH INTERBEDDED FINE SHID LAVERS, MONUT PLASTIC, A-7-6	SUBANGULAR, SUBROUNDED, OR ROUNDED. MINERALOGICAL COMPOSITION			ITAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 ER FOOT IF TESTED.	ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL
SOIL LEGEND AND AASHTO CLASSIFICATION GENERAL CRANULAR MATERIALS SILT-CLAY MATERIALS CLASS. (≤ 35% PASSING *200) (> 35% PASSING *200) ORGANIC MATERIALS	MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.	O IN DESCRIPTIONS CR	OCK (CR) WOULD YI	COARSE GRAIN IGNEDUS AND METAMORPHIC ROCK THAT ELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, ABBRO, SCHIST, ETC.	AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE. <u>CALCAREOUS (CALCJ-</u> SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.
GROUP A-1 A-3 A-2 A-4 A-5 A-6 A-7 A-1, A-2 A-4, A-5 CLASS. A-1-b A-2-4 A-2-5 A-2-6 A-2-7 A-1, A-2 A-4, A-5 A-6, A-7	COMPRESSIBILITY SLIGHTLY COMPRESSIBLE LIQUID LIMIT LES	SS THAN 31 ROI	DCK (NCR) SEDIMENTO	COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN ARY ROOK THAT WOULD YEILD SPT REFUSAL IF TESTED. ROCK TYPE PHYLLITE, SLATE, SANDSTONE, ETC.	<u>COLLUVIUM</u> - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE.
SYMBOL COORDINGS	MODERATELY COMPRESSIBLE LIGUID LIMIT EDI HIGHLY COMPRESSIBLE LIGUID LIMIT GRI PERCENTAGE OF MATERIAL		DIMENTARY ROCK SPT REFU	·	CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RLM AND EXPRESSED AS A PERCENTAGE.
* 10 58 MX SILT- MUCK, CLAY PEAT SOILS COLOR OF THE STATE	ORGANIC MATERIAL GRANULAR SILT - CLAY SOILS SOILS OT	HER MATERIAL FR	RESH ROCK FRESH, CRYSTALS BRIGHT,	WEATHERING FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER	_ <u>DIKE</u> - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK. DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE
LIDUID LIMIT 48 MX 41 MN 48 MX 41 MN 46 MX 41 MN 48 MX 41 MN SOTUS WITH	TRACE OF ORGANIC MATTER 2 - 3% 3 - 5% TRACE LITTLE ORGANIC MATTER 3 - 5% 5 - 12% LITTLE MODERATELY ORGANIC 5 - 10% 12 - 20% SOME	1 - 10% 10 - 20% 20 - 35%	HAMMER IF CRYSTALLINE. RY 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
PLASTIC INDEX 6 MX NP 18 HX 18 HX 11 HM 11	HIGHLY ORGANIC 310% 320% HIGHLY GROUND WATER	35% HIND HOUVE	OF A CRYSTALLINE NATURE.	EN FACE SHINE BRIGHTLY, ROCK RINGS UNDER HANMER BLOWS IF STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO	THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH. FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE
USUAL TYPES STORE FRAGS. FINE SILTY OR CLAYEY SILTY CLAYEY ORGANIC ORAVEL, AND SAND SAND SOILS SOILS MATTER	WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRIL STATIC WATER LEVEL AFTER 24 HOURS		LI.) 1 INCH. OPEN JOINTS MAY CONTA CRYSTALS ARE DULL AND DISCO	NN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR LORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.	SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE. FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.
GEN.RATING AS A EXCELLENT TO GOOD FAIR TO POOR FAIR TO POOR UNSUITABLE	VPW PEOCUED MATER CATHRATED TONE OF MATER DEADING	I	IDD.) GRANITOID ROCKS, MOST FELDSPA	SHOW DISCOLORATION AND WEATHERING EFFECTS. IN ARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS INS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED	$\frac{\textit{Fldat}}{\textit{Parent}} - \textit{Rock fragments on surface near their original position and dislogged from parent material.}$
PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30	SPRING OR SEEP	мог	WITH FRESH ROCK. DERATELY ALL ROCK EXCEPT QUARTZ DISC	DLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL	FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.
CONSISTENCY OR DENSENESS PRIMARY SOIL TYPE COMPACTNESS OR RANGE OF TAXADORD RANGE OF UNCONFINED PRIMARY SOIL TYPE COMPACTNESS OR PENETRATION RESISTENCE COMPRESSIVE STRENGTH	MISCELLANEOUS SYMBOLS ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION MITH SOIL DESCRIPTION MITH SOIL DESCRIPTION MISCELLANEOUS SYMBOLS SPT CPT SPT CPT SPT CPT WITH FINT FINT CPT WITH SOIL DESCRIPTION	SAMPLE (MO	VERE AND DISCOLORED AND A MAJORIT OD. SEV.) AND CAN BE EXCAVATED WITH A 1F TESTED, WOULD YIELD SPT RE	TY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH GEOLOGIST'S PICK. ROCK GIVES 'CLUNK' SOUND WHEN STRUCK.	FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.
CENSES LENCY (N-VALUE) (TONS/FT ²) VERY LOOSE (4	with soil description with soil of soi	DESIGNATIONS S - BULK SAMPLE SEV	EVERE ALL ROCK EXCEPT QUARTZ DISC EV.) IN STRENGTH TO STRONG SOIL.	OLORED OR STAINEO, ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN GRANITOID ROCKS ALL FELDSPARS ARE KADLINIZED TO SOME	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.
CRANULAR	ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT ————————————————————————————————————	SS - SPLIT SPOON SAMPLE	EXTENT. SOME FRAGMENTS OF S IF TESTED. YIELDS SPT N VALUE	<u> </u>	LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS. MOTILED (MOTI_) IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS, MOTILING IN
VERY DENSE 350 VERY SOFT 42 (0.25	INFERRED SOIL BOUNDARY MONITORING WELL	SAMPLE (V S	SEV.) THE MASS IS EFFECTIVELY REDU REMAINING. SAPROLITE IS AN EX	DLORED OR STAINED, ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT ICED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK AMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR	SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE. PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN
DENERALLY SOFT 2 TO 4 0.25 TO 0.50	INFERRED ROCK LINE PIEZOMETER	RS - ROCK SAMPLE RT - RECOMPACTED TRIAXIAL COM SAMPLE	MPLETE ROCK REDUCED TO SOIL, ROCK F	K FABRIC REMAIN. <i>IF TESTED, YIELDS SPT N VALUES < 100 BPF</i> ABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND ARTZ MAY BE PRESENT AS DIKES OR STRINGERS, SAPROLITE IS	INTERVENING IMPERVIOUS STRATUM. RESIDUAL (RES.) <u>SOIL</u> - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.
(COHESIVE) VERY STIFF 15 TO 30 2 TO 4 HARD >30 >4	25/825 DIP & DIP DIRECTION OF SLOPE INDICATOR INSTALLATION ROCK STRUCTURES	CBR - CALIFORNIA BEARING RATIO SAMPLE	ALSO AN EXAMPLE.	ROCK HARDNESS	ROCK QUALITY DESIGNATION (ROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.
TEXTURE OR GRAIN SIZE U.S. STD. SIEVE SIZE 4 10 40 60 200 270	SOUNDING ROD RED SPT REFUSAL	-		FE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES	SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.
OPENING (MM) 4.76 2,00 6.42 0.25 0.075 0.053	ABBREVIATIONS			OR PICK ONLY WITH DIFFICULTY, HARD HAMMER BLOWS REQUIRED	SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH 1TS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.
BOULDER COBBLE GRAVEL SAND SAND SILT CLAY (BLOR.) (COB.) (GR.) (CSE.SD.) (F SD.) (SLJ (CL.)	AR - AUGER REFUSAL HL - HIGHLY BT - BORING TERMINATED MED MEDIUM CL CLAY MICA MICACEOUS		MARD EXCAVATED BY HARD BLOW OF	OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED	SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.
GRAIN MM 305 75 2.0 0.25 0.05 0.005 SIZE IN. 12 3 SOIL MOISTURE - CORRELATION OF TERMS	CPT - CONE PENETRATION TEST MOD MODERATELY CSE CDARSE NP - NON PLASTIC OMT - DILATOMETER TEST ORG ORGANIC		HARD CAN BE EXCAVATED IN SMALL (.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CHIPS TO PEICES I INCH MAXIMUM SIZE BY HARD BLOWS OF THE	STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (BPT) - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REDUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER, SPT REFUSAL IS PENETRATION EQUAL TO OR LESS
SOIL MOISTURE SCALE FIELD MOISTURE GUIDE FOR FIELD MOISTURE DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION	DPT - DYNAMIC PENETRATION TEST PMT - PRESSUREMETER TEST VOID RATIO SAP SAPROLITIC F - FINE SD SAND, SANDY	s	POINT OF A GEOLOGIST'S PICK. SOFT CAN BE GROVED OR GOUGED RE FROM CHIPS TO SEVERAL INCHE	ADILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS IS IN SIZE BY MODERATE BLOWS OF A PICK POINT, SMALL, THIN	THAN 0.1 FOOT PER 60 BLOWS, STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH
- SATURATED - USUALLY LIQUID; VERY WET, USUALLY (SAT.) FROM BELOW THE GROUND WATER TABLE	FOSS FOSSILIFEROUS SL SILT, SILTY FRAC FRACTURED, FRACTURES SLI SLIGHTLY FRAGS FRAGMENTS TCR - TRICTORE REFUSAL		PIECES CAN BE BROKEN BY FIN VERY CAN BE CARVED WITH KNIFE, CA	GER PRESSURE. AN BE EXCAVATED READILY WITH POINT OF PICK, PIECES 1 INCH	OF STRATUM AND EXPRESSED AS A PERCENTAGE. STRATA ROCK QUALITY DESIGNATION (SROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE
PLASTIC SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE	EQUIPMENT USED ON SUBJECT PRO		OR MORE IN THICKNESS CAN BE FINGERNAIL. FRACTURE SPACING	BROKEN BY FINGER PRESSURE, CAN BE SCRATCHED READILY BY BEDDING	TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. IDPSOIL (IS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
(PI) PLASTIC LIMIT		HAMMER TYPE:	TERM SPACING	TERM THICKNESS	BENCH MARK:
OM OPTIMUM MOISTURE - MOIST - (M) SOLIDS AT OR NEAR OPTIMUM MOISTURE SL SHRINKAGE LIMIT	DRILL UNITS	X AUTOMATIC MANUAL	VERY WIDE MORE THAN 10 FEE WIDE 3 TO 10 FEET	T VERY THICKLY BEODED > 4 FEET THICKLY BEDDED 1.5 - 4 FEET THINLY BEDDED 0.16 - 1.5 FEET	ELEVATION: FT.
- DRY - (D) ATTAIN OPTIMUM MOISTURE	6° CONTINUOUS FLIGHT AUGER	CORE SIZE:	MODERATELY CLOSE 1 TO 3 FEET CLOSE 0.16 TO 1 FEET VERY CLOSE LESS THAN 0.16 FE	VERY THINLY BEDDED 0.03 - 0.16 FEET	NOTES:
PLASTICITY	A S HOLLOW HOUSERS	X-N_Q 508		INDURATION C 0.000 FEET	
PLASTICITY INDEX (PI) DRY STRENGTH			R SEDIMENTARY ROCKS, INDURATION IS THE H	ARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.	
NONPLASTIC Ø-5 VERY LOW LOW PLASTICITY 6-15 SLIGHT	X CME-558 X CASING X W/ ADVANCER			BBBING WITH FINGER FREES NUMEROUS GRAINS: NTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.	
16-25 MEDIUM	PORTABLE HOIST TRICONE STEEL TEETH	HAND TOOLS: POST HOLE DIGGER	MODERATELY INDURATED GR	IAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE;	
COLOR	X TRICONE 215/6 TUNGCARB.	HAND AUGER		EAKS EASILY WHEN HIT WITH HAMMER.	
DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN. RED. YELLOW-BROWN, BLUE-GRAY). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.	CORE BIT	SOUNDING ROD VANE SHEAR TEST	DI	MAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; FFICULT TO BREAK WITH HAMMER. HARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE;	
				AMPLE BREAKS ACROSS GRAINS.	





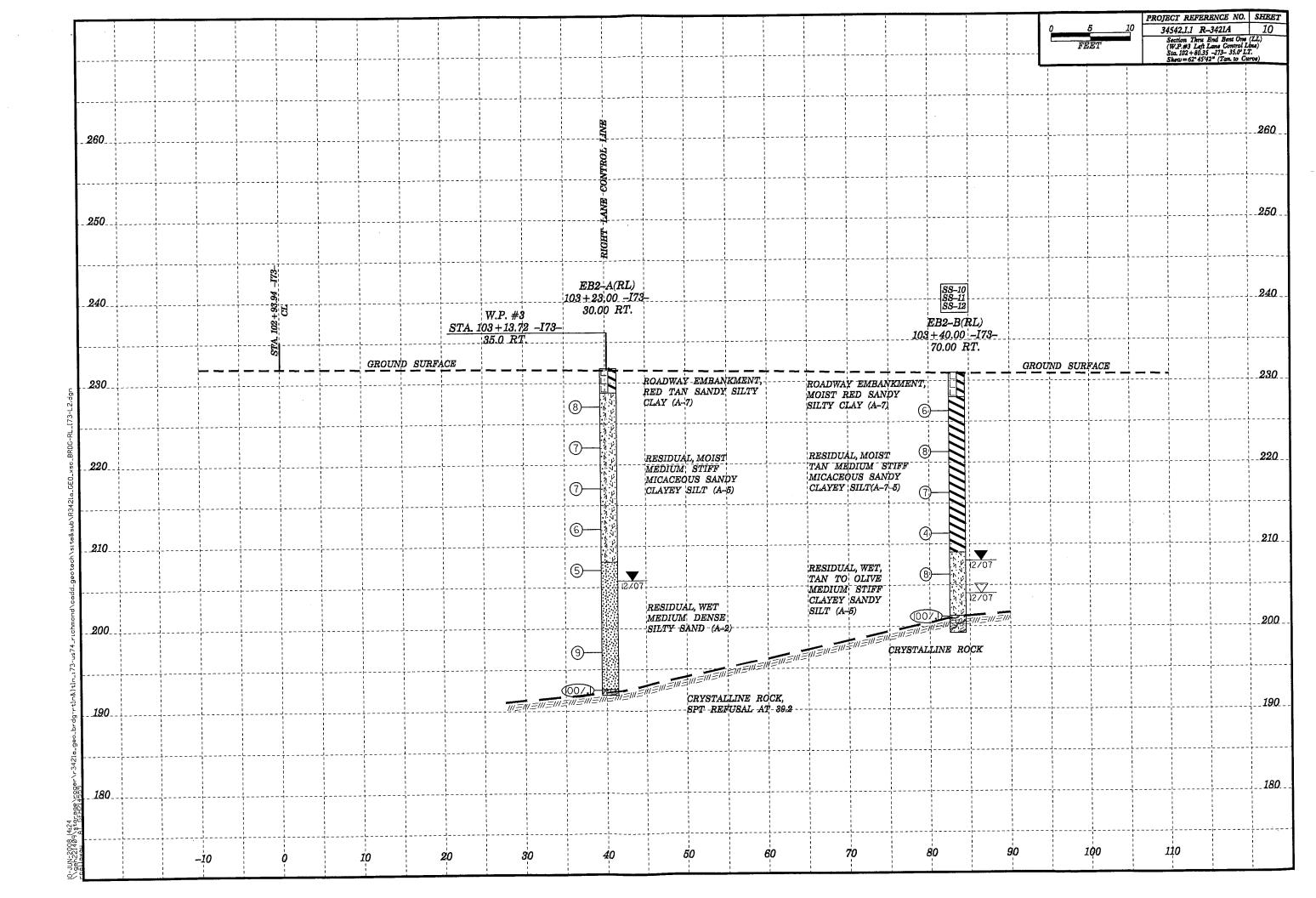
			0 5 10 PROJECT REFERENCE NO. SHEET 34542.1.1 R-3421.4 6
250			250
240		CONTROL LINE	24
230	B1A(LL) I73 101+50.00 R 1 -70.0000 225.7000 _STA_10 ROADWAY EMBANKMENT, STI	B1B(LL) 173 101+65.00 R 1 -30.0000 01+50.19 -173- 226.1000 35.0 LT.	23
220	ROADWAY EMBANKMENT, STITE MOIST, SANDY SILTY CLAY (A GROUND SURFACE RESIDUAL, MOIST, STIFF, SAN	BROWN SANDY SILTY (CLAV (A-7)
210	SILTY CLAY (A-7-5)	© RESIDUAL, TAN OLIV	E MEDIUM STIFF
200	B—————————————————————————————————————	(S) SANDY SILTY CLAY ((A-7)
190	CRYSTALLINE ROCK RESIDUAL, TAN SANDY CLAY (A-7) WEATHERED ROCK	©- = = = = = = = = = =	77=717=111=11-1-1-1-1-1-1-1-1-1-1-1-1-1-
		CRYSTALLINE ROCK, WITH WEATHERING 36.6' - 54,8' 15.7'/18.2' 1	COARSE GRAINED GABBRO ZONES DEVELOPED ALONG FRACTURES RECOVERY, (86%) 12.3'/18.2' RQD (68)
_170			
110	100 90 80 70 60	50 40 30 20	10 0 10

 						0 5 10 34542.1.1 R-3 FEET Section Thru En	3421A 7
						Section Thru En FEET (W.P.#3 Left La Sta. 102 + 80.35 - Skew = 62° 45'42°	173- 35.0° LT. (Tan. to Curve)
260							.26
250				YTROL LINE			25
240	33457		EB2A(LL) I73 102+85.00 R 1 -70.0000 -231.8000	W.P. #3 STA. 102+80.35 -173- 35.0 LT	EB2B(LL) 173 103+05.00 R 1 -30.0000 231.8000		.24
230 3 1	37819 745645	GROUND SURFACE	ARTIFIC	AL FILL, RED TAN BACKFILL, ILTY CLAY(A-7)		ROUND SURFACE PICIAL FILL, RED SANDED Y CLAY BACKFILL (A-7)	23
220						DUAL, SANDY SILTY CLAY LAYEY SANDY SILT (A-5)	22
210				L, MEDIUM - STIFF, MOIST TO -WET, - 'OLIVE' SANDY SILTY CLAY. (A-7)	TESII SILTY	DUAL, MEDIUM STIFF SANDY CLAY (A-7-5)	2
200		'/ = '// <u>-</u>	(Later)	///=///=///=///=///=///=///=///=///=//	()	HERED ROCK	.20
190							19
180							18
	110 100	90 80	70 6	50 50 40	30 20	10 0 10	

						05	PROJECT REFERENCE NO. SHEET 34542.1.1 R-3421A 8
						FEET	Section Thru End Bent One (RL) (W.P.#1 Right Lane Control Line) Sta. 100+65.58-173-35.0 RT. Skew=88*25'21" (Tan. to Curve)
_240							240
				FI	17A(RT.)		EB1-B(RL)
230			X	101+	31–A(RL) 173 08.00 R 1 10.0000 23.7000		EB1-B(RL) 173 101+40:00 R 1 70:0000 224,4000
			00. 1.1	2	23.7000	ROADWAY EMBANKMENT	
			ONTR		ROADWAY EMBANKMENT, ASPHALT PLUS ABC	BLACKTOP + ABC	
_220	60 - 173		NAME O	9—		ROADWAY EMBANKMENT MEDIUM, STIFF CLAYEY SILT WITH GRAVEL (A-4	(5)
	0+44.C		TH 17				
	<u>3T</u> A. 10		W.P. #1 STA, 100+65.58 _I73_			ROADWAY EMBANKMENT LOOSE CLAYEY SILTY S (A-2-6)	AND
210		ROUND SURFACE	35.0 RT.	(7)		GROUND SURFACE	210
					+	— — ROADWAY EMBANKMENT MEDIUM STIFF TO STIF TAN AND GREY SANDY	7
				(10)—		SILTY CLAY (A-7-6)	
200				(6)—		ROADWAY EMBANKMENT	© 1/07 200
				9	ROADWAY EMBANKMENT,	MEDIUM STIFF TO STII TAN AND GREY SANDY SILTY CLAY (A-7-5)	
			ALLUVIAL,	LOOSE MOIST SAND (A-2)	MEDIUM STIFF GRAVELLY		190
. 190				3		RESIDUAL, LOOSE RESIDUAL SAND (A-2-4)	
					RESIDUAL, VERY-LOOSE	(A-2-4) 	EH EN EN
400					10 DENGE, US ISAND (A-2)		180
180				37			
					CRYSTALLINE ROCK,		
170					FRESH DARK GRAY GABBRO.		170
_ 170							
a 160							160
7							
ā				50	60 70 90	gn 100	110
-1	0	10 20	30 40	50	60 70 80	90 100	110

,											1	0 5 FEET	PROJECT REFERENCE 34542.1.1 R-3421 Section Thru Bent 0 (W.P.#2 Right Lane Sta.101+89.65-173 Sheve=60*28'01* (25	LA
							+				 			
250						LINE					 			
240						:-control:								
		+69.84 LT3-			W.P. #2 STA, 101+89.65	HIGH 102 + 1 302 + 1 302 + 1 222 - 223	A(RL) 173 0.00 R 1 0.000 7.8000				B1-B() 173 102 + 35.0 70.00 226.10	RL) 0 R 1 00		
230		STA 101	ROUND SURFACE		35.0 RT.					GROUND SURFA		[
220							L SAI	ADWAY EMBANKMENT, D-BRN STIFF MOIST IDY SILTY CLAY (A-7) OUNDED GRAVEL		ROADWAY EMBAN RED BROWN SAN CLAY A-7	KMENT, DY SILTY			
210						(3)—	RES STII (A-7	IDUAL, RED, F MOIST CLAY)			(i)			
200						(6)—	RES	IDUAL. OLIVE		RESIDUAL, MOIST MEDIUM STIFF R TAN SLIGHTLY MICACEOUS SAND CLAYEY SILT (A-5	ED ()	V		
						8	LOC MOD SIL	IDUAL, OLIVE ISE TO V. DENSE ST MICA. CLAYEY IY. SAND (A-2)		- WEATHERED ROO	# (00 /) = = =	33.1 - 40.1'	<u>≒/// ≅/// = </u>	
In-173-us74_richn						(B)						0.0 / 7.0 1230 (0.0 /)	1.0 / 1	
.geo.brdg-rtln<						MSHI ENISH	HE WA	ADUAL SOIL FROM ATHERED GABBRO;		- CRYSTALLINE RO FRESH DARK GR GABBRO.	AY	40.1 – 54.7' 14.5'/14.6' REC (S	99%) 14.5'/14.6' RQD (99	9)
1700 1700 1700 1700 1700 1700 1700 1700							GAI 19.4	STALLINE ROCK, SH DARK GRAY BRO. - 65	S AL DOD (CC)					
geh221409\sto	-10	0	10	20	30	40	50 J5.5	//15.6' REC, (99%) 13.4'/1	5.6' RQD (86) 70	80	90	100	110	

