

SEE SHEET 3 FOR PLAN SHEET LAYOUT
AT TIME OF INVESTIGATION

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

| STATE | STATE PROJECT REFERENCE NO. | SHEET NO. | TOTAL SHEETS |
|-------|-----------------------------|-----------|--------------|
| N.C. | R-5703 | 1 | 33 |

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**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. 220 AND NO. 221 ON -L-
(FELIX HARVEY PARKWAY) OVER -Y8- (NC HWY 11)

INVENTORY

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 1919 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.

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

NOTES:

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

PERSONNEL

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INVESTIGATED BY S&ME, INC.

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SUBMITTED BY S&ME, INC.

DATE MARCH 2017

REFERENCE: R-5703

PROJECT: 46375



[Signature] 3-21-17
SIGNATURE DATE

**DOCUMENT NOT CONSIDERED FINAL
UNLESS ALL SIGNATURES COMPLETED**

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

| SOIL DESCRIPTION | | | | | | | | | | GRADATION | | | | | | | | | | ROCK DESCRIPTION | | | | | | | | | | TERMS AND DEFINITIONS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| <p>SOIL IS CONSIDERED UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO THE STANDARD PENETRATION TEST (AASHTO T 206, ASTM D1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY INCLUDE THE FOLLOWING: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. FOR EXAMPLE, <i>VERY STIFF, GRAY, SILTY CLAY, MOIST WITH INTERBEDDED FINE SAND LAYERS, HIGHLY PLASTIC, A-7-6</i></p> | | | | | | | | | | <p>WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE. UNIFORMLY GRADED - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLE SIZES OF TWO OR MORE SIZES.</p> | | | | | | | | | | <p>HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT REFUSAL IF TESTED, AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS IN NON-COASTAL PLAIN MATERIAL. THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:</p> | | | | | | | | | | <p>ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER. AQUIFER - A WATER BEARING FORMATION OR STRATA. ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND. ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, SUCH AS SHALE, SLATE, ETC. ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE. CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE. COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE. CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK. DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL. DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH. FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE. FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLOGGED 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 (ROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. 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 (SROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. TOPSOIL (TS) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SOIL LEGEND AND AASHTO CLASSIFICATION | | | | | | | | | | MINERALOGICAL COMPOSITION | | | | | | | | | | WEATHERING | | | | | | | | | | ROCK HARDNESS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>GENERAL CLASS.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th colspan="5">GRANULAR MATERIALS (≤ 35% PASSING #200)</th> <th colspan="5">SILT-CLAY MATERIALS (> 35% PASSING #200)</th> <th colspan="5">ORGANIC MATERIALS</th> </tr> <tr> <th>GROUP CLASS.</th> <th>A-1</th> <th>A-3</th> <th>A-2</th> <th>A-7</th> <th>A-4</th> <th>A-5</th> <th>A-6</th> <th>A-7</th> <th>A-1, A-2</th> <th>A-3</th> <th>A-4, A-5</th> <th>A-6, A-7</th> <th colspan="5"></th> </tr> <tr> <th>SYMBOL</th> <td colspan="4">[Pattern]</td> <td colspan="4">[Pattern]</td> <td colspan="4">[Pattern]</td> <td colspan="5"></td> </tr> <tr> <th>% PASSING #10 #40 #200</th> <td>50 Mx 30 Mx 15 Mx</td> <td>50 Mx 25 Mx</td> <td>51 MN 35 Mx 35 Mx</td> <td>51 MN 35 Mx 35 Mx</td> <td>36 MN 36 Mx 36 Mx</td> <td>36 MN 36 Mx 36 Mx</td> <td>36 MN 36 Mx 36 Mx</td> <td>36 MN 36 Mx 36 Mx</td> <td>41 MN 41 MN 41 MN</td> <td>41 MN 41 MN 41 MN</td> <td>41 MN 41 MN 41 MN</td> <td>41 MN 41 MN 41 MN</td> <td colspan="5"></td> </tr> <tr> <th>MATERIAL PASSING #40 LL PI</th> <td colspan="4"></td> <td>40 Mx 10 Mx</td> <td>41 MN 11 MN</td> <td>40 Mx 11 MN</td> <td>40 Mx 11 MN</td> <td>40 Mx 11 MN</td> <td>40 Mx 11 MN</td> <td>40 Mx 11 MN</td> <td>40 Mx 11 MN</td> <td colspan="5"></td> </tr> <tr> <th>GROUP INDEX</th> <td colspan="4">0</td> <td>4 Mx</td> <td>8 Mx</td> <td>12 Mx</td> <td>16 Mx</td> <td>NO Mx</td> <td colspan="5"></td> </tr> <tr> <th>USUAL TYPES OF MAJOR MATERIALS</th> <td colspan="2">FINE SAND</td> <td colspan="2">SILTY OR CLAYEY GRAVEL AND SAND</td> <td colspan="2">SILTY SOILS</td> <td colspan="2">CLAYEY SOILS</td> <td colspan="5"></td> </tr> <tr> <th>GEN. RATING AS SUBGRADE</th> <td colspan="4">EXCELLENT TO GOOD</td> <td colspan="4">FAIR TO POOR</td> <td>FAIR TO POOR</td> <td>POOR</td> <td colspan="5">UNSATURABLE</td> </tr> </table> | | | | | | | | | | GRANULAR MATERIALS (≤ 35% PASSING #200) | | | | | SILT-CLAY MATERIALS (> 35% PASSING #200) | | | | | ORGANIC MATERIALS | | | | | GROUP CLASS. | A-1 | A-3 | A-2 | A-7 | A-4 | A-5 | A-6 | A-7 | A-1, A-2 | A-3 | A-4, A-5 | A-6, A-7 | | | | | | SYMBOL | [Pattern] | | | | [Pattern] | | | | [Pattern] | | | | | | | | | % PASSING #10 #40 #200 | 50 Mx 30 Mx 15 Mx | 50 Mx 25 Mx | 51 MN 35 Mx 35 Mx | 51 MN 35 Mx 35 Mx | 36 MN 36 Mx 36 Mx | 36 MN 36 Mx 36 Mx | 36 MN 36 Mx 36 Mx | 36 MN 36 Mx 36 Mx | 41 MN 41 MN 41 MN | 41 MN 41 MN 41 MN | 41 MN 41 MN 41 MN | 41 MN 41 MN 41 MN | | | | | | MATERIAL PASSING #40 LL PI | | | | | 40 Mx 10 Mx | 41 MN 11 MN | 40 Mx 11 MN | 40 Mx 11 MN | 40 Mx 11 MN | 40 Mx 11 MN | 40 Mx 11 MN | 40 Mx 11 MN | | | | | | GROUP INDEX | 0 | | | | 4 Mx | 8 Mx | 12 Mx | 16 Mx | NO Mx | | | | | | USUAL TYPES OF MAJOR MATERIALS | 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 | UNSATURABLE | | | | | <p>MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHEN THEY ARE CONSIDERED OF SIGNIFICANCE.</p> | | | | | | | | | | <p>FRESH - ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING, ROCK RINGS UNDER HAMMER IF CRYSTALLINE. VERY SLIGHT (IV SLI) - ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN, CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY, ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE. SLIGHT (SLI) - ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH, OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED, CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS. MODERATE (MOD.) - SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK. MODERATELY SEVERE (MOD. SEV.) - ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED, IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION, ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. <i>IF TESTED, WOULD YIELD SPT REFUSAL</i> SEVERE (SEV.) - ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED, ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT, SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. <i>IF TESTED, WOULD YIELD SPT N VALUES > 100 BPF</i> VERY SEVERE (IV SEV.) - ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED, ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE THAT ONLY MINOR VESTIGES OF ORIGINAL ROCK FABRIC REMAIN. <i>IF TESTED, WOULD YIELD SPT N VALUES < 100 BPF</i> COMPLETE - ROCK REDUCED TO SOIL, ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS, SAPROLITE IS ALSO AN EXAMPLE.</p> | | | | | | | | | | <p>ROCK HARDNESS</p> <p>VERY HARD - CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK, BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK. HARD - CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY, HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN. MODERATELY HARD - CAN BE SCRATCHED BY KNIFE OR PICK, GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK, HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS. MEDIUM HARD - CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT, CAN BE EXCAVATED IN SMALL CHIPS TO PIECES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK. SOFT - CAN BE GROOVED OR GOUGED READILY BY KNIFE OR PICK, CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT, SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE. VERY SOFT - CAN BE CARVED WITH KNIFE, CAN BE EXCAVATED READILY WITH POINT OF PICK, PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE, CAN BE SCRATCHED READILY BY FINGER NAIL.</p> | | | | | | | | | |
| GRANULAR MATERIALS (≤ 35% PASSING #200) | | | | | SILT-CLAY MATERIALS (> 35% PASSING #200) | | | | | ORGANIC MATERIALS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| GROUP CLASS. | A-1 | A-3 | A-2 | A-7 | A-4 | A-5 | A-6 | A-7 | A-1, A-2 | A-3 | A-4, A-5 | A-6, A-7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| SYMBOL | [Pattern] | | | | [Pattern] | | | | [Pattern] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| % PASSING #10 #40 #200 | 50 Mx 30 Mx 15 Mx | 50 Mx 25 Mx | 51 MN 35 Mx 35 Mx | 51 MN 35 Mx 35 Mx | 36 MN 36 Mx 36 Mx | 36 MN 36 Mx 36 Mx | 36 MN 36 Mx 36 Mx | 36 MN 36 Mx 36 Mx | 41 MN 41 MN 41 MN | 41 MN 41 MN 41 MN | 41 MN 41 MN 41 MN | 41 MN 41 MN 41 MN | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MATERIAL PASSING #40 LL PI | | | | | 40 Mx 10 Mx | 41 MN 11 MN | 40 Mx 11 MN | 40 Mx 11 MN | 40 Mx 11 MN | 40 Mx 11 MN | 40 Mx 11 MN | 40 Mx 11 MN | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| GROUP INDEX | 0 | | | | 4 Mx | 8 Mx | 12 Mx | 16 Mx | NO Mx | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| USUAL TYPES OF MAJOR MATERIALS | 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 | UNSATURABLE | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CONSISTENCY OR DENSENESS | | | | | | | | | | GROUND WATER | | | | | | | | | | MISCELLANEOUS SYMBOLS | | | | | | | | | | RECOMMENDATION SYMBOLS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>PRIMARY SOIL TYPE</th> <th>COMPACTNESS OR CONSISTENCY</th> <th>RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE)</th> <th>RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT²)</th> </tr> <tr> <td>GENERALLY GRANULAR MATERIAL (NON-COHESIVE)</td> <td>VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE</td> <td>< 4 4 TO 10 10 TO 30 30 TO 50 > 50</td> <td>N/A</td> </tr> <tr> <td>GENERALLY SILT-CLAY MATERIAL (COHESIVE)</td> <td>VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD</td> <td>< 2 2 TO 4 4 TO 8 8 TO 15 15 TO 30 > 30</td> <td>< 0.25 0.25 TO 0.5 0.5 TO 1.0 1 TO 2 2 TO 4 > 4</td> </tr> </table> | | | | | | | | | | PRIMARY SOIL TYPE | COMPACTNESS OR CONSISTENCY | RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE) | RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT ²) | GENERALLY GRANULAR MATERIAL (NON-COHESIVE) | VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE | < 4 4 TO 10 10 TO 30 30 TO 50 > 50 | N/A | GENERALLY SILT-CLAY MATERIAL (COHESIVE) | VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD | < 2 2 TO 4 4 TO 8 8 TO 15 15 TO 30 > 30 | < 0.25 0.25 TO 0.5 0.5 TO 1.0 1 TO 2 2 TO 4 > 4 | <p>WATER LEVEL IN BORE HOLE IMMEDIATELY AFTER DRILLING STATIC WATER LEVEL AFTER _____ HOURS PERCHED WATER, SATURATED ZONE, OR WATER BEARING STRATA SPRING OR SEEP</p> | | | | | | | | | | <p>ROADWAY EMBANKMENT (RE) WITH SOIL DESCRIPTION SOIL SYMBOL ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT INFERRED SOIL BOUNDARY INFERRED ROCK LINE ALLUVIAL SOIL BOUNDARY</p> <p>25/025 DIP & DIP DIRECTION OF ROCK STRUCTURES SPT DMT TEST BORE AUGER BORING CORE BORING MONITORING WELL PIEZOMETER INSTALLATION</p> <p>SLOPE INDICATOR INSTALLATION CONE PENETROMETER TEST SOUNDING ROD TEST BORING WITH CORE SPT N-VALUE</p> | | | | | | | | | | <p>UNDERCUT SHALLOW UNDERCUT UNCLASSIFIED EXCAVATION - UNSUITABLE WASTE UNCLASSIFIED EXCAVATION - ACCEPTABLE DEGRADABLE ROCK</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PRIMARY SOIL TYPE | COMPACTNESS OR CONSISTENCY | RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE) | RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT ²) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| GENERALLY GRANULAR MATERIAL (NON-COHESIVE) | VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE | < 4 4 TO 10 10 TO 30 30 TO 50 > 50 | N/A | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| GENERALLY SILT-CLAY MATERIAL (COHESIVE) | VERY SOFT SOFT MEDIUM STIFF STIFF VERY STIFF HARD | < 2 2 TO 4 4 TO 8 8 TO 15 15 TO 30 > 30 | < 0.25 0.25 TO 0.5 0.5 TO 1.0 1 TO 2 2 TO 4 > 4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TEXTURE OR GRAIN SIZE | | | | | | | | | | ABBREVIATIONS | | | | | | | | | | EQUIPMENT USED ON SUBJECT PROJECT | | | | | | | | | | FRACTURE SPACING | | | | | | | | | | BEDDING | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>U.S. STD. SIEVE SIZE (OPENING (MM))</th> <th>4</th> <th>10</th> <th>40</th> <th>60</th> <th>200</th> <th>270</th> </tr> <tr> <td></td> <td>4.76</td> <td>2.00</td> <td>0.42</td> <td>0.25</td> <td>0.075</td> <td>0.053</td> </tr> <tr> <th>BOULDER (BLDR.)</th> <th>COBBLE (COB.)</th> <th>GRAVEL (GR.)</th> <th>COARSE SAND (CS, SD.)</th> <th>FINE SAND (F SD.)</th> <th>SILT (SL.)</th> <th>CLAY (CL.)</th> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <th>GRAIN SIZE</th> <th>MM</th> <th>305</th> <th>75</th> <th>2.0</th> <th>0.25</th> <th>0.05</th> <th>0.005</th> </tr> <tr> <td></td> <td>IN.</td> <td>12</td> <td>3</td> <td></td> <td></td> <td></td> <td></td> </tr> </table> | | | | | | | | | | U.S. STD. SIEVE SIZE (OPENING (MM)) | 4 | 10 | 40 | 60 | 200 | 270 | | 4.76 | 2.00 | 0.42 | 0.25 | 0.075 | 0.053 | BOULDER (BLDR.) | COBBLE (COB.) | GRAVEL (GR.) | COARSE SAND (CS, 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 | | | | | <p>AR - AUGER REFUSAL BT - BORING TERMINATED CL - CLAY CPT - COPE 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</p> <p>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</p> <p>VST - VANE SHEAR TEST WEA. - WEATHERED γ_s - UNIT WEIGHT γ_d - DRY UNIT WEIGHT</p> <p>SAMPLE ABBREVIATIONS S - BULK SS - SPLIT SPOON ST - SHELBY TUBE RS - ROCK RT - RECOMPACTED TRIAXIAL CBR - CALIFORNIA BEARING RATIO</p> | | | | | | | | | | <p>DRILL UNITS: <input type="checkbox"/> CME-45C <input type="checkbox"/> CME-55 <input type="checkbox"/> CME-550 <input type="checkbox"/> VANE SHEAR TEST <input type="checkbox"/> PORTABLE HOIST <input checked="" type="checkbox"/> BK-51</p> <p>ADVANCING TOOLS: <input type="checkbox"/> CLAY BITS <input type="checkbox"/> 6" CONTINUOUS FLIGHT AUGER <input type="checkbox"/> 8" HOLLOW AUGERS <input type="checkbox"/> HARD FACED FINGER BITS <input type="checkbox"/> TUNG-CARBIDE INSERTS <input checked="" type="checkbox"/> CASING <input type="checkbox"/> W/ ADVANCER <input checked="" type="checkbox"/> TRICONE 2 1/16" STEEL TEETH <input type="checkbox"/> TRICONE _____ * TUNG-CARB. <input type="checkbox"/> CORE BIT</p> <p>HAMMER TYPE: <input checked="" type="checkbox"/> AUTOMATIC <input type="checkbox"/> MANUAL</p> <p>CORE SIZE: <input type="checkbox"/> -B _____ <input type="checkbox"/> -H _____ <input type="checkbox"/> -N _____</p> <p>HAND TOOLS: <input type="checkbox"/> POST HOLE DIGGER <input type="checkbox"/> HAND AUGER <input type="checkbox"/> SOUNDING ROD <input type="checkbox"/> VANE SHEAR TEST</p> | | | | | | | | | | <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>TERM</th> <th>SPACING</th> <th>TERM</th> <th>THICKNESS</th> </tr> <tr> <td>VERY WIDE</td> <td>MORE THAN 10 FEET</td> <td>VERY THICKLY BEDDED</td> <td>4 FEET</td> </tr> <tr> <td>WIDE</td> <td>3 TO 10 FEET</td> <td>THICKLY BEDDED</td> <td>1.5 - 4 FEET</td> </tr> <tr> <td>MODERATELY CLOSE</td> <td>1 TO 3 FEET</td> <td>THINLY BEDDED</td> <td>0.16 - 1.5 FEET</td> </tr> <tr> <td>CLOSE</td> <td>0.16 TO 1 FOOT</td> <td>VERY THINLY BEDDED</td> <td>0.03 - 0.16 FEET</td> </tr> <tr> <td>VERY CLOSE</td> <td>LESS THAN 0.16 FEET</td> <td>THICKLY LAMINATED</td> <td>0.008 - 0.03 FEET</td> </tr> <tr> <td></td> <td></td> <td>THINLY LAMINATED</td> <td>< 0.008 FEET</td> </tr> </table> | | | | | | | | | | TERM | SPACING | TERM | THICKNESS | VERY WIDE | MORE THAN 10 FEET | VERY THICKLY BEDDED | 4 FEET | WIDE | 3 TO 10 FEET | THICKLY BEDDED | 1.5 - 4 FEET | MODERATELY CLOSE | 1 TO 3 FEET | THINLY BEDDED | 0.16 - 1.5 FEET | CLOSE | 0.16 TO 1 FOOT | VERY THINLY BEDDED | 0.03 - 0.16 FEET | VERY CLOSE | LESS THAN 0.16 FEET | THICKLY LAMINATED | 0.008 - 0.03 FEET | | | THINLY LAMINATED | < 0.008 FEET | <p>FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.</p> <p>FRIABLE - RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE. MODERATELY INDURATED - GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER. INDURATED - GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER. EXTREMELY INDURATED - SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| U.S. STD. SIEVE SIZE (OPENING (MM)) | 4 | 10 | 40 | 60 | 200 | 270 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 4.76 | 2.00 | 0.42 | 0.25 | 0.075 | 0.053 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| BOULDER (BLDR.) | COBBLE (COB.) | GRAVEL (GR.) | COARSE SAND (CS, SD.) | FINE SAND (F SD.) | SILT (SL.) | CLAY (CL.) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| GRAIN SIZE | MM | 305 | 75 | 2.0 | 0.25 | 0.05 | 0.005 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | IN. | 12 | 3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| TERM | SPACING | TERM | THICKNESS | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| VERY WIDE | MORE THAN 10 FEET | VERY THICKLY BEDDED | 4 FEET | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| WIDE | 3 TO 10 FEET | THICKLY BEDDED | 1.5 - 4 FEET | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MODERATELY CLOSE | 1 TO 3 FEET | THINLY BEDDED | 0.16 - 1.5 FEET | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CLOSE | 0.16 TO 1 FOOT | VERY THINLY BEDDED | 0.03 - 0.16 FEET | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| VERY CLOSE | LESS THAN 0.16 FEET | THICKLY LAMINATED | 0.008 - 0.03 FEET | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | THINLY LAMINATED | < 0.008 FEET | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PLASTICITY | | | | | | | | | | FRACTURE SPACING | | | | | | | | | | BEDDING | | | | | | | | | | NOTES: | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th colspan="2">PLASTICITY INDEX (PI)</th> <th>DRY STRENGTH</th> </tr> <tr> <td>NON PLASTIC</td> <td>0-5</td> <td>VERY LOW</td> </tr> <tr> <td>SLIGHTLY PLASTIC</td> <td>6-15</td> <td>SLIGHT</td> </tr> <tr> <td>MODERATELY PLASTIC</td> <td>16-25</td> <td>MEDIUM</td> </tr> <tr> <td>HIGHLY PLASTIC</td> <td>26 OR MORE</td> <td>HIGH</td> </tr> </table> | | | | | | | | | | 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 | <p>FRAC. - FRACTURED, FRACTURES FRAGS. - FRAGMENTS HI. - HIGHLY</p> | | | | | | | | | | <p>FRAC. - FRACTURED, FRACTURES FRAGS. - FRAGMENTS HI. - HIGHLY</p> | | | | | | | | | | <p>FRAC. - FRACTURED, FRACTURES FRAGS. - FRAGMENTS HI. - HIGHLY</p> | | | | | | | | | | <p>NOTES: FIAD - FILLED IMMEDIATELY AFTER DRILLING</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 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 | | | | | | | | | | FRACTURE SPACING | | | | | | | | | | BEDDING | | | | | | | | | | NOTES: | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>DESCRIPTIONS MAY INCLUDE COLOR OR COLOR COMBINATIONS (TAN, RED, YELLOW-BROWN, BLUE-GRAY). MODIFIERS SUCH AS LIGHT, DARK, STREAKED, ETC. ARE USED TO DESCRIBE APPEARANCE.</p> | | | | | | | | | | <p>FRAC. - FRACTURED, FRACTURES FRAGS. - FRAGMENTS HI. - HIGHLY</p> | | | | | | | | | | <p>FRAC. - FRACTURED, FRACTURES FRAGS. - FRAGMENTS HI. - HIGHLY</p> | | | | | | | | | | <p>FRAC. - FRACTURED, FRACTURES FRAGS. - FRAGMENTS HI. - HIGHLY</p> | | | | | | | | | | <p>NOTES: FIAD - FILLED IMMEDIATELY AFTER DRILLING</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

5/14/99

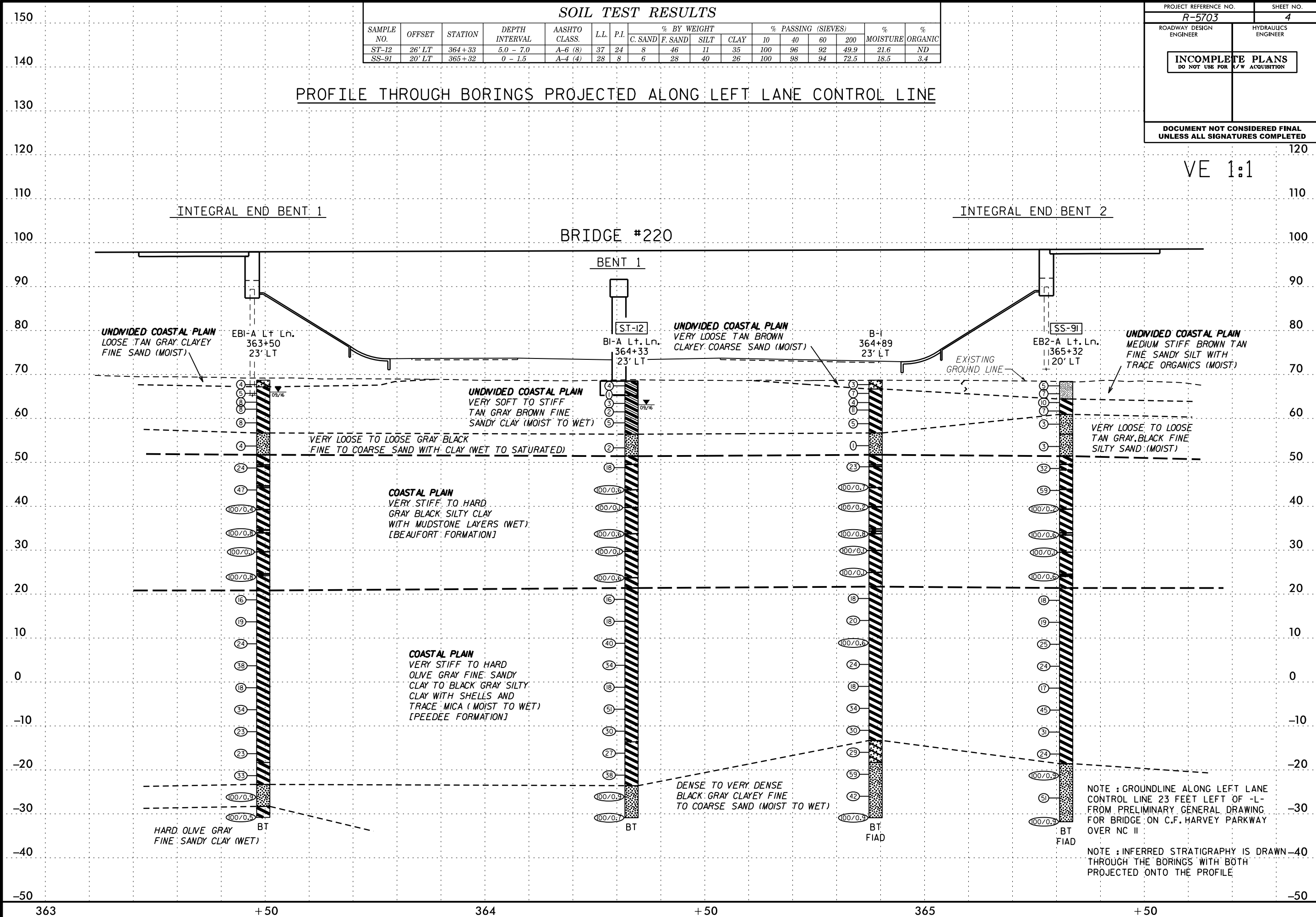
SOIL TEST RESULTS

| 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 | | |
| ST-12 | 26' LT | 364+33 | 5.0 - 7.0 | A-6 (8) | 37 | 24 | 8 | 46 | 11 | 35 | 100 | 96 | 92 | 49.9 | 21.6 | ND |
| SS-91 | 20' LT | 365+32 | 0 - 1.5 | A-4 (4) | 28 | 8 | 6 | 28 | 40 | 26 | 100 | 98 | 94 | 72.5 | 18.5 | 3.4 |

| | |
|---|-----------------------|
| PROJECT REFERENCE NO. R-5703 | SHEET NO. 4 |
| 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 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 II

