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REPORT ON
INITIAL SAFETY FACTOR ASSESSMENT
J.M. STUART ELECTRIC GENERATING STATION
PONDS 3A, 5, 6, 7, AND 10 ABERDEEN, OHIO

by Haley & Aldrich, Inc.
Cleveland, Ohio

for Dayton Power & Light Company
Aberdeen, Ohio

File No. 40373-347
October 2016

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Dayton Power & Light Company
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Attention: Mr. Craig Spangler
Leader, Commodities

Subject: Report on Initial Safety Factor Assessment
Ponds 3A, 5, 6, 7, and 10
J.M. Stuart Electric Generating Station
Aberdeen, Ohio

Mr. Spangler:

We are pleased to submit herewith our report entitled, "Report on Initial Safety Factor Assessment, J.M. Stuart Electric Generating Station, Ponds 3A, 5, 6, 7, and 10, Aberdeen, Ohio." This report includes background information regarding the project, the results of our field investigation program, and the results of our initial safety factor assessment.

This work was performed by Haley & Aldrich, Inc. (Haley & Aldrich) on behalf of DP&L in accordance with the United States Environmental Protection Agency's Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities, 40 CFR Part 257, specifically §257.73(e).

The scope of our work consisted of the following: 1) reviewing readily available reports, investigations, plans and data pertaining to the surface impoundments; 2) Planning and executing a field investigation program to obtain subsurface information for liquefaction and slope stability analyses; 3) Conducting a geotechnical laboratory testing program on soil and bottom ash samples recovered from subsurface explorations; 4) performing engineering evaluations related to seismic site response, liquefaction and slope stability; and 5) preparing and submitting this report presenting the results of our assessment.

Thank you for inviting us to complete this assessment and please feel free to contact us if you wish to discuss the contents of the report.

Sincerely yours,
HALEY & ALDRICH, INC.

Derrick A. Shelton
Geotechnical Program Manager | Senior Associate

Steven F. Putrich, P.E.
Vice President

Enclosures

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1. Introduction

1.1 GENERAL

Haley & Aldrich, Inc. (Haley & Aldrich) has been contracted by Dayton Power & Light Company (DP&L) to perform the Initial Safety Factor Assessment for Coal Combustion Residuals (CCR) surface impoundments 3A, 5, 6, 7, and 10 located at J.M. Stuart Electric Generating Station (JMSS) in Aberdeen, Ohio. This work was completed in accordance with the United States Environmental Protection Agency's (EPA's) Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities, 40 CFR Part 257, specifically §257.73(e) (EPA, 2015).

1.2 PURPOSE OF SAFETY FACTOR ASSESSMENT

The purpose of this study was to investigate the subsurface soil and water conditions at the site and to perform the initial safety factor assessment in accordance with Section §257.73(e)(1) of the Final CCR Rule. To achieve the objective discussed above, the scope of work undertaken for this investigation included the tasks listed below.

- Planning and executing a field investigation program to obtain subsurface information for liquefaction and slope stability analyses. The program consisted of:
  - Nine (9) test borings drilled to depths ranging from approximately 10 to 101 ft below ground surface;
  - Eight (8) observation wells drilled to depths ranging from approximately 31 to 61 ft below ground surface; and
  - Ten (10) cone penetrometer soundings (CPTs) advanced to depths ranging from approximately 50 to 100 ft below ground surface.
- Conducting a geotechnical laboratory testing program on soil and bottom ash samples recovered from subsurface explorations to aid in classification and for determination of engineering properties required for engineering analyses.
- Evaluating liquefaction susceptibility of material used to construct the impoundment embankments.
- Performing a site-specific seismic response analysis and Newmark displacement analysis of the impoundment embankment.
- Performing static and seismic stability analyses for rotational and block failure surfaces using limit equilibrium methods.

1.3 ELEVATION DATUM AND HORIZONTAL CONTROL

The elevations referenced in this report are in feet and are based on the North American Vertical Datum of 1988 (NAVD88). The horizontal control is the Ohio State Plan Coordinate System, which is based on North American Datum 83 (NAD83).

2. Description of Ponds

A summary of relevant information associated with each pond is provided below. Additional details can be found in the Haley & Aldrich's Initial Structural Stability Assessment Reports submitted to DP&L under separate cover.

2.1 DESCRIPTION OF POND 3A

Pond 3A is a CCR surface impoundment located immediately to the east of the J.M. Stuart Station power plant. The pond was designed by Bowser-Morner in 1976 and construction completed in 1978. The southern two-thirds of Pond 3A was constructed on top of Pond 3 which was closed and capped with 2 ft of clay prior to construction of Pond 3A. The pond is surrounded by above-grade earthen embankments with a clay core on the south, east and west sides. The north embankment of Pond 3A is comprised of the south embankment of the former Pond 8, which is currently occupied by Landfill 11.

The pond has an area of 52.7 acres and a volume of approximately 1,257 acre-feet. The embankment exterior slopes are approximately 2.5 horizontal to 1 vertical (2.5H:1V) and the height ranges from approximately 6 to 26 ft. The maximum storage and surcharge pool elevation are 553 ft and 556 ft, respectively.

Pond 3A receives sluiced fly ash from the J.M. Stuart plant. The impoundment's rectangular concrete decant structure is located in the northeast corner of the pond. The level in the pond is controlled by removable stop logs installed in the structure.

In response to seepage observed in 2010, BBC&M Engineering, Inc. (BBC&M) recommended installation of a 2-ft thick compacted clay liner in the bottom of Pond 3A within the limits where the former Pond 3 is buried. In 2010 and 2011, the new clay liner was installed.

2.2 DESCRIPTION OF POND 5

Pond 5 is a CCR surface impoundment located just to the west of the J.M. Stuart Station power plant. Pond 5 is bounded by earthen embankments which were constructed primarily of clay and have a total length of approximately 4,200 ft. Little Three Mile Creek is located to north of Pond 5.

The pond has an area of 41.1 acres at the crest and a volume of approximately 1,100 acre-feet, including the filled eastern portion of the impoundment. The embankment exterior slopes are approximately 2.5H:1V and the height ranges from 28 to 41 ft. The maximum storage and surcharge pool elevations are 524 ft and 530 ft, respectively.

The impoundment receives sluiced bottom ash, cooling tower and FGD blow-down, and liquid collected in area drains located at the plant. These influents are initially discharged into settling bays that have been excavated within the filled eastern portion of Pond 5. The Pond 5 decant structure is located at the west end of the impoundment and consists of a steel sheet pile structure equipped with a skimmer.

In response to seepage observed on the exterior slopes of Pond 5, BBC&M performed additional field and laboratory investigations in 2010 to assess the seepage and recommended remedial measures for controlling the seepage. In their report dated April 1, 2010, BBC&M recommended that an inverted filter

(i.e., drainage blanket) be installed on the exterior slopes in areas where seepage was observed. In 2010, the inverted filters were installed and continue to function today.

2.3 DESCRIPTION OF POND 6

Pond 6 is a CCR surface impoundment located immediately east of Pond 3A and north of Pond 7. The pond is surrounded on the east and south sides by above-grade earthen embankments constructed of clay fill material. The pond is incised on the north and west sides. The impoundment is separated from Pond 7 by an interior embankment between the two ponds.

After filling the pond with CCR, the eastern two-thirds of Pond 6 re-excavated to El. 523 around 1980. Also in 1980, seepage was observed exiting the east exterior slope of Pond 6 following an earthquake in August 1980. In their September 23, 1980 report, Bowser-Morner recommended that a 3-ft thick drainage blanket be placed on the exterior slope.

The original pond has an area of 36.7 acres with a volume of 1,390 acre-feet. The western half of the pond is filled and occupies 18.6 acres, while the eastern half of the pond is liquid filled with an operating area of 18.1 acres. In 2010, the east exterior slope was regraded to its current configuration of 3H:1V. The impoundment embankment height ranges from 28 to 31 ft. The maximum storage pool and surcharge pool elevations are 530 ft and 533 ft, respectively.

The pond currently receives ash sluicing water from Ponds 3A, 7 and 10, as well as coal storage area drainage, and Landfill 11 storm water, contact water and leachate. An emergency overflow structure/skimmer exists adjacent to the east interior slope of Pond 6 that conveys flow to Pond 7A as described below.

2.4 DESCRIPTION OF POND 7

Pond 7 is a CCR surface impoundment located immediately east of Pond 3A and south of Pond 6. Pond 7 was originally designed in the late-1970s. In approximately 1983, after initial filling of Pond 7 with fly ash, the majority of the pond area was re-excavated to accept future sluicing of ash from the power plant. An additional area was re-excavated and lined to create Pond 7A, an approximate 3-acre polishing pond located to the northeast of the larger liquid-filled pond. The pond has above-grade embankments constructed primarily of clay fill material on the south and east sides. On the west side the impoundment is partially incised, while on the north side an interior embankment separates Pond 7 from Pond 6.

Pond 7 has an area of approximately 38 acres at the crest and storage of 1,155 acre-ft (including Pond 7A and the filled portion of Pond 7). The impoundment embankment height ranges from 24 to 44 ft. It should be noted that the maximum height of 44 ft is based on measurements using ground surface elevation contour lines shown on Figure 4. The maximum height listed on the Ohio Department of Natural Resources 2014 dam inventory sheet is 39 ft. The maximum storage and surcharge pool elevations are 530 ft and 533 ft, respectively.

Sluiced ash from the power plant enters the southwest corner of Pond 7 through a series of HDPE pipes. Decanted liquid from Pond 7 discharges to Pond 6. From Pond 6, water flows to Pond 7A and eventually flows into a concrete weir structure with skimmer located along the east interior slope for final discharge to the Ohio River.

2.5 DESCRIPTION OF POND 10

Pond 10 is a CCR surface impoundment located north of Pond 3A. Pond 10 was designed by URS Greiner Woodward Clyde (URS Greiner) in 2001. There are above-grade embankments surrounding the pond except along the southeast side which is incised and borders Landfill No. 11. The above-grade embankments are constructed from bottom ash with a 2-ft thick sand drain and a 1.5-ft thick clay liner on the interior slopes and pond bottom.

Pond 10 is approximately 29 acres in area with storage of approximately 850 acre-ft. The impoundment embankment height ranges from 14 to 38 ft. It should be noted that the maximum height of 38 ft is based on ground surface elevation contour lines shown on Figure 5. The maximum height listed on the Ohio Department of Natural Resources 2014 dam inventory sheet is 24 ft. The maximum storage and surcharge pool elevations are 565 ft and 568 ft, respectively.

Pond 10 is currently used for settling of fly ash sluiced from the J.M. Stuart generating units.
The Pond 10 decant structure consists of a 24-ft high reinforced concrete riser structure located in the south corner of the pond that conveys decant to Pond 6. The level in the pond is controlled by removable stop logs installed in the structure.

3. Field Investigation Program

3.1 PREVIOUS EXPLORATIONS AND LABORATORY TESTING PERFORMED BY OTHERS

Several subsurface exploration and laboratory testing programs were previously performed at the site by others. The approximate locations of the relevant explorations performed by others are shown on the attached Figures 2 through 5. A brief summary of the explorations is provided below and relevant logs and laboratory test results are included in Appendix D.

- Forty-seven (47) test borings were drilled by Bowser-Morner Testing Laboratories of Dayton, Ohio in October 1974 during a soil investigation for the design of proposed Pond 3A (Bowser-Morner, 1975).

- Eighteen (18) test borings were drilled by Summit Drilling Company of Akron, Ohio for URS Greiner (URS Greiner) in February 1999 during a soil investigation for the design of proposed Pond 10 (URS Greiner, 1999).

- Three (3) test pits were excavated by Waterland and DP&L for URS Greiner in May 1999 during a soil investigation associated with the design of proposed Pond 10 prior to pond construction (URS Greiner, 1999).

- Seven (7) test borings were drilled by AEP Pro Serv of Groveport, Ohio for URS Corporation in January 2001 during an investigation associated with observed seepage at existing Pond 5 (URS Corporation, 2001).

- Nine (9) test borings were drilled by BBC&M during the period March 2010 to April 2010 to support an evaluation of the level of safety at existing Ponds 3A, 5, 6 and 7 (BBC&M, 2010).

- Two (2) hand-augered test borings were performed and eight (8) test pits were excavated by BBC&M in March 2010 for an assessment of seepage at existing Pond 5 (BBC&M, 2010).

- Three (3) CPT soundings were performed by In-Situ Soil Testing of Lancaster, Virginia for BBC&M in January 2011 for a liquefaction potential evaluation of the embankment foundation soils at existing Pond 10 (BBC&M, 2010).

3.2 CURRENT SUBSURFACE EXPLORATION PROGRAM

A subsurface exploration program was conducted at the project site during the period 16 May 2016 to 3 June 2016 to obtain subsurface information for engineering evaluations. The program consisted of performing nine (9) test borings, eight (8) observation wells, and ten (10) CPTs. The test borings and observation wells were drilled by Stearns Drilling Company of Dutton, Michigan using ATV-mounted CME 850 and CME 1050 drill rigs. The CPT soundings were advanced by ConeTec, Inc. of West Berlin, New Jersey using a truck-mounted rig. A Haley & Aldrich representative was present in the field to observe the subsurface explorations.

The locations of the subsurface explorations are shown on Figures 2 through 5. The as-drilled locations and elevations of the explorations were determined in the field by CESO, Inc. of Dayton, Ohio by optical

survey. The locations and elevations of the explorations should be considered accurate only to the degree implied by the method used. A summary of the subsurface explorations is presented in Table I[1].

3.2.1 Test Borings

The test borings were drilled to depths ranging from 10 ft to 101 ft below ground surface. The borings were advanced using 4-1/4-in. inside diameter (i.d.) hollow stem augers. Split-spoon samples were typically obtained at 5-ft intervals. Occasionally, continuous split-spoon sampling was performed. The standard penetration resistance was determined at each sample level by counting the number of blows required to drive a standard split-spoon sampler (1-3/8-in. inside diameter, 2-in. outside diameter) a distance of 24 in. into undisturbed soil and ash under the impact of a 140-lb hammer free-falling 30 in. The number of blows required to advance the sampler was recorded for each 6-in. interval. The standard penetration resistance N-value is determined by summing the number of blows required to advance the sampler the middle 12 in. of the 24-in. sampling range.

Relatively undisturbed samples of embankment fill and native soil were obtained by pushing a 3-in. diameter thin-walled steel tube (Shelby tube) at planned sampling depths at all test boring locations except HA-5-B3, HA-5-B4OW, and HA-7-B2. The hydraulics of the drill rig were used to advance the tubes. The tubes were removed from the ground and sealed.

Samples recovered from the borings were taken to Consulting Services Incorporated of Cincinnati, Ohio and GeoTesting Express, Inc. of Acton, Massachusetts for laboratory testing. The boring logs are presented in Appendix A. The boring logs and related information depict subsurface conditions only at the specific locations and at the particular time designated on the logs. Subsurface conditions at other locations may differ from conditions occurring at the exploration locations. Also the passage of time may result in a change in the subsurface conditions at these exploration locations.

3.2.2 Groundwater Observation Wells

The test borings associated with the observation wells were drilled to depths ranging from approximately 31 ft to 61 ft below ground surface. The borings were drilled using the same procedures described above in Paragraph 3.2.1 for the test borings. Samples recovered from the well borings were taken to the Haley & Aldrich's office for further evaluation.

Groundwater observation wells were installed in completed boreholes at the locations listed in Table I upon completion of drilling. The details of the well installations and the relationship to major soil strata are shown on the test boring logs in Appendix A.

The observation wells consisted of 2-in. I.D. slotted PVC well screens attached to 2-in. I.D. PVC riser pipes. The annular space surrounding each well point was backfilled with No. 2 Morie sand to a height of 3 to 5 ft above the top of the screen. A 3-ft thick bentonite plug was installed above the sand pack elevation. The wells were backfilled above the bentonite plug with auger cuttings to within 5 ft below ground surface. A 2-ft to 3-ft thick bentonite seal was installed at that elevation. The upper 2 to 3 ft of the wells were sealed with cement grout.

[1] Note: A table that does not appear near its citation can be found at the end of the report.

3.2.3 Cone Penetrometer Soundings

Several of the CPT soundings were performed immediately adjacent to SPT borings to facilitate correlating the readings from the CPT sounding with the laboratory test results and correlations associated with the split-spoon and Shelby tube samples. The CPT soundings were advanced to depths of approximately 50 ft and 100 ft below ground surface. The CPT soundings were performed using a piezocone penetrometer that provides measurements of pore water pressure at one or more locations on the penetrometer surface in general conformance with ASTM D5778. CPT data, including pore pressure measurements, were collected at 5-cm depth intervals. The rod string and cone were advanced in natural soil and fill materials at the standard rate of 2 cm/sec.

Seismic cone penetration testing was used to obtain in-situ measurements of shear wave velocity at HA-3-C1, HA-5-C1, HA-5-C3, and HA-10-C1. Measurements were taken at 2-meter (6.6-ft) intervals at all seismic cone penetration test locations, with the exception of HA-5-C3, where measurements were taken at 10-ft intervals. Pore water dissipation testing was also performed at select depths in all CPTs except HA-5-C2, HA-5-C6, and HA-10-C2 to estimate hydraulic conductivity/pore pressure dissipation properties. The CPT sounding results are presented in Appendix A.

3.3 LABORATORY TESTING PROGRAM

A laboratory testing program was conducted on selected soil and bottom ash samples recovered from subsurface explorations to aid in classification and for determination of engineering properties required for design. The primary purpose of the testing program was to evaluate the index and strength properties of the soil and bottom ash materials. Testing included natural moisture contents, Atterberg limits, grain size distributions, percent passing the No. 200 sieve, unconsolidated undrained (UU) triaxial strength, isotropically consolidated undrained (CIU) triaxial strength, and Shelby tube density. The tests were performed in general conformance with applicable ASTM test procedures. Results of the laboratory testing program are presented in Appendix B and are summarized in Table II[2].

[2] Note: A table that does not appear near its citation can be found at the end of the report.

4. Subsurface Conditions

4.1 GEOLOGY

J.M. Stuart Station is located in the Bluegrass Section of the Interior Low Plateaus physiographic province of Ohio (Brockman, 2007). The area was not glaciated during the Pleistocene ice ages, but was affected by outwash waters and sedimentation with melting glaciers. The region is characterized by unglaciated, alluvial clays and silts that were deposited in the backwater of the Ohio River, underlain by glacier outwash materials, typically consisting of sand, gravel and silt deposits (BBC&M, 2010). Ordovician sedimentary rocks, which mainly comprise shale and limestone, underlie the surface soil deposits. Reports prepared by URS Corporation indicate that the top of bedrock elevation at the site ranges from approximately El. 400 to 510 (URS Corporation, 1999, 2001).

4.2 SUBSURFACE CONDITIONS

Descriptions of the soil conditions encountered during the subsurface exploration program conducted at the site are provided below in order of increasing depth below ground surface. Actual soil conditions between boring locations may differ from these typical descriptions. Refer to the test boring logs for specific descriptions of soil samples obtained from the borings.

The subsurface conditions identified by the CPT soundings do not represent material classifications based on grain-size distributions, index tests, or visual observation. Rather, the CPT soundings provide an indicator of relative behavior type based on the mechanical characteristics measured during the soundings. For this reason, the descriptions of subsurface conditions discussed below are based on our visual-manual classification of samples obtained from test borings and the results of laboratory testing.

- *EMBANKMENT FILL* - Below the ground surface there is a stratum of FILL material primarily described as lean CLAY (CL), sandy lean CLAY (CL), SILT (ML), and sandy SILT (ML). This stratum was encountered in all borings except boring HA-5-B4OW. Where encountered this stratum was fully penetrated and the thickness of the stratum ranged from approximately 2.0 ft to 40.5 ft. The consistency of cohesive, fine-grained soils encountered in this stratum ranged from soft to very stiff, but was generally stiff.

- *BOTTOM ASH FILL* - Below the ground surface in borings HA-5-B2, HA-5-B3, HA-5-B4OW, and HA-10-B1 there is a stratum of fill material primarily consisting of bottom ash fill and generally described as silty SAND (SM), poorly-graded SAND (SP), and sandy SILT (ML). This stratum was fully penetrated where encountered. The thickness of this stratum ranged from approximately 21.5 ft to 45 ft. The density of coarse-grained soils encountered in this stratum ranged from very loose to dense but was generally very loose to medium dense.

- *FLY ASH* - Below the embankment fill at CPT HA-3-C1, there is a stratum of fill material primarily consisting of fly ash and generally described as clayey SILT (ML), SILT (ML), silty CLAY (CL). This stratum was encountered only in CPT HA-3-C1 and was fully penetrated. Where encountered and fully penetrated, the thickness of this stratum was approximately 31 ft.

- *ALLUVIAL CLAY/SILT DEPOSITS* – Below the EMBANKMENT FILL, BOTTOM ASH FILL, and FLY ASH there is a stratum of natural soil primarily described as sandy SILT (ML), SILT with sand (ML), and

lean CLAY (CL). This stratum was encountered in all borings except borings HA-5-B3, HA-5-B4OW and HA-10-B1. This stratum was fully penetrated in all borings where encountered with the exception of HA-5-B1. Where encountered and fully penetrated, the thickness of this stratum ranged from approximately 2 ft to 16 ft. The consistency of fine-grained soils encountered in this stratum ranged from soft to very stiff but was generally medium stiff.

- *ALLUVIAL SAND DEPOSITS* – Below the BOTTOM ASH FILL and ALLUVIAL CLAY/SILT DEPOSITS there is a stratum of natural soil primarily described as silty SAND (SM), poorly-graded SAND (SP), and well-graded SAND with silt (SW). This stratum was encountered in all borings except HA-5-B1. The density of coarse-grained soils encountered in this stratum ranged from very loose to dense but was generally loose to medium dense. This stratum was not fully penetrated in any of the borings.

4.3 GROUNDWATER CONDITIONS

Water levels were typically measured in the boreholes when water was encountered during drilling and within 24 hours after completion of the test borings. Measured water levels are summarized in Table I. Where encountered, measured water levels generally ranged from a depth of 2.8 to 49 ft below ground surface, which corresponds to a water level ranging between approximately El. 484.9 and El. 544.1. It should be noted that some water levels measured during drilling at Ponds 5 and 10 were significantly higher than the water levels measured in the other nearby explorations and likely represent localized perched water conditions.

In addition to water levels measured in the test borings, long-term water levels were measured in observation wells near the subject ponds. Measured water levels in the observation wells generally ranged from a depth of 5.9 to 50.2 ft below ground surface, which corresponds to a water level ranging between approximately El. 484.8 and El. 487.2. The observation well readings are summarized in Table III[3].

Water levels were also estimated by the cone penetrometer soundings and are also summarized in Table I. Water levels estimated during the soundings generally ranged from 10 to 69 ft below ground surface, which corresponds to a water level ranging between approximately El. 479.3 and El. 519.2. It should be noted that measurements estimated during the soundings did not involve physical observation of water levels, but rather an estimated water level based on pore pressure measurements. The estimates of water levels at each sounding should only be considered accurate to the degree implied by the determination method.

Water level readings have been made in the subsurface explorations at times and under conditions discussed herein. However, it must be noted that fluctuations in the level of the water may occur due to variations in power plant sluicing activities, season, rainfall, temperature, dewatering activities, and other factors not evident at the time measurements were made and reported herein.

[3] Note: A table that does not appear near its citation can be found at the end of the report.

5. Safety Factor Assessment

As mentioned previously, the purpose of this study was to perform the initial safety factor assessment in accordance with Section §257.73(e)(1) of the Final CCR Rule. As required by the rule, the initial safety factor assessment is performed for each CCR unit to determine calculated factors of safety for each CCR unit relative to the minimum prescribed safety factors for the critical cross section of the embankment. The minimum required safety factors are defined as follows:

- For dikes constructed of soils that have susceptibility to liquefaction, the calculated liquefaction factor of safety must equal or exceed 1.20.
- The calculated static factor of safety under the long-term, maximum storage pool loading condition must equal or exceed 1.50.
- The calculated static factor of safety under the maximum surcharge pool loading condition must equal or exceed 1.40.
- The calculated seismic factor of safety must equal or exceed 1.00.

Stability analyses have been performed in general conformance with the principles and methodologies described in the USACE Slope Stability Manual (U.S. Army Corps of Engineers, 2003). Conventional static and seismic stability analyses of the impoundment embankments were performed for rotational and block failures using limit equilibrium methods. Limit equilibrium methods compare forces, moments, and stresses which cause instability of the mass of the embankment to those which resist that instability. The principle of the limit equilibrium method is to assume that if the slope under consideration were about to fail, or at the structural limit of failure, then one must determine the resulting shear stresses along the expected failure surface. These determined shear stresses are then compared with the shear strength of the soils along the expected failure surface to determine the safety factor. Details of the analyses performed for Ponds 3A, 5, 6, 7 and 10 are presented in the following sections of this report.

5.1 DESIGN WATER LEVELS

In accordance with the Federal CCR Rule, the water retained in each impoundment must be modeled at the maximum storage pool level for the static drained and seismic undrained analyses. The maximum surcharge pool level must be used to model the ponded water for the static undrained analyses. A summary of the maximum storage pool and surcharge pool water levels at each pond are provided below. Note that maximum surcharge pool levels shown correspond to the top of embankment at each pond.

Location	Maximum Storage Pool Level	Maximum Surcharge Pool Level	Available Freeboard
Pond 3A	El. 553	El. 556	3 ft
Pond 5	El. 524	El. 530	6 ft
Pond 6	El. 530	El. 533	3 ft
Pond 7	El. 530	El. 533	3 ft
Pond 10	El. 565	El. 568	3 ft

The elevation of the groundwater table within the embankments and at the toe of slope were estimated based on groundwater conditions encountered in nearby subsurface explorations and groundwater

observation wells. Additionally, with the exception of Pond 5, there is no current evidence of seepage emanating from the exterior slopes of the ponds, suggesting that the phreatic surface is contained within and/or below the embankments. At Pond 5, the phreatic surface was modeled such that it exited the slope and intersected the inverted filter installed in 2010.

Given the prescribed impoundment pool levels and the observed static groundwater levels discussed above, a seepage analysis was performed to determine the piezometric head between the interior slope of the impoundment embankment and the exterior toe of the embankment. The computer software program, Slide 6.029, developed by RocScience, Inc., was used to perform the seepage analyses. Permeability values for each material layer were estimated from typical published values based on material description and correlations to grain size. During the course of the seepage analyses, minor adjustments were made to the permeability values and isotropic permeability ratios to best model the conditions observed in the field. Results from the seepage analysis provided pore pressure values within the model that were used in the stability analysis.

The models suggest that much of the seepage emanating from the ponds is moving downward into the more permeable alluvial foundation soils and establishing a groundwater table at or near the approximate elevation of the Ohio River rather than moving laterally through the less permeable embankments. The phreatic surfaces used in the slope stability models are shown on the slope stability graphical output included in Appendix C.

5.2 MATERIAL PROPERTIES

The material properties used in our analyses have been developed using the results of the referenced test borings, CPT soundings, and laboratory testing. When evaluating the CPT results, material strengths were typically determined by averaging the measurements in a particular stratum and choosing conservative strength properties equal to the average value minus one standard deviation. In cases where subsurface explorations and/or laboratory test data did not exist for certain strata, material properties were estimated based on properties used in historic analyses previously performed by others at the site or typical values as indicated below:

- Sluiced Fly Ash – historical values (URS Greiner, 1999)
- Inverted Filter (Pond 5) – historical values (BBC&M, 2010);
- Drainage Blanket (Pond 10) – historical values (BBC&M, 2010); and
- Clay Liner (Pond 3A and 10) – typical published values (refer to Appendix C).

A summary of the material properties is provided below in Table IV.

TABLE IV MATERIAL PROPERTIES						
Material	Material Strength	Unit Weight (pcf)	Cohesion (psf)	Friction Angle (degrees)	Vertical Stress Ratio	Minimum Shear Strength (psf)
Cohesive Embankment Fill	Drained	130	500	28	--	--
	Undrained	130	--	--	0.47	1300
Granular Embankment Fill (Pond 5)	Drained	120	0	34	--	--
	Undrained	120	0	34	--	--
Fly Ash Fill (Pond 3A)	Drained	100	0	29	--	--
	Undrained	100	--	--	0.47	1000
Sluiced Fly Ash	Drained	80	0	30	--	--
	Undrained	80	750	0	--	--
Bottom Ash Fill (Pond 10)	Drained	90	0	40	--	--
	Undrained	90	0	40	--	--
Alluvial Clay/Silt	Drained	120	50	32	--	--
	Undrained	120	--	--	0.3	1000
Sand	Drained	125	0	32	--	--
	Undrained	125	0	32	--	--
Clay Liner (Pond 3A and 10)	Drained	125	0	28	--	--
	Undrained	125	1300	0	--	--
Inverted Filter (Pond 5)	Drained	120	0	35	--	--
	Undrained	120	0	35	--	--
Drainage Blanket (Pond 10)	Drained	110	0	32	--	--
	Undrained	110	0	32	--	--

Seismic cone penetration testing was used to obtain in-situ measurements of shear wave velocity during the subsurface exploration program. The insitu measurements were performed to a depth of 100 ft below existing ground surface. The site specific shear wave velocity profiles are included in Appendix A.

5.3 SITE SPECIFIC SEISMIC RESPONSE ANALYSIS

5.3.1 Seismic Response Analysis

A site-specific target response spectrum was created for the J.M. Stuart Power Station to develop the 2,500-year (2% probability of exceedance in 50 years) earthquake motions for use in this study. The target spectrum was developed based on the maximum critical risk-targeted (MCE_R) spectral response acceleration. The design earthquake motion was determined to range between magnitude 4.80 and 6.21 at a distance of approximately 14 to 35 km from the site. Two different design methods (probabilistic and deterministic) were used to approximate the MCE_R spectrum and the lesser of the spectral response accelerations from each method at each period was used to create the site-specific target spectrum. The seismic hazard analysis results were then used to compute a 2,500-yr return period deterministic target spectrum for the 6.21 magnitude earthquake. A special type of target spectrum, called the conditional mean spectrum (CMS), was created for the study because it focuses the mean spectral response of all the ground motions to a particular period along the target spectrum. The

lesser of the spectral response accelerations from the probabilistic and deterministic methods at all periods was used to develop the design CMS target spectrum.

A CMS target spectrum was generated for both the short period (T*=0.1s) related to the sliding mass and long period (T*=0.75 s) related to the soil column thickness. The CMS spectrum corresponding to the long period (T*=0.75 s) was determined to be the most conservative and was used to complete the seismic response analysis

Seven time-history records with magnitudes ranging from 5.4 to 6.6 were used to match the CMS target spectrum for the site. The time histories represent the site-specific ground motions associated with the controlling earthquake event and consider the magnitude, distance and focal mechanism. The results of the one-dimensional ground response analysis indicate that the calculated site-specific peak ground acceleration (PGA) for a 2,500-year event ranges from 0.07g to 0.14g at the ground surface when scaled to the period of significance and from 0.11g to 0.20g at the top of embankment. Details of the seismic response analysis are included in Appendix C.

5.3.2 Newmark Displacement Analysis

The Newmark displacement analysis is based on the shear stress time history acting along the failure plane within the slope. The yield acceleration determined by the analysis is the minimum amount of ground acceleration necessary to initiate motion along the failure surface and is used to determine the appropriate pseudo-static coefficient for seismic stability analyses.

Shake 2000 was used to perform the Newmark displacement analysis by incorporating the results of the one-dimensional ground response analysis and estimating slope displacement for each of the seven time-histories discussed above. The critical impoundment cross-sections were evaluated and the most conservative location of the failure plane (shallowest) was determined to be approximately 20 ft below the top of slope. Correction factors were applied to scale the displacements to the target magnitude 6.21 event. Details of the analysis are included in Appendix C along with graphical presentation of the results.

5.4 LIQUEFACTION POTENTIAL EVALUATION

During strong earthquake shaking, loose, saturated cohesionless soil deposits may experience a sudden loss of strength and stiffness, sometimes resulting in loss of bearing capacity, large permanent lateral displacements, and/or seismic settlement of the ground. This phenomenon is called soil liquefaction. In accordance with the requirements of §257.73(e)(1), evaluations have been performed to assess the potential for liquefaction of the soils used to construct the impoundment embankments.

The results of the subsurface explorations performed at the site indicate that the majority of soils used to construct impoundment embankments at Ponds 3A, 6, and 7 consist of lean CLAY with occasional sand seams. At Pond 5, discrete layers of sand in excess of 1 ft thick were observed in the test borings and CPT soundings. As a result, a conservative assumption was made to perform a liquefaction triggering analysis of all “sand-like” soils observed in CPTs and test borings that penetrated the embankments at Ponds 3A, 5, 6, 7, and 10.

Details of the liquefaction triggering analysis are included in Appendix C and indicate that the "sand-like" portions of the materials used to construct the embankments at Ponds 3A, 5, 7, and 10 have factors of safety against liquefaction triggering that are greater than 1.2, and are not susceptible to liquefaction. However, at Pond 6, the embankment material located from a depth of approximately 10 ft below ground surface to the bottom of the embankment fill exhibit liquefaction triggering factors of safety below 1.2. Accordingly, we have conservatively assumed that these soils are susceptible to liquefaction and have performed a post-liquefaction stability analysis to evaluate the stability of the Pond 6 embankment if the "sand-like" embankment material below a depth of 10 ft were to liquefy. The results of the post-liquefaction stability analysis are discussed in section 5.5.3 of this report.

5.5 STABILITY ANALYSIS

5.5.1 Methodology for Analyses

The computer software program Slide 6.029 was used to evaluate the static and seismic stability of the impoundment embankments. Analyses were performed to evaluate static drained (long-term) and undrained (short-term) strength conditions for circular and block failures using Spencer's method of slices. Spencer's method of slices was selected because it fully satisfies the requirements of force and moment equilibrium (limit equilibrium method).

Seismic stability was evaluated using pseudo-static analyses. Pseudo-static analyses model the seismic shaking as a "permanent" body force that is added to the force-body diagram of a conventional static limit-equilibrium analysis; typically, only the horizontal component of earthquake shaking is modeled because the effects of vertical forces tend to average out to near zero (Jibson, 2011). This is a traditional approach for evaluating the stability of a slope during earthquake shaking and provides a simplified safety factor analysis for one earthquake pulse. A 20 percent reduction in material strength was incorporated in the pseudo-static analyses to represent the approximate threshold between large and small strains induced by cyclic loading (Duncan, 2014). A safety factor greater than or equal to one (FS ≥ 1.0) indicates a slope is stable and a safety factor below one (FS < 1.0) indicates that the slope is unstable.

Post-liquefaction stability analyses were performed under static, short-term (undrained) conditions. Reduced strengths were used in zones of embankment soil that were identified to be susceptible to liquefaction. The reduced strengths were determined based on the approach recommended in the University of California at Berkley Geotechnical Report No. UCBDT – 2010/01 (Seed, 2010).

5.5.2 Pseudo-static Coefficient

The pseudo-static coefficient, k_S, used in our seismic analyses was selected using the results of the Newmark displacement analysis discussed previously. According to the MSHA Impoundment Design Manual, the acceptable displacement of coal refuse impoundments is 25% of the upstream freeboard (MSHA, 2009)[4]. The freeboard at each pond and corresponding acceptable displacement is shown below.

Location	Available Freeboard	Acceptable Displacement
Pond 3A	3 ft	9 in.
Pond 5	6 ft	18 in.
Pond 6	3 ft	9 in.
Pond 7	3 ft	9 in.
Pond 10	3 ft	9 in.

As shown above, the smallest and most conservative acceptable displacement is 9 in. Accordingly, for a 9-in. acceptable displacement, the Newmark displacement curves in Appendix C show that the minimum allowable yield acceleration corresponding to the average displacement is 0.015g. A pseudostatic coefficient lower than 0.015g will result in more than 9 in. deformation and one higher than 0.015g will result in less than 9 in. deformation. For the seismic stability analyses performed for the impoundments, a pseudostatic coefficient of 0.30g was selected. This value was selected because it is slightly above the minimum value, which is conservative, and will result in displacements that are below MSHA acceptable values.

5.5.3 Results of Stability Evaluation

The critical cross section is defined as that which is anticipated to be most susceptible to failure amongst all cross sections. To identify the critical cross section(s) at our project site, we examined the following conditions at several cross section locations at each impoundment:

a. the geometry of the upstream and downstream slopes;
b. phreatic surface levels within and below the cross sections;
c. subsurface soil conditions;
d. presence or lack of surcharge loads behind the crest of the embankments; and
e. presence or lack of reinforcing measures in front of the embankments.

Examination of the conditions noted above resulted in the identification of one critical cross section at each pond except Pond 7. At Pond 7, multiple cross sections showed similar characteristics and were both analyzed. The locations of the critical cross sections are shown on Figures 2 through 5. The results of our analyses are presented below in Table V and are shown on the Slide output files included in Appendix C.

[4] This document is mentioned in the preamble of the Rule and is one of the reference documents that was used by the EPA to evaluate how to perform static and seismic stability analyses.

As shown below, the static safety factors are above the minimum required values for all sections. Similarly, the pseudo-static analyses for the analyzed sections indicate acceptable seismic safety factors for all cross sections. Lastly, the post-liquefaction safety factor at Pond 6 is above the minimum required value.

TABLE V
SUMMARY OF STATIC AND SEISMIC STABILITY EVALUATIONS

Pond	Cross Section	Condition[1]	Earthquake Event	Soil Strength	Required Safety Factor	Safety Factor	
						Rotational Failure Surface	Block Failure Surface
Pond 3A	A-A'	Static	-	Drained	1.5	2.2	2.5
				Undrained	1.4	1.9	1.9
		Seismic	2,500-year	Undrained[2]	1.0	1.3	1.4
Pond 5	A-A'	Static	-	Drained	1.5	2.6	2.9
				Undrained	1.4	1.7	2.0
		Seismic	2,500-year	Undrained[2]	1.0	1.3	1.5
Pond 6	A-A'	Static	-	Drained	1.5	2.4	2.8
				Undrained	1.4	2.2	2.3
		Seismic	2,500-year	Undrained[2]	1.0	1.6	1.7
		Post - Liquefaction	-	Undrained[3]	1.2	1.7	1.9
Pond 7	A-A'	Static	-	Drained	1.5	1.5	1.5
				Undrained	1.4	1.4	1.6
		Seismic	2,500-year	Undrained[2]	1.0	1.0	1.2
Pond 10	A-A'	Static	-	Drained	1.5	1.9	1.9
				Undrained	1.4	1.9	2.2
		Seismic	2,500-year	Undrained[2]	1.0	1.4	1.7

1. Refer to Table IV for material properties.
2. Soil strengths have been reduced by 20 percent for seismic analyses.
3. Liquefiable material within the embankment was analyzed using a reduced undrained shear strength of 600 psf

5.6 CONCLUSIONS

The analyses associated with the safety factor assessment have been performed in accordance with the requirement of Section §257.73 of the Final CCR Rule. A summary of our conclusions as they relate to the rule requirements are provided below.

- §257.73(e)(1)(i) - *The calculated static factor of safety under the long-term, maximum storage pool loading conditions must equal or exceed 1.50.*

  As shown in Table V, the static safety factors for the long-term (drained) maximum storage pool condition are above the minimum required value for the critical section analyzed at all ponds. Accordingly, this requirement has been met.
- §257.73(e)(1)(ii) - *The calculated static factor of safety under the maximum surcharge pool loading condition must equal or exceed 1.40.*

As shown in Table V, the static safety factors for the maximum surcharge pool loading condition (undrained) are above the minimum required value for the critical sections analyzed at all ponds. Accordingly, this requirement has been met.

- §257.73(e)(1)(iii) - *The calculated seismic factor of safety must equal or exceed 1.00.*

  As shown in Table V, the calculated seismic safety factors are above the minimum required value for the critical sections analyzed at all ponds. Accordingly, this requirement has been met.

- §257.73(e)(1)(iv) - *For dikes constructed of soils that have susceptibility to liquefaction, the calculated liquefaction factor of safety must equal or exceed 1.20.*

  The results of our subsurface investigation and liquefaction triggering evaluation indicate that the material used to construct the impoundment embankments at Ponds 3A, 5, 7, and 10 are not susceptible to liquefaction, but the "sand-like" embankment material below a depth of 10 ft at Pond 6 is susceptible to liquefaction. As a result, a post-liquefaction stability analysis was performed to evaluate the stability of the Pond 6 embankment if the "sand-like" embankment material below a depth of 10 ft were to liquefy. As shown in Table V, the calculated post-liquefaction safety factor for Pond 6 is above the minimum required value for the critical section. Accordingly, this requirement has been met.

6. Certification

Based on our review of the information provided to us by DP&L and the results of our field investigations and analyses, it is our opinion that the calculated factors of safety for the critical cross section of the embankment at Ponds 3A, 5, 6, 7 and 10 meet the minimum factors of safety specified in §257.73(e)(1)(i) through (iv) of the EPA's Final CCR Rule.

Certification Statement

I certify that the Initial Safety Factor Assessment for Ponds 3A, 5, 6, 7 and 10 at the DP&L J.M. Stuart Electric Generating Station meets the requirements of §257.73(e) of the EPA's Final CCR Rule.

Signed: _____
Consulting Engineer

Print Name: Steven F. Putrich
Ohio License No.: 67329
Title: Vice President
Company: Haley & Aldrich, Inc.

Professional Engineer's Seal and date:

References

1. BBC&M Engineering, Inc., (2010). “Ponds 3A, 5, 6 & 7 Slope Stability Investigation J.M. Stuart Station Aberdeen, Ohio”.

2. BBC&M Engineering, Inc., (2010). “Ash Pond 5 Seepage Assessment J.M. Stuart Station Aberdeen, Ohio”.

3. Bowser-Morner Testing Laboratories (1975). “Soil Investigation and Design for Proposed Fly Ash Dikes James M. Stuart Electric Generating Station, Aberdeen, Ohio.”

4. Brockman, C.S., (2007). “Physiographic Regions of Ohio”, Ohio Department of Natural Resources.

5. Duncan, J.M., Wright, S.G, and Brandon, T.L. (2014). Soil Strength and Slope Stability. John Wiley & Sons, Upper Saddle River, 2nd Edition, pp. 182-184.

6. Environmental Protection Agency, (2015). Code of Federal Regulations, “Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities; Final Rule, “Title 40, Chapter I, Parts 257 and 261, April 17.

7. Jibson, R.W., (2011). “Methods for assessing the stability of slopes during earthquakes—A Retrospective,” Engineering Geology, v. 122, p. 43-50.

8. Mine Safety and Health Administration – U.S. Department of Labor (MSHA), (May 2009. Rev. August 2010). Engineering and Design Manual Coal Refuse Disposal Facilities - Second Edition.

9. Seed (2010). ”Technical Review and Comments: 2008 EERI Monograph, Liquefaction During Earthquakes by. I.M. Idriss and R.W. Boulanger”, Geotechnical Report No. UCB/GT – 2010/01, University of California at Berkley.

10. U.S. Army Corps of Engineers (2003). “Engineering and Design: Slope Stability,” Engineer Manual EM-1110-2-1902, Department of the Army, U.S. Army Corps of Engineers, Washington, DC, October.

11. URS Greiner Woodward Clyde (1999). “Geotechnical Summary Report Ash Pond #10 DP&L J.M. Stuart Station Aberdeen, OH”.

12. URS Corporation (2001). “Geotechnical Engineering Report Bottom Ash Pond 5B Evaluation and Alternatives Analysis”.

TABLES

TABLE I
SUMMARY OF SUBSURFACE EXPLORATIONS
DAYTON POWER AND LIGHT
J.M. STUART STATION
ABERDEEN, OHIO

Exploration Designation[1]	Ground Surface El.[2] (ft)	Northing[2]	Easting[2]	Total Exploration Depth (ft)	Water[3]	
					Depth Below Ground Surface (ft)	Elevation (ft)
TEST BORINGS						
HA-5-B1	529.1	235791.052	1624144.305	65.0	14.5	514.6
HA-5-B2	529.0	235527.742	1625207.556	101.0	13.5	515.5
HA-5-B3	528.0	235838.695	1625415.596	70.0	14.5	513.5
HA-5-B4 OW	530.1	235352.785	1625619.622	100.0	15.4	514.7
HA-6-B1	532.9	232308.343	1633768.405	60.0	46.4	486.5
HA-7-B1	532.7	231519.139	1632559.127	60.0	45.2	487.5
HA-7-B2	493.5	231418.109	1632544.593	25.0	7.0	486.5
HA-7-B2A	493.5	231418.109	1632544.593	10.0	Not Measured	--
HA-10-B1	568.1	235344.552	1629137.250	50.0	24.0	544.1
OBSERVATION WELLS						
MW-5-5	487.7	236234.782	1623796.760	34.0	2.8	484.9
MW-5-6	497.3	234995.668	1625426.146	32.0	10.7	486.6
MW-5-7	529.8	235942.090	1626024.365	60.0	34.5	495.3
MW-18	497.3	232422.280	1629902.404	31.0	9.0	488.3
MW-19	492.1	231369.567	1632686.623	39.0	5.0	487.1
MW-20	501.5	232068.159	1633784.239	36.0	13.0	488.5
MW-21	533.8	232510.938	1631882.367	56.0	45.0	488.8
MW-22	533.9	232207.296	1632813.563	61.0	49.0	484.9
CONE PENETROMETER SOUNDINGS						
HA-3-C1	556.1	232292.163	1630730.343	90.0	69.0	487.1
HA-5-C1	529.1	235791.230	1624139.811	100.0	45.2	483.9
HA-5-C2	530.0	236306.434	1625229.500	60.0	45.0	485.0
HA-5-C3	529.6	235593.926	1625243.072	100.0	43.7	485.9
HA-5-C4	532.1	235335.555	1625605.184	100.0	20.0	512.1
HA-5-C5A	529.2	235493.231	1625552.880	100.0	10.0	519.2
HA-5-C6	529.3	235357.733	1625845.124	100.0	50.0	479.3
HA-6-C1	532.9	232302.571	1633765.974	95.0	50.6	482.3
HA-7-C1B	531.8	231681.624	1633466.383	70.0	46.7	485.1
HA-7-C2	532.4	231915.590	1631437.523	100.0	45.8	486.6
HA-10-C1	568.0	235339.085	1629132.619	50.0	54.0	514.0
HA-10-C2	568.3	235454.871	1630443.892	50.0	54.0	514.3

Notes:
1) Technical monitoring of subsurface explorations completed during the period 16 May 2016 through 3 June 2016 was performed by Haley & Aldrich, Inc.
2) As drilled locations and ground surface elevations of test borings and cone penetrometer soundings were determined in the field by CESO, INC. of Dayton, Ohio by optical survey. The coordinates are provided in units of feet, relative to the Ohio State Plane South Coordinate System (NAD83). The elevation data are provided in feet above sea level, relative to NAVD88.
3) Water level readings represent the highest water level observed either during drilling, after completion of the boring, or as indicated by subsurface exploration instruments. Refer to the subsurface exploration logs for additional water level data. Water level readings have been made in the subsurface explorations at times and under conditions discussed herein. However, it must be noted that fluctuations in the level of the water may occur due to variations in season, rainfall, temperature, and other factors not evident at the time measurements were made and reported.