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SHEET

PRO	JECT N				·1-		REP		-	COUNT	Υ	Richmo	nd			GEOLOGIST M	urray, C. C.	
SITE	DESCR	IPTIO	N LEF	T LAN					JS. ON I	-73 / US	220	BYPAS	SS BE	TWE	EN SR1244 A	ND SR 1140	GROUND	-
BOR	ING NO	. EB1/	A(LL)		s	T/	ATION 10	0+20		OFFSE	T 7	Oft LT			ALIGNMEN		0 HR.	N/A
COL	LAR EL	EV. 22	2.1 ft		T	0	TAL DEPT	H 44.8 ft		NORTH	IING	437,6	03		EASTING		24 HR.	N/
DRIL	L MAC	HINE (ME-5	50X	D	RI	ILL METH	OD H.S.	Augers							HAMMER TYP		
STAI	RT DAT	E 11/2	9/07		С	01	MP. DATE	11/29/07	•	SURFA	CE		DEP	TH N	I/A	DEPTH TO RO	OCK 44.8 ft	
ELEV	DRIVE	DEPTH		W CO	т	4		BLOWS P				SAMP.	V /	0		SOIL AND ROCK D	ESCRIPTION	
(ft)	(ft)	(ft)	0.5ft	0.5ft	0.5ft	+	0 2	5 5	U L	75 	100	NO.	/MOI	G	ELEV. (ft)			DEPTH
											ĺ							
225	-	-													-			
	-	Ė													222.1	GROUND SUI		
220	-	_														ROADWAY EMB. IST, MEDIUM STIFE	F, SILTY SANDY	
	218.1	4.0									•					CLAY EMBANKME	NT FILL (A-7)	
	-		5	4	5		. •9						М					
215		‡					1				_				<u>-</u>			
	213.1	9.0	3	3	2	\downarrow							м		-			
210		<u> </u>	ľ	"			● 5				-		'*'		•			
210	-	+				Ì	1								 -			
	208.1	14.0_	2	2	1		3						w		-			
205	_	ţ	i.				· · · ·								• 			
	203.1	19.0	ļ <u>.</u>	ļ		4	<u> </u> :::::				:		<u>,,,</u>		• •			
] :	<u> </u>	1	1	2		♦ 3 : : :						W		. -			
200	-	<u> </u>					.\				\dashv							
	198.1	24.0	3	3	8	-	. 11 .						М		- - 196.1			2
195	_	t					$f \cdot f \cdot \cdot$									RESIDUA		
	193.1	29.0					1:::								- IVIC	CLAY (A-		
		Ī	1	1	2		∮ 3 · · ·						M		- -			
190	-	-					1			.					 -			
	188.1	34.0	2	3	6	\dashv				.	:		w		-			
185		Ŧ					175								185.1	DECUDIT		3
	183.1	39.0					/			.					_ v	RESIDUA VET, MEDIUM DEN		
		Į.	4	6	9		15						W		- 180.6			4
175	180.6	+ 41.5 +	30	70	1		ļ									WEATHERED	ROCK	
	178.1	44.0	40	100/.0] 1		1			+					177.3	Boring Terminated v	ith Ctandard	4
175		Ŧ		1	1					100	0/.01				_ Pene	etration Test Refusal	at Elevation 177	.3
	1 -	‡				1							Ì		-	ft ON CRYSTALL	INE ROCK	
		‡	ŀ									}	ł		_			
170		‡																
		‡																
165		‡	•												-			
105	-	+													-			
j		‡													<u>-</u>			
160	┧ .	‡													_			
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155	-	+			1										- -			
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150		1													 -			
160		Ŧ													- -			
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NCDOT GEOTECHNICAL ENGINEERING UNIT

مراح				REL								_	,,,,,	. 7		111	. –	J. 11 1		//	<u>'</u>
	JECT N						R-342						UNTY						OGIST Mur		
SITE	DESCR	IPTIO	N LEF	T LAN	ЕВ	RID	GE O	VER	US 7	74 BL	JS. ON	-73	/ US 22	0 BYF	AS	SBE	TWE	EN SR1244 AND SE	R 1140	GROUND W	TR (ft)
BOR	NG NO.	. EB1	3(LL)			STA	ATION	1 10	0+53			OF	FSET	33ft L	T			ALIGNMENT -17	3-	0 HR.	N/A
COL	AR ELI	EV. 22	2.6 ft			TO	TAL D	EPT	H 43	3.9 ft		NO	RTHIN	G 437	7,64	5		EASTING 1,745,	759	24 HR.	N/A
DRIL	L MACH	HINE C	ME-5	50X		DRI	ILL M	ETH	OD H	1.S. <i>F</i>	Augers								MMER TYPE	Automatic	
STAI	RT DAT	E 11/2	9/07		- 1	COI	MP. D	ATE	11/2	29/07		su	RFACE	WAT	ER	DEP	TH	V/A DEI	TH TO ROC	K 43.9 ft	
ELEV	DRIVE ELEV	DEPTH	BLC	W COL		⊣ ।					ER FOO			SAN		▼/	0	SOIL A	ND ROCK DES	CRIPTION	
(ft)	(ft)	(ft)	0.5ft	0.5ft	0.5	ft	0	2	5	50 	·····	75 	100	NC).	/MOI	G	ELEV. (ft)		D:	EPTH (ft)
225	_																	<u>-</u> -			
	-		-			\dashv	 							+	\dashv				ROUND SURF		0.0 1.5
220	-						.			• •		1			1			221.1	BT + GRVL		1.5
	218.6	4.0	4	5	- 5	_	: <u> </u>		 	: :		: :		SS		М			. DENSE SAN	D AND GRAVEL	-
	-		"	ľ	J		. ¶¹ .]	0 .		: :						IVI		-	(A-2-7)		
215		F					-					+						_ -	٠.		
	_213.6	9.0	5	6	6	1	- 1	12				. .				М		- -			
210	-	<u> </u>										. .						-			
2.10	208.6 -	14.0_					1					. .									15.0
	-	-	6	7	7		: :,	14			· · ·	: :				М		- 207.6 - ROAI	OWAY EMBAN	KMENT	15,0
205	_	<u> </u>					$\perp i$			• •		Ή:	· · · ·					- MOIST ME - S	D. STIFF, TO ILTY CLAY (A-	511FF SANDY 7-6)	
	203.6 -	19.0	3	3	3		1.	: :	: :	: :		: :	· · · ·	SS	-7	М		- -			
	-						-1°.					: :			Ħ			- -			
200	198.6 -	24.0					- j -														
	190.0	24.0	2	4	6		· •1	٠ .				: :	 	SS	-8	М		- -			
195] -	<u> </u>					1 : }		: :			. .						- -			
	193.6	29.0				_						.						- -			
	-	‡	5	4	4		•8	: :				. :				M		-			
190	-	<u> </u>					· -			• •		· ·						– — 189.6			33.0
	188.6	34.0	3	3	8	\dashv	: <u> </u>		::]] ;	<i>.</i>			М		- MOÏST, M	RESIDUAL EDIUM STIFF	SAND (A-2-4)	
		‡					1:3	'' . 	: :				 					-			
185	183.6	300							 					1				- -			
	103.0		5	5	10	0		15				: :		SS	-9	W		_			
180	-	Ŧ								٠.		•						<u>-</u> 			
		<u> </u>	↓	<u> </u>		_	<u> </u>	<u>:</u>				<u></u>		Ц			777	179.1 178.7/\ W	EATHERED R	OCK	43.5
] :	Ŧ																	ED SEVERELY RYSTALLINE F	WEATHERED ROCK	1
175	-	‡																Boring Termi	nated BY AUG	R REFUSAL at	' K
		‡																- Elevation 17	o. / ILON CICE	MELINE ROOM	IX.
470		‡												1				- -			
170	-	‡			·	- 1												- -			
		İ													İ			-			
165		+												ŀ	1			-			
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160	-	‡																- -			
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155	-	‡																<u> </u>			
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NCDOT GEOTECHNICAL ENGINEERING UNIT

	J V	الإ	30	REI	LOC	3 F	REPC	ORT										
PRO	JECT N	O. 345	42.1.	1	ID.	R-34	421A			COI	UNTY	Richmo	nd			GEOLOGIST Mu	rray, C. C.	
SITE	DESCR	RIPTIO	N LEF	T LAN	IE BRI	DGE	OVER	JS 74 BL	JS. ON	-73 /	US 220	BYPAS	SS BE	TWE	EN SR1244	AND SR 1140	GROUND.V	VTR (ft)
BOR	ING NO	. B1A(LL)		S	TATI	ON 101	+50		OFF	SET 7	Oft LT			ALIGNME	NT -173-	0 HR.	N/A
COL	LAR EL	EV. 22	5.7 ft		TO	JATC	L DEPTH	49.6 ft		NOF	RTHING	437,7	30		EASTING		24 HR.	N/A
DRIL	L MAC	HINE C	ME-5	50X	DI	RILL	METHO	DNWC	asing w	/ Core	e					HAMMER TYPE		
STAI	RT DAT	E 12/0	6/07		C	OMP.	. DATE	12/06/07		SUF	RFACE	WATER	RDEP	TH I	N/A	DEPTH TO ROO	28.7 ft	
ELEV	DRIVE	DEPTH		DW CO				BLOWS P			400	SAMP.	/ /	0		SOIL AND ROCK DES		
(ft)	(ft)	(ft)	0.5ft	0.5ft	0.5ft	0	25 	50	, 	75 1	100	NO.	MOI	I G	ELEV. (ft)		(DEPTH (ft)
230	-	Ĺ													<u> </u>			
1	-		*												- -		-105	
225	_	<u> </u>		 								 			_ 225.7	GROUND SURF	NKMENT	0.0
	3	Ī				:	1								- STI	FF, MOIST, SANDY SI	LTY CLAY (A-7)
		İ				:	1::			: -					- 220.7			5.0
220	218.8	6.9				-									- MOI	RESIDUAL ST, STIFF, SANDY SIL	TY CLAY (A-7-	5)
	210.0	1 0.3	4	5	6		1 11					SS-18	М		-		,	,
215	-	Ŧ					1								<u>}</u>			
	213.8	11.9	2	3	7						: : :		М					
į.	-	Ŧ	1			-	10 .				: : :		,**		_ _ 210.7			15.0
210	200.0	16.9				ŀ	1			+-				1.7.	MOI	RESIDUAL ST, STIFF, SANDY CL	AYEY SILT (A-	5)
	208.8 -	16.9	4	5	6	:	111					SS-19	М	7.7	-	01,0111,01112702		-,
205	-	‡				:	1::1	: : : :		. :				1,4				
	203.8	21.9_	2	4	5	-				. .			М	1 1	-			
	:	†	2	"	~	:	9						IVI	7 7	[
200	-	‡				<u> </u> -	1			+				7.7	-			
		26.9 28.5	2	2	6	11:	8							× × ×	197.0			28.7
195		+	2	2	6] :'	8			- -					- 194.6	CRYSTALLINE F MODERATELY WEA	ATHERED	31.1
100	-	‡				-	· · [7					[]	CRYSTALLINE RESIDUAL		
	190.9	34.8				:									190.9	TAN SANDY CLA	Y (A-7)	34.8
190	190.9	- 34.0	63	37/.1	1	<u> -</u>					100/.6					WEATHERED R	OCK .	
m		‡	ļ			:		: : : :		: :								
185	186.7	- 39.0.	42	58/.2	1					: :	100/.7				185.0			40.7
3 100	1	‡				-				. .					_	CRYSTALLINE F UNWEATHERED UNF		
<u>G</u>		‡				:				: :					£			
8 <u>180</u>	-	‡								- -					[-		•	
일 -		‡				:				: :					-			
0 7 175	<u> </u>	‡—			-	Η.			L	· -	• • •	 	-		176.1 Boi	ring Terminated at Eleva	ation 176.1 ft IN	49.6
sn-s	1 -	‡													E	CRYSTALLINE	ROCK	
<u> </u>		‡													F			
ਭੂ <u>। 170</u>	-	‡													_			
ဗ္ဗ		‡			ŀ										F			
描 165		‡												1	E			
	1 -	‡													F			
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NIS 4 E E		‡													F			
155 08	† .	‡													F			
DOT BORE SINGLE R3421A GEO BH BRDG RL&LL 773-US74.GPJ NC_DOT.GDT G6/10/08 12		‡			1										F			

NCDOT GEOTECHNICAL ENGINEERING UNIT

(2)	少 U	2 7 (CO	RE B	OR	INC	3 RE	PO	RT						12
PRO.	JECT NO				D. R-					· ·	UNTY Richmond		GEOLOGIST Mur	ray, C. C.	
SITE	DESCRI	PTION	N LEF	T LANE	BRIDG	SE OV	ER US 7	4 BUS	. ON	I-73 <i>i</i>	/ US 220 BYPASS BETWEE	N SR1244 A	ND SR 1140	GROUND V	NTR (ft)
BOR	ING NO.	B1A(LL)		STA	rion	101+50			OF	FSET 70ft LT	ALIGNMEN	T -173-	0 HR.	N/A
COLI	LAR ELE	V. 22	5.7 ft		TOT	AL DE	PTH 49.	6 ft		NO	RTHING 437,730	EASTING	1,745,698	24 HR.	N/A
DRIL	L MACH	INE C	ME-5	50X	DRIL	L ME	THOD N	W Cas	ing w	/ Coi	re		HAMMER TYPE	Automatic	
STAF	RT DATE	12/0	6/07		сом	P. DA	TE 12/0	6/07		su	RFACE WATER DEPTH N/	۹	DEPTH TO ROC	K 28.7 ft	
COR	E SIZE N	ΛX					N 11.3 f			DR	ILLER Estep, J. E.				
ELEV (ft)	RUN ELEV (ft)	EPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	REC. (ft) %	JN RQD (ft) %	SAMP. NO.	STR REC. (ft) %	ATA RQD (ft) %	L O G	D ELEV. (ft)	ESCRIPTION A	AND REMARKS		DEPTH (ft)
197												Begin Coring			
195	197.0 195.9 194.6	28.7 29.8	1.1		(1.0) 91% /	(1.0) \ 91% /		(2.3) 96%	(2.1) 88%		197.0 194.6		INE ROCK EATHERED ROCK		28.7 31.1
	194.6	31.1			(1.3)	(1.1)						RESI	DUAL		
	1				انتتا						190.9				34.8
190	+			N=100/.6							<u> </u>	WEATHER	RED ROCK		
	‡										-				
185	185.0	40.7	L.,_	N=100/.7	7: ::	11.5		/C C:	(6.5)		185.0	051/5	INE BOOK		40.7
			4.0		(4.0) 100%	(4.0) 100%		(8.9) 100%	(8.9) 100%		FRESH UN		INE ROCK UNFRACTURED GA	BBRO	
	181.0	44.7			11.5						-				
180	†		4.9		(4.9) 100%	(4.9) 100%					 				
	176.1	49.6									- 176.1				49.6
175_	1/6.1	49.0										d at Elevation 1	76.1 ft IN CRYSTALLI	NE ROCK	49.6
	‡				,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,						-		•		-
170	‡										- -				-
170_											<u>-</u> -				
	‡				,						- -				
165											<u>-</u>				
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400	‡										-				
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155	‡										<u>-</u>				
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130															
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SHEET

	JECT N						R-3421A	COUNTY				GEOLOGIST Mur	rray, C. C.	
				T LAN	$ \tau$		IDGE OVER US 74 BUS. ON	1-73 / US 220	BYPASS	BETWE			GROUND W	TR (f
	NG NO					ST	TATION 101+65	OFFSET 3	30ft LT		ALIGNMEN	IT -I73-	0 HR.	N/
COLL	AR EL	EV. 22	26.1 ft			ТО	OTAL DEPTH 54.8 ft	NORTHING	437,755	1	EASTING	1,745,732	24 HR.	29.
DRIL	L MACI	HINE (CME-5	50X		DR	RILL METHOD NW Casing w	/ Core				HAMMER TYPE	Automatic	
STAF	RT DAT	E 12/1	1/07			CO	OMP. DATE 12/11/07	SURFACE	WATER D	DEPTH I	V/A	DEPTH TO ROC	K 36.6 ft	
ELEV	DRIVE ELEV	DEPTH	<u> </u>	ow co		_	BLOWS PER FOO		SAMP.	O L	;	SOIL AND ROCK DES	CRIPTION	
(ft)	(ft)	(ft)	0.5ft	0.5ft	0.5	ift	0 25 50	75 100	NO.	MOI G	ELEV. (ft)		D	EPTH
230	-	-									-			
	-	-									-			
225	-		ļ	<u> </u>		-		1	-		226.1	GROUND SURF		
	1										REC	BROWN SANDY SIL	TY CLAY (A-7)	
	-										- -			
220	-	-									220.1	RESIDUAL		
}	218.7	7 <u>-4</u>	3	4	5	\dashv				$_{M}$	TAN	OLIVE MEDIUM STIFE	F SANDY SILTY	
215	-	-					: : : : : : : : : : : : : : :				-	CLAY (A-7)		
215	_ - 213.7 -	- - 12.4									_			
	-	-	2	2	3		•5° · · · · · · · · · · · · · · · · · · ·		'	M	<u> </u>			
210		-									_			
}	_ 208.7 -	- 17 ₋ 4	2	3	4	\dashv			,	$_{\scriptscriptstyle{M}}$	_			
	-	-			ŀ						_			
205	_ _203.7	- - 22.4												-
		-	3	2	3		5: : : : : : : : : : : : : : : : : : :		1	м	<u>-</u> -			
200	_	-					-				_			
-	198.7 -	- 27.4	2	4	5	_		: : : :		MT 🖺	-			
		_	_	,	Ĭ		. • • • • • • • • • • • • • • • • •				_ _ _			
195	_ 193.7 -	- - 32.4									_			
	183.7		2	2	4	٦	6		1	M	<u>-</u>			
190	-	_									- 189 5			3
]							100/.5			-	CRYSTALLINE RO		
	-	_									- WE	DARSE GRAINED GA EATHERING ZONES I	DEVELOPED	
185		-						-			_	ALONG FRACTU	IRES	
	1	-									-			
180	1	_									- -			
	-	-									_			
		_									-			
175	4	_												
	1	_												_
170		-				+		1 [- 171.3 - Borin	g Terminated at Elevat		5
	7	-									- -	CRYSTALLINE R	OCK	
	1	-									-			
165	-										- .			
	1	-									- -			
160	1	-									-			
	-	-									 -			
	1	-									- -			
155	1													
	-	-									- -			
- 1		-							1 1		-			



_							3 RE	PU	RI	1				
	JECT N					-3421A				٠		OLOGIST Mur	,	
				T LANE				4 BUS	. ON		US 220 BYPASS BETWEEN SR1244 AND	SR 1140	GROUND W	TR (ft)
	ING NO						101+65			—	FSET 30ft LT ALIGNMENT		0 HR.	N/A
	LAR EL						PTH 54			1	RTHING 437,755 EASTING 1,74	15,732	24 HR.	29.0
	L MACI			50X			THOD N		sing w			IAMMER TYPE		
	RT DAT		1/07		·		TE 12/1			su	RFACE WATER DEPTH N/A D	EPTH TO ROC	K 36.6 ft	
COR	E SIZE	NX			TOTA	AL RU	N 18.2 f		ATA		ILLER Estep, J. E.		··	
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	REC. (ft)	RQD (ft)	SAMP. NO.	STR REC. (ft) %	RQD (ft)	L O G	DESCRIPTION AND ELEV. (ft)	REMARKS	D	EPTH (ft
189.5	-	36.6 40.3	3.7		(2.1) 57%	(1.9) 51%		(15.7) 86%	(12.3) 68%		Begin Coring @ - 189.5 CRYSTALLINE - NEARLY UNWEATHERED BLOCKS - WASHED OUT INTERVALS	ROCK OF GABBRO SEI	PARATED BY	36.6
185	185.8 _ - - -	40.3	5.0		(4.6) 92%	(4.0) 80%					- - -			
180	180.8	45.3	4.8		(4.5) 94%	(3.4) 71%					· -			
175	176.0	50.1	4.7		(4.5) 96%	(3.0) 64%					· · -			
170	171.3 - -	54.8								200	171.3 Boring Terminated at Elevation 171.3	ft IN CRYSTALLIN	NE ROCK	54.8
165	-	- - -									- .			
160		-												
155		-										•		
	1.1	-												
150	-	- - -												
145	- 1	-									-			
140	1													
135		- - -					:							
130	- - -	- - -								•				
		- - -									-			
125	-	-									-			
120	- - - -	- - -								-	-			
115	† 										-			
110		- - -												