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

5/14/99

5/14/99

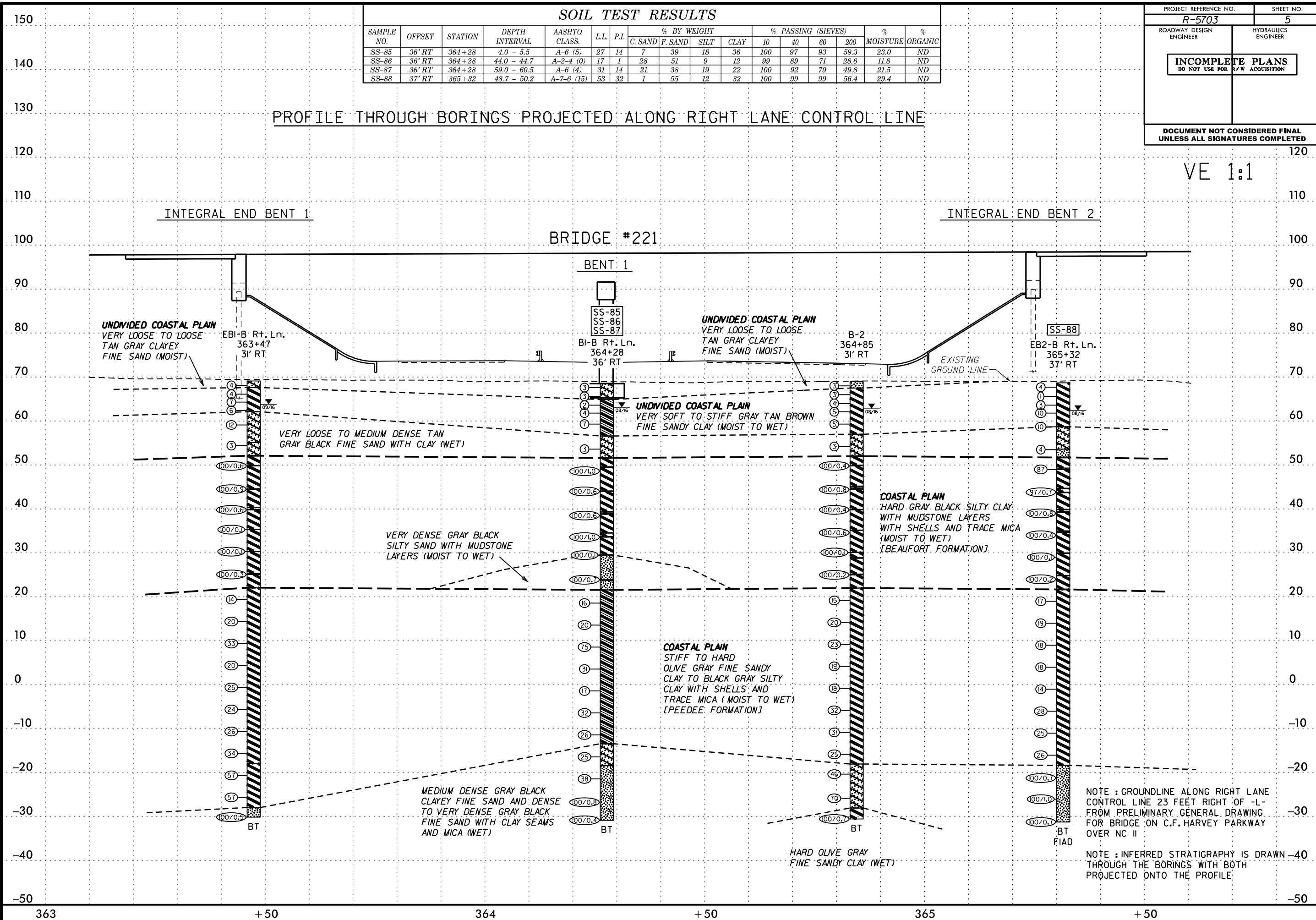
SOIL TEST RESULTS

| 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-85 | 36' RT | 364+28 | 4.0 - 5.5 | A-6 (5) | 27 | 14 | 7 | 39 | 18 | 36 | 100 | 97 | 93 | 59.3 | 23.0 | ND |
| SS-86 | 36' RT | 364+28 | 44.0 - 44.7 | A-2-4 (0) | 17 | 1 | 28 | 51 | 9 | 12 | 99 | 89 | 71 | 28.6 | 11.8 | ND |
| SS-87 | 36' RT | 364+28 | 59.0 - 60.5 | A-6 (4) | 31 | 14 | 21 | 38 | 19 | 22 | 100 | 92 | 79 | 49.8 | 21.5 | ND |
| SS-88 | 37' RT | 365+32 | 48.7 - 50.2 | A-7-6 (15) | 53 | 32 | 1 | 55 | 12 | 32 | 100 | 99 | 99 | 56.4 | 29.4 | ND |

| | |
|--|-----------------------|
| PROJECT REFERENCE NO. R-5703 | SHEET NO. 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



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 II

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

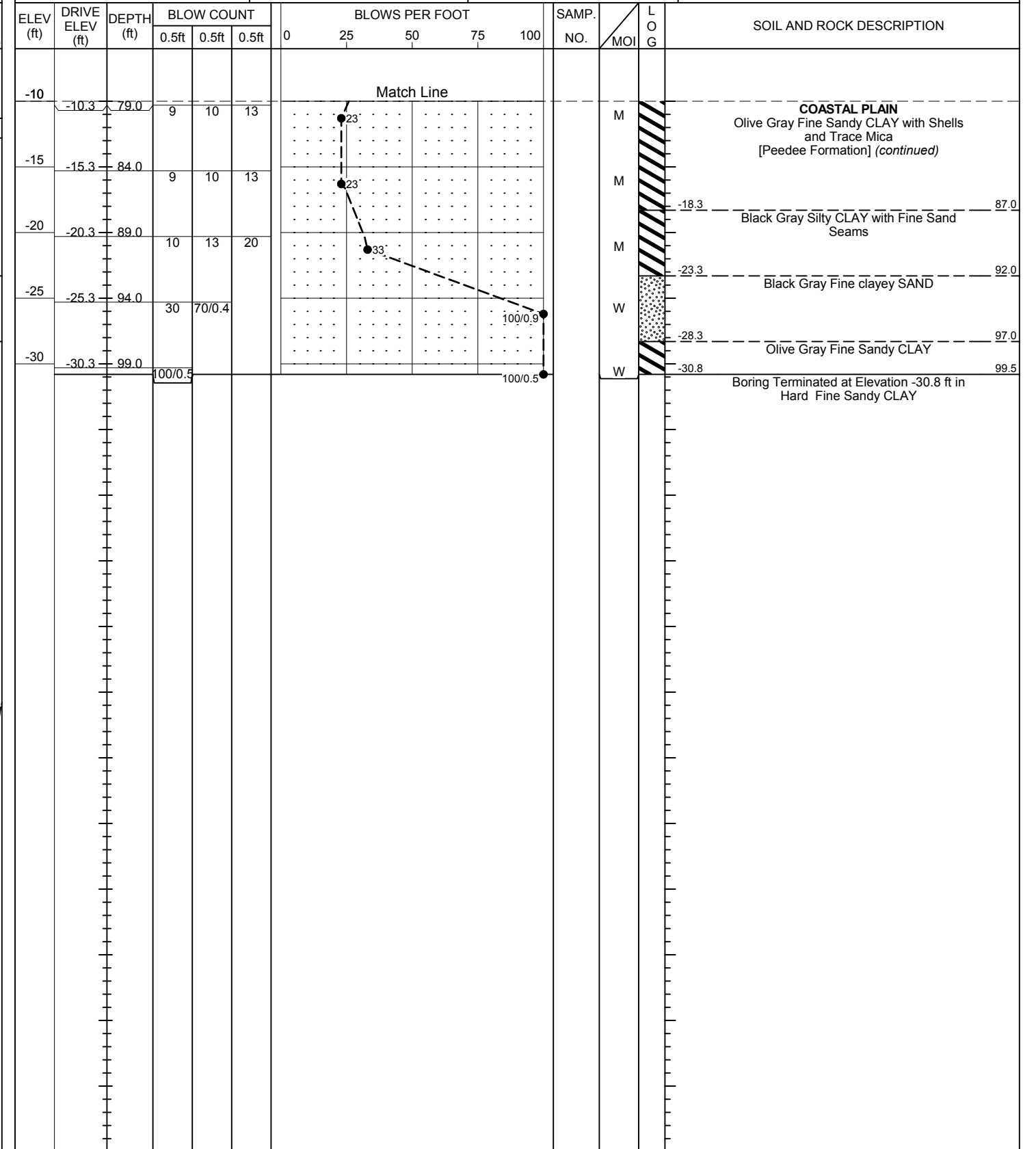
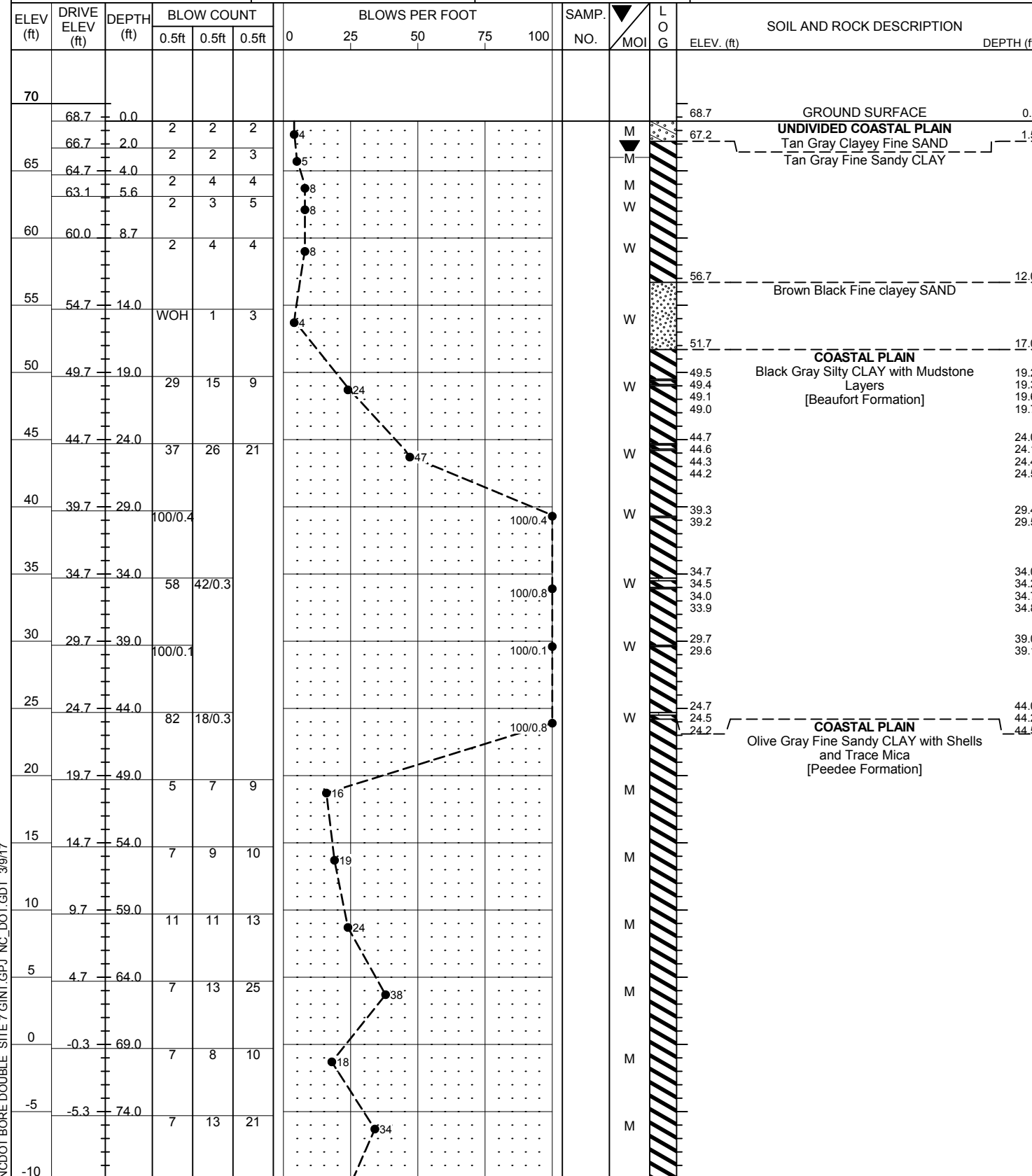
SS TIME DESIGN

GEOTECHNICAL BORING REPORT

BORE LOG

| | | | |
|---|----------------------------|--------------------------------|--------------------------------|
| WBS 46375.1.1 | TIP R-5703 | COUNTY LENOIR | GEOLOGIST Wright, F.K. |
| SITE DESCRIPTION Bridge No. 220 on -L- (Felix Harvey Pkwy) over -Y8- (NC 11) | | | GROUND WTR (ft) |
| BORING NO. EB1-A Lt Ln. | STATION 363+50 | OFFSET 23 ft LT | ALIGNMENT -L- |
| COLLAR ELEV. 68.7 ft | TOTAL DEPTH 99.5 ft | NORTHING 577,737 | EASTING 2,449,219 |
| DRILL RIG/HAMMER EFF./DATE BRI9103 BK-51 89% 05/04/2016 | | DRILL METHOD Mud Rotary | HAMMER TYPE Automatic |
| DRILLER Eister, G. | START DATE 08/31/16 | COMP. DATE 08/31/16 | SURFACE WATER DEPTH N/A |

| | | | |
|---|----------------------------|--------------------------------|--------------------------------|
| WBS 46375.1.1 | TIP R-5703 | COUNTY LENOIR | GEOLOGIST Wright, F.K. |
| SITE DESCRIPTION Bridge No. 220 on -L- (Felix Harvey Pkwy) over -Y8- (NC 11) | | | GROUND WTR (ft) |
| BORING NO. EB1-A Lt Ln. | STATION 363+50 | OFFSET 23 ft LT | ALIGNMENT -L- |
| COLLAR ELEV. 68.7 ft | TOTAL DEPTH 99.5 ft | NORTHING 577,737 | EASTING 2,449,219 |
| DRILL RIG/HAMMER EFF./DATE BRI9103 BK-51 89% 05/04/2016 | | DRILL METHOD Mud Rotary | HAMMER TYPE Automatic |
| DRILLER Eister, G. | START DATE 08/31/16 | COMP. DATE 08/31/16 | SURFACE WATER DEPTH N/A |



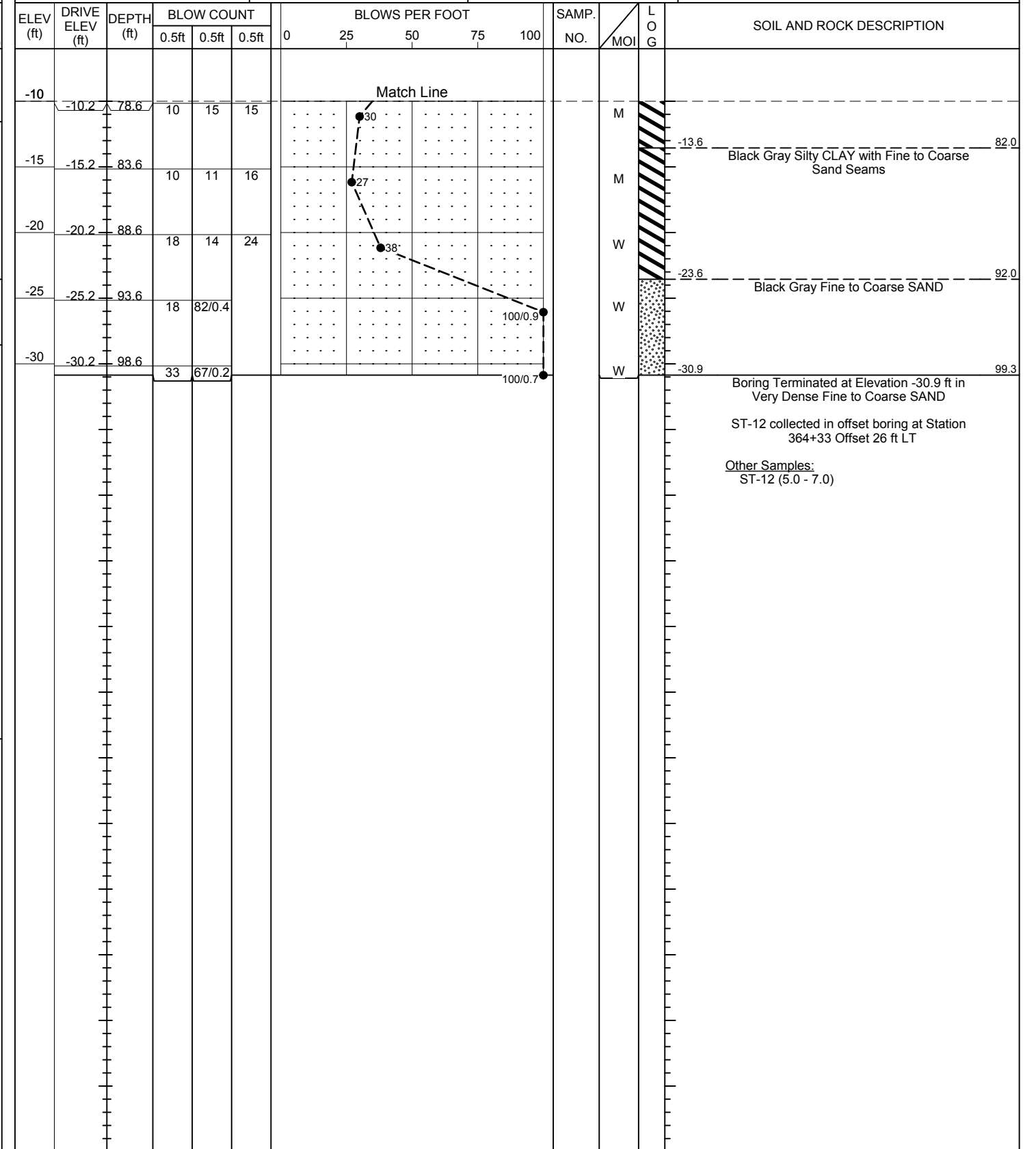
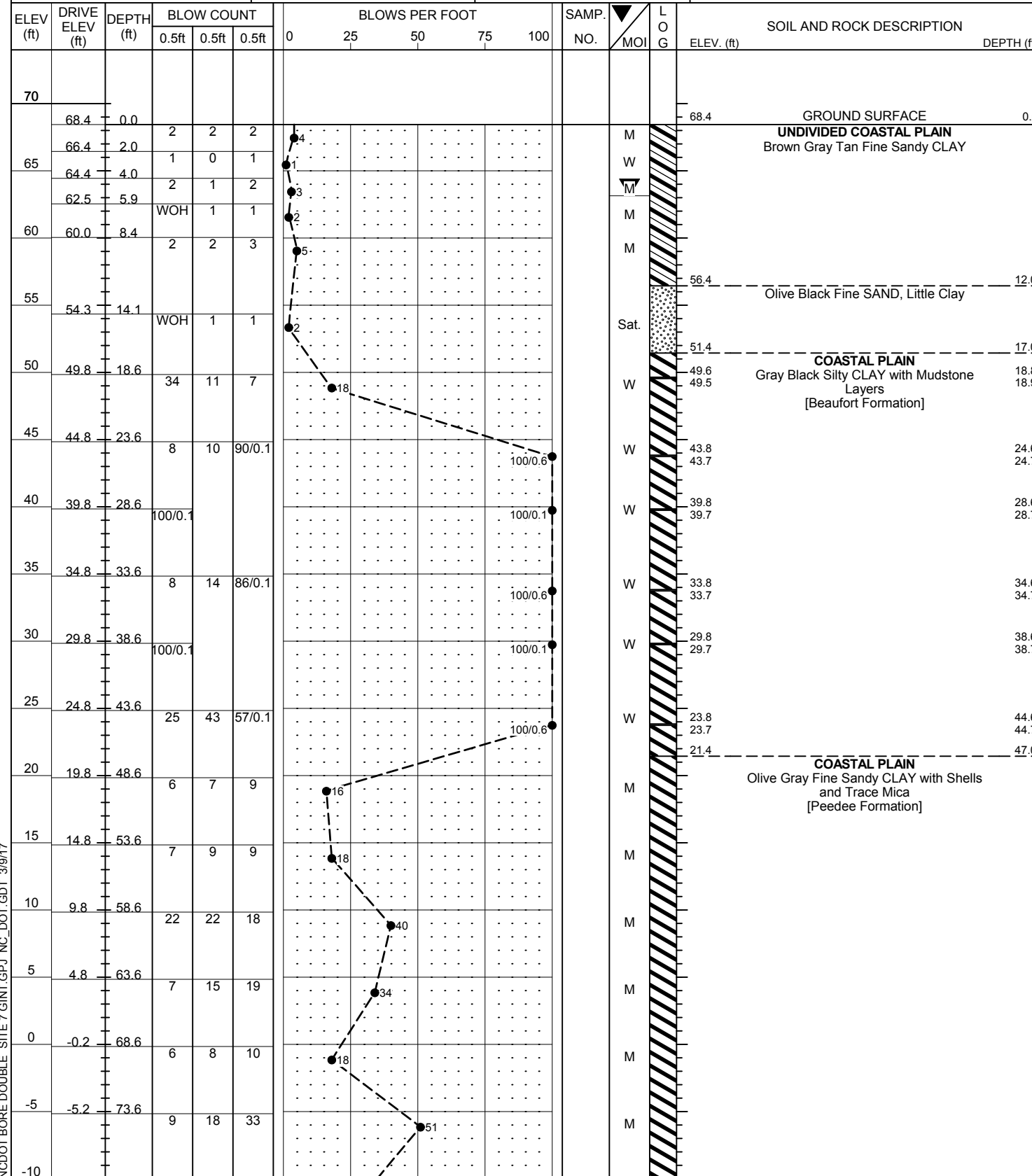
NCDOT BORE DOUBLE SITE 7 GINT.GPJ NC_DOT.GDT 3/9/17

GEOTECHNICAL BORING REPORT

BORE LOG

| | | | |
|---|----------------------------|--------------------------------|--------------------------------|
| WBS 46375.1.1 | TIP R-5703 | COUNTY LENOIR | GEOLOGIST Wright, F.K. |
| SITE DESCRIPTION Bridge No. 220 on -L- (Felix Harvey Pkwy) over -Y8- (NC 11) | | | GROUND WTR (ft) |
| BORING NO. B1-A LT LN | STATION 364+33 | OFFSET 23 ft LT | ALIGNMENT -L- |
| COLLAR ELEV. 68.4 ft | TOTAL DEPTH 99.3 ft | NORTHING 577,670 | EASTING 2,449,270 |
| DRILL RIG/HAMMER EFF./DATE BRI9103 BK-51 89% 05/04/2016 | | DRILL METHOD Mud Rotary | HAMMER TYPE Automatic |
| DRILLER Eister, G. | START DATE 08/31/16 | COMP. DATE 08/31/16 | SURFACE WATER DEPTH N/A |

| | | | |
|---|----------------------------|--------------------------------|--------------------------------|
| WBS 46375.1.1 | TIP R-5703 | COUNTY LENOIR | GEOLOGIST Wright, F.K. |
| SITE DESCRIPTION Bridge No. 220 on -L- (Felix Harvey Pkwy) over -Y8- (NC 11) | | | GROUND WTR (ft) |
| BORING NO. B1-A LT LN | STATION 364+33 | OFFSET 23 ft LT | ALIGNMENT -L- |
| COLLAR ELEV. 68.4 ft | TOTAL DEPTH 99.3 ft | NORTHING 577,670 | EASTING 2,449,270 |
| DRILL RIG/HAMMER EFF./DATE BRI9103 BK-51 89% 05/04/2016 | | DRILL METHOD Mud Rotary | HAMMER TYPE Automatic |
| DRILLER Eister, G. | START DATE 08/31/16 | COMP. DATE 08/31/16 | SURFACE WATER DEPTH N/A |



