

REFERENCE: B-4863

PROJECT: 40212

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

STRUCTURE
SUBSURFACE INVESTIGATION

COUNTY CARTERET
PROJECT DESCRIPTION BRIDGE NO. 73 OVER THE STRAITS AT HARKERS ISLAND ON SR 1535

CONTENTS

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STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B-4863	1	40

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 (919) 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 INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS MAY VARY CONSIDERABLY WITH TIME ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

THE BIDDER OR CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE PLANS ARE PRELIMINARY ONLY AND IN MANY CASES THE FINAL DESIGN DETAILS ARE DIFFERENT. FOR BIDDING AND CONSTRUCTION PURPOSES, REFER TO THE CONSTRUCTION PLANS AND DOCUMENTS FOR FINAL DESIGN INFORMATION ON THIS PROJECT. THE DEPARTMENT DOES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOR THE INTERPRETATIONS MADE, OR OPINION OF THE DEPARTMENT AS TO THE TYPE OF MATERIALS AND CONDITIONS TO BE ENCOUNTERED. THE BIDDER OR CONTRACTOR IS CAUTIONED TO MAKE SUCH INDEPENDENT SUBSURFACE INVESTIGATIONS AS HE DEEMS NECESSARY TO SATISFY HIMSELF AS TO CONDITIONS TO BE ENCOUNTERED ON THE PROJECT. THE CONTRACTOR SHALL HAVE NO CLAIM FOR ADDITIONAL COMPENSATION OR FOR AN EXTENSION OF TIME FOR ANY REASON RESULTING FROM THE ACTUAL CONDITIONS ENCOUNTERED AT THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

- NOTES:
- 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.

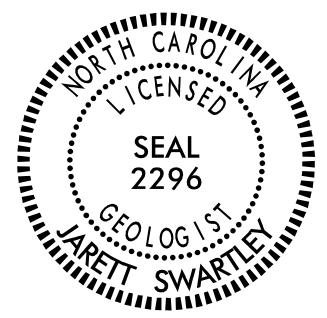
PERSONNEL

- J.R. SWARTLEY
- G.H. GOSLIN
- T.J. HILL
- T.J. WHITE
- S.D. PUGH
- M.R. NORWOOD
- T.D. NUSS

INVESTIGATED BY J.R. SWARTLEY
 DRAWN BY J.R. SWARTLEY
 CHECKED BY S.S. LANEY
 SUBMITTED BY S.S. LANEY
 DATE MAY 2018



3201 SPRING FOREST ROAD
RALEIGH, NC 27616
(919) 872-2660



DocuSigned by:
Stewart S. Laney, PE 6/2020
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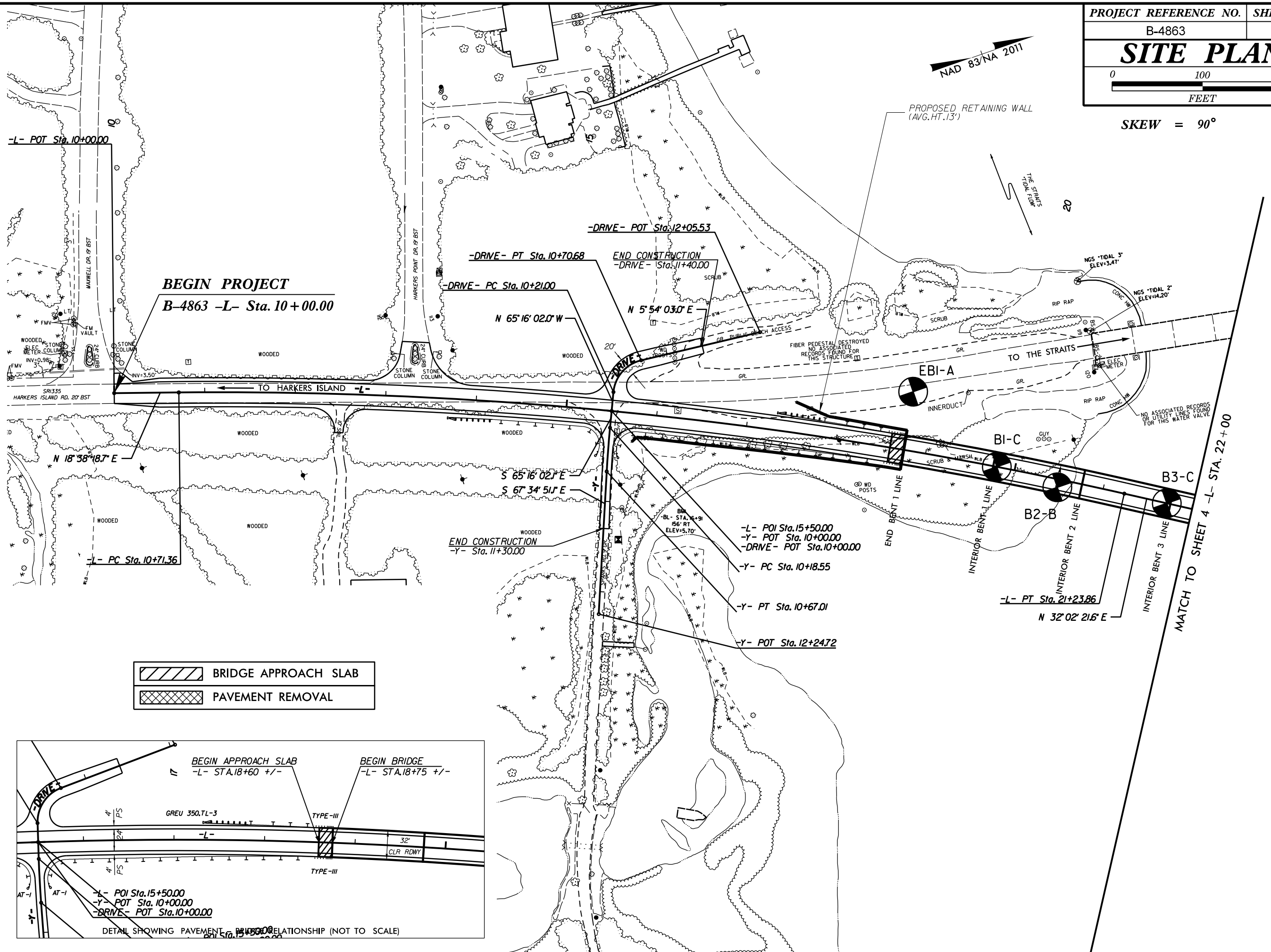
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UNLESS ALL SIGNATURES COMPLETED

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
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SUBSURFACE INVESTIGATION
SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

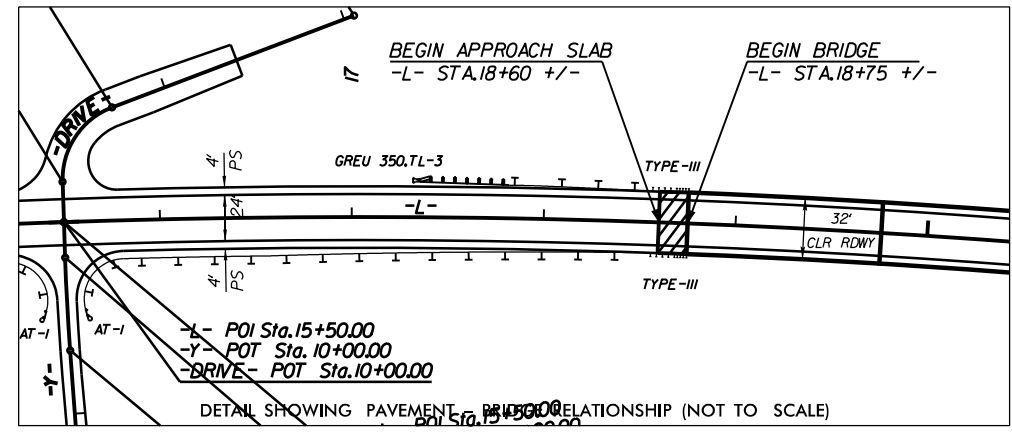
SOIL DESCRIPTION										GRADATION										ROCK DESCRIPTION										TERMS AND DEFINITIONS																																																																								
<p>SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO THE STANDARD PENETRATION TEST (AASHTO T 208, ASTM D1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE, <i>VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6</i></p>										<p>WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE. 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.</p>										<p>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. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS IN NON-COASTAL PLAIN MATERIAL. THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:</p>										<p>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. ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE. CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE. COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE. CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK. DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL. DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH. FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE. FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLOADED FROM PARENT MATERIAL. FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM. FORMATION (FM) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD. JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED. LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT. LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS. MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE. PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM. RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. ROCK QUALITY DESIGNATION (RQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK. SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS. SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE. STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (IN OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. STRATA ROCK QUALITY DESIGNATION (SROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.</p>																																																																								
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<p>MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.</p>										<p>SLIGHTLY COMPRESSIBLE LL < 31 MODERATELY COMPRESSIBLE LL = 31 - 50 HIGHLY COMPRESSIBLE LL > 50</p>										<p>FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.</p>										<p>COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.</p>																																																																								
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ROCK RINGS UNDER HAMMER IF CRYSTALLINE. VERY SLIGHT (IV SLI) ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN. CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE. SLIGHT (SLI) ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS. MODERATE (MOD.) SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK. MODERATELY SEVERE (MOD. SEV.) ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. <i>IF TESTED, WOULD YIELD SPT REFUSAL</i> SEVERE (SEV.) ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. <i>IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF</i> VERY SEVERE (IV SEV.) ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. <i>IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF</i> COMPLETE ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. 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<p>DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.</p>										<p>UNDERCUT SHALLOW UNDERCUT UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK UNCLASSIFIED EXCAVATION - ACCEPTABLE, BUT NOT TO BE USED IN THE TOP 3 FEET OF EMBANKMENT OR BACKFILL</p>										<p>AR - AUGER REFUSAL BT - BORING TERMINATED CL - CLAY CPT - CONE PENETRATION TEST CSE - COARSE DMT - DILATOMETER TEST DPT - DYNAMIC PENETRATION TEST e - VOID RATIO F - FINE FOSS. - FOSSILIFEROUS FRAC. - FRACTURED, FRACTURES FRAGS. - FRAGMENTS HI. - HIGHLY MED. - MEDIUM MICA - MICACEOUS MOD. - MODERATELY NP - NON PLASTIC ORG. - ORGANIC PMT - PRESSUREMETER TEST SAP. - SAPROLITIC SD. - SAND, SANDY SL. - SILT, SILTY SLI. - SLIGHTLY TCR - TRICONE REFUSAL w - MOISTURE CONTENT V - VERY VST - VANE SHEAR TEST WEA. - WEATHERED UNIT WEIGHT DRY UNIT WEIGHT SAMPLE ABBREVIATIONS S - BULK SS - SPLIT SPOON ST - SHELBY TUBE RS - ROCK RT - RECOMPACTED TRIAXIAL CBR - CALIFORNIA BEARING RATIO</p>										<p>VERY HARD CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK. HARD CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN. MODERATELY HARD CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS. MEDIUM HARD CAN BE GROUDED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PIECES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK. SOFT CAN BE GROUDED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE. VERY SOFT CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGER NAIL.</p>																																																																								
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SKEW = 90°

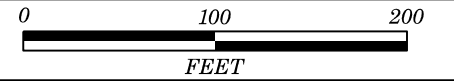
NAD 83/NA 2011



	BRIDGE APPROACH SLAB
	PAVEMENT REMOVAL



SITE PLAN



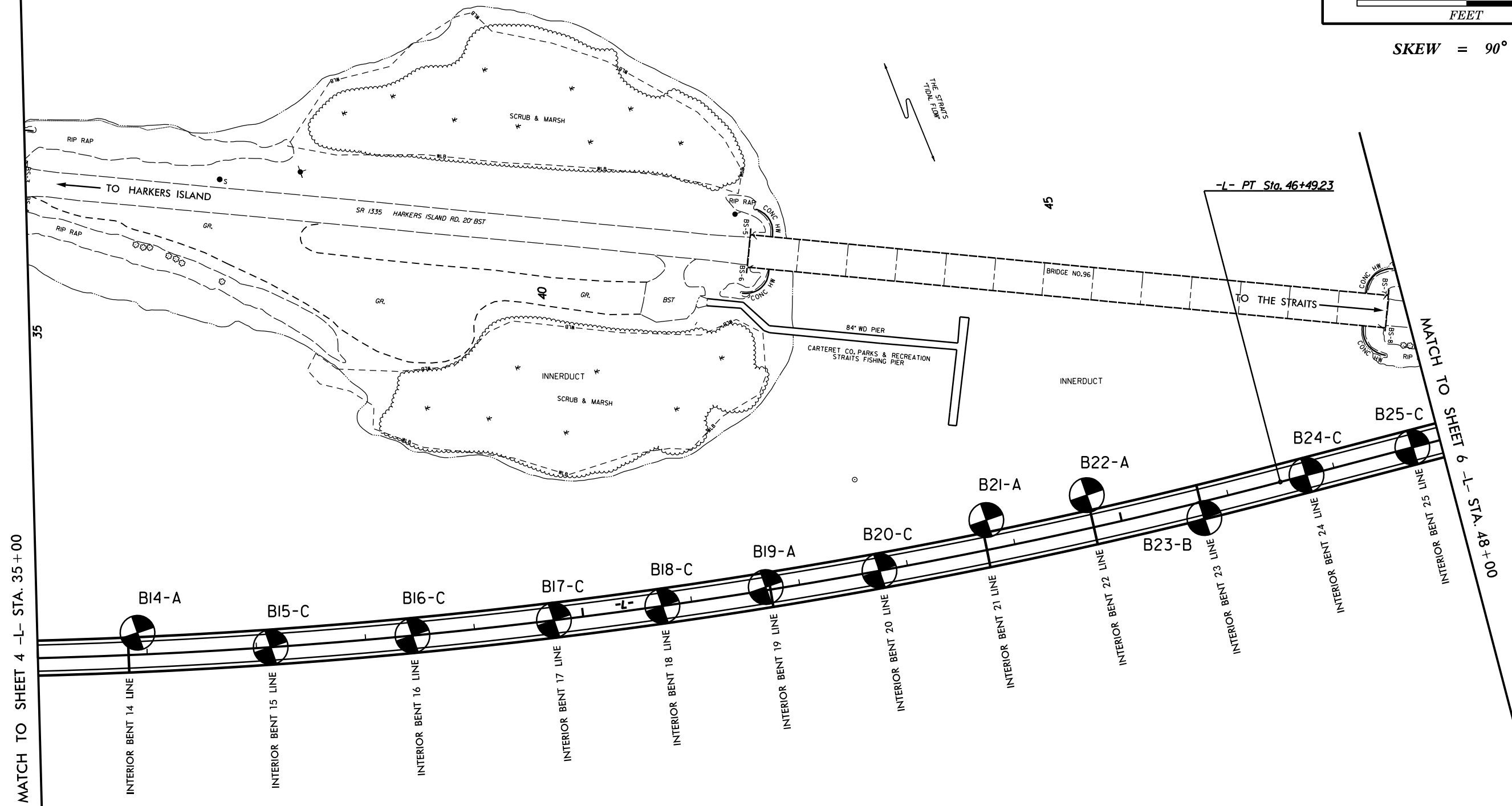
SKEW = 90°
 B7 SKEW = 61°11'11"
 B8 SKEW = 62°39'05"



PROJECT REFERENCE NO.	SHEET NO.
B-4863	5
SITE PLAN	
 0 100 200 FEET	

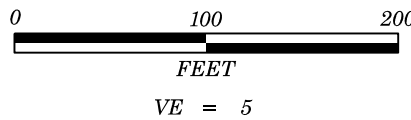
NAD 83/NA 2011

SKEW = 90°



5/14/99

-L-

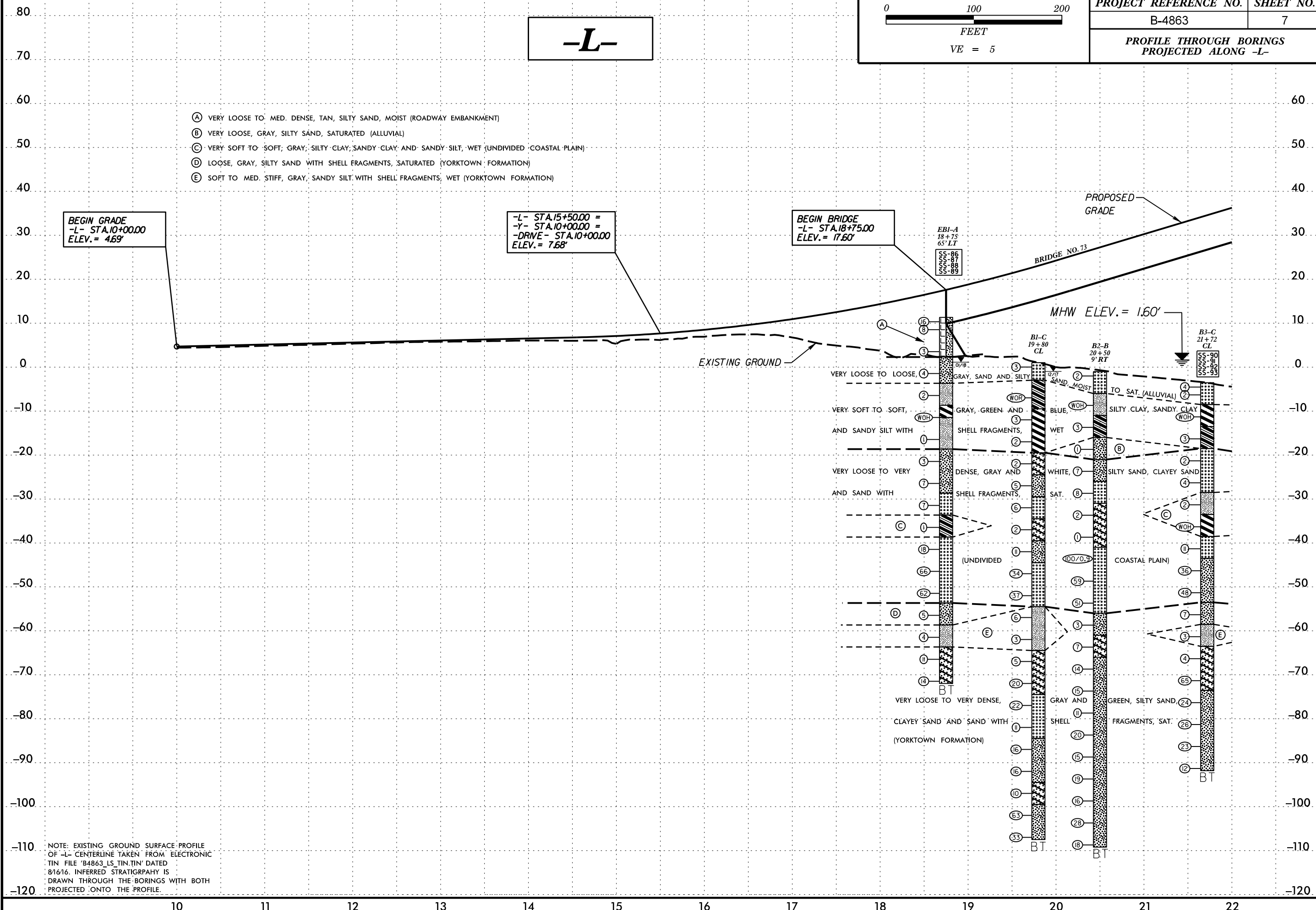


PROJECT REFERENCE NO. SHEET NO.

B-4863

7

PROFILE THROUGH BORINGS
PROJECTED ALONG -L-

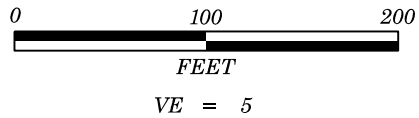


NOTE: EXISTING GROUND SURFACE PROFILE OF -L- CENTERLINE TAKEN FROM ELECTRONIC TIN FILE 'B4863_LS_TIN.TIN' DATED 8/16/16. INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE PROFILE.

SYSTEMS
EDN

5/14/99

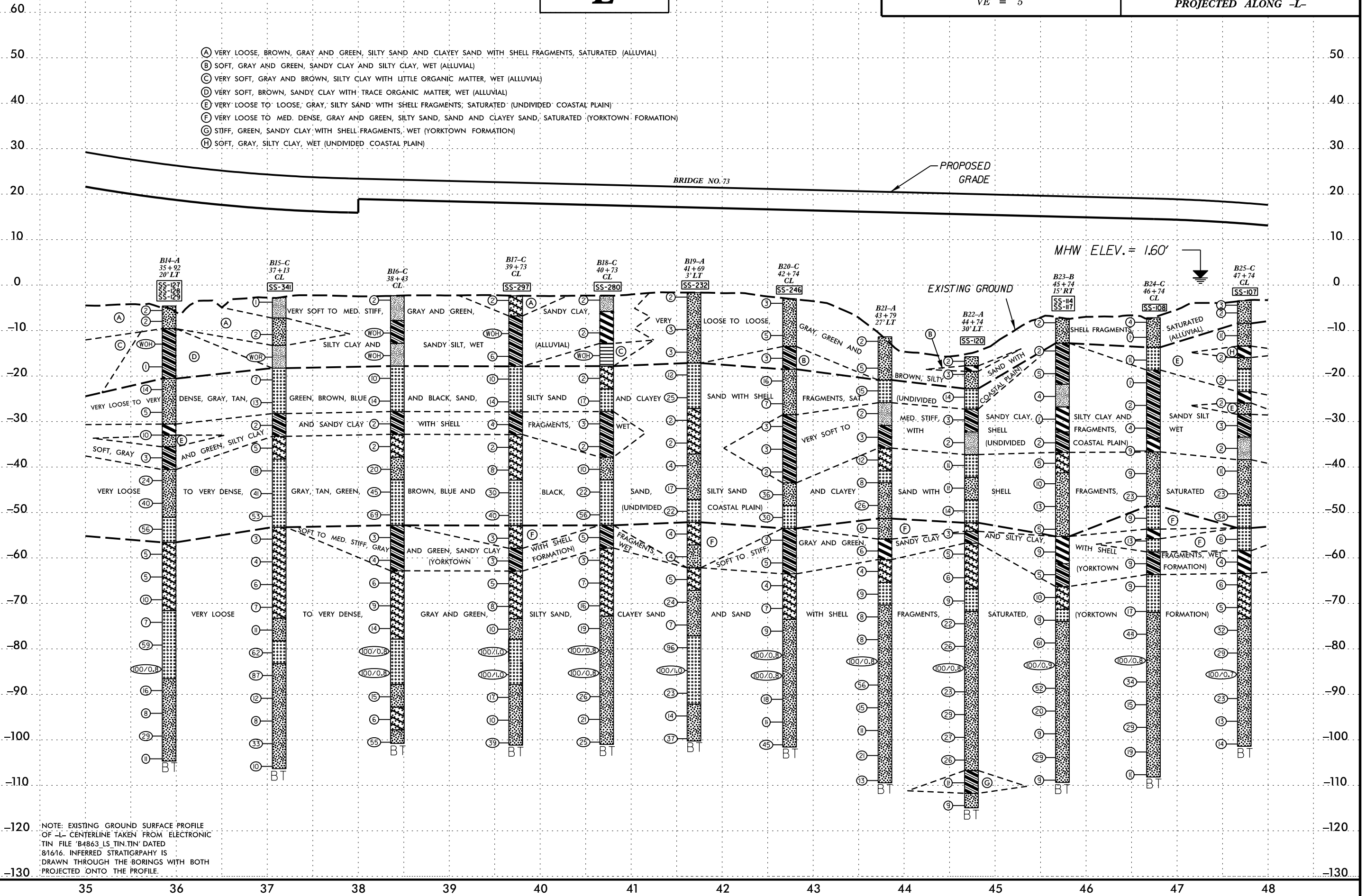
-L-



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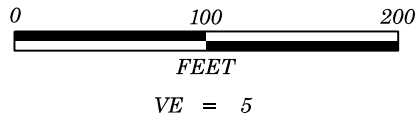
B-4863 9

PROFILE THROUGH BORINGS
PROJECTED ALONG -L-



5/14/99

-L-

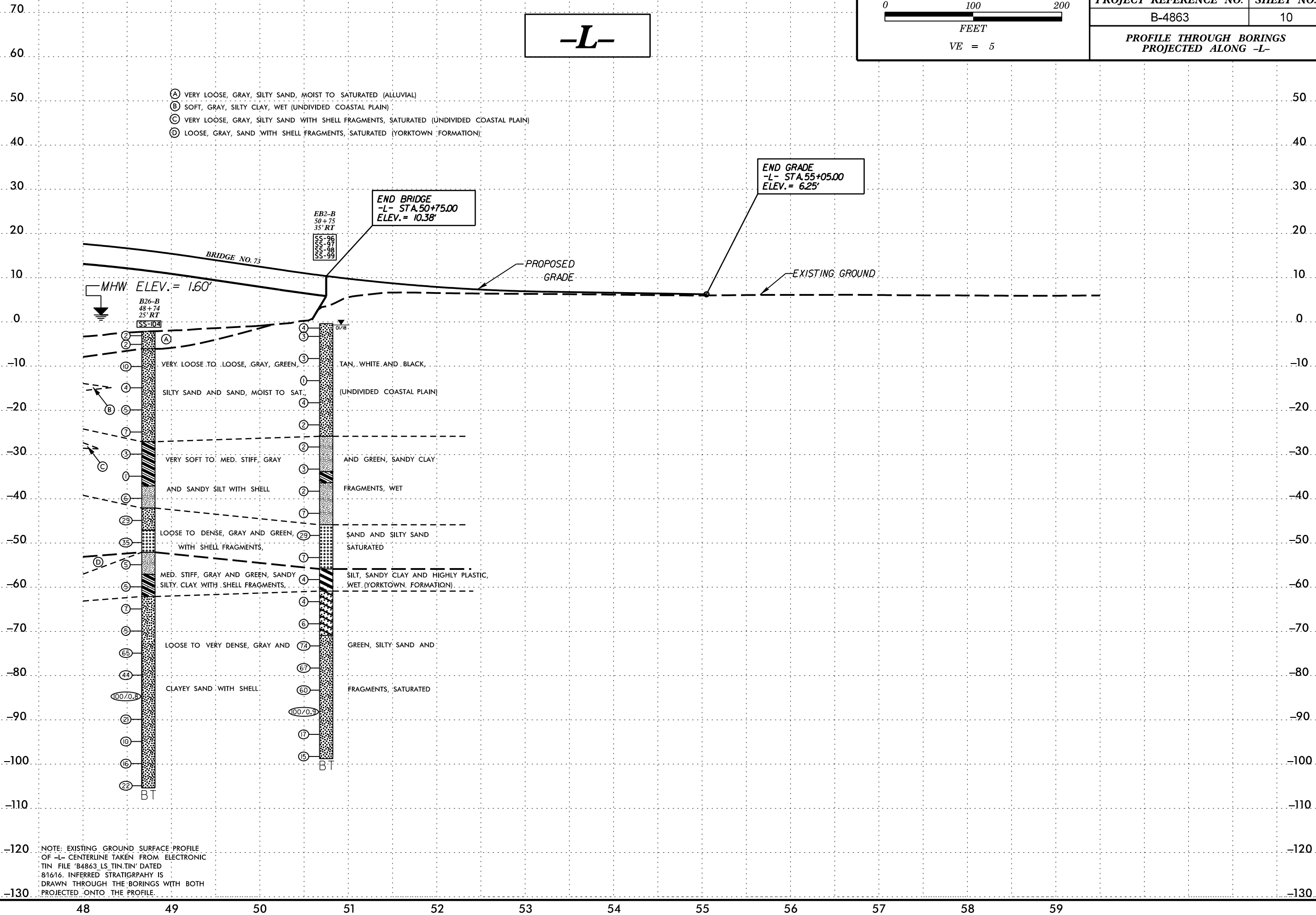


PROJECT REFERENCE NO. SHEET NO.

B-4863

10

PROFILE THROUGH BORINGS
PROJECTED ALONG -L-



SYSTEMS TIME \$\$\$\$\$\$

GEOTECHNICAL BORING REPORT

BORE LOG

WBS 40212.1.3		TIP B-4863		COUNTY CARTERET		GEOLOGIST Hill, T.J.								
SITE DESCRIPTION BRIDGE NO. 73 OVER THE STRAITS AT HARKERS ISLAND ON SR 1535 (-L-)							GROUND WTR (ft)							
BORING NO. B1-C		STATION 19+80		OFFSET CL		ALIGNMENT -L-								
COLLAR ELEV. 1.0 ft		TOTAL DEPTH 108.5 ft		NORTHING 359,723		EASTING 2,727,754								
DRILL RIG/HAMMER EFF./DATE SME1524 CME-45B 85% 05/02/2017			DRILL METHOD Mud Rotary			HAMMER TYPE Automatic								
DRILLER White, T.J.		START DATE 12/18/17		COMP. DATE 12/19/17		SURFACE WATER DEPTH N/A								
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				
5														
0	1.0	0.0		WOH	1	2								GROUND SURFACE
-5	-6.0	7.0		WOR	WOR	WOR								ALLUVIAL GRAY SAND
-10	-11.0	12.0			1	1	2							GRAY, SANDY CLAY AND SILTY CLAY
-15	-16.0	17.0			1	1	1							
-20	-21.0	22.0			1	1	1							UNDIVIDED COASTAL PLAIN GRAY, CLAYEY SAND
-25	-26.0	27.0			2	2	3							GRAY, SILTY SAND AND SAND WITH SHELL FRAGMENTS
-30	-31.0	32.0			3	2	4							
-35	-36.0	37.0		WOH	1	1								GRAY, CLAYEY SAND WITH SHELL FRAGMENTS
-40	-41.0	42.0			4	5	6							GRAY, SILTY SAND AND SAND WITH SHELL FRAGMENTS
-45	-46.0	47.0			8	16	18							
-50	-51.0	52.0			12	20	17							
-55	-56.0	57.0			6	3	3							COASTAL PLAIN GRAY, SANDY SILT WITH SHELL FRAGMENTS (YORKTOWN FORMATION)
-60	-61.0	62.0			1	1	2							
-65	-66.0	67.0			3	2	3							GRAY, CLAYEY SAND WITH SHELL FRAGMENTS
-70	-71.0	72.0			3	9	11							
-75														Boring Terminated at Elevation -107.5 ft IN DENSE SAND (COASTAL PLAIN)

WBS 40212.1.3		TIP B-4863		COUNTY CARTERET		GEOLOGIST Hill, T.J.								
SITE DESCRIPTION BRIDGE NO. 73 OVER THE STRAITS AT HARKERS ISLAND ON SR 1535 (-L-)							GROUND WTR (ft)							
BORING NO. B1-C		STATION 19+80		OFFSET CL		ALIGNMENT -L-								
COLLAR ELEV. 1.0 ft		TOTAL DEPTH 108.5 ft		NORTHING 359,723		EASTING 2,727,754								
DRILL RIG/HAMMER EFF./DATE SME1524 CME-45B 85% 05/02/2017			DRILL METHOD Mud Rotary			HAMMER TYPE Automatic								
DRILLER White, T.J.		START DATE 12/18/17		COMP. DATE 12/19/17		SURFACE WATER DEPTH N/A								
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100				
-75														
-80	-76.0	77.0		6	8	14								Match Line
-85	-81.0	82.0		6	5	6								GRAY, SAND AND SILTY SAND WITH SHELL FRAGMENTS (continued)
-90	-86.0	87.0		7	8	8								
-95	-91.0	92.0		3	6	10								
-100	-96.0	97.0		4	5	5								GRAY, CLAYEY SAND WITH SHELL FRAGMENTS
-105	-101.0	102.0		23	35	28								GRAY, SILTY SAND
-107.5	-106.0	107.0		9	12	21								Boring Terminated at Elevation -107.5 ft IN DENSE SAND (COASTAL PLAIN)

NCDOT BORE DOUBLE B4863_GEO_BRDG0073.GPJ NC_DOT_GDT 5/14/18

GEOTECHNICAL BORING REPORT

BORE LOG

WBS 40212.1.3		TIP B-4863		COUNTY CARTERET		GEOLOGIST Swartley, J. R.									
SITE DESCRIPTION BRIDGE NO. 73 OVER THE STRAITS AT HARKERS ISLAND ON SR 1535 (-L-)							GROUND WTR (ft)								
BORING NO. B3-C		STATION 21+72		OFFSET CL		ALIGNMENT -L-									
COLLAR ELEV. -3.5 ft		TOTAL DEPTH 88.3 ft		NORTHING 359,887		EASTING 2,727,854									
DRILL RIG/HAMMER EFF./DATE SME1524 CME-45B 85% 05/02/2017				DRILL METHOD Mud Rotary		HAMMER TYPE Automatic									
DRILLER White, T.J.		START DATE 01/09/18		COMP. DATE 01/09/18		SURFACE WATER DEPTH 1.0ft									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
0															
-3.5	0.0														
-5	-5.3	1.8	WOH	2	2										
-10	-10.3	6.8													
-15	-15.3	11.8	WOR	1	2										
-20	-20.3	16.8													
-25	-25.3	21.8	WOH	1	1										
-30	-30.3	26.8													
-35	-35.3	31.8	WOR	1	1										
-40	-40.3	36.8													
-45	-45.3	41.8													
-50	-50.3	46.8													
-55	-55.3	51.8													
-60	-60.3	56.8													
-65	-65.3	61.8													
-70	-70.3	66.8													
-75	-75.3	71.8													
-80															

WBS 40212.1.3		TIP B-4863		COUNTY CARTERET		GEOLOGIST Swartley, J. R.									
SITE DESCRIPTION BRIDGE NO. 73 OVER THE STRAITS AT HARKERS ISLAND ON SR 1535 (-L-)							GROUND WTR (ft)								
BORING NO. B3-C		STATION 21+72		OFFSET CL		ALIGNMENT -L-									
COLLAR ELEV. -3.5 ft		TOTAL DEPTH 88.3 ft		NORTHING 359,887		EASTING 2,727,854									
DRILL RIG/HAMMER EFF./DATE SME1524 CME-45B 85% 05/02/2017				DRILL METHOD Mud Rotary		HAMMER TYPE Automatic									
DRILLER White, T.J.		START DATE 01/09/18		COMP. DATE 01/09/18		SURFACE WATER DEPTH 1.0ft									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
-80	-80.3	76.8													
-85	-85.3	81.8													
-90	-90.3	86.8													

NCDOT BORE DOUBLE B4863_GEO_BRDG0073.GPJ_NC_DOT.GDT 5/14/18

GEOTECHNICAL BORING REPORT

BORE LOG

WBS 40212.1.3		TIP B-4863		COUNTY CARTERET		GEOLOGIST Swartley, J. R.	
SITE DESCRIPTION BRIDGE NO. 73 OVER THE STRAITS AT HARKERS ISLAND ON SR 1535 (-L-)							GROUND WTR (ft)
BORING NO. B7-B		STATION 26+34		OFFSET 17 ft RT		ALIGNMENT -L-	
COLLAR ELEV. -12.9 ft		TOTAL DEPTH 111.1 ft		NORTHING 360,279		EASTING 2,728,101	
DRILL RIG/HAMMER EFF./DATE SME2204 CME-45C 90% 07/31/2017				DRILL METHOD Mud Rotary		HAMMER TYPE Automatic	
DRILLER Norwood, M.R.		START DATE 03/28/18		COMP. DATE 03/28/18		SURFACE WATER DEPTH 12.5ft	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
0															
-5															
-10															
-12.9	-12.9	0.0													
-15			WOH	1	0										
-17.8		4.9	WOH	2	1										
-20			WOH	2	1										
-22.8		9.9		1	2	1									
-27.8		14.9		1	1	1									
-32.8		19.9	WOH	2	2										
-37.8		24.9		1	1	1									
-42.8		29.9		7	13	24									
-47.8		34.9		6	15	23									
-53.0		40.1		11	14	6									
-58.0		45.1		1	2	3									
-63.0		50.1		3	3	3									
-68.0		55.1		4	5	7									
-73.0		60.1		4	4	5									
-78.0		65.1		11	13	16									
-80															

WBS 40212.1.3		TIP B-4863		COUNTY CARTERET		GEOLOGIST Swartley, J. R.	
SITE DESCRIPTION BRIDGE NO. 73 OVER THE STRAITS AT HARKERS ISLAND ON SR 1535 (-L-)							GROUND WTR (ft)
BORING NO. B7-B		STATION 26+34		OFFSET 17 ft RT		ALIGNMENT -L-	
COLLAR ELEV. -12.9 ft		TOTAL DEPTH 111.1 ft		NORTHING 360,279		EASTING 2,728,101	
DRILL RIG/HAMMER EFF./DATE SME2204 CME-45C 90% 07/31/2017				DRILL METHOD Mud Rotary		HAMMER TYPE Automatic	
DRILLER Norwood, M.R.		START DATE 03/28/18		COMP. DATE 03/28/18		SURFACE WATER DEPTH 12.5ft	

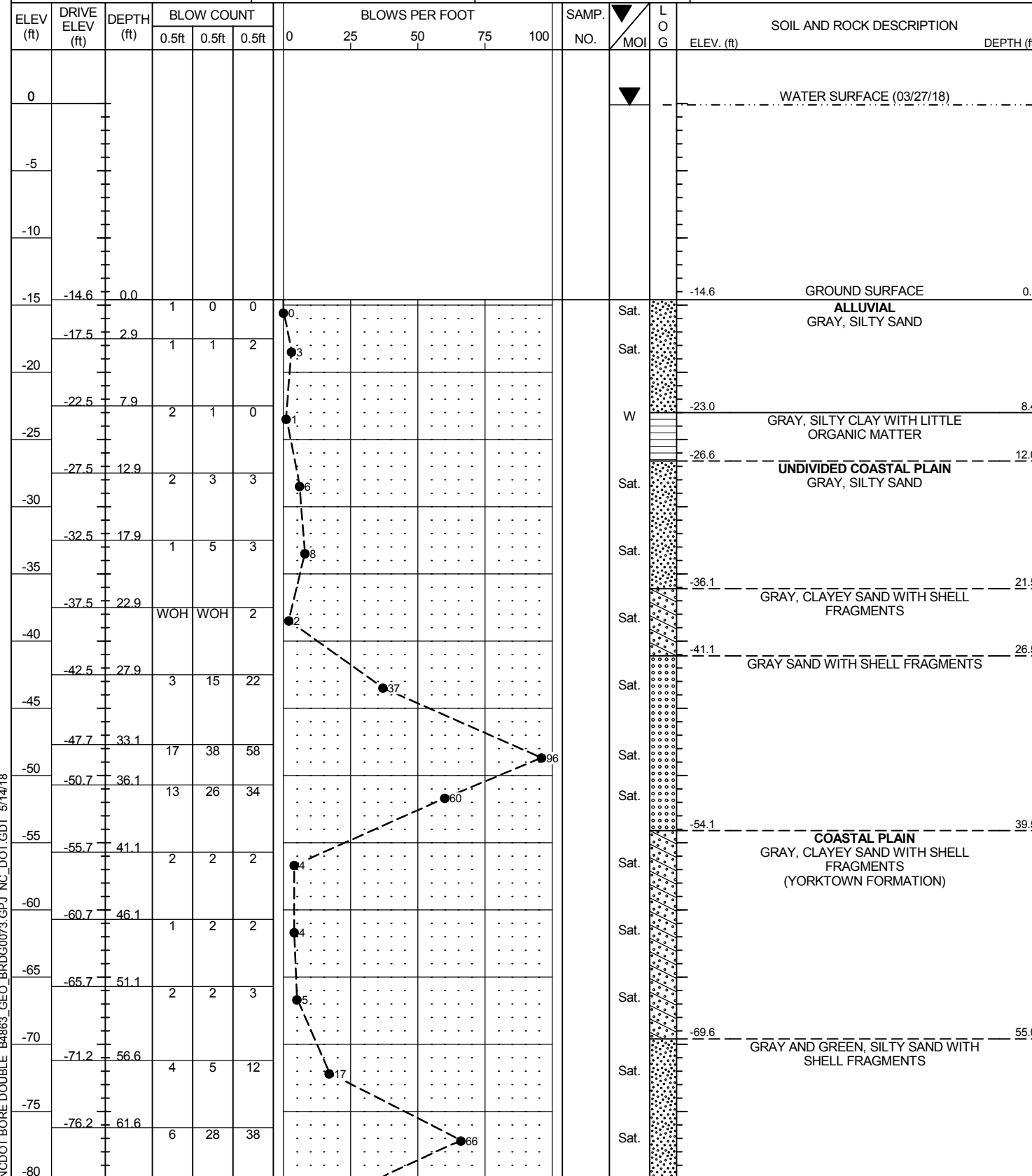
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
-80															
-83.0		70.1		7	13	22									
-85															
-88.0		75.1		6	5	6									
-90															
-93.0		80.1		5	6	7									
-95															
-98.0		85.1		5	7	7									
-100															
-103.0		90.1		7	8	7									
-105															
-108.0		95.1		9	15	6									
-110															
-113.0		100.1		2	8	5									
-115															
-118.0		105.1		3	5	7									
-120															
-122.5		109.6		5	6	7									

NCDOT BORE DOUBLE B4863_GEO_BRDG0073.GPJ_NC_DOT.GDT 5/14/18

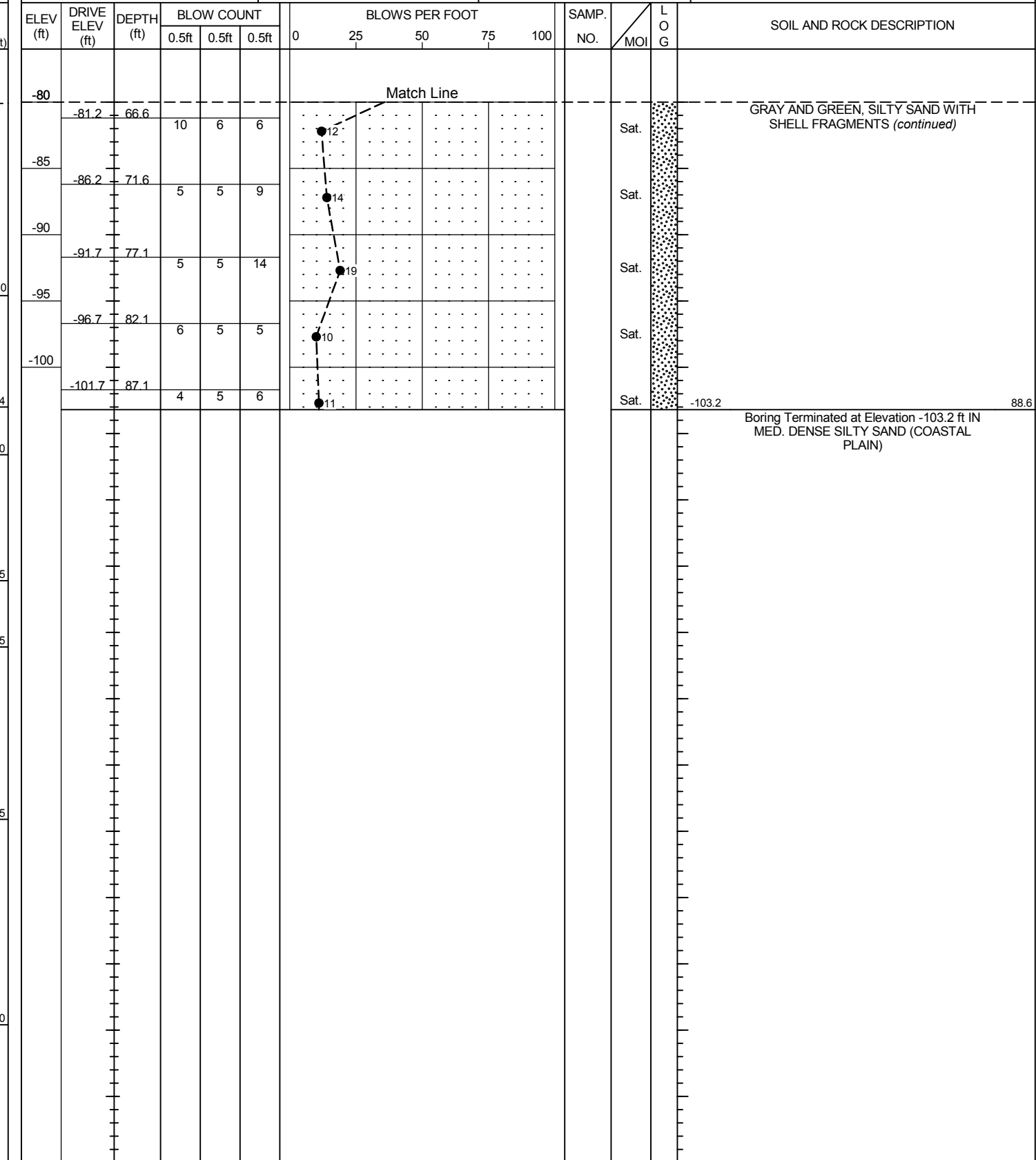
GEOTECHNICAL BORING REPORT

BORE LOG

WBS 40212.1.3	TIP B-4863	COUNTY CARTERET	GEOLOGIST Swartley, J. R.
SITE DESCRIPTION BRIDGE NO. 73 OVER THE STRAITS AT HARKERS ISLAND ON SR 1535 (-L-)			GROUND WTR (ft)
BORING NO. B10-A	STATION 30+68	OFFSET 31 ft LT	ALIGNMENT -L-
COLLAR ELEV. -14.6 ft	TOTAL DEPTH 88.6 ft	NORTHING 360,691	EASTING 2,728,242
DRILL RIG/HAMMER EFF./DATE SME2204 CME-45C 90% 07/31/2017		DRILL METHOD Mud Rotary	HAMMER TYPE Automatic
DRILLER Norwood, M.R.	START DATE 03/27/18	COMP. DATE 03/28/18	SURFACE WATER DEPTH 14.5ft



WBS 40212.1.3	TIP B-4863	COUNTY CARTERET	GEOLOGIST Swartley, J. R.
SITE DESCRIPTION BRIDGE NO. 73 OVER THE STRAITS AT HARKERS ISLAND ON SR 1535 (-L-)			GROUND WTR (ft)
BORING NO. B10-A	STATION 30+68	OFFSET 31 ft LT	ALIGNMENT -L-
COLLAR ELEV. -14.6 ft	TOTAL DEPTH 88.6 ft	NORTHING 360,691	EASTING 2,728,242
DRILL RIG/HAMMER EFF./DATE SME2204 CME-45C 90% 07/31/2017		DRILL METHOD Mud Rotary	HAMMER TYPE Automatic
DRILLER Norwood, M.R.	START DATE 03/27/18	COMP. DATE 03/28/18	SURFACE WATER DEPTH 14.5ft



NCDOT BORE DOUBLE B4863_GEO_BRDG0073.GPJ NC_DOT.GDT 5/14/18

GEOTECHNICAL BORING REPORT

BORE LOG

WBS 40212.1.3		TIP B-4863		COUNTY CARTERET		GEOLOGIST Goslin, G.H.										
SITE DESCRIPTION BRIDGE NO. 73 OVER THE STRAITS AT HARKERS ISLAND ON SR 1535 (-L-)							GROUND WTR (ft)									
BORING NO. B12-A		STATION 33+28		OFFSET 14 ft LT		ALIGNMENT -L-										
COLLAR ELEV. -5.6 ft		TOTAL DEPTH 98.9 ft		NORTHING 360,926		EASTING 2,728,352										
DRILL RIG/HAMMER EFF./DATE SME2204 CME-45C 90% 07/31/2017			DRILL METHOD Mud Rotary		HAMMER TYPE Automatic											
DRILLER Norwood, M.R.		START DATE 02/19/18		COMP. DATE 02/20/18		SURFACE WATER DEPTH 5.5ft										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
0																
-5	-5.6	0.0														
	-8.0	2.4	WOH	1	2											
-10																
	-13.0	7.4	WOH	WOH	WOH											
-15																
	-18.0	12.4	WOH	WOH	WOH											
-20																
	-23.0	17.4	WOH	WOH												
-25																
	-28.0	22.4	1	1	2											
-30																
	-33.0	27.4	WOH	1	1											
-35																
	-38.0	32.4	1	3	4											
-40																
	-43.0	37.4	12	12	18											
-45																
	-48.0	42.4	10	8	19											
-50																
	-53.0	47.4	21	32	32											
-55																
	-58.0	52.4	4	3	2											
-60																
	-63.0	57.4	2	2	2											
-65																
	-68.0	62.4	2	3	4											
-70																
	-73.0	67.4	3	3	5											
-75																
	-78.0	72.4	12	33	50											
-80																

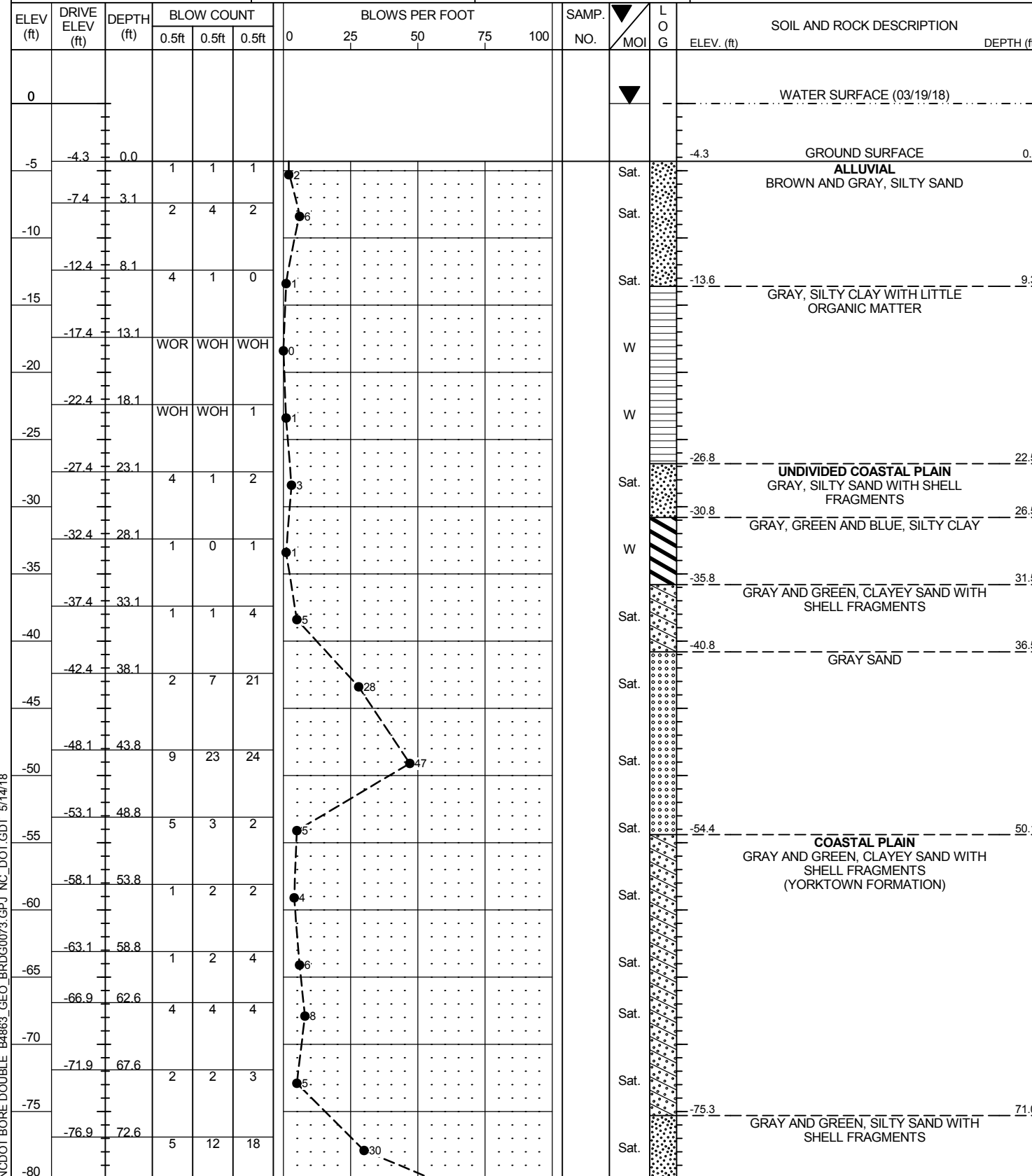
WBS 40212.1.3		TIP B-4863		COUNTY CARTERET		GEOLOGIST Goslin, G.H.										
SITE DESCRIPTION BRIDGE NO. 73 OVER THE STRAITS AT HARKERS ISLAND ON SR 1535 (-L-)							GROUND WTR (ft)									
BORING NO. B12-A		STATION 33+28		OFFSET 14 ft LT		ALIGNMENT -L-										
COLLAR ELEV. -5.6 ft		TOTAL DEPTH 98.9 ft		NORTHING 360,926		EASTING 2,728,352										
DRILL RIG/HAMMER EFF./DATE SME2204 CME-45C 90% 07/31/2017			DRILL METHOD Mud Rotary		HAMMER TYPE Automatic											
DRILLER Norwood, M.R.		START DATE 02/19/18		COMP. DATE 02/20/18		SURFACE WATER DEPTH 5.5ft										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
-80																
-85	-83.0	77.4	22	27	28											
-90	-88.0	82.4	7	3	6											
-95	-93.0	87.4	4	4	6											
-100	-98.0	92.4	9	6	6											
	-103.0	97.4	5	5	5											

NCDOT BORE DOUBLE B4863_GEO_BRDG0073.GPJ_NC_DOT.GDT 5/14/18

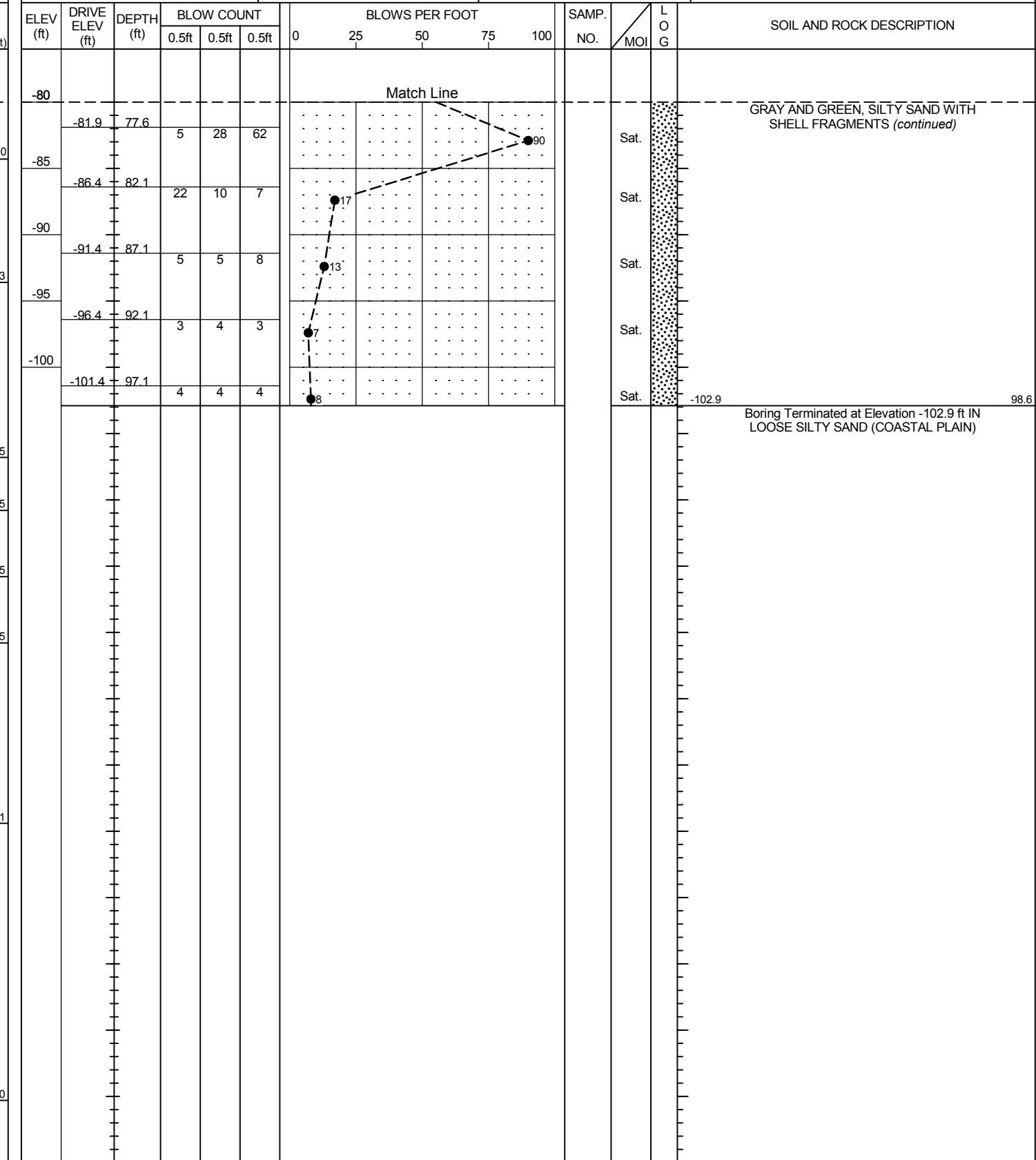
GEOTECHNICAL BORING REPORT

BORE LOG

WBS 40212.1.3		TIP B-4863		COUNTY CARTERET		GEOLOGIST Swartley, J. R.	
SITE DESCRIPTION BRIDGE NO. 73 OVER THE STRAITS AT HARKERS ISLAND ON SR 1535 (-L-)							GROUND WTR (ft)
BORING NO. B13-A		STATION 34+42		OFFSET 15 ft LT		ALIGNMENT -L-	
COLLAR ELEV. -4.3 ft		TOTAL DEPTH 98.6 ft		NORTHING 361,034		EASTING 2,728,388	
DRILL RIG/HAMMER EFF./DATE SME2204 CME-45C 90% 07/31/2017			DRILL METHOD Mud Rotary		HAMMER TYPE Automatic		
DRILLER Norwood, M.R.		START DATE 03/19/18		COMP. DATE 03/20/18		SURFACE WATER DEPTH 4.3ft	