SHEET

PRO.	JECT N	O. 345	542.1.	1	ID.	R	R-3421A			COUN	TY I	Richmo	nd			GEOLOGIST M	lurray, C. C.	
SITE	DESCR	IPTIO	N LEF	T LAI	NE BF	RID	GE OVER	R US 74 E	BUS. ON I	-73 / US	\$ 220	BYPA	SSBE	TWE	EN SR1244 A	ND SR 1140	GROUND V	VTR (ft
BOR	NG NO.	. EB2/	A(LL)		S	STA	ATION 10	2+85		OFFSE	ET 7	Oft LT			ALIGNMEN	T -173-	0 HR.	N/A
COL	AR ELI	EV. 23	31.8 ft	-	T	гот	TAL DEPT	H 35.0 f	t	NORTH	HING	437,8	62		EASTING	1,745,664	24 HR.	26.0
DRIL	L MACH	HINE (CME-5	50X		DRII	LL METH	OD NW	Casing w	SPT						HAMMER TY	PE Automatic	
STAF	RT DATE	E 12/0	4/07		С	ON	MP. DATE	12/04/0	7	SURFA	ACE	WATE	R DEF	TH N	I/A	DEPTH TO RO	OCK 28.5 ft	
LEV	DRIVE ELEV	DEPTH	BLC	ow.co	UNT	\prod		BLOWS	PER FOOT			SAMP.	V /	LO		OIL AND ROCK D	ESCRIPTION	
(ft)	(ft)	(ft)	0.5ft	0.5ft	0.5ft	1	0 2	5 ,	50	75 i	100	NO.	MOI		ELEV. (ft)			DEPTH
													ļ					
235	_	_		ŀ											-			
	1	-	·								Ī				•			
	}			<u> </u>		+	.1		T	T			 		231.8	GROUND SU ARTIFICIAL		
230	1	Ē					1		 	 					RE - 228.6	D TAN BACKFILL, CLAY(A-	SANDY SILTY	3
}	228.0	3.8	2	3	4	$\dashv \mid$	1,		1 : : : :	1			M			RESIDUA	.L	
225	1	-					7						"'		MEDI	JM STIFF, MOIST LIVE' SANDY SILT	Y CLAY. (A-7)	U
	223.0	8.8													-			
		-	3	3	4	1	• 1 · · · ·			: : :	: :		М					
220		_						· · · ·	<u> </u>						-			
}	218.0	- 13.8			4	41	1:::			1 : : :	: :		١		•			
,,,	1	-	2	3	4		♦ 7 · ·						М					
215	+	_				11	- \			 					-			
1	_213.0	18.8	5	4	7	$\exists $. }		: : : :	: : :	: :		w					
210	_	-	-				Ī.	• • • •							-			
	208.0	23.8	ĺ				j:::			: : :	: :							
	-	-	2	2	3	1	5						₩					
205	-	-					1		1	+	\dashv				=			
	203.0	28.8	30	100/,1			ļ-,-,-,-		ļ <u></u>						203.3	CRYSTALLINE	ROCK	28
200	‡	-		1007.1						10	00/ <u>.</u> 1							
	400.0	-		ŀ											-			
}	198.0	33.8	39	100/.1	ļ	Ш		· · · ·	<u> </u>	<u> </u>	00/.1	<u> </u>			196.8	T	OED DEE:10.11	35
195			}											-	– Boring – Eleva	Terminated BY AU ion 196.8 ft IN CR	SER REFUSAL a STALLINE ROC	K
	1	-																
400	1	-																
190	-	_													-			
İ	1	•										İ						
185	_	_																
	1	_																
	7	_		1								1						
180	-													F	-			
	+	-										}		F				
175	1	-																
	-	-													-			
	1	-													•			
170	_	_		1											-			
	1	L																
		_								•								
165	-													{	-			
	7													F				
160	1		į															
	-	-																
	-	<u> </u>													•			
155	_	ļ.	1		1							1	1	{ F	•			



PRO	JECT N	O. 34	542.1.	1 ·	IE).	R-3421A	COUNTY	Richmo	nd			GEOLOGIST Mu	rray, C. C.	
SITE	DESCR	RIPTIO	N LEF	T LAN	NE E	BRII	IDGE OVER US 74 BUS. ON	1-73 / US 22	0 BYPA	SS BI	ETW	EEN SR1244 A	AND SR 1140	GROUND W	/TR (ft
	ING NO					ST	TATION 103+05	OFFSET	30ft LT		· .	ALIGNME	NT -173-	0 HR.	N/A
COL	LAR EL	EV. 23	31.8 ft		_	ТО	OTAL DEPTH 26.8 ft	NORTHING	3 437,8	391		EASTING	1,745,698	24 HR.	N/A
DRIL	L MACI	HINE (ME-5	50X		DR	RILL METHOD H.S. Augers						HAMMER TYPE	Automatic	
STAI	RT DAT	E 12/0	4/07			CO	OMP. DATE 12/04/07	SURFACE	WATE	R DE	PTH	N/A	DEPTH TO ROO	CK 26.8 ft	
ELEV	DRIVE ELEV	DEPTH (ft)		ow co			BLOWS PER FOC		SAMP.	17			SOIL AND ROCK DES	SCRIPTION	
(ft)	(ft)	(11)	0.5ft	0.5ft	0.5	oft	0 25 50	75 100	NO.	МО) G	ELEV. (ft)			EPTH (
235	_	-							Ì			-			
	-											231.8	GROUND SURF	FACE	c
230	-	_									X		ARTIFICIAL F	ILL	
	228.0	3.8									X.	228.8	SANDY SILTY CLAY RESIDUAL	BACKFILL (A-7) 3
		-	3	3	4		7		SS-13	М	1		DIUM STIFF TO STIFF		
225	-	_									ΔV	- CL	AY TO CLAYEY SAN	DY SILT (A-5)	
	223.0	8.8	2	3	6	-					1.1	- -			
220	-		-							M	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	<u> </u>			
	218.0	13.8									12	218.8			13
			2	3	5	7	••8 • • • • • • • • • • • • • • • • • •		SS-14	М		- MEDII	RESIDUAL UM STIFF SANDY SIL	.TY CLAY (A-7-	5)
215	-	_				ļ						_			
	213.0	18.8	3	3	4	_				Ì		-			
210	-	-			-					М		 -			
	- 208.0	- - - 23.8										-			
	ZU0_U		1	4	3					w		-			
205		- 				+		.	ļ			205.1	WEATHERED RO	nck.	26. 1 26.
	-	-										Boring	Terminated BY AUGE	R REFUSAL at	
200	-	-										- Eleva	tion 205.0 ft ON CRYS	TALLINE ROCE	(
	-	F										-			
	1											-			
195	-	_										- 			
	1	-										-			
190	‡	-										- -			
	7	-										-			
	‡	[-			
185	1	_										<u>-</u>			
	‡	-										- -			
180	‡	-										- -			
	+	-										-			
	‡	-										<u>.</u> -			
175	#	- -										- 			
	†	-										- -			
170	‡	-										<u>-</u> -			
., 0	‡	- -										 -			
	‡	-										<u>-</u> -			
165	‡	-										- -			
	‡	• •	:									- -			
160	‡	- -										- -			
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	‡	- -									1 }	-			
155	†	-		L							<u></u>	.			

PRO	JECT N	0. 345	42.1.1	1	IC).	R-3421A		COUNTY	Richmo	nd		GE	OLOGIST Mui	rray, C. C.	
SITE	DESCR	RIPTIO	N RIG	HT LA	NE	BR	RIDGE OVER US 74 BUS	. ON	I-73 / US22	BYPA	ASS B	ETW	EEN SR 1244 ANI	O SR II40	GROUND V	NTR (f
BOR	NG NO	. EB1-	Ą(RL)			ST	TATION 101+08		OFFSET 3	Oft RT			ALIGNMENT -	173-	0 HR.	28.0
COLI	AR EL	.EV. 22	23.7 ft			то	OTAL DEPTH 45.9 ft		NORTHING	437,7	15		EASTING 1,74	5,805	24 HR.	FIAD
DRIL	L MAC	HINE C	ME-5	50X		DR	RILL METHOD H.S. Aug	ers					Н	AMMER TYPE	Automatic	
STAF	RT DAT	E 11/2	8/08			CO	OMP. DATE 11/28/08		SURFACE	WATE	R DEF	TH N	I/A D	EPTH TO ROC	CK 45.9 ft	
ELEV	DRIVE	DEPTH	BLC	ow co	UNT	. [BLOWS PER	FOOT		SAMP	V /	L	SOIL	AND ROCK DES	SCRIPTION	
(ft)	ELEV (ft)	(ft)		0.5ft	0.5	oft	0 25 50		75 100	NO.	МО		ELEV. (ft)			DEPTH (
225	_		ļ										_			
		<u> </u>			_	+			T		 		. 223.7 - 223.2 RC	GROUND ADWAY EMBAN	NKMENT	0
		Ŧ	}										- 222.2	ASPHALT PLUS	ABC	1
220	219.7-	4.0	3	4	5	_			 • • • • 		١			STIFF GRAVELL		Υ
		ľ	3	4	٥		9				M		- -	(A-7)		
215		‡										-5	•			
213	-	‡											 -			
		‡								-			- -			
210	209.7-	14.0											_			
		T 14.0	5	11	6		17				М		_			
		Ŧ					::::: :						- '			
205	204.7-	19.0						• • •					-			
		‡	3	3	7		10 : 10 : : : :			ļ	M		• •			
		1											- -			
200	198.8	24.9				-	- - 		 				-			
		+ 27.3	2	2	4		6				М		• -			
195		Ŧ									\square		•	•		
100	194.7-	29.0	4	4	5	\exists	. •9				М		193.7	ALLUVIAL		30
		‡					$ \hat{\mathcal{J}}_{i} : : : : $	· · ·					- LC	OSE MOIST SAI	ND (A-2)	
190	1897-	34.0					1 .									34
		<u> </u>	3	1	2	?	43	 	: : : :		М		- - VERY LO	RESIDUAL OSE TO DENSE,		2)
		<u> </u>				ļ		 					- -		•	•
185	184.7 -	39.0	1	3	5						l w		 -			
		Ŧ	'	,		'					**		-			
180		‡	}										- -			
100	179.7 -	44.0	7	19	11	8	37				l.w		-			45
			<u> </u>		-	-				-			_ 177.8 _ Boring Ter	minated BY AUG	ER REFUSAL a	t
175		<u> </u>											Elevation	177.8 ft ON CRYS	STALLINE ROC	;K
		+											- -			
		Ŧ											-			
170	-	‡										{	-			
		‡								-			- -			
405		‡											-			
165	-	<u> </u>				- 1							-			
		<u>†</u>	1			- 1	1						 =			
160		Ŧ				-	1									
	1	‡											_			
		‡											- -			
155		<u> </u>											_			
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150	-	‡					1						- 			
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		+		1		-										



PRO.	JECT N	O. 345	42.1.1	1	ID.	R-3421A		COUNTY	Richmo	nd	·	GEOLOGIST M		
SITE	DESCR	RIPTIO	N RIG	HT LA	NE BI	RIDGE OVE	ER US 74 BUS. C	N I-73 / US22	0 BYPA	SS BET	WEEN SR 124	4 AND SR II40	GROUND	WTR (f
BOR	NG NO	. EB1-	B(RL)		S ⁻	TATION 10	01+40	OFFSET	70ft RT		ALIGNME	NT -173-	0 HR.	25.0
COLI	AR EL	EV . 22	4.4 ft		T	OTAL DEP	TH 37.3 ft	NORTHING	3 437,7	56	EASTING	1,745,835	24 HR.	FIAD
DRIL	LMACH	HINE C	ME-5	50X	D	RILL METH	IOD H.S. Augers					HAMMER TYP	E Automatic	
STAF	RT DAT	E 11/2	8/07		C	OMP. DATE	11/28/07	SURFACE	WATER	R DEPTI	H N/A	DEPTH TO RO	OCK 37.3 ft	
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLC 0.5ft	0.5ft		0 2	BLOWS PER FOO	OT 75 100	SAMP. NO.	. • /	CO G ELEV. (ft)	SOIL AND ROCK D		DEPTH (
225								· · · · · · · · · · · · · · · · · · ·			224.4	GROUNI		0
	-	[222.9	ROADWAY EMBA BLACKTOP +	ABC	
220	220.4	4.0_	ž	3	2				SS-1	M		ROADWAY EMBA	EY SILT WITH	
	-	-	_		_	₹ 5			33-1	"	218.4	GRAVEL (A	·	. 6.
215	- 215.4	- 9.0] :\::					l N	OOSE CLAYEY SILT	Y SAND (A-2-6)	
210		-	6	7	7	•14			SS-2	мЬ				
	-	- -				::;:::					7			
210	210.4_	14.0	3	4	6	10				МЬ				
	-	Ė				: 7, . :				L.	207.4			17.
205	205.4	19.0									ME.	ROADWAY EMBA DIUM STIFF TO STIFI		Υ
	-	F	2	3	4	.•7			SS-3	МЬ		SANDY SILTY CL	AY (A-7-6)	
	-	F									202.4	ROADWAY EMBA		22
200	200.4	24.0.	3	2	4	6			SS-4	M	J- ME	DIUM STIFF TO STIFI SANDY SILTY CL		Ϋ́
	-					$\begin{bmatrix} 1 & T & \vdots \\ T & \vdots \end{bmatrix}$					3			
195	195.4	29.0									\			
	-	F	6	6	4	. •10 .				W	\$			
	-	<u> </u>				: : : :					191.4			33
190	190.4	34.0	3	2	5	• 7			SS-5	w	% <u>[</u> 	RESIDUA LOOSE RESIDUAL :	L SAND (A-2-4)	
		<u> </u>				<u> </u>		<u> </u>			187.1	•		37.
185	_	E										ng Terminated BY AUG ation 187.1 ft ON CR		
	_										[
	-										[
180	-	_							1		-			
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175	-	ŀ									Ł			
		ł												
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170	_	<u> </u>									-			
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165	_	<u> </u>												
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160	-	<u> </u>									_			
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155	-	<u> </u>									E			
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145	_	I	1	1		1			1	1	Γ			

PRO.	JECT N	0. 345	42.1.1		ID.	. F	R-3421A	COUNTY	Richmo	nd		GEOLOGIST Mu	rray, C. C.
SITE	DESCR	IPTIO	N RIG	HT LA	NE E	3RI	IDGE OVER US 74 BUS. ON	I 1-73 / US22	0 BYPA	SS BI	ETW	EEN SR 1244 AND SR II40	GROUND WTR (f
BORI	NG NO	. B1-A	(RL)		5	STA	ATION 102+10	OFFSET 3	30ft RT			ALIGNMENT -173-	0 HR. ' N//
COLL	AR EL	EV. 22	7.8 ft		7	го	TAL DEPTH 65.0 ft	NORTHING	437,8	13		EASTING 1,745,779	24 HR. FIAI
RIL	L MACH	HINE C	ME-5	50X	[DRI	ILL METHOD NW Casing w	/ SPT Core				HAMMER TYPE	Automatic
STAF	RT DATI	E 12/0	5/07		C	COI	MP. DATE 12/06/07	SURFACE	WATE	R DEP	TH N	N/A DEPTH TO ROO	CK 43.4 ft
LEV	DRIVE	DEPTH	BLC	w co	UNT		BLOWS PER FOO	Ť	SAMP.	V /	L	SOIL AND ROCK DES	SCRIPTION
(ft)	ELEV (ft)	(ft)	0.5ft	0.5ft	0.5ft	t	0 25 50	75 100	NO.	моі		ELEV. (ft)	DEPTH
								j					
230	_												
	-	_										227.8 GROUND	waii-v a
,	-	_										ROADWAY EMBAI RED-BRN STIFF MOIST	SANDY SILTY
225	7	<u> </u>										L CLAY (A-7) W/ ROUND -	DED GRAVEL
	-						13::: :::: ::::	.				-	
220	220.4	7.4		ļ.,	<u></u>	_					比	<u>-</u>	
	7	<u>.</u>	3	4	6		•10	.		M		_	
	-											_	
15	215.4	12.4_	3	4	5	\dashv	•9			М	FB	<u>-</u>	
	-											212.8 RESIDUAL	1
210	210.4	17.4		<u> </u>								RED, STIFF MOIST (
	-		5	6	7		13			М	1		2
	-	-										RESIDUAL OLIVE LOOSE TO V. DEN	
205	205.4	22.4	2	3	4	\dashv	7			М		CLAYEY SILTY SA	
	-	 										• •	
,,,	200.4	27.4			ļ								
200_			2	3	3		6 6			М		<u>-</u> -	
	-	-										<u>-</u>	
195	195.4	32.4	3	4	4	4				М		<u>-</u>	
	-	ţ		~			. \	: : : : :		'"		 	
	400.4	27.4			1			: : : : :				<u> </u>	
190	190.4	3/4	4	6	9	7	. •15			М		 	
	-	<u> </u>						: : : : :				<u> </u>	
185	185.4	42.4	27	40	100/.	-	. 7.	~ ~				184.4	4
	-	<u> </u>	21	40	100/.	1		100/.1	•			CRYSTALLINE F	ROCK
		<u> </u>										REFUSAL @ 44.5, BI	EGIN CORE
180	-	<u> </u>										WEATHERED TO FRE	SH SLIGHTLY
		ł										GABBRO. WEATHERIN	NG IS ALONG
175		E										FRACTURE RESIDUAL	
	-	Ŧ						.]				RESIDUAL SOIL FROM GABBRO, (A	
		Ŧ						.				CRYSTALLINE I DARK GRAY VERY	ROCK
170	-	Ŧ										WEATHERED TO FRE	SH SLIGHTLY
	-	Ŧ										GABBRO. WEATHERIN	G DECREASES
165	-	‡						.				WITH DEPT	п.
<u>, , , , , , , , , , , , , , , , , , , </u>	-	Ŧ										162.8	6
	-	‡		 	T	+	<u></u>	<u> </u>	1		شاحم	Boring Terminated at Elevi CRYSTALLINE	ation 162.8 ft IN
160	-	‡										- OKTOTALLINE	,,,,,,,,,,
	:	‡	1									<u> </u>	
455		‡										<u> </u>	
155	-	‡										 -	
		1										<u> </u>	
150		1								L			



SHEE 16

	/ <u>\</u>			KE D						-			0501 00107 14	
	ECT NO				D. R-			7.00		L	UNTY Richmond		GEOLOGIST M	
				H LANE				/4 BU	S. ON	$\overline{}$	/ US220 BYPASS BETY	·	-	GROUND WTR (ft)
	NG NO.						102+10			-	SET 30ft RT	ALIGNMEN	·····	0 HR. N/A
	AR ELE				ļ		PTH 65				RTHING 437,813	EASTING	T	24 HR. FIAD
	L MACH			50X	 		HOD N		ing w				HAMMER TYP	
<u> </u>	RT DATE		5/07		 		TE 12/0			 	RFACE WATER DEPTH	I N/A	DEPTH TO RC	OCK 43.4 ft
COR	SIZE	NX		DDII.	1	IL RU	N 20.5 f	t STR	ΔΤΔ	 	LLER Estep, J. E.			
ELEV (ft)	ELEV	DEPTH (ft)	RUN (ft)	DRILL RATE	REC.	RQD (ft) %	SAMP. NO.	REC. (ft)	RQD (ft) %	Ö		DESCRIPTION A	AND REMARKS	
(19	(ft)	(19	(1.0)	(Min/ft)	(ft) %	%		<u>%</u>	`%′	G	ELEV. (ft)			DEPTH (ft)
183.3	183.3 182.4	- 44.5	0.9		(0.5)	(0.5)					182 4	Begin Coring CRYSTAL	3 (0) 44.5 ft LINE ROCK	45_4:
180	182.4_ 1 1	₹_45.4_/ -	5.0		(5.0)	\56% / (1.0)							NED GABBRO VER TURED. WEATHEF	
100	7	-			100%	20%					178.4		continued) DUAL	49.4
	177.4	- 50.4 -	5.0		(4.9)	(3.4)		(15.5) 99%	(13.4) 86%			CRYSTALI	INE ROCK	
175	_	-			98%	68%						ARSE GRAINED		RESH SLIGHTLY RING DECREASES
	172.4	- - 55.4									·	WITH	DEPTH.	
170			4.8		(4.8) 100%	(4.2) 88%					•			
170	7	- !				- /					-			
	167.6	- 60.2 -	4.8		(4.8)	(4.8)					•			
165	1	- -			100%	100%					• 			
	162.8	65.0				_				5	. 162.8			65.0
400	1	-									Boring Term	inated at Elevation	162.8 ft IN CRYSTA	ILLINE ROCK
160	1	-												
	‡	-									•			
155		-									-			
	1	_			}						•			
	1	_				ļ					•			
150	-	_									- •			
	1	_									• •			
145	-	<u>-</u>									- 			
	-	-						ŀ			• •			
440	-	-									.			
140	-	-									-			
	-	-									• •			
135											- 			
	-	<u> </u>					i							
422	-	<u> </u>									• -			
130		‡			-						- -			
	-	-		1							- -			
125	-	<u> </u>									<u>-</u>			
	-	<u> </u>									• •			
1	-	‡									- -			
120		<u> </u>												
	_	‡									- -			
115	-	‡									- -			
	-	-									- -			
		ļ									- -			
110	_	<u> </u>									 -			•
] -	E									<u>.</u>			
105] -	E									- 			
		<u> </u>	<u> </u>			L		<u> </u>						

