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REFERENCE: R-5703

PROJECT: 46375

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

STRUCTURE SUBSURFACE INVESTIGATION

COUNTY *LENOIR*

PROJECT DESCRIPTION *C.F. HARVEY PARKWAY AND NC 58 TO INTERSECTION OF NC 11 AND GRANGER STATION ROAD GRADING, PAVING, DRAINAGE, STRUCTURES AND SIGNALS*

SITE DESCRIPTION *BRIDGE NO. 208 AND NO. 209 ON -L- (FELIX HARVEY PARKWAY) OVER -Y1- (NC 58) BETWEEN SR 1581 AND SR 1730*

INVENTORY

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	R-5703	1	42

CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF PREPARING THE SCOPE OF WORK TO BE INCLUDED IN THE REQUEST FOR PROPOSAL. 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.

SOIL AND ROCK BOUNDARIES WITHIN A BOREHOLE ARE BASED ON GEOTECHNICAL INTERPRETATION UNLESS ENCOUNTERED IN A SAMPLE. INTERPRETED BOUNDARIES MAY NOT NECESSARILY REFLECT ACTUAL SUBSURFACE CONDITIONS BETWEEN SAMPLED STRATA AND BOREHOLE INFORMATION MAY NOT NECESSARILY REFLECT ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS. 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.

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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

S. LANEY
K. HILL
S. MITCHELL
S. TIERNAN
C. CHANDLER
F. WRIGHT
E. BLONSHINE
J. PEELE
M. RAWLS

INVESTIGATED BY *S&ME, INC.*

DRAWN BY *C. CHANDLER*

CHECKED BY *S. MITCHELL*

SUBMITTED BY *S&ME, INC.*

DATE *MAY 2017*

NORTH CAROLINA PROFESSIONAL SEAL 031013 ENGINEER STEWART S. LANEY

SIGNATURE DATE

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

PROJECT REFERENCE NO.	SHEET NO.
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NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

SUBSURFACE INVESTIGATION

SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

SOIL DESCRIPTION

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,
VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6

SOIL LEGEND AND AASHTO CLASSIFICATION

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	
	A-1-a	A-1-b		A-2-4	A-2-5	A-2-6	A-2-7				A-7-5, A-7-6			
SYMBOL														
% PASSING #10	50 MX													
#40	30 MX	50 MX	51 MN											
#200	15 MX	25 MX	10 MX	35 MX	35 MX	35 MX	35 MX	36 MN	36 MN	36 MN	36 MN	GRANULAR SOILS	SILT-CLAY SOILS	MUCK, PEAT
MATERIAL PASSING #40 LL PI	— 6 MX		— NP	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	40 MX 10 MX	41 MN 10 MX	40 MX 11 MN	41 MN 11 MN	SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER		HIGHLY ORGANIC SOILS
GROUP INDEX	0		0	0		4 MX		8 MX	12 MX	16 MX	NO MX			
USUAL TYPES OF MAJOR MATERIALS	STONE FRAGS. GRAVEL, AND SAND		FINE SAND	SILTY OR CLAYEY GRAVEL AND SAND				SILTY SOILS		CLAYEY SOILS				
GEN. RATING AS SUBGRADE	EXCELLENT TO GOOD							FAIR TO POOR				FAIR TO POOR	POOR	UNSUITABLE

PI OF A-7-5 SUBGROUP IS ≤ LL - 30 ; PI OF A-7-6 SUBGROUP IS > LL - 30

CONSISTENCY OR DENSENESS

PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY	RANGE OF STANDARD PENETRATION RESISTENCE (N-VALUE)	RANGE OF UNCONFINED COMPRESSIVE STRENGTH ($TONS/FT^2$)
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE	< 4	N/A
	LOOSE	4 TO 10	
	MEDIUM DENSE	10 TO 30	
	DENSE	30 TO 50	
	VERY DENSE	> 50	
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT	< 2	< 0.25
	SOFT	2 TO 4	0.25 TO 0.5
	MEDIUM STIFF	4 TO 8	0.5 TO 1.0
	STIFF	8 TO 15	1 TO 2
	VERY STIFF	15 TO 30	2 TO 4
	HARD	> 30	> 4

TEXTURE OR GRAIN SIZE

U.S. STD. SIEVE SIZE	4	10	40	60	200	270
OPENING (MM)	4.76	2.00	0.42	0.25	0.075	0.053

BOULDER (BLDR.)	COBBLE (COB.)	GRAVEL (GR.)	COARSE SAND (CSE. SD.)	FINE SAND (F SD.)	SILT (SL.)	CLAY (CL.)

GRAIN SIZE	MM	305	75	2.0	0.25	0.05	0.005
	IN.	12	3				

SOIL MOISTURE - CORRELATION OF TERMS

SOIL MOISTURE SCALE (ATTERBERG LIMITS)	FIELD MOISTURE DESCRIPTION	GUIDE FOR FIELD MOISTURE DESCRIPTION
	- SATURATED - (SAT.)	USUALLY LIQUID; VERY WET, USUALLY FROM BELOW THE GROUND WATER TABLE
LL — LIQUID LIMIT		
PLASTIC RANGE (PI)	- WET - (W)	SEMISOLID; REQUIRES DRYING TO ATTAIN OPTIMUM MOISTURE
PL — PLASTIC LIMIT		
OM — OPTIMUM MOISTURE	- MOIST - (M)	SOLID; AT OR NEAR OPTIMUM MOISTURE
SL — SHRINKAGE LIMIT		
	- DRY - (D)	REQUIRES ADDITIONAL WATER TO ATTAIN OPTIMUM MOISTURE

PLASTICITY

	PLASTICITY INDEX (PI)	DRY STRENGTH
NON PLASTIC	0-5	VERY LOW
SLIGHTLY PLASTIC	6-15	SLIGHT
MODERATELY PLASTIC	16-25	MEDIUM
HIGHLY PLASTIC	26 OR MORE	HIGH

COLOR

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.

GRADATION

WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE.
UNIFORMLY GRADED - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE.
GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.

ANGULARITY OF GRAINS

THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS: ANGULAR, SUBANGULAR, SUBROUNDED, OR ROUNDED.

MINERALOGICAL COMPOSITION

MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.

COMPRESSIBILITY

SLIGHTLY COMPRESSIBLE	LL < 31
MODERATELY COMPRESSIBLE	LL = 31 - 50
HIGHLY COMPRESSIBLE	LL > 50

PERCENTAGE OF MATERIAL

ORGANIC MATERIAL	GRANULAR SOILS	SILT - CLAY SOILS	OTHER MATERIAL	
TRACE OF ORGANIC MATTER	2 - 3%	3 - 5%	TRACE	1 - 10%
LITTLE ORGANIC MATTER	3 - 5%	5 - 12%	LITTLE	10 - 20%
MODERATELY ORGANIC	5 - 10%	12 - 20%	SOME	20 - 35%
HIGHLY ORGANIC	> 10%	> 20%	HIGHLY	35% AND ABOVE

GROUND WATER

- WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING
- STATIC WATER LEVEL AFTER ____ HOURS
- PW — PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA
- SPRING OR SEEP

MISCELLANEOUS SYMBOLS

- ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION
- SOIL SYMBOL
- ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT
- INFERRED SOIL BOUNDARY
- INFERRED ROCK LINE
- ALLUVIAL SOIL BOUNDARY
- 25/025 — DIP & DIP DIRECTION OF ROCK STRUCTURES
- SPT, DPT, DMT, VST, PMT — TEST BORING
- AUGER BORING
- CORE BORING
- MW — MONITORING WELL
- PIEZOMETER INSTALLATION
- SLOPE INDICATOR INSTALLATION
- CONE PENETROMETER TEST
- SOUNDING ROD
- TEST BORING WITH CORE
- SPT N-VALUE

RECOMMENDATION SYMBOLS

- 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

ABBREVIATIONS

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
γ - UNIT WEIGHT
γ_d - DRY UNIT WEIGHT

SAMPLE ABBREVIATIONS

S - BULK
SS - SPLIT SPOON
ST - SHELBY TUBE
RS - ROCK
RT - RECOMPACTED TRIAXIAL
CBR - CALIFORNIA BEARING RATIO

EQUIPMENT USED ON SUBJECT PROJECT

DRILL UNITS:
- [ ] CME-45C
- [ ] CME-55
- [ ] CME-550
- [ ] VANE SHEAR TEST
- [ ] PORTABLE HOIST
- [X] CME-550
- [X] D-25

ADVANCING TOOLS:
- [ ] CLAY BITS
- [ ] 6" CONTINUOUS FLIGHT AUGER
- [ ] 8" HOLLOW AUGERS
- [ ] HARD FACED FINGER BITS
- [ ] TUNG.-CARBIDE INSERTS
- [X] CASING [ ] W/ ADVANCER
- [X] TRICONE 2 15/16" STEEL TEETH
- [ ] TRICONE _____" TUNG.-CARB.
- [ ] CORE BIT
- [ ] _____

HAMMER TYPE:
- [X] AUTOMATIC [ ] MANUAL

CORE SIZE:
- [ ] -B _____ [ ] -H _____
- [ ] -N _____

HAND TOOLS:
- [ ] POST HOLE DIGGER
- [ ] HAND AUGER
- [ ] SOUNDING ROD
- [ ] VANE SHEAR TEST
- [ ] _____

ROCK DESCRIPTION

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:

WEATHERED ROCK (WR)	NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.
CRYSTALLINE ROCK (CR)	FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.
NON-CRYSTALLINE ROCK (NCR)	FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YEILD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.
COASTAL PLAIN SEDIMENTARY ROCK (CP)	COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.

WEATHERING

FRESH	ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.
VERY SLIGHT (V 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. *IF TESTED, WOULD YIELD SPT REFUSAL*
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. *IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF*
VERY SEVERE (V 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. *IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF*
COMPLETE	ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.

ROCK HARDNESS

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 GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.
SOFT	CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS 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 FINGERNAIL.

FRACTURE SPACING

TERM	SPACING
VERY WIDE	MORE THAN 10 FEET
WIDE	3 TO 10 FEET
MODERATELY CLOSE	1 TO 3 FEET
CLOSE	0.16 TO 1 FOOT
VERY CLOSE	LESS THAN 0.16 FEET

BEDDING

TERM	THICKNESS
VERY THICKLY BEDDED	4 FEET
THICKLY BEDDED	1.5 - 4 FEET
THINLY BEDDED	0.16 - 1.5 FEET
VERY THINLY BEDDED	0.03 - 0.16 FEET
THICKLY LAMINATED	0.008 - 0.03 FEET
THINLY LAMINATED	< 0.008 FEET

INDURATION

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.

TERMS AND DEFINITIONS

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 (N OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS 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 (SRQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE.

TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.

BENCH MARK: 81.85 FEET RIGHT -L- 87+34 BM 10 RR SPIKE IN BASE OF 24" PINE
N 577,986.3920 E 2,422,782.2840 ELEVATION: 76.99 FEET

NOTES:
FIAD - FILLED IMMEDIATLEY AFTER DRILLING

DATE: 8-15-14

PROJECT REFERENCE NO.	SHEET NO.
R-5703	3

SITE PLAN

0 40 80
FEET

SKEW 84°05'30"
SITE 1

NC GRID
NAD 83/NSRS 2007

-L- POT Sta.89+28.52 =
-Y1- POT Sta.28+62.92

87 88 89 90 91 92

27

NC HWY 58

TO SR 1581 (JOHN MEWBOURNE RD.)

END BENT #1

END BENT #2

BRIDGE 208

28

EB1-A LT LN

B-1

EB2-A LT LN

LEFT CONTROL LINE

-L-

TO SR 1581

TO SR 1004

84°05'30"

B-2

EB2-B RT LN

RIGHT CONTROL LINE

29

WOODS

BM 10

EB1-B RT LN

BRIDGE 209

END BENT #1

END BENT #2

30

-Y1-

NC HWY 58

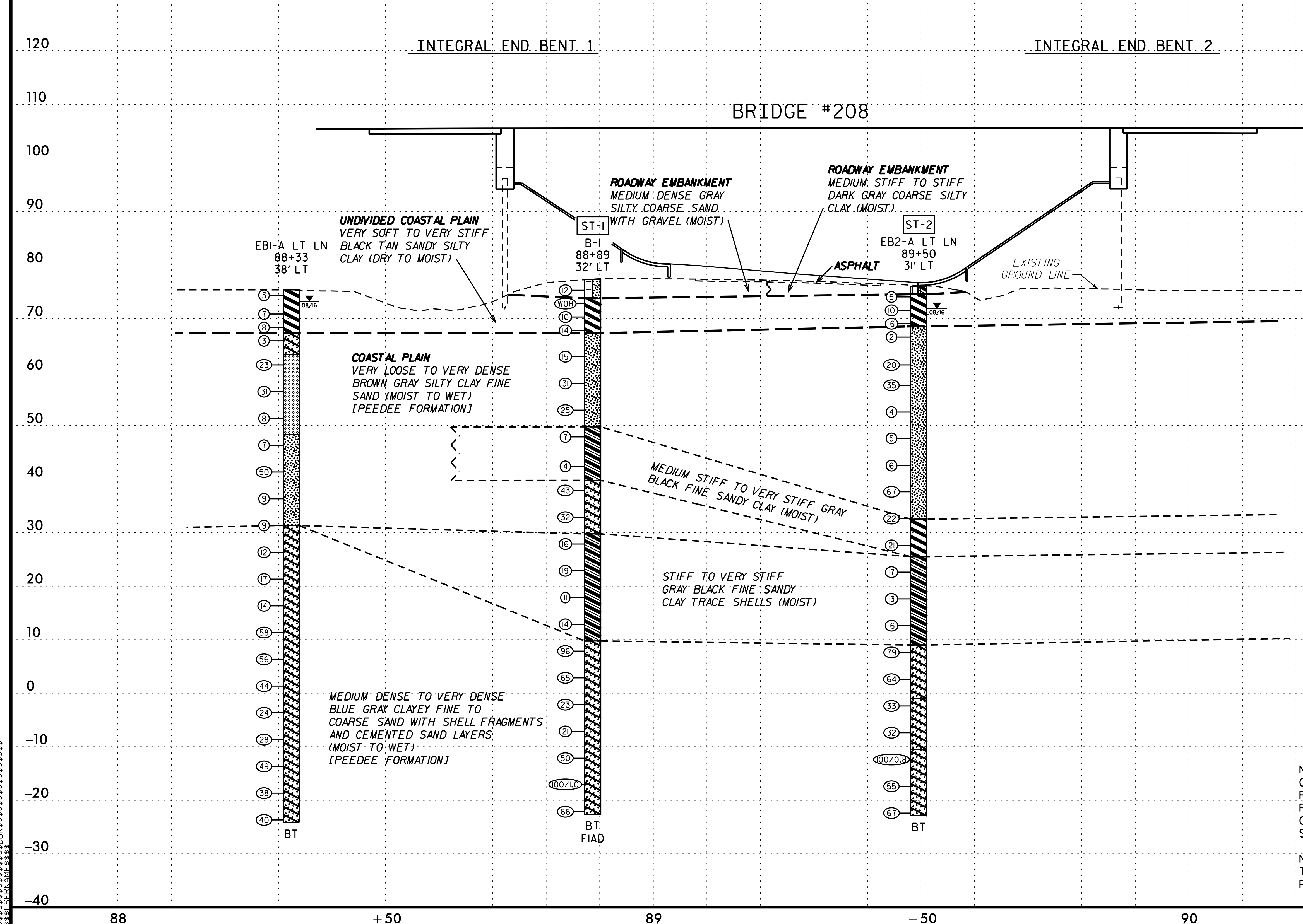
TO SR 1730 (HUMPHREY RD.)

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)				% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	60	200		
ST-1	36' LT	88+89	10.5 – 12.5	A-2-4 (0)	24	2	42	37	5	9	93	80	51	15.6	29.3	ND
ST-2	34' LT	89+50	8.0 – 10.0	A-2-4 (0)	30	1	35	39	8	8	90	75	55	19.3	30.6	ND

PROFILE THROUGH BORINGS PROJECTED ALONG LEFT LANE CONTROL LINE

VE 1:1



NOTE : GROUNDLINE ALONG LEFT LANE CONTROL LINE 23 FEET LEFT OF -L- FROM PRELIMINARY GENERAL DRAWING FOR BRIDGE ON C.F. HARVEY PARKWAY OVER NC HWY 58 BETWEEN SR 1581 AND SR 1730

NOTE : INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE PROFILE

$$$$$SYSTIME$$$$$ $$$$$$$$$$$$$$$$DGN$$$$$$$$$$$$$$$$$$$$ $$$$USERNAME$$$$

5/14/99

SOIL TEST RESULTS

SAMPLE NO.	OFFSET	STATION	DEPTH INTERVAL	AASHTO CLASS.	L.L.	P.I.	% BY WEIGHT				% PASSING (SIEVES)				% MOISTURE	% ORGANIC
							C. SAND	F. SAND	SILT	CLAY	10	40	60	200		
SS-7	33' RT	89+45	1.0 – 2.5	A-4 (1)	21	8	16	43	21	20	100	91	84	47.4	13.4	1.8

PROJECT REFERENCE NO.	SHEET NO.
R-5703	5
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

INCOMPLETE PLANS
DO NOT USE FOR R/W ACQUISITION

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

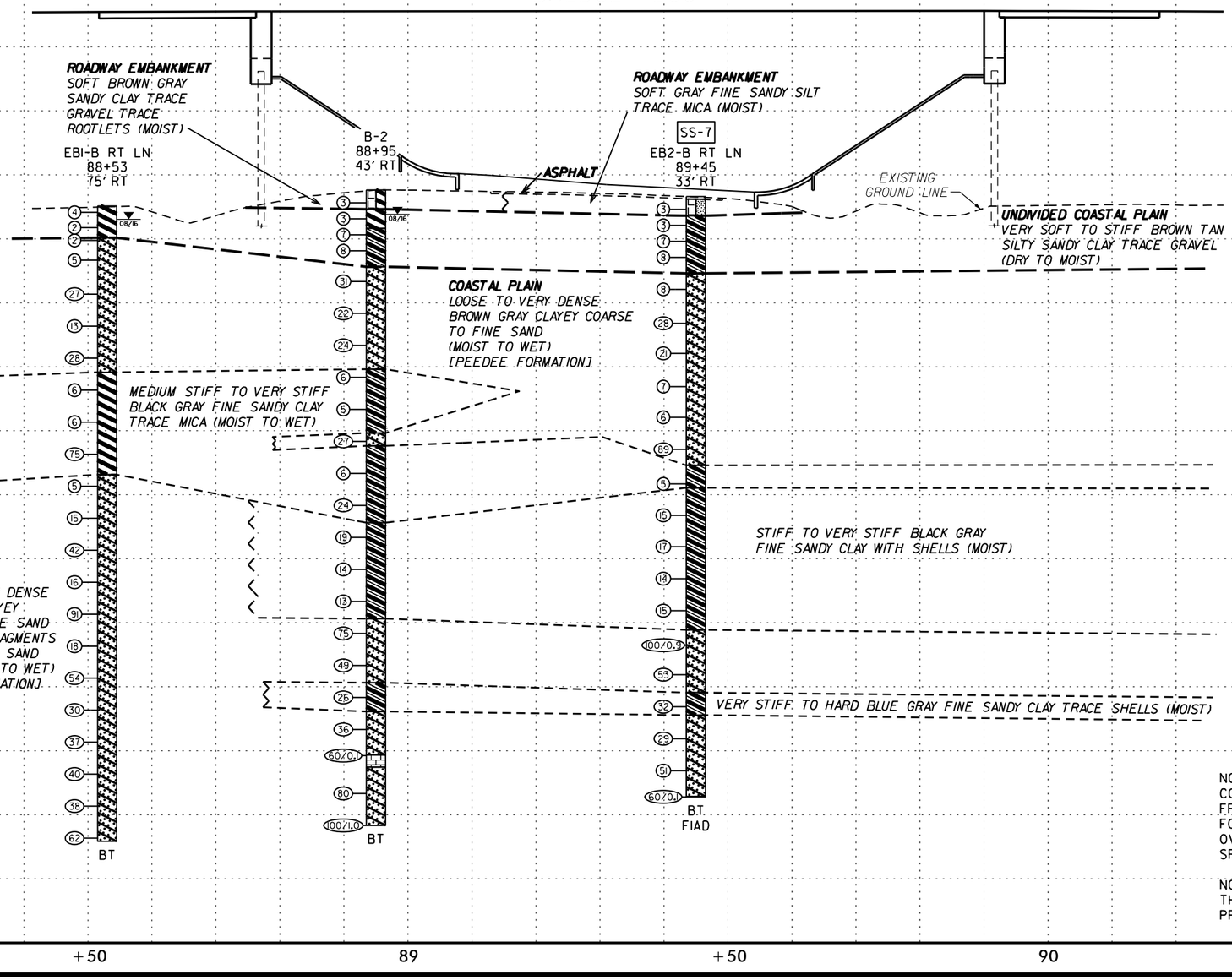
PROFILE THROUGH BORINGS PROJECTED ALONG RIGHT LANE CONTROL LINE

VE 1:1

INTEGRAL END BENT 1

INTEGRAL END BENT 2

BRIDGE #209



NOTE : GROUNDLINE ALONG RIGHT LANE CONTROL LINE 23 FEET RIGHT OF -L- FROM PRELIMINARY GENERAL DRAWING FOR BRIDGE ON C.F. HARVEY PARKWAY OVER NC HWY 58 BETWEEN SR 1581 AND SR 1730

NOTE : INFERRED STRATIGRAPHY IS DRAWN THROUGH THE BORINGS WITH BOTH PROJECTED ONTO THE PROFILE.

$$$$$$$$SYSTIME$$$$$$$$
$$$$$$$$DGN$$$$$$$$$$$$$$$$$$$$
$$$$$$$$FILENAME$$$$$$$$

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

WBS 46375.1.1	**TIP** R-5703	**COUNTY** LENOIR	**GEOLOGIST** Peele, J.E.	
SITE DESCRIPTION Bridge No. 208 on -L- (Felix Harvey Pkwy) over -Y1- (NC HWY 58)				**GROUND WTR (ft)**
BORING NO. EB1-A Lt. Ln.	**STATION** 88+33	**OFFSET** 38 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 75.3 ft	**TOTAL DEPTH** 99.5 ft	**NORTHING** 578,131	**EASTING** 2,422,839	**24 HR.** 2.2
DRILL RIG/HAMMER EFF./DATE MID5152 D-25 90% 08/16/2016		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Fowler, A.	**START DATE** 08/30/16	**COMP. DATE** 08/31/16	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
										ELEV. (ft) DEPTH (ft)
80										
75	75.3	0.0	2	2	1	3		M		75.3 GROUND SURFACE 0.0 **UNDIVIDED COASTAL PLAIN** Brown Silty CLAY
	71.8	3.5	2	2	5	7		M		
70	69.3	6.0	3	2	6	8		M		
	66.8	8.5	1	1	2	3		M		67.3 8.0 **COASTAL PLAIN** Brown Clayey Fine SAND [Peedee Formation]
65	62.3	13.0	5	9	14	23		W		63.3 12.0 Green Gray Fine SAND
60	57.3	18.0	6	12	19	31		W		
55	52.3	23.0	4	2	6	8		W		
50	47.3	28.0	2	3	4	7		M		48.3 27.0 Dark Brown Gray Silty SAND
45	42.3	33.0	19	27	23	50		W		
40	37.3	38.0	1	4	5	9		W		
35	32.3	43.0	6	4	5	9		M		31.3 44.0 Dark Gray Fine Clayey Fine SAND with Shell Fragments
30	27.3	48.0	4	5	7	12		M		
25	22.3	53.0	6	7	10	17		M		
20	17.3	58.0	4	6	8	14		M		
15	12.3	63.0	5	35	23	58		M		
10	7.3	68.0	20	28	28	56		W		
5	2.3	73.0	20	20	24	44		W		
0										

WBS 46375.1.1	**TIP** R-5703	**COUNTY** LENOIR	**GEOLOGIST** Peele, J.E.	
SITE DESCRIPTION Bridge No. 208 on -L- (Felix Harvey Pkwy) over -Y1- (NC HWY 58)				**GROUND WTR (ft)**
BORING NO. EB1-A Lt. Ln.	**STATION** 88+33	**OFFSET** 38 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 75.3 ft	**TOTAL DEPTH** 99.5 ft	**NORTHING** 578,131	**EASTING** 2,422,839	**24 HR.** 2.2
DRILL RIG/HAMMER EFF./DATE MID5152 D-25 90% 08/16/2016		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Fowler, A.	**START DATE** 08/30/16	**COMP. DATE** 08/31/16	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
0						Match Line				
-5	-2.7	78.0	9	10	14	24		W		Dark Gray Fine Clayey Fine SAND with Shell Fragments *(continued)*
-10	-7.7	83.0	7	11	17	28		W		
-15	-12.7	88.0	13	26	23	49		W		
-20	-17.7	93.0	14	17	21	38		W		
	-22.7	98.0	12	15	25	40		W		-24.2 99.5 Boring Terminated at Elevation -24.2 ft in Dense clayey fine SAND and Shell Fragments