WBS 40212.1.3		TIP B-4863		COUNTY CARTERET		GEOLOGIST Swartley, J. R.	
SITE DESCRIPTION BRIDGE NO. 73 OVER THE STRAITS AT HARKERS ISLAND ON SR 1535 (-L-)							GROUND WTR (ft)
BORING NO. B13-A		STATION 34+42		OFFSET 15 ft LT		ALIGNMENT -L-	
COLLAR ELEV. -4.3 ft		TOTAL DEPTH 98.6 ft		NORTHING 361,034		EASTING 2,728,388	
DRILL RIG/HAMMER EFF./DATE SME2204 CME-45C 90% 07/31/2017			DRILL METHOD Mud Rotary		HAMMER TYPE Automatic		
DRILLER Norwood, M.R.		START DATE 03/19/18		COMP. DATE 03/20/18		SURFACE WATER DEPTH 4.3ft	



NCDOT BORE DOUBLE B4863_GEO_BRDG0073.GPJ_NC_DOT.GDT 5/14/18

GEOTECHNICAL BORING REPORT

BORE LOG

WBS 40212.1.3		TIP B-4863		COUNTY CARTERET		GEOLOGIST Swartley, J. R.	
SITE DESCRIPTION BRIDGE NO. 73 OVER THE STRAITS AT HARKERS ISLAND ON SR 1535 (-L-)							GROUND WTR (ft)
BORING NO. B14-A		STATION 35+92		OFFSET 20 ft LT		ALIGNMENT -L-	
COLLAR ELEV. -4.6 ft		TOTAL DEPTH 100.1 ft		NORTHING 361,178		EASTING 2,728,428	
DRILL RIG/HAMMER EFF./DATE SME2204 CME-45C 90% 07/31/2017				DRILL METHOD Mud Rotary		HAMMER TYPE Automatic	
DRILLER Norwood, M.R.		START DATE 03/08/18		COMP. DATE 03/09/18		SURFACE WATER DEPTH 5.0ft	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
0															
-5	-4.6	0.0	1	1	1										
	-7.0	2.4	1	1	1										
-10	-12.0	7.4	WOH	WOH	WOH										
	-17.0	12.4	WOH	1	0										
-20	-22.0	17.4	5	7	7										
	-27.0	22.4	3	3	2										
-30	-32.0	27.4	2	7	3										
	-37.0	32.4	2	2	1										
-40	-42.0	37.4	6	10	14										
	-47.0	42.4	7	16	24										
-50	-52.7	48.1	15	30	26										
	-58.2	53.6	5	2	3										
-60	-63.2	58.6	1	3	2										
	-68.2	63.6	3	5	5										
-70	-73.2	68.6	4	3	4										
	-78.2	73.6	9	23	36										

WBS 40212.1.3		TIP B-4863		COUNTY CARTERET		GEOLOGIST Swartley, J. R.	
SITE DESCRIPTION BRIDGE NO. 73 OVER THE STRAITS AT HARKERS ISLAND ON SR 1535 (-L-)							GROUND WTR (ft)
BORING NO. B14-A		STATION 35+92		OFFSET 20 ft LT		ALIGNMENT -L-	
COLLAR ELEV. -4.6 ft		TOTAL DEPTH 100.1 ft		NORTHING 361,178		EASTING 2,728,428	
DRILL RIG/HAMMER EFF./DATE SME2204 CME-45C 90% 07/31/2017				DRILL METHOD Mud Rotary		HAMMER TYPE Automatic	
DRILLER Norwood, M.R.		START DATE 03/08/18		COMP. DATE 03/09/18		SURFACE WATER DEPTH 5.0ft	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
-80															
-85	-83.2	78.6	11	47	53/0.3										
	-88.2	83.6	6	7	9										
-90	-93.2	88.6	1	4	4										
	-98.2	93.6	7	11	18										
-100	-103.2	98.6	5	5	6										

NCDOT BORE DOUBLE B4863_GEO_BRDG0073.GPJ_NC_DOT.GDT 5/14/18

GEOTECHNICAL BORING REPORT

BORE LOG

WBS 40212.1.3		TIP B-4863		COUNTY CARTERET		GEOLOGIST Goslin, G.H.	
SITE DESCRIPTION BRIDGE NO. 73 OVER THE STRAITS AT HARKERS ISLAND ON SR 1535 (-L-)							GROUND WTR (ft)
BORING NO. B16-C		STATION 38+43		OFFSET CL		ALIGNMENT -L-	
COLLAR ELEV. -2.3 ft		TOTAL DEPTH 98.7 ft		NORTHING 361,414		EASTING 2,728,513	
DRILL RIG/HAMMER EFF./DATE SME1524 CME-45B 85% 05/02/2017				DRILL METHOD Mud Rotary		HAMMER TYPE Automatic	
DRILLER White, T.J.		START DATE 02/27/18		COMP. DATE 02/28/18		SURFACE WATER DEPTH 1.5ft	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
0															
	-2.3	0.0													
-5			1	1	1										
-10	-9.5	7.2	WOH	WOH	WOH										
-15	-14.5	12.2	WOH	WOH	WOH										
-20	-19.5	17.2	3	4	6										
-25	-24.5	22.2	5	5	9										
-30	-29.5	27.2	WOH	1	1										
-35	-34.5	32.2	1	1	1										
-40	-39.5	37.2	6	10	10										
-45	-44.5	42.2	12	16	29										
-50	-49.5	47.2	25	30	39										
-55	-54.5	52.2	2	2	1										
-60	-59.5	57.2	1	2	2										
-65	-64.5	62.2	4	3	3										
-70	-69.5	67.2	3	6	3										
-75	-74.5	72.2	4	7	7										
-80	-79.5	77.2													

WBS 40212.1.3		TIP B-4863		COUNTY CARTERET		GEOLOGIST Goslin, G.H.	
SITE DESCRIPTION BRIDGE NO. 73 OVER THE STRAITS AT HARKERS ISLAND ON SR 1535 (-L-)							GROUND WTR (ft)
BORING NO. B16-C		STATION 38+43		OFFSET CL		ALIGNMENT -L-	
COLLAR ELEV. -2.3 ft		TOTAL DEPTH 98.7 ft		NORTHING 361,414		EASTING 2,728,513	
DRILL RIG/HAMMER EFF./DATE SME1524 CME-45B 85% 05/02/2017				DRILL METHOD Mud Rotary		HAMMER TYPE Automatic	
DRILLER White, T.J.		START DATE 02/27/18		COMP. DATE 02/28/18		SURFACE WATER DEPTH 1.5ft	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
-80															
			41	59	0.3										
-85	-84.5	82.2	57	43	0.3										
-90	-89.5	87.2	6	8	7										
-95	-94.5	92.2	3	2	4										
-100	-99.5	97.2	11	27	28										

NCDOT BORE DOUBLE B4863_GEO_BRDG0073.GPJ_NC_DOT.GDT 5/14/18

GEOTECHNICAL BORING REPORT

BORE LOG

WBS 40212.1.3		TIP B-4863		COUNTY CARTERET		GEOLOGIST Goslin, G.H.									
SITE DESCRIPTION BRIDGE NO. 73 OVER THE STRAITS AT HARKERS ISLAND ON SR 1535 (-L-)							GROUND WTR (ft)								
BORING NO. B17-C		STATION 39+73		OFFSET CL		ALIGNMENT -L-									
COLLAR ELEV. -2.4 ft		TOTAL DEPTH 98.8 ft		NORTHING 361,541		EASTING 2,728,543									
DRILL RIG/HAMMER EFF./DATE SME1524 CME-45B 85% 05/02/2017				DRILL METHOD Mud Rotary		HAMMER TYPE Automatic									
DRILLER White, T.J.		START DATE 02/26/18		COMP. DATE 02/27/18		SURFACE WATER DEPTH 1.2ft									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
0	-2.4	0.0													
-5	-2.4	0.0	1	1	1	2									
-10	-9.7	7.3	WOH	WOH	WOH										
-15	-14.7	12.3	1	3	3										
-20	-19.7	17.3	3	4	6										
-25	-24.7	22.3	5	6	8										
-30	-29.7	27.3	1	1	3										
-35	-34.7	32.3	1	1	1										
-40	-39.7	37.3	5	4	4										
-45	-44.7	42.3	8	14	16										
-50	-49.7	47.3	18	20	20										
-55	-54.7	52.3	2	2	1										
-60	-59.7	57.3	1	1	2										
-65	-64.7	62.3	3	3	2										
-70	-69.7	67.3	5	5	3										
-75	-74.7	72.3	6	3	7										
-80	-79.7	77.3													

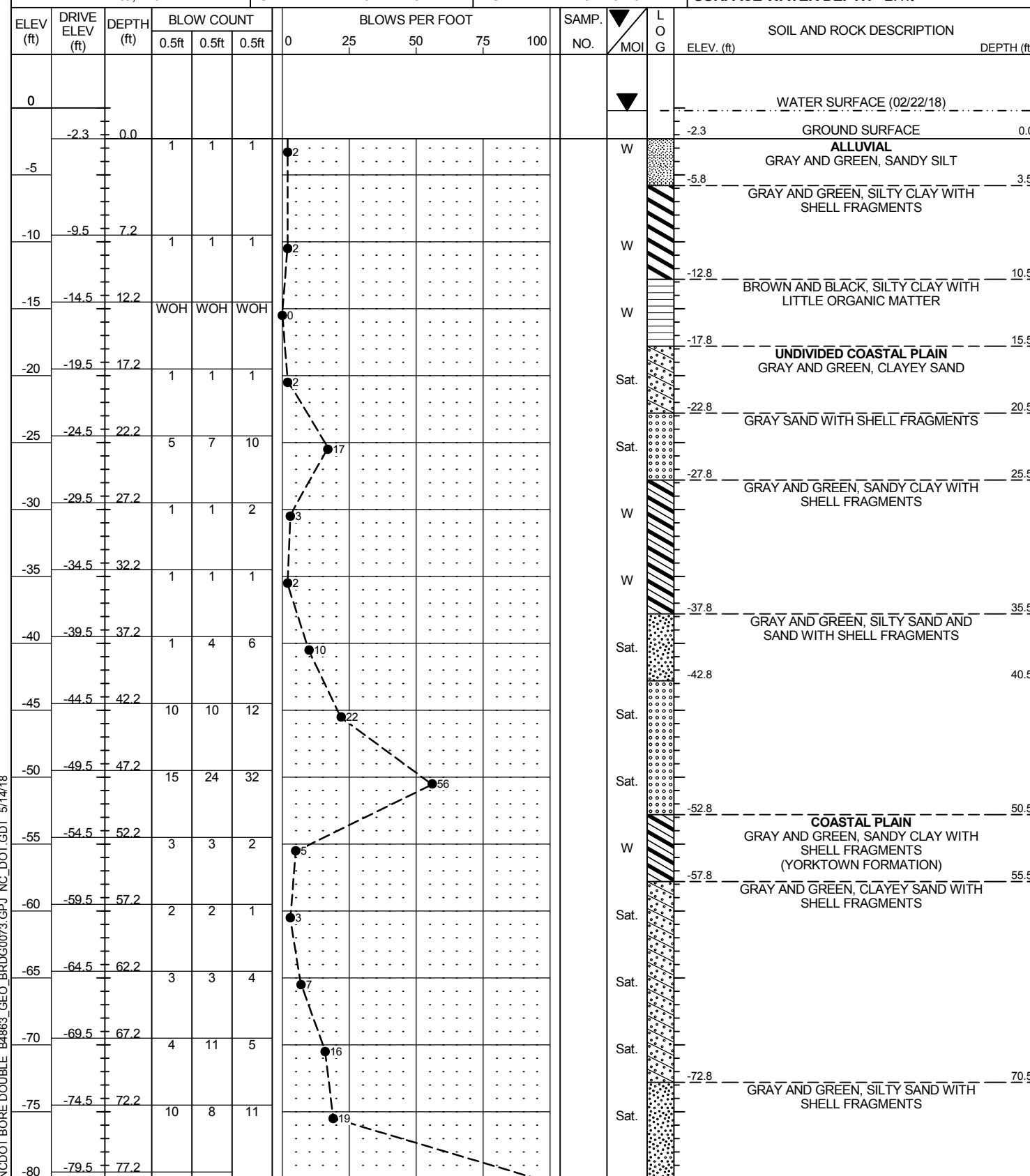
WBS 40212.1.3		TIP B-4863		COUNTY CARTERET		GEOLOGIST Goslin, G.H.									
SITE DESCRIPTION BRIDGE NO. 73 OVER THE STRAITS AT HARKERS ISLAND ON SR 1535 (-L-)							GROUND WTR (ft)								
BORING NO. B17-C		STATION 39+73		OFFSET CL		ALIGNMENT -L-									
COLLAR ELEV. -2.4 ft		TOTAL DEPTH 98.8 ft		NORTHING 361,541		EASTING 2,728,543									
DRILL RIG/HAMMER EFF./DATE SME1524 CME-45B 85% 05/02/2017				DRILL METHOD Mud Rotary		HAMMER TYPE Automatic									
DRILLER White, T.J.		START DATE 02/26/18		COMP. DATE 02/27/18		SURFACE WATER DEPTH 1.2ft									
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG MOI	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
-80															
-85	-84.7	82.3	36	64	0.5										
-90	-89.7	87.3	4	5	12										
-95	-94.7	92.3	4	4	6										
-100	-99.7	97.3	5	11	28										

NCDOT BORE DOUBLE B4863_GEO_BRDG0073.GPJ_NC_DOT_GDT 5/14/18

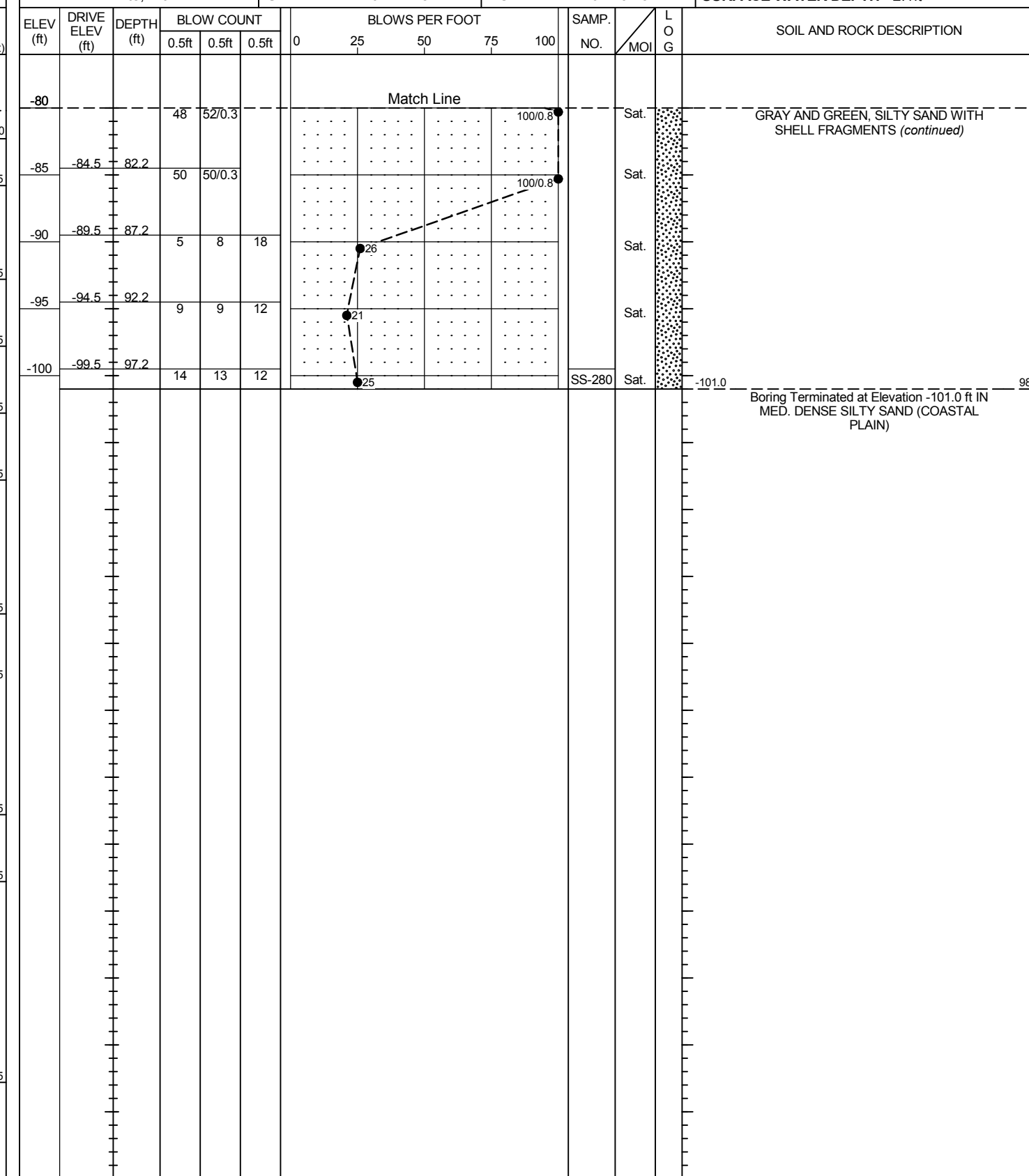
GEOTECHNICAL BORING REPORT

BORE LOG

WBS 40212.1.3		TIP B-4863		COUNTY CARTERET		GEOLOGIST Goslin, G.H.	
SITE DESCRIPTION BRIDGE NO. 73 OVER THE STRAITS AT HARKERS ISLAND ON SR 1535 (-L-)							GROUND WTR (ft)
BORING NO. B18-C		STATION 40+73		OFFSET CL		ALIGNMENT -L-	
COLLAR ELEV. -2.3 ft		TOTAL DEPTH 98.7 ft		NORTHING 361,639		EASTING 2,728,563	
DRILL RIG/HAMMER EFF./DATE SME1524 CME-45B 85% 05/02/2017			DRILL METHOD Mud Rotary		HAMMER TYPE Automatic		
DRILLER White, T.J.		START DATE 02/22/18		COMP. DATE 02/23/18		SURFACE WATER DEPTH 2.1ft	



WBS 40212.1.3		TIP B-4863		COUNTY CARTERET		GEOLOGIST Goslin, G.H.	
SITE DESCRIPTION BRIDGE NO. 73 OVER THE STRAITS AT HARKERS ISLAND ON SR 1535 (-L-)							GROUND WTR (ft)
BORING NO. B18-C		STATION 40+73		OFFSET CL		ALIGNMENT -L-	
COLLAR ELEV. -2.3 ft		TOTAL DEPTH 98.7 ft		NORTHING 361,639		EASTING 2,728,563	
DRILL RIG/HAMMER EFF./DATE SME1524 CME-45B 85% 05/02/2017			DRILL METHOD Mud Rotary		HAMMER TYPE Automatic		
DRILLER White, T.J.		START DATE 02/22/18		COMP. DATE 02/23/18		SURFACE WATER DEPTH 2.1ft	



NCDOT BORE DOUBLE B4863_GEO_BRDG0073.GPJ_NC_DOT.GDT 5/14/18

GEOTECHNICAL BORING REPORT

BORE LOG

WBS 40212.1.3		TIP B-4863		COUNTY CARTERET		GEOLOGIST Swartley, J. R.	
SITE DESCRIPTION BRIDGE NO. 73 OVER THE STRAITS AT HARKERS ISLAND ON SR 1535 (-L-)							GROUND WTR (ft)
BORING NO. B24-C		STATION 46+74		OFFSET CL		ALIGNMENT -L-	
COLLAR ELEV. -7.2 ft		TOTAL DEPTH 101.0 ft		NORTHING 362,234		EASTING 2,728,644	
DRILL RIG/HAMMER EFF./DATE SME2204 CME-45C 90% 07/31/2017				DRILL METHOD Mud Rotary		HAMMER TYPE Automatic	
DRILLER White, T.J.		START DATE 02/21/18		COMP. DATE 02/21/18		SURFACE WATER DEPTH 9.0ft	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
0															
-5															
-7.2	-7.2	0.0	1	1	3										
-10	-10.5	3.3	2	1	0										
-15	-15.5	8.3	5	5	6										
-20	-20.5	13.3	2	1	0										
-25	-25.5	18.3	2	1	1										
-30	-30.5	23.3	2	1	3										
-35	-35.5	28.3	1	1	8										
-40	-40.5	33.3	4	5	4										
-45	-45.5	38.3	6	11	12										
-50	-50.3	43.1	6	5	4										
-55	-55.3	48.1	11	7	6										
-60	-60.3	53.1	2	4	5										
-65	-65.3	58.1	2	5	4										
-70	-70.8	63.6	5	4	13										
-75	-75.8	68.6	23	20	24										
-80															

WBS 40212.1.3		TIP B-4863		COUNTY CARTERET		GEOLOGIST Swartley, J. R.	
SITE DESCRIPTION BRIDGE NO. 73 OVER THE STRAITS AT HARKERS ISLAND ON SR 1535 (-L-)							GROUND WTR (ft)
BORING NO. B24-C		STATION 46+74		OFFSET CL		ALIGNMENT -L-	
COLLAR ELEV. -7.2 ft		TOTAL DEPTH 101.0 ft		NORTHING 362,234		EASTING 2,728,644	
DRILL RIG/HAMMER EFF./DATE SME2204 CME-45C 90% 07/31/2017				DRILL METHOD Mud Rotary		HAMMER TYPE Automatic	
DRILLER White, T.J.		START DATE 02/21/18		COMP. DATE 02/21/18		SURFACE WATER DEPTH 9.0ft	

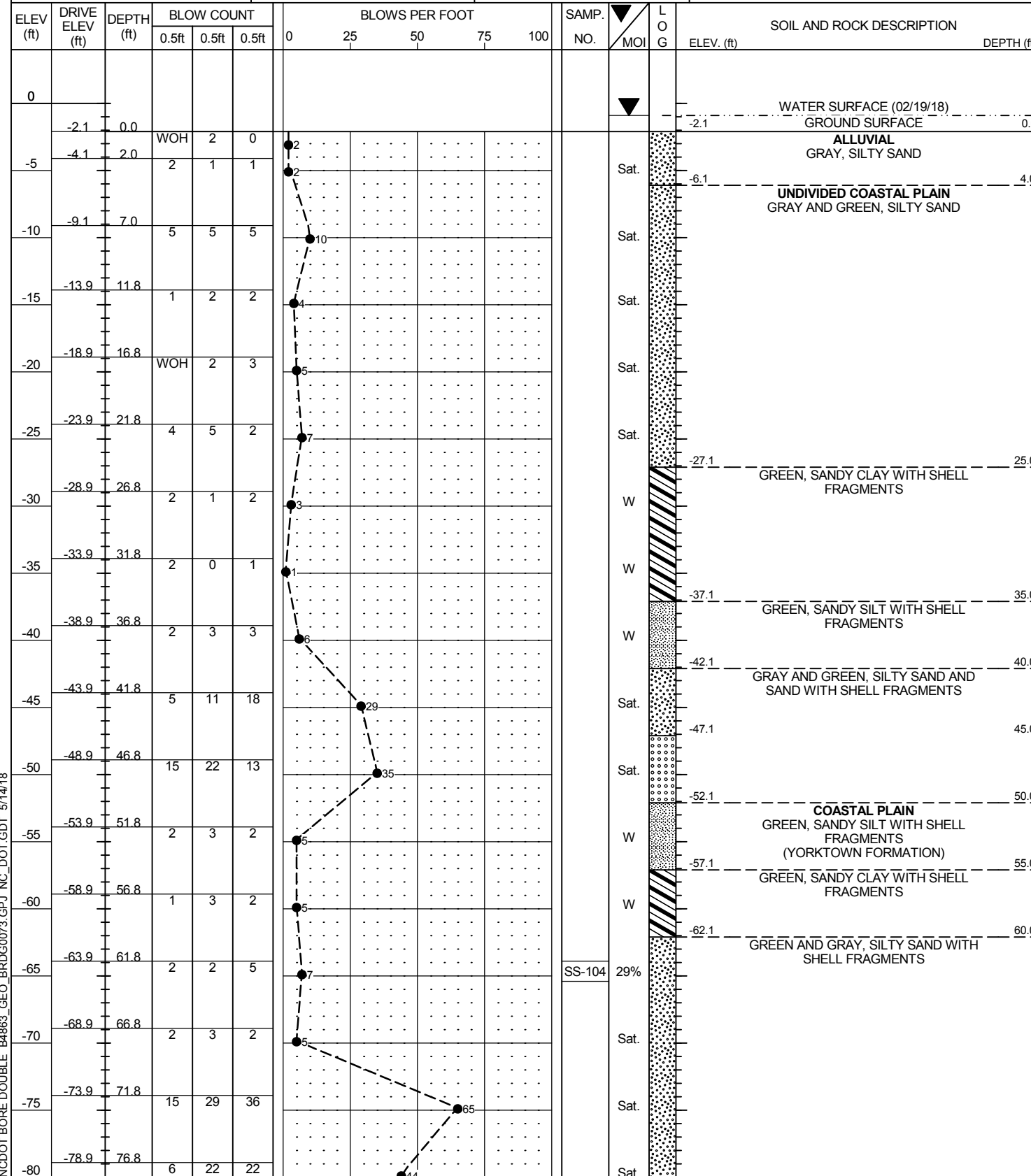
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
-80															
-85															
-81.3	-81.3	74.1	45	51	49/0.3										
-90															
-86.3	-86.3	79.1	17	18	16										
-95															
-91.3	-91.3	84.1	4	4	11										
-100															
-96.3	-96.3	89.1	6	11	18										
-105															
-101.7	-101.7	94.5	9	10	9										
-106.7	-106.7	99.5	5	5	6										
-108.2															

NCDOT BORE DOUBLE B4863_GEO_BRDG0073.GPJ NC_DOT_GDT 5/14/18

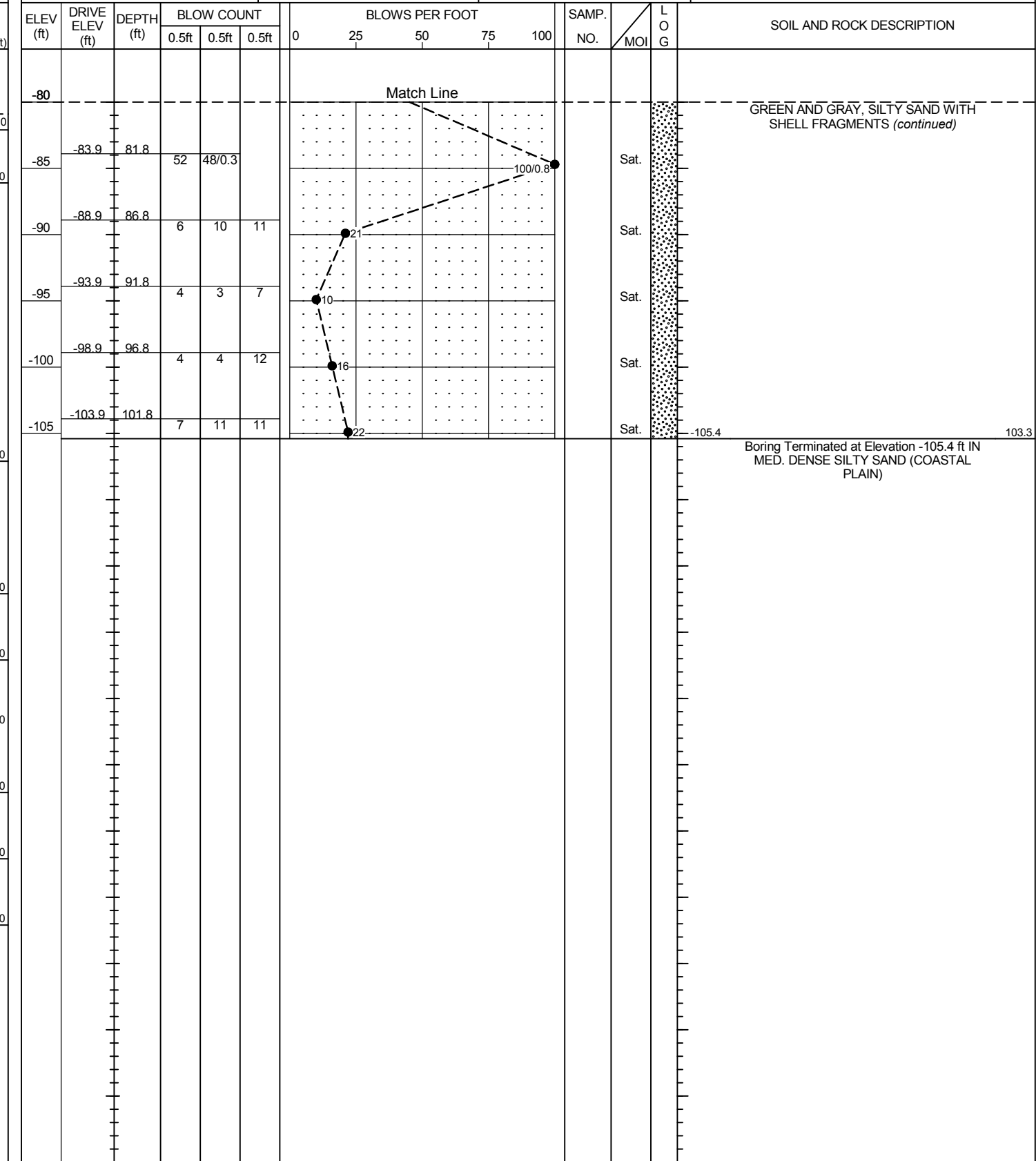
GEOTECHNICAL BORING REPORT

BORE LOG

WBS 40212.1.3		TIP B-4863		COUNTY CARTERET		GEOLOGIST Swartley, J. R.	
SITE DESCRIPTION BRIDGE NO. 73 OVER THE STRAITS AT HARKERS ISLAND ON SR 1535 (-L-)							GROUND WTR (ft)
BORING NO. B26-B		STATION 48+74		OFFSET 25 ft RT		ALIGNMENT -L-	
COLLAR ELEV. -2.1 ft		TOTAL DEPTH 103.3 ft		NORTHING 362,431		EASTING 2,728,686	
DRILL RIG/HAMMER EFF./DATE SME1524 CME-45B 85% 05/02/2017			DRILL METHOD Mud Rotary		HAMMER TYPE Automatic		
DRILLER White, T.J.		START DATE 02/19/18		COMP. DATE 02/20/18		SURFACE WATER DEPTH 1.2ft	



WBS 40212.1.3		TIP B-4863		COUNTY CARTERET		GEOLOGIST Swartley, J. R.	
SITE DESCRIPTION BRIDGE NO. 73 OVER THE STRAITS AT HARKERS ISLAND ON SR 1535 (-L-)							GROUND WTR (ft)
BORING NO. B26-B		STATION 48+74		OFFSET 25 ft RT		ALIGNMENT -L-	
COLLAR ELEV. -2.1 ft		TOTAL DEPTH 103.3 ft		NORTHING 362,431		EASTING 2,728,686	
DRILL RIG/HAMMER EFF./DATE SME1524 CME-45B 85% 05/02/2017			DRILL METHOD Mud Rotary		HAMMER TYPE Automatic		
DRILLER White, T.J.		START DATE 02/19/18		COMP. DATE 02/20/18		SURFACE WATER DEPTH 1.2ft	



NCDOT BORE DOUBLE B4863_GEO_BRDG0073.GPJ_NC_DOT.GDT 5/14/18



SUMMARY OF LABORATORY TEST DATA
Soil Classification and Gradation

S&ME, Inc. Raleigh, 3201 Spring Forest Road, Raleigh, North Carolina 27616			
S&ME Project #:	6235-17-046	Date Report	1/29/2018
State Project No.:	40212.1.3	County:	Carteret
		Date Tested	1/19 - 1/29/18
Federal ID No.:		TIP No.:	B-4863
Project Name:	Bridge No. 73 over the Straits at Harkers Island on SR 1535 (-L-)		
Client Name:	NCDOT Geotechnical Engineering Unit Raleigh, NC		

Sample No.	Station #:	Offset	Alignment	Sample Depth (ft)	AASHTO Classification	Total % Passing					Total Mortar Fraction (%)				LL	PL	PI	Moist. %
						Sieve #					Coarse Sand	Fine Sand	Silt	Clay				
						10	40	60	200	270								
SS-86	18+75	65 LT	-L-	22.8-23.3	A-4 (1)	100	100	98	43.7	34.0	2	64	10	24	28	18	10	32.2
SS-87	18+75	65 LT	-L-	26.8-28.3	A-4 (1)	100	100	99	45.4	35.1	1	64	10	25	24	16	8	32.9
SS-88	18+75	65 LT	-L-	46.8-48.3	A-6 (10)	100	97	93	77.3	58.9	7	34	29	30	34	19	15	35.0
SS-89	18+75	65 LT	-L-	71.8-73.3	A-4 (0)	98	91	78	36.1	27.7	20	52	8	20	27	19	8	32.4
SS-90	21+72	CL	-L-	11.8-13.3	A-6 (11)	100	100	99	69.3	57.5	1	42	21	36	38	19	19	32.8
SS-91	21+72	CL	-L-	21.8-23.3	A-3 (0)	100	100	97	7.9	6.0	3	91	2	4	16	N.P.	N.P.	25.5
SS-92	21+72	CL	-L-	26.8-28.3	A-4 (0)	98	87	79	50.3	35.4	19	45	22	14	23	20	3	33.1
SS-93	21+72	CL	-L-	56.8-58.3	A-4 (0)	98	93	85	37.3	28.3	13	58	9	20	26	18	8	29.9
SS-96	50+75	35 RT	-L-	26.9-28.4	A-4 (4)	100	100	99	65.6	43.2	1	56	26	17	30	21	9	46.8
SS-97	50+75	35 RT	-L-	36.9-38.4	A-4 (0)	100	94	85	38.4	28.9	14	57	13	16	24	17	7	33.7
SS-98	50+75	35 RT	-L-	56.9-58.4	A-7-6 (23)	99	93	89	80.5	75.0	10	14	45	31	49	21	28	44.4
SS-99	50+75	35 RT	-L-	61.9-63.4	A-2-6 (0)	96	86	74	30.9	27.4	23	49	7	21	28	17	11	32.7
SS-104	48+74	25 RT	-L-	61.8-63.3	A-2-4 (0)	95	80	63	23.1	22.0	34	43	7	16	23	19	4	28.7
SS-107	47+74	CL	-L-	31.5-33.0	A-4 (3)	100	97	93	64.7	53.2	7	40	35	18	27	20	7	48.2
SS-108	46+74	CL	-L-	13.3-14.8	A-6 (11)	100	100	100	76.7	61.1	0	39	30	31	36	21	15	51.0
SS-114	45+74	15 RT	-L-	16.2-17.7	A-4 (0)	100	100	99	53.8	33.8	1	65	18	16	24	23	1	ND
SS-117	45+74	15 RT	-L-	40.4-41.9	A-2-4 (0)	98	86	54	18.2	4.9	45	50	3	2	18	N.P.	N.P.	ND
SS-120	44+74	30 LT	-L-	17.9-19.4	A-4 (0)	96	87	80	45.0	36.3	17	45	22	16	23	18	5	49.6
SS-127	35+92	20 LT	-L-	12.4-13.9	A-6 (4)	100	99	98	56.0	52.8	2	45	32	21	31	18	13	51.0
SS-128	35+92	20 LT	-L-	48.1-49.6	A-3 (0)	100	97	45	4.1	3.4	55	42	1	2	19	N.P.	N.P.	ND
SS-129	35+92	20 LT	-L-	78.6-79.9	A-3 (0)	97	96	95	8.0	6.7	2	91	2	5	19	N.P.	N.P.	ND
SS-202	33+28	14 LT	-L-	7.4-8.9	A-6 (3)	99	98	97	55.8	48.6	2	49	26	23	29	18	11	60.6
SS-205	33+28	14 LT	-L-	22.4-23.9	A-4 (0)	100	99	99	60.1	44.8	1	54	30	15	25	22	3	ND
SS-213	33+28	14 LT	-L-	62.4-63.9	A-2-6 (0)	80	53	39	20.5	19.4	51	25	7	17	26	14	12	27.9
SS-220	33+28	14 LT	-L-	97.4-98.9	A-2-4 (0)	99	91	73	27.9	24.8	26	49	11	14	22	20	2	ND
SS-232	41+69	3 LT	-L-	57.1-58.6	A-2-4 (0)	90	81	67	34.0	31.1	26	39	19	16	24	18	6	ND
SS-246	42+74	CL	-L-	27.1-28.6	A-6 (8)	100	99	99	71.3	65.7	1	33	38	28	33	20	13	47.5
SS-280	40+73	CL	-L-	97.2-98.7	A-2-4 (0)	100	98	94	13.7	12.5	6	82	5	7	17	N.P.	N.P.	ND
SS-297	39+73	CL	-L-	82.3-83.3	A-3 (0)	98	98	97	9.1	7.3	1	92	3	4	21	N.P.	N.P.	ND
SS-341	37+13	CL	-L-	102.1-103.6	A-2-4 (0)	100	98	95	34.8	30.4	5	65	15	15	27	22	5	ND
ST-8	50+75	35 RT	-L-	33.9-35.9	A-6 (5)	100	99	NA	56.3	NA	6	56	23	16	31	16	15	45.0

SITE PHOTOGRAPHS

Bridge No. 73 over the Straits at Harkers Island on SR 1535 (-L-)



Looking South towards End Bent 1



Looking Northwest



Looking Southwest towards End Bent 1

REFERENCE: B-4863

PROJECT: 40212

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

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	B-4863	1	60

STRUCTURE
SUBSURFACE INVESTIGATION

CONTENTS

SHEET NO.	DESCRIPTION
1	TITLE SHEET
2	LEGEND (SOIL & ROCK)
3-4	SITE PLAN(S)
5-6	PROFILE(S)
7-13	BORE LOGS(S)
14-15	SOIL TEST RESULTS
15-35	TRIAIAL TEST RESULTS
36-60	CONSOLIDATION TEST RESULTS

COUNTY CARTERET

PROJECT DESCRIPTION BRIDGE NO. 73 OVER THE STRAITS AT HARKERS ISLAND ON SR 1535

SITE DESCRIPTION RETAINING WALL INVESTIGATION - WALL NOS. 1 AND 2

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 (919) 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 INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS MAY VARY CONSIDERABLY WITH TIME ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

THE BIDDER OR CONTRACTOR IS CAUTIONED THAT DETAILS SHOWN ON THE SUBSURFACE PLANS ARE PRELIMINARY ONLY AND IN MANY CASES THE FINAL DESIGN DETAILS ARE DIFFERENT. FOR BIDDING AND CONSTRUCTION PURPOSES, REFER TO THE CONSTRUCTION PLANS AND DOCUMENTS FOR FINAL DESIGN INFORMATION ON THIS PROJECT. THE DEPARTMENT DOES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, NOR THE INTERPRETATIONS MADE, OR OPINION OF THE DEPARTMENT AS TO THE TYPE OF MATERIALS AND CONDITIONS TO BE ENCOUNTERED. THE BIDDER OR CONTRACTOR IS CAUTIONED TO MAKE SUCH INDEPENDENT SUBSURFACE INVESTIGATIONS AS HE DEEMS NECESSARY TO SATISFY HIMSELF AS TO CONDITIONS TO BE ENCOUNTERED ON THE PROJECT. THE CONTRACTOR SHALL HAVE NO CLAIM FOR ADDITIONAL COMPENSATION OR FOR AN EXTENSION OF TIME FOR ANY REASON RESULTING FROM THE ACTUAL CONDITIONS ENCOUNTERED AT THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

- NOTES:
1. 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.

PERSONNEL

J.R. SWARTLEY

T.J. HILL

T.J. WHITE

S.D. PUGH

INVESTIGATED BY J.R. SWARTLEY

DRAWN BY J.R. SWARTLEY

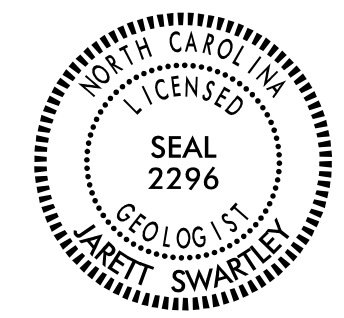
CHECKED BY S.S. LANEY

SUBMITTED BY S.S. LANEY

DATE JULY 2018



3201 SPRING FOREST ROAD
RALEIGH, NC 27616
(919) 872-2660



DocuSigned by:
Jarett Swartley 3/6/2020

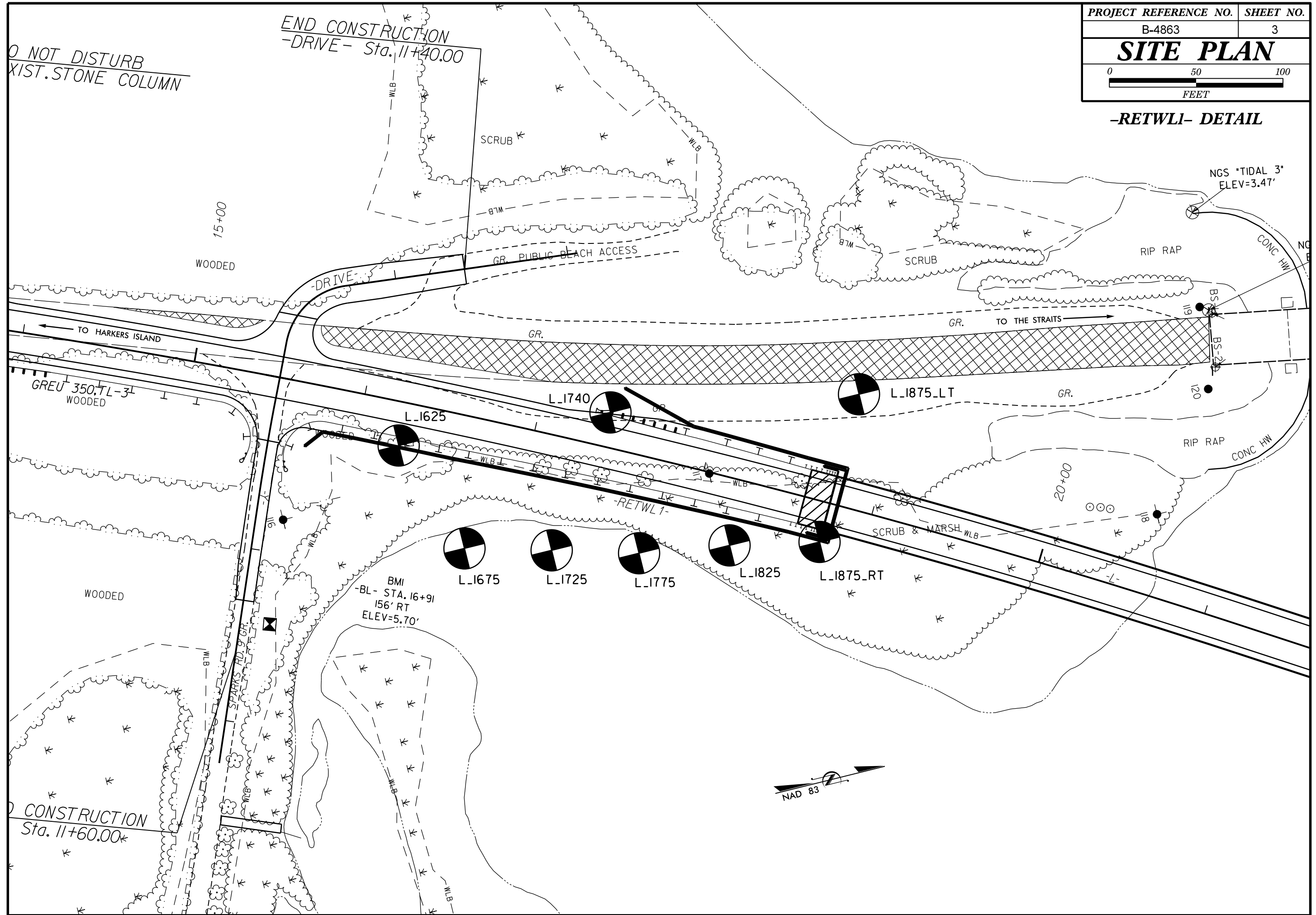
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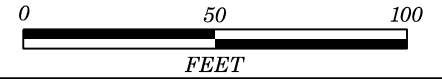
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT
SUBSURFACE INVESTIGATION
SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION										GRADATION										ROCK DESCRIPTION										TERMS AND DEFINITIONS																																																																																																																																											
<p>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 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: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE, <i>VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6</i></p>										<p>WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE. 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.</p>										<p>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. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS IN NON-COASTAL PLAIN MATERIAL. THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:</p>										<p>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. ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE. CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE. COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE. CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK. DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL. DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH. FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE. FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL. FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM. FORMATION (FM) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD. JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED. LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT. LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS. MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE. PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM. RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. ROCK QUALITY DESIGNATION (RQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK. SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS. SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE. STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (IN OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. STRATA CORE RECOVERY (SREC.) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. STRATA ROCK QUALITY DESIGNATION (SROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. TOPSOIL (TS) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.</p>																																																																																																																																											
SOIL LEGEND AND AASHTO CLASSIFICATION										ANGULARITY OF GRAINS										WEATHERED ROCK (WR)										CRYSTALLINE ROCK (CR)																																																																																																																																											
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>GENERAL CLASS.</th> <th colspan="5">GRANULAR MATERIALS (≤ 35% PASSING #200)</th> <th colspan="5">SILT-CLAY MATERIALS (> 35% PASSING #200)</th> <th colspan="5">ORGANIC MATERIALS</th> </tr> <tr> <th>GROUP CLASS.</th> <th>A-1</th> <th>A-3</th> <th>A-2</th> <th>A-4</th> <th>A-5</th> <th>A-6</th> <th>A-7</th> <th>A-1, A-2</th> <th>A-3</th> <th>A-4, A-5</th> <th>A-6, A-7</th> <th colspan="5"></th> </tr> <tr> <th>SYMBOL</th> <td colspan="5">[Pattern]</td> <td colspan="5">[Pattern]</td> <td colspan="5">[Pattern]</td> </tr> <tr> <th>% PASSING #10 #40 #200</th> <td>50 MX 30 MX 15 MX</td> <td>50 MX 25 MX</td> <td>51 MN 35 MX 35 MX</td> <td>40 MX 41 MN 40 MX 41 MN</td> <td>40 MX 41 MN 40 MX 41 MN</td> <td>40 MX 41 MN 40 MX 41 MN</td> <td>40 MX 41 MN 40 MX 41 MN</td> <td>40 MX 41 MN 40 MX 41 MN</td> <td>40 MX 41 MN 40 MX 41 MN</td> <td>40 MX 41 MN 40 MX 41 MN</td> <td>40 MX 41 MN 40 MX 41 MN</td> <td colspan="5"></td> </tr> <tr> <th>MATERIAL PASSING #40 LL PI</th> <td colspan="5"></td> <td colspan="5"></td> <td colspan="5"></td> </tr> <tr> <th>GROUP INDEX</th> <td colspan="5"></td> <td colspan="5"></td> <td colspan="5"></td> </tr> <tr> <th>USUAL TYPES OF MAJOR MATERIALS</th> <td colspan="2">STONE FRAGS. GRAVEL, AND SAND</td> <td colspan="2">FINE SAND</td> <td colspan="2">SILTY OR CLAYEY GRAVEL AND SAND</td> <td colspan="2">SILTY SOILS</td> <td colspan="2">CLAYEY SOILS</td> <td colspan="5">SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER</td> </tr> <tr> <th>GEN. RATING AS SUBGRADE</th> <td colspan="5">EXCELLENT TO GOOD</td> <td colspan="5">FAIR TO POOR</td> <td colspan="5">FAIR TO POOR POOR UNSUITABLE</td> </tr> </table>										GENERAL CLASS.	GRANULAR MATERIALS (≤ 35% PASSING #200)					SILT-CLAY MATERIALS (> 35% PASSING #200)					ORGANIC MATERIALS					GROUP CLASS.	A-1	A-3	A-2	A-4	A-5	A-6	A-7	A-1, A-2	A-3	A-4, A-5	A-6, A-7						SYMBOL	[Pattern]					[Pattern]					[Pattern]					% PASSING #10 #40 #200	50 MX 30 MX 15 MX	50 MX 25 MX	51 MN 35 MX 35 MX	40 MX 41 MN 40 MX 41 MN	40 MX 41 MN 40 MX 41 MN	40 MX 41 MN 40 MX 41 MN	40 MX 41 MN 40 MX 41 MN	40 MX 41 MN 40 MX 41 MN	40 MX 41 MN 40 MX 41 MN	40 MX 41 MN 40 MX 41 MN	40 MX 41 MN 40 MX 41 MN						MATERIAL PASSING #40 LL PI																GROUP INDEX																USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS. GRAVEL, AND SAND		FINE SAND		SILTY OR CLAYEY GRAVEL AND SAND		SILTY SOILS		CLAYEY SOILS		SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER					GEN. RATING AS SUBGRADE	EXCELLENT TO GOOD					FAIR TO POOR					FAIR TO POOR POOR UNSUITABLE					<p>THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.</p>										<p>NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.</p>										<p>FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.</p>									
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MINERALOGICAL COMPOSITION										COMPRESSION										NON-CRYSTALLINE ROCK (NCR)										COASTAL PLAIN SEDIMENTARY ROCK (CP)																																																																																																																																											
<p>MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.</p>										<p>SLIGHTLY COMPRESSIBLE LL < 31 MODERATELY COMPRESSIBLE LL = 31 - 50 HIGHLY COMPRESSIBLE LL > 50</p>										<p>FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.</p>										<p>COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.</p>																																																																																																																																											
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<p>DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.</p>										<p>FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC. FRIABLE RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE. MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER. INDURATED GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER. EXTREMELY INDURATED SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.</p>										<p>* ELEVATIONS DERIVED FROM GEOPAK AND .TIN FILE 'B4863.LS.TIN.TIN' DATED 8/16/16</p>										<p>FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC. FRIABLE RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE. MODERATELY INDURATED GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER. INDURATED GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER. EXTREMELY INDURATED SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.</p>																																																																																																																																											

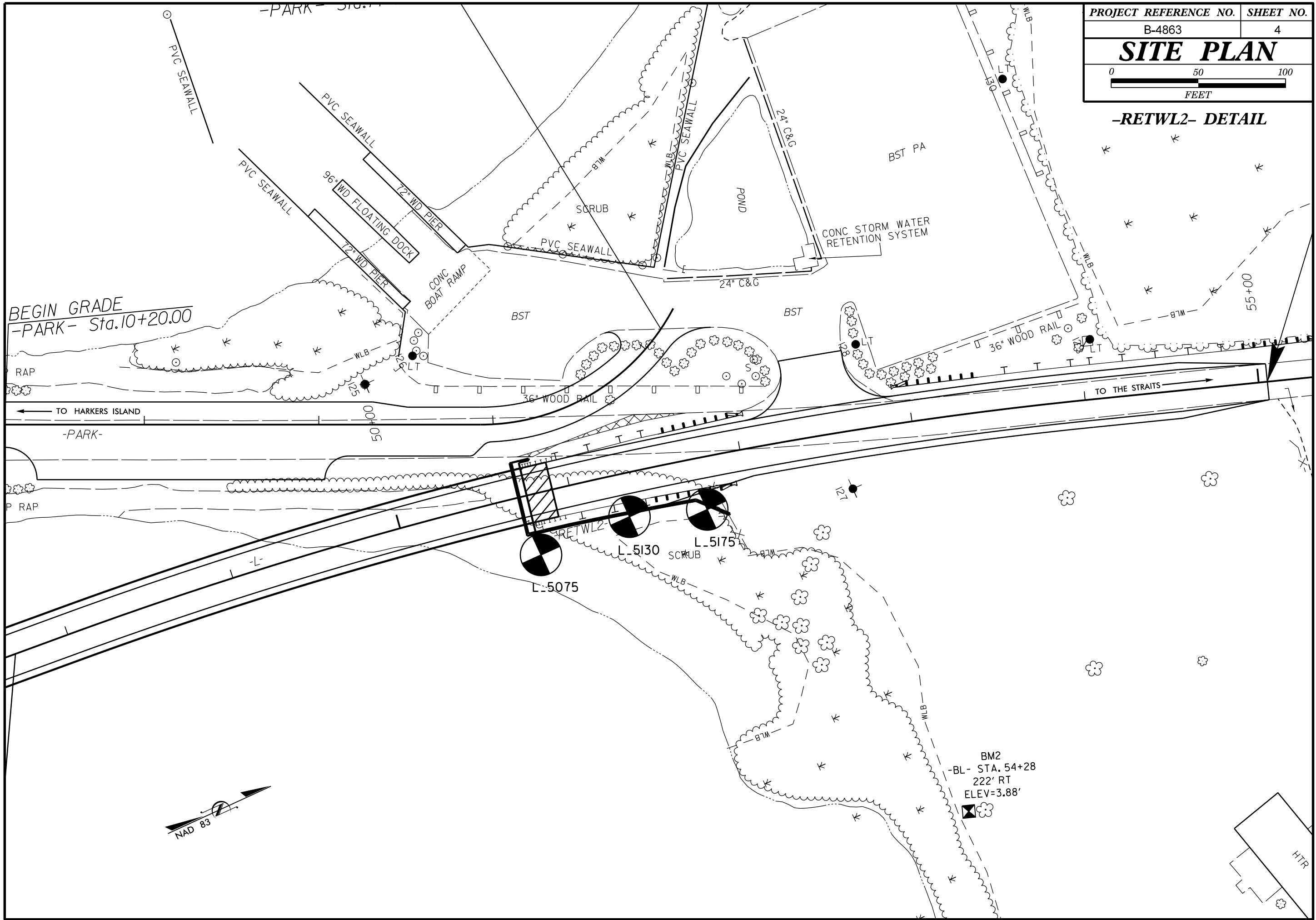
-RETWL1- DETAIL



SITE PLAN



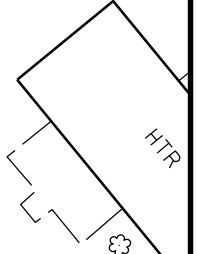
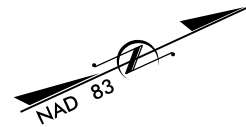
-RETWL2- DETAIL



BEGIN GRADE
-PARK- Sta.10+20.00

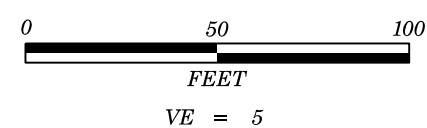
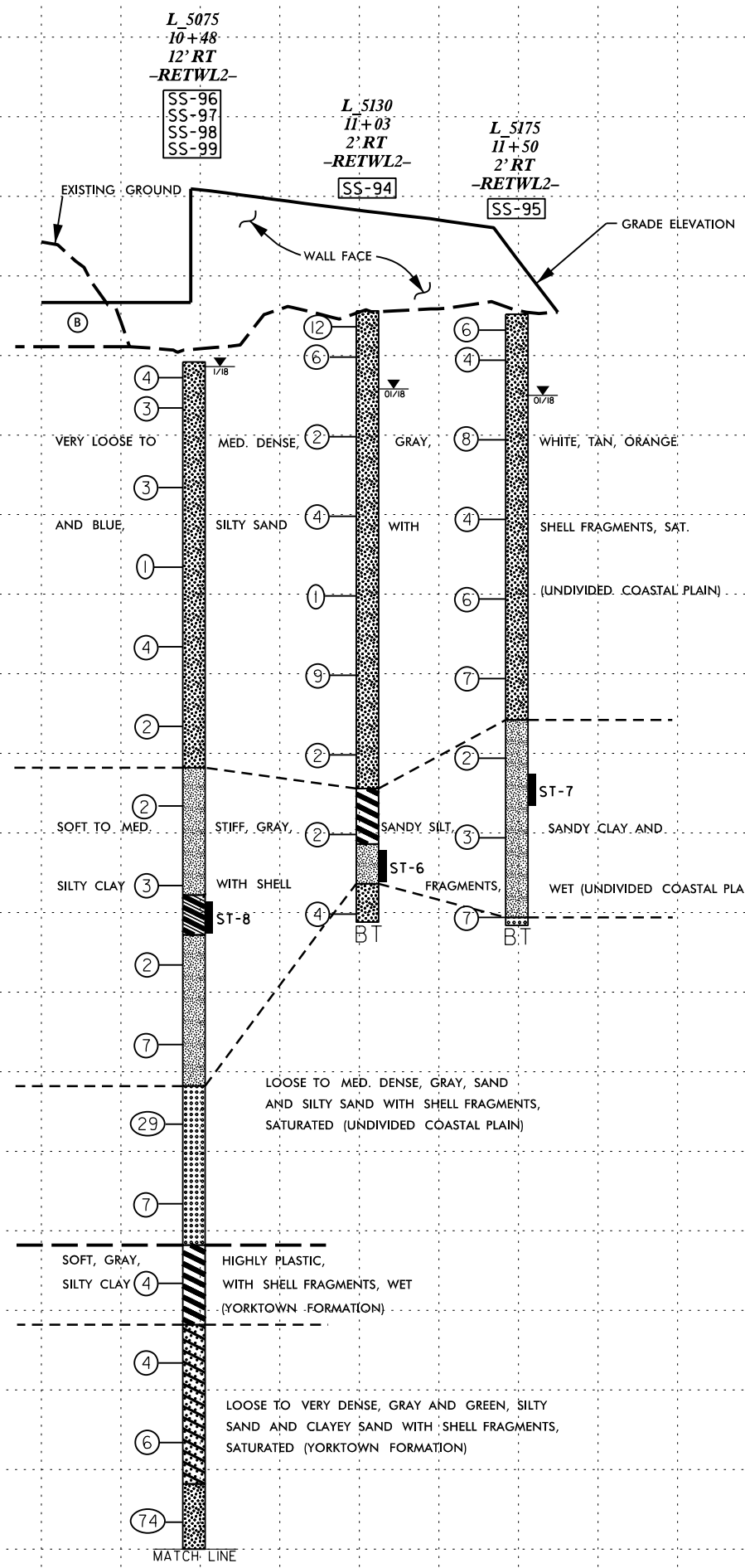
TO HARKERS ISLAND

-PARK-



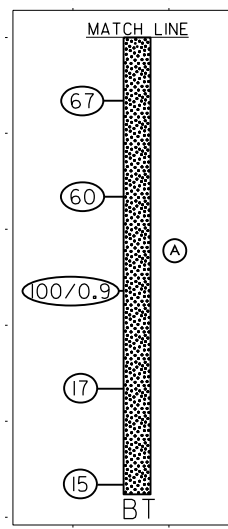
5/14/99

20
10
0
-10
-20
-30
-40
-50
-60
-70
-80



PROJECT REFERENCE NO.	SHEET NO.
B-4863	6
PROFILE PROJECTED ALONG -RETWL2-	

- (A) MED. DENSE TO VERY DENSE, GRAY AND GREEN, SILTY SAND WITH SHELL FRAGMENTS, SATURATED (YORKTOWN FORMATION)
- (B) VERY LOOSE TO DENSE, TAN, SILTY SAND, MOIST (ROADWAY EMBANKMENT)



GROUNDLINE PROFILE IS CONSTRUCTED ALONG FACE OF THE WALL. GROUNDLINE PROFILE IS FROM WALL ENVELOPE FILE 'B4863.SMJ.RW.Ldgn' DATED 7/13/18 RECEIVED FROM NCDOT O&U. OFFSETS ARE FROM THE FACE OF THE WALL.