SHEET

	》(T	D	BO	REI	00	G REP	ORT									
1	JECT N				1	R-3421A				Richmor				OLOGIST Mu		
SITE	DESCR	IPTIO	N RIG	HT LA	NE B	RIDGE OVE	R US 74 BUS	S. ON I-73 /	US220	0 BYPA	SS BE	TWI	EEN SR 1244 AN		GROUND V	• • •
BOR	ING NO	. B1-B	(RL)		S	TATION 10	2+35	OFFS	SET 7	Oft RT			ALIGNMENT -		0 HR.	N/A
COLI	LAR EL	EV. 22	6.1 ft		TO	OTAL DEPT	H 55.0 ft	NOR'	THING	437,84	47		EASTING 1,74	15,812	24 HR.	29.0
DRIL	L MACH	HINE C	ME-5	50X	D	RILL METH	DD NW Casi	ng w/ SPT	Core				<u> </u>	AMMER TYP	E Automatic	
STAF	RT DAT	E 12/0	5/07		C	OMP. DATE	12/05/07	SURI	FACE	WATER	DEP	TH N	VA C	EPTH TO RO	CK 32.9 ft	
ELEV	DRIVE	DEPTH	BLC	ow co	UNT		BLOWS PER	FOOT		SAMP.	lacktriangledown/	L	SOIL	AND ROCK DE	SCRIPTION	
(ft)	ELEV (ft)	(ft)	0.5ft	0.5ft	0.5ft	0 25	5 50	75	100	NO.	MOI	Ğ	ELEV. (ft)			DEPTH (ft)
230	-	-							-					GROUND	ı	0.0
225	_			<u> </u>						1		F	R	DADWAY EMBA BROWN SANDY		
	1												- KED	BKOVIII SKIAD I	OLIT OLA	
220	 -	‡											- -			
220	218.7 -	7.4				1							 - 			
		<u> </u>	4	3	4	• 7.				SS-15	М		_			
215	-	‡					-						-			
1	213.7	.12.4	2	3	4	<u> </u>	: : : : :		: : :		М	FR				
	-	t	~			: : :			: :			F	- - 210.1			16.
210	2007	47.4										7.7		RESIDUAI ST MEDIUM STI		
	208.7	17.4	2	3	3	\$ 6			: : :	SS-16	w	7. Z	SLIGHT	Y MICACEOUS	SANDY CLAYE	Υ
205] :	‡					:::: :					7.7	- 	SILT (A-5)	
200	203.7	22.4			<u> </u>	1				00.45	-	7 V	Ł			
		‡	2	3	4	1 .7.	:::: :		: : :	SS-17	-	1, 1,	F		•	
200		‡				1						12.17	<u> </u>			
	198.7	27.4	4	5	8				: : :		_	1,1	-			
		ł							<i>-</i>		-	1	-			
195	402.7	32.4				<u> </u>					l	100	<u>194.6</u> 193.2	WEATHERED	ROCK	31. 32.
	193.7	7 32.4	33	100/.1	Ī			.	100/.1					CRYSTALLINE RY SLIGHTLY W		
190		Ŧ			1						1		₹ UN	FRACTURED TO	SLIGHTLY	
	-	‡											GRAINE	TURED DARK O GABBRO. ZOI	NES WEATHER	ED
3		‡					: : : : :					بر مرکز مرکز	186.0	O CLAY ALONG		40
185		‡											FR	CRYSTALLINE ESH DARK GRA		
		‡											F			
		1											-			
180	-	<u>†</u>											}_ }-			
		±				11::::	:::: :		'				1			
175		Ŧ	1				.	• • • •					-			
3	1	Ŧ						-			1		<u> </u>			
į		‡										يُمْضِعُ السِّمِ	- 171.4			54 N
170	ļ .	‡			—	T	<u> </u>						Boring	Terminated at Ele CRYSTALLINE	evation 1/1.1 ft l E ROCK	N
3		‡											F			
5		<u>†</u>				1							F			
165	-	\pm											-			
5		‡											E			
160		‡								ĺ			F			
2 100	7	‡											-			
185 180 180 185 175 175 175 175 175 175 175 175 175 17		‡											F			
155 155		<u> </u>											F			
BOK K		Ŧ		İ									<u> </u>			
<u> </u>		Ŧ											ţ			
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\geq							3 RE	, 0		· ·					
	JECT N					3421A					UNTY Richmond		GEOLOGIST M		
SITE	DESCR	RIPTIO	N RIG	HT LANE	BRID	GE O	VER US	74 BU	S. ON		/ US220 BYPASS BETWE			GROUND W	
	NG NO				└		102+35				FSET 70ft RT	ALIGNMEN		0 HR.	N/A
	AR EL						PTH 55.				RTHING 437,847	EASTING		24 HR.	29.0
	L MAC			50X			THOD N		sing w				HAMMER TYP	·	
STAF	RT DAT	E 12/0	5/07				TE 12/0				RFACE WATER DEPTH N	Α	DEPTH TO RO	OCK 32.9 ft	
COR	E SIZE	NX			TOTA		N 21.6 f	t STR	ΛΤΛ	 -	LLER Estep, J. E.				
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	REC. (ft)	RQD (ft) %	SAMP. NO.	REC. (ft)	RQD (ft) %	L O G	ELEV. (ft)	ESCRIPTION	AND REMARKS	D	EPTH (ft)
193	193.0	33.1	2.0		(2.0)	(1.5)						Begin Corin	g @ 33.1 ft LINE ROCK		
190	191.0	35.1	5.0		(4.3) 86%	75% (3.4) 68%					FRACTURED DA	Y WEATHERE RK GRAY CO	ED UNFRACTURED ARSE GRAINED GA ALONG JOINTS. (cc	ABBRO, ZONES	
185	186.0	40.1	4.9		(4.9)	(4.9)		(14.5)	(14.5)		186.0	CRYSTAL	LINE ROCK		40.1
105	-	-	4.5		100%	100%		(14.5) 99%	99%		_ UNWEATHER		URED GABBRO WI	TH RQD=100	
	181.1	45.0									. -				
180		- 13.3	4.8		(4.8)	(4.8) 100%					- -				
		Ŧ			,						- -				
175	176.3	49.8	4.9		(4.8)	(4.7)					- -				
.,, 5		Ŧ			98%	96%					· -				
	171.4	54.7			ļ			ļ		وكي المجلو	- 171.4		171 1 0 IN OF YOT	WINE BOOK	54.7
170	-	-	}								Boring Terminal	ed at Elevation	171.1 ft IN CRYSTA	ALLINE ROCK	
		Ŧ									<u>-</u>				
165		Ŧ		'							<u>.</u>			•	
	-	Ŧ				'					 				
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160	-	Ŧ									_ -				
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155	_	1									-				
		‡									- -				
		1									-				
150	-	‡				1					<u></u>				
		+									<u>-</u>				
145		‡									_				
		‡													
140		‡									-				
1-40	1 -	‡									- -				
140		‡									<u>-</u> -				
135		‡									_				
		‡				-									
130		Ŧ									<u>.</u>				
130	1 .	Ŧ									Ē				
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125		Ŧ									_				
120		Ŧ					-								
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115		\pm									 				
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SHEET

PRO.	ECT N	0. 345	42.1.	1	ID.	R-3	421A			COUNT	Υ	Richmo	nd			GEOLOGIST M	urray, C. C.	
SITE	DESCR	IPTIO	N RIG	HT LA	NE B	RIDO	GE OVE	R US 74	BUS. ON	l-73 / U	S22	BYPA	SS BI	ETWE	EN SR 1244	AND SR II40	GROUND V	VTR (f
BORI	NG NO	. EB2-	A(RL)	1	s	TATI	ION 10	3+23		OFFSE	Т 3	Oft RT			ALIGNMEN	T -l73-	0 HR.	N/A
COLL	AR EL	EV. 23	1.8 ft		T	ОТА	L DEPT	TH 39.9 f	1	NORTH	IING	437,9	23		EASTING	1,745,752	24 HR.	26.
DRIL	L MACH	line C	ME-5	50X	D	RILL	METH	OD H.S.	Augers							HAMMER TYP	E Automatic	
STAF	T DAT	E 12/0	4/07		С	OMP	DATE	12/04/0	7	SURFA	CE	WATER	R DEP	TH N	/A	DEPTH TO RO	OCK 39.2 ft	
LEV	DRIVE	DEPTH	BLC	ow co	UNT	П		BLOWS	PER FOO	Τ		SAMP.	$\mathbf{V}/$	L		OIL AND ROCK D	ESCRIPTION	
(ft)	ELEV (ft)	(ft)	0.5ft	0.5ft	0.5ft	0	2	5	50	75 	100	NO.	MOI		ELEV. (ft)			DEPTH
																		·
235		_													.			
	-															000111	-	
	-			-	ļ	 	1	T	T	.	-				231.8	GROUNI ROADWAY EMB		
230		Ţ				ŀ	 		-						- RE	D TAN SANDY SIL	.TY CLAY (A-7)	;
	228_1_	3.7	3	3	5	- -	ļ			.			M	7.		RESIDUA STIF MEDIUM STIF		
225	-						T			.	-			X . F		SANDY CLAYEY		
23	-													1	-			
1	223_1	8.7	3	3	4	;] · · · ●7 · ·	::::					М	12.1	•			
220	-	L												[4:1]	-			
	218.1	13.7] -					:			[3,5]	•			
			2	3	4] [4	7				-		М	1				
15	-	‡					1		1		\dashv			12.15	-			
	213.1	18.7		3	3	;			: : :	: : : :			w	1	•			
	-	_	1	3			p 6			: : : :			**	1, 1	•			
210	-	t				١H			 				ĺ		- 208.1			2
	208.1	23.7	1	. 2	3	┤│				: : : :	:		₩			RESIDUA		
205	-	Ŧ						: : : :					_	{	. WET	MEDIUM DENSE	SILTY SAND (A-2	:)
	-	‡				\prod	1						l		•			
	-	‡					į:::				-				-			
200	_	‡				11:	· 1 · · · ·								<u> </u>			
	198 1	33.7	_	<u> </u>	1	41:	1								- -			
		ļ	2	3	6		9			: : : :					• •			
195	-	ł				 -		 		. 	\exists		1					
	193.1.	38.7	16	100/.	1	11.					07.1				- 192.6 - 191.9	CRYSTALLINE	ROCK	3
190		+			100.1										- \	SPT REFUSAL Terminated BY AU	. AT 39.2	
	-	‡													- Boring Eleva	ition 191.9 ft IN CR	YSTALLINE ROC	K
		‡													-			
185	_	‡													<u>-</u>			
		‡													-			
		<u> </u>													<u>.</u>			
180	-	Ŧ													<u> </u>			
		Ŧ													- -			
175		‡																
115	-	‡	1												-			
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170	_	<u> </u>													_			
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165		‡													-			
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160	-	\pm													- -			
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NCDOT GEOTECHNICAL ENGINEERING UNIT

C	J. A.		3 <i>01</i>	REL	_00	3 REF	PORT								/	8
	JECT NO				_i	R-3421A			COUNTY					GEOLOGIST Mur	, <u> </u>	
SITE	DESCR	IPTION	N RIG	HT LA							SS BI	ETW	EEN SR 1244	AND SR II40	GROUND W	` 1
BOR	ING NO.	EB2-	B(RL)			TATION 1			OFFSET 7				ALIGNME		0 HR.	27.0
	LAR ELE						TH 31.8 ft		NORTHING	437,9	48		EASTING		24 HR.	23.0
	L MACH			50X	_		HOD H.S.							HAMMER TYPE		
STAF	RT DATE	11/3				OMP. DAT	E 12/04/07		SURFACE			1 HT	N/A	DEPTH TO ROC	29.7 ft	
ELEV (ft)	ELEV	DEPTH (ft)	0.5ft	0.5ft	JNT 0.5ft	О		ER FOOT 0	75 100	SAMP.	моі	ō		SOIL AND ROCK DES		EDTU (III)
1.7	(ft)		0.510	0.511	0.51		1			110.	/ WICI	G	ELEV. (ft)			EPTH (ft)
225																
235_	+	- -											<u>-</u> -			
	1	-											- - 231.0	GROUND		0.0
230		_				1							_	ROADWAY EMBAN MOIST RED SANDY S		
	227.3	- - 3.7.											228.0	RESIDUAL		3.0
225	1	-	3	3	3	6				SS-10	М		_ MOI	ST TAN MEDIUM STIF SANDY CLAYEY SII		
	7	-					: : : :						<u>.</u>		, ,	
	222.3.	8.7	3	3	5	.1					М		- -			
220		_				1			 				_ -			
	_217.3	13.7											-			ĺ
215]	_	2	3	4	. • 7				SS-11	М		-			
	-	-						 					- -			
	212.3	18./ -	2	2	2	4 4					w		. -			
210	_	_		,		1	 						209.0	DECIDIAL		22.0
	207.3	23.7	2	3	5	: : : <i>j</i> :				SS-12	y	1,1	_ w	RESIDUAL ET, TAN TO OLIVE ME	EDIUM STIFF	
205		-			J	. ●8				33-12	77	1 2	- 	CLAYEY SANDY SI	IL1 (A-5)	
	202.3	28.7									<u> </u>		- -	•		
200	202.3	- 28-/ -	5	32	100/.1		†	 		,			201.3	CRYSTALLINE R	оск	29.7
200		-	ļ	ļ					<u> </u>			1	199.2 Borin	g Terminated BY AUGE		31.8
	-	-												ation 199.2 ft IN CRYS		
195	_	-				ļ							<u>-</u>			
	-	ļ											- -			
190	-	-										{	<u>-</u>			1
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185	-	[-		ļ											
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180		<u> </u>				1							-			
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175		‡						•					- -			
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170	-	‡											-			
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165		‡								1			-			
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160	-	Ŧ											[•
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155		Ŧ									<u>L_</u>		<u> </u>			
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M & T Form 503

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAY MATERIALS & TESTS UNIT SOILS LABORATORY

	REPORT ON SAM	PLES OF	SOILS FOR C	QUAL	JTY	
Project	3454211	County	RICHMOND		Owner	
Date: Sampled	12/12/07	Received	12/19/07		Reported	12/21/07
Sampled from		_		Ву	C C MUR	RAY
Submitted by	N WAINAINA				1995	Standard Specification

6/10/08

TEST RESULTS

Proj. Sample No.		SS-7	SS-8	SS-9	SS-10	SS-11_	SS-12
Lab. Sample No.		742750	742751	742752	742753	742754	742755
Retained #4 Sieve	%	-	1	-	_	-	-
Passing #10 Sieve	%	95	95	100	100	100	100
Passing #40 Sieve	%	82	80	87	93	90	86
Passing #200 Sieve	%	67	59	27	65	65	50

MINUS NO. 10 FRACTION

SOIL MORTAR - 100%							·······
Coarse Sand Ret - #60	%	19.6	24.6	30.5	12.3	18.8	23.8
Fine Sand Ret - #270	%	12.5	16.0	51.1	32.3	21.6	31.9
Silt 0.05 - 0.005 mm	%	15.4	8.9	14.3	33.1	37.4	28.1
Clay < 0.005 mm	%	52.5	50.5	4.0	22.2	22.2	16.2
Passing #40 Sieve	%	-	-	-	-		
LOCATION	%	EB1B	EB1B	EB1B	-		-

L. L.		47	69	26	59	57	51
P. I.		21	39	NP	17	16	9
AASHTO Classification		A-7-6(13)	A-7-5(21)	A-2-4(0)	A-7-5(12)	A-7-5(12)	A-5(3)
Station		100+50	100+50	100+50	103+40	103+40	103+40
OFFSET		30 LT	30 LT	30 LT	70 RT	70 RT	70 RT
ALIGNMENT		SBL	SBL	SBL	I 73 NB	I 73 NB	I 73 NB
Depth (Ft)		19.00	24.00	39.00	3.70	13.70	23.70
7	to	20.50	25.50	40.50	5.20	15.20	25.20

Date: Sampled	12/12/07	Received	12/19/07		Reported 12/21/07			
Sampled from		_		Ву	C C MUR			
Submitted by	N WAINAINA			· -	1995	Standard S _I	pecifications	
742744 TO 742′ 6/10/08	762	TE	ST RESU	LTS				
Proj. Sample N	0.	SS-1	SS-2	SS-3	SS-4	SS-5	SS-6	
Lab. Sample N		742744	742745	742746	742747	742748	742749	
Retained #4 S		1	12	-	-	-	15	
Passing #10 S		95	81	98	98	100	78	
Passing #40 S		68	43	82	86	82	50	
Passing #200 S		36	19	61	57	33	30	
		MINUS	NO. 10 FR.	ACTION				
SOIL MORTA	R - 100%							
Coarse Sand	Ret - #60 %	43.6	61.8	25.5	22.8	31.7	47.8	
Fine Sand R	et - #270 %	21.2	16.7	14.9	23.0	43.6	15.6	
Silt 0.05 - 0.	005 mm %	8.9	4.3	15.2	19.8	20.6	3.3	
Clay < 0.005	5 mm %	26.3	17.2	44.4	34.3	4.0	33,3	
Passing #40 S	lieve %	-	-		-	-	-	
LOCATION	%	EB1B	EB1B	EB1A	EB1A	EB1A	EB1B	
L. L.		27	33	47	55	35	42	
P. I.		9	14	19	24	6	17	
AASHTO Clas	sification	A-4(0)	A-2-6(0)	A-7-6(10)	A-7-5(12)	A-2-4(0)	A-2-7(1)	
Station		101+40	101+40	101+40	101+40	101+40	100+50	
OFFSET		70 RT	70 RT	70 RT	70 RT	70 RT	30 LT	

NBL

4.00

5.50

to

NBL

9.00

10.50

R-3421A

3454211

T. I. P. No.

Project

ALIGNMENT

cc: C C MURRAY Soils File

Depth (Ft)

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAY

MATERIALS & TESTS UNIT

SOILS LABORATORY

County RICHMOND

Owner

NBL

34.00

35.50

NBL

24.00

25.50

NBL

19.00

20.50

SBL

4.00

5.50

REPORT ON SAMPLES OF SOILS FOR QUALITY

Soils Engineer

M & T Form 503

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAY MATERIALS & TESTS UNIT SOILS LABORATORY

TELD MA	R-3421A						
T. I. P. No.	REPORT ON SAME	LES OF	SOILS FO	R QUALI	ITY		
Project	3454211	County	RICHMO	ND	Owner		
Date: Sampled	12/12/07	Received	12/19/07		Reported	12/21/07	
Sampled from		ı		Ву	C C MUR	RAY	
Submitted by	N WAINAINA				1995	Standard S _I	ecifications
742744 TO 7427 6/10/08	762	TE	ST RESUI	LTS			
Droi Comple M	ĺo	SS-13	SS-14	SS-15	SS-16	SS-17	SS-18

Proj. Sample No.		SS-13	SS-14	SS-15	SS-16	SS-17	SS-18
Lab. Sample No.		742756	742757	742758	742759	742760	742761
Retained #4 Sieve	%	-	-	-	-	-	•
Passing #10 Sieve	%	100	100	100	100	100	100
Passing #40 Sieve	%	93	93	92	94	88	100
Passing #200 Sieve	. %	61	60	79	61	46	81

		MINUS	NO. 10 FRA	ACTION			
SOIL MORTAR - 100%							,,
Coarse Sand Ret - #60	%	16.2	17.4	13.7	15.2	22.4	1.2
Fine Sand Ret - #270	%	29.3	27.5	8.7	30.9	39.4	23.2
Silt 0.05 - 0.005 mm	%	34.3	34.9	10.9	39.8	28.1	33.1
Clay < 0.005 mm	%	20.2	20.2	66.7	14.1	10.1	42.4
Passing #40 Sieve	%	-	-	-	-	<u> </u>	-
Passing #200 Sieve	%	-	-	-	-	-	

L.L.	56	53	69	59	52	69
P. I.	10	12	33	8	8	23
AASHTO Classification	A-5(7)	A-7-5(8)	A-7-5(30)	A-5(7)	A-5(2)	A-7-5(24)
Station	103+05	103+05	102+35	102+35	102+35	101+50
OFFSET	30 LT	30 LT	70 RT	70 RT	70 RT	70 LT
ALIGNMENT	I 73 NB	I 73 NB	I 73 NB	I 73 NB	I 73 NB	173-SB
Depth (Ft)	3.80	13.80	7.40	17.40	22.40	6.90
to	5.30	15.30	8.90	18.90	23.90	8.40

T. I. P. No.	R-3421A		_					
			PLES OF SOILS FO		R QUAL	ITY		
Project	3454211		County	RICHMO	ND	Owner		
Date: Sampled	12/12/07		Received	12/19/07		Reported	12/21/07	
Sampled from	7,100		-		Ву			
Submitted by	N WAINAINA				•		Standard Sp	ecifications
742744 TO 742° 6/10/08	762		TE	ST RESUI	LTS			
Proj. Sample N	lo.		SS-19					
Lab. Sample N	0.		742762					
Retained #4 S	ieve	%	2					··- ··· · · · · · · · · · · · · · · · ·
Passing #10 S		%	97					
Passing #40 S		%	91					
Passing #200	Sieve	%	53					······································
			MINUS	NO. 10 FRA	ACTION			
SOIL MORTA	R - 100%							
Coarse Sand	Ret - #60	%	20.0					
Fine Sand R	et - #270	%	31.7					
Silt 0.05 - 0.	005 mm	%	34.1					
Clay < 0.005		%	14.1					· · · · · · · · · · · · · · · · · · ·
Passing #40 S		%	-					
Passing #200	Sieve	%	-					
				,			·	·
L. L.			59	<u> </u>		· 		
P. I.			4			_		
AASHTO Clas	sification		A-5(3)	1				
Station			101+50	1			 	
OFFSET			70 LT	ļ			 	
ALIGNMENT	····		173-SB				 	
Depth (Ft)			16.90				 	~

18.40

to

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAY

MATERIALS & TESTS UNIT

SOILS LABORATORY

Soils Engineer

R-3421A 34542 RICHMOND COUNTY SOUTH BOUND LANE BRIDGE OVER US 74 ON I-73 / US 220 BYPASS BETWEEN SR1244 AND SR1140

CORE PHOTOS





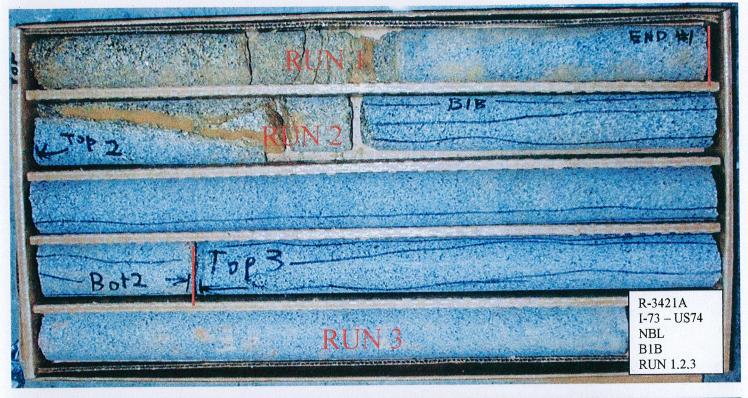




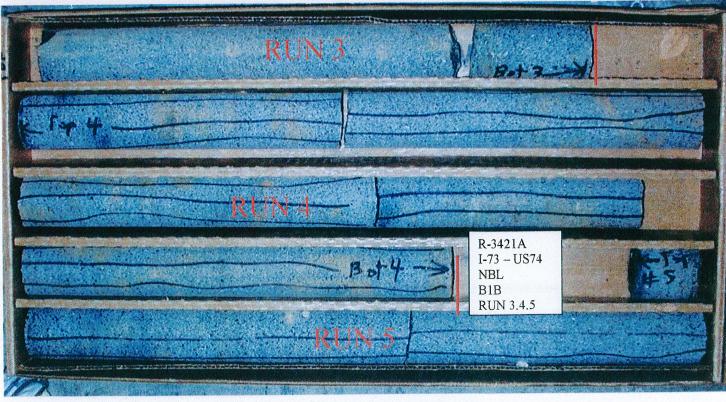
R-3421A 34542 RICHMOND COUNTY NORTH BOUND LANE BRIDGE OVER US 74 ON I-73 / US 220 BYPASS BETWEEN SR1244 AND SR1140