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 46375.1.1	**TIP** R-5703	**COUNTY** LENOIR	**GEOLOGIST** Blonshine, E.G.	
SITE DESCRIPTION Bridge No. 208 on -L- (Felix Harvey Pkwy) over -Y1- (NC HWY 58)				**GROUND WTR (ft)**
BORING NO. B-1	**STATION** 88+89	**OFFSET** 32 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 77.3 ft	**TOTAL DEPTH** 99.9 ft	**NORTHING** 578,142	**EASTING** 2,422,895	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE HPC2473 CME-550 92% 12/09/2015		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER White, J.	**START DATE** 08/11/16	**COMP. DATE** 08/11/16	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft)	DEPTH (ft)
80											
										77.3 GROUND SURFACE	0.0
	76.3	1.0	7	8	4	12		M		**ROADWAY EMBANKMENT** Gray Silty Coarse SAND with Gravel	
75	73.8	3.5	WOH	WOH	WOH	0		M		73.8 **UNDIVIDED COASTAL PLAIN**	3.5
	71.3	6.0	2	3	7	10		D		Tan Coarse Sandy Silty CLAY, Trace Gravel	
70	68.8	8.5	7	7	7	14		M		67.3 **COASTAL PLAIN**	10.0
	63.9	13.4	8	9	6	15		W		Black-Dark Gray Clayey Fine SAND [Peedee Formation]	
65											
60	58.9	18.4	12	15	16	31		W			
	53.9	23.4	9	12	13	25		W			
55											
50	48.9	28.4	3	4	3	7		M		49.8 Black Fine Sandy CLAY	27.5
	43.4	33.9	WOR	2	2	4		M			
45											
40	38.9	38.4	7	21	22	43		M		39.8 Dark Gray Clayey Coarse SAND	37.5
	33.9	43.4	20	21	11	32		W			
35											
30	28.9	48.4	5	7	9	16		M		29.8 Black Fine Sandy CLAY, Trace Shell, Trace Mica	47.5
	23.9	53.4	7	9	10	19		M			
25											
20	18.9	58.4	5	5	6	11		M			
	13.9	63.4	5	6	8	14		M			
15											
10	8.9	68.4	21	56	40	96		M		9.8 Blue Gray Clayey Coarse SAND, Trace Shells and cemented sand	67.5
	3.9	73.4	14	28	37	65		W			
5											
0											

WBS 46375.1.1	**TIP** R-5703	**COUNTY** LENOIR	**GEOLOGIST** Blonshine, E.G.	
SITE DESCRIPTION Bridge No. 208 on -L- (Felix Harvey Pkwy) over -Y1- (NC HWY 58)				**GROUND WTR (ft)**
BORING NO. B-1	**STATION** 88+89	**OFFSET** 32 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 77.3 ft	**TOTAL DEPTH** 99.9 ft	**NORTHING** 578,142	**EASTING** 2,422,895	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE HPC2473 CME-550 92% 12/09/2015		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER White, J.	**START DATE** 08/11/16	**COMP. DATE** 08/11/16	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
0						Match Line				
	-1.1	78.4	7	9	14	23		W		Blue Gray Clayey Coarse SAND, Trace Shells and cemented sand *(continued)*
-5	-6.1	83.4	6	9	12	21		W		
-10	-11.1	88.4	13	20	30	50		W		
-15	-16.1	93.4	21	79/0.5		100/1.0		M		
-20	-21.1	98.4	29	38	28	66		M		-22.6 Boring Terminated at Elevation -22.6 ft in Very Dense Clayey Coarse SAND 99.9 ST-1 collected in offset boring at Station 88+89 Offset 36 ft LT Other Samples: ST-1 (10.5 - 12.5)

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 46375.1.1	**TIP** R-5703	**COUNTY** LENOIR	**GEOLOGIST** Blonshine, E.G.	
SITE DESCRIPTION Bridge No. 208 on -L- (Felix Harvey Pkwy) over -Y1- (NC HWY 58)				**GROUND WTR (ft)**
BORING NO. EB2-A Lt. Ln.	**STATION** 89+50	**OFFSET** 31 ft LT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 76.0 ft	**TOTAL DEPTH** 98.9 ft	**NORTHING** 578,160	**EASTING** 2,422,953	**24 HR.** 4.2
DRILL RIG/HAMMER EFF./DATE HPC2473 CME-550 92% 12/09/2015		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER White, J.	**START DATE** 08/03/16	**COMP. DATE** 08/04/16	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft) DEPTH (ft)
80										
75	75.0	1.0	4	3	2	5		M		76.0 0.0 GROUND SURFACE **ROADWAY EMBANKMENT**
	72.5	3.5	3	3	7	10		M		74.5 1.5 Dark Gray Coarse Sandy CLAY with Gravel **UNDIVIDED COASTAL PLAIN**
70	70.0	6.0	6	8	8	16		M		Gray Fine Sandy CLAY
	67.5	8.5	2	1	1	2		W		68.5 7.5 **COASTAL PLAIN**
65										Dark Gray/Black Clayey Fine SAND [Peedee Formation]
	62.3	13.7	WOH	8	12	20		M		
60	58.5	17.5	14	15	20	35		M		
55	53.5	22.5	3	2	2	4		M		
50	48.6	27.4	3	2	3	5		M		
45	43.5	32.5	WOH	2	4	6		M		
40	38.6	37.4	19	31	36	67		W		
35	33.6	42.4	19	14	8	22		M		32.5 43.5 Dark Gray/Black Fine Sandy CLAY
30	28.6	47.4	5	11	10	21		M		25.5 50.5 Dark Gray/Black Fine Sandy CLAY with Shell Hash
25	23.6	52.4	6	8	9	17		M		
20	18.6	57.4	5	6	7	13		M		
15	13.6	62.4	6	8	8	16		M		
10	8.6	67.4	24	29	50	79		M		9.0 67.0 Blueish Dark Gray Clayey Coarse SAND with Shell Hash
5	3.6	72.4	20	31	33	64		M		

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
0						Match Line				
-5	-1.4	77.4	8	12	21	33		M		-1.0 77.0 Blue Gray Clayey Fine SAND
-10	-6.4	82.4	10	14	18	32		M		-10.5 86.5 Blue Gray Clayey Coarse SAND with Shell Hash, Possible Petrified Wood with Rock Fragments
-15	-11.4	87.4	13	87/0.3		100/0.8		W		
-20	-16.4	92.4	24	25	30	55		W		
	-21.4	97.4	49	37	30	67		W		-22.9 98.9 Boring Terminated at Elevation -22.9 ft in Very Dense Blue Grey Clayey Coarse SAND with Shell Hash

ST-2 collected in offset boring at Station 89+50 Offset 34 ft LT

Other Samples:
ST-2 (8.0 - 10.0)

NCDOT GEOTECHNICAL ENGINEERING UNIT
BOREHOLE REPORT

WBS 46375.1.1	**TIP** R-5703	**COUNTY** LENOIR	**GEOLOGIST** Peele, J.E.	
SITE DESCRIPTION Bridge No. 209 on -L- (Felix Harvey Pkwy) over -Y1- (NC HWY 58)				**GROUND WTR (ft)**
BORING NO. EB1-B Rt. Ln.	**STATION** 88+53	**OFFSET** 75 ft RT	**ALIGNMENT** -L-	**0 HR.** 2.0
COLLAR ELEV. 75.1 ft	**TOTAL DEPTH** 99.3 ft	**NORTHING** 578,029	**EASTING** 2,422,894	**24 HR.** 2.1
DRILL RIG/HAMMER EFF./DATE MID5152 D-25 90% 08/16/2016		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Fowler, A.	**START DATE** 08/29/16	**COMP. DATE** 08/29/16	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
										ELEV. (ft) DEPTH (ft)
80										
75	75.1	0.0	1	2	2	4		M		75.1 GROUND SURFACE 0.0
	72.7	2.4	1	1	1	2		M		**UNDIVIDED COASTAL PLAIN** Dark Brown Silty CLAY
70	70.7	4.4	WOH	WOH	2	2		W		70.1 5.0
	67.6	7.5	4	3	2	5		W		**COASTAL PLAIN** Brown Gray Clayey Fine SAND [Peedee Formation]
65										
	62.3	12.8	7	14	13	27		W		
60										
	57.3	17.8	2	5	8	13		W		
55										
	52.3	22.8	8	13	15	28		W		
50										49.1 26.0 Dark Gray Fine Sandy CLAY
	47.3	27.8	3	2	4	6		W		
45										
	42.3	32.8	3	2	4	6		W		
40										
	37.3	37.8	22	36	39	75		W		
35										
	32.3	42.8	2	2	3	5		W		33.1 42.0 Green Gray Clayey Fine SAND with Shell Fragments
30										
	27.3	47.8	5	7	8	15		W		
25										
	22.3	52.8	6	8	34	42		W		
20										
	17.3	57.8	6	7	9	16		M		
15										
	12.3	62.8	28	37	54	91		W		
10										
	7.3	67.8	5	7	11	18		W		
5										
	2.3	72.8	15	27	27	54		W		
0										

WBS 46375.1.1	**TIP** R-5703	**COUNTY** LENOIR	**GEOLOGIST** Peele, J.E.	
SITE DESCRIPTION Bridge No. 209 on -L- (Felix Harvey Pkwy) over -Y1- (NC HWY 58)				**GROUND WTR (ft)**
BORING NO. EB1-B Rt. Ln.	**STATION** 88+53	**OFFSET** 75 ft RT	**ALIGNMENT** -L-	**0 HR.** 2.0
COLLAR ELEV. 75.1 ft	**TOTAL DEPTH** 99.3 ft	**NORTHING** 578,029	**EASTING** 2,422,894	**24 HR.** 2.1
DRILL RIG/HAMMER EFF./DATE MID5152 D-25 90% 08/16/2016		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER Fowler, A.	**START DATE** 08/29/16	**COMP. DATE** 08/29/16	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
0						Match Line				Green Gray Clayey Fine SAND with Shell Fragments *(continued)*
	-2.7	77.8	8	13	17	30		W		
-5										
	-7.7	82.8	8	13	24	37		W		
-10										
	-12.7	87.8	13	14	26	40		W		
-15										
	-17.7	92.8	13	16	22	38		W		
-20										
	-22.7	97.8	22	27	35	62		W		-24.2 99.3 Boring Terminated at Elevation -24.2 ft in Very Dense Fine SAND with Clay Seams, Shell Fragments

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 46375.1.1	**TIP** R-5703	**COUNTY** LENOIR	**GEOLOGIST** Blonshine, E.G.	
SITE DESCRIPTION Bridge No. 209 on -L- (Felix Harvey Pkwy) over -Y1- (NC HWY 58)				**GROUND WTR (ft)**
BORING NO. B-2	**STATION** 88+95	**OFFSET** 43 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 77.6 ft	**TOTAL DEPTH** 99.3 ft	**NORTHING** 578,072	**EASTING** 2,422,924	**24 HR.** 3.8
DRILL RIG/HAMMER EFF./DATE HPC2473 CME-550 92% 12/09/2015		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER White, J.	**START DATE** 08/10/16	**COMP. DATE** 08/10/16	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft) DEPTH (ft)
80										
	76.6	1.0								77.6 GROUND SURFACE 0.0
75			5	2	1	3		M		**ROADWAY EMBANKMENT** Brown Gray Tan Sandy CLAY, Trace Gravel, Trace Rootlets
	74.1	3.5								74.6 3.0
			2	1	2	3		M		**UNDIVIDED COASTAL PLAIN** Brown Gray Tan Sandy CLAY
	71.6	6.0								71.6 6.0
70			2	3	4	7		D		Tan Coarse Sandy Silty CLAY with Larger Smoothed Granules (Pebbles)
	69.1	8.5								
			3	4	4	8		M		
65	64.3	13.3								65.6 12.0
			11	15	16	31		W		**COASTAL PLAIN** Dark Gray Clayey Fine SAND [Peedee Formation]
60	59.3	18.3								
			7	9	13	22		W		
55	54.3	23.3								
			11	12	12	24		W		
50	49.3	28.3								49.6 28.0
			3	3	3	6		W		Blue Black Fine Sandy CLAY
45	44.3	33.3								
			2	2	3	5		M		
40	39.3	38.3								39.6 38.0
			14	15	12	27		M		Blue Black Coarse Clayey SAND
35	34.3	43.3								37.6 40.0
			3	3	3	6		M		Black Fine Sandy CLAY
30	29.3	48.3								
			8	13	11	24		M		
25	24.3	53.3								25.6 52.0
			7	9	10	19		M		Black-Dark Gray Fine Sandy CLAY, Trace Shells, Trace Mica
20	19.3	58.3								
			5	7	7	14		M		
15	14.3	63.3								
			5	6	7	13		M		
10	9.3	68.3								10.6 67.0
			18	39	36	75		M		Blue Gray Clayey Fine SAND, Trace Shells
5	4.3	73.3								
			19	22	27	49		M		
0										0.6 77.0

WBS 46375.1.1	**TIP** R-5703	**COUNTY** LENOIR	**GEOLOGIST** Blonshine, E.G.	
SITE DESCRIPTION Bridge No. 209 on -L- (Felix Harvey Pkwy) over -Y1- (NC HWY 58)				**GROUND WTR (ft)**
BORING NO. B-2	**STATION** 88+95	**OFFSET** 43 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 77.6 ft	**TOTAL DEPTH** 99.3 ft	**NORTHING** 578,072	**EASTING** 2,422,924	**24 HR.** 3.8
DRILL RIG/HAMMER EFF./DATE HPC2473 CME-550 92% 12/09/2015		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER White, J.	**START DATE** 08/10/16	**COMP. DATE** 08/10/16	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
0						Match Line				
	-0.7	78.3	9	11	15	26		M		Blue Gray Fine Sandy CLAY, Trace Mica *(continued)*
-5	-5.7	83.3	8	15	21	36		M		-3.9 81.5
										Dark Gray Clayey Coarse SAND, Trace Shells and cemented sand layers
-10	-10.7	88.3	60/0.1			60/0.1		W		-10.7 88.3
										-12.6 90.2
-15	-15.7	93.3	22	35	45	80		M		
-20	-20.7	98.3	46	54/0.5		100/1.0		M		-21.7 99.3
										Boring Terminated at Elevation -21.7 ft in Very Dense Clayey Coarse SAND

NCDOT GEOTECHNICAL ENGINEERING UNIT
BORELOG REPORT

WBS 46375.1.1	**TIP** R-5703	**COUNTY** LENOIR	**GEOLOGIST** Blonshine, E.G.	
SITE DESCRIPTION Bridge No. 209 on -L- (Felix Harvey Pkwy) over -Y1- (NC HWY 58)				**GROUND WTR (ft)**
BORING NO. EB2-B Rt. Ln.	**STATION** 89+45	**OFFSET** 33 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 76.6 ft	**TOTAL DEPTH** 93.8 ft	**NORTHING** 578,097	**EASTING** 2,422,968	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE HPC2473 CME-550 92% 12/09/2015		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER White, J.	**START DATE** 08/08/16	**COMP. DATE** 08/08/16	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION ELEV. (ft) DEPTH (ft)
80										
75	75.6	1.0	3	1	2	3				76.6 1.0 GROUND SURFACE 76.2 0.4 ASPHALT
	73.1	3.5	WOH	1	2	3	SS-7	13%		**ROADWAY EMBANKMENT** Gray Fine Sandy SILT Trace Mica and little rootlets 73.6 3.0
70	70.6	6.0	2	4	3	7		M		**UNDIVIDED COASTAL PLAIN** Tan Gray Fine to Coarse Sandy CLAY with Gravel
	68.1	8.5	5	4	4	8		D		
65	63.1	13.5	1	3	5	8		D		64.6 12.0 **COASTAL PLAIN** Blue Gray Clayey Coarse SAND [Peedee Formation]
60	57.8	18.8	4	12	16	28		W		
55	53.1	23.5	4	9	12	21		W		
50	47.9	28.7	3	3	4	7		W		
45	43.1	33.5	2	2	4	6		M		
40	38.1	38.5	12	33	56	89		M		34.6 42.0 Black Fine Sandy CLAY Trace Mica
35	32.7	43.9	2	2	3	5		M		31.1 45.5 Black/Dark Gray Fine Sandy CLAY with Shells
30	27.8	48.8	5	7	8	15		M		
25	22.9	53.7	6	8	9	17		M		
20	17.9	58.7	6	6	8	14		M		
15	12.9	63.7	6	7	8	15		M		
10	7.9	68.7	31	43	57/0.4	100/0.9		M		8.9 67.7 Blue Gray Clayey Coarse SAND with Shells
5	2.9	73.7	16	26	27	53		M		
0										

WBS 46375.1.1	**TIP** R-5703	**COUNTY** LENOIR	**GEOLOGIST** Blonshine, E.G.	
SITE DESCRIPTION Bridge No. 209 on -L- (Felix Harvey Pkwy) over -Y1- (NC HWY 58)				**GROUND WTR (ft)**
BORING NO. EB2-B Rt. Ln.	**STATION** 89+45	**OFFSET** 33 ft RT	**ALIGNMENT** -L-	**0 HR.** N/A
COLLAR ELEV. 76.6 ft	**TOTAL DEPTH** 93.8 ft	**NORTHING** 578,097	**EASTING** 2,422,968	**24 HR.** FIAD
DRILL RIG/HAMMER EFF./DATE HPC2473 CME-550 92% 12/09/2015		**DRILL METHOD** Mud Rotary	**HAMMER TYPE** Automatic	
DRILLER White, J.	**START DATE** 08/08/16	**COMP. DATE** 08/08/16	**SURFACE WATER DEPTH** N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT 0.5ft	0.5ft	0.5ft	BLOWS PER FOOT 0 25 50 75 100	SAMP. NO.	MOI	LOG	SOIL AND ROCK DESCRIPTION
0						Match Line				
-5	-2.1	78.7	10	14	18	32		M		0.9 77.5 Blue Gray Fine Sandy CLAY with Shells
-10	-7.1	83.7	9	12	17	29		M		-4.4 81.0 Blue Gray Clayey Fine SAND with Shells and Cemented Layers
-15	-12.1	88.7	10	16	35	51		W		
	-17.1	93.7	60/0.1			60/0.1				-17.1 93.7 -17.2 93.8 Boring Terminated at Elevation -17.2 ft in Very Dense clayey fine to coarse sand with shells

Form No. TR-T88
Revision No. 0
Revision Date: 12/20/09

Particle Size Analysis of Soils

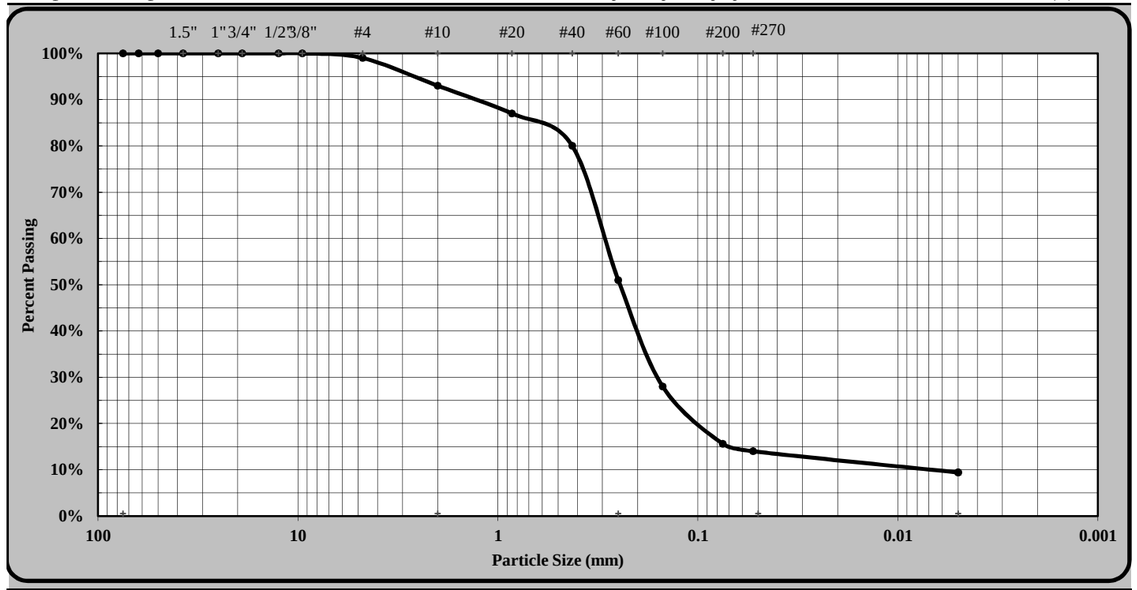
AASHTO T88 as Modified by NCDOT

S&ME

Quality Assurance

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

S&ME Project #:	6235-16-010	Report Date:	12/27/16
Project Name:	C.F. Harvey Parkway Extension R-5703	Test Date(s):	12/24 - 12/27/16
State Project #:	N/A F.A. Project No: N/A	TIP NO:	N/A
Client Name:	Michael Baker Engineering		
Address:	Raleigh, NC		
Boring #:	B-1 Sample #: ST-1	Sample Date:	N/A
Location:	88+89 Offset: 36 LT	Depth (ft):	10.5 - 12.5 ft.
Sample Description:	Gray Silty Clayey Fine to Coarse SAND A-2-4 (0)		



As Defined by NCDOT		Fine Sand	< 0.25 mm and > 0.05 mm
Gravel	< 75 mm and > 2.00 mm	Silt	< 0.05 and > 0.005 mm
Coarse Sand	< 2.00 mm and >0.25 mm	Clay	< 0.005 mm

Maximum Particle Size	3/8"	Coarse Sand	42%	Silt	5%
Gravel	7%	Fine Sand	37%	Clay	9%
Apparent Relative Density	ND	Moisture Content	29.3%	% Passing #200	15.6%
Liquid Limit	24	Plastic Limit	22	Plastic Index	2

Soil Mortar (-#10 Sieve)

Coarse Sand	45%	Fine Sand	40%	Silt	5%	Clay	10%
Description of Sand & Gravel Particles:		Rounded	☐			Angular	☒
Hard & Durable	☒	Soft	☐			Weathered & Friable	☐

References / Comments / Deviations: ND=Not Determined.

Mal Krajan, ET	104-01-0703	Laboratory Manager	12/27/2016
Technician Name	*Certification No.*	*Position*	*Date*
Mal Krajan, ET	*Signature*	Laboratory Manager	9/26/2016
Technical Responsibility		*Position*	*Date*

Oedometer Settlement Tests

Sample details

Sketch showing specimen location in original Sample

Depth	10.5 - 12.5 ft.
Description:	Gray Silty Clayey Fine to Coarse SAND (A-2-4) (0)
Type	Undisturbed
Height H_0 (in)	0.998
Diameter D_0 (in)	2.501
Weight W_0 (gr)	150.89
Bulk Density ρ (PCF)	117.24
Particle Density ρ_s	2.658 (measured)

Initial Conditions

Settlement Channel	1942
Moisture Content w_0%	27.6
Dry Density ρ_d (PCF)	91.91
Voids Ratio e_0	0.8045
Deg of Saturation S_0%	91.0
Swelling Pressure Ss (TSF)	0.000

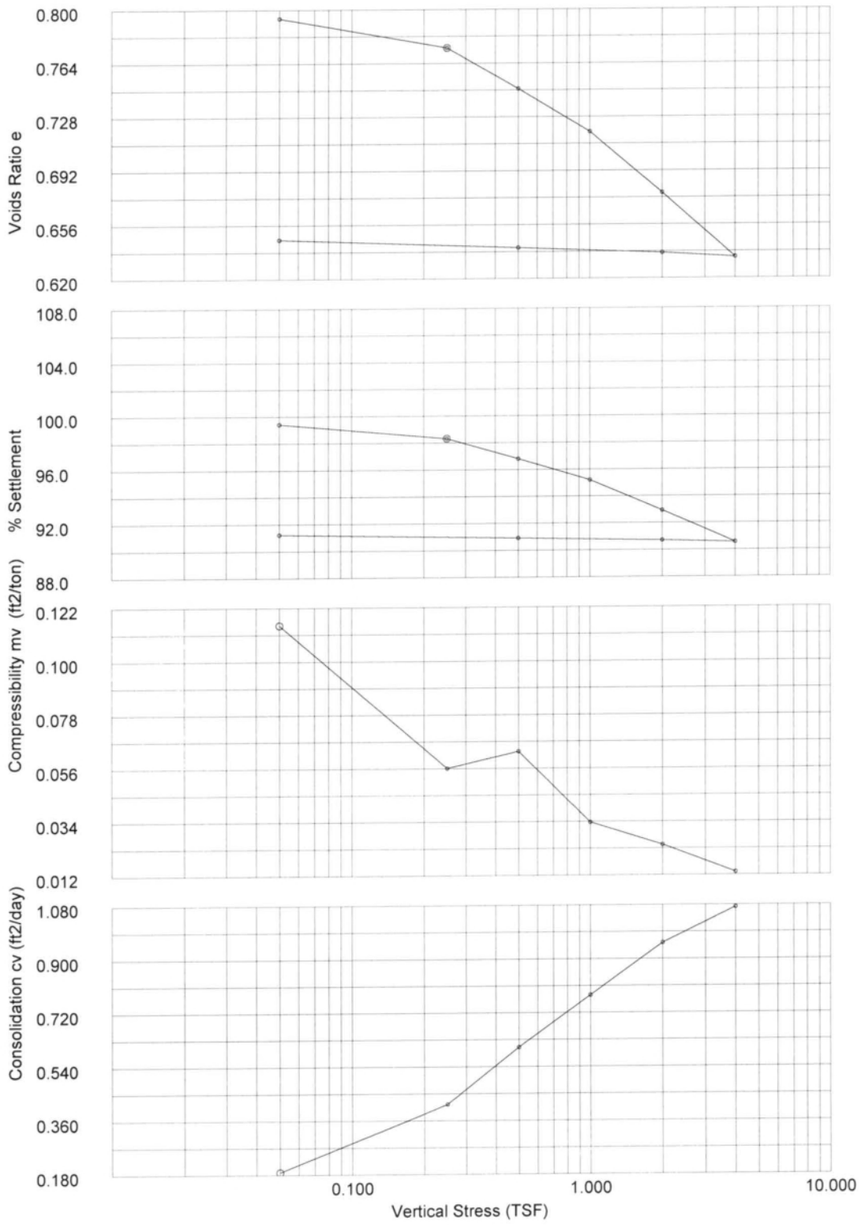
Final Conditions

Moisture Content w_f%	24.2
Dry Density ρ_d (PCF)	100.73
Voids Ratio e_f	0.6465
Deg of Saturation S_f%	99.51
Settlement: (in)	0.087
Compression Index C_c	0.150
Notes:	Test specimen takne from the middle portion of UD tube.

