CONTENTS

56015

5

REFERENCE

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STATE OF NORTH CAROLINA

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY MADISON

PROJECT DESCRIPTION REPLACE BRIDGE #151 ON SR 1330 (BAKER'S CREEK RD.)

OVER SPILLCORN CREEK

SITE DESCRIPTION .

169 R 13. BP. N PROJEC

Ι	STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
	N.C.	SF-560151	1	9

CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF STUDY, PLANNING AND DESIGN, AND NOT FOR CONSTRUCTION OR PAY PURPOSES. THE VARIOUS FIELD BORING LOGS, ROCK CORES AND SOLI TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEICH BY CONTACTING THE N.C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT 1991 707-6805. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA ARE NOT PART OF THE CONTRACT.

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THE BIDDER OF CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE PLATORS. 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 INTERRETATIONS MADE, OR OPHION 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 HINSELF 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 ACULAL CONDITIONS ENCOUNTERED AT THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

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

NCDOT – GEU C.D. JOHNSON

D.O. CHEEK

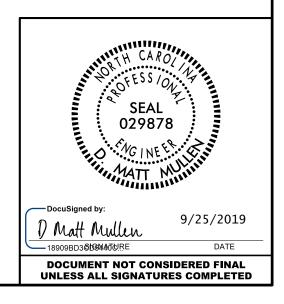
C.J. COFFEY

INVESTIGATED BY ______

DRAWN BY DMM

CHECKED BY JCK

SUBMITTED BY JCK



SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

			SOIL	DESCRIF	PTION					GI	RADATION				ROCK DESCRIPTION					
					.OR WEATHERED				WELL GRADED - INDICA						HARD ROCK	IS NON-COAS	STAL PLAIN MATE	ERIAL THAT W	/OULD YIELD SPT REFUSAL STAL PLAIN MATERIAL WOU	IF TESTED. AN
ACCORD	ING TO THE	STANDARD	PENETRATION	TEST (AASHTO	O T 206,ASTM	D1586). SOI	L CLASSIFIC	CATION	UNIFORMLY GRADED - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.						SPT REFUSA	L IS PENETR	RATION BY A SPL	LIT SPOON SA	MPLER EQUAL TO OR LESS NSITION BETWEEN SOIL A	THAN Ø.1 FOOT
CONSIST	ENCY, COLOR,	TEXTURE, N	IOISTURE, AASH	TO CLASSIFIC	ONS GENERALLY CATION,AND OT⊨	ER PERTIN	ENT FACTOR	S SUCH	ANGULARITY OF GRAINS						REPRESENTE	D BY A ZONE	E OF WEATHERED) ROCK.		NU RUCK 15 UP
					CTURE, PLASTICI FINE SAND LAYER				THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS:							RIALS ARE TY	YPICALLY DIVIDE			
					CLASSIF				ANGULAR, SUBAN	IGULAR, SUBROUNDED,					WEATHERED ROCK (WR)	22			N MATERIAL THAT WOULD ' NOT IF TESTED.	YIELD SPT N VA
GENERAL		granular ma			CLAY MATERIALS	OF	GANIC MATERI	ALS			SICAL COMPOS			<u></u>	CRYSTALLIN	E			RAIN IGNEOUS AND METAMO	
CLASS.		≤ 35% PASSI A-3	A-2		2 PASSING 200)					MES SUCH AS QUART. N DESCRIPTIONS WHE					ROCK (CR)	2	CNEIS	SS, GABBRO, SC		
GROUP CLASS.	A-1-a A-1-b		A-2-5 A-2-6 A		A-7-5, A-7-6	A-1, A-2 A-3	A-4, A-5 A-6, A-7			COMP	PRESSIBILITY				NON-CRYSTA		FINE	TO COARSE C	RAIN METAMORPHIC AND NO THAT WOULD YEILD SPT	DN-COASTAL PLA REFUSAL IF TES
SYMBOL				S						HTLY COMPRESSIBLE RATELY COMPRESSIB		LL <	31 31 - 50	2	ROCK (NCR)		ROCK	TYPE INCLUD	ES PHYLLITE, SLATE, SANDS	STONE, ETC.
% PASSING	<u>00000000000</u> 0000000000000000000000000	*****								Y COMPRESSIBLE	LE .	LL >			SEDIMENTAR		SPT F	REFUSAL. ROC	K TYPE INCLUDES LIMESTO	
* 10	50 MX					GRANULAR	SILT- CLAY	MUCK,		PERCENTA	AGE OF MATER	RIAL			(CP)		SHELL	U BEDS, ETC.	IERING	
	30 MX 50 MX 15 MX 25 MX		35 MX 35 MX 3	5 MX 36 MN 3F	6 MN 36 MN 36 MN	SOILS	SOILS	PEAT	ORGANIC MATERIAL	GRANULAR SOILS	SILT - CLAY SOILS	O	THER M	ATERIAL	FRESH	ROCK FRESH	H. CRYSTALS BRIG		S MAY SHOW SLIGHT STAIN	NG. ROCK RINGS
MATERIAL									TRACE OF ORGANIC M	ATTER 2 - 3%	3 - 5%	TRA		1 - 10% 10 - 20%			CRYSTALLINE.			
PASSING #40 LL	_	- 40 M	41 MN 40 MX 4	1 MN 40 MX 4	1 MN 40 MX 41 MN		S WITH		LITTLE ORGANIC MAT MODERATELY ORGANIC	5 - 10%	5 - 12% 12 - 20%	SOM		20 - 35%	VERY SLIGHT (V SLI.)				SOME JOINTS MAY SHOW THE SHINE BRIGHTLY. ROCK RINGS	
PI	6 MX				8 MX 11 MN 11 MN		le or Erate	HIGHLY	HIGHLY ORGANIC	> 10%	> 20%	HIGH	HLY	35% AND ABOVE	(Y 5E1./		TALLINE NATURE.		SHILE BRIGHTET, ROCK MINO	
GROUP INDEX	Ø	0	Ø 4 MX	8 MX 12	2 MX 16 MX NO MX		nts of Ganic	ORGANIC SOILS		GRO	OUND WATER				SLIGHT				AND DISCOLORATION EXTEND	
USUAL TYPES OF MAJOR	STONE FRAGS. GRAVEL, AND	FINE	SILTY OR CLAYEY	SILTY	CLAYEY		TTER		∇	WATER LEVEL IN	BORE HOLE IMMEDI	ATELY AF	TER DF	RILLING	(SLI.)				IN GRANITOID ROCKS SOME I YSTALLINE ROCKS RING UND	
MATERIALS	SAND	SAND (GRAVEL AND SAND	SOILS	S SOILS				▼	STATIC WATER LE	EVEL AFTER 24	HOURS			MODERATE				COLORATION AND WEATHERIN	
GEN. RATING		EXCELLENT T	0 6000	Fŕ	AIR TO POOR	FAIR TO	POOR	UNSUITABLE	<u>∑pw</u>	PERCHED WATER.S	SATURATED ZONE, OF	R WATER	BEARIN	G STRATA	(MOD.)				ULL AND DISCOLORED, SOME HOWS SIGNIFICANT LOSS OF	
AS SUBGRADE					A-7-6 SUBGROUP IS	POOR			0-111 -	SPRING OR SEEP						WITH FRESH				
					DENSENESS				-	MISCELL	ANEOUS SYMB				MODERATELY SEVERE				R STAINED. IN GRANITOID RO	
			ACTNESS OR		OF STANDARD		GE OF UNC	ONFINED							(MOD. SEV.)	AND CAN BE	E EXCAVATED WIT	TH A GEOLOGIS	T'S PICK. ROCK GIVES CLUN	
PRIMARY S	SOIL TYPE		SISTENCY		TION RESISTENCE	COM	RESSIVE S (TONS/FT		L ROADWAY EMB		DIP & DIP DIF DIP & DIP DIF OF ROCK STRU	RECTION			SEVERE		WOULD YIELD SP		STAINED. ROCK FABRIC CL	
CENEDA		VEF	Y LOOSE	-	< 4				1 4					SLOPE INDICATOR	(SEV.)	REDUCED IN	N STRENGTH TO S	STRONG SOIL.	IN GRANITOID ROCKS ALL FE	LDSPARS ARE KA
GENERA			LOOSE UM DENSE		4 TO 10 10 TO 30		N/A		SOIL SYMBOL		DOPT DMT TEST BO		\smile	INSTALLATION			XTENT. SOME FR4 WOULD YIELD SP		TRONG ROCK USUALLY REMAI	N.
MATERIA (NON-CO			DENSE		30 TO 50		N/ H			ILL (AF) OTHER Y EMBANKMENT	AUGER BORING	. (CONE PENETROMETER TEST	VERY				STAINED. ROCK FABRIC ELE	EMENTS ARE DISC
			RY DENSE	<u> </u>	> 50					لم			•	COUNDING DOD	SEVERE (V SEV.)				OIL STATUS, WITH ONLY FRA ROCK WEATHERED TO A DEC	
GENERA	LLY		RY SOFT SOFT		< 2 2 TO 4		< 0.25 0.25 TO 0	0.5	- INFERRED SO		Ť		.	SOUNDING ROD					AIN. IF TESTED, WOULD YIEL	
SILT-CL MATERIA			IUM STIFF STIFF		4 TO 8 8 TO 15		0.5 TO 1 1 TO 2		INFERRED ROOM	CK LINE	◯ MONITORING W	ELL -		TEST BORING WITH CORE	COMPLETE				T DISCERNIBLE, OR DISCERNIE BE PRESENT AS DIKES OR	
COHESI			RY STIFF		5 TO 30		2 TO 4		TTTT ALLUVIAL SO	L BOUNDARY	△ PIEZOMETER INSTALLATION	(Ò-	SPT N-VALUE		ALSO AN E		S. GOHNIZ MHI	DE FRESENT HS DIKES ON	STRINGERS, SHEP
							> 4				NDATION SYME							ROCK H	ARDNESS	
	5.15 OL75													IED EXCAVATION -	VERY HARD				RP PICK. BREAKING OF HAND	SPECIMENS REQU
U.S. STD. SI OPENING (M			4 10 4.76 2.0		60 200 0.25 0.07					UNCLASSIFIED E UNSUITABLE WAS		acc ادج‴אב	CEPTABL	E,BUT NOT TO BE	HARD		ARD BLOWS OF TH RATCHED BY KNIE		S PICK. LY WITH DIFFICULTY. HARD	HAMMER BLOWS F
BOULDE	B CO	BLE	GRAVEL	COARSE			SILT	CLAY	SHALLOW UNDERCUT	UNCLASSIFIED E				HE TOP 3 FEET OF NT OR BACKFILL			HAND SPECIMEN.			
(BLDR.)		0B.)	(GR.)	SAND (CSE. SD.	SAN (F S	ן ט	(SL.)	(CL.)		ABB	REVIATIONS				MODERATELY HARD				DUGES OR GROOVES TO 0.25 ST'S PICK. HAND SPECIMENS	
GRAIN MM	1 305	75	2.	0	0.25	0.05	0.005		AR - AUGER REFUSAL	MED	- MEDIUM	٧	ST - VA	ANE SHEAR TEST		BY MODERA				CAR DE DETACAE
SIZE IN.	. 12	3							BT - BORING TERMINATE		- MICACEOUS - MODERATELY			EATHERED T WEIGHT	MEDIUM HARD				DEEP BY FIRM PRESSURE O EICES 1 INCH MAXIMUM SIZE	
	S	OIL MC	ISTURE -	CORREL	ATION OF	TERMS			CPT - CONE PENETRATIO	N TEST NP - 1	NON PLASTIC	بر ر		UNIT WEIGHT	THEND		A GEOLOGIST'S PI		EICES I INCH PRAIMON SIZE	BT THIND DEOWS
	MOISTURE : TERBERG LIN			MOISTURE	GUIDE FOR	FIELD MO	ISTURE DES	CRIPTION	CSE COARSE DMT - DILATOMETER TES		- ORGANIC - PRESSUREMETER T	EST	SAMPL	E ABBREVIATIONS	SOFT				NIFE OR PICK. CAN BE EXCA BY MODERATE BLOWS OF A	
			CAT						DPT - DYNAMIC PENETRA	TION TEST SAP	- SAPROLITIC	S	- BULI				N BE BROKEN BY			FICK FUINT. SMM
			- SATU (SA	IRATED -	USUALLY L FROM BELC				e - VOID RATIO F - FINE		SAND, SANDY SILT, SILTY			LIT SPOON ELBY TUBE	VERY				AVATED READILY WITH POINT	
PLASTIC		LIMIT	-						FOSS FOSSILIFEROUS		SLIGHTLY		RS - RO		SOFT	FINGERNAIL		I BE BRUKEN E	Y FINGER PRESSURE. CAN B	- SURATURED REA
RANGE <			- WET	- (W)	SEMISOLID; ATTAIN OP				FRAC FRACTURED, FRAC FRAGS FRAGMENTS		- TRICONE REFUSAL MOISTURE CONTENT	R C		COMPACTED TRIAXIAL ALIFORNIA BEARING		FRACTUR	RE SPACING		BEI	DDING
(PI) PL		C LIMIT							HI HIGHLY	V - VE				ATIO	TERM		SPACIN	NG	TERM	THICK
OM			- MOIS	T - (M)	SOLID; AT (OR NEAR O	РТІМИМ МО	ISTURE		UIPMENT USED				-	VERY WII WIDE		MORE THAN 3 TO 10		VERY THICKLY BEDDE THICKLY BEDDED	D 4 FE 1.5 - 4
SL									DRILL UNITS:	ADVANCING TOOLS:			MER TYP	ATIC MANUAL	MODERAT CLOSE	ELY CLOSE	1 TO 3 F Ø.16 TO 1		THINLY BEDDED VERY THINLY BEDDED	0.16 - 1. 0.03 - 0.
			- DRY	- (D)	REQUIRES (1			US FLIGHT AUGER				VERY CL	OSE	LESS THAN Ø		THICKLY LAMINATED	0.008 - 0.
L					ATTAIN OP	IMUM MUI	DIURE		CME-55	8 HOLLOW AU			E SIZE:	П-н					THINLY LAMINATED	< 0.008
				ASTICIT					СМЕ-550		FINGER BITS				FOR SEDIME	NTARY ROCKS	S. INDURATION IS		ING OF MATERIAL BY CEME	NTING. HEAT. PR
NON	N PLASTIC		PLAS	0-5	<u>EX (P])</u>		VERY LOW						-N <u>XWL</u>	_	FRIA		R	UBBING WITH	FINGER FREES NUMEROUS (GRAINS:
SLI	GHTLY PLAS			6-15			SLIGHT		VANE SHEAR TEST		W/ ADVANCER	HAND	TOOLS		E NIHO				BY HAMMER DISINTEGRATES	
	DERATELY PL HLY PLASTI			16-25 26 OR MORE	E		MEDIUM HIGH		PORTABLE HOIST		STEEL TEETH			HOLE DIGGER	MODE	RATELY INDU			SEPARATED FROM SAMPLE WHEN HIT WITH HAMMER.	WITH STEEL P
				COLOR							• TUNGCARB.		HAND 4						FFICULT TO SEPARATE WIT	H STEEL PROBE
DECORD					IONS (TAN, RED	VELLOW		-08420						ING ROD SHEAR TEST	INDUF	RATED			BREAK WITH HAMMER.	
					ARE USED TO [EXTR	EMELY INDUR			BLOWS REQUIRED TO BREA 5 ACROSS GRAINS.	K SAMPLE;
																	51			