CORE PHOTOS



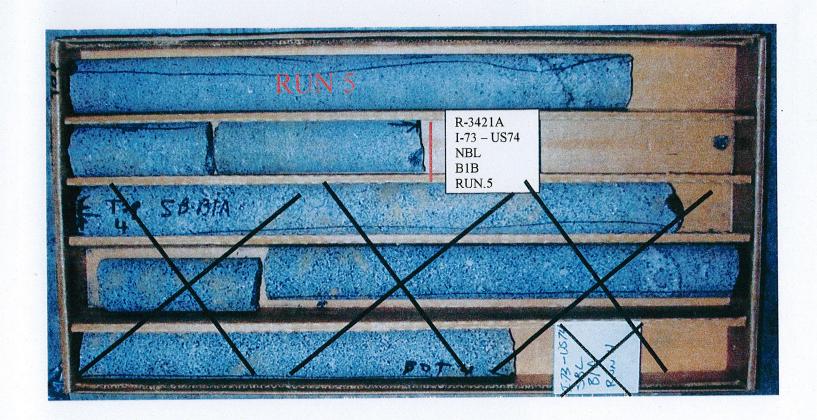






R-3421A 34542 RICHMOND COUNTY NORTH BOUND LANE BRIDGE OVER US 74 ON I-73 / US 220 BYPASS BETWEEN SR1244 AND SR1140

PHOTOS



D: R-3421A

OJECT: 34542.1.1

STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

J Fargher

N.C. 34542.1.1 R-3421A 1

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1	TITLE SHEET
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II.	SOIL TEST RESULTS .
	SCOUR REPORT
12	CORE PHOTOGRAPH(S)
	SITE PHOTOGRAPH(S)

STRUCTURE SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. 34542.1.1 R-3421A F.A. PROJ. NHF-220(4)

COUNTY RICHMOND

PROJECT DESCRIPTION US-220 BYPASS FROM US-74 BYPASS WEST

OF ROCKINGHAM AT SR 1109 INTERCHANGE TO 0.3 MILES

SOUTH OF SR 1140

SITE DESCRIPTION BRIDGE OVER US-74 BUS. WEST COLLECTOR

ON RAMP C BETWEEN I-73 /US-220 BYPASS AND

US-74 BUS. EAST (STA. 11+47.77 -RPC- /24+61.99 -FLY-)

CAUTION NOTICE

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

CENERAL SOIL AND ROCK STRATA DESCRIPTIONS AND INDICATED BOUNDARIES ARE BASED ON A GEOTECHNICAL INTERPRETATION OF ALL AVAILABLE SUBSURFACE DATA AND MAY NOT NECESSARILY REFLECT THE ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS OR BETWEEN SAMPLED STRATA MITHIN THE BORENOLE, THE LABORATORY SAMPLE DATA AND THE IN STILL UN-PLACED TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABLITY INNERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOIL MOSITURE CONDITIONS INDICATED IN THE SUBSURFACE NVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS TO CLIMATICAL CONDITIONS TO CLIMATIC CONDITIONS TO CLIMATICAL CONDITIONS TO CLIMATICAL CONDITION

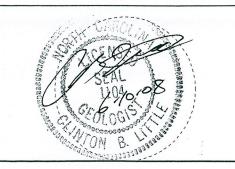
THE BIDDER OR CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE PLANS ARE PRELIMINARY ONLY AND IN MANY CASES THE FINAL DESIGN DETAILS ARE DIFFERENT. FOR BIDDING AND CONSTRUCTION PLANS AND DOCUMENTS FOR FINAL DESIGN INFORMATION ON THIS PROJECT. THE DEPARTMENT DOES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOR THE INTERPRETATIONS MADE, OR OPINION OF THE EMPERIMENT AS TO THE TYPE OF MATERIALS AND CONDITIONS TO BE ENCOUNTERED. THE BIDDER OR CONTRACTOR IS CAUTIONED TO MAKE SUCH INDEPENDENT SUBSURFACE INVESTIGATIONS AS HE DEEMS NECESSARY TO SATISFY HUMSELF AS TO CONDITIONS TO BE ENCOUNTEDED ON THIS PROJECT. THE CONTRACTOR SHALL HAVE NO CLAM 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.

	J.E. ESTEP
-	
_	
5H27 -	
INVESTIGATED BY_	C.C. MURRAY
CHECKED BY	C.B. LITTLE
	C.B. LITTLE

MAY 2008

PERSONNEL

C.C. MURRAY



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

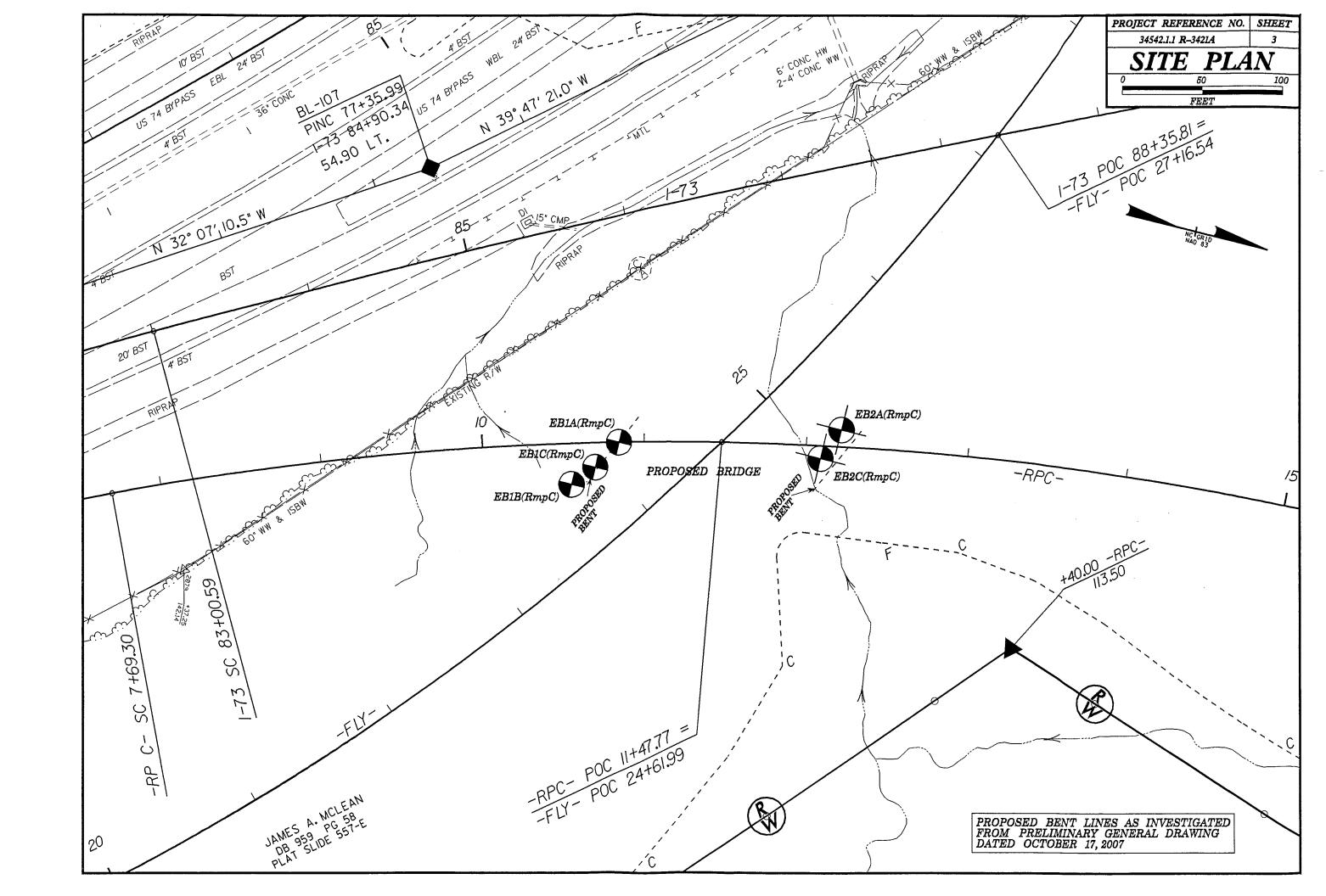
NOTE - BY HAVING REQUESTED THIS INFORMATION THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS
FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE
CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

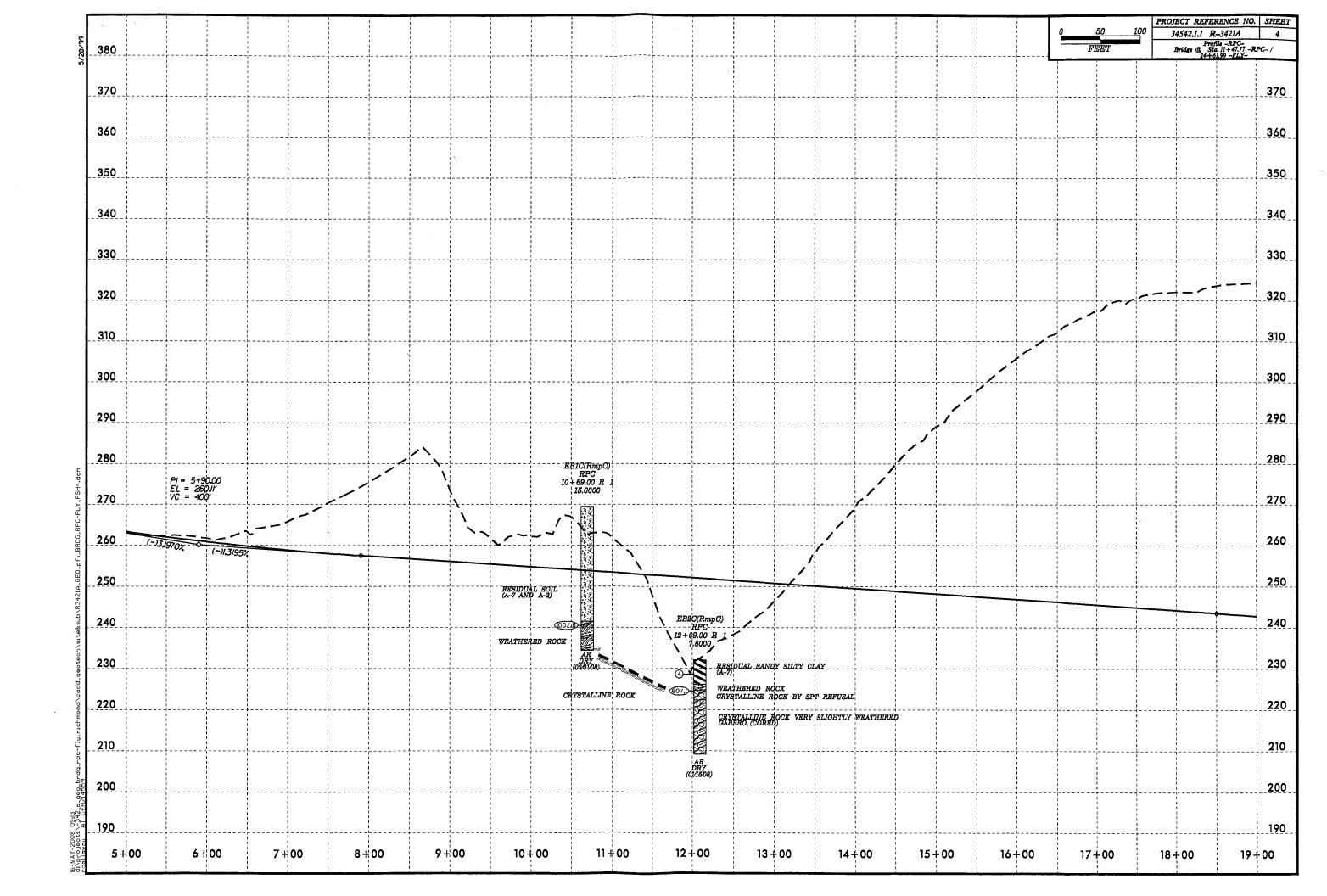
DIVISION OF HIGHWAYS

GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE. HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD YIELD SPT REFUSAL AN INFERRED													
SOIL DESCRIPTION			ROCK DESCRIPTION	TERMS AND DEFINITIONS									
SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER, AND YIELD LESS THAN 180 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST MASHTO T286, ASTIN D-1586, SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM, BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH	UNIFORM - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY POORLY GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OF ANGULARITY OF GRAIN	THE SAME SIZES, (ALSO IR MORE SIZES,		ALLUVIUM (ALLUVJ. SOILS THAT HAVE BEEN TRANSPORTED BY WATER. ADUIFER - A WATER BEARING FORMATION OR STRATA. ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND. ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS.									
AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE: VERY STAFF, GRASSITY CLA, MOST WITH INTERGEDUED FINE SAND LIVERS, MIGHT PLASTIC, A-7-6	THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY TH SUBANGULAR, SUBROUNDED, OR ROUNDED.	vi	MEATHERED NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100	OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC.									
SOIL LEGEND AND AASHTO CLASSIFICATION	MINERALOGICAL COMPOSIT	TION —	BLOWS PER FOOT IF TESTED. BLOWS PER FOOT IF TESTED. BLOWS PER FOOT IF TESTED.	ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DDES NOT NECESSARILY RISE TO OR ABOVE THE									
GENERAL GRANULAR MATERIALS SILT-CLAY MATERIALS ORGANIC MATERIALS (> 35% PASSING *200) (> 35% PASSING *200)	MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARI WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.	E USED IN DESCRIPTIONS	RYSTALLINE WOULD YIELD SYT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, ORGENS, GABBRO, SCHIST, ETC.	GROUND SURFACE. CALCAREOUS (CALC) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.									
GROUP A-1 A-3 A-2 A-4 A-5 A-6 A-7 A-1, A-2 A-4, A-5	COMPRESSIBILITY		ION-CRYSTALLINE FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YELLD SPT REFUSAL IF TESTED, ROCK TYPE	COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM									
CLASS. A-1-a A-1-b A-2-4(A-2-5) A-2-6(A-2-7) A-73 A-3 A-6, A-7 SYMBOL 0000 00000 00000 00000 00000 00000 0000	MODERATELY COMPRESSIBLE LIQUID LIM	ATT LESS THAN 31 ATT EQUAL TO 31-50 CO ATT GREATER THAN 50 SE	OCK (NCR) SEDIMENTARY NOCK THE SANDSTONE, ETC. OASTAL PLAIN COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD EDIMENTARY ROCK SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED	OF SLOPE, <u>CORE RECOVERY (REC.)</u> - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.									
Z PASSING 10 58 MX SILT-	PERCENTAGE OF MATER	IAL	P) SHELL BEDS, ETC. WEATHERING	<u>DIKE</u> - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT									
	AT UNGANIC MATERIAL SOILS SOILS TRACE OF ORGANIC MATTER 2 - 3% 3 - 5%	TRACE 1 - 10%	RESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER HAMMER IF CRYSTALLINE.	ROCKS OR CUTS MASSIVE ROCK. <u>DIP</u> - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.									
LIDUID LIMIT PLASTIC INDEX 6 MX NP 18 MX 13 MN 14 MN 14 MX 14 MN 14 MX 14 MN SOILS WITH PLASTIC INDEX 6 MX NP 18 MX 13 MN 11 MN 18 MX 18 MX 11 MN 18 MX 11 MN LITTLE OR HI	MODERATELY ORGANIC 5 - 10% 12 - 20%		ERY SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, 7 SLI, ORYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.	<u>OIP_DIRECTION OUP_AZIMUTHU_</u> THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.									
GROUP INDEX 0 0 0 0 4 MX 8 MX 12 MX 16 MX NO MX MODERATE OF SUBJECT OF STORE FRASS. FINE SILTY OR CLAYEY SILTY CLAYEY ORGANIC	ANIC GROUND WATER S WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER		LIGHT ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO SLI,) 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME DCCASIONAL FELDSPAR	FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE.									
OF MAJOR GRAVEL, AND SAND GRAVEL AND SAND SOILS SOILS MATTER	STATIC WATER LEVEL AFTER 24 HOURS	M	CRYSTALS ARE DULL AND DISCOLORED, CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS, (DOERATE SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS, IN	FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM									
	ITABLE PERCHED WATER, SATURATED ZONE, OR WATER BEA	1	MOD.) GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED	PARENT MATERIAL.									
SUBGRADE FOR A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30	SPRING OR SEEP	110	WITH FRESH ROCK.	FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.									
CONSISTENCY OR DENSENESS COMPACTNESS OR RANGE OF STANDARD RANGE OF UNCONFINE	MISCELLANEOUS SYMBOI	LS SE	ODERATELY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL EVERE AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH 40D. SEV.J AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES 'CLUNK' SOUND WHEN STRUCK.	FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.									
PRIMARY SOIL TYPE COMPRETATION RESISTENCE COMPRESSIVE STRENG (N-YALUE) (TONS/FT2)	H ROADWAY EMBANKMENT (RE) SPT CHT TEST BOIL VITH SOIL DESCRIPTION ST PHT TEST BOIL TEST BOIL OF THE PHT CHT TEST BOIL OF THE PHT CHT CHT CHT CHT CHT CHT CHT CHT CHT C		IF TESTED, WOULD YIELD SPT REFUSAL EVERE ALL ROCK EXCEPT OWARTZ DISCOLORED OR STAINED, ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED	JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.									
GENERALLY VERY LODSE 4 TO 10	SOIL SYMBOL AUGER BORIN	5 BOLK ONLIGE	EVERE ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED SEV.) IN STRENGTH TO STRONG SOIL, IN GRANITOID ROCKS ALL FELDSPARS ARE KADLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN.	LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT.									
MATERIAL MEDIUM DENSE 10 TO 30 N/A	ARTIFICIAL FILL (AF) OTHER THAN BOODWAY EMBANYMENT CORE BORING	SAMPLE	IF TESTED, YIELDS SPT N VALUES > 180 BPF	LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.									
(NON-COHESIVE) DENSE 30 TO 50 VERY DENSE >50	M HIM HOADIM ENDANGEN	ST - SHELBY TUBE VE	ERY SEVERE ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT 1 SEV.) THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK	MOTILED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS MOTILING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.									
VERY SOFT	INFERRED SOIL BOUNDARY MONITORING		REMAINING, SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. <i>IF TESTED YIELDS SPT N VALUES (100 BPF</i>	PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM.									
SILT-CLAY MEDIUM STIFF 4 TO 8 0.5 TO 1.00 MATERIAL STIFF 8 TO 15 1 TO 2	INFERRED ROCK LINE A PIEZOMETER INSTALLATION		DMPLETE ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND	RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.									
(COHESIVE) VERY STIFF 15 TO 30 2 TO 4 HARD >30 24	SLOPE INDICA	ATOR SAMPLE	SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.	ROCK QUALITY DESIGNATION (ROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND									
TEXTURE OR GRAIN SIZE	25/925 DIP & DIP DIRECTION OF INSTALLATION ROCK STRUCTURES SPT N-VALUE	RATIO SAMPLE	ROCK HARDNESS	EXPRESSED AS A PERCENTAGE.									
U.S. STD. SIEVE SIZE 4 10 40 60 200 270	SOUNDING ROD REF SPT REFUSAL	i V	VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.	SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.									
OPENING (MM)	ABBREVIATIONS AR - AUGER REFUSAL HI HIGHLY	# - MOISTURE CONTENT	HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.	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 BEDOING OR SCHISTOSITY OF THE INTRUDED ROCKS.									
GRAIN MM 365 75 2.0 9.25 9.05 0.095		V - VERY	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 BY MODERATE BLOWS.	SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE.									
SOIL MOISTURE - CORRELATION OF TERMS	CSE COARSE DMT - DILATOMETER TEST DPT - DYNAMIC PENETRATION TEST DPT - DYNAMIC PENETRATION TEST DPT - PRESSUREMETER TEST	γ - UNIT WEIGHT γ - DRY 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 CHIP'S TO PEICES I INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A EGOLOGIST'S PICK.	STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (BPT) - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL 15 PENETRATION EQUAL TO OR LESS									
SOIL MOISTURE SCALE FIELD MOISTURE GUIDE FOR FIELD MOISTURE DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRI	F - FINE SAP SAPROLITIC SAPROLITIC SAPR		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 PIECE'S CAN BE BROKEN BY FINGER PRESSURE.	THAN 0.1 FOOT PER 60 BLOWS. STRATA CORE RECOVERY (SRCC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.									
- SATURATED - USUALLY LIQUID; VERY WET, USUALLY LIQUID; VERY WET, USUALLY LIQUID THE GROUND WATER TO SATURATED - USUALLY LIQUID; VERY WET, USUALLY L	FOSS FOSSILIFEROUS SL SILT, SILTY FRAC FRACTURED, FRACTURES SLI SLIGHTLY FRAGS FRAGMENTS TCR - TRICONE REFUSAL		VERY CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK, PIECES 1 INCH SOFT OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY	Strata rock quality designation (srod) - A measure of rock quality described by total length of rock segments within a stratum edual to or greater than 4 inches divided by the									
PLASTIC SEMISOLID; REQUIRES DRYING TO	EQUIPMENT USED ON SUBJECT	PRO.IFCT	FINGERNAIL. FRACTURE SPACING BEDDING	TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE, IDPSDIL (15.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER,									
(PI) PL PLASTIC LIMIT ATTAIN OPTIMUM MOISTURE		HAMMER TYPE:	TERM SPACING TERM THICKNESS	BENCH MARK:									
OM DPTIMUM MOISTURE - MOIST - (M) SOLID, AT OR NEAR OPTIMUM MOIS	URE CLAY BITS	X AUTOMATIC MANUAL	VERY WIDE MORE THAN 10 FEET VERY THICKLY BEDOED > 4 FEET WIDE 3 TO 10 FEET THICKLY BEDOED 1.5 - 4 FEET										
SL SHRINKAGE LIMIT	MOBILE B- CLAY BITS 6° CONTINUOUS FLIGHT AUGER	2005 2175	MODERATELY CLOSE 1 TO 3 FEET THINLY BEDDED 0.16 - 1.5 FEET	ELEVATION: FT.									
- ORY - (D) REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE	BK-51 X 8*HOLLDW AUGERS	CORE SIZE:	CLOSE	NOTES:									
PLASTICITY	CME-45C HARD FACED FINGER BITS	[X]-N Q	INDURATION										
PLASTICITY INDEX (PI) DRY STRENGTH NONPLASTIC 0-5 VERY LOW	X TUNG-CARBIDE INSERTS		OR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.										
LOW PLASTICITY 8-15 SLIGHT	X CME-550 X CASING X W/ ADVANCER	HAND TODLS:	FRIABLE RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.										
MED. PLASTICITY 16-25 MEDIUM HIGH PLASTICITY 26 OR MORE HIGH	PORTABLE HOIST TRICONE STEEL TEETH	POST HOLE DIGGER	MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.										
COLOR	X TRICONE 215/16 TUNGCARB.	HAND AUGER SDUNDING ROD	INDURATED GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE;										
DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRA	X CORE BIT	VANE SHEAR TEST	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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			1					FEET	Section Thru W.P.#1 Sta. 10 Shew = 1	End Bent One +83.75 -RPC- 30°00'00"
290						FD1D/D	mn()			290
						EB1B(R $10+54.00$	-RPC-			
				EB1	C(RmpC	25.05	RT.			
280		F:1	$R1\Delta(RmnC)$	10+69	0.00 - RI	25.05				28
		10+	レーエ・レーレ・・・・・エ・レル・・し		.00 NI.					1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
270			0.08 RT .				d			27
2.0			J				4			
				\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\			RESIDUA	L SOIL		
260		REACE					(A-5)			26
	-nouND-	RESIDUAL SO	IL							1
070	GK93	SUBEACE RESIDUAL SO (A-2, to A-7)		,'			WEATH	HERED RO	CK	
250		(44)	00000	/						25
	RESIDUAL SA	ND (A-2-4)								
240				\$00/8						24
	THE THE THE THE THE THE THE THE THE THE	60/.			V					. 1
	CRYSTALLINE	ROCK 60/.				-				
230										23
			(CRYSTA	LLINE I	ROCK				
220		7377								22
220	CRYSTALL	INE ROCK								
210							3			21
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900									1 1	0.0
200	50 40 20	20 10	A	10	20	30 4	10 50	60	70	20 80
60	50 40 30	20 10	9	10	20	JU 4	10 50	60	70	0(