TABLE II
SUMMARY OF LABORATORY TEST RESULTS
DAYTON POWER AND LIGHT
J.M. STUART STATION
ABERDEEN, OHIO

Boring Designation	Sample Number	Sample Depth (ft)	USCS Symbol	Material Type	Moisture Content (%)	LL	PL	PI	% Gravel	% Sand	% Fines	Tube Density		UU Triaxial			CU Triaxial			
												Average Moisture Content (%)	Average Dry Density (pcf)	Moisture Content (%)	Dry Density (pcf)	Undrained Shear Strength (psf)	Average Moisture Content (%)	Average Dry Density (pcf)	c' (psf)	ϕ' (degrees)
HA-5-B1	S1	1.0-3.0	CL	FILL	14.5	28	19	9			58.0									
HA-5-B1	S2	4.0-6.0	SM	FILL	14.2				22.0	44.0	34.0									
HA-5-B1	U1	10.0-12.0	CL	FILL	21	41	21	20			97.0	20.7	102.9				20.3	101.2	671.0	28.4
HA-5-B1	S7	29.0-31.0	CL	FILL	22.6	43	25	18	0.0	1.0	99.0									
HA-5-B1	U2	34.0-36.0	CL	FILL	34	36	20	16			82.9	22.6	101.8	25.5	99.7	1337.3				
HA-5-B1	U3	43.0-45.0	ML	ALLUVIAL	29	31	24	7			52.4	32.2	86				32.2	87.3	105.6	33.8
HA-5-B2	S2	4.0-6.0	ML	BOTTOM ASH FILL	20.8				0.0	45.0	55.0									
HA-5-B2	S5	19.0-21.0	SM	BOTTOM ASH FILL	25.6				11.0	65.0	24.0									
HA-5-B2	S6	24.0-26.0	SM	BOTTOM ASH FILL	33.3				0.0	55.0	45.0									
HA-5-B2	S9	30.0-32.0	CL	FILL	14.5	30	20	10	15.0	20.0	65.0									
HA-5-B2	S12	36.0-38.0	MH	ALLUVIAL	35.1	60	32	28	0.0	7.4	92.6									
HA-5-B2	U1	40.0-42.0	SP-SM	ALLUVIAL							7.9									
HA-5-B2	S16	48.0-50.0	SP-SM	ALLUVIAL	23.5				4.9	88.1	7.0									
HA-5-B3	S3	9.0-11.0	SM	BOTTOM ASH FILL	28				7.6	65.8	26.6									
HA-5-B3	S12	41.0-43.0	SP	ALLUVIAL	25				2.2	95.1	2.7									
HA-5-B4 OW	S3	9.0-11.0	SM	BOTTOM ASH FILL	29.4				4.0	72.6	23.4									
HA-5-B4 OW	S7	29.0-31.0	SW-SM	BOTTOM ASH FILL	37.7				21.6	71.9	6.5									
HA-5-B4 OW	S9	39.0-41.0	SM	BOTTOM ASH FILL	56.1				4.5	74.0	21.4									
HA-5-B4 OW	S12	54.0-56.0	SP-SM	ALLUVIAL	23.6				8.1	86.4	5.5									
HA-6-B1	S1	1.0-3.0	CL-ML	FILL	11.2	28	21	7			59.0									
HA-6-B1	S2	4.0-6.0	CL	FILL	18.3	32	20	12	1.2	27.4	70.1									
HA-6-B1	U1	12.0-14.0	CL	FILL	13	23	15	8			61.2	16.7	115	16.5	116.3	3445.9				
HA-6-B1	U2	21.0-23.0	CL-ML	FILL	14	23	17	6			53.4	14.4	115.3				14.4	114.0	718.6	31.9
HA-6-B1	U3	36.0-38.0	SC	ALLUVIAL	11	37	19	18			20.6	14.1	114.9				14.1	115.0	580.3	30.8
HA-6-B1	S8	39.0-41.0	SC	ALLUVIAL	14.3				27.1	54.7	18.2									
HA-6-B1	S11	54.0-56.0	SP-SC	ALLUVIAL	23.2				1.8	91.8	6.4									
HA-7-B1	S3	9.0-11.0	CL	FILL	12.7	35	21	14	0.0	20.4	79.6									
HA-7-B1	U2	20.0-22.0	CL	FILL	23	45	23	22			96.2	21.1	105.2				20.5	107.0	675.4	27.9
HA-7-B1	S7	34.0-36.0	ML	ALLUVIAL	18.5															
HA-7-B1	S8	36.0-38.0	SM	ALLUVIAL	15.6	22	19	3	0.0	66.4	33.6									
HA-7-B1	U3	42.0-44.0	CL-ML	ALLUVIAL	25	24	19	5			61.2	24.2	98.7				25.6	97.1	452.2	34.4
HA-7-B1	S11	54.0-56.0	SM	ALLUVIAL	20.1				3.3	59.6	37.1									
HA-7-B2	S2	4.0-6.0	CL	ALLUVIAL	17.5	28	19	9	0.0	35.9	64.1									
HA-7-B2	S4	13.0-15.0	CL-ML	ALLUVIAL	25.3	27	21	6	0.0	29.4	70.5									
HA-7-B2	S6	23.0-25.0	SP	ALLUVIAL	20.5				11.2	85.5	3.3									
HA-7-B2A	U2	8.0-10.0	CL	ALLUVIAL	26	30	19	11			72.4	26.6	96.1				26.6	96.2	197.3	33.2
HA-10-B1	S1	0.0-2.0	SC	FILL	13.6	38	22	16			34.0									
HA-10-B1	S3	9.0-11.0	SM	BOTTOM ASH FILL	15.4	NP	NP	NP	1.9	69.7	28.4									
HA-10-B1	S4	14.0-16.0	SM	BOTTOM ASH FILL	16.4	NP	NP	NP	4.8	70.8	24.4									
HA-10-B1	S6	24.0-26.0	SM	ALLUVIAL	17.2						29.0									
HA-10-B1	S7	29.0-31.0	SC	ALLUVIAL	5.2				33.8	52.6	13.5									

TABLE III
SUMMARY OF OBSERVATION WELL READINGS
DAYTON POWER AND LIGHT
J.M. STUART STATION
ABERDEEN, OHIO

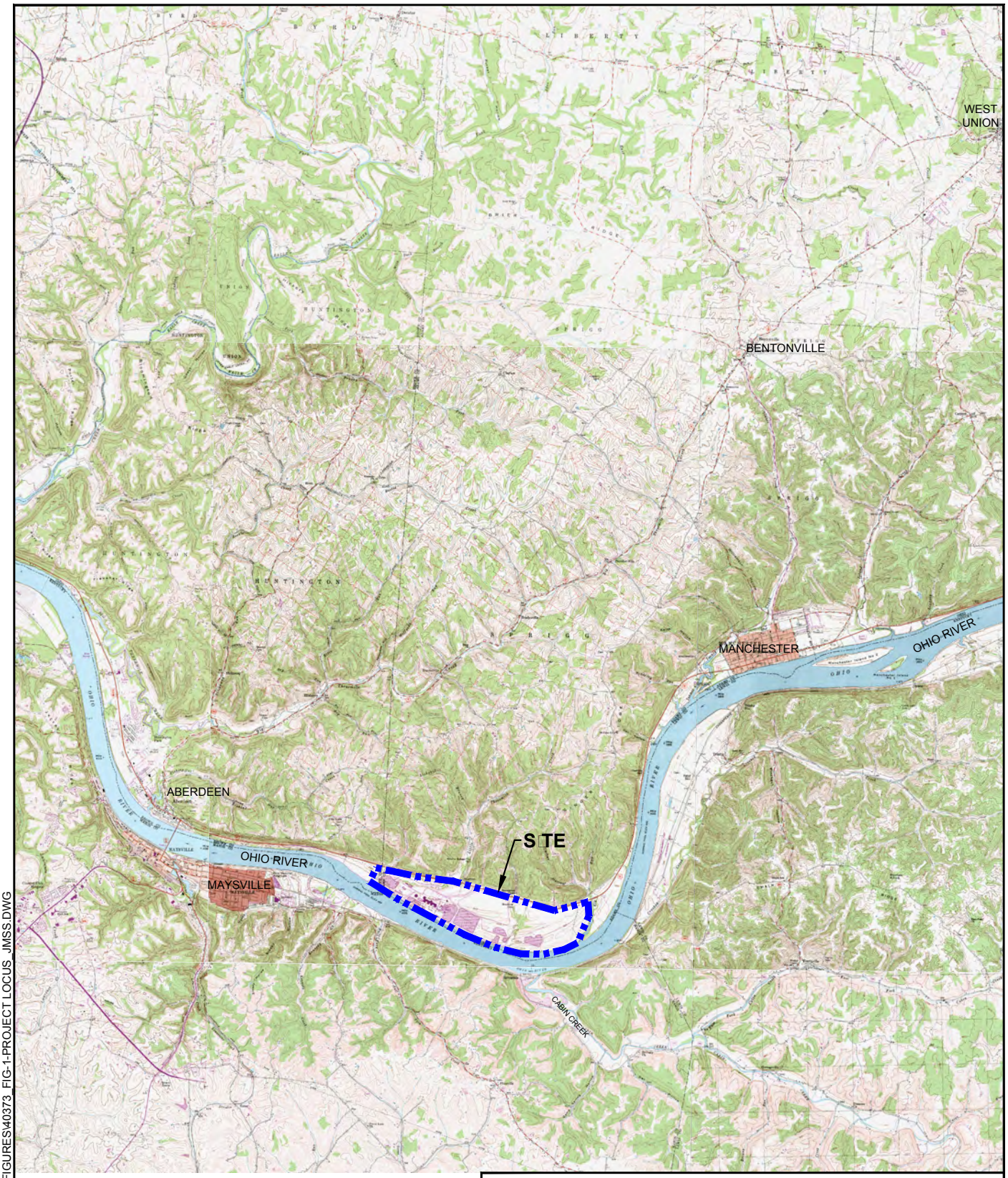
Observation Well Designation	Top of Casing Elevation (ft)	Well Depth (ft)	Measurement Date	Depth to Water[1,2] (ft)	Groundwater Elevation (ft)	Well Installation Notes
MW-5-5	490.7	31.2	7/11/2016	5.90	484.8	Well was installed on 05/18/2016
MW-5-6	500.3	30.2	7/11/2016	14.06	486.2	Well was installed on 05/17/2016
MW-5-7	533.0	60.2	7/12/2016	46.20	486.8	Well was installed on 05/17/2016
MW-18	500.2	31.0	7/14/2016	14.10	486.1	Well was installed on 05/20/2016
MW-19	494.8	39.0	7/14/2016	9.44	485.4	Well was installed on 05/24/2016
MW-20	504.0	35.2	7/14/2016	18.17	485.8	Well was installed on 05/25/2016
MW-21	536.8	56.0	7/14/2016	49.60	487.2	Well was installed on 08/14/2015
MW-22	536.9	60.2	7/14/2016	50.20	486.7	Well was installed on 05/19/2016

Notes:

1) Groundwater level readings have been made in the wells at times and under conditions discussed herein. However it must be noted that fluctuations in the level of the groundwater may occur due to variations in season, rainfall, temperature, and other factors not evident at the time measurements were made and reported.

2) Depth to water readings are recorded from top of casing.

FIGURES



TO O SO E: SGS TO OG M S
SSELL LLE DE T EST N ON M S LLE E ST
M S LLE EST M N ESTE SL NDS O O
M S L O NGE G TOLLES O O ENT
D NGLES

HALEY ALDRICH

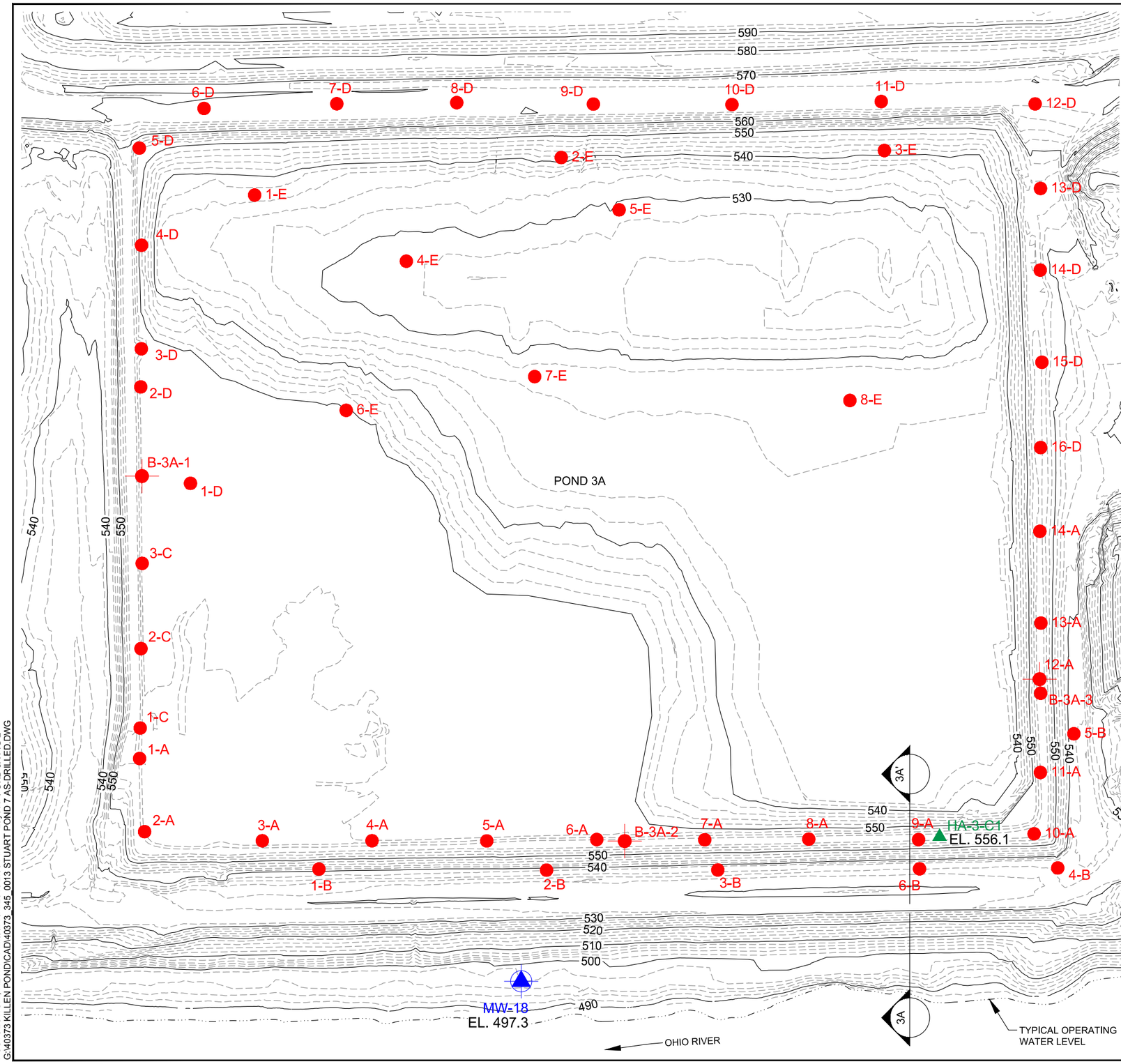
DAYTON POWER & LIGHT COMPANY
J. M. STUART GENERATING STATION
745 U.S. ROUTE 52
ABERDEEN, OHIO

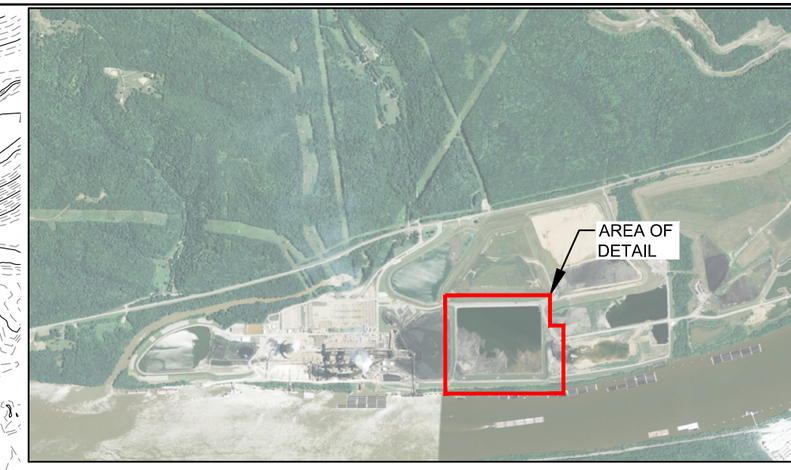
PROJECT LOCUS

APPROXIMATE SCALE: 1" 10 000'
OCTOBER 2016

FIGURE 1

LUCAS, ANDY Printed: 8/16/2016 3:57 PM Layout: FIGURE 1
G:\40373_DP&L\CAD-JMSS\GLOBAL\FIGURES\40373_FIG-1-PROJECT LOCUS_JMSS.DWG





KEY MAP

0 1500 3000

APPROXIMATE SCALE IN FEET

LEGEND

HA-6-C1 EL. 556.1 — DESIGNATION, LOCATION AND GROUND SURFACE ELEVATION OF CONE PENETROMETER SOUNDINGS PERFORMED BY CONETEC, INC. OF WEST BERLIN, NEW JERSEY DURING THE PERIOD 19 MAY 2016 TO 23 MAY 2016.

MW-18 EL. 497.3 — DESIGNATION, LOCATION AND GROUND SURFACE ELEVATION OF MONITORING WELL INSTALLED BY STEARNS DRILLING COMPANY OF DUTTON, MICHIGAN DURING THE PERIOD 16 MAY 2016 TO 3 JUNE 2016.

12-D — DESIGNATION AND APPROXIMATE LOCATION OF BORING PERFORMED BY EBASCO SERVICES, INC. IN 1974. EXPLORATIONS PERFORMED PRIOR TO POND CONSTRUCTION.

B-7-1 — DESIGNATION AND APPROXIMATE LOCATION OF TEST BORING PERFORMED BY BBCM IN 2010. EXPLORATIONS PERFORMED AFTER POND CONSTRUCTION.

3A 3A' — LOCATION OF SLOPE STABILITY CROSS SECTION

NOTES:

1. TOPOGRAPHY FROM GROUND CONTROL SURVEYS DATED APRIL 2013 BY L.R. KIMBALL, AND FROM AERIAL PHOTOGRAPHY DATED APRIL 18, 2013.
   a. HORIZONTAL CONTROL IS BASED ON NAD83 OH STATE PLANE DATUM.
   b. VERTICAL CONTROL IS BASED ON THE J.M.STUART DATUM, WHICH IS 1.43 FEET ABOVE NAVD88 DATUM.
2. TOPOGRAPHY FROM 2013 SURVEY WAS COMBINED WITH POND BATHYMETRY (POND 7 FROM 2012, POND 10 FROM 2013, PONDS 3A, 5, 6 FROM 2014).
3. ELEVATIONS OF EXPLORATIONS INDICATED ON THIS DRAWING ARE IN FEET AND REFER TO NAVD88 DATUM.
4. BACKGROUND IMAGE FOR KEY MAP IS DATED 15 JUNE 2014 FROM ESRI GIS.
5. TECHNICAL MONITORING OF TEST BORINGS, CONE PENTROMETER SOUNDINGS AND MONITORING WELLS COMPLETED DURING THE PERIOD 16 MAY 2016 TO 3 JUNE 2016 WAS PERFORMED BY HALEY & ALDRICH, INC.
6. AS-DRILLED LOCATIONS AND GROUND SURFACE ELEVATIONS OF TEST BORINGS, CONE PENTROMETER SOUNDINGS, AND MONITORING WELLS PERFORMED BY HALEY & ALDRICH IN 2016 WERE DETERMINED IN THE FIELD BY CESO, INC. OF DAYTON, OHIO BY OPTICAL SURVEY.

0 200 400

SCALE IN FEET

HALEY ALDRICH

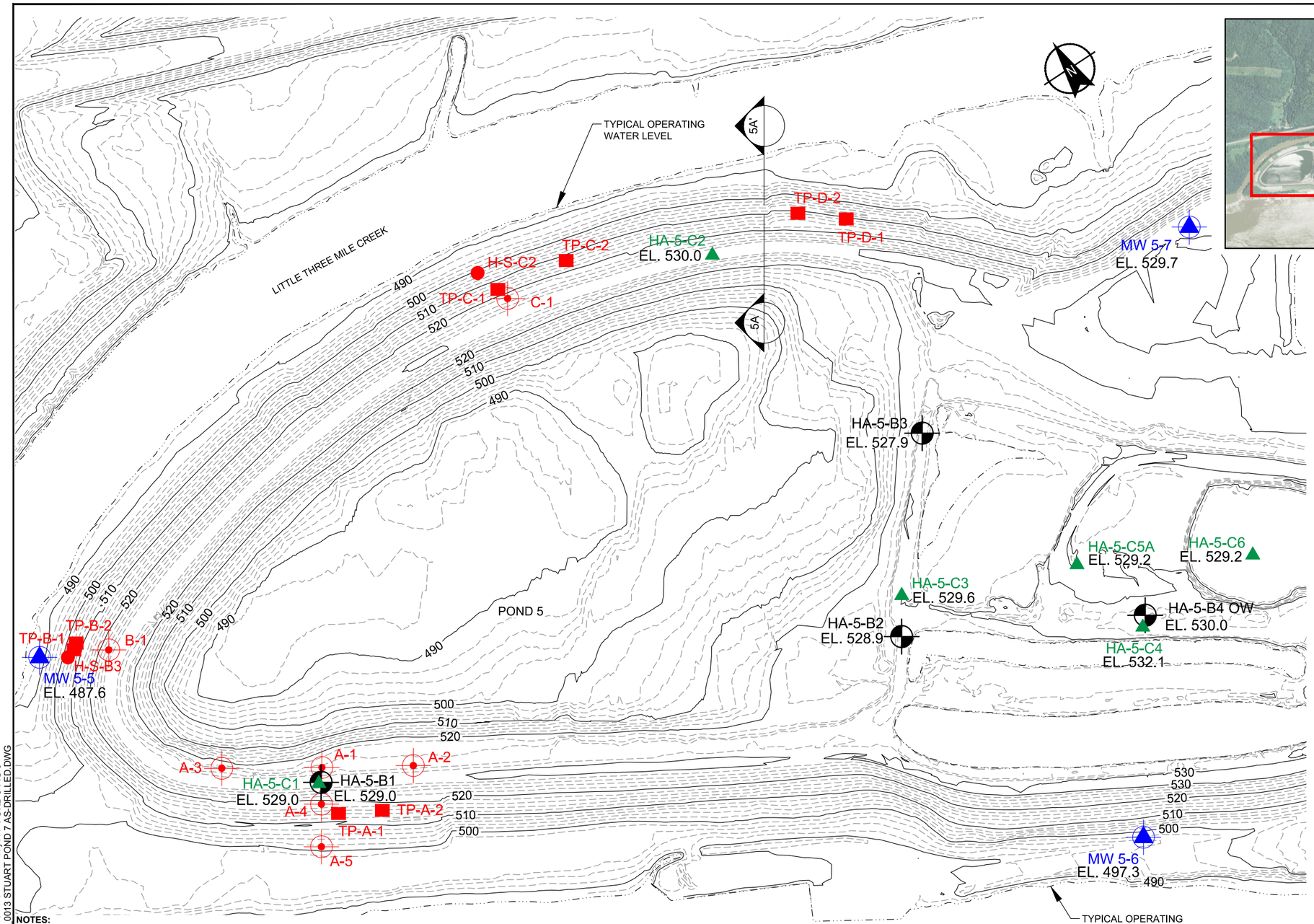
DAYTON POWER & LIGHT COMPANY
J.M. STUART ELECTRIC GENERATING STATION
ABERDEEN, OHIO

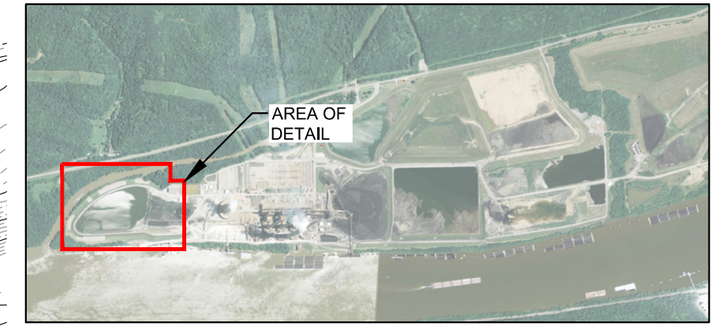
SUBSURFACE EXPLORATION
LOCATION PLAN - POND 3A

SCALE: AS SHOWN
OCTOBER 2016

FIGURE 2

POSTOLOWSKI, KEVIN Printed: 10/4/2016 2:08 PM Layout: POND 3A FIG 2
G:\40373 KILLEN POND\CAD\40373_345_0013 STUART POND 7 AS-DRILLED.DWG





KEY MAP

0 1500 3000

APPROXIMATE SCALE IN FEET

LEGEND

HA-5-B3 EL. 527.9 — DESIGNATION, LOCATION AND GROUND SURFACE ELEVATION OF TEST BORINGS PERFORMED BY STEARNS DRILLING COMPANY OF DUTTON, MICHIGAN DURING THE PERIOD 23 MAY 2016 TO 2 JUNE 2016.

HA-6-C6 EL. 529.2 — DESIGNATION, LOCATION AND GROUND SURFACE ELEVATION OF CONE PENETROMETER SOUNDINGS PERFORMED BY CONETEC, INC. OF WEST BERLIN, NEW JERSEY DURING THE PERIOD 19 MAY 2016 TO 23 MAY 2016.

MW-5-6 EL. 497.3 — DESIGNATION, LOCATION AND GROUND SURFACE ELEVATION OF MONITORING WELL INSTALLED BY STEARNS DRILLING COMPANY OF DUTTON, MICHIGAN DURING THE PERIOD 16 MAY 2016 TO 3 JUNE 2016.

B-1 — DESIGNATION AND APPROXIMATE LOCATION OF TEST BORING PERFORMED BY URS IN 2001. EXPLORATIONS PERFORMED AFTER POND CONSTRUCTION.

H-S-B3 — DESIGNATION AND APPROXIMATE LOCATION OF HAND AUGER TEST BORING PERFORMED BY BBC&M ENGINEERING IN 2010. PERFORMED AFTER POND CONSTRUCTION.

TP-B-1 — DESIGNATION AND APPROXIMATE LOCATION OF TEST PIT PERFORMED BY BBC&M ENGINEERING IN 2010. PERFORMED AFTER POND CONSTRUCTION.

5A 5A' — LOCATION OF SLOPE STABILITY CROSS SECTION

0 200 400

SCALE IN FEET

NOTES:

1. TOPOGRAPHY FROM GROUND CONTROL SURVEYS DATED APRIL 2013 BY L.R. KIMBALL, AND FROM AERIAL PHOTOGRAPHY DATED APRIL 18, 2013.
   a. HORIZONTAL CONTROL IS BASED ON NAD83 OH STATE PLANE DATUM.
   b. VERTICAL CONTROL IS BASED ON THE J.M.STUART DATUM, WHICH IS 1.43 FEET ABOVE NAVD88 DATUM.
2. TOPOGRAPHY FROM 2013 SURVEY WAS COMBINED WITH POND BATHYMETRY (POND 7 FROM 2012, POND 10 FROM 2013, PONDS 3A, 5, 6 FROM 2014).
3. ELEVATIONS OF EXPLORATIONS INDICATED ON THIS DRAWING ARE IN FEET AND REFER TO NAVD88 DATUM.
4. BACKGROUND IMAGE FOR KEY MAP IS DATED 15 JUNE 2014 FROM ESRI GIS.
5. TECHNICAL MONITORING OF TEST BORINGS, CONE PENTROMETER SOUNDINGS AND MONITORING WELLS COMPLETED DURING THE PERIOD 16 MAY 2016 TO 3 JUNE 2016 WAS PERFORMED BY HALEY & ALDRICH, INC.
6. AS-DRILLED LOCATIONS AND GROUND SURFACE ELEVATIONS OF TEST BORINGS, CONE PENTROMETER SOUNDINGS, AND MONITORING WELLS PERFORMED BY HALEY & ALDRICH IN 2016 WERE DETERMINED IN THE FIELD BY CESO, INC. OF DAYTON, OHIO BY OPTICAL SURVEY.

HALEY ALDRICH

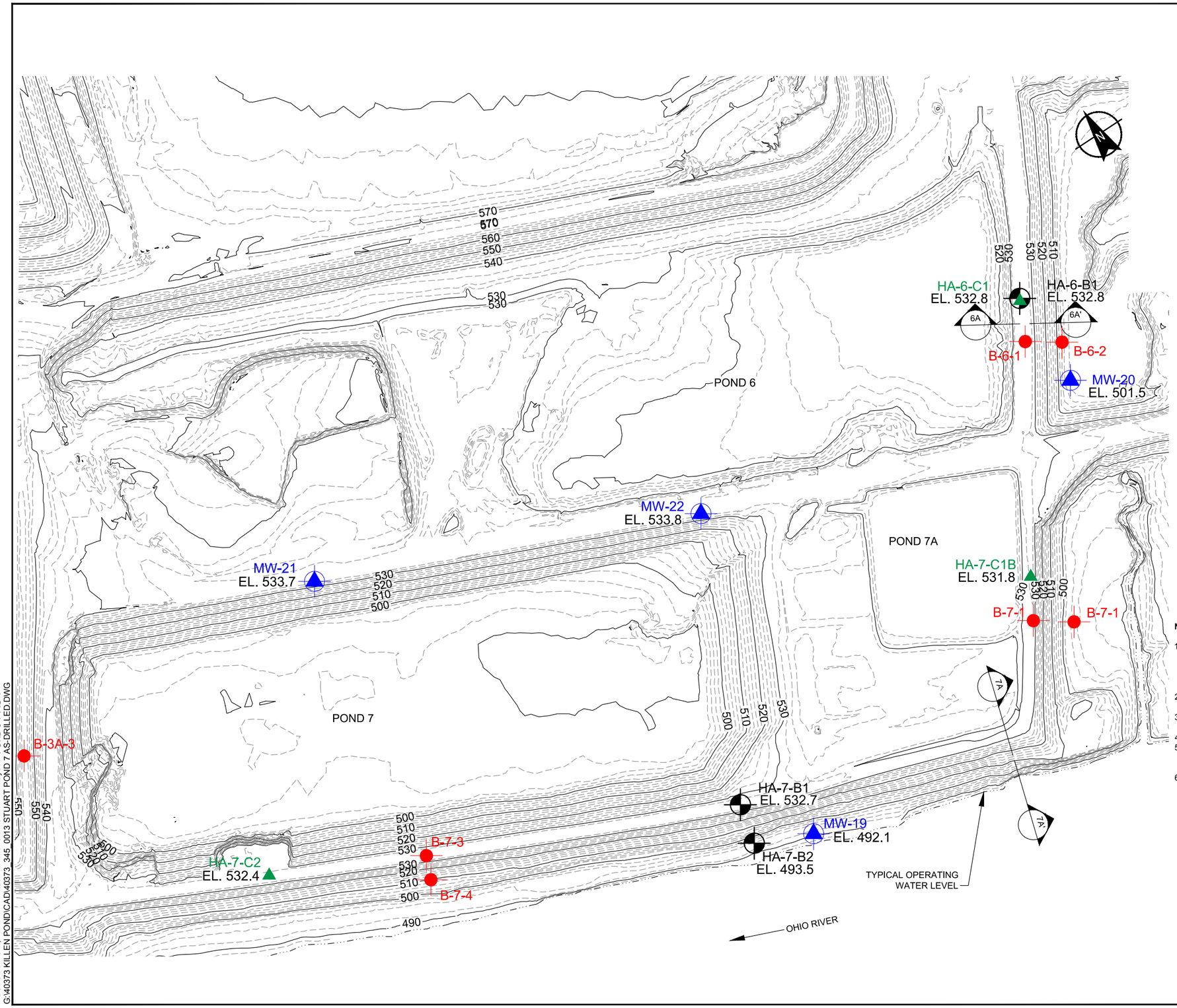
DAYTON POWER & LIGHT COMPANY
J.M. STUART ELECTRIC GENERATING STATION
ABERDEEN, OHIO

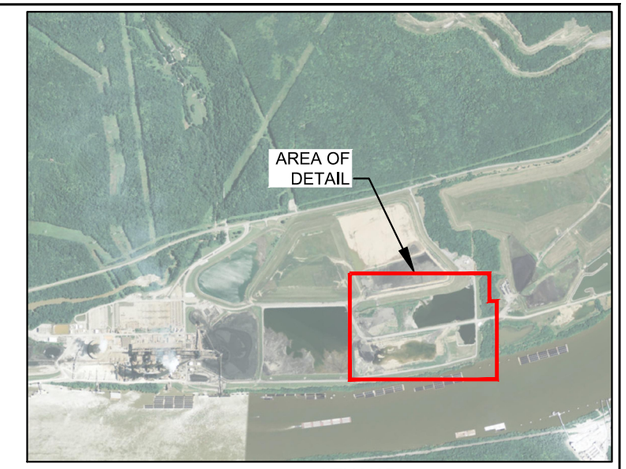
SUBSURFACE EXPLORATION
LOCATION PLAN - POND 5

SCALE: AS SHOWN
OCTOBER 2016

FIGURE 3

POSTOLOWSKI, KEVIN Printed: 10/4/2016 1:48 PM Layout: POND 5 FIG 3
G:\40373 KILLEN POND\CAD\40373_345_0013 STUART POND 7 AS-DRILLED.DWG





KEY MAP

0 1500 3000

APPROXIMATE SCALE IN FEET

LEGEND

HA-6-B1 EL. 532.8 — DESIGNATION, LOCATION AND GROUND SURFACE ELEVATION OF TEST BORINGS PERFORMED BY STEARNS DRILLING COMPANY OF DUTTON, MICHIGAN DURING THE PERIOD 23 MAY 2016 TO 2 JUNE 2016.

HA-6-C1 EL. 532.8 — DESIGNATION, LOCATION AND GROUND SURFACE ELEVATION OF CONE PENETROMETER SOUNDINGS PERFORMED BY CONETEC, INC. OF WEST BERLIN, NEW JERSEY DURING THE PERIOD 19 MAY 2016 TO 23 MAY 2016.

MW-20 EL. 501.5 — DESIGNATION, LOCATION AND GROUND SURFACE ELEVATION OF MONITORING WELL INSTALLED BY STEARNS DRILLING COMPANY OF DUTTON, MICHIGAN DURING THE PERIOD 16 MAY 2016 TO 3 JUNE 2016.

B-7-1 — DESIGNATION AND APPROXIMATE LOCATION OF TEST BORING PERFORMED BY BBCM IN 2010. EXPLORATIONS PERFORMED AFTER POND CONSTRUCTION.

6A 6A' — LOCATION OF SLOPE STABILITY CROSS SECTION

NOTES:

1. TOPOGRAPHY FROM GROUND CONTROL SURVEYS DATED APRIL 2013 BY L.R. KIMBALL, AND FROM AERIAL PHOTOGRAPHY DATED APRIL 18, 2013.
   a. HORIZONTAL CONTROL IS BASED ON NAD83 OH STATE PLANE DATUM.
   b. VERTICAL CONTROL IS BASED ON THE J.M.STUART DATUM, WHICH IS 1.43 FEET ABOVE NAVD88 DATUMERTICAL CONTROL DATUM OF TOPOGRAPHY IS UNKNOWN.
2. TOPOGRAPHY FROM 2013 SURVEY WAS COMBINED WITH POND BATHYMETRY (POND 7 FROM 2012, POND 10 FROM 2013, PONDS 3A, 5, 6 FROM 2014).
3. ELEVATIONS OF EXPLORATIONS INDICATED ON THIS DRAWING ARE IN FEET AND REFER TO NAVD88 DATUM.
4. BACKGROUND IMAGE FOR KEY MAP IS DATED 15 JUNE 2014 FROM ESRI GIS.
5. TECHNICAL MONITORING OF TEST BORINGS, CONE PENTROMETER SOUNDINGS AND MONITORING WELLS COMPLETED DURING THE PERIOD 16 MAY 2016 TO 3 JUNE 2016 WAS PERFORMED BY HALEY & ALDRICH, INC.
6. AS-DRILLED LOCATIONS AND GROUND SURFACE ELEVATIONS OF TEST BORINGS, CONE PENTROMETER SOUNDINGS, AND MONITORING WELLS PERFORMED BY HALEY & ALDRICH IN 2016 WERE DETERMINED IN THE FIELD BY CESO, INC. OF DAYTON, OHIO BY OPTICAL SURVEY.

0 250 500

SCALE IN FEET

HALEY ALDRICH

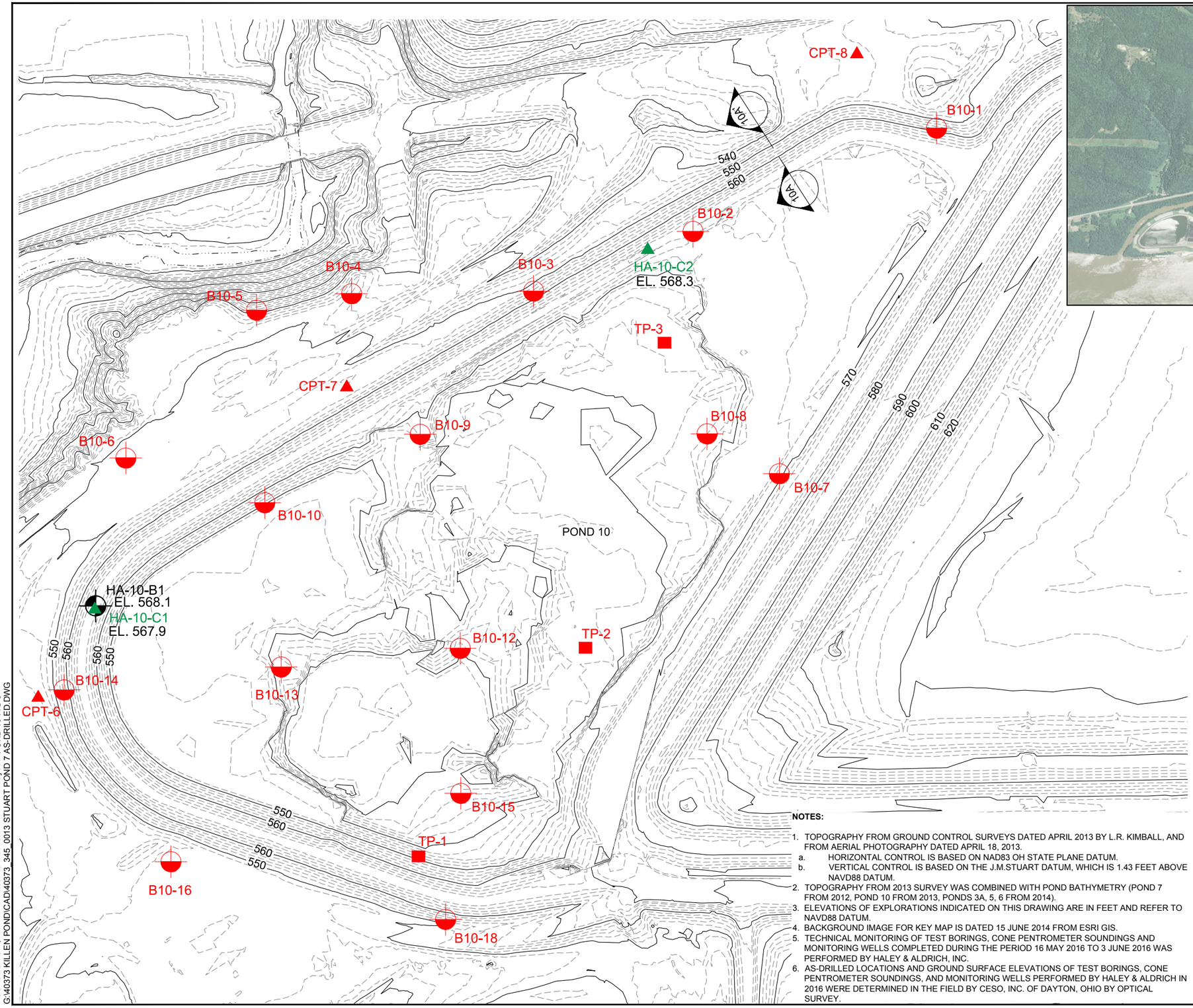
DAYTON POWER & LIGHT COMPANY
J.M. STUART ELECTRIC GENERATING STATION
ABERDEEN, OHIO

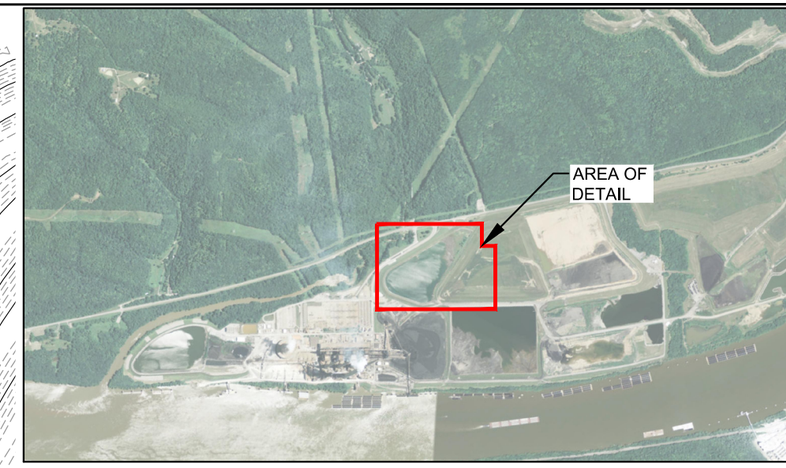
SUBSURFACE EXPLORATION LOCATION PLAN - POND 6 AND 7

SCALE: AS SHOWN
OCTOBER 2016

FIGURE 4

POSTOLOWSKI, KEVIN Printed: 10/4/2016 3:15 PM Layout: POND 6-7 FIG 4
G:\40373 KILLEN POND\CAD\40373_345_0013 STUART POND 7 AS-DRILLED.DWG





KEY MAP

0 1500 3000

APPROXIMATE SCALE IN FEET

LEGEND

HA-10-B1 / EL. 568.1 — DESIGNATION, LOCATION AND GROUND SURFACE ELEVATION OF TEST BORINGS PERFORMED BY STEARNS DRILLING COMPANY OF DUTTON, MICHIGAN DURING THE PERIOD 23 MAY 2016 TO 2 JUNE 2016.

HA-6-C1 / EL. 567.9 — DESIGNATION, LOCATION AND GROUND SURFACE ELEVATION OF CONE PENETROMETER SOUNDINGS PERFORMED BY CONETEC, INC. OF WEST BERLIN, NEW JERSEY DURING THE PERIOD 19 MAY 2016 TO 23 MAY 2016.

B10-1 — DESIGNATION AND APPROXIMATE LOCATION OF TEST BORING PERFORMED BY URS IN 1999. EXPLORATIONS PERFORMED PRIOR TO POND CONSTRUCTION.

TP-1 — DESIGNATION AND APPROXIMATE LOCATION OF TEST PIT PERFORMED BY URS IN 1999. EXPLORATIONS PERFORMED PRIOR TO POND CONSTRUCTION.

HAC1 — DESIGNATION AND APPROXIMATE LOCATION OF CONE PENETROMETER SOUNDING LOCATION PERFORMED BY BBCM IN 2011. EXPLORATIONS PERFORMED AFTER POND CONSTRUCTION.

10A 10A' — LOCATION OF SLOPE STABILITY CROSS SECTION

0 200 400

SCALE IN FEET

NOTES:

1. TOPOGRAPHY FROM GROUND CONTROL SURVEYS DATED APRIL 2013 BY L.R. KIMBALL, AND FROM AERIAL PHOTOGRAPHY DATED APRIL 18, 2013.
   a. HORIZONTAL CONTROL IS BASED ON NAD83 OH STATE PLANE DATUM.
   b. VERTICAL CONTROL IS BASED ON THE J.M.STUART DATUM, WHICH IS 1.43 FEET ABOVE NAVD88 DATUM.
2. TOPOGRAPHY FROM 2013 SURVEY WAS COMBINED WITH POND BATHYMETRY (POND 7 FROM 2012, POND 10 FROM 2013, PONDS 3A, 5, 6 FROM 2014).
3. ELEVATIONS OF EXPLORATIONS INDICATED ON THIS DRAWING ARE IN FEET AND REFER TO NAVD88 DATUM.
4. BACKGROUND IMAGE FOR KEY MAP IS DATED 15 JUNE 2014 FROM ESRI GIS.
5. TECHNICAL MONITORING OF TEST BORINGS, CONE PENTROMETER SOUNDINGS AND MONITORING WELLS COMPLETED DURING THE PERIOD 16 MAY 2016 TO 3 JUNE 2016 WAS PERFORMED BY HALEY & ALDRICH, INC.
6. AS-DRILLED LOCATIONS AND GROUND SURFACE ELEVATIONS OF TEST BORINGS, CONE PENTROMETER SOUNDINGS, AND MONITORING WELLS PERFORMED BY HALEY & ALDRICH IN 2016 WERE DETERMINED IN THE FIELD BY CESO, INC. OF DAYTON, OHIO BY OPTICAL SURVEY.