-RETWL2-

10+00 11+00 12+00

-80

GEOTECHNICAL BORING REPORT

BORE LOG

WBS 40212.1.1		TIP B-4863		COUNTY CARTERET		GEOLOGIST Swartley, J. R.											
SITE DESCRIPTION RETAINING WALL INVESTIGATION - WALL NOS. 1 AND 2							GROUND WTR (ft)										
BORING NO. L_1625		STATION 10+57		OFFSET 2 ft LT		ALIGNMENT -RETWL1-											
COLLAR ELEV. 3.2 ft		TOTAL DEPTH 38.4 ft		NORTHING 359,399		EASTING 2,727,610											
DRILL RIG/HAMMER EFF./DATE SME1524 CME-45B 85% 05/02/2017				DRILL METHOD Mud Rotary		HAMMER TYPE Automatic											
DRILLER White, T.J.		START DATE 01/07/18		COMP. DATE 01/07/18		SURFACE WATER DEPTH N/A											
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)			
			0.5ft	0.5ft	0.5ft	0	25	50	75	100							
5	3.2	0.0	1	2	3										3.2	GROUND SURFACE	0.0
0	1.3	1.9	1	2	1											ALLUVIAL BROWN, SILTY SAND	
-5	-3.7	6.9	2	1	3												
-10	-8.7	11.9	WOH	WOH	WOH											GRAY, SANDY SILT	10.5
-15	-13.7	16.9	WOH	2	2											GRAY, SILTY CLAY	15.5
-20	-18.7	21.9	2	3	5											UNDIVIDED COASTAL PLAIN GRAY, SILTY SAND WITH SHELL FRAGMENTS	20.5
-25	-23.7	26.9	2	0	1											GRAY, SILTY CLAY WITH SHELL FRAGMENTS	25.5
-30	-28.7	31.9	WOH	1	2											GRAY, SILTY SAND AND SAND WITH SHELL FRAGMENTS	32.9
-35	-33.7	36.9	7	10	10											Boring Terminated at Elevation -35.2 ft IN MED. DENSE SAND (UNDIVIDED COASTAL PLAIN)	38.4

WBS 40212.1.1		TIP B-4863		COUNTY CARTERET		GEOLOGIST Swartley, J. R.											
SITE DESCRIPTION RETAINING WALL INVESTIGATION - WALL NOS. 1 AND 2							GROUND WTR (ft)										
BORING NO. L_1675		STATION 11+06		OFFSET 49 ft RT		ALIGNMENT -RETWL1-											
COLLAR ELEV. -2.0 ft		TOTAL DEPTH 33.3 ft		NORTHING 359,422		EASTING 2,727,676											
DRILL RIG/HAMMER EFF./DATE SME1524 CME-45B 85% 05/02/2017				DRILL METHOD Mud Rotary		HAMMER TYPE Automatic											
DRILLER White, T.J.		START DATE 01/02/18		COMP. DATE 01/02/18		SURFACE WATER DEPTH 0.5ft											
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)			
			0.5ft	0.5ft	0.5ft	0	25	50	75	100							
0	-2.0	0.0	1	1	1											WATER SURFACE (01/02/18)	-0.0
-5																ALLUVIAL GRAY, SAND AND SILTY SAND	
-10	-8.8	6.8	WOH	1	0											GRAY, SILTY CLAY	7.3
-15	-13.8	11.8	1	1	1											GRAY, CLAYEY SILT	10.0
-20	-18.8	16.8	2	2	3											UNDIVIDED COASTAL PLAIN GRAY, SILTY SAND WITH SHELL FRAGMENTS	17.3
-25	-23.8	21.8	2	2	2											GRAY, SILTY CLAY WITH SHELL FRAGMENTS	20.0
-30	-28.8	26.8	2	1	1											GRAY, SILTY SAND WITH SHELL FRAGMENTS	30.0
-35	-33.8	31.8	9	8	7											Boring Terminated at Elevation -35.3 ft IN MED. DENSE SILTY SAND (UNDIVIDED COASTAL PLAIN)	33.3

NCDOT BORE DOUBLE B4863_GEO_RWAL.GPJ NC_DOT.GDT 7/30/18

GEOTECHNICAL BORING REPORT

BORE LOG

WBS 40212.1.1		TIP B-4863		COUNTY CARTERET		GEOLOGIST Swartley, J. R.										
SITE DESCRIPTION RETAINING WALL INVESTIGATION - WALL NOS. 1 AND 2							GROUND WTR (ft)									
BORING NO. L_5130		STATION 11+03		OFFSET 2 ft RT		ALIGNMENT -RETWL2-										
COLLAR ELEV. 2.8 ft		TOTAL DEPTH 38.4 ft		NORTHING 362,680		EASTING 2,728,727										
DRILL RIG/HAMMER EFF./DATE SME1524 CME-45B 85% 05/02/2017			DRILL METHOD Mud Rotary		HAMMER TYPE Automatic											
DRILLER White, T.J.		START DATE 01/10/18		COMP. DATE 01/10/18		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
5	2.8	0.0												2.8	GROUND SURFACE	0.0
0	0.9	1.9	1	5	7										UNDIVIDED COASTAL PLAIN GRAY, TAN AND BLUE, SILTY SAND WITH SHELL FRAGMENTS	
-5	-4.1	6.9	1	1	1										Sat.	
-10	-9.1	11.9	2	2	2										Sat.	
-15	-14.1	16.9	1	0	1										Sat.	
-20	-19.1	21.9	3	3	6										Sat.	
-25	-24.1	26.9	1	1	1										Sat.	
-30	-29.1	31.9	1	1	1										Sat.	
-35	-34.1	36.9	1	2	2										Sat.	
Boring Terminated at Elevation -35.6 ft IN LOOSE SILTY SAND (UNDIVIDED COASTAL PLAIN)																
Other Samples: ST-6 (33.9 - 35.9)																

WBS 40212.1.1		TIP B-4863		COUNTY CARTERET		GEOLOGIST Swartley, J. R.										
SITE DESCRIPTION RETAINING WALL INVESTIGATION - WALL NOS. 1 AND 2							GROUND WTR (ft)									
BORING NO. L_5175		STATION 11+50		OFFSET 2 ft RT		ALIGNMENT -RETWL2-										
COLLAR ELEV. 2.6 ft		TOTAL DEPTH 38.4 ft		NORTHING 362,723		EASTING 2,728,742										
DRILL RIG/HAMMER EFF./DATE SME1524 CME-45B 85% 05/02/2017			DRILL METHOD Mud Rotary		HAMMER TYPE Automatic											
DRILLER White, T.J.		START DATE 01/11/18		COMP. DATE 01/11/18		SURFACE WATER DEPTH N/A										
ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)		
			0.5ft	0.5ft	0.5ft	0	25	50	75	100						
5	2.6	0.0												2.6	GROUND SURFACE	0.0
0	0.7	1.9	4	3	3										UNDIVIDED COASTAL PLAIN TAN, GRAY AND ORANGE, SILTY SAND	
-5	-4.3	6.9	3	3	5										Sat.	
-10	-9.3	11.9	2	2	2										Sat.	
-15	-14.3	16.9	2	2	4										Sat.	
-20	-19.3	21.9	3	2	5										Sat.	
-25	-24.3	26.9	2	1	1										Sat.	
-30	-29.3	31.9	4	2	1										Sat.	
-35	-34.3	36.9	1	2	5										Sat.	
Boring Terminated at Elevation -35.8 ft IN LOOSE SAND (UNDIVIDED COASTAL PLAIN)																
Other Samples: ST-7 (28.9 - 30.9)																

NCDOT BORE DOUBLE B4863_GEO_RWAL.GPJ NC_DOT.GDT 7/30/18



SUMMARY OF LABORATORY TEST DATA
Soil Classification and Gradation

S&ME, Inc. Raleigh, 3201 Spring Forest Road, Raleigh, North Carolina 27616

S&ME Project #: 6235-17-045 Date Report 1/29/2018
 State Project No.: 40212.1.1 County: Carteret Date Tested 1/19 - 1/29/18
 Federal ID No.: TIP No.: B-4863
 Project Name: Bridge No. 73 over the Straits at Harkers Island on SR 1535, Retaining Walls 1 and 2
 Client Name: NCDOT Geotechnical Engineering Unit Client Address: Raleigh, NC

Sample No.	Station #:	Offset	Alignment	Sample Depth (ft)	AASHTO Classification	Total % Passing					Total Mortar Fraction (%)				LL	PL	PI	Moist. %
						Sieve #					Coarse Sand	Fine Sand	Silt	Clay				
						10	40	60	200	270								
SS-66	12+06	31 RT	-RETWL1-	17.1-18.6	A-6 (11)	100	96	95	74.4	67.8	5	27	28	40	35	18	17	39.9
SS-80	11+06	49 RT	-RETWL1-	11.8-13.3	A-5 (2)	100	98	96	61.0	43.8	4	52	24	20	41	38	3	55.9
SS-81	14+93	16 LT	-RETWL1-	11.9-13.4	A-2-4 (0)	100	96	84	32.2	19.1	16	65	6	13	19	18	1	27.1
SS-82	14+93	16 LT	-RETWL1-	16.9-18.4	A-6 (9)	100	99	98	79.6	67.0	2	31	32	35	29	15	14	34.8
SS-83	14+93	16 LT	-RETWL1-	21.9-23.4	A-2-4 (0)	100	100	99	35.4	23.1	1	76	10	13	28	25	3	43.2
SS-84	10+57	2 LT	-RETWL1-	11.9-13.4	A-4 (0)	100	100	98	44.5	23.7	2	74	10	14	20	19	1	33.4
SS-85	10+57	2 LT	-RETWL1-	16.9-18.4	A-7-6 (15)	100	98	94	73.1	61.9	6	32	29	33	48	28	20	70.2
SS-86	13+61	43 RT	-RETWL1-	22.8-23.3	A-4 (1)	100	100	98	43.7	34.0	2	64	10	24	28	18	10	32.2
SS-87	13+61	43 RT	-RETWL1-	26.8-28.3	A-4 (1)	100	100	99	45.4	35.1	1	64	10	25	24	16	8	32.9
SS-88	13+61	43 RT	-RETWL1-	46.8-48.3	A-6 (10)	100	97	93	77.3	58.9	7	34	29	30	34	19	15	35.0
SS-89	13+61	43 RT	-RETWL1-	71.8-73.3	A-4 (0)	98	91	78	36.1	27.7	20	52	8	20	27	19	8	32.4
SS-94	11+03	2 RT	-RETWL2-	31.9-33.4	A-7-6 (17)	100	100	99	81.2	64.9	1	34	27	38	41	20	21	69.4
SS-95	11+50	2 RT	-RETWL2-	26.9-28.4	A-4 (3)	100	100	100	68.5	39.4	0	61	22	17	26	18	8	41.0
SS-96	10+48	12 RT	-RETWL2-	26.9-28.4	A-4 (4)	100	100	99	65.6	43.2	1	56	26	17	30	21	9	46.8
SS-97	10+48	12 RT	-RETWL2-	36.9-38.4	A-4 (0)	100	94	85	38.4	28.9	14	57	13	16	24	17	7	33.7
SS-98	10+48	12 RT	-RETWL2-	56.9-58.4	A-7-6 (23)	99	93	89	80.5	75.0	10	14	45	31	49	21	28	44.4
SS-99	10+48	12 RT	-RETWL2-	61.9-63.4	A-2-6 (0)	96	86	74	30.9	27.4	23	49	7	21	28	17	11	32.7

References / Comments / Deviations: ND=Not Determined, N.P.=Nonplastic.

AASHTO T88: Particle Size Analysis of Soils as Modified by the NCDOT AASHTO T89: Determining the Liquid Limit of Soils
 AASHTO T90: Determining the Plastic Limit & Plasticity Index of Soils AASHTO T265: Laboratory Determination of Moisture Content of Soils
 AASHTO M145: The Classification of Soils and Soil Aggregate Mixtures for Highway Construction Purposes

Mal Krajan, ET  104-01-0703 Robert E. Kral, PE Project Manager
 Technician Name: Signature Certification # Technical Responsibility: Position

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SUMMIT Engineering Laboratory & Testing, Inc.

COMPANY NAME AND CERTIFICATION NO. SUMMIT (119-0705)

NCDOT Project 40212.1.1 Tested By: F. Gonzalez

Project Name Bridge No. 73 on SR 1535 Checked By Mimi Hourani
Over the Straits @ Harkers Island

Client S&ME, Inc. - Charlotte Date: 2/12/2018

TEST RESULTS

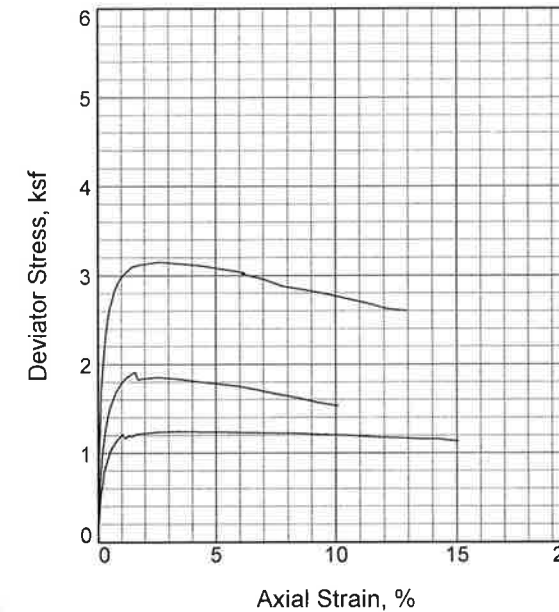
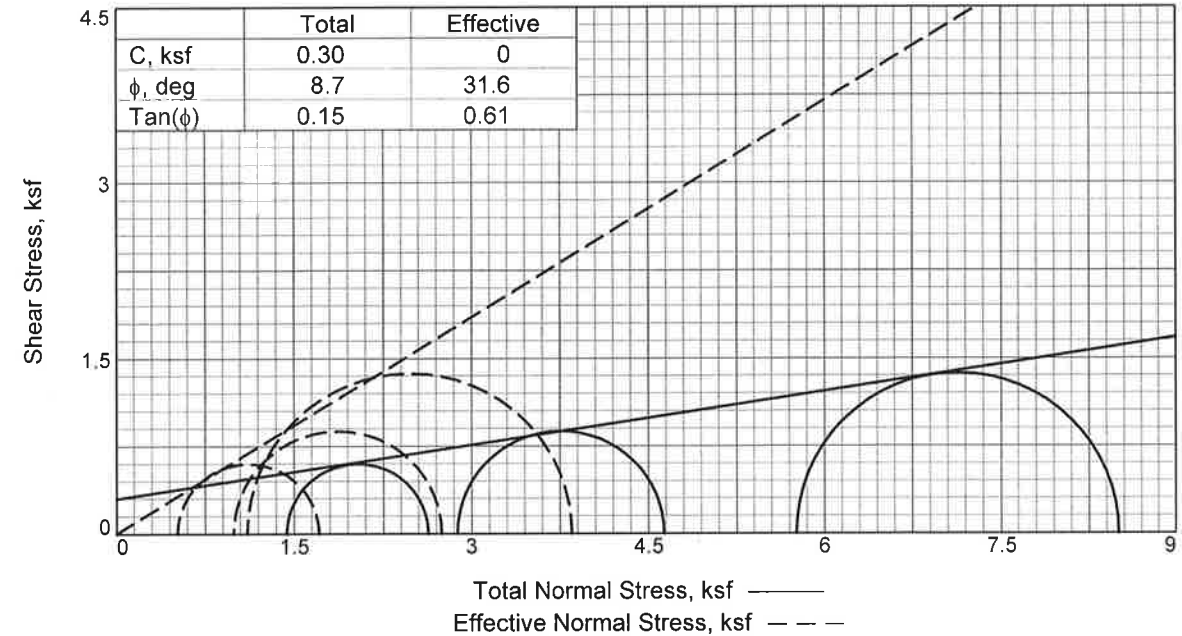
Boring No.	L_1825	L_1675	L_5130	L_5175	L_5075	L_1740
Station No.	12+57	11+05	11+03	11+50	10+48	14+93
Sample No.	ST-4	ST-5	ST-6	ST-7	ST-8	ST-3
Offset	22 RT	74 RT	2 RT	2 RT	12 RT	16 LT
Depth (ft)	11.0-13.0	7.0-9.0	33.9-35.9	28.9-30.9	33.9-35.9	18.9-20.9
Retained #4 Sieve %	0	0	0	0	0	0
Passing #10 Sieve %	100	100	100	100	100	100
Passing #40 Sieve %	100	100	100	100	99	99
Passing #200 Sieve %	44	32	45	60	56	59

MINUS NO. 10 FRACTION

SOIL MORTAR - 100%						
Coarse Sand Ret - #60 %	0.2	1.7	3.3	0.2	5.5	6.1
Fine Sand Ret - #270 %	62.8	74.7	70.3	53.9	55.7	41.9
Silt 0.05 - 0.005 mm %	10.7	6.7	13.4	26.6	23.3	22.6
Clay < 0.005 mm %	26.3	16.9	13.1	19.4	15.5	29.4
Passing #40 Sieve %	100.0	99.6	99.6	100.0	98.8	98.5
Passing #200 Sieve %	43.6	32.2	44.8	60.2	56.3	58.9

Liquid Limit	26	21	27	28	31	25
Plasticity Index	9	2	9	9	15	10
AASHTO Classification	A-4(1)	A-2-4(0)	A-4(1)	A-4(3)	A-6(5)	A-4(3)

Mimi Hourani
Lab Manager



Sample No.	1	2	3
Initial			
Water Content, %	34.0	38.8	35.4
Dry Density, pcf	87.3	81.3	85.1
Saturation, %	98.5	97.7	97.5
Void Ratio	0.9312	1.0726	0.9801
Diameter, in.	2.846	2.854	2.850
Height, in.	6.025	6.051	6.004
At Test			
Water Content, %	31.8	33.7	29.0
Dry Density, pcf	90.7	88.3	94.5
Saturation, %	100.0	100.0	100.0
Void Ratio	0.8586	0.9088	0.7835
Diameter, in.	2.805	2.767	2.757
Height, in.	5.969	5.927	5.780
Strain rate, %/min.	0.05	0.05	0.05
Back Pressure, psi	60.00	60.00	60.00
Cell Pressure, psi	70.00	80.00	100.00
Fail. Stress, ksf	1.19	1.75	2.74
Total Pore Pr., ksf	9.56	10.53	13.29
Ult. Stress, ksf			
Total Pore Pr., ksf			
$\bar{\sigma}_1$ Failure, ksf	1.71	2.74	3.85
$\bar{\sigma}_3$ Failure, ksf	0.52	0.99	1.11

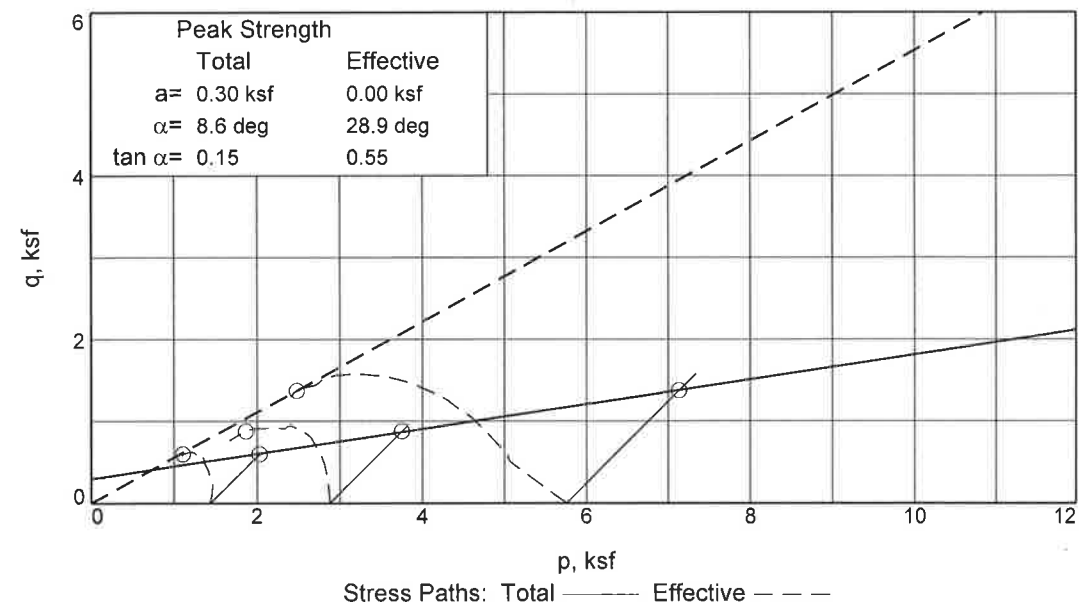
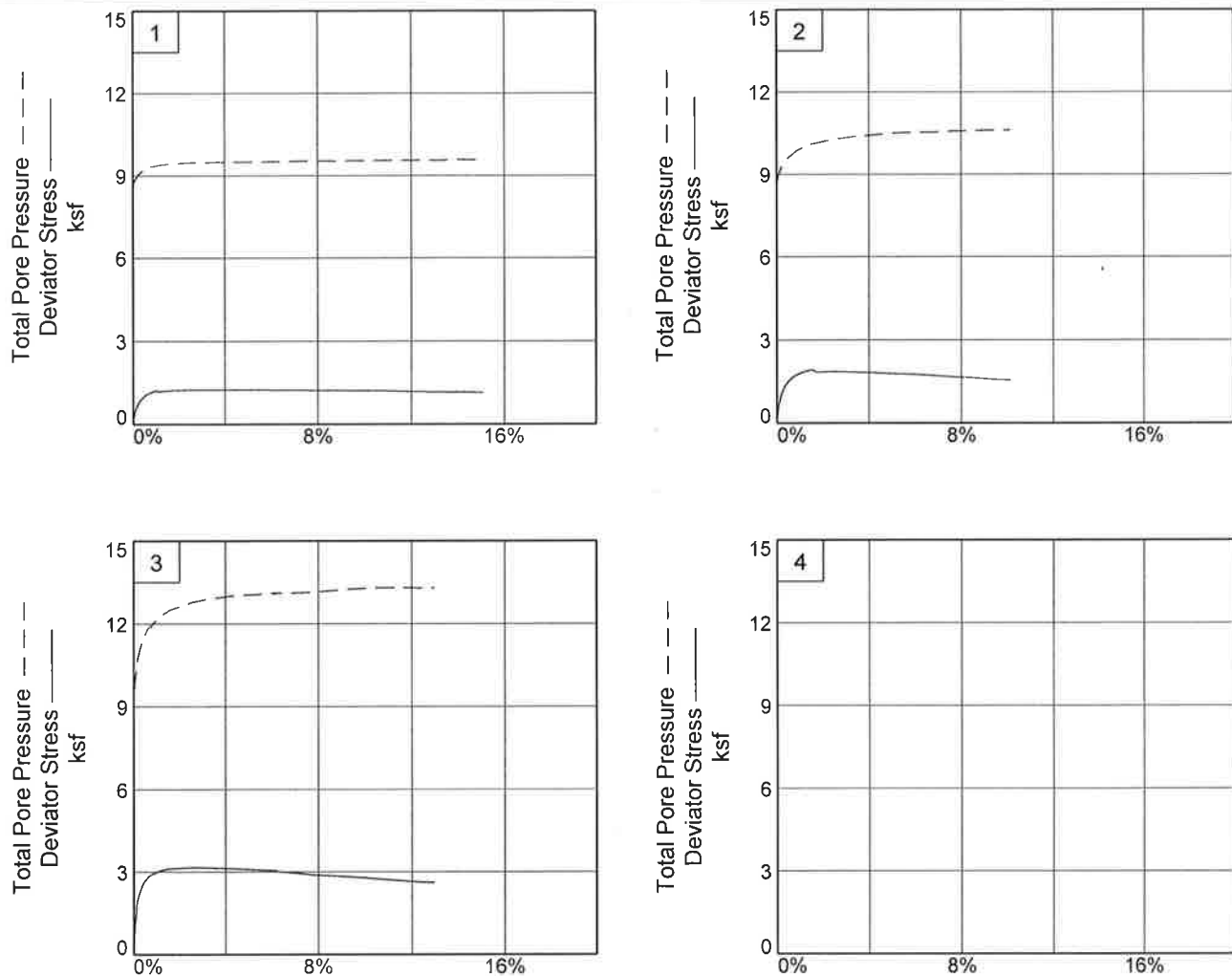
Type of Test: CU with Pore Pressures
Sample Type: Shelby Tube
Description: Grey Sandy Lean Clay
 LL= 25 PL= 15 PI= 10
Assumed Specific Gravity= 2.70
Remarks:

Client: S&ME, Inc. - Charlotte
Project: Bridge No. 73 on SR 1535 over
The Straits @ Harkers Island
Location: ST-3 UD @ 18.9'-20.9'
Proj. No.: 6235-17-045 **Date Sampled:** 02-15-18

TRIAXIAL SHEAR TEST REPORT
Summit Engineering
Ft. Mill, South Carolina

Figure _____

Tested By: FG Checked By: MH



Client: S&ME, Inc. - Charlotte
 Project: Bridge No. 73 on SR 1535 over
 Location: ST-3 UD @ 18.9'-20.9'
 Project No.: 6235-17-045

Figure _____ **Summit Engineering**

Tested By: FG Checked By: MH

TRIAxIAL COMPRESSION TEST
 CU with Pore Pressures

2/21/2018
 10:50 AM

Date: 02-15-18
 Client: S&ME, Inc. - Charlotte
 Project: Bridge No. 73 on SR 1535 over
 The Straits @ Harkers Island

Project No.: 6235-17-045
 Location: ST-3 UD @ 18.9'-20.9'
 Description: Grey Sandy Lean Clay

Remarks:
 Type of Sample: Shelby Tube
 Assumed Specific Gravity=2.70 LL=25 PL=15 PI=10
 Test Method: ASTM D 4767 Method B

Parameters for Specimen No. 1				
Specimen Parameter	Initial	Saturated	Consolidated	Final
Moisture content: Moist soil+tare, gms.	1176.340			1157.350
Moisture content: Dry soil+tare, gms.	878.120			878.120
Moisture content: Tare, gms.	0.000			0.000
Moisture, %	34.0	33.3	31.8	31.8
Moist specimen weight, gms.	1176.34			
Diameter, in.	2.846	2.824	2.805	
Area, in. ²	6.362	6.262	6.180	
Height, in.	6.025	6.018	5.969	
Net decrease in height, in.		0.007	0.049	
Net decrease in water volume, cc.			13.100	
Wet density, pcf	116.9	118.3	119.5	
Dry density, pcf	87.3	88.8	90.7	
Void ratio	0.9312	0.8988	0.8586	
Saturation, %	98.5	100.0	100.0	

Test Readings for Specimen No. 1

Membrane modulus = 0.124105 kN/cm²
 Membrane thickness = 0.02 cm
 Filter paper coefficient = 0.001926 kN/cm
 Filter paper coverage = 50%
 Consolidation cell pressure = 70.00 psi (10.08 ksf)
 Consolidation back pressure = 60.00 psi (8.64 ksf)
 Consolidation effective confining stress = 1.44 ksf
 Strain rate, %/min. = 0.05
 Fail. Stress = 1.19 ksf at reading no. 33

Summit Engineering

Test Readings for Specimen No. 1

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf	Minor Eff. Stress ksf	Major Eff. Stress ksf	1:3 Ratio	Pore Press. psi	P ksf	Q ksf
0	0.0000	0.0	0	0.0	0.00	1.44	1.44	1.00	60.00	1.44	0.00
1	0.0020	9.4	9	0.0	0.22	1.35	1.57	1.16	60.60	1.46	0.11
2	0.0030	12.0	12	0.1	0.28	1.32	1.60	1.21	60.80	1.46	0.14
3	0.0050	18.0	18	0.1	0.42	1.27	1.69	1.33	61.20	1.48	0.21
4	0.0090	25.3	25	0.2	0.59	1.15	1.74	1.51	62.00	1.45	0.29
5	0.0110	27.4	27	0.2	0.64	1.12	1.76	1.57	62.20	1.44	0.32
6	0.0150	33.3	33	0.3	0.77	1.04	1.81	1.75	62.80	1.42	0.39
7	0.0210	37.7	38	0.4	0.88	0.96	1.84	1.91	63.30	1.40	0.44
8	0.0260	41.0	41	0.4	0.95	0.91	1.86	2.05	63.70	1.38	0.48
9	0.0310	43.9	44	0.5	1.02	0.86	1.88	2.18	64.00	1.37	0.51
10	0.0360	46.0	46	0.6	1.07	0.84	1.90	2.28	64.20	1.37	0.53
11	0.0420	47.8	48	0.7	1.11	0.81	1.91	2.37	64.40	1.36	0.55
12	0.0470	49.3	49	0.8	1.14	0.78	1.92	2.47	64.60	1.35	0.57
13	0.0520	50.3	50	0.9	1.16	0.76	1.93	2.52	64.70	1.34	0.58
14	0.0570	51.5	52	1.0	1.19	0.75	1.94	2.59	64.80	1.34	0.59
15	0.0620	52.5	53	1.0	1.21	0.73	1.95	2.65	64.90	1.34	0.61
16	0.0680	53.4	53	1.1	1.16	0.72	1.88	2.62	65.00	1.30	0.58
17	0.0730	54.2	54	1.2	1.18	0.71	1.88	2.67	65.10	1.29	0.59
18	0.0780	55.1	55	1.3	1.19	0.69	1.88	2.73	65.20	1.29	0.60
19	0.0840	55.4	55	1.4	1.19	0.69	1.88	2.72	65.20	1.29	0.60
20	0.0890	55.5	56	1.5	1.19	0.68	1.87	2.76	65.30	1.27	0.59
21	0.0940	56.5	57	1.6	1.21	0.66	1.87	2.82	65.40	1.27	0.60
22	0.1000	57.1	57	1.7	1.21	0.66	1.87	2.83	65.40	1.27	0.61
23	0.1520	59.5	60	2.5	1.24	0.62	1.86	3.00	65.70	1.24	0.62
24	0.2040	60.2	60	3.4	1.24	0.60	1.85	3.05	65.80	1.22	0.62
25	0.2520	60.6	61	4.2	1.24	0.58	1.81	3.15	66.00	1.19	0.62
26	0.3040	61.2	61	5.1	1.24	0.58	1.81	3.15	66.00	1.20	0.62
27	0.3510	61.4	61	5.9	1.23	0.58	1.81	3.14	66.00	1.19	0.62
28	0.4040	61.8	62	6.8	1.23	0.56	1.79	3.19	66.10	1.18	0.61
29	0.4510	62.1	62	7.6	1.22	0.55	1.77	3.24	66.20	1.16	0.61
30	0.5040	62.5	63	8.4	1.22	0.55	1.77	3.23	66.20	1.16	0.61
31	0.5510	62.6	63	9.2	1.21	0.55	1.76	3.21	66.20	1.15	0.60
32	0.6040	62.9	63	10.1	1.20	0.53	1.74	3.26	66.30	1.13	0.60
33	0.6510	62.9	63	10.9	1.19	0.52	1.71	3.30	66.40	1.11	0.60
34	0.7040	62.9	63	11.8	1.18	0.52	1.70	3.27	66.40	1.11	0.59
35	0.7520	63.0	63	12.6	1.17	0.53	1.70	3.19	66.30	1.12	0.58
36	0.8040	63.1	63	13.5	1.16	0.52	1.68	3.23	66.40	1.10	0.58
37	0.8510	63.5	64	14.3	1.15	0.50	1.66	3.29	66.50	1.08	0.58
38	0.9000	63.0	63	15.1	1.13	0.52	1.65	3.18	66.40	1.08	0.57

Parameters for Specimen No. 2

Specimen Parameter	Initial	Saturated	Consolidated	Final
Moisture content: Moist soil+tare, gms.	1146.950			1104.480
Moisture content: Dry soil+tare, gms.	826.350			826.350
Moisture content: Tare, gms.	0.000			0.000
Moisture, %	38.8	38.0	33.7	33.7
Moist specimen weight, gms.	1146.95			
Diameter, in.	2.854	2.823	2.767	
Area, in. ²	6.397	6.258	6.015	
Height, in.	6.051	6.043	5.927	
Net decrease in height, in.		0.008	0.116	
Net decrease in water volume, cc.			35.500	
Wet density, pcf	112.9	114.8	118.0	
Dry density, pcf	81.3	83.2	88.3	
Void ratio	1.0726	1.0247	0.9088	
Saturation, %	97.7	100.0	100.0	

Test Readings for Specimen No. 2

Membrane modulus = 0.124105 kN/cm²
 Membrane thickness = 0.02 cm
 Filter paper coefficient = 0.001926 kN/cm
 Filter paper coverage = 50%
 Consolidation cell pressure = 80.00 psi (11.52 ksf)
 Consolidation back pressure = 60.00 psi (8.64 ksf)
 Consolidation effective confining stress = 2.88 ksf
 Strain rate, %/min. = 0.05
 Fail. Stress = 1.75 ksf at reading no. 25

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf	Minor Eff. Stress ksf	Major Eff. Stress ksf	1:3 Ratio	Pore Press. psi	P ksf	Q ksf
0	0.0000	0.0	0	0.0	0.00	2.88	2.88	1.00	60.00	2.88	0.00
1	0.0030	17.8	18	0.1	0.43	2.65	3.08	1.16	61.60	2.86	0.21
2	0.0050	25.6	26	0.1	0.61	2.55	3.16	1.24	62.30	2.85	0.31
3	0.0100	39.4	39	0.2	0.94	2.35	3.29	1.40	63.70	2.82	0.47
4	0.0150	48.1	48	0.3	1.15	2.20	3.35	1.52	64.70	2.78	0.57
5	0.0200	54.3	54	0.3	1.30	2.09	3.38	1.62	65.50	2.74	0.65
6	0.0250	59.2	59	0.4	1.41	2.00	3.41	1.71	66.10	2.71	0.71
7	0.0300	63.2	63	0.5	1.51	1.93	3.44	1.78	66.60	2.68	0.75
8	0.0360	66.4	66	0.6	1.58	1.87	3.45	1.84	67.00	2.66	0.79
9	0.0410	68.9	69	0.7	1.64	1.81	3.45	1.90	67.40	2.63	0.82
10	0.0460	71.1	71	0.8	1.69	1.76	3.45	1.96	67.80	2.60	0.84
11	0.0510	72.9	73	0.9	1.73	1.70	3.43	2.02	68.20	2.56	0.87
12	0.0560	74.5	75	0.9	1.77	1.66	3.42	2.07	68.50	2.54	0.88
13	0.0620	75.9	76	1.0	1.80	1.61	3.41	2.11	68.80	2.51	0.90
14	0.0670	77.2	77	1.1	1.83	1.58	3.41	2.15	69.00	2.50	0.91
15	0.0720	78.3	78	1.2	1.85	1.54	3.39	2.20	69.30	2.47	0.93
16	0.0780	79.0	79	1.3	1.87	1.51	3.38	2.23	69.50	2.45	0.93
17	0.0830	79.8	80	1.4	1.88	1.48	3.37	2.27	69.70	2.43	0.94
18	0.0890	80.5	81	1.5	1.90	1.45	3.35	2.31	69.90	2.40	0.95
19	0.0940	81.1	81	1.6	1.91	1.44	3.35	2.33	70.00	2.40	0.96
20	0.1000	81.9	82	1.7	1.83	1.43	3.25	2.28	70.10	2.34	0.91
21	0.1510	84.5	85	2.5	1.85	1.25	3.11	2.48	71.30	2.18	0.93

Test Readings for Specimen No. 2

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf	Minor Eff. Stress ksf	Major Eff. Stress ksf	1:3 Ratio	Pore Press. psi	P ksf	Q ksf
22	0.2040	84.3	84	3.4	1.83	1.15	2.98	2.59	72.00	2.07	0.92
23	0.2520	83.8	84	4.3	1.80	1.08	2.88	2.67	72.50	1.98	0.90
24	0.3040	83.5	84	5.1	1.78	1.02	2.80	2.74	72.90	1.91	0.89
25	0.3520	83.0	83	5.9	1.75	0.99	2.74	2.76	73.10	1.87	0.88
26	0.4040	81.8	82	6.8	1.71	0.98	2.69	2.74	73.20	1.83	0.85
27	0.4510	80.4	80	7.6	1.66	0.95	2.61	2.75	73.40	1.78	0.83
28	0.5000	79.2	79	8.4	1.62	0.94	2.55	2.73	73.50	1.75	0.81
29	0.5520	77.5	78	9.3	1.56	0.92	2.49	2.70	73.60	1.70	0.78
30	0.6000	76.5	77	10.1	1.53	0.91	2.44	2.68	73.70	1.67	0.76

Parameters for Specimen No. 3

Specimen Parameter	Initial	Saturated	Consolidated	Final
Moisture content: Moist soil+tare, gms.	1158.850			1104.230
Moisture content: Dry soil+tare, gms.	855.860			855.860
Moisture content: Tare, gms.	0.000			0.000
Moisture, %	35.4	35.0	29.0	29.0
Moist specimen weight, gms.	1158.85			
Diameter, in.	2.850	2.820	2.757	
Area, in. ²	6.379	6.248	5.969	
Height, in.	6.004	6.019	5.780	
Net decrease in height, in.		-0.015	0.239	
Net decrease in water volume, cc.			50.900	
Wet density, pcf	115.3	117.0	121.9	
Dry density, pcf	85.1	86.7	94.5	
Void ratio	0.9801	0.9441	0.7835	
Saturation, %	97.5	100.0	100.0	

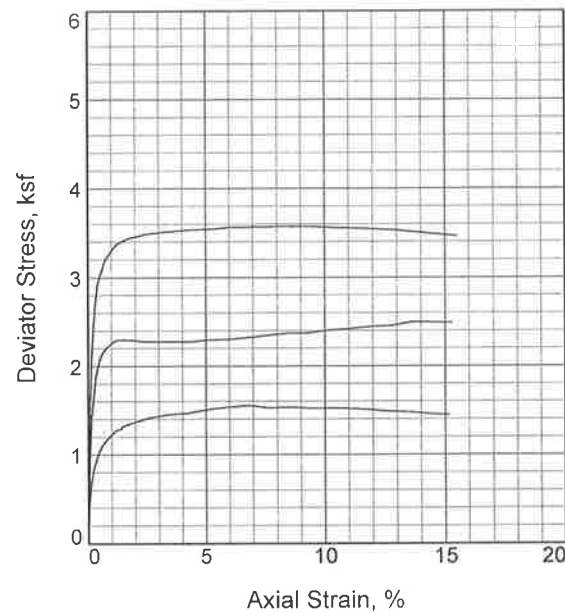
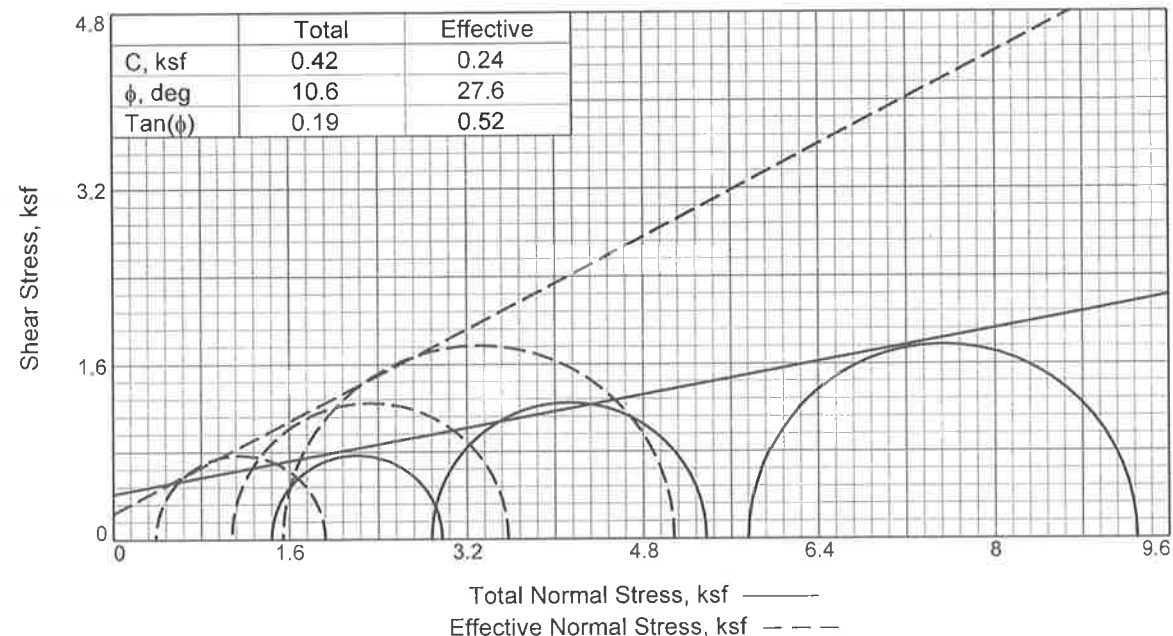
Test Readings for Specimen No. 3

Membrane modulus = 0.124105 kN/cm²
 Membrane thickness = 0.02 cm
 Filter paper coefficient = 0.001926 kN/cm
 Filter paper coverage = 50%
 Consolidation cell pressure = 100.00 psi (14.40 ksf)
 Consolidation back pressure = 60.00 psi (8.64 ksf)
 Consolidation effective confining stress = 5.76 ksf
 Strain rate, %/min. = 0.05
 Fail. Stress = 2.74 ksf at reading no. 30

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf	Minor Eff. Stress ksf	Major Eff. Stress ksf	1:3 Ratio	Pore Press. psi	P ksf	Q ksf
0	0.0000	0.0	0	0.0	0.00	5.76	5.76	1.00	60.00	5.76	0.00
1	0.0030	41.8	42	0.1	1.01	4.56	5.57	1.22	68.30	5.07	0.50
2	0.0050	49.8	50	0.1	1.20	4.42	5.62	1.27	69.30	5.02	0.60
3	0.0080	70.8	71	0.1	1.71	3.95	5.65	1.43	72.60	4.80	0.85
4	0.0140	86.7	87	0.2	2.09	3.56	5.64	1.59	75.30	4.60	1.04
5	0.0190	96.7	97	0.3	2.33	3.27	5.59	1.71	77.30	4.43	1.16
6	0.0240	104.6	105	0.4	2.51	3.05	5.57	1.82	78.80	4.31	1.26
7	0.0290	109.8	110	0.5	2.64	2.88	5.52	1.92	80.00	4.20	1.32
8	0.0350	113.8	114	0.6	2.73	2.72	5.45	2.00	81.10	4.09	1.36

Test Readings for Specimen No. 3

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf	Minor Eff. Stress ksf	Major Eff. Stress ksf	1:3 Ratio	Pore Press. psi	P ksf	Q ksf
9	0.0390	117.2	117	0.7	2.81	2.59	5.40	2.08	82.00	4.00	1.40
10	0.0450	120.0	120	0.8	2.87	2.49	5.36	2.15	82.70	3.93	1.44
11	0.0500	122.3	122	0.9	2.92	2.39	5.32	2.22	83.40	3.85	1.46
12	0.0560	124.1	124	1.0	2.96	2.32	5.28	2.28	83.90	3.80	1.48
13	0.0600	125.4	125	1.0	2.99	2.25	5.24	2.33	84.40	3.74	1.50
14	0.0660	126.6	127	1.1	3.02	2.19	5.21	2.38	84.80	3.70	1.51
15	0.0710	127.7	128	1.2	3.04	2.13	5.17	2.43	85.20	3.65	1.52
16	0.0770	128.7	129	1.3	3.06	2.07	5.14	2.48	85.60	3.61	1.53
17	0.0810	129.7	130	1.4	3.09	2.03	5.12	2.52	85.90	3.57	1.54
18	0.0870	130.4	130	1.5	3.10	1.99	5.09	2.56	86.20	3.54	1.55
19	0.0920	130.7	131	1.6	3.10	1.93	5.03	2.61	86.60	3.48	1.55
20	0.0980	131.3	131	1.7	3.11	1.90	5.01	2.64	86.80	3.46	1.56
21	0.1520	134.1	134	2.6	3.15	1.63	4.78	2.94	88.70	3.20	1.58
22	0.2030	134.4	134	3.5	3.13	1.48	4.61	3.11	89.70	3.05	1.56
23	0.2520	134.8	135	4.4	3.11	1.38	4.49	3.25	90.40	2.94	1.56
24	0.3600	133.8	134	6.2	3.03	1.31	4.34	3.31	90.90	2.82	1.51
25	0.3510	133.0	133	6.1	3.01	1.28	4.30	3.35	91.10	2.79	1.51
26	0.4030	131.8	132	7.0	2.96	1.28	4.24	3.31	91.10	2.76	1.48
27	0.4510	129.4	129	7.8	2.88	1.27	4.15	3.27	91.20	2.71	1.44
28	0.5030	128.8	129	8.7	2.84	1.20	4.03	3.37	91.70	2.61	1.42
29	0.5530	128.0	128	9.6	2.79	1.14	3.93	3.45	92.10	2.53	1.40
30	0.6030	126.9	127	10.4	2.74	1.11	3.85	3.47	92.30	2.48	1.37
31	0.6500	125.7	126	11.2	2.69	1.09	3.79	3.46	92.40	2.44	1.35
32	0.7000	123.9	124	12.1	2.63	1.11	3.74	3.37	92.30	2.42	1.31
33	0.7500	123.8	124	13.0	2.60	1.11	3.71	3.34	92.30	2.41	1.30



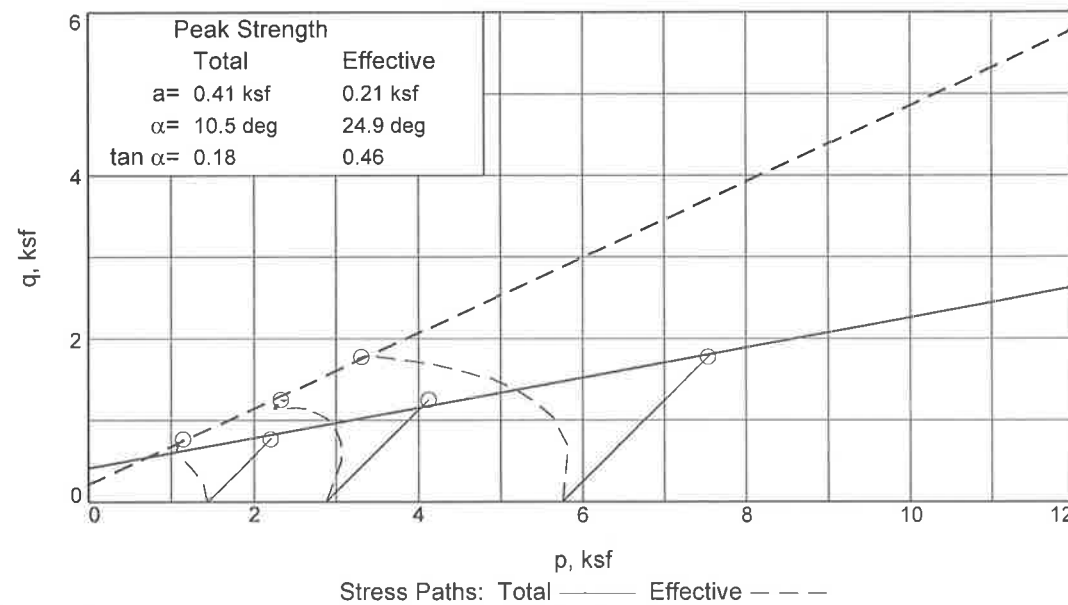
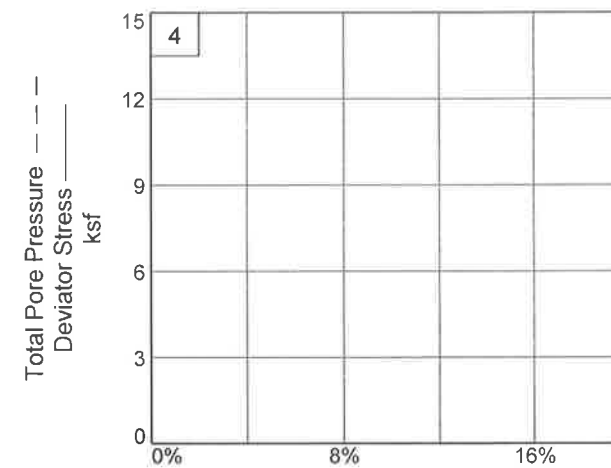
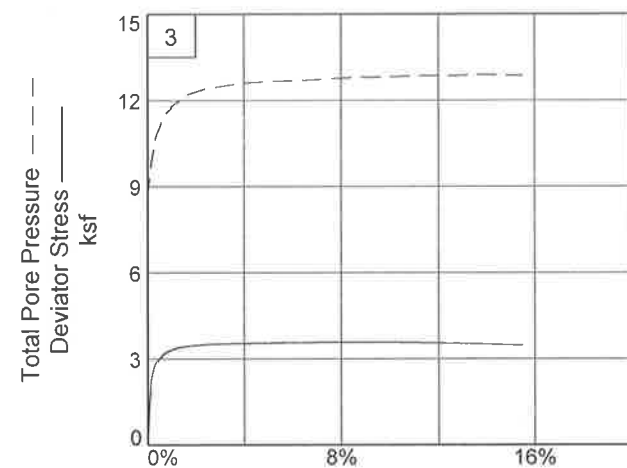
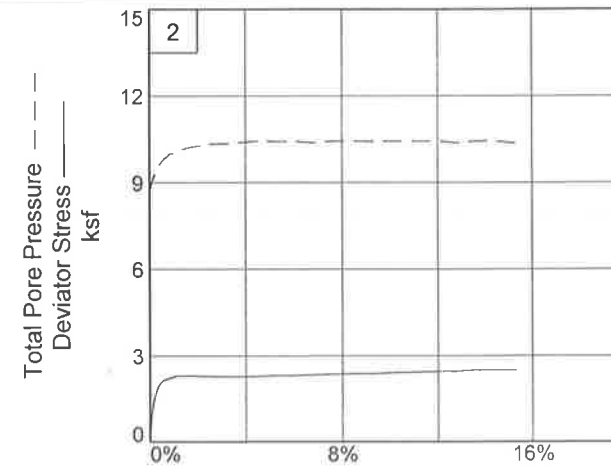
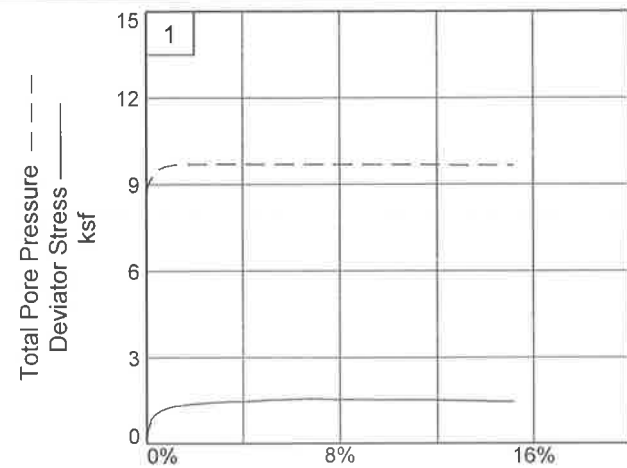
Sample No.	1	2	3
Initial			
Water Content, %	32.7	32.7	34.4
Dry Density, pcf	88.9	87.3	86.8
Saturation, %	98.5	94.8	98.5
Void Ratio	0.8950	0.9318	0.9420
Diameter, in.	2.874	2.867	2.876
Height, in.	5.985	5.981	5.970
At Test			
Water Content, %	28.1	28.5	28.3
Dry Density, pcf	95.9	95.3	95.5
Saturation, %	100.0	100.0	100.0
Void Ratio	0.7577	0.7692	0.7641
Diameter, in.	2.780	2.767	2.777
Height, in.	5.933	5.882	5.815
Strain rate, %/min.	0.07	0.05	0.05
Back Pressure, psi	60.00	60.00	60.00
Cell Pressure, psi	70.00	80.00	100.00
Fail. Stress, ksf	1.53	2.49	3.54
Total Pore Pr., ksf	9.69	10.44	12.86
Ult. Stress, ksf			
Total Pore Pr., ksf			
$\bar{\sigma}_1$ Failure, ksf	1.92	3.57	5.08
$\bar{\sigma}_3$ Failure, ksf	0.39	1.08	1.54

Type of Test: CU with Pore Pressures
Sample Type: Shelby Tube
Description: Grey-Brown Clayey Sand
 LL= 26 PL= 17 PI= 9
Assumed Specific Gravity= 2.70
Remarks:

Client: S&ME, Inc. - Charlotte
Project: Bridge No. 73 on SR 1535 over The Straits @ Harkers Island
Location: ST-4 UD @ 11.0'-13.0'
Proj. No.: 6235-17-045 **Date Sampled:** 01-24-18
TRIAXIAL SHEAR TEST REPORT
 Summit Engineering
 Ft. Mill, South Carolina

Figure _____

Tested By: FG Checked By: MH



Client: S&ME, Inc. - Charlotte
Project: Bridge No. 73 on SR 1535 over
Location: ST-4 UD @ 11.0'-13.0'
Project No.: 6235-17-045

Figure _____

Summit Engineering

Tested By: FG Checked By: MH

TRIAxIAL COMPRESSION TEST
CU with Pore Pressures

2/14/2018
10:56 AM

Date: 01-24-18
Client: S&ME, Inc. - Charlotte
Project: Bridge No. 73 on SR 1535 over
The Straits @ Harkers Island
Project No.: 6235-17-045
Location: ST-4 UD @ 11.0'-13.0'
Description: Grey-Brown Clayey Sand
Remarks:
Type of Sample: Shelby Tube
Assumed Specific Gravity=2.70 **LL=**26 **PL=**17 **PI=**9
Test Method: ASTM D 4767 Method B

Parameters for Specimen No. 1

Specimen Parameter	Initial	Saturated	Consolidated	Final
Moisture content: Moist soil+tare, gms.	1202.650			1160.930
Moisture content: Dry soil+tare, gms.	906.540			906.540
Moisture content: Tare, gms.	0.000			0.000
Moisture, %	32.7	30.1	28.1	28.1
Moist specimen weight, gms.	1202.65			
Diameter, in.	2.874	2.812	2.780	
Area, in. ²	6.487	6.212	6.070	
Height, in.	5.985	5.981	5.933	
Net decrease in height, in.		0.004	0.048	
Net decrease in water volume, cc.			18.700	
Wet density, pcf	118.0	121.0	122.8	
Dry density, pcf	88.9	93.0	95.9	
Void ratio	0.8950	0.8134	0.7577	
Saturation, %	98.5	100.0	100.0	

Test Readings for Specimen No. 1

Membrane modulus = 0.124105 kN/cm²
Membrane thickness = 0.02 cm
Consolidation cell pressure = 70.00 psi (10.08 ksf)
Consolidation back pressure = 60.00 psi (8.64 ksf)
Consolidation effective confining stress = 1.44 ksf
Strain rate, %/min. = 0.07
Fail. Stress = 1.53 ksf at reading no. 30

Test Readings for Specimen No. 1

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf	Minor Eff. Stress ksf	Major Eff. Stress ksf	1:3 Ratio	Pore Press. psi	P ksf	Q ksf
0	0.0000	0.0	0	0.0	0.00	1.44	1.44	1.00	60.00	1.44	0.00
1	0.0030	18.5	19	0.1	0.44	1.18	1.62	1.37	61.80	1.40	0.22
2	0.0050	21.5	22	0.1	0.51	1.12	1.63	1.45	62.20	1.38	0.25
3	0.0090	29.3	29	0.2	0.69	0.96	1.66	1.72	63.30	1.31	0.35
4	0.0140	34.7	35	0.2	0.82	0.85	1.67	1.97	64.10	1.26	0.41
5	0.0190	38.5	39	0.3	0.91	0.76	1.67	2.19	64.70	1.22	0.46
6	0.0240	41.5	42	0.4	0.98	0.69	1.67	2.42	65.20	1.18	0.49
7	0.0290	43.9	44	0.5	1.04	0.65	1.68	2.60	65.50	1.17	0.52
8	0.0340	45.7	46	0.6	1.08	0.59	1.67	2.83	65.90	1.13	0.54
9	0.0380	47.3	47	0.6	1.11	0.56	1.68	2.99	66.10	1.12	0.56
10	0.0440	48.7	49	0.7	1.15	0.53	1.68	3.15	66.30	1.11	0.57
11	0.0490	50.0	50	0.8	1.18	0.50	1.68	3.33	66.50	1.09	0.59
12	0.0530	50.9	51	0.9	1.20	0.49	1.69	3.44	66.60	1.09	0.60
13	0.0580	51.8	52	1.0	1.22	0.48	1.69	3.56	66.70	1.08	0.61
14	0.0640	53.1	53	1.1	1.25	0.46	1.71	3.70	66.80	1.08	0.62
15	0.0690	54.0	54	1.2	1.27	0.45	1.71	3.84	66.90	1.08	0.63
16	0.0730	54.5	55	1.2	1.28	0.43	1.71	3.96	67.00	1.07	0.64
17	0.0780	54.8	55	1.3	1.28	0.43	1.71	3.97	67.00	1.07	0.64
18	0.0840	55.1	55	1.4	1.29	0.43	1.72	3.98	67.00	1.08	0.64
19	0.0860	56.3	56	1.4	1.32	0.43	1.75	4.05	67.00	1.09	0.66
20	0.0940	56.9	57	1.6	1.33	0.42	1.75	4.18	67.10	1.08	0.66
21	0.0960	57.1	57	1.6	1.33	0.42	1.75	4.19	67.10	1.08	0.67
22	0.1030	57.8	58	1.7	1.35	0.40	1.75	4.34	67.20	1.08	0.67
23	0.1510	61.0	61	2.5	1.41	0.39	1.80	4.63	67.30	1.09	0.71
24	0.2010	63.3	63	3.4	1.45	0.37	1.83	4.88	67.40	1.10	0.73
25	0.2530	64.6	65	4.3	1.47	0.39	1.86	4.77	67.30	1.12	0.73
26	0.3010	66.9	67	5.1	1.51	0.39	1.90	4.87	67.30	1.14	0.75
27	0.3510	68.7	69	5.9	1.53	0.39	1.92	4.94	67.30	1.16	0.77
28	0.4040	70.3	70	6.8	1.55	0.40	1.96	4.85	67.20	1.18	0.78
29	0.4520	69.7	70	7.6	1.53	0.39	1.92	4.93	67.30	1.15	0.76
30	0.5020	70.6	71	8.5	1.53	0.39	1.92	4.94	67.30	1.16	0.77
31	0.5540	70.7	71	9.3	1.52	0.40	1.92	4.77	67.20	1.16	0.76
32	0.6040	71.4	71	10.2	1.52	0.40	1.92	4.77	67.20	1.16	0.76
33	0.6500	71.9	72	11.0	1.52	0.40	1.92	4.77	67.20	1.16	0.76
34	0.7050	71.9	72	11.9	1.50	0.40	1.91	4.73	67.20	1.15	0.75
35	0.7500	71.8	72	12.6	1.49	0.42	1.91	4.56	67.10	1.16	0.74
36	0.8050	71.9	72	13.6	1.47	0.42	1.89	4.53	67.10	1.15	0.74
37	0.8500	71.7	72	14.3	1.46	0.42	1.87	4.49	67.10	1.15	0.73
38	0.9000	71.8	72	15.2	1.44	0.42	1.86	4.46	67.10	1.14	0.72