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000													280
280													20
270													27
260													26
						(2)			ACTIV	E STRE	AM		25
250				-	$EB2A(R) \ 12 + 21.00 \ 10.40$	$mpC) \ -RPC- \ LT.$	T DO	(D C)	CHAN				<i></i>
240		GR	RQUND	SURFA.			19 + 09	(RmpC) 00 –RPC 00 RT.	RESIDU	JAL SAN	VDY (29)		24
	-	RESIDUAL ROC	CLAY CK, (COI	(A-7) 6 (ED)	07.)								
230		$RESIDU \ SILTY$	JAL SA	NDY	8		4		WEAT	HERED	ROCK ≘		25
220	71.		- <u>-</u> -	<u> </u>	0/.0			CF	YSTALI	INE RO	CK		22
		CRYSTA	l l	, '				C	ORED I	OCK			
210		WEATH											21
		CRYSTA	LLINE	ROCK									
200		40	90	90	10	A	10	20	20	10	50	60	20 7
70	60 50	40	30	20	10	0	10	20	30	40	JU	UU	

NCDOT GEOTECHNICAL ENGINEERING UNIT

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PRO	JECT NO	O. 345	542.1.	1	. סו	R-3421A	COUNTY F	RICHM	OND		GEOLOGIST Murray, C. C.
SITE	DESCR	IPTIO	N RA	MP C	BRIDO	GE OVER FLY	·				GROUND WTR
BOR	ING NO.	EB1	۹(Rm	pC)	s	STATION 10+84	OFFSET 0	ft RT			ALIGNMENT -RPC- 0 HR. N
COL	LAR ELI	EV. 26	32.8 ft		Т	OTAL DEPTH 28.8 ft	NORTHING	436,3	30		EASTING 1,746,448 24 HR. N
DRIL	L MACH	IINE C	CME-	550X	ם	DRILL METHOD H.S. Augers					HAMMER TYPE Automatic
STA	RT DATE	€ 01/3	1/08		С	OMP. DATE 01/31/08	SURFACE	WATER	RDEP	A HT	N/A DEPTH TO ROCK 19.0 ft
ELEV	DRIVE ELEV	DEPTH	 -	ow co	т	BLOWS PER FOO		SAMP.	lacksquare	0 L	SOIL AND ROCK DESCRIPTION
(ft)	(ft)	(ft)	0.5ft	0.5ft	0.5ft	0 25 50	75 100	NO.	MOI	G	ELEV (ft) DEPTI
265											_
]	- -		ļ							262.8 GROUND SURFACE
200	1	-					1				RESIDUAL CLAYEY TO SANDY RESIDUAL SOIL (A-2,
260	-										A-7) -
	1	- 									• •
255	†	-									- -
		-									- -
250		-									- -
400	249.3	13.5	8	14	30	<u> </u>		\$S-47	-		T249.3 RESIDUAL
		-		''		44		00 17	1		DENSE, MOIST, TAN SAND (A-2-4)
245	244.3	185					· · · · ·]		
	-233.3	- 10.5	38	60/.1	1		60/.1				CRYSTALLINE ROCK
240	-	-									PRESUMED CRYSTALLINE ROCK, SPT REFUSAL
240	239.3	23.5	45	60/.1	-]				- -
	-	-					60/.1		}		- -
235	234.3	- 20 5									
	234.3	- 20.3	60/.1	}	1	<u> </u>	60/.1		 	121/20	Boring Terminated BY AUGER REFUSAL at Elevation 234.0 ft IN HARD CRYSTALLINE
200	-	-									ROCK
230	-	-			-						- -
	-	_									- -
225	_				į.						- -
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NCDOT GEOTECHNICAL ENGINEERING UNIT BORELOG REPORT

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												**		
	JECT N						R-3421A	COUNTY F	RICHM	OND			GEOLOGIST Mu	
							OVER FLY							GROUND WTR (ft)
-	ING NO			pC)			ATION 10+54	OFFSET 2				ALIGNMEN		0 HR. N/A
	LAR EL						TAL DEPTH 25.0 ft	NORTHING	436,3	07		EASTING 1	1	24 HR. N/A
	L MACH			50X			ILL METHOD H.S. Augers	<u></u>					HAMMER TYPE	······································
STAF	RT DATI	= 01/3				OI/	MP. DATE 01/31/08	SURFACE	~~~~	RDEF	<i>A</i> 1	√A 	DEPTH TO RO	CK 25.0 ft
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	-	0.5ft	···		BLOWS PER FOOT 0 25 50	75 100	SAMP. NO.	мо	O G	S ELEV. (ft)	OIL AND ROCK DE	SCRIPTION DEPTH (ft)
275	_	•									77.		GROUND SUR	
270	-					-				М	7, 27, 27	• - •	RESIDUAL SOIL	. (A-5)
265_	-										77.27.2	- 		
260		- :									7. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2. 2.	- - - - -		
255	_	-				$\ \cdot\ $		+		М	17	253,9	MEATIE	19.4
250	-	-										. PF - . 248.3	WEATHERED R RESUMED WEATHE	RED ROCK
245	-	-									122	Boring	Terminated BY AUGE on 248.3 ft ON HARE ROCK	25.0 R REFUSAL at O CRYSTALLINE
240	-	-												
235	-	-										-		
230	- - - -	-										· · · · · · · · · · · · · · · · · · ·		
225	-	-										· - ·		
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225 220 215 210 205	- - - -	-										-		
210	-	-										-		
205	- - - - -	- - -										· - ·		
200	-	- - - -										- -		
195		-		<u> </u>	<u> </u>	<u></u>	****				1 +			

NCDOT GEOTECHNICAL ENGINEERING UNIT



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PRO.	JECT N	D. 345	42.1.1		ID.	R-	-3421A			COUNTY	F	RICHM	DNC			GEOLOGIST Mu	rray, C. C.	
SITE	DESCR	IPTIO	N RAI	MP C E	BRIDG	E (OVER FL	Υ		·							GROUND W	VTR (ft)
BOR	ING NO.	EB10	C(Rmp	C)	SI	ГАТ	TION 10	+69		OFFSET					ALIGNMEN	NT -RPC-	0 HR.	N/A
COL	LAR ELE	EV. 26	9.5 ft		TC)TC	AL DEPT	H 35.1 ft		NORTHIN	1G	436,3	19		EASTING	1,746,466	24 HR.	N/A
DRIL	L MACH	IINE C	ME-5	50X			L METHO								··	HAMMER TYPE	E Automatic	
STAF	RT DATE	02/0				MC	IP. DATE			SURFAC	E١			HTY	I/A	DEPTH TO RO	CK 35.1 ft	
ELEV	DRIVE ELEV	DEPTH (ft)		W COL		١		BLOWS F				SAMP.	/		,	SOIL AND ROCK DE		
(ft)	(ft)	(11)	0.5ft	0.5ft	0.5ft	0	25	· -	0	75 100	+	NO.	/MO	l G	ELEV. (ft)			DEPTH (ft)
270	-	-	ļ				 		· · · · · ·		1			2.50	- 269.5	GROUND SURI RESIDUAL		0.0
	$oxed{1}$														•	RESIDUAL SOIL (A-		
265]	•												1	- -			
	1	-					1							\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	•			
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260	1	-				-	1			+	4			1.7	- -			
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245	‡	•]				1:::							\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	•			
210	-	-									1			1,7	- •			
	241.3	- 28.2						+	· · · · ·					7 7	- 241.5			28.0
240		-	35	65/.3		L				100/.8	3				– PRI	WEATHERED R ESUMED SEVERELY		
		•													•	CRYSTALLINE I	ROCK	
235		-						· · · ·										
200		<u>-</u>				ᄩ					Ц				234.4 Boring	g Terminated BY AUG	ER REFUSAL at	35.1
		- -	İ												Eleva	tion 234.4 ft ON HARI ROCK	D CRYSTALLIN	E
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225		- -													- -			
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PRO.	JECT N	O. 345	542.1.1	1	ID.). F	R-3421A	COUNTY	RICHM	OND	_, _,_		GEOLOGIST M	urray, C. C.
SITE	DESCR	RIPTIO	N RAN	MP C E	BRID	OGE	OVER FLY							GROUND WTR (1
BOR	ING NO	. EB20	C(Rmp	C)		STA	ATION 12+09	OFFSET	8ft RT			ALIGNMEN	T -RPC-	0 HR. N/
COLI	AR EL	EV. 23	32.1 ft		1	TOT	TAL DEPTH 23.0 ft	NORTHIN	G 436,4	53		EASTING 1	,746,428	24 HR. N/
DRIL	L MAC	HINE C	ME-5	50X	1	DRI	ILL METHOD NW Casing	v/ SPT Core					HAMMER TYP	E Automatic
STAF	RT DAT	E 01/0	5/08			CO	MP. DATE 01/05/08	SURFACE	WATER	R DEF	1 HT	V/A	DEPTH TO RO	CK 7.5 ft
ELEV	DRIVE ELEV	DEPTH		W CO			BLOWS PER FOO		SAMP.	V /	L	S	OIL AND ROCK DE	SCRIPTION
(ft)	(ft)	(ft)	0.5ft	0.5ft	0.5ft	ift	0 25 50	75 100	NO.	МО		ELEV. (ft)		DEPTH
235	_													
	-	-	ļ			$\perp \parallel$	<u></u>		<u> </u>			232.1	GROUND SUR	
230	229.6	r 2.5										SOFT,	RESIDUA MOIST RED BROV	VN SANDY SILTY
Ì			4	2	2		•4:::			М		-	CLAY (A-7	")
	-	_										226.1		
225	224.6	7.5_	60/.1					60/.1		M		224.6	WEATHERED F WEATHERED	
-	-	-	607.1									- 222.3 HAT	CRYSTALLINE RD CRYSTALLINE	ROCK
220	-	-										- \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	REFUSAL	
	-	-										 - GABB	CRYSTALLINE RO VERY SLIGHTI	
	-	_										<u>-</u>		
215	1	-										<u>-</u>		
-	4	-										-		
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210									1			209.1		2
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205	3											-		
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200	1	-										<u>-</u>		
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	JECT N				D. R-					100	UNTY RICHMOND		GEOLOGIST N	<u>-</u>	TD /
	NG NO			/IP C BR	т		12+09			Tor	FSET 8ft RT	ALIGNMEN	T DDC	GROUND W	
	AR EL			···			PTH 23	0.4		+		EASTING	·		N/A
												EASTING	7	24 HR.	N/A
	L MACI				 		THOD N		sing w	1			HAMMER TYP		
	RT DAT		15/08	-	 		TE 01/0				RFACE WATER DEPTH N/A	·	DEPTH TO RO	JCK 7.5 π	
	RUN			DRILL	<u> </u>	AL RU JN	N 18.2 f		ATA	L	ILLER Estep, J. E.				
LEV (ft)	ELEV	DEPTH (ft)	RUN (ft)	RATE (Min/ft)	REC. (ft) %	RQD (ft) %	SAMP. NO.	REC. (ft)	RQD (ft) %	ÖG		SCRIPTION	AND REMARKS	_	_
	(ft)		,,	(WIII/IL)	%	%		%	%	6	ELEV. (ft)	D 1 - 0 1 -			EPTH
22.3	222.3	9.8	3.2		(3.1)	(3.1)		(13.1)	(13.1) 99%	(F)	222.3		LINE ROCK		9
20_	219.1	13.0			97%	97%		99%	99%		DARK GRAY GABBR		BHTLY WEATHERE UND	ED TO FRESH AN	D
	-		5.0		(5.0) 100%	(5.0) 100%					•				
215	-	-									- •				
	214.1	18.0	5.0		(5.0)	(5.0)					-				
	-	-			100%	100%					•				
10	209.1	23.0									- - - 209.1				23
	-	-	5.0		(5.0)	(5.0) 100%				-	Boring Terminated at	Elevation 209.	1 ft IN HARD CRYS	TALLINE ROCK	
05	-	-			100%	10070			ĺ		<u>.</u>				
	204.1	28.0			ļ						- ·				
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BORING NO. EB2A(RmpC) STATION 12+21 OFFSET 10ft LT ALIGNMENT -RPC- 0 HR. II COLLAR ELEV. 235.2 ft TOTAL DEPTH 15.2 ft NORTHING 436,461 EASTING 1,746,408 24 HR. II DRILL MACHINE CME-550X DRILL METHOD NW Casing w/ Advancer HAMMER TYPE Automatic START DATE 01/10/08 COMP. DATE 01/10/08 SURFACE WATER DEPTH N/A DEPTH TO ROCK 15.2 ft ELEV DRIVE DEPTH BLOW COUNT BLOWS PER FOOT SAMP. TO SOIL AND ROCK DESCRIPTION	PRC	JECT N	O. 34	542.1.1	1	ID.	R-3421A	COUNTY	RICHM	OND		GEOLOGIST N	Murray, C. C.
COLLAR ELEV. 235.2 ft TOTAL DEPTH 15.2 ft NORTHING 436,461 EASTING 1,746,408 24 HR.	SITE	DESCR	IPTIO	N RAI	MP C I	BRIDG	OVER FLY	•					GROUND WTR (f
DRILL MACHINE CME-550X DRILL METHOD NW Casing w/ Advancer HAMMER TYPE Automatic	BOF	ING NO.	EB2	A(Rmp	C)	S	ATION 12+21	OFFSET	10ft LT			ALIGNMENT -RPC-	0 HR. N/
START DATE 01/10/08 SURFACE WATER DEPTH N/A DEPTH TO ROCK 15.2 ft	COL	LAR ELI	EV. 23	35.2 ft		T	TAL DEPTH 15.2 ft	NORTHIN	3 436,4	61		EASTING 1,746,408	24 HR. N/
DRIVE (II)	DRII	L MACH	INE (CME-5	50X	D	ILL METHOD NW Casing	w/ Advancer				HAMMER TY	PE Automatic
(ft) (ft) (ft) 0.5ft 0.5	STA	RT DATE	E 01/1	10/08		C	MP. DATE 01/10/08	SURFACE	WATE	R DEF	1 HT	N/A DEPTH TO R	OCK 15.2 ft
(ft) (ft) (ft) 0.5ft 0.5	ELEV	DRIVE	DEPTH	BLC)W CO	UNT	BLOWS PER FO	тос	SAMP.	V /		SOIL AND ROCK D	DESCRIPTION
235	(ft)		· (ft)		0.5ft	0.5ft	0 25 50	75 100	NO.	МО			DEPTH
230 229.3 5.9 2 2 6	240		_									_	
230 229.3 5.9 2 2 6												- - - 225.2 GROUND SU	IRFACE (
230 229.3 5.9 2 2 6	235		<u> </u>		 					М	Z	233.9 RESIDU	AL
220 2 2 6 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8]	_									CRYSTALLIN	EROCK
226 2 6 6 6 7 7 7 7 7 7 7	230	-										•	•
225 507.1 790.1 223.0 CRYSTALLINE ROCK SPT REPUSAL at Elevation 270.0 ft Of MAID GRYSTALLINE ROCK CRYSTALLINE ROCK		229.3	5.9	2	2	6				М		RESIDUA	
220 CRYSTALLINE ROCK SPT REFUSAL 220 WEATHERE NOCK Boring Terminating SY AUGER REFUSAL at Elevation 220 in On Araba CrystalLine ROCK 2215 210 225 226 227 2280 RATHERE NOCK Boring Terminating SY AUGER REFUSAL at Elevation 220 in On Araba CrystalLine ROCK 7 280 8 281 CRYSTALLINE ROCK 8 281 CRYSTALL		1	-									BROWN SANDY SIL	-TY CLAY (A-7)
200	225		-	[-		-	
220 SPT REFUSAL 220.0 WEATHERED ROCK] :	-	[60/ 1	:					CRYSTALLIN	E ROCK 12
215	220	-	-	[507.1						SPT REFL	JSAL 14
215 Elevation 220.0 ft On HARD CRYSTALLINE ROCK 210	.220			1				<u></u>			Y//-/	Boring Terminated BY AU	IGER REFUSAL at
205	215												
190 190 185 180	210		-]						- - -	
	205	-	-		į							- - - -	
	200	-										-	
185 180 170													
185 180 170 170	195	-											
180	190	- - -	 									- - -	
175	185	-	- -									- - - -	
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SHEET

V	J) (I	U	CO	RE B	OF	?/N(G RE	PO	RT	•					•	-
PRO	JECT N	IO. 345	542.1.	1 1	D. R	-3421/	4			CC	UNTY F	RICHMOND		GEOLOGIST Mu	rray, C. C.	
SITE	DESC	RIPTIO	N RAI	MP C BR	IDGE	OVER	FLY						- 4		GROUND W	/TR (ft)
BOR	ING NO). EB2/	A(Rmp	C)	STA	TION	12+21			OF	FSET 10	Off LT	ALIGNMEN	IT -RPC-	0 HR.	N/A
COL	LAR EL	EV. 23	35.2 ft		тот	AL DE	EPTH 15	.2 ft		NC	RTHING	436,461	EASTING	1,746,408	24 HR.	N/A
DRIL	L MAC	HINE (CME-5	50X	DRIL	L ME	THOD N	W Ca	sing w	√ Ad	vancer			HAMMER TYPE	Automatic	
STA	RT DAT	E 01/1	0/08		COM	P. DA	TE 01/1	0/08		su	RFACE V	VATER DEPTH N/	'A	DEPTH TO ROO	CK 15.2 ft	
COR	E SIZE	NX			TOTA	AL RU	JN 5.5 ft			DR	ILLER E	step, J. E.	•	1		
ELEV (ft)	RUN ELEV (ft)	DEPTH (ft)	RUN (ft)	DRILL RATE (Min/ft)	REC. (ft) %	JN RQD (ft) %	SAMP. NO.	STF REC. (ft) %	RATA RQD (ft) %	L O G	ELEV. (ft)		ESCRIPTION	AND REMARKS		EPTH (ft)
233.9						·							Begin Corir	ng @ 1.3 ft		
230	233.9	1.3	5.5		(1.1) 20%	(0.0) 0%		(1.1) 24%	(0.0) 0% 0	1	233.9		CRYSTAL UNWEATHER	LINE ROCK ED VESTIGAL ROCK NE GRAINED GABBR		1.3
	228.4	6.8	N=8 RI										RES	DUAL		5.9
225	_	‡ <u>‡</u>									223.0					12.2
		Ŧ		N=60/.1		•				5	221,2			LINE ROCK		14.0
220		221.2 WEATHERE 220.0 Boring Terminated BY AUGER REFU CRYSTALLII											FUSAL at Elevation 22	20.0 ft ON HARD	15.2	
215	-	‡ <u>+</u>					<u> </u>				- - -					
210		 									- -					
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M & T Form 503

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

DIVISION OF HIGHWAY MATERIALS & TESTS UNIT SOILS LABORATORY

T. I. P. No. R-3421A

REPORT ON SAMPLES OF SOILS FOR QUALITY

 Project
 34552.1.1
 County
 RICHMOND
 Owner

 Date: Sampled 11/15/04
 Received 11/30/04
 Reported 12/2/2004

 Sampled from Submitted by
 N WAINAINA
 By C C MURRAY

 Submitted by
 N WAINAINA
 1995 Standard Specifications

718367 TO 718403 6/5/08

TEST RESULTS

Proj. Sample No.		SS-41	SS-42	SS-44	SS-45	SS-46	SS-47
Lab. Sample No.		718373	718374	718375	718376	718377	718378
Retained #4 Sieve	%	8	-	-		-	7
Passing #10 Sieve	%	88	100	99	98	98	78
Passing #40 Sieve	%	39	59	63	51	51	41
Passing #200 Sieve	%	10	29	29	27	14	20

MINUS NO. 10 FRACTION

SOIL MORTAR - 100%							
Coarse Sand Ret - #60	%	71.1	66.5	55.2	63.0	70.5	63.2
Fine Sand Ret - #270	%	18.6	4.9	16.8	17.3	16.3	12.7
Silt 0.05 - 0.005 mm	%	2.2	0.3	2.2	2.3	2.1	5.5
Clay < 0.005 mm	%	8.1	28.3	25.9	17.4	11.1	18.6
Passing #40 Sieve	%	-	-	-	-	_	-
Passing #200 Sieve	%	-	-	-	-	-	_

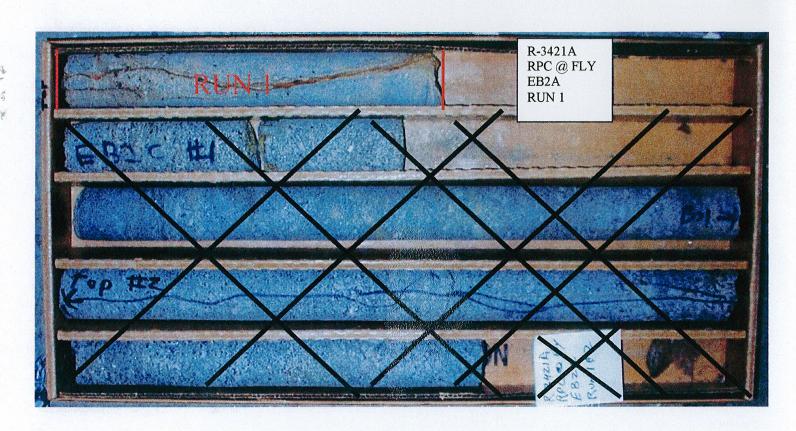
L. L.		21	64	47	40	28	38
P. I.		NP	38	25	20	4	23
AASHTO Classification		A-1-b(0)	A-2-7(4)	A-2-7(2)	A-2-6(1)	A-2-4(0)	A-2-6(1)
Station		12+00	12+00	12+00	12+00	12+00	12+00
		130 RT	130 RT	130 RT	130 RT	130 RT	130 RT
Hole No.		FLY	FLY	FLY	FLY	FLY	FLY
Depth (Ft)		38.30	43.30	53.30	58.30	63.30	68.30
	to	39.80	44.80	54.80	59.80	64.80	69.80

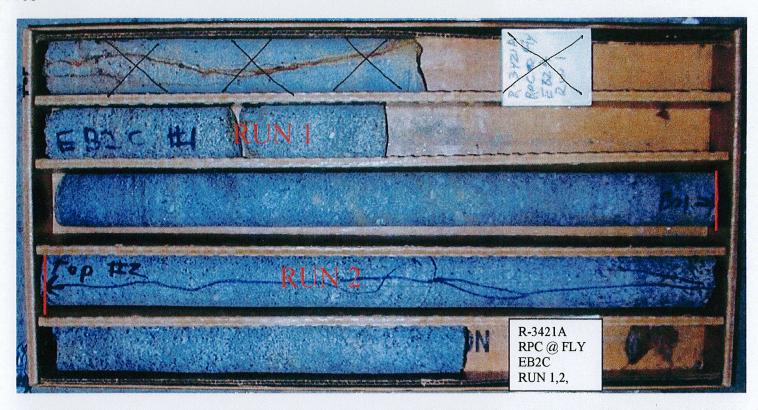
Soils Engineer

Page 2

R-3421A 34542 RICHMOND COUNTY BRIDGE OVER US 74 BUSINESS WEST COLLECTOR ON RAMP C BETWEEN I-73 / US 220 BYPASS AND US 74

CORE PHOTOS







X REFERENCE

CONTENTS

DESCRIPTION

TITLE SHEET LEGEND SITE PLAN

BORING LOGS SITE PHOTOGRAPHS

PROFILE

SHEET NO.