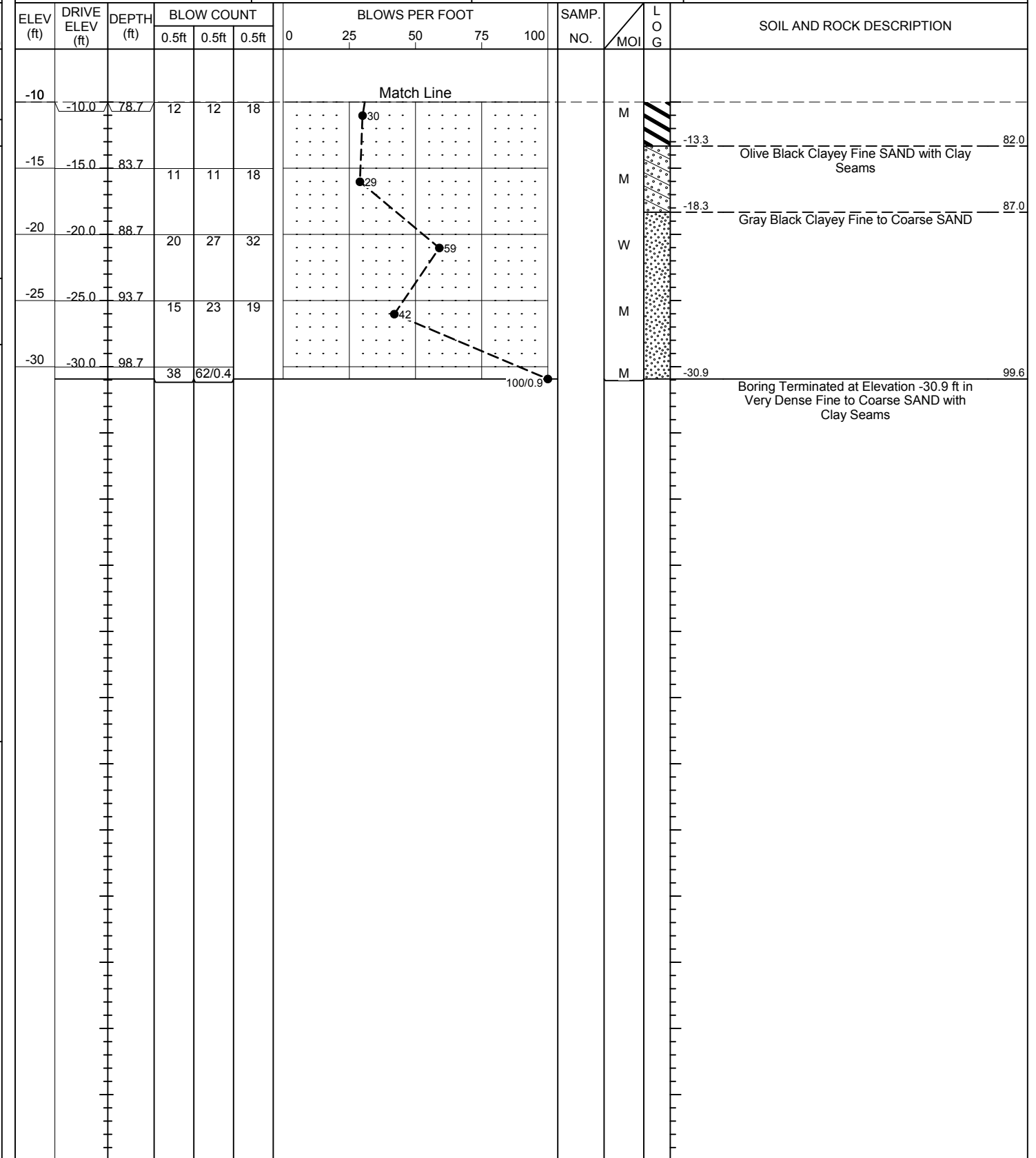
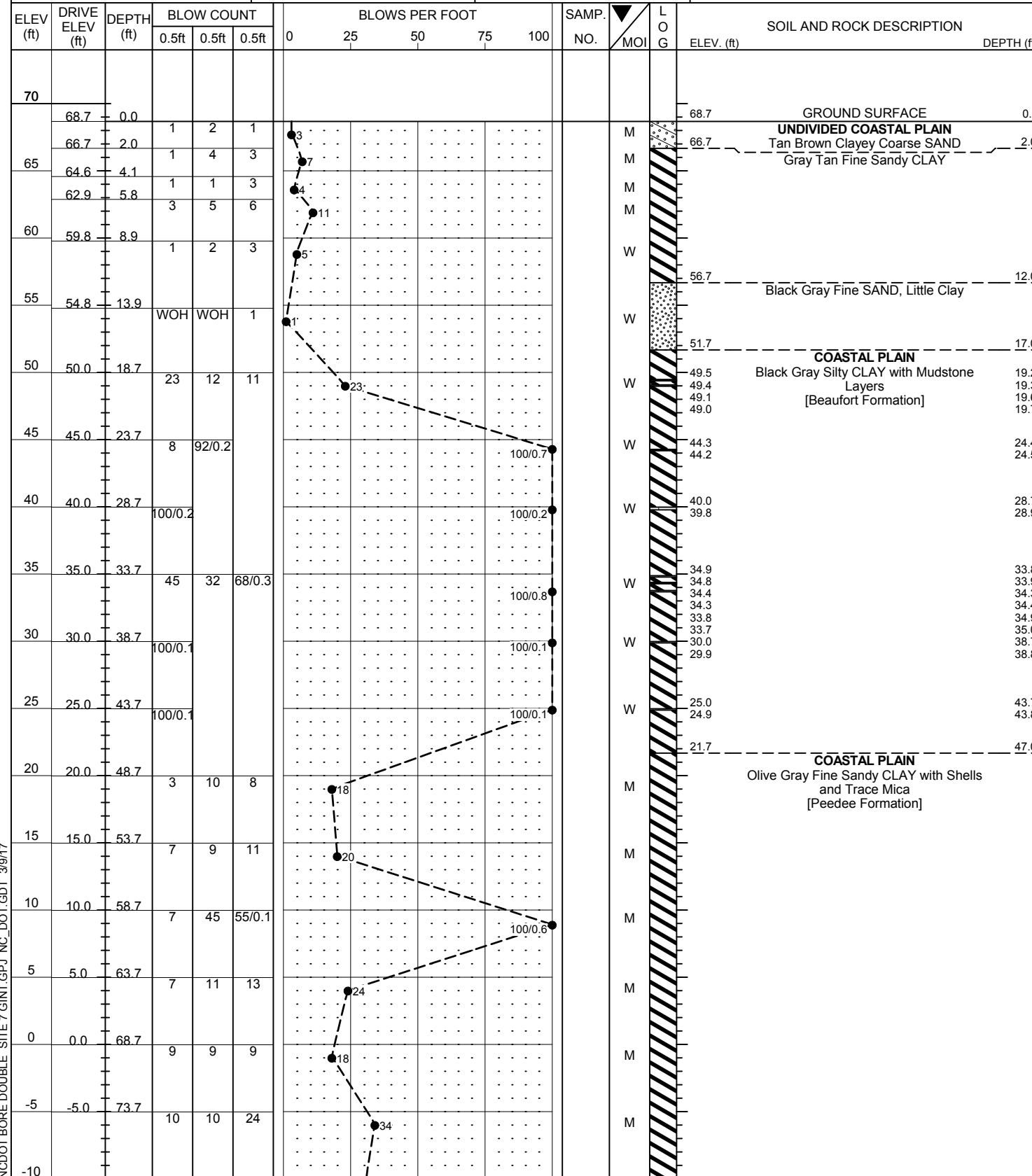
NCDOT BORE DOUBLE SITE 7 GINT.GPJ NC_DOT.GDT 3/9/17

GEOTECHNICAL BORING REPORT

BORE LOG

| | | | |
|---|----------------------------|--------------------------------|--------------------------------|
| WBS 46375.1.1 | TIP R-5703 | COUNTY LENOIR | GEOLOGIST Wright, F.K. |
| SITE DESCRIPTION Bridge No. 220 on -L- (Felix Harvey Pkwy) over -Y8- (NC 11) | | | GROUND WTR (ft) |
| BORING NO. B-1 | STATION 364+89 | OFFSET 23 ft LT | ALIGNMENT -L- |
| COLLAR ELEV. 68.7 ft | TOTAL DEPTH 99.6 ft | NORTHING 577,626 | EASTING 2,449,304 |
| DRILL RIG/HAMMER EFF./DATE BRI9103 BK-51 89% 05/04/2016 | | DRILL METHOD Mud Rotary | HAMMER TYPE Automatic |
| DRILLER Eister, G. | START DATE 09/01/16 | COMP. DATE 09/01/16 | SURFACE WATER DEPTH N/A |

| | | | |
|---|----------------------------|--------------------------------|--------------------------------|
| WBS 46375.1.1 | TIP R-5703 | COUNTY LENOIR | GEOLOGIST Wright, F.K. |
| SITE DESCRIPTION Bridge No. 220 on -L- (Felix Harvey Pkwy) over -Y8- (NC 11) | | | GROUND WTR (ft) |
| BORING NO. B-1 | STATION 364+89 | OFFSET 23 ft LT | ALIGNMENT -L- |
| COLLAR ELEV. 68.7 ft | TOTAL DEPTH 99.6 ft | NORTHING 577,626 | EASTING 2,449,304 |
| DRILL RIG/HAMMER EFF./DATE BRI9103 BK-51 89% 05/04/2016 | | DRILL METHOD Mud Rotary | HAMMER TYPE Automatic |
| DRILLER Eister, G. | START DATE 09/01/16 | COMP. DATE 09/01/16 | SURFACE WATER DEPTH N/A |



NCDOT BORE DOUBLE SITE 7 GINT.GPJ NC_DOT.GDT 3/9/17

GEOTECHNICAL BORING REPORT

BORE LOG

| | | | |
|---|----------------------------|--------------------------------|--------------------------------|
| WBS 46375.1.1 | TIP R-5703 | COUNTY LENOIR | GEOLOGIST Wright, F.K. |
| SITE DESCRIPTION Bridge No. 221 on -L- (Felix Harvey Pkwy) over -Y8- (NC 11) | | | GROUND WTR (ft) |
| BORING NO. B-2 | STATION 364+85 | OFFSET 31 ft RT | ALIGNMENT -L- |
| COLLAR ELEV. 69.0 ft | TOTAL DEPTH 99.5 ft | NORTHING 577,596 | EASTING 2,449,258 |
| DRILL RIG/HAMMER EFF./DATE BRI9103 BK-51 89% 05/04/2016 | | DRILL METHOD Mud Rotary | HAMMER TYPE Automatic |
| DRILLER Eister, G. | START DATE 08/29/16 | COMP. DATE 08/30/16 | SURFACE WATER DEPTH N/A |

| ELEV (ft) | DRIVE ELEV (ft) | DEPTH (ft) | BLOW COUNT | | | BLOWS PER FOOT | | | | | SAMP. NO. | LOG | SOIL AND ROCK DESCRIPTION | DEPTH (ft) |
|-----------|-----------------|------------|------------|--------|-------|----------------|----|----|----|-----|-----------|-----|---|------------|
| | | | 0.5ft | 0.5ft | 0.5ft | 0 | 25 | 50 | 75 | 100 | | | | |
| 70 | 69.0 | 0.0 | 1 | 1 | 2 | | | | | | | M | GROUND SURFACE | 0.0 |
| | 67.0 | 2.0 | 1 | 1 | 2 | | | | | | | M | UNDIVIDED COASTAL PLAIN Tan Silty Fine SAND with trace roots Gray Tan Fine Sandy CLAY | 1.5 |
| 65 | 65.0 | 4.0 | 1 | 2 | 2 | | | | | | | W | | |
| | 63.1 | 5.9 | 2 | 2 | 3 | | | | | | | W | | |
| 60 | 60.3 | 8.7 | 3 | 1 | 4 | | | | | | | W | | |
| | 55.2 | 13.8 | WOH | 1 | 2 | | | | | | | W | | |
| 55 | 55.2 | 13.8 | | | | | | | | | | W | | |
| | 52.0 | 17.0 | | | | | | | | | | W | COASTAL PLAIN Black Gray Silty CLAY with Mudstone Layers [Beaufort Formation] | 17.0 |
| 50 | 50.2 | 18.8 | 100/0.4 | | | | | | | | | W | | 19.0 |
| | 49.8 | 19.2 | | | | | | | | | | W | | 19.2 |
| | 45.2 | 23.8 | 24 | 76/0.3 | | | | | | | | W | | 23.8 |
| | 45.0 | | | | | | | | | | | W | | 24.0 |
| | 44.7 | | | | | | | | | | | W | | 24.3 |
| | 44.4 | | | | | | | | | | | W | | 24.6 |
| 40 | 40.2 | 28.8 | 100/0.4 | | | | | | | | | W | | 29.1 |
| | 39.9 | | | | | | | | | | | W | | 29.2 |
| | 39.8 | | | | | | | | | | | W | | |
| 35 | 35.2 | 33.8 | 90 | 10/0.1 | | | | | | | | W | | 33.8 |
| | 35.1 | | | | | | | | | | | W | | 33.9 |
| | 30.2 | 38.8 | 100/0.1 | | | | | | | | | W | | 38.8 |
| | 30.1 | | | | | | | | | | | W | | 38.9 |
| | 28.9 | | | | | | | | | | | W | | 40.1 |
| | 28.8 | | | | | | | | | | | W | | 40.2 |
| 25 | 25.2 | 43.8 | 100/0.2 | | | | | | | | | W | | 43.8 |
| | 25.0 | | | | | | | | | | | W | | 44.0 |
| | 22.0 | 47.0 | | | | | | | | | | W | | 47.0 |
| 20 | 20.2 | 48.8 | 4 | 6 | 9 | | | | | | | M | COASTAL PLAIN Olive Gray Fine Sandy CLAY with Shells [Pee Dee Formation] | |
| 15 | 15.2 | 53.8 | 8 | 9 | 11 | | | | | | | M | | |
| | 10.2 | 58.8 | 6 | 9 | 14 | | | | | | | M | | |
| | 5.2 | 63.8 | 6 | 8 | 11 | | | | | | | M | | |
| 0 | 0.2 | 68.8 | 9 | 8 | 10 | | | | | | | M | | |
| -5 | -4.8 | 73.8 | 8 | 12 | 20 | | | | | | | M | | |
| -10 | -9.8 | 78.8 | | | | | | | | | | M | | |

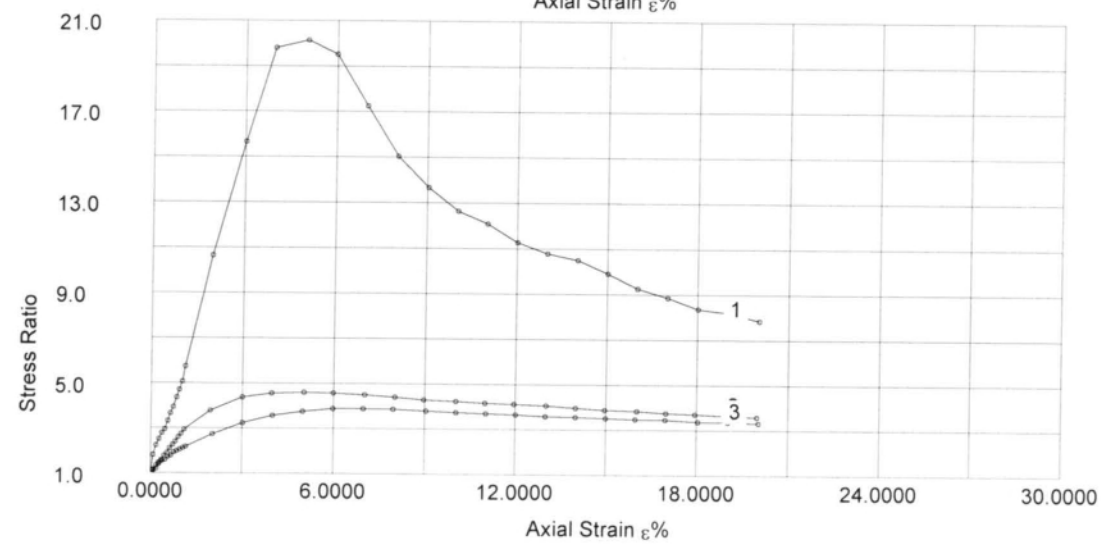
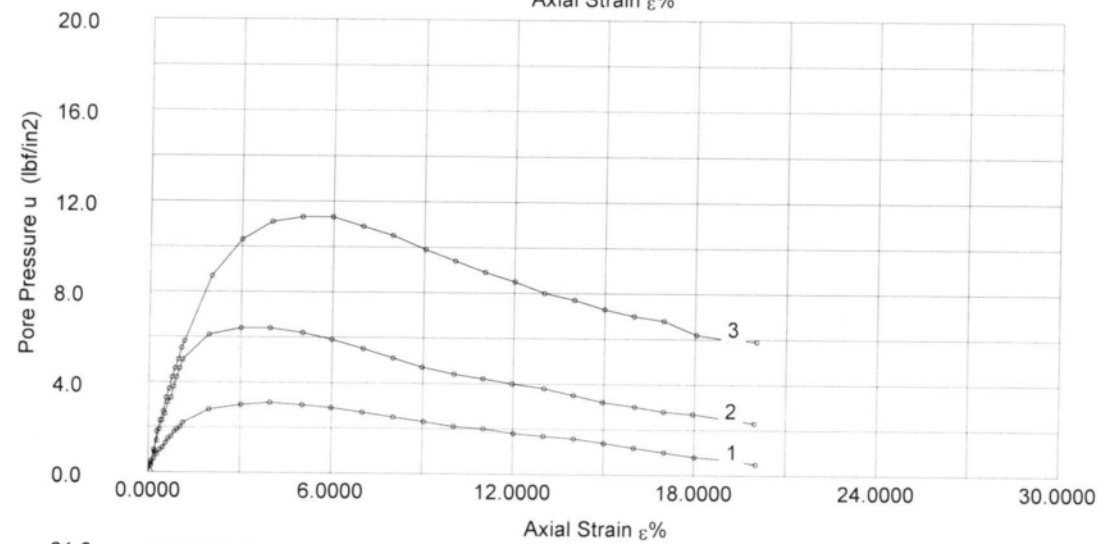
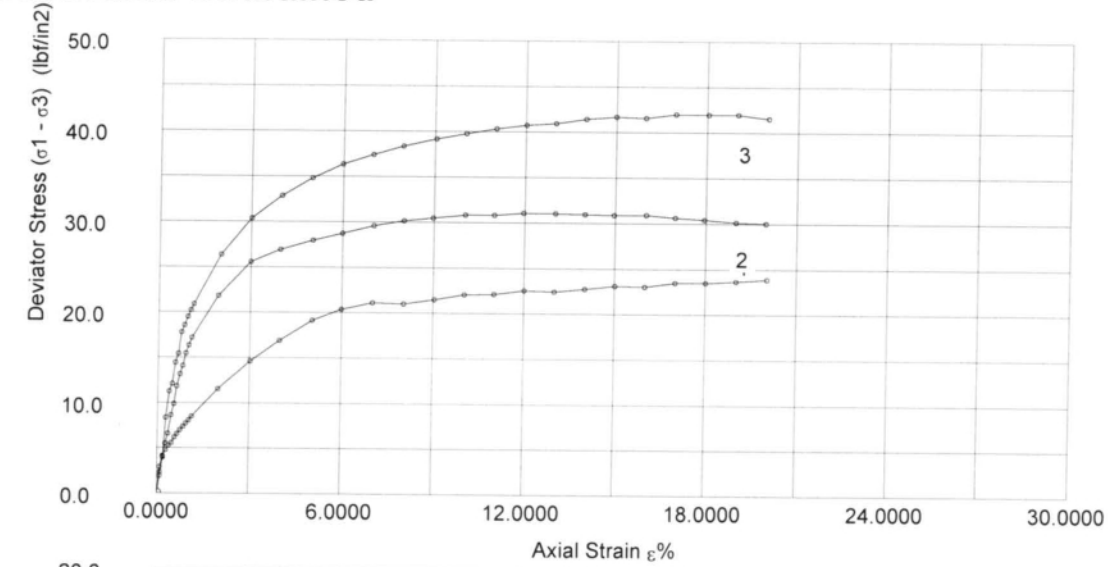
NCDOT BORE DOUBLE SITE 7 GINT.GPJ NC_DOT.GDT 3/9/17

| | | | |
|---|----------------------------|--------------------------------|--------------------------------|
| WBS 46375.1.1 | TIP R-5703 | COUNTY LENOIR | GEOLOGIST Wright, F.K. |
| SITE DESCRIPTION Bridge No. 221 on -L- (Felix Harvey Pkwy) over -Y8- (NC 11) | | | GROUND WTR (ft) |
| BORING NO. B-2 | STATION 364+85 | OFFSET 31 ft RT | ALIGNMENT -L- |
| COLLAR ELEV. 69.0 ft | TOTAL DEPTH 99.5 ft | NORTHING 577,596 | EASTING 2,449,258 |
| DRILL RIG/HAMMER EFF./DATE BRI9103 BK-51 89% 05/04/2016 | | DRILL METHOD Mud Rotary | HAMMER TYPE Automatic |
| DRILLER Eister, G. | START DATE 08/29/16 | COMP. DATE 08/30/16 | SURFACE WATER DEPTH N/A |

| ELEV (ft) | DRIVE ELEV (ft) | DEPTH (ft) | BLOW COUNT | | | BLOWS PER FOOT | | | | | SAMP. NO. | LOG | SOIL AND ROCK DESCRIPTION | DEPTH (ft) |
|-----------|-----------------|------------|------------|--------|-------|----------------|----|----|----|-----|-----------|-----|--|------------|
| | | | 0.5ft | 0.5ft | 0.5ft | 0 | 25 | 50 | 75 | 100 | | | | |
| -10 | | | 11 | 13 | 18 | | | | | | | M | Match Line | |
| | | | | | | | | | | | | M | COASTAL PLAIN Olive Gray Fine Sandy CLAY with Shells [Pee Dee Formation] (continued) | |
| -15 | -14.8 | 83.8 | 10 | 12 | 13 | | | | | | | M | | |
| | | | | | | | | | | | | W | | |
| -20 | -19.3 | 88.3 | 21 | 28 | 18 | | | | | | | W | Olive Gray Clayey Fine SAND with Clay Seams | 87.0 |
| | | | | | | | | | | | | W | | |
| -25 | -24.8 | 93.8 | 13 | 30 | 40 | | | | | | | W | | |
| | | | | | | | | | | | | W | | |
| -30 | -29.8 | 98.8 | 32 | 68/0.2 | | | | | | | | W | Olive Gray Fine Sandy CLAY | 97.0 |
| | | | | | | | | | | | | W | Boring Terminated at Elevation -30.5 ft in Hard Olive Grey Fine Sandy CLAY | 99.5 |

Effective Stress Triaxial Compression

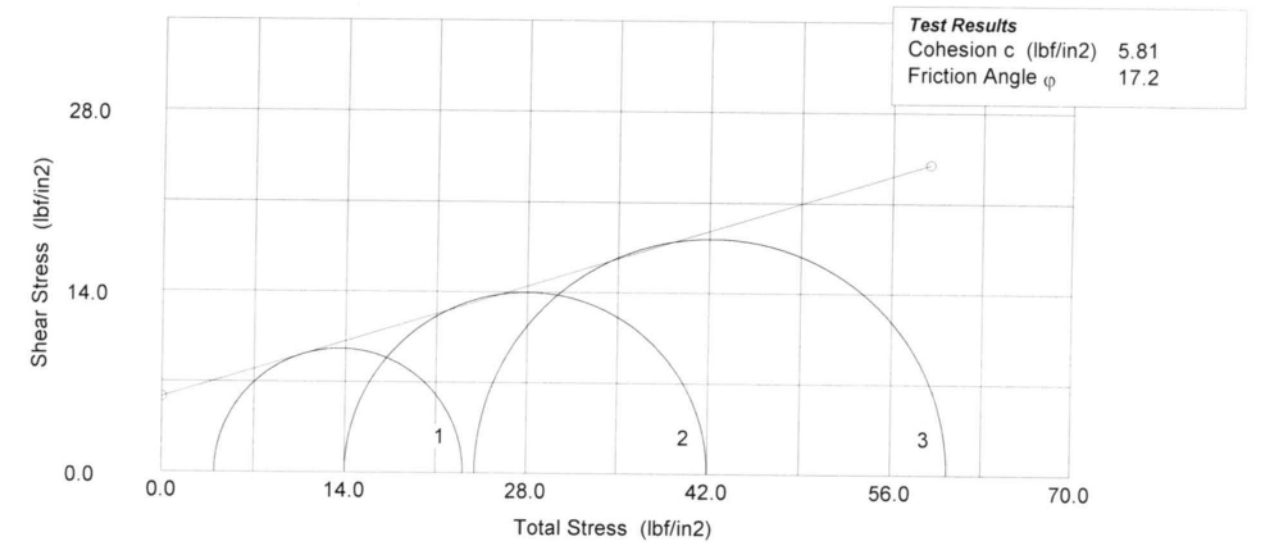
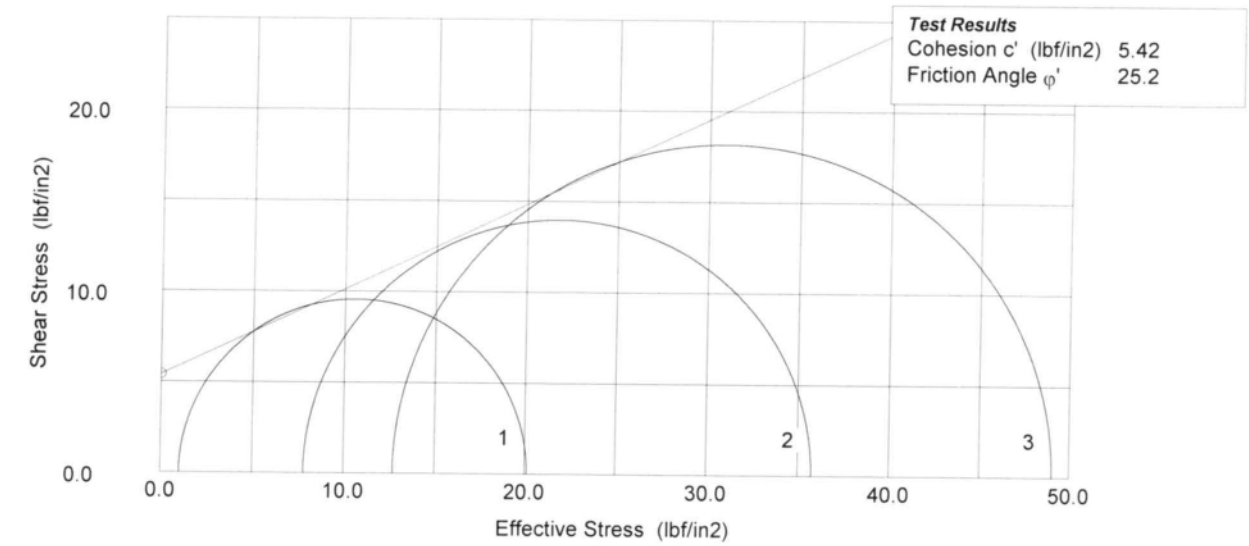
Consolidated Undrained



| | | |
|--------------------|-----------------------------|---------------------------------|
| | Test Method: ASTM D4767-95 | Test name: CU Triaxial (SS, MS) |
| | Site Reference: C.F. Harvey | Date of Test: 12-3-16 |
| | Jobfile: E:\16010.JOB | Sample: ST-12 |
| | Operator: <i>ML</i> | Borehole: B1-A LT LN |
| Checked: <i>ML</i> | Approved: | |

Effective Stress Triaxial Compression

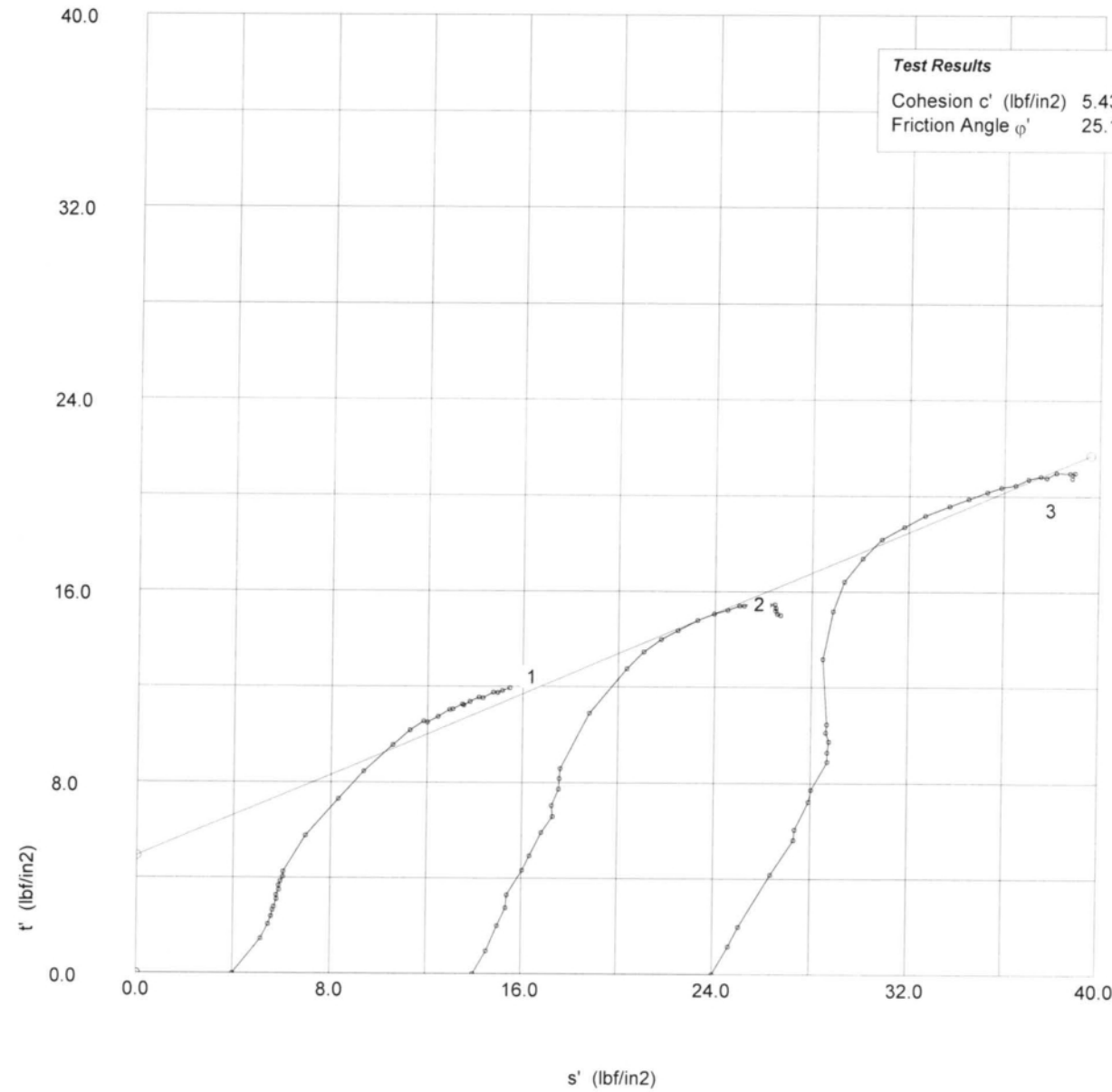
Consolidated Undrained



| | | |
|--------------------|-----------------------------|---------------------------------|
| | Test Method: ASTM D4767-95 | Test name: CU Triaxial (SS, MS) |
| | Site Reference: C.F. Harvey | Date of Test: 12-3-16 |
| | Jobfile: E:\16010.JOB | Sample: ST-12 |
| | Operator: <i>ML</i> | Borehole: B1-A LT LN |
| Checked: <i>ML</i> | Approved: | |