S&ME

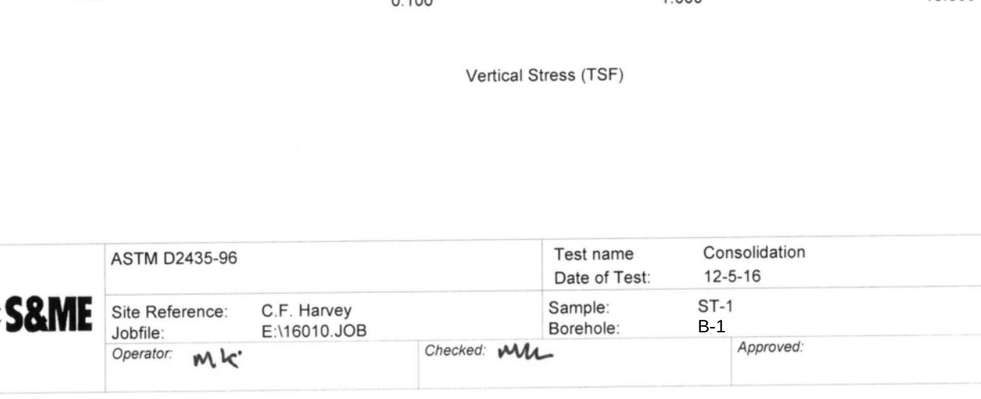
ASTM D2435-96		Test name	Consolidation
		Date of Test:	12-5-16
Site Reference:	C.F. Harvey	Sample:	ST-1
Jobfile:	E:\16010.JOB	Borehole:	B-1
Operator: MLC	Checked: MLC	Approved:	

Oedometer Settlement Tests



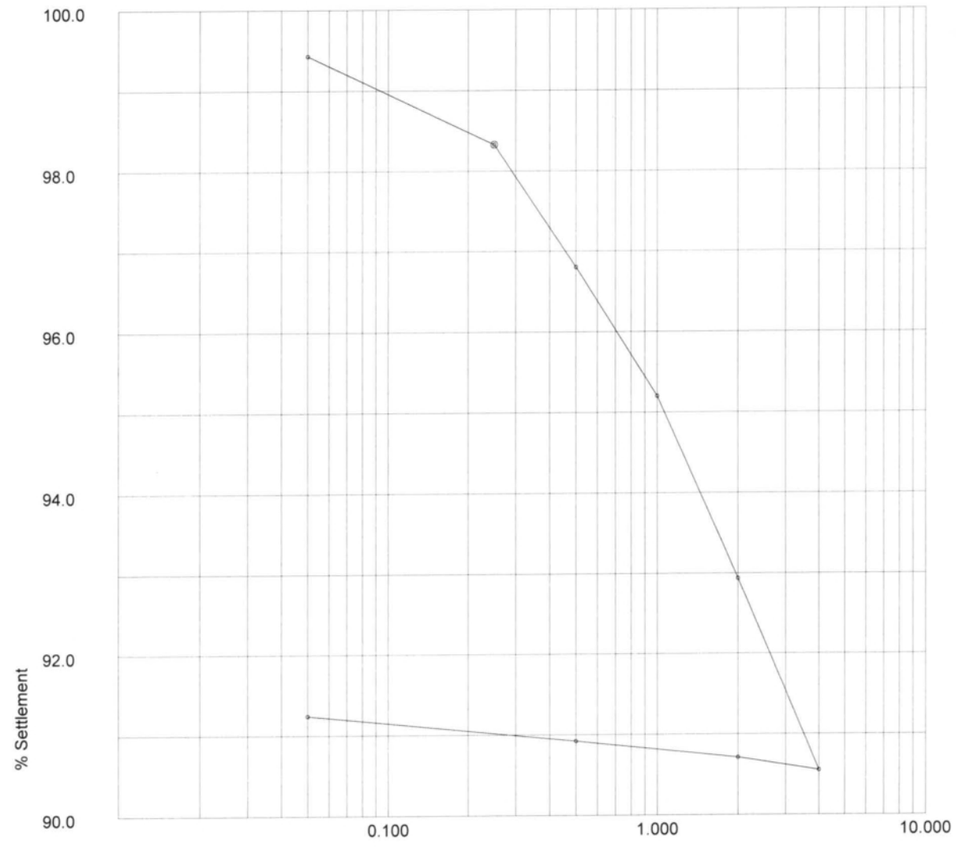
S&ME	ASTM D2435-96	Test name	Consolidation
		Date of Test:	12-5-16
	Site Reference: C.F. Harvey	Sample:	ST-1
	Jobfile: E:\16010.JOB	Borehole:	B-1
	Operator: MLC	Checked: MLC	Approved:

Oedometer Settlement Tests



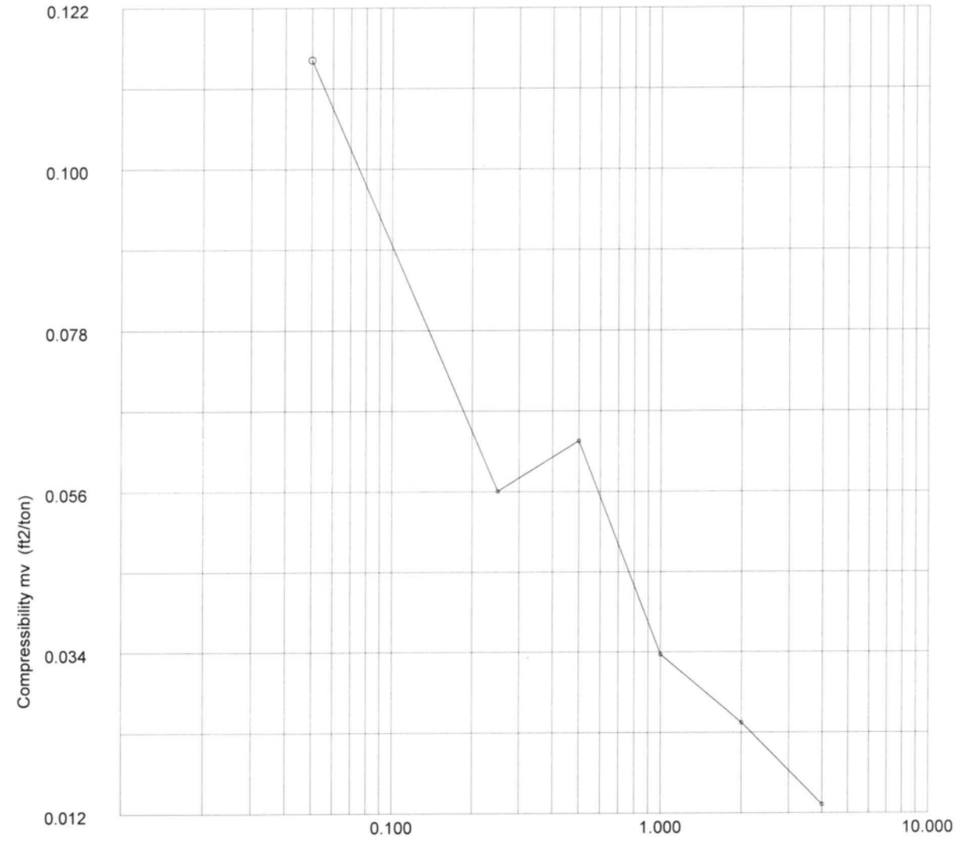
S&ME	ASTM D2435-96	Test name	Consolidation
		Date of Test:	12-5-16
	Site Reference: C.F. Harvey	Sample:	ST-1
	Jobfile: E:\16010.JOB	Borehole:	B-1
	Operator: MK	Checked: MLC	Approved:

Oedometer Settlement Tests



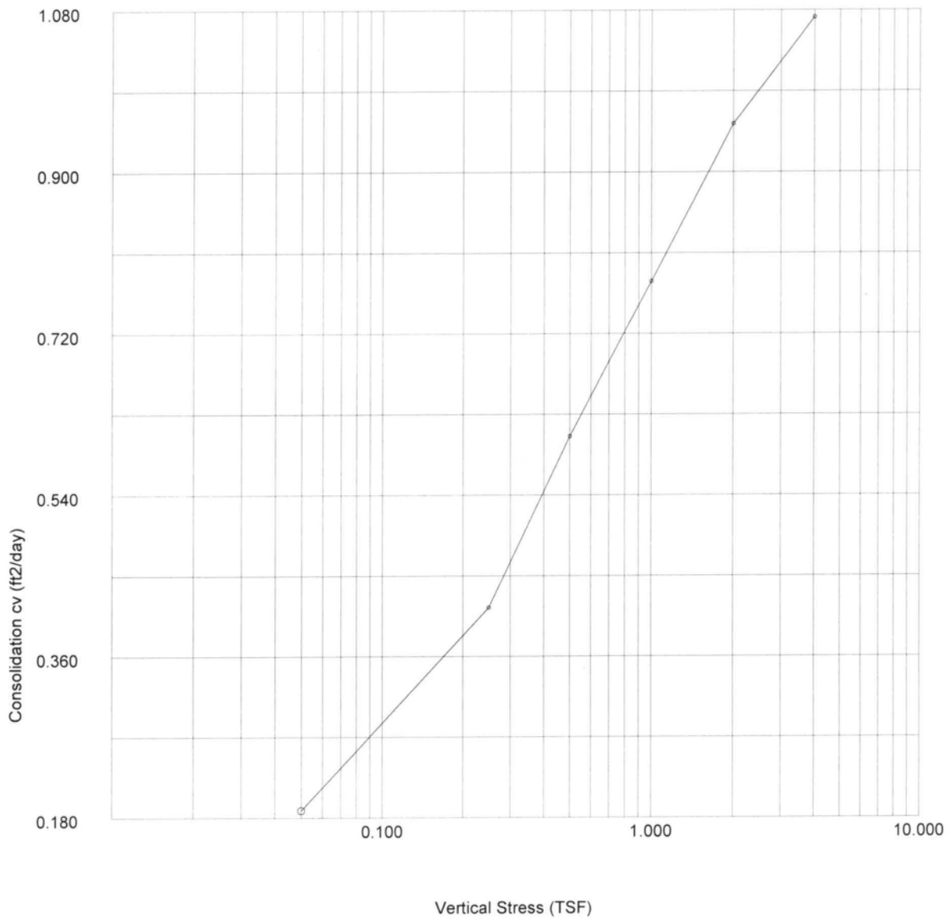
S&ME	ASTM D2435-96	Test name	Consolidation
		Date of Test:	12-5-16
	Site Reference: C.F. Harvey	Sample:	ST-1
	Jobfile: E:\16010.JOB	Borehole:	B-1
	Operator: MLC	Checked: MLC	Approved:

Oedometer Settlement Tests



S&ME	ASTM D2435-96	Test name	Consolidation
		Date of Test:	12-5-16
	Site Reference: C.F. Harvey	Sample:	ST-1
	Jobfile: E:\16010.JOB	Borehole:	B-1
	Operator: MLC	Checked: MLC	Approved:

Oedometer Settlement Tests



ASTM D2435-96		Test name	Consolidation
		Date of Test:	12-5-16
Site Reference:	C.F. Harvey	Sample:	ST-1
Jobfile:	E:\16010.JOB	Borehole:	B-1
Operator: MLC	Checked: MLC	Approved:	

Oedometer Settlement Tests

Stress (TSF)	Initial Temp. oC	Settlement Total (in)	Cal Corr. (in)	Final Temp. oC	Voids Ratio e_f	t_{50} (mins)	Secondary Compr C_{sec}	c_v (ft2/day)	m_v (ft2/ton)
0.050	21.6	0.0057	0.0	21.6	0.7942	2.630	0.0006	0.188	0.115
0.250	21.6	0.0167	0.0	21.6	0.7743	1.175	0.0006	0.415	0.056
0.500	21.6	0.0319	0.0	21.6	0.7468	0.783	0.0008	0.605	0.063
1.000	21.6	0.0479	0.0	21.6	0.7179	0.590	0.0007	0.779	0.034
2.000	21.6	0.0705	0.0	21.6	0.6771	0.462	0.0079	0.953	0.024
4.000	21.6	0.0943	0.0	21.6	0.6340	0.391	0.0001	1.072	0.013
2.000	21.6	0.0927	0.0	21.6	0.6369				0.001
0.500	21.6	0.0906	0.0	21.6	0.6407				0.002
0.050	21.6	0.0874	0.0	21.6	0.6465				0.008

ASTM D2435-96		Test name	Consolidation
		Date of Test:	12-5-16
Site Reference:	C.F. Harvey	Sample:	ST-1
Jobfile:	E:\16010.JOB	Borehole:	B-1
Operator: MLC	Checked: MLC	Approved:	

Oedometer Settlement Tests

No.	Time (mins)	Displacement (divs)	Displacement (in)	Settlement (in)
1	0.000	0	0.0000	0.0000
2	0.017	1	0.0001	0.0001
3	0.167	9	0.0009	0.0009
4	0.417	13	0.0013	0.0013
5	0.917	17	0.0017	0.0017
6	1.917	24	0.0024	0.0024
7	3.917	33	0.0033	0.0033
8	7.917	41	0.0041	0.0041
9	14.917	49	0.0049	0.0049
10	29.917	54	0.0054	0.0054
11	59.917	56	0.0056	0.0056
12	98.200	57	0.0057	0.0057

S&ME

ASTM D2435-96

Test name Consolidation Load: 0.050 (TSF)
Date of Test: 12-5-16

Site Reference: C.F. Harvey
Jobfile: E:\16010.JOB

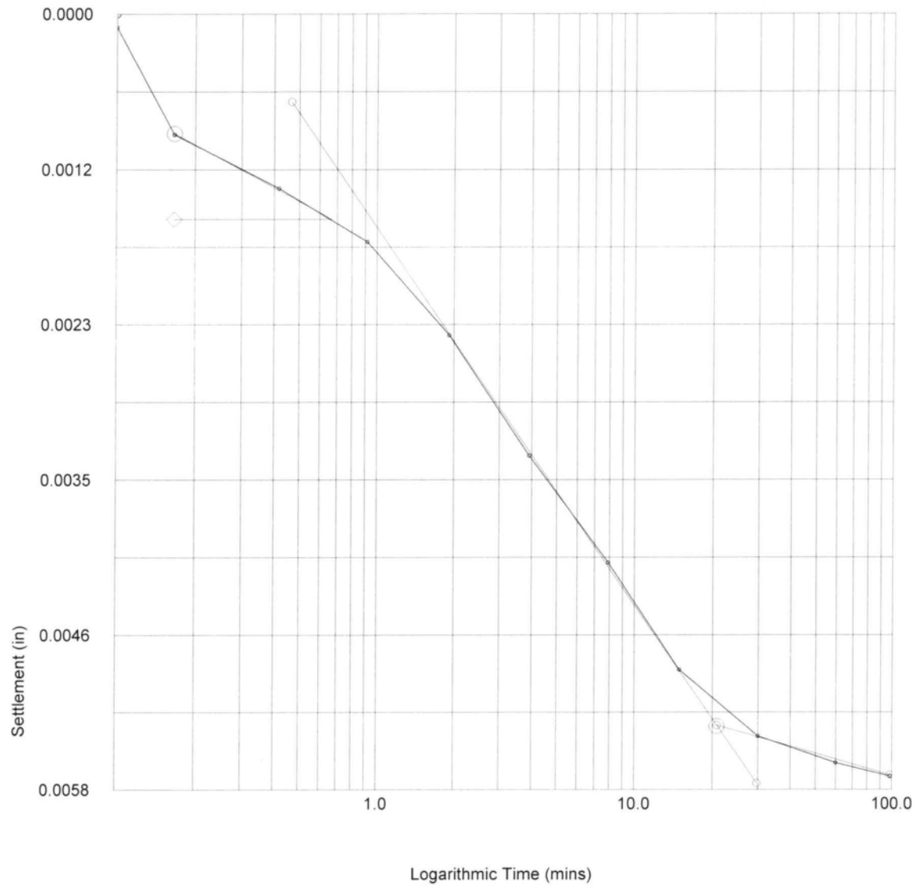
Sample: ST-1
Borehole: B-1

Operator: MLC | Checked: MLC | Approved:

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF)	0.050
Initial Temp oC	21.6
Correction (in)	0.0
Settlement (in)	0.0057
Voids Ratio e	0.7942
Final Temp oC	0.0
t_{50} (mins)	2.63
c_v (ft2/day)	0.188
m_v (ft2/ton)	0.115
Sec Compression C_{sec}	0.0006



S&ME

ASTM D2435-96

Test name Consolidation
Date of Test: 12-5-16

Site Reference: C.F. Harvey
Jobfile: E:\16010.JOB

Sample: ST-1
Borehole: B-1

Operator: MLC | Checked: MLC | Approved:

Oedometer Settlement Tests

No.	Time (mins)	Displacement (divs)	Displacement (in)	Settlement (in)
1	0.000	57	0.0057	0.0057
2	0.017	65	0.0065	0.0065
3	0.033	65	0.0065	0.0065
4	0.050	73	0.0073	0.0073
5	0.067	77	0.0077	0.0077
6	0.083	79	0.0079	0.0079
7	0.100	80	0.0080	0.0080
8	0.200	86	0.0086	0.0086
9	0.400	94	0.0094	0.0094
10	0.800	105	0.0105	0.0105
11	1.000	112	0.0112	0.0112
12	2.000	122	0.0122	0.0122
13	4.000	137	0.0137	0.0137
14	8.000	150	0.0150	0.0150
15	10.000	153	0.0153	0.0153
16	20.000	160	0.0160	0.0160
17	40.000	163	0.0163	0.0163
18	80.000	165	0.0165	0.0165
19	100.000	166	0.0166	0.0166
20	163.170	167	0.0167	0.0167

S&ME

ASTM D2435-96

Test name Consolidation Load: 0.250 (TSF)
Date of Test: 12-5-16

Site Reference: C.F. Harvey
Jobfile: E:\16010.JOB

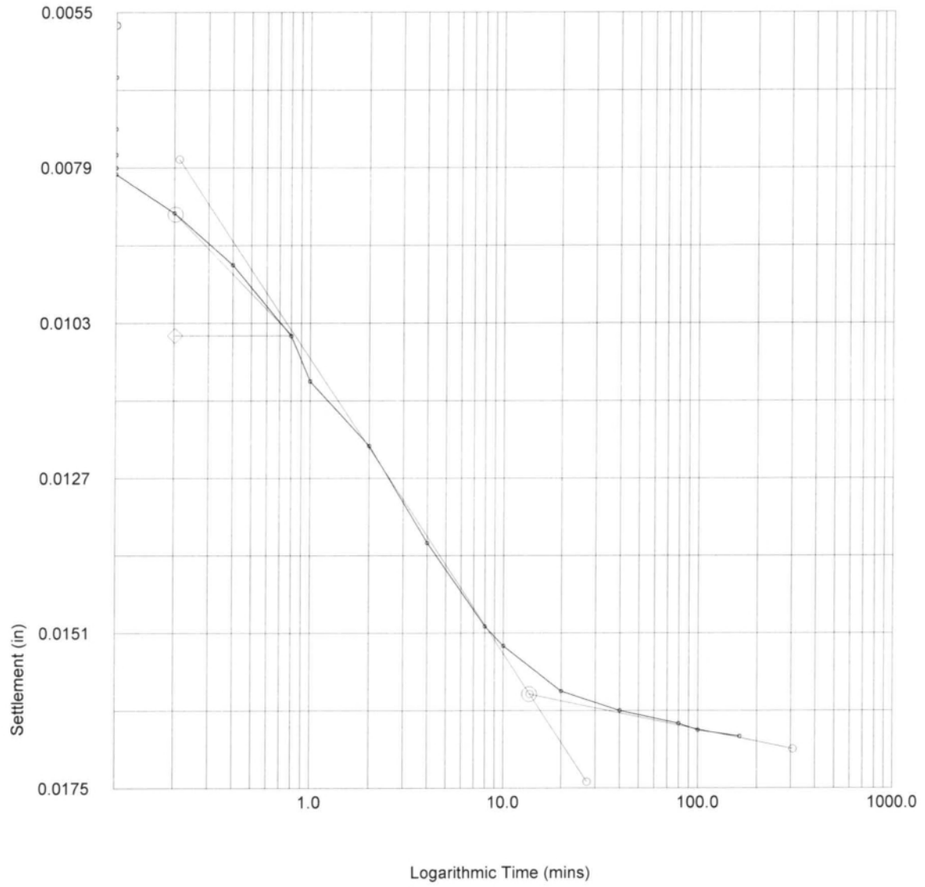
Sample: ST-1
Borehole: B-1

Operator: MLC Checked: MLC Approved:

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF)	0.250
Initial Temp oC	21.6
Correction (in)	0.0
Settlement (in)	0.011
Voids Ratio e	0.7743
Final Temp oC	0.0
t_{50} (mins)	1.17
c_v (ft2/day)	0.415
m_v (ft2/ton)	0.056
Sec Compression C_{sec}	0.0006



S&ME

ASTM D2435-96

Test name Consolidation
Date of Test: 12-5-16

Site Reference: C.F. Harvey
Jobfile: E:\16010.JOB

Sample: ST-1
Borehole: B-1

Operator: MLC Checked: MLC Approved:

Oedometer Settlement Tests

No.	Time (mins)	Displacement (divs)	Displacement (in)	Settlement (in)
1	0.000	167	0.0167	0.0167
2	0.017	168	0.0168	0.0168
3	0.033	170	0.0170	0.0170
4	0.050	177	0.0177	0.0177
5	0.067	182	0.0182	0.0182
6	0.083	184	0.0184	0.0184
7	0.100	185	0.0185	0.0185
8	0.200	198	0.0198	0.0198
9	0.400	217	0.0217	0.0217
10	0.800	237	0.0237	0.0237
11	1.000	241	0.0241	0.0241
12	2.000	264	0.0264	0.0264
13	4.000	281	0.0281	0.0281
14	8.000	296	0.0296	0.0296
15	10.000	298	0.0298	0.0298
16	20.000	305	0.0305	0.0305
17	40.000	312	0.0312	0.0312
18	80.000	316	0.0316	0.0316
19	100.000	317	0.0317	0.0317
20	196.000	319	0.0319	0.0319