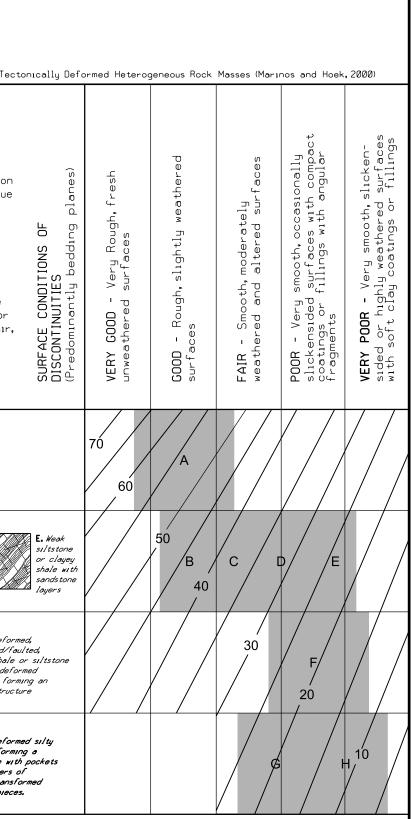
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TERMS AND DEFINITIONS ED. AN INFERRED) SPT REFUSAL. 1 FOOT PER 60 IS OFTEN ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER. AQUIFER - A WATER BEARING FORMATION OR STRATA. ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND. ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, SUCH AS SHALE, SLATE, ETC. N VALUES > ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND CK THAT SURFACE. CLUDES GRANITE, CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE. AL PLAIN IF TESTED. COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE. MAY NOT YIELD STONE, CEMENTED CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. $\underline{\text{DIKE}}$ - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK. RINGS UNDER DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL. NATINGS IF OPEN. DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH. AMMER BLOWS IF FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE СК ИР ТО SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE. FELDSPAR FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. BLOWS. $\underline{\mathsf{FLOAT}}$ - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL. . IN Y. ROCK HAS AS COMPARED FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM. FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD. ELDSPARS DULL OSS OF STRENGTH WHEN STRUCK. JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED. LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO VIDENT BUT ITS LATERAL EXTENT. ARE KAOLINIZED LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS. MOTTLED (MOT.)- IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE. RE DISCERNIBLE PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE STRONG ROCK ONLY MINOR OF AN INTERVENING IMPERVIOUS STRATUM. ALUES < 100 BPF RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. IN SMALL AND ROCK QUALITY DESIGNATION (ROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF SAPROLITE IS ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK. S REQUIRES SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO LOWS REQUIRED THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS. <u>SLICKENSIDE</u> - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE. EEP CAN BE ETACHED STANDARD PENETRATION TEST (PENETRATION RESISTANCE)(SPT) - NUMBER OF BLOWS (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL OR PICK POINT WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL BLOWS OF THE TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. $\underline{STRATA CORE RECOVERY (SREC.)}$ - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. FRAGMENTS IT. SMALL. THIN STRATA ROCK QUALITY DESIGNATION (SROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. PIECES 1 INCH ED READILY BY TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER. BENCH MARK: BM#I THICKNESS 4 FEET 1.5 - 4 FEET ELEVATION: 2038.9 FEET 16 - 1.5 FEET NOTES: 3 - 0.16 FEET 08 - 0.03 FEET 0.008 FEET AT, PRESSURE, ETC. TEEL PROBE:

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

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



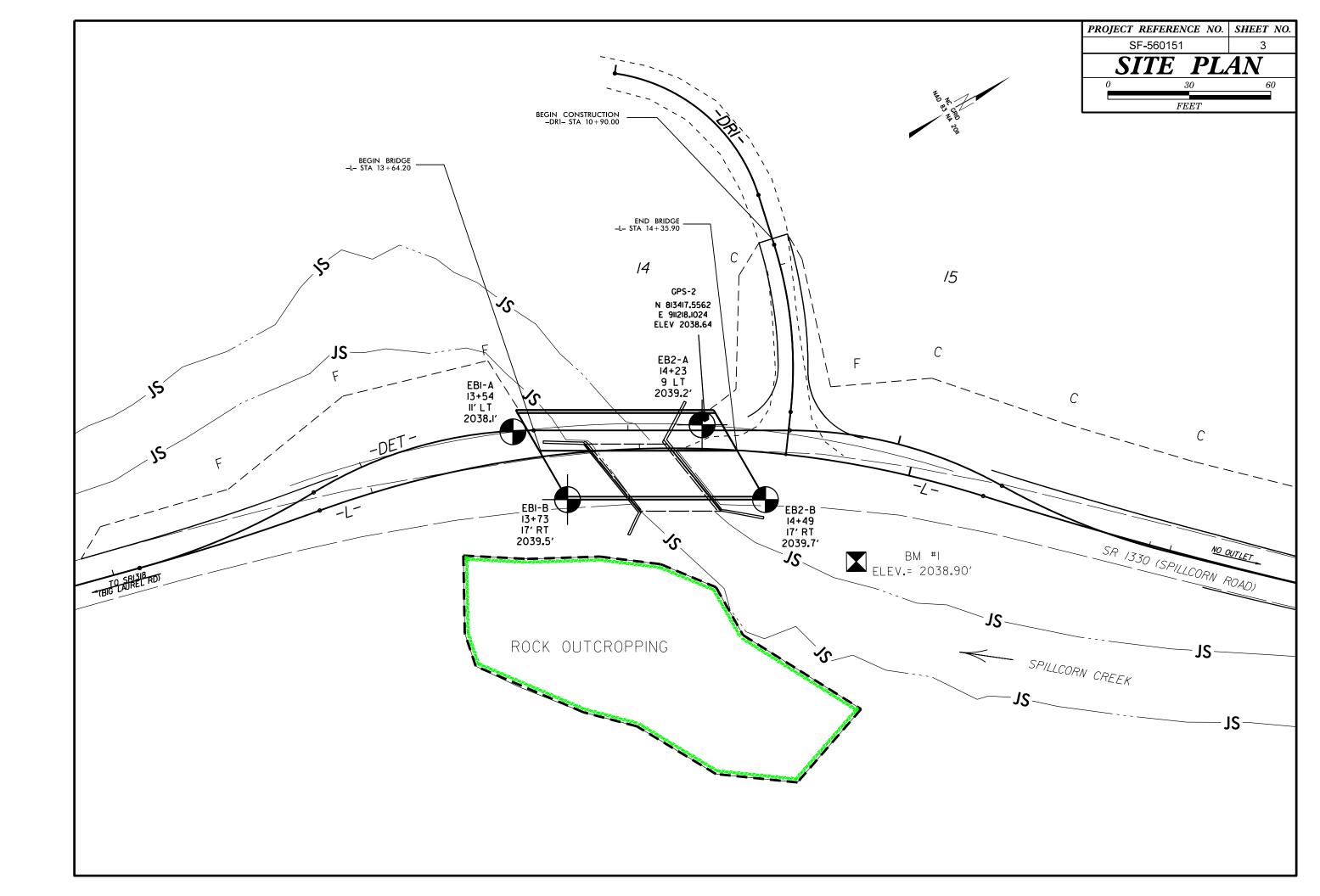
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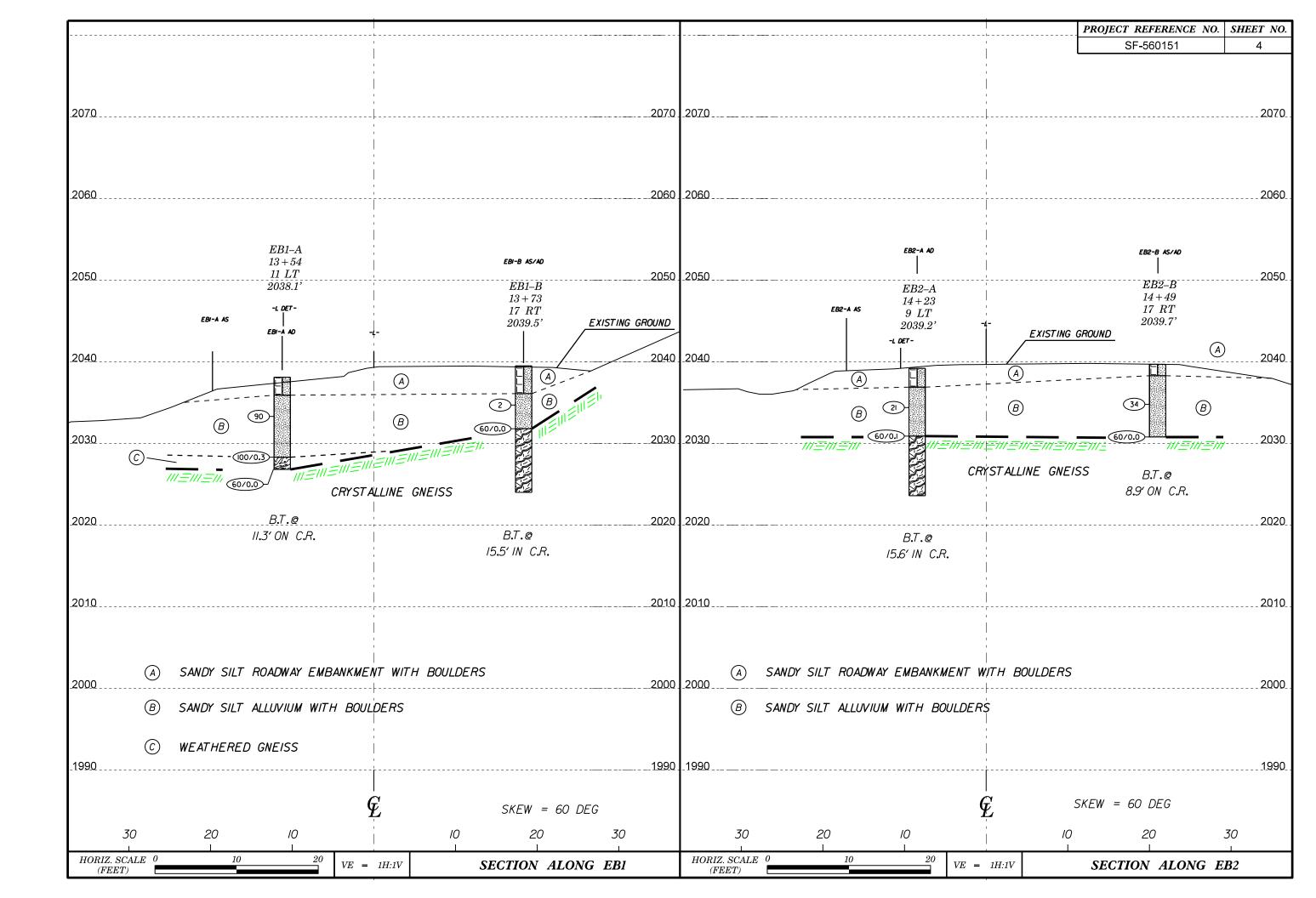
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SHEET NO.