Parameters for Specimen No. 2

Specimen Parameter	Initial	Saturated	Consolidated	Final
Moisture content: Moist soil+tare, gms.	1173.720			1136.280
Moisture content: Dry soil+tare, gms.	884.350			884.350
Moisture content: Tare, gms.	0.000			0.000
Moisture, %	32.7	32.7	28.5	28.5
Moist specimen weight, gms.	1173.72			
Diameter, in.	2.867	2.829	2.767	
Area, in. ²	6.456	6.288	6.012	
Height, in.	5.981	5.982	5.882	
Net decrease in height, in.		-0.001	0.100	
Net decrease in water volume, cc.			36.900	
Wet density, pcf	115.8	118.8	122.4	
Dry density, pcf	87.3	89.6	95.3	
Void ratio	0.9318	0.8818	0.7692	
Saturation, %	94.8	100.0	100.0	

Test Readings for Specimen No. 2

Membrane modulus = 0.124105 kN/cm²
 Membrane thickness = 0.02 cm
 Consolidation cell pressure = 80.00 psi (11.52 ksf)
 Consolidation back pressure = 60.00 psi (8.64 ksf)
 Consolidation effective confining stress = 2.88 ksf
 Strain rate, %/min. = 0.05
 Fail. Stress = 2.49 ksf at reading no. 33

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf	Minor Eff. Stress ksf	Major Eff. Stress ksf	1:3 Ratio	Pore Press. psi	P ksf	Q ksf
0	0.0000	0.0	0	0.0	0.00	2.88	2.88	1.00	60.00	2.88	0.00
1	0.0050	40.4	40	0.1	0.97	2.58	3.54	1.38	62.10	3.06	0.48
2	0.0100	59.7	60	0.2	1.43	2.35	3.77	1.61	63.70	3.06	0.71
3	0.0160	71.2	71	0.3	1.70	2.16	3.86	1.79	65.00	3.01	0.85
4	0.0200	78.7	79	0.3	1.88	2.02	3.89	1.93	66.00	2.96	0.94
5	0.0260	84.1	84	0.4	2.01	1.90	3.91	2.06	66.80	2.90	1.00
6	0.0310	87.5	88	0.5	2.08	1.80	3.88	2.16	67.50	2.84	1.04
7	0.0360	89.8	90	0.6	2.14	1.73	3.87	2.24	68.00	2.80	1.07
8	0.0420	91.6	92	0.7	2.18	1.66	3.83	2.32	68.50	2.75	1.09
9	0.0470	92.9	93	0.8	2.21	1.60	3.81	2.38	68.90	2.70	1.10
10	0.0520	93.6	94	0.9	2.22	1.56	3.78	2.43	69.20	2.67	1.11
11	0.0580	95.0	95	1.0	2.25	1.56	3.81	2.45	69.20	2.68	1.13
12	0.0630	95.9	96	1.1	2.27	1.50	3.77	2.52	69.60	2.63	1.14
13	0.0680	96.5	97	1.2	2.28	1.44	3.72	2.59	70.00	2.58	1.14
14	0.0730	96.9	97	1.2	2.29	1.41	3.70	2.62	70.20	2.56	1.15
15	0.0780	97.1	97	1.3	2.29	1.38	3.68	2.66	70.40	2.53	1.15
16	0.0840	97.1	97	1.4	2.29	1.37	3.66	2.68	70.50	2.51	1.15
17	0.0890	97.4	97	1.5	2.30	1.34	3.64	2.72	70.70	2.49	1.15
18	0.0950	97.4	97	1.6	2.30	1.32	3.62	2.73	70.80	2.47	1.15
19	0.1000	97.4	97	1.7	2.29	1.31	3.60	2.75	70.90	2.46	1.15
20	0.1520	97.4	97	2.6	2.27	1.20	3.47	2.90	71.70	2.33	1.14
21	0.2040	98.5	99	3.5	2.28	1.17	3.44	2.95	71.90	2.31	1.14
22	0.2520	99.2	99	4.3	2.27	1.11	3.38	3.05	72.30	2.25	1.14
23	0.3010	100.9	101	5.1	2.29	1.09	3.39	3.10	72.40	2.24	1.15

Test Readings for Specimen No. 2

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf	Minor Eff. Stress ksf	Major Eff. Stress ksf	1:3 Ratio	Pore Press. psi	P ksf	Q ksf
24	0.3520	102.3	102	6.0	2.30	1.09	3.40	3.11	72.40	2.25	1.15
25	0.4050	104.2	104	6.9	2.32	1.15	3.48	3.02	72.00	2.31	1.16
26	0.4520	106.2	106	7.7	2.35	1.08	3.43	3.17	72.50	2.25	1.17
27	0.5000	108.2	108	8.5	2.37	1.08	3.45	3.20	72.50	2.27	1.19
28	0.5520	109.4	109	9.4	2.37	1.11	3.48	3.14	72.30	2.30	1.19
29	0.6000	111.9	112	10.2	2.41	1.08	3.49	3.23	72.50	2.28	1.20
30	0.6520	113.7	114	11.1	2.42	1.08	3.50	3.24	72.50	2.29	1.21
31	0.7000	115.7	116	11.9	2.44	1.08	3.52	3.26	72.50	2.30	1.22
32	0.7520	117.4	117	12.8	2.45	1.15	3.60	3.13	72.00	2.38	1.23
33	0.8030	120.6	121	13.7	2.49	1.08	3.57	3.31	72.50	2.33	1.25
34	0.8520	121.6	122	14.5	2.49	1.09	3.59	3.28	72.40	2.34	1.25
35	0.9000	122.5	123	15.3	2.49	1.17	3.65	3.13	71.90	2.41	1.24

Parameters for Specimen No. 3

Specimen Parameter	Initial	Saturated	Consolidated	Final
Moisture content: Moist soil+tare, gms.	1187.250			1133.650
Moisture content: Dry soil+tare, gms.	883.590			883.590
Moisture content: Tare, gms.	0.000			0.000
Moisture, %	34.4	34.2	28.3	28.3
Moist specimen weight, gms.	1187.25			
Diameter, in.	2.876	2.863	2.777	
Area, in. ²	6.496	6.437	6.058	
Height, in.	5.970	5.969	5.815	
Net decrease in height, in.		0.001	0.154	
Net decrease in water volume, cc.			52.300	
Wet density, pcf	116.6	117.6	122.6	
Dry density, pcf	86.8	87.6	95.5	
Void ratio	0.9420	0.9239	0.7641	
Saturation, %	98.5	100.0	100.0	

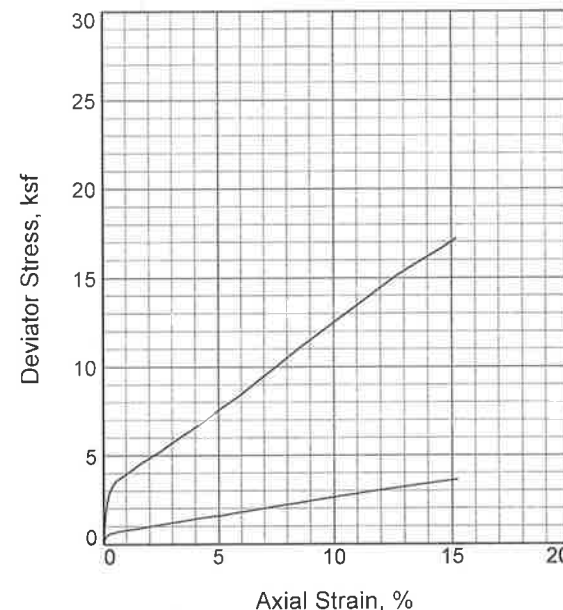
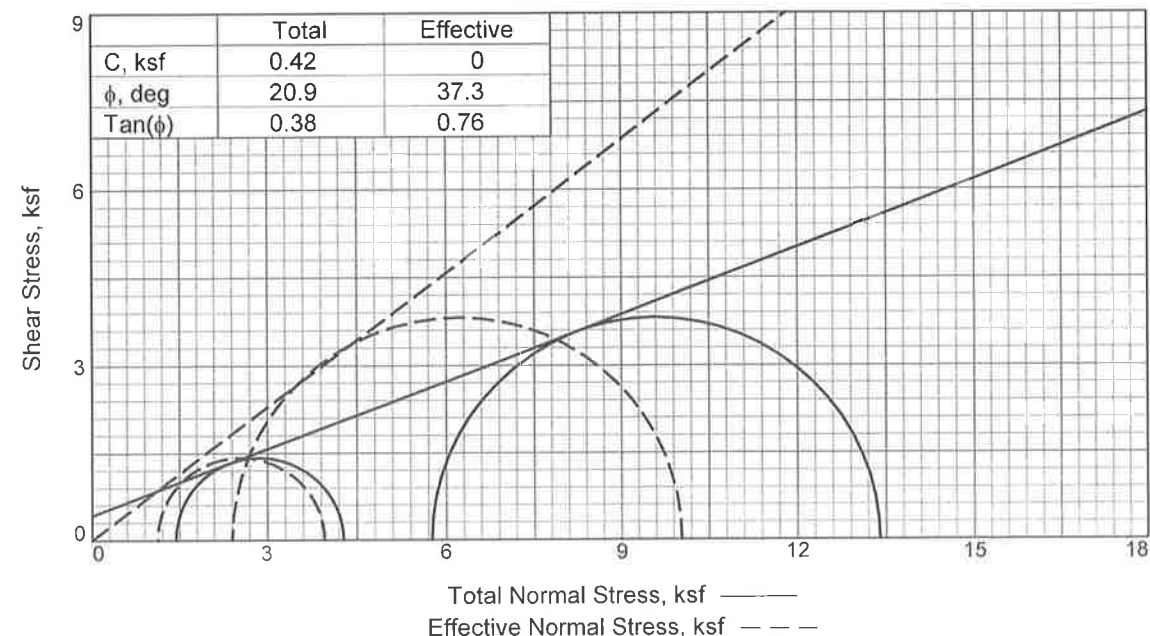
Test Readings for Specimen No. 3

Membrane modulus = 0.124105 kN/cm²
 Membrane thickness = 0.02 cm
 Consolidation cell pressure = 100.00 psi (14.40 ksf)
 Consolidation back pressure = 60.00 psi (8.64 ksf)
 Consolidation effective confining stress = 5.76 ksf
 Strain rate, %/min. = 0.05
 Fail. Stress = 3.54 ksf at reading no. 32

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf	Minor Eff. Stress ksf	Major Eff. Stress ksf	1:3 Ratio	Pore Press. psi	P ksf	Q ksf
0	0.0000	0.0	0	0.0	0.00	5.76	5.76	1.00	60.00	5.76	0.00
1	0.0050	57.4	57	0.1	1.36	5.14	6.50	1.27	64.30	5.82	0.68
2	0.0090	87.0	87	0.2	2.06	4.61	6.67	1.45	68.00	5.64	1.03
3	0.0140	103.9	104	0.2	2.46	4.18	6.64	1.59	71.00	5.41	1.23
4	0.0190	114.9	115	0.3	2.72	3.84	6.57	1.71	73.30	5.21	1.36
5	0.0240	122.4	122	0.4	2.90	3.57	6.47	1.81	75.20	5.02	1.45
6	0.0300	127.8	128	0.5	3.02	3.37	6.39	1.90	76.60	4.88	1.51
7	0.0350	130.3	130	0.6	3.08	3.18	6.26	1.97	77.90	4.72	1.54

Test Readings for Specimen No. 3

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf	Minor Eff. Stress ksf	Major Eff. Stress ksf	1:3 Ratio	Pore Press. psi	P ksf	Q ksf
8	0.0390	133.6	134	0.7	3.15	3.04	6.19	2.04	78.90	4.62	1.58
9	0.0440	136.0	136	0.8	3.21	2.91	6.12	2.10	79.80	4.51	1.60
10	0.0500	137.6	138	0.9	3.24	2.81	6.05	2.15	80.50	4.43	1.62
11	0.0580	139.6	140	1.0	3.28	2.71	5.99	2.21	81.20	4.35	1.64
12	0.0600	141.0	141	1.0	3.32	2.62	5.94	2.27	81.80	4.28	1.66
13	0.0660	142.4	142	1.1	3.35	2.55	5.90	2.31	82.30	4.22	1.67
14	0.0710	143.5	144	1.2	3.37	2.48	5.85	2.36	82.80	4.16	1.68
15	0.0770	144.4	144	1.3	3.39	2.43	5.82	2.39	83.10	4.13	1.69
16	0.0810	145.1	145	1.4	3.40	2.38	5.78	2.43	83.50	4.08	1.70
17	0.0870	145.5	146	1.5	3.41	2.33	5.74	2.46	83.80	4.04	1.70
18	0.0920	146.3	146	1.6	3.42	2.29	5.71	2.49	84.10	4.00	1.71
19	0.0980	146.9	147	1.7	3.43	2.25	5.68	2.53	84.40	3.96	1.72
20	0.1020	147.4	147	1.8	3.44	2.20	5.65	2.56	84.70	3.92	1.72
21	0.1500	150.8	151	2.6	3.49	1.99	5.48	2.76	86.20	3.73	1.75
22	0.2020	153.3	153	3.5	3.52	1.86	5.37	2.89	87.10	3.62	1.76
23	0.2500	155.3	155	4.3	3.53	1.79	5.32	2.98	87.60	3.55	1.77
24	0.3000	157.1	157	5.2	3.54	1.74	5.28	3.03	87.90	3.51	1.77
25	0.3520	159.6	160	6.1	3.56	1.71	5.28	3.08	88.10	3.50	1.78
26	0.4040	161.2	161	6.9	3.57	1.68	5.25	3.12	88.30	3.47	1.78
27	0.4520	162.9	163	7.8	3.57	1.64	5.21	3.18	88.60	3.43	1.79
28	0.5040	164.7	165	8.7	3.58	1.61	5.19	3.22	88.80	3.40	1.79
29	0.5520	166.0	166	9.5	3.57	1.60	5.17	3.23	88.90	3.38	1.79
30	0.6050	167.2	167	10.4	3.56	1.57	5.13	3.27	89.10	3.35	1.78
31	0.6520	168.4	168	11.2	3.55	1.56	5.11	3.29	89.20	3.33	1.78
32	0.7030	169.5	170	12.1	3.54	1.54	5.08	3.30	89.30	3.31	1.77
33	0.7500	170.6	171	12.9	3.53	1.54	5.07	3.29	89.30	3.31	1.77
34	0.8050	171.2	171	13.8	3.51	1.51	5.02	3.32	89.50	3.26	1.75
35	0.8510	171.7	172	14.6	3.48	1.53	5.01	3.28	89.40	3.27	1.74
36	0.9020	172.4	172	15.5	3.46	1.53	4.99	3.27	89.40	3.26	1.73



Sample No.	1	2
Initial		
Water Content, %	27.0	25.5
Dry Density, pcf	96.4	99.1
Saturation, %	97.5	98.5
Void Ratio	0.7488	0.7002
Diameter, in.	2.874	2.867
Height, in.	6.022	5.985
At Test		
Water Content, %	22.0	20.5
Dry Density, pcf	105.8	108.5
Saturation, %	100.0	100.0
Void Ratio	0.5935	0.5529
Diameter, in.	2.767	2.751
Height, in.	5.919	5.936
Strain rate, %/min.	0.07	0.07
Back Pressure, psi	60.00	60.00
Cell Pressure, psi	70.00	100.00
Fail. Stress, ksf	2.8	7.6
Total Pore Pr., ksf	9.0	12.0
Ult. Stress, ksf		
Total Pore Pr., ksf		
σ_1 Failure, ksf	4.0	10.0
σ_3 Failure, ksf	1.1	2.4

Type of Test: CU with Pore Pressures
Sample Type: Shelby Tube
Description: Grey Silty Sand
LL= 21 PL= 19 PI= 2
Assumed Specific Gravity= 2.70
Remarks:

Client: S&ME, Inc. - Charlotte

Project: Bridge No. 73 on SR 1535 over The Straits @ Harkers Island
Location: ST-5 UD @ 7.0'-9.0'

Proj. No.: 6235-17-045 **Date Sampled:** 01-24-18

TRIAXIAL SHEAR TEST REPORT
 Summit Engineering
 Ft. Mill, South Carolina

Figure _____

TRIAxIAL COMPRESSION TEST
CU with Pore Pressures

2/14/2018
1:59 PM

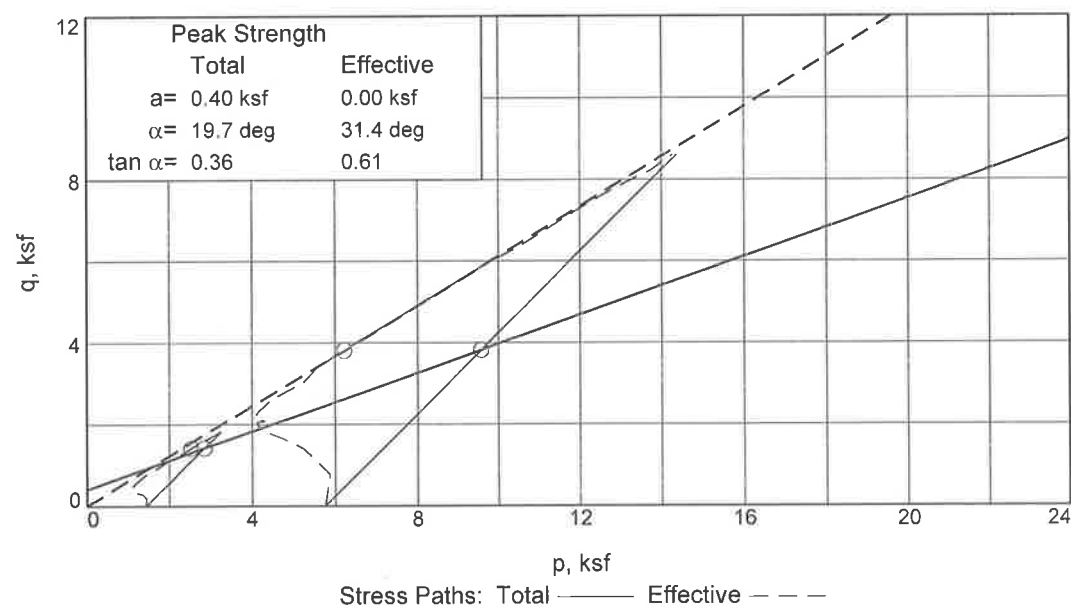
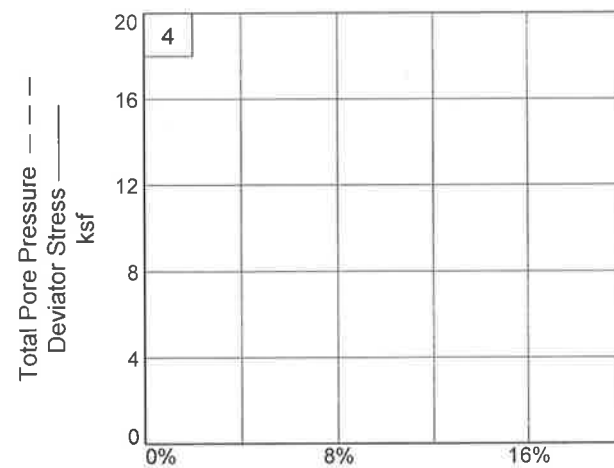
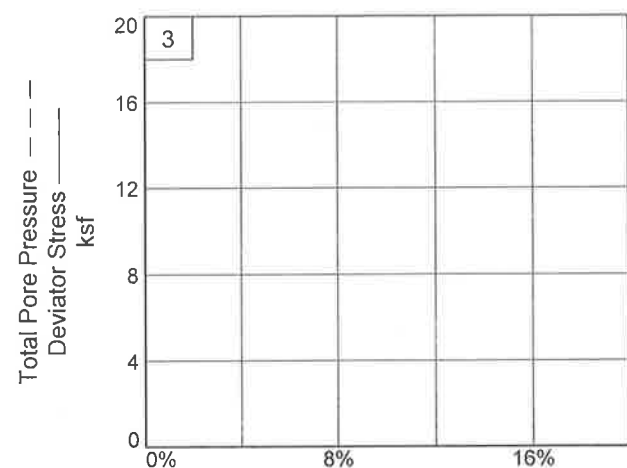
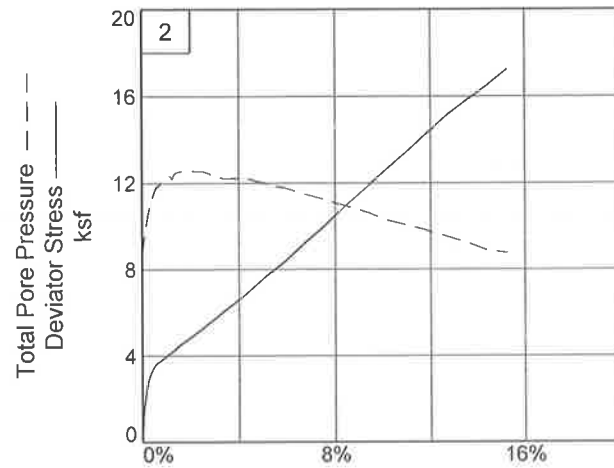
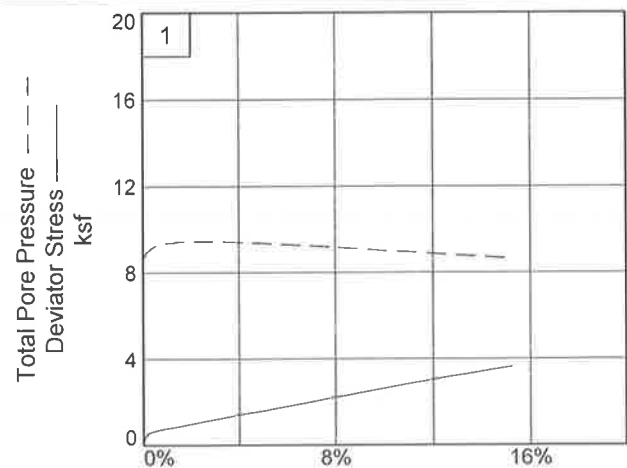
Date: 01-24-18
Client: S&ME, Inc. - Charlotte
Project: Bridge No. 73 on SR 1535 over
The Straits @ Harkers Island
Project No.: 6235-17-045
Location: ST-5 UD @ 7.0'-9.0'
Description: Grey Silty Sand
Remarks:
Type of Sample: Shelby Tube
Assumed Specific Gravity=2.70 **LL=**21 **PL=**19 **PI=**2
Test Method: ASTM D 4767 Method B

Parameters for Specimen No. 1

Specimen Parameter	Initial	Saturated	Consolidated	Final
Moisture content: Moist soil+tare, gms.	1255.680			1205.670
Moisture content: Dry soil+tare, gms.	988.410			988.410
Moisture content: Tare, gms.	0.000			0.000
Moisture, %	27.0	23.5	22.0	22.0
Moist specimen weight, gms.	1255.68			
Diameter, in.	2.874	2.787	2.767	
Area, in. ²	6.487	6.100	6.014	
Height, in.	6.022	5.991	5.919	
Net decrease in height, in.		0.031	0.072	
Net decrease in water volume, cc.			15.500	
Wet density, pcf	122.4	127.3	129.0	
Dry density, pcf	96.4	103.0	105.8	
Void ratio	0.7488	0.6358	0.5935	
Saturation, %	97.5	100.0	100.0	

Test Readings for Specimen No. 1

Membrane modulus = 0.124105 kN/cm²
 Membrane thickness = 0.02 cm
 Consolidation cell pressure = 70.00 psi (10.08 ksf)
 Consolidation back pressure = 60.00 psi (8.64 ksf)
 Consolidation effective confining stress = 1.44 ksf
 Strain rate, %/min. = 0.07
 Fail. Stress = 2.83 ksf at reading no. 30



Client: S&ME, Inc. - Charlotte
Project: Bridge No. 73 on SR 1535 over
Location: ST-5 UD @ 7.0'-9.0'
Project No.: 6235-17-045

Figure _____

Summit Engineering

Tested By: FG Checked By: MH

Summit Engineering

Test Readings for Specimen No. 1

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf	Minor Eff. Stress ksf	Major Eff. Stress ksf	1:3 Ratio	Pore Press. psi	P ksf	Q ksf
0	0.0000	0.0	0	0.0	0.00	1.44	1.44	1.00	60.00	1.44	0.00
1	0.0050	16.1	16	0.1	0.39	1.27	1.65	1.30	61.20	1.46	0.19
2	0.0110	20.9	21	0.2	0.50	1.15	1.65	1.43	62.00	1.40	0.25
3	0.0160	23.7	24	0.3	0.57	1.08	1.65	1.52	62.50	1.36	0.28
4	0.0200	25.0	25	0.3	0.60	1.01	1.60	1.59	63.00	1.31	0.30
5	0.0260	26.4	26	0.4	0.63	0.94	1.57	1.67	63.50	1.25	0.31
6	0.0320	27.8	28	0.5	0.66	0.88	1.54	1.75	63.90	1.21	0.33
7	0.0370	29.0	29	0.6	0.69	0.84	1.53	1.83	64.20	1.18	0.35
8	0.0430	30.2	30	0.7	0.72	0.81	1.52	1.89	64.40	1.17	0.36
9	0.0490	31.1	31	0.8	0.74	0.76	1.50	1.97	64.70	1.13	0.37
10	0.0540	32.0	32	0.9	0.76	0.75	1.51	2.01	64.80	1.13	0.38
11	0.0590	32.9	33	1.0	0.78	0.72	1.50	2.08	65.00	1.11	0.39
12	0.0640	33.5	34	1.1	0.79	0.71	1.50	2.12	65.10	1.10	0.40
13	0.0690	34.3	34	1.2	0.81	0.69	1.50	2.17	65.20	1.10	0.41
14	0.0750	35.0	35	1.3	0.83	0.69	1.52	2.20	65.20	1.10	0.41
15	0.0800	35.7	36	1.4	0.84	0.69	1.53	2.22	65.20	1.11	0.42
16	0.0850	36.4	36	1.4	0.86	0.66	1.52	2.30	65.40	1.09	0.43
17	0.0910	37.0	37	1.5	0.87	0.66	1.53	2.32	65.40	1.10	0.44
18	0.0960	37.9	38	1.6	0.89	0.65	1.54	2.38	65.50	1.09	0.45
19	0.1010	38.6	39	1.7	0.91	0.65	1.56	2.40	65.50	1.10	0.45
20	0.1530	47.4	47	2.6	1.11	0.63	1.74	2.74	65.60	1.19	0.55
21	0.2000	54.7	55	3.4	1.27	0.65	1.91	2.95	65.50	1.28	0.63
22	0.2530	63.9	64	4.3	1.46	0.68	2.14	3.16	65.30	1.41	0.73
23	0.3000	70.5	71	5.1	1.60	0.72	2.32	3.23	65.00	1.52	0.80
24	0.3530	79.5	80	6.0	1.79	0.78	2.57	3.30	64.60	1.67	0.90
25	0.4010	87.4	87	6.8	1.95	0.84	2.79	3.34	64.20	1.81	0.98
26	0.4530	97.1	97	7.7	2.15	0.89	3.04	3.40	63.80	1.97	1.07
27	0.5000	104.7	105	8.4	2.30	0.95	3.25	3.41	63.40	2.10	1.15
28	0.5520	114.7	115	9.3	2.49	1.01	3.50	3.47	63.00	2.25	1.25
29	0.6040	124.1	124	10.2	2.67	1.09	3.76	3.44	62.40	2.43	1.33
30	0.6520	133.0	133	11.0	2.83	1.12	3.96	3.52	62.20	2.54	1.42
31	0.7040	142.6	143	11.9	3.01	1.20	4.20	3.52	61.70	2.70	1.50
32	0.7500	151.2	151	12.7	3.16	1.25	4.41	3.52	61.30	2.83	1.58
33	0.8030	160.4	160	13.6	3.32	1.32	4.64	3.51	60.80	2.98	1.66
34	0.8510	169.2	169	14.4	3.47	1.38	4.85	3.51	60.40	3.12	1.73
35	0.9030	178.8	179	15.3	3.63	1.44	5.07	3.52	60.00	3.25	1.81

Parameters for Specimen No. 2

Specimen Parameter	Initial	Saturated	Consolidated	Final
Moisture content: Moist soil+tare, gms.	1262.360			1211.380
Moisture content: Dry soil+tare, gms.	1005.470			1005.470
Moisture content: Tare, gms.	0.000			0.000
Moisture, %	25.5	23.3	20.5	20.5
Moist specimen weight, gms.	1262.36			
Diameter, in.	2.867	2.808	2.751	
Area, in. ²	6.456	6.193	5.945	
Height, in.	5.985	5.982	5.936	
Net decrease in height, in.		0.003	0.046	
Net decrease in water volume, cc.			28.800	
Wet density, pcf	124.5	127.5	130.8	
Dry density, pcf	99.1	103.4	108.5	
Void ratio	0.7002	0.6303	0.5529	
Saturation, %	98.5	100.0	100.0	

Test Readings for Specimen No. 2

Membrane modulus = 0.124105 kN/cm²

Membrane thickness = 0.02 cm

Consolidation cell pressure = 100.00 psi (14.40 ksf)

Consolidation back pressure = 60.00 psi (8.64 ksf)

Consolidation effective confining stress = 5.76 ksf

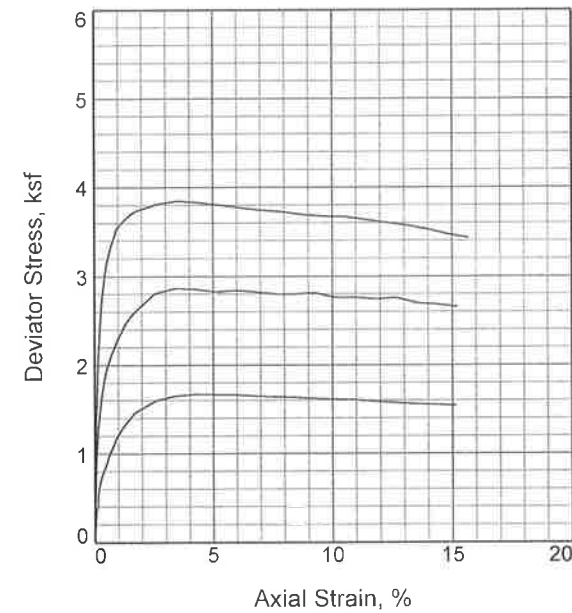
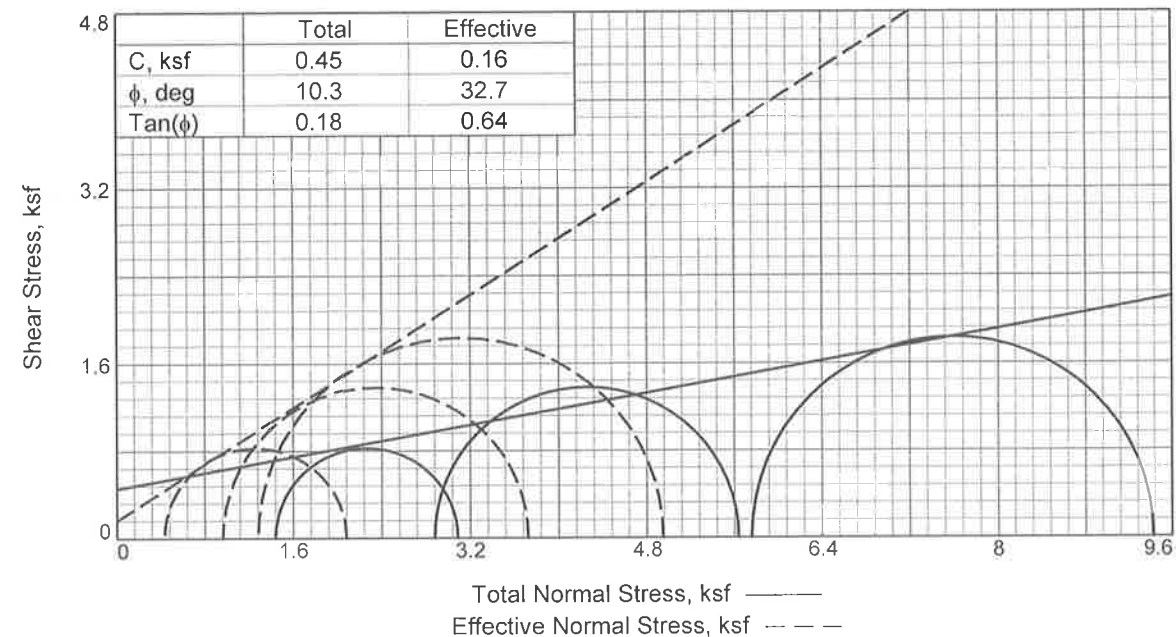
Strain rate, %/min. = 0.07

Fail. Stress = 7.63 ksf at reading no. 24

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf	Minor Eff. Stress ksf	Major Eff. Stress ksf	1:3 Ratio	Pore Press. psi	P ksf	Q ksf
0	0.0000	0.0	0	0.0	0.00	5.76	5.76	1.00	60.00	5.76	0.00
1	0.0050	63.7	64	0.1	1.54	5.11	6.65	1.30	64.50	5.88	0.77
2	0.0100	96.1	96	0.2	2.32	4.33	6.66	1.54	69.90	5.50	1.16
3	0.0150	116.4	116	0.3	2.81	3.83	6.64	1.73	73.40	5.24	1.41
4	0.0210	129.3	129	0.4	3.12	3.40	6.52	1.92	76.40	4.96	1.56
5	0.0260	138.5	139	0.4	3.34	3.08	6.42	2.08	78.60	4.75	1.67
6	0.0310	144.9	145	0.5	3.49	2.82	6.31	2.24	80.40	4.57	1.75
7	0.0360	149.7	150	0.6	3.60	2.62	6.22	2.38	81.80	4.42	1.80
8	0.0440	154.0	154	0.7	3.70	2.46	6.16	2.50	82.90	4.31	1.85
9	0.0500	158.1	158	0.8	3.80	2.33	6.13	2.63	83.80	4.23	1.90
10	0.0550	161.5	162	0.9	3.88	2.23	6.11	2.74	84.50	4.17	1.94
11	0.0590	165.0	165	1.0	3.96	2.16	6.12	2.83	85.00	4.14	1.98
12	0.0640	168.2	168	1.1	4.03	2.10	6.13	2.92	85.40	4.12	2.02
13	0.0700	171.2	171	1.2	4.10	2.09	6.19	2.96	85.50	4.14	2.05
14	0.0740	173.7	174	1.2	4.15	2.23	6.39	2.86	84.50	4.31	2.08
15	0.0800	177.0	177	1.3	4.23	1.97	6.20	3.14	86.30	4.09	2.11
16	0.0820	180.3	180	1.4	4.31	1.94	6.25	3.22	86.50	4.10	2.15
17	0.0870	184.1	184	1.5	4.39	1.90	6.29	3.31	86.80	4.10	2.20
18	0.0930	187.1	187	1.6	4.46	1.87	6.33	3.38	87.00	4.10	2.23
19	0.0980	190.6	191	1.7	4.54	1.86	6.40	3.44	87.10	4.13	2.27
20	0.1030	193.6	194	1.7	4.61	1.84	6.45	3.50	87.20	4.15	2.30
21	0.1500	223.1	223	2.5	5.27	1.87	7.14	3.81	87.00	4.51	2.63
22	0.2010	258.4	258	3.4	6.05	2.22	8.26	3.73	84.60	5.24	3.02
23	0.2520	292.4	292	4.2	6.78	2.17	8.96	4.12	84.90	5.57	3.39

Test Readings for Specimen No. 2

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf	Minor Eff. Stress ksf	Major Eff. Stress ksf	1:3 Ratio	Pore Press. psi	P ksf	Q ksf
24	0.3020	332.0	332	5.1	7.63	2.40	10.04	4.17	83.30	6.22	3.82
25	0.3530	368.1	368	5.9	8.39	2.65	11.04	4.16	81.60	6.84	4.19
26	0.4030	410.6	411	6.8	9.27	2.92	12.19	4.17	79.70	7.56	4.64
27	0.4510	449.8	450	7.6	10.07	3.18	13.25	4.16	77.90	8.22	5.03
28	0.5020	495.0	495	8.5	10.98	3.47	14.45	4.16	75.90	8.96	5.49
29	0.5550	539.5	540	9.3	11.85	3.77	15.62	4.14	73.80	9.70	5.92
30	0.6020	580.2	580	10.1	12.63	4.13	16.76	4.06	71.30	10.45	6.31
31	0.6550	624.9	625	11.0	13.47	4.38	17.84	4.08	69.60	11.11	6.73
32	0.7000	666.1	666	11.8	14.23	4.59	18.82	4.10	68.10	11.71	7.12
33	0.7510	712.7	713	12.7	15.08	4.88	19.96	4.09	66.10	12.42	7.54
34	0.8040	755.7	756	13.5	15.82	5.20	21.02	4.04	63.90	13.11	7.91
35	0.8510	792.0	792	14.3	16.43	5.52	21.95	3.98	61.70	13.73	8.22
36	0.9040	838.1	838	15.2	17.21	5.66	22.87	4.04	60.70	14.26	8.60



Sample No.	1	2	3
Initial			
Water Content, %	42.2	39.1	40.4
Dry Density, pcf	78.7	81.0	79.5
Saturation, %	99.8	97.7	97.4
Void Ratio	1.1414	1.0821	1.1194
Diameter, in.	2.885	2.885	2.885
Height, in.	6.015	6.030	5.936
At Test			
Water Content, %	39.1	36.8	34.8
Dry Density, pcf	82.0	84.6	86.9
Saturation, %	100.0	100.0	100.0
Void Ratio	1.0562	0.9931	0.9396
Diameter, in.	2.843	2.844	2.806
Height, in.	5.946	5.939	5.743
Strain rate, %/min.	0.05	0.05	0.05
Back Pressure, psi	60.00	60.00	60.00
Cell Pressure, psi	70.00	80.00	100.00
Fail. Stress, ksf	1.65	2.76	3.67
Total Pore Pr., ksf	9.65	10.56	13.12
Ult. Stress, ksf			
Total Pore Pr., ksf			
$\bar{\sigma}_1$ Failure, ksf	2.08	3.72	4.95
$\bar{\sigma}_3$ Failure, ksf	0.43	0.96	1.28

Type of Test: CU with Pore Pressures
Sample Type: Shelby Tube
Description: Grey Clayey Sand
 LL= 27 PL= 18 PI= 9
Assumed Specific Gravity= 2.70
Remarks:

Client: S&ME, Inc. - Charlotte
Project: Bridge No. 73 on SR 1535 over The Straits @ Harkers Island
Location: ST-6 UD @ 33.9'-35.9'
Proj. No.: 6235-17-045 **Date Sampled:** 01-30-18

TRIAXIAL SHEAR TEST REPORT
 Summit Engineering
 Ft. Mill, South Carolina

Tested By: FG Checked By: MH

TRIAXIAL COMPRESSION TEST
CU with Pore Pressures

2/14/2018
1:22 PM

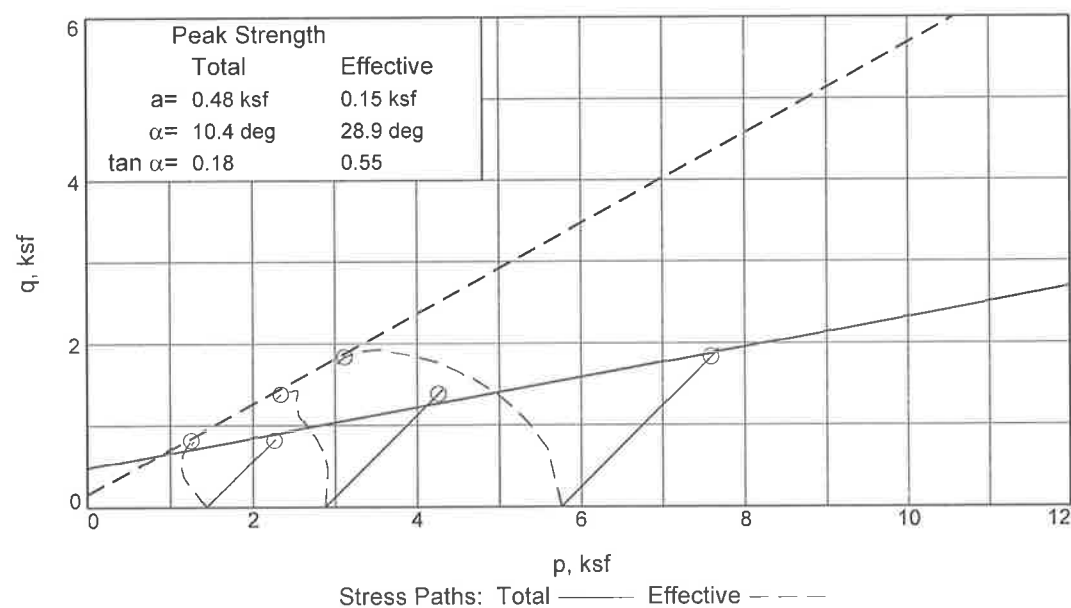
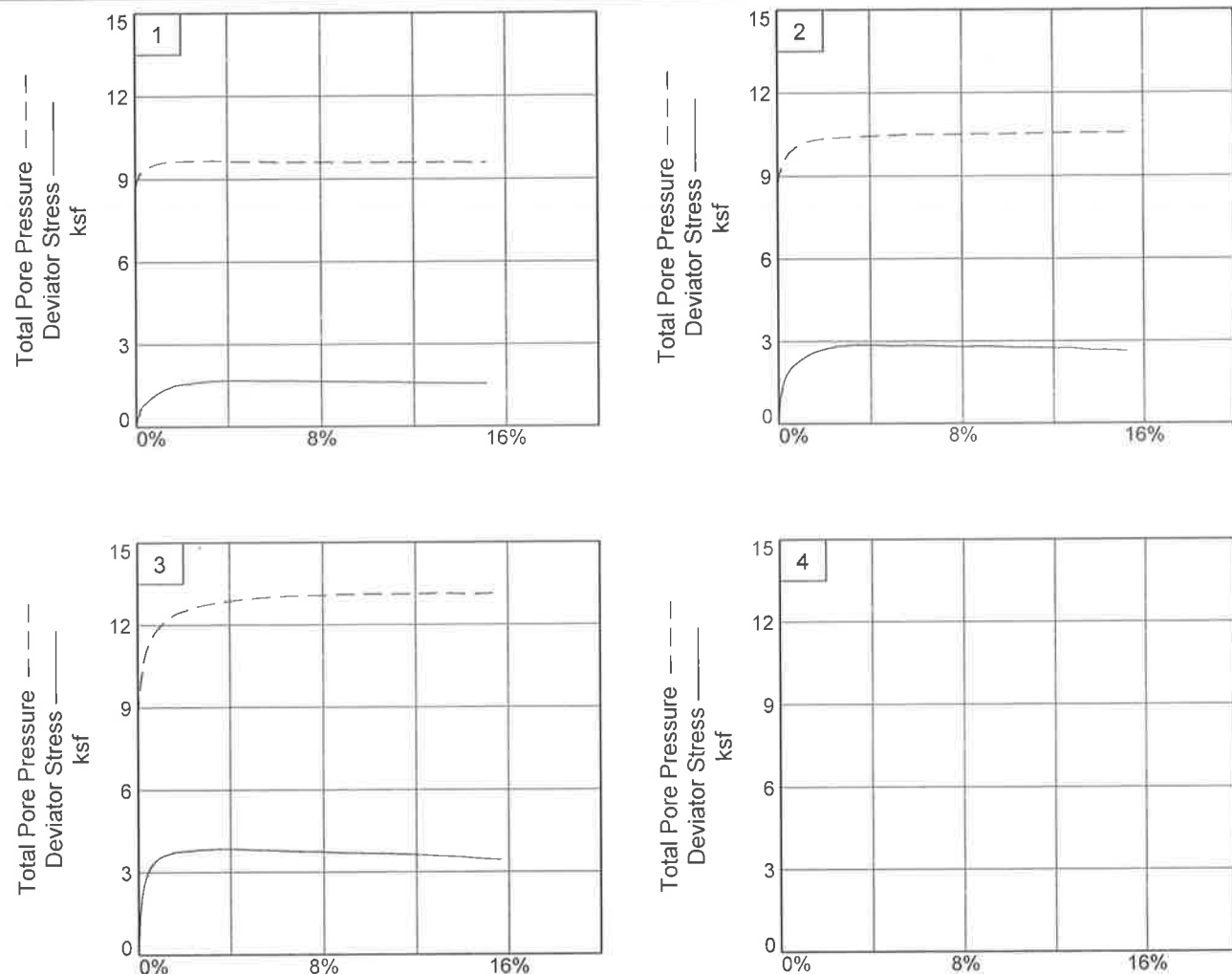
Date: 01-30-18
Client: S&ME, Inc. - Charlotte
Project: Bridge No. 73 on SR 1535 over
The Straits @ Harkers Island
Project No.: 6235-17-045
Location: ST-6 UD @ 33.9'-35.9'
Description: Grey Clayey Sand
Remarks:
Type of Sample: Shelby Tube
Assumed Specific Gravity=2.70 **LL=**27 **PL=**18 **PI=**9
Test Method: ASTM D 4767 Method B

Parameters for Specimen No. 1

Specimen Parameter	Initial	Saturated	Consolidated	Final
Moisture content: Moist soil+tare, gms.	1155.070			1130.240
Moisture content: Dry soil+tare, gms.	812.420			812.420
Moisture content: Tare, gms.	0.000			0.000
Moisture, %	42.2	41.0	39.1	39.1
Moist specimen weight, gms.	1155.07			
Diameter, in.	2.885	2.866	2.843	
Area, in. ²	6.537	6.450	6.350	
Height, in.	6.015	5.996	5.946	
Net decrease in height, in.		0.019	0.050	
Net decrease in water volume, cc.			15.000	
Wet density, pcf	111.9	112.8	114.0	
Dry density, pcf	78.7	80.0	82.0	
Void ratio	1.1414	1.1061	1.0562	
Saturation, %	99.8	100.0	100.0	

Test Readings for Specimen No. 1

Membrane modulus = 0.124105 kN/cm²
Membrane thickness = 0.02 cm
Consolidation cell pressure = 70.00 psi (10.08 ksf)
Consolidation back pressure = 60.00 psi (8.64 ksf)
Consolidation effective confining stress = 1.44 ksf
Strain rate, %/min. = 0.05
Fail. Stress = 1.65 ksf at reading no. 22



Client: S&ME, Inc. - Charlotte
Project: Bridge No. 73 on SR 1535 over
Location: ST-6 UD @ 33.9'-35.9'
Project No.: 6235-17-045

Figure _____ **Summit Engineering**

Tested By: FG _____ Checked By: MH _____

Summit Engineering

Test Readings for Specimen No. 1

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf	Minor Eff. Stress ksf	Major Eff. Stress ksf	1:3 Ratio	Pore Press. psi	P ksf	Q ksf
0	0.0000	0.0	0	0.0	0.00	1.44	1.44	1.00	60.00	1.44	0.00
1	0.0050	16.0	16	0.1	0.36	1.12	1.49	1.32	62.20	1.30	0.18
2	0.0080	17.6	18	0.1	0.40	1.08	1.48	1.37	62.50	1.28	0.20
3	0.0100	24.8	25	0.2	0.56	0.95	1.51	1.59	63.40	1.23	0.28
4	0.0145	30.1	30	0.2	0.68	0.85	1.53	1.80	64.10	1.19	0.34
5	0.0210	34.4	34	0.4	0.78	0.78	1.55	2.00	64.60	1.17	0.39
6	0.0280	37.9	38	0.5	0.86	0.73	1.59	2.16	64.90	1.16	0.43
7	0.0340	41.5	42	0.6	0.94	0.68	1.61	2.38	65.30	1.14	0.47
8	0.0380	44.3	44	0.6	1.00	0.65	1.65	2.54	65.50	1.15	0.50
9	0.0440	46.8	47	0.7	1.05	0.62	1.67	2.70	65.70	1.15	0.53
10	0.0490	49.1	49	0.8	1.10	0.59	1.69	2.87	65.90	1.14	0.55
11	0.0530	51.5	52	0.9	1.16	0.56	1.72	3.06	66.10	1.14	0.58
12	0.0590	53.5	54	1.0	1.20	0.55	1.75	3.20	66.20	1.15	0.60
13	0.0640	55.4	55	1.1	1.24	0.53	1.78	3.33	66.30	1.15	0.62
14	0.0690	57.1	57	1.2	1.28	0.50	1.78	3.54	66.50	1.14	0.64
15	0.0750	58.7	59	1.3	1.31	0.50	1.82	3.61	66.50	1.16	0.66
16	0.0800	60.3	60	1.3	1.35	0.49	1.84	3.76	66.60	1.16	0.67
17	0.0860	61.7	62	1.4	1.38	0.48	1.85	3.90	66.70	1.16	0.69
18	0.0910	62.9	63	1.5	1.40	0.48	1.88	3.96	66.70	1.18	0.70
19	0.0960	64.4	64	1.6	1.44	0.48	1.91	4.02	66.70	1.19	0.72
20	0.1010	65.5	66	1.7	1.46	0.46	1.92	4.17	66.80	1.19	0.73
21	0.1540	72.4	72	2.6	1.60	0.45	2.05	4.58	66.90	1.25	0.80
22	0.2010	75.2	75	3.4	1.65	0.43	2.08	4.81	67.00	1.26	0.82
23	0.2530	76.9	77	4.3	1.67	0.45	2.12	4.74	66.90	1.28	0.83
24	0.3020	77.4	77	5.1	1.67	0.45	2.11	4.73	66.90	1.28	0.83
25	0.3530	78.0	78	5.9	1.66	0.46	2.12	4.61	66.80	1.29	0.83
26	0.4040	77.9	78	6.8	1.65	0.48	2.12	4.46	66.70	1.30	0.82
27	0.4510	78.3	78	7.6	1.64	0.46	2.10	4.56	66.80	1.28	0.82
28	0.5020	78.6	79	8.4	1.63	0.48	2.11	4.43	66.70	1.29	0.82
29	0.5520	78.8	79	9.3	1.62	0.48	2.10	4.41	66.70	1.29	0.81
30	0.6040	79.1	79	10.2	1.61	0.48	2.09	4.39	66.70	1.28	0.81
31	0.6500	79.4	79	10.9	1.60	0.48	2.08	4.37	66.70	1.28	0.80
32	0.7010	79.3	79	11.8	1.59	0.48	2.06	4.34	66.70	1.27	0.79
33	0.7510	79.4	79	12.6	1.57	0.48	2.05	4.31	66.70	1.26	0.79
34	0.8010	79.4	79	13.5	1.56	0.48	2.03	4.28	66.70	1.25	0.78
35	0.8510	79.9	80	14.3	1.55	0.49	2.04	4.17	66.60	1.27	0.78
36	0.9010	80.1	80	15.2	1.54	0.49	2.03	4.15	66.60	1.26	0.77

Parameters for Specimen No. 2

Specimen Parameter	Initial	Saturated	Consolidated	Final
Moisture content: Moist soil+tare, gms.	1165.520			1145.720
Moisture content: Dry soil+tare, gms.	837.630			837.630
Moisture content: Tare, gms.	0.000			0.000
Moisture, %	39.1	39.6	36.8	36.8
Moist specimen weight, gms.	1165.52			
Diameter, in.	2.885	2.882	2.844	
Area, in. ²	6.537	6.523	6.353	
Height, in.	6.030	6.009	5.939	
Net decrease in height, in.		0.021	0.070	
Net decrease in water volume, cc.			24.000	
Wet density, pcf	112.6	113.7	115.7	
Dry density, pcf	81.0	81.4	84.6	
Void ratio	1.0821	1.0705	0.9931	
Saturation, %	97.7	100.0	100.0	

Test Readings for Specimen No. 2

Membrane modulus = 0.124105 kN/cm²

Membrane thickness = 0.02 cm

Consolidation cell pressure = 80.00 psi (11.52 ksf)

Consolidation back pressure = 60.00 psi (8.64 ksf)

Consolidation effective confining stress = 2.88 ksf

Strain rate, %/min. = 0.05

Fail. Stress = 2.76 ksf at reading no. 32

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf	Minor Eff. Stress ksf	Major Eff. Stress ksf	1:3 Ratio	Pore Press. psi	P ksf	Q ksf
0	0.0000	0.0	0	0.0	0.00	2.88	2.88	1.00	60.00	2.88	0.00
1	0.0050	40.2	40	0.1	0.91	2.46	3.37	1.37	62.90	2.92	0.46
2	0.0100	57.0	57	0.2	1.29	2.23	3.52	1.58	64.50	2.88	0.64
3	0.0150	67.8	68	0.3	1.53	2.04	3.58	1.75	65.80	2.81	0.77
4	0.0200	75.3	75	0.3	1.70	1.92	3.62	1.89	66.70	2.77	0.85
5	0.0250	81.1	81	0.4	1.83	1.80	3.63	2.02	67.50	2.72	0.92
6	0.0300	85.9	86	0.5	1.94	1.70	3.64	2.14	68.20	2.67	0.97
7	0.0360	90.0	90	0.6	2.03	1.63	3.65	2.25	68.70	2.64	1.01
8	0.0410	93.1	93	0.7	2.10	1.57	3.67	2.34	69.10	2.62	1.05
9	0.0460	95.7	96	0.8	2.15	1.51	3.66	2.42	69.50	2.59	1.08
10	0.0510	98.1	98	0.9	2.20	1.47	3.67	2.50	69.80	2.57	1.10
11	0.0560	100.8	101	0.9	2.26	1.43	3.69	2.59	70.10	2.56	1.13
12	0.0610	103.4	103	1.0	2.32	1.40	3.72	2.66	70.30	2.56	1.16
13	0.0670	105.6	106	1.1	2.37	1.37	3.73	2.73	70.50	2.55	1.18
14	0.0720	107.8	108	1.2	2.41	1.34	3.75	2.80	70.70	2.55	1.21
15	0.0770	109.8	110	1.3	2.46	1.31	3.77	2.87	70.90	2.54	1.23
16	0.0820	111.5	112	1.4	2.49	1.30	3.79	2.92	71.00	2.54	1.25
17	0.0870	113.2	113	1.5	2.53	1.27	3.80	3.00	71.20	2.53	1.26
18	0.0930	114.8	115	1.6	2.56	1.25	3.81	3.04	71.30	2.53	1.28
19	0.1030	117.0	117	1.7	2.61	1.22	3.83	3.13	71.50	2.53	1.30
20	0.1510	127.0	127	2.5	2.81	1.15	3.96	3.44	72.00	2.55	1.40
21	0.2040	130.9	131	3.4	2.86	1.11	3.97	3.58	72.30	2.54	1.43
22	0.2510	131.6	132	4.2	2.86	1.08	3.94	3.65	72.50	2.51	1.43
23	0.3040	131.2	131	5.1	2.82	1.05	3.87	3.68	72.70	2.46	1.41

Test Readings for Specimen No. 2

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf	Minor Eff. Stress ksf	Major Eff. Stress ksf	1:3 Ratio	Pore Press. psi	P ksf	Q ksf
24	0.3540	133.3	133	6.0	2.84	1.02	3.86	3.78	72.90	2.44	1.42
25	0.4030	133.6	134	6.8	2.82	1.02	3.85	3.76	72.90	2.43	1.41
26	0.4510	133.7	134	7.6	2.80	1.02	3.82	3.74	72.90	2.42	1.40
27	0.5030	135.0	135	8.5	2.80	1.02	3.82	3.74	72.90	2.42	1.40
28	0.5510	136.7	137	9.3	2.81	1.01	3.82	3.79	73.00	2.41	1.41
29	0.6040	135.5	136	10.2	2.76	1.01	3.77	3.74	73.00	2.39	1.38
30	0.6510	136.8	137	11.0	2.76	0.99	3.75	3.78	73.10	2.37	1.38
31	0.7030	137.1	137	11.8	2.74	0.98	3.72	3.80	73.20	2.35	1.37
32	0.7520	139.4	139	12.7	2.76	0.96	3.72	3.86	73.30	2.34	1.38
33	0.8040	137.6	138	13.5	2.70	0.96	3.66	3.79	73.30	2.31	1.35
34	0.8510	138.1	138	14.3	2.68	0.96	3.65	3.78	73.30	2.31	1.34
35	0.9040	138.1	138	15.2	2.65	0.96	3.62	3.75	73.30	2.29	1.33