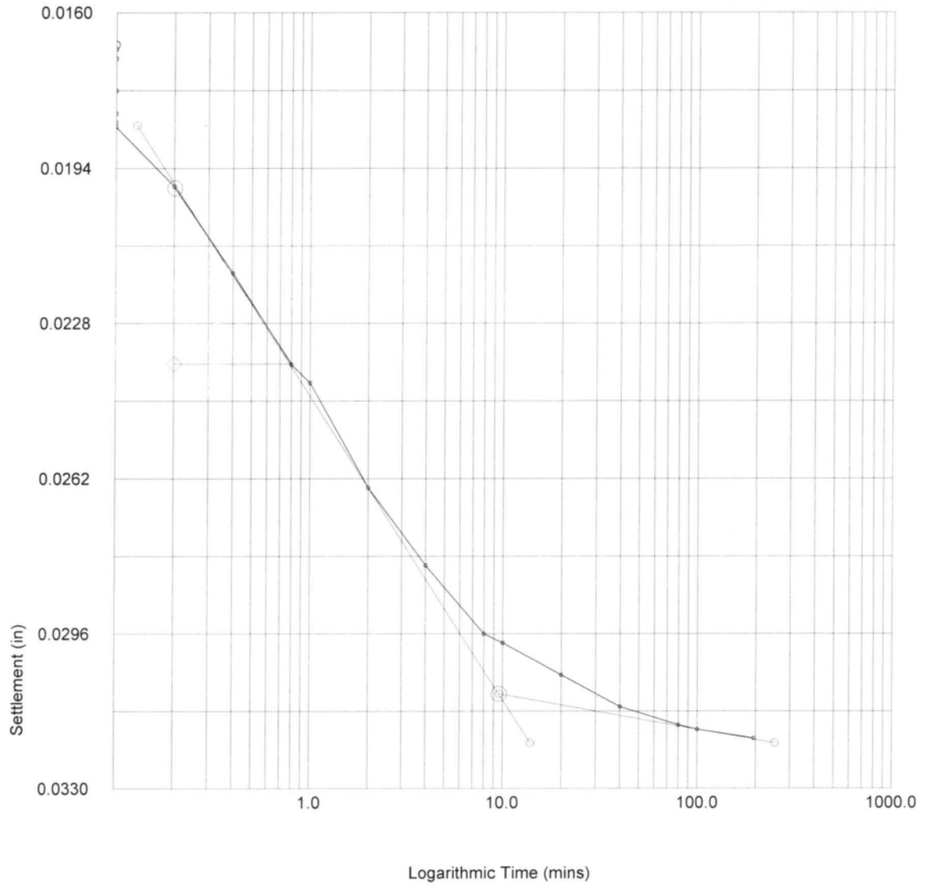
S&ME

ASTM D2435-96		Test name	Consolidation Load: 0.500 (TSF)
		Date of Test:	12-5-16
Site Reference:	C.F. Harvey	Sample:	ST-1
Jobfile:	E:\16010.JOB	Borehole:	B-1
Operator: MK	*Checked:* MK	*Approved:*	

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF)	0.500
Initial Temp oC	21.6
Correction (in)	0.0
Settlement (in)	0.0152
Voids Ratio e	0.7468
Final Temp oC	0.0
t_{50} (mins)	0.78
c_v (ft2/day)	0.605
m_v (ft2/ton)	0.063
Sec Compression C_{sec}	0.0008



S&ME

ASTM D2435-96		Test name	Consolidation
		Date of Test:	12-5-16
Site Reference:	C.F. Harvey	Sample:	ST-1
Jobfile:	E:\16010.JOB	Borehole:	B-1
Operator: MK	*Checked:* MK	*Approved:*	

Oedometer Settlement Tests

No.	Time (mins)	Displacement (divs)	Displacement (in)	Settlement (in)
1	0.000	319	0.0319	0.0319
2	0.017	335	0.0335	0.0335
3	0.033	335	0.0335	0.0335
4	0.050	353	0.0353	0.0353
5	0.067	358	0.0358	0.0358
6	0.083	361	0.0361	0.0361
7	0.100	366	0.0366	0.0366
8	0.200	377	0.0377	0.0377
9	0.400	393	0.0393	0.0393
10	0.800	415	0.0415	0.0415
11	1.000	421	0.0421	0.0421
12	2.000	441	0.0441	0.0441
13	4.000	457	0.0457	0.0457
14	8.000	465	0.0465	0.0465
15	10.000	465	0.0465	0.0465
16	20.000	473	0.0473	0.0473
17	40.000	476	0.0476	0.0476
18	80.000	478	0.0478	0.0478
19	100.000	478	0.0478	0.0478
20	136.630	479	0.0479	0.0479

S&ME

ASTM D2435-96

Test name Consolidation Load: 1.000 (TSF)
Date of Test: 12-5-16

Site Reference: C.F. Harvey
Jobfile: E:\16010.JOB

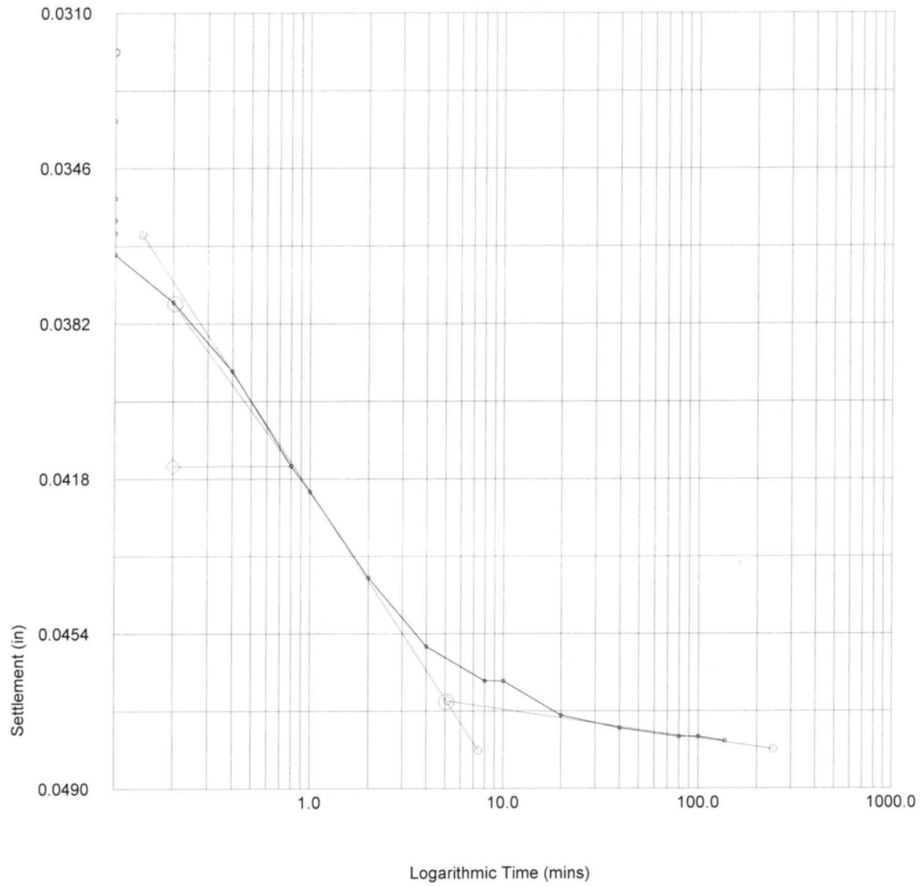
Sample: ST-1
Borehole: B-1

Operator: MLC Checked: MLC Approved:

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF)	1.000
Initial Temp oC	21.6
Correction (in)	0.0
Settlement (in)	0.016
Voids Ratio e	0.7179
Final Temp oC	0.0
t_{50} (mins)	0.59
c_v (ft2/day)	0.779
m_v (ft2/ton)	0.034
Sec Compression C_{sec}	0.0007



S&ME

ASTM D2435-96

Test name Consolidation
Date of Test: 12-5-16

Site Reference: C.F. Harvey
Jobfile: E:\16010.JOB

Sample: ST-1
Borehole: B-1

Operator: MLC Checked: MLC Approved:

Oedometer Settlement Tests

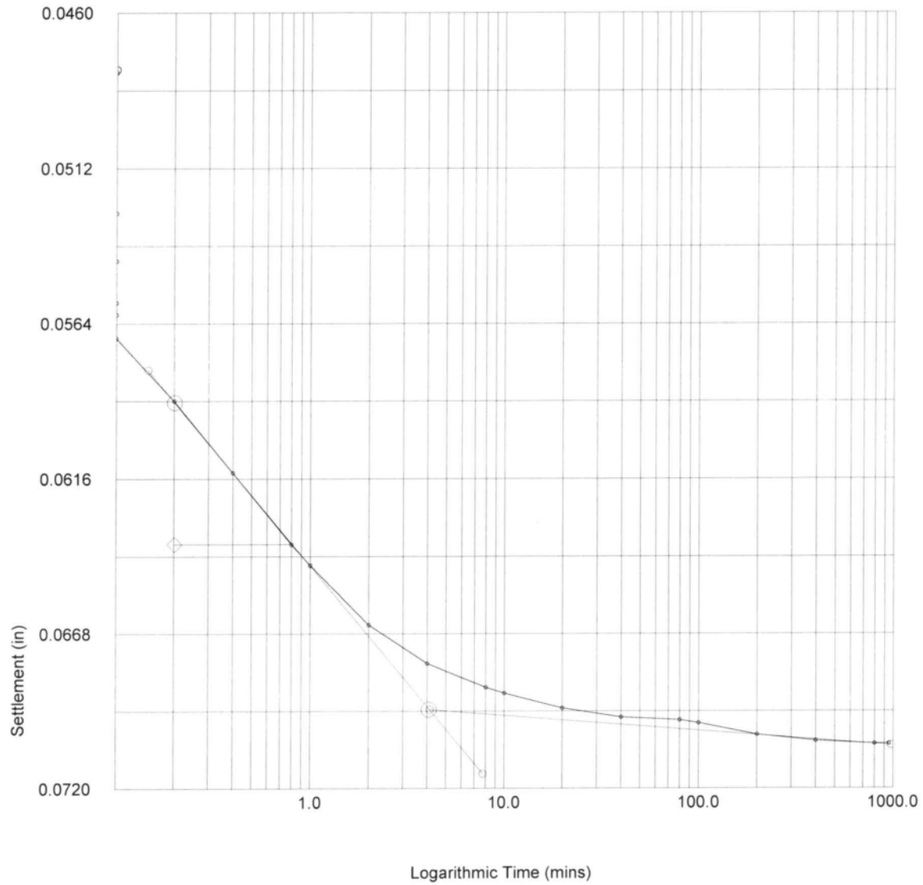
No.	Time (mins)	Displacement (divs)	Displacement (in)	Settlement (in)
1	0.000	479	0.0479	0.0479
2	0.017	480	0.0480	0.0480
3	0.033	527	0.0527	0.0527
4	0.050	543	0.0543	0.0543
5	0.067	557	0.0557	0.0557
6	0.083	561	0.0561	0.0561
7	0.100	569	0.0569	0.0569
8	0.200	590	0.0590	0.0590
9	0.400	614	0.0614	0.0614
10	0.800	638	0.0638	0.0638
11	1.000	645	0.0645	0.0645
12	2.000	665	0.0665	0.0665
13	4.000	678	0.0678	0.0678
14	8.000	686	0.0686	0.0686
15	10.000	688	0.0688	0.0688
16	20.000	693	0.0693	0.0693
17	40.000	696	0.0696	0.0696
18	80.000	697	0.0697	0.0697
19	100.000	698	0.0698	0.0698
20	200.000	702	0.0702	0.0702
21	400.000	704	0.0704	0.0704
22	800.000	705	0.0705	0.0705
23	949.100	705	0.0705	0.0705

S&ME	ASTM D2435-96		Test name	Consolidation Load: 2.000 (TSF)
			Date of Test:	12-5-16
	Site Reference:	C.F. Harvey	Sample:	ST-1
	Jobfile:	E:\16010.JOB	Borehole:	B-1
	Operator: mk	*Checked:* mk		*Approved:*

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF)	2.000
Initial Temp oC	21.6
Correction (in)	0.0
Settlement (in)	0.0226
Voids Ratio e	0.6771
Final Temp oC	0.0
t_{50} (mins)	0.46
c_v (ft2/day)	0.953
m_v (ft2/ton)	0.024
Sec Compression C_{sec}	0.0079



S&ME	ASTM D2435-96		Test name	Consolidation
			Date of Test:	12-5-16
	Site Reference:	C.F. Harvey	Sample:	ST-1
	Jobfile:	E:\16010.JOB	Borehole:	B-1
	Operator: mk	*Checked:* mk		*Approved:*

Oedometer Settlement Tests

No.	Time (mins)	Displacement (divs)	Displacement (in)	Settlement (in)
1	0.000	705	0.0705	0.0705
2	0.017	714	0.0714	0.0714
3	0.033	736	0.0736	0.0736
4	0.050	777	0.0777	0.0777
5	0.067	790	0.0790	0.0790
6	0.083	801	0.0801	0.0801
7	0.100	808	0.0808	0.0808
8	0.200	837	0.0837	0.0837
9	0.400	864	0.0864	0.0864
10	0.800	889	0.0889	0.0889
11	1.000	896	0.0896	0.0896
12	2.000	912	0.0912	0.0912
13	4.000	921	0.0921	0.0921
14	8.000	929	0.0929	0.0929
15	10.000	929	0.0929	0.0929
16	20.000	936	0.0936	0.0936
17	40.000	937	0.0937	0.0937
18	80.000	943	0.0943	0.0943
19	100.000	943	0.0943	0.0943
20	161.130	943	0.0943	0.0943

S&ME

ASTM D2435-96

Test name Consolidation Load: 4.000 (TSF)
Date of Test: 12-5-16

Site Reference: C.F. Harvey
Jobfile: E:\16010.JOB

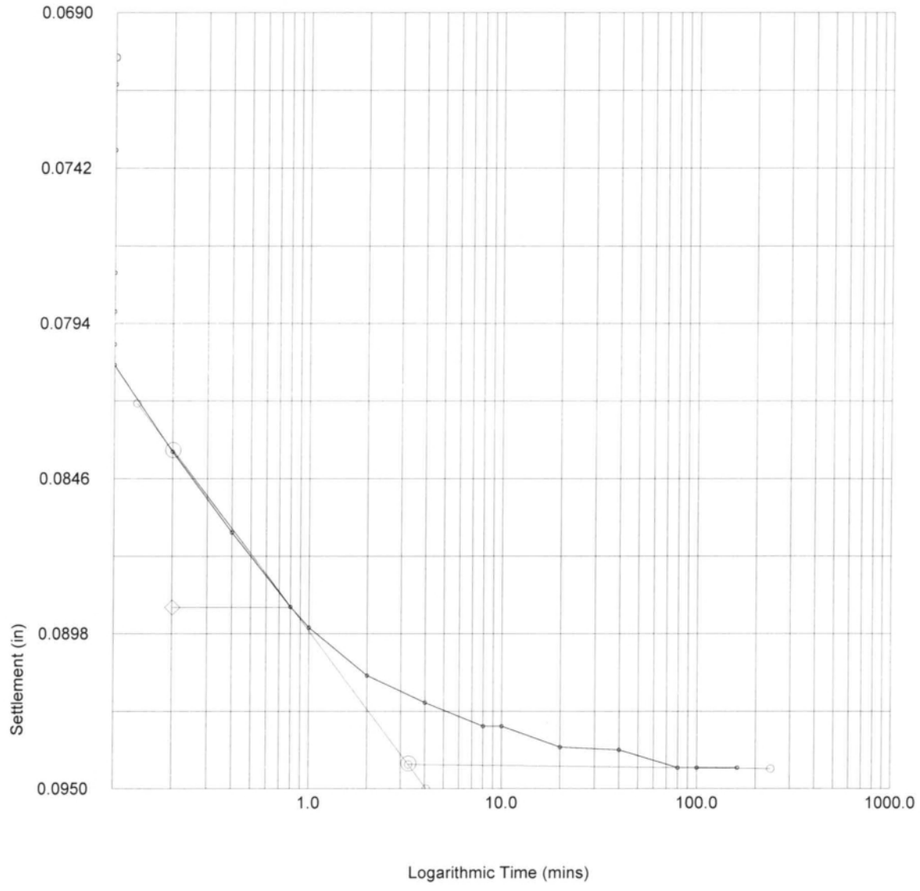
Sample: ST-1
Borehole: B-1

Operator: MK Checked: MK Approved:

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF)	4.000
Initial Temp oC	21.6
Correction (in)	0.0
Settlement (in)	0.0238
Voids Ratio e	0.6340
Final Temp oC	0.0
t_{50} (mins)	0.39
c_v (ft2/day)	1.072
m_v (ft2/ton)	0.013
Sec Compression C_{sec}	0.0001



S&ME

ASTM D2435-96

Test name Consolidation
Date of Test: 12-5-16

Site Reference: C.F. Harvey
Jobfile: E:\16010.JOB

Sample: ST-1
Borehole: B-1

Operator: MK Checked: MK Approved:

Oedometer Settlement Tests

No.	Time (mins)	Displacement (divs)	Displacement (in)	Settlement (in)
1	0.000	943	0.0943	0.0943
2	0.017	933	0.0933	0.0933
3	0.033	933	0.0933	0.0933
4	0.050	932	0.0932	0.0932
5	0.067	930	0.0930	0.0930
6	0.083	930	0.0930	0.0930
7	0.100	930	0.0930	0.0930
8	0.200	930	0.0930	0.0930
9	0.400	929	0.0929	0.0929
10	0.800	929	0.0929	0.0929
11	1.000	928	0.0928	0.0928
12	2.000	928	0.0928	0.0928
13	4.000	928	0.0928	0.0928
14	8.000	928	0.0928	0.0928
15	10.000	928	0.0928	0.0928
16	20.000	927	0.0927	0.0927
17	40.000	927	0.0927	0.0927
18	79.330	927	0.0927	0.0927

S&ME

ASTM D2435-96

Test name: Consolidation Load: 2.000 (TSF)
Date of Test: 12-5-16

Site Reference: C.F. Harvey
Jobfile: E:\16010.JOB

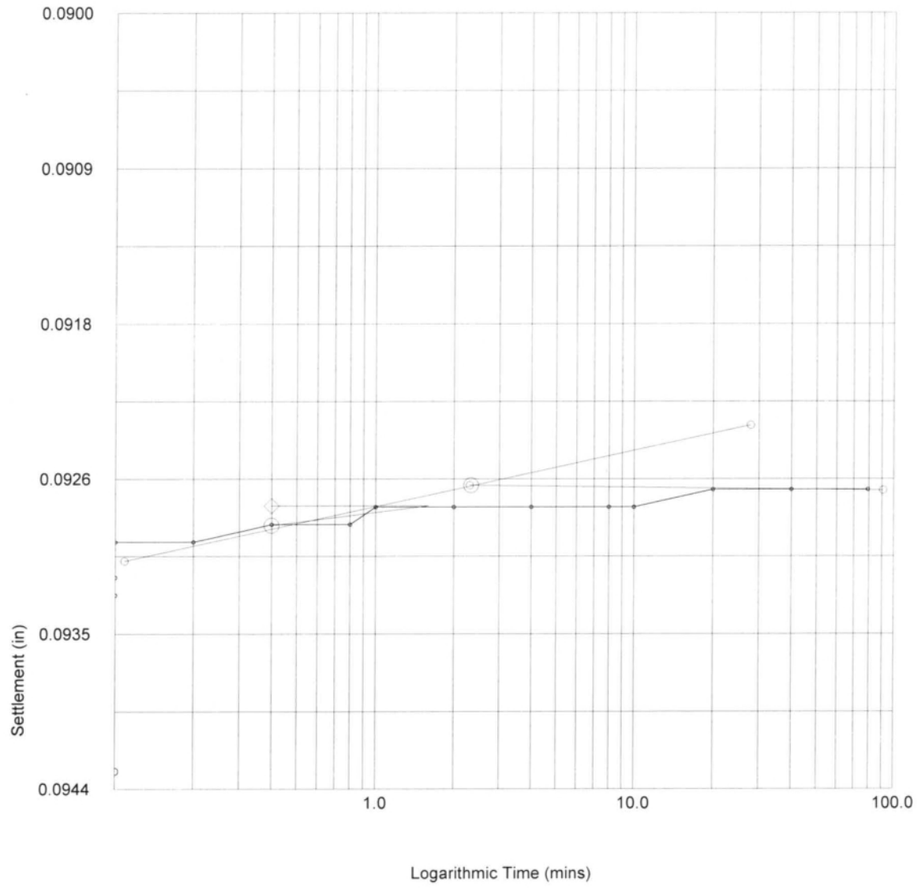
Sample: ST-1
Borehole: B-1

Operator: MK Checked: MK Approved:

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF)	2.000
Initial Temp oC	21.6
Correction (in)	0.0
Settlement (in)	0.0016
Voids Ratio e	0.6369
Final Temp oC	
t_{50} (mins)	
c_v (ft2/day)	
m_v (ft2/ton)	
Sec Compression C_{sec}	



S&ME

ASTM D2435-96

Test name: Consolidation
Date of Test: 12-5-16

Site Reference: C.F. Harvey
Jobfile: E:\16010.JOB

Sample: ST-1
Borehole: B-1

Operator: MK Checked: MK Approved:

Oedometer Settlement Tests

No.	Time (mins)	Displacement (divs)	Displacement (in)	Settlement (in)
1	0.000	927	0.0927	0.0927
2	0.017	921	0.0921	0.0921
3	0.033	921	0.0921	0.0921
4	0.050	913	0.0913	0.0913
5	0.067	913	0.0913	0.0913
6	0.083	913	0.0913	0.0913
7	0.100	913	0.0913	0.0913
8	0.200	912	0.0912	0.0912
9	0.400	911	0.0911	0.0911
10	0.800	911	0.0911	0.0911
11	1.000	910	0.0910	0.0910
12	2.000	910	0.0910	0.0910
13	4.000	910	0.0910	0.0910
14	8.000	909	0.0909	0.0909
15	10.000	909	0.0909	0.0909
16	20.000	909	0.0909	0.0909
17	40.000	907	0.0907	0.0907
18	80.000	906	0.0906	0.0906
19	86.333	906	0.0906	0.0906

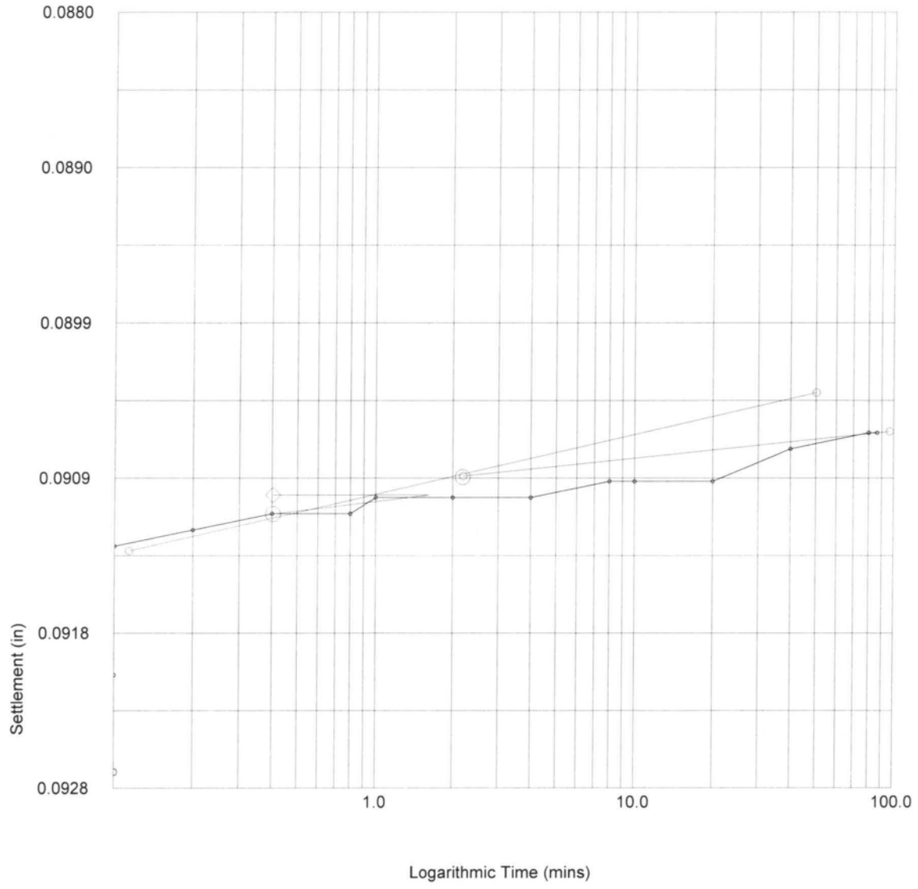
S&ME

ASTM D2435-96		Test name	Consolidation Load: 0.500 (TSF)
		Date of Test:	12-5-16
Site Reference:	C.F. Harvey	Sample:	ST-1
Jobfile:	E:\16010.JOB	Borehole:	B-1
Operator: MK	*Checked:* MK		*Approved:*

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF)	0.500
Initial Temp oC	21.6
Correction (in)	0.0
Settlement (in)	0.0021
Voids Ratio e	0.6407
Final Temp oC	
t_{50} (mins)	
c_v (ft2/day)	
m_v (ft2/ton)	
Sec Compression C_{sec}	



S&ME

ASTM D2435-96		Test name	Consolidation
		Date of Test:	12-5-16
Site Reference:	C.F. Harvey	Sample:	ST-1
Jobfile:	E:\16010.JOB	Borehole:	B-1
Operator: MK	*Checked:* MK		*Approved:*

Oedometer Settlement Tests

No.	Time (mins)	Displacement (divs)	Displacement (in)	Settlement (in)
1	0.000	906	0.0906	0.0906
2	0.017	902	0.0902	0.0902
3	0.033	902	0.0902	0.0902
4	0.050	897	0.0897	0.0897
5	0.067	896	0.0896	0.0896
6	0.083	895	0.0895	0.0895
7	0.100	894	0.0894	0.0894
8	0.200	891	0.0891	0.0891
9	0.400	889	0.0889	0.0889
10	0.800	886	0.0886	0.0886
11	1.000	884	0.0884	0.0884
12	2.000	881	0.0881	0.0881
13	4.000	880	0.0880	0.0880
14	8.000	879	0.0879	0.0879
15	10.000	878	0.0878	0.0878
16	20.000	877	0.0877	0.0877
17	40.000	876	0.0876	0.0876
18	80.000	875	0.0875	0.0875
19	100.000	875	0.0875	0.0875
20	200.000	874	0.0874	0.0874
21	216.330	874	0.0874	0.0874