HALEY ALDRICH

DAYTON POWER & LIGHT COMPANY
J.M. STUART ELECTRIC GENERATING STATION
ABERDEEN, OHIO

SUBSURFACE EXPLORATION
LOCATION PLAN - POND 10

SCALE: AS SHOWN
OCTOBER 2016

FIGURE 5

POSTOLOWSKI, KEVIN Printed: 10/4/2016 2:17 PM Layout: POND 10 FIG 5
G:\40373 KILLEN POND\CAD\40373_345_0013 STUART POND 7 AS-DRILLED.DWG

APPENDIX A

Test Boring Logs and CPT Related Information

TEST BORING REPORT

HALEY ALDRICH

Boring No. HA-5-B1

Project	JM Stuart Station, 745 US HWY 52, Aberdeen, Ohio 45101
Client	The Dayton Power and Light Company
Contractor	Stearns Drilling

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	HSA	S	--	Rig Make & Model: CME 1050
Inside Diameter (in.)	4.0	1.375	--	Bit Type: Cutting Head Drill Mud: None
Hammer Weight (lb)	SPUN	140	-	Casing: Spun to 66.0 ft
Hammer Fall (in.)	-	30	-	Hoist/Hammer: Winch Automatic Hammer PID Make & Model: N/A

File No.	40373-346
Sheet No.	1 of 3
Start	23 May 2016
Finish	24 May 2016
Driller	B. Grahm
H&A Rep.	C. Toscano
Elevation	529.1
Datum	NAVD 88
Location	See Plan N 235791 E 1624144

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Stratum Change Elev/Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0	4 6 5 6	S1 24	1.0 3.0		CL	Stiff brown sandy lean CLAY (CL) no odor, dry, contains frequent seams of elastic silt and trace fine gravel -FILL-					42	58				
	7 9 5 5	S2 24	4.0 6.0		CL	Similar to S1					40	60				
5				524.1 5.0	SM	Medium dense brown silty SAND with gravel (SM), no odor, dry		22	4	15	25	34				
	1 2 3 3	S3 24	8.0 10.0	521.1 8.0	CL	Medium stiff yellow-brown lean CLAY (CL), no odor, moist, contains trace coarse to fine sand PP=2.5 tsf						100	S	M	M	H
10	P U S H	U1 24	10.0 12.0		CL	Yellow-brown lean CLAY (CL), dry, torvane=4.5 kg/cm^2					3	97				
15	3 5 4 9	S4 24	14.0 16.0		CL	Stiff yellow-brown to gray-brown lean CLAY (CL), no odor, moist, contains frequent seams of fine sandy clay and layers of slag particles (occasional)						100	S	M	M	H
20	5 7	S5 24	19.0 21.0		CL	Very stiff yellow-brown lean CLAY (CL), no odor, wet						100 100	S S	M M	M M	H H

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft) to: Bottom of Casing	Bottom of Hole	Water
5/23/16	17:00	.15	19	19	16.8
5/24/16	08:00	14	24	36	14.5

Sample ID

O - Open End Rod
T - Thin Wall Tube
U - Undisturbed Sample
S - Split Spoon Sample

Well Diagram

Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary

Overburden (ft)	66.0
Rock Cored (ft)	--
Samples	13S, 3U

Boring No. HA-5-B1

Field Tests: **Dilatancy**: R - Rapid S - Slow N - None **Plasticity**: N - Nonplastic L - Low M - Medium H - High
Toughness: L - Low M - Medium H - High **Dry Strength**: N - None L - Low M - Medium H - High V - Very High

***Note: Maximum particle size (mps) is determined by direct observation within the limitations of sampler size.**

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

H&A-TEST BORING-07-1 HA-LIB09.GLB HA-TB+CORE+WELL-09 W FENCE.GDT \\WAS\COMMON\PROJECTS\40373 DP&L\-345 STUART STATION\FIELDWORK\BORING LOGS\GINT\40373-346TB_2016.GPJ 3 Oct 16

TEST BORING REPORT

HALEY ALDRICH

Boring No. HA-5-B1
File No. 40373-346
Sheet No. 2 of 3

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Stratum Change Elev/Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
20	12 15			509.1 20.0	SM	Dark brown silty SAND with gravel (SM), no odor, wet -FILL-	5	10	5	15	25	40				
				505.1 24.0												
25	2 6 7 9	S6 24	24.0 26.0		CL	Stiff yellow-brown lean CLAY (CL), no odor, moist, contains frequent seams of silt and trace coarse to fine gravel PP=5 tsf						100	S	M	M	H
30	3 6 13 15	S7 24	29.0 31.0		CL	Very stiff yellow-brown lean CLAY (CL), wet, contains trace of coarse to fine gravel PP=2.75 tsf					1	99				
35	P U S H	U2 20	34.0 36.0		CL	Yellow-brown lean CLAY with sand (CL), wet. 3.0 in. water at the top of tube. Bottom 4.0 in. of clay was lost at bottom of tube.					17	83				
40	5 6 11 12	S8 24	39.0 41.0		CL	Very stiff yellow-brown lean CLAY with sand (CL), no odor, moist					20	80				
				488.6 40.5												
	4 8 6 9	S9 24	41.0 43.0		ML	Stiff gray sandy SILT (ML), wet, contains frequent fine sand partings					30	70				
45	P U S H	U3 24	43.0 45.0		ML	Gray sandy SILT (ML), moist, torvane=3 kg/cm^2 PP=1.0 tsf -ALLUVIAL DEPOSITS-					48	52				
	3	S10	49.0		ML	Medium stiff olive-gray sandy SILT (ML), slight organic odor, moist, with					40	60				

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

H&A-TEST BORING-07-1 HA-LIB09.GLB HA-TB+CORE+WELL-09 W FENCE.GDT \\WAS\COMMON\PROJECTS\40373 DP&L\-345 STUART STATION\FIELDWORK\BORING LOGS\GINT\40373-346TB_2016.GPJ 3 Oct 16

TEST BORING REPORT

HALEY ALDRICH

Boring No. HA-5-B1
File No. 40373-346
Sheet No. 3 of 3

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Stratum Change Elev/Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
50	3 3 5	24	51.0			frequent seams of fine sand -ALLUVIAL DEPOSITS-										
55	3 3 5 3	S11 24	54.0 56.0		ML	Medium stiff olive-gray SILT (ML) with sand, slight organic odor, moist, contains frequent seams of fine sand.					20	80				
60	3 2 7 5	S12 24	59.0 61.0		ML	Similar to S10, except stiff and olive-brown.					15	85				
65	2 3 4 5	S13 24	64.0 66.0		ML	Similar to S10, except olive-brown					15	85				
				463.1 66.0		BOTTOM OF EXPLORATION 66.0 FT Notes: Set 24 hour temporary standpipe at 65.0 ft. Screen set at 60.0 to 65.0 ft Boring tremie grouted to ground surface after 24 hour water level reading.										

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. HA-5-B1

TEST BORING REPORT

HALEY ALDRICH

Boring No. HA-5-B2

Project	JM Stuart Station, 745 US HWY 52, Aberdeen, Ohio 45101
Client	The Dayton Power and Light Company
Contractor	Stearns Drilling

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	HSA	S	--	Rig Make & Model: CME 1050
Inside Diameter (in.)	4 1/4	1.375	--	Bit Type: Cutting Head Drill Mud: None
Hammer Weight (lb)	-	140	-	Casing: HSA Spun to 99.0 ft
Hammer Fall (in.)	-	30	-	Hoist/Hammer: Winch Automatic Hammer PID Make & Model: N/A

File No.	40373-346
Sheet No.	1 of 4
Start	1 June 2016
Finish	2 June 2016
Driller	B. Grahm
H&A Rep.	D. Warren
Elevation	529.0
Datum	NAVD 88
Location	See Plan N 235528 E 1625208

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Stratum Change Elev/Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0	3 2 2 2	S1 18	0.0 2.0		ML	Very loose gray SILT with sand (ML), no structure, no odor, moist -BOTTOM ASH FILL-					15	85				
5	3 2 3 2	S2 20	4.0 6.0		ML	Loose mottled orange-brown to gray sandy SILT (ML), trace slag, no structure, no odor, moist, contains trace slag					45	55				
				520.0 9.0												
10	3 3 2 3	S3 20	9.0 11.0		SM	Loose gray-brown silty SAND (SM), no structure, no odor, moist, contains trace slag					60	40				
				515.0 14.0												
15	4 4 4 5	S4 18	14.0 16.0		SP-SM	Loose gray poorly graded SAND with silt (SP-SM), no structure, no odor, wet, contains trace slag				30	60	10				
				510.0 19.0												
20	7 10	S5 18	19.0 21.0		SM	Medium dense silty SAND (SM), no structure, no odor, wet, contains trace slag		11	12	22	31	24				

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft) to: Bottom of Casing	Bottom of Hole	Water
6/1/16	10:00		14	16	13.5

Sample ID

O - Open End Rod
T - Thin Wall Tube
U - Undisturbed Sample
S - Split Spoon Sample

Well Diagram

Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary

Overburden (ft)	101.0
Rock Cored (ft)	--
Samples	S27, 1U

Boring No. HA-5-B2

Field Tests: **Dilatancy**: R - Rapid S - Slow N - None **Toughness**: L - Low M - Medium H - High **Plasticity**: N - Nonplastic L - Low M - Medium H - High **Dry Strength**: N - None L - Low M - Medium H - High V - Very High

***Note: Maximum particle size (mps) is determined by direct observation within the limitations of sampler size.**

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

H&A-TEST BORING-07-1 HA-LIB09.GLB HA-TB+CORE+WELL-09 W FENCE.GDT \\WAS\COMMON\PROJECTS\40373 DP&L\-345 STUART STATION\FIELDWORK\BORING LOGS\GINT\40373-346TB_2016.GPJ 3 Oct 16

HALEY ALDRICH

TEST BORING REPORT

Boring No. HA-5-B2
File No. 40373-346
Sheet No. 2 of 4

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Stratum Change Elev/Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
20	10 12					-BOTTOM ASH FILL-										
25	8 9 12 13	S6 17	24.0 26.0		SM	Similar to S5, except medium dense					55	45				
	2 2 1 2	S7 9	26.0 28.0	503.0 26.0	SP-SM	Very loose gray poorly-graded SAND with silt (SP-SM), no structure, no odor, wet				30	60	10				
	2 2 6 10	S8 S8A 22	28.0 30.0 29.0		SP-SM	Similar to S7, except loose				30	60	10				
				500.0 29.0	CL	Medium stiff mottled yellow-brown to dark brown lean CLAY with sand (CL), no structure, no odor, moist			5	10	5	80				
30	2 4 6 11	S9 14	30.0 32.0		CL	Stiff mottled yellow-brown to gray-brown sandy lean CLAY with gravel (CL), no structure, no odor, wet, contains frequent seams of silty sand		15	5	5	10	65				
	4 5 6 8	S10 16	32.0 34.0		CL	Similar to S9		15	5	5	10	65				
35	6 6 9 11	S11 16	34.0 36.0		CL	Siff mottled yellow-brown to gray-brown sandy lean CLAY (CL), no structure, no odor, moist, contains occasional black cinders -FILL-					35	65				
	2 2 2 5	S12 18	36.0 38.0	493.0 36.0	MH	Soft gray elastic SILT (MH), contains trace decomposed roots -ALLUVIAL DEPOSITS-			5	1	1	93				
	3 3 6 13	NR	38.0 40.0	491.0 38.0		No recovery 38.0 to 40.0 ft, spoon pushing coarse gravel/cobble										
40	P U S H	U1 22	40.0 42.0		SP-SM	Gray poorly-graded SAND with silt (SP-SM)					92	8				
	3 3 4 7	S13 18	42.0 44.0	487.0 42.0	SM	Loose brown silty SAND with gravel (SM), no structure, no door, wet		15	5	30	35	15				
45	2 2 3 3	S14 20	44.0 46.0		SM	Loose brown silty SAND (SM), no structure, no odor, wet			10	25	50	15				
	2 2 3 3	S15 15	46.0 48.0	483.0 46.0	SP-SM	Loose orange-brown poorly graded SAND with silt (SP-SM), no structure, no odor, wet, contains trace gravel		5	10	40	38	7				
	3 3 5 5	S16 18	48.0 50.0		SP-SM	Similar to S15, except contains occasional thin seams of black organic soil		5	15	61	12	7				

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. HA-5-B2

H&A-TEST BORING-07-1 HA-LIB09.GLB HA-TB+CORE+WELL-09 W FENCE.GDT \\WAS\COMMON\PROJECTS\40373 DP&L\-345 STUART STATION\FIELDWORK\BORING LOGS\GINT\40373-346TB_2016.GPJ 3 Oct 16

TEST BORING REPORT

HALEY ALDRICH

Boring No. HA-5-B2
File No. 40373-346
Sheet No. 3 of 4

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Stratum Change Elev/Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
50						-ALLUVIAL DEPOSITS-										
				475.0 / 54.0												
55	2 3 5 5	S17 23	54.0 56.0		SW-SM	Loose brown well graved SAND with silt and gravel (SW-SM), no structure, no odor, wet		15	20	40	15	10				
60	2 2 4 4	S18 18	59.0 61.0		SW-SM	Loose brown well-graded SAND with silt (SW-SM), stratified, no odor, wet, contains occasional thin seams of dark brown organic soil			30	30	25	15				
				465.0 / 64.0												
65	2 3 5 5	S19 15	64.0 66.0		SP	Loose brown poorly graded SAND trace fine gravel (SP), no structure, no odor, wet		5	10	60	25					
70	3 3 5 7	S20 16	69.0 71.0		SP	Loose brown poorly graded SAND (SP), no structure, no odor, wet			15	60	25					
75	1 4 9 12	S21 14	74.0 76.0		SP	Medium dense brown poorly graded SAND trace gravel (SP), no structure, no odor, wet	5	5	5	60	25					
									35	35	30					

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. HA-5-B2

TEST BORING REPORT

HALEY ALDRICH

Boring No. HA-5-B2
File No. 40373-346
Sheet No. 4 of 4

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Stratum Change Elev/Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
80	4 5 9 10	S22 16	79.0 81.0		SP	Medium dense brown well-graded SAND (SP), no structure, no odor, wet										
						-ALLUVIAL DEPOSITS-										
85	7 8 11 12	S23 15	84.0 86.0		SP	Medium dense brown poorly graded SAND (SP) no structure, no odor, wet, contains trace gravel and occasional seams of dark brown organic soil		10	10	50	25	5				
90	7 10 15 18	S24 18	89.0 91.0		SP	Medium dense brown poorly graded SAND (SP), trace fine gravel, no structure, no odor, wet, contains trace fine gravel		5	10	50	35					
95	7 8 12 15	S25 8	94.0 96.0		SP	Similar to S24, except contains trace coarse to fine gravel (SP)	5	5	10	60	20					
100	3 5 6 7	S26 14	99.0 101.0		SP	Medium dense brown poorly graded SAND (SP), no structure, no odor, wet			5	50	45					
				428.0 101.0		BOTTOM OF EXPLORATION 101.0 FT Note: Borehole tremie grouted to ground surface upon completion.										

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. HA-5-B2

H&A-TEST BORING-07-1 HA-LIB09.GLB HA-TB+CORE+WELL-09 W FENCE.GDT \\WAS\COMMON\PROJECTS\40373 DP&L\-345 STUART STATION\FIELDWORK\BORING LOGS\GINT\40373-346TB_2016.GPJ 3 Oct 16

TEST BORING REPORT

HALEY ALDRICH

Boring No. HA-5-B3

Project	JM Stuart Station, 745 US HWY 52, Aberdeen, Ohio 45101
Client	The Dayton Power and Light Company
Contractor	Stearns Drilling

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	HSA	S	--	Rig Make & Model: CME 1050
Inside Diameter (in.)	4.0	1.375	--	Bit Type: Cutting Head Drill Mud: None
Hammer Weight (lb)	-	140	-	Casing: HSA Spun to 68.0 ft
Hammer Fall (in.)	-	30	-	Hoist/Hammer: Winch Automatic Hammer PID Make & Model: N/A

File No.	40373-346
Sheet No.	1 of 3
Start	31 May 2016
Finish	1 June 2016
Driller	B. Grahm
H&A Rep.	C. Toscano
Elevation	528.0
Datum	NAVD 88
Location	See Plan N 235839 E 1625416

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Stratum Change Elev/Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0																
	4 9 10 13	S1 20	2.0 4.0		SM	Medium dense gray silty SAND (SM), no odor, dry Fine sands appear to be quartz particles, fines ash specs, contains trace coarse sand.				5	60	35				
	13 18 29 30	S2 24	4.0 6.0		SM	Similar to S1, except dense, gray-brown -BOTTOM ASH FILL-			5	15	50	30				
5																
	9 10 14 15	S3 22	9.0 11.0		SM	Similar to S1		8	9	25	31	27				
10																
	9 11 12 15	S4 24	14.0 16.0		SM	Similar to S1, except moist				5	55	40				
15																
	13 15	S5 24	19.0 21.0		SM	Dense gray silty SAND (SM), no odor, wet				5	55	40				
20																

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft) to: Bottom of Casing	Bottom of Hole	Water
6/01/16	07:00	12	24	26	14.5

Sample ID

O - Open End Rod
T - Thin Wall Tube
U - Undisturbed Sample
S - Split Spoon Sample

Well Diagram

Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary

Overburden (ft)	70.0
Rock Cored (ft)	
Samples	19S

Boring No. HA-5-B3

Field Tests: **Dilatancy**: R - Rapid S - Slow N - None **Toughness**: L - Low M - Medium H - High **Plasticity**: N - Nonplastic L - Low M - Medium H - High **Dry Strength**: N - None L - Low M - Medium H - High V - Very High

***Note: Maximum particle size (mps) is determined by direct observation within the limitations of sampler size.**

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

H&A-TEST BORING-07-1 HA-LIB09.GLB HA-TB+CORE+WELL-09 W FENCE.GDT \\WAS\COMMON\PROJECTS\40373 DP&L\-345 STUART STATION\FIELDWORK\BORING LOGS\GINT\40373-346TB_2016.GPJ 3 Oct 16

TEST BORING REPORT

HALEY ALDRICH

Boring No. HA-5-B3
File No. 40373-346
Sheet No. 2 of 3

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Stratum Change Elev/Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
20	21 25					-BOTTOM ASH FILL-										
				505.0 23.0												
	4 5 7 9	S6 24	24.0 26.0		CL	Stiff yellow-brown lean CLAY with sand (CL), no odor, wet, contains trace coarse to fine gravel				10	10	80				
25	2 4 5 10	S7 24	26.0 28.0		CL	Stiff yellow-brown lean CLAY trace sand (CL), no odor, moist PP=4.0 tsf						100				
						-FILL-										
30	3 8 20 29	S8 S8A 24	30.0 32.0 31.0		CL	Very stiff yellow-brown to gray-brown lean CLAY (CL), no odor, wet						100				
				497.0 31.0	SP-SM	Medium dense gray poorly graded SAND with silt (SP-SM), no odor, wet, contains trace organic fragments				20	70	10				
	4 10 19 21	S9 24	32.0 34.0		SP-SM	Similar to S8A, except contains frequent silty clay layers				20	70	10				
				494.0 34.0												
35	7 18 22 19	S10 20	34.0 36.0		SP	Dense light brown poorly graded SAND (SP), no odor, moist, well stratified				15	85					
						-ALLUVIAL DEPOSITS-										
	5 4 5 7	S11 12	38.0 40.0		SP	Loose light brown poorly graded SAND (SP), no odor, wet				30	70					
40	2 2 2 2	S12 20	41.0 43.0		SP	Similar to S11, except very loose		2	2	28	65	3				
				484.0 44.0												
45	1 2 1 3	S13 3	44.0 46.0		SM	Very loose brown silty SAND with gravel (SM), no odor, wet Note: Poor recovery due to pushing coarse gravel	10	5	5	15	50	15				
				482.0 46.0												
	3 4 6 7	S14 20	46.0 48.0		SP	Loose light brown poorly graded SAND trace coarse to fine gravel (SP)				50	50					
	2 3 4 5	S15 16	48.0 50.0		SP	Similar to S14				60	40					

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. HA-5-B3

TEST BORING REPORT

HALEY ALDRICH

Boring No. HA-5-B3
File No. 40373-346
Sheet No. 3 of 3

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Stratum Change Elev/Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
50						-ALLUVIAL DEPOSITS-										
55	2 1 3 5	S16 18	54.0 56.0		SP	Very loose brown poorly graded SAND (SP), trace fine gravel, no odor, wet			5	75	20					
60	4 7 8 10	S17 12	59.0 61.0		SP	Similar to S16, except medium dense			5	75	20					
65	2 3 6 8	S18 13	64.0 66.0		SP	Similar to S16, except loose			25	65	10					
	3 3 6 9	S19 14	68.0 70.0		SP	Loose brown poorly graded SAND (SP), trace fine gravel, no odor, wet			20	65	15					
70				458.0 70.0		BOTTOM OF EXPLORATION 70.0 FT Note: Borehole tremie grouted to ground surface upon completion.										

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. HA-5-B3

TEST BORING REPORT

HALEY ALDRICH

Boring No. HA-5-B4OW

Project	JM Stuart Station, 745 US HWY 52, Aberdeen, Ohio 45101
Client	The Dayton Power and Light Company
Contractor	Stearns Drilling

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	HSA	S	--	Rig Make & Model: CME 1050
Inside Diameter (in.)	4 1/4	1.375	--	Bit Type: Cutting Head Drill Mud: None
Hammer Weight (lb)	-	140	-	Casing: HSA Spun to 99.0 ft
Hammer Fall (in.)	-	30	-	Hoist/Hammer: Winch Automatic Hammer PID Make & Model: N/A

File No.	40373-346
Sheet No.	1 of 4
Start	2 June 2016
Finish	2 June 2016
Driller	B. Grahm
H&A Rep.	D. Warren
Elevation	530.1
Datum	NAVD 88
Location	See Plan N 235353 E 1625620

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Well Diagram	Stratum Change Elev/Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0	5 8 8 8	S1 24	0.0 2.0			SM	Medium dense tan gray silty SAND (SM), no structure, no odor, moist -GYPSUM AND BOTTOM ASH FILL-					60	40				
					526.1 4.0												
5	3 3 3 5	S2 22	4.0 6.0			SP	Loose gray poorly graded SAND (SP), no structure, no odor, dry -BOTTOM ASH FILL-				15	85					
					521.1 9.0												
10	5 8 7 7	S3 22	9.0 11.0			SM	Medium dense gray and tan silty SAND (SM), no odor, dry		4	18	25	30	23				
					516.1 14.0												
15 ▽	2 2 1 1	S4 18	14.0 16.0			SP	Very loose gray poorly graded SAND (SP), no structure, no odor, moist				15	85					
20	2 1	S5 12	19.0 21.0			SP	Very loose gray poorly graded SAND (SP), no structure, no odor, wet, contains trace slag			5	15	80					

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft) to: Bottom of Casing	Bottom of Hole	Water
6/02/16	10:30	-	19	21	15.4

Sample ID

O - Open End Rod
T - Thin Wall Tube
U - Undisturbed Sample
S - Split Spoon Sample

Well Diagram

Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary

Overburden (ft)	101.0
Rock Cored (ft)	
Samples	21S

Boring No. HA-5-B4OW

Field Tests: **Dilatancy**: R - Rapid S - Slow N - None **Toughness**: L - Low M - Medium H - High **Plasticity**: N - Nonplastic L - Low M - Medium H - High **Dry Strength**: N - None L - Low M - Medium H - High V - Very High

***Note: Maximum particle size (mps) is determined by direct observation within the limitations of sampler size.**

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

H&A-TEST BORING-07-1 HA-LIB09.GLB HA-TB+CORE+WELL-09 W FENCE.GDT \\WAS\COMMON\PROJECTS\40373 DP&L\-345 STUART STATION\FIELDWORK\BORING LOGS\GINT\40373-346TB_2016.GPJ 3 Oct 16

TEST BORING REPORT

HALEY ALDRICH

Boring No. HA-5-B4OW
File No. 40373-346
Sheet No. 2 of 4

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Well Diagram	Stratum Change Elev/Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
20	1 2																
25	2 2 2 2	S6 16	24.0 26.0			SP	Similar to S5 -BOTTOM ASH FILL-			10	15	75					
					501.1 29.0	SW-SM	Very loose gray well-graded SAND with silt and gravel (SW-SM), no structure, no odor, wet		22	18	25	28	7				
30	2 2 2 1	S7 18	29.0 31.0														
					496.1 34.0	SP	Similar to S5				20	80					
35	1 1 1 1	S8 9	34.0 36.0														
					491.1 39.0	SM	Very loose gray silty SAND (SM), no structure, no odor, wet		5	8	19	47	21				
40	1 1 1 1	S9 10	39.0 41.0														
					486.1 44.0	SP-SM	Medium dense poorly-graded SAND with silt (SP-SM), no structure, no odor, wet				5	85	10				
45	2 4 13 28	S10 S10A 18	44.0 46.0		485.1 45.0	SM	Medium dense brown silty SAND (SM), weakly stratified, no odor, wet, contains trace gravel -ALLUVIAL DEPOSITS-		5	5	10	60	20				
					481.1 49.0	SP	Loose brown poorly graded SAND (SP), no structure, no odor, wet,		5	5	70	20					

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. HA-5-B4OW

TEST BORING REPORT

HALEY ALDRICH

Boring No. HA-5-B4OW
File No. 40373-346
Sheet No. 3 of 4

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Well Diagram	Stratum Change Elev/Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
50	3 6 5	8	51.0				contains trace gravel -ALLUVIAL DEPOSITS-										
					476.1 54.0												
55	1 3 5 5	S12 15	54.0 56.0			SP-SM	Loose brown poorly graded SAND with silt (SP-SM) weakly stratified, no odor, wet, contains occasional very thin laminae of black organic soil		8	8	53	25	6				
					471.1 59.0												
60	1 3 5 6	S13 18	59.0 61.0			SP	Loose brown poorly graded SAND (SP) weakly stratified, no odor, wet, contains occasional very thin laminae of black organic soil					95	5				
65	3 4 6 10	S14 8	64.0 66.0			SP	Loose brown poorly graded SAND (SP), no structure, no odor, wet, contains trace gravel		5	10	65	20					
70	3 5 8 6	S15 12	69.0 71.0			SP	Similar to S14, except medium dense		5	5	50	40					
					456.1 74.0												
75	3 5 8 11	S16 18	74.0 76.0			SW	Medium dense brown well graded SAND with gravel (SW), no structure, no odor, wet		15	20	45	20					

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. HA-5-B4OW

TEST BORING REPORT

HALEY ALDRICH

Boring No. HA-5-B4OW
File No. 40373-346
Sheet No. 4 of 4

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Well Diagram	Stratum Change Elev/Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
80	3 4 5 6	S17 18	79.0 81.0			SW	Similar to S16, except loose		15	20	45	20					
							-ALLUVIAL DEPOSITS-										
					446.1 84.0	SP-SM	Medium dense brown poorly graded SAND with silt (SP-SM) no structure, no odor, wet, contains occasional seams of well graded sand			10	10	70	10				
85	4 7 10 10	S18 12	84.0 86.0														
					441.1 89.0	SW	Medium dense brown well graded SAND with gravel (SW), no structure, no odor, wet		15	25	40	20					
90	4 4 8 13	S19 18	89.0 91.0														
					436.1 94.0	SP	Medium dense brown poorly graded SAND (SP), no structure, no odor, wet, contains trace gravel	5	5	5	55	30					
95	4 4 11 13	S20 18	94.0 96.0														
					431.1 99.0	SW	Loose brown well graded SAND with gravel (SW), no structure, no odor, wet		15	15	40	30					
100	2 3 6 12	S21 8	99.0 101.0														
					429.1 101.0		BOTTOM OF EXPLORATION 101.0 FT Notes: Moved drilling rig 5.0 ft east and installed observation well to 35.0 ft depth in unsampled borehole. Ten ft of 0.010 in slot well screen used for well point. Borehole tremie grouted upon completion.										

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. HA-5-B4OW

TEST BORING REPORT

HALEY ALDRICH

Boring No. HA-6-B1

Project	JM Stuart Station, 745 US HWY 52, Aberdeen, Ohio 45101
Client	The Dayton Power and Light Company
Contractor	Stearns Drilling

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	HSA	S	--	Rig Make & Model: CME 1050
Inside Diameter (in.)	4.0	1.375	--	Bit Type: Cutting Head Drill Mud: None
Hammer Weight (lb)	SPUN	140	-	Casing: Spun to 59.0 ft
Hammer Fall (in.)	-	30	-	Hoist/Hammer: Winch Automatic Hammer PID Make & Model: N/A

File No.	40373-346
Sheet No.	1 of 3
Start	25 May 2016
Finish	25 May 2016
Driller	B. Grahm
H&A Rep.	C. Toscano
Elevation	532.9
Datum	NAVD 88
Location	See Plan N 232308 E 1633768

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Stratum Change Elev/Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0						-SAND/GRAVEL ROAD-										
				531.9												
	8 5 10 10	S1 24	1.0 3.0	1.0	CL-ML	Stiff yellow-brown sandy lean CLAY/SILT (CL-ML), no odor, dry, contains trace coarse to fine gravel -FILL-					41	59				
				528.9												
	5 5 8 15	S2 20	4.0 6.0	4.0	CL	Stiff yellow-brown sandy lean CLAY (CL) with silt, no odor, dry		2	4	4	20	70	S	M	M	H
5																
	6 6 9 12	S3 24	9.0 11.0		CL	Similar to S2, except contains frequent pockets of elastic silt				5	25	70				
10																
	P U S H	U1 22	12.0 14.0		CL	Yellow-brown lean sandy CLAY (CL), dry torvane = 9 kg/cm^2 PP=4.5 tsf					38	62				
15																
	3 3	S4 24	19.0 21.0		CL	Similar to S2, except contains trace coal fragments					30	70				H
20																

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft) to: Bottom of Casing	Bottom of Hole	Water
5/26/16	0800	14	59.0	61.0	46.4

Sample ID

O - Open End Rod
T - Thin Wall Tube
U - Undisturbed Sample
S - Split Spoon Sample

Well Diagram

Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary

Overburden (ft)	61.0
Rock Cored (ft)	--
Samples	12S, 3U

Boring No. HA-6-B1

Field Tests: **Dilatancy**: R - Rapid S - Slow N - None **Toughness**: L - Low M - Medium H - High **Plasticity**: N - Nonplastic L - Low M - Medium H - High **Dry Strength**: N - None L - Low M - Medium H - High V - Very High

***Note: Maximum particle size (mps) is determined by direct observation within the limitations of sampler size.**

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

H&A-TEST BORING-07-1 HA-LIB09.GLB HA-TB+CORE+WELL-09 W FENCE.GDT \\WAS\COMMON\PROJECTS\40373 DP&L\-345 STUART STATION\FIELDWORK\BORING LOGS\GINT\40373-346TB_2016.GPJ 3 Oct 16

TEST BORING REPORT

HALEY ALDRICH

Boring No. HA-6-B1
File No. 40373-346
Sheet No. 2 of 3

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Stratum Change Elev/Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
20	7 8															
				511.9												
	P U S H	U2 24	21.0 23.0	21.0	CL-ML	Yellow-brown sandy lean CLAY/SILT (CL-ML) PP=>4.5 tsf torvane = 9 kg/cm^2						53				
				508.9												
	5 7 10 12	S5 24	24.0 26.0	24.0	ML	Very stiff yellow-brown SILT with sand (ML), no odor, dry -FILL-				5	20	75				
25																
				503.9												
	8 7 10 9	S6 24	29.0 31.0	29.0	CL	Very stiff yellow-brown lean CLAY (CL), contains frequent pockets and layers of elastic silt, no odor, dry					5	95				
30																
	4 6 10 13	S7 24	33.0 35.0		CL	Similar to S6, except yellow-brown to gray-brown, trace organic fibers						100				H
35																
				497.4												
	P U S H	U3 24	36.0 38.0	35.5	SC	Yellow-brown clayey SAND (SC) -ALLUVIAL DEPOSITS-					79	21				
40	7 8 8 8	S8 25	39.0 41.0		SC	Medium dense yellow-brown clayey SAND with fine gravel (SC), no odor, moist		27	10	24	21	18				
				488.9												
	9 11 10 10	S9 24	44.0 46.0	44.0	CL	Very stiff yellow-brown to gray-brown lean CLAY with sand (CL),no odor, moist, contains trace coarse gravel				5	10	85				
45																
				483.9												
	1	S10	49.0	49.0	SP	Very loose brown poorly graded SAND (SP), no odor, wet			5	60	35					

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. HA-6-B1

TEST BORING REPORT

HALEY ALDRICH

Boring No. HA-6-B1
File No. 40373-346
Sheet No. 3 of 3

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Stratum Change Elev/Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
50	1 2 2	24	51.0			-ALLUVIAL DEPOSITS-										
				478.9 54.0												
55	1 1 3 3	S11 24	54.0 56.0		SP-SC	Very loose brown poorly-graded SAND with clay (SP-SC), no odor, wet		2	1	60	31	6				
				473.9 59.0												
60	1 2 8 10	S12 24	59.0 61.0		SP	Loose brown poorly-graded SAND (SP), no odor, wet			5	85	10					
				471.9 61.0		BOTTOM OF EXPLORATION 61.0 FT Notes: Set 24.0 hour temporary standpipe at 59.0 ft. 5.0 ft screen set at bottom. Backhole grouted upon completion after 24. Boring tremie grouted to ground surface after 24 hour water level reading.										

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. HA-6-B1

TEST BORING REPORT

HALEY ALDRICH

Boring No. HA-7-B1

Project	JM Stuart Station, 745 US HWY 52, Aberdeen, Ohio 45101
Client	The Dayton Power and Light Company
Contractor	Stearns Drilling

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	HSA	S	--	Rig Make & Model: CME 1050
Inside Diameter (in.)	4.0	1.375	--	Bit Type: Cutting Head Drill Mud: None
Hammer Weight (lb)	-	140	-	Casing: HSA Spun to 59.0 ft
Hammer Fall (in.)	-	30	-	Hoist/Hammer: Winch Automatic Hammer PID Make & Model: N/A

File No.	40373-346
Sheet No.	1 of 3
Start	24 May 2016
Finish	25 May 2016
Driller	B. Grahm
H&A Rep.	C. Toscano
Elevation	532.7
Datum	NAVD 88
Location	See Plan N 231519 E 1632559

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Stratum Change Elev/Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0	7 7 12 7	S1 15	1.0 3.0		CL	Very stiff brown lean CLAY with sand (CL), no odor, dry, contains trace coarse to fine gravel -FILL-					15	85				
5	7 8 15 15	S2 20	4.0 6.0		CL	Similar to S1, except contains yellow-brown frequent interbedded seams and pockets of silt					15	85				
	PUSH	U1 24	7.0 9.0		CL	Yellow-brown lean CLAY (CL), dry torvane 4.5 kg/cm^2 PP= 4.0 tsf										
10	3 4 6 9	S3 24	9.0 11.0		CL	Stiff yellow-brown lean CLAY with sand (CL), no odor, dry				3	17	80				
15	8 9 14 17	S4 24	14.0 16.0		CL	Similar to S1, except yellow-brown						100				
20	PUSH	U1B 10	18.0 20.0		CL	Yellow-brown lean CLAY (CL), dry, sample discarded						100				

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft) to: Bottom of Casing	Bottom of Hole	Water
5/25/16	0800	20	59.0	61.0	45.2

Sample ID

O - Open End Rod
T - Thin Wall Tube
U - Undisturbed Sample
S - Split Spoon Sample

Well Diagram

Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary

Overburden (ft)	61.0
Rock Cored (ft)	--
Samples	12S, 3U

Boring No. HA-7-B1

Field Tests: **Dilatancy**: R - Rapid S - Slow N - None **Plasticity**: N - Nonplastic L - Low M - Medium H - High
Toughness: L - Low M - Medium H - High **Dry Strength**: N - None L - Low M - Medium H - High V - Very High

***Note: Maximum particle size (mps) is determined by direct observation within the limitations of sampler size.**

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

H&A-TEST BORING-07-1 HA-LIB09.GLB HA-TB+CORE+WELL-09 W FENCE.GDT \\WAS\COMMON\PROJECTS\40373 DP&L\-345 STUART STATION\FIELDWORK\BORING LOGS\GINT\40373-346TB_2016.GPJ 3 Oct 16

TEST BORING REPORT

HALEY ALDRICH

Boring No. HA-7-B1
File No. 40373-346
Sheet No. 2 of 3

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Stratum Change Elev/Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
20	PUSH	U2 24	20.0 22.0		CL	Yellow-brown lean CLAY (CL), dry torvane 5.5 kg/cm^2 PP= 4.5 tsf						96				
25	4 6 10 13	S5 24	24.0 26.0		CL	Very stiff yellow-brown lean CLAY (CL), no odor, dry						100				
30	3 4 7 9	S6 24	29.0 31.0		CL	Stiff yellow-brown lean CLAY (CL), no odor, dry PP= 4.0 tsf						100				
				498.7 34.0												
35	4 3 3 9	S7 24	34.0 36.0		ML	Medium stiff yellow-brown SILT (ML), no odor, moist, contains frequent pockets of elastic silt PP= 1.0 tsf					5	95				
				496.7 36.0		-ALLUVIAL DEPOSITS-										
	2 4 6 4	S8 24	36.0 38.0		SM	Loose yellow-brown silty SAND (SM), no odor, moist				3	63	34				
40	3 3 4 4	S9 24	39.0 41.0		SM	S9: Similar to S8					65	35				
				491.7 41.0												
	PUSH	U3 24	42.0 44.0		CL-ML	Yellow-brown lean sandy CLAY/SILT (CL-ML)					39	61				
45																
				483.7 49.0												
	2	S10	49.0		SP	Very loose yellow-brown poorly graded SAND (SP), no odor, wet, contains				20	80					

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. HA-7-B1

H&A-TEST BORING-07-1 HA-LIB09.GLB HA-TB+CORE+WELL-09 W FENCE.GDT \\WAS\COMMON\PROJECTS\40373 DP&L\-345 STUART STATION\FIELDWORK\BORING LOGS\GINT\40373-346TB_2016.GPJ 3 Oct 16

TEST BORING REPORT

HALEY ALDRICH

Boring No. HA-7-B1
File No. 40373-346
Sheet No. 3 of 3

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Stratum Change Elev/Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
50	2 1 1	24	51.0			occasional layers of silt and clay -ALLUVIAL DEPOSITS-										
				478.7 54.0												
55	8 12 16 16	S11 8	54.0 56.0		SM	Medium dense yellow-brown silty SAND (SM), no odor, wet, contains frequent layers of medium to fine sand		3	4	22	34	37				
				473.7 59.0												
60	2 3 5 7	S12 18	59.0 61.0		SW	Loose brown well graded SAND (SW), no odor, wet, contains trace coarse to fine gravel			25	50	25					
				471.7 61.0		BOTTOM OF EXPLORATION 61.0 FT Notes: Set 24.0 hour temporary standpipe at 59.0 ft. Boring tremie grouted to ground surface after 24 hour water level reading.										

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. HA-7-B1

H&A-TEST BORING-07-1 HA-LIB09.GLB HA-TB+CORE+WELL-09 W FENCE.GDT \\WAS\COMMON\PROJECTS\40373 DP&L\-345 STUART STATION\FIELDWORK\BORING LOGS\GINT\40373-346TB_2016.GPJ 3 Oct 16

TEST BORING REPORT

HALEY ALDRICH

Boring No. HA-7-B2

Project	JM Stuart Station, 745 US HWY 52, Aberdeen, Ohio 45101
Client	The Dayton Power and Light Company
Contractor	Stearns Drilling

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	HSA	S	--	Rig Make & Model: CME 1050
Inside Diameter (in.)	4.0	1.375	--	Bit Type: Cutting Head Drill Mud: None
Hammer Weight (lb)	-	140	-	Casing: HSA Spun to 23.0 ft
Hammer Fall (in.)	-	30	-	Hoist/Hammer: Winch Automatic Hammer PID Make & Model: N/A

File No.	40373-346
Sheet No.	1 of 2
Start	26 May 2016
Finish	26 May 2016
Driller	B. Grahm
H&A Rep.	C. Toscano
Elevation	493.5
Datum	NAVD 88
Location	See Plan N 231418 E 1632546

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Stratum Change Elev/Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0	2 1 3 5	S1 24	0.0 2.0	491.5 2.0	CL	Soft yellow-brown lean CLAY (CL), no odor, moist, contains trace organic fibers, grass -FILL-						100				
	1 3 5 4	S2 24	4.0 6.0		CL	Medium stiff yellow-brown sandy lean CLAY (CL), no odor, moist ALLUVIAL DEPOSITS-					36	64				
5	2 1 2 3	S3 24	8.0 10.0		CL	Soft yellow-brown sandy lean CLAY (CL), no odor, wet					30	70				
10	2 3 4 6	S4 24	13.0 15.0	480.5 13.0	CL-ML	Medium stiff yellow-brown sandy lean CLAY/SILT with sand (CL-ML), no odor, wet, contains alternating layers of fine sand, silt, and clay					29	71				
15	6 9 5 3	S5 10	18.0 20.0	475.5 18.0	SW	Medium dense yellow-brown well graded SAND with gravel (SW), no odor, wet		15	22	30	30	3				
20																

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft) to: Bottom of Casing	Bottom of Hole	Water
5/26/16	1400	0.5		25.0	7.0

Sample ID

O - Open End Rod
T - Thin Wall Tube
U - Undisturbed Sample
S - Split Spoon Sample

Well Diagram

Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary

Overburden (ft)	25.0
Rock Cored (ft)	--
Samples	6S, 2U

Boring No. HA-7-B2

Field Tests: **Dilatancy**: R - Rapid S - Slow N - None **Toughness**: L - Low M - Medium H - High **Plasticity**: N - Nonplastic L - Low M - Medium H - High **Dry Strength**: N - None L - Low M - Medium H - High V - Very High

***Note: Maximum particle size (mps) is determined by direct observation within the limitations of sampler size.**

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

H&A-TEST BORING-07-1 HA-LIB09.GLB HA-TB+CORE+WELL-09 W FENCE.GDT \\WAS\COMMON\PROJECTS\40373 DP&L\-345 STUART STATION\FIELDWORK\BORING LOGS\GINT\40373-346TB_2016.GPJ 3 Oct 16

TEST BORING REPORT

HALEY ALDRICH

Boring No. HA-7-B2
File No. 40373-346
Sheet No. 2 of 2

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Stratum Change Elev/Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
20																
				470.5												
	2 3 5 10	S6 20	23.0 25.0	23.0	SP	Loose yellow-brown poorly graded SAND (SP), no odor, wet, contains occasional sandy gravel layers -ALLUVIAL DEPOSITS-		11	9	50	27	3				
25				468.5 25.0		BOTTOM OF EXPLORATION 25.0 FT Notes: Moved 5 ft east, advanced borehole and sampled two undisturbed tubes Borehole tremie grouted to ground surface upon completion.										

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. HA-7-B2

TEST BORING REPORT

HALEY ALDRICH

Boring No. HA-7-B2A

Project	JM Stuart Station, 745 US HWY 52, Aberdeen, Ohio 45101
Client	The Dayton Power and Light Company
Contractor	Stearns Drilling

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	HSA	S	--	Rig Make & Model: CME 1050
Inside Diameter (in.)	4.0	1.375	--	Bit Type: Cutting Head Drill Mud: None
Hammer Weight (lb)	-	140	-	Casing: HSA Spun to 23.0 ft
Hammer Fall (in.)	-	30	-	Hoist/Hammer: Winch Automatic Hammer PID Make & Model: N/A

File No.	40373-346
Sheet No.	1 of 1
Start	26 May 2016
Finish	26 May 2016
Driller	B. Grahm
H&A Rep.	C. Toscano
Elevation	493.5
Datum	NAVD 88
Location	See Plan N 231418 E 1632546

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Stratum Change Elev/Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0				491.5 2.0												
5		U1 24	6.0 8.0		CL	Yellow-brown sandy CLAY (CL), moist, torvane= 3 kg/cm^2 PP=1.25 tsf					5	95				
		U2 24	8.0 10.0		CL	Yellow-brown sandy CLAY (CL), wet, torvane= 3 kg/cm^2 PP=0.5 tsf					28	72				
10				483.5 10.0		BOTTOM OF EXPLORATION 10.0 FT Note: Borehole tremie grouted to ground surface upon completion.										