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DATE: 8-19-16





		BORE LOG		
WBS 17BP.13.R.169	TIP SF-560151	COUNTY MADISON	GEOLOGIST Johnson, C. I	D.
SITE DESCRIPTION BRID	GE #151 ON SR-1330 (SPILLCO	RN RD.) OVER SPILLCORN CRI	EEK	GROUND WTR (ft
BORING NO. EB1-A	STATION 13+54	OFFSET 11 ft LT		0 HR. N/A
COLLAR ELEV. 2,038.1 f	t TOTAL DEPTH 11.3 f	ft NORTHING 813,353	B EASTING 911,188	24 HR. 6.1
DRILL RIG/HAMMER EFF./DATE	AFO6744 CME - 45C 92% 07/31/201	7 DRILL ME	THOD NW Casing w/SPT H4	MIMER TYPE Automatic
DRILLER Cheek, D. O.	START DATE 09/12/	19 COMP. DATE 09/12	2/19 SURFACE WATER DEPTH	N/A
	W COUNT BLOWS	PER FOOT SAMP.	MOI G ELEV. (ft)	
2040 2035 2,033.3 4.8 31 2030	42 48			BANKMENT ND-SLT, DULDERS AL
		60/0.0	2,028.3 2,026.8 GREY, WEA CRYSTALLIN GREY CRYSTALLIN Boring Terminated W PENETRATION TES Elevation 2,026.8 ft ON - - - - - - - - - - - - -	GNEISS IE ROCK ROCK (GNEISS) ITH STANDARD ST REFUSAL at

SHEET 5

									BORE	LOG	i													
WBS	17BP	.13.R.1	69		ТІ	IP SF-56	60151	COUN	TY MADISO	N			GEOLOGIST Johnson, C. D.		WB	S 17BP.13	3.R.169			TIP	SF-56	0151		
SITE	DESCR	IPTION	BRI	DGE #	151 ON	N SR-133	0 (SPILLCO	ORN RD.)	OVER SPILL	CORN C	REEK	(GROUND WTR (ft)	SIT		TION E	BRID	GE #151	ON S	R-133) (SPILLO	COR	
BOR	ing no.	EB1-	В		S	TATION	13+73		OFFSET	17 ft RT			ALIGNMENT L	0 HR. N/A	BO	ring no.	EB1-B			STAT	TION	13+73		
COL	LAR EL	EV. 2,	039.5	ft	т	OTAL DE	PTH 15.5	ft	NORTHING	3 813,3	59		EASTING 911,220	24 HR. Dry		LLAR ELEV				TOTAL DEPTH 15.5 ft				
DRIL	RIG/HAI	VIMER E	FF./DAT	E AFO	C6744 C	ME-45C9	2%07/31/20	17		DRILLI	VIETHC	DD N	WCasing W/SPT & Core HAN	IMER TYPE Automatic	DRIL	LL RIG/HAMM	ER EFF./	/DATE	AF0674	44 CME	-45C9	2%07/31/2	2017	
DRIL	LER C	heek, [D. O.		S	TART DA	TE 09/10	'19	COMP. DA	TE 09/	10/19		SURFACE WATER DEPTH	N/A	DRI	ILLER Che	ek, D. C	0.		STAF	rt da	TE 09/1	0/19	
ELEV	DRIVE ELEV	DEPTH	BLC	ow co			BLOW	PER FOO	T	SAMP.	. /		SOIL AND ROCK DE	SCRIPTION	CO	RE SIZE N	IXWL			1		N 7.8 ft		
(ft)	(ft)	(ft)	0.5ft	0.5ft	0.5ft	0	25	50	75 100	NO.	мо	I G			ELE		EPTH R	RUN	DRILL RATE	REC.	JN RQD	SAMP.	S RE(
															(ft)	(ft)	(ft)	(ft)	(Min/ft)	REC. (ft) %	(ft) %	NO.	(ft) %	
2040		Ļ											_2,039.5 GROUND SUF	RFACE 0.0	2031.	79	77		0.00/0.0		(0.0)			
		Į –							· · · · ·				- ROADWAY EMBA BROWN, SND	NKMENT	2030	2,031.0		2.8	6:32/0.8 N=60/0.0 6:32/0.8 5:15/1.0 2:50/1.0 3:48/1.0 2:04/1.0 1:09/1.0 1:29/1.0 2:33/1.0	(2.4) 86%	(2.3) 82%			
		ŧ							· · · · · ·			E	ASPHALT/BOU	LDERS 3.4		-	10.0	5.0	5:15/1.0 2:50/1.0	(5.0) 100%	(0.8)			
2035	2,034.7	4.8	1	1	1						w		ALLUVIA BROWN, SL MIC, SND		2025				3:48/1.0 2:04/1.0	100%	10%			
	2,031.8	7.7				•2		┝┥┽┿┿	· · · · · ·				2,031.8	7.7	2023	2,024.0	15.5		1:29/1.0					
2030		1	60/0.0)					60/0.0			R	- CRYSTALLINE GREY-BROWN, WEA	ROCK CRYSTALLINE		1 ‡		ľ	(2.00, 1.0)	ĺ				
		ŧ		1									- ROCK (GNE	ISS)		‡								
		Ŧ		1			· · · · ·	· · · · ·	· · · · · ·				7.7' - 11.5' GSI = 8 11.5' - 15.5' GSI = 4			‡								
2025	-	ł												<u>15.5</u>		1 1								
		ł											Boring Terminated at Elev ROCK (GNE	ration 2,024.0 ft IN		1 1								
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CORE LOG COUNTY MADISON GEOLOGIST Johnson, C. D. ORN RD.) OVER SPILLCORN CREEK OFFSET 17 ft RT ALIGNMENT L **NORTHING** 813,359 **EASTING** 911,220 DRILL METHOD NW Casing W/SPT & Core SURFACE WATER DEPTH N/A COMP. DATE 09/10/19 19 STRATA L REC. RQD O (ft) (ft) G DESCRIPTION AND REMARKS Begin Coring @ 7.7 ft

GEOTECHNICAL BORING REPORT

N/A

Dry

GROUND WTR (ft)

0 HR.

24 HR.

HAMMER TYPE Automatic

	Begin Coring @ 7.7 ft	
J.	Begin Coring @ 7.7 ft - 2,031.8 CRYSTALLINE ROCK 7.7	
1		L
	7.7' - 11.5' GSI = 85-90	
The second	- 11.5' - 15.5' GSI = 50-60	
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	Boring Terminated at Elevation 2,024.0 ft IN ROCK (GNEISS)	1
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WBS	17BP	.13.R.16	69		ТІ	P SF-560	0151	COUNT	Y MADISO	N			GEOLOGIST Johnson, C. D.				3 17BP.13.F					SF-56			OUNT
SITE	DESCR	IPTION	BRI	DGE #	151 OI	N SR-1330	(SPILLCO	RN RD.) (OVER SPILL	CORNC	REEK			GROUND WT	R (ft)	SITE	E DESCRIPTI	ON	BRID	GE #151	ON S	R-133	0 (SPILL	CORN	RD.)
BORI	NG NO.	EB2-	A		S	TATION	14+23		OFFSET	9 ft LT			ALIGNMENT L	0 HR.	N/A	BOR	Ring No. Ei	32-A			STA	TION	14+23		
COLL	AR EL	EV. 2,	039.2	ft	т	OTAL DEF	TH 15.61	ť	NORTHING	813,4	15		EASTING 911,220	24 HR.	5.4	COLLAR ELEV. 2,0			39.2 ft	t	тот	AL DE	PTH 15	.6 ft	
DRILL	rig/hai	/IMER EF	FF./DAT	E AFO	26744 C	ME - 45C 92	2%07/31/201	7		DRILLI	VIETHOD	NV	W Casing W/SPT & Core HAM	ER TYPE Autom	atic	DRIL	L RIG/HAMME	R EFF.	./DATE	AF067	44 CME	-45C9	2%07/31/	2017	
DRILI	ER C	heek, D	D. O.		S	TART DAT	E 09/12/	19	COMP. DA	TE 09/	/12/19		SURFACE WATER DEPTH N	Ά		DRIL	LER Cheel	k, D.	0.		STA	rt da	TE 09/ ⁻	12/19	
ELEV		DEPTH	H BLC	ow co	UNT		BLOWS	PER FOO	T	SAMP		L O	SOIL AND ROCK DES			COF	RE SIZE NX	NL					N 7.3 ft		
(ft)	(ft)	(ft)	0.5ft	0.5ft	0.5ft	0	25	50	75 100	NO.	моі				PTH (ft)	ELEV		тн	RUN	DRILL RATE	REC.	UN RQD	SAMP.	STF REC.	RATA RQD
																(ft)	(ft) (f	t)	(ft)	(Min/ft)	(ft) %	RQD (ft) %	NO.	(ft) %	RQD (ft) %
2040		Ļ												ACE	0.0	2030.8	6 	3		0.42/0.2	(1.0)	(0.6)			
	•	-					1						ROADWAY EMBAN	KMENT			2,028.6 10	.6	2.3	N=60/0.1 0:43/0.3	78%	26%			
0005		ŧ					/ 		. .				2,036.9 BROWN, SND- ASPHALT/BOUL		2.3		‡		5.0	0:43/0.3 <i>N=60/0.1</i> 0:43/0.3 1:50/1.0 2:17/1.0	(5.0) 100%	(3.3) 66%			
2035	2,034.4	4.8	4	7	14								ALLUVIAL BROWN-GREY, SND-S	LT, w/PEBS		2025				3:31/1.0 1:51/1.0 1:47/1 0					
		‡				9	21 	<u> </u>					<u> </u>				2,023.6-15	.0		3:31/1.0 1:51/1.0 1:47/1.0 1:36/1.0 2:38/1.0	<u> </u>			\vdash	
2030	2,030.9	+ 8.3 -	60/0.1	1				· · · ·	60/0.1	•			2,030.9 CRYSTALLINE F		8.3		‡								
		‡					. .		 				GREY CRYSTALLINE RC	OCK (GNEISS)			‡								
2025	•	‡											GSI = 65-70				‡								
2025	-	ŧ													15.6		‡								
Ī		ţ								1		-	Boring Terminated at Eleva ROCK (GNEIS	tion 2,023.6 ft IN			‡								
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GEOTECHNICAL BORING REPORT