5-6

STATE OF NORTH CAROLINA

DEPARTMENT OF TRANSPORTATION **DIVISION OF HIGHWAYS**

GEOTECHNICAL ENGINEERING UNIT

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY **RICHMOND**

PROJECT DESCRIPTION US 220 BYPASS FROM US 74 BYPASS WEST OF ROCKINGHAM AT SR 1109 INTERCHANGE

TO 0.3 MILES SOUTH OF SR 1140

SITE DESCRIPTION CULVERT AT -LOOP B- STA. 8+68.70 ON US74/I73 INTERCHANGE OVER UNNAMED TRIBUTARY TO PEE DEE RIVER

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-3421A	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 REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N. C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT 1991 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 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 INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS MAY VARY CONSIDERABLY WITH TIME ACCORDING TO CLIMATIC CONDITIONS MEDICATED DESCRIPTIONS AND ASSECTIONS OF THE INVESTIGATION. THE STATEM LEVELS OR SOIL MOISTURE CONDITIONS MAY VARY CONSIDERABLY WITH TIME ACCORDING TO CLIMATIC CONDITIONS MEDICATED DESCRIPTIONS AND ASSECTIONS AND ASSECTIONS OF THE INVESTIGATION. THE ACCORDING TO CLIMATIC CONDITIONS MEDICATED DESCRIPTIONS AND ASSECTIONS AND ASSECTIONS OF THE ACCORDING TO CLIMATIC CONDITIONS MEDICATED DESCRIPTIONS AND ASSECTIONS AND ASSECTIONS OF THE ACCORDING TO CLIMATIC CONDITIONS MEDICATED DESCRIPTIONS AND ASSECTIONS AND ASSECTIONS OF THE ACCORDING TO CLIMATIC CONDITIONS MEDICATED DESCRIPTIONS AND ASSECTIONS AND ASSECTIONS OF THE ACCORDING TO CLIMATIC CONDITIONS MEDICATED DESCRIPTIONS AND ASSECTIONS AND ASSECTIONS OF THE ACCORDING TO CLIMATIC CONDITIONS MEDICATED ASSECTIONS OF THE ACCORDING TO CLIMATIC CONDITIONS MEDICATED ASSECTIONS OF THE ACCORDING TO CLIMATIC CONDITIONS MEDICATED ASSECTIONS OF THE ACCORDING TO CLIMATIC CONDITIONS MEDICATED ASSECTIONS. INCLUDING TEMPERATURES, PRECIPITATION AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

THE BIDDER OR CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE PLANS ARE PRELIMINARY ONLY AND IN MANY CASES THE FINAL DESIGN DETAILS ARE DIFFERENT, FOR BIDDING AND CONSTRUCTION PURPOSES, REFER TO THE CONSTRUCTION PLANS AND DOCUMENTS FOR FINAL DESIGN INFORMATION ON THIS PROJECT. THE DEPARTMENT DOES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOR THE INTERPRETATIONS MADE, OR OPINION OF THE DEPARTMENT AS TO THE TYPE OF MATERIALS AND CONDITIONS TO BE ENCOUNTERED. THE BIDDER OR CONTRACTOR IS CAUTIONED TO MAKE SUCH INDEPENDENT SUBSURFACE INVESTIGATIONS AS HE DEEMS NECESSARY TO SATISFY HIMSELF AS TO CONDITIONS TO BE ENCOUNTERED ON 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.

- IES:
 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.

PERSONNEL C. JONES B. KEANEY B. HOWEY C. WANG D. RACEY S. DAVIS

INVESTIGATED BY F & R, INC HDR ENGINEERING, INC

DRAWN BY _C. MYERS

CHECKED BY B. KEANEY SUBMITTED BY ENGINEERING, INC.



8/18/2015

SIGNATURE

DATE

PROJECT REFERENCE NO. SHEET NO.

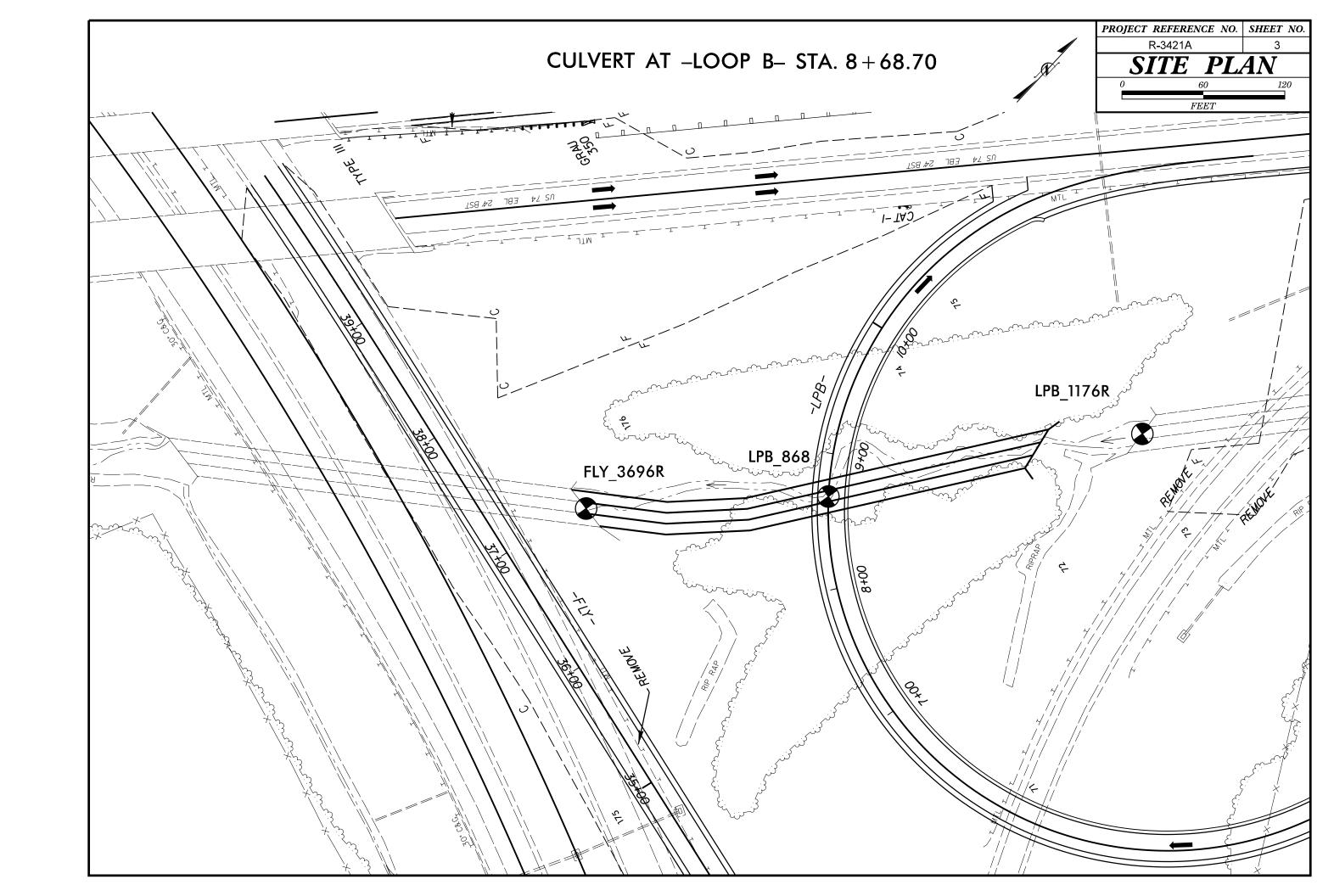
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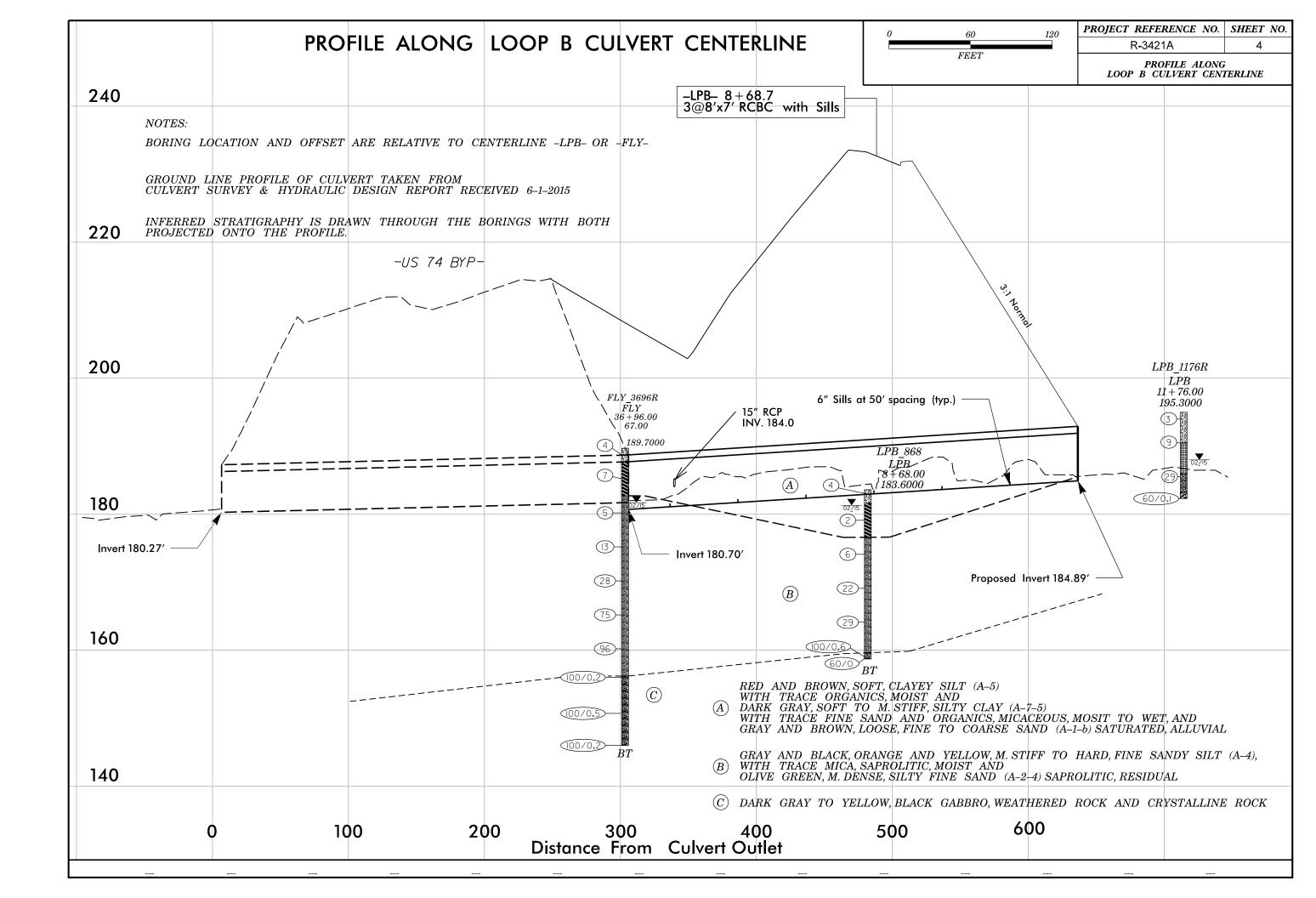
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION	GRADATION	ROCK DESCRIPTION	TERMS AND DEFINITIONS
SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER AND YIELD LESS THAN 100 BLOWS PER FOOT	WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE. UNIFORMLY GRADED - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE.	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 IS BASED ON THE AASHTO SYSTEM, BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING:	GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.	SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN	AQUIFER - A WATER BEARING FORMATION OR STRATA.
CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH	ANGULARITY OF GRAINS	REPRESENTED BY A ZONE OF WEATHERED ROCK. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:	ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.
AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE, VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6	THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS:	WEATHERED WON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT 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.
SOIL LEGEND AND AASHTO CLASSIFICATION	ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.	ROCK (WR) 100 BLOWS PER FOOT IF TESTED.	ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT
GENERAL GRANULAR MATERIALS SILT-CLAY MATERIALS ORGANIC MATERIALS	MINERALOGICAL COMPOSITION	CRYSTALLINE FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT	WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE.
LLASS. (\$35% PASSING *200) (>35% PASSING *200)	MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAQLIN, 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.	CALCAREOUS (CALC,) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE.
GROUP A-1 A-3 A-2 A-4 A-5 A-6 A-7 A-1, A-2 A-4, A-5 CLASS. A-1-a A-1-b A-2-4 A-2-5 A-2-6 A-2-7 A-2-6 A-2-7 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.	COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM
SYMBOL 000000000	SLIGHTLY COMPRESSIBLE LL < 31	ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.	OF SLOPE.
7. PASSING	MODERATELY COMPRESSIBLE LL = 31 - 50 HIGHLY COMPRESSIBLE LL > 50	COASTAL PLAIN COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SEDIMENTARY ROCK SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED	CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.
*10 50 MX GRANULAR SIL1- MUCK,	PERCENTAGE OF MATERIAL	CP) SHELL BEDS, ETC. WEATHERING	<u>DIKE</u> - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT
*40 30 MX 50 MX 51 MN PEAT *200 15 MX 25 MX 10 MX 35 MX 35 MX 35 MX 36 MN 36 MN 36 MN 36 MN 36 MN 56 M	GRANULAR SILT - CLAY ORGANIC MATERIAL SOILS SOILS OTHER MATERIAL	FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER	ROCKS OR CUTS MASSIVE ROCK.
MATERIAL	TRACE OF ORGANIC MATTER 2 - 3% 3 - 5% TRACE 1 - 10%	HAMMER IF CRYSTALLINE.	<u>DIP</u> - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL.
PASSING *40 SOILS WITH	LITTLE ORGANIC MATTER 3 - 5% 5 - 12% LITTLE 10 - 20% 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
LL 48 MX 41 MN 48 MX 41 MN 48 MX 41 MN 48 MX 41 MN LITTLE OR LITTLE OR NP 18 MX 18 MX 11 MN 11 MN 18 MX 18 MX 11 MN 11 MN MODERATE HIGHLY	HIGHLY ORGANIC > 10% > 20% HIGHLY 35% AND ABOVE	(V SLI.) CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.	LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.
GROUP INDEX 0 0 0 4 MX 8 MX 12 MX 16 MX NO MX AMOUNTS OF SOLIS	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 CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.	SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE. FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.
OF MAJOR GRAVEL, AND SAND GRAVEL AND SAND SOILS SOILS	STATIC WATER LEVEL AFTER 24 HOURS	MODERATE SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN	FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM
CEN RATING FAIR TO	∇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	SPRING OR SEEP	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 ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30	<u> </u>	MODERATELY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL	FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD.
CONSISTENCY OR DENSENESS	MISCELLANEOUS SYMBOLS	SEVERE AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH (MOD. SEV.) AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK.	JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.
PRIMARY SOIL TYPE COMPACTNESS OR CONSISTENCY RANGE OF STANDARD RANGE OF UNCONFINED PENETRATION RESISTENCE COMPRESSIVE STRENGTH	ROADWAY EMBANKMENT (RE) 25/025 DIP & DIP DIRECTION	IF TESTED, WOULD YIELD SPT REFUSAL	LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO
(N-VALUE) (TUNS/FT=)	WITH SOIL DESCRIPTION OF ROCK STRUCTURES	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	ITS LATERAL EXTENT.
GENERALLY VERY LOOSE	SOIL SYMBOL OPT ONT TEST BORING SLOPE INDICATOR INSTALLATION	(SEV.) REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN.	LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS.
GRANULAR MEDIUM DENSE 10 TO 30 N/A MATERIAL DENSE 30 TO 50	ARTIFICIAL FILL (AF) OTHER AUGER BORING COME PENETROMETER THAN ROADWAY EMBANKMENT TEST	IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF	MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE.
(NON-COHESIVE) VERY DENSE > 50	THAN ROADWAY EMBANKMENT TEST	VERY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE SEVERE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK	PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE
VERY SOFT < 2 < 0.25	— INFERRED SOIL BOUNDARY — CORE BORING ■ SOUNDING ROD	(V SEV.) REMAINING, SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR	OF AN INTERVENING IMPERVIOUS STRATUM.
GENERALLY SOFT 2 TO 4 0.25 TO 0.5 SILT-CLAY MEDIUM STIFF 4 TO 8 0.5 TO 1.0	TEST BORING WELL TEST BORING WITH CORE	VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. <u>IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF</u> COMPLETE ROCK REDUCED TO SOIL, ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND	RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.
MATERIAL STIFF 8 TO 15 1 TO 2	2157245752	SCATTERED CONCENTRATIONS, QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS, 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
(COHESIVE) VERY STIFF 15 TO 30 2 TO 4 HARD > 30 > 4	TTT ALLUVIAL SOIL BOUNDARY A MISCUMETER OF SPT N-VALUE	ALSO AN EXAMPLE.	RUN AND EXPRESSED AS A PERCENTAGE.
TEXTURE OR GRAIN SIZE	RECOMMENDATION SYMBOLS	ROCK HARDNESS VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES	SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK.
U.S. STD. SIEVE SIZE 4 10 40 60 200 270	UNCLASSIFIED EXCAVATION - UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE	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 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 THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS.
BOULDER COBBLE GRAVEL COARSE FINE SILT CLAY	UNDERCUT OR BACKFILL SHALLOW 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	SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT
(BLDR.) (COB.) (GR.) (GSE. 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 BT - BORING TERMINATED MICA MICACEOUS WEA WEATHERED	BY MODERATE BLOWS.	STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (N OR BPF) OF A 140 LB, HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL
SIZE IN. 12 3	CL CLAY MOD MODERATELY 7 - UNIT WEIGHT	MEDIUM CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. HARD CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE	WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL
SOIL MOISTURE - CORRELATION OF TERMS	CPT - CONE PENETRATION TEST NP - NON PLASTIC 7 _d - DRY UNIT WEIGHT CSE COARSE ORG ORGANIC	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 DMT - DILATOMETER TEST PMT - PRESSUREMETER TEST SAMPLE ABBREVIATIONS	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	STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.
(ATTERBERG LIMITS) DESCRIPTION OUTDE FOR FIELD POISTONE DESCRIPTION			
(HITEMBERG EIMITS) DESCRIPTION	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
- SATURATED - USUALLY LIQUID; VERY WET, USUALLY (SAT.) FROM BELOW THE GROUND WATER TABLE	DPT - DYNAMIC PENETRATION TEST SAP SAPROLITIC S - BULK e - VOID RATIO SD SAND, SANDY SS - SPLIT SPOON F - FINE SL SILT, SILTY ST - SHELBY TUBE	VERY CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH	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.
- SATURATED - USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE	DPT - DYNAMIC PENETRATION TEST		STRATA ROCK QUALITY DESIGNATION (SROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO 00 RORGATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
- SATURATED - USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE LL LIQUID LIMIT PLASTIC SEMISOLID; REQUIRES DRYING TO	DPT - DYNAMUC PENETRATION TEST SAP SAPROLITIC S - BULK e - VOID RATIO SD SAND, SANDY SS - SPLIT SPOON F - FINE SL SILT, SILTY ST - SHELBY TUBE FOSS FOSSILIFEROUS SLI SLIGHTLY RS - ROCK FRACT - FRACTURED, FRACTURES TCR - TRICONE REFUSAL RT - RECOMPACTED TRIAXIAL FRAGS FRAGMENTS W - MOISTURE CONTENT CBR - CALIFORNIA BEARING	VERY CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK, PIECES 1 INCH SOFT OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY	THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.
- SATURATED - USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE PLASTIC - WET - (W) SEMISOLID; REQUIRES DRYING TO	DPT - DYNAMIC PENETRATION TEST SAP SAPROLITIC S - BULK e - VOID RATIO SD SAND, SANDY SS - SPLIT SPOON F - FINE SL SILT, SILTY ST - SHELBY TUBE FOSS FOSSILIFEROUS SLI SLIGHTLY RS - ROCK FRACL - FRACTURED, FRACTURES TCR - TRICONE REFUSAL FRAGS FRAGMENTS " MOISTURE CONTENT CBR - CALIFORNIA BEARING HI HIGHLY V - VERY RATIO	VERY SOFT CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK, PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL. FRACTURE SPACING BEDDING IERM SPACING IERM IHICKNESS	THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER. BENCH MARK:
- SATURATED - USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE LL LIQUID LIMIT PLASTIC SEMISOLID; REQUIRES DRYING TO	DPT - DYNAMIC PENETRATION TEST SAP SAPROLITIC S - BULK e - VOID RATIO SD SAND, SANDY SS - SPLIT SPOON F - FINE SL SILT, SILTY ST - SHELBY TUBE FOSS FOSSILIFEROUS SLI SLIGHTLY RS - ROCK FRAC FRACTURED, FRACTURES TCR - TRICONE REFUSAL FRAGS FRAGMENTS W- MOISTURE CONTENT HI HIGHLY V - VERY CBR - CALIFORNIA BEARING EQUIPMENT USED ON SUBJECT PROJECT	VERY CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK, PIECES 1 INCH SOFT OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL. FRACTURE SPACING IERM SPACING 1ERM THICKNESS VERY WIDE MORE THAN 10 FEET WIDE 3 TO 10 FEET THICKLY BEDDED 1.5 - 4 FEET	THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER. BENCH MARK:
PLASTIC RANGE (PI) PL PLASTIC LIMIT OM OPTIMUM MOISTURE SL SHRINKAGE LIMIT OM OPTIMUM MOISTURE SHRINKAGE LIMIT OM OPTIMUM MOISTURE SHRINKAGE LIMIT OM OPTIMUM MOISTURE SHRINKAGE LIMIT OM OPTIMUM MOISTURE SHRINKAGE LIMIT	DPT - DYNAMIC PENETRATION TEST SAP SAPROLITIC S - BULK e - VOID RATIO SD SAND, SANDY SS - SPLIT SPOON F - FINE SL SILT, SILTY ST - SHELBY TUBE FOSS FOSSILIFEROUS SLI SLIGHTLY RS - ROCK FRACT FRACTURED, FRACTURES TCR - TRICONE REFUSAL FRAGS FRAGMENTS W- MOISTURE CONTENT HI HIGHLY V - VERY RATIO EQUIPMENT USED ON SUBJECT PROJECT	VERY CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK, PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL. FRACTURE SPACING TERM SPACING 1ERM VERY WIDE MORE THAN 10 FEET VERY THICKLY BEDDED 4 FEET	THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER. BENCH MARK:
SEMISOLID; REDUIRES DRYING TO ATTAIN OPTIMUM MOISTURE SHRINKAGE LIMIT OM OPTIMUM MOISTURE SHRINKAGE LIMIT OM OPTIMUM MOISTURE SHRINKAGE LIMIT OM OPTIMUM MOISTURE SHRINKAGE LIMIT ON OPTIMUM MOISTURE SHRINKAGE LIMIT ON REQUIRES ADDITIONAL WATER TO	DPT - DYNAMIC PENETRATION TEST SAP SAPROLITIC S - BULK e - VOID RATIO SD SAND, SANDY SS - SPLIT SPOON F - FINE SL SILT, SILTY ST - SHELBY TUBE FOSS FOSSILFEROUS SLI SLIGHTLY RS - ROCK FRAC FRACTURED, FRACTURES TCR - TRICONE REFUSAL FRAGS FRAGMENTS W- MOISTURE CONTENT HI HIGHLY V - VERY RATIO EQUIPMENT USED ON SUBJECT PROJECT DRILL UNITS: ADVANCING TOOLS: HAMMER TYPE: CME-45C CANTINUOUS FLIGHT AUGER	VERY CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK, PIECES 1 INCH SOFT OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL. FRACTURE SPACING VERY WIDE SPACING VERY WIDE MORE THAN 10 FEET VERY THICKLY BEDDED 4 FEET WIDE 3 TO 10 FEET THICKLY BEDDED 1.5 - 4 FEET MODERATELY CLOSE 1 TO 3 FEET THINLY BEDDED 0.16 - 1.5 FEET CLOSE 0.16 TO 1 FOOT VERY THINLY BEDDED 0.008 - 0.16 FEET VERY CLOSE LESS THAN 0.16 FEET THICKLY BEDDED 0.008 - 0.03 FEET	THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER. BENCH MARK:
CATTERORIO CINITS DESCRIPTION	DPT - DYNAMIC PENETRATION TEST SAP SAPROLITIC S - BULK e - VOID RATIO SD SAND, SANDY SS - SPLIT SPOON F - FINE SL SILT, SILTY ST - SHELBY TUBE FOSS FOSSILIFEROUS SLI SLIGHTLY RS - ROCK FRAC FRACTURED, FRACTURES TCR - TRICONE REFUSAL FRAGS FRAGMENTS W- MOISTURE CONTENT HI HIGHLY V - VERY CBR - CALIFORNIA BEARING RATIO EQUIPMENT USED ON SUBJECT PROJECT DRILL UNITS: ADVANCING TOOLS: HAMMER TYPE: CME-45C CLAY BITS X AUTOMATIC MANUAL X CME-55 CORE SIZE:	VERY CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK, PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL. FRACTURE SPACING TERM SPACING TERM THICKNESS VERY WIDE MORE THAN 10 FEET VERY THICKLY BEDDED 4 FEET WIDE 3 TO 10 FEET THICKLY BEDDED 1.5 - 4 FEET MODERATELY CLOSE 1.10 3 FEET THINLY BEDDED 0.03 - 0.16 FEET CLOSE 0.16 TO 1 FOOT VERY THINLY BEDDED 0.03 - 0.16 FEET	THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTACE. TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER. BENCH MARK:
DESCRIPTION SATURATED - USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE PLASTIC RANGE (PI) PL PLASTIC LIMIT - WET - (W) SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE SL SHRINKAGE LIMIT - MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE - DRY - (D) REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE PLASTICITY PLASTICITY	DPT - DYNAMIC PENETRATION TEST SAP SAPROLITIC S - BULK e - VOID RATIO SD SAND, SANDY SS - SPLIT SPOON F - FINE SL SILT, SILTY ST - SHELBY TUBE FOSS FOSSILIFEROUS SLI SLIGHTLY RS - ROCK FRAC FRACTURED, FRACTURES TCR - TRICONE REFUSAL FRAGS FRAGMENTS W- MOISTURE CONTENT HI HIGHLY V - VERY CBR - CALIFORNIA BEARING RATIO EQUIPMENT USED ON SUBJECT PROJECT DRILL UNITS: ADVANCING TOOLS: HAMMER TYPE: CME-45C CLAY BITS X AUTOMATIC MANUAL X CME-55 8 HOLLOW AUGERS CORE SIZE: - B - H	VERY CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK, PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL. FRACTURE SPACING IERM SPACING VERY WIDE MORE THAN 10 FEET VERY THICKLY BEDDED 4 FEET WIDE 3 TO 10 FEET THICKLY BEDDED 1.5 - 4 FEET MODERATELY CLOSE 1 TO 3 FEET THINKLY BEDDED 0.16 - 1.5 FEET CLOSE 0.16 TO 1 FOOT VERY THINKLY BEDDED 0.03 - 0.16 FEET VERY CLOSE LESS THAN 0.16 FEET THICKLY LAMINATED 0.008 - 0.03 FEET THINKLY LAMINATED 0.008 FEET	THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTACE. DOPOOL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER. BENCH MARK:
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CATTERNOON CLIMITS CASTURATED USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE	DPT - DYNAMIC PENETRATION TEST SAP SAPROLITIC S - BULK	VERY CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK, PIECES 1 INCH SOFT OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL. FRACTURE SPACING TERM SPACING VERY WIDE MORE THAN 10 FEET VERY THICKLY BEDDED 4. FEET WIDE 3 TO 10 FEET THICKLY BEDDED 0.15 - 4 FEET MODERATELY CLOSE 1.TO 3 FEET THICKLY BEDDED 0.16 - 1.5 FEET CLOSE 0.16 TO 1 FOOT VERY THINLY BEDDED 0.003 - 0.16 FEET THICKLY LAMINATED 0.008 - 0.03 FEET THICKLY LAMINATED 0.008 FEET	THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTACE. DOPOOL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER. BENCH MARK:
- SATURATED - USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE - WET - (W) SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE - WET - (W) SOLID; AT OR NEAR OPTIMUM MOISTURE - WET - (W) SOLID; AT OR NEAR OPTIMUM MOISTURE - DRY - (D) REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE - DRY - (D) REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE - PLASTICITY - PLASTICITY INDEX (PI) DRY STRENGTH NON PLASTIC - O-5 VERY LOW	DPT - DYNAMIC PENETRATION TEST SAP SAPROLITIC S - BULK	VERY CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK, PIECES 1 INCH SOFT OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL. FRACTURE SPACING TERM SPACING VERY WIDE MORE THAN 10 FEET VERY THICKLY BEDDED 4 FEET WIDE 3 TO 10 FEET THICKLY BEDDED 4.15 - 4 FEET MODERATELY CLOSE 1 TO 3 FEET THICKLY BEDDED 0.16 - 1.5 FEET CLOSE 0.16 TO 1 FOOT VERY THINLY BEDDED 0.003 - 0.16 FEET VERY CLOSE LESS THAN 0.16 FEET THICKLY LAMINATED 0.008 - 0.03 FEET THICKLY LAMINATED 0.008 FEET THICKLY LAMINATED 0.008 FEET THICKLY LAMINATED 0.008 FEET THICKLY LAMINATED 0.008 FEET THICKLY LAMINATED 0.008 FEET THICKLY LAMINATED 0.008 FEET THICKLY LAMINATED 0.008 FEET INDURATION FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.	THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTACE. DOPOOL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER. BENCH MARK:
- SATURATED - USUALLY LIQUID: VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE - SATURATED - USUALLY LIQUID: VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE - WET - (W) SEMISOLID: REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE - WET - (W) SOLID: AT OR NEAR OPTIMUM MOISTURE - DRY - (D) REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE - DRY - (D) REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE - PLASTICITY NON PLASTIC SLIGHTLY PLASTIC MODERATELY PLASTIC MODERATELY PLASTIC 16-25 MEDIUM	DPT - DYNAMIC PENETRATION TEST SAP SAPROLITIC S - BULK	VERY CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK, PIECES 1 INCH SOFT OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL. FRACTURE SPACING VERY WIDE MORE THAN 10 FEET VERY THICKLY BEDDED 4 FEET WIDE 3 TO 10 FEET THICKLY BEDDED 4.15 - 4 FEET THICKLY BEDDED 6.16 - 1.5 FEET CLOSE 0.16 TO 1 FOOT VERY THINLY BEDDED 0.16 - 1.5 FEET THICKLY BEDDED 0.003 - 0.16 FEET THICKLY BEDDED 0.003 - 0.16 FEET THICKLY BEDDED 0.003 - 0.16 FEET THICKLY BEDDED 0.003 - 0.16 FEET THICKLY BEDDED 0.003 - 0.16 FEET THICKLY LAMINATED 0.0008 - 0.03 FEET THICKLY LAMINATED 0.0008 - 0.03 FEET THICKLY LAMINATED 0.0008 - 0.03 FEET THICKLY LAMINATED 0.0008 FEET THICKLY LAMINATED 0.00	THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. DOPOOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER. BENCH MARK:
DESCRIPTION - SATURATED - USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE - WET - (W) SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE - WET - (W) SOLID; AT OR NEAR OPTIMUM MOISTURE - DRY - (D) REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE - DRY - (D) REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE - DRY - (D) REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE - DRY - (D) REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE - PLASTICITY NON PLASTIC SLIGHTLY PLASTIC SLIGHTLY PLASTIC HIGHLY PLASTIC HIGHLY PLASTIC COLOR	DPT - DYNAMIC PENETRATION TEST SAP SAPROLITIC S - BULK e - VOID RATIO SD SAND, SANDY SS - SPLIT SPOON F - FINE SL SILT, SILTY ST - SHELBY TUBE FOSS FOSSILIFEROUS SLI SLIGHTLY RS - ROCK FRAC FRACTURED, FRACTURES TCR - TRICONE REFUSAL FRAGS FRAGMENTS W- MOISTURE CONTENT HI HIGHLY V - VERY CRY CRY CALIFORNIA BEARING RATIO CRY - CALIFORNIA BEARING RATIO CRY - CALIFORNIA BEARING RATIO DRILL UNITS: ADVANCING TOOLS: HAMMER TYPE: CME-45C	VERY CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK, PIECES 1 INCH SOFT OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL. FRACTURE SPACING IERM SPACING VERY WIDE MORE THAN 10 FEET VERY THICKLY BEDDED 4 FEET WIDE 3 TO 10 FEET THICKLY BEDDED 1.5 - 4 FEET WIDE 1 TO 3 FEET THICKLY BEDDED 0.16 - 1.5 FEET CLOSE 0.16 TO 1 FOOT VERY THINLY BEDDED 0.03 - 0.16 FEET VERY CLOSE LESS THAN 0.16 FEET THICKLY BEDDED 0.089 - 0.09 FEET THICKLY LAMINATED 0.089 F.0.09 FEET THICKLY LAMINATED 0.089 F.0.09 FEET THICKLY LAMINATED 0.089 F.0.09 FEET THICKLY LAMINATED 0.089 F.0.09 FEET THICKLY LAMINATED 0.089 F.0.09 FEET THICKLY LAMINATED 0.089 F.0.0	THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. DOPOOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER. BENCH MARK:
- SATURATED - USUALLY LIQUID: VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE LIQUID LIMIT PLASTIC LIMIT OM OPTIMUM MOISTURE SL SHRINKAGE LIMIT - WET - (W) SEMISOLID: REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE - MOIST - (M) SOLID: AT OR NEAR OPTIMUM MOISTURE - DRY - (D) REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE PLASTICITY NON PLASTIC NON PLASTIC SLIGHTLY PLASTIC MODERATELY PLASTIC HIGHLY PLASTIC 26 OR MORE - SEMISOLID: REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE - WET - (W) SEMISOLID: REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE - WET - (W) SEMISOLID: REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE - DRY - (D) REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE - DRY - (D) PLASTICITY INDEX (PI) DRY STRENGTH NON PLASTIC - SATURATED - USUALLY LIQUID: VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE	DPT - DYNAMIC PENETRATION TEST SAP SAPROLITIC S - BULK	VERY CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK, PIECES 1 INCH SOFT OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL. FRACTURE SPACING IERM SPACING VERY WIDE MORE THAN 10 FEET VERY THICKLY BEDDED 4 FEET THICKLY BEDDED 1.5 - 4 FEET THIC	THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. DOPOOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER. BENCH MARK:





BORIN COLLA DRILL F DRILLE	IG NO. AR ELE RIG/HAM ER S.	FLY_ V. 18	_3696F		`		4 Bypass	West of R	Rockingham	at SR1	109 to	0.3 m	niles south	of SR1140	6	ROUND WTR (f	A SIT						110 74 5								
DRILLE DRILLE	AR ELE RIG/HAN ER S.	V. 18		₹	ST								_	01 01(11140			, I Siii	E DES	SCRIPTIC	JN US	220 B	sypass f	rom US 74 Bypass v	vest of R	ockingnam a	at SR1109	to 0.3	miles sout	n of SR1140	GR	OUND WTR
DRILLE DRILLE	RIG/HAN		0 7 ft			ATION 3	6+96		OFFSET	67 ft R	Т		ALIGNI	MENT -FLY-	(HR. 5.	BOI	RING	NO. LP	B_868		ST	ATION 8+68		OFFSET (CL		ALIGN	IMENT -LPB-	0 H	IR. 2
DRILLI ELEV [ER S.	MACD ED	9.7 11		то	TAL DEP	FH 43.7	ft	NORTHIN					IG 1,745,286		HR. 8.	COI	LLAR	ELEV.	183.6 ft		то	TAL DEPTH 24.9 f	t	NORTHING				NG 1,745,410	24 H	
ELEV		IIVIEK EI	FF./DA	TE F&	R2175 (CME-55 76	% 02/05/201	15		DRILL	. METH	IOD H	I.S. Augers		HAMMER	TYPE Automatic	DRII	LL RIG	HAMMER	EFF./DA	TE F8	&R2175	CME-55 76% 02/05/201	5		DRILL ME	THOD	H.S. Augers		HAMMER T	YPE Automati
		Davis				ART DATI			COMP. DA			4 . 1	SURFA	CE WATER DEF	PTH N/A		DRI		S. Dav				ART DATE 02/18/1	15	COMP. DA	TE 02/18	/15	SURF	ACE WATER DEF	PTH N/A	
	DRIVE ELEV (ft)	DEPTH (ft)	-	W COL		0		PER FOOT 50	Г 7 <u>5</u> 100		P. W	0	ELEV. (ft)	SOIL AND RO	OCK DESCR	PTION DEPTH	ELE\		EV DEP	···	0.5ft	0.5ft	1	PER FOOT 50	75 100	SAMP.	MOI (SOIL AND RO	CK DESCRIPT	TION
	(11)										T WK	01 0	LLLV. (II)			DEFIII		(1			IVIOI C				
190	189.7	- 0.0	WOH	1	3							2531	189.7		ND SURFACE		.0 185		 									183.6	GPOLIN	D SURFACE	
	1	-	WOII	'	١ ،	₹4					M	N. V	1 <u>87.7</u> _ F	Red and brown, clay	L LUVIAL ayey SILT (A-	5) with trace	. <u>o</u>	183	3.6 + 0.0	WOH	1	3	4			1 1,	M.	<u> </u>	AL	LUVIAL	20. 1
185	186.2	3.5	2	3	4	7					-M-	, []	, ' _'	organics Dark gray, silty CLA	AY (A-7-5) w	th trace fine	180) 180	0.1 T 3.5				[:::::					\-\ \ \	Red and brown, clay organics	s micaceous	i
	7	-				7				1	√M-		_	sand and org	ganics, mica	eous			7	WOH	WOH	2	2				w	\	Red, dark gray, silty organics	CLAY (A-7-5) s, micaceous	with trace
	181.2	- - ₈₅										'	<u> </u>		ESIDUAL		. <u>0</u>		‡									176.6	· ·		
180		-	3	2	3	5		 • • • • •		-	М		<u>-</u> ;	Brown, black with sandy SILT (A-4) w			175	5 175	5.1 + 8.5	2	3	3	1				м		Gray and black with		
	‡	- -				`\; : :							<u>-</u>						‡	-							IVI S		(A-4) with trad	ce mica, sapro	litic
175	176.2	13.5	2	6	7	: \ : :					М		-				170	170	0.1 + 13.5	_			::\:\: ::::					#			
173	7	-	-		·			1		1	IVI		-				170	- 1/1	0.1 + 13. ;	9	10	12					М	F			
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170	171.2	- 18.5	5	12	16		28				М		_				165	5 165	5.1 18.5		14	15	\ \					Ł			
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	166.2	23.5							.				E						±						.			Ł			
65	4	-	12	50	25		+	+	75	-	M		F				160		0.1 T 23.5 8.7 + 24.9	1 40	32	68/0.1		+	100/0.6		372	159.6 158.7		ERED ROCK	
	1	-											-					158	8.7 † 24. 3 †	60/0			1		100/0.6 60/0	'	72/	- 130.7	Yellow, bla	ack, GABBRO	
160	161.2	28.5	12	22	74														‡									ļ	Boring Termin Penetration Test Re	ated with Stan	dard ion 158 7
00	7	-	-					1		96			-						‡									<u> </u>	ft ON CRYSTALL		
	4500								: : : : : !				156.2			33	5		‡									<u> </u>		Notes	
155	156.2	- 33.5 -	100/0.2						100/0.2	•		1	130.2		IERED ROC	(.5											_		2' Topsoil refusal at 24.9'	
	1	-							.				E	Dark gray to	to gray, GABI	BRO			±									Ł			
	151.2	38.5											_						±									E			
150	4	- [100/0.5				+	+	100/0.5	1 I			F						Ŧ									F			
	1	-											Ē						Ŧ									F			
<u> </u>	146.2	43.5	100/0.2			<u> </u>	1	1	100/0.2	\blacksquare				Boring Terminated	d at Elevation	146 O ft IN	.7		Ŧ									F			
	7	-											Ε	WEATHERED	D ROCK (GA	BBRO)			‡									F			
	‡	-											-	1	Notes				‡									-			
		-											_	1) 0.:	0.2' Topsoil				‡									_			
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/BS 34542.1.FR4	TIP R-3421A	COUNTY RICHM	OND	GEOLOGIST C. Wang	_
ITE DESCRIPTION US 220 B	pass from US 74 Bypass	Nest of Rockinghan	at SR1109 to 0.3 m	iles south of SR1140	GROUND WTR (fi
ORING NO. LPB_1176R	STATION 11+76	OFFSET	151 ft RT	ALIGNMENT -LPB-	0 HR. Dr
OLLAR ELEV. 195.3 ft	TOTAL DEPTH 12.7 f	t NORTHI	G 437,169	EASTING 1,745,548	24 HR. 7.0
RILL RIG/HAMMER EFF./DATE F8	R2175 CME-55 76% 02/05/201	5	DRILL METHOD H.	S. Augers HAMN	IER TYPE Automatic
RILLER S. Davis	START DATE 02/16/1	5 COMP. D	ATE 02/17/15	SURFACE WATER DEPTH N	/A
EV DRIVE DEPTH BLOW COL		PER FOOT	SAMP. L	SOIL AND ROCK DES	CRIPTION
(ft) (ft) (ft) 0.5ft 0.5ft	0.5ft 0 25	50 75 10	NO. MOI G	ELEV. (ft)	DEPTH
95 195.3 0.0 WOH 1	2 3		W N	- 195.3 GROUND SURF. - ALLUVIAL Red and brown, clayey SILT fine sand and organics,	(A-5) with trace
191.8 + 3.5 4 2	7		Sat. 1000		4
186.8 + 8.5			000	186.2	!
5 12 14	15 •29	· · · · · · · ·		RESIDUAL	
182.7 + 12.6		60/0.		Olive green, silty fine SA 183.5 saprolitic CRYSTALLINE R	/ [_]
				GABBRO Boring Terminated with Penetration Test Refusal at ft IN CRYSTALLINE ROC Notes 1) Strata break in split spoor 2) Hard drilling at 3) Auger refusal at 3) Auger refusal at 3	Elevation 182.6 K (GABBRO) n at 4.5' and 9.1' 11.8'



Photo 1: Looking South Along Loop B Culvert