Parameters for Specimen No. 3

Specimen Parameter	Initial	Saturated	Consolidated	Final
Moisture content: Moist soil+tare, gms.	1137.270			1091.990
Moisture content: Dry soil+tare, gms.	810.080			810.080
Moisture content: Tare, gms.	0.000			0.000
Moisture, %	40.4	39.2	34.8	34.8
Moist specimen weight, gms.	1137.27			
Diameter, in.	2.885	2.845	2.806	
Area, in. ²	6.537	6.358	6.184	
Height, in.	5.936	5.926	5.743	
Net decrease in height, in.		0.010	0.183	
Net decrease in water volume, cc.			35.500	
Wet density, pcf	111.7	114.0	117.1	
Dry density, pcf	79.5	81.9	86.9	
Void ratio	1.1194	1.0579	0.9396	
Saturation, %	97.4	100.0	100.0	

Test Readings for Specimen No. 3

Membrane modulus = 0.124105 kN/cm²

Membrane thickness = 0.02 cm

Consolidation cell pressure = 100.00 psi (14.40 ksf)

Consolidation back pressure = 60.00 psi (8.64 ksf)

Consolidation effective confining stress = 5.76 ksf

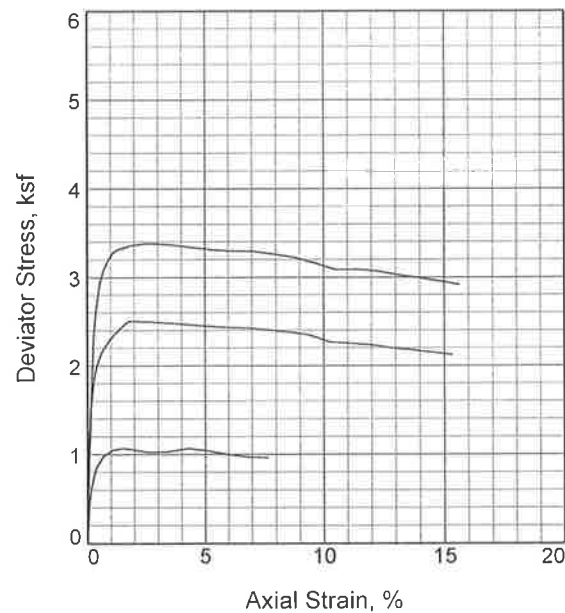
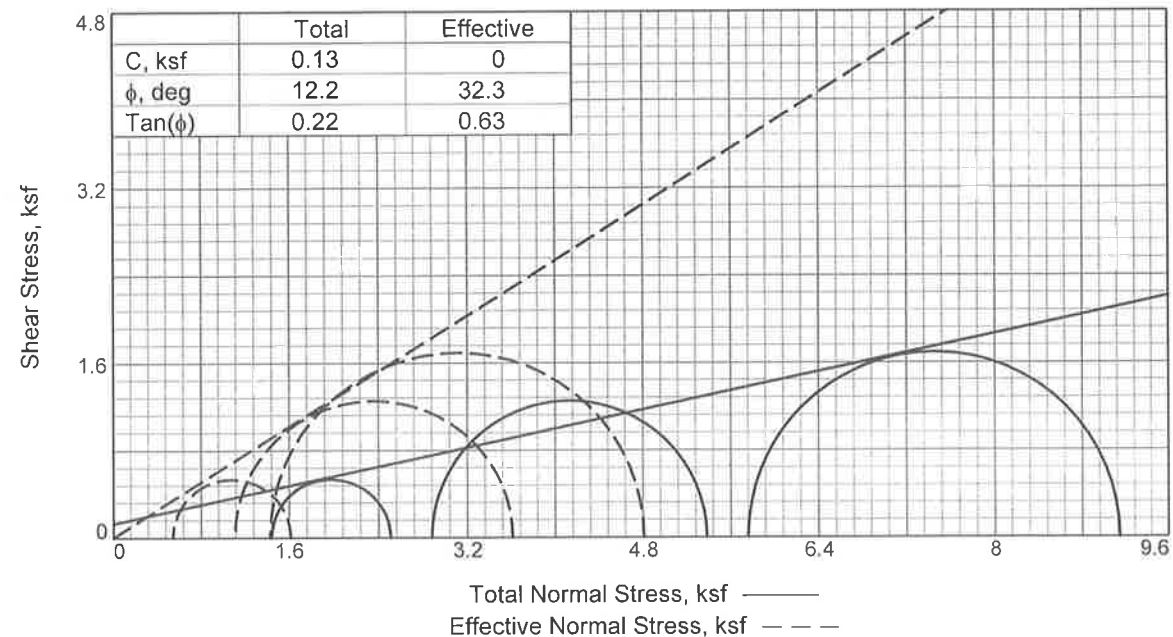
Strain rate, %/min. = 0.05

Fail. Stress = 3.67 ksf at reading no. 30

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf	Minor Eff. Stress ksf	Major Eff. Stress ksf	1:3 Ratio	Pore Press. psi	P ksf	Q ksf
0	0.0000	0.0	0	0.0	0.00	5.76	5.76	1.00	60.00	5.76	0.00
1	0.0050	61.2	61	0.1	1.42	4.88	6.31	1.29	66.10	5.59	0.71
2	0.0090	88.2	88	0.2	2.05	4.33	6.39	1.47	69.90	5.36	1.03
3	0.0140	105.9	106	0.2	2.46	3.92	6.38	1.63	72.80	5.15	1.23
4	0.0190	118.5	119	0.3	2.75	3.60	6.35	1.76	75.00	4.98	1.38
5	0.0240	127.6	128	0.4	2.96	3.34	6.30	1.89	76.80	4.82	1.48
6	0.0290	134.5	135	0.5	3.12	3.14	6.26	1.99	78.20	4.70	1.56
7	0.0340	139.5	140	0.6	3.23	2.97	6.20	2.09	79.40	4.58	1.61

Test Readings for Specimen No. 3

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf	Minor Eff. Stress ksf	Major Eff. Stress ksf	1:3 Ratio	Pore Press. psi	P ksf	Q ksf
8	0.0390	143.3	143	0.7	3.31	2.85	6.17	2.16	80.20	4.51	1.66
9	0.0440	146.8	147	0.8	3.39	2.72	6.11	2.25	81.10	4.42	1.70
10	0.0490	149.6	150	0.9	3.45	2.62	6.07	2.32	81.80	4.35	1.73
11	0.0520	152.2	152	0.9	3.51	2.52	6.03	2.39	82.50	4.28	1.76
12	0.0580	154.2	154	1.0	3.55	2.43	5.99	2.46	83.10	4.21	1.78
13	0.0630	155.7	156	1.1	3.59	2.36	5.95	2.52	83.60	4.15	1.79
14	0.0690	157.0	157	1.2	3.61	2.29	5.90	2.58	84.10	4.10	1.81
15	0.0730	158.1	158	1.3	3.63	2.23	5.87	2.63	84.50	4.05	1.82
16	0.0780	159.1	159	1.4	3.65	2.17	5.83	2.68	84.90	4.00	1.83
17	0.0840	160.4	160	1.5	3.68	2.13	5.81	2.73	85.20	3.97	1.84
18	0.0890	161.3	161	1.5	3.70	2.07	5.77	2.78	85.60	3.92	1.85
19	0.0940	162.2	162	1.6	3.72	2.04	5.76	2.82	85.80	3.90	1.86
20	0.1000	163.1	163	1.7	3.73	2.00	5.73	2.86	86.10	3.87	1.87
21	0.1530	168.1	168	2.7	3.81	1.73	5.54	3.21	88.00	3.63	1.91
22	0.2020	171.2	171	3.5	3.85	1.60	5.45	3.41	88.90	3.52	1.92
23	0.2500	171.9	172	4.4	3.83	1.51	5.34	3.53	89.50	3.43	1.91
24	0.3030	172.2	172	5.3	3.80	1.43	5.22	3.66	90.10	3.32	1.90
25	0.3500	172.4	172	6.1	3.77	1.38	5.15	3.73	90.40	3.27	1.89
26	0.4030	172.8	173	7.0	3.74	1.35	5.10	3.76	90.60	3.22	1.87
27	0.4540	173.7	174	7.9	3.73	1.34	5.06	3.78	90.70	3.20	1.86
28	0.5020	173.7	174	8.7	3.69	1.31	5.00	3.82	90.90	3.16	1.85
29	0.5530	174.6	175	9.6	3.67	1.30	4.97	3.84	91.00	3.13	1.84
30	0.6040	175.9	176	10.5	3.67	1.28	4.95	3.86	91.10	3.11	1.83
31	0.6530	176.2	176	11.4	3.64	1.28	4.92	3.84	91.10	3.10	1.82
32	0.7030	176.3	176	12.2	3.60	1.28	4.88	3.81	91.10	3.08	1.80
33	0.7540	176.4	176	13.1	3.57	1.27	4.84	3.82	91.20	3.05	1.78
34	0.8020	176.1	176	14.0	3.53	1.28	4.81	3.75	91.10	3.05	1.76
35	0.8560	174.9	175	14.9	3.47	1.28	4.75	3.70	91.10	3.01	1.73
36	0.9000	174.6	175	15.7	3.43	1.27	4.70	3.71	91.20	2.98	1.71



Sample No.	1	2	3
Initial			
Water Content, %	41.4	32.4	44.5
Dry Density, pcf	77.8	86.5	75.7
Saturation, %	95.9	92.2	97.9
Void Ratio	1.1654	0.9478	1.2263
Diameter, in.	2.883	2.880	2.873
Height, in.	5.985	5.967	6.010
At Test			
Water Content, %	37.2	28.9	36.1
Dry Density, pcf	84.1	94.7	85.3
Saturation, %	100.0	100.0	100.0
Void Ratio	1.0032	0.7797	0.9754
Diameter, in.	2.793	2.774	2.766
Height, in.	5.901	5.876	5.755
Strain rate, %/min.	0.05	0.0050	0.05
Back Pressure, psi	60.00	60.00	60.00
Cell Pressure, psi	70.00	80.00	100.00
Fail. Stress, ksf	1.07	2.50	3.38
Total Pore Pr., ksf	9.53	10.41	12.97
Ult. Stress, ksf			
Total Pore Pr., ksf			
$\bar{\sigma}_1$ Failure, ksf	1.61	3.61	4.81
$\bar{\sigma}_3$ Failure, ksf	0.55	1.11	1.43

Type of Test:
CU with Pore Pressures

Sample Type: Shelby Tube

Description: Grey Sandy Lean Clay

LL= 28 PL= 19 PI= 9

Assumed Specific Gravity= 2.70

Remarks:

Client: S&ME, Inc. - Charlotte

Project: Bridge No. 73 on SR 1535 over The Straits @ Harkers Island

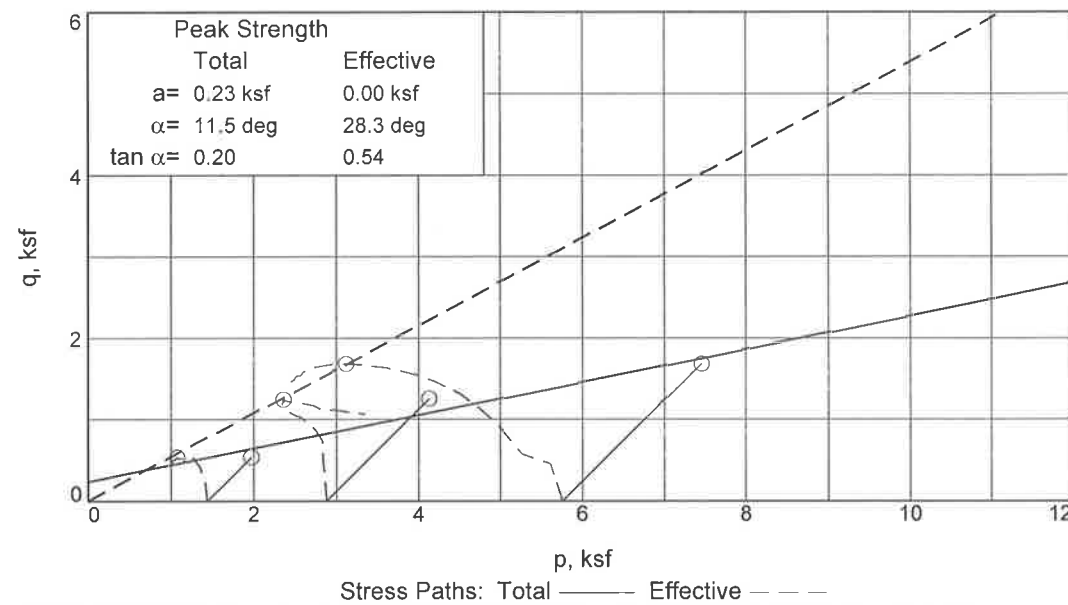
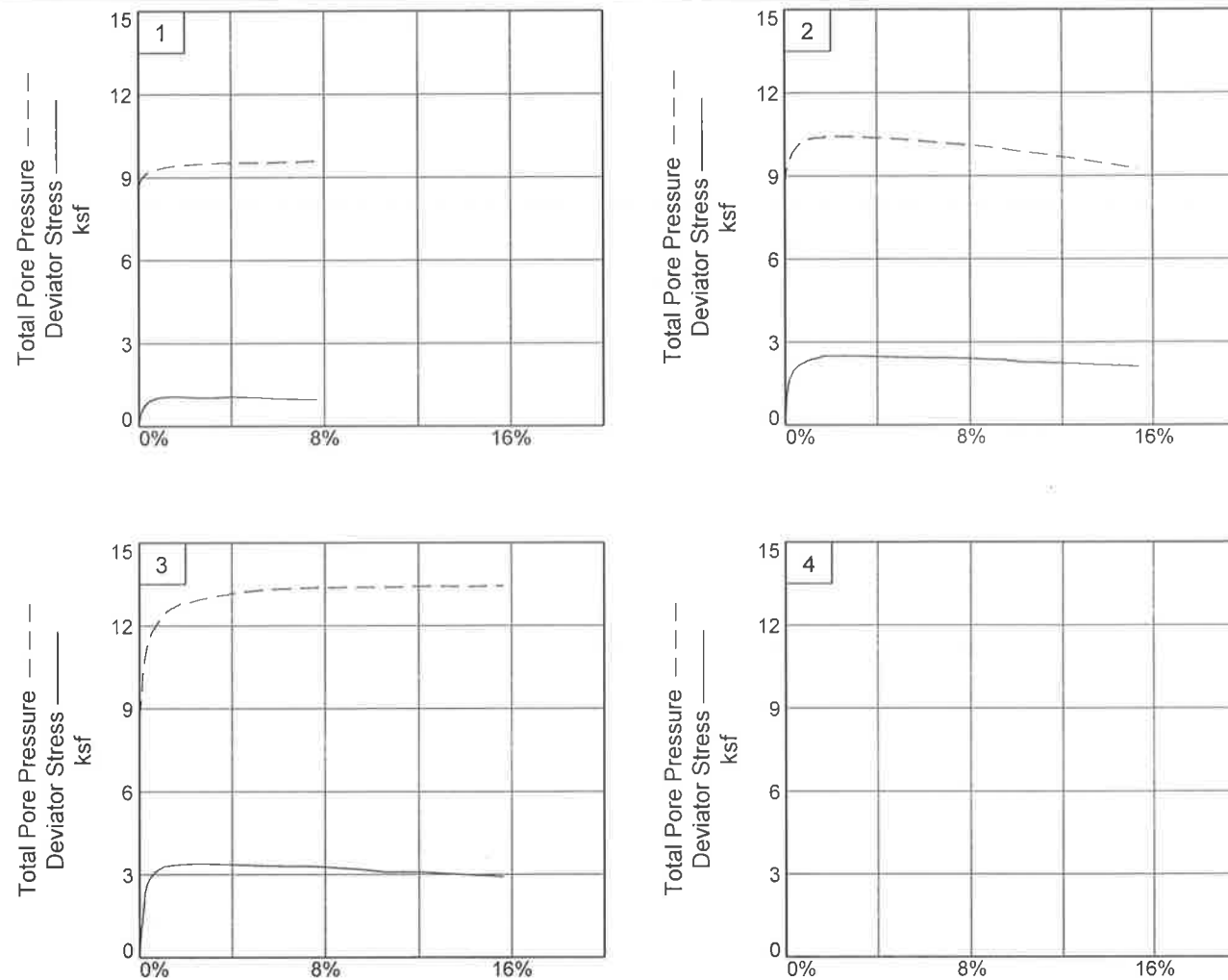
Location: ST-7 UD @ 28.9'-30.9'

Proj. No.: 6235-17-045 **Date Sampled:** 02-01-18

TRIAXIAL SHEAR TEST REPORT
Summit Engineering
Ft. Mill, South Carolina

Figure _____

Tested By: FG Checked By: MH



Client: S&ME, Inc. - Charlotte

Project: Bridge No. 73 on SR 1535 over The Straits @ Harkers Island

Location: ST-7 UD @ 28.9'-30.9'

Project No.: 6235-17-045

Figure _____

Summit Engineering

Tested By: FG Checked By: MH

TRIAXIAL COMPRESSION TEST
CU with Pore Pressures

2/14/2018
1:19 PM

Date: 02-01-18
Client: S&ME, Inc. - Charlotte
Project: Bridge No. 73 on SR 1535 over
The Straits @ Harkers Island
Project No.: 6235-17-045
Location: ST-7 UD @ 28.9'-30.9'
Description: Grey Sandy Lean Clay
Remarks:
Type of Sample: Shelby Tube
Assumed Specific Gravity=2.70 **LL=**28 **PL=**19 **PI=**9
Test Method: ASTM D 4767 Method B

Parameters for Specimen No. 1

Specimen Parameter	Initial	Saturated	Consolidated	Final
Moisture content: Moist soil+tare, gms.	1128.930			1094.940
Moisture content: Dry soil+tare, gms.	798.320			798.320
Moisture content: Tare, gms.	0.000			0.000
Moisture, %	41.4	39.4	37.2	37.2
Moist specimen weight, gms.	1128.93			
Diameter, in.	2.883	2.816	2.793	
Area, in. ²	6.528	6.227	6.125	
Height, in.	5.985	5.977	5.901	
Net decrease in height, in.		0.008	0.076	
Net decrease in water volume, cc.			17.600	
Wet density, pcf	110.1	113.9	115.4	
Dry density, pcf	77.8	81.7	84.1	
Void ratio	1.1654	1.0627	1.0032	
Saturation, %	95.9	100.0	100.0	

Test Readings for Specimen No. 1

Membrane modulus = 0.124105 kN/cm²
Membrane thickness = 0.02 cm
Consolidation cell pressure = 70.00 psi (10.08 ksf)
Consolidation back pressure = 60.00 psi (8.64 ksf)
Consolidation effective confining stress = 1.44 ksf
Strain rate, %/min. = 0.05
Fail. Stress = 1.07 ksf at reading no. 22

Test Readings for Specimen No. 1

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf	Minor Eff. Stress ksf	Major Eff. Stress ksf	1:3 Ratio	Pore Press. psi	P ksf	Q ksf
0	0.0000	0.0	0	0.0	0.00	1.44	1.44	1.00	60.00	1.44	0.00
1	0.0050	18.0	18	0.1	0.42	1.21	1.63	1.35	61.60	1.42	0.21
2	0.0100	26.0	26	0.2	0.61	1.09	1.70	1.56	62.40	1.40	0.31
3	0.0150	30.9	31	0.3	0.72	1.01	1.73	1.72	63.00	1.37	0.36
4	0.0200	34.7	35	0.3	0.81	0.95	1.76	1.86	63.40	1.36	0.41
5	0.0250	37.3	37	0.4	0.87	0.91	1.78	1.96	63.70	1.34	0.44
6	0.0310	38.9	39	0.5	0.91	0.86	1.77	2.05	64.00	1.32	0.45
7	0.0360	40.5	41	0.6	0.95	0.84	1.78	2.13	64.20	1.31	0.47
8	0.0410	41.9	42	0.7	0.98	0.82	1.80	2.19	64.30	1.31	0.49
9	0.0470	42.9	43	0.8	1.00	0.81	1.81	2.24	64.40	1.31	0.50
10	0.0520	43.5	44	0.9	1.01	0.79	1.81	2.28	64.50	1.30	0.51
11	0.0580	44.3	44	1.0	1.03	0.76	1.79	2.35	64.70	1.28	0.52
12	0.0630	45.0	45	1.1	1.05	0.75	1.80	2.40	64.80	1.27	0.52
13	0.0680	45.3	45	1.2	1.05	0.72	1.77	2.46	65.00	1.25	0.53
14	0.0730	45.5	46	1.2	1.06	0.72	1.78	2.47	65.00	1.25	0.53
15	0.0790	45.7	46	1.3	1.06	0.71	1.77	2.50	65.10	1.24	0.53
16	0.0840	45.9	46	1.4	1.06	0.69	1.75	2.54	65.20	1.22	0.53
17	0.0900	46.0	46	1.5	1.06	0.69	1.76	2.54	65.20	1.22	0.53
18	0.0950	45.9	46	1.6	1.06	0.68	1.74	2.57	65.30	1.21	0.53
19	0.1000	45.9	46	1.7	1.06	0.66	1.72	2.60	65.40	1.19	0.53
20	0.1520	44.7	45	2.6	1.02	0.60	1.63	2.69	65.80	1.12	0.51
21	0.2040	45.4	45	3.5	1.03	0.58	1.61	2.79	66.00	1.09	0.52
22	0.2520	47.4	47	4.3	1.07	0.55	1.61	2.95	66.20	1.08	0.53
23	0.3000	46.6	47	5.1	1.04	0.55	1.59	2.90	66.20	1.07	0.52
24	0.3520	45.2	45	6.0	1.00	0.55	1.55	2.83	66.20	1.05	0.50
25	0.4010	44.3	44	6.8	0.97	0.52	1.49	2.87	66.40	1.00	0.49
26	0.4530	44.3	44	7.7	0.96	0.50	1.47	2.91	66.50	0.98	0.48

Parameters for Specimen No. 2

Specimen Parameter	Initial	Saturated	Consolidated	Final
Moisture content: Moist soil+tare, gms.	1168.700			1137.980
Moisture content: Dry soil+tare, gms.	882.980			882.980
Moisture content: Tare, gms.	0.000			0.000
Moisture, %	32.4	31.2	28.9	28.9
Moist specimen weight, gms.	1168.70			
Diameter, in.	2.880	2.805	2.774	
Area, in. ²	6.514	6.182	6.045	
Height, in.	5.967	5.945	5.876	
Net decrease in height, in.		0.022	0.069	
Net decrease in water volume, cc.			20.200	
Wet density, pcf	114.5	120.1	122.1	
Dry density, pcf	86.5	91.5	94.7	
Void ratio	0.9478	0.8415	0.7797	
Saturation, %	92.2	100.0	100.0	

Test Readings for Specimen No. 2

Membrane modulus = 0.124105 kN/cm²
 Membrane thickness = 0.02 cm
 Consolidation cell pressure = 80.00 psi (11.52 ksf)
 Consolidation back pressure = 60.00 psi (8.64 ksf)
 Consolidation effective confining stress = 2.88 ksf
 Strain rate, %/min. = 0.0050
 Fail. Stress = 2.50 ksf at reading no. 20

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf	Minor Eff. Stress ksf	Major Eff. Stress ksf	1:3 Ratio	Pore Press. psi	P ksf	Q ksf
0	0.0000	0.0	0	0.0	0.00	2.88	2.88	1.00	60.00	2.88	0.00
1	0.0040	41.2	41	0.1	0.98	2.35	3.33	1.42	63.70	2.84	0.49
2	0.0080	61.5	62	0.1	1.46	2.10	3.57	1.70	65.40	2.83	0.73
3	0.0140	73.3	73	0.2	1.74	1.87	3.61	1.93	67.00	2.74	0.87
4	0.0190	80.1	80	0.3	1.90	1.70	3.60	2.12	68.20	2.65	0.95
5	0.0250	84.6	85	0.4	2.01	1.58	3.59	2.27	69.00	2.59	1.00
6	0.0300	87.8	88	0.5	2.08	1.50	3.58	2.39	69.60	2.54	1.04
7	0.0350	90.2	90	0.6	2.14	1.41	3.55	2.51	70.20	2.48	1.07
8	0.0410	92.5	93	0.7	2.19	1.34	3.53	2.63	70.70	2.43	1.09
9	0.0460	94.0	94	0.8	2.22	1.30	3.52	2.71	71.00	2.41	1.11
10	0.0510	95.4	95	0.9	2.25	1.25	3.51	2.80	71.30	2.38	1.13
11	0.0560	97.2	97	1.0	2.29	1.22	3.52	2.87	71.50	2.37	1.15
12	0.0610	98.3	98	1.0	2.32	1.21	3.53	2.92	71.60	2.37	1.16
13	0.0670	99.7	100	1.1	2.35	1.18	3.53	2.99	71.80	2.35	1.17
14	0.0720	100.7	101	1.2	2.37	1.17	3.54	3.03	71.90	2.35	1.18
15	0.0770	101.8	102	1.3	2.39	1.15	3.55	3.08	72.00	2.35	1.20
16	0.0820	102.9	103	1.4	2.42	1.14	3.55	3.12	72.10	2.35	1.21
17	0.0880	103.9	104	1.5	2.44	1.14	3.58	3.14	72.10	2.36	1.22
18	0.0930	105.2	105	1.6	2.47	1.14	3.60	3.17	72.10	2.37	1.23
19	0.0990	106.0	106	1.7	2.48	1.14	3.62	3.18	72.10	2.38	1.24
20	0.1040	106.9	107	1.8	2.50	1.11	3.61	3.26	72.30	2.36	1.25
21	0.1510	107.6	108	2.6	2.50	1.09	3.59	3.28	72.40	2.34	1.25
22	0.2040	107.9	108	3.5	2.48	1.12	3.60	3.21	72.20	2.36	1.24
23	0.2510	108.0	108	4.3	2.46	1.17	3.63	3.11	71.90	2.40	1.23

Test Readings for Specimen No. 2

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf	Minor Eff. Stress ksf	Major Eff. Stress ksf	1:3 Ratio	Pore Press. psi	P ksf	Q ksf
24	0.3040	108.2	108	5.2	2.44	1.21	3.65	3.02	71.60	2.43	1.22
25	0.3510	108.5	109	6.0	2.43	1.27	3.70	2.92	71.20	2.48	1.22
26	0.4030	109.3	109	6.9	2.43	1.34	3.76	2.81	70.70	2.55	1.21
27	0.4510	109.3	109	7.7	2.40	1.40	3.80	2.72	70.30	2.60	1.20
28	0.5040	109.2	109	8.6	2.38	1.47	3.85	2.62	69.80	2.66	1.19
29	0.5510	108.8	109	9.4	2.35	1.56	3.90	2.51	69.20	2.73	1.17
30	0.6030	106.0	106	10.3	2.27	1.67	3.94	2.36	68.40	2.80	1.13
31	0.6510	106.3	106	11.1	2.25	1.74	3.99	2.29	67.90	2.87	1.13
32	0.7040	106.5	107	12.0	2.23	1.84	4.08	2.21	67.20	2.96	1.12
33	0.7500	106.0	106	12.8	2.20	1.94	4.15	2.13	66.50	3.05	1.10
34	0.8030	105.8	106	13.7	2.18	2.06	4.24	2.06	65.70	3.15	1.09
35	0.8550	105.5	106	14.6	2.15	2.17	4.32	1.99	64.90	3.25	1.07
36	0.9020	105.1	105	15.4	2.12	2.29	4.41	1.93	64.10	3.35	1.06

Parameters for Specimen No. 3

Specimen Parameter	Initial	Saturated	Consolidated	Final
Moisture content: Moist soil+tare, gms.	1118.740			1054.010
Moisture content: Dry soil+tare, gms.	774.300			774.300
Moisture content: Tare, gms.	0.000			0.000
Moisture, %	44.5	45.8	36.1	36.1
Moist specimen weight, gms.	1118.74			
Diameter, in.	2.873	2.874	2.766	
Area, in. ²	6.483	6.488	6.007	
Height, in.	6.010	6.031	5.755	
Net decrease in height, in.		-0.021	0.276	
Net decrease in water volume, cc.			74.700	
Wet density, pcf	109.4	109.9	116.2	
Dry density, pcf	75.7	75.4	85.3	
Void ratio	1.2263	1.2358	0.9754	
Saturation, %	97.9	100.0	100.0	

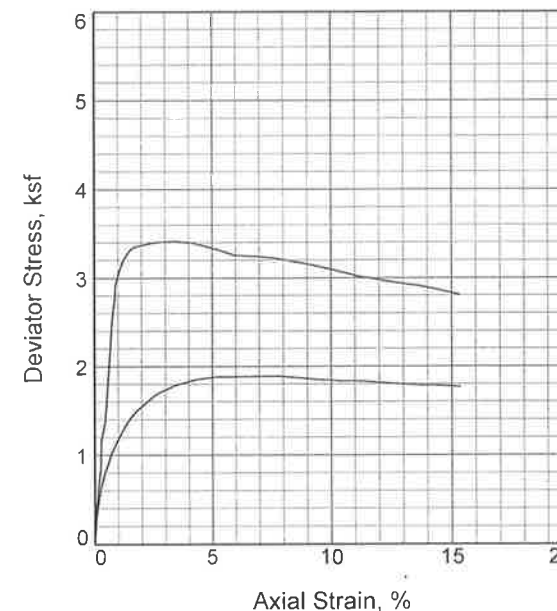
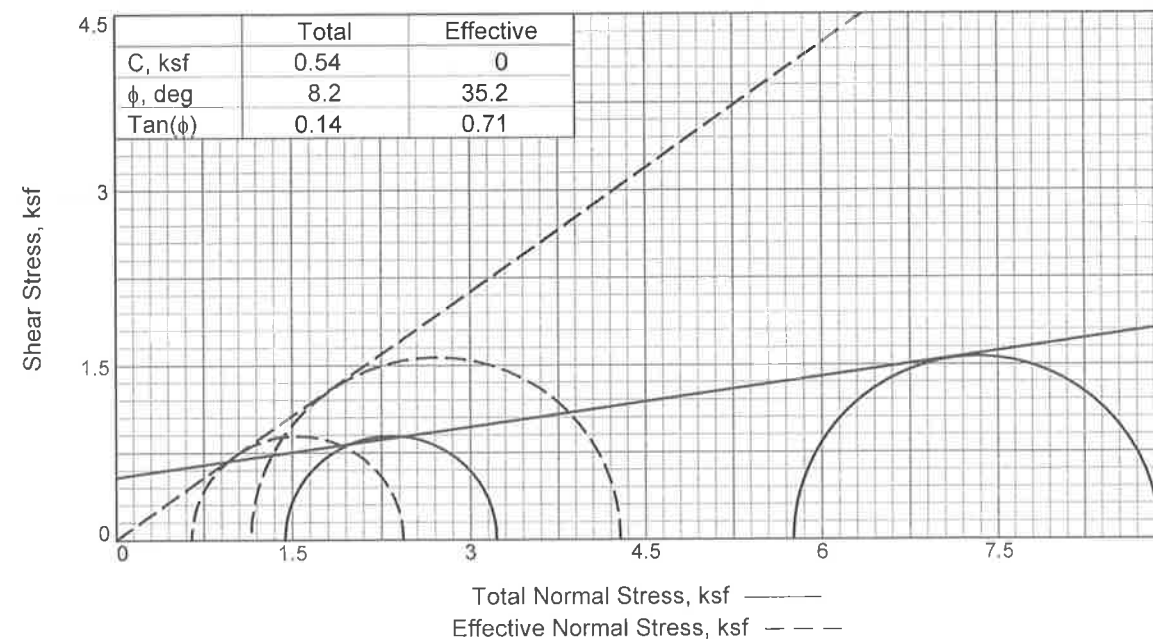
Test Readings for Specimen No. 3

Membrane modulus = 0.124105 kN/cm²
 Membrane thickness = 0.02 cm
 Consolidation cell pressure = 100.00 psi (14.40 ksf)
 Consolidation back pressure = 60.00 psi (8.64 ksf)
 Consolidation effective confining stress = 5.76 ksf
 Strain rate, %/min. = 0.05
 Fail. Stress = 3.38 ksf at reading no. 22

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf	Minor Eff. Stress ksf	Major Eff. Stress ksf	1:3 Ratio	Pore Press. psi	P ksf	Q ksf
0	0.0000	0.0	0	0.0	0.00	5.76	5.76	1.00	60.00	5.76	0.00
1	0.0050	38.8	39	0.1	0.93	5.14	6.07	1.18	64.30	5.61	0.46
2	0.0070	48.6	49	0.1	1.16	4.68	5.84	1.25	67.50	5.26	0.58
3	0.0120	78.1	78	0.2	1.87	4.03	5.90	1.46	72.00	4.97	0.93
4	0.0160	96.9	97	0.3	2.32	3.56	5.87	1.65	75.30	4.72	1.16
5	0.0210	109.2	109	0.4	2.61	3.21	5.82	1.81	77.70	4.52	1.30
6	0.0270	117.4	117	0.5	2.80	2.94	5.74	1.95	79.60	4.34	1.40

Test Readings for Specimen No. 3

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf	Minor Eff. Stress ksf	Major Eff. Stress ksf	1:3 Ratio	Pore Press. psi	P ksf	Q ksf
7	0.0310	123.2	123	0.5	2.94	2.74	5.67	2.07	81.00	4.20	1.47
8	0.0370	127.3	127	0.6	3.03	2.55	5.58	2.19	82.30	4.06	1.52
9	0.0420	130.4	130	0.7	3.10	2.40	5.51	2.29	83.30	3.96	1.55
10	0.0480	132.8	133	0.8	3.16	2.29	5.45	2.38	84.10	3.87	1.58
11	0.0520	134.7	135	0.9	3.20	2.19	5.39	2.46	84.80	3.79	1.60
12	0.0580	136.3	136	1.0	3.23	2.10	5.34	2.54	85.40	3.72	1.62
13	0.0600	137.5	138	1.0	3.26	2.02	5.28	2.62	86.00	3.65	1.63
14	0.0660	138.5	139	1.1	3.28	1.96	5.24	2.68	86.40	3.60	1.64
15	0.0710	139.5	140	1.2	3.30	1.89	5.19	2.75	86.90	3.54	1.65
16	0.0770	140.0	140	1.3	3.31	1.84	5.15	2.80	87.20	3.50	1.66
17	0.0810	140.5	141	1.4	3.32	1.79	5.11	2.86	87.60	3.45	1.66
18	0.0890	140.9	141	1.5	3.33	1.76	5.08	2.89	87.80	3.42	1.66
19	0.0920	141.6	142	1.6	3.34	1.70	5.04	2.97	88.20	3.37	1.67
20	0.0980	141.8	142	1.7	3.34	1.67	5.01	3.00	88.40	3.34	1.67
21	0.1020	142.4	142	1.8	3.35	1.63	4.98	3.06	88.70	3.30	1.68
22	0.1500	144.9	145	2.6	3.38	1.43	4.81	3.37	90.10	3.12	1.69
23	0.2000	145.6	146	3.5	3.37	1.28	4.65	3.63	91.10	2.97	1.68
24	0.2530	145.7	146	4.4	3.34	1.20	4.53	3.79	91.70	2.86	1.67
25	0.3030	145.8	146	5.3	3.31	1.12	4.43	3.95	92.20	2.78	1.66
26	0.3500	146.4	146	6.1	3.30	1.08	4.38	4.05	92.50	2.73	1.65
27	0.4030	147.7	148	7.0	3.29	1.05	4.34	4.13	92.70	2.70	1.65
28	0.4550	147.7	148	7.9	3.26	1.02	4.28	4.19	92.90	2.65	1.63
29	0.5030	147.4	147	8.7	3.22	1.02	4.25	4.15	92.90	2.63	1.61
30	0.5520	146.0	146	9.6	3.16	1.01	4.17	4.14	93.00	2.59	1.58
31	0.6040	143.8	144	10.5	3.09	1.02	4.11	4.02	92.90	2.57	1.54
32	0.6530	145.4	145	11.3	3.09	0.99	4.08	4.11	93.10	2.54	1.55
33	0.7000	145.9	146	12.2	3.07	0.98	4.05	4.14	93.20	2.52	1.54
34	0.7500	145.2	145	13.0	3.03	0.98	4.01	4.09	93.20	2.49	1.51
35	0.8010	144.9	145	13.9	2.99	0.99	3.98	4.01	93.10	2.49	1.50
36	0.8540	144.6	145	14.8	2.95	0.98	3.93	4.01	93.20	2.46	1.48
37	0.9000	144.0	144	15.6	2.91	0.96	3.88	4.02	93.30	2.42	1.46



	1	2
Sample No.		
Initial		
Water Content, %	45.0	40.8
Dry Density, pcf	74.3	73.4
Saturation, %	95.8	85.1
Void Ratio	1.2691	1.2949
Diameter, in.	2.872	2.882
Height, in.	5.937	6.006
At Test		
Water Content, %	41.2	36.5
Dry Density, pcf	79.8	84.9
Saturation, %	100.0	100.0
Void Ratio	1.1132	0.9862
Diameter, in.	2.792	2.713
Height, in.	5.852	5.865
Strain rate, %/min.	0.05	0.05
Back Pressure, psi	60.00	60.00
Cell Pressure, psi	70.00	100.00
Fail. Stress, ksf	1.78	3.13
Total Pore Pr., ksf	9.43	13.25
Ult. Stress, ksf		
Total Pore Pr., ksf		
$\bar{\sigma}_1$ Failure, ksf	2.43	4.28
$\bar{\sigma}_3$ Failure, ksf	0.65	1.15

Type of Test:
CU with Pore Pressures

Sample Type: Shelby Tube

Description: Grey Sandy Lean Clay

LL= 31 PL= 16 PI= 15

Assumed Specific Gravity= 2.70

Remarks:

Client: S&ME, Inc. - Charlotte

Project: Bridge No. 73 on SR 1535 over The Straits @ Harkers Island

Location: ST-8 UD @ 33.9'-35.9'

Proj. No.: 6235-17-045 **Date Sampled:** 02-03-18

TRIAXIAL SHEAR TEST REPORT
Summit Engineering
Ft. Mill, South Carolina

Figure _____

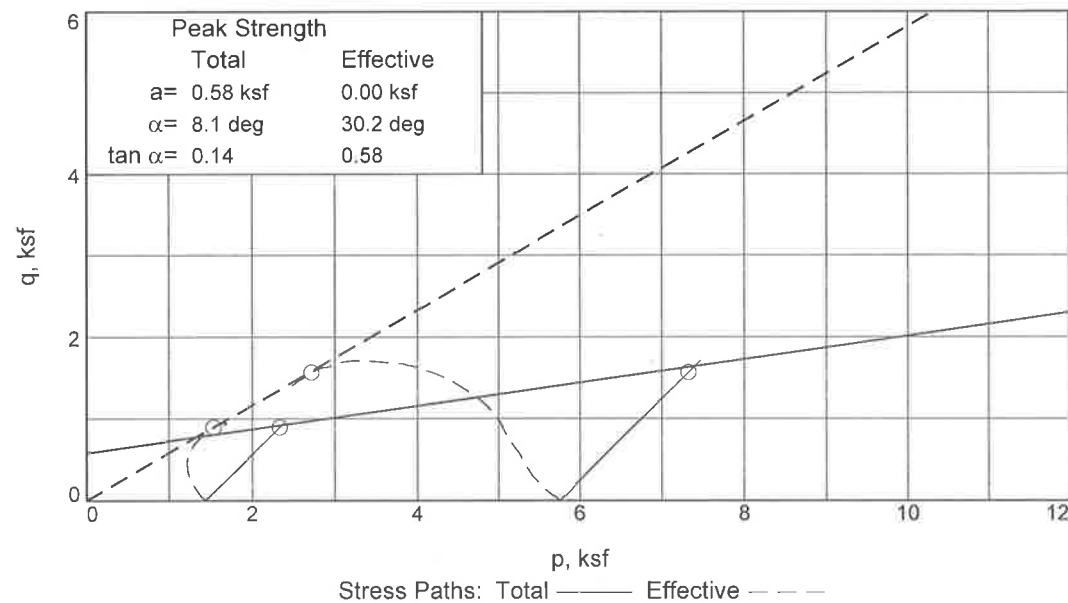
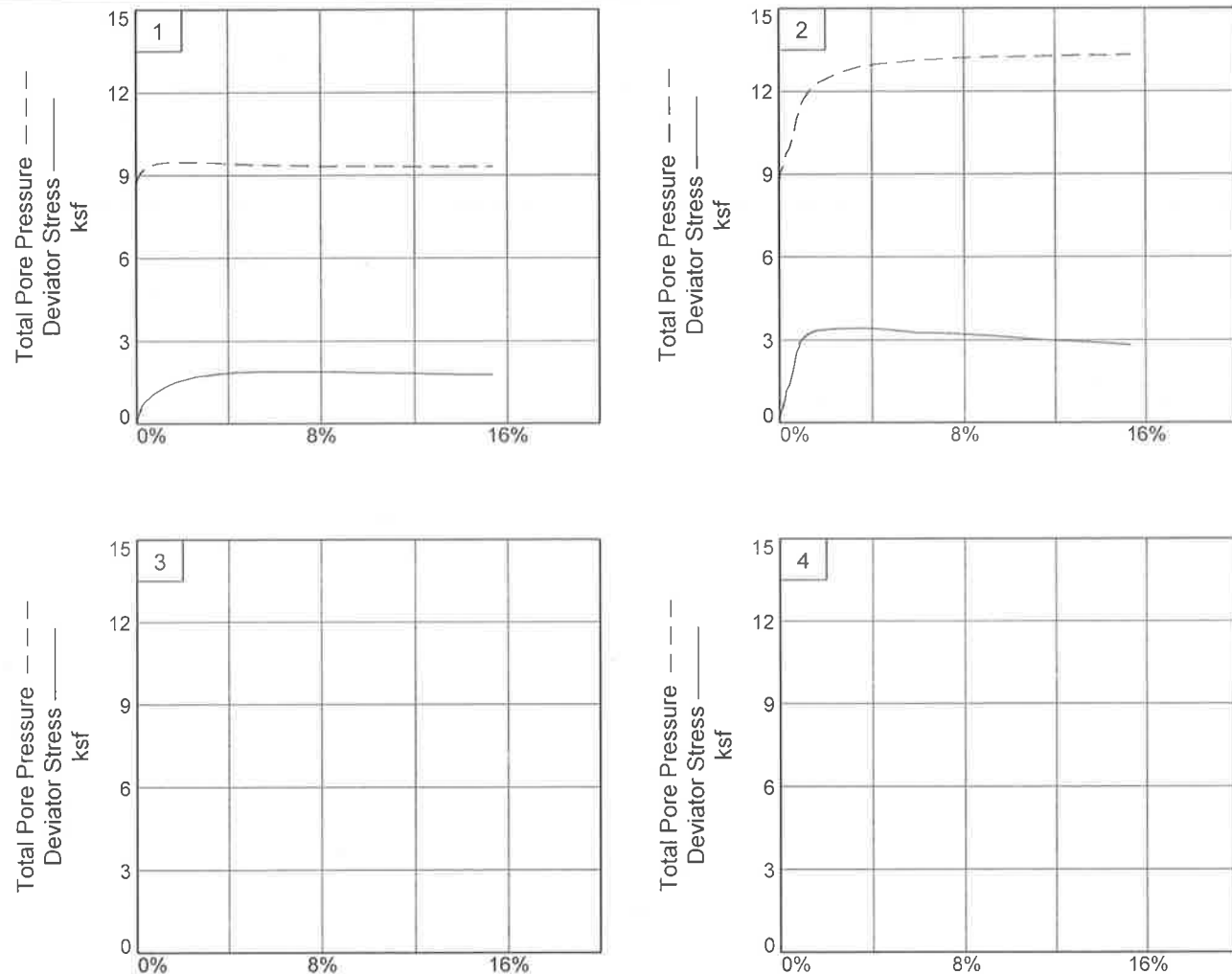
TRIAxIAL COMPRESSION TEST
CU with Pore Pressures

2/14/2018
2:59 PM

Date: 02-03-18
Client: S&ME, Inc. - Charlotte
Project: Bridge No. 73 on SR 1535 over
The Straits @ Harkers Island
Project No.: 6235-17-045
Location: ST-8 UD @ 33.9'-35.9'
Description: Grey Sandy Lean Clay
Remarks:
Type of Sample: Shelby Tube
Assumed Specific Gravity=2.70 **LL=**31 **PL=**16 **PI=**15
Test Method: ASTM D 4767 Method B

Parameters for Specimen No. 1				
Specimen Parameter	Initial	Saturated	Consolidated	Final
Moisture content: Moist soil+tare, gms.	1116.660			1087.520
Moisture content: Dry soil+tare, gms.	770.040			770.040
Moisture content: Tare, gms.	0.000			0.000
Moisture, %	45.0	43.2	41.2	41.2
Moist specimen weight, gms.	1087.52			
Diameter, in.	2.872	2.807	2.792	
Area, in. ²	6.478	6.187	6.121	
Height, in.	5.937	5.932	5.852	
Net decrease in height, in.		0.005	0.080	
Net decrease in water volume, cc.			14.500	
Wet density, pcf	107.7	111.4	112.6	
Dry density, pcf	74.3	77.8	79.8	
Void ratio	1.2691	1.1654	1.1132	
Saturation, %	95.8	100.0	100.0	

Test Readings for Specimen No. 1
Membrane modulus = 0.124105 kN/cm²
Membrane thickness = 0.02 cm
Consolidation cell pressure = 70.00 psi (10.08 ksf)
Consolidation back pressure = 60.00 psi (8.64 ksf)
Consolidation effective confining stress = 1.44 ksf
Strain rate, %/min. = 0.05
Fail. Stress = 1.78 ksf at reading no. 23



Client: S&ME, Inc. - Charlotte
Project: Bridge No. 73 on SR 1535 over
Location: ST-8 UD @ 33.9'-35.9'
Project No.: 6235-17-045

Figure _____ **Summit Engineering**

Tested By: FG Checked By: MH

Summit Engineering

Test Readings for Specimen No. 1

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf	Minor Eff. Stress ksf	Major Eff. Stress ksf	1:3 Ratio	Pore Press. psi	P ksf	Q ksf
0	0.0000	0.0	0	0.0	0.00	1.44	1.44	1.00	60.00	1.44	0.00
1	0.0030	7.4	7	0.1	0.17	1.28	1.46	1.14	61.10	1.37	0.09
2	0.0050	12.0	12	0.1	0.28	1.20	1.48	1.24	61.70	1.34	0.14
3	0.0070	15.8	16	0.1	0.37	1.12	1.49	1.33	62.20	1.31	0.19
4	0.0120	22.6	23	0.2	0.53	1.01	1.54	1.53	63.00	1.27	0.27
5	0.0170	27.6	28	0.3	0.65	0.92	1.57	1.70	63.60	1.25	0.32
6	0.0220	31.6	32	0.4	0.74	0.86	1.60	1.86	64.00	1.23	0.37
7	0.0270	35.0	35	0.5	0.82	0.82	1.64	2.00	64.30	1.23	0.41
8	0.0330	38.1	38	0.6	0.89	0.78	1.67	2.15	64.60	1.22	0.45
9	0.0380	41.2	41	0.6	0.96	0.75	1.71	2.29	64.80	1.23	0.48
10	0.0430	43.9	44	0.7	1.03	0.72	1.75	2.42	65.00	1.23	0.51
11	0.0490	46.4	46	0.8	1.08	0.71	1.79	2.53	65.10	1.25	0.54
12	0.0540	48.8	49	0.9	1.14	0.68	1.81	2.68	65.30	1.25	0.57
13	0.0600	50.9	51	1.0	1.19	0.66	1.85	2.79	65.40	1.26	0.59
14	0.0650	53.0	53	1.1	1.23	0.65	1.88	2.90	65.50	1.26	0.62
15	0.0700	55.0	55	1.2	1.28	0.65	1.93	2.97	65.50	1.29	0.64
16	0.0750	56.7	57	1.3	1.32	0.63	1.95	3.08	65.60	1.29	0.66
17	0.0800	58.5	59	1.4	1.36	0.63	1.99	3.14	65.60	1.31	0.68
18	0.0860	60.1	60	1.5	1.39	0.62	2.01	3.25	65.70	1.32	0.70
19	0.0910	61.5	62	1.6	1.42	0.62	2.04	3.30	65.70	1.33	0.71
20	0.0960	62.9	63	1.6	1.46	0.62	2.07	3.35	65.70	1.35	0.73
21	0.1010	64.1	64	1.7	1.48	0.62	2.10	3.39	65.70	1.36	0.74
22	0.1530	73.5	74	2.6	1.68	0.62	2.30	3.72	65.70	1.46	0.84
23	0.2000	78.5	79	3.4	1.78	0.65	2.43	3.75	65.50	1.54	0.89
24	0.2540	82.3	82	4.3	1.85	0.68	2.53	3.74	65.30	1.60	0.93
25	0.3010	84.2	84	5.1	1.88	0.71	2.58	3.66	65.10	1.65	0.94
26	0.3530	85.1	85	6.0	1.88	0.72	2.60	3.61	65.00	1.66	0.94
27	0.4010	86.0	86	6.9	1.88	0.72	2.60	3.62	65.00	1.66	0.94
28	0.4540	87.1	87	7.8	1.89	0.75	2.64	3.52	64.80	1.69	0.95
29	0.5010	86.9	87	8.6	1.87	0.75	2.62	3.50	64.80	1.68	0.93
30	0.5530	86.8	87	9.4	1.85	0.76	2.61	3.42	64.70	1.69	0.92
31	0.6010	87.0	87	10.3	1.84	0.75	2.59	3.45	64.80	1.67	0.92
32	0.6550	87.7	88	11.2	1.83	0.76	2.60	3.40	64.70	1.68	0.92
33	0.7020	87.8	88	12.0	1.82	0.76	2.58	3.38	64.70	1.67	0.91
34	0.7540	87.7	88	12.9	1.80	0.76	2.56	3.36	64.70	1.66	0.90
35	0.8010	87.8	88	13.7	1.78	0.78	2.56	3.29	64.60	1.67	0.89
36	0.8550	88.5	89	14.6	1.78	0.76	2.54	3.33	64.70	1.65	0.89
37	0.9000	88.7	89	15.4	1.77	0.76	2.53	3.31	64.70	1.65	0.88

Parameters for Specimen No. 2

Specimen Parameter	Initial	Saturated	Consolidated	Final
Moisture content: Moist soil+tare, gms.	1063.800			1031.270
Moisture content: Dry soil+tare, gms.	755.370			755.370
Moisture content: Tare, gms.	0.000			0.000
Moisture, %	40.8	44.3	36.5	36.5
Moist specimen weight, gms.	1063.80			
Diameter, in.	2.882	2.822	2.713	
Area, in. ²	6.523	6.254	5.782	
Height, in.	6.006	5.993	5.865	
Net decrease in height, in.		0.013	0.128	
Net decrease in water volume, cc.			58.500	
Wet density, pcf	103.4	110.8	115.9	
Dry density, pcf	73.4	76.8	84.9	
Void ratio	1.2949	1.1953	0.9862	
Saturation, %	85.1	100.0	100.0	

Test Readings for Specimen No. 2

Membrane modulus = 0.124105 kN/cm²

Membrane thickness = 0.02 cm

Consolidation cell pressure = 100.00 psi (14.40 ksf)

Consolidation back pressure = 60.00 psi (8.64 ksf)

Consolidation effective confining stress = 5.76 ksf

Strain rate, %/min. = 0.05

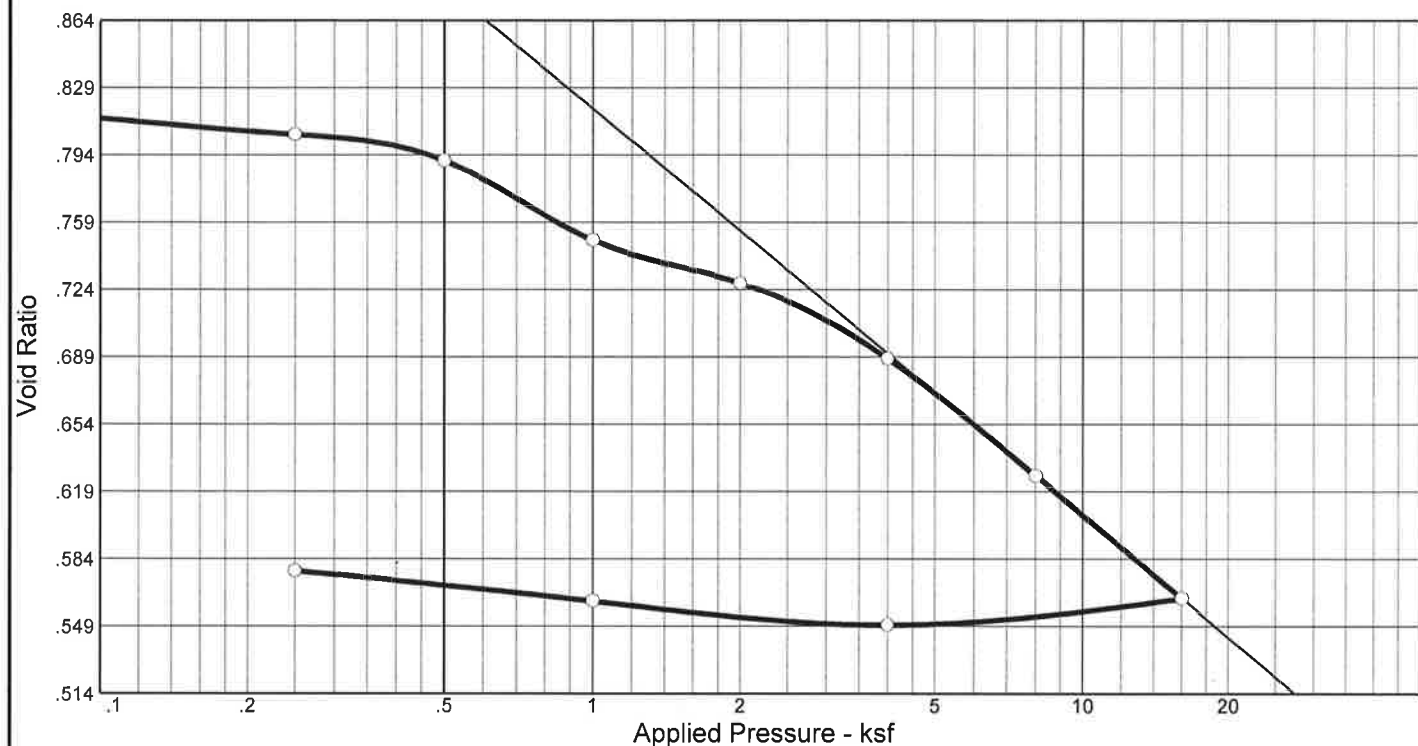
Fail. Stress = 3.13 ksf at reading no. 30

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf	Minor Eff. Stress ksf	Major Eff. Stress ksf	1:3 Ratio	Pore Press. psi	P ksf	Q ksf
0	0.0000	0.0	0	0.0	0.00	5.76	5.76	1.00	60.00	5.76	0.00
1	0.0030	12.4	12	0.1	0.31	5.40	5.71	1.06	62.50	5.55	0.15
2	0.0050	16.4	16	0.1	0.41	5.31	5.72	1.08	63.10	5.52	0.20
3	0.0100	24.7	25	0.2	0.61	5.11	5.73	1.12	64.50	5.42	0.31
4	0.0150	34.4	34	0.3	0.85	4.91	5.77	1.17	65.90	5.34	0.43
5	0.0170	46.4	46	0.3	1.15	4.68	5.83	1.25	67.50	5.26	0.58
6	0.0260	55.2	55	0.4	1.37	4.49	5.86	1.30	68.80	5.18	0.68
7	0.0300	64.2	64	0.5	1.59	4.31	5.90	1.37	70.10	5.10	0.80
8	0.0360	78.7	79	0.6	1.95	4.03	5.98	1.48	72.00	5.01	0.97
9	0.0410	94.0	94	0.7	2.32	3.69	6.01	1.63	74.40	4.85	1.16
10	0.0450	104.6	105	0.8	2.59	3.40	5.98	1.76	76.40	4.69	1.29
11	0.0510	111.9	112	0.9	2.76	3.17	5.93	1.87	78.00	4.55	1.38
12	0.0520	117.7	118	0.9	2.91	2.98	5.89	1.97	79.30	4.43	1.45
13	0.0580	122.2	122	1.0	3.01	2.82	5.84	2.07	80.40	4.33	1.51
14	0.0630	125.7	126	1.1	3.10	2.68	5.78	2.16	81.40	4.23	1.55
15	0.0690	128.4	128	1.2	3.16	2.56	5.72	2.23	82.20	4.14	1.58
16	0.0730	130.5	131	1.2	3.21	2.45	5.66	2.31	83.00	4.05	1.60
17	0.0790	132.1	132	1.3	3.25	2.38	5.62	2.37	83.50	4.00	1.62
18	0.0840	133.9	134	1.4	3.29	2.29	5.58	2.44	84.10	3.93	1.64
19	0.0890	135.0	135	1.5	3.31	2.22	5.53	2.49	84.60	3.87	1.66
20	0.0950	136.2	136	1.6	3.34	2.16	5.50	2.55	85.00	3.83	1.67
21	0.1000	136.9	137	1.7	3.35	2.09	5.44	2.61	85.50	3.76	1.68
22	0.1500	140.2	140	2.6	3.40	1.74	5.15	2.95	87.90	3.44	1.70
23	0.2020	142.0	142	3.4	3.41	1.53	4.94	3.24	89.40	3.23	1.71

Test Readings for Specimen No. 2

No.	Def. Dial in.	Load Dial	Load lbs.	Strain %	Deviator Stress ksf	Minor Eff. Stress ksf	Major Eff. Stress ksf	1:3 Ratio	Pore Press. psi	P ksf	Q ksf
24	0.2500	142.2	142	4.3	3.39	1.41	4.80	3.40	90.20	3.11	1.70
25	0.3020	140.8	141	5.1	3.33	1.34	4.67	3.48	90.70	3.00	1.66
26	0.3500	139.0	139	6.0	3.26	1.28	4.54	3.54	91.10	2.91	1.63
27	0.4020	139.8	140	6.9	3.24	1.24	4.48	3.62	91.40	2.86	1.62
28	0.4540	140.0	140	7.7	3.22	1.20	4.41	3.69	91.70	2.80	1.61
29	0.5020	139.5	140	8.6	3.18	1.18	4.36	3.69	91.80	2.77	1.59
30	0.5520	138.8	139	9.4	3.13	1.15	4.28	3.72	92.00	2.72	1.57
31	0.6020	137.7	138	10.3	3.08	1.15	4.23	3.67	92.00	2.69	1.54
32	0.6530	136.3	136	11.1	3.02	1.14	4.15	3.65	92.10	2.65	1.51
33	0.7030	135.9	136	12.0	2.98	1.12	4.10	3.65	92.20	2.61	1.49
34	0.7540	135.4	135	12.9	2.94	1.11	4.05	3.65	92.30	2.58	1.47
35	0.8040	135.2	135	13.7	2.91	1.09	4.00	3.66	92.40	2.55	1.45
36	0.8510	134.2	134	14.5	2.86	1.09	3.95	3.61	92.40	2.52	1.43
37	0.9000	133.1	133	15.3	2.81	1.08	3.89	3.60	92.50	2.48	1.40