		ELC			GEOLOGIS	T Johnson	n, C. D.		
			ORN CREEK			,	,	GROU	ND WTR (ft)
	-	SET 9 f			ALIGNMEN	ΠL		0 HR.	
	L		813,415		EASTING			24 HR.	5.4
			RILL METHOD	NW			HAMM		Automatic
	CON		09/12/19		SURFACE		PTH N/	A	
RATA RQD	L								
(ft) %	O G	ELEV. (ft)		D	ESCRIPTION	AND REMAP	RKS		DEPTH (ft
				С	ontinued from	n previous p	age		
	-	2,030.9			CRYSTAL	LINE ROCK			8.3
					GSI = 6	5-70			
		-							
	∽∕ -	2,023.6	Boring Te	rmina	ted at Elevatio	n 2,023.6 ft I	N ROCK (GNEISS)	<u> </u>
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	BO	RE LOG		
WBS 17BP.13.R.169	TIP SF-560151 COUNT	Y MADISON	GEOLOGIST Johnson, C. D.	·
SITE DESCRIPTION BRIDGE #151	ON SR-1330 (SPILLCORN RD.) C	VER SPILLCORN CREEK		GROUND WTR (ft)
Boring NO. EB2-B	STATION 14+49	OFFSET 17 ft RT	ALIGNMENT L	0 HR. N/A
COLLAR ELEV. 2,039.7 ft	TOTAL DEPTH 8.9 ft	NORTHING 813,422	EASTING 911,256	24 HR. Dry
DRILL RIG/HAMMER EFF./DATE AF0674	44 CME - 45C 92%07/31/2017	DRILL METHOD NW	Casing w/SPT HAMM	ER TYPE Automatic
DRILLER Cheek, D. O.	START DATE 09/10/19	COMP. DATE 09/10/19	SURFACE WATER DEPTH N//	A
ELEV DRIVE DEPTH BLOW COUN		75 100 NO. MOI G	SOIL AND ROCK DES	CRIPTION
		· · · · · · · · · · · · · · · · · · ·	2,039.7 GROUND SURF/ 2,038.3 ROADWAY EMBANI BROWN, SND-S ASPHALT/BOULD ALLUVIAL BROWN, SL MIC, SND-S 2,030.8 CRYSTALLINE RO Boring Terminated WITH PENETRATION TEST R Elevation 2,030.8 ft ON RO	KMENT 1. SLT, JERS SLT, w/PEBS BLT, w/PEBS CK (GNEISS) STANDARD VEFUSAL at

SHEET 8

CORE PHOTOGRAPHS

EB1-B

BOX 1 OF 1: 7.7 - 15.5 FEET 7.7' - 11.5' GSI = 85 - 90 11.5' - 15.5' GSI = 50 - 60

EB2-A BOX 1 OF 1: 8.3 - 15.6 FEET GSI = 65 - 70







SHEET 9 560151 (17.BP.13.R.169) / MADISON BRIDGE NO. 151

CONTENTS

560066

5

REFERENCE

<u>SHEET NO.</u>	DESCRIPTION
I	TITLE SHEET
2	LEGEND (SOIL & ROCK)
2A	SUPPLEMENTAL LEGEND (GSI)
3	SITE PLAN
4	CROSS SECTIONS
5-7	BORE LOGS & CORE REPORT
8	CORE PHOTOGRAPH

STATE OF NORTH CAROLINA

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY MADISON

PROJECT DESCRIPTION REPLACE BRIDGE #66 ON SR 1396 (HUNTER CREEK RD.) OVER

WALNUT CREEK

SITE DESCRIPTION

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	SF-560066	1	8

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 SOLI TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEICH BY CONTACTING THE N.C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT 1991 707-6805. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES AND SOIL TEST DATA ARE NOT PART OF THE CONTRACT.

GENERAL SOL 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 BORCHOLE. THE LABORATORY SAMPLE DATA AND THE IN SITU UN-FLACE)TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOL MOISTURE CONDITIONS, MOICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION, THESE WATER LEVELS OR SOL MOISTURE CONDITIONS MAY YARY CONSIDERABLY WITH TIME ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

THE BIDDER OF 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 INTERRETATIONS MADE, OR OPHION OF THE DEPARTMENT AS TO THE TYPE OF MATERIALS AND CONSTRUCTIONS TO BE ENCOUNTERED. THE BIDDER OR CONTRACTOR IS CAUTIONED TO MAKE SUCH INDEPENDENT SUBSURFACE INVESTIGATIONS AS HE DEEMS NECESSARY TO SATISFY THINSELF 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 ACUAL CONDITIONS ENCOUNTERED AT THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