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft) to: Bottom of Casing	Bottom of Hole	Water

Sample ID

O - Open End Rod
T - Thin Wall Tube
U - Undisturbed Sample
S - Split Spoon Sample

Well Diagram

Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary

Overburden (ft)	10.0
Rock Cored (ft)	--
Samples	2U

Boring No. HA-7-B2A

Field Tests: **Dilatancy**: R - Rapid S - Slow N - None **Plasticity**: N - Nonplastic L - Low M - Medium H - High
Toughness: L - Low M - Medium H - High **Dry Strength**: N - None L - Low M - Medium H - High V - Very High

***Note: Maximum particle size (mps) is determined by direct observation within the limitations of sampler size.**

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

H&A-TEST BORING-07-1 HA-LIB09.GLB HA-TB+CORE+WELL-09 W FENCE.GDT \\WAS\COMMON\PROJECTS\40373 DP&L\-345 STUART STATION\FIELDWORK\BORING LOGS\GINT\40373-346TB_2016.GPJ 3 Oct 16

TEST BORING REPORT

HALEY ALDRICH

Boring No. HA-10-B1

Project	JM Stuart Station, 745 US HWY 52, Aberdeen, Ohio 45101
Client	The Dayton Power and Light Company
Contractor	Stearns Drilling

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	HSA	S	--	Rig Make & Model: CME 1050
Inside Diameter (in.)	4.0	1.375	--	Bit Type: Cutting Head Drill Mud: None
Hammer Weight (lb)	-	140	-	Casing: HSA Spun to 51.0 ft
Hammer Fall (in.)	-	30	-	Hoist/Hammer: Winch Automatic Hammer PID Make & Model: N/A

File No.	40373-346
Sheet No.	1 of 3
Start	25 May 2016
Finish	25 May 2016
Driller	B. Grahm
H&A Rep.	C. Toscano
Elevation	568.1
Datum	NAVD 88
Location	See Plan N 235345 E 1629137

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Stratum Change Elev/Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0	8 6 10 10	S1 20	0.0 2.0		SC	Medium dense yellow-brown clayey SAND (SC), no odor, dry -FILL-					66	34				
				565.6 2.5												
5	8 12 16 16	S2 20	4.0 6.0		SM	Medium dense gray silty SAND (SM), no odor, dry -BOTTOM ASH FILL-				10	60	30				
10	8 15 17 13	S3 24	9.0 11.0		SM	Similar to S2, except dense, contains trace fine gravel		2	6	24	40	28				
15	8 10 11 13	S4 24	14.0 16.0		SM	Similar to S2, except contains trace fine gravel		5	8	21	42	24				
20	10 14	S5 S5A 24	19.0 21.0		SM	Similar to S2, except dense				15	45	40				

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft) to: Bottom of Casing	Bottom of Hole	Water
5/25/16	14:00		26	26	24
5/25/16	16:20	0.5	49.0	51.0	47.5
5/26/16	0730	18	49.0	51.0	49.3

Sample ID

O - Open End Rod
T - Thin Wall Tube
U - Undisturbed Sample
S - Split Spoon Sample

Well Diagram

Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary

Overburden (ft)	51.0
Rock Cored (ft)	--
Samples	11S, 1U

Boring No. HA-10-B1

Field Tests: **Dilatancy**: R - Rapid S - Slow N - None **Plasticity**: N - Nonplastic L - Low M - Medium H - High
Toughness: L - Low M - Medium H - High **Dry Strength**: N - None L - Low M - Medium H - High V - Very High

***Note: Maximum particle size (mps) is determined by direct observation within the limitations of sampler size.**

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

H&A-TEST BORING-07-1 HA-LIB09.GLB HA-TB+CORE+WELL-09 W FENCE.GDT \\WAS\COMMON\PROJECTS\40373 DP&L\-345 STUART STATION\FIELDWORK\BORING LOGS\GINT\40373-346TB_2016.GPJ 3 Oct 16

TEST BORING REPORT

HALEY ALDRICH

Boring No. HA-10-B1
File No. 40373-346
Sheet No. 2 of 3

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Stratum Change Elev/Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
20	18 19			548.1 20.0	SM	Dense brown silty SAND with gravel (SM), no odor, moist -BOTTOM ASH FILL-	5	10	10	40	20	15				
				544.1 24.0	SM	Loose yellow-brown silty SAND (SM), no odor, wet -ALLUVIAL DEPOSITS-					71	29				
25	4 4 3 3	S6 24	24.0 26.0													
	PUSH	U1 20	26.0 28.0		SM	Yellow-brown silty SAND (SM), wet										
				541.1 27.0												
30	4 6 7 7	S7 24	29.0 31.0		SC	Medium dense light brown clayey SAND with gravel (SC), no odor, moist	5	29	13	30	9	14				
				534.1 34.0	SP-SM	Medium dense light brown poorly-graded SAND with silt and gravel (SP-SM), no odor, moist	5	25	10	30	10	10				
35	2 8 11 9	S8 24	34.0 36.0													
				529.1 39.0	SP	Very loose light brown poorly graded SAND (SP), well stratified, no odor, moist, contains trace coarse to fine gravel, trace bituminous coal particles			10	75	15					
40	1 1 1 1	S9 20	39.0 41.0													
45	1 1 2 1	S10 24	44.0 46.0		SP	S10: Similar to S9			5	85	10					
				519.1 49.0	SW	Loose light brown well graded SAND (SW), no odor, wet, contains trace			20	55	25					
	4	S11	49.0													

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. HA-10-B1

H&A-TEST BORING-07-1 HA-LIB09.GLB HA-TB+CORE+WELL-09 W FENCE.GDT \\WAS\COMMON\PROJECTS\40373 DP&L\-345 STUART STATION\FIELDWORK\BORING LOGS\GINT\40373-346TB_2016.GPJ 3 Oct 16

HALEY ALDRICH

TEST BORING REPORT

Boring No. HA-10-B1
File No. 40373-346
Sheet No. 3 of 3

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Stratum Change Elev/Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
50	5 5 2	20	51.0			coarse to fine gravel -ALLUVIAL DEPOSITS-										
				517.1 51.0		BOTTOM OF EXPLORATION 51.0 FT Notes: Set 24.0 hour temporary standpipe at 49.0 ft. Boring tremie grouted to ground surface after 24 hour water level reading.										

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. HA-10-B1

TEST BORING REPORT

Boring No. GP 5-5

Project	JM STUART ELECTRIC GENERATING STATION
Client	DAYTON POWER AND LIGHT
Contractor	STEARNS DRILLING

File No.	40373-346
Sheet No.	1 of 2
Start	17 May 2016
Finish	17 May 2016
Driller	Tom Ulrich
H&A Rep.	T. Clausen
Elevation Datum	
Location	See Plan

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type		G	--	Rig Make & Model: Geoprobe 7822 DT (track)
Inside Diameter (in.)		1 3/8	--	Bit Type:
Hammer Weight (lb)		--	-	Drill Mud: None
Hammer Fall (in.)		--	-	Casing: Driven
				Hoist/Hammer: Automatic Hammer
				PID Make & Model:

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Stratum Change Elev/Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)
0		CS-1 32/60	0.0 5.0		SW	Well-graded SAND (SW) with gravel and cobbles.
				1.6	CL	Brown-gray to brown, lean CLAY (CL) with silt and sand, low to medium plasticity, little fine to medium sand; trace coarse sand and fine gravel.
5		CS-2 47/60	5.0 10.0	5.0	CL	As above, lean clay (CL).
				5.9	SW	Well-graded SAND (SW) with trace organics.
				6.1	ML	Soft, light olive brown to dark brown, sandy SILT (ML), mostly fine sand to medium sand, some clay fines, few to some fine gravel (subrounded to angular clasts), moist.
10		CS-3 42/60	10.0 15.0	10.0	SM	As above, soft, brown, silty SAND (SM), fine to coarse sand and 20% fine rounded gravel.
				10.7	GP	Very loose, brown, poorly-graded fine GRAVEL (GP) with silt and sand, rounded to subrounded gravel clasts, wet (some sample washed out of core).
15		CS-4 48/60	15.0 20.0	15.0	GP	As above, poorly-graded GRAVEL (GP) with silt and sand, fine to coarse subangular to rounded gravel clasts, some flat pebbles, with 2-4-inch seams of low to medium plasticity lean clay (CL).
				17.3	ML	Soft to very soft, brown-gray SILT (ML) with trace woody debris, organic odor.
20						

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft) to: Bottom of Casing	Bottom of Hole	Water

Sample ID

O - Open End Rod
T - Thin Wall Tube
U - Undisturbed Sample
S - Split Spoon Sample

Well Diagram

Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary

Overburden (ft)	30
Rock Cored (ft)	
Samples	6

Boring No. GP 5-5

Field Tests: **Dilatancy**: R - Rapid S - Slow N - None **Toughness**: L - Low M - Medium H - High **Plasticity**: N - Nonplastic L - Low M - Medium H - High **Dry Strength**: N - None L - Low M - Medium H - High V - Very High

***Note: Maximum particle size (mps) is determined by direct observation within the limitations of sampler size.**

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

H&A-TEST BORING-07-1 HA-LIB09-REV.GLB HA-TB+CORE+WELL-07-1.GDT \\CLE\PROJECTS\40373_DP&L\GINT AND HIST. LOGS\STUART.GPJ Oct 3, 16

TEST BORING REPORT

Boring No. GP 5-5
File No. 40373-346
Sheet No. 2 of 2

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Stratum Change Elev/Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)
20		CS-5 37/60	20.0 25.0	20.0	ML	Dark gray-brown to dark gray, SILT (ML) with clay, few seams contain higher percentage of non-plastic lean clay.
25		CS-6 60/60	25.0 30.0	25.0	ML	As above, dark brown, SILT (ML) with clay and organic debris (leaves, wood, stems, branches).
				26.7	CL	Lean clay (CL) seam.
				27.0	SP	Olive brown to dark yellow-brown, fine to medium SAND (SP) with trace clay and few clay blebs.
30				30.0		**BOTTOM OF EXPLORATION AT 30 FEET**

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. GP 5-5

TEST BORING REPORT

Boring No. MW-5-5

Project	JM STUART ELECTRIC GENERATING STATION
Client	DAYTON POWER AND LIGHT
Contractor	STEARNS DRILLING

File No.	40373-346
Sheet No.	1 of 2
Start	18 May 2016
Finish	18 May 2016
Driller	Jim Gryska
H&A Rep.	S. Lewis
Elevation	487.7
Datum	
Location	See Plan N 236,234 E 1,623,796

	Casing	Sampler	Barrel
Type	Steel	Steel	--
Inside Diameter (in.)	4.25	1 3/8	--
Hammer Weight (lb)		140	-
Hammer Fall (in.)		30	-

Drilling Equipment and Procedures

Rig Make & Model: CME 850XR
Bit Type: Cutting Head
Drill Mud: None
Casing: HSA
Hoist/Hammer: Automatic Hammer
PID Make & Model: N/A

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Well Diagram	Stratum Change Elev/Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)
0							Blind drilled to 30 ft. See boring log GP 5-5 for soil description of 0-30.0 ft.
					486.1 1.6		
5					481.8 5.9		
					481.6 6.1		
10					477.0 10.7		
15					470.4 17.3		
20							

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft) to: Bottom of Casing	Bottom of Hole	Water
05/18/2016	15:10	1	21	31	2.8

Sample ID

O - Open End Rod
T - Thin Wall Tube
U - Undisturbed Sample
S - Split Spoon Sample

Well Diagram

Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary

Overburden (ft)	34
Rock Cored (ft)	
Samples	2

Boring No. MW-5-5

Field Tests: **Dilatancy**: R - Rapid S - Slow N - None **Toughness**: L - Low M - Medium H - High **Plasticity**: N - Nonplastic L - Low M - Medium H - High **Dry Strength**: N - None L - Low M - Medium H - High V - Very High

***Note: Maximum particle size (mps) is determined by direct observation within the limitations of sampler size.**

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

H&A-TEST BORING-07-1 HA-LIB09-REV.GLB HA-TB+CORE+WELL-07-1.GDT \\CLE\PROJECTS\40373_DP&L\GINT AND HIST. LOGS\STUART.GPJ Oct 3, 16

TEST BORING REPORT

Boring No. MW-5-5
File No. 40373-346
Sheet No. 2 of 2

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Well Diagram	Stratum Change Elev/Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)
20							Continued...See boring log GP 5-5 for soil description of 0-30.0 ft.
25							
30					457.7		
	2 1 2 4	S-1 24/24	30.0 32.0		30.0	SP	Very loose, gray-brown, poorly graded SAND (SP), mostly fine to coarse sand; trace fine gravel (rounded), no odor, wet, MPS 15 mm.
					456.7 31.0	CL	Soft, gray-brown, silty, lean CLAY, thinly laminated, no odor, wet.
	1 1 2 2	S-2 24/24	32.0 34.0				
					453.7 34.0		**BOTTOM OF EXPLORATION 34.0 FT**

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. MW-5-5

H&A-TEST BORING-07-1 HA-LIB09-REV.GLB HA-TB+CORE+WELL-07-1.GDT \\CLE\PROJECTS\40373_DP&L\GINT AND HIST. LOGS\STUART.GPJ Oct 3, 16

TEST BORING REPORT

Boring No. GP 5-6

Project	JM STUART ELECTRIC GENERATING STATION
Client	DAYTON POWER AND LIGHT
Contractor	STEARNS DRILLING

File No.	40373-346
Sheet No.	1 of 2
Start	18 May 2016
Finish	18 May 2016
Driller	Tom Ulrich
H&A Rep.	T. Clausen
Elevation Datum	
Location	See Plan

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type		G	--	Rig Make & Model: Geoprobe 7822 DT (track)
Inside Diameter (in.)		1 3/8	--	Bit Type:
Hammer Weight (lb)		--	-	Drill Mud: None
Hammer Fall (in.)		--	-	Casing: Driven
				Hoist/Hammer: Automatic Hammer
				PID Make & Model:

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Stratum Change Elev/Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)
0						Blind drilled to depth, see log MW 5-6 for soil description.
5		CS-1 39/60	5.0 10.0		ML/CL	
10						
15						
20						

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft) to: Bottom of Casing	Bottom of Hole	Water

Sample ID

O - Open End Rod
T - Thin Wall Tube
U - Undisturbed Sample
S - Split Spoon Sample

Well Diagram

Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary

Overburden (ft)	25
Rock Cored (ft)	
Samples	2

Boring No. GP 5-6

Field Tests: **Dilatancy**: R - Rapid S - Slow N - None **Plasticity**: N - Nonplastic L - Low M - Medium H - High
Toughness: L - Low M - Medium H - High **Dry Strength**: N - None L - Low M - Medium H - High V - Very High

***Note: Maximum particle size (mps) is determined by direct observation within the limitations of sampler size.**

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

H&A-TEST BORING-07-1 HA-LIB09-REV.GLB HA-TB+CORE+WELL-07-1.GDT \\CLE\PROJECTS\40373_DP&L\GINT AND HIST. LOGS\STUART.GPJ Oct 3, 16

TEST BORING REPORT

Boring No. GP 5-6

File No. 40373-346
Sheet No. 2 of 2

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Stratum Change Elev/Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)
20		CS-2 60/60	20.0 25.0		SP	Continued...See log for MW 5-6 for soil description.
25				25.0		**BOTTOM OF EXPLORATION AT 25 FEET**

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. GP 5-6

H&A-TEST BORING-07-1 HA-LIB09-REV.GLB HA-TB+CORE+WELL-07-1.GDT \\CLE\PROJECTS\40373_DP&L\GINT AND HIST. LOGS\STUART.GPJ Oct 3, 16

TEST BORING REPORT

Boring No. MW-5-6

Project	JM STUART ELECTRIC GENERATING STATION
Client	DAYTON POWER AND LIGHT
Contractor	STEARNS DRILLING

	Casing	Sampler	Barrel
Type	Steel	Steel	--
Inside Diameter (in.)	4.25	1 3/8	--
Hammer Weight (lb)		140	-
Hammer Fall (in.)		30	-

Drilling Equipment and Procedures

Rig Make & Model: CME 850XR
Bit Type: Cutting Head
Drill Mud: None
Casing: HSA
Hoist/Hammer: Automatic Hammer
PID Make & Model: N/A

File No.	40373-346
Sheet No.	1 of 2
Start	17 May 2016
Finish	17 May 2016
Driller	Jim Gryska
H&A Rep.	S. Lewis
Elevation	497.3
Datum	
Location	See Plan
	N 234,996
	E 1,625,425

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Well Diagram	Stratum Change Elev/Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)
0							Blind drill to 5.0 ft.
					492.3 / 5.0		
5	1 2 3 3	S-1 24/24	5.0 7.0			CL	Medium-stiff, brown, lean CLAY (CL), some fine sand, no odor, moist.
					487.3 / 10.0		
10	1 1 3 3	S-2 23/24	10.0 12.0			CL	Soft, brown, lean CLAY (CL), some fine sand, as above, red and black mottling, no odor, moist.
					486.3 / 11.0	SP-SC	Loose, brown, clayey, fine SAND (SP-SC), no odor, wet.
					482.3 / 15.0		
15	1 12 12 13	S-3 18/24	15.0 17.0			SW-SC	Medium-dense, brown, well-graded SAND with clay (SW-SC), mostly fine to coarse sand, some gravel (rounded clasts), no odor, wet.
20							

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft) to: Bottom of Casing	Bottom of Hole	Water
5/18/2016	16:10	24	20	30	10.7

Sample ID

O - Open End Rod
T - Thin Wall Tube
U - Undisturbed Sample
S - Split Spoon Sample

Well Diagram

Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary

Overburden (ft)	32
Rock Cored (ft)	
Samples	9

Boring No. MW-5-6

Field Tests: **Dilatancy**: R - Rapid S - Slow N - None **Toughness**: L - Low M - Medium H - High **Plasticity**: N - Nonplastic L - Low M - Medium H - High **Dry Strength**: N - None L - Low M - Medium H - High V - Very High

***Note: Maximum particle size (mps) is determined by direct observation within the limitations of sampler size.**

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

TEST BORING REPORT

Boring No. MW-5-6
File No. 40373-346
Sheet No. 2 of 2

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Well Diagram	Stratum Change Elev/Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)
20	WOH WOH 2 3	S-4 16/24	20.0 22.0		477.3 20.0	SW	Continued...Very loose, dark brown, well-graded SAND (SW), mostly fine to coarse sand, some gravel (rounded clasts), no odor, wet.
	3 4 5 6	S-5 21/24	22.0 24.0			SW	Well-graded SAND (SW), as above, some sub-angular to rounded gravel.
25	2 1 3 4	S-6 8/24	24.0 26.0			SW	Well-graded SAND (SW), as above, some sub-rounded to rounded gravel.
	2 2 3 4	S-7 12/24	26.0 28.0			SW	Well-graded SAND (SW), as above, some rounded gravel.
	2 3 5 9	S-8 13/24	28.0 30.0			SW	Well-graded SAND (SW), as above.
30	2 3 5 5	S-9 16/24	30.0 32.0			SW	Well-graded SAND (SW), as above.
					465.3 32.0		**BOTTOM OF EXPLORATION 32.0 FT**

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. MW-5-6

TEST BORING REPORT

Boring No. GP 5-7

Project	JM STUART ELECTRIC GENERATING STATION
Client	DAYTON POWER AND LIGHT
Contractor	STEARNS DRILLING

File No.	40373-346
Sheet No.	1 of 3
Start	18 May 2016
Finish	18 May 2016
Driller	Tom Ulrich
H&A Rep.	T. Clausen
Elevation Datum	
Location	See Plan

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type		G	--	Rig Make & Model: Geoprobe 7822 DT (track)
Inside Diameter (in.)		1 3/8	--	Bit Type:
Hammer Weight (lb)		--	-	Drill Mud: None
Hammer Fall (in.)		--	-	Casing: Driven
				Hoist/Hammer: Automatic Hammer
				PID Make & Model:

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Stratum Change Elev/Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)
0						Blind drilled to depth, see log MW 5-7 for soil description.
5						
10						
15						
20						

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft) to: Bottom of Casing	Bottom of Hole	Water

Sample ID

O - Open End Rod
T - Thin Wall Tube
U - Undisturbed Sample
S - Split Spoon Sample

Well Diagram

Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary

Overburden (ft)	25
Rock Cored (ft)	
Samples	2

Boring No. GP 5-7

Field Tests: **Dilatancy**: R - Rapid S - Slow N - None **Plasticity**: N - Nonplastic L - Low M - Medium H - High
Toughness: L - Low M - Medium H - High **Dry Strength**: N - None L - Low M - Medium H - High V - Very High

***Note: Maximum particle size (mps) is determined by direct observation within the limitations of sampler size.**

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

TEST BORING REPORT

Boring No. GP 5-7
File No. 40373-346
Sheet No. 2 of 3

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Stratum Change Elev/Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)
20						Continued...Blind drilled to depth, see MW 5-7 for soil description.
25						
30						
		CS-1 24/24	33.0 35.0	33.0	ML/ CL	
35						
40						
45						

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. GP 5-7

TEST BORING REPORT

Boring No. GP 5-7

File No. 40373-346
Sheet No. 3 of 3

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Stratum Change Elev/Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)
50		CS-2 60/60	50.0 55.0		SP	Continued...Blind drilled to depth, see MW 5-7 for soil description.
55				55.0		**BOTTOM OF EXPLORATION AT 55 FEET**

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. GP 5-7

TEST BORING REPORT

Boring No. MW-5-7

Project	JM STUART ELECTRIC GENERATING STATION
Client	DAYTON POWER AND LIGHT
Contractor	STEARNS DRILLING

File No.	40373-346
Sheet No.	1 of 3
Start	17 May 2016
Finish	17 May 2016
Driller	Bert Graham
H&A Rep.	C. Toscano
Elevation Datum	529.8
Location	See Plan N 235,942 E 1,626,025

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	Steel	Steel	--	Rig Make & Model: CME 1050
Inside Diameter (in.)	4.25	1 3/8	--	Bit Type: Cutting Head
Hammer Weight (lb)		140	-	Drill Mud: None
Hammer Fall (in.)		30	-	Casing: HSA
				Hoist/Hammer: Automatic Hammer
				PID Make & Model: N/A

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Stratum Change Elev/Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)
0				529.3		-TOPSOIL-
				0.5	SW	Advanced auger to 4.0 ft Blind drill to 4.0 ft. Topsoil on auger flights with coarse to fine sand with slight hydrocarbon odor. FILL
				525.8		
	3 3 3 6	S1 18/24	4.0 6.0	4.0	SW	Loose, light brown, well-graded SAND (SW), trace coal particles and fragments, brick particles, MPS 10 mm, no odor, moist. FILL
5						
	1 1 2 3	S2 18/24	9.0 11.0		SP	Very loose, light brown, poorly-graded SAND (SP), MPS 3 mm, dry.
10						
				515.8		
	3 6 6 8	S3 18/24	14.0 16.0	14.0	SP	Medium-dense, light brown, poorly-graded SAND (SP), occasional layers of fine sand, MPS 5 mm, dry, stratified.
15						
	3 3	S4 18/24	19.0 21.0		SW	Loose, light brown, well-graded SAND (SW), trace coarse sand to fine gravel, MPS 20 mm, moist.
20						

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft) to: Bottom of Casing	Bottom of Hole	Water
5/17/2016	17:00	.5	50	60	34.5

Sample ID

O - Open End Rod
T - Thin Wall Tube
U - Undisturbed Sample
S - Split Spoon Sample

Well Diagram

Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary

Overburden (ft)	60
Rock Cored (ft)	
Samples	13

Boring No. MW-5-7

Field Tests: **Dilatancy**: R - Rapid S - Slow N - None **Plasticity**: N - Nonplastic L - Low M - Medium H - High
Toughness: L - Low M - Medium H - High **Dry Strength**: N - None L - Low M - Medium H - High V - Very High

***Note: Maximum particle size (mps) is determined by direct observation within the limitations of sampler size.**

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

TEST BORING REPORT

Boring No. MW-5-7
File No. 40373-346
Sheet No. 2 of 3

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Well Diagram	Stratum Change Elev/Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)
20	4 6						
	4 5 7 8	S5 18/24	24.0 26.0			SP	Medium-dense, light brown, poorly-graded SAND (SP), MPS 5 mm, stratified, dry.
25							
	3 4 4 6	S6 15/24	29.0 31.0			SP	As above, loose, poorly-graded SAND (SP), trace bituminous coal particles.
30							
	1 2 1 3	S7 18/24	34.0 36.0		495.3 34.5	SP	Very loose, brown, poorly-graded SAND (SP), MPS 3 mm, wet.
35						ML	Soft, yellow-brown SILT (ML), MPS < 1 mm, wet. Perched groundwater
					493.3 36.5	SP	Loose, light brown, poorly-graded SAND (SP), MPS 3 mm, moist, trace bituminous coal particles and fragments.
	3 4 6 8	S8 18/24	39.0 41.0				
40							
	1 2 3 4	S9 12/24	44.0 46.0			SW	Loose, gray, well-graded SAND (SW), MPS 10 mm, wet.
45							
	2	S10	49.0			SW	Loose, brown, well-graded SAND (SW), MPS 20mm, trace coarse sand to fine gravel, wet.

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

H&A-TEST BORING-07-1 HA-LIB09-REV.GLB HA-TB+CORE+WELL-07-1.GDT \\CLE\PROJECTS\40373_DP&L\GINT AND HIST. LOGS\STUART.GPJ Oct 3, 16

TEST BORING REPORT

Boring No. MW-5-7
File No. 40373-346
Sheet No. 3 of 3

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Well Diagram	Stratum Change Elev/Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)
50	4 6 7	24/24	51.0				
55	3 5 6 7	S11 18/24	54.0 56.0			SW-G	Medium-dense, brown to gray-brown, well graded SAND (SW-G) with gravel, MPS 25 mm, wet.
	3 5 7 9	S12 18/24	56.0 58.0			SW	As above, well-graded SAND (SW).
	2 4 5 9	S13 18/24	58.0 60.0			SW	Loose, brown, well-graded SAND (SW), trace coarse sand to fine gravel, MPS 20 mm, wet.
60					469.8 60.0		**BOTTOM OF EXPLORATION 60.0 FT**

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. MW-5-7

TEST BORING REPORT

Boring No. MW-18

Project	JM STUART ELECTRIC GENERATING STATION
Client	DAYTON POWER AND LIGHT
Contractor	STEARNS DRILLING

File No. 40373-346
Sheet No. 1 of 2
Start 19 May 2016
Finish 20 May 2016
Driller Jim Gryska
H&A Rep. S. Lewis
Elevation 497.3
Datum
Location See Plan
N 232,422
E 1,629,901

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	Steel	Steel	--	Rig Make & Model: CME 850XR
Inside Diameter (in.)	4.25	1 3/8	--	Bit Type: Cutting Head
Hammer Weight (lb)		140	-	Drill Mud: None
Hammer Fall (in.)		30	-	Casing: HSA
				Hoist/Hammer: Winch Automatic Hammer
				PID Make & Model: N/A

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Well Diagram	Stratum Change Elev/Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)
0							Advanced auger to 4.0 ft
					493.3 4.0		
	4 6 8 8	S-1 16/24	4.0 6.0			ML	Stiff, dark brown SILT, thinly laminated with frequent sand layers, gray and brown mottling, no odor, moist
5							-ALLUVIUM-
	1 1 2 2	S-2 20/24	9.0 11.0			ML	Soft, gray, sandy SILT, frequent fine sand layers, wood fragments, no odor, moist
10							
	1 1 3 3	S-3 21/24	14.0 16.0			ML	Soft, brown, sandy SILT, frequent fine sand layers, no odor, wet
15							
	2 2	S-4 24/24	19.0 21.0			ML	Silt, as above, gray
20							

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft) to: Bottom of Casing	Bottom of Hole	Water
5/20/2016	9:50	17	21	31	9.0

Sample ID

O - Open End Rod
T - Thin Wall Tube
U - Undisturbed Sample
S - Split Spoon Sample

Well Diagram

Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary

Overburden (ft)	31
Rock Cored (ft)	
Samples	9

Boring No. MW-18

Field Tests: **Dilatancy**: R - Rapid S - Slow N - None **Plasticity**: N - Nonplastic L - Low M - Medium H - High
Toughness: L - Low M - Medium H - High **Dry Strength**: N - None L - Low M - Medium H - High V - Very High

***Note: Maximum particle size (mps) is determined by direct observation within the limitations of sampler size.**

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

H&A-TEST BORING-07-1 HA-LIB09-REV.GLB HA-TB+CORE+WELL-07-1.GDT \\CLE\PROJECTS\40373_DP&L\GINT AND HIST. LOGS\STUART.GPJ Oct 3, 16

TEST BORING REPORT

Boring No. MW-18
File No. 40373-346
Sheet No. 2 of 2

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Well Diagram	Stratum Change Elev/Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)
20	2 2						
	2 2 3 5	S-5 24/24	21.0 23.0			ML	Silt, as above -ALLUVIUM-
					474.3 23.0	SP-SM	Very loose, brown, fine to medium silty SAND, no odor, wet -ALLUVIUM-
	1 WOH WOH WOH	S-6 20/24	23.0 25.0				
25	2 1 1 2	S-7 24/24	25.0 27.0			SP	Very loose, brown, fine to medium SAND, no odor, wet
	2 2 4 6	S-8 24/24	27.0 29.0			SP	Loose, gray-brown, fine to coarse SAND, trace fine to coarse gravel, no odor, wet
30	3 5 7 9	S-9 20/24	29.0 31.0			SP	Poorly-graded sand, as above, medium-dense
					466.3 31.0		**BOTTOM OF EXPLORATION 31.0 FT**

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. MW-18

TEST BORING REPORT

Boring No. MW-19

Project	JM STUART ELECTRIC GENERATING STATION
Client	DAYTON POWER AND LIGHT
Contractor	STEARNS DRILLING

File No. 40373-346
Sheet No. 1 of 2
Start 23 May 2016
Finish 24 May 2016
Driller Jim Gryska
H&A Rep. S. Lewis
Elevation 492.1
Datum
Location See Plan
N 231,369
E 1,632,686

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	Steel	Steel	--	Rig Make & Model: CME 850XR
Inside Diameter (in.)	4.25	1 3/8	--	Bit Type: Cutting Head
Hammer Weight (lb)		140	-	Drill Mud: None
Hammer Fall (in.)		30	-	Casing: HSA
				Hoist/Hammer: Winch Automatic Hammer
				PID Make & Model: N/A

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Well Diagram	Stratum Change Elev/Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)
0							Auger advanced to 4.0 ft
					488.1 4.0		
	1 2 3 3	S-1 12/24	4.0 6.0			ML	Medium-stiff, gray-brown SILT, trace fine sand, thinly laminated, no odor, moist -ALLUVIUM-
5							
	2 1 2 3	S-2 24/24	9.0 11.0			CL	Soft, gray, lean CLAY, no odor, moist
10							
	WOH 1 1 2	S-3 24/24	14.0 16.0			CL	Lean CLAY, as above, black wood fragments
15							
	WOH 1	S-4 24/24	19.0 21.0			CL	Lean CLAY, as above
20							

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft) to: Bottom of Casing	Bottom of Hole	Water
05/18/2016	11:45	1.5	29	39	5.0

Sample ID
O - Open End Rod
T - Thin Wall Tube
U - Undisturbed Sample
S - Split Spoon Sample

Well Diagram
Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary

Overburden (ft)	39
Rock Cored (ft)	
Samples	13

Boring No. MW-19

Field Tests: **Dilatancy**: R - Rapid S - Slow N - None **Plasticity**: N - Nonplastic L - Low M - Medium H - High
Toughness: L - Low M - Medium H - High **Dry Strength**: N - None L - Low M - Medium H - High V - Very High

***Note: Maximum particle size (mps) is determined by direct observation within the limitations of sampler size.**

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

H&A-TEST BORING-07-1 HA-LIB09-REV.GLB HA-TB+CORE+WELL-07-1.GDT \\CLE\PROJECTS\40373_DP&L\GINT AND HIST. LOGS\STUART.GPJ Oct 3, 16

TEST BORING REPORT

Boring No. MW-19
File No. 40373-346
Sheet No. 2 of 2

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Well Diagram	Stratum Change Elev/Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)
20	2 2						
	WOH 1 2 2	S-5 24/24	21.0 23.0			CL	Lean CLAY, as above -ALLUVIUM-
	WOH WOH 1 1	S-6 24/24	23.0 25.0			CL	Lean CLAY, as above
25	WOH 2 4 4	S-7 24/24	25.0 27.0			CL	Lean CLAY, as above
	1 2 3 3	S-8 24/24	27.0 29.0			CL	Lean CLAY, as above Fine sand layer, 3 in. thick
30	WOH 2 4 6	S-9 24/24	29.0 31.0			CL	Lean CLAY, as above
	1 2 3 4	S-10 24/24	31.0 33.0			CL	Lean CLAY, as above Fine sand layer, wet, 0.25 in. thick
	3 4 7 8	S-11 13/24	33.0 35.0			CL	Very stiff, gray, lean CLAY with fine to medium sand, no odor, wet
35	7 12 6 7	S-12 17/24	35.0 37.0		457.1 35.0	SM	Medium-dense, brown-gray, fine to coarse silty SAND, trace fine gravel, no odor, wet -ALLUVIUM-
	1 2 4 6	S-13 19/24	37.0 39.0			SM	Silty Sand, as above, loose
					453.1 39.0		**BOTTOM OF EXPLORATION 39.0 FT**

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. MW-19

H&A-TEST BORING-07-1 HA-LIB09-REV.GLB HA-TB+CORE+WELL-07-1.GDT \\CLE\PROJECTS\40373_DP&L\GINT AND HIST. LOGS\STUART.GPJ Oct 3, 16

TEST BORING REPORT

Boring No. MW-20

Project	JM STUART ELECTRIC GENERATING STATION
Client	DAYTON POWER AND LIGHT
Contractor	STEARNS DRILLING

File No. 40373-346
Sheet No. 1 of 2
Start 25 May 2016
Finish 25 May 2016
Driller Jim Gryska
H&A Rep. S. Lewis
Elevation 501.5
Datum
Location See Plan
N 232,067
E 1,633,785

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	Steel	Steel	--	Rig Make & Model: CME 850XR
Inside Diameter (in.)	4.25	1 3/8	--	Bit Type: Cutting Head
Hammer Weight (lb)		140	-	Drill Mud: None
Hammer Fall (in.)		30	-	Casing: HSA
				Hoist/Hammer: Winch Automatic Hammer
				PID Make & Model: N/A

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Well Diagram	Stratum Change Elev/Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)
0							Advanced auger to 6.0 ft
5					495.5 6.0		
	4 6 9 11	S-1 24/24	6.0 8.0			ML	Stiff, brown SILT, gray mottling, no odor, moist, rootlets present -FILL-
10	3 4 4 5	S-2 24/24	9.0 11.0				SILT as above, medium stiff, thinly laminated, no organics
	1 2 3 3	S-3 22/24	14.0 16.0		487.3 14.2	SM	Silt above, medium-stiff Loose, brown, fine to coarse silty SAND, no odor, wet -ALLUVIUM-
15							
20	WOH WOH	S-4 14/24	19.0 21.0			SM	Very loose, brown, silty fine to coarse SAND, trace fine to coarse gravel, no odor, wet

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft) to: Bottom of Casing	Bottom of Hole	Water
5/25/2016	13:15	2.25	26	36	13.0

Sample ID
O - Open End Rod
T - Thin Wall Tube
U - Undisturbed Sample
S - Split Spoon Sample

Well Diagram
Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary

Overburden (ft)	36
Rock Cored (ft)	
Samples	10

Boring No. MW-20

Field Tests: **Dilatancy**: R - Rapid S - Slow N - None **Plasticity**: N - Nonplastic L - Low M - Medium H - High
Toughness: L - Low M - Medium H - High **Dry Strength**: N - None L - Low M - Medium H - High V - Very High

***Note: Maximum particle size (mps) is determined by direct observation within the limitations of sampler size.**

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

H&A-TEST BORING-07-1 HA-LIB09-REV.GLB HA-TB+CORE+WELL-07-1.GDT \\CLE\PROJECTS\40373_DP&L\GINT AND HIST. LOGS\STUART.GPJ Oct 3, 16

TEST BORING REPORT

Boring No. MW-20
File No. 40373-346
Sheet No. 2 of 2

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Well Diagram	Stratum Change Elev/Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)
20	1 2						
25	2 2 4 4	S-5 17/24	24.0 26.0			SW	Loose, brown, well-graded, fine to coarse SAND, trace fine, rounded gravel, no odor, wet -ALLUVIUM-
	2 2 3 4	S-6 20/24	26.0 28.0			SW	Well-graded SAND, as above
	2 2 3 5	S-7 17/24	28.0 30.0			SW	Well-graded SAND, as above
30	1 1 4 5	S-8 24/24	30.0 32.0			SP	Loose, brown, fine to coarse poorly-graded SAND, no odor, wet -ALLUVIUM-
	1 2 4 4	S-9 11/24	32.0 34.0			SP	Poorly-graded SAND, as above
35	2 4 5 7	S-10 14/24	34.0 36.0			SP	Poorly-graded SAND, as above
					465.5 36.0		**BOTTOM OF EXPLORATION 36.0**

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. MW-20

H&A-TEST BORING-07-1 HA-LIB09-REV.GLB HA-TB+CORE+WELL-07-1.GDT \\CLE\PROJECTS\40373_DP&L\GINT AND HIST. LOGS\STUART.GPJ Oct 3, 16

TEST BORING REPORT

Boring No. MW-21

Project	JM STUART ELECTRIC GENERATING STATION
Client	DAYTON POWER AND LIGHT
Contractor	STEARNS DRILLING

File No. 40373-346
Sheet No. 1 of 3
Start 18 May 2016
Finish 18 May 2016
Driller Bert Graham
H&A Rep. C. Toscano
Elevation 533.8
Datum
Location See Plan
N 232,511
E 1,631,881

	Casing	Sampler	Barrel
Type	Steel	Steel	--
Inside Diameter (in.)	4.25	1 3/8	--
Hammer Weight (lb)		140	-
Hammer Fall (in.)		30	-

Drilling Equipment and Procedures

Rig Make & Model: CME 1050
Bit Type: Cutting Head
Drill Mud: None
Casing: HSA
Hoist/Hammer: Winch Automatic Hammer
PID Make & Model: N/A

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Well Diagram	Stratum Change Elev/Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)
0					533.3		-GRAVEL ROADWAY-
					0.5	ML	Advanced auger to 4.0 ft Silts and clays on auger flights -REWORKED FILL-
					529.8		
	5 6 6 9	S1 6/24	4.0 6.0		4.0	ML	Stiff, yellow-brown SILT with sand, pockets of lean clay and silty, fine sand, trace fine gravel, coal particles, no structure, mottled, MPS 10 mm, no odor, dry -FILL-
5							
10	4 4 6 8	S2 20/24	9.0 11.0			CL	Stiff, yellow-brown, lean CLAY, frequent pockets and seams of silt and fine sand, MPS 2 mm, no structure, mottled, no odor, dry
15	3 5 8 10	S3 24/24	14.0 16.0			ML	Stiff, yellow-brown SILT, occasional pockets of gray, fine, silty sand, trace coarse to fine gravel, MPS 5 mm, no structure, mottled, no odor, dry
20	3 4	S4 24/24	19.0 21.0			ML	SILT, as above, pockets of lean clay, MPS 2 mm

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft) to: Bottom of Casing	Bottom of Hole	Water
05/18/2016	16:15	0.25	46.0	56.0	45.0

Sample ID
O - Open End Rod
T - Thin Wall Tube
U - Undisturbed Sample
S - Split Spoon Sample

Well Diagram
Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary

Overburden (ft)	56
Rock Cored (ft)	
Samples	12

Boring No. MW-21

Field Tests: **Dilatancy**: R - Rapid S - Slow N - None **Plasticity**: N - Nonplastic L - Low M - Medium H - High
Toughness: L - Low M - Medium H - High **Dry Strength**: N - None L - Low M - Medium H - High V - Very High

***Note: Maximum particle size (mps) is determined by direct observation within the limitations of sampler size.**

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

H&A-TEST BORING-07-1 HA-LIB09-REV.GLB HA-TB+CORE+WELL-07-1.GDT \\CLE\PROJECTS\40373_DP&L\GINT AND HIST. LOGS\STUART.GPJ Oct 3, 16

TEST BORING REPORT

Boring No. MW-21
File No. 40373-346
Sheet No. 2 of 3

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Well Diagram	Stratum Change Elev/Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)
20	7 8						
25	5 5 14 15	S5 24/24	24.0 26.0			CL	Very stiff, yellow-brown, lean CLAY, frequent seams and pockets of silty and fine, sandy silt, MPS 1 mm, no structure, mottled, no odor, dry -REWORKED FILL-
30	3 6 8 4	S6 24/24	29.0 31.0			CL	Lean CLAY, as above, stiff
35	2 4 5 5	S7 24/24	34.0 36.0			ML	Stiff, yellow-brown, lean CLAY with sand, MPS 3mm, no structure, no odor, moist
40	3 3 3 3	S8 24/24	39.0 41.0		494.3 39.5	SP	Loose, yellow-brown, poorly-graded SAND, trace coarse to fine gravel, trace sub-bituminous coal particles, MPS 5 mm, no odor, moist -ALLUVIUM-
45	3 3 4 5	S9 24/24	44.0 46.0			SP	Poorly-graded SAND, as above, interbedded layer of sub-bituminous coal particles to fragments, wet
	1 2 2 4	S10 24/24	46.0 48.0			SP	Poorly-graded SAND, as above, very loose, trace sub-bituminous coal particles, wet
	6 5 4 6	S11 24/24	48.0 50.0			SP	Loose, light brown, poorly-graded SAND, trace coarse to fine gravel, MPS 20 mm, no odor, wet

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. MW-21

TEST BORING REPORT

Boring No. MW-21

File No. 40373-346
Sheet No. 3 of 3

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Well Diagram	Stratum Change Elev/Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)
50							
55	3 7 6 7	S12 24/24	54.0 56.0			SP	Poorly-graded SAND, as above, medium-dense ALLUVIUM
					477.8 56.0		**BOTTOM OF EXPLORATION 56.0 FT**

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. MW-21

H&A-TEST BORING-07-1 HA-LIB09-REV.GLB HA-TB+CORE+WELL-07-1.GDT \\CLE\PROJECTS\40373_DP&L\GINT AND HIST. LOGS\STUART.GPJ Oct 3, 16

TEST BORING REPORT

Boring No. MW-22

Project	JM STUART ELECTRIC GENERATING STATION
Client	DAYTON POWER AND LIGHT
Contractor	STEARNS DRILLING

File No. 40373-346
Sheet No. 1 of 2
Start 19 May 2016
Finish 19 May 2016
Driller Bert Graham
H&A Rep. C. Toscano
Elevation 533.9
Datum
Location See Plan
N 232,207
E 1,632,812

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	Steel	Steel	--	Rig Make & Model: CME 1050
Inside Diameter (in.)	4.25	1 3/8	--	Bit Type: Cutting Head
Hammer Weight (lb)		140	-	Drill Mud: None
Hammer Fall (in.)		30	-	Casing: HSA
				Hoist/Hammer: Winch Automatic Hammer
				PID Make & Model: N/A

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Well Diagram	Stratum Change Elev/Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)
0					533.4		-GRAVEL ROADWAY-
					0.5	CL	Advanced auger to 4.0 ft
							Clays on auger flights
							-REWORKED FILL-
	4 6 10 10	S1 24/24	4.0 6.0			CL	Very stiff, yellow-brown, lean CLAY, trace coarse to fine gravel, MPS 20 mm, no odor, dry
5							
					527.4 6.5	PIPE	Note: Obstruction at 6.5-9.0 ft: concrete fragments and pieces coming up on auger flights. HDPE piece of pipe on auger flight.
							-CONCRETE CONDUIT-
	4 6 14 9	S2 20/24	9.0 11.0		524.9 9.0	CL	Very stiff, yellow-brown, lean CLAY, MPS < 1 mm, no odor, wet
10							-REWORKED FILL-
15	4 5 8 16	S3 24/24	14.0 16.0			CL	Lean CLAY, as above, stiff
20	3 4 6 8	S4 24/24	19.0 21.0			CL	Lean CLAY, as above, frequent elastic silt seams
25	6 6	S5 24/24	24.0			CL	Lean CLAY, as above, very stiff, no silt seams

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft) to: Bottom of Casing	Bottom of Hole	Water
5/19/2016	16:30	0.25	51	61	49.0

Sample ID
O - Open End Rod
T - Thin Wall Tube
U - Undisturbed Sample
S - Split Spoon Sample

Well Diagram
Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary

Overburden (ft)	61
Rock Cored (ft)	
Samples	12

Boring No. MW-22

Field Tests: **Dilatancy**: R - Rapid S - Slow N - None **Toughness**: L - Low M - Medium H - High **Plasticity**: N - Nonplastic L - Low M - Medium H - High **Dry Strength**: N - None L - Low M - Medium H - High V - Very High

***Note: Maximum particle size (mps) is determined by direct observation within the limitations of sampler size.**

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

H&A-TEST BORING-07-1 HA-LIB09-REV.GLB HA-TB+CORE+WELL-07-1.GDT \\CLE\PROJECTS\40373_DP&L\GINT AND HIST. LOGS\STUART.GPJ Oct 3, 16

TEST BORING REPORT

Boring No. MW-22
File No. 40373-346
Sheet No. 2 of 2

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	Well Diagram	Stratum Change Elev/Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size*, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)
25	10 13		26.0				
30	5 7 16 14	S6 24/24	29.0 31.0			CL-ML	Very stiff, yellow-brown SILT, frequent seams of silty clay and fine sand particles -REWORKED FILL-
35	4 6 7 10	S7 24/24	34.0 36.0			ML	Stiff, yellow-brown SILT with sand, trace coarse to fine gravel, MPS 15 mm, no odor, moist
					494.9 39.0		
40	5 10 8 7	S8 14/24	39.0 41.0			SW	Medium-dense, brown, well-graded SAND with gravel, MPS 25 mm, no odor, dry -ALLUVIUM-
45	4 4 5 9	0/24	44.0 46.0				No recovery. Pushed spoon to 46.0 ft
	7 6 5 6	S9 6/24	46.0 48.0			SP	Medium-dense, brown, poorly-graded SAND, interbedded layer of sub-bituminous coal particles to fragments, trace coarse to fine gravel, MPS 20 mm, no odor, moist Note: Used 3 in. spoon to retain soil sample
50	1 1 1 2	S10 15/24	49.0 51.0			SP	Poorly-graded SAND, as above, very loose
55	9 14 14 16	S11 24/24	54.0 56.0			SP	Poorly-graded SAND, as above, medium-dense Note: Blow counts are higher due to increase of soil inside bottom of auger prior to sampling.
60	2 3 7 9	S12 10/24	59.0 61.0			SP	Poorly-graded SAND, as above, loose
							BOTTOM OF EXPLORATION 61.0 FT

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. MW-22

H&A-TEST BORING-07-1 HA-LIB09-REV.GLB HA-TB+CORE+WELL-07-1.GDT \\CLE\PROJECTS\40373_DP&L\GINT AND HIST. LOGS\STUART.GPJ Oct 3, 16

Cone Penetration Test Summary and

Standard Cone Penetration Test Plots

CONETEC

Job No:	16-53041
Client:	Haley & Aldrich
Project:	DP&L JM Stuart Station, Aberdeen, OH
Start Date:	19-May-2016
End Date:	24-May-2016