Consolidation Test Report



Coefficients of Consolidation and Secondary Consolidation

No.	Load (ksf)	C _v (in.2/min.)	C _α	No.	Load (ksf)	C _v (in.2/min.)	C _α	No.	Load (ksf)	C _v (in.2/min.)	C _α
1	0.25	0.260									
2	0.50	0.016									
3	1.00	0.034									
4	2.00	0.034									
5	4.00	0.032									
6	8.00	0.033									
7	16.00	0.053									
8	4.00	0.205									
9	1.00	0.057									
10	0.25	0.013									

MATERIAL DESCRIPTION

USCS **AASHTO**

Grey-Brown Clayey Sand

LL	PI	Sp. Gr.	Overburden (ksf)	Dry Dens. (pcf)		Moisture		Saturation		Void Ratio		P _c (ksf)	C _c
				Init.	Final	Init.	Final	Init.	Final	Init.	Final		
26	9	2.70		93.0		26.4 %	18.8 %	87.6 %	87.8 %	0.813	0.578	1.86	0.21

Preparation Process:	D2435 Method	C _r	Swell Press. (ksf)	Heave %
Condition of Test:		0.02		

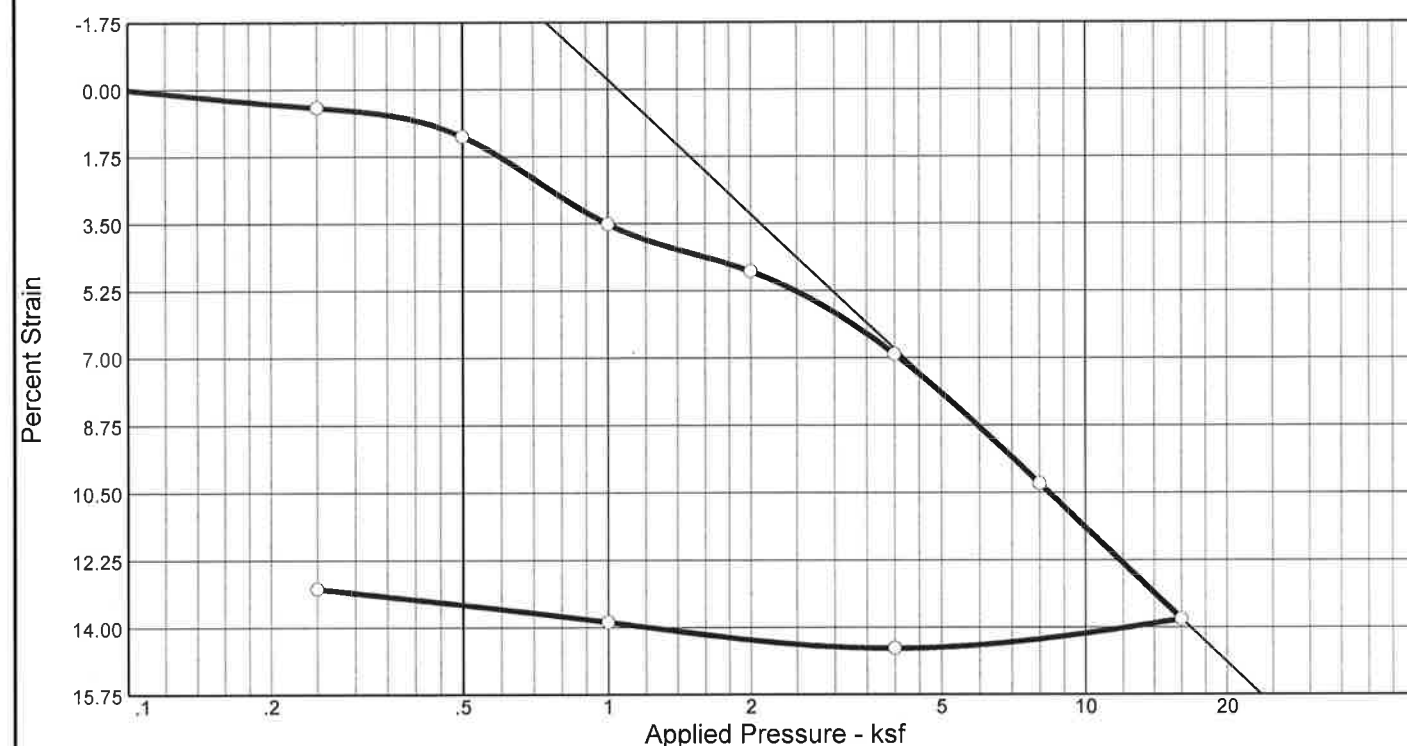
Project No. 6235-17-045 **Client:** S&ME, Inc. - Charlotte
Project: Bridge No. 73 on SR 1535 over The Straits @ Harkers Island
Location: ST-4 UD @ 11.0'-13.0'

Summit Engineering
Ft. Mill, South Carolina

Remarks:

Checked By:
Title:
 Figure

Consolidation Test Report



Coefficients of Consolidation and Secondary Consolidation

No.	Load (ksf)	C _v (in.2/min.)	C _α	No.	Load (ksf)	C _v (in.2/min.)	C _α	No.	Load (ksf)	C _v (in.2/min.)	C _α
1	0.25	0.260									
2	0.50	0.016									
3	1.00	0.034									
4	2.00	0.034									
5	4.00	0.032									
6	8.00	0.033									
7	16.00	0.053									
8	4.00	0.205									
9	1.00	0.057									
10	0.25	0.013									

MATERIAL DESCRIPTION

USCS **AASHTO**

Grey-Brown Clayey Sand

LL	PI	Sp. Gr.	Overburden (ksf)	Dry Dens. (pcf)		Moisture		Saturation		Void Ratio		P _c (ksf)	C _c
				Init.	Final	Init.	Final	Init.	Final	Init.	Final		
26	9	2.70		93.0		26.4 %	18.8 %	87.6 %	87.8 %	0.813	0.578	1.86	0.21

Preparation Process:	D2435 Method	C _r	Swell Press. (ksf)	Heave %
Condition of Test:		0.02		

Project No. 6235-17-045 **Client:** S&ME, Inc. - Charlotte
Project: Bridge No. 73 on SR 1535 over The Straits @ Harkers Island
Location: ST-4 UD @ 11.0'-13.0'

Summit Engineering
Ft. Mill, South Carolina

Remarks:

Checked By:
Title:
 Figure

CONSOLIDATION TEST DATA

Client: S&ME, Inc. - Charlotte
 Project: Bridge No. 73 on SR 1535 over
 The Straits @ Harkers Island
 Project Number: 6235-17-045

Sample Data

Source:
 Sample No.:
 Elev. or Depth: Sample Length(in./cm.):
 Location: ST-4 UD @ 11.0'-13.0'
 Description: Grey-Brown Clayey Sand
 Liquid Limit: 6 Plasticity Index: 9
 USCS: AASHTO: Figure No.:
 Testing Remarks:

Test Specimen Data

TOTAL SAMPLE	BEFORE TEST	AFTER TEST
Wet w+t = 151.39 g.	Consolidometer # = 2	Wet w+t = 142.28 g.
Dry w+t = 119.77 g.		Dry w+t = 119.77 g.
Tare Wt. = .00 g.	Spec. Gravity = 2.70	Tare Wt. = .00 g.
Height = 1.00 in.	Height = 1.00 in.	
Diameter = 2.50 in.	Diameter = 2.50 in.	
Weight = 151.39 g.	Defl. Table = 2	
Moisture = 26.4 %	Ht. Solids = 0.5515 in.	Moisture = 18.8 %
Wet Den. = 117.5 pcf	Dry Wt. = 119.77 g.	Dry Wt. = 119.77 g.*
Dry Den. = 93.0 pcf	Void Ratio = 0.813	Void Ratio = 0.578
	Saturation = 87.6 %	

* Final dry weight used in calculations

End-of-Load Summary

Pressure (ksf)	Final Dial (in.)	Machine Defl. (in.)	C _v (in. ² /min.)	C _α	Void Ratio	% Compression /Swell
start	0.00000				0.813	
0.25	0.00590	0.00010	0.260		0.805*	0.5 Compr.*
0.50	0.01290	0.00020	0.016		0.791*	1.2 Compr.*
1.00	0.03740	0.00060	0.034		0.750*	3.5 Compr.*
2.00	0.05250	0.00080	0.034		0.727*	4.7 Compr.*
4.00	0.07660	0.00150	0.032		0.688*	6.9 Compr.*
8.00	0.11350	0.00220	0.033		0.627*	10.3 Compr.*
16.00	0.15190	0.00290	0.053		0.564*	13.8 Compr.*
4.00	0.14720	0.00240	0.205		0.550*	14.5 Compr.*
1.00	0.13910	0.00160	0.057		0.562*	13.9 Compr.*
0.25	0.12810	0.00090	0.013		0.578*	13.0 Compr.*

*CALCULATED USING D₁₀₀ INSTEAD OF FINAL READING

C_c = 0.21 P_c = 1.86 ksf C_r = 0.02

Pressure: 0.25 ksf

TEST READINGS

Load No. 1

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.00000	11	60.00	0.00530
2	0.10	0.00370	12	120.00	0.00540
3	0.25	0.00400	13	240.00	0.00550
4	0.50	0.00450	14	480.00	0.00560
5	1.00	0.00470	15	720.00	0.00590
6	2.00	0.00470			
7	4.00	0.00470			
8	8.00	0.00470			
9	15.00	0.00470			
10	30.00	0.00530			

Void Ratio = 0.805 Compression = 0.5 % >>> CALCULATED USING D₁₀₀
 D₀ = 0.00292 D₉₀ = 0.00453 D₁₀₀ = 0.00471
 C_v at 0.8 min. = 0.260 in.²/min.

Pressure: 0.50 ksf

TEST READINGS

Load No. 2

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.00590	11	60.00	0.01280
2	0.10	0.00880	12	120.00	0.01290
3	0.25	0.00930			
4	0.50	0.00950			
5	1.00	0.01010			
6	2.00	0.01030			
7	4.00	0.01080			
8	8.00	0.01170			
9	15.00	0.01220			
10	30.00	0.01260			

Void Ratio = 0.791 Compression = 1.2 % >>> CALCULATED USING D₁₀₀
 D₀ = 0.00853 D₉₀ = 0.01185 D₁₀₀ = 0.01222
 C_v at 12.7 min. = 0.016 in.²/min.

Pressure: 1.00 ksf

TEST READINGS

Load No. 3

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.01220	11	60.00	0.03660
2	0.10	0.03320	12	120.00	0.03710
3	0.25	0.03340	13	240.00	0.03740
4	0.50	0.03350			
5	1.00	0.03420			
6	2.00	0.03480			
7	4.00	0.03510			
8	8.00	0.03570			
9	15.00	0.03590			
10	30.00	0.03650			

Void Ratio = 0.750 Compression = 3.5 % >>> CALCULATED USING D₁₀₀
 D₀ = 0.03222 D₉₀ = 0.03481 D₁₀₀ = 0.03509
 C_v at 5.9 min. = 0.034 in.²/min.

Pressure: 2.00 ksf TEST READINGS Load No. 4

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.03740	11	60.00	0.05040
2	0.10	0.04120	12	120.00	0.05110
3	0.25	0.04200	13	240.00	0.05180
4	0.50	0.04280	14	480.00	0.05210
5	1.00	0.04390	15	720.00	0.05250
6	2.00	0.04540			
7	4.00	0.04690			
8	8.00	0.04800			
9	15.00	0.04880			
10	30.00	0.04960			

Void Ratio = 0.727 Compression = 4.7 % >>> CALCULATED USING D₁₀₀
 D₀ = 0.03953 D₉₀ = 0.04662 D₁₀₀ = 0.04741
 C_v at 5.7 min. = 0.034 in.²/min.

Pressure: 4.00 ksf TEST READINGS Load No. 5

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.05250	11	60.00	0.07430
2	0.10	0.05740	12	120.00	0.07570
3	0.25	0.05880	13	240.00	0.07660
4	0.50	0.06050			
5	1.00	0.06240			
6	2.00	0.06530			
7	4.00	0.06790			
8	8.00	0.07020			
9	15.00	0.07180			
10	30.00	0.07320			

Void Ratio = 0.688 Compression = 6.9 % >>> CALCULATED USING D₁₀₀
 D₀ = 0.05431 D₉₀ = 0.06755 D₁₀₀ = 0.06902
 C_v at 5.8 min. = 0.032 in.²/min.

Pressure: 8.00 ksf TEST READINGS Load No. 6

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.07660	11	60.00	0.10950
2	0.10	0.08450	12	120.00	0.11090
3	0.25	0.08690	13	240.00	0.11180
4	0.50	0.08950	14	480.00	0.11270
5	1.00	0.09330	15	720.00	0.11330
6	2.00	0.09750	16	960.00	0.11350
7	4.00	0.10140			
8	8.00	0.10450			
9	15.00	0.10630			
10	30.00	0.10800			

Void Ratio = 0.627 Compression = 10.3 % >>> CALCULATED USING D₁₀₀
 D₀ = 0.07991 D₉₀ = 0.10036 D₁₀₀ = 0.10263
 C_v at 5.3 min. = 0.033 in.²/min.

Pressure: 16.00 ksf TEST READINGS Load No. 7

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.11350	11	60.00	0.14710
2	0.10	0.12080	12	120.00	0.14850
3	0.25	0.12390	13	240.00	0.14950
4	0.50	0.12720	14	480.00	0.15050
5	1.00	0.13180	15	720.00	0.15110
6	2.00	0.13620	16	960.00	0.15160
7	4.00	0.13990	17	1440.00	0.15190
8	8.00	0.14240			
9	15.00	0.14440			
10	30.00	0.14580			

Void Ratio = 0.564 Compression = 13.8 % >>> CALCULATED USING D₁₀₀
 D₀ = 0.11396 D₉₀ = 0.13539 D₁₀₀ = 0.13777
 C_v at 3.0 min. = 0.053 in.²/min.

Pressure: 4.00 ksf TEST READINGS Load No. 8

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.15190	11	60.00	0.14730
2	0.10	0.14870	12	120.00	0.14720
3	0.24	0.14850			
4	0.50	0.14800			
5	1.00	0.14790			
6	2.00	0.14780			
7	4.00	0.14780			
8	8.00	0.14770			
9	15.00	0.14760			
10	30.00	0.14760			

Void Ratio = 0.550 Compression = 14.5 % >>> CALCULATED USING D₁₀₀
 D₀ = 0.14691 D₉₀ = 0.14554 D₁₀₀ = 0.14539
 C_v at 0.8 min. = 0.205 in.²/min.

Pressure: 1.00 ksf TEST READINGS Load No. 9

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.14720	11	60.00	0.13910
2	0.10	0.14340	12	120.00	0.13910
3	0.25	0.14260			
4	0.50	0.14210			
5	1.00	0.14140			
6	2.00	0.14070			
7	4.00	0.14020			
8	8.00	0.13980			
9	15.00	0.13970			
10	30.00	0.13930			

Void Ratio = 0.562 Compression = 13.9 % >>> CALCULATED USING D₁₀₀
 D₀ = 0.14231 D₉₀ = 0.13890 D₁₀₀ = 0.13852
 C_v at 2.7 min. = 0.057 in.²/min.

Pressure: 0.25 ksf

TEST READINGS

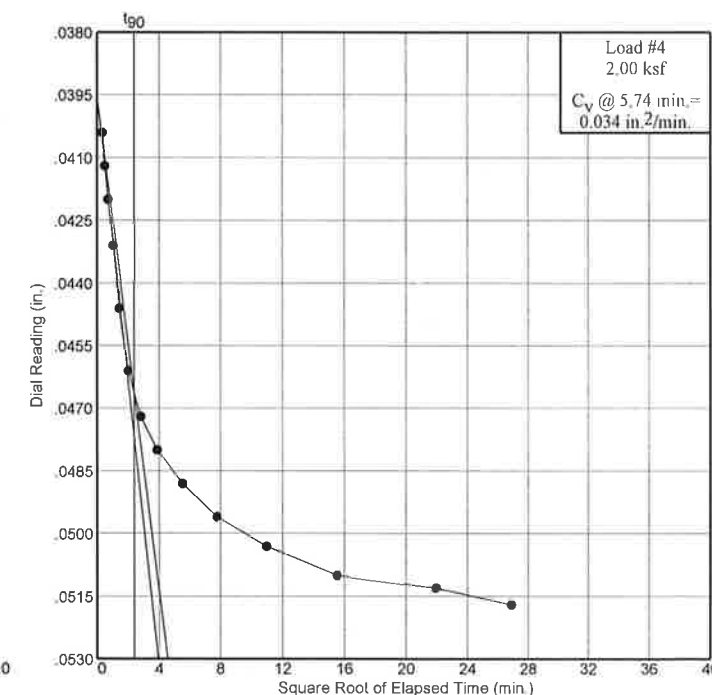
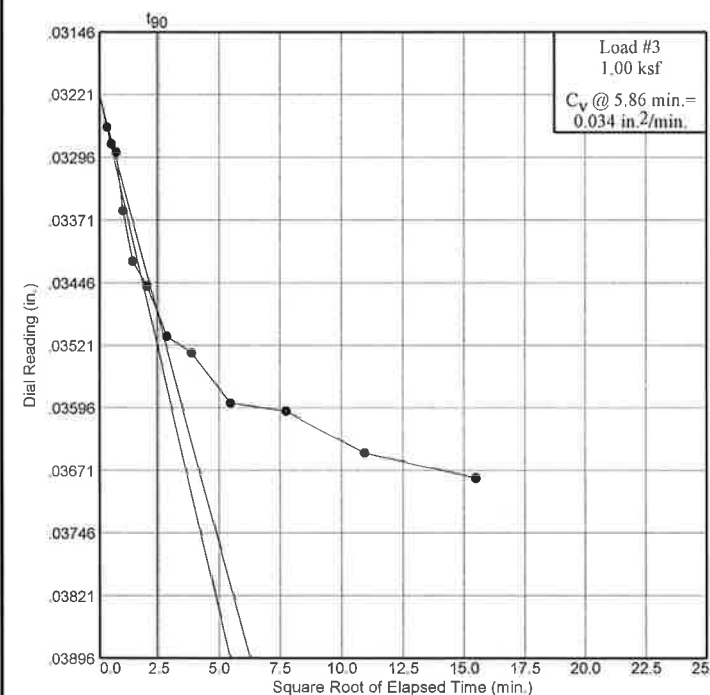
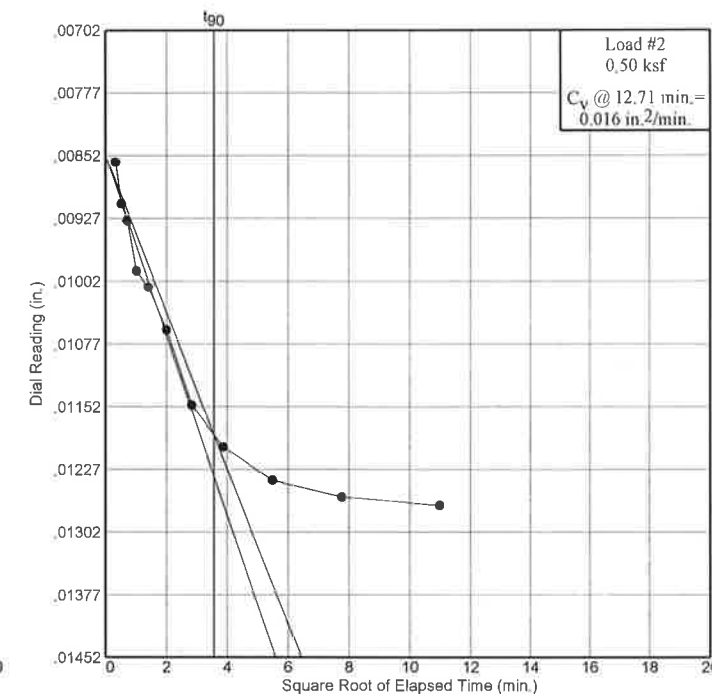
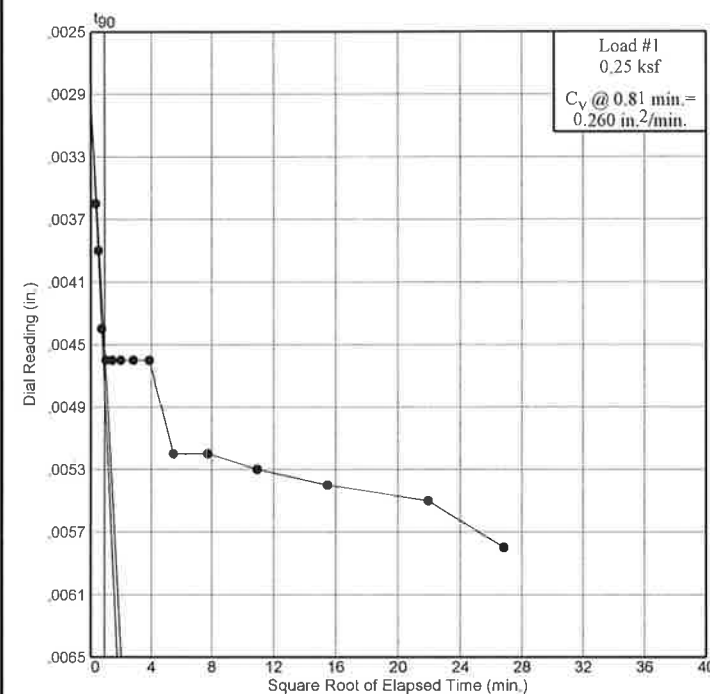
Load No. 10

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.13910	11	60.00	0.12960
2	0.10	0.13530	12	120.00	0.12940
3	0.25	0.13500	13	240.00	0.12880
4	0.50	0.13440	14	480.00	0.12860
5	1.00	0.13410	15	720.00	0.12860
6	2.00	0.13330	16	960.00	0.12850
7	4.00	0.13250	17	1440.00	0.12810
8	8.00	0.13170			
9	15.00	0.13090			
10	30.00	0.13020			

Void Ratio = 0.578 Compression = 13.0 % >>> CALCULATED USING D₁₀₀
 D₀ = 0.13467 D₉₀ = 0.13033 D₁₀₀ = 0.12985
 C_v at 11.9 min. = 0.013 in.²/min.

Dial Reading vs. Time

Project No.: 6235-17-045
 Project: Bridge No. 73 on SR 1535 over
 The Straits @ Harkers Island
 Location: ST-4 UD @ 11.0'-13.0'

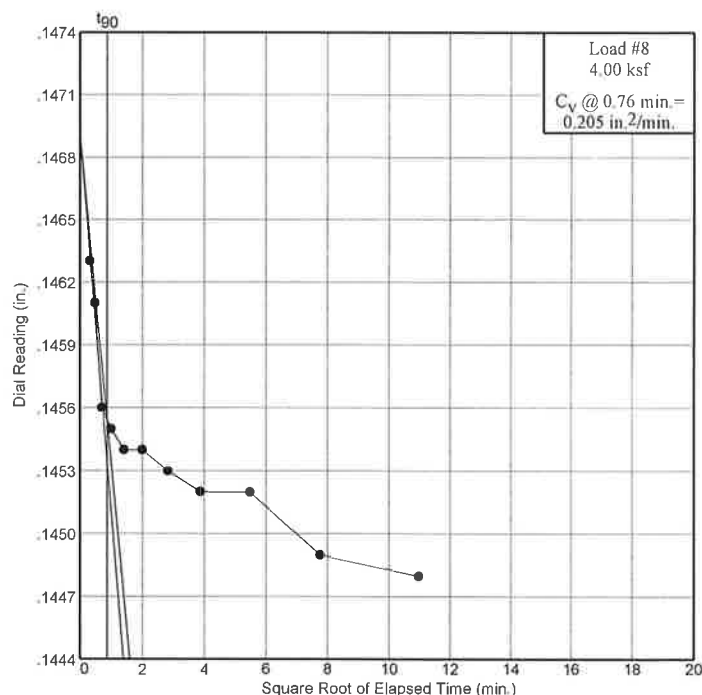
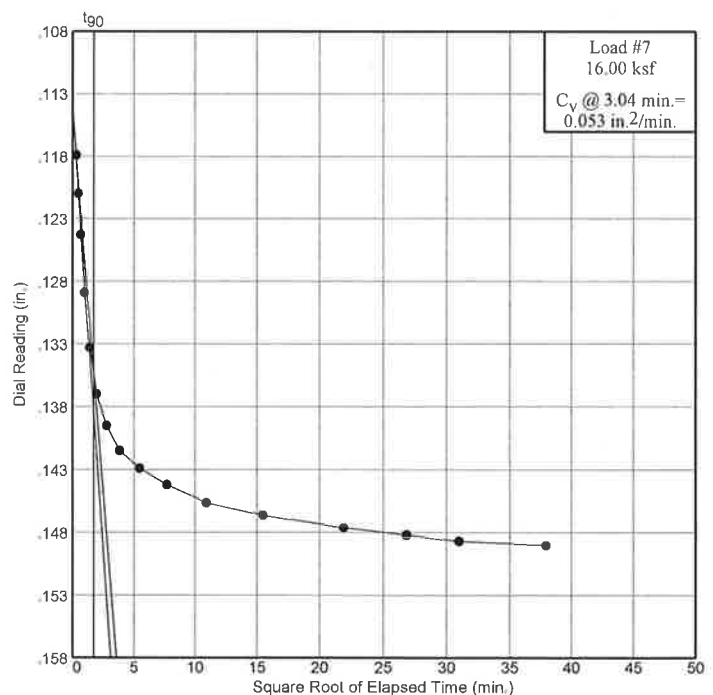
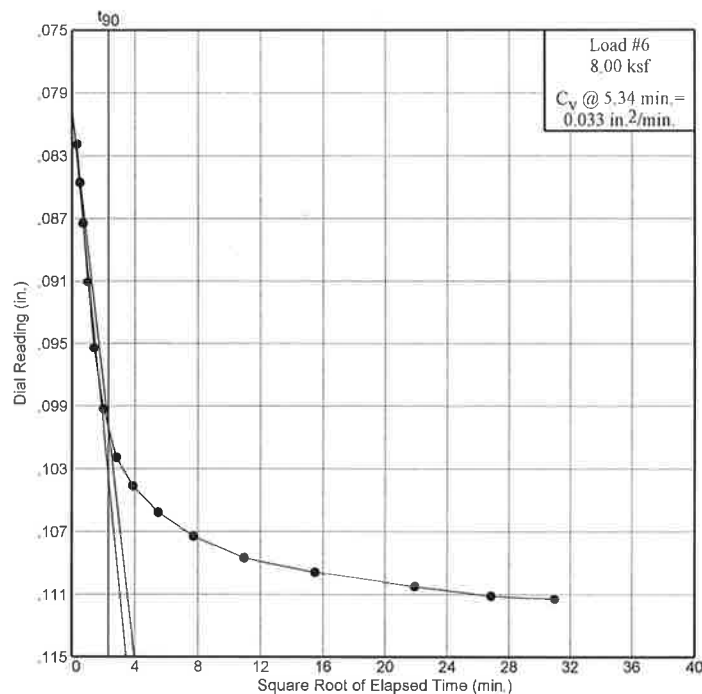
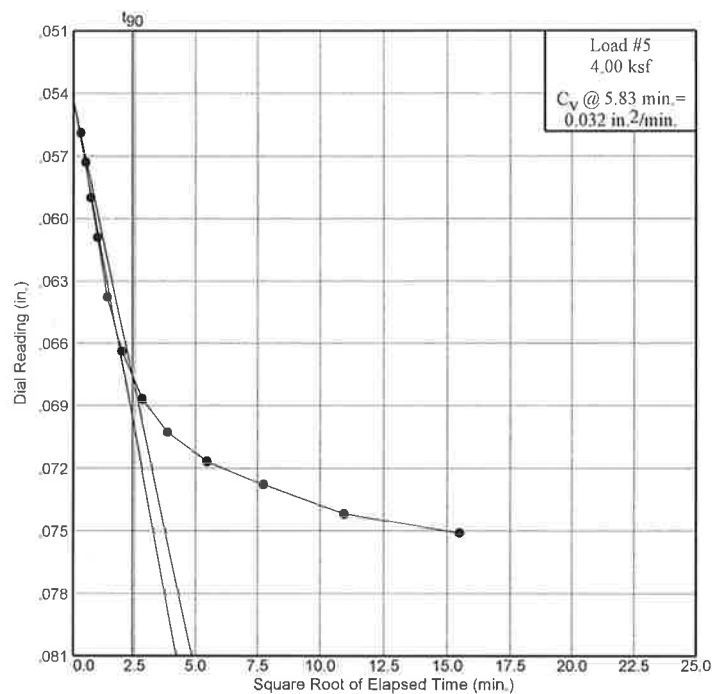


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Figure

Dial Reading vs. Time

Project No.: 6235-17-045
 Project: Bridge No. 73 on SR 1535 over
 The Straits @ Harkers Island
 Location: ST-4 UD @ 11.0'-13.0'

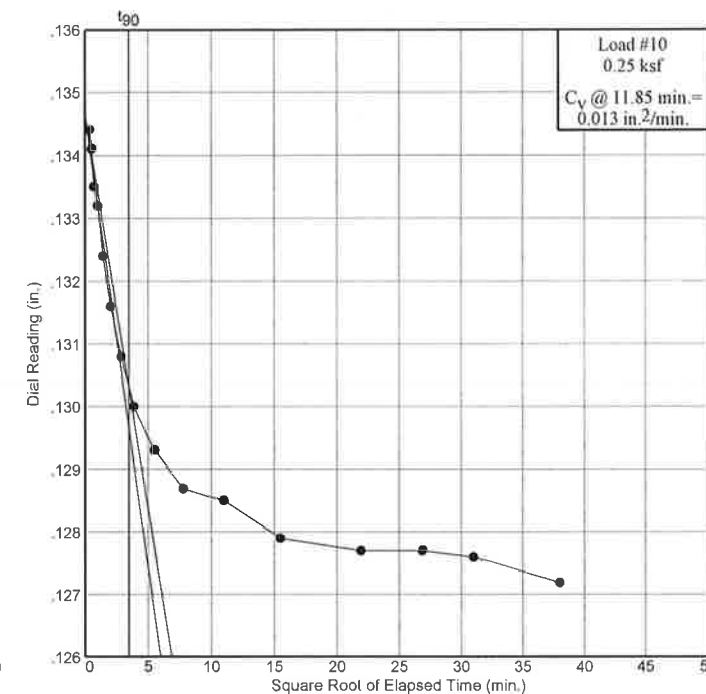
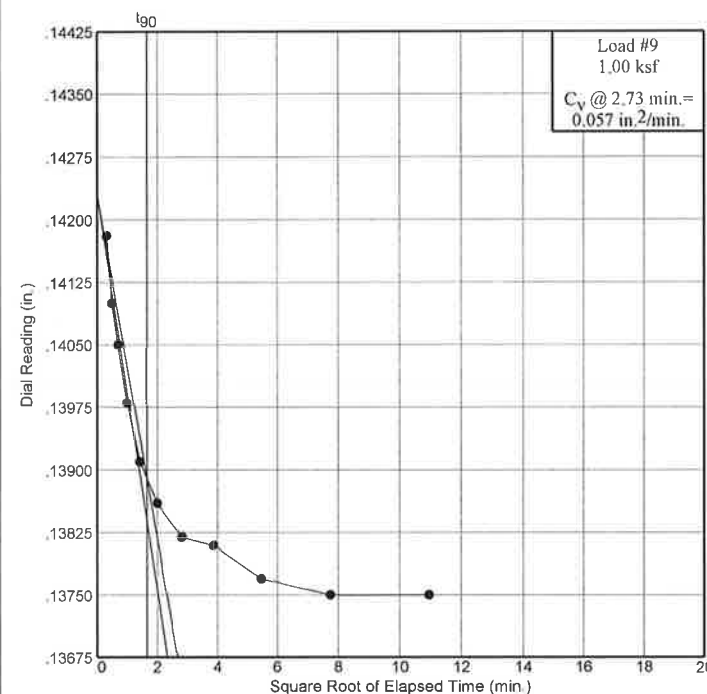


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Figure

Dial Reading vs. Time

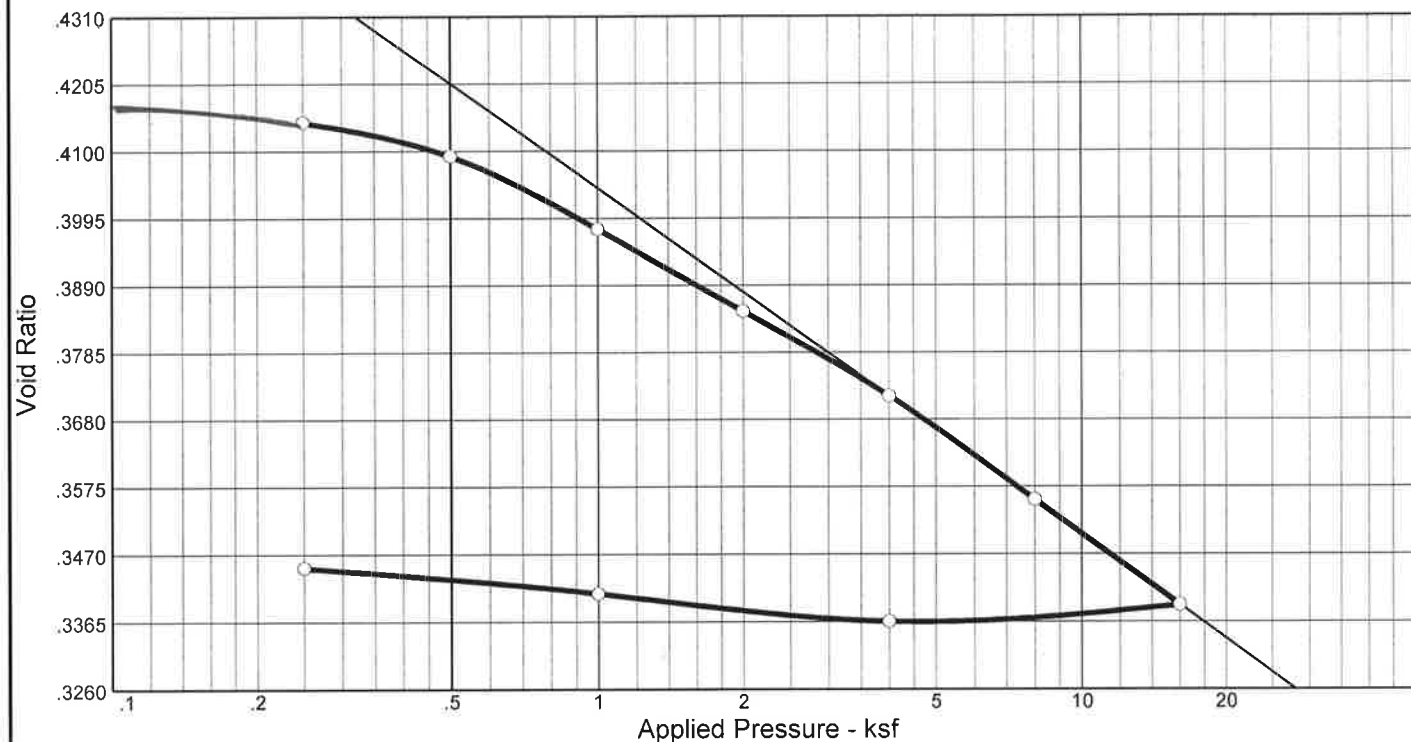
Project No.: 6235-17-045
 Project: Bridge No. 73 on SR 1535 over
 The Straits @ Harkers Island
 Location: ST-4 UD @ 11.0'-13.0'



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Figure

Consolidation Test Report



Coefficients of Consolidation and Secondary Consolidation											
No.	Load (ksf)	C _v (in.2/min.)	C _α	No.	Load (ksf)	C _v (in.2/min.)	C _α	No.	Load (ksf)	C _v (in.2/min.)	C _α
1	0.25	0.012									
2	0.50	0.270									
3	1.00	0.033									
4	2.00	0.038									
5	4.00	0.072									
6	8.00	0.078									
7	16.00	0.141									
8	4.00	0.240									
9	1.00	0.562									
10	0.25	0.541									

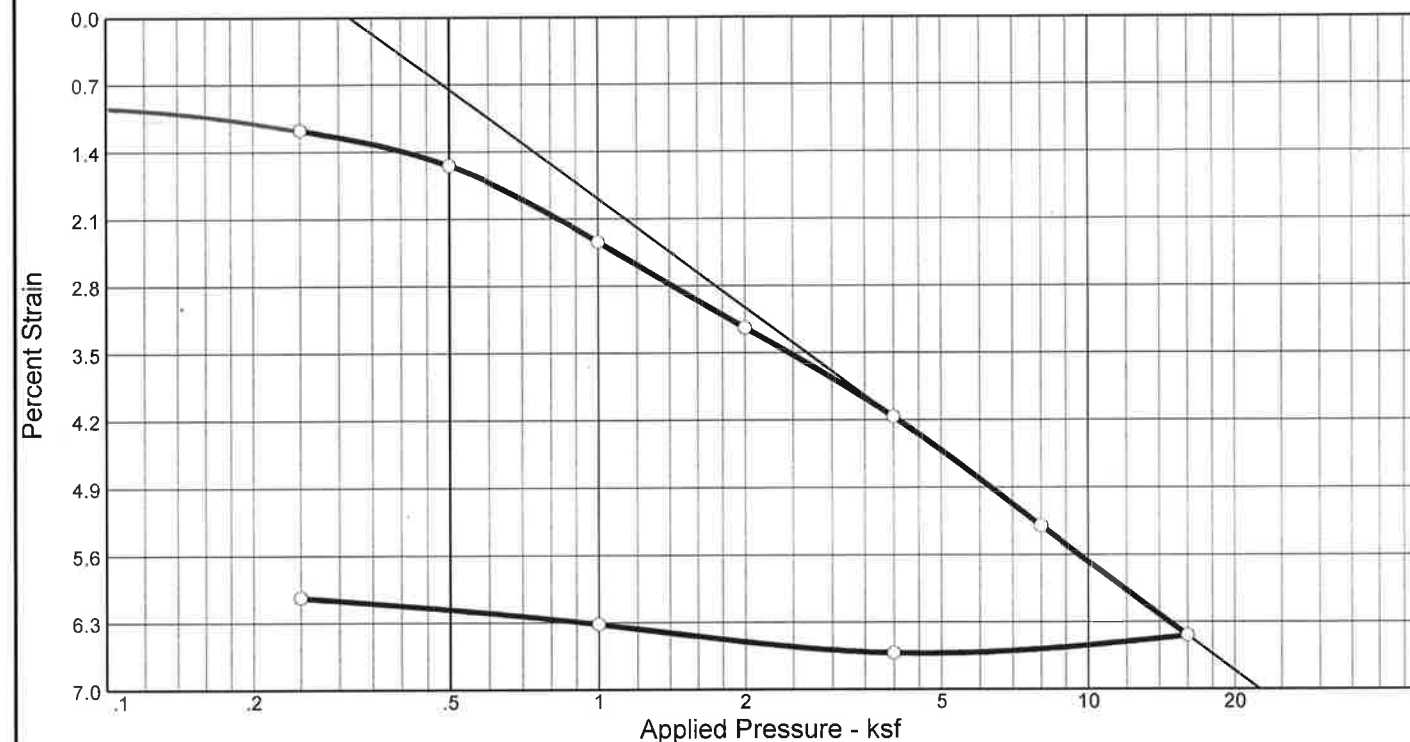
MATERIAL DESCRIPTION										USCS	AASHTO		
Grey Silty Sand													
LL	PI	Sp. Gr.	Overburden (ksf)	Dry Dens. (pcf)		Moisture		Saturation		Void Ratio		P _c (ksf)	C _c
				Init.	Final	Init.	Final	Init.	Final	Init.	Final		
21	2	2.70		117.8		17.9 %	14.0 %	112.0 %	100.0 %	0.431	0.345	0.96	0.05

Preparation Process:	D2435 Method	C _r	Swell Press. (ksf)	Heave %
Condition of Test:		0.01		

Project No. 6235-17-045 **Client:** S&ME, Inc. - Charlotte
Project: Bridge No. 73 on SR 1535 over The Straits @ Harkers Island
Location: ST-5 UD @ 7.0'-9.0'
Summit Engineering
Ft. Mill, South Carolina

Remarks:
Checked By:
Title:
Figure

Consolidation Test Report



Coefficients of Consolidation and Secondary Consolidation											
No.	Load (ksf)	C _v (in.2/min.)	C _α	No.	Load (ksf)	C _v (in.2/min.)	C _α	No.	Load (ksf)	C _v (in.2/min.)	C _α
1	0.25	0.012									
2	0.50	0.270									
3	1.00	0.033									
4	2.00	0.038									
5	4.00	0.072									
6	8.00	0.078									
7	16.00	0.141									
8	4.00	0.240									
9	1.00	0.562									
10	0.25	0.541									

MATERIAL DESCRIPTION										USCS	AASHTO		
Grey Silty Sand													
LL	PI	Sp. Gr.	Overburden (ksf)	Dry Dens. (pcf)		Moisture		Saturation		Void Ratio		P _c (ksf)	C _c
				Init.	Final	Init.	Final	Init.	Final	Init.	Final		
21	2	2.70		117.8		17.9 %	14.0 %	112.0 %	100.0 %	0.431	0.345	0.96	0.05

Preparation Process:	D2435 Method	C _r	Swell Press. (ksf)	Heave %
Condition of Test:		0.01		

Project No. 6235-17-045 **Client:** S&ME, Inc. - Charlotte
Project: Bridge No. 73 on SR 1535 over The Straits @ Harkers Island
Location: ST-5 UD @ 7.0'-9.0'
Summit Engineering
Ft. Mill, South Carolina

Remarks:
Checked By:
Title:
Figure

CONSOLIDATION TEST DATA

Client: S&ME, Inc. - Charlotte
Project: Bridge No. 73 on SR 1535 over
The Straits @ Harkers Island
Project Number: 6235-17-045

Sample Data

Source:
Sample No.:
Elev. or Depth: Sample Length(in./cm.):
Location: ST-5 UD @ 7.0'-9.0'
Description: Grey Silty Sand
Liquid Limit: 21 Plasticity Index: 2
USCS: AASHTO: Figure No.:
Testing Remarks:

Test Specimen Data

TOTAL SAMPLE	BEFORE TEST	AFTER TEST
Wet w+t = 178.90 g.	Consolidometer # = 3	Wet w+t = 172.92 g.
Dry w+t = 151.74 g.		Dry w+t = 151.74 g.
Tare Wt. = .00 g.	Spec. Gravity = 2.70	Tare Wt. = .00 g.
Height = 1.00 in.	Height = 1.00 in.	
Diameter = 2.50 in.	Diameter = 2.50 in.	
Weight = 178.90 g.	Defl. Table = 3	
Moisture = 17.9 %	Ht. Solids = 0.6987 in.	Moisture = 14.0 %
Wet Den. = 138.8 pcf	Dry Wt. = 151.74 g.	Dry Wt. = 151.74 g.*
Dry Den. = 117.8 pcf	Void Ratio = 0.431	Void Ratio = 0.345
	Saturation = 112.0 %	

* Final dry weight used in calculations

End-of-Load Summary

Pressure (ksf)	Final Dial (in.)	Machine Defl. (in.)	C _v (in. ² /min.)	C _α	Void Ratio	% Compression /Swell
start	0.00000				0.431	
0.25	0.01310	0.00020	0.012		0.415*	1.2 Compr.*
0.50	0.01810	0.00020	0.270		0.409*	1.6 Compr.*
1.00	0.02570	0.00080	0.033		0.398*	2.3 Compr.*
2.00	0.03540	0.00100	0.038		0.385*	3.2 Compr.*
4.00	0.04560	0.00170	0.072		0.372*	4.2 Compr.*
8.00	0.05840	0.00230	0.078		0.355*	5.3 Compr.*
16.00	0.07160	0.00300	0.141		0.339*	6.4 Compr.*
4.00	0.06840	0.00240	0.240		0.337*	6.6 Compr.*
1.00	0.06440	0.00150	0.562		0.341*	6.3 Compr.*
0.25	0.06090	0.00100	0.541		0.345*	6.0 Compr.*

*CALCULATED USING D₁₀₀ INSTEAD OF FINAL READING

C_c = 0.05 P_c = 0.98 ksf C_r = 0.01

Pressure: 0.25 ksf

TEST READINGS

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.00000	11	60.00	0.01230
2	0.10	0.00310	12	120.00	0.01260
3	0.25	0.00350	13	240.00	0.01280
4	0.50	0.00390	14	480.00	0.01290
5	1.00	0.00450	15	720.00	0.01310
6	2.00	0.00560			
7	4.00	0.00710			
8	8.00	0.00920			
9	15.00	0.01080			
10	30.00	0.01190			

Void Ratio = 0.415 Compression = 1.2 % >>> CALCULATED USING D₁₀₀
D₀ = 0.00201 D₉₀ = 0.01077 D₁₀₀ = 0.01174
C_v at 17.0 min. = 0.012 in.²/min.

Pressure: 0.50 ksf

TEST READINGS

Load No. 2

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.01310	11	60.00	0.01780
2	0.10	0.01540	12	120.00	0.01810
3	0.25	0.01560			
4	0.50	0.01580			
5	1.00	0.01590			
6	2.00	0.01610			
7	4.00	0.01650			
8	8.00	0.01680			
9	15.00	0.01740			
10	30.00	0.01760			

Void Ratio = 0.409 Compression = 1.6 % >>> CALCULATED USING D₁₀₀
D₀ = 0.01488 D₉₀ = 0.01566 D₁₀₀ = 0.01574
C_v at 0.8 min. = 0.270 in.²/min.

Pressure: 1.00 ksf

TEST READINGS

Load No. 3

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.01810	11	60.00	0.02520
2	0.10	0.02140	12	120.00	0.02550
3	0.25	0.02160	13	240.00	0.02570
4	0.50	0.02200			
5	1.00	0.02240			
6	2.00	0.02300			
7	4.00	0.02360			
8	8.00	0.02410			
9	15.00	0.02460			
10	30.00	0.02480			

Void Ratio = 0.398 Compression = 2.3 % >>> CALCULATED USING D₁₀₀
D₀ = 0.02021 D₉₀ = 0.02308 D₁₀₀ = 0.02340
C_v at 6.1 min. = 0.033 in.²/min.

Pressure: 2.00 ksf TEST READINGS Load No. 4

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.02570	11	60.00	0.03440
2	0.10	0.03000	12	120.00	0.03470
3	0.25	0.03040	13	240.00	0.03500
4	0.50	0.03100	14	480.00	0.03520
5	1.00	0.03160	15	720.00	0.03540
6	2.00	0.03220			
7	4.00	0.03280			
8	8.00	0.03340			
9	15.00	0.03360			
10	30.00	0.03410			

Void Ratio = 0.385 Compression = 3.2 % >>> CALCULATED USING D₁₀₀
 D₀ = 0.02868 D₉₀ = 0.03201 D₁₀₀ = 0.03238
 C_v at 5.3 min. = 0.038 in.²/min.

Pressure: 4.00 ksf TEST READINGS Load No. 5

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.03540	11	60.00	0.04480
2	0.10	0.04030	12	120.00	0.04530
3	0.25	0.04090	13	240.00	0.04560
4	0.50	0.04150			
5	1.00	0.04220			
6	2.00	0.04280			
7	4.00	0.04330			
8	8.00	0.04380			
9	15.00	0.04410			
10	30.00	0.04460			

Void Ratio = 0.372 Compression = 4.2 % >>> CALCULATED USING D₁₀₀
 D₀ = 0.03805 D₉₀ = 0.04129 D₁₀₀ = 0.04165
 C_v at 2.7 min. = 0.072 in.²/min.

Pressure: 8.00 ksf TEST READINGS Load No. 6

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.04560	11	60.00	0.05690
2	0.10	0.05190	12	120.00	0.05740
3	0.25	0.05280	13	240.00	0.05760
4	0.50	0.05350	14	480.00	0.05800
5	1.00	0.05420	15	720.00	0.05830
6	2.00	0.05480	16	960.00	0.05840
7	4.00	0.05520			
8	8.00	0.05580			
9	15.00	0.05610			
10	30.00	0.05660			

Void Ratio = 0.355 Compression = 5.3 % >>> CALCULATED USING D₁₀₀
 D₀ = 0.04912 D₉₀ = 0.05260 D₁₀₀ = 0.05299
 C_v at 2.4 min. = 0.078 in.²/min.

Pressure: 16.00 ksf TEST READINGS Load No. 7

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.05840	11	60.00	0.06960
2	0.10	0.06470	12	120.00	0.07010
3	0.25	0.06560	13	240.00	0.07050
4	0.50	0.06630	14	480.00	0.07100
5	1.00	0.06690	15	720.00	0.07120
6	2.00	0.06730	16	960.00	0.07140
7	4.00	0.06790	17	1200.00	0.07160
8	8.00	0.06840	18	1440.00	0.07160
9	15.00	0.06880			
10	30.00	0.06920			

Void Ratio = 0.339 Compression = 6.4 % >>> CALCULATED USING D₁₀₀
 D₀ = 0.06088 D₉₀ = 0.06405 D₁₀₀ = 0.06440
 C_v at 1.3 min. = 0.141 in.²/min.

Pressure: 4.00 ksf TEST READINGS Load No. 8

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.07160	11	60.00	0.06850
2	0.10	0.06870	12	120.00	0.06840
3	0.25	0.06870			
4	0.50	0.06860			
5	1.00	0.06860			
6	2.00	0.06860			
7	4.00	0.06860			
8	8.00	0.06860			
9	15.00	0.06850			
10	30.00	0.06850			

Void Ratio = 0.337 Compression = 6.6 % >>> CALCULATED USING D₁₀₀
 D₀ = 0.06640 D₉₀ = 0.06620 D₁₀₀ = 0.06618
 C_v at 0.8 min. = 0.240 in.²/min.

Pressure: 1.00 ksf TEST READINGS Load No. 9

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.06840	11	60.00	0.06440
2	0.10	0.06490	12	120.00	0.06440
3	0.25	0.06470			
4	0.50	0.06470			
5	1.00	0.06460			
6	2.00	0.06460			
7	4.00	0.06450			
8	8.00	0.06450			
9	15.00	0.06450			
10	30.00	0.06450			

Void Ratio = 0.341 Compression = 6.3 % >>> CALCULATED USING D₁₀₀
 D₀ = 0.06374 D₉₀ = 0.06320 D₁₀₀ = 0.06314
 C_v at 0.3 min. = 0.562 in.²/min.

Pressure: 0.25 ksf

TEST READINGS

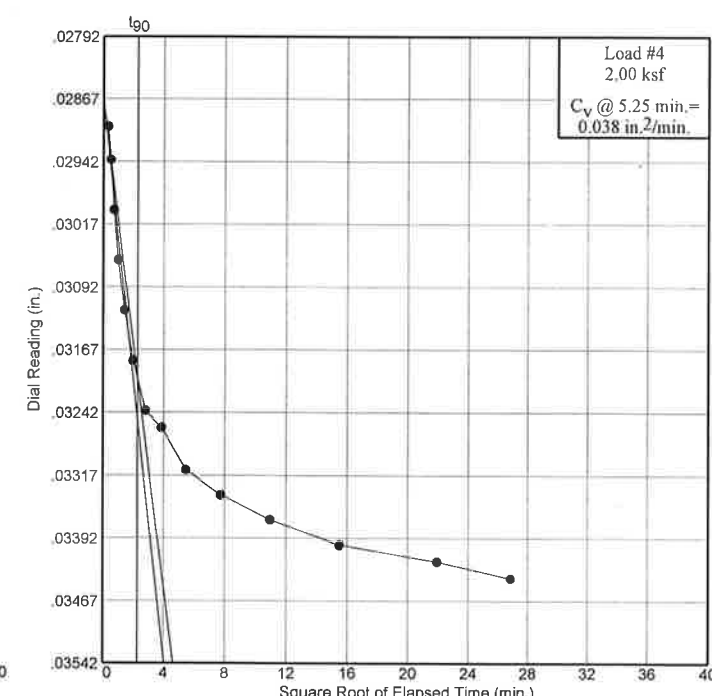
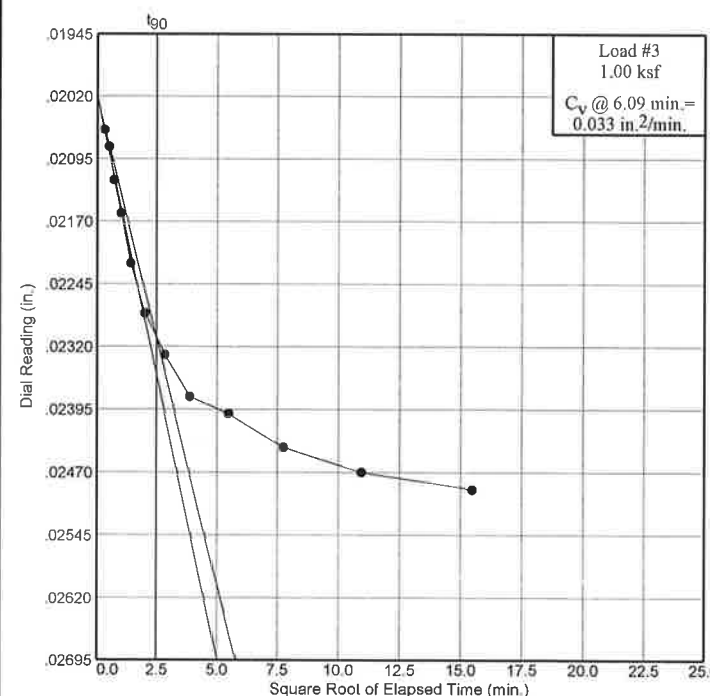
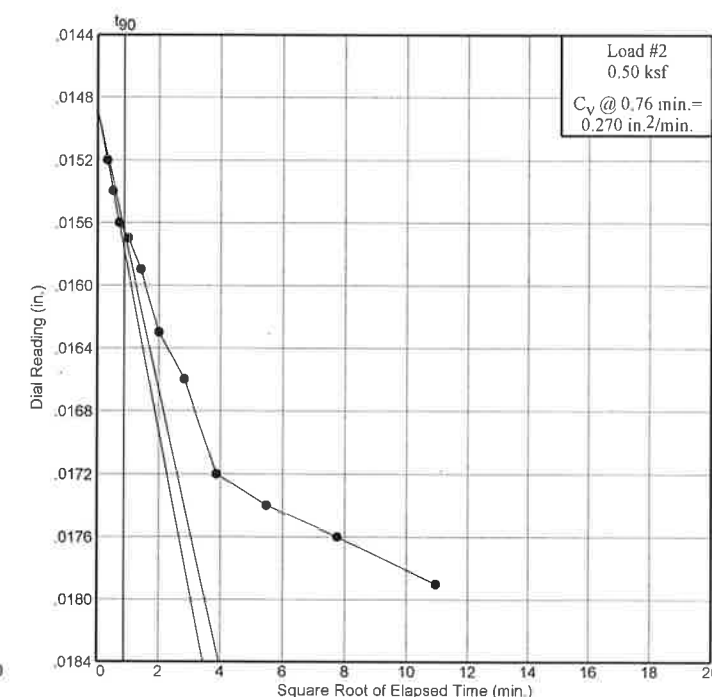
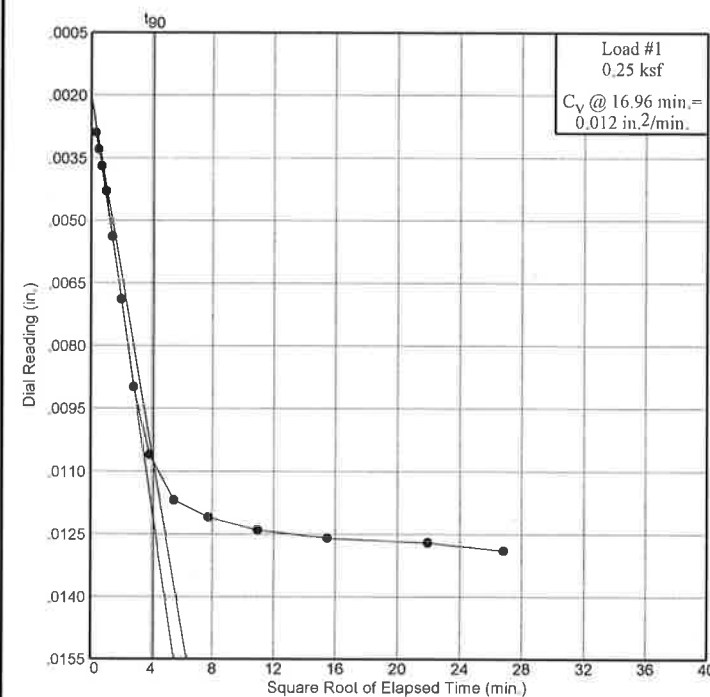
Load No. 10

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.06440	11	60.00	0.06110
2	0.10	0.06230	12	120.00	0.06100
3	0.25	0.06160	13	240.00	0.06100
4	0.50	0.06150	14	480.00	0.06090
5	1.00	0.06140	15	720.00	0.06090
6	2.00	0.06140			
7	4.00	0.06130			
8	8.00	0.06120			
9	15.00	0.06120			
10	30.00	0.06120			

Void Ratio = 0.345 Compression = 6.0 % >>> CALCULATED USING D₁₀₀
 D₀ = 0.06250 D₉₀ = 0.06056 D₁₀₀ = 0.06034
 C_v at 0.3 min. = 0.541 in.²/min.