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

PERSONNEL

C.D. JOHNSON

D.O. CHEEK

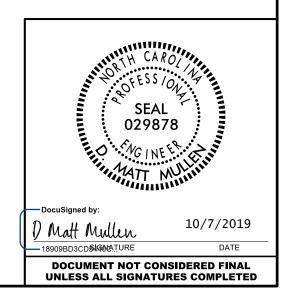
C.J. COFFEY

INVESTIGATED BY ______

DRAWN BY DMM

CHECKED BY JCK

SUBMITTED BY JCK



SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

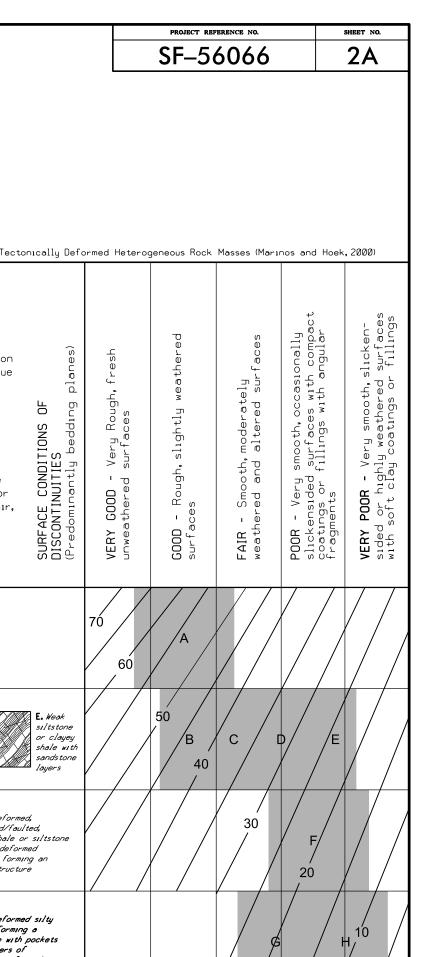
SOIL DESCRIPTION	GRADATION	ROCK DESCRIPTION	TERMS AND DEFINITIONS
SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN	WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE.	HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED. AN INFERRED	ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER.
BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO THE STANDARD PENETRATION TEST (AASHTO T 206, ASTM D1586). SOIL CLASSIFICATION	UNIFORMLY GRADED - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE.	ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60	AQUIFER - A WATER BEARING FORMATION OR STRATA.
IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING:	GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.	BLOWS IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK.	ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND.
CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE,	ANGULARITY OF GRAINS	ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:	ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING
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: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.	WEATHERED NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES >	A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, SUCH AS SHALE, SLATE, ETC.
SOIL LEGEND AND AASHTO CLASSIFICATION	MINERALOGICAL COMPOSITION	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	MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC.	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.
CLASS. (≤ 35% PASSING *200) (> 35% PASSING *200) (> 35% PASSING *200) (> 35% PASSING *200) GR01IP A-1 A-3 A-2 A-4 A-5 A-6 A-7 A-1, A-2 A-4, A-5	ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.	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-2-6 A-2-7 A-7a A-6, A-7	COMPRESSIBILITY	NON-CRYSTALLINE FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN	<u>COLLUVIUM</u> - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM
	SLIGHTLY COMPRESSIBLE LL < 31	ROCK (NCR)	OF SLOPE.
SYMBOL COCCOCCCCCCCCCCCCCCCCCCCCCCCCCCCCCCC	MODERATELY COMPRESSIBLE LL = 31 - 50 HIGHLY COMPRESSIBLE LL > 50	COASTAL PLAIN COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD	CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED
7. PASSING *10 50 MX GRANULAR SILT-	PERCENTAGE OF MATERIAL	(CP) SHELL BEDS, ETC.	BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.
10 50 MA CONTROL NO CLAY PROT	GRANULAR SILT - CLAY	WEATHERING	DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK.
•200 15 MX 25 MX 10 MX 35 MX 35 MX 35 MX 35 MX 35 MX 36 MN 36 MN 36 MN 36 MN	ORGANIC MATERIAL SOILS SOILS OTHER MATERIAL	FRESH ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER	DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE
MATERIAL	TRACE OF ORGANIC MATTER 2 3% 3 -5% TRACE 1 10% LITTLE ORGANIC MATTER 3 -5% 5 -12% LITTLE 10 -20%	HAMMER IF CRYSTALLINE.	HORIZONTAL.
PASSING *40 40 MX 41 MN 40 MX 41 MN 40 MX 41 MN 40 MX 41 MN 40 MX 41 MN 50 LS WITH	MODERATELY ORGANIC 5 - 10% 12 - 20% SOME 20 - 35%	VERY SLIGHT ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, (V SLI.) CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY, ROCK RINGS UNDER HAMMER BLOWS IF	DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE
PI 6 MX NP 10 MX 10 MX 11 MN 11 MN 10 MX 10 MX 11 MN 11 MN 11 MN 11 MN MODEPATE HIGHLY	HIGHLY ORGANIC > 10% > 20% HIGHLY 35% AND ABOVE	OF A CRYSTALLINE NATURE.	LINE OF DIP, MEASURED CLOCKWISE FROM NORTH.
GROUP INDEX Ø Ø Ø 4 MX 8 MX 12 MX 16 MX NO MX AMOUNTS OF ORGANIC	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.) I 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.
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	FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES.
	∇PW PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA	(MOD.) GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS	FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL.
GEN.RATING EXCELLENT TO GOOD FAIR TO POOR POOR UNSUITABLE		DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED	FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM.
PIOF A-7-5 SUBGROUP IS ≤ LL - 30 ;PIOF A-7-6 SUBGROUP IS > LL - 30	SPRING OR SEEP	WITH FRESH ROCK.	FORMATION (FM.) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE
CONSISTENCY OR DENSENESS	MISCELLANEOUS SYMBOLS	MODERATELY ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL SEVERE AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH	FIELD.
DEMARY COL TYPE COMPACTNESS OR RANGE OF STANDARD RANGE OF UNCONFINED		(MOD.SEV.) AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES 'CLUNK' SOUND WHEN STRUCK.	JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED.
PRIMARY SOIL TYPE CONFIDENCE COMPRESSIVE STRENGTH CONSISTENCY (N-VALUE) (TONS/FT ²)	ROADWAY EMBANKMENT (RE) 25/025 DIP & DIP DIRECTION WITH SOIL DESCRIPTION OF ROCK STRUCTURES	IF TESTED, WOULD YIELD SPT REFUSAL	LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO
VERY LOOSE < 4		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 LOOSE 4 TO 10	SOIL SYMBOL OF DAT TEST BORING SLUPE INDICATOR	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		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) DENSE 30 TO 50 VERY DENSE > 50		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		VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. <u>IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF</u>	RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK.
SILT-CLAY MEDIUM STIFF 4 TO 8 0.5 TO 1.0 MATERIAL STIFF 8 TO 15 1 TO 2	THE INFERRED ROCK LINE MONITORING WELL WITH CORE	COMPLETE ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. OUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS	ROCK QUALITY DESIGNATION (ROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF
(COHESIVE) VERY STIFF 15 TO 30 2 TO 4		ALSO AN EXAMPLE.	ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE.
HARD > 30 > 4		ROCK HARDNESS	SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT
TEXTURE OR GRAIN SIZE	RECOMMENDATION SYMBOLS	VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES	ROCK.
U.S. STD. SIEVE SIZE 4 10 40 60 200 270		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		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	SHALLOW UNCLASSIFIED EXCAVATION - USED IN THE TOP 3 FEEL OF ACCEPTABLE DEGRADABLE ROCK EMBANKMENT OR BACKFILL	TO DETACH HAND SPECIMEN.	
(BLDR.) (COB.) (GR.) SHIND SHIND (SL.) (CL.)	ABBREVIATIONS	MODERATELY CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE HARD EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED	<u>SLICKENSIDE</u> - 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	AR - AUGER REFUSAL MED MEDIUM VST - VANE SHEAR TEST	BY MODERATE BLOWS.	STANDARD PENETRATION TEST (PENETRATION RESISTANCE)(SPT) - NUMBER OF BLOWS (N OR BPF) OF
SIZE IN. 12 3	BT - BORING TERMINATED MICA MICACEOUS WEA WEATHERED	MEDIUM CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT.	A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL
SOIL MOISTURE - CORRELATION OF TERMS	CLCLAY MODMODERATELY γ -UNIT WEIGHT CPT - CONE PENETRATION TEST NP - NON PLASTIC $\gamma_{\rm A}$ - DRY UNIT WEIGHT	HARD CAN BE EXCAVATED IN SMALL CHIPS TO PEICES I INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.	WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS.
	CSE COARSE ORG ORGANIC	SOFT CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS	STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY
(ATTERBERG LIMITS) DESCRIPTION GUIDE FOR FIELD MOISTURE DESCRIPTION	DMT - DILATOMETER TEST PMT - PRESSUREMETER TEST <u>SAMPLE ABBREVIATIONS</u>	FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN	TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE.
- SATURATED - USUALLY LIQUID; VERY WET, USUALLY	DPT - DYNAMIC PENETRATION TEST SAP SAPROLITIC S - BULK e - VOID RATIO SD SAND, SANDY SS - SPLIT SPOON	PIECES CAN BE BROKEN BY FINGER PRESSURE.	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
(SAT.) FROM BELOW THE GROUND WATER TABLE	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 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.
	FOSS FOSSILIFEROUS SLI SLIGHTLY RS - ROCK FRAC FRACTURED, FRACTURES TCR - TRICONE REFUSAL RT - RECOMPACTED TRIAXIAL	FINGERNAIL.	TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.
RANGE - WET - (W) SEMISULIU: REQUIRES DRYING TO	FRAC FRACTURED, FRACTURES TCR - TRICONE REFUSAL RT - RECOMPACTED TRIAXIAL FRAGS FRAGMENTS w - MOISTURE CONTENT CBR - CALIFORNIA BEARING	FRACTURE SPACING BEDDING	BENCH MARK: GPS-2
	HI HIGHLY V - VERY RATIO	TERM SPACING TERM THICKNESS	
ON ODTIVING MOIST - (M) SOLID; AT OR NEAR OPTIMUM MOISTURE	EQUIPMENT USED ON SUBJECT PROJECT	VERY WIDE MORE THAN 10 FEET VERY THICKLY BEDDED 4 FEET	ELEVATION: 2150.33 FEET
OM + OPTIMUM MOISTURE	DRILL UNITS: ADVANCING TOOLS: HAMMER TYPE:	WIDE 3 TO 10 FEET THICKLY BEDDED 1.5 - 4 FEET MODERATELY CLOSE 1 TO 3 FEET THINLY BEDDED 0.16 - 1.5 FEET	
SL SHRINKAGE LIMIT	X CME-45C CLAY BITS X AUTOMATIC MANUAL	CLOSE 0.16 TO 1 FOOT VERY THINLY BEDDED 0.03 - 0.16 FEET	NOTES:
- DRY - (D) ATTAIN OPTIMUM MOISTURE	6' CONTINUOUS FLIGHT AUGER CORE SIZE:	VERY CLOSE LESS THAN 0.16 FEET THICKLY LAMINATED 0.008 - 0.03 FEET THINLY LAMINATED < 0.008 FEET	
	CME-55 8' HOLLOW AUGERS CORE SIZE: 8' HOLLOW AUGERS	INDURATION	
PLASTICITY		FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.	
PLASTICITY INDEX (PI) DRY STRENGTH NON PLASTIC Ø-5 VERY LOW		DUDDING WITH EINGED EDEES NUMEDOUS COATNO.	
SLIGHTLY PLASTIC 6-15 SLIGHT	VANE SHEAR TEST	FRIABLE GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.	
MODERATELY PLASTIC 16-25 MEDIUM	X CASING X W/ ADVANCER POST HOLE DIGGER	MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE;	
HIGHLY PLASTIC 26 OR MORE HIGH	PORTABLE HOIST	MODERATELY INDURATED BREAKS EASILY WHEN HIT WITH HAMMER.	
COLOR		INDURATED GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE;	
DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY).	CORE BIT VANE SHEAR TEST	DIFFICULT TO BREAK WITH HAMMER.	
MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.		EXTREMELY INDURATED SAMPLE BREAKS ACROSS GRAINS.	DATE: 8-15-14

PROJECT REFERENCE NO.