CONE PENETRATION TEST SUMMARY

Sounding ID	File Name	Date	Cone	Assumed Phreatic Surface[1] (ft)	Final Depth (ft)	Shear Wave Velocity Tests	Northing[2] (ft)	Easting (ft)	Elevation (ft)	Refer to Notation Number
SCPT16-HA-3-C1	16-53041_SPHA-3-C1	24-May-2016	419:T1500F15U500	69.0	90.06	15	232292	1630730	556.15	3
SCPT16-HA-5-C1	16-53041_SPHA-5-C1	19-May-2016	419:T1500F15U500	45.2	100.06	17	235791	1624140	529.07	
CPT16-HA-5-C2	16-53041_CPHA-5-C2	20-May-2016	419:T1500F15U500	45.0	60.04		236306	1625230	530.02	3
CPT16-HA-6-C1	16-53041_CPHA-6-C1	20-May-2016	419:T1500F15U500	50.6	95.14		232303	1633766	532.87	
CPT16-HA-7-C1B	16-53041_CPHA-7-C1B	24-May-2016	419:T1500F15U500	46.7	70.05		231682	1633466	531.81	
CPT16-HA-7-C2	16-53041_CPHA-7-C2	24-May-2016	419:T1500F15U500	45.8	100.06		231916	1631438	532.45	
SCPT16-HA-10-C1	16-53041_SPHA-10-C1	19-May-2016	419:T1500F15U500	54.0	50.03	9	235339	1629133	567.96	3
CPT16-HA-10-C2	16-53041_CPHA-10-C2	23-May-2016	419:T1500F15U500	54.0	50.03		235455	1630444	568.29	3
Totals	8 soundings				615.48	41				

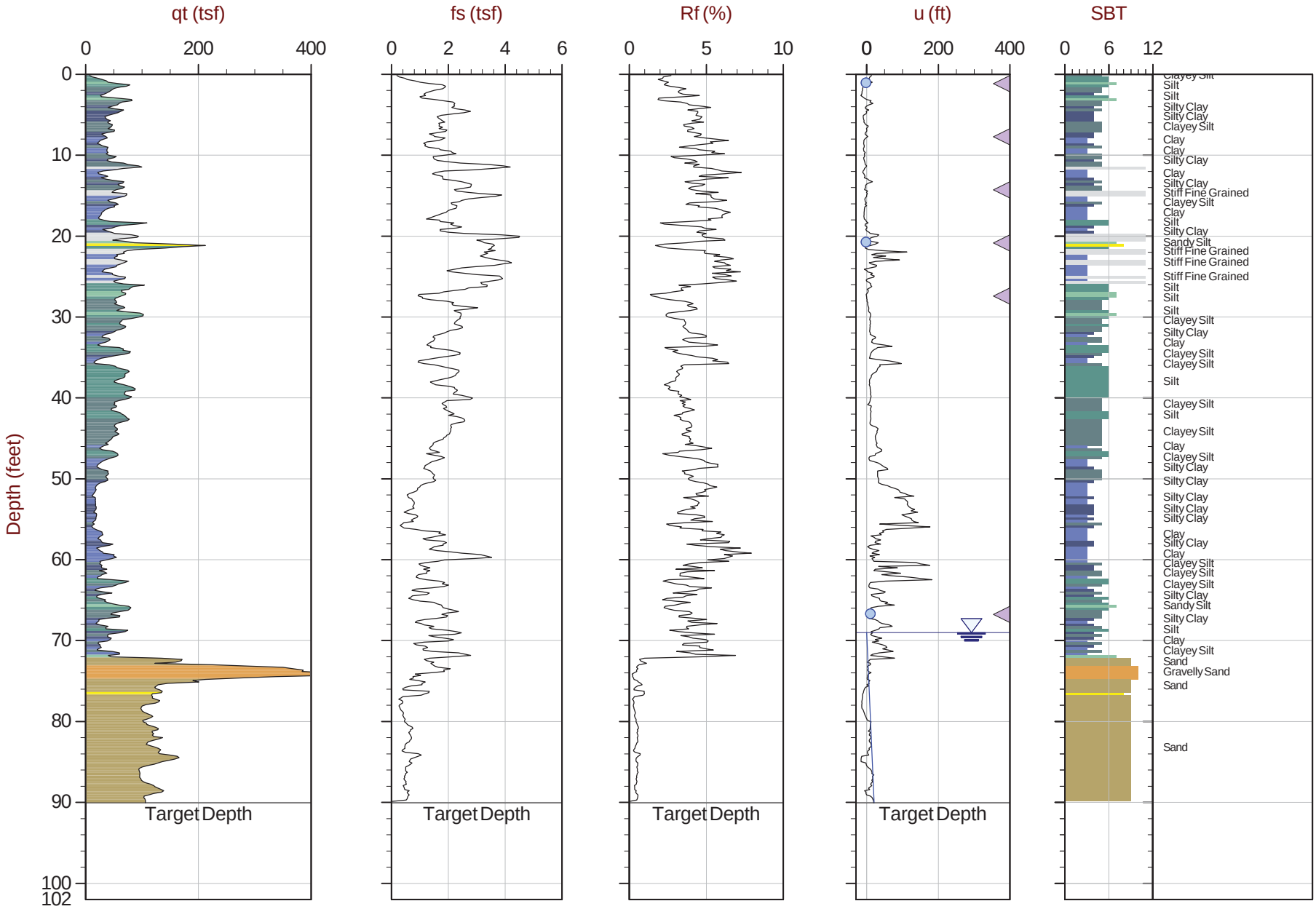
1. Assumed phreatic surface depths were determined from the pore pressure data unless otherwise noted. Hydrostatic data were used for calculated parameters.
2. Coordinates are NAD83 / Ohio State Plane Coordinates South and were provided to us by the client.
3. Assumed phreatic surface estimated from dynamic pore pressure response.
4. No phreatic surface detected

CONETEC

Haley & Aldrich

Job No: 16-53041
Date: 05:24:16 12:18
Site: DP&L JM Stuart Station, Aberdeen, OH

Sounding: SCPT16-HA-3-C1
Cone: 419:T1500F15U500



Max Depth: 27.450 m / 90.06 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.100 m

File: 16-53041_SPHA-3-C1.COR

SBT: Robertson and Campanella, 1986
Coords: Ohio SPC South N: 232292m E: 1630730m Elev: 556.15

Hydrostatic Line · Ueq · Assumed Ueq · PPD, Ueq achieved · PPD, Ueq not achieved

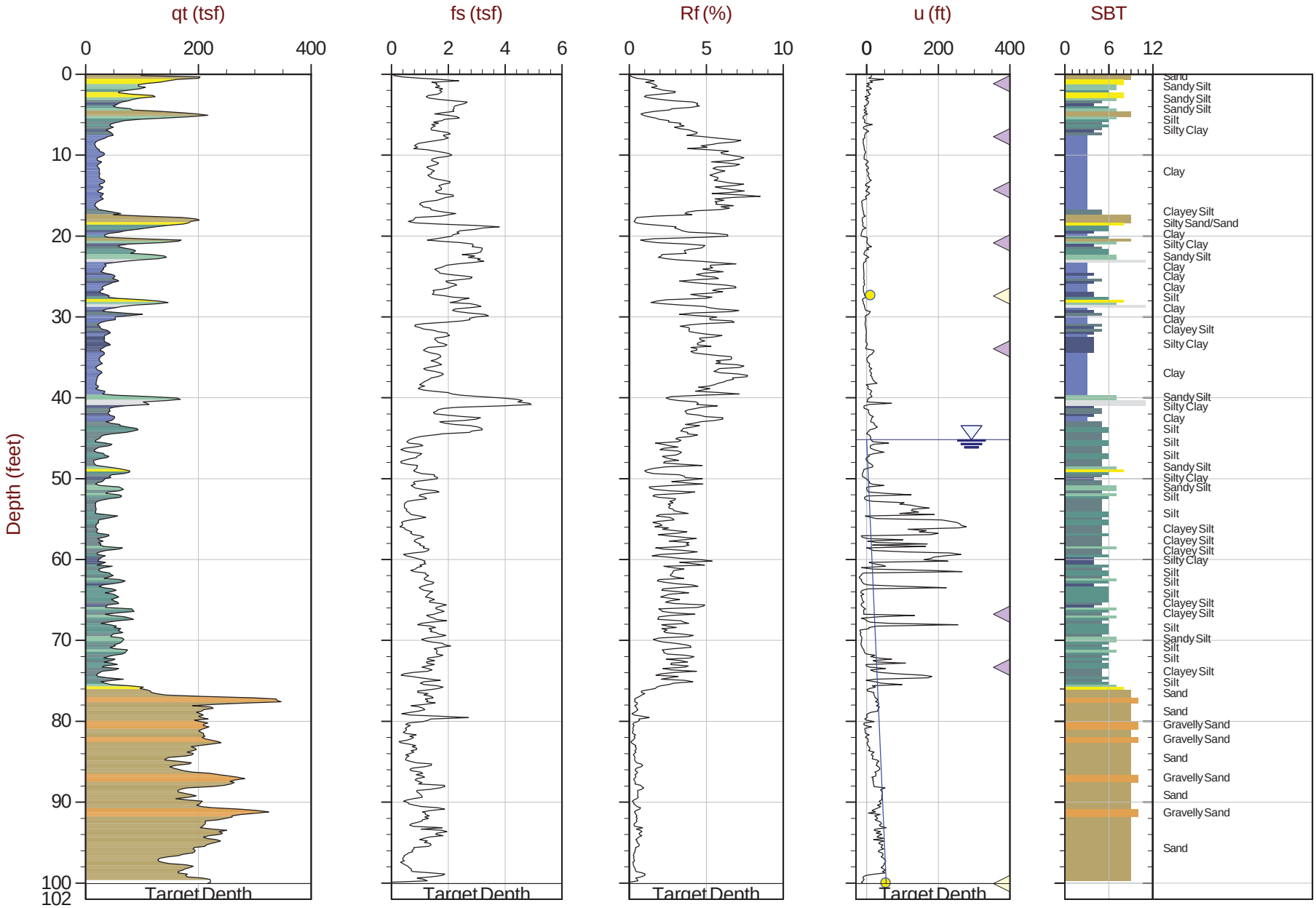
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Haley & Aldrich

Job No: 16-53041
Date: 05:19:16 10:06
Site: DP&L JM Stuart Station, Aberdeen, OH

Sounding: SCPT16-HA-5-C1
Cone: 419:T1500F15U500



Max Depth: 30.500 m / 100.06 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.100 m

File: 16-53041_SPHA-5-C1.COR

SBT: Robertson and Campanella, 1986
Coords: Ohio SPC South N: 235791m E: 1624140m Elev: 529.07

Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

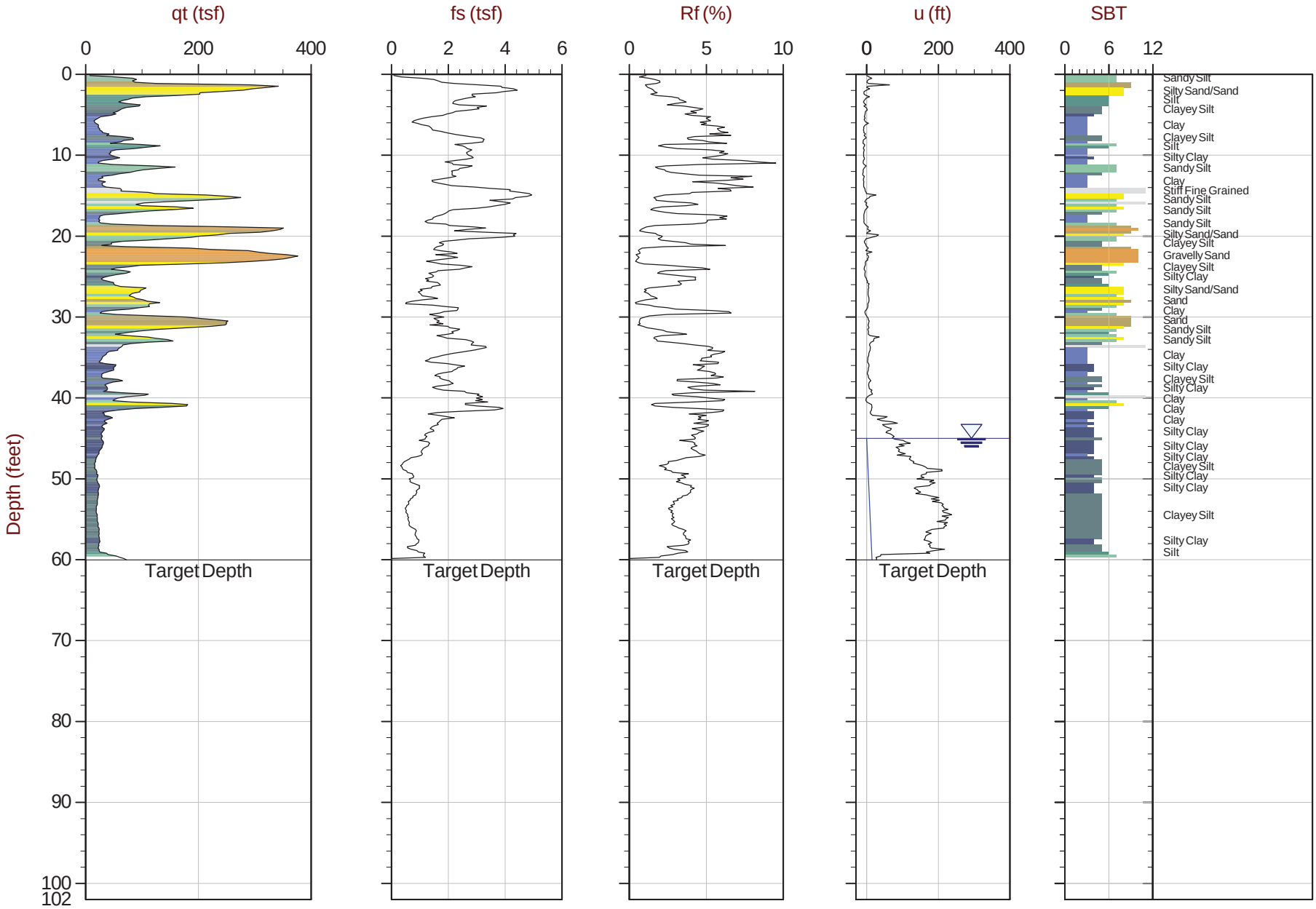
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Haley & Aldrich

Job No: 16-53041
Date: 05:20:16 13:17
Site: DP&L JM Stuart Station, Aberdeen, OH

Sounding: CPT16-HA-5-C2
Cone: 419:T1500F15U500



Max Depth: 18.300 m / 60.04 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.100 m

File: 16-53041_CPHA-5-C2.COR

SBT: Robertson and Campanella, 1986
Coords: Ohio SPC South N: 236306m E: 1625230m Elev: 530.02

Hydrostatic Line · Ueq · Assumed Ueq · PPD, Ueq achieved · PPD, Ueq not achieved

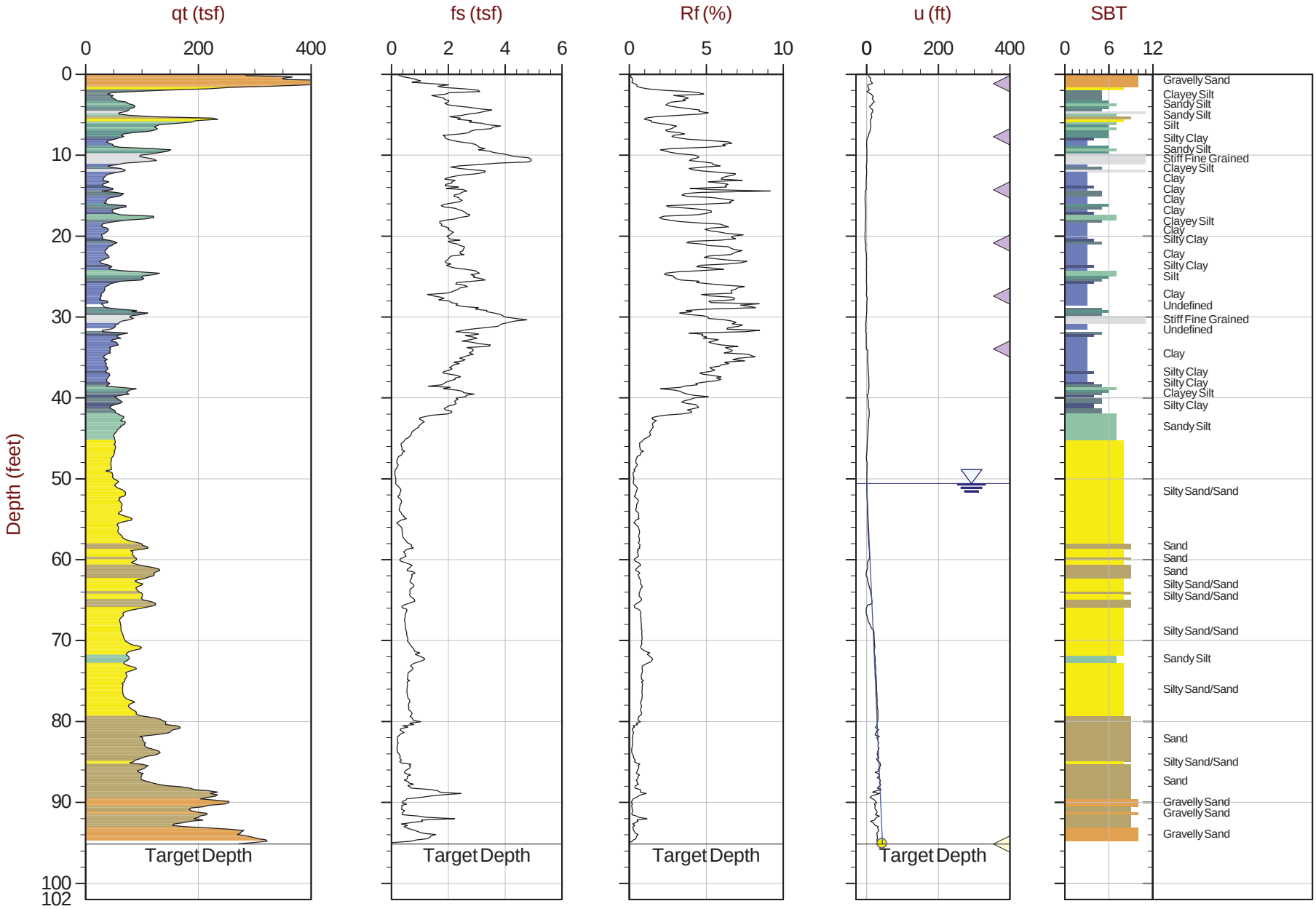
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Haley & Aldrich

Job No: 16-53041
Date: 05:20:16 08:22
Site: DP&L JM Stuart Station, Aberdeen, OH

Sounding: CPT16-HA-6-C1
Cone: 419:T1500F15U500



Max Depth: 29.000 m / 95.14 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.100 m

File: 16-53041_CPHA-6-C1.COR

SBT: Robertson and Campanella, 1986
Coords: Ohio SPC South N: 232303m E: 1633766m Elev: 532.87

Hydrostatic Line · Ueq · Assumed Ueq · PPD, Ueq achieved · PPD, Ueq not achieved

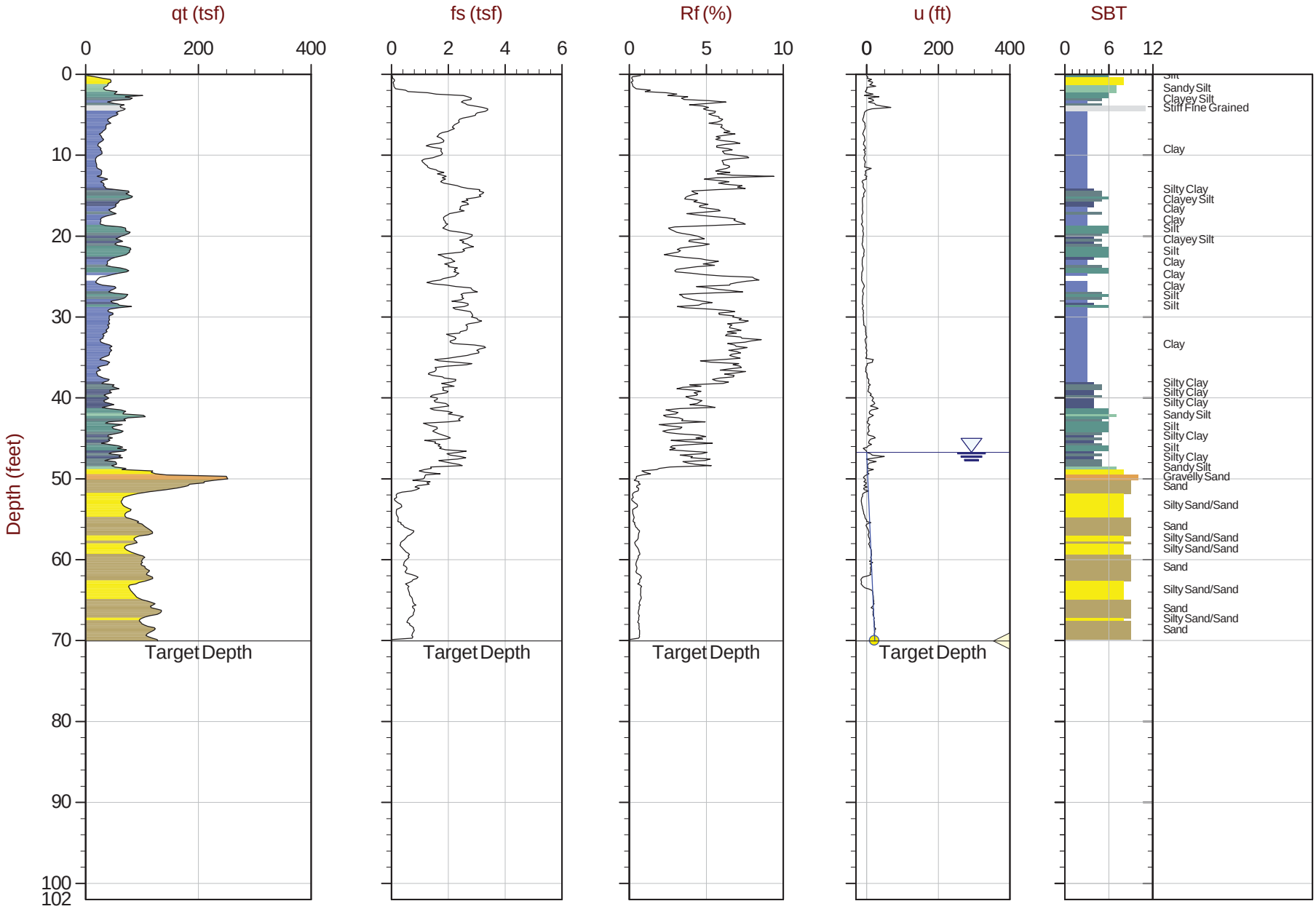
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Haley & Aldrich

Job No: 16-53041
Date: 05:24:16 16:31
Site: DP&L JM Stuart Station, Aberdeen, OH

Sounding: CPT16-HA-7-C1B
Cone: 419:T1500F15U500



Max Depth: 21.350 m / 70.05 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.100 m

File: 16-53041_CPHA-7-C1B.COR

SBT: Robertson and Campanella, 1986
Coords: Ohio SPC South N: 231682m E: 1633466m Elev: 531.81

Hydrostatic Line · Ueq · Assumed Ueq · PPD, Ueq achieved · PPD, Ueq not achieved

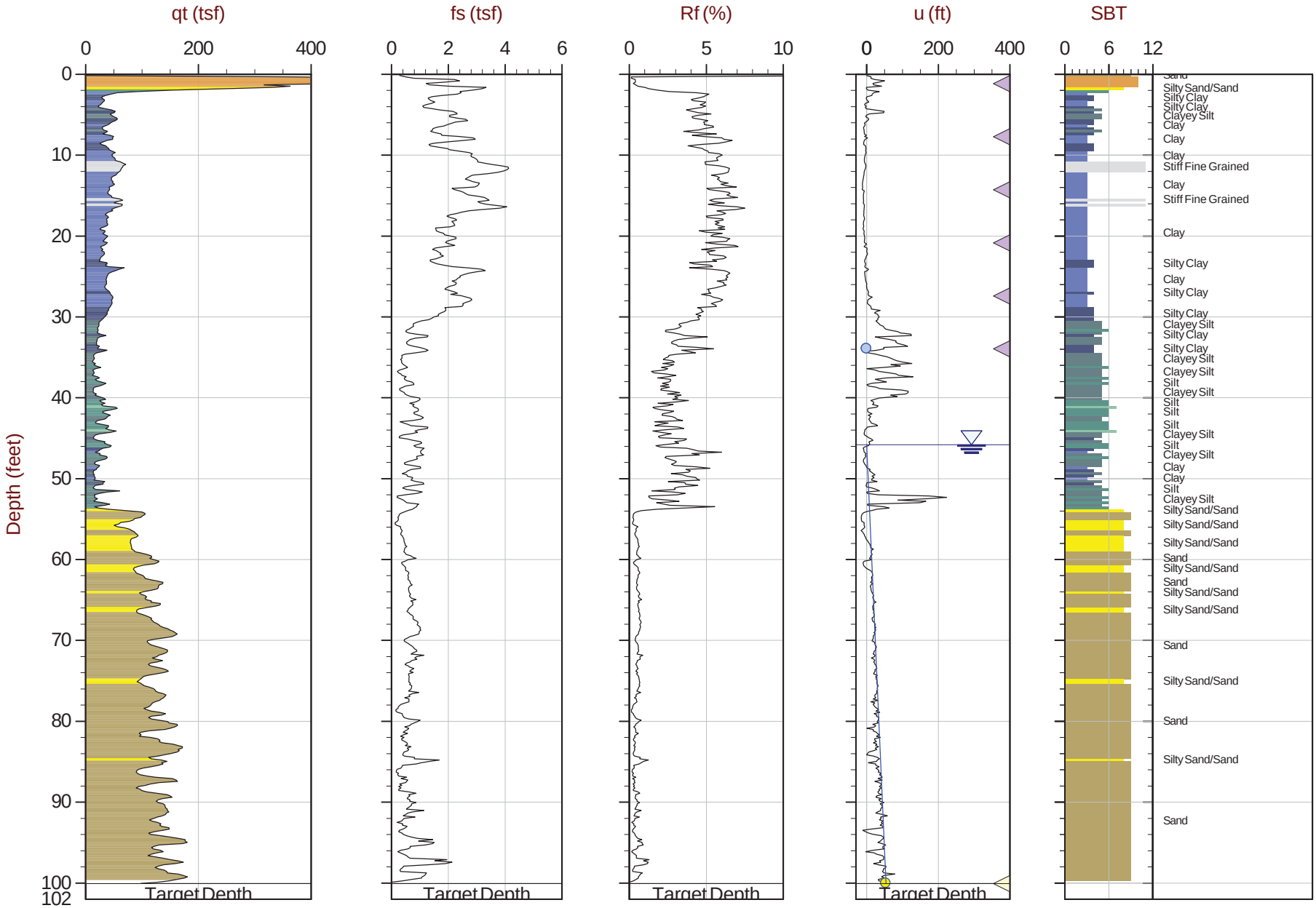
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Haley & Aldrich

Job No: 16-53041
Date: 05:24:16 08:58
Site: DP&L JM Stuart Station, Aberdeen, OH

Sounding: CPT16-HA-7-C2
Cone: 419:T1500F15U500



Max Depth: 30.500 m / 100.06 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.100 m

File: 16-53041_CPHA-7-C2.COR

SBT: Robertson and Campanella, 1986
Coords: Ohio SPC South N: 231916m E: 1631438m Elev: 532.45

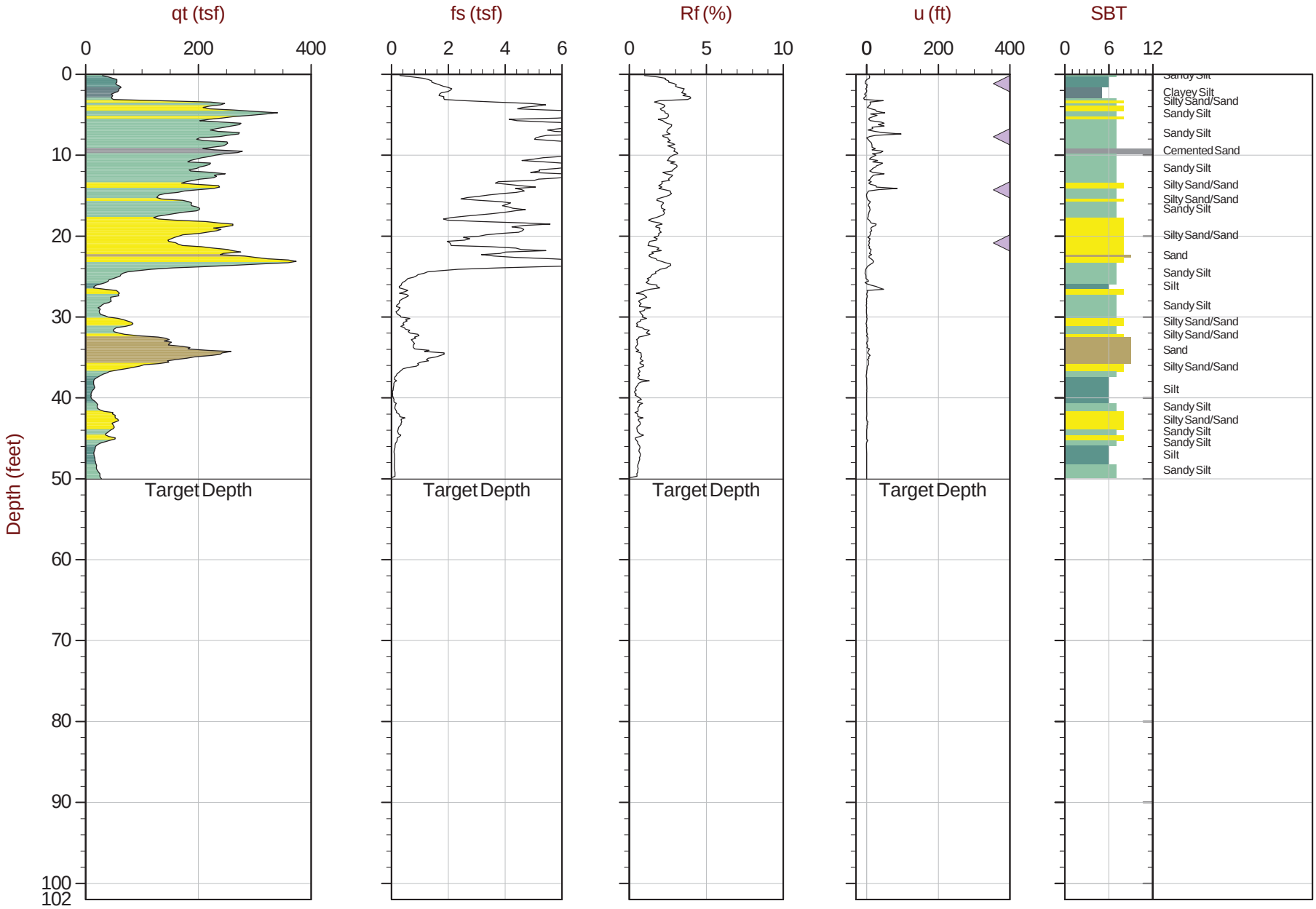
Hydrostatic Line · Ueq · Assumed Ueq · PPD, Ueq achieved · PPD, Ueq not achieved

The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

Haley & Aldrich

Job No: 16-53041
Date: 05:19:16 10:06
Site: DP&L JM Stuart Station, Aberdeen, OH

Sounding: SCPT16-HA-10-C1
Cone: 419:T1500F15U500



Max Depth: 15.250 m / 50.03 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.100 m

File: 16-53041_SPHA-10-C1.COR

SBT: Robertson and Campanella, 1986
Coords: Ohio SPC South N: 235339m E: 1629133m Elev: 567.96

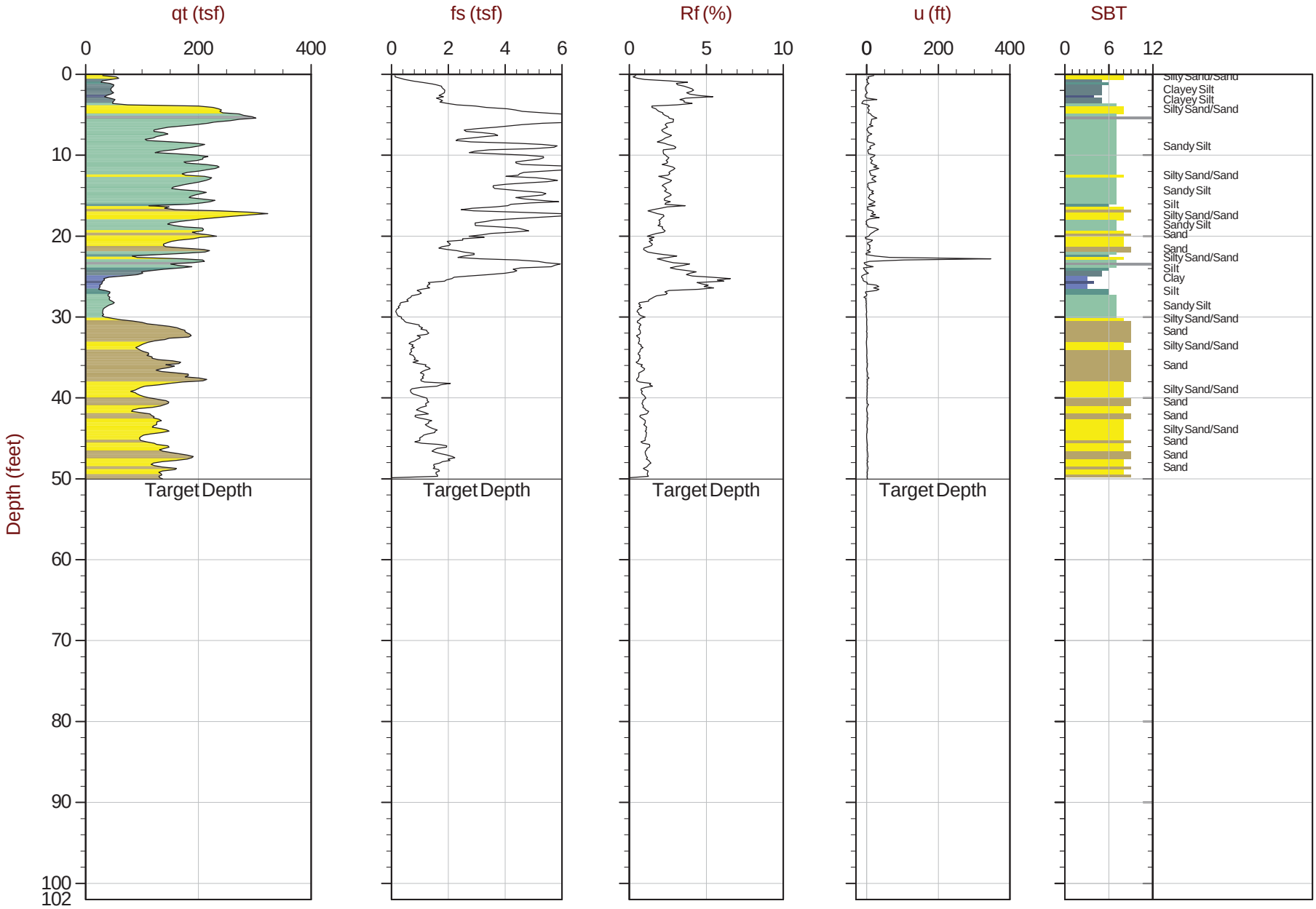
Hydrostatic Line · Ueq · Assumed Ueq · PPD, Ueq achieved · PPD, Ueq not achieved

The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

Haley & Aldrich

Job No: 16-53041
Date: 05:23:16 15:40
Site: DP&L JM Stuart Station, Aberdeen, OH

Sounding: CPT16-HA-10-C2
Cone: 419:T1500F15U500



Max Depth: 15.250 m / 50.03 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.100 m

File: 16-53041_CPHA-10-C2.COR

SBT: Robertson and Campanella, 1986
Coords: Ohio SPC South N: 235455m E: 1630444m Elev: 568.29

Hydrostatic Line · Ueq · Assumed Ueq · PPD, Ueq achieved · PPD, Ueq not achieved

The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

Normalized Cone Penetration Test Plots

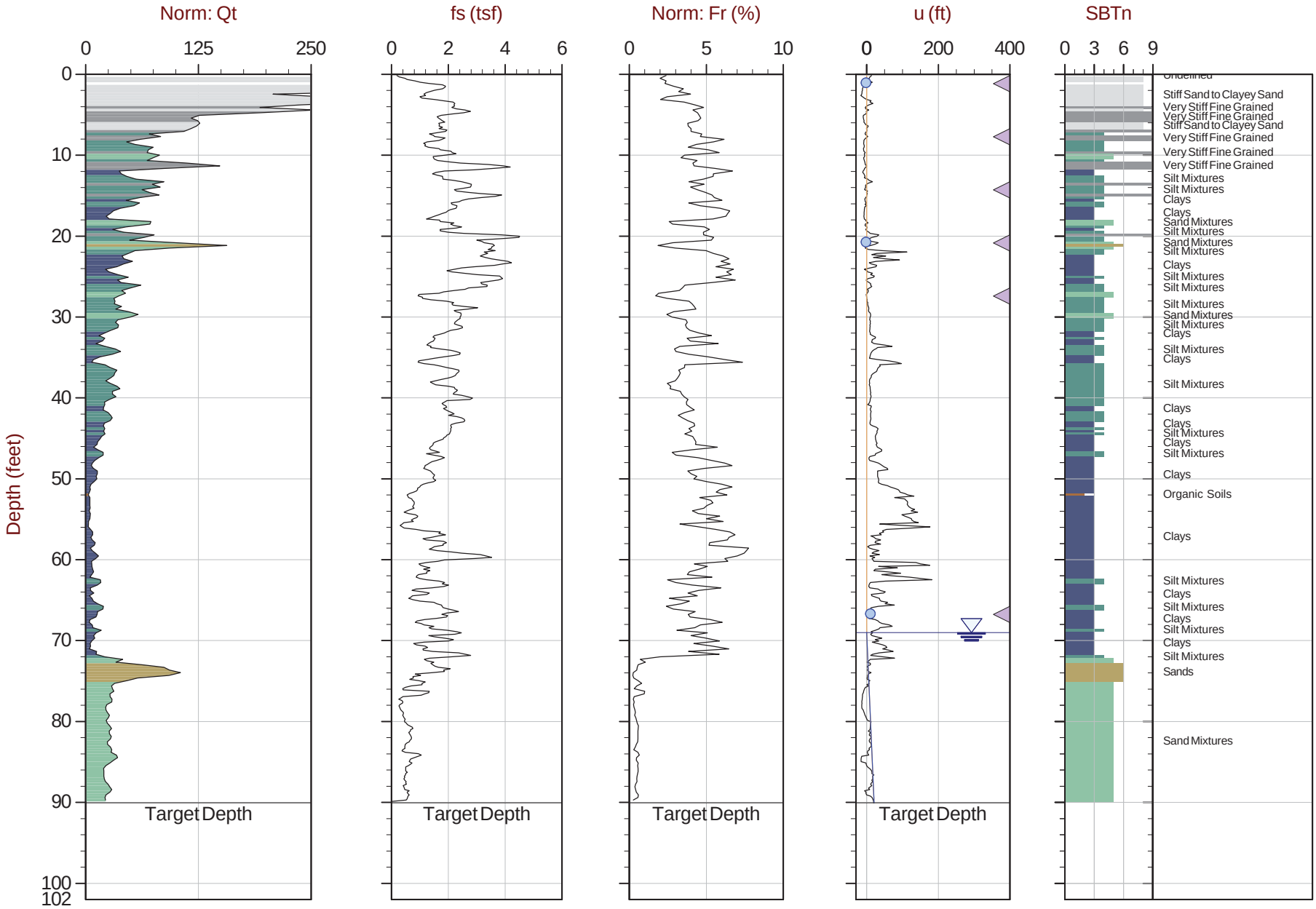
CONETEC

CONETEC

Haley & Aldrich

Job No: 16-53041
Date: 05:24:16 12:18
Site: DP&L JM Stuart Station, Aberdeen, OH

Sounding: SCPT16-HA-3-C1
Cone: 419:T1500F15U500



Max Depth: 27.450 m / 90.06 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.100 m

File: 16-53041_SPHA-3-C1.COR

SBT: Robertson, 1990
Coords: Ohio SPC South N: 232292m E: 1630730m Elev: 556.15

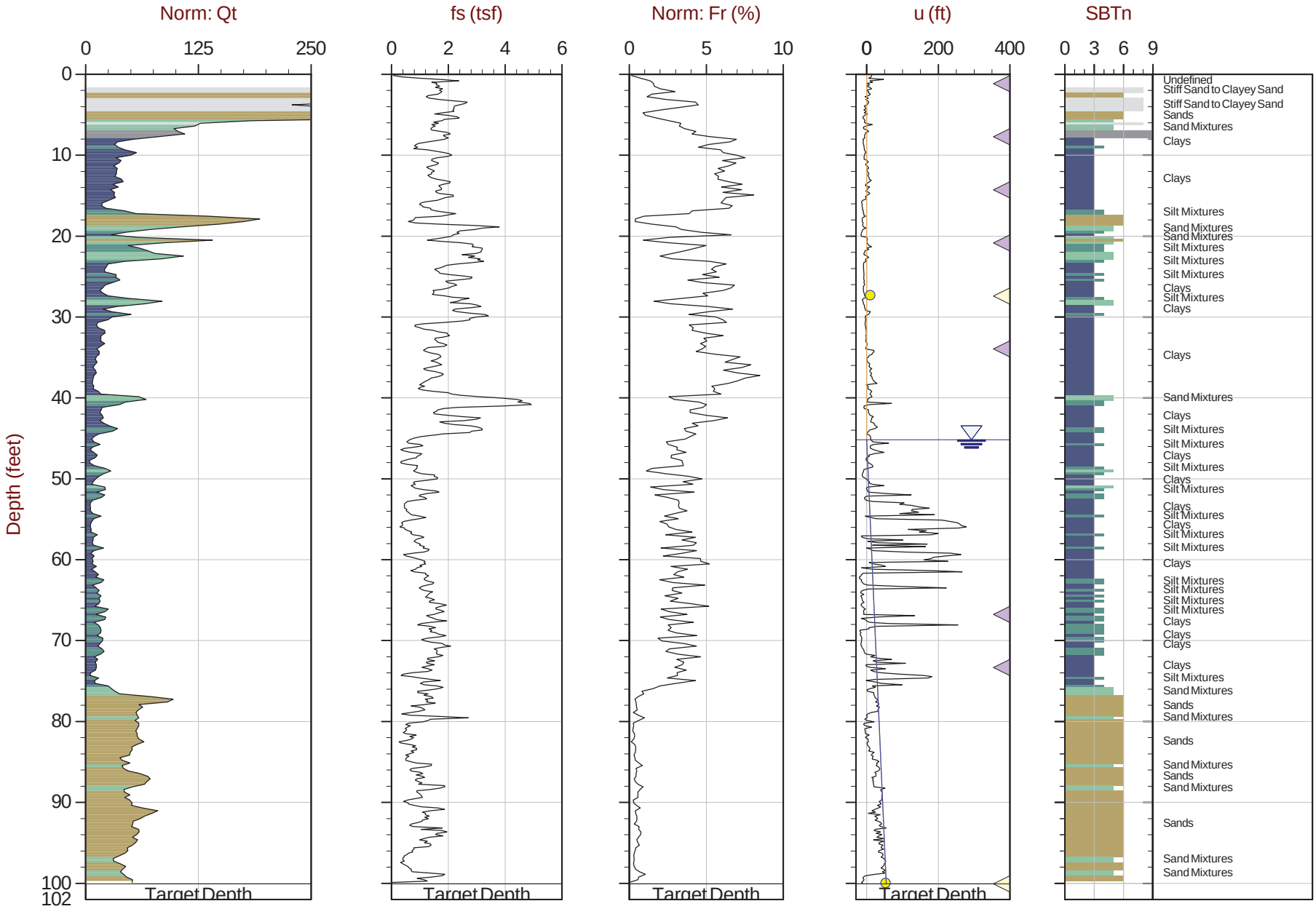
Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

Haley & Aldrich

Job No: 16-53041
Date: 05:19:16 10:06
Site: DP&L JM Stuart Station, Aberdeen, OH

Sounding: SCPT16-HA-5-C1
Cone: 419:T1500F15U500



Max Depth: 30.500 m / 100.06 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.100 m

File: 16-53041_SPHA-5-C1.COR

SBT: Robertson, 1990
Coords: Ohio SPC South N: 235791m E: 1624140m Elev: 529.07

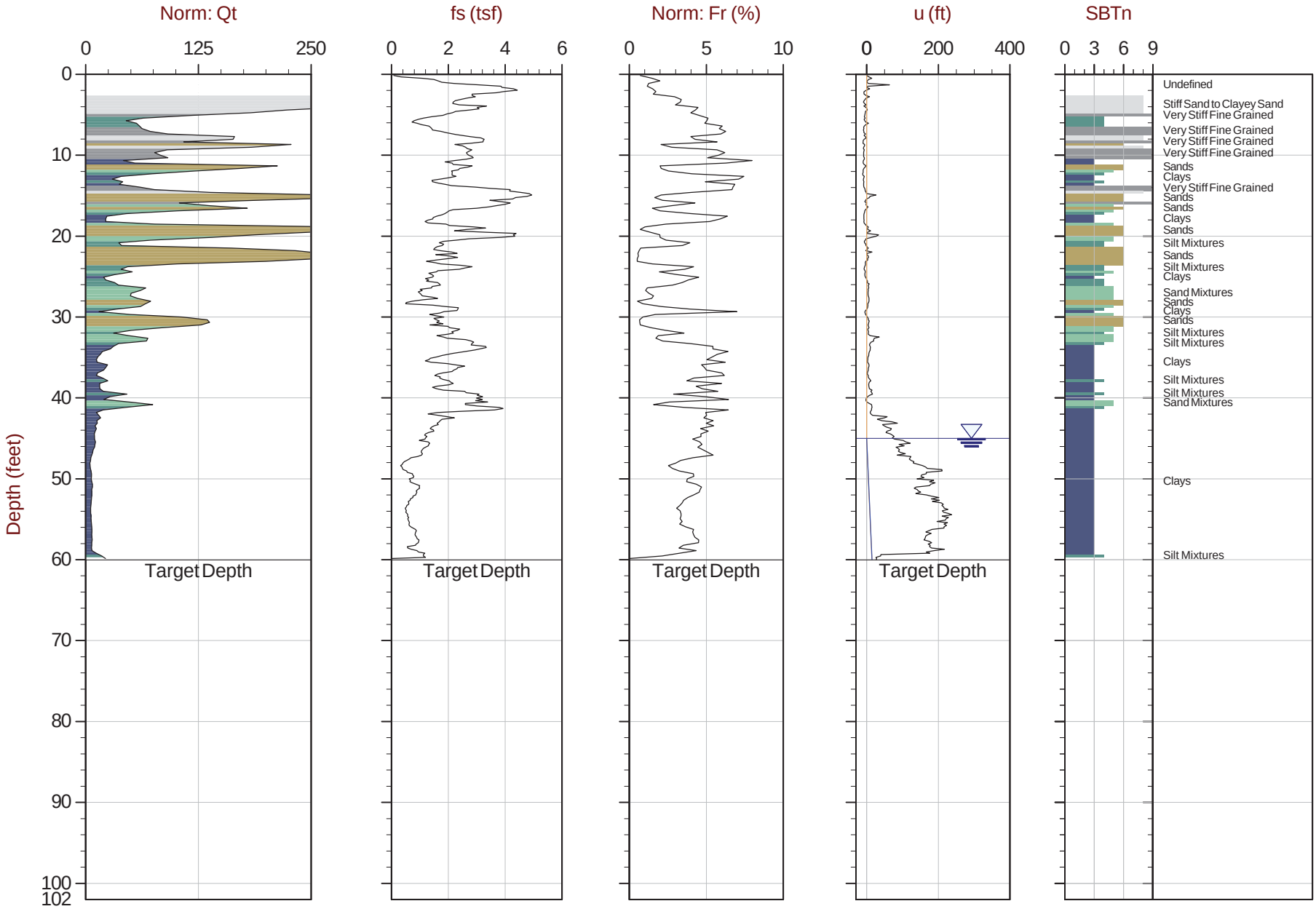
Hydrostatic Line · Ueq · Assumed Ueq · PPD, Ueq achieved · PPD, Ueq not achieved