Dial Reading vs. Time

Project No.: 6235-17-045
 Project: Bridge No. 73 on SR 1535 over
 The Straits @ Harkers Island
 Location: ST-5 UD @ 7.0'-9.0'

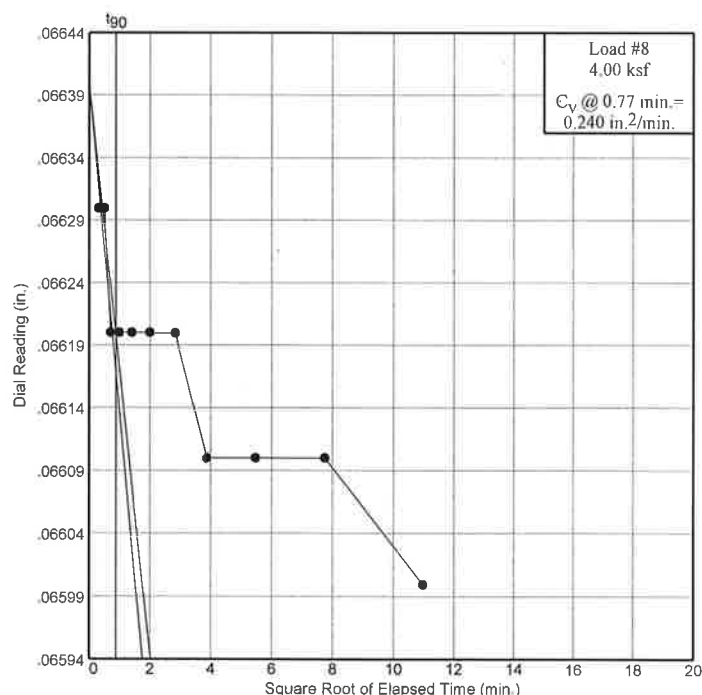
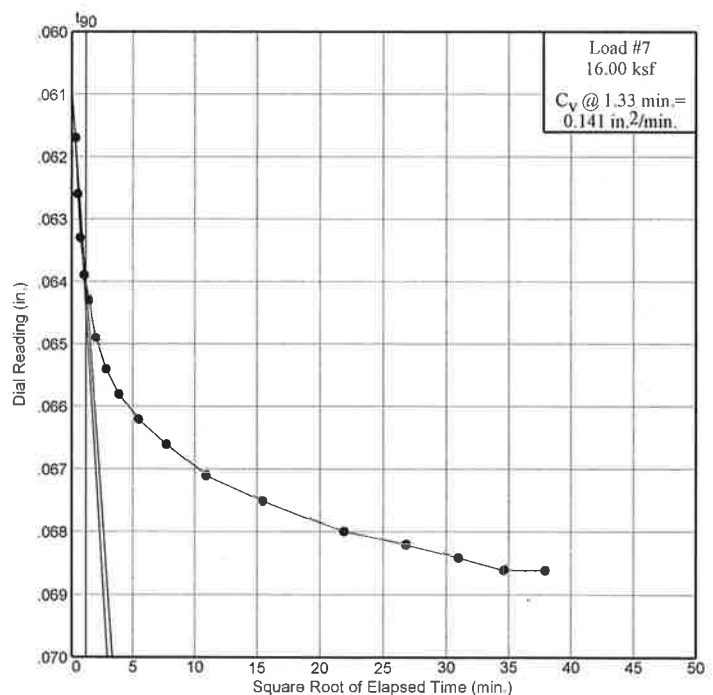
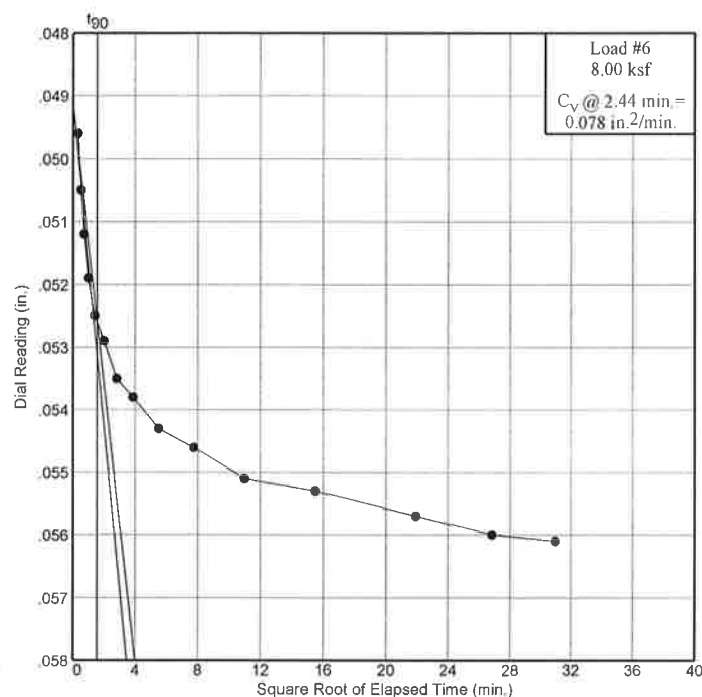
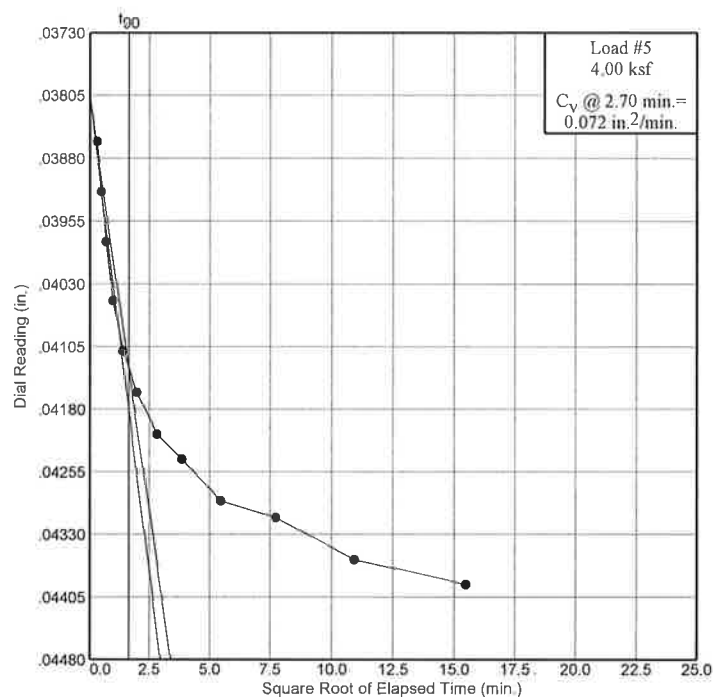


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Figure

Dial Reading vs. Time

Project No.: 6235-17-045
 Project: Bridge No. 73 on SR 1535 over
 The Straits @ Harkers Island
 Location: ST-5 UD @ 7.0'-9.0'

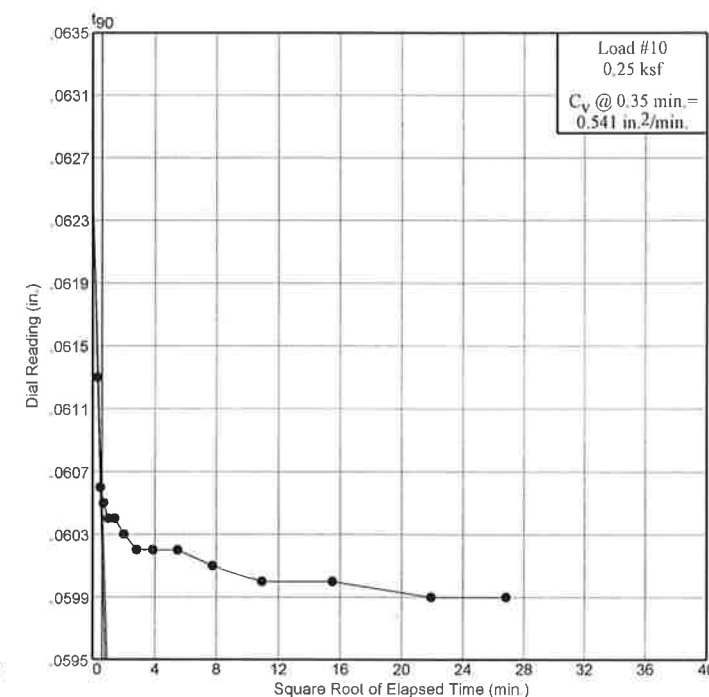
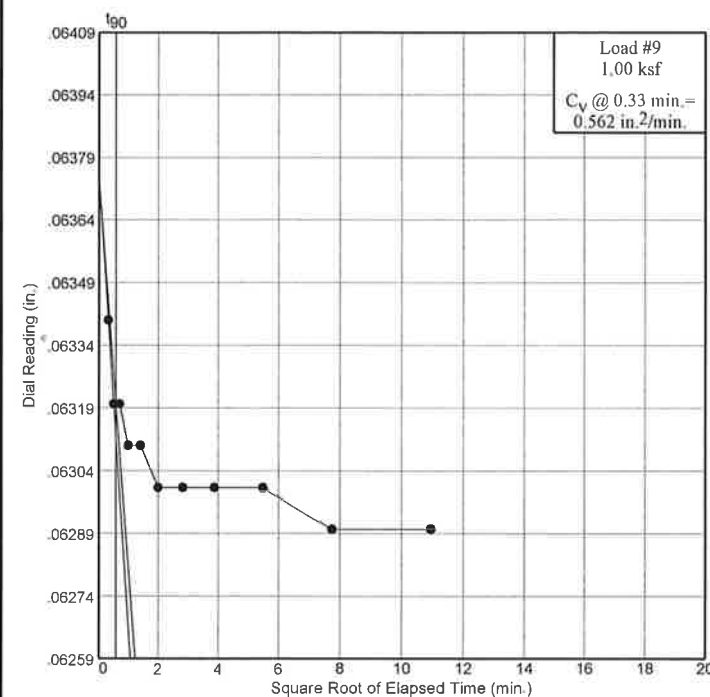


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Figure

Dial Reading vs. Time

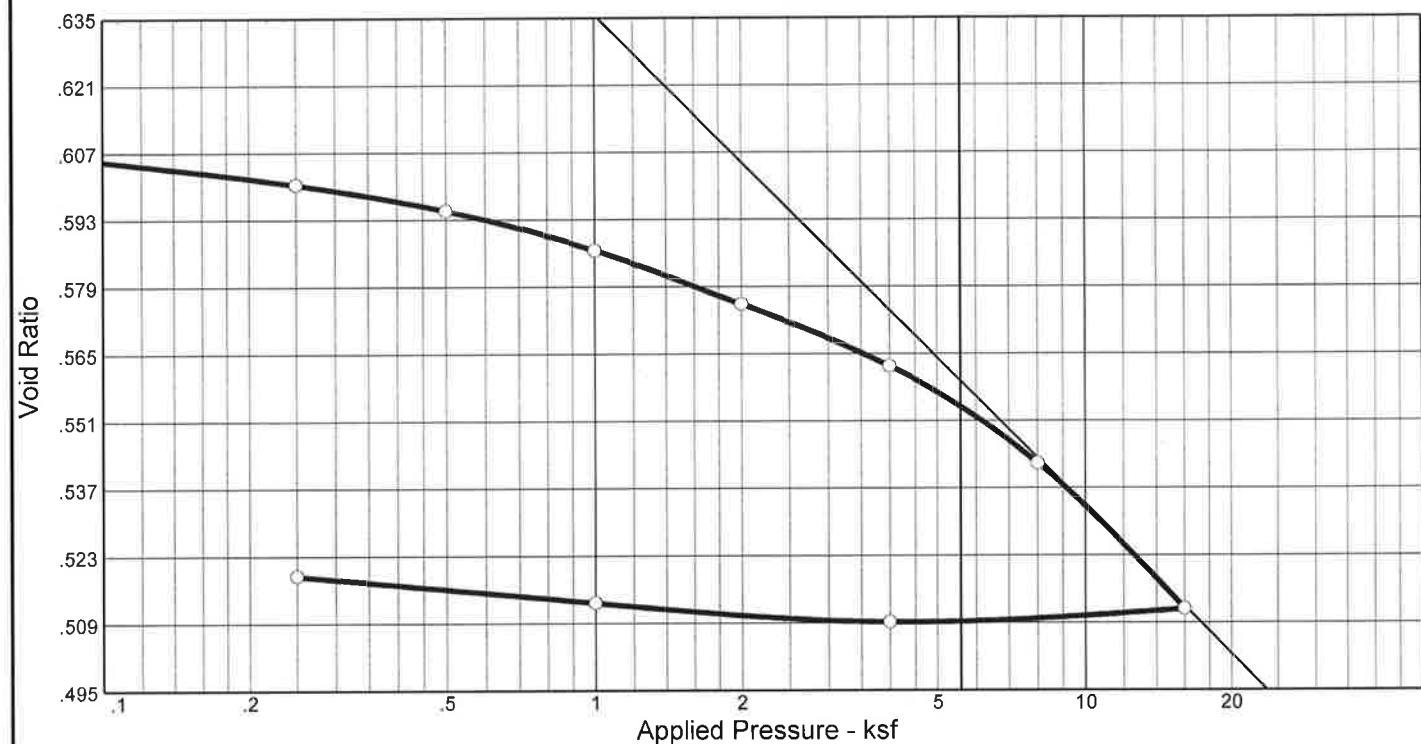
Project No.: 6235-17-045
 Project: Bridge No. 73 on SR 1535 over
 The Straits @ Harkers Island
 Location: ST-5 UD @ 7.0'-9.0'



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Figure

Consolidation Test Report



Coefficients of Consolidation and Secondary Consolidation

No.	Load (ksf)	C _v (in.2/min.)	C _α	No.	Load (ksf)	C _v (in.2/min.)	C _α	No.	Load (ksf)	C _v (in.2/min.)	C _α
1	0.25	0.322									
2	0.50	0.039									
3	1.00	0.074									
4	2.00	0.034									
5	4.00	0.134									
6	8.00	0.067									
7	16.00	0.020									
8	4.00	1.408									
9	1.00	0.570									
10	0.25	0.290									

MATERIAL DESCRIPTION

USCS

AASHTO

Grey Clayey Sand

LL	PI	Sp. Gr.	Overburden (ksf)	Dry Dens. (pcf)		Moisture		Saturation		Void Ratio		P _c (ksf)	C _c
				Init.	Final	Init.	Final	Init.	Final	Init.	Final		
27	9	2.70		105.0		13.0 %	11.2 %	58.0 %	58.4 %	0.605	0.519	6.65	0.10

Preparation Process:

D2435 Method

C_r

Swell Press. (ksf)

Heave %

Condition of Test:

0.01

Project No. 6235-17-045 **Client:** S&ME, Inc. - Charlotte

Project: Bridge No. 73 on SR 1535 over The Straits @ Harkers Island

Location: ST-6 UD @ 33.9'-35.9'

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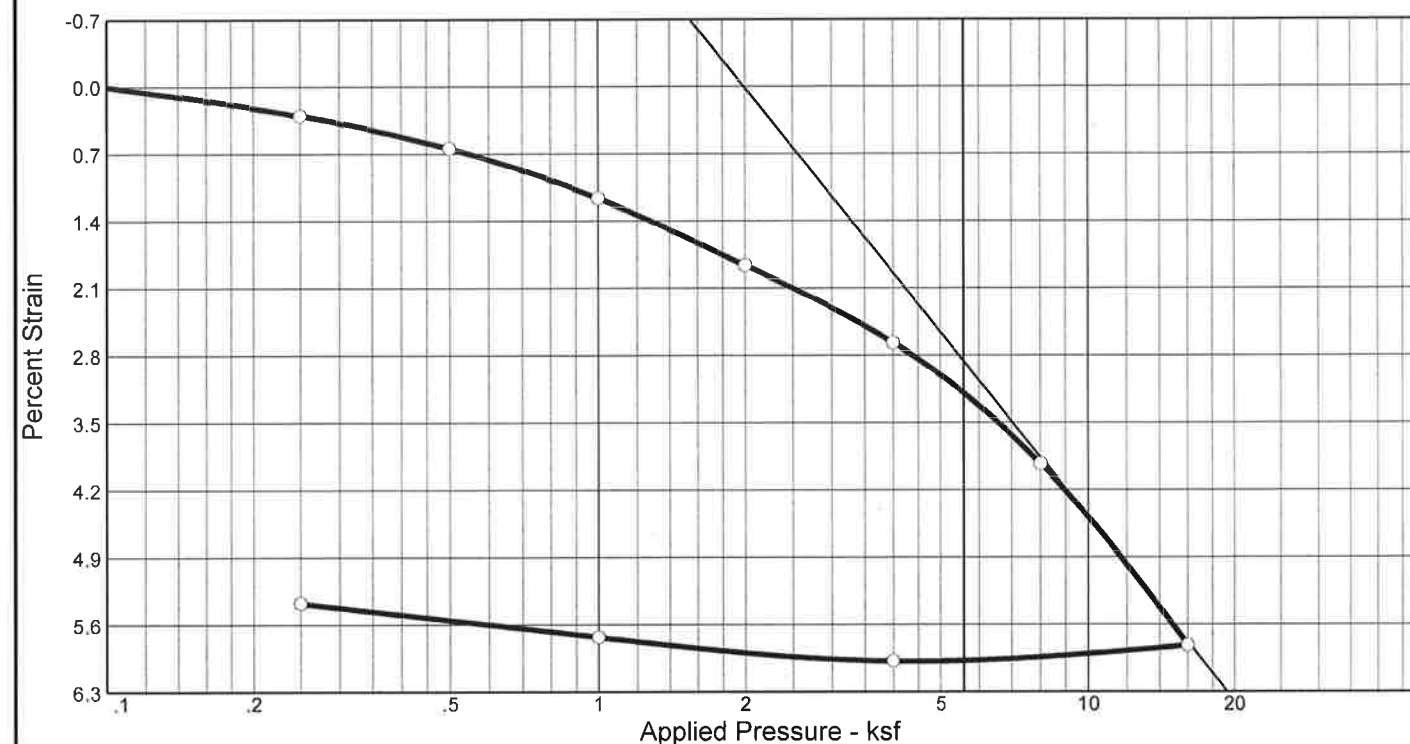
Remarks:

Checked By:

Title:

Figure

Consolidation Test Report



Coefficients of Consolidation and Secondary Consolidation

No.	Load (ksf)	C _v (in.2/min.)	C _α	No.	Load (ksf)	C _v (in.2/min.)	C _α	No.	Load (ksf)	C _v (in.2/min.)	C _α
1	0.25	0.322									
2	0.50	0.039									
3	1.00	0.074									
4	2.00	0.034									
5	4.00	0.134									
6	8.00	0.067									
7	16.00	0.020									
8	4.00	1.408									
9	1.00	0.570									
10	0.25	0.290									

MATERIAL DESCRIPTION

USCS

AASHTO

Grey Clayey Sand

LL	PI	Sp. Gr.	Overburden (ksf)	Dry Dens. (pcf)		Moisture		Saturation		Void Ratio		P _c (ksf)	C _c
				Init.	Final	Init.	Final	Init.	Final	Init.	Final		
27	9	2.70		105.0		13.0 %	11.2 %	58.0 %	58.4 %	0.605	0.519	6.65	0.10

Preparation Process:

D2435 Method

C_r

Swell Press. (ksf)

Heave %

Condition of Test:

0.01

Project No. 6235-17-045 **Client:** S&ME, Inc. - Charlotte

Project: Bridge No. 73 on SR 1535 over The Straits @ Harkers Island

Location: ST-6 UD @ 33.9'-35.9'

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Ft. Mill, South Carolina

Remarks:

Checked By:

Title:

Figure

CONSOLIDATION TEST DATA

Client: S&ME, Inc. - Charlotte
 Project: Bridge No. 73 on SR 1535 over
 The Straits @ Harkers Island
 Project Number: 6235-17-045

Sample Data

Source:
 Sample No.:
 Elev. or Depth: Sample Length(in./cm.):
 Location: ST-6 UD @ 33.9'-35.9'
 Description: Grey Clayey Sand
 Liquid Limit: 27 Plasticity Index: 9
 USCS: AASHTO: Figure No.:
 Testing Remarks:

Test Specimen Data

TOTAL SAMPLE	BEFORE TEST	AFTER TEST
Wet w+t = 152.89 g.	Consolidometer # = 3	Wet w+t = 150.49 g.
Dry w+t = 135.30 g.		Dry w+t = 135.30 g.
Tare Wt. = .00 g.	Spec. Gravity = 2.70	Tare Wt. = .00 g.
Height = 1.00 in.	Height = 1.00 in.	
Diameter = 2.50 in.	Diameter = 2.50 in.	
Weight = 152.89 g.	Defl. Table = 3	
Moisture = 13.0 %	Ht. Solids = 0.6230 in.	Moisture = 11.2 %
Wet Den. = 118.7 pcf	Dry Wt. = 135.30 g.	Dry Wt. = 135.30 g.*
Dry Den. = 105.0 pcf	Void Ratio = 0.605	Void Ratio = 0.519
	Saturation = 58.0 %	

* Final dry weight used in calculations

End-of-Load Summary

Pressure (ksf)	Final Dial (in.)	Machine Defl. (in.)	C _v (in. ² /min.)	C _α	Void Ratio	% Compression / Swell
start	0.00000				0.605	
0.25	0.00360	0.00020	0.322		0.600*	0.3 Compr.*
0.50	0.00800	0.00050	0.039		0.595*	0.6 Compr.*
1.00	0.01410	0.00080	0.074		0.587*	1.2 Compr.*
2.00	0.02200	0.00100	0.034		0.575*	1.9 Compr.*
4.00	0.03300	0.00170	0.134		0.562*	2.7 Compr.*
8.00	0.04640	0.00230	0.067		0.542*	3.9 Compr.*
16.00	0.06590	0.00300	0.020		0.512*	5.8 Compr.*
4.00	0.06280	0.00240	1.408		0.509*	6.0 Compr.*
1.00	0.05840	0.00150	0.570		0.513*	5.7 Compr.*
0.25	0.05390	0.00100	0.290		0.519*	5.4 Compr.*

*CALCULATED USING D₁₀₀ INSTEAD OF FINAL READING

C_c = 0.10 P_c = 6.65 ksf C_r = 0.01

Pressure: 0.25 ksf

TEST READINGS

Load No. 1

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.00000	11	60.00	0.00360
2	0.10	0.00300			
3	0.25	0.00310			
4	0.50	0.00320			
5	1.00	0.00320			
6	2.00	0.00320			
7	4.00	0.00330			
8	8.00	0.00330			
9	15.00	0.00340			
10	30.00	0.00350			

Void Ratio = 0.600 Compression = 0.3 % >>> CALCULATED USING D₁₀₀
 D₀ = 0.00264 D₉₀ = 0.00300 D₁₀₀ = 0.00304
 C_v at 0.7 min. = 0.322 in.²/min.

Pressure: 0.50 ksf

TEST READINGS

Load No. 2

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.00360	11	60.00	0.00730
2	0.10	0.00610	12	120.00	0.00750
3	0.25	0.00630	13	240.00	0.00770
4	0.50	0.00650	14	480.00	0.00780
5	1.00	0.00650	15	720.00	0.00800
6	2.00	0.00660			
7	4.00	0.00680			
8	8.00	0.00690			
9	15.00	0.00690			
10	30.00	0.00710			

Void Ratio = 0.595 Compression = 0.6 % >>> CALCULATED USING D₁₀₀
 D₀ = 0.00561 D₉₀ = 0.00634 D₁₀₀ = 0.00642
 C_v at 5.4 min. = 0.039 in.²/min.

Pressure: 1.00 ksf

TEST READINGS

Load No. 3

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.00800	11	60.00	0.01320
2	0.10	0.01170	12	120.00	0.01330
3	0.25	0.01180	13	240.00	0.01370
4	0.50	0.01200	14	480.00	0.01400
5	1.00	0.01210	15	720.00	0.01410
6	2.00	0.01230			
7	4.00	0.01240			
8	8.00	0.01250			
9	15.00	0.01270			
10	30.00	0.01290			

Void Ratio = 0.587 Compression = 1.2 % >>> CALCULATED USING D₁₀₀
 D₀ = 0.01075 D₉₀ = 0.01154 D₁₀₀ = 0.01163
 C_v at 2.8 min. = 0.074 in.²/min.

Pressure: 2.00 ksf TEST READINGS Load No. 4

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.01410	11	60.00	0.02040
2	0.10	0.01850	12	120.00	0.02080
3	0.25	0.01870	13	240.00	0.02110
4	0.50	0.01888	14	480.00	0.02130
5	1.00	0.01890	15	720.00	0.02160
6	2.00	0.01920	16	960.00	0.02170
7	4.00	0.01940	17	1440.00	0.02200
8	8.00	0.01960			
9	15.00	0.01980			
10	30.00	0.02010			

Void Ratio = 0.575 Compression = 1.9 % >>> CALCULATED USING D_{100}
 $D_0 = 0.01743$ $D_{90} = 0.01851$ $D_{100} = 0.01863$
 C_v at 5.9 min. = 0.034 in.²/min.

Pressure: 4.00 ksf TEST READINGS Load No. 5

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.02200	11	60.00	0.03000
2	0.10	0.02710	12	120.00	0.03060
3	0.25	0.02750	13	240.00	0.03090
4	0.50	0.02770	14	480.00	0.03160
5	1.00	0.02810	15	720.00	0.03170
6	2.00	0.02830	16	960.00	0.03210
7	4.00	0.02850	17	1440.00	0.03300
8	8.00	0.02890			
9	15.00	0.02920			
10	30.00	0.02970			

Void Ratio = 0.562 Compression = 2.7 % >>> CALCULATED USING D_{100}
 $D_0 = 0.02501$ $D_{90} = 0.02651$ $D_{100} = 0.02667$
 C_v at 1.5 min. = 0.134 in.²/min.

Pressure: 8.00 ksf TEST READINGS Load No. 6

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.03300	11	60.00	0.04360
2	0.10	0.03920	12	120.00	0.04420
3	0.25	0.03970	13	240.00	0.04490
4	0.50	0.04020	14	480.00	0.04550
5	1.00	0.04050	15	720.00	0.04590
6	2.00	0.04110	16	960.00	0.04610
7	4.00	0.04150	17	1200.00	0.04640
8	8.00	0.04200			
9	15.00	0.04250			
10	30.00	0.04290			

Void Ratio = 0.542 Compression = 3.9 % >>> CALCULATED USING D_{100}
 $D_0 = 0.03653$ $D_{90} = 0.03900$ $D_{100} = 0.03928$
 C_v at 2.9 min. = 0.067 in.²/min.

Pressure: 16.00 ksf TEST READINGS Load No. 7

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.04640	11	60.00	0.06270
2	0.10	0.05630	12	120.00	0.06350
3	0.25	0.05720	13	240.00	0.06430
4	0.50	0.05790	14	480.00	0.06500
5	1.00	0.05850	15	720.00	0.06540
6	2.00	0.05910	16	960.00	0.06570
7	4.00	0.05970	17	1200.00	0.06590
8	8.00	0.06050			
9	15.00	0.06120			
10	30.00	0.06190			

Void Ratio = 0.512 Compression = 5.8 % >>> CALCULATED USING D_{100}
 $D_0 = 0.05353$ $D_{90} = 0.05768$ $D_{100} = 0.05814$
 C_v at 9.6 min. = 0.020 in.²/min.

Pressure: 4.00 ksf TEST READINGS Load No. 8

No.	Elapsed Time	Dial Reading
1	0.00	0.06590
2	0.10	0.06280
3	0.25	0.06280
4	0.50	0.06280
5	1.00	0.06280

Void Ratio = 0.509 Compression = 6.0 % >>> CALCULATED USING D_{100}
 $D_0 = 0.06590$ $D_{90} = 0.06040$ $D_{100} = 0.05979$
 C_v at 0.1 min. = 1.408 in.²/min.

Pressure: 1.00 ksf TEST READINGS Load No. 9

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.06280	11	60.00	0.05850
2	0.10	0.05890	12	120.00	0.05840
3	0.25	0.05880			
4	0.50	0.05880			
5	1.00	0.05880			
6	2.00	0.05870			
7	4.00	0.05870			
8	8.00	0.05870			
9	15.00	0.05860			
10	30.00	0.05850			

Void Ratio = 0.513 Compression = 5.7 % >>> CALCULATED USING D_{100}
 $D_0 = 0.05757$ $D_{90} = 0.05730$ $D_{100} = 0.05727$
 C_v at 0.3 min. = 0.570 in.²/min.

Pressure: 0.25 ksf

TEST READINGS

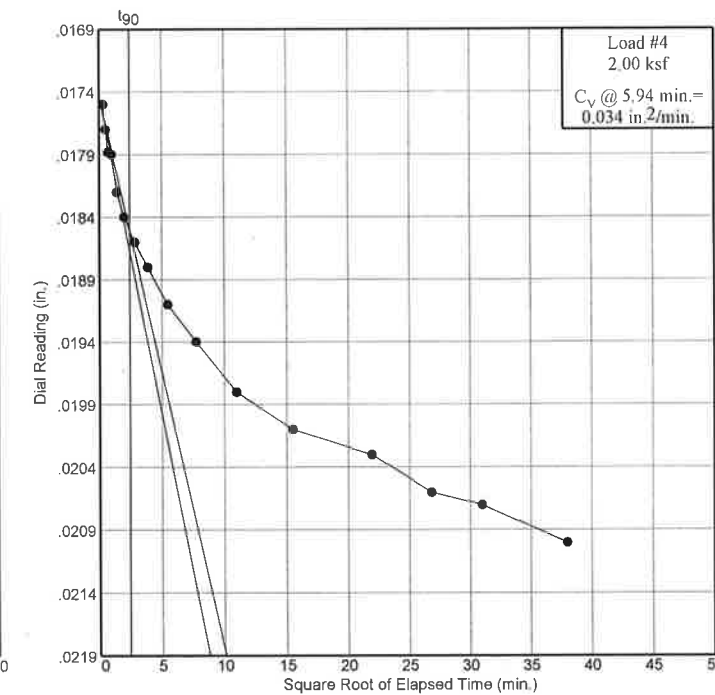
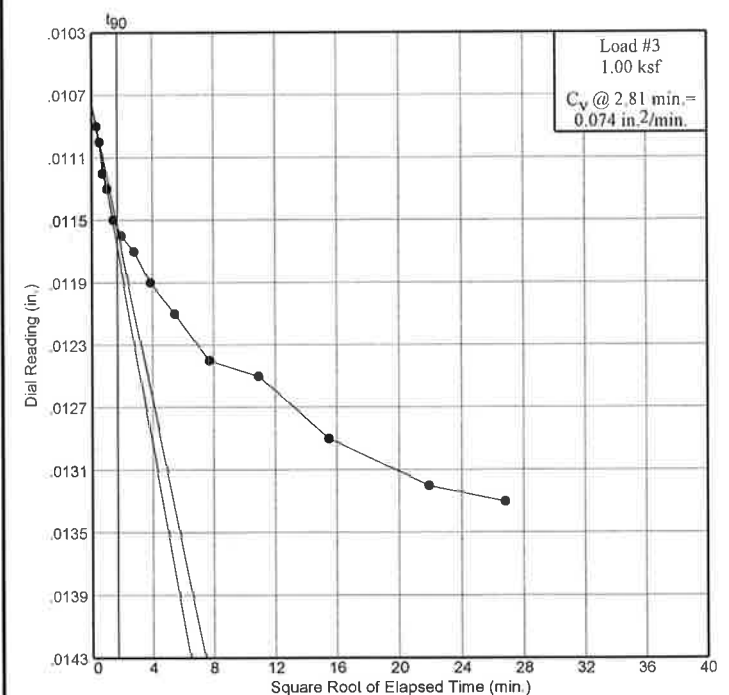
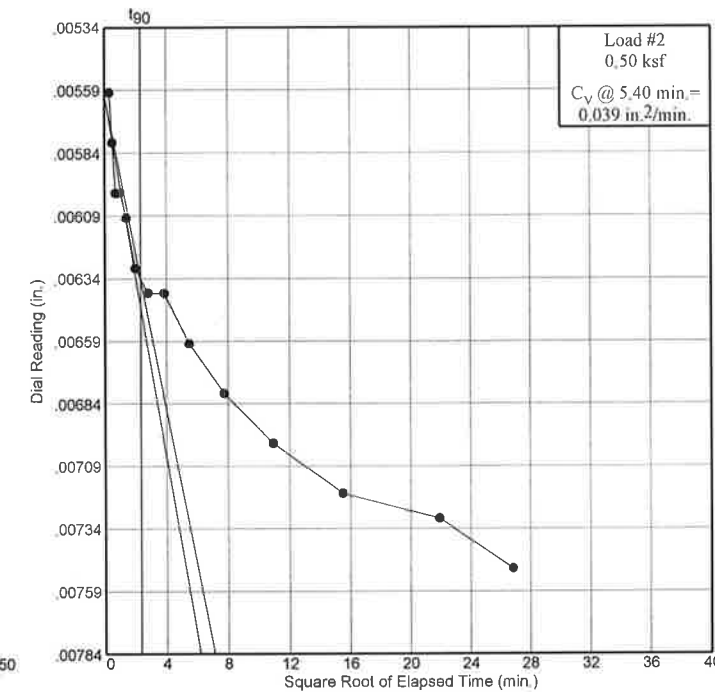
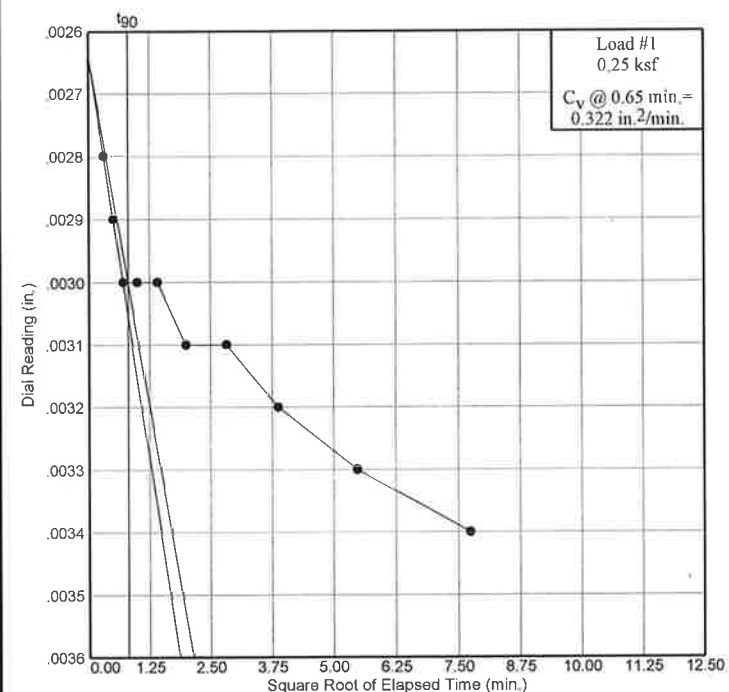
Load No. 10

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.05840	11	60.00	0.05420
2	0.10	0.05500	12	120.00	0.05410
3	0.25	0.05490	13	240.00	0.05410
4	0.50	0.05480	14	480.00	0.05400
5	1.00	0.05480	15	720.00	0.05400
6	2.00	0.05470	16	960.00	0.05390
7	4.00	0.05460			
8	8.00	0.05460			
9	15.00	0.05450			
10	30.00	0.05440			

Void Ratio = 0.519 Compression = 5.4 % >>> CALCULATED USING D₁₀₀
 D₀ = 0.05416 D₉₀ = 0.05380 D₁₀₀ = 0.05376
 C_v at 0.7 min. = 0.290 in.²/min.

Dial Reading vs. Time

Project No.: 6235-17-045
 Project: Bridge No. 73 on SR 1535 over
 The Straits @ Harkers Island
 Location: ST-6 UD @ 33.9'-35.9'

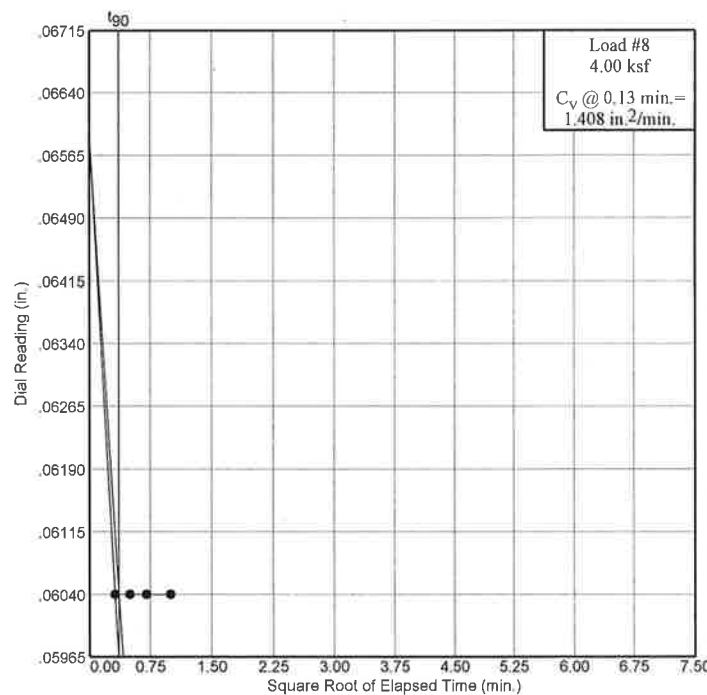
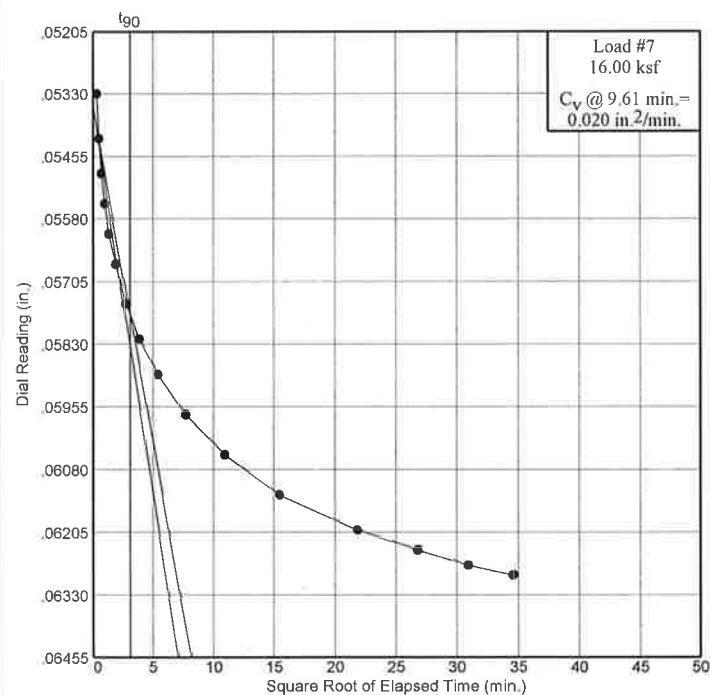
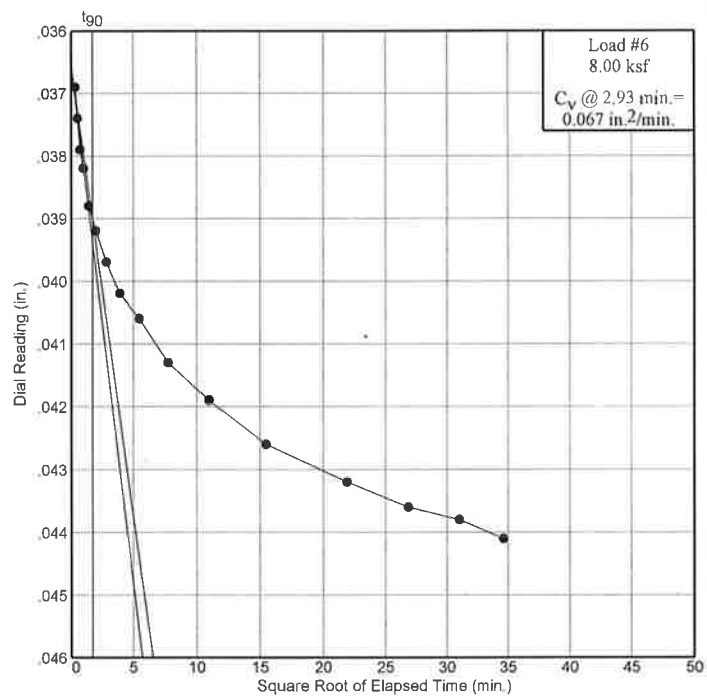
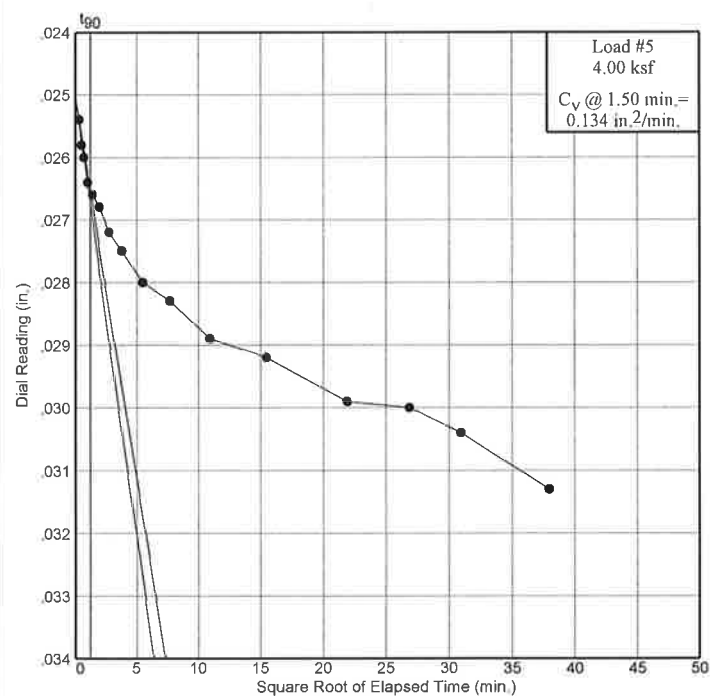


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Figure

Dial Reading vs. Time

Project No.: 6235-17-045
 Project: Bridge No. 73 on SR 1535 over
 The Straits @ Harkers Island
 Location: ST-6 UD @ 33.9'-35.9'

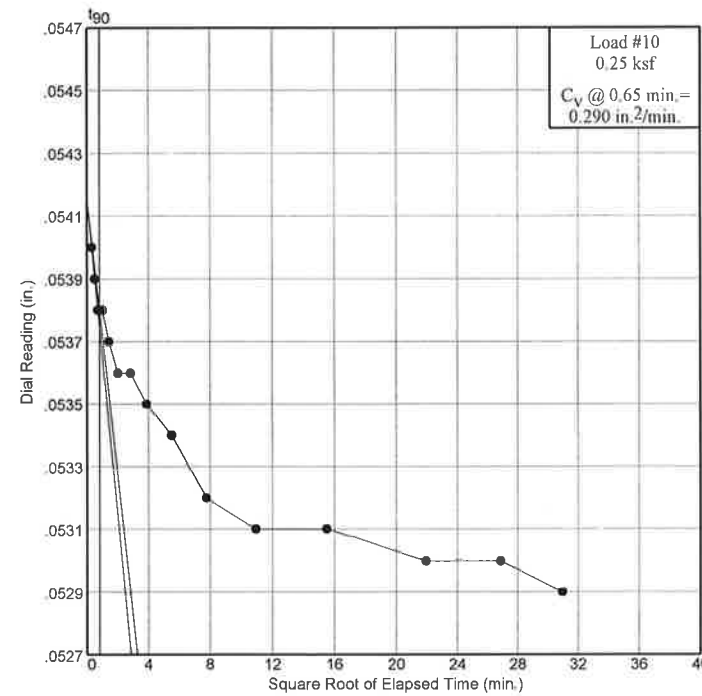
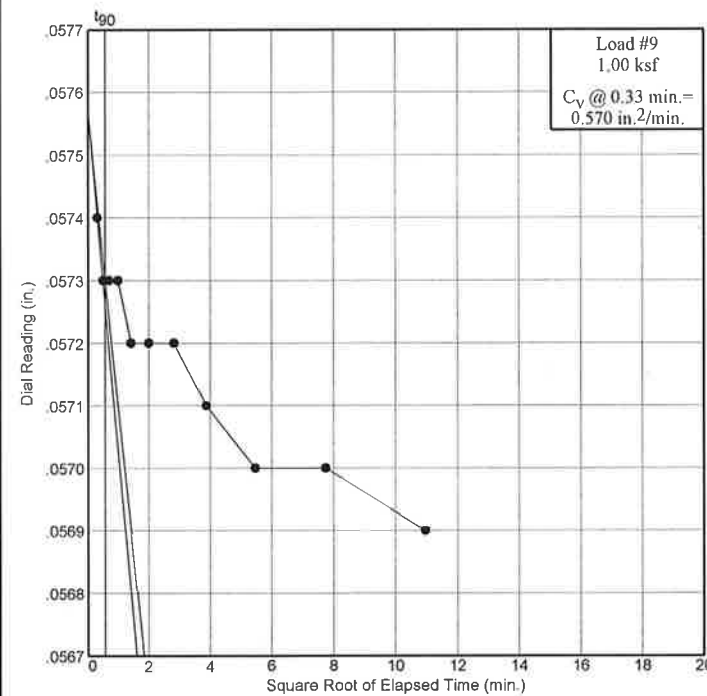


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Figure

Dial Reading vs. Time

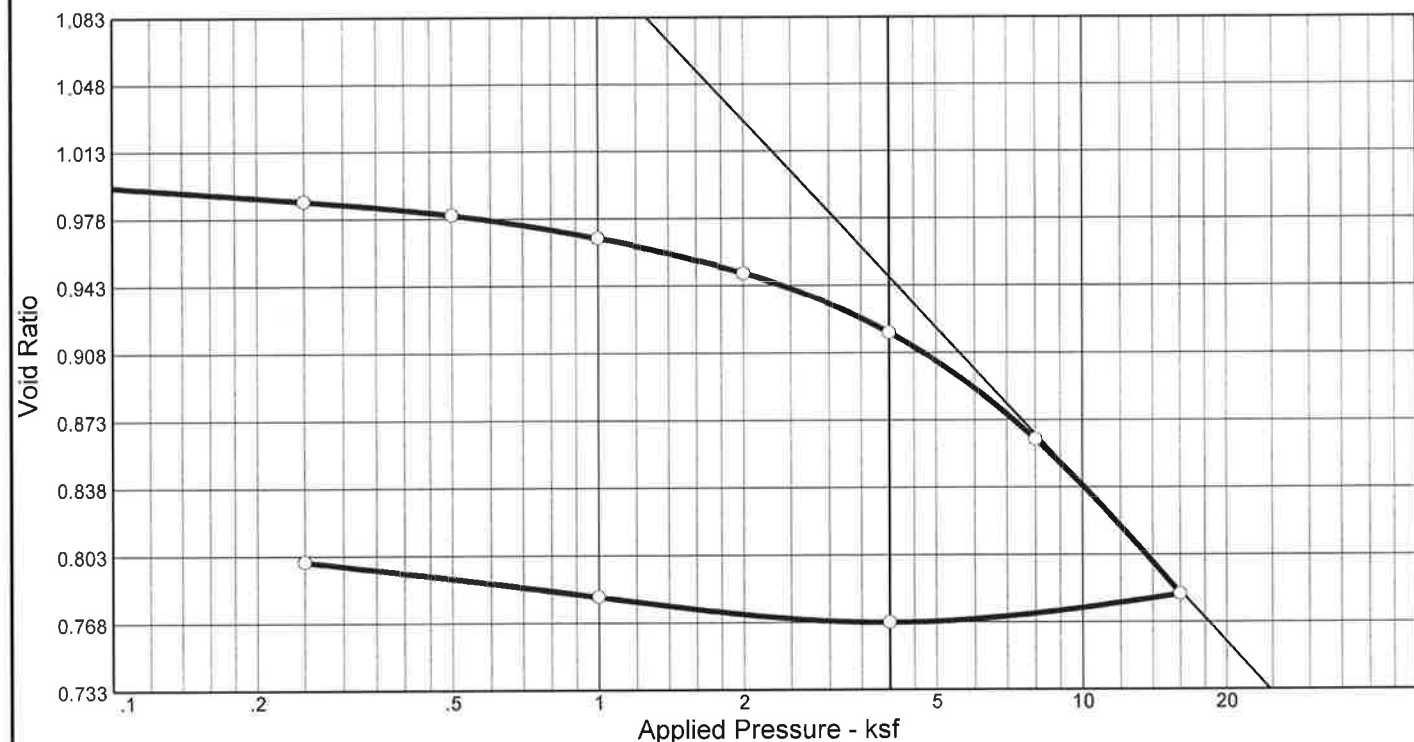
Project No.: 6235-17-045
 Project: Bridge No. 73 on SR 1535 over
 The Straits @ Harkers Island
 Location: ST-6 UD @ 33.9'-35.9'



Summit Engineering
 Ft. Mill, South Carolina

Figure

Consolidation Test Report



Coefficients of Consolidation and Secondary Consolidation											
No.	Load (ksf)	C _v (in.2/min.)	C _α	No.	Load (ksf)	C _v (in.2/min.)	C _α	No.	Load (ksf)	C _v (in.2/min.)	C _α
1	0.25	0.638									
2	0.50	0.580									
3	1.00	0.270									
4	2.00	0.149									
5	4.00	0.043									
6	8.00	0.072									
7	16.00	0.067									
8	4.00	0.053									
9	1.00	0.107									
10	0.25	0.016									

MATERIAL DESCRIPTION										USCS		AASHTO	
Grey Sandy Lean Clay													
LL	PI	Sp. Gr.	Overburden (ksf)	Dry Dens. (pcf)		Moisture		Saturation		Void Ratio		P _c (ksf)	C _c
				Init.	Final	Init.	Final	Init.	Final	Init.	Final		
28	9	2.70		84.5		34.6 %	29.8 %	93.9 %	100.0 %	0.995	0.800	5.55	0.27

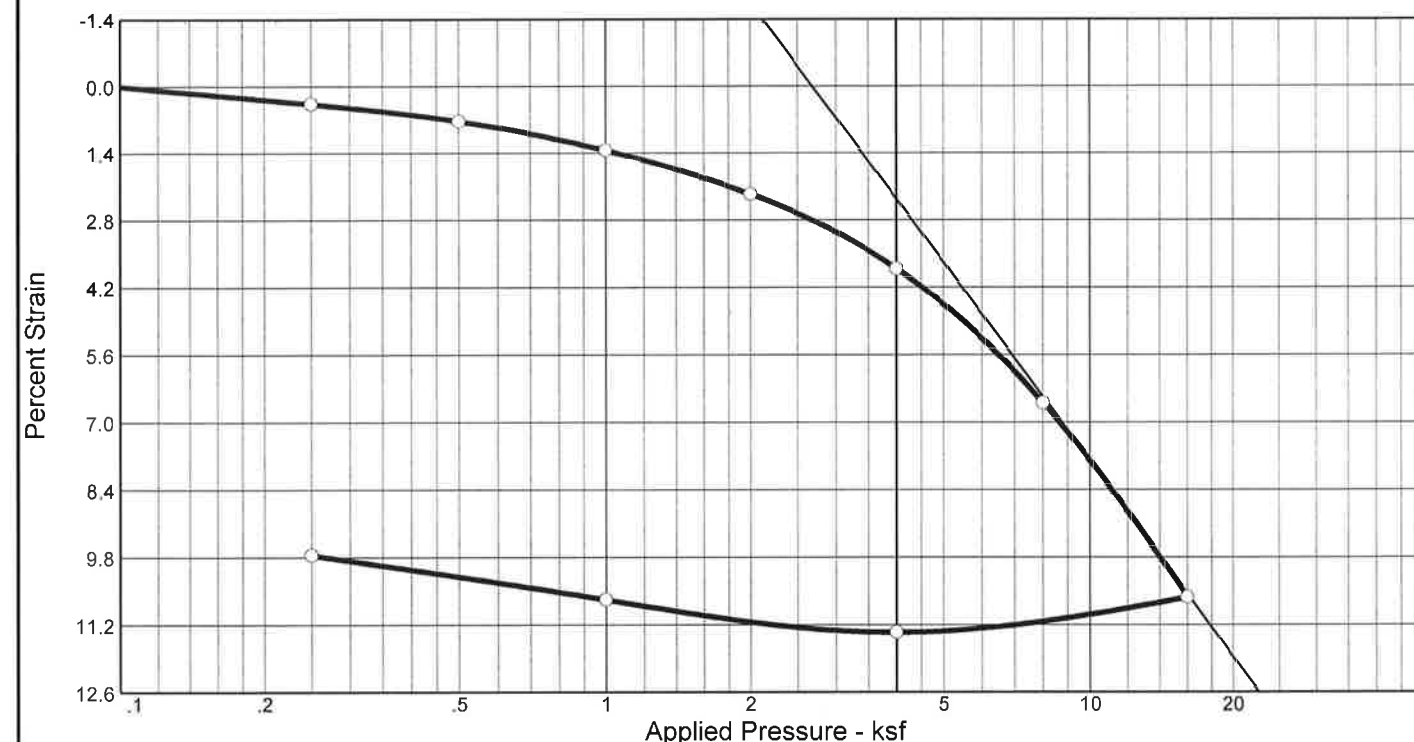
Preparation Process:	D2435 Method	C _r	Swell Press. (ksf)	Heave %
Condition of Test:		0.03		

Project No. 6235-17-045 **Client:** S&ME, Inc. - Charlotte
Project: Bridge No. 73 on SR 1535 over The Straits @ Harkers Island
Location: ST-7 UD @ 28.9'-30.9'

Summit Engineering
Ft. Mill, South Carolina

Remarks:
Checked By:
Title:
Figure

Consolidation Test Report



Coefficients of Consolidation and Secondary Consolidation											
No.	Load (ksf)	C _v (in.2/min.)	C _α	No.	Load (ksf)	C _v (in.2/min.)	C _α	No.	Load (ksf)	C _v (in.2/min.)	C _α
1	0.25	0.638									
2	0.50	0.580									
3	1.00	0.270									
4	2.00	0.149									
5	4.00	0.043									
6	8.00	0.072									
7	16.00	0.067									
8	4.00	0.053									
9	1.00	0.107									
10	0.25	0.016									

MATERIAL DESCRIPTION										USCS		AASHTO	
Grey Sandy Lean Clay													
LL	PI	Sp. Gr.	Overburden (ksf)	Dry Dens. (pcf)		Moisture		Saturation		Void Ratio		P _c (ksf)	C _c
				Init.	Final	Init.	Final	Init.	Final	Init.	Final		
28	9	2.70		84.5		34.6 %	29.8 %	93.9 %	100.0 %	0.995	0.800	5.55	0.27

Preparation Process:	D2435 Method	C _r	Swell Press. (ksf)	Heave %
Condition of Test:		0.03		

Project No. 6235-17-045 **Client:** S&ME, Inc. - Charlotte
Project: Bridge No. 73 on SR 1535 over The Straits @ Harkers Island
Location: ST-7 UD @ 28.9'-30.9'

Summit Engineering
Ft. Mill, South Carolina

Remarks:
Checked By:
Title:
Figure

CONSOLIDATION TEST DATA

Client: S&ME, Inc. - Charlotte
 Project: Bridge No. 73 on SR 1535 over
 The Straits @ Harkers Island
 Project Number: 6235-17-045

Sample Data

Source:
 Sample No.:
 Elev. or Depth: Sample Length(in./cm.):
 Location: ST-7 UD @ 28.9'-30.9'
 Description: Grey Sandy Lean Clay
 Liquid Limit: 28 Plasticity Index: 9
 USCS: AASHTO: Figure No.:
 Testing Remarks:

Test Specimen Data

TOTAL SAMPLE	BEFORE TEST	AFTER TEST
Wet w+t = 146.57 g.	Consolidometer # = 1	Wet w+t = 141.31 g.
Dry w+t = 108.89 g.		Dry w+t = 108.89 g.
Tare Wt. = .00 g.	Spec. Gravity = 2.70	Tare Wt. = .00 g.
Height = 1.00 in.	Height = 1.00 in.	
Diameter = 2.50 in.	Diameter = 2.50 in.	
Weight = 146.57 g.	Defl. Table = 1	
Moisture = 34.6 %	Ht. Solids = 0.5014 in.	Moisture = 29.8 %
Wet Den. = 113.8 pcf	Dry Wt. = 108.89 g.	Dry Wt. = 108.89 g.*
Dry Den. = 84.5 pcf	Void Ratio = 0.995	Void Ratio = 0.800
	Saturation = 93.9 %	

* Final dry weight used in calculations

End-of-Load Summary

Pressure (ksf)	Final Dial (in.)	Machine Defl. (in.)	C _v (in. ² /min.)	C _α	Void Ratio	% Compression / Swell
start	0.00000				0.995	
0.25	0.00400	0.00030	0.638		0.987*	0.4 Compr.*
0.50	0.00900	0.00060	0.580		0.980*	0.7 Compr.*
1.00	0.01610	0.00100	0.270		0.968*	1.3 Compr.*
2.00	0.02730	0.00140	0.149		0.949*	2.3 Compr.*
4.00	0.04710	0.00170	0.043		0.919*	3.8 Compr.*
8.00	0.08160	0.00230	0.072		0.863*	6.6 Compr.*
16.00	0.12140	0.00310	0.067		0.783*	10.6 Compr.*
4.00	0.11590	0.00250	0.053		0.768*	11.4 Compr.*
1.00	0.10640	0.00200	0.107		0.782*	10.7 Compr.*
0.25	0.09580	0.00160	0.016		0.800*	9.7 Compr.*

*CALCULATED USING D₁₀₀ INSTEAD OF FINAL READING

C_c = 0.27 P_c = 5.55 ksf C_r = 0.03

Pressure: 0.25 ksf

TEST READINGS

Load No. 1

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.00000	11	60.00	0.00400
2	0.10	0.00330			
3	0.25	0.00380			
4	0.50	0.00380			
5	1.00	0.00380			
6	2.00	0.00380			
7	4.00	0.00380			
8	8.00	0.00390			
9	15.00	0.00390			
10	30.00	0.00400			

Void Ratio = 0.987 Compression = 0.4 % >>> CALCULATED USING D₁₀₀
 D₀ = 0.00214 D₉₀ = 0.00350 D₁₀₀ = 0.00365
 C_v at 0.3 min. = 0.638 in.²/min.