Effective Stress Triaxial Compression

Consolidated Undrained



Test Results
 Cohesion c' (lbf/in²) 5.43
 Friction Angle ϕ' 25.1

Effective Stress Triaxial Compression

Consolidated Undrained Shear (Specimen 1)

| No. | Strain (divs) | Strain $\epsilon\%$ | Load (divs) | Load (lbs) | Pore Prs (divs) | Pore Prs (lbf/in ²) | D. Stress $(\sigma_1 - \sigma_3)_m$ (lbf/in ²) | D. Stress $(\sigma_1 - \sigma_3)_c$ (lbf/in ²) | Minor Str σ_3' (lbf/in ²) | Major Str σ_1' (lbf/in ²) | Ratio σ_1'/σ_3' |
|-----|---------------|---------------------|-------------|------------|-----------------|---------------------------------|--|--|--|--|-----------------------------|
| 1 | 12 | 0.00 | 647 | 0.0 | 0 | 0.0 | 0.0 | 0.0 | 4.00 | 4.00 | 1.00 |
| 2 | 61 | 0.08 | 833 | 18.6 | 3 | 0.3 | 2.9 | 2.9 | 3.70 | 6.60 | 1.78 |
| 3 | 117 | 0.18 | 911 | 26.4 | 6 | 0.6 | 4.1 | 4.1 | 3.40 | 7.51 | 2.21 |
| 4 | 174 | 0.27 | 953 | 30.6 | 8 | 0.8 | 4.8 | 4.8 | 3.20 | 7.96 | 2.49 |
| 5 | 229 | 0.37 | 986 | 33.9 | 10 | 1.0 | 5.3 | 5.3 | 3.00 | 8.27 | 2.76 |
| 6 | 284 | 0.46 | 1006 | 35.9 | 11 | 1.1 | 5.6 | 5.6 | 2.90 | 8.48 | 2.92 |
| 7 | 342 | 0.56 | 1056 | 40.9 | 13 | 1.3 | 6.3 | 6.2 | 2.70 | 8.89 | 3.29 |
| 8 | 396 | 0.65 | 1081 | 43.4 | 15 | 1.5 | 6.7 | 6.6 | 2.50 | 9.07 | 3.63 |
| 9 | 450 | 0.74 | 1108 | 46.1 | 16 | 1.6 | 7.1 | 7.0 | 2.40 | 9.38 | 3.91 |
| 10 | 509 | 0.84 | 1133 | 48.6 | 18 | 1.8 | 7.5 | 7.4 | 2.20 | 9.56 | 4.35 |
| 11 | 563 | 0.93 | 1156 | 50.9 | 19 | 1.9 | 7.9 | 7.7 | 2.10 | 9.81 | 4.67 |
| 12 | 617 | 1.02 | 1181 | 53.4 | 20 | 2.0 | 8.2 | 8.1 | 2.00 | 10.09 | 5.04 |
| 13 | 677 | 1.13 | 1209 | 56.2 | 22 | 2.2 | 8.7 | 8.5 | 1.80 | 10.31 | 5.73 |
| 14 | 1181 | 1.98 | 1420 | 77.3 | 28 | 2.8 | 11.8 | 11.5 | 1.20 | 12.75 | 10.62 |
| 15 | 1797 | 3.02 | 1637 | 99.0 | 30 | 3.0 | 15.0 | 14.6 | 1.00 | 15.62 | 15.62 |
| 16 | 2360 | 3.97 | 1807 | 116.0 | 31 | 3.1 | 17.4 | 16.9 | 0.90 | 17.81 | 19.78 |
| 17 | 2983 | 5.03 | 1975 | 132.8 | 30 | 3.0 | 19.7 | 19.1 | 1.00 | 20.12 | 20.12 |
| 18 | 3550 | 5.99 | 2077 | 143.0 | 29 | 2.9 | 21.0 | 20.3 | 1.10 | 21.44 | 19.49 |
| 19 | 4150 | 7.01 | 2150 | 150.3 | 27 | 2.7 | 21.8 | 21.1 | 1.30 | 22.40 | 17.23 |
| 20 | 4756 | 8.03 | 2166 | 151.9 | 25 | 2.5 | 21.8 | 21.0 | 1.50 | 22.51 | 15.00 |
| 21 | 5352 | 9.04 | 2223 | 157.6 | 23 | 2.3 | 22.4 | 21.5 | 1.70 | 23.20 | 13.64 |
| 22 | 5940 | 10.04 | 2287 | 164.0 | 21 | 2.1 | 23.0 | 22.1 | 1.90 | 23.97 | 12.62 |
| 23 | 6518 | 11.01 | 2315 | 166.8 | 20 | 2.0 | 23.2 | 22.1 | 2.00 | 24.13 | 12.06 |
| 24 | 7106 | 12.01 | 2369 | 172.2 | 18 | 1.8 | 23.6 | 22.5 | 2.20 | 24.73 | 11.24 |
| 25 | 7695 | 13.01 | 2388 | 174.1 | 17 | 1.7 | 23.6 | 22.5 | 2.30 | 24.76 | 10.76 |
| 26 | 8286 | 14.01 | 2436 | 178.9 | 16 | 1.6 | 24.0 | 22.8 | 2.40 | 25.15 | 10.48 |
| 27 | 8876 | 15.01 | 2489 | 184.2 | 14 | 1.4 | 24.4 | 23.1 | 2.60 | 25.72 | 9.89 |
| 28 | 9466 | 16.00 | 2511 | 186.4 | 12 | 1.2 | 24.4 | 23.1 | 2.80 | 25.86 | 9.23 |
| 29 | 10056 | 17.00 | 2574 | 192.7 | 10 | 1.0 | 25.0 | 23.5 | 3.00 | 26.51 | 8.84 |
| 30 | 10649 | 18.01 | 2601 | 195.4 | 8 | 0.8 | 25.0 | 23.5 | 3.20 | 26.69 | 8.34 |
| 31 | 11245 | 19.02 | 2643 | 199.6 | 7 | 0.7 | 25.2 | 23.7 | 3.30 | 26.97 | 8.17 |
| 32 | 11846 | 20.03 | 2689 | 204.2 | 5 | 0.5 | 25.5 | 23.9 | 3.50 | 27.39 | 7.83 |



Test Method: ASTM D4767-95

Test name CU Triaxial (SS, MS)

Date of Test: 12-3-16

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

Sample: ST-12
 Borehole: B1-A LT LN

Operator: *mk*

Checked: *mk*

Approved:



Test Method: ASTM D4767-95

Test name CU Triaxial (SS, MS) Shear (Specimen 1)

Date of Test: 12-3-16

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

Sample: ST-12
 Borehole: B1-A LT LN

Operator: *mk*

Checked: *mk*

Approved:

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 (σ ₁ - σ ₃) _m (lbf/in2) | D. Stress (σ ₁ - σ ₃) _c (lbf/in2) | Minor Str σ ₃ ' (lbf/in2) | Major Str σ ₁ ' (lbf/in2) | Ratio σ ₁ '/σ ₃ ' |
|-----|---------------|-----------|-------------|------------|-----------------|--------------------|---|---|--------------------------------------|--------------------------------------|---|
| 1 | 33 | 0.00 | 686 | 0.0 | 0 | 0.0 | 0.0 | 0.0 | 14.00 | 14.00 | 1.00 |
| 2 | 80 | 0.08 | 808 | 12.2 | 4 | 0.4 | 1.9 | 1.9 | 13.60 | 15.52 | 1.14 |
| 3 | 137 | 0.18 | 942 | 25.6 | 10 | 1.0 | 4.0 | 4.0 | 13.00 | 17.02 | 1.31 |
| 4 | 190 | 0.27 | 1038 | 35.2 | 14 | 1.4 | 5.5 | 5.5 | 12.60 | 18.12 | 1.44 |
| 5 | 241 | 0.35 | 1108 | 42.2 | 19 | 1.9 | 6.6 | 6.6 | 12.10 | 18.71 | 1.55 |
| 6 | 297 | 0.45 | 1239 | 55.3 | 23 | 2.3 | 8.7 | 8.7 | 11.70 | 20.36 | 1.74 |
| 7 | 352 | 0.54 | 1328 | 64.2 | 26 | 2.6 | 10.0 | 9.9 | 11.40 | 21.28 | 1.87 |
| 8 | 404 | 0.63 | 1453 | 76.7 | 31 | 3.1 | 12.0 | 11.8 | 10.90 | 22.72 | 2.08 |
| 9 | 462 | 0.73 | 1540 | 85.4 | 33 | 3.3 | 13.3 | 13.2 | 10.70 | 23.87 | 2.23 |
| 10 | 515 | 0.82 | 1600 | 91.4 | 38 | 3.8 | 14.3 | 14.1 | 10.20 | 24.29 | 2.38 |
| 11 | 569 | 0.91 | 1688 | 100.2 | 42 | 4.2 | 15.6 | 15.5 | 9.80 | 25.25 | 2.58 |
| 12 | 627 | 1.00 | 1745 | 105.9 | 46 | 4.6 | 16.5 | 16.3 | 9.40 | 25.72 | 2.74 |
| 13 | 681 | 1.10 | 1801 | 111.5 | 50 | 5.0 | 17.3 | 17.2 | 9.00 | 26.18 | 2.91 |
| 14 | 1188 | 1.95 | 2118 | 143.2 | 61 | 6.1 | 22.1 | 21.8 | 7.90 | 29.70 | 3.76 |
| 15 | 1811 | 3.01 | 2384 | 169.8 | 64 | 6.4 | 25.9 | 25.5 | 7.60 | 33.14 | 4.36 |
| 16 | 2377 | 3.96 | 2501 | 181.5 | 64 | 6.4 | 27.4 | 26.9 | 7.60 | 34.53 | 4.54 |
| 17 | 3004 | 5.02 | 2596 | 191.0 | 62 | 6.2 | 28.5 | 28.0 | 7.80 | 35.76 | 4.59 |
| 18 | 3572 | 5.98 | 2673 | 198.7 | 59 | 5.9 | 29.4 | 28.7 | 8.10 | 36.83 | 4.55 |
| 19 | 4180 | 7.01 | 2757 | 207.1 | 55 | 5.5 | 30.3 | 29.6 | 8.50 | 38.06 | 4.48 |
| 20 | 4768 | 8.01 | 2824 | 213.8 | 51 | 5.1 | 30.9 | 30.1 | 8.90 | 39.03 | 4.39 |
| 21 | 5336 | 8.97 | 2874 | 218.8 | 47 | 4.7 | 31.3 | 30.4 | 9.30 | 39.74 | 4.27 |
| 22 | 5966 | 10.03 | 2932 | 224.6 | 44 | 4.4 | 31.8 | 30.8 | 9.60 | 40.41 | 4.21 |
| 23 | 6535 | 10.99 | 2962 | 227.6 | 42 | 4.2 | 31.8 | 30.8 | 9.80 | 40.62 | 4.14 |
| 24 | 7109 | 11.96 | 3010 | 232.4 | 40 | 4.0 | 32.2 | 31.1 | 10.00 | 41.05 | 4.11 |
| 25 | 7734 | 13.02 | 3040 | 235.4 | 38 | 3.8 | 32.2 | 31.0 | 10.20 | 41.21 | 4.04 |
| 26 | 8308 | 13.99 | 3068 | 238.2 | 35 | 3.5 | 32.2 | 31.0 | 10.50 | 41.45 | 3.95 |
| 27 | 8878 | 14.96 | 3093 | 240.7 | 32 | 3.2 | 32.2 | 30.9 | 10.80 | 41.67 | 3.86 |
| 28 | 9507 | 16.02 | 3132 | 244.6 | 30 | 3.0 | 32.3 | 30.9 | 11.00 | 41.92 | 3.81 |
| 29 | 10079 | 16.99 | 3143 | 245.7 | 28 | 2.8 | 32.1 | 30.6 | 11.20 | 41.82 | 3.73 |
| 30 | 10648 | 17.95 | 3160 | 247.4 | 27 | 2.7 | 31.9 | 30.4 | 11.30 | 41.70 | 3.69 |
| 31 | 11263 | 18.99 | 3174 | 248.8 | 25 | 2.5 | 31.7 | 30.1 | 11.50 | 41.64 | 3.62 |
| 32 | 11848 | 19.98 | 3198 | 251.2 | 23 | 2.3 | 31.6 | 30.0 | 11.70 | 41.71 | 3.57 |

| | | |
|--|-----------------------------|--|
| | Test Method: ASTM D4767-95 | Test name: CU Triaxial (SS, MS) Shear (Specimen 2) |
| | Site Reference: C.F. Harvey | Date of Test: 12-3-16 |
| | Jobfile: E:\16010.JOB | Sample: ST-12 |
| | Operator: <i>MLC</i> | Borehole: B1-A LT LN |
| | Checked: <i>MLC</i> | Approved: |

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 (σ ₁ - σ ₃) _m (lbf/in2) | D. Stress (σ ₁ - σ ₃) _c (lbf/in2) | Minor Str σ ₃ ' (lbf/in2) | Major Str σ ₁ ' (lbf/in2) | Ratio σ ₁ '/σ ₃ ' |
|-----|---------------|-----------|-------------|------------|-----------------|--------------------|---|---|--------------------------------------|--------------------------------------|---|
| 1 | 47 | 0.00 | 717 | 0.0 | 0 | 0.0 | 0.0 | 0.0 | 24.00 | 24.00 | 1.00 |
| 2 | 102 | 0.10 | 864 | 14.7 | 5 | 0.5 | 2.3 | 2.3 | 23.50 | 25.83 | 1.10 |
| 3 | 156 | 0.19 | 967 | 25.0 | 9 | 0.9 | 4.0 | 4.0 | 23.10 | 27.06 | 1.17 |
| 4 | 208 | 0.28 | 1245 | 52.8 | 18 | 1.8 | 8.4 | 8.4 | 22.20 | 30.56 | 1.38 |
| 5 | 267 | 0.38 | 1428 | 71.1 | 23 | 2.3 | 11.2 | 11.2 | 21.70 | 32.94 | 1.52 |
| 6 | 320 | 0.47 | 1484 | 76.7 | 27 | 2.7 | 12.1 | 12.1 | 21.30 | 33.42 | 1.57 |
| 7 | 375 | 0.57 | 1642 | 92.5 | 33 | 3.3 | 14.6 | 14.4 | 20.70 | 35.14 | 1.70 |
| 8 | 434 | 0.67 | 1706 | 98.9 | 37 | 3.7 | 15.6 | 15.4 | 20.30 | 35.73 | 1.76 |
| 9 | 487 | 0.76 | 1856 | 113.9 | 42 | 4.2 | 17.9 | 17.8 | 19.80 | 37.58 | 1.90 |
| 10 | 543 | 0.86 | 1906 | 118.9 | 46 | 4.6 | 18.7 | 18.6 | 19.40 | 37.95 | 1.96 |
| 11 | 601 | 0.96 | 1967 | 125.0 | 50 | 5.0 | 19.7 | 19.5 | 19.00 | 38.49 | 2.03 |
| 12 | 655 | 1.05 | 2015 | 129.8 | 55 | 5.5 | 20.4 | 20.2 | 18.50 | 38.73 | 2.09 |
| 13 | 711 | 1.15 | 2059 | 134.2 | 58 | 5.8 | 21.1 | 20.9 | 18.20 | 39.10 | 2.15 |
| 14 | 1218 | 2.03 | 2429 | 171.2 | 87 | 8.7 | 26.6 | 26.3 | 15.30 | 41.64 | 2.72 |
| 15 | 1787 | 3.02 | 2712 | 199.5 | 103 | 10.3 | 30.7 | 30.4 | 13.70 | 44.05 | 3.22 |
| 16 | 2354 | 4.00 | 2904 | 218.7 | 111 | 11.1 | 33.3 | 32.8 | 12.90 | 45.75 | 3.55 |
| 17 | 2921 | 4.98 | 3060 | 234.3 | 113 | 11.3 | 35.3 | 34.8 | 12.70 | 47.48 | 3.74 |
| 18 | 3496 | 5.98 | 3196 | 247.9 | 113 | 11.3 | 37.0 | 36.4 | 12.70 | 49.06 | 3.86 |
| 19 | 4065 | 6.97 | 3299 | 258.2 | 109 | 10.9 | 38.1 | 37.4 | 13.10 | 50.51 | 3.86 |
| 20 | 4636 | 7.96 | 3396 | 267.9 | 105 | 10.5 | 39.1 | 38.3 | 13.50 | 51.85 | 3.84 |
| 21 | 5263 | 9.04 | 3490 | 277.3 | 99 | 9.9 | 40.0 | 39.2 | 14.10 | 53.26 | 3.78 |
| 22 | 5833 | 10.03 | 3568 | 285.1 | 94 | 9.4 | 40.7 | 39.8 | 14.60 | 54.36 | 3.72 |
| 23 | 6407 | 11.03 | 3646 | 292.9 | 89 | 8.9 | 41.4 | 40.3 | 15.10 | 55.43 | 3.67 |
| 24 | 6976 | 12.01 | 3713 | 299.6 | 85 | 8.5 | 41.8 | 40.7 | 15.50 | 56.23 | 3.63 |
| 25 | 7544 | 13.00 | 3766 | 304.9 | 80 | 8.0 | 42.1 | 40.9 | 16.00 | 56.93 | 3.56 |
| 26 | 8119 | 13.99 | 3843 | 312.6 | 77 | 7.7 | 42.7 | 41.4 | 16.30 | 57.72 | 3.54 |
| 27 | 8688 | 14.98 | 3902 | 318.5 | 73 | 7.3 | 43.0 | 41.7 | 16.70 | 58.37 | 3.50 |
| 28 | 9258 | 15.97 | 3936 | 321.9 | 70 | 7.0 | 42.9 | 41.6 | 17.00 | 58.56 | 3.44 |
| 29 | 9831 | 16.96 | 4013 | 329.6 | 68 | 6.8 | 43.4 | 42.0 | 17.20 | 59.20 | 3.44 |
| 30 | 10454 | 18.04 | 4057 | 334.0 | 62 | 6.2 | 43.5 | 41.9 | 17.80 | 59.74 | 3.36 |
| 31 | 11023 | 19.03 | 4102 | 338.5 | 60 | 6.0 | 43.5 | 42.0 | 18.00 | 59.95 | 3.33 |
| 32 | 11598 | 20.02 | 4113 | 339.6 | 59 | 5.9 | 43.1 | 41.5 | 18.10 | 59.62 | 3.29 |

| | | |
|--|-----------------------------|--|
| | Test Method: ASTM D4767-95 | Test name: CU Triaxial (SS, MS) Shear (Specimen 3) |
| | Site Reference: C.F. Harvey | Date of Test: 12-3-16 |
| | Jobfile: E:\16010.JOB | Sample: ST-12 |
| | Operator: <i>MLC</i> | Borehole: B1-A LT LN |
| | Checked: <i>MLC</i> | Approved: |

Oedometer Settlement Tests

Sample details

Sketch showing specimen location in original Sample



Depth: 5.0 - 7.0 ft.
Description: Gray Coarse to Fine Sandy Silty CLAY (A-6) (8)

Type: Undisturbed
Height H_0 (in): 0.995
Diameter D_0 (in): 2.501
Weight W_0 (gr): 162.05
Bulk Density ρ (PCF): 126.29
Particle Density ρ_s : 2.669 (measured)

Initial Conditions

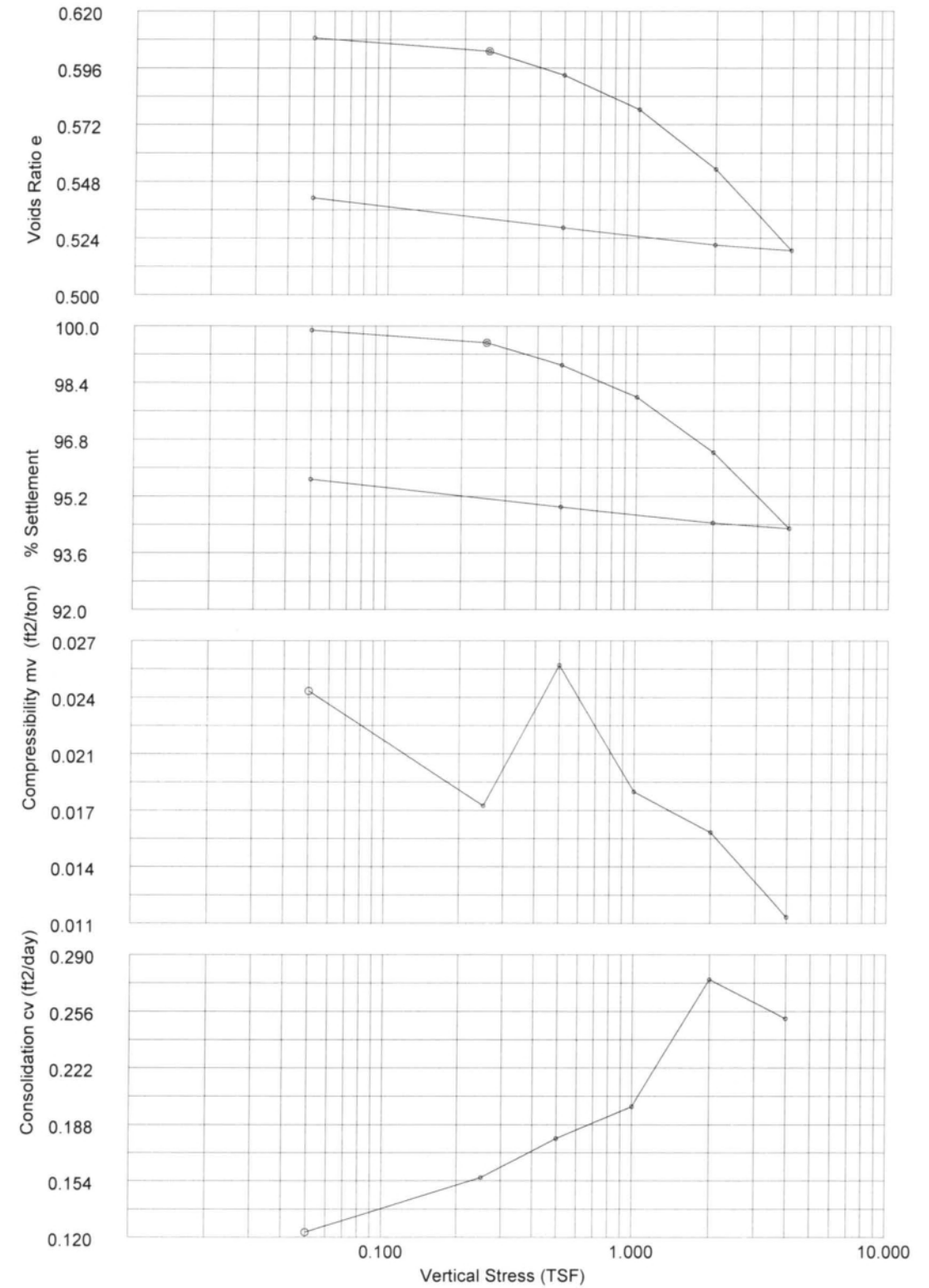
Settlement Channel: 1065
Moisture Content w_0 %: 22.1
Dry Density ρ_d (PCF): 103.40
Voids Ratio e_0 : 0.6107
Deg of Saturation S_0 %: 96.8
Swelling Pressure S_s (TSF): 0.000

Final Conditions

Moisture Content w_f %: 20.5
Dry Density ρ_d (PCF): 108.07
Voids Ratio e_f : 0.5411
Deg of Saturation S_f %: 100.00
Settlement: (in): 0.043
Compression Index C_c : 0.120

Notes: Test specimen taken from the middle portion of UD tube.