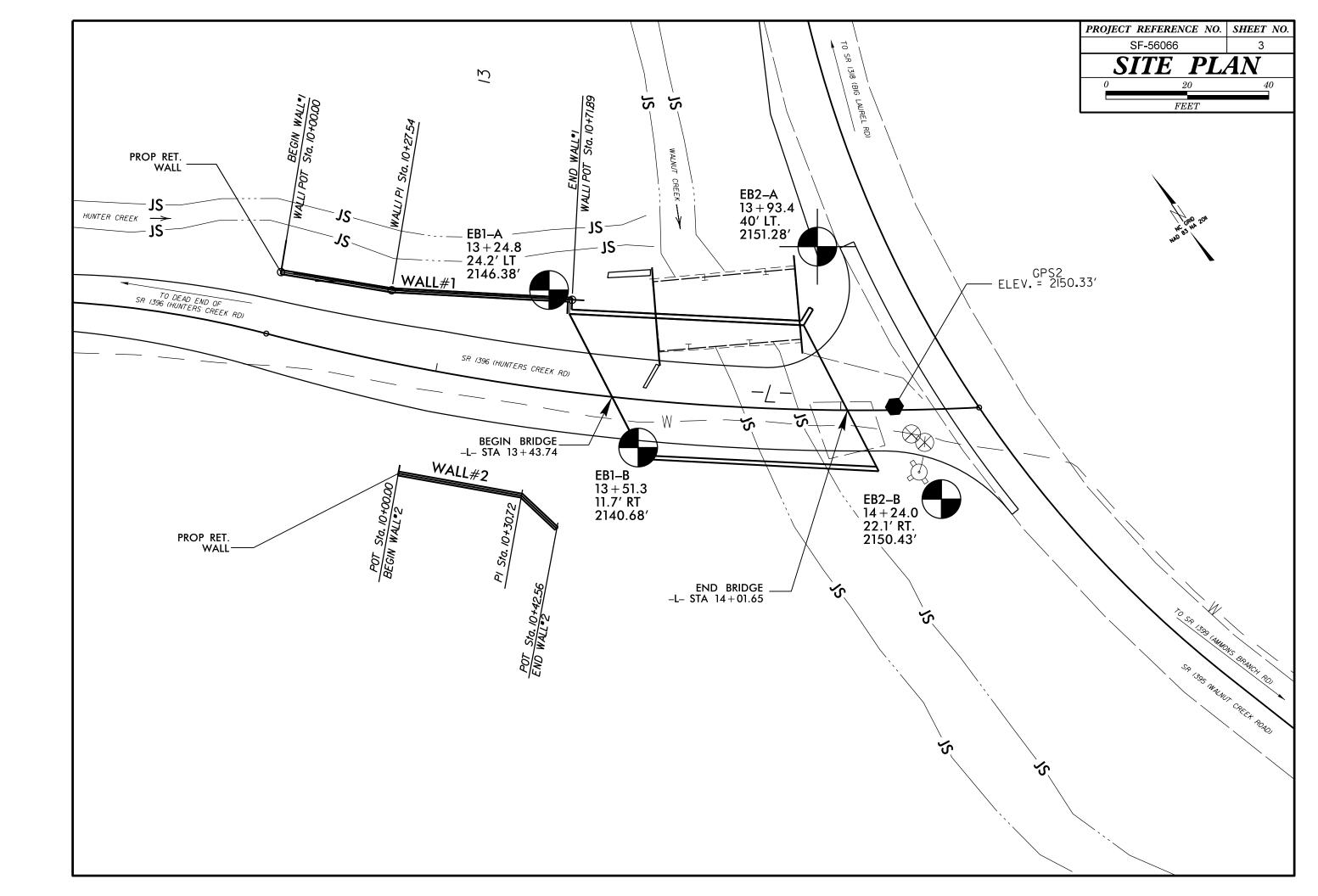
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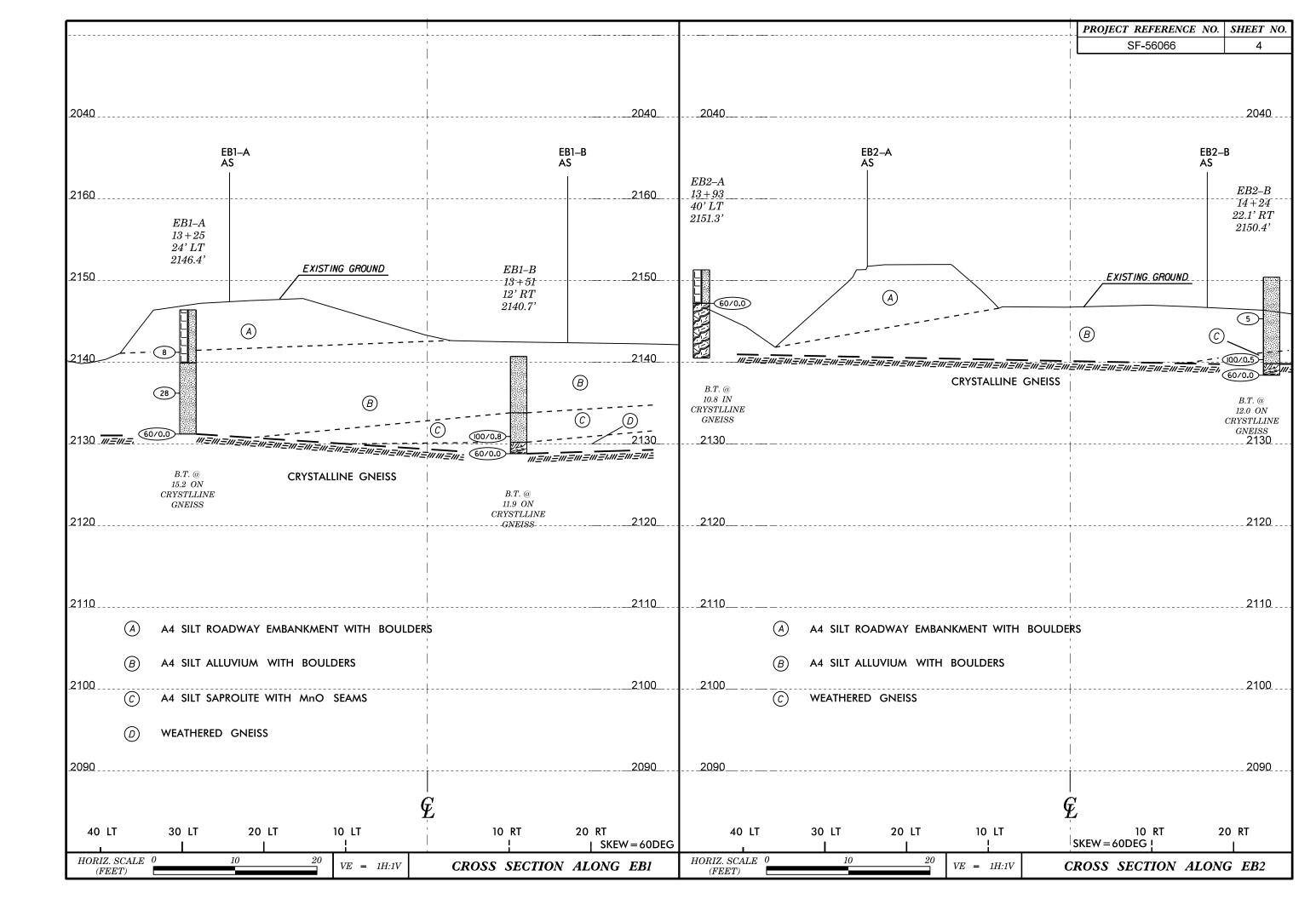
SUPPLEMENTAL LEGEND, GEOLOGICAL STRENGTH INDEX (GSI) TABLES FROM AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS

AASHTO LRFD Figure 10.4.6.4–1 — Determination of GSI for Jointed	Rock Mass (Marı	nos and Hoek, 2	2000)			AASHTO LRFD Figure 10.4.6.4-2 — Determination of GSI for Tectonica
GEOLOGICAL STRENGTH INDEX (GSI) FOR JOINTED ROCKS (Hoek and Marinos, 2000) From the lithology, structure and surface conditions of the discontinuities, estimate the average value of GSI. Do not try to be too precise. Quoting a range from 33 to 37 is more realistic than stating that GSI = 35. Note that the table does not apply to structurally controlled failures. Where weak planar structural planes are present in an unfavorable orientation with respect to the excavation face, these will dominate the rock mass behaviour. The shear strength of surfaces in rocks that are prone to deterioration as a result of changes in moisture content will be reduced if water is present. When working with rocks in the fair to very poor categories, a shift to the right may be made for wet conditions. Water pressure is dealt with by effective stress analysis.	Very roug	Surfaces Surfaces	HAL P FAIR A Smooth, moderately weathered and altered surfaces	 POOR Slickensided, highly weathered surfaces with compact coatings or fillings or angular fragments 	V VERY POOR Slickensided, highly weathered surfaces with soft clay coatings or fillings	GSI FOR HETEROGENEOUS ROCK MASSES SUCH AS FLYSCH (Marinos. P and Hoek E., 2000) From a description of the lithology, structure and surface conditions (particularly of the bedding planes), choose a box in the chart. Locate the position in the box that corresponds to the condition of the discontinuities and estimate the average value of GSI from the contours. Do not attempt to be too precise. Quoting a range from 33 to 37 is more realistic than giving GSI = 35. Note that the Hoek-Brown criterion does not apply to structurally controlled failures. Where unfavourably oriented continuous weak planar discontinuities are present, these will dominate the behaviour of the rock mass. The strength of some rock masses is reduced by the presence of groundwater and this can be allowed for by a slight shift to the right in the columns for fair, poor and very poor conditions. Water pressure does not change the value of GSI and it is dealt with by using effective stress analysis.
INTACT OR MASSIVE - intact rock specimens or massive in situ rock with few widely spaced discontinuities	90			, N/A	N/A	A. Thick bedded, very blocky sandstone The effect of pelitic coatings on the bedding planes is minimized by the confinement of the rock mass. In shallow tunnels or slopes these bedding planes may cause structurally controlled instability.
disturbed rock mass consisting of cubical blocks formed by three intersecting discontinuity sets		70 60	50			B. Sand- stone with thin inter- layers of siltstone amounts B. Sand- stone and siltstone in similar amounts b. Siltstone or silty shale with sand- stone layers and stone and stone and stone and stone and stone and stone and stone and siltstone amounts
VERY BLOCKY - interlocked, partially disturbed mass with multi-faceted angular blocks formed by 4 or more joint sets BLOCKY/DISTURBED/SEAMY - folded with angular blocks formed by many intersecting discontinuity sets. Persistence of bedding planes or schistosity			40	30		C. D. E. and G - may be more or less folded than illustrated but this does not change the strength. Tectonic deformation, faulting and loss of continuity moves these categories to F and H.
DISINTEGRATED - poorly inter- locked, heavily broken rock mass with mixture of angular and rounded rock pieces				20		G. Undisturbed silty or clayey shale with or without a few very thin sandstone layers
LAMINATED/SHEARED - Lack of blockiness due to close spacing of weak schistosity or shear planes	N/A	N/A			10	Mans deformation after tectonic disturbance