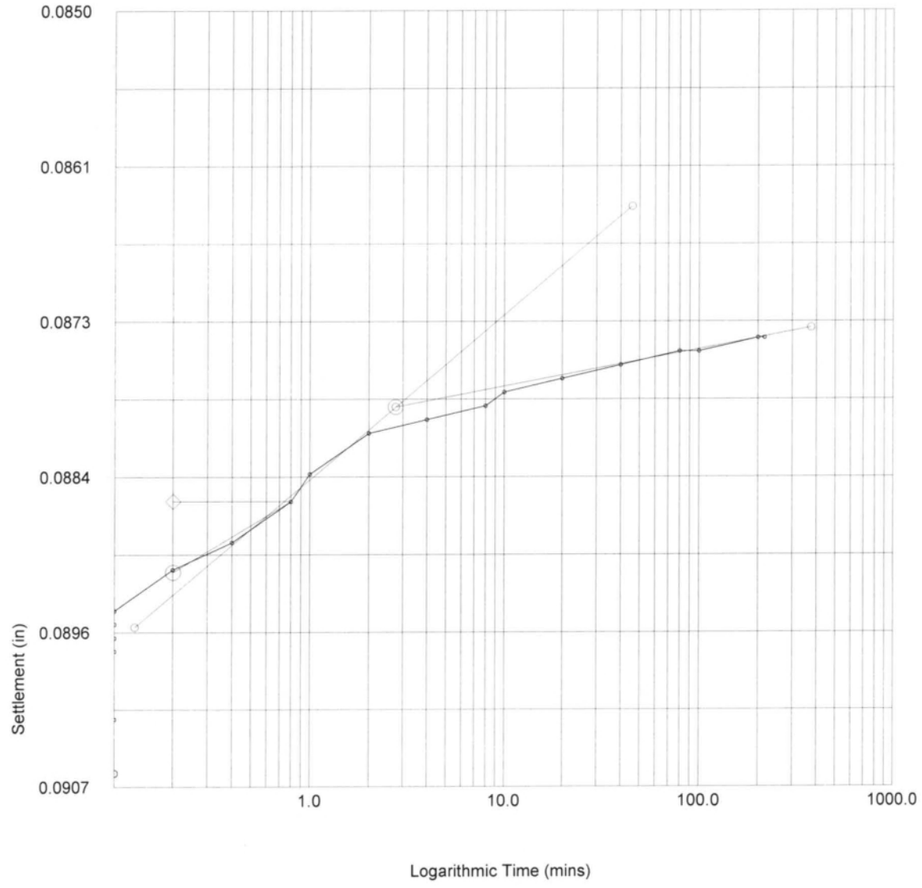
S&ME

ASTM D2435-96			Test name	Consolidation Load: 0.050 (TSF)	
			Date of Test:	12-5-16	
Site Reference:	C.F. Harvey		Sample:	ST-1	
Jobfile:	E:\16010.JOB		Borehole:	B-1	
Operator: MLC	*Checked:* MLC	*Approved:*			

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF)	0.050
Initial Temp oC	21.6
Correction (in)	0.0
Settlement (in)	0.0032
Voids Ratio e	0.6465
Final Temp oC	
t_{50} (mins)	
c_v (ft2/day)	
m_v (ft2/ton)	
Sec Compression C_{sec}	



S&ME

ASTM D2435-96			Test name	Consolidation	
			Date of Test:	12-5-16	
Site Reference:	C.F. Harvey		Sample:	ST-1	
Jobfile:	E:\16010.JOB		Borehole:	B-1	
Operator: MLC	*Checked:* MLC	*Approved:*			

Effective Stress Triaxial Compression

Consolidated Undrained

Sample details

Sketch showing specimen location in original Sample

Depth 10.5 - 12.5 ft.
Description: Gray Silty Clayey Fine to Coarse SAND (A-2-4) (0)

	Specimen 1	Specimen 2	Specimen 3
Type	Undisturbed	Undisturbed	Undisturbed
Height H_0 (in)	5.9714	6.034	5.923
Diameter D_0 (in)	2.863	2.863	2.867
Weight W_0 (gr)	1181.6	1184.6	1182.4
Bulk Density ρ (PCF)	117.09	116.17	117.80
Particle Density ρ_s	2.658 (measured)	2.658 (measured)	2.658 (measured)

Initial Conditions

	Specimen 1	Specimen 2	Specimen 3
Cell Pressure σ_3 (lbf/in2)	5.5	18.0	30.0
Pore Pressure u (lbf/in2)	0.0	0.0	0.0
Machine Speed d_r(in/min)	0.0059	0.0051	0.0061
No. of Membranes	1	1	1
Total Thickness (in)	0.012	0.012	0.012
Strain Channel	1798	1798	1798
Load Channel	1776	1776	1776
Pore P. Channel	1779	1779	1779
Volume Channel	Volume Chang	Volume Chang	Volume Chang
Moisture Content w_0%	29.3	29.8	28.9
Dry Density ρ_{d0} (PCF)	90.53	89.50	91.41
Voids Ratio e_0	0.83	0.85	0.81
Deg of Saturation S_0%	93.74	92.85	94.22
Final B Value	0.98	0.99	0.99

Final Conditions

	Specimen 1	Specimen 2	Specimen 3
Moisture Content w_f%	28.8	27.3	25.3
Dry Density ρ_d (PCF)	93.06	94.57	97.44
Voids Ratio e_f	0.78	0.75	0.70
Deg of Saturation S_f%	97.97	96.20	95.80
Failure Criteria	Mx Stress Ratio	Mx Stress Ratio	Mx Stress Ratio
Axial Strain ε_f%	4.0	6.0	7.0
Corr Dev Stress $(\sigma_1 - \sigma_3)f$ (lbf/in2)	10.6	17.6	31.4
Minor Stress σ_{3f} (lbf/in2)	2.2	5.5	11.3
Major Stress σ_{1f} (lbf/in2)	12.8	23.1	42.7
Stress Ratio $(\sigma_1/\sigma_3)_f$	5.8	4.2	3.8

Notes:

Failure Sketch

Sp 1 Sp 2

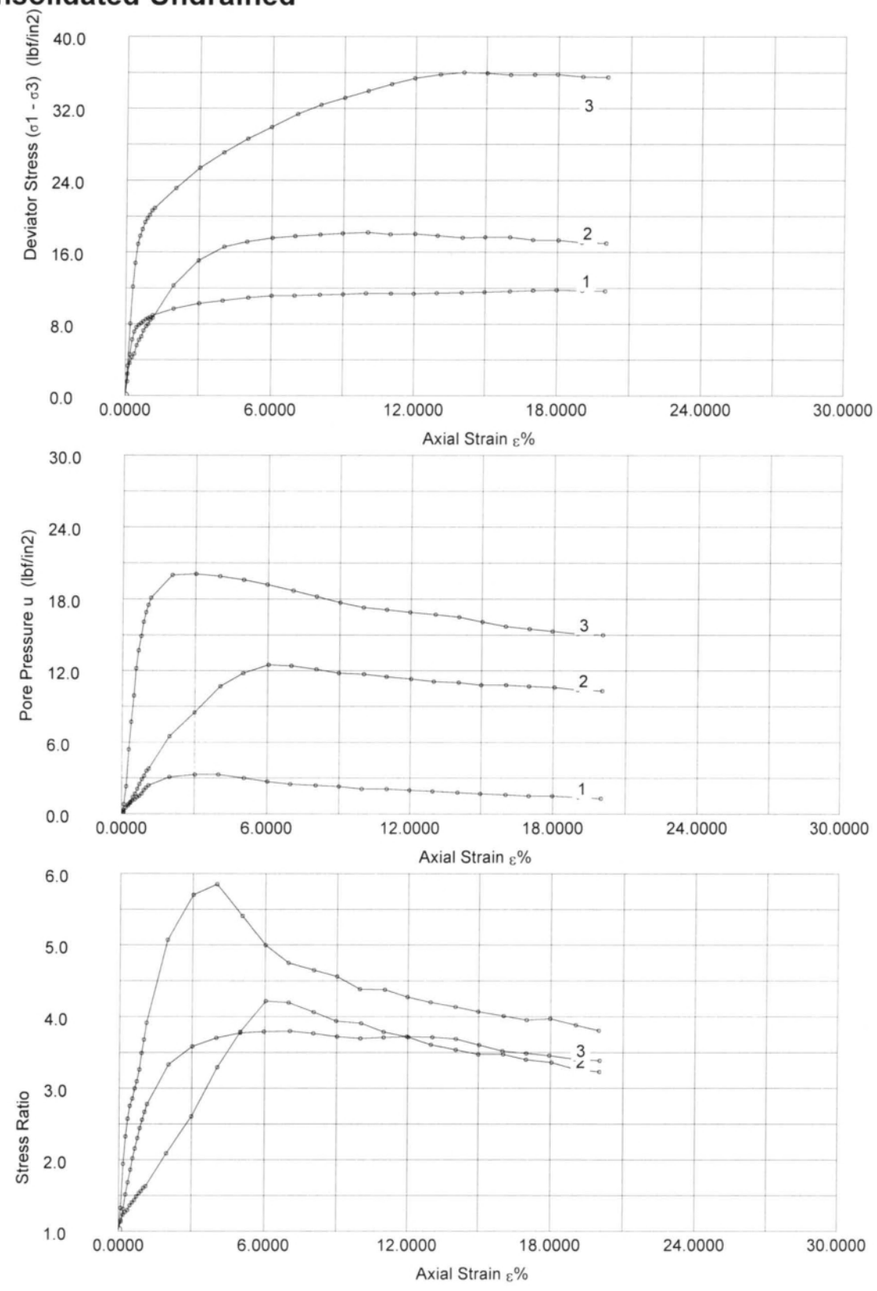
Sp 3

Surface Inclination

S&ME	Test Method: ASTM D4767-95	Test name: CU Triaxial (SS, MS)	
	Site Reference: C.F. Harvey	Date of Test: 12-5-16	
	Jobfile: E:\16010.JOB	Sample: ST-1	
		Borehole: B-1	
	Operator: MK	Checked: MK	Approved:

Effective Stress Triaxial Compression

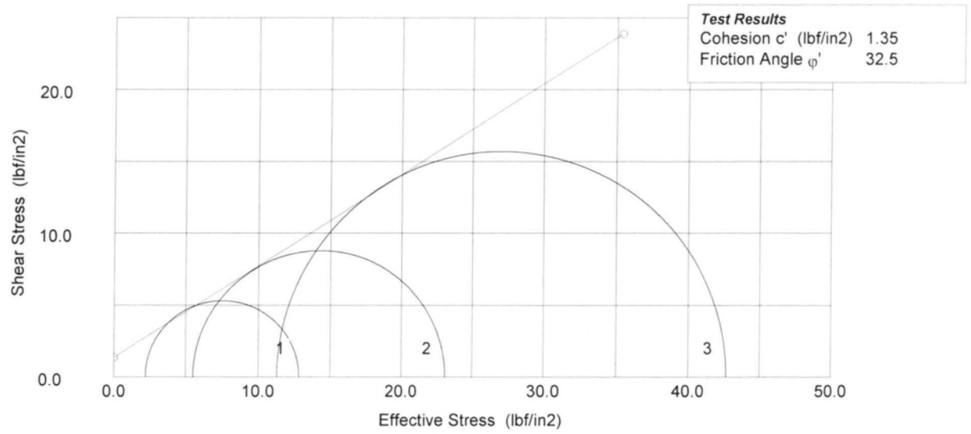
Consolidated Undrained

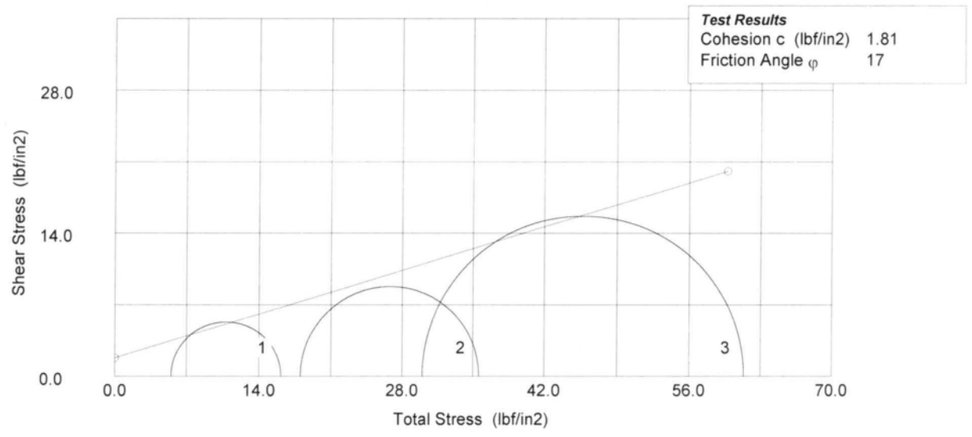


S&ME	Test Method: ASTM D4767-95	Test name: CU Triaxial (SS, MS)	
	Site Reference: C.F. Harvey	Date of Test: 12-5-16	
	Jobfile: E:\16010.JOB	Sample: ST-1	
		Borehole: B-1	
	Operator: MK	Checked: MK	Approved:

Effective Stress Triaxial Compression

Consolidated Undrained

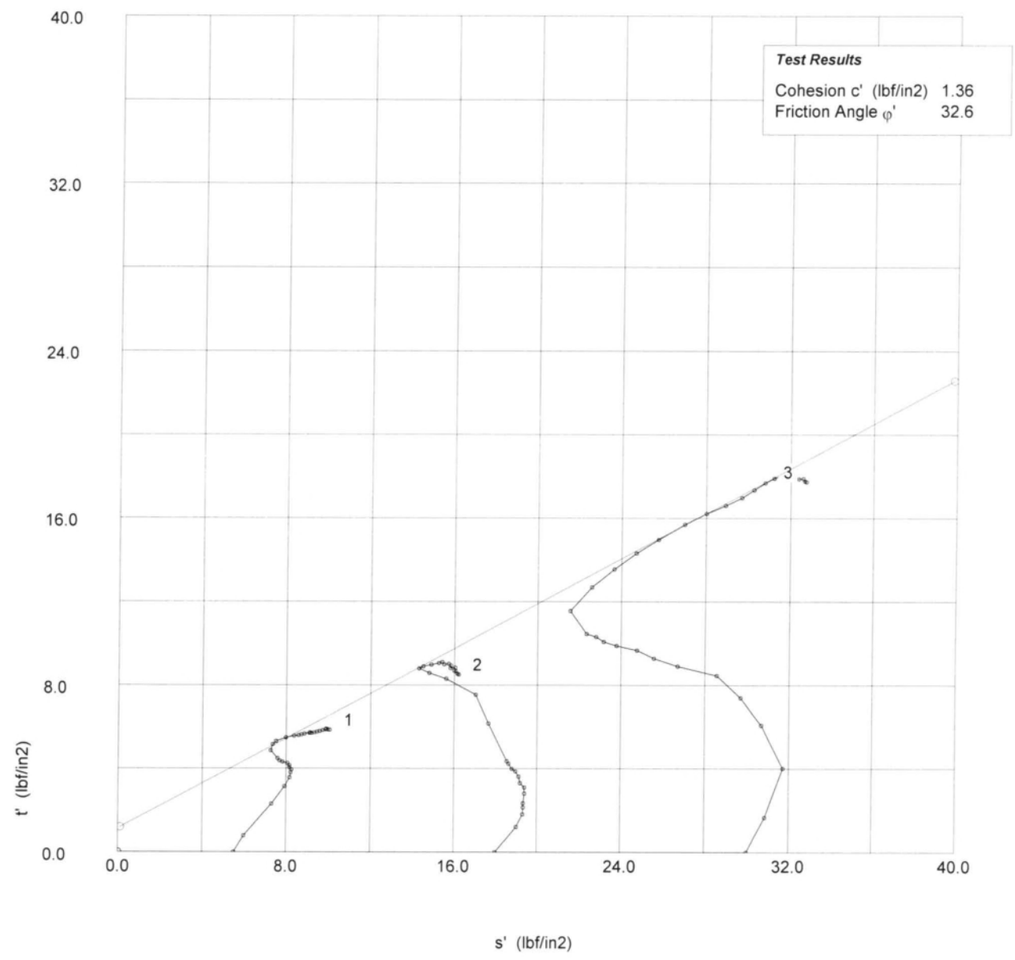




S&ME	Test Method: ASTM D4767-95	Test name: CU Triaxial (SS, MS)	
	Site Reference: C.F. Harvey	Sample: ST-1	
	Jobfile: E:\16010.JOB	Borehole: B-1	
	Operator: MLC	Checked: MLC	Approved:

Effective Stress Triaxial Compression

Consolidated Undrained



S&ME	Test Method: ASTM D4767-95	Test name: CU Triaxial (SS, MS)	
	Site Reference: C.F. Harvey	Sample: ST-1	
	Jobfile: E:\16010.JOB	Borehole: B-1	
	Operator: MLC	Checked: MLC	Approved:

Effective Stress Triaxial Compression

Consolidated Undrained Shear (Specimen 1)

No.	Strain (divs)	Strain ε%	Load (divs)	Load (lbs)	Pore Prs (divs)	Pore Prs (lbf/in2)	D. Stress $(\sigma_1 - \sigma_3)_m$ (lbf/in2)	D. Stress $(\sigma_1 - \sigma_3)_c$ (lbf/in2)	Minor Str σ_3' (lbf/in2)	Major Str σ_1' (lbf/in2)	Ratio σ_1'/σ_3'
1	41	0.00	519	0.0	0	0.0	0.0	0.0	5.50	5.50	1.00
2	91	0.08	619	10.0	3	0.3	1.6	1.6	5.20	6.78	1.30
3	145	0.18	811	29.2	5	0.5	4.6	4.6	5.00	9.61	1.92
4	201	0.27	917	39.8	7	0.7	6.3	6.3	4.80	11.08	2.31
5	252	0.36	972	45.3	9	0.9	7.1	7.1	4.60	11.74	2.55
6	306	0.45	1003	48.4	11	1.1	7.6	7.6	4.40	12.02	2.73
7	365	0.55	1031	51.2	12	1.2	8.1	7.9	4.30	12.20	2.84
8	420	0.64	1045	52.6	14	1.4	8.3	8.1	4.10	12.21	2.98
9	474	0.73	1058	53.9	15	1.5	8.5	8.3	4.00	12.31	3.08
10	534	0.83	1072	55.3	17	1.7	8.7	8.5	3.80	12.32	3.24
11	587	0.92	1081	56.2	20	2.0	8.8	8.7	3.50	12.15	3.47
12	642	1.02	1089	57.0	22	2.2	8.9	8.8	3.30	12.07	3.66
13	702	1.12	1103	58.4	24	2.4	9.1	9.0	3.10	12.08	3.90
14	1210	1.98	1164	64.5	31	3.1	10.0	9.7	2.40	12.12	5.05
15	1830	3.02	1214	69.5	33	3.3	10.7	10.3	2.20	12.51	5.68
16	2397	3.98	1250	73.1	33	3.3	11.1	10.6	2.20	12.83	5.83
17	3025	5.04	1286	76.7	30	3.0	11.5	11.0	2.50	13.47	5.39
18	3592	6.00	1311	79.2	27	2.7	11.8	11.1	2.80	13.94	4.98
19	4164	6.97	1328	80.9	25	2.5	11.9	11.2	3.00	14.19	4.73
20	4791	8.03	1347	82.8	24	2.4	12.0	11.3	3.10	14.35	4.63
21	5364	9.00	1367	84.8	23	2.3	12.2	11.3	3.20	14.53	4.54
22	5933	9.96	1389	87.0	21	2.1	12.4	11.4	3.40	14.84	4.36
23	6563	11.02	1403	88.4	21	2.1	12.4	11.4	3.40	14.81	4.36
24	7132	11.98	1417	89.8	20	2.0	12.5	11.4	3.50	14.89	4.25
25	7703	12.95	1436	91.7	19	1.9	12.6	11.5	3.60	15.05	4.18
26	8330	14.01	1459	94.0	18	1.8	12.8	11.5	3.70	15.23	4.12
27	8901	14.97	1478	95.9	17	1.7	12.9	11.6	3.80	15.39	4.05
28	9530	16.04	1500	98.1	16	1.6	13.0	11.7	3.90	15.55	3.99
29	10102	17.00	1523	100.4	15	1.5	13.2	11.7	4.00	15.73	3.93
30	10675	17.97	1545	102.6	15	1.5	13.3	11.8	4.00	15.80	3.95
31	11303	19.03	1556	103.7	14	1.4	13.3	11.7	4.10	15.83	3.86
32	11865	19.98	1569	105.0	13	1.3	13.3	11.7	4.20	15.90	3.79

S&ME

Test Method: ASTM D4767-95 | Test name: CU Triaxial (SS, MS) Shear (Specimen 1)
Site Reference: C.F. Harvey | Date of Test: 12-5-16
Jobfile: E:\16010.JOB | Sample: ST-1
Operator: MK | Checked: MK | Approved: | Borehole: B-1

Effective Stress Triaxial Compression

Consolidated Undrained Shear (Specimen 2)

No.	Strain (divs)	Strain ε%	Load (divs)	Load (lbs)	Pore Prs (divs)	Pore Prs (lbf/in2)	D. Stress $(\sigma_1 - \sigma_3)_m$ (lbf/in2)	D. Stress $(\sigma_1 - \sigma_3)_c$ (lbf/in2)	Minor Str σ_3' (lbf/in2)	Major Str σ_1' (lbf/in2)	Ratio σ_1'/σ_3'
1	35	0.00	602	0.0	0	0.0	0.0	0.0	18.00	18.00	1.00
2	90	0.09	753	15.1	2	0.2	2.4	2.4	17.80	20.23	1.14
3	143	0.18	828	22.6	5	0.5	3.6	3.6	17.50	21.14	1.21
4	201	0.28	869	26.7	8	0.8	4.3	4.3	17.20	21.49	1.25
5	255	0.37	894	29.2	10	1.0	4.7	4.7	17.00	21.69	1.28
6	308	0.46	952	35.0	14	1.4	5.6	5.6	16.60	22.21	1.34
7	367	0.56	999	39.7	17	1.7	6.4	6.2	16.30	22.50	1.38
8	421	0.65	1025	42.3	21	2.1	6.8	6.6	15.90	22.51	1.42
9	475	0.74	1065	46.3	25	2.5	7.4	7.2	15.50	22.75	1.47
10	534	0.84	1096	49.4	29	2.9	7.9	7.7	15.10	22.83	1.51
11	587	0.93	1112	51.0	32	3.2	8.1	8.0	14.80	22.78	1.54
12	642	1.02	1143	54.1	36	3.6	8.6	8.5	14.40	22.87	1.59
13	699	1.12	1158	55.6	38	3.8	8.9	8.7	14.20	22.90	1.61
14	1203	1.97	1399	79.7	65	6.5	12.6	12.3	11.50	23.81	2.07
15	1811	3.00	1589	98.7	85	8.5	15.4	15.1	9.50	24.57	2.59
16	2427	4.04	1706	110.4	107	10.7	17.1	16.6	7.30	23.90	3.27
17	2987	4.98	1759	115.7	118	11.8	17.7	17.2	6.20	23.36	3.77
18	3608	6.03	1806	120.4	125	12.5	18.2	17.6	5.50	23.10	4.20
19	4168	6.98	1837	123.5	124	12.4	18.5	17.8	5.60	23.40	4.18
20	4788	8.02	1867	126.5	121	12.1	18.8	18.0	5.90	23.85	4.04
21	5350	8.97	1895	129.3	118	11.8	19.0	18.1	6.20	24.29	3.92
22	5972	10.02	1923	132.1	117	11.7	19.2	18.2	6.30	24.50	3.89
23	6537	10.97	1928	132.6	115	11.5	19.0	18.0	6.50	24.49	3.77
24	7160	12.03	1953	135.1	113	11.3	19.2	18.0	6.70	24.74	3.69
25	7724	12.98	1959	135.7	111	11.1	19.0	17.9	6.90	24.75	3.59
26	8347	14.03	1964	136.2	110	11.0	18.9	17.6	7.00	24.61	3.52
27	8913	14.98	1987	138.5	108	10.8	19.0	17.7	7.20	24.86	3.45
28	9536	16.04	2009	140.7	108	10.8	19.0	17.7	7.20	24.86	3.45
29	10100	16.99	2009	140.7	107	10.7	18.8	17.4	7.30	24.67	3.38
30	10725	18.04	2028	142.6	106	10.6	18.8	17.3	7.40	24.72	3.34
31	11293	19.00	2030	142.8	104	10.4	18.6	17.1	7.60	24.69	3.25
32	11898	20.02	2045	144.3	103	10.3	18.6	17.0	7.70	24.71	3.21