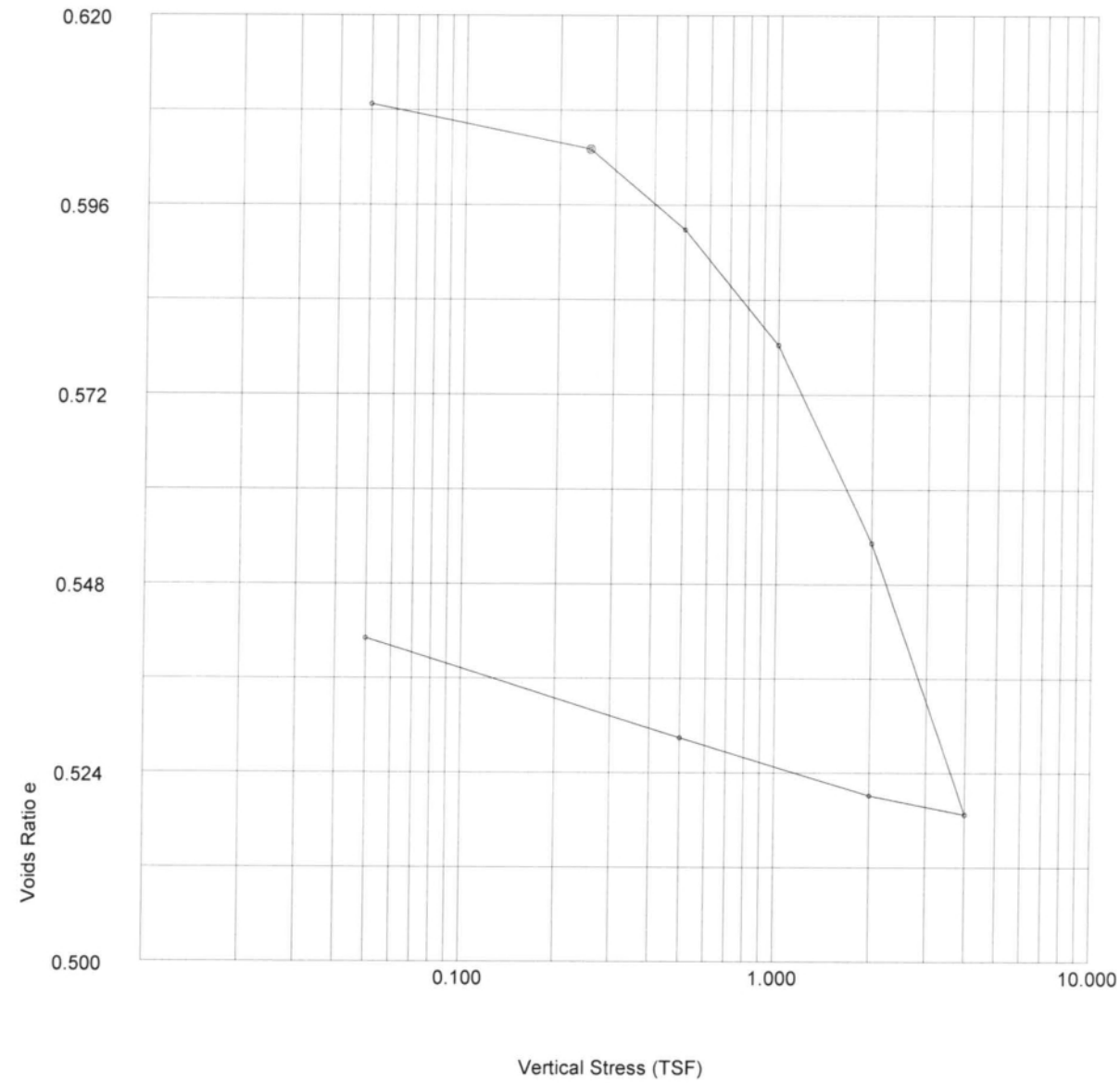
Oedometer Settlement Tests



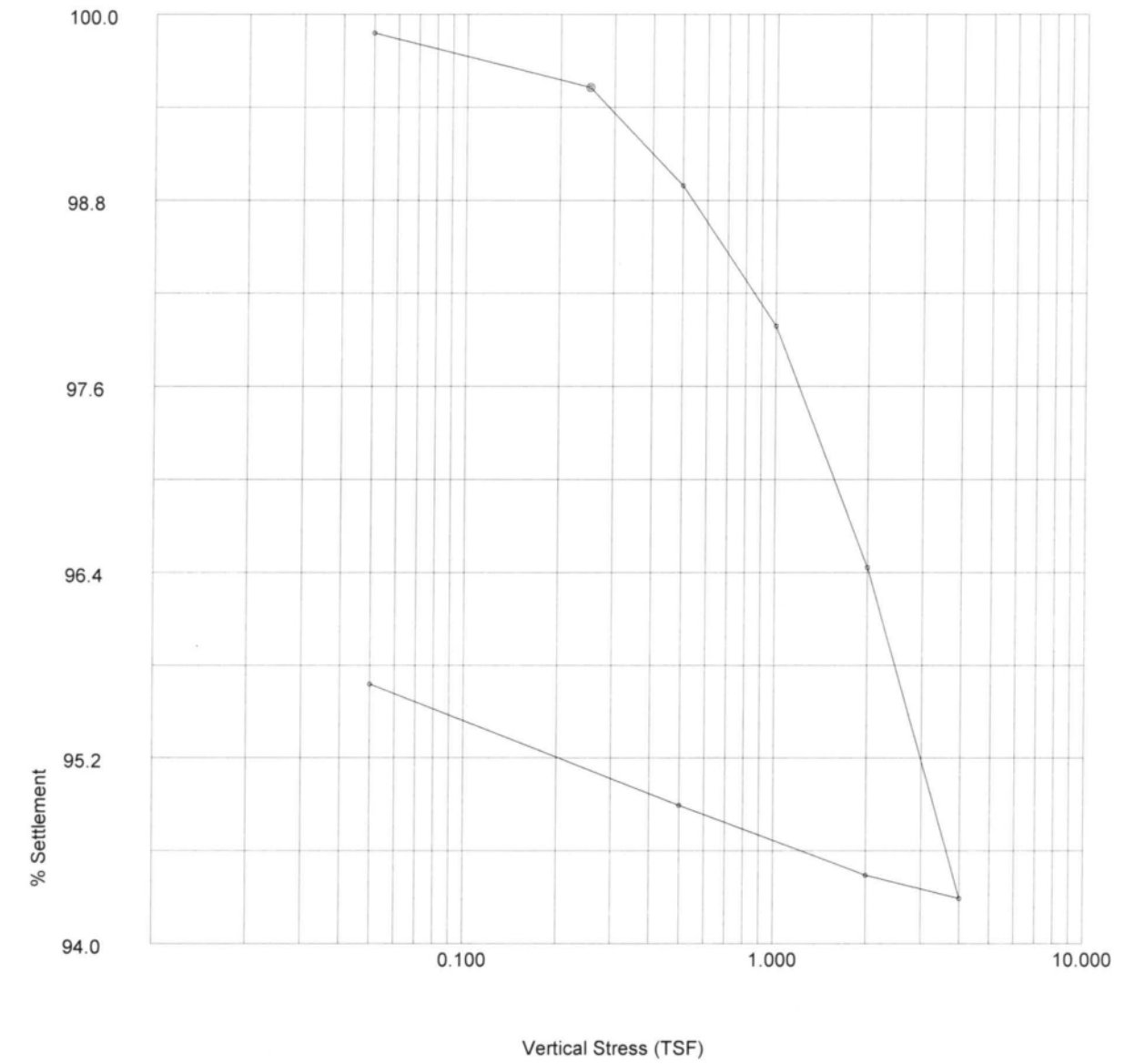
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|--------------------|-----------------------------|--------------------------|
| | ASTM D2435-96 | Test name: Consolidation |
| | Site Reference: C.F. Harvey | Date of Test: 12-3-16 |
| | Jobfile: E:\16010.JOB | Sample: ST-1 |
| | Operator: <i>mk</i> | Borehole: B1-A LT LN |
| Checked: <i>mk</i> | Approved: | |

| | | |
|--------------------|-----------------------------|--------------------------|
| | ASTM D2435-96 | Test name: Consolidation |
| | Site Reference: C.F. Harvey | Date of Test: 12-3-16 |
| | Jobfile: E:\16010.JOB | Sample: ST-1 |
| | Operator: <i>mk</i> | Borehole: B1-A LT LN |
| Checked: <i>mk</i> | Approved: | |

Oedometer Settlement Tests



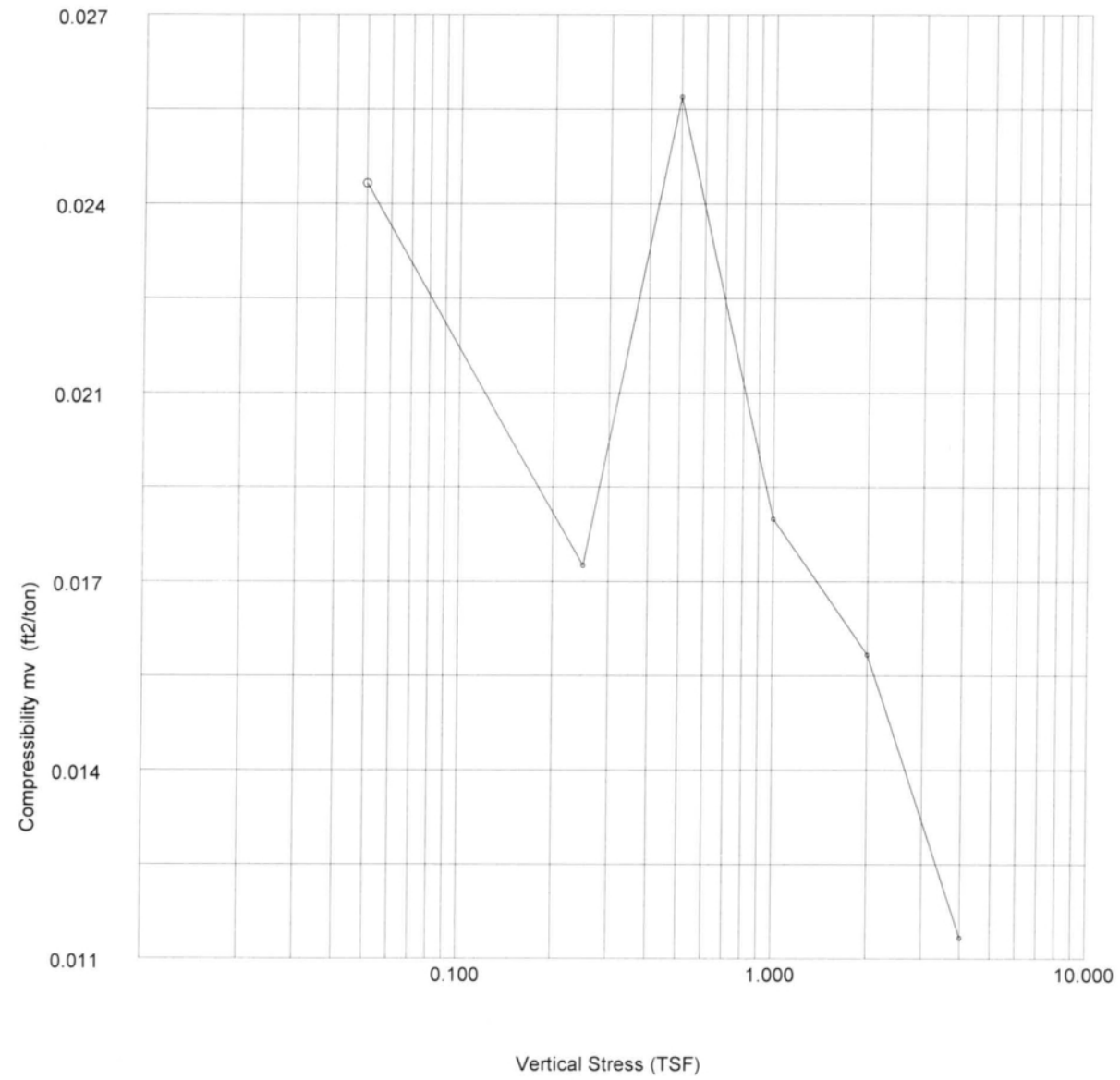
Oedometer Settlement Tests



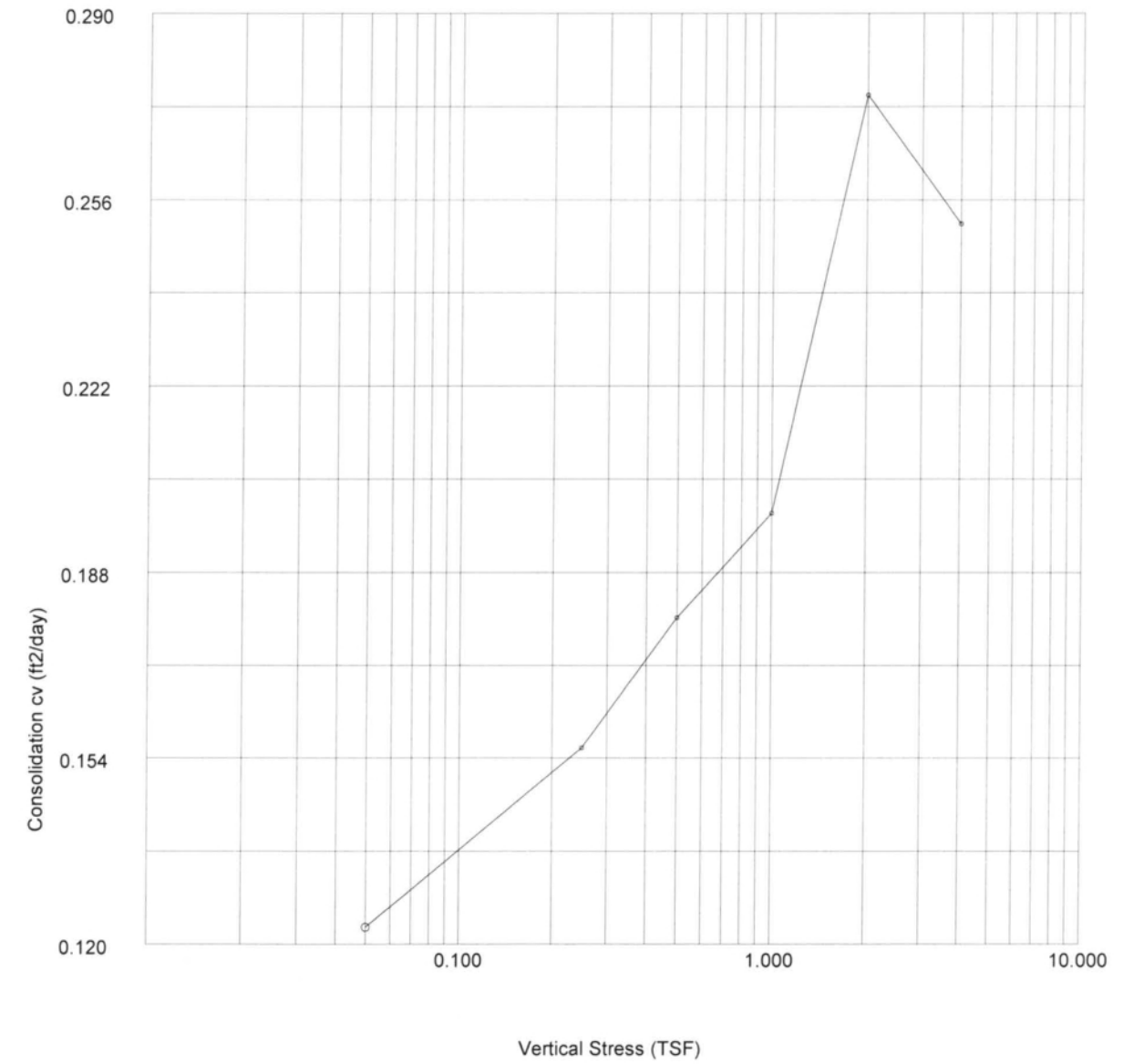
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|--|-----------------------------|-----------------|---------------|---------------|
| | ASTM D2435-96 | | Test name | Consolidation |
| | Site Reference: C.F. Harvey | | Date of Test: | 12-3-16 |
| | Jobfile: E:\16010.JOB | | Sample: | ST-1 |
| | Operator: <i>mlc</i> | | Borehole: | B1-A LT LN |
| | Checked: <i>mlc</i> | Approved: _____ | | |

| | | | | |
|--|-----------------------------|-----------------|---------------|---------------|
| | ASTM D2435-96 | | Test name | Consolidation |
| | Site Reference: C.F. Harvey | | Date of Test: | 12-3-16 |
| | Jobfile: E:\16010.JOB | | Sample: | ST-1 |
| | Operator: <i>mlc</i> | | Borehole: | B1-A LT LN |
| | Checked: <i>mlc</i> | Approved: _____ | | |

Oedometer Settlement Tests



Oedometer Settlement Tests



| | | |
|--|-----------------------------|--------------------------|
| | ASTM D2435-96 | Test name: Consolidation |
| | Site Reference: C.F. Harvey | Date of Test: 12-3-16 |
| | Jobfile: E:\16010.JOB | Sample: ST-1 |
| | Operator: <i>mlc</i> | Borehole: B1-A LT LN |
| | Checked: <i>mlc</i> | Approved: _____ |

| | | |
|--|-----------------------------|--------------------------|
| | ASTM D2435-96 | Test name: Consolidation |
| | Site Reference: C.F. Harvey | Date of Test: 12-3-16 |
| | Jobfile: E:\16010.JOB | Sample: ST-1 |
| | Operator: <i>mlc</i> | Borehole: B1-A LT LN |
| | Checked: <i>mlc</i> | 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 (ft ² /day) | m_v (ft ² /ton) |
|--------------|------------------|-----------------------|----------------|----------------|-------------------|-----------------|---------------------------|------------------------------|------------------------------|
| 0.050 | 21.6 | 0.0012 | 0.0 | 21.6 | 0.6087 | 4.017 | 0.0001 | 0.123 | 0.024 |
| 0.250 | 21.6 | 0.0047 | 0.0 | 21.6 | 0.6031 | 3.156 | 0.0003 | 0.156 | 0.018 |
| 0.500 | 21.6 | 0.0110 | 0.0 | 21.6 | 0.5929 | 2.711 | 0.0005 | 0.180 | 0.026 |
| 1.000 | 21.6 | 0.0200 | 0.0 | 21.6 | 0.5783 | 2.413 | 0.0025 | 0.199 | 0.018 |
| 2.000 | 21.6 | 0.0355 | 0.0 | 21.6 | 0.5532 | 1.701 | 0.0002 | 0.275 | 0.016 |
| 4.000 | 21.6 | 0.0568 | 0.0 | 21.6 | 0.5187 | 1.789 | 0.0008 | 0.252 | 0.011 |
| 2.000 | 21.6 | 0.0553 | 0.0 | 21.6 | 0.5212 | | | | 0.001 |
| 0.500 | 21.6 | 0.0508 | 0.0 | 21.6 | 0.5285 | | | | 0.003 |
| 0.050 | 21.6 | 0.0430 | 0.0 | 21.6 | 0.5411 | | | | 0.018 |

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 | 2 | 0.0002 | 0.0002 |
| 4 | 0.050 | 2 | 0.0002 | 0.0002 |
| 5 | 0.067 | 2 | 0.0002 | 0.0002 |
| 6 | 0.083 | 2 | 0.0002 | 0.0002 |
| 7 | 0.100 | 2 | 0.0002 | 0.0002 |
| 8 | 0.200 | 2 | 0.0002 | 0.0002 |
| 9 | 0.400 | 3 | 0.0003 | 0.0003 |
| 10 | 0.800 | 4 | 0.0004 | 0.0004 |
| 11 | 1.000 | 4 | 0.0004 | 0.0004 |
| 12 | 2.000 | 5 | 0.0005 | 0.0005 |
| 13 | 4.000 | 6 | 0.0006 | 0.0006 |
| 14 | 8.000 | 8 | 0.0008 | 0.0008 |
| 15 | 10.000 | 9 | 0.0009 | 0.0009 |
| 16 | 20.000 | 10 | 0.0010 | 0.0010 |
| 17 | 40.000 | 11 | 0.0011 | 0.0011 |
| 18 | 80.000 | 11 | 0.0011 | 0.0011 |
| 19 | 100.000 | 12 | 0.0012 | 0.0012 |
| 20 | 199.170 | 12 | 0.0012 | 0.0012 |

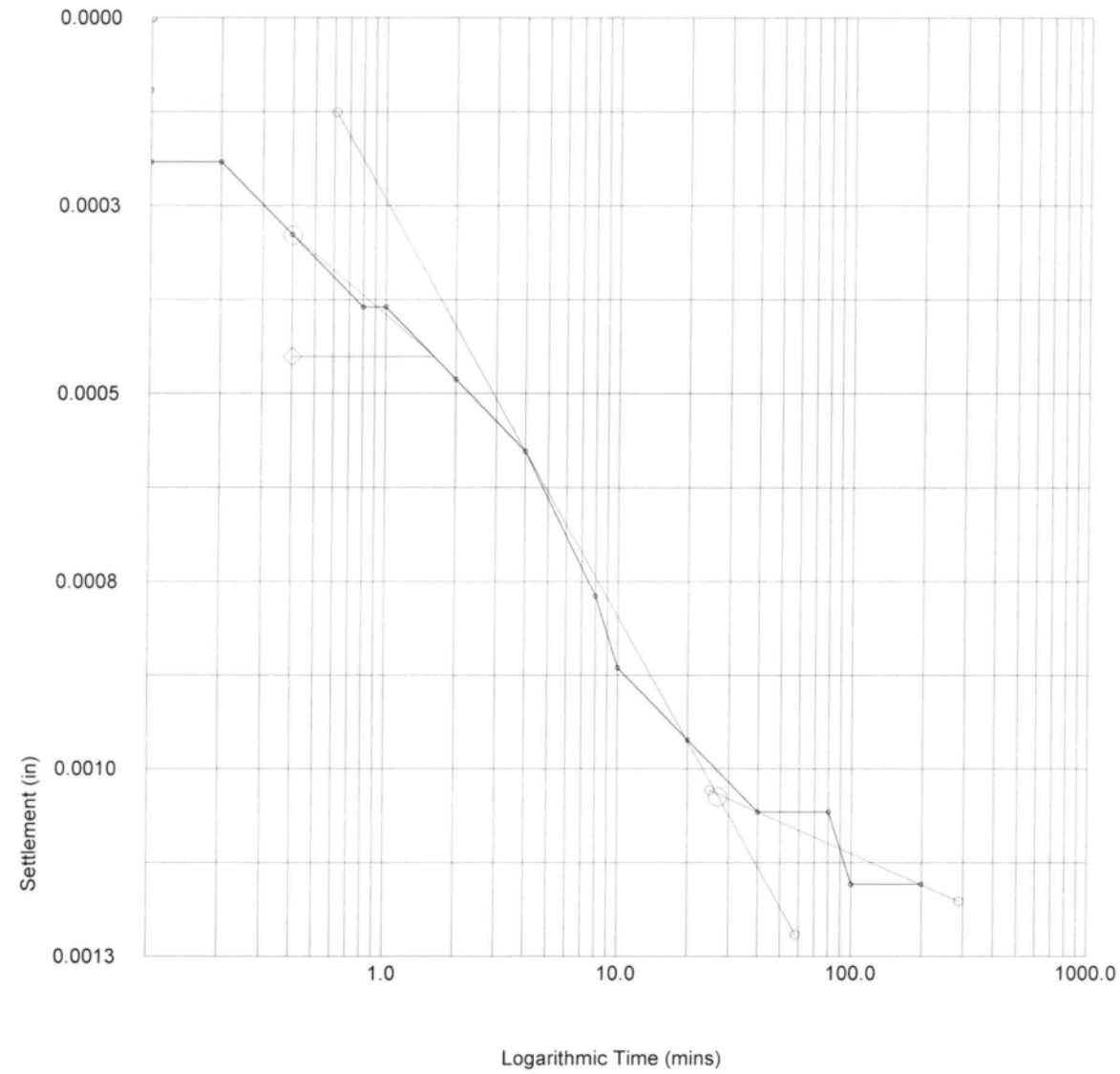
| | | | |
|----------------------|-----------------------------|---------------|---------------|
| | ASTM D2435-96 | Test name | Consolidation |
| | Site Reference: C.F. Harvey | Date of Test: | 12-3-16 |
| | Jobfile: E:\16010.JOB | Sample: | ST-1 |
| Operator: <i>mlc</i> | Checked: <i>mlc</i> | Borehole: | B1-A LT LN |
| | | Approved: | |

| | | | |
|----------------------|-----------------------------|---------------|---------------------------------|
| | ASTM D2435-96 | Test name | Consolidation Load: 0.050 (TSF) |
| | Site Reference: C.F. Harvey | Date of Test: | 12-3-16 |
| | Jobfile: E:\16010.JOB | Sample: | ST-1 |
| Operator: <i>mlc</i> | Checked: <i>mlc</i> | Borehole: | B1-A LT LN |
| | | Approved: | |

Oedometer Settlement Tests

Settlement Stage Results

| | |
|---------------------------------------|--------|
| Vertical Stress (TSF) | 0.050 |
| Initial Temp oC | 21.6 |
| Correction (in) | 0.0 |
| Settlement (in) | 0.0012 |
| Voids Ratio e | 0.6087 |
| Final Temp oC | 0.0 |
| t ₅₀ (mins) | 4.02 |
| c _v (ft ² /day) | 0.123 |
| m _v (ft ² /ton) | 0.024 |
| Sec Compression C _{sec} | 0.0001 |



Oedometer Settlement Tests

| No. | Time (mins) | Displacement (divs) | Displacement (in) | Settlement (in) |
|-----|-------------|---------------------|-------------------|-----------------|
| 1 | 0.000 | 12 | 0.0012 | 0.0012 |
| 2 | 0.017 | 13 | 0.0013 | 0.0013 |
| 3 | 0.033 | 13 | 0.0013 | 0.0013 |
| 4 | 0.050 | 20 | 0.0020 | 0.0020 |
| 5 | 0.067 | 20 | 0.0020 | 0.0020 |
| 6 | 0.083 | 21 | 0.0021 | 0.0021 |
| 7 | 0.100 | 21 | 0.0021 | 0.0021 |
| 8 | 0.200 | 23 | 0.0023 | 0.0023 |
| 9 | 0.400 | 25 | 0.0025 | 0.0025 |
| 10 | 0.800 | 26 | 0.0026 | 0.0026 |
| 11 | 1.000 | 27 | 0.0027 | 0.0027 |
| 12 | 2.000 | 30 | 0.0030 | 0.0030 |
| 13 | 4.000 | 34 | 0.0034 | 0.0034 |
| 14 | 8.000 | 38 | 0.0038 | 0.0038 |
| 15 | 10.000 | 40 | 0.0040 | 0.0040 |
| 16 | 20.000 | 43 | 0.0043 | 0.0043 |
| 17 | 40.000 | 46 | 0.0046 | 0.0046 |
| 18 | 80.000 | 47 | 0.0047 | 0.0047 |
| 19 | 99.930 | 47 | 0.0047 | 0.0047 |