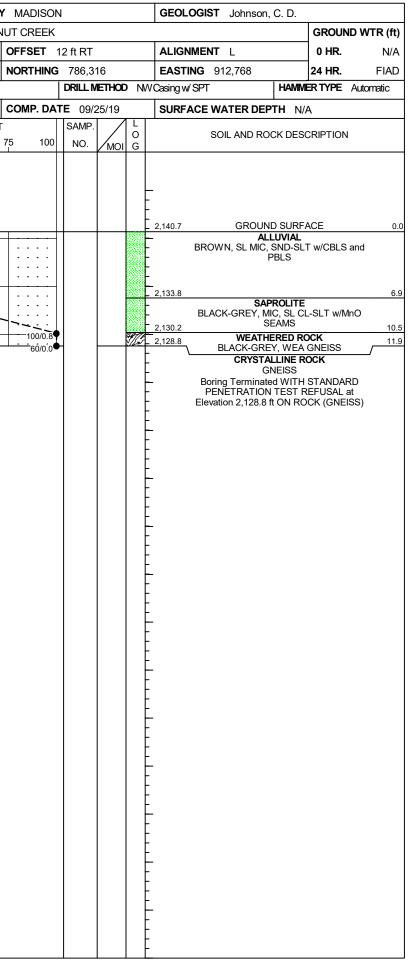
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BOR	ing no	. EB2-	A		s	TATIO	N 13	8+93			OFF	SET 4	0 ft LT			ALIG	NMENT L		0 HR.	N/A	во	ring no	. EB2	-A		STA	TION	13+93			
COL	LAR EL	EV. 2,	151.3	ft	Т	OTAL I	DEPT	H 10).8 ft		NOR	THING	786,3	333		EAS	FING 912,83	32	24 HR.	Dry		LLAR EL						PTH 10			
DRILL	RIG/HA	VIMER EF	-F./DAT	E AF	06744 (CME - 45	5C 92%	507/31/2	2017				DRILL	VIETHO	D N	NCasing	W/SPT & Core	HAMIN	NER TYPE A	Automatic	DRI	ll Rig/Ha	MIMER E	FF./DAT	TE AFO	744 CME	-45C9	92%07/31/	2017		
DRIL	LER (S	TART I	DATE	09/2	24/19		CON	IP. DA	FE 09/	24/19		SUR	ACE WATE	R DEPTH N	/A		DR	LLER (Cheek, I	D. O.		STA	RT DA	TE 09/2	24/19		
ELEV	DRIVE FL FV		BLC	bw cc	-			BLO\		R FOO	Т		SAMP	. V /	L		SOIL AI	ND ROCK DES	CRIPTION		со	RE SIZE	NXWI					N 6.7 ft			
(ft)	(ft)	(ft)	0.5ft	0.5ft	0.5ft	0	2	25	50		75	100	NO.	Имо	G	ELEV.				DEPTH (ft)	ELE		DEPTI		DRILL RATE	REC.	UN RQD (ft) %	SAMP.	REC.	RATA RQD]
																					(ft)	(ft)	(ft)	(ft)	(Min/ft) (ft) %	(ft) %	NO.	(ft) %	(ft) %	
2155		Ļ														_					<u>2147.</u>	18	- 41	17	N/A/0	7 (1.6)	(0.4)			<u> </u>	•
		‡														-					214	2,147.2 5 2,145.5	5 <u>- 5.8</u>	1.7 5.0	N=60/0 N/A/0.	94%	24%				
2150		<u>†</u>				<u> </u>		1	• •		-				1 199	- 2,151.3 -		ROUND SURF		0.0			‡	0.0	N/A/0. N=60/0 N/A/0. N/A/1. 2:41/1. 1:43/1. 1:46/1. 1:52/1.)/ (4.4)) 88%	(2.2)				
.150		‡						<u>i: :</u>								-		/N, SND-SLT,				2.140.5	+ 5+ 10.8		1:43/1.	2					
	2,147.2	4.1	60/0.0					<u> .</u> . 		· · ·		 60/0.0				2,147.2	C	RYSTALLINE R		4.1			1		1:50/1.	۵́/		1			
2145		‡	00/0.0													-	PINK-G	REY GRANIT	C GNEISS				1								
		‡						 		· · ·						-		GSI = 55-60					1								
		‡						· · · ·		: : :						- - 2,140.5				10.8			‡								
	-	+						•			•	•	1			-		nated at Elevat ROCK (GNEIS		ft IN			±								
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GEOTECHNICAL BORING REPORT

	CORE LOG	GEOLOGIST Johns			
	NUT CREEK		ын, о. <i>D</i> .	GPOLINI	D WTR (ft)
				1	
	OFFSET 40 ft LT			0 HR.	N/A
	NORTHING 786,333	EASTING 912,832		24 HR.	Dry
	DRILL METHOD	NW Casing W/SPT & Core		ERTYPE	Automatic
	COMP. DATE 09/24/19	SURFACE WATER D	DEPTH N//	4	
		DESCRIPTION AND REM	ARKS		
(ft) %	G ELEV. (ft)				DEPTH (f
_	2 147 2	Begin Coring @ 4.1 CRYSTALLINE ROC	ft		
	2,147.2	CRISIALLINE ROC	n		4.1
		GSI = 55-60			
	2,140.5 Boring Tel	rminated at Elevation 2,140.51	ft IN ROCK (GNEISS)	10.8
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WBS 1	17BP.13.R.17	71		ТІ	P SF-560066	COUNT	Y MADISON				GEOLOGIST Johnson, C. D.		
SITE DE	SCRIPTION	REPL	ACE	BRDG	#66 ON SR-1396 O		NUT CREEK					GROUND WT	R (ft)
BORING	5 NO . EB2-E	3		ST	TATION 14+24		OFFSET 2	2 ft RT			ALIGNMENT L	0 HR.	N/A
COLLA	R ELEV. 2, ²	150.4 ft		тс	OTAL DEPTH 12.0	ft	NORTHING	786,26	64		EASTING 912,822	24 HR.	10.7
DRILL RIC	G/HAMMER EF	F./DATE	AFO	6744 C	ME - 45C 92% 07/31/201	7		DRILL N	IETHOD	D NW	Casing w/SPT HAMM	ER TYPE Autom	natic
DRII I F	R Cheek, D	0		ST	TART DATE 09/24/	19	COMP. DAT	F 09/2	24/19		SURFACE WATER DEPTH N/	Δ	
	RIVE ELEV (ft)	BLO	W COU 0.5ft	JNT		PER FOOT 50	L	SAMP. NO.	MOI	L O G	SOIL AND ROCK DES		
2 155 2150											2,150.4 GROUND SURFA	ACE	0.
	Ŧ				! <u></u>		BOULDER			F	- ALLUVIAL BROWN, SL MIC, SND-SL	.T, w/PEBLS,	
<u>2145</u> 2,	145.3 <u>5.1</u>	WOH	2	3	●5.~ · · · · · · · · · · · · · · · · · ·				м		GRVLS, SL C	_	
2140 2.	140.3 10.1	100/0.5								F	2,139.8		10
2.		60/0.0					 60/0.0				2,138.4 WEATHERED RC BROWN-BLACK, MIC, W CRYSTALLINE R BROWN-BLACK G Boring Terminated WITH PENETRATION TEST R Elevation 2,138.4 ft ON RC	EA GNEISS / DCK NEISS STANDARD EFUSAL at	12

SHEET 7

CORE PHOTOGRAPHS

EB2-A

BOX 1 OF 1: 4.1 - 10.8 FEET GSI 55 - 60





SHEET 8 SF-560066 (17.BP.13.R.171) / MADISON BRIDGE NO. 066