The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

Haley & Aldrich

Job No: 16-53041
Date: 05:20:16 13:17
Site: DP&L JM Stuart Station, Aberdeen, OH

Sounding: CPT16-HA-5-C2
Cone: 419:T1500F15U500



Max Depth: 18.300 m / 60.04 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.100 m

File: 16-53041_CPHA-5-C2.COR

SBT: Robertson, 1990
Coords: Ohio SPC South N: 236306m E: 1625230m Elev: 530.02

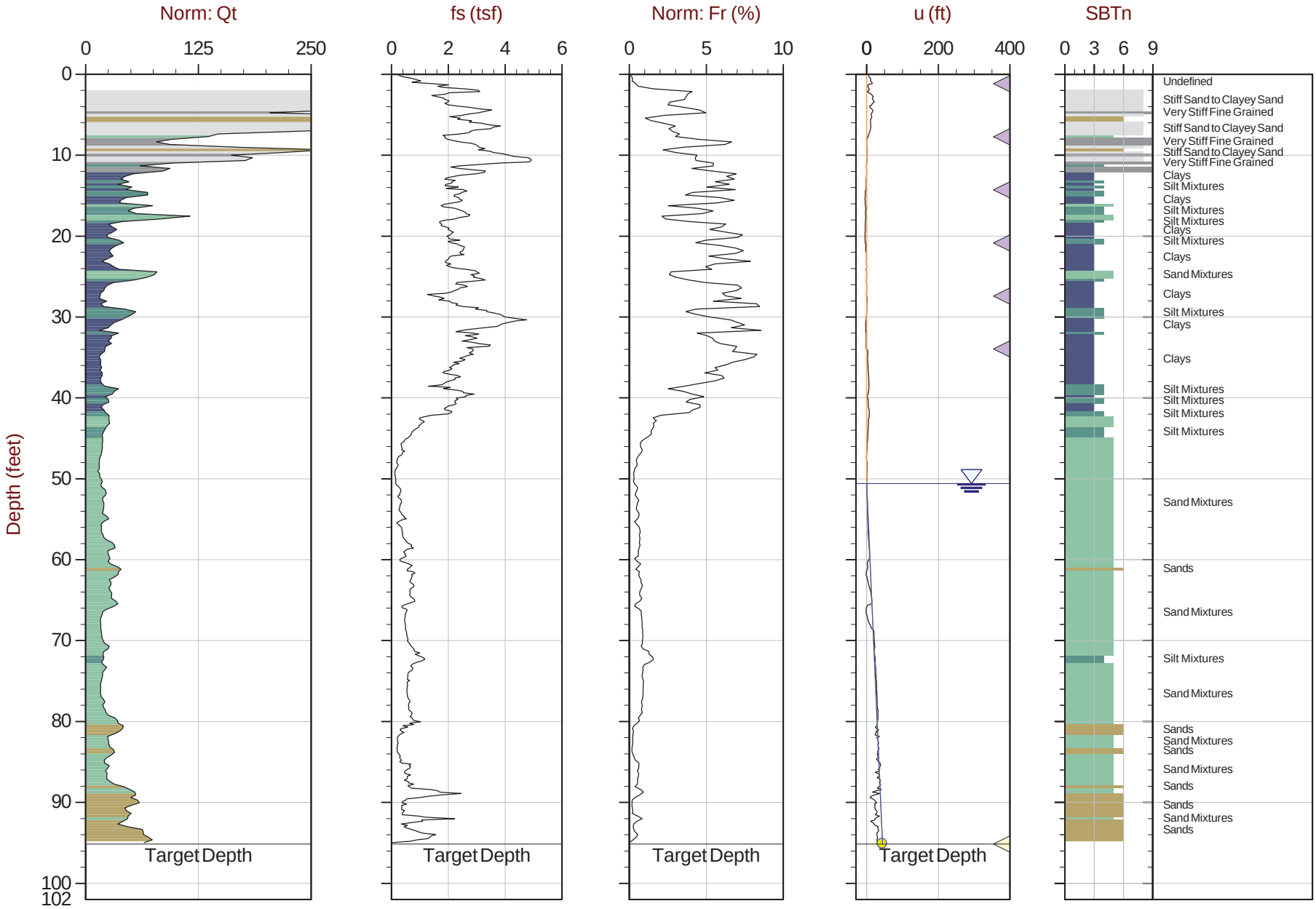
Hydrostatic Line · Ueq · Assumed Ueq · PPD, Ueq achieved · PPD, Ueq not achieved

The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

Haley & Aldrich

Job No: 16-53041
Date: 05:20:16 08:22
Site: DP&L JM Stuart Station, Aberdeen, OH

Sounding: CPT16-HA-6-C1
Cone: 419:T1500F15U500



Max Depth: 29.000 m / 95.14 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.100 m

File: 16-53041_CPHA-6-C1.COR

SBT: Robertson, 1990
Coords: Ohio SPC South N: 232303m E: 1633766m Elev: 532.87

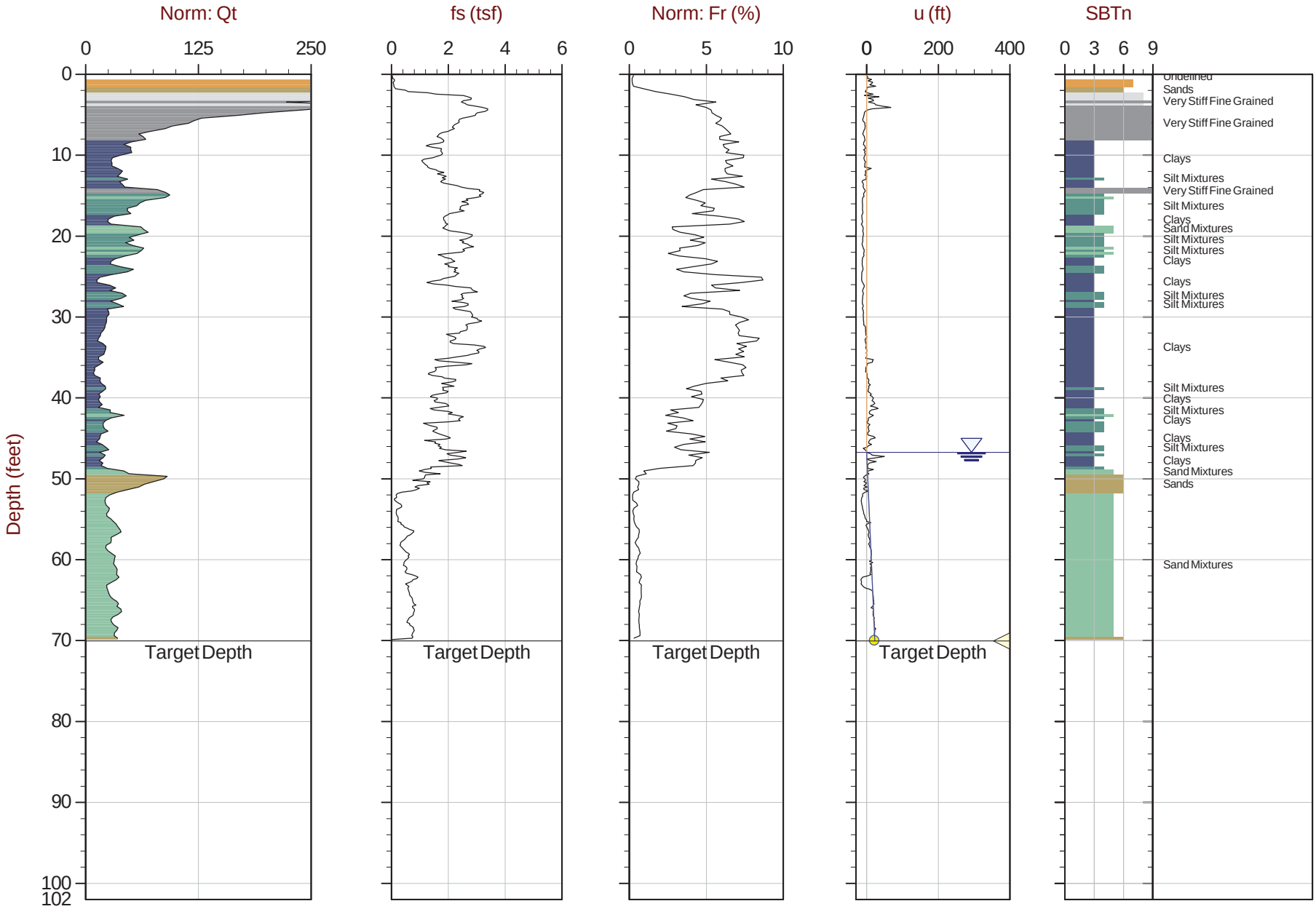
Hydrostatic Line · Ueq · Assumed Ueq · PPD, Ueq achieved · PPD, Ueq not achieved

The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

Haley & Aldrich

Job No: 16-53041
Date: 05:24:16 16:31
Site: DP&L JM Stuart Station, Aberdeen, OH

Sounding: CPT16-HA-7-C1B
Cone: 419:T1500F15U500



Max Depth: 21.350 m / 70.05 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.100 m

File: 16-53041_CPHA-7-C1B.COR

SBT: Robertson, 1990
Coords: Ohio SPC South N: 231682m E: 1633466m Elev: 531.81

Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

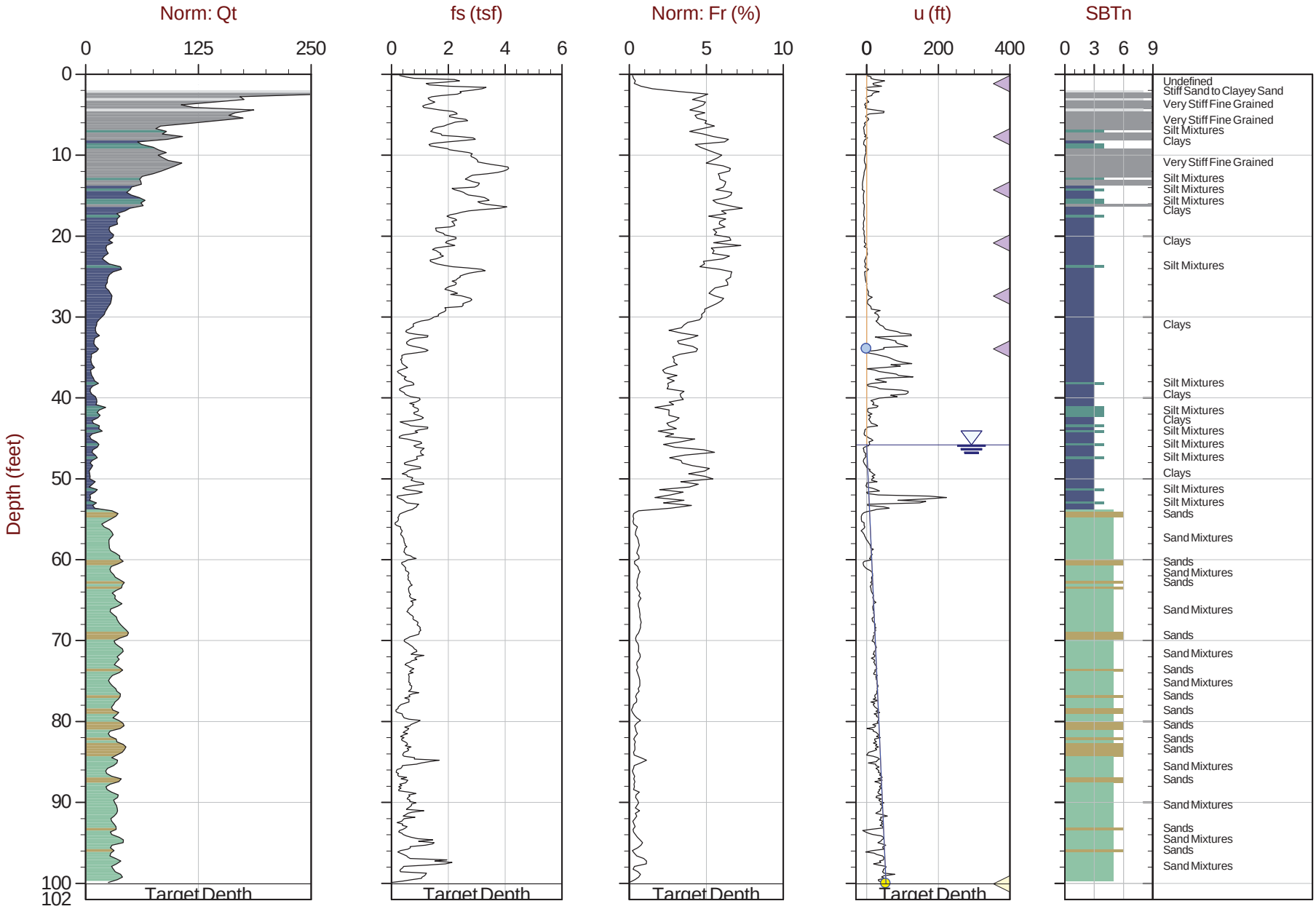
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Haley & Aldrich

Job No: 16-53041
Date: 05:24:16 08:58
Site: DP&L JM Stuart Station, Aberdeen, OH

Sounding: CPT16-HA-7-C2
Cone: 419:T1500F15U500



Max Depth: 30.500 m / 100.06 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.100 m

File: 16-53041_CPHA-7-C2.COR

SBT: Robertson, 1990
Coords: Ohio SPC South N: 231916m E: 1631438m Elev: 532.45

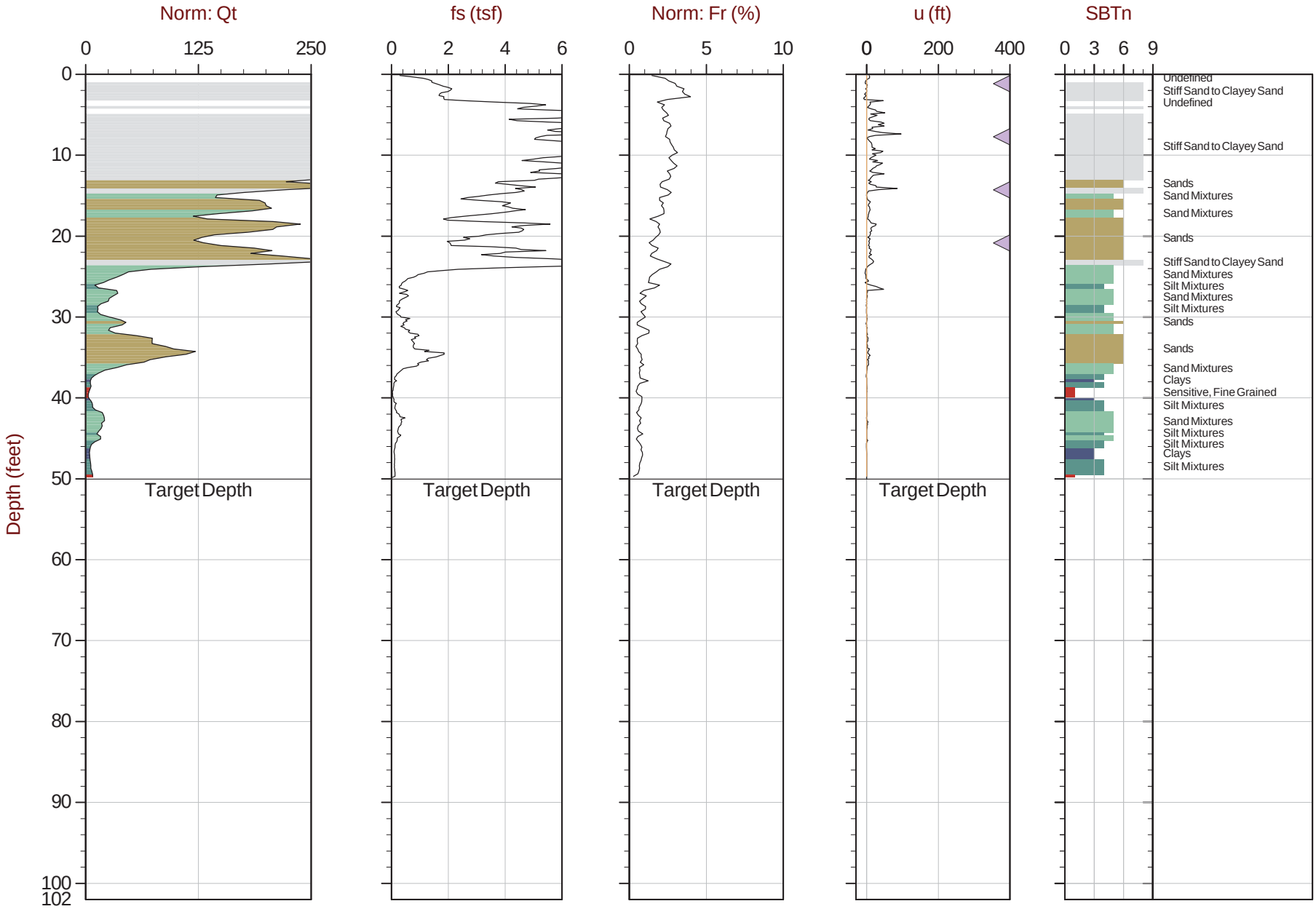
Hydrostatic Line · Ueq · Assumed Ueq · PPD, Ueq achieved · PPD, Ueq not achieved

The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

Haley & Aldrich

Job No: 16-53041
Date: 05:19:16 10:06
Site: DP&L JM Stuart Station, Aberdeen, OH

Sounding: SCPT16-HA-10-C1
Cone: 419:T1500F15U500



Max Depth: 15.250 m / 50.03 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.100 m

File: 16-53041_SPHA-10-C1.COR

SBT: Robertson, 1990
Coords: Ohio SPC South N: 235339m E: 1629133m Elev: 567.96

Hydrostatic Line ● Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

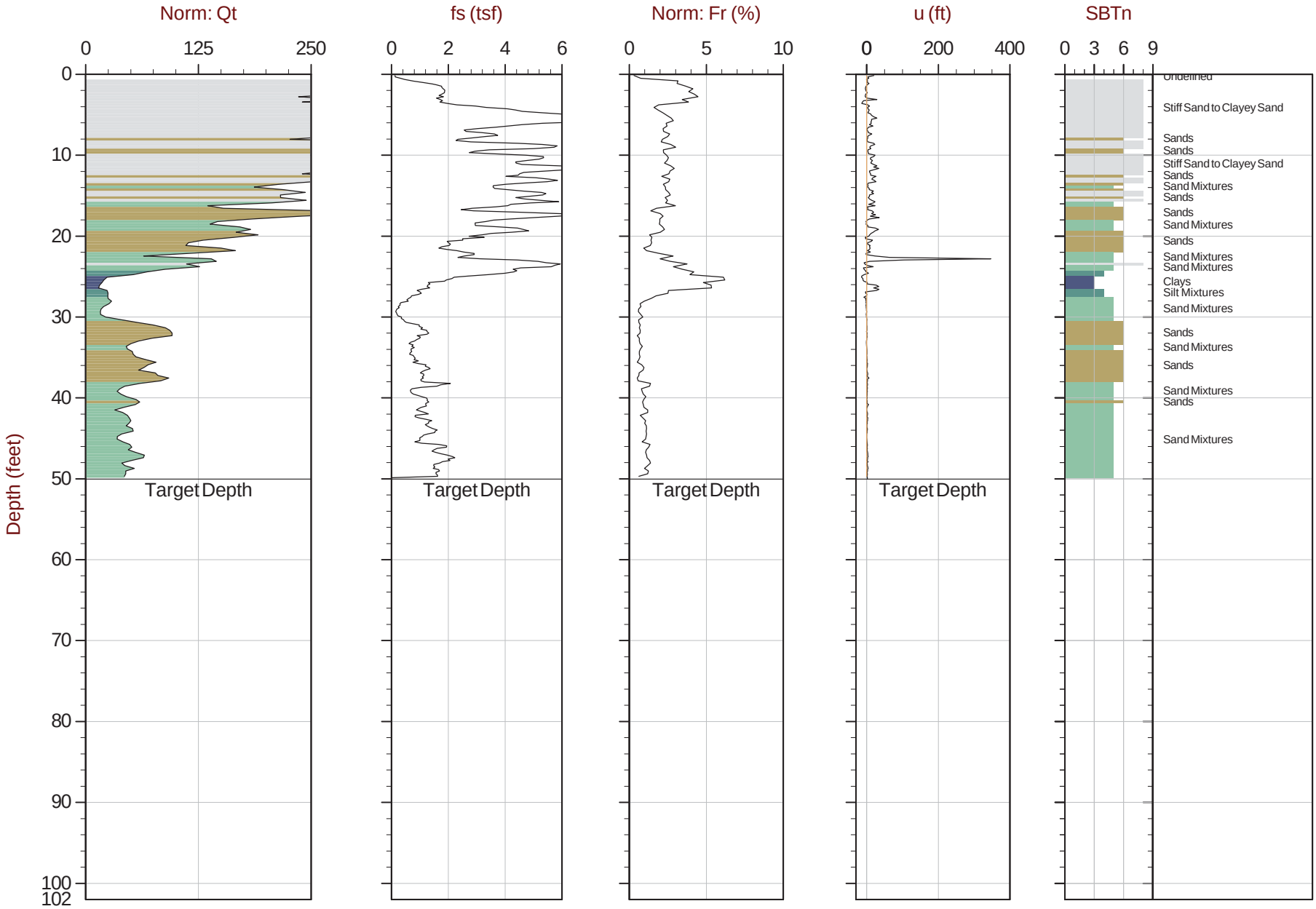
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Haley & Aldrich

Job No: 16-53041
Date: 05:23:16 15:40
Site: DP&L JM Stuart Station, Aberdeen, OH

Sounding: CPT16-HA-10-C2
Cone: 419:T1500F15U500



Max Depth: 15.250 m / 50.03 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.100 m

File: 16-53041_CPHA-10-C2.COR

SBT: Robertson, 1990
Coords: Ohio SPC South N: 235455m E: 1630444m Elev: 568.29

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

Seismic Cone Penetration Test Plots

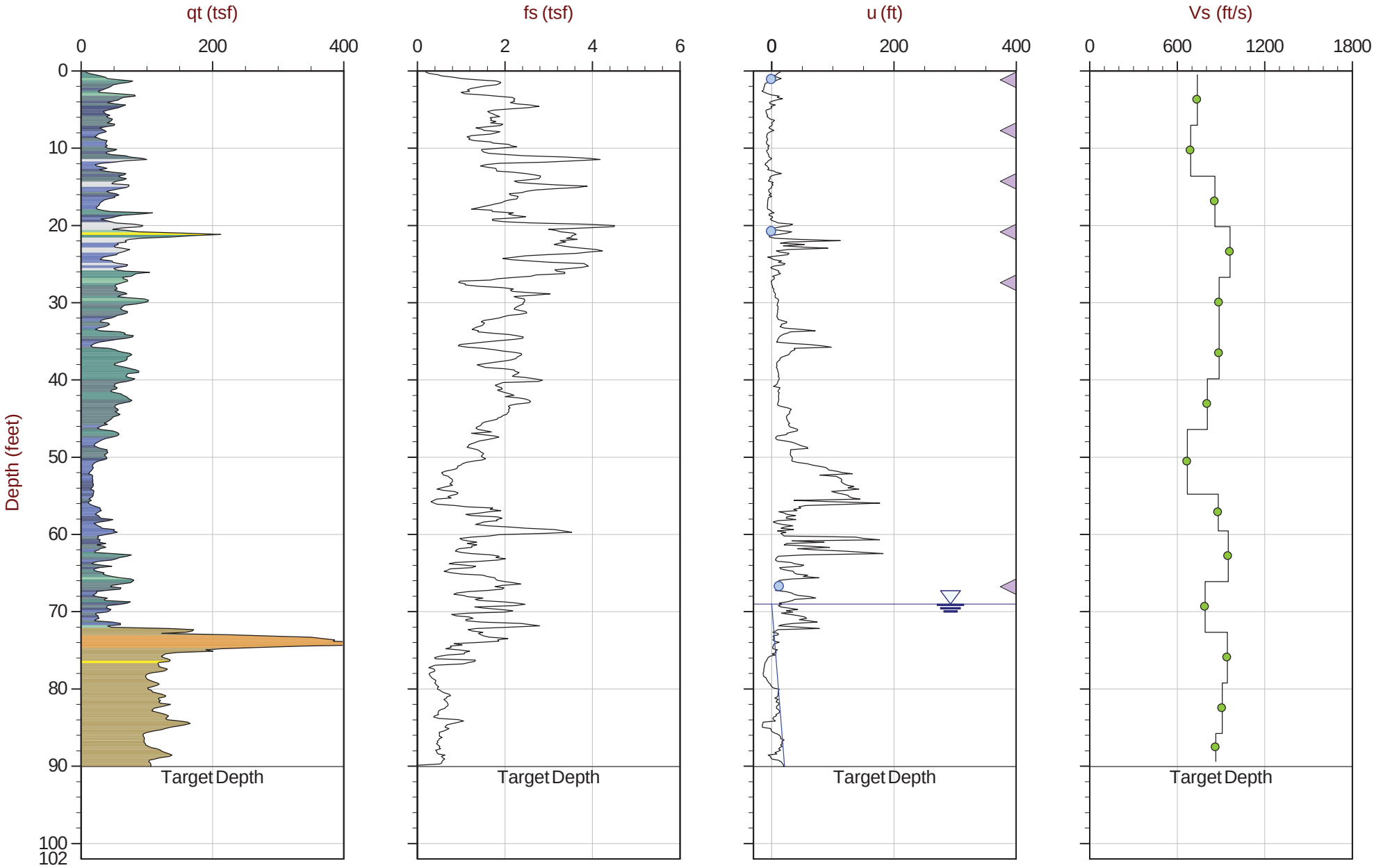
CONETEC

CONETEC

Haley & Aldrich

Job No: 16-53041
Date: 05:24:16 12:18
Site: DP&L JM Stuart Station, Aberdeen, OH

Sounding: SCPT16-HA-3-C1
Cone: 419:T1500F15U500



Max Depth: 27.450 m / 90.06 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.100 m

File: 16-53041_SPHA-3-C1.COR

SBT: Robertson and Campanella, 1986
Coords: Ohio SPC South N: 232292m E: 1630730m Elev: 556.15

Hydrostatic Line · Ueq · Assumed Ueq · PPD, Ueq achieved · PPD, Ueq not achieved

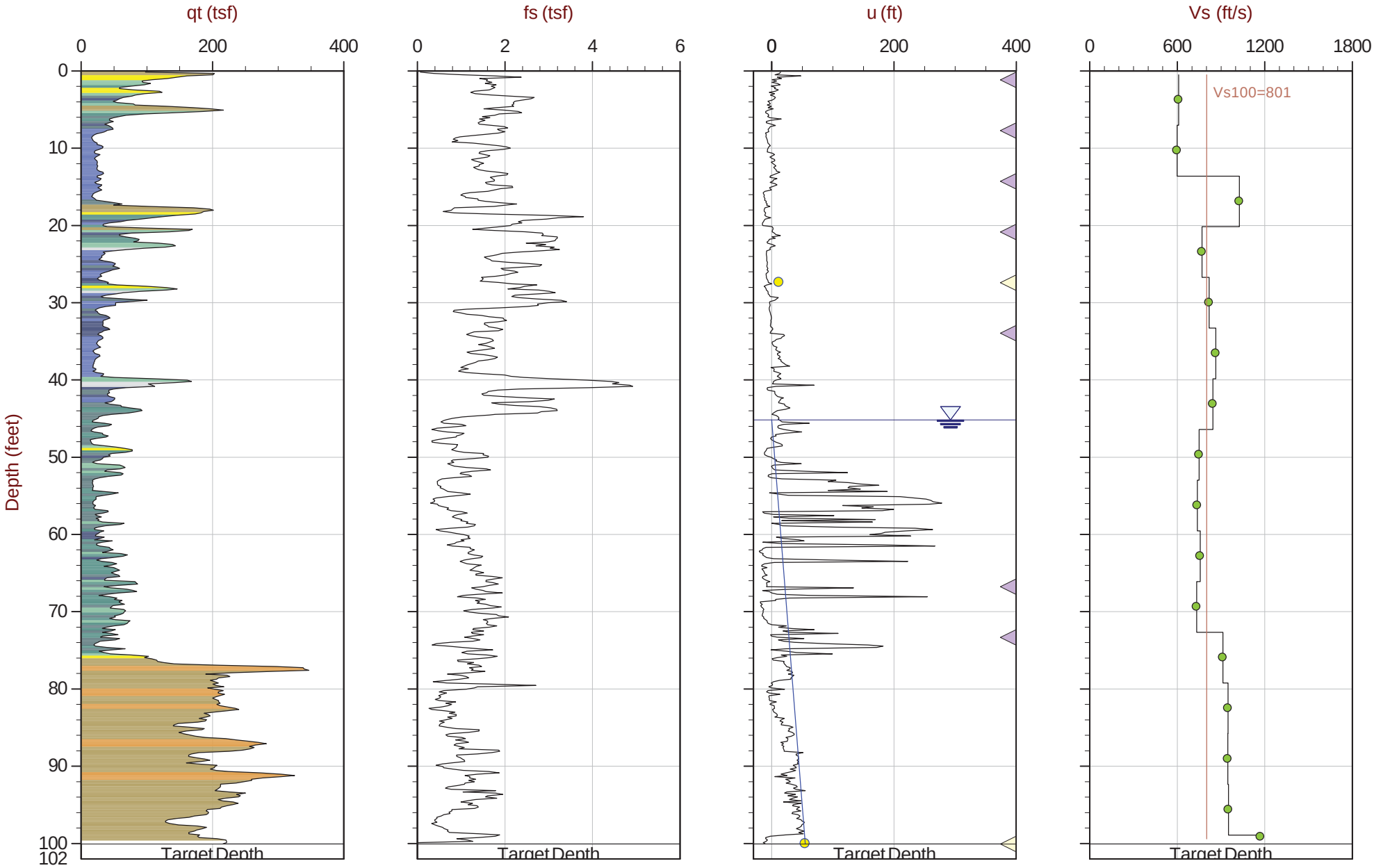
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Haley & Aldrich

Job No: 16-53041
Date: 05:19:16 10:06
Site: DP&L JM Stuart Station, Aberdeen, OH

Sounding: SCPT16-HA-5-C1
Cone: 419:T1500F15U500



Max Depth: 30.500 m / 100.06 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.100 m

File: 16-53041_SPHA-5-C1.COR

SBT: Robertson and Campanella, 1986
Coords: Ohio SPC South N: 235791m E: 1624140m Elev: 529.07

Hydrostatic Line · Ueq · Assumed Ueq · PPD, Ueq achieved · PPD, Ueq not achieved

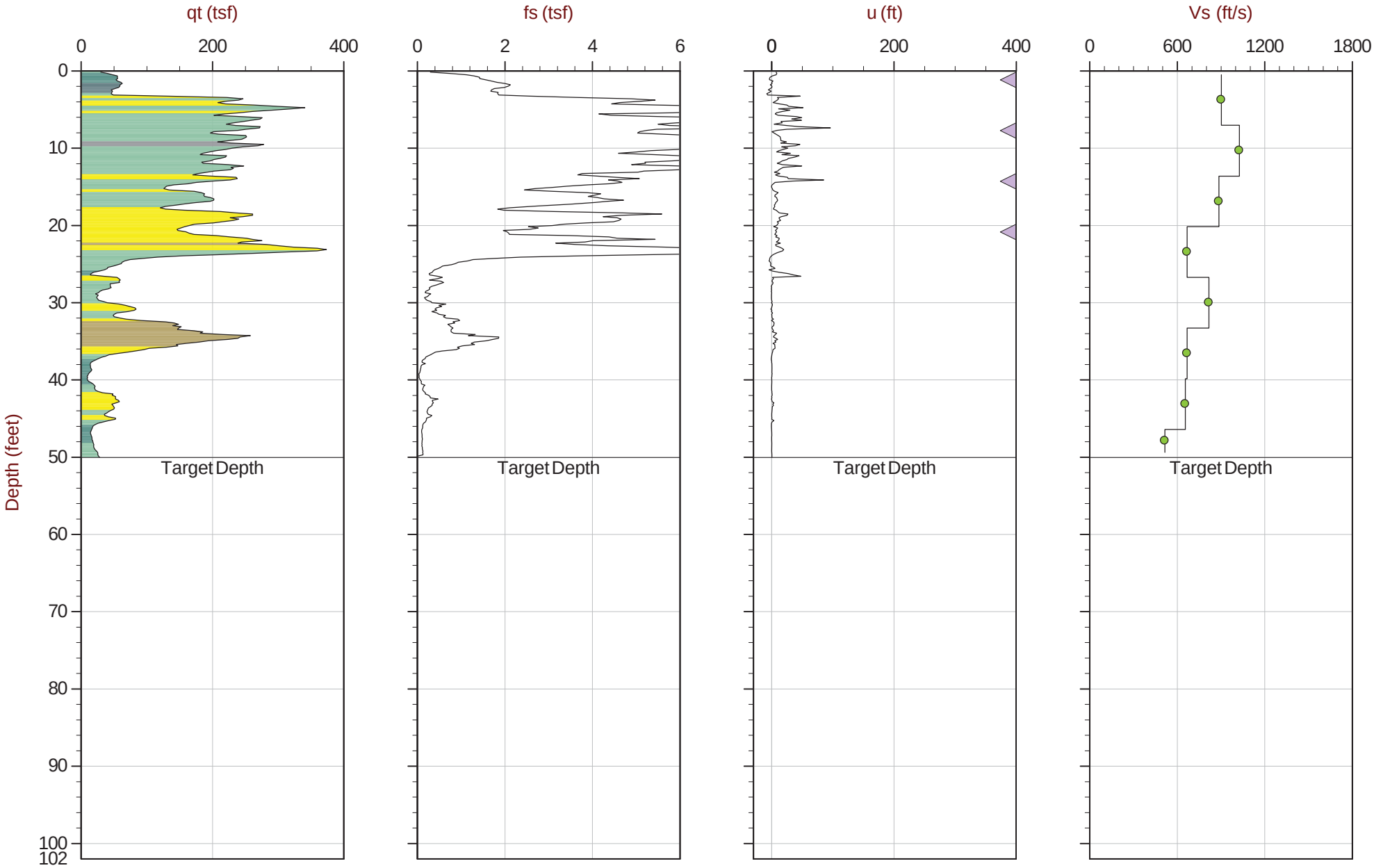
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Haley & Aldrich

Job No: 16-53041
Date: 05:19:16 10:06
Site: DP&L JM Stuart Station, Aberdeen, OH

Sounding: SCPT16-HA-10-C1
Cone: 419:T1500F15U500



Max Depth: 15.250 m / 50.03 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.100 m

File: 16-53041_SPHA-10-C1.COR

SBT: Robertson and Campanella, 1986
Coords: Ohio SPC South N: 235339m E: 1629133m Elev: 567.96

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

Seismic Cone Penetration Test Tabular Results (Vs)

CONETEC

Job No:	16-53041
Client:	Haley & Aldrich
Project:	DP&L JM Stuart Station, Aberdeen, OH
Sounding ID:	SCPT16-HA-3-C1
Date:	24-May-2016

Seismic Source:	Beam
Source Offset (ft):	1.97
Source Depth (ft):	0.00
Geophone Offset (ft):	0.66

SCPTu SHEAR WAVE VELOCITY TEST RESULTS - Vs

Tip Depth (ft)	Geophone Depth (ft)	Ray Path (ft)	Ray Path Difference (ft)	Travel Time Interval (ms)	Interval Velocity (ft/s)
1.15	0.49	2.03			
7.71	7.05	7.32	5.29	7.17	739
14.27	13.62	13.76	6.43	9.29	693
20.83	20.18	20.27	6.52	7.58	859
27.40	26.74	26.81	6.54	6.79	963
33.96	33.30	33.36	6.55	7.38	888
40.52	39.86	39.91	6.55	7.38	888
47.08	46.42	46.47	6.55	8.12	807
55.45	54.79	54.83	8.36	12.48	670
60.20	59.55	59.58	4.75	5.40	881
66.77	66.11	66.14	6.56	6.90	951
73.33	72.67	72.70	6.56	8.29	792
79.89	79.23	79.26	6.56	6.95	944
86.45	85.79	85.82	6.56	7.22	909
90.06	89.40	89.42	3.61	4.17	865

Job No:	16-53041
Client:	Haley & Aldrich
Project:	DP&L JM Stuart Station, Aberdeen, OH
Sounding ID:	SCPT16-HA-5-C1
Date:	19-May-2016

Seismic Source:	Beam
Source Offset (ft):	1.97
Source Depth (ft):	0.00
Geophone Offset (ft):	0.66

SCPTu SHEAR WAVE VELOCITY TEST RESULTS - Vs

Tip Depth (ft)	Geophone Depth (ft)	Ray Path (ft)	Ray Path Difference (ft)	Travel Time Interval (ms)	Interval Velocity (ft/s)
1.15	0.49	2.03			
7.71	7.05	7.32	5.29	8.66	611
14.27	13.62	13.76	6.43	10.72	600
20.83	20.18	20.27	6.52	6.35	1026
27.40	26.74	26.81	6.54	8.48	771
33.96	33.30	33.36	6.55	8.00	819
40.52	39.86	39.91	6.55	7.57	865
47.08	46.42	46.47	6.55	7.76	845
53.64	52.99	53.02	6.56	8.72	751
60.20	59.55	59.58	6.56	8.87	739
66.77	66.11	66.14	6.56	8.64	759
73.33	72.67	72.70	6.56	8.94	734
79.89	79.23	79.26	6.56	7.19	913
86.45	85.79	85.82	6.56	6.91	949
93.01	92.36	92.38	6.56	6.92	948
99.57	98.92	98.94	6.56	6.89	952
100.07	99.41	99.43	0.49	0.42	1171

Job No:	16-53041
Client:	Haley & Aldrich
Project:	DP&L JM Stuart Station, Aberdeen, OH
Sounding ID:	SCPT16-HA-10-C1
Date:	19-May-2016

Seismic Source:	Beam
Source Offset (ft):	1.97
Source Depth (ft):	0.00
Geophone Offset (ft):	0.66

SCPTu SHEAR WAVE VELOCITY TEST RESULTS - Vs

Tip Depth (ft)	Geophone Depth (ft)	Ray Path (ft)	Ray Path Difference (ft)	Travel Time Interval (ms)	Interval Velocity (ft/s)
1.15	0.49	2.03			
7.71	7.05	7.32	5.29	5.86	903
14.27	13.62	13.76	6.43	6.26	1027
20.83	20.18	20.27	6.52	7.36	886
27.40	26.74	26.81	6.54	9.79	668
33.96	33.30	33.36	6.55	8.02	817
40.52	39.86	39.91	6.55	9.79	669
47.08	46.42	46.47	6.55	9.99	656
50.03	49.38	49.42	2.95	5.72	516

Pore Pressure Dissipation Summary and

Pore Pressure Dissipation Plots

CONETEC

Job No:	16-53041
Client:	Haley & Aldrich
Project:	DP&L JM Stuart Station, Aberdeen, OH
Start Date:	19-May-2016
End Date:	24-May-2016

CPTu PORE PRESSURE DISSIPATION SUMMARY

Sounding ID	File Name	Cone Area (cm^2)	Duration (s)	Test Depth (ft)	Estimated Equilibrium Pore Pressure U_{eq} (ft)	Calculated Phreatic Surface (ft)	Estimated Phreatic Surface (ft)	t_{50} [a] (s)	Assumed Rigidity Index (I_r)	c_h [b] (cm^2/min)
SCPT16-HA-3-C1	16-53041_SPHA-3-C1	15	300	1.15	0.00		1.15	225	100	3.12
SCPT16-HA-3-C1	16-53041_SPHA-3-C1	15	120	7.71						
SCPT16-HA-3-C1	16-53041_SPHA-3-C1	15	300	14.27						
SCPT16-HA-3-C1	16-53041_SPHA-3-C1	15	300	20.83	0.00		20.83			
SCPT16-HA-3-C1	16-53041_SPHA-3-C1	15	300	27.39						
SCPT16-HA-3-C1	16-53041_SPHA-3-C1	15	180	66.76	12.76		54.00	58	100	12.02
SCPT16-HA-5-C1	16-53041_SPHA-5-C1	15	300	1.15						
SCPT16-HA-5-C1	16-53041_SPHA-5-C1	15	120	7.71						
SCPT16-HA-5-C1	16-53041_SPHA-5-C1	15	300	14.27						
SCPT16-HA-5-C1	16-53041_SPHA-5-C1	15	300	20.83						
SCPT16-HA-5-C1	16-53041_SPHA-5-C1	15	300	27.39	12.02	15.38				
SCPT16-HA-5-C1	16-53041_SPHA-5-C1	15	120	33.96						
SCPT16-HA-5-C1	16-53041_SPHA-5-C1	15	115	66.76						
SCPT16-HA-5-C1	16-53041_SPHA-5-C1	15	120	73.33						
SCPT16-HA-5-C1	16-53041_SPHA-5-C1	15	275	100.06	54.90	45.16				
CPT16-HA-6-C1	16-53041_CPHA-6-C1	15	300	1.15						
CPT16-HA-6-C1	16-53041_CPHA-6-C1	15	300	7.71						
CPT16-HA-6-C1	16-53041_CPHA-6-C1	15	300	14.27						
CPT16-HA-6-C1	16-53041_CPHA-6-C1	15	300	20.83						
CPT16-HA-6-C1	16-53041_CPHA-6-C1	15	185	27.39						
CPT16-HA-6-C1	16-53041_CPHA-6-C1	15	135	33.96						
CPT16-HA-6-C1	16-53041_CPHA-6-C1	15	100	95.14	44.56	50.59				

Job No:	16-53041
Client:	Haley & Aldrich
Project:	DP&L JM Stuart Station, Aberdeen, OH
Start Date:	19-May-2016
End Date:	24-May-2016