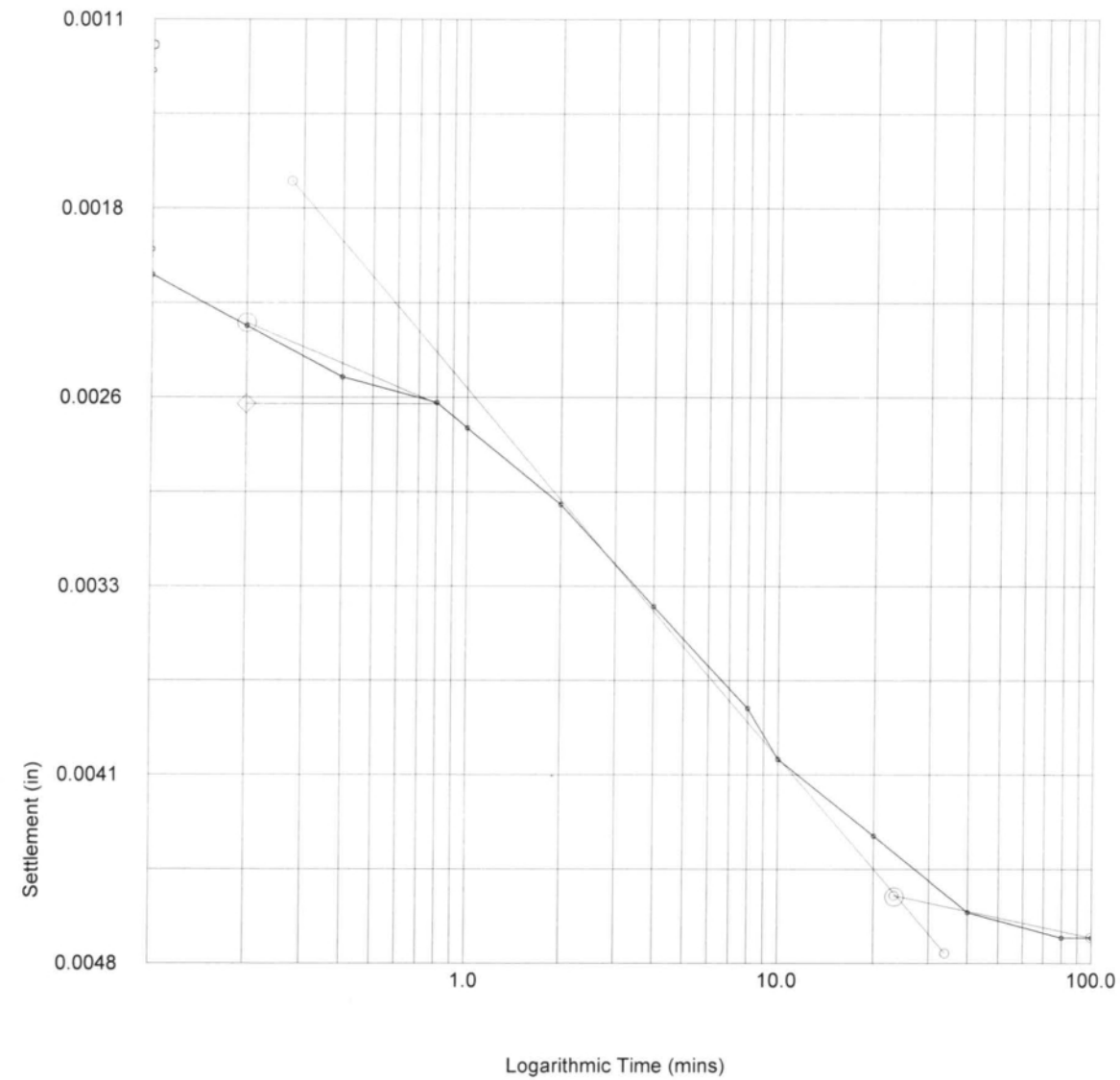
| | | |
|--|-----------------------------|--------------------------|
| | ASTM D2435-96 | Test name: Consolidation |
| | Site Reference: C.F. Harvey | Date of Test: 12-3-16 |
| | Jobfile: E:\16010.JOB | Sample: ST-1 |
| | Operator: <i>mlc</i> | Borehole: B1-A LT LN |
| | Checked: <i>mlc</i> | Approved: _____ |

| | | |
|--|-----------------------------|--|
| | ASTM D2435-96 | Test name: Consolidation Load: 0.250 (TSF) |
| | Site Reference: C.F. Harvey | Date of Test: 12-3-16 |
| | Jobfile: E:\16010.JOB | Sample: ST-1 |
| | Operator: <i>mlc</i> | Borehole: B1-A LT LN |
| | Checked: <i>mlc</i> | Approved: _____ |

Oedometer Settlement Tests

Settlement Stage Results

| | |
|---------------------------------------|--------|
| Vertical Stress (TSF) | 0.250 |
| Initial Temp oC | 21.6 |
| Correction (in) | 0.0 |
| Settlement (in) | 0.0035 |
| Voids Ratio e | 0.6031 |
| Final Temp oC | 0.0 |
| t ₅₀ (mins) | 3.16 |
| c _v (ft ² /day) | 0.156 |
| m _v (ft ² /ton) | 0.018 |
| Sec Compression C _{sec} | 0.0003 |



| | | | |
|--|-----------------------------|---------------|---------------|
| | ASTM D2435-96 | Test name | Consolidation |
| | Site Reference: C.F. Harvey | Date of Test: | 12-3-16 |
| | Jobfile: E:\16010.JOB | Sample: | ST-1 |
| | Operator: <i>mlc</i> | Borehole: | B1-A LT LN |
| | Checked: <i>mlc</i> | Approved: | |

Oedometer Settlement Tests

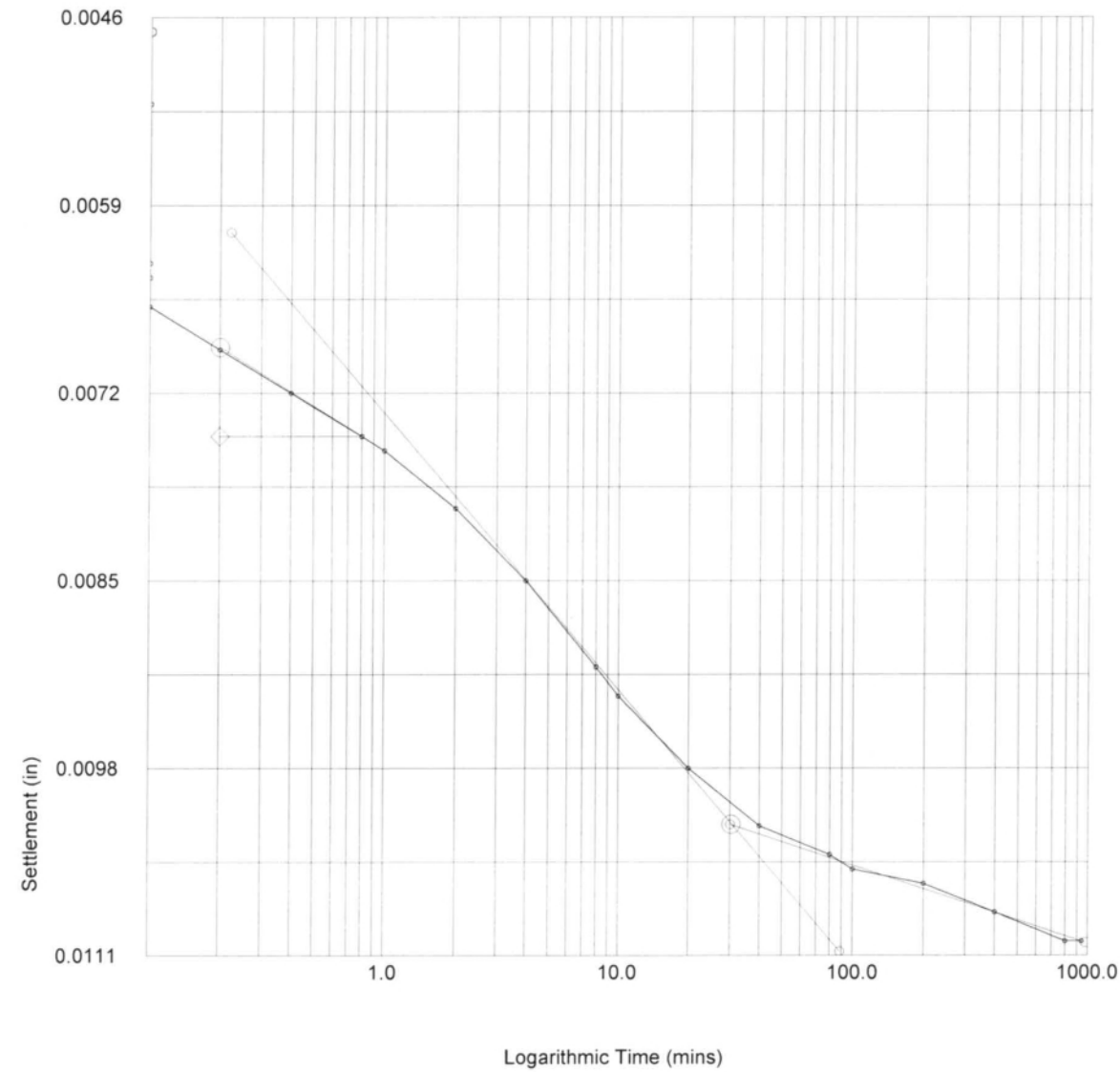
| No. | Time (mins) | Displacement (divs) | Displacement (in) | Settlement (in) |
|-----|-------------|---------------------|-------------------|-----------------|
| 1 | 0.000 | 47 | 0.0047 | 0.0047 |
| 2 | 0.017 | 52 | 0.0052 | 0.0052 |
| 3 | 0.033 | 52 | 0.0052 | 0.0052 |
| 4 | 0.050 | 63 | 0.0063 | 0.0063 |
| 5 | 0.067 | 64 | 0.0064 | 0.0064 |
| 6 | 0.083 | 66 | 0.0066 | 0.0066 |
| 7 | 0.100 | 66 | 0.0066 | 0.0066 |
| 8 | 0.200 | 69 | 0.0069 | 0.0069 |
| 9 | 0.400 | 72 | 0.0072 | 0.0072 |
| 10 | 0.800 | 75 | 0.0075 | 0.0075 |
| 11 | 1.000 | 76 | 0.0076 | 0.0076 |
| 12 | 2.000 | 80 | 0.0080 | 0.0080 |
| 13 | 4.000 | 85 | 0.0085 | 0.0085 |
| 14 | 8.000 | 91 | 0.0091 | 0.0091 |
| 15 | 10.000 | 93 | 0.0093 | 0.0093 |
| 16 | 20.000 | 98 | 0.0098 | 0.0098 |
| 17 | 40.000 | 102 | 0.0102 | 0.0102 |
| 18 | 80.000 | 104 | 0.0104 | 0.0104 |
| 19 | 100.000 | 105 | 0.0105 | 0.0105 |
| 20 | 200.000 | 106 | 0.0106 | 0.0106 |
| 21 | 400.000 | 108 | 0.0108 | 0.0108 |
| 22 | 800.000 | 110 | 0.0110 | 0.0110 |
| 23 | 942.950 | 110 | 0.0110 | 0.0110 |

| | | | |
|--|-----------------------------|---------------|---------------------------------|
| | ASTM D2435-96 | Test name | Consolidation Load: 0.500 (TSF) |
| | Site Reference: C.F. Harvey | Date of Test: | 12-3-16 |
| | Jobfile: E:\16010.JOB | Sample: | ST-1 |
| | Operator: <i>mlc</i> | Borehole: | B1-A LT LN |
| | Checked: <i>mlc</i> | Approved: | |

Oedometer Settlement Tests

Settlement Stage Results

| | |
|---------------------------------------|--------|
| Vertical Stress (TSF) | 0.500 |
| Initial Temp oC | 21.6 |
| Correction (in) | 0.0 |
| Settlement (in) | 0.0063 |
| Voids Ratio e | 0.5929 |
| Final Temp oC | 0.0 |
| t ₅₀ (mins) | 2.71 |
| c _v (ft ² /day) | 0.18 |
| m _v (ft ² /ton) | 0.026 |
| Sec Compression C _{sec} | 0.0005 |



Oedometer Settlement Tests

| No. | Time (mins) | Displacement (divs) | Displacement (in) | Settlement (in) |
|-----|-------------|---------------------|-------------------|-----------------|
| 1 | 0.000 | 110 | 0.0110 | 0.0110 |
| 2 | 0.017 | 118 | 0.0118 | 0.0118 |
| 3 | 0.033 | 138 | 0.0138 | 0.0138 |
| 4 | 0.050 | 141 | 0.0141 | 0.0141 |
| 5 | 0.067 | 142 | 0.0142 | 0.0142 |
| 6 | 0.083 | 144 | 0.0144 | 0.0144 |
| 7 | 0.100 | 145 | 0.0145 | 0.0145 |
| 8 | 0.200 | 149 | 0.0149 | 0.0149 |
| 9 | 0.400 | 153 | 0.0153 | 0.0153 |
| 10 | 0.800 | 158 | 0.0158 | 0.0158 |
| 11 | 1.000 | 160 | 0.0160 | 0.0160 |
| 12 | 2.000 | 166 | 0.0166 | 0.0166 |
| 13 | 4.000 | 173 | 0.0173 | 0.0173 |
| 14 | 8.000 | 181 | 0.0181 | 0.0181 |
| 15 | 10.000 | 183 | 0.0183 | 0.0183 |
| 16 | 20.267 | 190 | 0.0190 | 0.0190 |
| 17 | 40.267 | 194 | 0.0194 | 0.0194 |
| 18 | 80.267 | 197 | 0.0197 | 0.0197 |
| 19 | 100.267 | 198 | 0.0198 | 0.0198 |
| 20 | 200.267 | 200 | 0.0200 | 0.0200 |
| 21 | 250.117 | 200 | 0.0200 | 0.0200 |



ASTM D2435-96
 Site Reference: C.F. Harvey
 Jobfile: E:\16010.JOB
 Operator: *mk*

Test name: Consolidation
 Date of Test: 12-3-16
 Sample: ST-1
 Borehole: B1-A LT LN
 Checked: *mk* Approved: _____



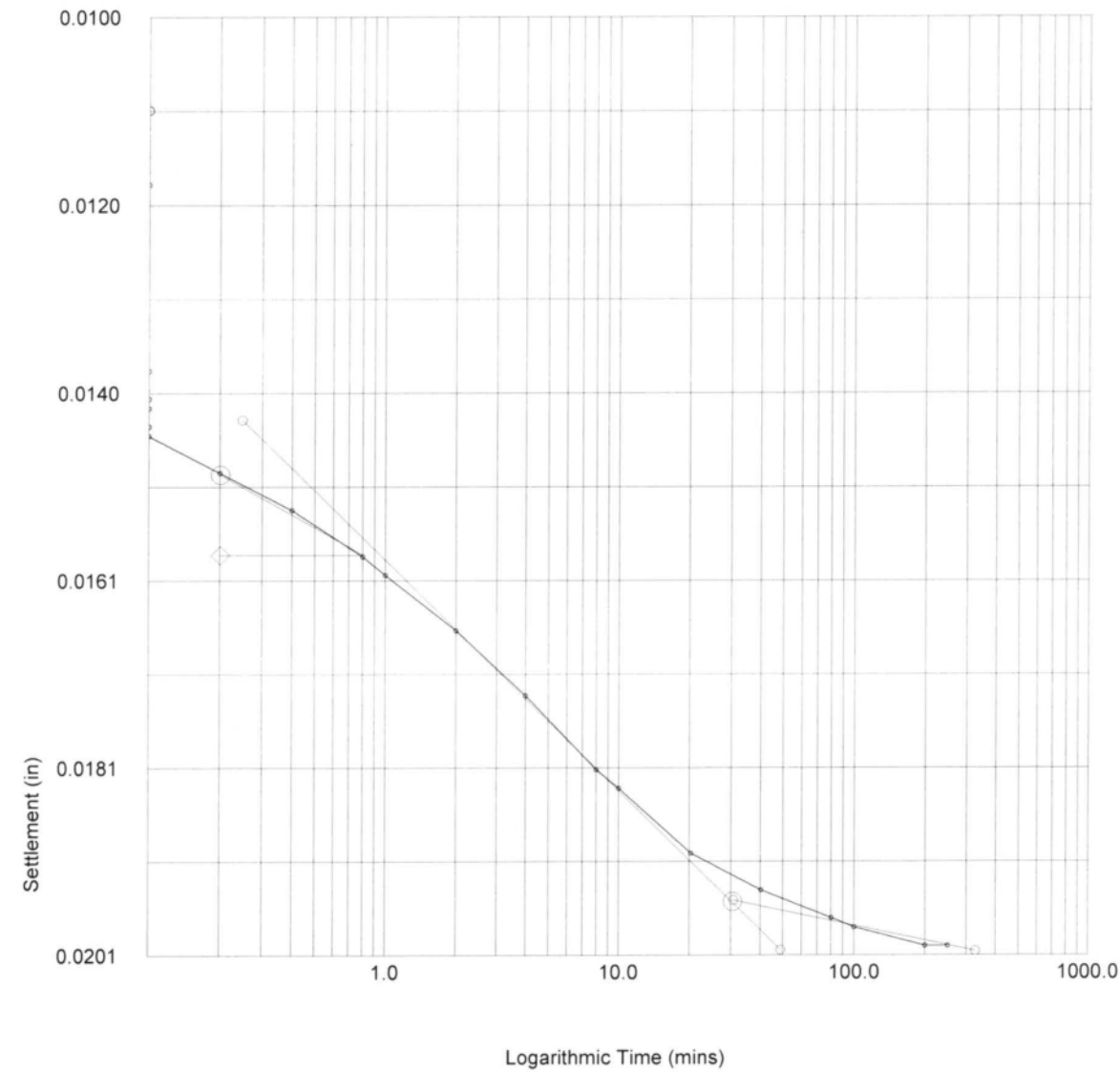
ASTM D2435-96
 Site Reference: C.F. Harvey
 Jobfile: E:\16010.JOB
 Operator: *mk*

Test name: Consolidation Load: 1.000 (TSF)
 Date of Test: 12-3-16
 Sample: ST-1
 Borehole: B1-A LT LN
 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) | 0.009 |
| Voids Ratio e | 0.5783 |
| Final Temp oC | 0.0 |
| t ₅₀ (mins) | 2.41 |
| c _v (ft ² /day) | 0.199 |
| m _v (ft ² /ton) | 0.018 |
| Sec Compression C _{sec} | 0.0025 |



Oedometer Settlement Tests

| No. | Time (mins) | Displacement (divs) | Displacement (in) | Settlement (in) |
|-----|-------------|---------------------|-------------------|-----------------|
| 1 | 0.000 | 200 | 0.0200 | 0.0200 |
| 2 | 0.017 | 201 | 0.0201 | 0.0201 |
| 3 | 0.033 | 201 | 0.0201 | 0.0201 |
| 4 | 0.050 | 205 | 0.0205 | 0.0205 |
| 5 | 0.067 | 259 | 0.0259 | 0.0259 |
| 6 | 0.083 | 266 | 0.0266 | 0.0266 |
| 7 | 0.100 | 268 | 0.0268 | 0.0268 |
| 8 | 0.200 | 277 | 0.0277 | 0.0277 |
| 9 | 0.400 | 286 | 0.0286 | 0.0286 |
| 10 | 0.800 | 295 | 0.0295 | 0.0295 |
| 11 | 1.000 | 298 | 0.0298 | 0.0298 |
| 12 | 2.000 | 309 | 0.0309 | 0.0309 |
| 13 | 4.000 | 321 | 0.0321 | 0.0321 |
| 14 | 8.000 | 332 | 0.0332 | 0.0332 |
| 15 | 10.000 | 336 | 0.0336 | 0.0336 |
| 16 | 20.000 | 345 | 0.0345 | 0.0345 |
| 17 | 40.000 | 349 | 0.0349 | 0.0349 |
| 18 | 80.000 | 353 | 0.0353 | 0.0353 |
| 19 | 100.000 | 354 | 0.0354 | 0.0354 |
| 20 | 200.000 | 355 | 0.0355 | 0.0355 |
| 21 | 216.170 | 355 | 0.0355 | 0.0355 |



ASTM D2435-96
 Site Reference: C.F. Harvey
 Jobfile: E:\16010.JOB
 Operator: *mk*

Test name: Consolidation
 Date of Test: 12-3-16
 Sample: ST-1
 Borehole: B1-A LT LN
 Checked: *mk*

Approved:



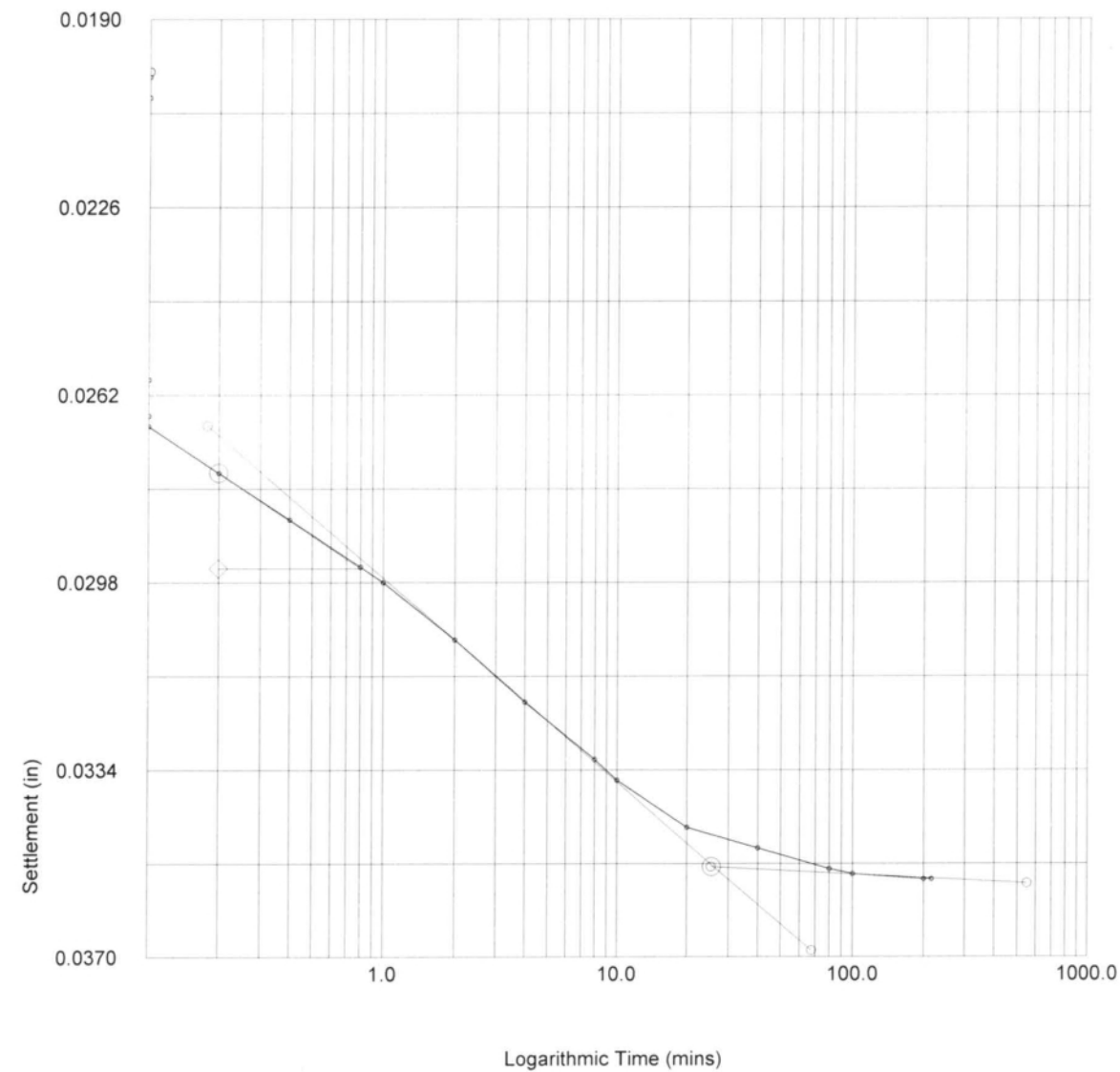
ASTM D2435-96
 Site Reference: C.F. Harvey
 Jobfile: E:\16010.JOB
 Operator: *mu*

Test name: Consolidation Load: 2.000 (TSF)
 Date of Test: 12-3-16
 Sample: ST-1
 Borehole: B1-A LT LN
 Checked: *mu*
 Approved:

Oedometer Settlement Tests

Settlement Stage Results

| | |
|---------------------------------------|--------|
| Vertical Stress (TSF) | 2.000 |
| Initial Temp oC | 21.6 |
| Correction (in) | 0.0 |
| Settlement (in) | 0.0155 |
| Void Ratio e | 0.5532 |
| Final Temp oC | 0.0 |
| t ₅₀ (mins) | 1.70 |
| c _v (ft ² /day) | 0.275 |
| m _v (ft ² /ton) | 0.016 |
| Sec Compression C _{sec} | 0.0002 |



Oedometer Settlement Tests

| No. | Time (mins) | Displacement (divs) | Displacement (in) | Settlement (in) |
|-----|-------------|---------------------|-------------------|-----------------|
| 1 | 0.000 | 355 | 0.0355 | 0.0355 |
| 2 | 0.017 | 364 | 0.0364 | 0.0364 |
| 3 | 0.033 | 364 | 0.0364 | 0.0364 |
| 4 | 0.050 | 393 | 0.0393 | 0.0393 |
| 5 | 0.067 | 421 | 0.0421 | 0.0421 |
| 6 | 0.083 | 434 | 0.0434 | 0.0434 |
| 7 | 0.100 | 437 | 0.0437 | 0.0437 |
| 8 | 0.200 | 449 | 0.0449 | 0.0449 |
| 9 | 0.400 | 460 | 0.0460 | 0.0460 |
| 10 | 0.800 | 473 | 0.0473 | 0.0473 |
| 11 | 1.000 | 477 | 0.0477 | 0.0477 |
| 12 | 2.000 | 493 | 0.0493 | 0.0493 |
| 13 | 4.000 | 511 | 0.0511 | 0.0511 |
| 14 | 8.000 | 528 | 0.0528 | 0.0528 |
| 15 | 10.000 | 533 | 0.0533 | 0.0533 |
| 16 | 20.000 | 546 | 0.0546 | 0.0546 |
| 17 | 40.000 | 554 | 0.0554 | 0.0554 |
| 18 | 80.000 | 559 | 0.0559 | 0.0559 |
| 19 | 100.000 | 560 | 0.0560 | 0.0560 |
| 20 | 200.000 | 562 | 0.0562 | 0.0562 |
| 21 | 400.000 | 565 | 0.0565 | 0.0565 |
| 22 | 800.000 | 567 | 0.0567 | 0.0567 |
| 23 | 999.967 | 568 | 0.0568 | 0.0568 |