S&ME

Test Method: ASTM D4767-95 | Test name: CU Triaxial (SS, MS) Shear (Specimen 2)
Site Reference: C.F. Harvey | Date of Test: 12-5-16
Jobfile: E:\16010.JOB | Sample: ST-1
Operator: MK | Checked: MK | Approved: | Borehole: B-1

Effective Stress Triaxial Compression

Consolidated Undrained Shear (Specimen 3)

No.	Strain (divs)	Strain ε%	Load (divs)	Load (lbs)	Pore Prs (divs)	Pore Prs (lbf/in2)	D. Stress $(\sigma_1 - \sigma_3)_m$ (lbf/in2)	D. Stress $(\sigma_1 - \sigma_3)_c$ (lbf/in2)	Minor Str σ_3' (lbf/in2)	Major Str σ_1' (lbf/in2)	Ratio σ_1'/σ_3'
1	247	0.00	688	0.0	0	0.0	0.0	0.0	30.00	30.00	1.00
2	302	0.09	894	20.6	8	0.8	3.3	3.3	29.20	32.53	1.11
3	359	0.19	1186	49.8	23	2.3	8.0	8.0	27.70	35.74	1.29
4	414	0.29	1442	75.4	54	5.4	12.2	12.2	24.60	36.76	1.49
5	468	0.38	1606	91.8	77	7.7	14.8	14.8	22.30	37.09	1.66
6	526	0.48	1739	105.1	99	9.9	16.9	16.9	20.10	37.01	1.84
7	580	0.57	1806	111.8	122	12.2	18.0	17.8	17.80	35.61	2.00
8	634	0.67	1853	116.5	137	13.7	18.7	18.6	16.30	34.85	2.14
9	694	0.77	1903	121.5	149	14.9	19.5	19.3	15.10	34.44	2.28
10	749	0.87	1931	124.3	161	16.1	19.9	19.8	13.90	33.67	2.42
11	805	0.96	1956	126.8	169	16.9	20.3	20.1	13.10	33.25	2.54
12	863	1.06	1987	129.9	175	17.5	20.8	20.6	12.50	33.12	2.65
13	919	1.16	2006	131.8	181	18.1	21.1	20.9	11.90	32.81	2.76
14	1428	2.04	2165	147.7	200	20.0	23.4	23.1	10.00	33.12	3.31
15	1994	3.01	2329	164.1	201	20.1	25.7	25.4	9.90	35.28	3.56
16	2566	4.00	2465	177.7	199	19.9	27.6	27.1	10.10	37.21	3.68
17	3134	4.98	2587	189.9	196	19.6	29.2	28.6	10.40	39.02	3.75
18	3702	5.96	2698	201.0	192	19.2	30.6	29.9	10.80	40.73	3.77
19	4330	7.04	2823	213.5	187	18.7	32.1	31.4	11.30	42.68	3.78
20	4897	8.02	2921	223.3	182	18.2	33.2	32.4	11.80	44.22	3.75
21	5472	9.01	3004	231.6	177	17.7	34.1	33.2	12.30	45.50	3.70
22	6039	9.99	3087	239.9	173	17.3	34.9	34.0	12.70	46.66	3.67
23	6609	10.97	3171	248.3	171	17.1	35.7	34.7	12.90	47.61	3.69
24	7183	11.96	3251	256.3	169	16.9	36.5	35.4	13.10	48.47	3.70
25	7808	13.04	3318	263.0	167	16.7	37.0	35.8	13.30	49.10	3.69
26	8383	14.03	3369	268.1	165	16.5	37.3	36.0	13.50	49.51	3.67
27	8952	15.01	3399	271.1	161	16.1	37.3	35.9	13.90	49.84	3.59
28	9523	16.00	3420	273.2	157	15.7	37.1	35.7	14.30	50.03	3.50
29	10100	16.99	3460	277.2	155	15.5	37.2	35.8	14.50	50.26	3.47
30	10654	17.95	3499	281.1	153	15.3	37.3	35.8	14.70	50.48	3.43
31	11260	18.99	3520	283.2	151	15.1	37.1	35.5	14.90	50.44	3.39
32	11863	20.03	3555	286.7	150	15.0	37.1	35.5	15.00	50.48	3.37

S&ME

Test Method: ASTM D4767-95		Test name	CU Triaxial (SS, MS) Shear (Specimen 3)
		Date of Test:	12-5-16
Site Reference:	C.F. Harvey	Sample:	ST-1
Jobfile:	E:\16010.JOB	Borehole:	B-1
Operator: MLL	Checked: MLL	Approved:	

Form No. TR-T88
Revision No. 0
Revision Date: 12/20/09

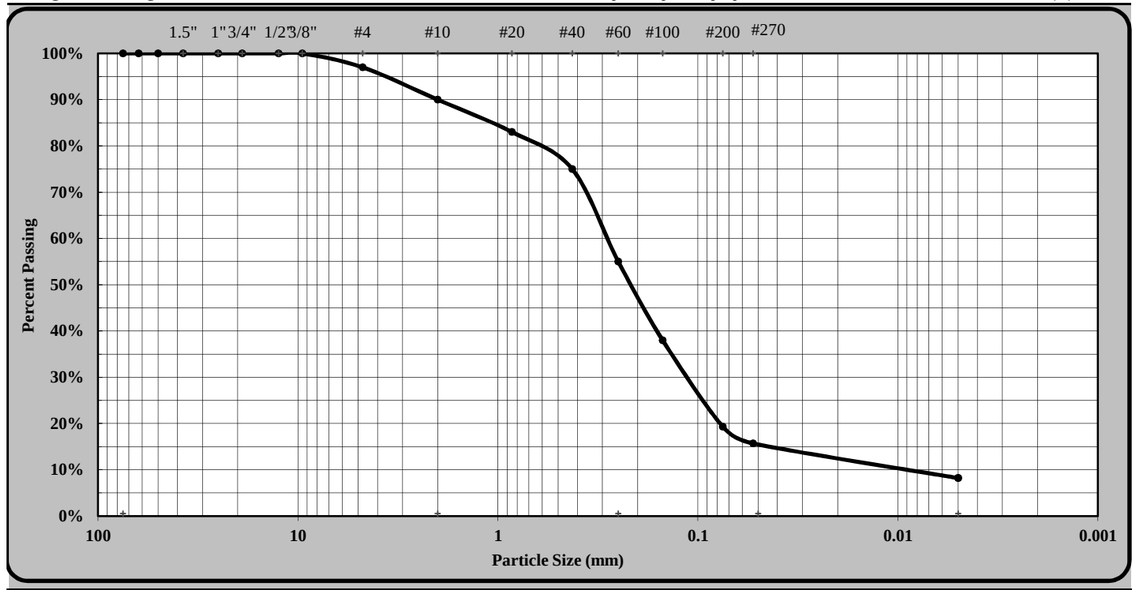
Particle Size Analysis of Soils

AASHTO T88 as Modified by NCDOT

S&ME
Quality Assurance

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

S&ME Project #:	6235-16-010	Report Date:	12/27/16
Project Name:	C.F. Harvey Parkway Extension R-5703	Test Date(s):	12/24 - 12/27/16
State Project #:	N/A F.A. Project No: N/A	TIP NO:	N/A
Client Name:	Michael Baker Engineering		
Address:	Raleigh, NC		
Boring #:	EB2-A LT LN Sample #: ST-2	Sample Date:	N/A
Location:	89+50 Offset: 34 LT	Depth (ft):	8.0 - 10.0 ft.
Sample Description:	Gray Silty Clayey Coarse to Fine SAND	A-2-4	(0)



As Defined by NCDOT		Fine Sand	< 0.25 mm and > 0.05 mm
Gravel	< 75 mm and > 2.00 mm	Silt	< 0.05 and > 0.005 mm
Coarse Sand	< 2.00 mm and >0.25 mm	Clay	< 0.005 mm

Maximum Particle Size	#4	Coarse Sand	35%	Silt	8%
Gravel	10%	Fine Sand	39%	Clay	8%
Apparent Relative Density	ND	Moisture Content	30.6%	% Passing #200	19.3%
Liquid Limit	30	Plastic Limit	29	Plastic Index	1

Soil Mortar (-#10 Sieve)

Coarse Sand	39%	Fine Sand	44%	Silt	8%	Clay	9%
Description of Sand & Gravel Particles:		Rounded	☐			Angular	☒
Hard & Durable	☒	Soft	☐			Weathered & Friable	☐

References / Comments / Deviations: ND=Not Determined.

Mal Krajan, ET	104-01-0703	Laboratory Manager	12/27/2016
Technician Name	*Certification No.*	*Position*	*Date*
Mal Krajan, ET		Laboratory Manager	9/26/2016
Technical Responsibility	*Signature*	*Position*	*Date*

Oedometer Settlement Tests

Sample details

Sketch showing specimen location in original Sample

Depth	8.0 - 10.0 ft.
Description:	Gray Silty Clayey Coarse to Fine SAND (A-2-4) (0)
Type	Undisturbed
Height H_0 (in)	0.997
Diameter D_0 (in)	2.501
Weight W_0 (gr)	148.43
Bulk Density ρ (PCF)	115.45
Particle Density ρ_s	2.653 (measured)

Initial Conditions

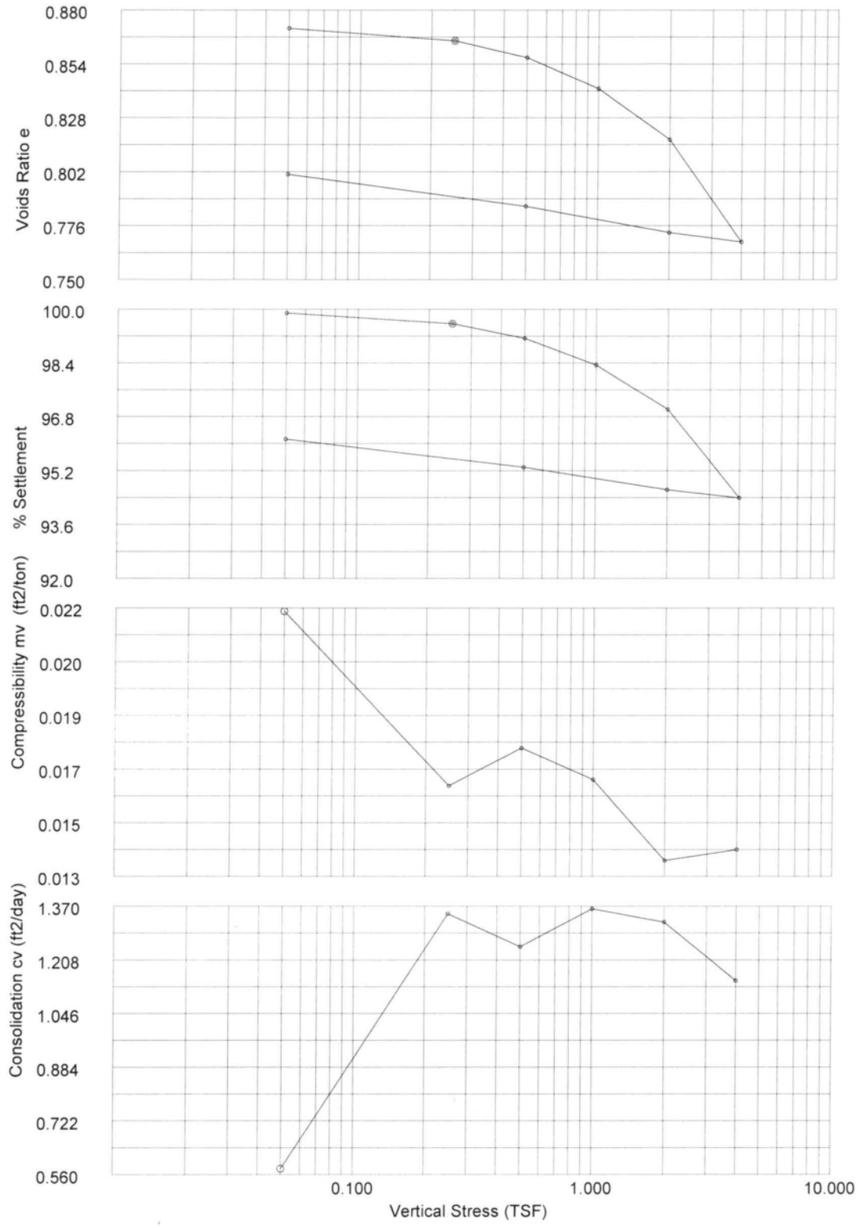
Settlement Channel	1065
Moisture Content w_0%	30.6
Dry Density ρ_d (PCF)	88.38
Voids Ratio e_0	0.8732
Deg of Saturation S_0%	93.1
Swelling Pressure Ss (TSF)	0.000

Final Conditions

Moisture Content w_f%	34.0
Dry Density ρ_d (PCF)	91.94
Voids Ratio e_f	0.8007
Deg of Saturation S_f%	100.00
Settlement: (in)	0.039
Compression Index C_c	0.168
Notes:	Test specimen taken from the middle portion of UD tube.

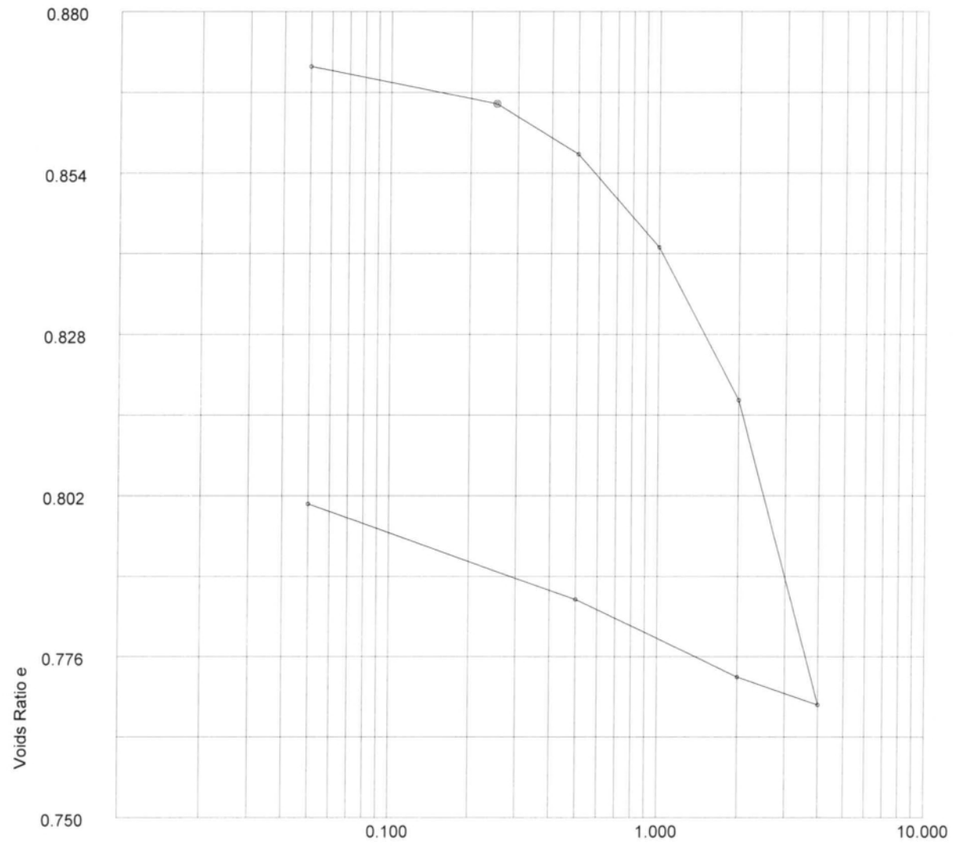
S&ME	ASTM D2435-96		Test name: Consolidation Date of Test: 12-16-16	
	Site Reference: C.F. Harvey Jobfile: E:\16010.JOB		Sample: ST-2 Borehole: EB2-A LT LN	
	Operator: MLC	Checked: MLC		Approved:

Oedometer Settlement Tests



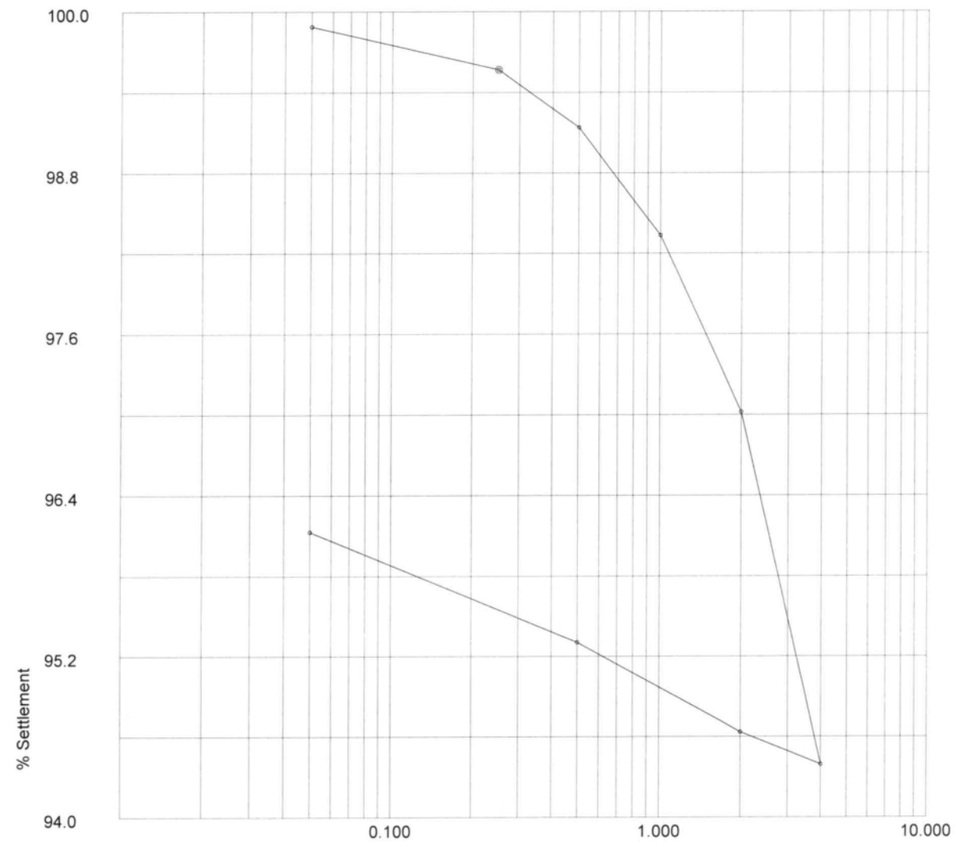
S&ME	ASTM D2435-96		Test name: Consolidation Date of Test: 12-16-16	
	Site Reference: C.F. Harvey Jobfile: E:\16010.JOB		Sample: ST-2 Borehole: EB2-A LT LN	
	Operator: MLC	Checked: MLC		Approved:

Oedometer Settlement Tests



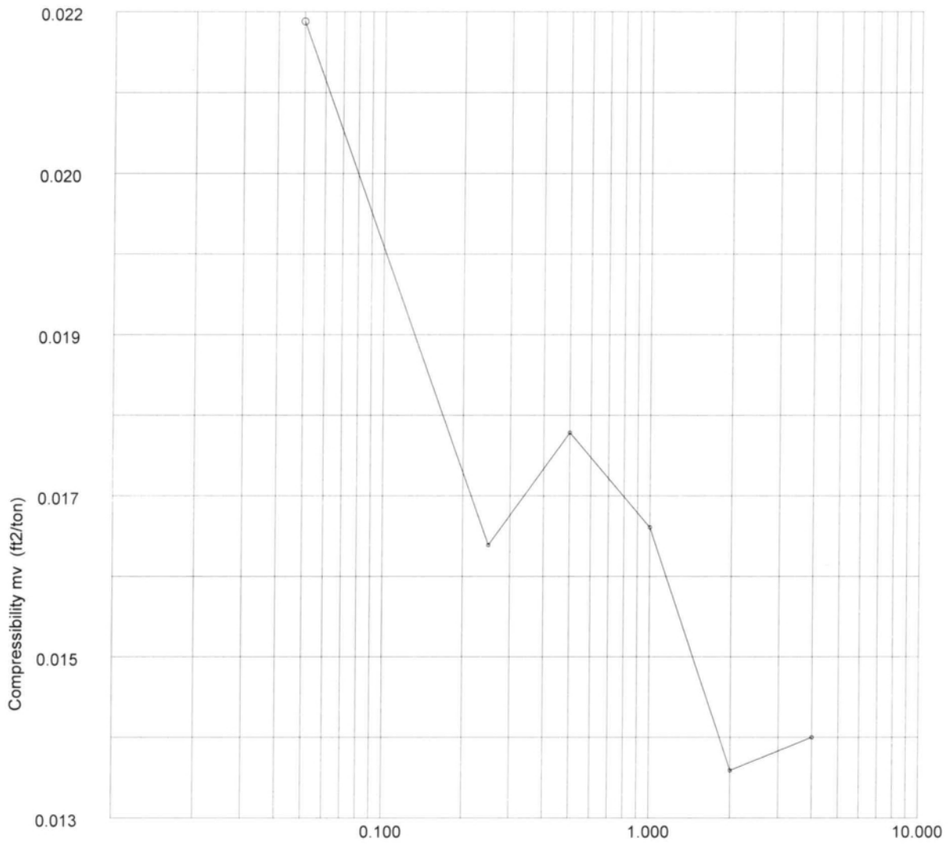
S&ME	ASTM D2435-96	Test name: Consolidation	
	Site Reference: C.F. Harvey	Date of Test: 12-16-16	
	Jobfile: E:\16010.JOB	Sample: ST-2	
		Borehole: EB2-A LT LN	
	Operator: MK	Checked: MK	Approved:

Oedometer Settlement Tests



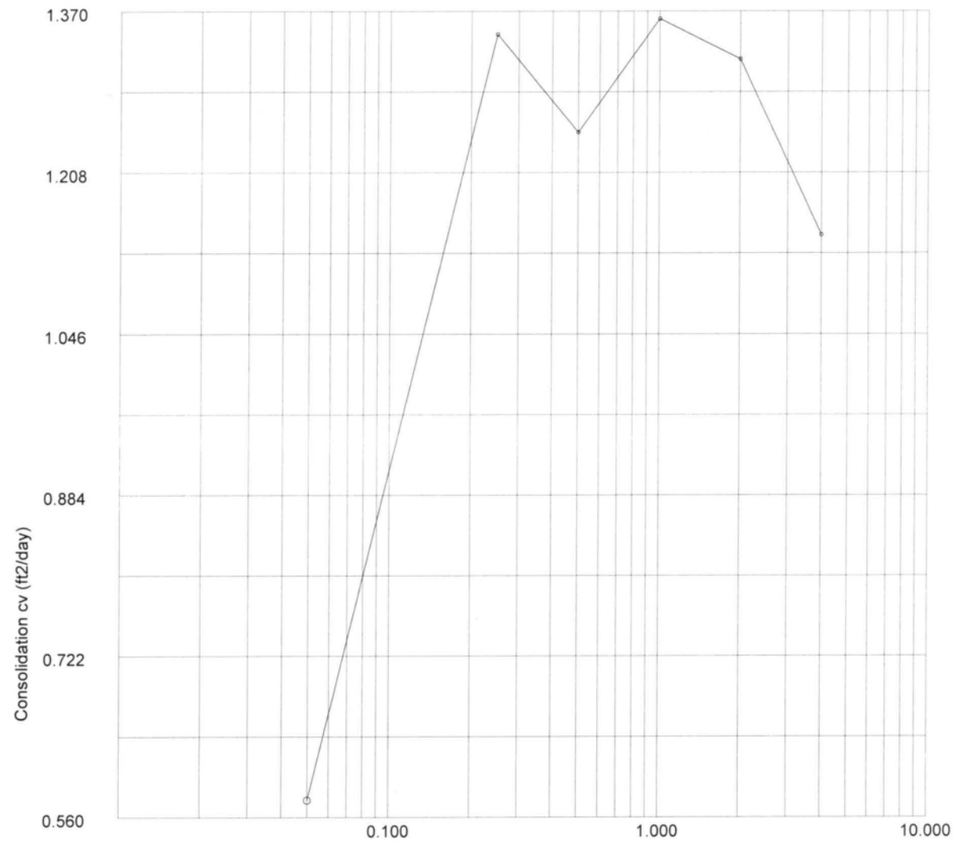
S&ME	ASTM D2435-96	Test name: Consolidation	
	Site Reference: C.F. Harvey	Date of Test: 12-16-16	
	Jobfile: E:\16010.JOB	Sample: ST-2	
		Borehole: EB2-A LT LN	
	Operator: MK	Checked: MK	Approved:

Oedometer Settlement Tests



S&ME	ASTM D2435-96	Test name: Consolidation	
	Site Reference: C.F. Harvey	Date of Test: 12-16-16	
	Jobfile: E:\16010.JOB	Sample: ST-2	
		Borehole: EB2-A LT LN	
	Operator: MK	Checked: MK	Approved:

Oedometer Settlement Tests



S&ME	ASTM D2435-96	Test name: Consolidation	
	Site Reference: C.F. Harvey	Date of Test: 12-16-16	
	Jobfile: E:\16010.JOB	Sample: ST-2	
		Borehole: EB2-A LT LN	
	Operator: MK	Checked: MK	Approved:

Oedometer Settlement Tests

Stress (TSF)	Initial Temp. oC	Settlement Total (in)	Cal Corr. (in)	Final Temp. oC	Voids Ratio e_f	t_{50} (mins)	Secondary Compr C_{sec}	c_v (ft2/day)	m_v (ft2/ton)
0.050	21.6	0.0011	0.0	21.6	0.8712	0.860	0.00	0.577	0.022
0.250	21.6	0.0043	0.0	21.6	0.8651	0.367	0.0001	1.347	0.016
0.500	21.6	0.0086	0.0	21.6	0.8571	0.393	0.0002	1.248	0.017
1.000	21.6	0.0166	0.0	21.6	0.8420	0.356	0.0002	1.362	0.016
2.000	21.6	0.0297	0.0	21.6	0.8174	0.359	0.0002	1.322	0.014
4.000	21.6	0.0559	0.0	21.6	0.7682	0.398	0.0011	1.145	0.014
2.000	21.6	0.0535	0.0	21.6	0.7727				0.001
0.500	21.6	0.0468	0.0	21.6	0.7853				0.005
0.050	21.6	0.0386	0.0	21.6	0.8007				0.019

S&ME

ASTM D2435-96 | Test name: Consolidation | Date of Test: 12-16-16

Site Reference: C.F. Harvey | Jobfile: E:\16010.JOB | Sample: ST-2 | Borehole: EB2-A LT LN

Operator: MLC | Checked: MLC | Approved:

Oedometer Settlement Tests

No.	Time (mins)	Displacement (divs)	Displacement (in)	Settlement (in)
1	0.000	0	0.0000	0.0000
2	0.017	1	0.0001	0.0001
3	0.033	1	0.0001	0.0001
4	0.050	1	0.0001	0.0001
5	0.067	1	0.0001	0.0001
6	0.083	1	0.0001	0.0001
7	0.100	4	0.0004	0.0004
8	0.200	5	0.0005	0.0005
9	0.400	6	0.0006	0.0006
10	0.800	7	0.0007	0.0007
11	1.000	7	0.0007	0.0007
12	2.000	9	0.0009	0.0009
13	4.000	9	0.0009	0.0009
14	8.000	10	0.0010	0.0010
15	10.000	10	0.0010	0.0010
16	20.000	11	0.0011	0.0011
17	40.000	11	0.0011	0.0011
18	46.167	11	0.0011	0.0011

S&ME

ASTM D2435-96 | Test name: Consolidation Load: 0.050 (TSF) | Date of Test: 12-16-16

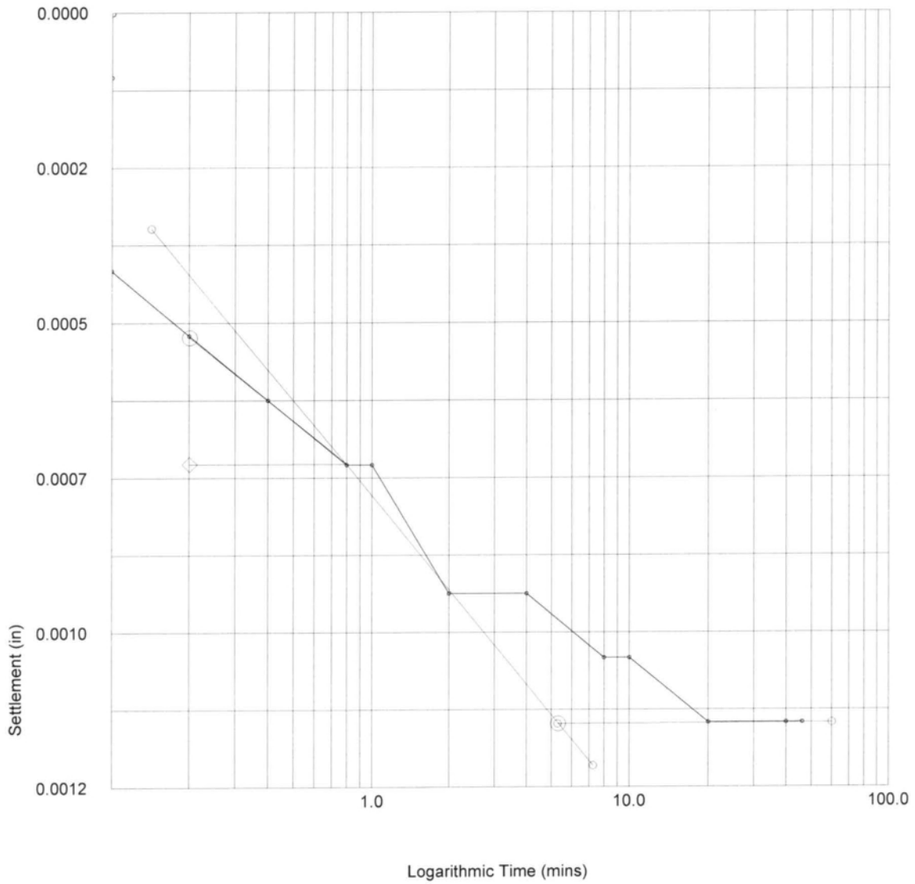
Site Reference: C.F. Harvey | Jobfile: E:\16010.JOB | Sample: ST-2 | Borehole: EB2-A LT LN

Operator: MLC | Checked: MLC | Approved:

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF)	0.050
Initial Temp oC	21.6
Correction (in)	0.0
Settlement (in)	0.0011
Voids Ratio e	0.8712
Final Temp oC	0.0
t_{50} (mins)	0.86
c_v (ft2/day)	0.577
m_v (ft2/ton)	0.022
Sec Compression C_{sec}	0.00



S&ME	ASTM D2435-96		Test name	Consolidation
			Date of Test:	12-16-16
	Site Reference:	C.F. Harvey	Sample:	ST-2
	Jobfile:	E:\16010.JOB	Borehole:	EB2-A LT LN
	Operator: MLC	*Checked:* MLC		*Approved:*

Oedometer Settlement Tests

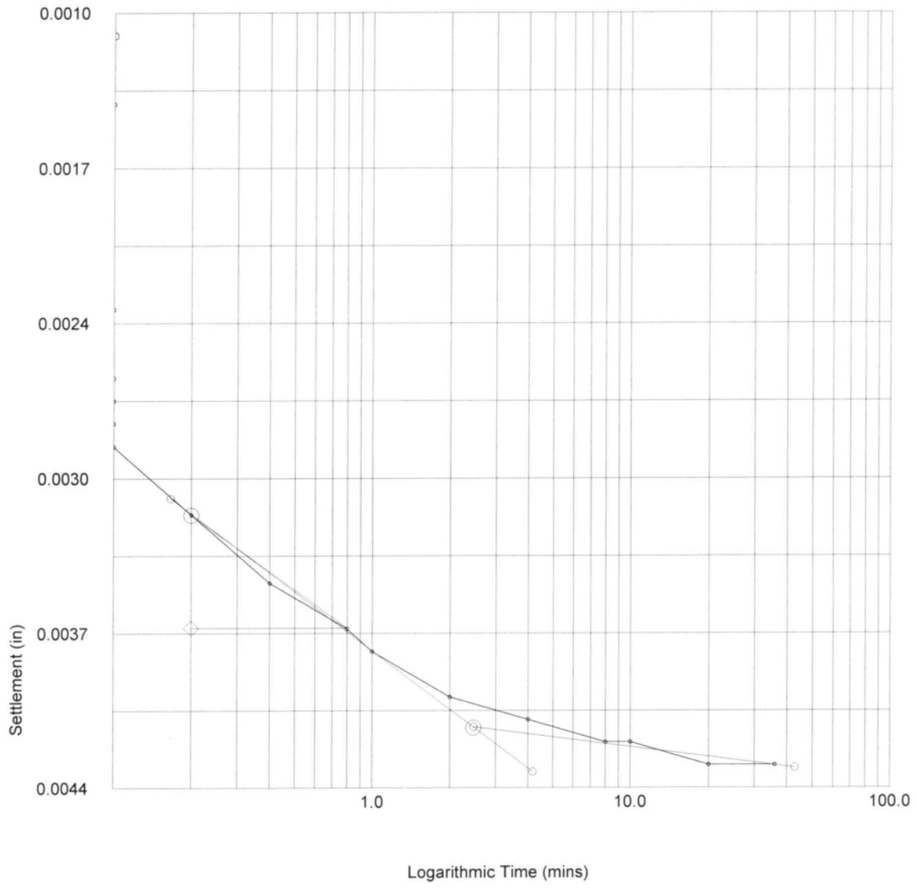
No.	Time (mins)	Displacement (divs)	Displacement (in)	Settlement (in)
1	0.000	11	0.0011	0.0011
2	0.017	14	0.0014	0.0014
3	0.033	23	0.0023	0.0023
4	0.050	26	0.0026	0.0026
5	0.067	27	0.0027	0.0027
6	0.083	28	0.0028	0.0028
7	0.100	29	0.0029	0.0029
8	0.200	32	0.0032	0.0032
9	0.400	35	0.0035	0.0035
10	0.800	37	0.0037	0.0037
11	1.000	38	0.0038	0.0038
12	2.000	40	0.0040	0.0040
13	4.000	41	0.0041	0.0041
14	8.000	42	0.0042	0.0042
15	10.000	42	0.0042	0.0042
16	20.000	43	0.0043	0.0043
17	35.867	43	0.0043	0.0043

S&ME	ASTM D2435-96		Test name	Consolidation Load: 0.250 (TSF)
			Date of Test:	12-16-16
	Site Reference:	C.F. Harvey	Sample:	ST-2
	Jobfile:	E:\16010.JOB	Borehole:	EB2-A LT LN
	Operator: MLC	*Checked:* MLC		*Approved:*

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF)	0.250
Initial Temp oC	21.6
Correction (in)	0.0
Settlement (in)	0.0032
Voids Ratio e	0.8651
Final Temp oC	0.0
t_{50} (mins)	0.37
c_v (ft2/day)	1.347
m_v (ft2/ton)	0.016
Sec Compression C_{sec}	0.0001



S&ME	ASTM D2435-96		Test name: Consolidation Date of Test: 12-16-16	
	Site Reference: C.F. Harvey Jobfile: E:\16010.JOB		Sample: ST-2 Borehole: EB2-A LT LN	
	Operator: MLC	*Checked:* MLC		*Approved:*

Oedometer Settlement Tests

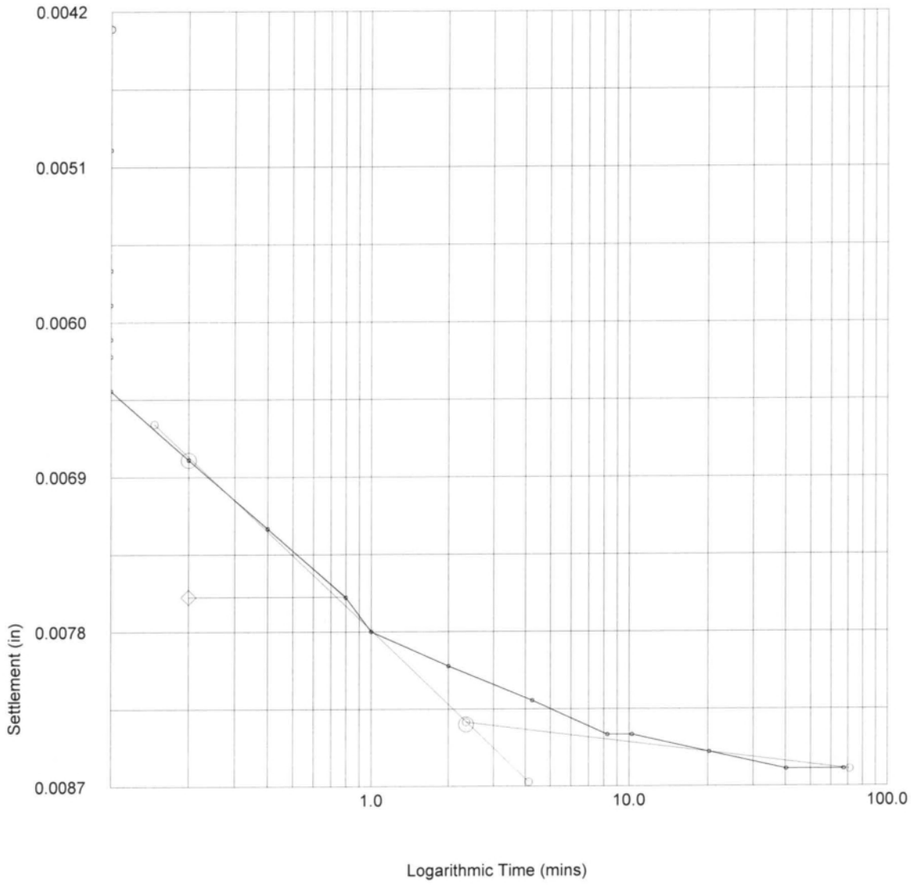
No.	Time (mins)	Displacement (divs)	Displacement (in)	Settlement (in)
1	0.000	43	0.0043	0.0043
2	0.017	50	0.0050	0.0050
3	0.033	57	0.0057	0.0057
4	0.050	59	0.0059	0.0059
5	0.067	61	0.0061	0.0061
6	0.083	62	0.0062	0.0062
7	0.100	64	0.0064	0.0064
8	0.200	68	0.0068	0.0068
9	0.400	72	0.0072	0.0072
10	0.800	76	0.0076	0.0076
11	1.000	78	0.0078	0.0078
12	2.000	80	0.0080	0.0080
13	4.250	82	0.0082	0.0082
14	8.250	84	0.0084	0.0084
15	10.250	84	0.0084	0.0084
16	20.250	85	0.0085	0.0085
17	40.250	86	0.0086	0.0086
18	67.350	86	0.0086	0.0086

S&ME	ASTM D2435-96		Test name: Consolidation Load: 0.500 (TSF) Date of Test: 12-16-16	
	Site Reference: C.F. Harvey Jobfile: E:\16010.JOB		Sample: ST-2 Borehole: EB2-A LT LN	
	Operator: MLC	*Checked:* MLC		*Approved:*

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF)	0.500
Initial Temp oC	21.6
Correction (in)	0.0
Settlement (in)	0.0043
Voids Ratio e	0.8571
Final Temp oC	0.0
t_{50} (mins)	0.39
c_v (ft2/day)	1.248
m_v (ft2/ton)	0.017
Sec Compression C_{sec}	0.0002



S&ME	ASTM D2435-96		Test name	Consolidation	
			Date of Test:	12-16-16	
	Site Reference:	C.F. Harvey	Sample:	ST-2	
	Jobfile:	E:\16010.JOB	Borehole:	EB2-A LT LN	
	Operator: MK	*Checked:* MK	*Approved:*		

Oedometer Settlement Tests

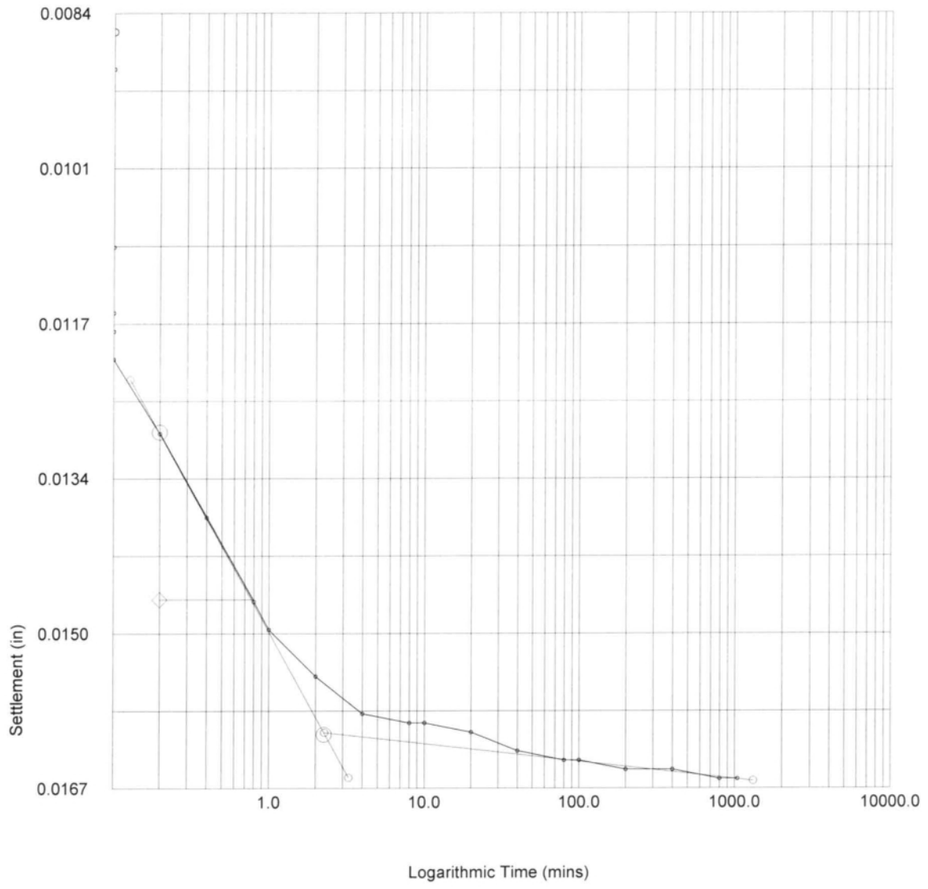
No.	Time (mins)	Displacement (divs)	Displacement (in)	Settlement (in)
1	0.000	86	0.0086	0.0086
2	0.017	90	0.0090	0.0090
3	0.033	90	0.0090	0.0090
4	0.050	109	0.0109	0.0109
5	0.067	116	0.0116	0.0116
6	0.083	118	0.0118	0.0118
7	0.100	121	0.0121	0.0121
8	0.200	129	0.0129	0.0129
9	0.400	138	0.0138	0.0138
10	0.800	147	0.0147	0.0147
11	1.000	150	0.0150	0.0150
12	2.000	155	0.0155	0.0155
13	4.000	159	0.0159	0.0159
14	8.000	160	0.0160	0.0160
15	10.000	160	0.0160	0.0160
16	20.000	161	0.0161	0.0161
17	40.000	163	0.0163	0.0163
18	80.000	164	0.0164	0.0164
19	100.000	164	0.0164	0.0164
20	200.000	165	0.0165	0.0165
21	400.000	165	0.0165	0.0165
22	800.000	166	0.0166	0.0166
23	1039.917	166	0.0166	0.0166

S&ME	ASTM D2435-96		Test name	Consolidation	Load: 1.000 (TSF)
			Date of Test:	12-16-16	
	Site Reference:	C.F. Harvey	Sample:	ST-2	
	Jobfile:	E:\16010.JOB	Borehole:	EB2-A LT LN	
	Operator: MK	*Checked:* MK	*Approved:*		

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF)	1.000
Initial Temp oC	21.6
Correction (in)	0.0
Settlement (in)	0.008
Voids Ratio e	0.8420
Final Temp oC	0.0
t_{50} (mins)	0.36
c_v (ft2/day)	1.362
m_v (ft2/ton)	0.016
Sec Compression C_{sec}	0.0002



S&ME	ASTM D2435-96		Test name: Consolidation Date of Test: 12-16-16	
	Site Reference: C.F. Harvey Jobfile: E:\16010.JOB		Sample: ST-2 Borehole: EB2-A LT LN	
	Operator: MLK	*Checked:* MLK		*Approved:*

Oedometer Settlement Tests

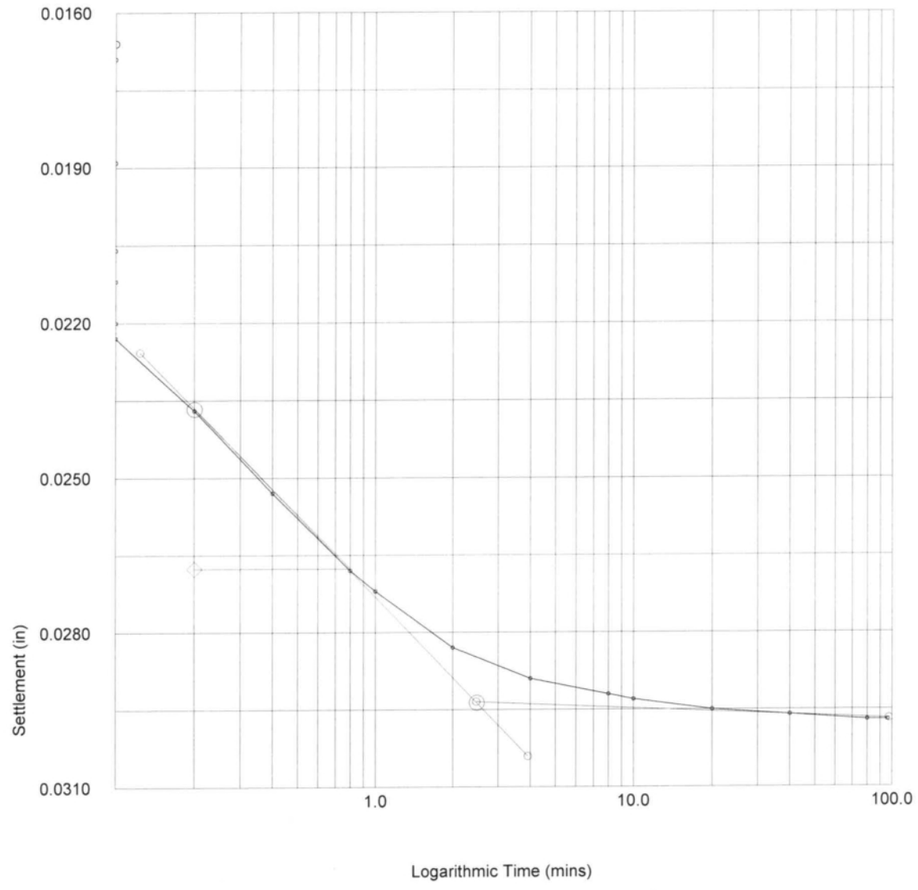
No.	Time (mins)	Displacement (divs)	Displacement (in)	Settlement (in)
1	0.000	166	0.0166	0.0166
2	0.017	169	0.0169	0.0169
3	0.033	189	0.0189	0.0189
4	0.050	206	0.0206	0.0206
5	0.067	212	0.0212	0.0212
6	0.083	220	0.0220	0.0220
7	0.100	223	0.0223	0.0223
8	0.200	237	0.0237	0.0237
9	0.400	253	0.0253	0.0253
10	0.800	268	0.0268	0.0268
11	1.000	272	0.0272	0.0272
12	2.000	283	0.0283	0.0283
13	4.000	289	0.0289	0.0289
14	8.000	292	0.0292	0.0292
15	10.000	293	0.0293	0.0293
16	20.000	295	0.0295	0.0295
17	40.000	296	0.0296	0.0296
18	80.000	297	0.0297	0.0297
19	96.330	297	0.0297	0.0297

S&ME	ASTM D2435-96		Test name: Consolidation Load: 2.000 (TSF) Date of Test: 12-16-16	
	Site Reference: C.F. Harvey Jobfile: E:\16010.JOB		Sample: ST-2 Borehole: EB2-A LT LN	
	Operator: MLK	*Checked:* MLK		*Approved:*

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF)	2.000
Initial Temp oC	21.6
Correction (in)	0.0
Settlement (in)	0.0131
Voids Ratio e	0.8174
Final Temp oC	0.0
t_{50} (mins)	0.36
c_v (ft2/day)	1.322
m_v (ft2/ton)	0.014
Sec Compression C_{sec}	0.0002



S&ME	ASTM D2435-96		Test name Date of Test:	Consolidation 12-16-16
	Site Reference: C.F. Harvey Jobfile: E:\16010.JOB		Sample: Borehole:	ST-2 EB2-A LT LN
	Operator: MLL	*Checked:* MK		*Approved:*