Pressure: 0.50 ksf

TEST READINGS

Load No. 2

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.00400	11	60.00	0.00870
2	0.10	0.00730	12	120.00	0.00890
3	0.25	0.00770	13	240.00	0.00890
4	0.50	0.00780	14	480.00	0.00900
5	1.00	0.00790	15	720.00	0.00900
6	2.00	0.00800			
7	4.00	0.00810			
8	8.00	0.00810			
9	15.00	0.00830			
10	30.00	0.00860			

Void Ratio = 0.980 Compression = 0.7 % >>> CALCULATED USING D₁₀₀
 D₀ = 0.00601 D₉₀ = 0.00715 D₁₀₀ = 0.00727
 C_v at 0.4 min. = 0.580 in.²/min.

Pressure: 1.00 ksf

TEST READINGS

Load No. 3

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.00900	11	60.00	0.01520
2	0.10	0.01360	12	120.00	0.01550
3	0.25	0.01380	13	240.00	0.01590
4	0.50	0.01420	14	480.00	0.01610
5	1.00	0.01430	15	720.00	0.01610
6	2.00	0.01440			
7	4.00	0.01450			
8	8.00	0.01460			
9	15.00	0.01500			
10	30.00	0.01510			

Void Ratio = 0.968 Compression = 1.3 % >>> CALCULATED USING D₁₀₀
 D₀ = 0.01208 D₉₀ = 0.01326 D₁₀₀ = 0.01339
 C_v at 0.8 min. = 0.270 in.²/min.

Pressure: 2.00 ksf TEST READINGS Load No. 4

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.01610	11	60.00	0.02550
2	0.10	0.02230	12	120.00	0.02580
3	0.25	0.02290	13	240.00	0.02630
4	0.50	0.02320	14	480.00	0.02680
5	1.00	0.02370	15	720.00	0.02710
6	2.00	0.02390	16	960.00	0.02720
7	4.00	0.02410	17	1200.00	0.02720
8	8.00	0.02460	18	1440.00	0.02730
9	15.00	0.02480			
10	30.00	0.02510			

Void Ratio = 0.949 Compression = 2.3 % >>> CALCULATED USING D₁₀₀
 D₀ = 0.02039 D₉₀ = 0.02238 D₁₀₀ = 0.02260
 C_v at 1.4 min. = 0.149 in.²/min.

Pressure: 4.00 ksf TEST READINGS Load No. 5

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.02730	11	60.00	0.04170
2	0.10	0.03490	12	120.00	0.04270
3	0.25	0.03600	13	240.00	0.04370
4	0.50	0.03690	14	480.00	0.04470
5	1.00	0.03770	15	720.00	0.04510
6	2.00	0.03850	16	960.00	0.04560
7	4.00	0.03920	17	1200.00	0.04570
8	8.00	0.03990	18	1440.00	0.04710
9	15.00	0.04050			
10	30.00	0.04110			

Void Ratio = 0.919 Compression = 3.8 % >>> CALCULATED USING D₁₀₀
 D₀ = 0.03309 D₉₀ = 0.03762 D₁₀₀ = 0.03812
 C_v at 4.6 min. = 0.043 in.²/min.

Pressure: 8.00 ksf TEST READINGS Load No. 6

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.04710	11	60.00	0.07440
2	0.10	0.05610	12	120.00	0.07600
3	0.25	0.05900	13	240.00	0.07770
4	0.50	0.06140	14	480.00	0.07940
5	1.00	0.06390	15	720.00	0.08060
6	2.00	0.06620	16	960.00	0.08100
7	4.00	0.06810	17	1200.00	0.08160
8	8.00	0.06970			
9	15.00	0.07120			
10	30.00	0.07290			

Void Ratio = 0.863 Compression = 6.6 % >>> CALCULATED USING D₁₀₀
 D₀ = 0.05195 D₉₀ = 0.06455 D₁₀₀ = 0.06595
 C_v at 2.6 min. = 0.072 in.²/min.

Pressure: 16.00 ksf TEST READINGS Load No. 7

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.08160	11	60.00	0.11540
2	0.10	0.09190	12	120.00	0.11690
3	0.25	0.09580	13	240.00	0.11840
4	0.50	0.09930	14	480.00	0.11980
5	1.00	0.10320	15	720.00	0.12060
6	2.00	0.10650	16	1200.00	0.12140
7	4.00	0.10900			
8	8.00	0.11110			
9	15.00	0.11260			
10	30.00	0.11410			

Void Ratio = 0.783 Compression = 10.6 % >>> CALCULATED USING D₁₀₀
 D₀ = 0.08590 D₉₀ = 0.10421 D₁₀₀ = 0.10624
 C_v at 2.6 min. = 0.067 in.²/min.

Pressure: 4.00 ksf TEST READINGS Load No. 8

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.12140	11	60.00	0.11590
2	0.10	0.11690			
3	0.25	0.11680			
4	0.50	0.11670			
5	1.00	0.11660			
6	2.00	0.11620			
7	4.00	0.11610			
8	8.00	0.11610			
9	15.00	0.11600			
10	30.00	0.11600			

Void Ratio = 0.768 Compression = 11.4 % >>> CALCULATED USING D₁₀₀
 D₀ = 0.11475 D₉₀ = 0.11364 D₁₀₀ = 0.11352
 C_v at 3.1 min. = 0.053 in.²/min.

Pressure: 1.00 ksf TEST READINGS Load No. 9

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.11590	11	60.00	0.10700
2	0.10	0.11220	12	120.00	0.10640
3	0.25	0.11120			
4	0.50	0.11050			
5	1.00	0.10960			
6	2.00	0.10890			
7	4.00	0.10820			
8	8.00	0.10790			
9	15.00	0.10740			
10	30.00	0.10720			

Void Ratio = 0.782 Compression = 10.7 % >>> CALCULATED USING D₁₀₀
 D₀ = 0.11122 D₉₀ = 0.10717 D₁₀₀ = 0.10672
 C_v at 1.6 min. = 0.107 in.²/min.

Pressure: 0.25 ksf

TEST READINGS

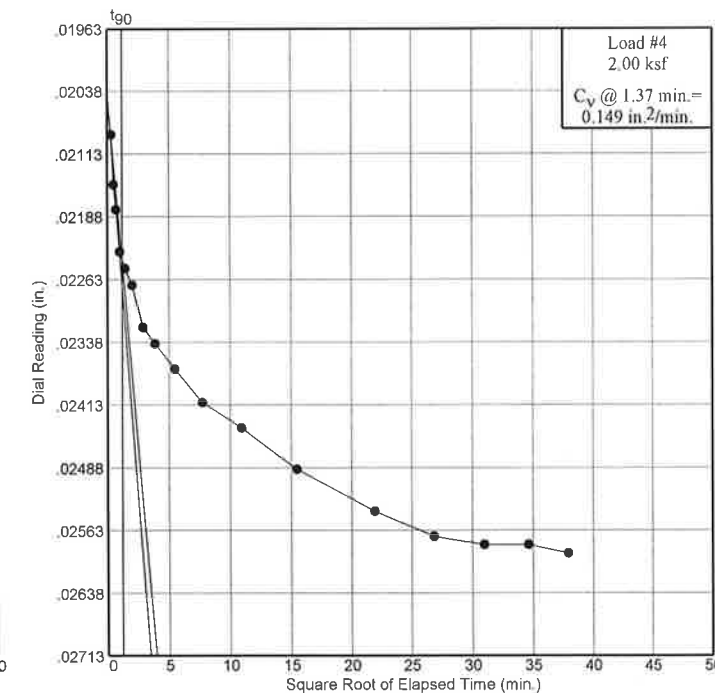
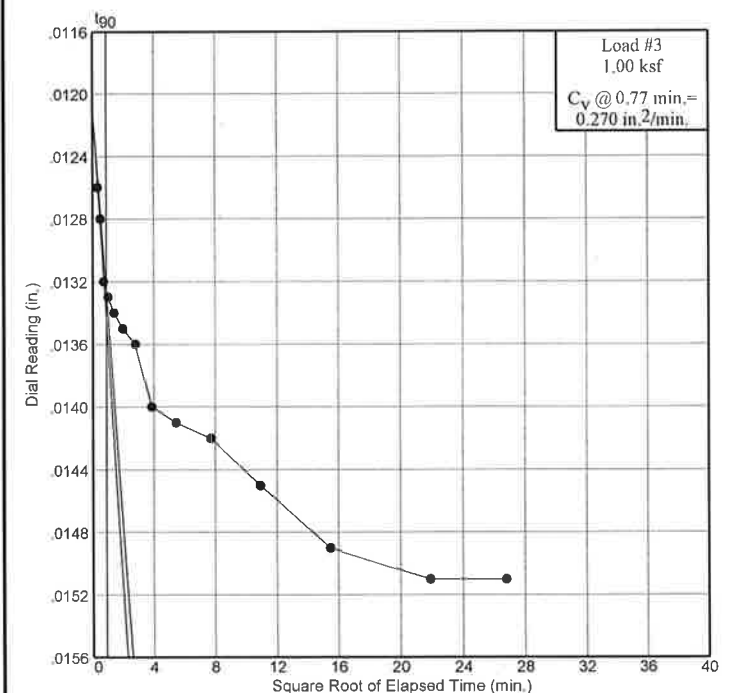
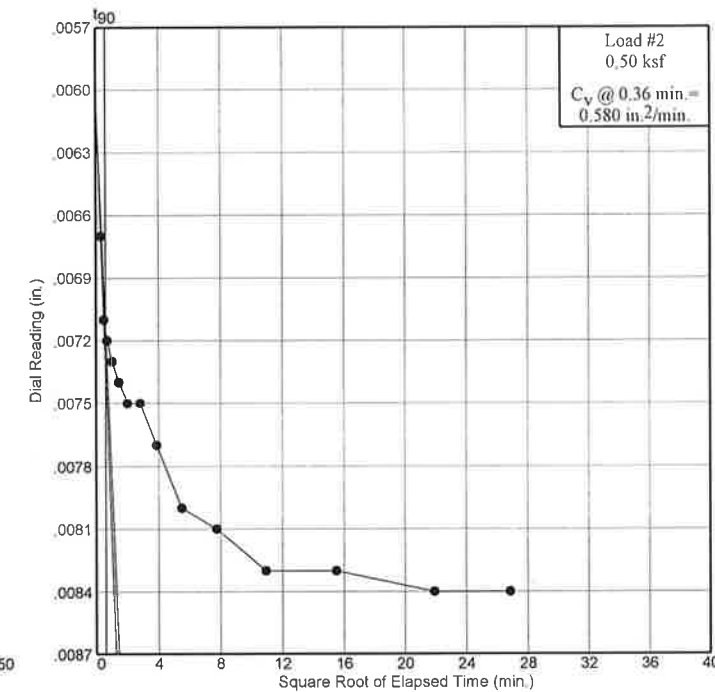
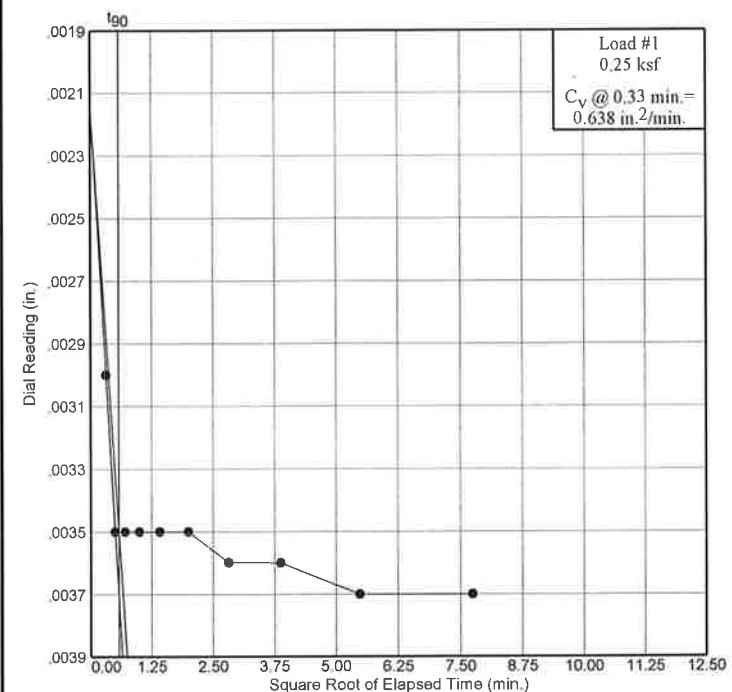
Load No. 10

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.10640	11	60.00	0.09770
2	0.10	0.10310	12	120.00	0.09700
3	0.25	0.10260	13	240.00	0.09660
4	0.50	0.10230	14	480.00	0.09610
5	1.00	0.10170	15	720.00	0.09590
6	2.00	0.10100	16	960.00	0.09580
7	4.00	0.10050			
8	8.00	0.09980			
9	15.00	0.09910			
10	30.00	0.09840			

Void Ratio = 0.800 Compression = 9.7 % >>> CALCULATED USING D₁₀₀
 D₀ = 0.10160 D₉₀ = 0.09790 D₁₀₀ = 0.09749
 C_v at 10.7 min. = 0.016 in.²/min.

Dial Reading vs. Time

Project No.: 6235-17-045
 Project: Bridge No. 73 on SR 1535 over
 The Straits @ Harkers Island
 Location: ST-7 UD @ 28.9'-30.9'

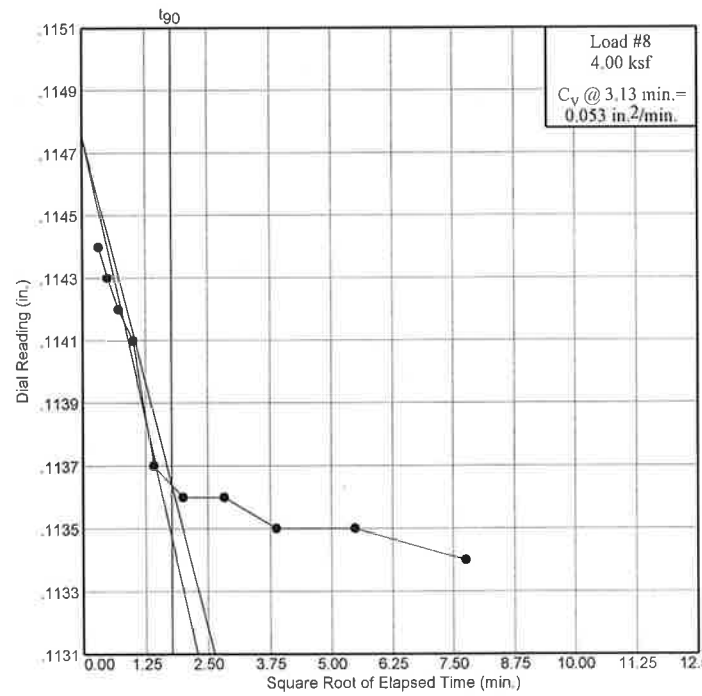
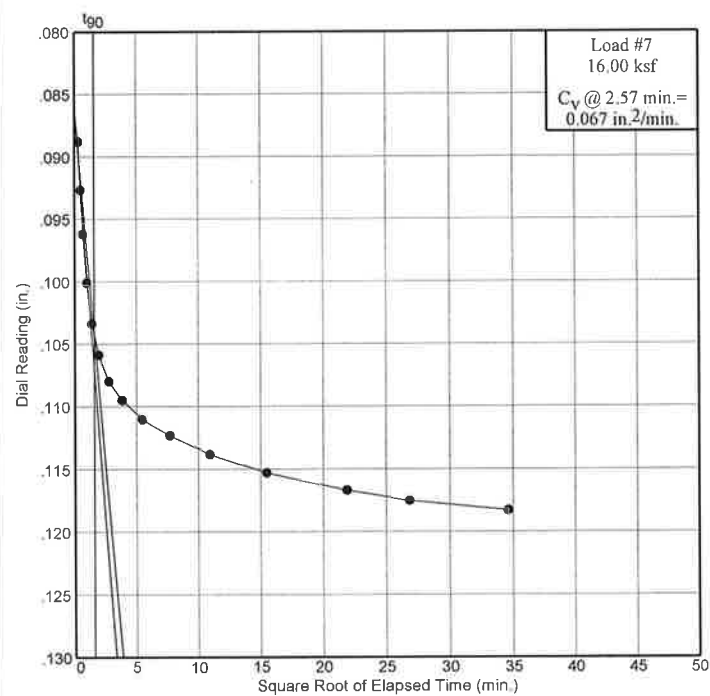
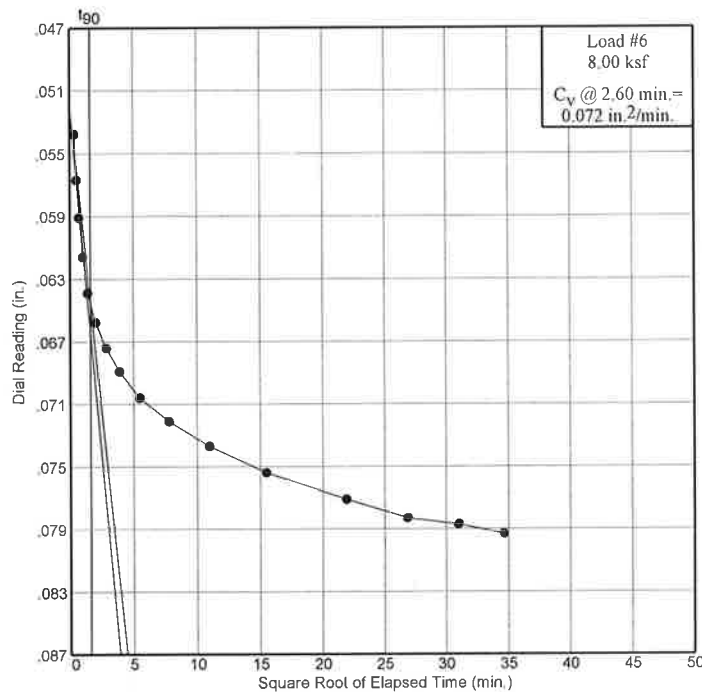
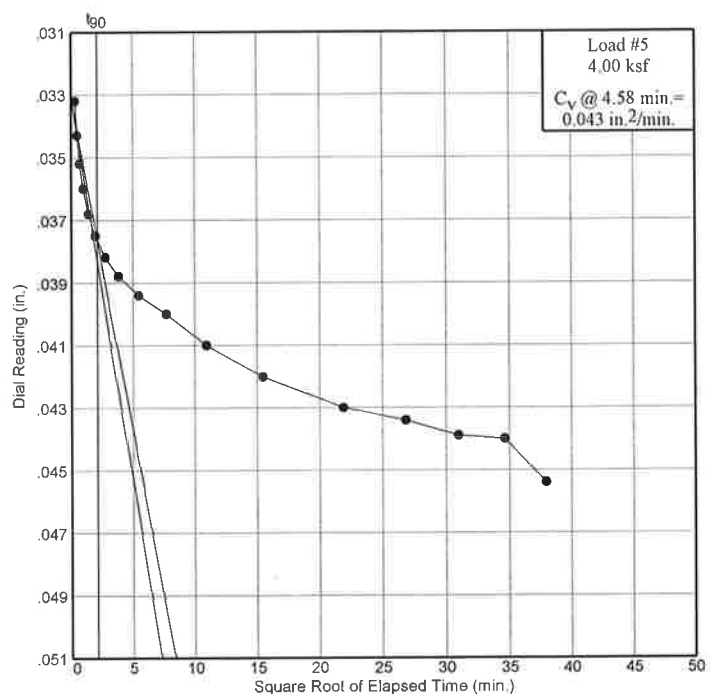


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Figure

Dial Reading vs. Time

Project No.: 6235-17-045
 Project: Bridge No. 73 on SR 1535 over
 The Straits @ Harkers Island
 Location: ST-7 UD @ 28.9'-30.9'

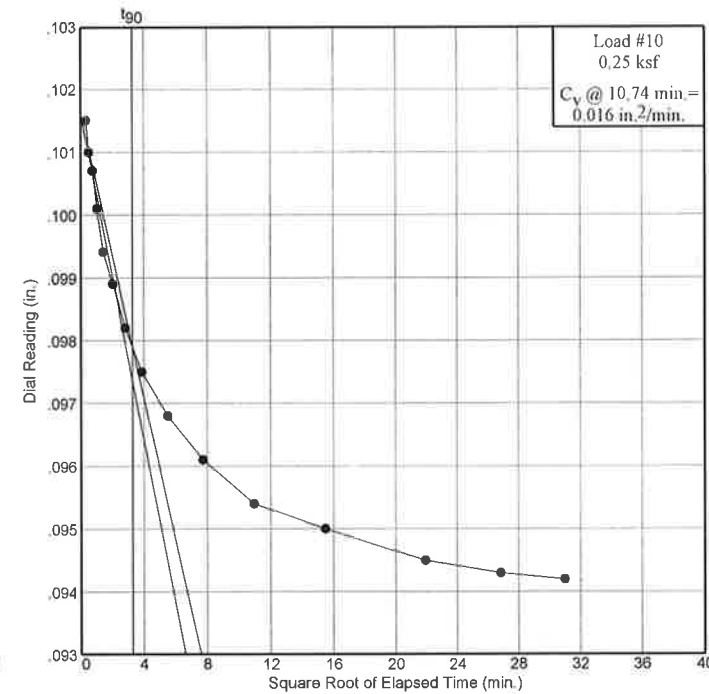
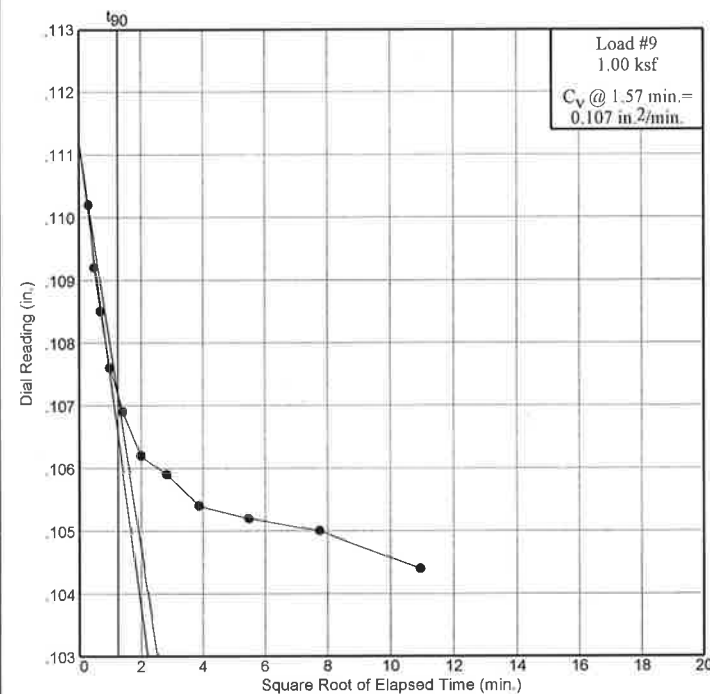


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Figure

Dial Reading vs. Time

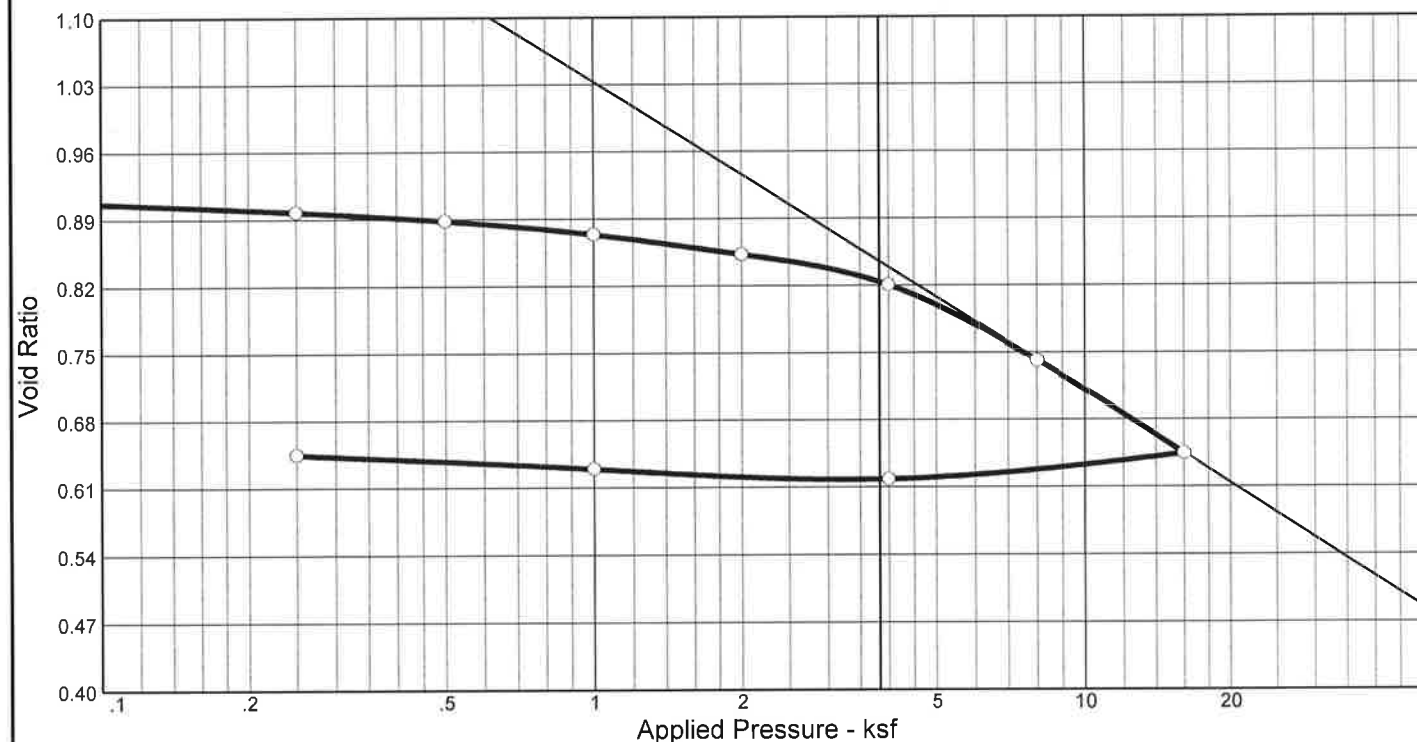
Project No.: 6235-17-045
 Project: Bridge No. 73 on SR 1535 over
 The Straits @ Harkers Island
 Location: ST-7 UD @ 28.9'-30.9'



Summit Engineering
 Ft. Mill, South Carolina

Figure

Consolidation Test Report



Coefficients of Consolidation and Secondary Consolidation

No.	Load (ksf)	C _v (in.2/min.)	C _α	No.	Load (ksf)	C _v (in.2/min.)	C _α	No.	Load (ksf)	C _v (in.2/min.)	C _α
1	0.25	0.583									
2	0.50	0.166									
3	1.00	0.075									
4	2.00	0.044									
5	4.00	0.076									
6	8.00	0.038									
7	16.00	0.063									
8	4.00	0.233									
9	1.00	0.116									
10	0.25	0.028									

MATERIAL DESCRIPTION

USCS **AASHTO**

Grey Sandy Lean Clay

LL	PI	Sp. Gr.	Overburden (ksf)	Dry Dens. (pcf)		Moisture		Saturation		Void Ratio		P _c (ksf)	C _c
				Init.	Final	Init.	Final	Init.	Final	Init.	Final		
31	15	2.70		88.4		33.0 %	25.0 %	98.3 %	100.0 %	0.907	0.645	4.70	0.32

Preparation Process:

D2435 Method	C _r	Swell Press. (ksf)	Heave %
	0.03		

Condition of Test:

Project No. 6235-17-045 **Client:** S&ME, Inc. - Charlotte

Project: Bridge No. 73 on SR 1535 over The Straits @ Harkers Island

Location: ST-8 UD @ 33.9'-35.9'

Remarks:

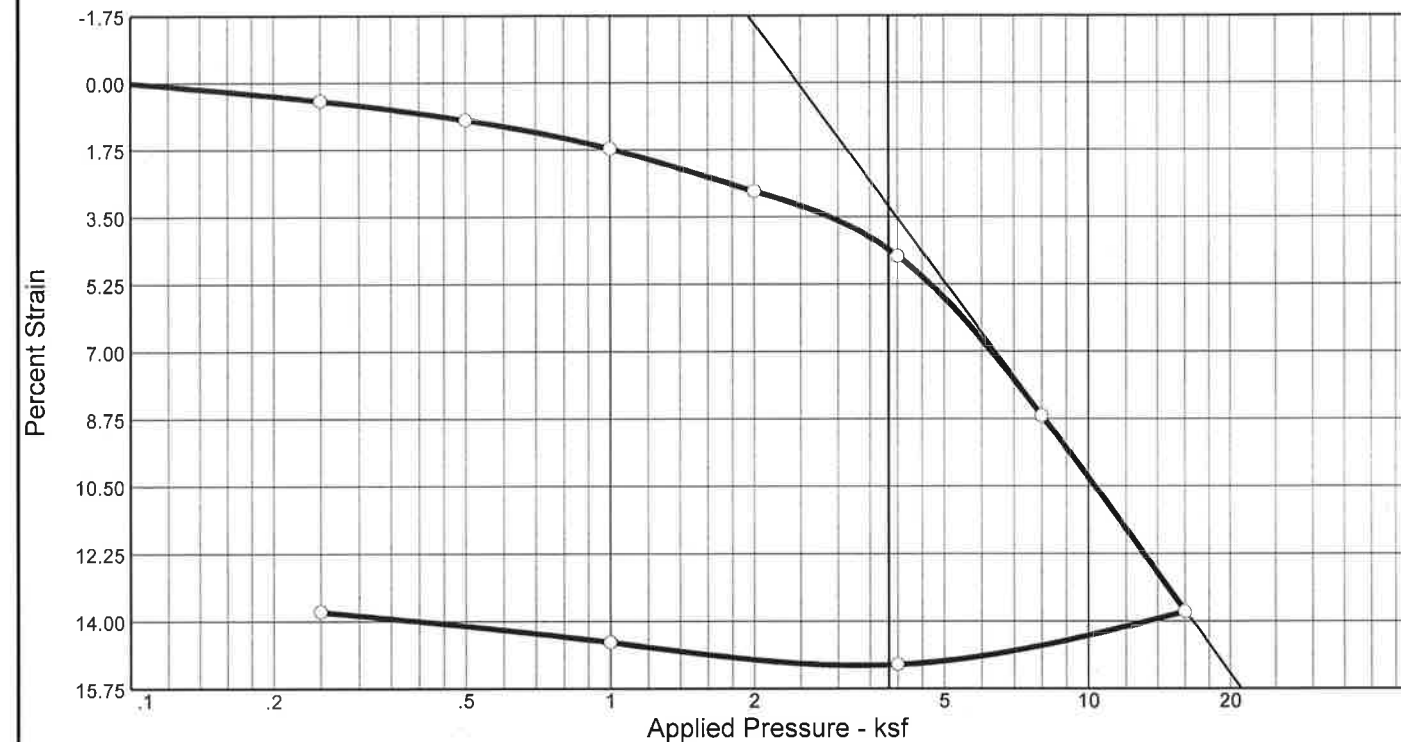
Checked By:

Title:

Summit Engineering
Ft. Mill, South Carolina

Figure

Consolidation Test Report



Coefficients of Consolidation and Secondary Consolidation

No.	Load (ksf)	C _v (in.2/min.)	C _α	No.	Load (ksf)	C _v (in.2/min.)	C _α	No.	Load (ksf)	C _v (in.2/min.)	C _α
1	0.25	0.583									
2	0.50	0.166									
3	1.00	0.075									
4	2.00	0.044									
5	4.00	0.076									
6	8.00	0.038									
7	16.00	0.063									
8	4.00	0.233									
9	1.00	0.116									
10	0.25	0.028									

MATERIAL DESCRIPTION

USCS **AASHTO**

Grey Sandy Lean Clay

LL	PI	Sp. Gr.	Overburden (ksf)	Dry Dens. (pcf)		Moisture		Saturation		Void Ratio		P _c (ksf)	C _c
				Init.	Final	Init.	Final	Init.	Final	Init.	Final		
31	15	2.70		88.4		33.0 %	25.0 %	98.3 %	100.0 %	0.907	0.645	4.70	0.32

Preparation Process:

D2435 Method	C _r	Swell Press. (ksf)	Heave %
	0.03		

Condition of Test:

Project No. 6235-17-045 **Client:** S&ME, Inc. - Charlotte

Project: Bridge No. 73 on SR 1535 over The Straits @ Harkers Island

Location: ST-8 UD @ 33.9'-35.9'

Remarks:

Checked By:

Title:

Summit Engineering
Ft. Mill, South Carolina

Figure

CONSOLIDATION TEST DATA

Client: S&ME, Inc. - Charlotte
 Project: Bridge No. 73 on SR 1535 over
 The Straits @ Harkers Island
 Project Number: 6235-17-045

Sample Data

Source:
 Sample No.:
 Elev. or Depth: Sample Length(in./cm.):
 Location: ST-8 UD @ 33.9'-35.9'
 Description: Grey Sandy Lean Clay
 Liquid Limit: 31 Plasticity Index: 15
 USCS: AASHTO: Figure No.:
 Testing Remarks:

Test Specimen Data

TOTAL SAMPLE	BEFORE TEST	AFTER TEST
Wet w+t = 151.49 g.	Consolidometer # = 2	Wet w+t = 142.40 g.
Dry w+t = 113.90 g.		Dry w+t = 113.90 g.
Tare Wt. = .00 g.	Spec. Gravity = 2.70	Tare Wt. = .00 g.
Height = 1.00 in.	Height = 1.00 in.	
Diameter = 2.50 in.	Diameter = 2.50 in.	
Weight = 151.49 g.	Defl. Table = 2	
Moisture = 33.0 %	Ht. Solids = 0.5244 in.	Moisture = 25.0 %
Wet Den. = 117.6 pcf	Dry Wt. = 113.90 g.	Dry Wt. = 113.90 g.*
Dry Den. = 88.4 pcf	Void Ratio = 0.907	Void Ratio = 0.645
	Saturation = 98.3 %	

* Final dry weight used in calculations

End-of-Load Summary

Pressure (ksf)	Final Dial (in.)	Machine Defl. (in.)	C _v (in. ² /min.)	C _α	Void Ratio	% Compression /Swell
start	0.00000				0.907	
0.25	0.00580	0.00010	0.583		0.898*	0.5 Compr.*
0.50	0.01200	0.00020	0.166		0.888*	1.0 Compr.*
1.00	0.02010	0.00060	0.075		0.874*	1.7 Compr.*
2.00	0.03300	0.00080	0.044		0.853*	2.8 Compr.*
4.00	0.06020	0.00150	0.076		0.821*	4.5 Compr.*
8.00	0.10720	0.00220	0.038		0.741*	8.7 Compr.*
16.00	0.15690	0.00290	0.063		0.645*	13.7 Compr.*
4.00	0.15350	0.00240	0.233		0.619*	15.1 Compr.*
1.00	0.14550	0.00160	0.116		0.630*	14.5 Compr.*
0.25	0.13530	0.00090	0.028		0.645*	13.7 Compr.*

*CALCULATED USING D₁₀₀ INSTEAD OF FINAL READING

C_c = 0.32 P_c = 4.70 ksf C_r = 0.03

Pressure: 0.25 ksf

TEST READINGS

Load No. 1

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.00000	11	60.00	0.00580
2	0.10	0.00420			
3	0.25	0.00460			
4	0.50	0.00470			
5	1.00	0.00480			
6	2.00	0.00490			
7	4.00	0.00500			
8	8.00	0.00540			
9	15.00	0.00550			
10	30.00	0.00570			

Void Ratio = 0.898 Compression = 0.5 % >>> CALCULATED USING D₁₀₀
 D₀ = 0.00341 D₉₀ = 0.00455 D₁₀₀ = 0.00467
 C_v at 0.4 min. = 0.583 in.²/min.

Pressure: 0.50 ksf

TEST READINGS

Load No. 2

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.00580	11	60.00	0.01120
2	0.10	0.00880	12	120.00	0.01140
3	0.25	0.00900	13	240.00	0.01180
4	0.50	0.00950	14	480.00	0.01200
5	1.00	0.00970	15	720.00	0.01200
6	2.00	0.00980			
7	4.00	0.01030			
8	8.00	0.01050			
9	15.00	0.01060			
10	30.00	0.01110			

Void Ratio = 0.888 Compression = 1.0 % >>> CALCULATED USING D₁₀₀
 D₀ = 0.00817 D₉₀ = 0.00953 D₁₀₀ = 0.00968
 C_v at 1.3 min. = 0.166 in.²/min.

Pressure: 1.00 ksf

TEST READINGS

Load No. 3

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.01200	11	60.00	0.01900
2	0.10	0.01600	12	120.00	0.01920
3	0.25	0.01640	13	240.00	0.01980
4	0.50	0.01680	14	480.00	0.02000
5	1.00	0.01700	15	720.00	0.02010
6	2.00	0.01750			
7	4.00	0.01770			
8	8.00	0.01790			
9	15.00	0.01830			
10	30.00	0.01850			

Void Ratio = 0.874 Compression = 1.7 % >>> CALCULATED USING D₁₀₀
 D₀ = 0.01512 D₉₀ = 0.01698 D₁₀₀ = 0.01719
 C_v at 2.7 min. = 0.075 in.²/min.

Pressure: 2.00 ksf TEST READINGS Load No. 4

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.02010	11	60.00	0.03040
2	0.10	0.02560	12	120.00	0.03110
3	0.25	0.02640	13	240.00	0.03140
4	0.50	0.02710	14	480.00	0.03210
5	1.00	0.02750	15	720.00	0.03270
6	2.00	0.02810	16	960.00	0.03280
7	4.00	0.02870	17	1200.00	0.03280
8	8.00	0.02890	18	1440.00	0.03300
9	15.00	0.02950			
10	30.00	0.02980			

Void Ratio = 0.853 Compression = 2.8 % >>> CALCULATED USING D₁₀₀
D₀ = 0.02473 D₉₀ = 0.02793 D₁₀₀ = 0.02829
C_v at 4.6 min. = 0.044 in.²/min.

Pressure: 4.00 ksf TEST READINGS Load No. 5

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.03300	11	60.00	0.05130
2	0.10	0.04010	12	120.00	0.05280
3	0.25	0.04170	13	240.00	0.05430
4	0.50	0.04320	14	480.00	0.05600
5	1.00	0.04430	15	720.00	0.05680
6	2.00	0.04560	16	960.00	0.05760
7	4.00	0.04660	17	1200.00	0.05790
8	8.00	0.04780	18	1440.00	0.06020
9	15.00	0.04880			
10	30.00	0.05020			

Void Ratio = 0.821 Compression = 4.5 % >>> CALCULATED USING D₁₀₀
D₀ = 0.03766 D₉₀ = 0.04442 D₁₀₀ = 0.04518
C_v at 2.6 min. = 0.076 in.²/min.

Pressure: 8.00 ksf TEST READINGS Load No. 6

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.06020	11	60.00	0.09640
2	0.10	0.07030	12	120.00	0.09910
3	0.25	0.07380	13	240.00	0.10160
4	0.50	0.07690	14	480.00	0.10420
5	1.00	0.08020	15	720.00	0.10560
6	2.00	0.08340	16	960.00	0.10650
7	4.00	0.08640	17	1200.00	0.10720
8	8.00	0.08890			
9	15.00	0.09120			
10	30.00	0.09380			

Void Ratio = 0.741 Compression = 8.7 % >>> CALCULATED USING D₁₀₀
D₀ = 0.06710 D₉₀ = 0.08475 D₁₀₀ = 0.08672
C_v at 4.8 min. = 0.038 in.²/min.

Pressure: 16.00 ksf TEST READINGS Load No. 7

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.10720	11	60.00	0.14890
2	0.10	0.12030	12	120.00	0.15100
3	0.25	0.12500	13	240.00	0.15280
4	0.50	0.12900	14	480.00	0.15460
5	1.00	0.13350	15	720.00	0.15590
6	2.00	0.13700	16	960.00	0.15640
7	4.00	0.14010	17	1200.00	0.15690
8	8.00	0.14260			
9	15.00	0.14480			
10	30.00	0.14700			

Void Ratio = 0.645 Compression = 13.7 % >>> CALCULATED USING D₁₀₀
D₀ = 0.11427 D₉₀ = 0.13507 D₁₀₀ = 0.13738
C_v at 2.6 min. = 0.063 in.²/min.

Pressure: 4.00 ksf TEST READINGS Load No. 8

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.15690	11	60.00	0.15350
2	0.10	0.15380			
3	0.25	0.15370			
4	0.50	0.15360			
5	1.00	0.15360			
6	2.00	0.15360			
7	4.00	0.15360			
8	8.00	0.15360			
9	15.00	0.15360			
10	30.00	0.15350			

Void Ratio = 0.619 Compression = 15.1 % >>> CALCULATED USING D₁₀₀
D₀ = 0.15156 D₉₀ = 0.15120 D₁₀₀ = 0.15116
C_v at 0.7 min. = 0.233 in.²/min.

Pressure: 1.00 ksf TEST READINGS Load No. 9

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.15350	11	60.00	0.14570
2	0.10	0.14940	12	120.00	0.14550
3	0.25	0.14870			
4	0.50	0.14800			
5	1.00	0.14740			
6	2.00	0.14710			
7	4.00	0.14670			
8	8.00	0.14650			
9	15.00	0.14630			
10	30.00	0.14600			

Void Ratio = 0.630 Compression = 14.5 % >>> CALCULATED USING D₁₀₀
D₀ = 0.14862 D₉₀ = 0.14569 D₁₀₀ = 0.14536
C_v at 1.3 min. = 0.116 in.²/min.

Pressure: 0.25 ksf

TEST READINGS

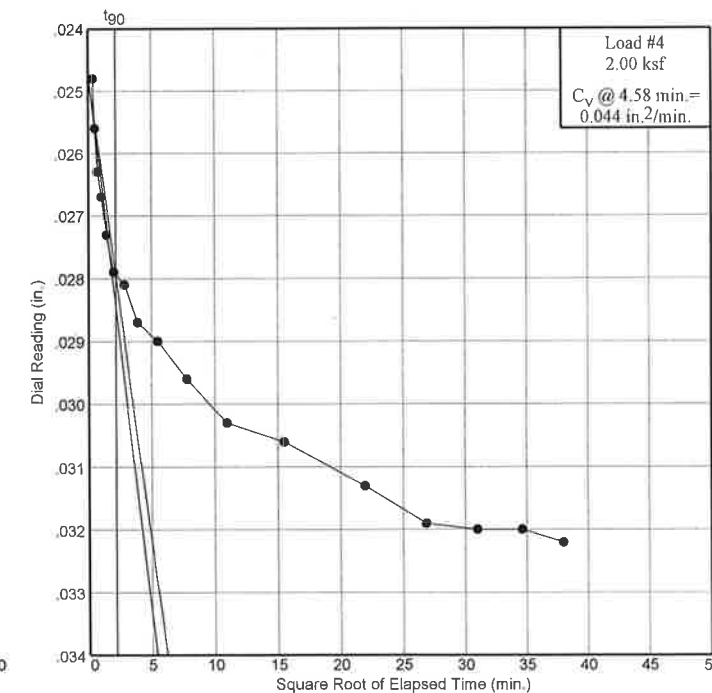
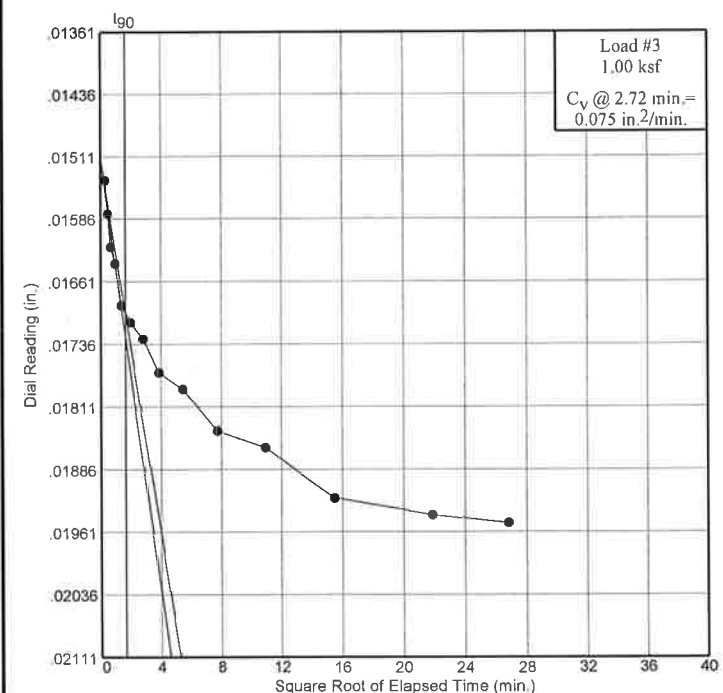
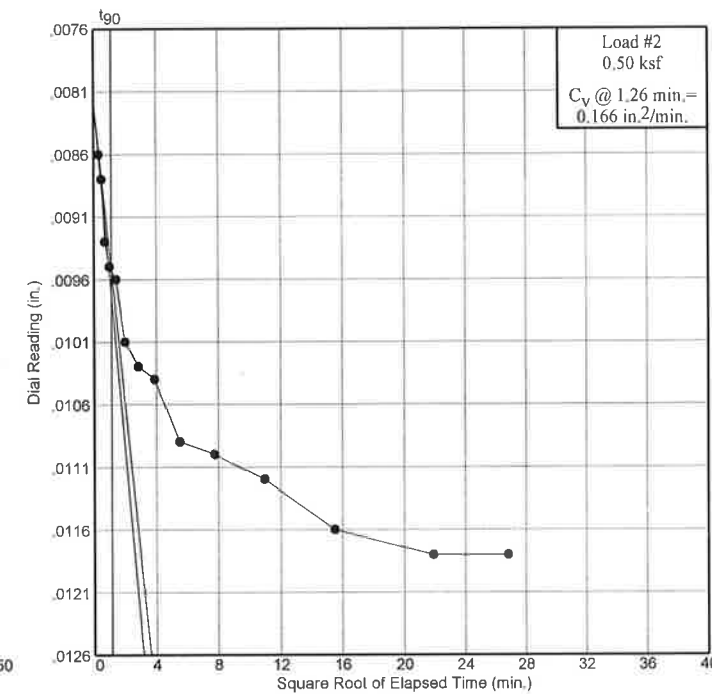
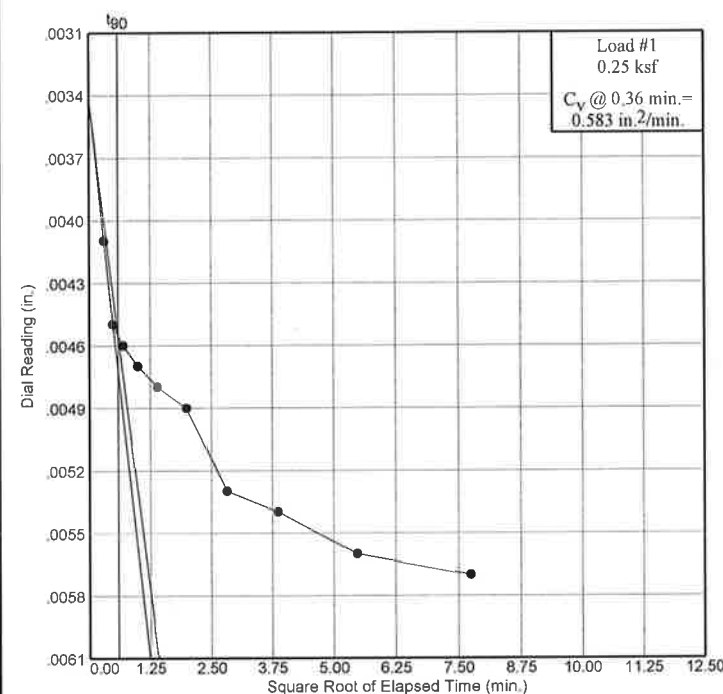
Load No. 10

No.	Elapsed Time	Dial Reading	No.	Elapsed Time	Dial Reading
1	0.00	0.14550	11	60.00	0.13690
2	0.10	0.14250	12	120.00	0.13660
3	0.25	0.14180	13	240.00	0.13610
4	0.50	0.14150	14	480.00	0.13590
5	1.00	0.14070	15	720.00	0.13540
6	2.00	0.13990	16	960.00	0.13530
7	4.00	0.13920			
8	8.00	0.13840			
9	15.00	0.13780			
10	30.00	0.13750			

Void Ratio = 0.645 Compression = 13.7 % >>> CALCULATED USING D₁₀₀
 D₀ = 0.14195 D₉₀ = 0.13793 D₁₀₀ = 0.13748
 C_v at 5.7 min. = 0.028 in.²/min.

Dial Reading vs. Time

Project No.: 6235-17-045
 Project: Bridge No. 73 on SR 1535 over
 The Straits @ Harkers Island
 Location: ST-8 UD @ 33.9'-35.9'

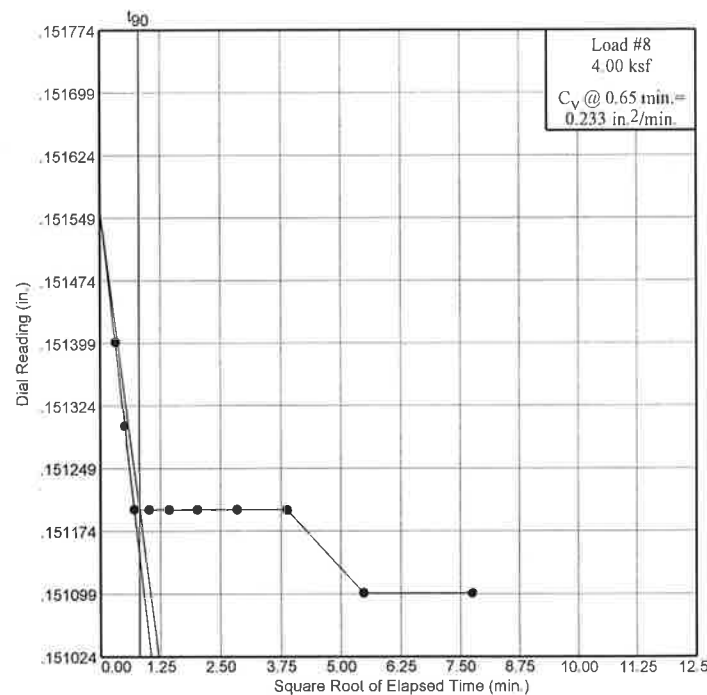
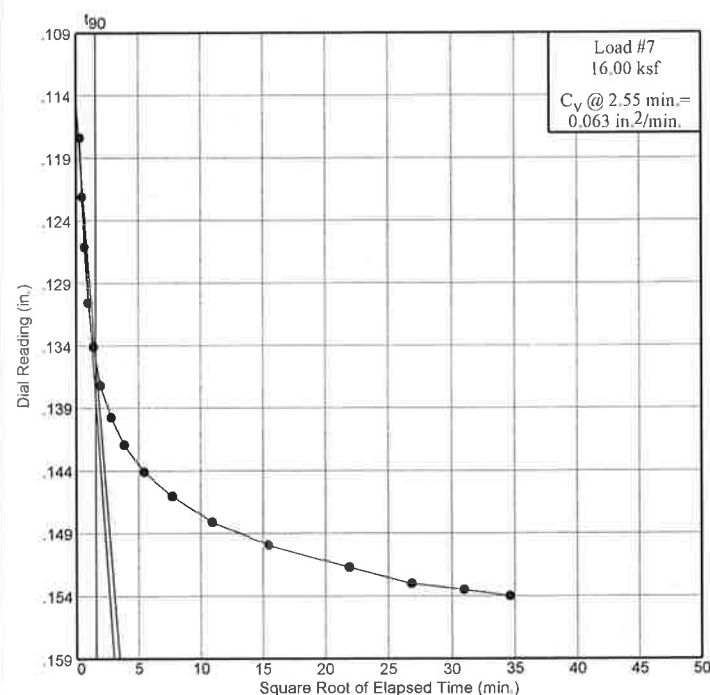
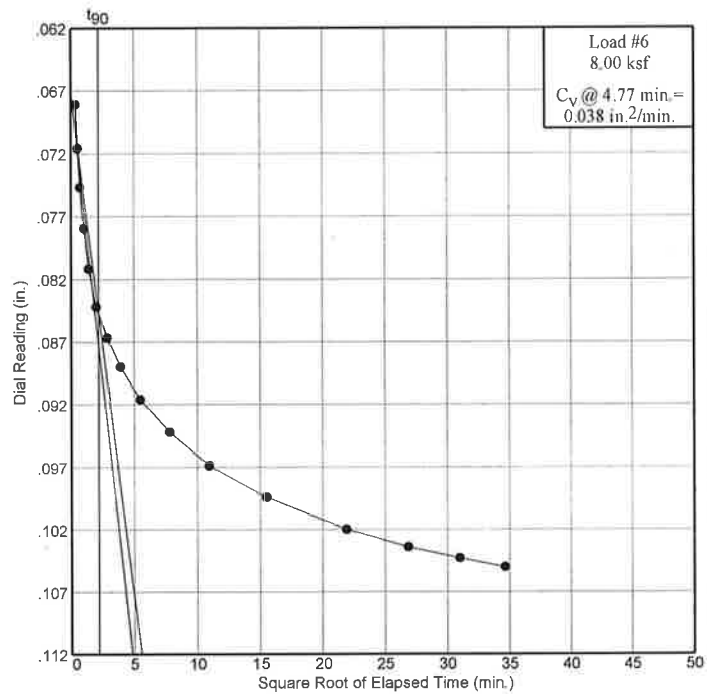
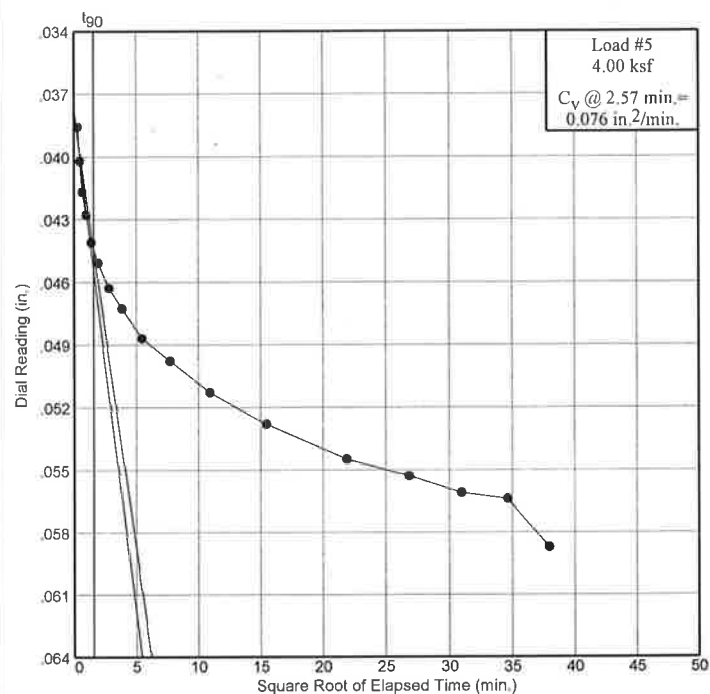


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Figure

Dial Reading vs. Time

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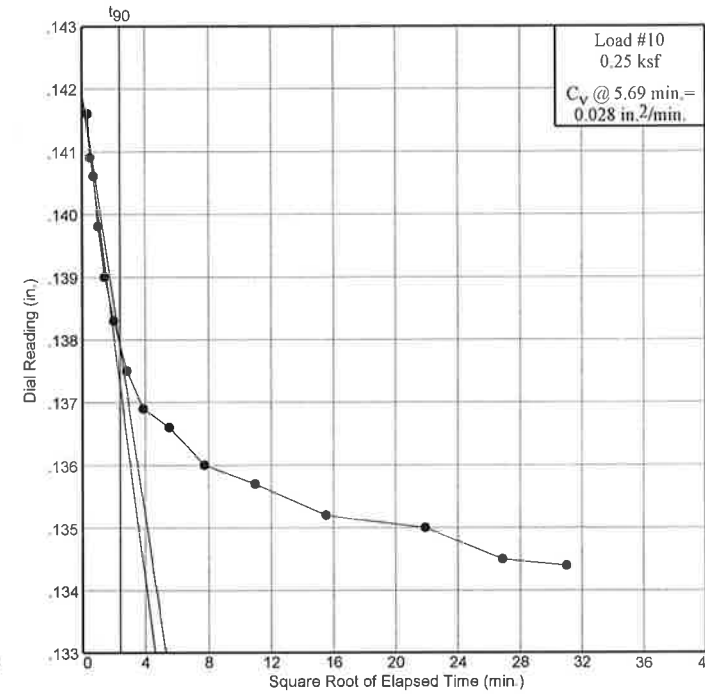
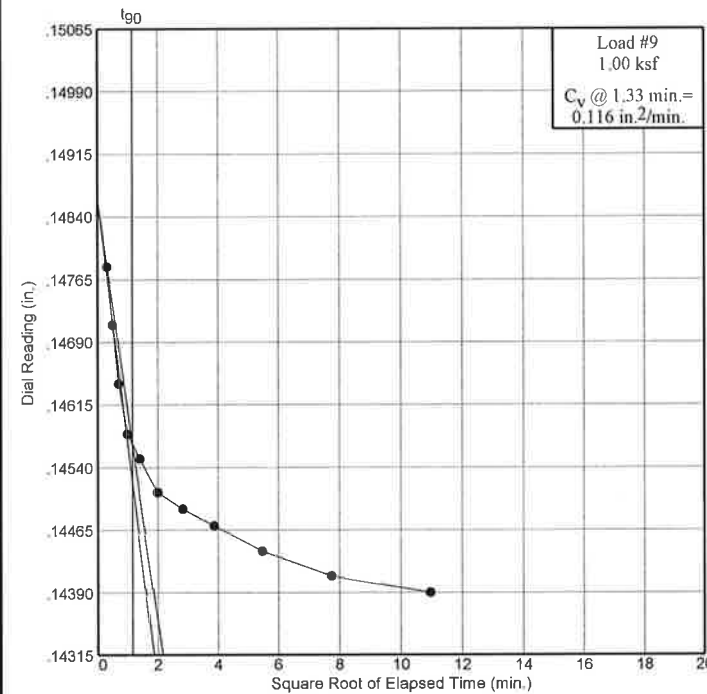


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Figure

Dial Reading vs. Time

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Figure