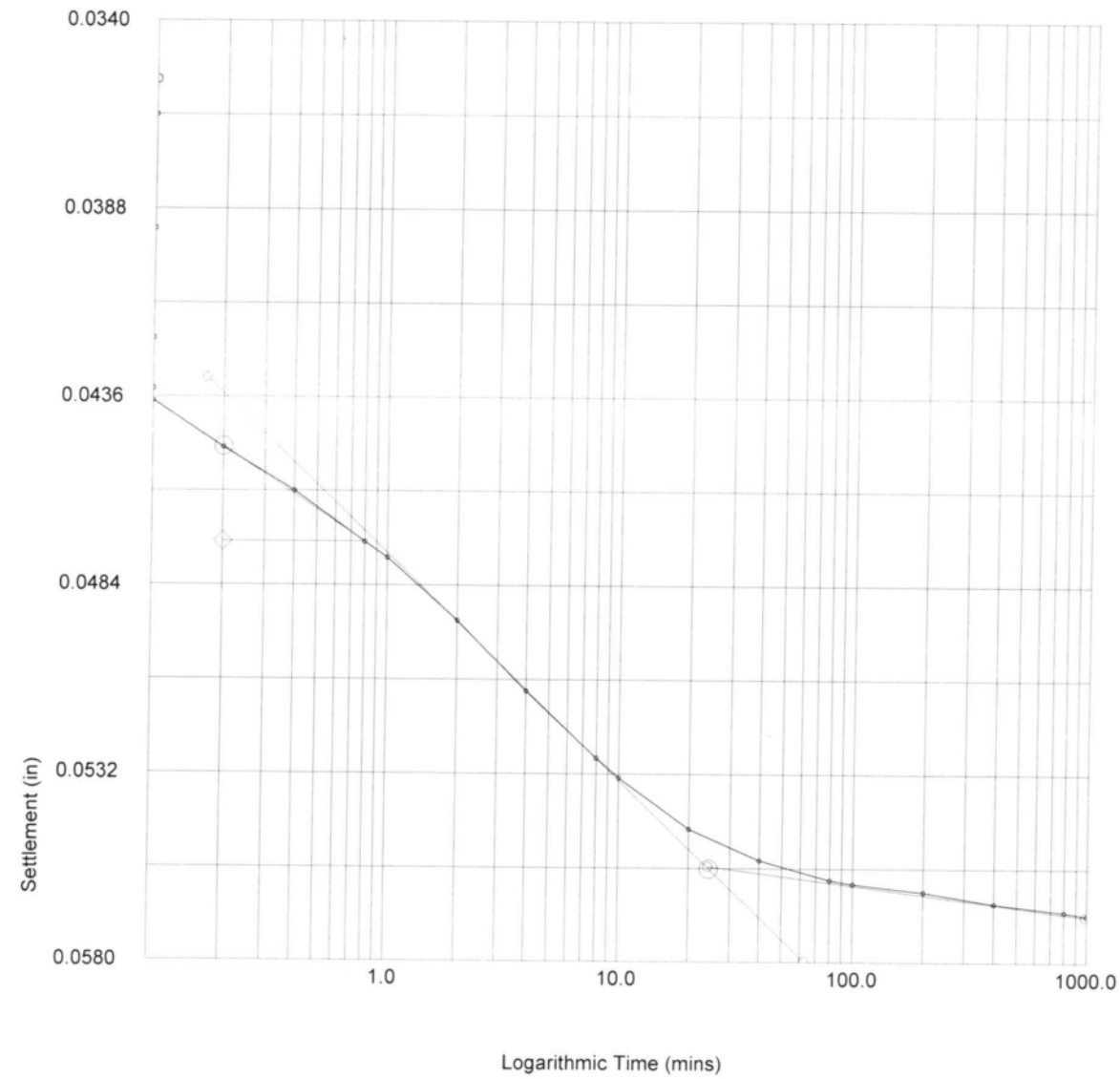
| | | | |
|--|-----------------------------|---------------|---------------|
| | ASTM D2435-96 | Test name | Consolidation |
| | Site Reference: C.F. Harvey | Date of Test: | 12-3-16 |
| | Jobfile: E:\16010.JOB | Sample: | ST-1 |
| | Operator: <i>mll</i> | Borehole: | B1-A LT LN |
| | Checked: <i>mll</i> | Approved: | |

| | | | |
|--|-----------------------------|---------------|---------------------------------|
| | ASTM D2435-96 | Test name | Consolidation Load: 4.000 (TSF) |
| | Site Reference: C.F. Harvey | Date of Test: | 12-3-16 |
| | Jobfile: E:\16010.JOB | Sample: | ST-1 |
| | Operator: <i>mll</i> | Borehole: | B1-A LT LN |
| | Checked: <i>mll</i> | Approved: | |

Oedometer Settlement Tests

Settlement Stage Results

| | |
|---------------------------------------|--------|
| Vertical Stress (TSF) | 4.000 |
| Initial Temp oC | 21.6 |
| Correction (in) | 0.0 |
| Settlement (in) | 0.0213 |
| Voids Ratio e | 0.5187 |
| Final Temp oC | 0.0 |
| t ₅₀ (mins) | 1.79 |
| c _v (ft ² /day) | 0.252 |
| m _v (ft ² /ton) | 0.011 |
| Sec Compression C _{sec} | 0.0008 |



| | | | |
|--|-----------------------------|---------------|---------------|
| | ASTM D2435-96 | Test name | Consolidation |
| | Site Reference: C.F. Harvey | Date of Test: | 12-3-16 |
| | Jobfile: E:\16010.JOB | Sample: | ST-1 |
| | Operator: <i>mlc</i> | Borehole: | B1-A LT LN |
| | Checked: <i>mlc</i> | Approved: | |

Oedometer Settlement Tests

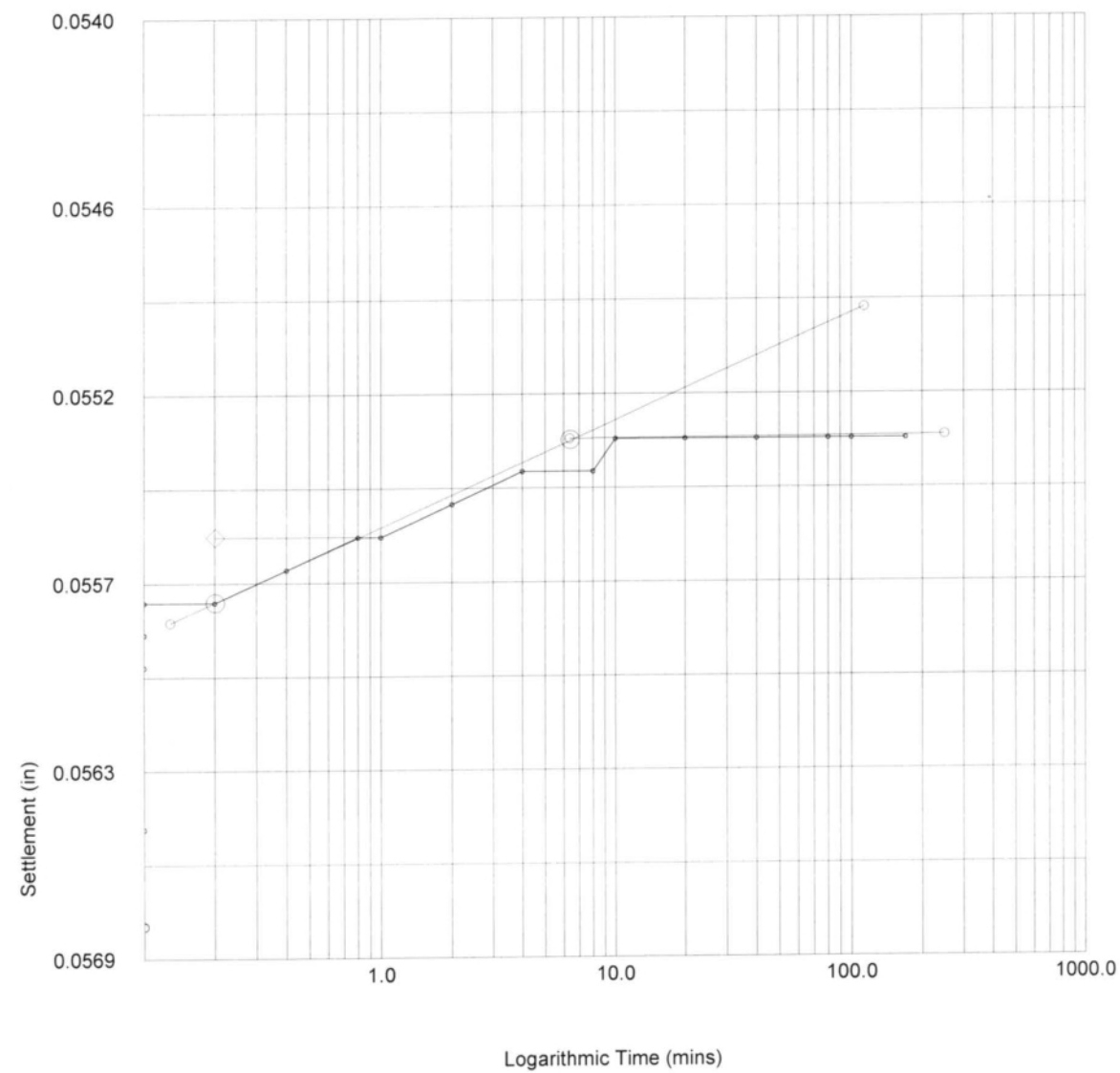
| No. | Time (mins) | Displacement (divs) | Displacement (in) | Settlement (in) |
|-----|-------------|---------------------|-------------------|-----------------|
| 1 | 0.000 | 568 | 0.0568 | 0.0568 |
| 2 | 0.017 | 565 | 0.0565 | 0.0565 |
| 3 | 0.033 | 560 | 0.0560 | 0.0560 |
| 4 | 0.050 | 559 | 0.0559 | 0.0559 |
| 5 | 0.067 | 559 | 0.0559 | 0.0559 |
| 6 | 0.083 | 559 | 0.0559 | 0.0559 |
| 7 | 0.100 | 558 | 0.0558 | 0.0558 |
| 8 | 0.200 | 558 | 0.0558 | 0.0558 |
| 9 | 0.400 | 557 | 0.0557 | 0.0557 |
| 10 | 0.800 | 556 | 0.0556 | 0.0556 |
| 11 | 1.000 | 556 | 0.0556 | 0.0556 |
| 12 | 2.000 | 555 | 0.0555 | 0.0555 |
| 13 | 4.000 | 554 | 0.0554 | 0.0554 |
| 14 | 8.000 | 554 | 0.0554 | 0.0554 |
| 15 | 10.000 | 553 | 0.0553 | 0.0553 |
| 16 | 20.000 | 553 | 0.0553 | 0.0553 |
| 17 | 40.000 | 553 | 0.0553 | 0.0553 |
| 18 | 80.000 | 553 | 0.0553 | 0.0553 |
| 19 | 100.000 | 553 | 0.0553 | 0.0553 |
| 20 | 169.630 | 553 | 0.0553 | 0.0553 |

| | | | |
|--|-----------------------------|---------------|---------------------------------|
| | ASTM D2435-96 | Test name | Consolidation Load: 2.000 (TSF) |
| | Site Reference: C.F. Harvey | Date of Test: | 12-3-16 |
| | Jobfile: E:\16010.JOB | Sample: | ST-1 |
| | Operator: <i>mlc</i> | Borehole: | B1-A LT LN |
| | Checked: <i>mlc</i> | Approved: | |

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF) 2.000
 Initial Temp oC 21.6
 Correction (in) 0.0
 Settlement (in) 0.0015
 Voids Ratio e 0.5212
 Final Temp oC
 t₅₀ (mins)
 c_v (ft²/day)
 m_v (ft²/ton)
 Sec Compression C_{sec}



Oedometer Settlement Tests

| No. | Time (mins) | Displacement (divs) | Displacement (in) | Settlement (in) |
|-----|-------------|---------------------|-------------------|-----------------|
| 1 | 0.000 | 553 | 0.0553 | 0.0553 |
| 2 | 0.017 | 552 | 0.0552 | 0.0552 |
| 3 | 0.033 | 546 | 0.0546 | 0.0546 |
| 4 | 0.050 | 545 | 0.0545 | 0.0545 |
| 5 | 0.067 | 540 | 0.0540 | 0.0540 |
| 6 | 0.083 | 538 | 0.0538 | 0.0538 |
| 7 | 0.100 | 538 | 0.0538 | 0.0538 |
| 8 | 0.200 | 535 | 0.0535 | 0.0535 |
| 9 | 0.400 | 533 | 0.0533 | 0.0533 |
| 10 | 0.800 | 530 | 0.0530 | 0.0530 |
| 11 | 1.000 | 529 | 0.0529 | 0.0529 |
| 12 | 2.000 | 525 | 0.0525 | 0.0525 |
| 13 | 4.000 | 521 | 0.0521 | 0.0521 |
| 14 | 8.000 | 516 | 0.0516 | 0.0516 |
| 15 | 10.000 | 515 | 0.0515 | 0.0515 |
| 16 | 20.000 | 511 | 0.0511 | 0.0511 |
| 17 | 40.000 | 509 | 0.0509 | 0.0509 |
| 18 | 80.000 | 508 | 0.0508 | 0.0508 |
| 19 | 100.000 | 508 | 0.0508 | 0.0508 |
| 20 | 174.580 | 508 | 0.0508 | 0.0508 |

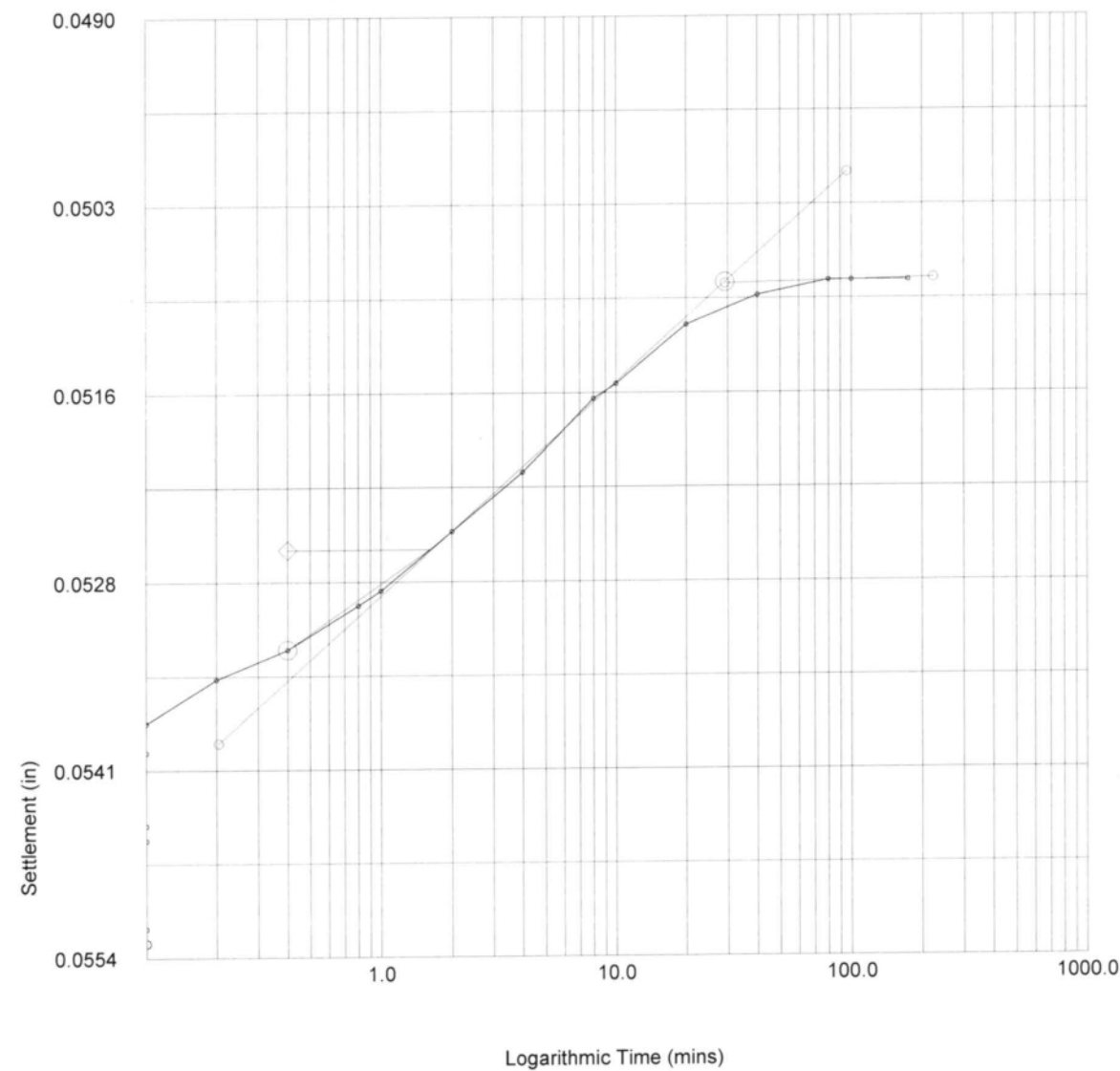
| | | |
|--|-----------------------------|--------------------------|
| | ASTM D2435-96 | Test name: Consolidation |
| | Site Reference: C.F. Harvey | Date of Test: 12-3-16 |
| | Jobfile: E:\16010.JOB | Sample: ST-1 |
| | Operator: <i>mlc</i> | Borehole: B1-A LT LN |
| | Checked: <i>mlc</i> | Approved: _____ |

| | | |
|--|-----------------------------|--|
| | ASTM D2435-96 | Test name: Consolidation Load: 0.500 (TSF) |
| | Site Reference: C.F. Harvey | Date of Test: 12-3-16 |
| | Jobfile: E:\16010.JOB | Sample: ST-1 |
| | Operator: <i>mlc</i> | Borehole: B1-A LT LN |
| | Checked: <i>mlc</i> | Approved: _____ |

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF) 0.500
 Initial Temp oC 21.6
 Correction (in) 0.0
 Settlement (in) 0.0045
 Voids Ratio e 0.5285
 Final Temp oC
 t₅₀ (mins)
 c_v (ft²/day)
 m_v (ft²/ton)
 Sec Compression C_{sec}



Oedometer Settlement Tests

| No. | Time (mins) | Displacement (divs) | Displacement (in) | Settlement (in) |
|-----|-------------|---------------------|-------------------|-----------------|
| 1 | 0.000 | 508 | 0.0508 | 0.0508 |
| 2 | 0.017 | 504 | 0.0504 | 0.0504 |
| 3 | 0.033 | 504 | 0.0504 | 0.0504 |
| 4 | 0.050 | 501 | 0.0501 | 0.0501 |
| 5 | 0.067 | 500 | 0.0500 | 0.0500 |
| 6 | 0.083 | 500 | 0.0500 | 0.0500 |
| 7 | 0.100 | 499 | 0.0499 | 0.0499 |
| 8 | 0.200 | 498 | 0.0498 | 0.0498 |
| 9 | 0.400 | 496 | 0.0496 | 0.0496 |
| 10 | 0.800 | 493 | 0.0493 | 0.0493 |
| 11 | 1.000 | 492 | 0.0492 | 0.0492 |
| 12 | 2.000 | 488 | 0.0488 | 0.0488 |
| 13 | 4.000 | 483 | 0.0483 | 0.0483 |
| 14 | 8.000 | 476 | 0.0476 | 0.0476 |
| 15 | 10.000 | 473 | 0.0473 | 0.0473 |
| 16 | 20.000 | 464 | 0.0464 | 0.0464 |
| 17 | 40.000 | 451 | 0.0451 | 0.0451 |
| 18 | 80.000 | 440 | 0.0440 | 0.0440 |
| 19 | 100.000 | 438 | 0.0438 | 0.0438 |
| 20 | 200.000 | 434 | 0.0434 | 0.0434 |
| 21 | 400.000 | 431 | 0.0431 | 0.0431 |
| 22 | 492.120 | 430 | 0.0430 | 0.0430 |

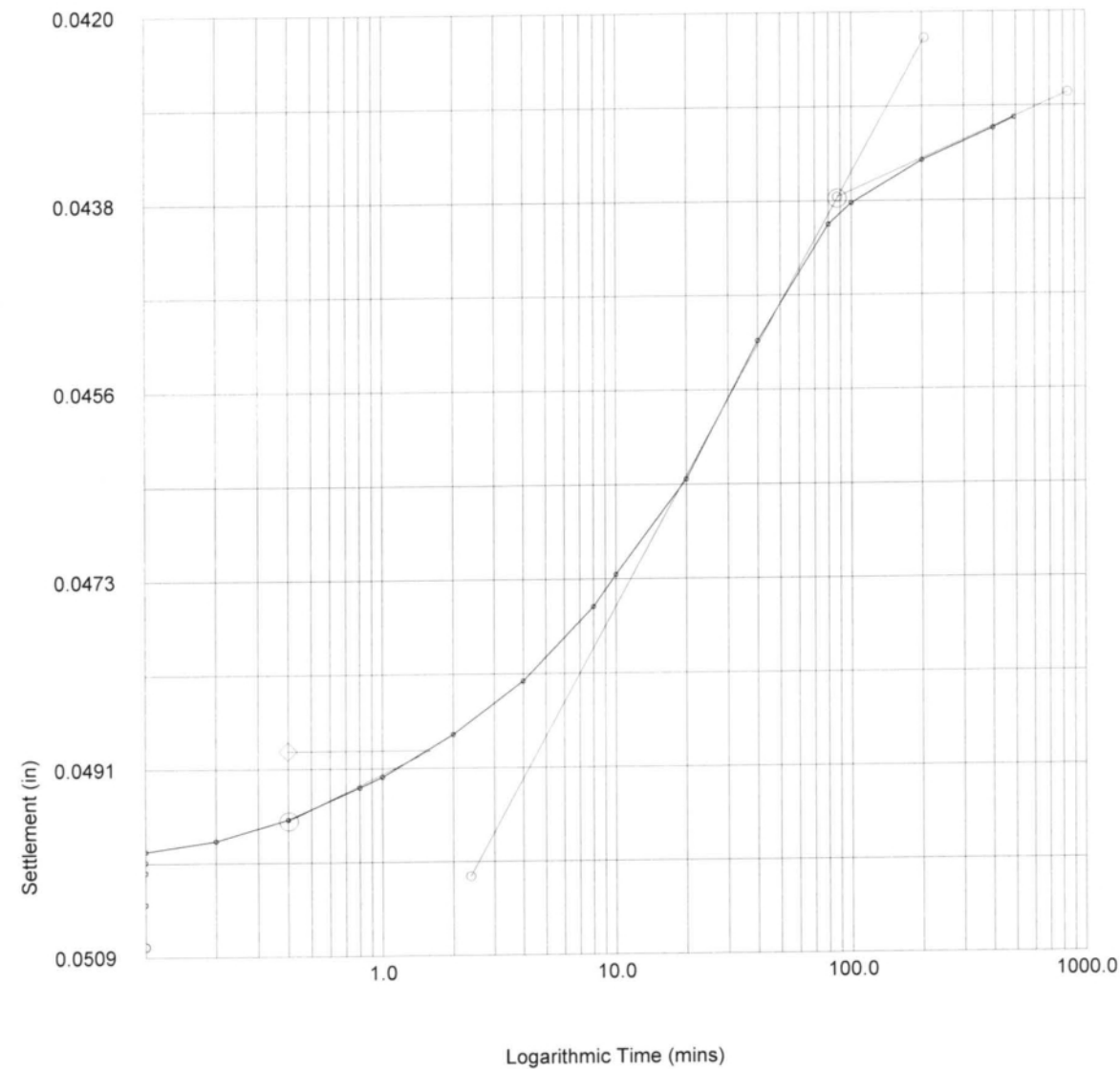
| | | |
|--|-----------------------------|--------------------------|
| | ASTM D2435-96 | Test name: Consolidation |
| | Site Reference: C.F. Harvey | Date of Test: 12-3-16 |
| | Jobfile: E:\16010.JOB | Sample: ST-1 |
| | Operator: <i>mlk</i> | Borehole: B1-A LT LN |
| | Checked: <i>mlk</i> | Approved: _____ |

| | | |
|--|-----------------------------|--|
| | ASTM D2435-96 | Test name: Consolidation Load: 0.050 (TSF) |
| | Site Reference: C.F. Harvey | Date of Test: 12-3-16 |
| | Jobfile: E:\16010.JOB | Sample: ST-1 |
| | Operator: <i>mlk</i> | Borehole: B1-A LT LN |
| | Checked: <i>mlk</i> | Approved: _____ |

Oedometer Settlement Tests

Settlement Stage Results

Vertical Stress (TSF) 0.050
 Initial Temp oC 21.6
 Correction (in) 0.0
 Settlement (in) 0.0078
 Voids Ratio e 0.5411
 Final Temp oC
 t_{50} (mins)
 c_v (ft²/day)
 m_v (ft²/ton)
 Sec Compression C_{sec}



| | | |
|---------------------|-----------------------------|--------------------------|
| | ASTM D2435-96 | Test name: Consolidation |
| | Site Reference: C.F. Harvey | Date of Test: 12-3-16 |
| | Jobfile: E:\16010.JOB | Sample: ST-1 |
| Operator: <i>mu</i> | Checked: <i>mu</i> | Borehole: B1-A LT LN |
| | | Approved: _____ |

Form No. TR-T88

Revision No. 0

Revision Date: 12/20/09

Particle Size Analysis of Soils

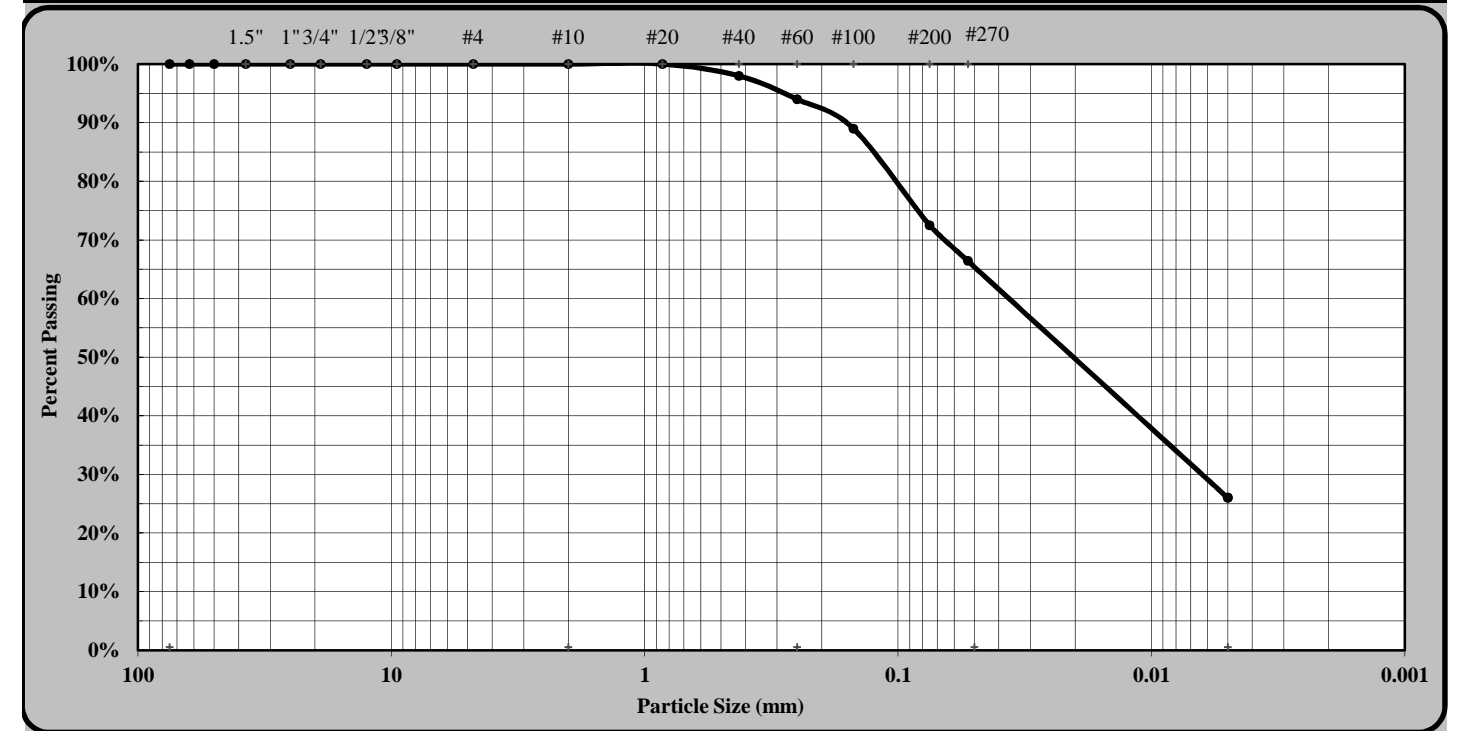
AASHTO T88 as Modified by NCDOT



30 of 33

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 #: | 46375.1.1 | F.A. Project No: | N/A |
| Client Name: | Michael Baker Engineering | TIP NO: | R-5703 |
| Address: | Raleigh, NC | | |
| Boring #: | EB2-A Lt. Ln. | Sample #: | SS-91 |
| Location: | 365+32 | Sample Date: | 9/1/16 |
| | | Offset: | 20' LT |
| | | Depth (ft): | 0.0 - 1.5 |
| Sample Description: | Gray Coarse to Fine Sandy Clayey SILT A-4 (4) | | |



| 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 | #10 | Coarse Sand | 6% | Silt | 40% |
| Gravel | 0% | Fine Sand | 28% | Clay | 26% |
| Apparent Relative Density | ND | Moisture Content | 19% | % Passing #200 | 72.5% |
| Liquid Limit | 28 | Plastic Limit | 20 | Plastic Index | 8 |
| Soil Mortar (-#10 Sieve) | | | | | |
| Coarse Sand | 6% | Fine Sand | 28% | Silt | 40% |
| | | | | Clay | 26% |
| Description of Sand & Gravel Particles: | Rounded | <input type="checkbox"/> | Angular | <input type="checkbox"/> | |
| Hard & Durable | <input type="checkbox"/> | Soft | <input type="checkbox"/> | Weathered & Friable | <input type="checkbox"/> |

References / Comments / Deviations: ND=Not Determined.