Oedometer Settlement Tests

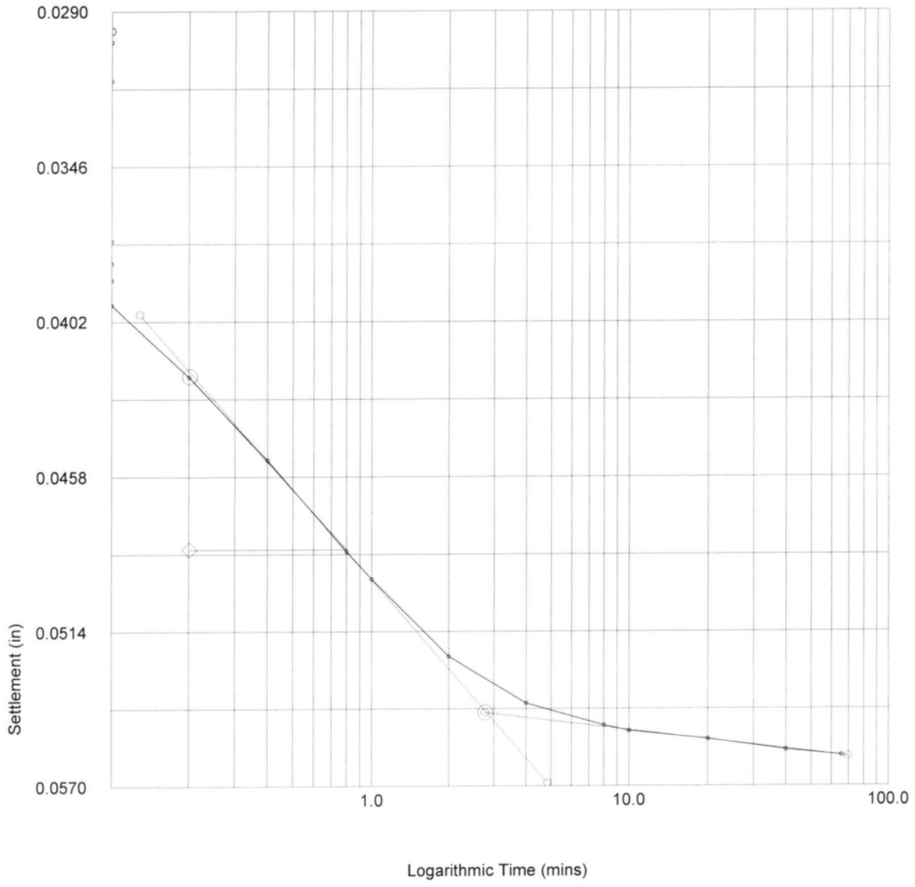
No.	Time (mins)	Displacement (divs)	Displacement (in)	Settlement (in)
1	0.000	297	0.0297	0.0297
2	0.017	301	0.0301	0.0301
3	0.033	315	0.0315	0.0315
4	0.050	373	0.0373	0.0373
5	0.067	381	0.0381	0.0381
6	0.083	387	0.0387	0.0387
7	0.100	396	0.0396	0.0396
8	0.200	422	0.0422	0.0422
9	0.400	452	0.0452	0.0452
10	0.800	485	0.0485	0.0485
11	1.000	495	0.0495	0.0495
12	2.000	523	0.0523	0.0523
13	4.000	540	0.0540	0.0540
14	8.000	548	0.0548	0.0548
15	10.000	550	0.0550	0.0550
16	20.000	553	0.0553	0.0553
17	40.000	557	0.0557	0.0557
18	65.600	559	0.0559	0.0559

S&ME	ASTM D2435-96		Test name Date of Test:	Consolidation Load: 4.000 (TSF) 12-16-16
	Site Reference: C.F. Harvey Jobfile: E:\16010.JOB		Sample: Borehole:	ST-2 EB2-A LT LN
	Operator: MK	*Checked:* MK		*Approved:*

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF)	4.000
Initial Temp oC	21.6
Correction (in)	0.0
Settlement (in)	0.0262
Voids Ratio e	0.7682
Final Temp oC	0.0
t_{50} (mins)	0.40
c_v (ft2/day)	1.145
m_v (ft2/ton)	0.014
Sec Compression C_{sec}	0.0011



S&ME	ASTM D2435-96		Test name: Consolidation Date of Test: 12-16-16	
	Site Reference: C.F. Harvey Jobfile: E:\16010.JOB		Sample: ST-2 Borehole: EB2-A LT LN	
	Operator: MLC	*Checked:* MLC		*Approved:*

Oedometer Settlement Tests

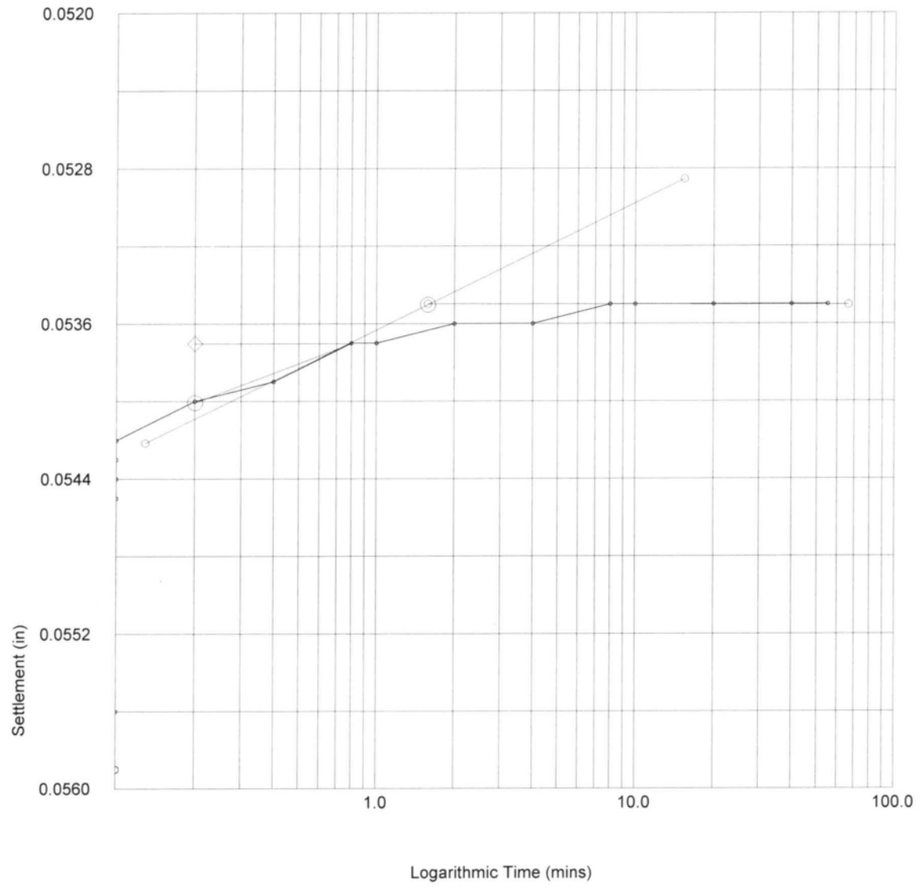
No.	Time (mins)	Displacement (divs)	Displacement (in)	Settlement (in)
1	0.000	559	0.0559	0.0559
2	0.017	556	0.0556	0.0556
3	0.033	556	0.0556	0.0556
4	0.050	545	0.0545	0.0545
5	0.067	544	0.0544	0.0544
6	0.083	543	0.0543	0.0543
7	0.100	542	0.0542	0.0542
8	0.200	540	0.0540	0.0540
9	0.400	539	0.0539	0.0539
10	0.800	537	0.0537	0.0537
11	1.000	537	0.0537	0.0537
12	2.000	536	0.0536	0.0536
13	4.000	536	0.0536	0.0536
14	8.000	535	0.0535	0.0535
15	10.000	535	0.0535	0.0535
16	20.000	535	0.0535	0.0535
17	40.000	535	0.0535	0.0535
18	55.167	535	0.0535	0.0535

S&ME	ASTM D2435-96		Test name: Consolidation Load: 2.000 (TSF) Date of Test: 12-16-16	
	Site Reference: C.F. Harvey Jobfile: E:\16010.JOB		Sample: ST-2 Borehole: EB2-A LT LN	
	Operator: MLC	*Checked:* MLC		*Approved:*

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF)	2.000
Initial Temp oC	21.6
Correction (in)	0.0
Settlement (in)	0.0024
Voids Ratio e	0.7727
Final Temp oC	
t_{50} (mins)	
c_v (ft2/day)	
m_v (ft2/ton)	
Sec Compression C_{sec}	



S&ME	ASTM D2435-96		Test name: Consolidation Date of Test: 12-16-16	
	Site Reference: C.F. Harvey Jobfile: E:\16010.JOB		Sample: ST-2 Borehole: EB2-A LT LN	
	Operator: MLK	*Checked:* MLK		*Approved:*

Oedometer Settlement Tests

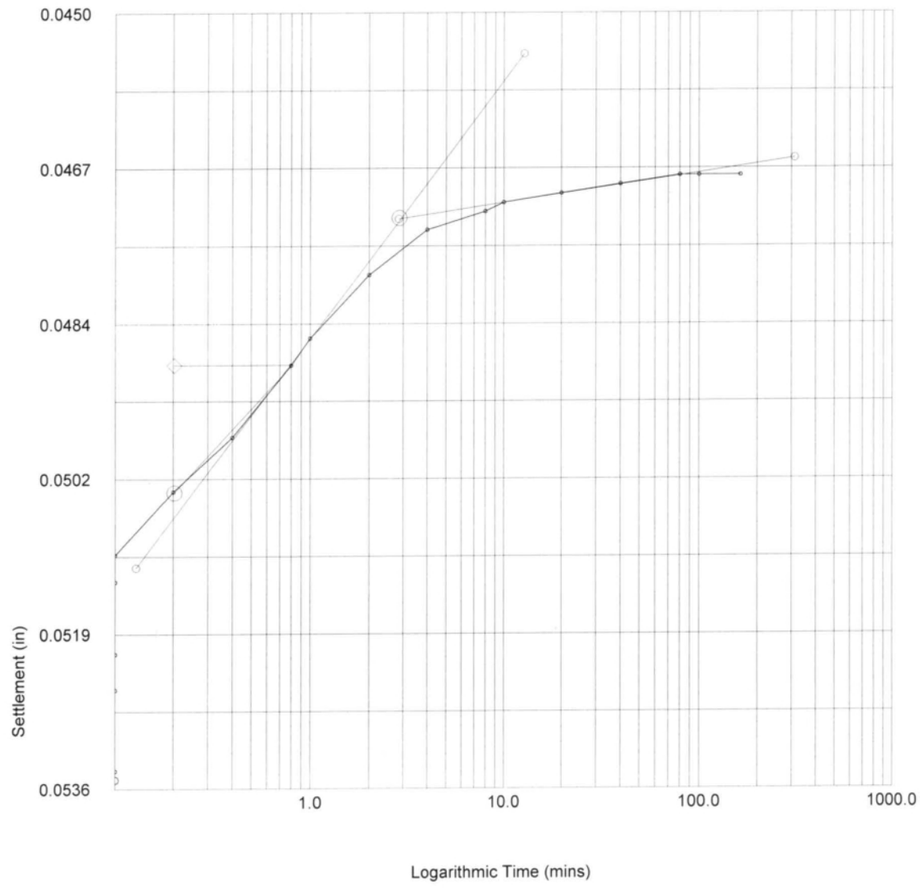
No.	Time (mins)	Displacement (divs)	Displacement (in)	Settlement (in)
1	0.000	535	0.0535	0.0535
2	0.017	534	0.0534	0.0534
3	0.033	534	0.0534	0.0534
4	0.050	525	0.0525	0.0525
5	0.067	521	0.0521	0.0521
6	0.083	513	0.0513	0.0513
7	0.100	510	0.0510	0.0510
8	0.200	503	0.0503	0.0503
9	0.400	497	0.0497	0.0497
10	0.800	489	0.0489	0.0489
11	1.000	486	0.0486	0.0486
12	2.000	479	0.0479	0.0479
13	4.000	474	0.0474	0.0474
14	8.000	472	0.0472	0.0472
15	10.000	471	0.0471	0.0471
16	20.000	470	0.0470	0.0470
17	40.000	469	0.0469	0.0469
18	80.000	468	0.0468	0.0468
19	100.000	468	0.0468	0.0468
20	163.330	468	0.0468	0.0468

S&ME	ASTM D2435-96		Test name: Consolidation Load: 0.500 (TSF) Date of Test: 12-16-16	
	Site Reference: C.F. Harvey Jobfile: E:\16010.JOB		Sample: ST-2 Borehole: EB2-A LT LN	
	Operator: MLK	*Checked:* MLK		*Approved:*

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF)	0.500
Initial Temp oC	21.6
Correction (in)	0.0
Settlement (in)	0.0067
Voids Ratio e	0.7853
Final Temp oC	
t_{50} (mins)	
c_v (ft2/day)	
m_v (ft2/ton)	
Sec Compression C_{sec}	



S&ME	ASTM D2435-96		Test name: Consolidation Date of Test: 12-16-16	
	Site Reference: C.F. Harvey Jobfile: E:\16010.JOB		Sample: ST-2 Borehole: EB2-A LT LN	
	Operator: MK	*Checked:* MK		*Approved:*

Oedometer Settlement Tests

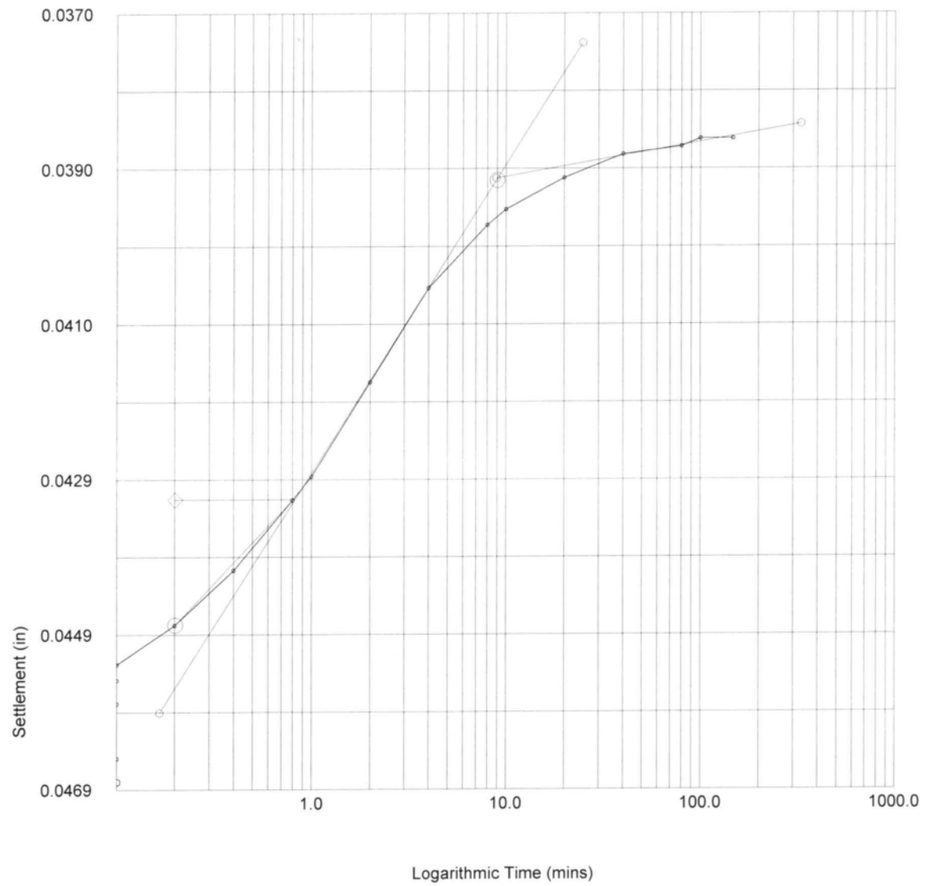
No.	Time (mins)	Displacement (divs)	Displacement (in)	Settlement (in)
1	0.000	468	0.0468	0.0468
2	0.017	465	0.0465	0.0465
3	0.033	465	0.0465	0.0465
4	0.050	458	0.0458	0.0458
5	0.067	455	0.0455	0.0455
6	0.083	453	0.0453	0.0453
7	0.100	453	0.0453	0.0453
8	0.200	448	0.0448	0.0448
9	0.400	441	0.0441	0.0441
10	0.800	432	0.0432	0.0432
11	1.000	429	0.0429	0.0429
12	2.000	417	0.0417	0.0417
13	4.000	405	0.0405	0.0405
14	8.000	397	0.0397	0.0397
15	10.000	395	0.0395	0.0395
16	20.000	391	0.0391	0.0391
17	40.000	388	0.0388	0.0388
18	80.000	387	0.0387	0.0387
19	100.000	386	0.0386	0.0386
20	147.470	386	0.0386	0.0386

S&ME	ASTM D2435-96		Test name: Consolidation Load: 0.050 (TSF) Date of Test: 12-16-16	
	Site Reference: C.F. Harvey Jobfile: E:\16010.JOB		Sample: ST-2 Borehole: EB2-A LT LN	
	Operator: MK	*Checked:* MK		*Approved:*

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF)	0.050
Initial Temp oC	21.6
Correction (in)	0.0
Settlement (in)	0.0082
Voids Ratio e	0.8007
Final Temp oC	
t_{50} (mins)	
c_v (ft2/day)	
m_v (ft2/ton)	
Sec Compression C_{sec}	



S&ME	ASTM D2435-96	Test name	Consolidation
		Date of Test:	12-16-16
	Site Reference: C.F. Harvey	Sample:	ST-2
	Jobfile: E:\16010.JOB	Borehole:	EB2-A LT LN
	Operator: MLC	Checked: MLC	Approved:

Form No. TR-T88
Revision No. 0
Revision Date: 12/20/09

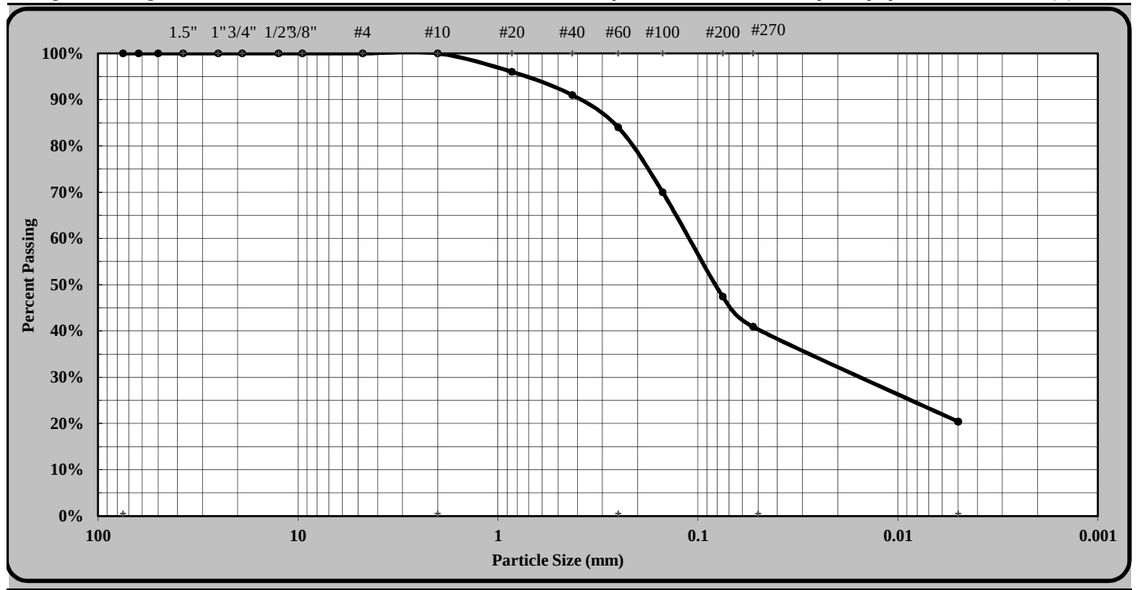
Particle Size Analysis of Soils

AASHTO T88 as Modified by NCDOT

S&ME
Quality Assurance

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

S&ME Project #:	6235-16-010	Report Date:	11/14/16
Project Name:	C.F. Harvey Parkway Extension R-5703	Test Date(s):	10/7 - 11/14/16
State Project #:	N/A F.A. Project No: N/A	TIP NO:	N/A
Client Name:	Michael Baker Engineering		
Address:	Raleigh, NC		
Boring #:	EB2-B RT LN Sample #: SS-7	Sample Date:	N/A
Location:	89+45 Offset: 33 RT	Depth (ft):	1.0 - 2.5
Sample Description:	Gray Coarse to Fine Sandy Clayey SILT	A-4	(1)



As Defined by NCDOT		Fine Sand	< 0.25 mm and > 0.05 mm
Gravel	< 75 mm and > 2.00 mm	Silt	< 0.05 and > 0.005 mm
Coarse Sand	< 2.00 mm and >0.25 mm	Clay	< 0.005 mm

Maximum Particle Size	#4	Coarse Sand	16%	Silt	21%
Gravel	0%	Fine Sand	43%	Clay	20%
Apparent Relative Density	ND	Moisture Content	13.4%	% Passing #200	47.4%
Liquid Limit	21	Plastic Limit	13	Plastic Index	8

Soil Mortar (-#10 Sieve)

Coarse Sand	16%	Fine Sand	43%	Silt	21%	Clay	20%
Description of Sand & Gravel Particles:		Rounded	☐	Angular		☐	
Hard & Durable	☐	Soft	☐	Weathered & Friable		☐	

References / Comments / Deviations: ND=Not Determined.

Mal Krajan, ET	104-01-0703	Laboratory Manager	11/14/2016
Technician Name	*Certification No.*	*Position*	*Date*
Mal Krajan, ET		Laboratory Manager	11/14/2016
Technical Responsibility	*Signature*	*Position*	*Date*

Form No: TR-T267
Revision No. 0
Revision Date: 07/10/08

Moisture, Ash, and Organic Matter

AASHTO T-267 — *Quality Assurance*

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

Project #:	**6235-16-010**	Report Date:	10/21/16
Project Name:	C.F. Harvey Parkway Extension R-5703	Test Date(s):	10/18 - 10/21/16
Client Name:	Michael Baker Engineering		
Client Address:	Raleigh, NC		

Boring #:	EB2-B RT LN	Sample #:	SS-7	Sample Date:	N/A
Location:	89+45	Offset:	33 RT	Depth (ft):	1.0 - 2.5

Sample Description: Gray Coarse to Fine Sandy Clayey SILT (A-4) (1)

Equipment: *Balance: 0.01 g.Readability, 500g. Minimum Capaccity*

Balance: S&ME ID #: ***1024*** *Cal. Date:* ***11/06/16*** *Due:* ***11/06/17***

Method A: Moisture Content Determination *Required Oven Temperature:105 ± 5 °C*

	Oven Temperature: **105 °C**	*Tare #*	h
t	Tare Weight *(Dish plus Aluminum Foil Cover)*	*grams*	45.60
a	Mass of ***As-Received*** Specimen + Tare Wt.	*grams*	91.99
b	Mass of Oven Dry Specimen + Tare Wt.	*grams*	86.51
w	Water Weight	*(a-b)*	5.48
A	Mass of As-Received Specimen	*(a-t)*	46.39
B	Mass of Oven Dry Specimen	*(b-t)*	40.91
	% Moisture Content as a % of As Received or Total Mass	*(w/A)*100*	**11.8%**
	% Moisture Content as a % of Oven-dried Mass	*(w/B)*100*	**13.4%**

Oven S&ME ID #: ***1454*** *Cal. Date:* ***10/7/16*** *Due:* ***10/7/17***

Method C (440 ° C) or D (750 ° C): Ash Content and Organic Matter Determination

	Muffle Furnace: **455 °C**	*Tare #*	84
t	Tare Weight *(Dish plus Aluminum Foil Cover)*	*grams*	49.60
b	Mass of Oven Dry Specimen + Tare Wt.	*grams*	85.32
c	Ash Weight + Tare Wt.	*grams*	84.68
C	Ash Weight	*c-t*	35.08
B	Mass of Oven Dry Specimen	*(b-t)*	35.72
D	***% Ash Content***	*(C/B)*100*	**98.2%**
	% Organic Matter	*100-D*	**1.8%**

Muffle Furnace: S&ME ID #: ***00261***

Notes / Deviations / References:

Mal Krajan, ET — *Technical Responsibility*
Signature
Laboratory Manager — *Position*
11/14/2016 — *Date*

Form No: TR-T289-1
Revision No. 0
Revision Date: 07/10/08

pH of Soil

AASHTO T289 — *Quality Assurance*

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

Project #:	**6235-16-010**	Report Date:	11/7/16
Project Name:	C.F. Harvey Parkway Extension R-5703	Test Date(s):	11/5 - 11/7/16
Client Name:	Michael Baker Engineering		
Client Address:	Raleigh, NC		

Boring #:	EB2-B RT LN	Sample #:	SS-7	Sample Date:	N/A
Location:	89+45	Offset:	33 RT	Depth (ft):	1.0 - 2.5

Sample Description: Gray Coarse to Fine Sandy Clayey SILT (A-4) (1)

Equipment:

Balance		*S&ME ID#*	*1024*	*Cal. Date:*	*11/6/16*	*Due:*	*11/6/17*
Sieve:	*#10*	*S&ME ID#*	*13223*	*Cal. Date:*	*6/11/16*	*Due:*	*6/11/17*
pH Meter:		*S&ME ID#*	*1365*	*Cal. Date:*	*11/7/16*	*Due:*	*NA*

pH Meter Calibration

Buffer Solution	***Results***
pH buffer 7.0	***7.02***
pH buffer 4.01	***4.01***
pH buffer 10.0	***10.03***
Buffer Temperature ^{0}C	***22.4***

Measuring pH of Soil

Measurements	
Weigtht of Air Dry Soil (g)	***30.00***
Distilled Water (g)	***30.01***
Temperature ^{0}C	***22.2***
pH Readings	***5.69***

Notes / Deviations / References: AASHTO T-289: Determining pH of Soil for Use in Corrosion Testing

Mal Krajan, ET — *Technical Responsibility*
Signature
Laboratory Manager — *Position*
11/14/2016 — *Date*