Mal Krajan, ET

Technician Name

104-01-0703

Certification No.

Laboratory Manager

Position

11/14/2016

Date

Mal Krajan, ET

Technical Responsibility

Signature

Laboratory Manager

Position

11/14/2016

Date

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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 Road, 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-A Lt. Ln. | Sample #: | SS-91 |
| | | Sample Date: | 9/1/16 |
| Location: | 365+32 | Offset: | 20' LT |
| | | Depth (ft): | 0.0 - 1.5 |
| Sample Description: | Gray Coarse to Fine Sandy Clayey SILT (A-4) (4) | | |
| Equipment: | Balance: 0.01 g. Readability, 500g. Minimum Capacity | | |
| 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 # | B |
|--|---|-----------|-------|
| t | Tare Weight (Dish plus Aluminum Foil Cover) | grams | 52.79 |
| a | Mass of As-Received Specimen + Tare Wt. | grams | 95.22 |
| b | Mass of Oven Dry Specimen + Tare Wt. | grams | 88.59 |
| w | Water Weight | (a-b) | 6.63 |
| A | Mass of As-Received Specimen | (a-t) | 42.43 |
| B | Mass of Oven Dry Specimen | (b-t) | 35.80 |
| % Moisture Content as a % of As Received or Total Mass | | (w/A)*100 | 15.6% |
| % Moisture Content as a % of Oven-dried Mass | | (w/B)*100 | 18.5% |

| | | | | | |
|------|-----------------|------------|---------|------|---------|
| 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 # | 6 |
|------------------------|---|-----------|-------|
| t | Tare Weight (Dish plus Aluminum Foil Cover) | grams | 13.60 |
| b | Mass of Oven Dry Specimen + Tare Wt. | grams | 39.84 |
| c | Ash Weight + Tare Wt. | grams | 38.94 |
| C | Ash Weight | c-t | 25.34 |
| B | Mass of Oven Dry Specimen | (b-t) | 26.24 |
| D | % Ash Content | (C/B)*100 | 96.6% |
| | % Organic Matter | 100-D | 3.4% |

| | |
|-----------------|------------------|
| Muffle Furnace: | S&ME ID #: 00261 |
|-----------------|------------------|

Notes / Deviations / References:

Mal Krajan, ET
 Technical Responsibility

Signature

Laboratory Manager
 Position

11/14/2016
 Date

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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-A Lt. Ln. | Sample #: | SS-91 | Sample Date: |
| | | | | 9/1/16 |
| Location: | 365+32 | Offset: | 20' LT | Depth (ft): |
| | | | | 0.0 - 1.5 |
| Sample Description: | Gray Coarse to Fine Sandy Clayey SILT (A-4) (4) | | | |
| Equipment: | Balance | | | |
| 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 °C | 22.4 |

Measuring pH of Soil

| Measurements | |
|----------------------------|-------|
| Weight of Air Dry Soil (g) | 30.03 |
| Distilled Water (g) | 30.04 |
| Temperature °C | 21.8 |
| pH Readings | 5.97 |

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

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Particle Size Analysis of Soils

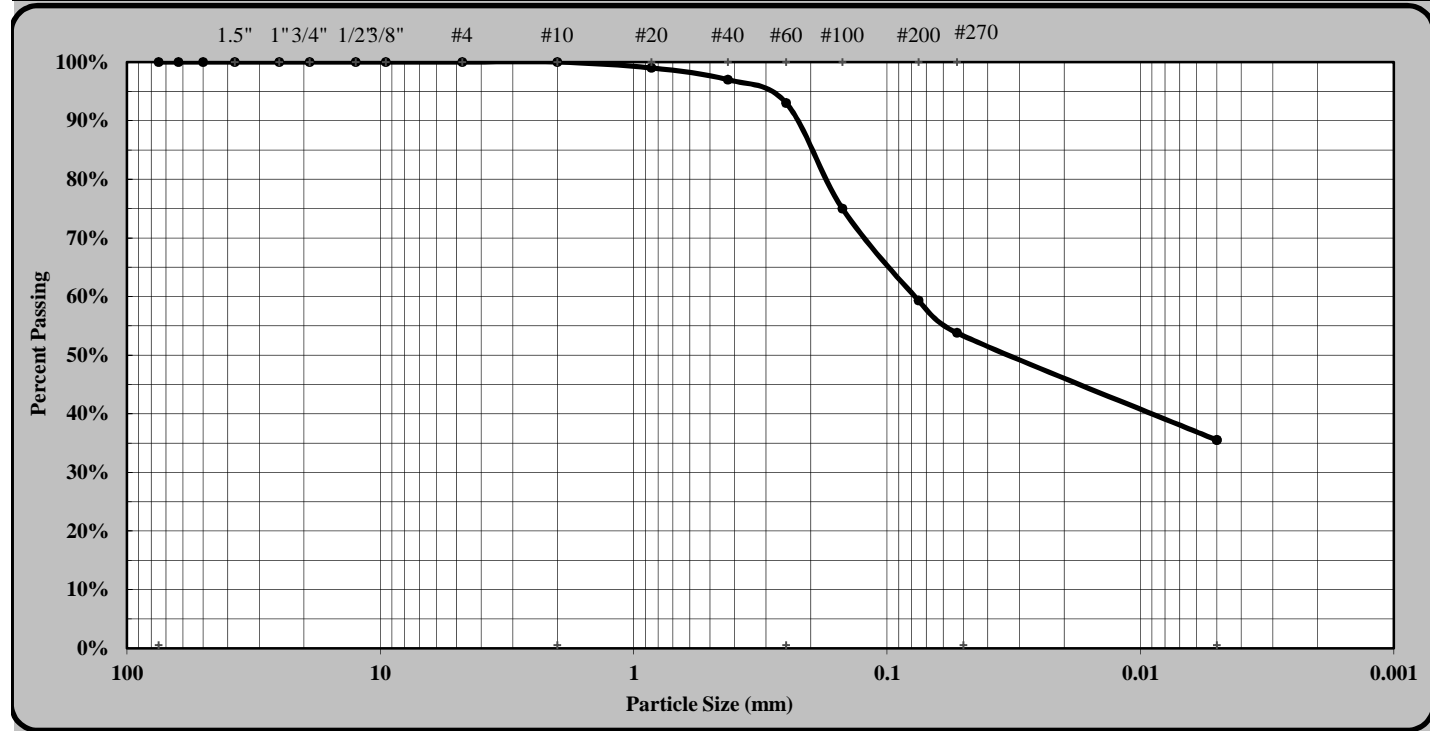
AASHTO T88 as Modified by NCDOT



Quality Assurance

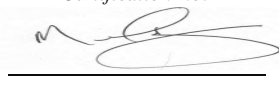
S&ME, Inc. Raleigh, 3201 Spring Forest Road, Raleigh, North Carolina 27616

| | | | |
|---------------------|--|------------------|----------------|
| S&ME Project #: | 6235-16-010 | Report Date: | 10/5/16 |
| Project Name: | C.F. Harvey Parkway Extension R-5703 | Test Date(s): | 9/28 - 10/5/16 |
| State Project #: | 46375.1.1 | F.A. Project No: | N/A |
| | | TIP NO: | R-5703 |
| Client Name: | Michael Baker Engineering | | |
| Address: | Raleigh, NC | | |
| Boring #: | B1-B RT LN | Sample #: | SS-85 |
| | | Sample Date: | 8/30/16 |
| Location: | 364+28 | Offset: | 36' RT |
| | | Depth (ft): | 4.0 - 5.5 |
| Sample Description: | Gray Coarse to Fine Sandy Silty CLAY A-6 (5) | | |



| 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 | 7% | Silt | 18% |
| Gravel | 0% | Fine Sand | 39% | Clay | 36% |
| Apparent Relative Density | ND | Moisture Content | 23% | % Passing #200 | 59.3% |
| Liquid Limit | 27 | Plastic Limit | 13 | Plastic Index | 14 |
| Soil Mortar (-#10 Sieve) | | | | | |
| Coarse Sand | 7% | Fine Sand | 39% | Silt | 18% |
| | | | | Clay | 36% |
| Description of Sand & Gravel Particles: | Rounded | <input type="checkbox"/> | Angular | <input type="checkbox"/> | |
| Hard & Durable | <input type="checkbox"/> | Soft | <input type="checkbox"/> | Weathered & Friable | <input type="checkbox"/> |

References / Comments / Deviations: ND=Not Determined.

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

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Particle Size Analysis of Soils

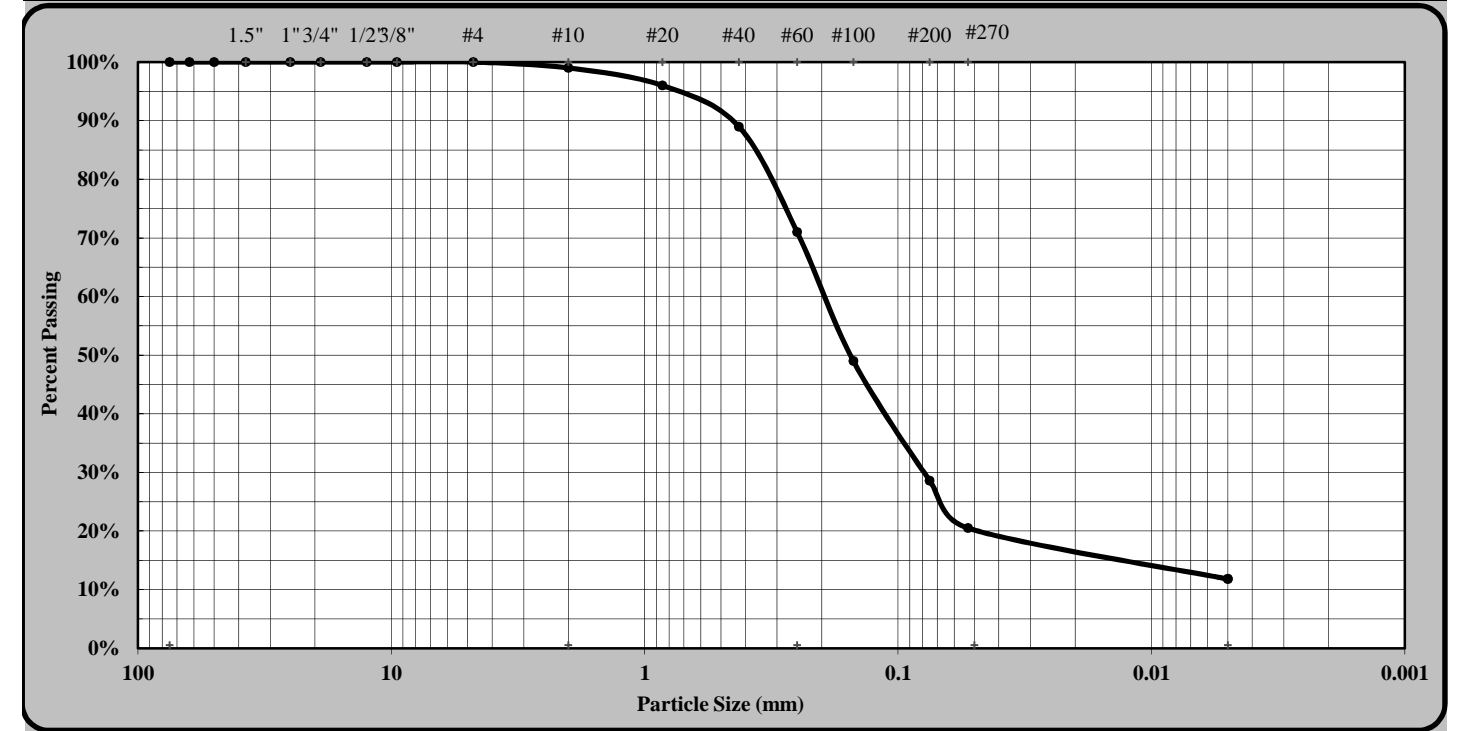
AASHTO T88 as Modified by NCDOT



Quality Assurance

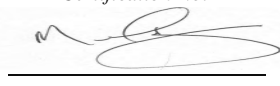
S&ME, Inc. Raleigh, 3201 Spring Forest Road, Raleigh, North Carolina 27616

| | | | |
|---------------------|--|------------------|----------------|
| S&ME Project #: | 6235-16-010 | Report Date: | 10/5/16 |
| Project Name: | C.F. Harvey Parkway Extension R-5703 | Test Date(s): | 9/28 - 10/5/16 |
| State Project #: | 46375.1.1 | F.A. Project No: | N/A |
| | | TIP NO: | R-5703 |
| Client Name: | Michael Baker Engineering | | |
| Address: | Raleigh, NC | | |
| Boring #: | B1-B RT LN | Sample #: | SS-86 |
| | | Sample Date: | 8/30/16 |
| Location: | 364+28 | Offset: | 36' RT |
| | | Depth (ft): | 44.0 - 44.7 |
| Sample Description: | Dark 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 | 28% | Silt | 9% |
| Gravel | 1% | Fine Sand | 51% | Clay | 12% |
| Apparent Relative Density | ND | Moisture Content | 12% | % Passing #200 | 28.6% |
| Liquid Limit | 17 | Plastic Limit | 16 | Plastic Index | 1 |
| Soil Mortar (-#10 Sieve) | | | | | |
| Coarse Sand | 28% | Fine Sand | 51% | Silt | 9% |
| | | | | Clay | 12% |
| Description of Sand & Gravel Particles: | Rounded | <input type="checkbox"/> | Angular | <input type="checkbox"/> | |
| Hard & Durable | <input type="checkbox"/> | Soft | <input type="checkbox"/> | Weathered & Friable | <input type="checkbox"/> |

References / Comments / Deviations: ND=Not Determined.

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

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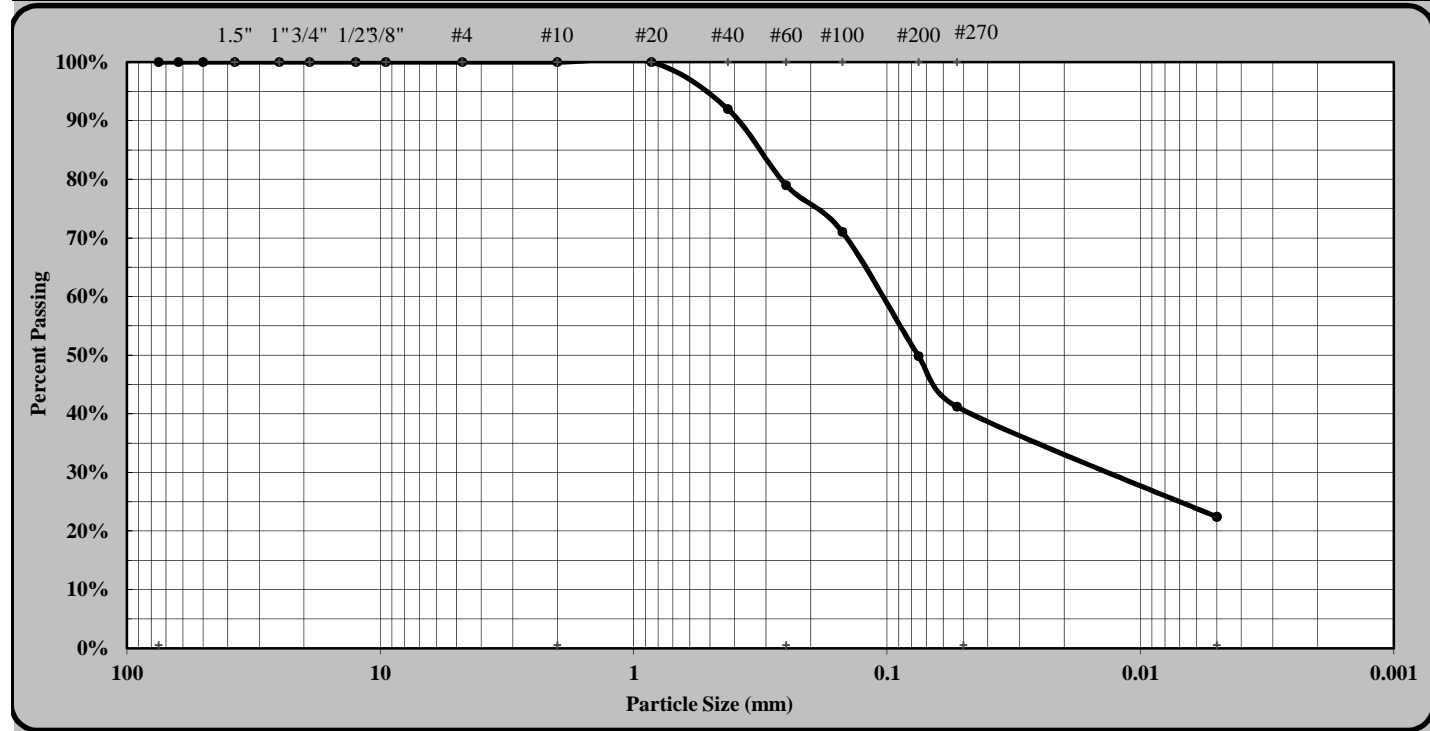
Particle Size Analysis of Soils

AASHTO T88 as Modified by NCDOT



Quality Assurance

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|---|-------------------------|------------------|------------|
| S&ME, Inc. Raleigh, 3201 Spring Forest Road, Raleigh, North Carolina 27616 | | | |
| S&ME Project #: | 6235-16-010 | Report Date: | 11/13/16 |
| Project Name: | NC 242 (Harvey Parkway) | Test Date(s): | 11/1-13/16 |
| State Project #: | 46375.1.1 | F.A. Project No: | N/A |
| | | TIP NO: | R-5703 |
| Client Name: | NCDOT | | |
| Address: | Raleigh, NC | | |
| Boring #: | B1-B RT LN | Sample #: | SS-87 |
| | | Sample Date: | 8/30/16 |
| Location: | 364+28 | Offset: | 36' RT |
| | | Depth (ft): | 59.0-60.5' |
| Sample Description: | 0 A-6 (4) | | |



| | | | |
|---|-------------------------------------|---------------------|-------------------------------------|
| 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 | #20 | Coarse Sand | 21% |
| | | Silt | 19% |
| Gravel | 0% | Fine Sand | 38% |
| | | Clay | 22% |
| Apparent Relative Density | 2.650 | Moisture Content | 21.5% |
| | | % Passing #200 | 49.8% |
| Liquid Limit | 31 | Plastic Limit | 17 |
| | | Plastic Index | 14 |
| Soil Mortar (-#10 Sieve) | | | |
| Coarse Sand | 21% | Fine Sand | 38% |
| | | Silt | 19% |
| | | Clay | 22% |
| Description of Sand & Gravel Particles: | Rounded <input type="checkbox"/> | Angular | <input checked="" type="checkbox"/> |
| Hard & Durable | <input checked="" type="checkbox"/> | Soft | <input type="checkbox"/> |
| | | Weathered & Friable | <input type="checkbox"/> |

References / Comments / Deviations: ND=Not Determined.

Karen Warner 118-06-0305 Laboratory Technician 11/13/2016
Technician Name *Certification No.* *Position* *Date*

Stewart Laney _____ Project Manager
Technical Responsibility *Signature* *Position* *Date*

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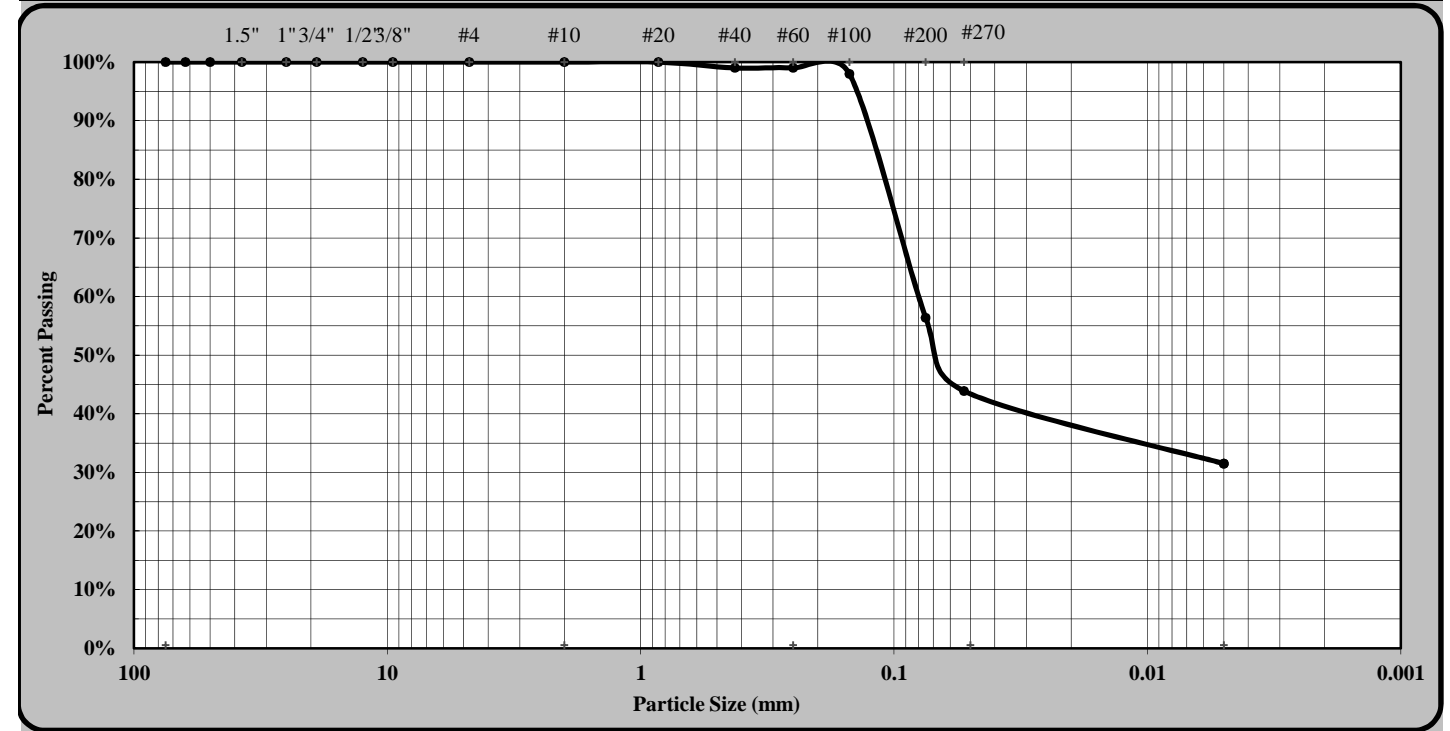
Particle Size Analysis of Soils

AASHTO T88 as Modified by NCDOT



Quality Assurance

| | | | |
|---|--|------------------|----------------|
| S&ME, Inc. Raleigh, 3201 Spring Forest Road, Raleigh, North Carolina 27616 | | | |
| S&ME Project #: | 6235-16-010 | Report Date: | 10/5/16 |
| Project Name: | C.F. Harvey Parkway Extension R-5703 | Test Date(s): | 9/28 - 10/5/16 |
| State Project #: | 46375.1.1 | F.A. Project No: | N/A |
| | | TIP NO: | R-5703 |
| Client Name: | Michael Baker Engineering | | |
| Address: | Raleigh, NC | | |
| Boring #: | EB2-B Rt. Ln. | Sample #: | SS-88 |
| | | Sample Date: | 8/26/16 |
| Location: | 365+32 | Offset: | 37' RT |
| | | Depth (ft): | 48.7 - 50.2 |
| Sample Description: | Dark Gray Coarse to Fine Sandy Silty CLAY A-7-6 (15) | | |



| | | | |
|---|----------------------------------|---------------------|--------------------------|
| 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 | 1% |
| | | Silt | 12% |
| Gravel | 0% | Fine Sand | 55% |
| | | Clay | 32% |
| Apparent Relative Density | ND | Moisture Content | 29% |
| | | % Passing #200 | 56.4% |
| Liquid Limit | 53 | Plastic Limit | 21 |
| | | Plastic Index | 32 |
| Soil Mortar (-#10 Sieve) | | | |
| Coarse Sand | 1% | Fine Sand | 55% |
| | | Silt | 12% |
| | | Clay | 32% |
| Description of Sand & Gravel Particles: | Rounded <input type="checkbox"/> | Angular | <input type="checkbox"/> |
| Hard & Durable | <input type="checkbox"/> | Soft | <input type="checkbox"/> |
| | | Weathered & Friable | <input type="checkbox"/> |

References / Comments / Deviations: ND=Not Determined.

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

Mal Krajan, ET _____ Laboratory Manager 9/26/2016
Technical Responsibility *Signature* *Position* *Date*

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