CPTu PORE PRESSURE DISSIPATION SUMMARY

Sounding ID	File Name	Cone Area (cm^2)	Duration (s)	Test Depth (ft)	Estimated Equilibrium Pore Pressure U_{eq} (ft)	Calculated Phreatic Surface (ft)	Estimated Phreatic Surface (ft)	t_{50} [a] (s)	Assumed Rigidity Index (I_r)	c_h [b] (cm^2/min)
CPT16-HA-7-C1B	16-53041_CPHA-7-C1B	15	85	70.05	23.31	46.74				
CPT16-HA-7-C2	16-53041_CPHA-7-C2	15	300	1.15						
CPT16-HA-7-C2	16-53041_CPHA-7-C2	15	300	7.71						
CPT16-HA-7-C2	16-53041_CPHA-7-C2	15	120	14.27						
CPT16-HA-7-C2	16-53041_CPHA-7-C2	15	120	20.83						
CPT16-HA-7-C2	16-53041_CPHA-7-C2	15	120	27.39						
CPT16-HA-7-C2	16-53041_CPHA-7-C2	15	300	33.96	0.00		33.96	85	100	8.29
CPT16-HA-7-C2	16-53041_CPHA-7-C2	15	300	100.06	54.26	45.80				
SCPT16-HA-10-C1	16-53041_SPHA-10-C1	15	130	1.15						
SCPT16-HA-10-C1	16-53041_SPHA-10-C1	15	300	7.71						
SCPT16-HA-10-C1	16-53041_SPHA-10-C1	15	260	14.27						
SCPT16-HA-10-C1	16-53041_SPHA-10-C1	15	260	20.83						
Totals	34 dissipations		127.8 min							

a. Time is relative to where umax occurred

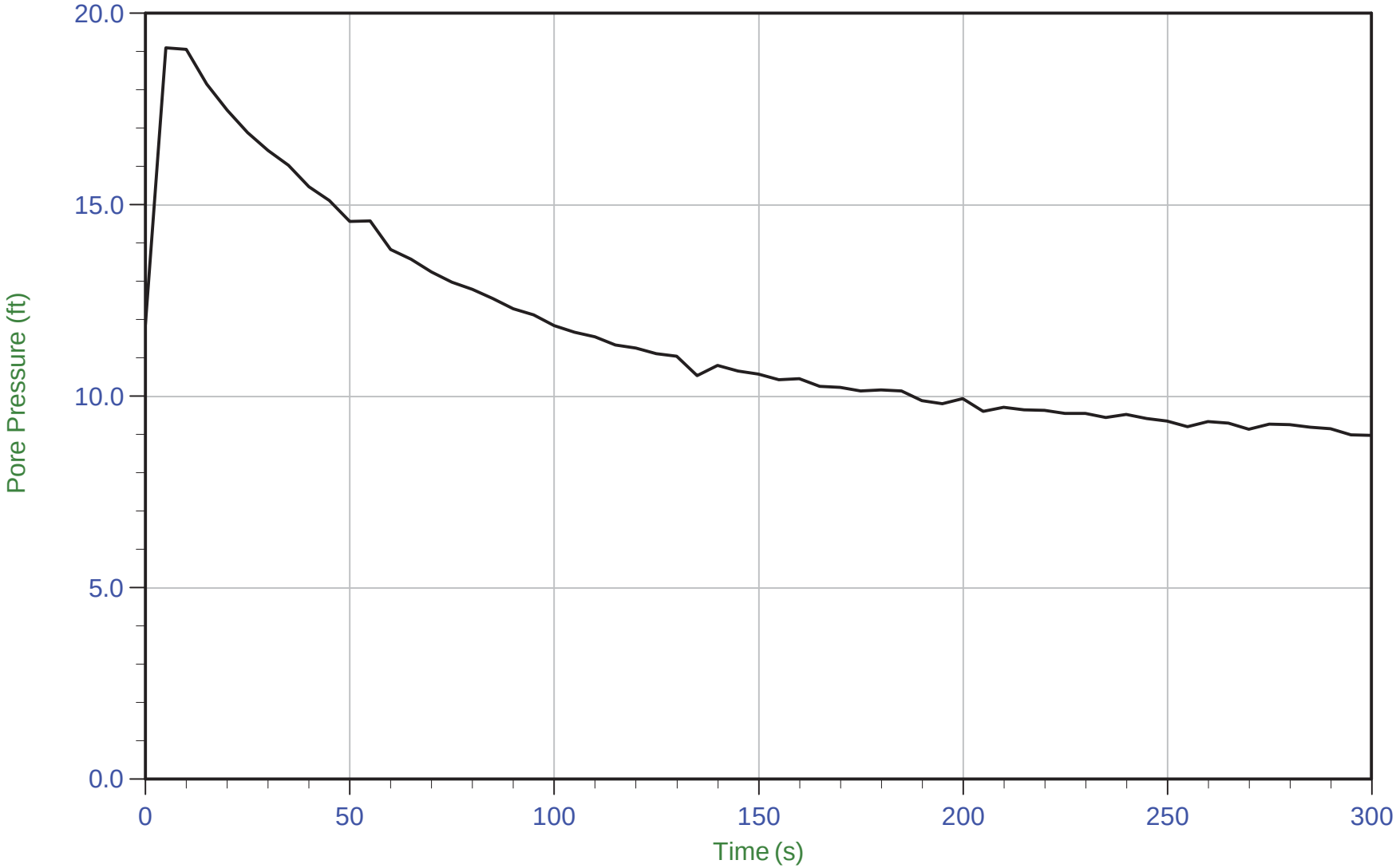
b. Houlsby and Teh, 1991

CONETEC

Haley & Aldrich

Job No: 16-53041
Date: 24-May-2016 12:18:15
Site: DP&L JM Stuart Station, Aberdeen, OH

Sounding: SCPT16-HA-3-C1
Cone: AD419
Cone Area: 15 sq cm



Trace Summary:

Filename: 16-53041_SPHA-3-C1.PPD
Depth: 0.350 m / 1.148 ft
Duration: 300.0 s

U Min: 9.0 ft
U Max: 19.1 ft

WT: 0.350 m / 1.148 ft
Ueq: 0.0 ft
U(50): 9.55 ft

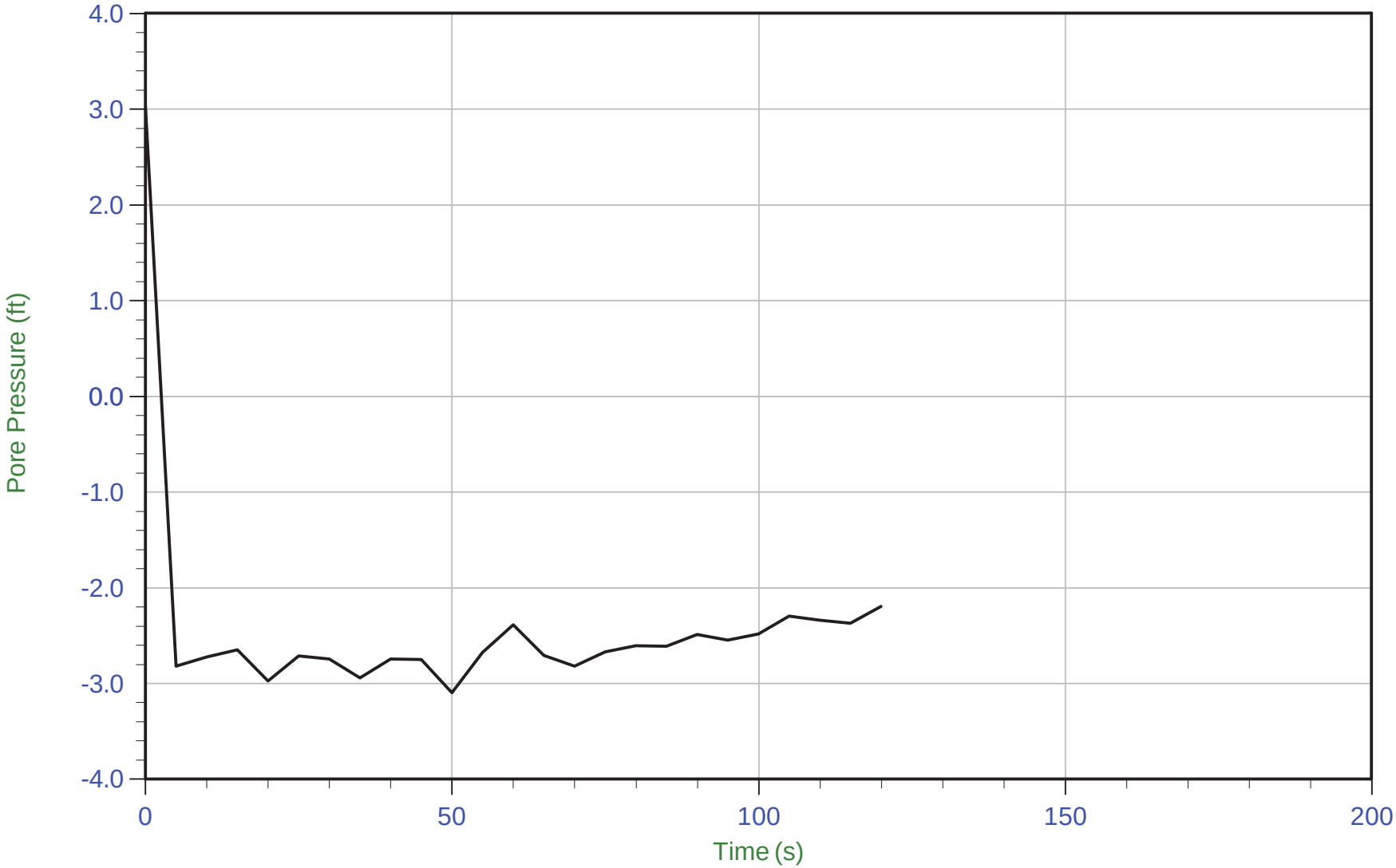
T(50): 225.2 s
Ir: 100
Ch: 3.1 sq cm/min

CONETEC

Haley & Aldrich

Job No: 16-53041
Date: 24-May-2016 12:18:15
Site: DP&L JM Stuart Station, Aberdeen, OH

Sounding: SCPT16-HA-3-C1
Cone: AD419
Cone Area: 15 sq cm



Trace Summary:

Filename: 16-53041_SPHA-3-C1.PPD
Depth: 2.350 m / 7.710 ft
Duration: 120.0 s

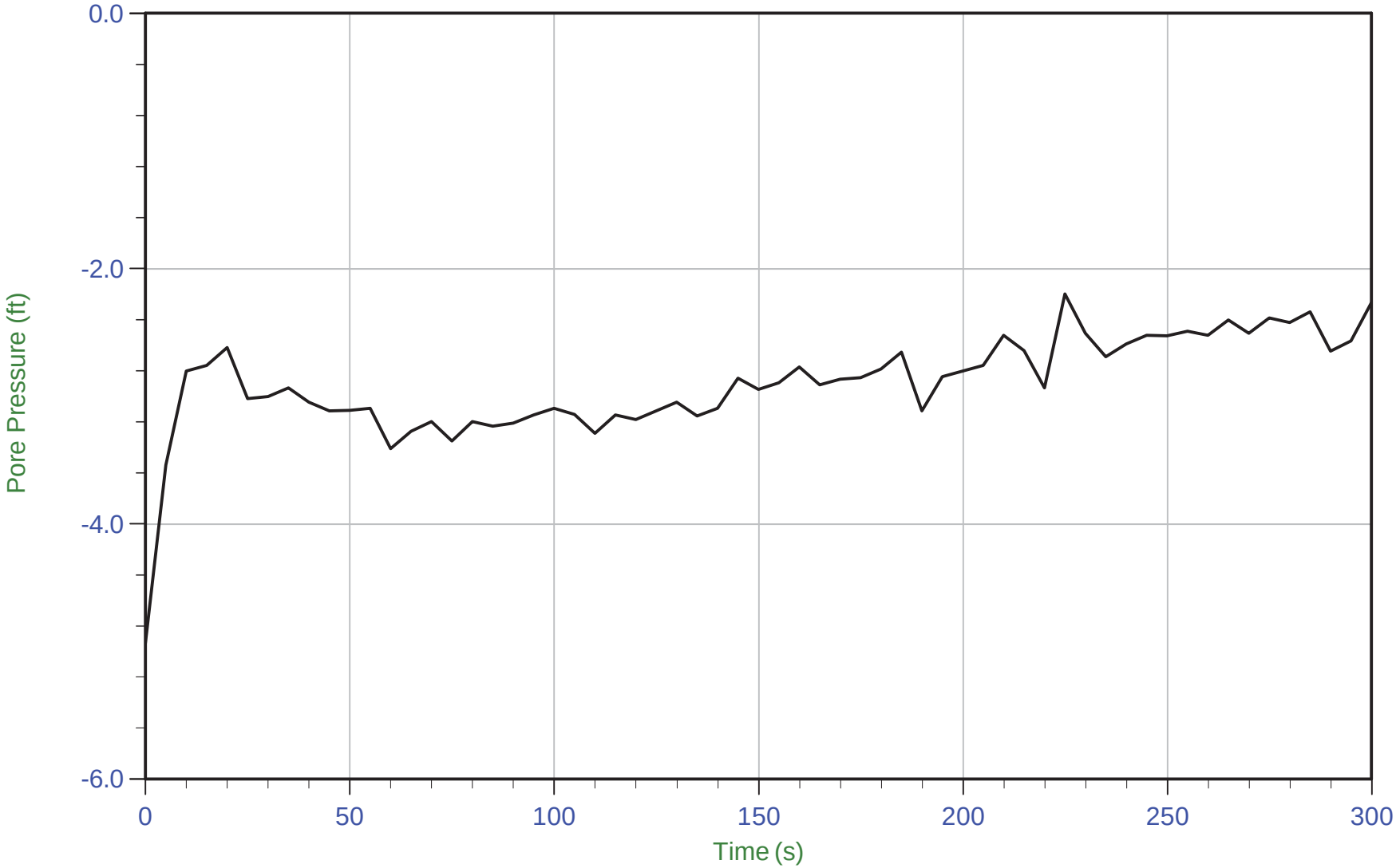
U Min: -3.1 ft
U Max: 3.0 ft

CONETEC

Haley & Aldrich

Job No: 16-53041
Date: 24-May-2016 12:18:15
Site: DP&L JM Stuart Station, Aberdeen, OH

Sounding: SCPT16-HA-3-C1
Cone: AD419
Cone Area: 15 sq cm

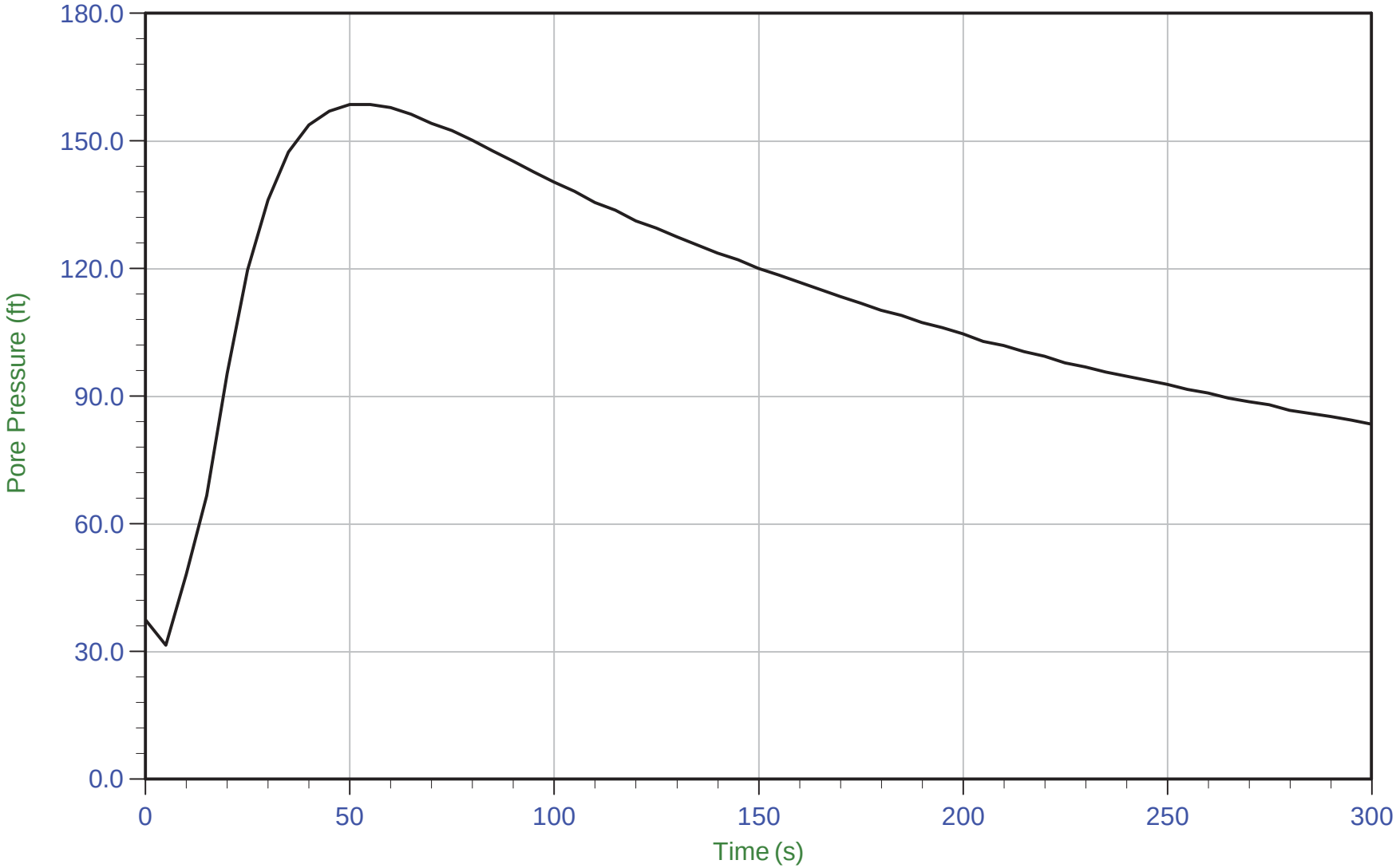


Trace Summary:

Filename: 16-53041_SPHA-3-C1.PPD
Depth: 4.350 m / 14.271 ft
Duration: 300.0 s

U Min: -4.9 ft
U Max: -2.2 ft

Haley & Aldrich	Job No: 16-53041 Date: 24-May-2016 12:18:15 Site: DP&L JM Stuart Station, Aberdeen, OH	Sounding: SCPT16-HA-3-C1 Cone: AD419 Cone Area: 15 sq cm



Trace Summary:

Filename: 16-53041_SPHA-3-C1.PPD
Depth: 6.350 m / 20.833 ft
Duration: 300.0 s

U Min: 31.4 ft
U Max: 158.6 ft

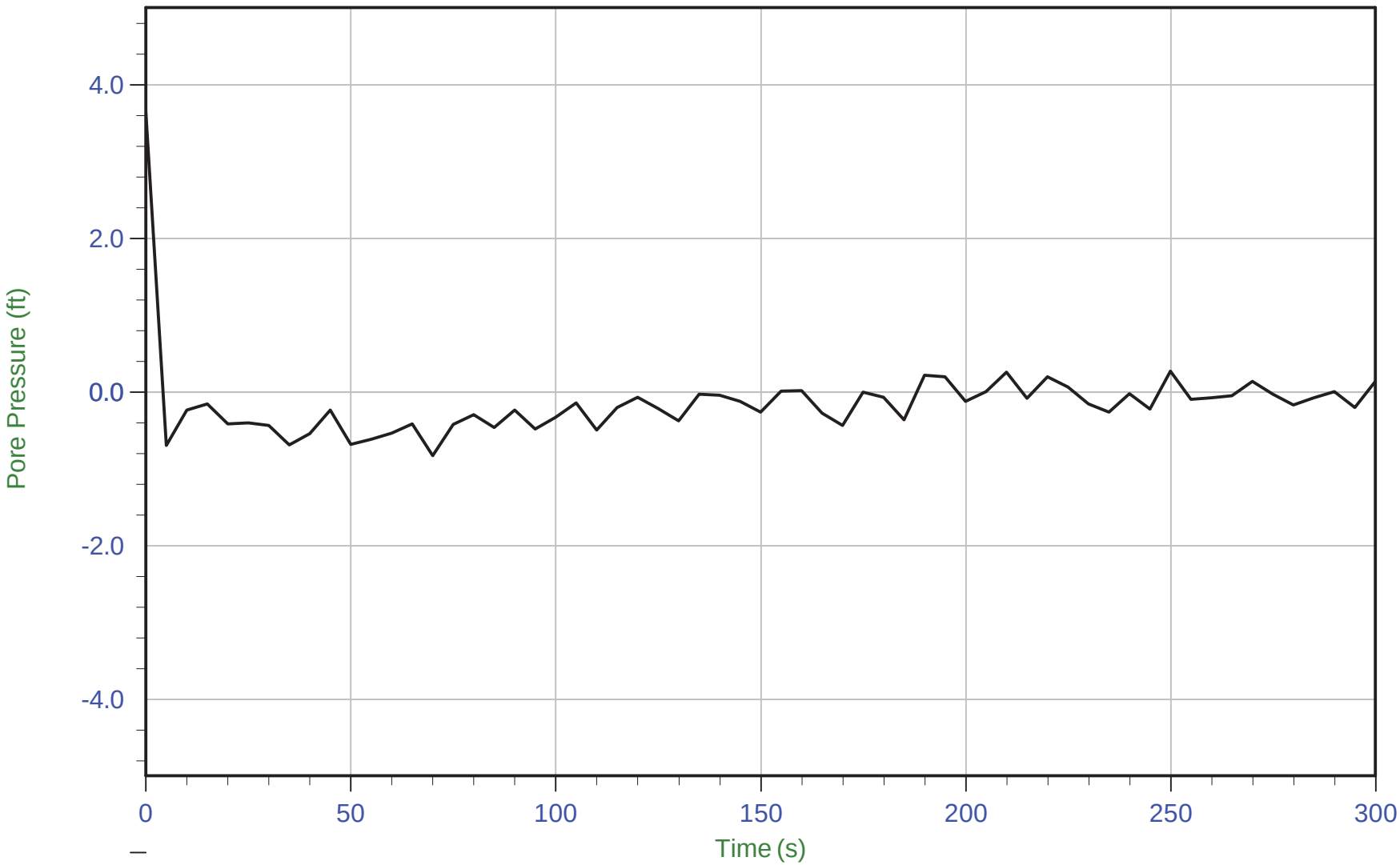
WT: 6.350 m / 20.833 ft
Ueq: 0.0 ft

CONETEC

Haley & Aldrich

Job No: 16-53041
Date: 24-May-2016 12:18:15
Site: DP&L JM Stuart Station, Aberdeen, OH

Sounding: SCPT16-HA-3-C1
Cone: AD419
Cone Area: 15 sq cm



Trace Summary:

Filename: 16-53041_SPHA-3-C1.PPD
Depth: 8.350 m / 27.395 ft
Duration: 300.0 s

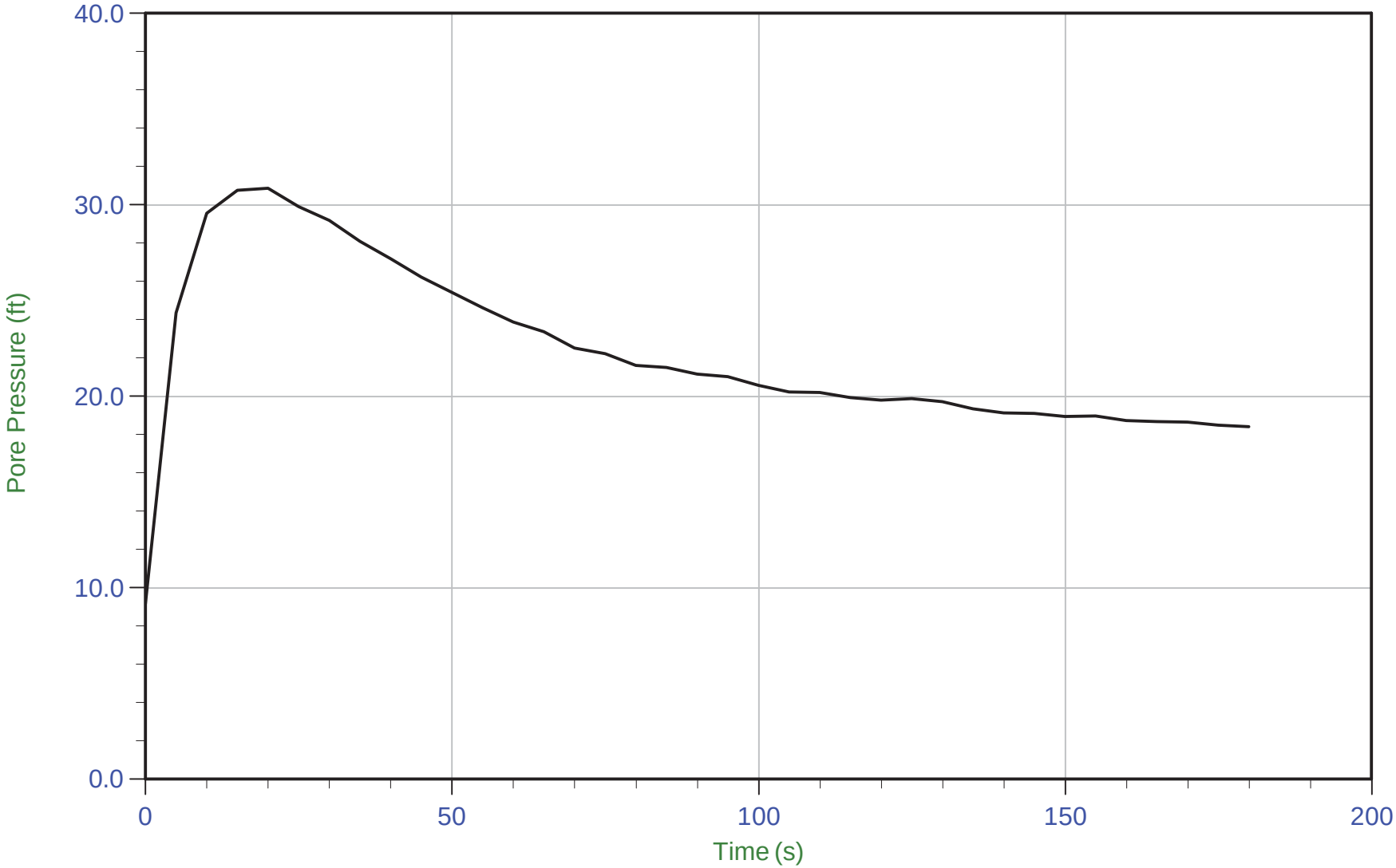
U Min: -0.8 ft
U Max: 3.6 ft

CONETEC

Haley & Aldrich

Job No: 16-53041
Date: 24-May-2016 12:18:15
Site: DP&L JM Stuart Station, Aberdeen, OH

Sounding: SCPT16-HA-3-C1
Cone: AD419
Cone Area: 15 sq cm



Trace Summary:

Filename: 16-53041_SPHA-3-C1.PPD
Depth: 20.350 m / 66.764 ft
Duration: 180.0 s

U Min: 9.2 ft
U Max: 30.9 ft

WT: 16.459 m / 54.000 ft
Ueq: 12.8 ft
U(50): 21.82 ft

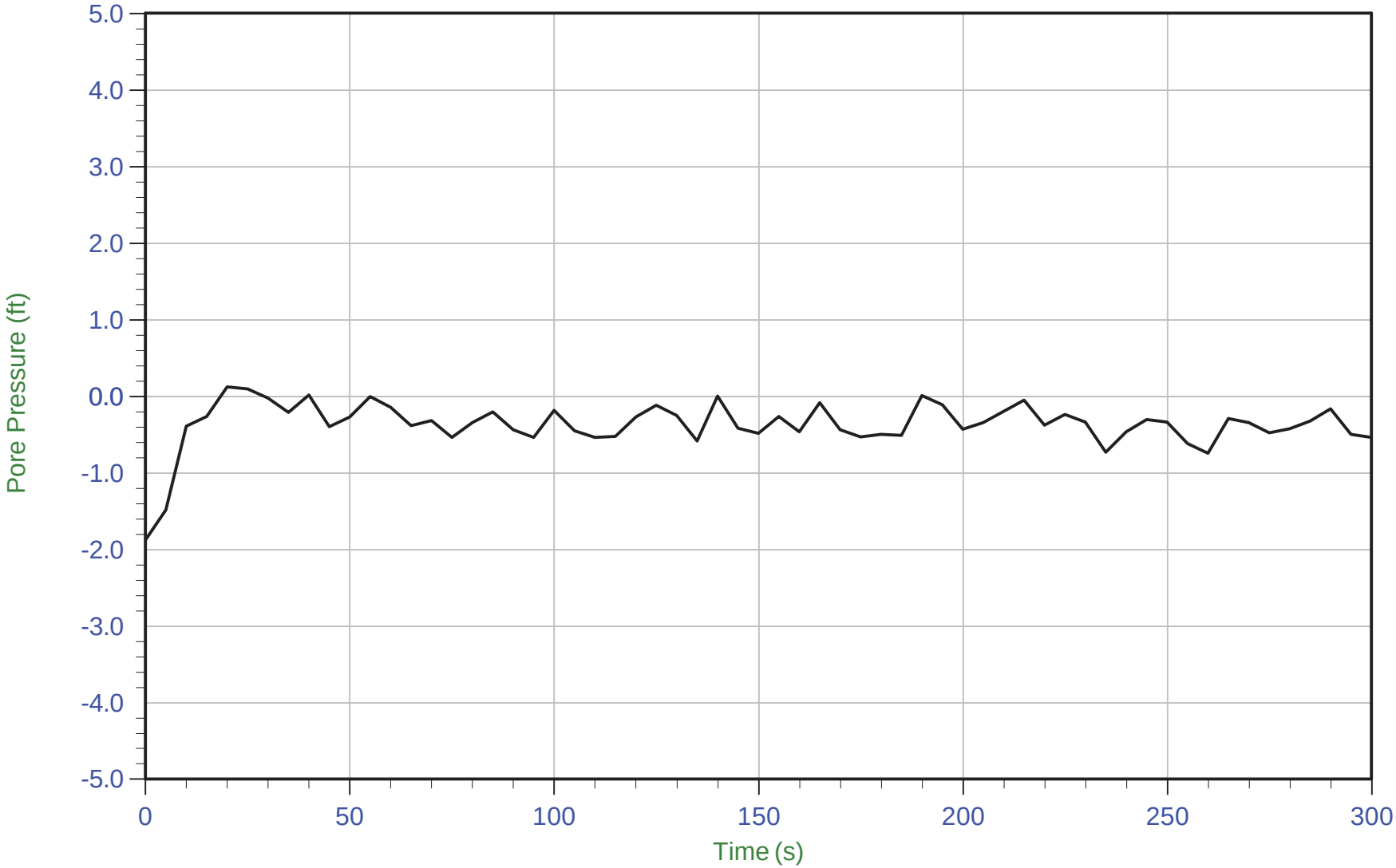
T(50): 58.4 s
Ir: 100
Ch: 12.0 sq cm/min

CONETEC

Haley & Aldrich

Job No: 16-53041
Date: 19-May-2016 10:06:16
Site: DP&L JM Stuart Station, Aberdeen, OH

Sounding: SCPT16-HA-5-C1
Cone: AD419
Cone Area: 15 sq cm



Trace Summary:

Filename: 16-53041_SPHA-5-C1.PPD
Depth: 0.350 m / 1.148 ft
Duration: 300.0 s

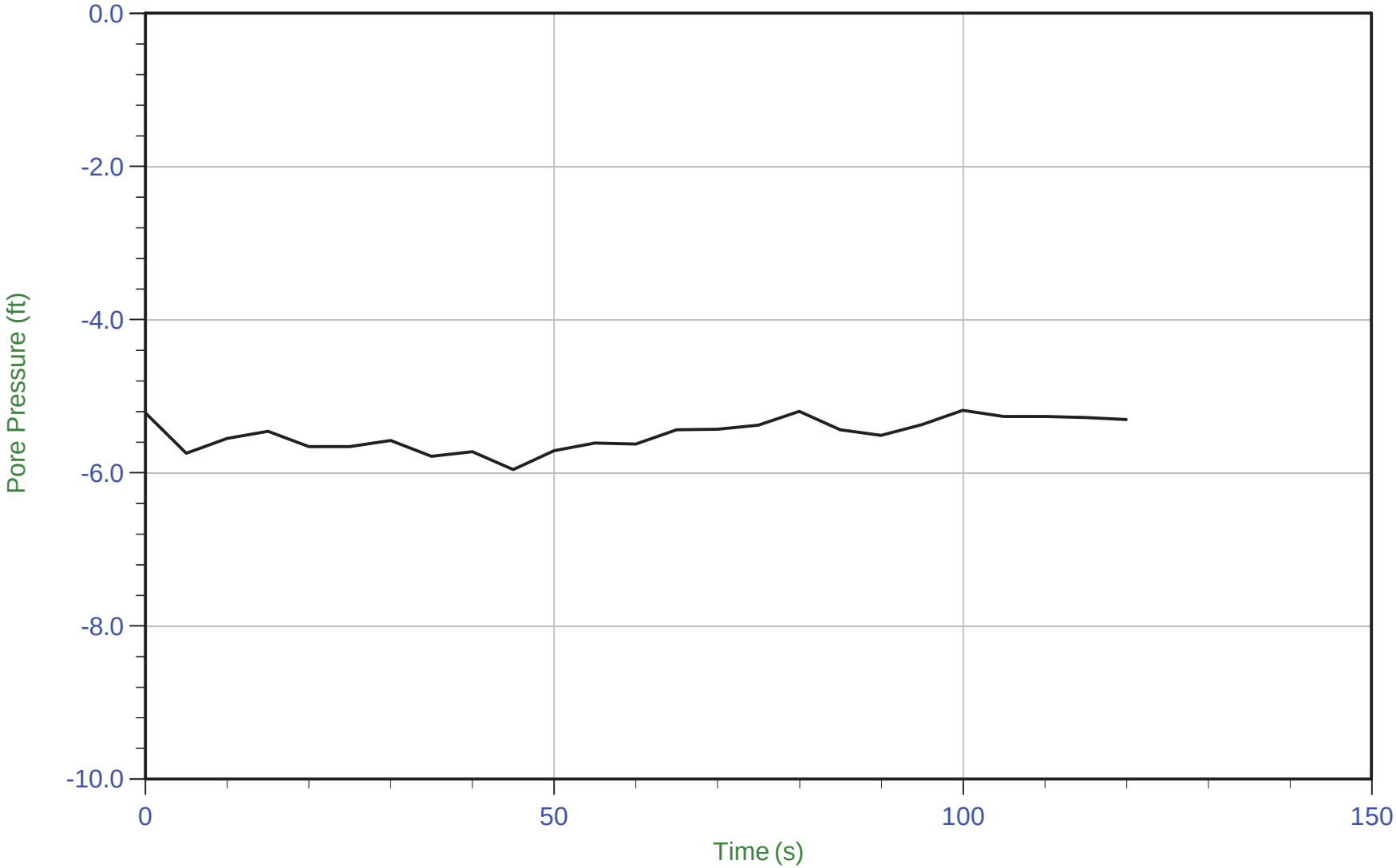
U Min: -1.9 ft
U Max: 0.1 ft

CONETEC

Haley & Aldrich

Job No: 16-53041
Date: 19-May-2016 10:06:16
Site: DP&L JM Stuart Station, Aberdeen, OH

Sounding: SCPT16-HA-5-C1
Cone: AD419
Cone Area: 15 sq cm



Trace Summary:

Filename: 16-53041_SPHA-5-C1.PPD
Depth: 2.350 m / 7.710 ft
Duration: 120.0 s

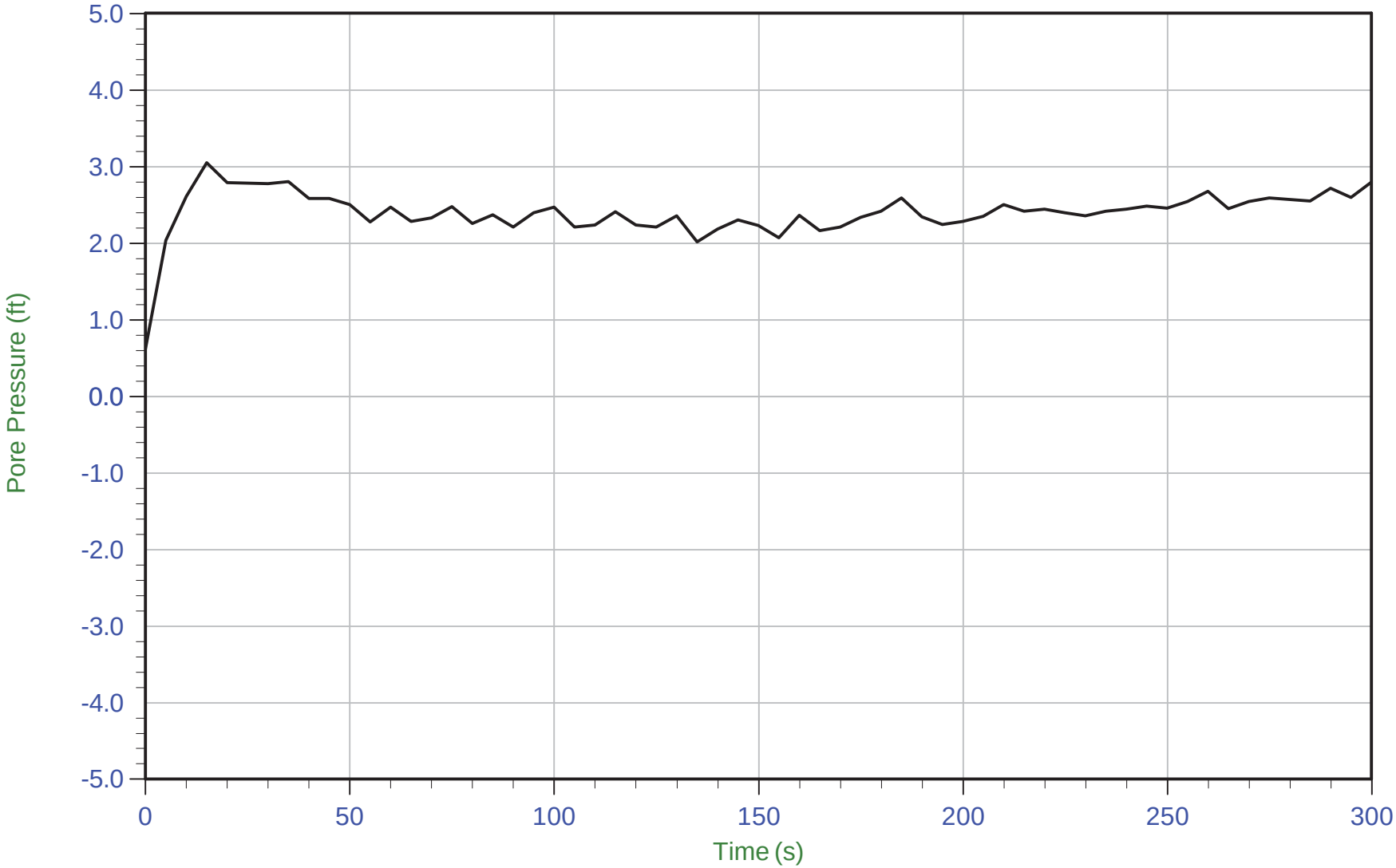
U Min: -6.0 ft
U Max: -5.2 ft

CONETEC

Haley & Aldrich

Job No: 16-53041
Date: 19-May-2016 10:06:16
Site: DP&L JM Stuart Station, Aberdeen, OH

Sounding: SCPT16-HA-5-C1
Cone: AD419
Cone Area: 15 sq cm



Trace Summary:

Filename: 16-53041_SPHA-5-C1.PPD
Depth: 4.350 m / 14.271 ft
Duration: 300.0 s

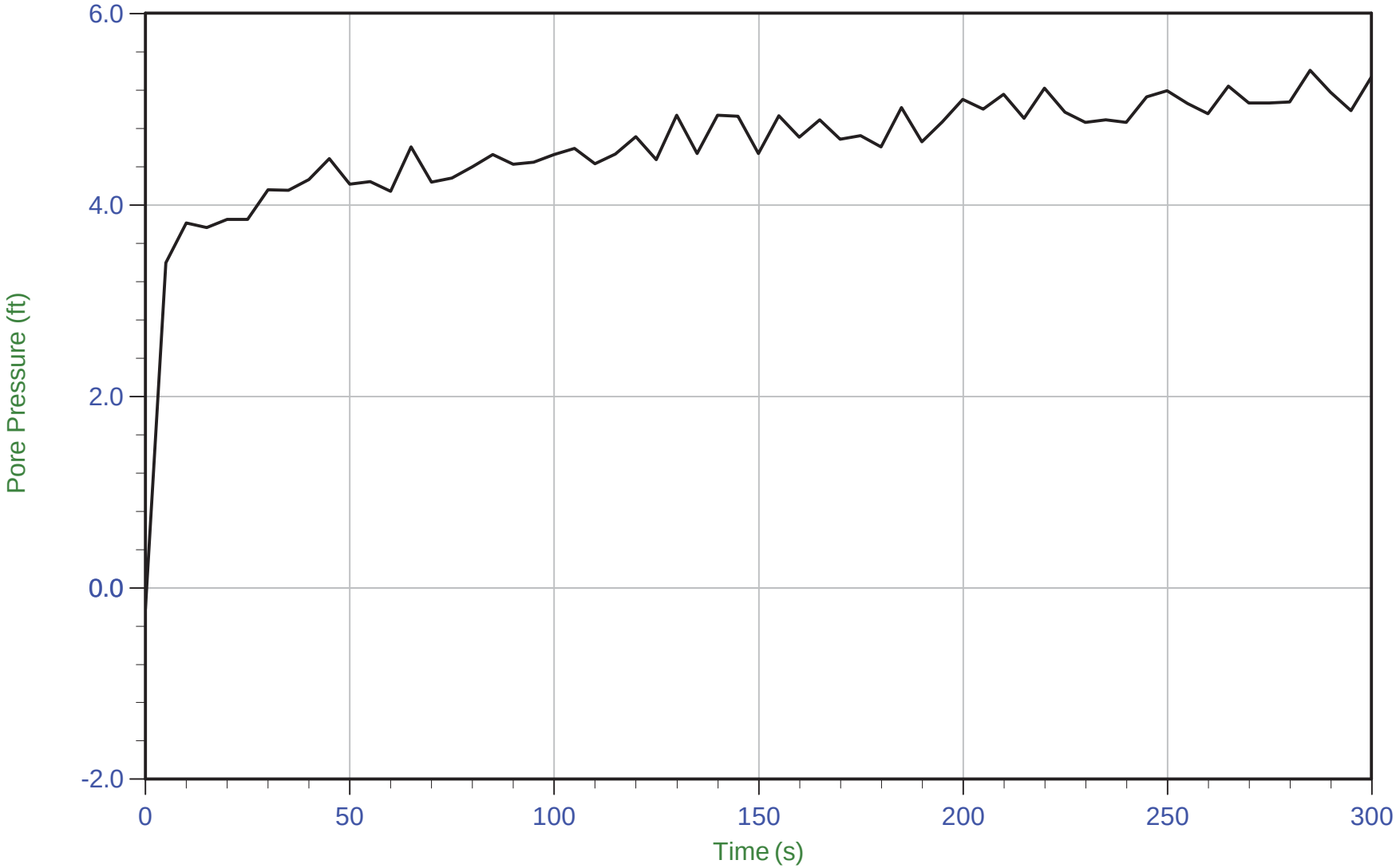
U Min: 0.6 ft
U Max: 3.1 ft

CONETEC

Haley & Aldrich

Job No: 16-53041
Date: 19-May-2016 10:06:16
Site: DP&L JM Stuart Station, Aberdeen, OH

Sounding: SCPT16-HA-5-C1
Cone: AD419
Cone Area: 15 sq cm



Trace Summary:

Filename: 16-53041_SPHA-5-C1.PPD
Depth: 6.350 m / 20.833 ft
Duration: 300.0 s

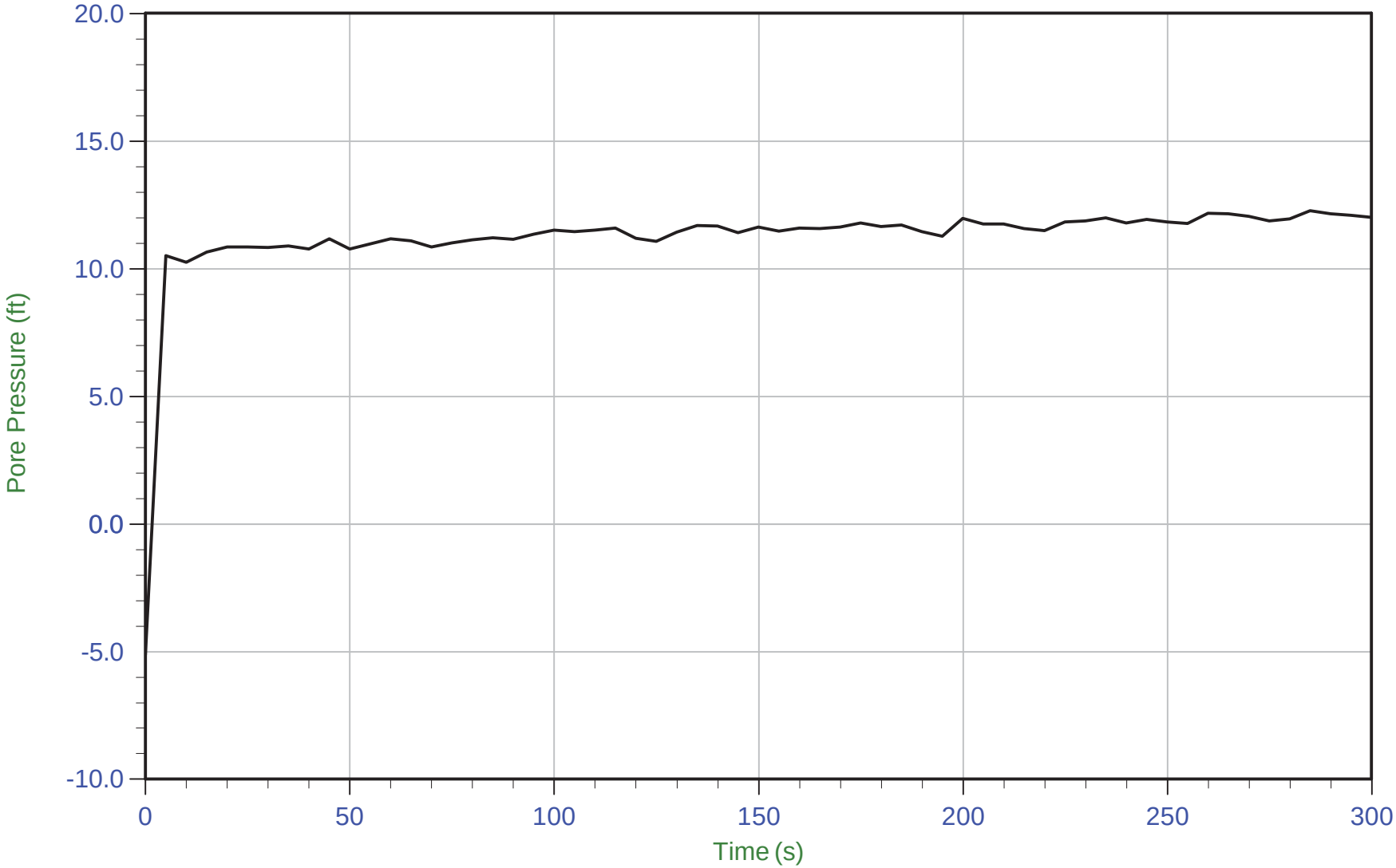
U Min: -0.2 ft
U Max: 5.4 ft

CONETEC

Haley & Aldrich

Job No: 16-53041
Date: 19-May-2016 10:06:16
Site: DP&L JM Stuart Station, Aberdeen, OH

Sounding: SCPT16-HA-5-C1
Cone: AD419
Cone Area: 15 sq cm



Trace Summary:

Filename: 16-53041_SPHA-5-C1.PPD
Depth: 8.350 m / 27.395 ft
Duration: 300.0 s

U Min: -5.1 ft
U Max: 12.3 ft

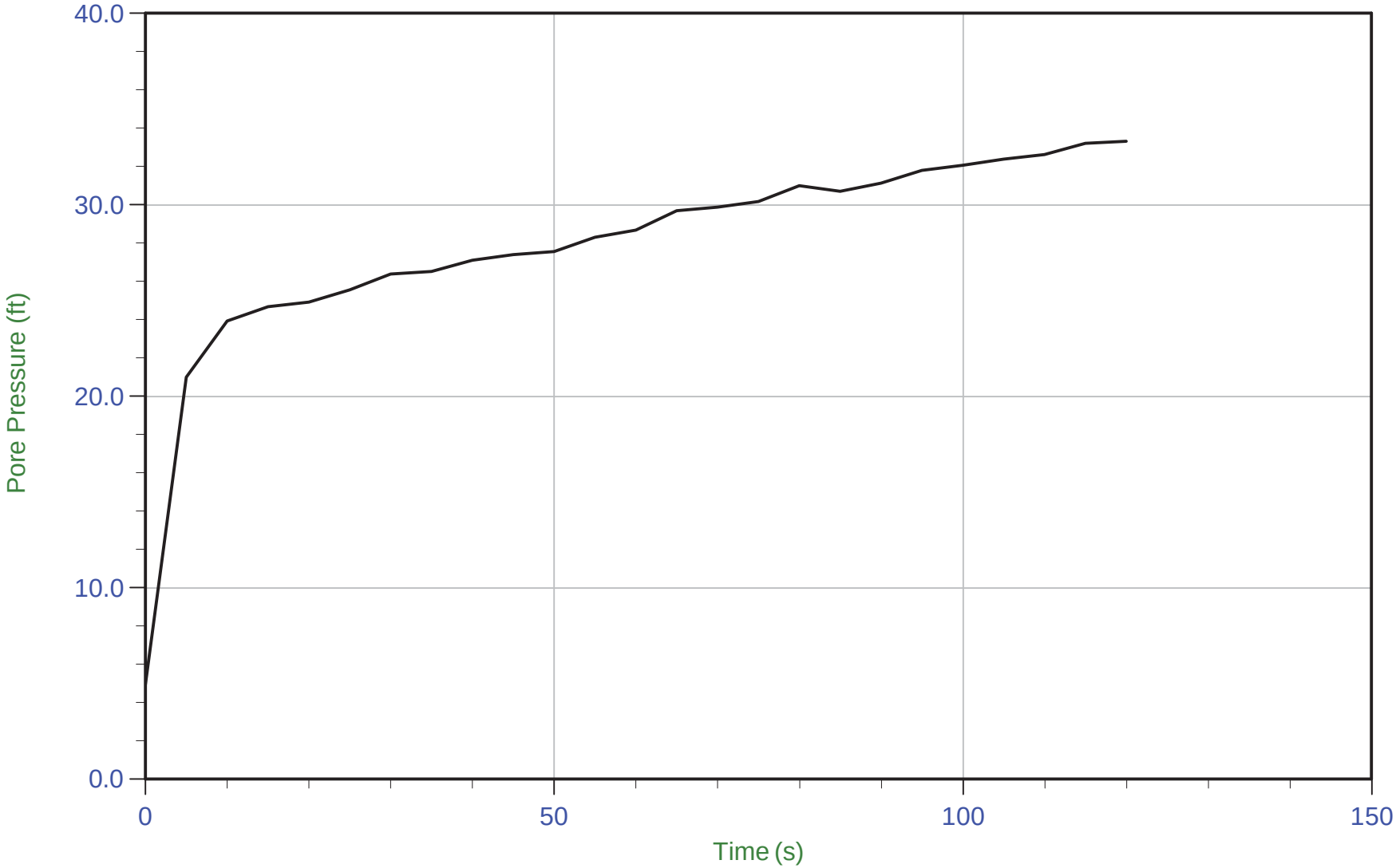
WT: 4.687 m / 15.379 ft
Ueq: 12.0 ft

CONETEC

Haley & Aldrich

Job No: 16-53041
Date: 19-May-2016 10:06:16
Site: DP&L JM Stuart Station, Aberdeen, OH

Sounding: SCPT16-HA-5-C1
Cone: AD419
Cone Area: 15 sq cm

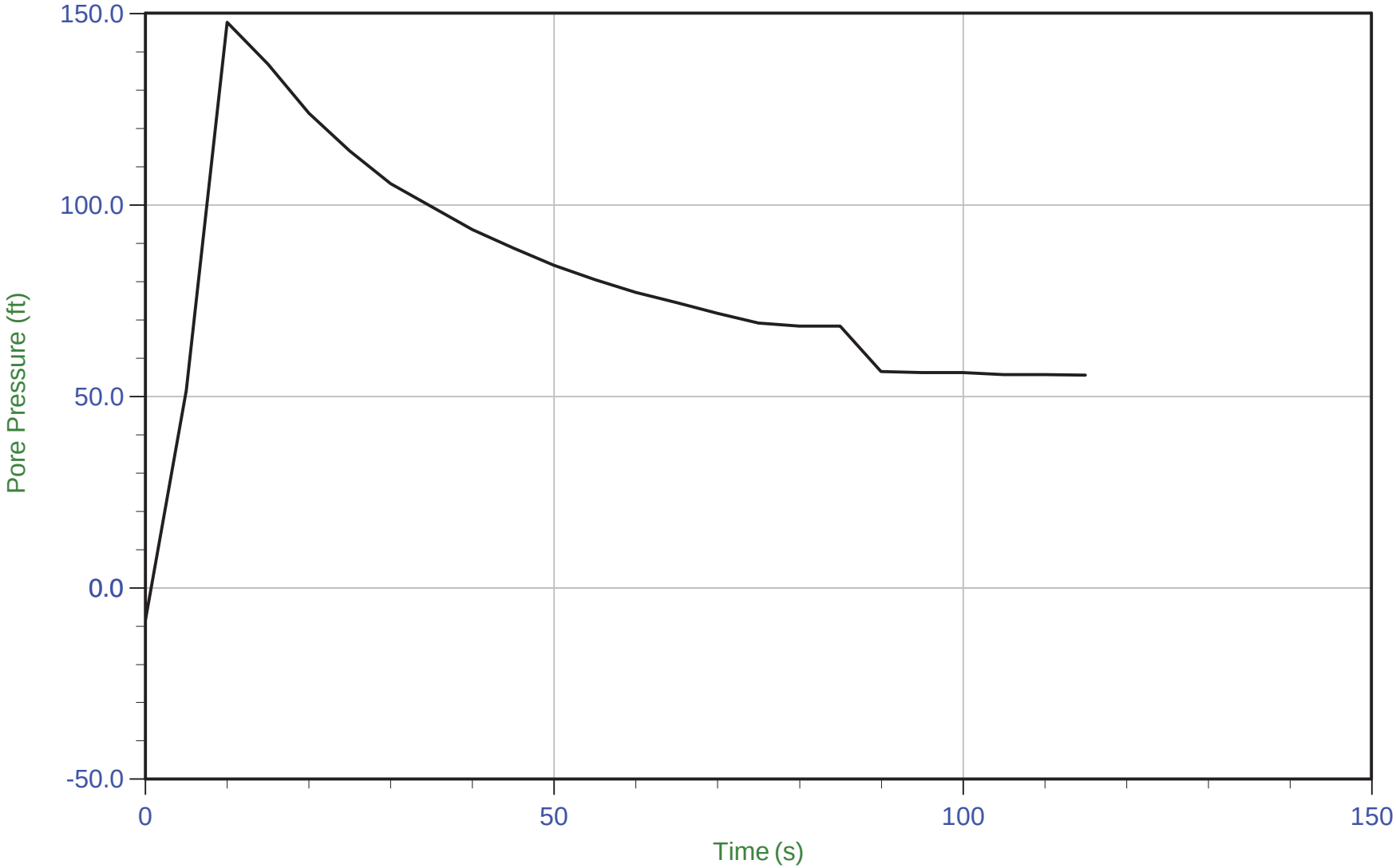


Trace Summary:

Filename: 16-53041_SPHA-5-C1.PPD
Depth: 10.350 m / 33.956 ft
Duration: 120.0 s

U Min: 4.9 ft
U Max: 33.3 ft

Haley & Aldrich	Job No: 16-53041 Date: 19-May-2016 10:06:16 Site: DP&L JM Stuart Station, Aberdeen, OH	Sounding: SCPT16-HA-5-C1 Cone: AD419 Cone Area: 15 sq cm



Trace Summary:

Filename: 16-53041_SPHA-5-C1.PPD
Depth: 20.350 m / 66.764 ft
Duration: 115.0 s

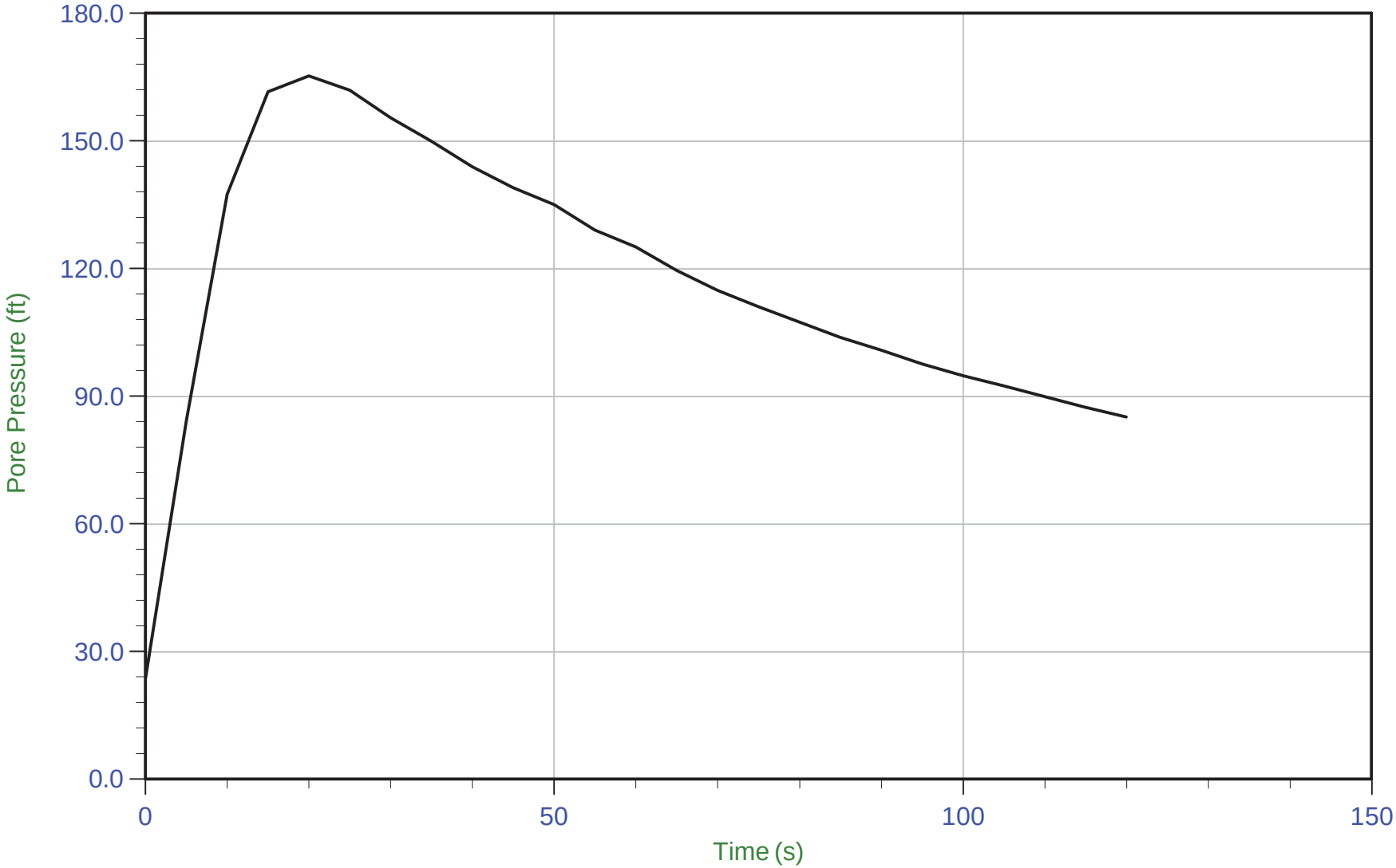
U Min: -8.5 ft
U Max: 147.6 ft

CONETEC

Haley & Aldrich

Job No: 16-53041
Date: 19-May-2016 10:06:16
Site: DP&L JM Stuart Station, Aberdeen, OH

Sounding: SCPT16-HA-5-C1
Cone: AD419
Cone Area: 15 sq cm



Trace Summary:

Filename: 16-53041_SPHA-5-C1.PPD
Depth: 22.350 m / 73.326 ft
Duration: 120.0 s

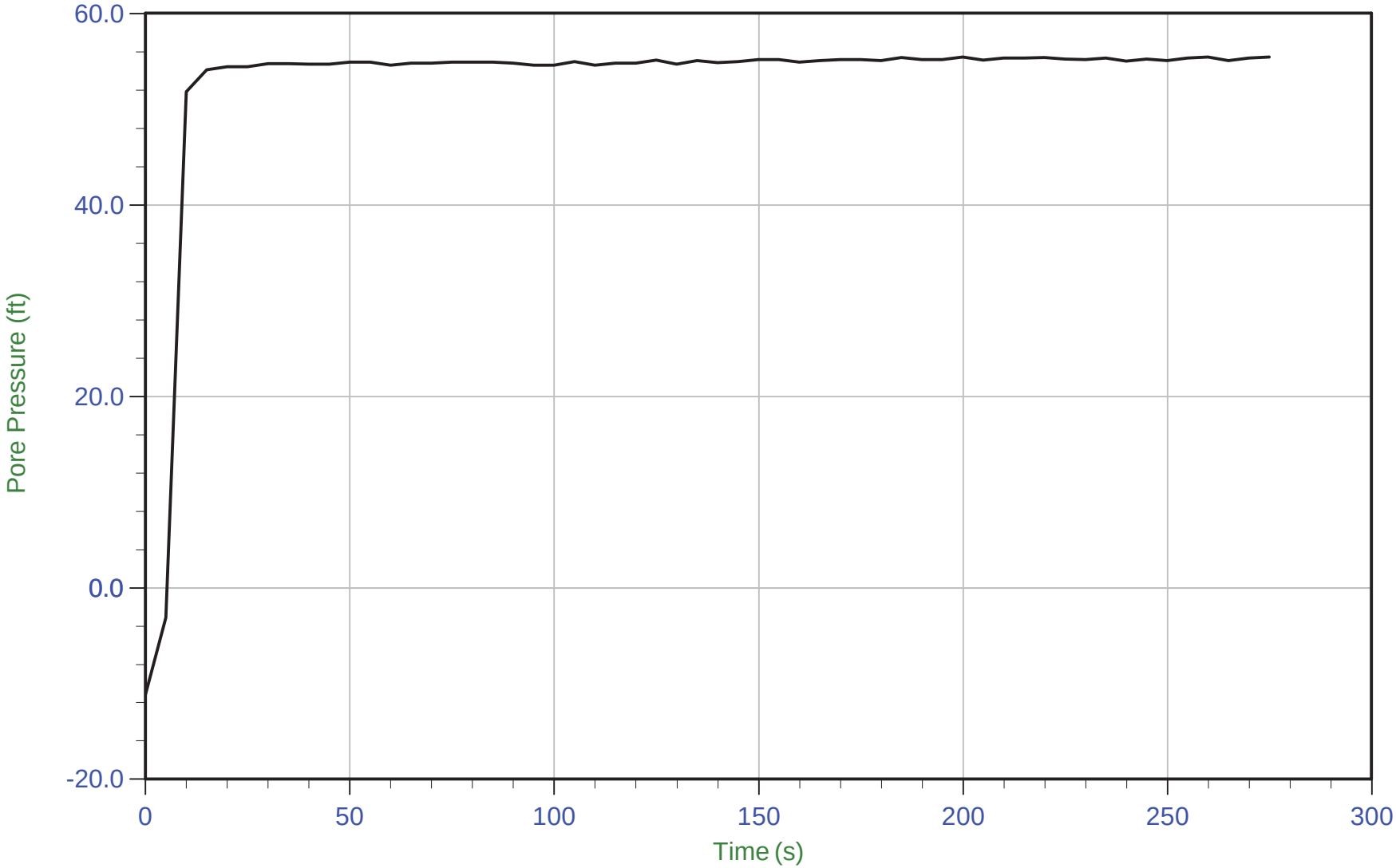
U Min: 23.6 ft
U Max: 165.4 ft

CONETEC

Haley & Aldrich

Job No: 16-53041
Date: 19-May-2016 10:06:16
Site: DP&L JM Stuart Station, Aberdeen, OH

Sounding: SCPT16-HA-5-C1
Cone: AD419
Cone Area: 15 sq cm



Trace Summary:

Filename: 16-53041_SPHA-5-C1.PPD
Depth: 30.500 m / 100.064 ft
Duration: 275.0 s

U Min: -11.2 ft
U Max: 55.4 ft

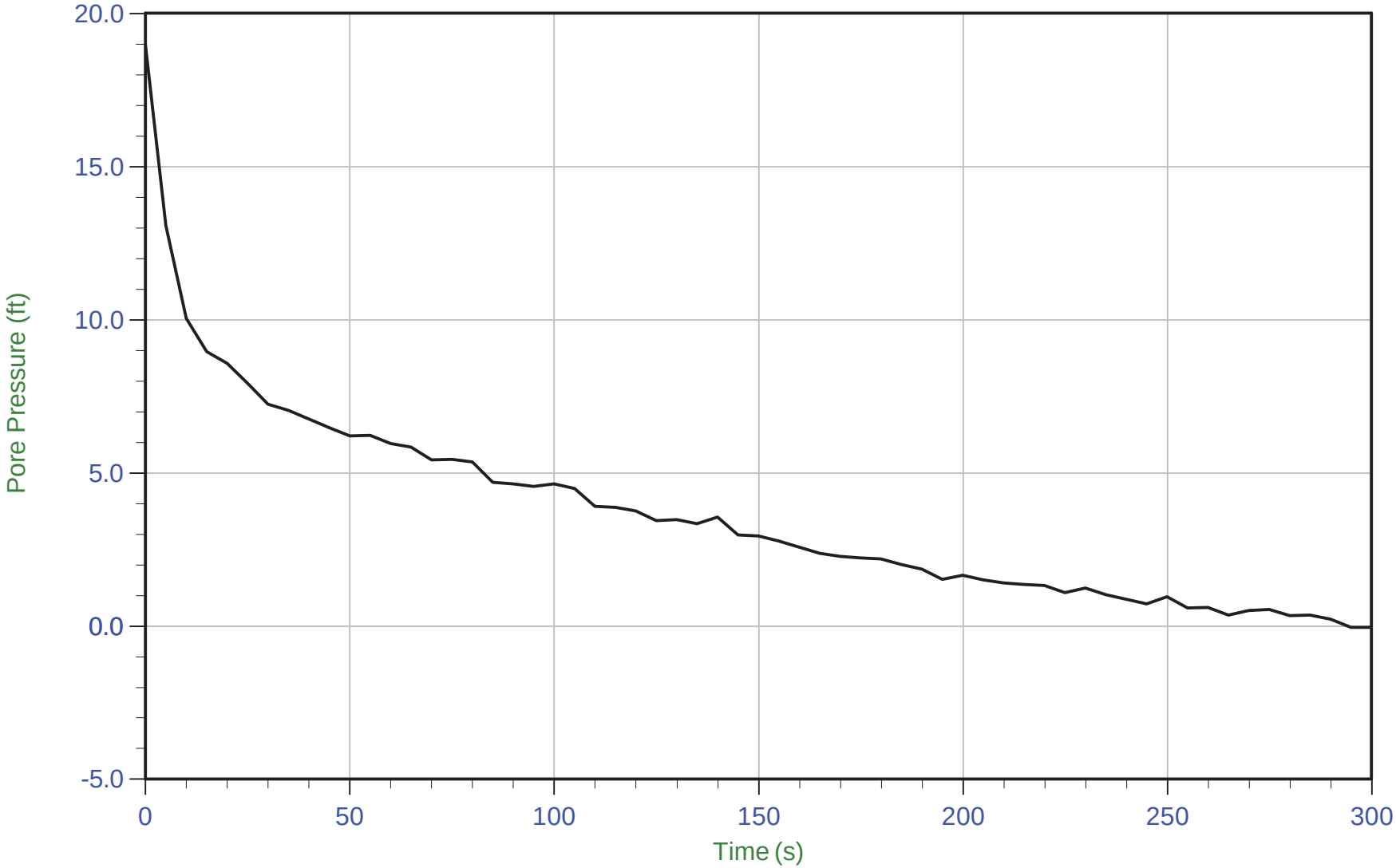
WT: 13.766 m / 45.163 ft
Ueq: 54.9 ft

CONETEC

Haley & Aldrich

Job No: 16-53041
Date: 20-May-2016 08:22:53
Site: DP&L JM Stuart Station, Aberdeen, OH

Sounding: CPT16-HA-6-C1
Cone: AD419
Cone Area: 15 sq cm



Trace Summary:

Filename: 16-53041_CPHA-6-C1.PPD
Depth: 0.350 m / 1.148 ft
Duration: 300.0 s

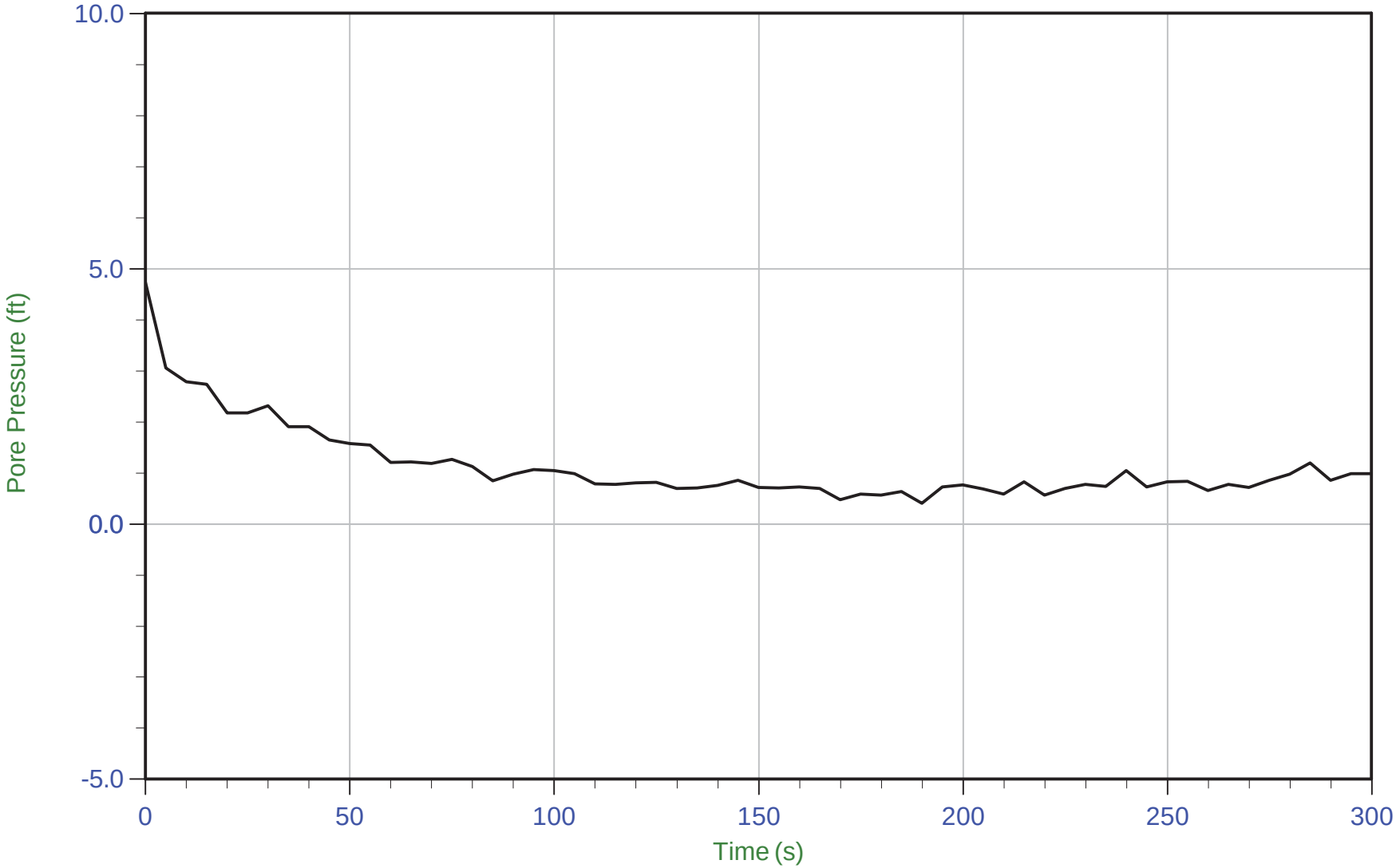
U Min: -0.0 ft
U Max: 19.0 ft

CONETEC

Haley & Aldrich

Job No: 16-53041
Date: 20-May-2016 08:22:53
Site: DP&L JM Stuart Station, Aberdeen, OH

Sounding: CPT16-HA-6-C1
Cone: AD419
Cone Area: 15 sq cm

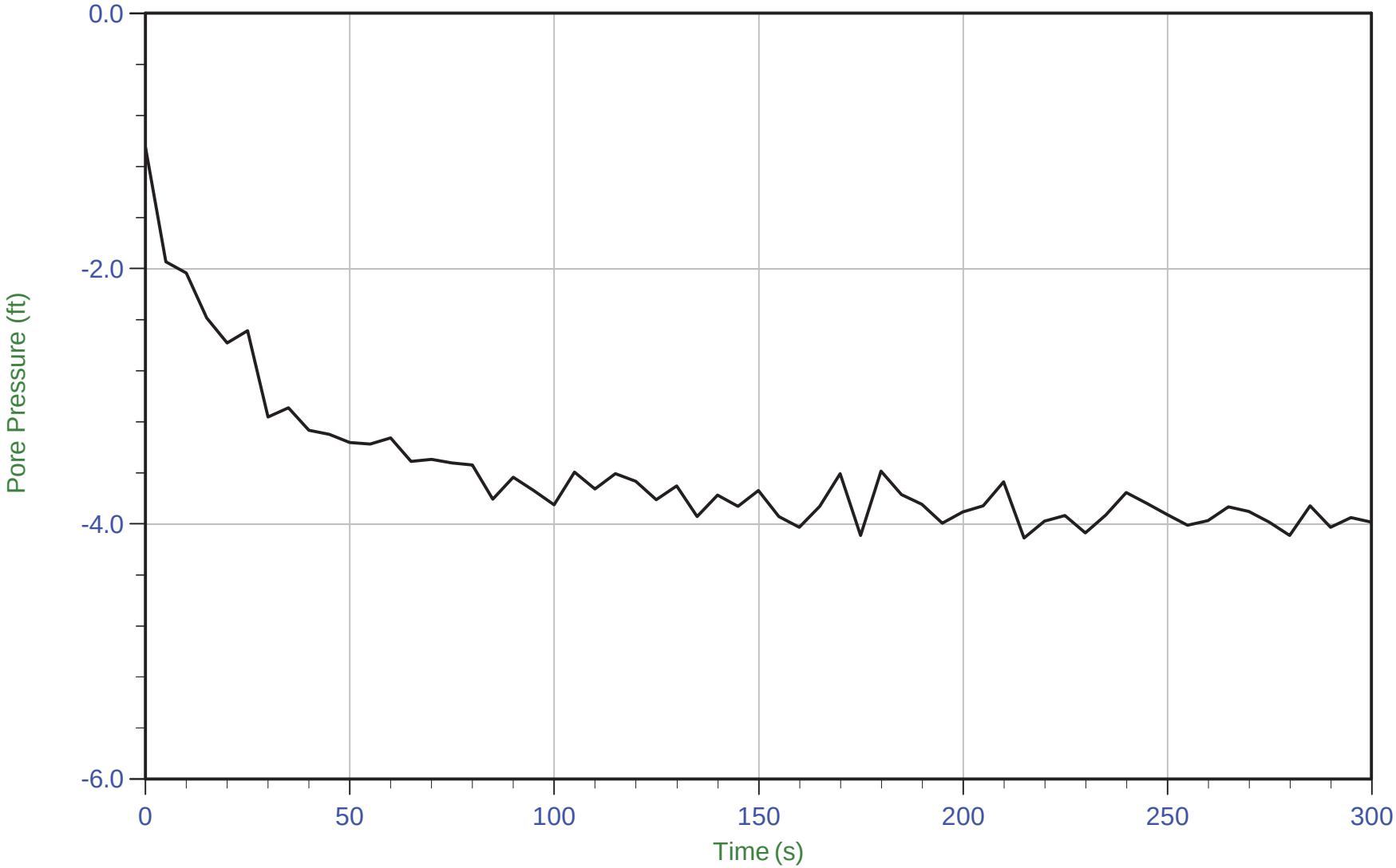


Trace Summary:

Filename: 16-53041_CPHA-6-C1.PPD
Depth: 2.350 m / 7.710 ft
Duration: 300.0 s

U Min: 0.4 ft
U Max: 4.7 ft

CONETEC	Haley & Aldrich	Job No: 16-53041 Date: 20-May-2016 08:22:53 Site: DP&L JM Stuart Station, Aberdeen, OH
		Sounding: CPT16-HA-6-C1 Cone: AD419 Cone Area: 15 sq cm

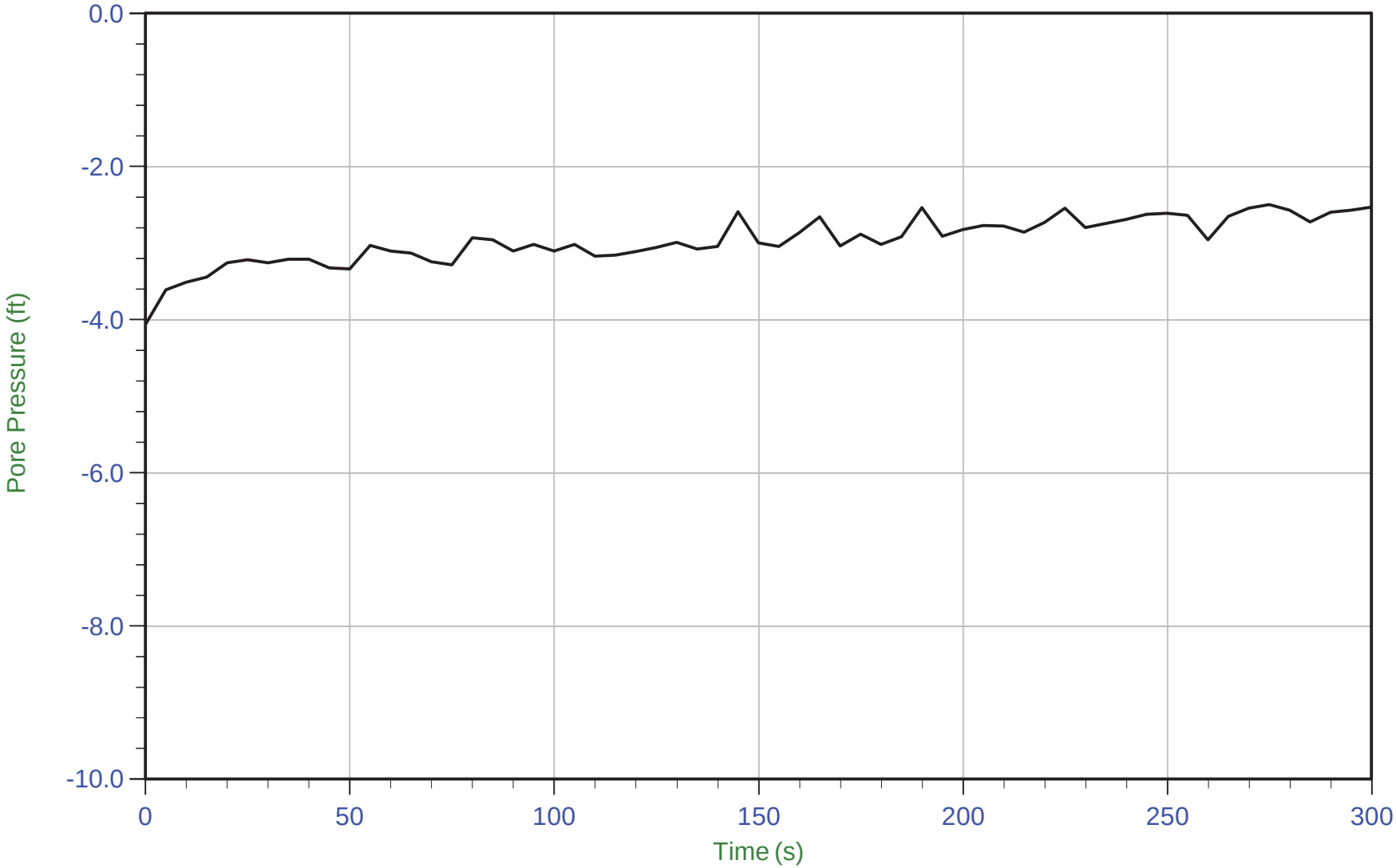


Trace Summary:

Filename: 16-53041_CPHA-6-C1.PPD
Depth: 4.350 m / 14.271 ft
Duration: 300.0 s

U Min: -4.1 ft
U Max: -1.0 ft

CONETEC	Haley & Aldrich	Job No: 16-53041 Date: 20-May-2016 08:22:53 Site: DP&L JM Stuart Station, Aberdeen, OH
		Sounding: CPT16-HA-6-C1 Cone: AD419 Cone Area: 15 sq cm



Trace Summary:

Filename: 16-53041_CPHA-6-C1.PPD
Depth: 6.350 m / 20.833 ft
Duration: 300.0 s

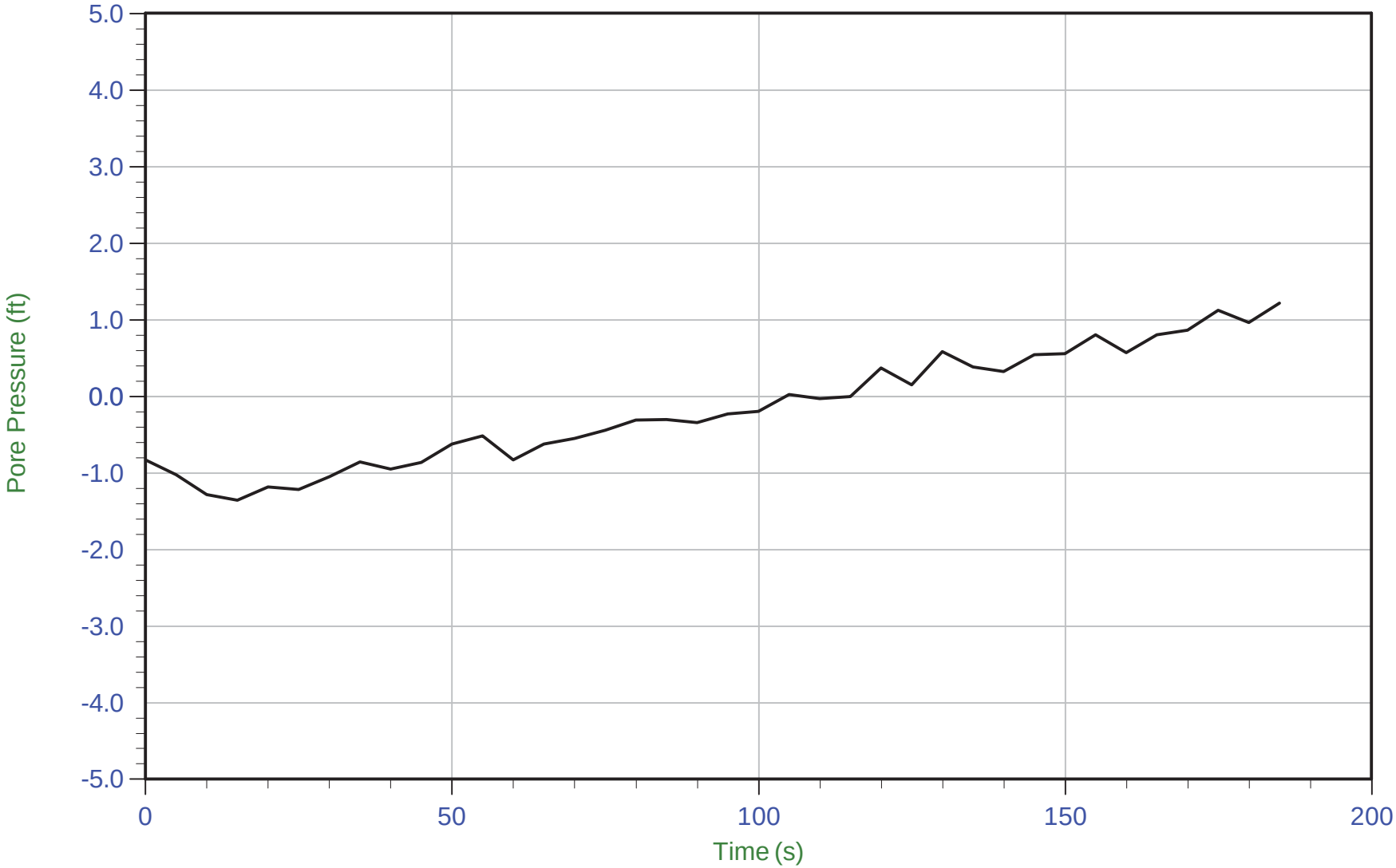
U Min: -4.1 ft
U Max: -2.5 ft

CONETEC

Haley & Aldrich

Job No: 16-53041
Date: 20-May-2016 08:22:53
Site: DP&L JM Stuart Station, Aberdeen, OH

Sounding: CPT16-HA-6-C1
Cone: AD419
Cone Area: 15 sq cm



Trace Summary:

Filename: 16-53041_CPHA-6-C1.PPD
Depth: 8.350 m / 27.395 ft
Duration: 185.0 s

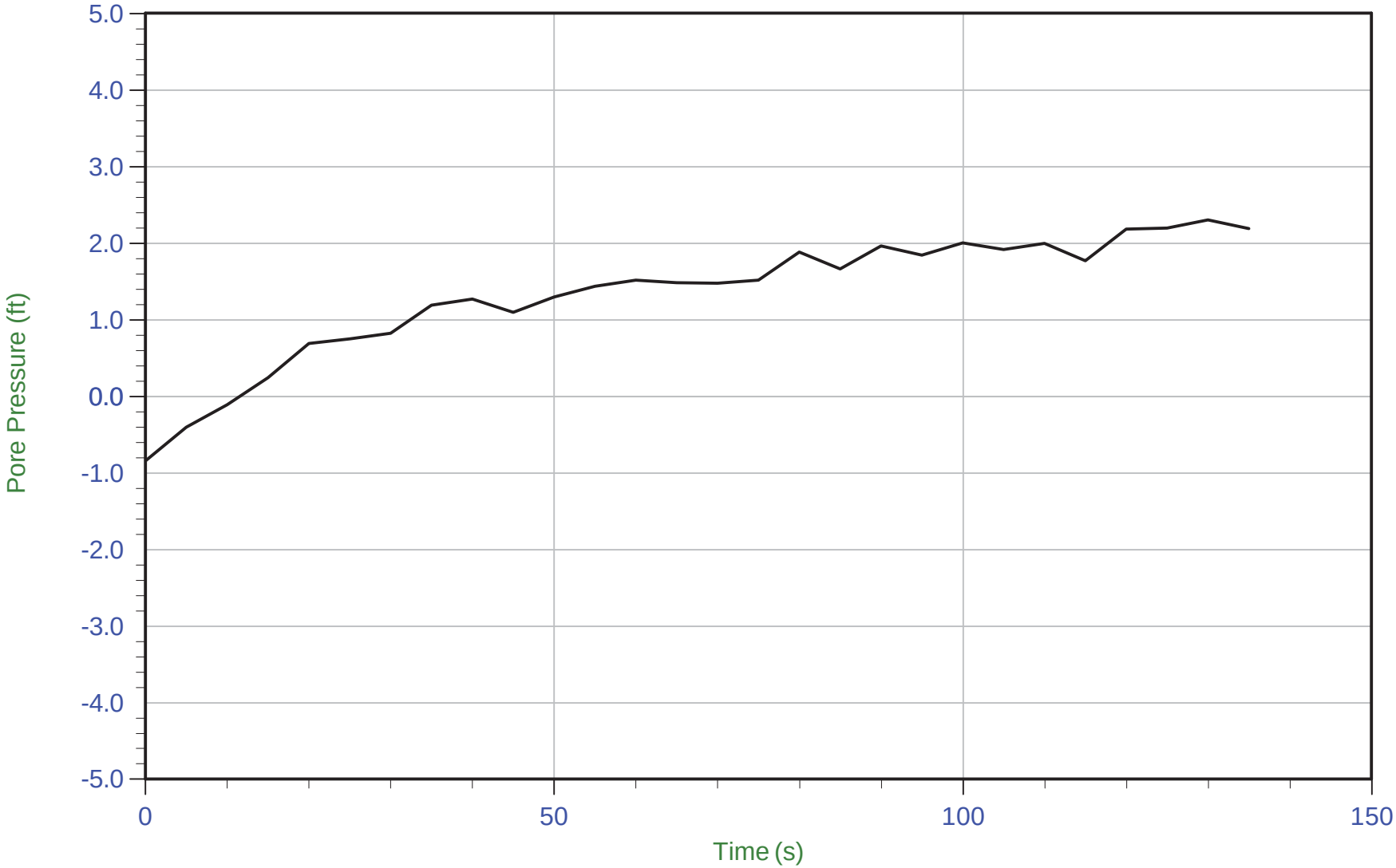
U Min: -1.4 ft
U Max: 1.2 ft

CONETEC

Haley & Aldrich

Job No: 16-53041
Date: 20-May-2016 08:22:53
Site: DP&L JM Stuart Station, Aberdeen, OH

Sounding: CPT16-HA-6-C1
Cone: AD419
Cone Area: 15 sq cm



Trace Summary:

Filename: 16-53041_CPHA-6-C1.PPD
Depth: 10.350 m / 33.956 ft
Duration: 135.0 s

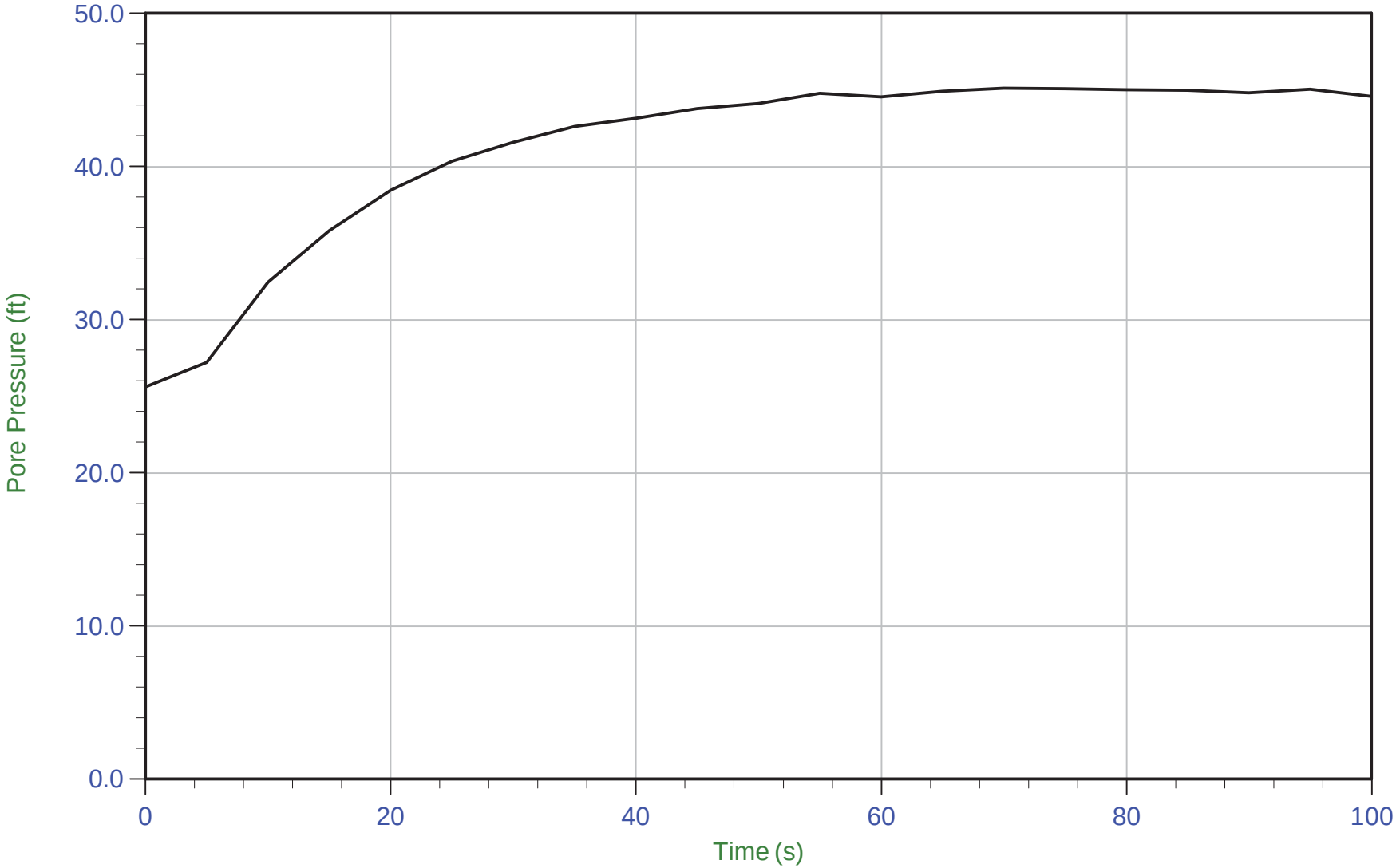
U Min: -0.8 ft
U Max: 2.3 ft

CONETEC

Haley & Aldrich

Job No: 16-53041
Date: 20-May-2016 08:22:53
Site: DP&L JM Stuart Station, Aberdeen, OH

Sounding: CPT16-HA-6-C1
Cone: AD419
Cone Area: 15 sq cm



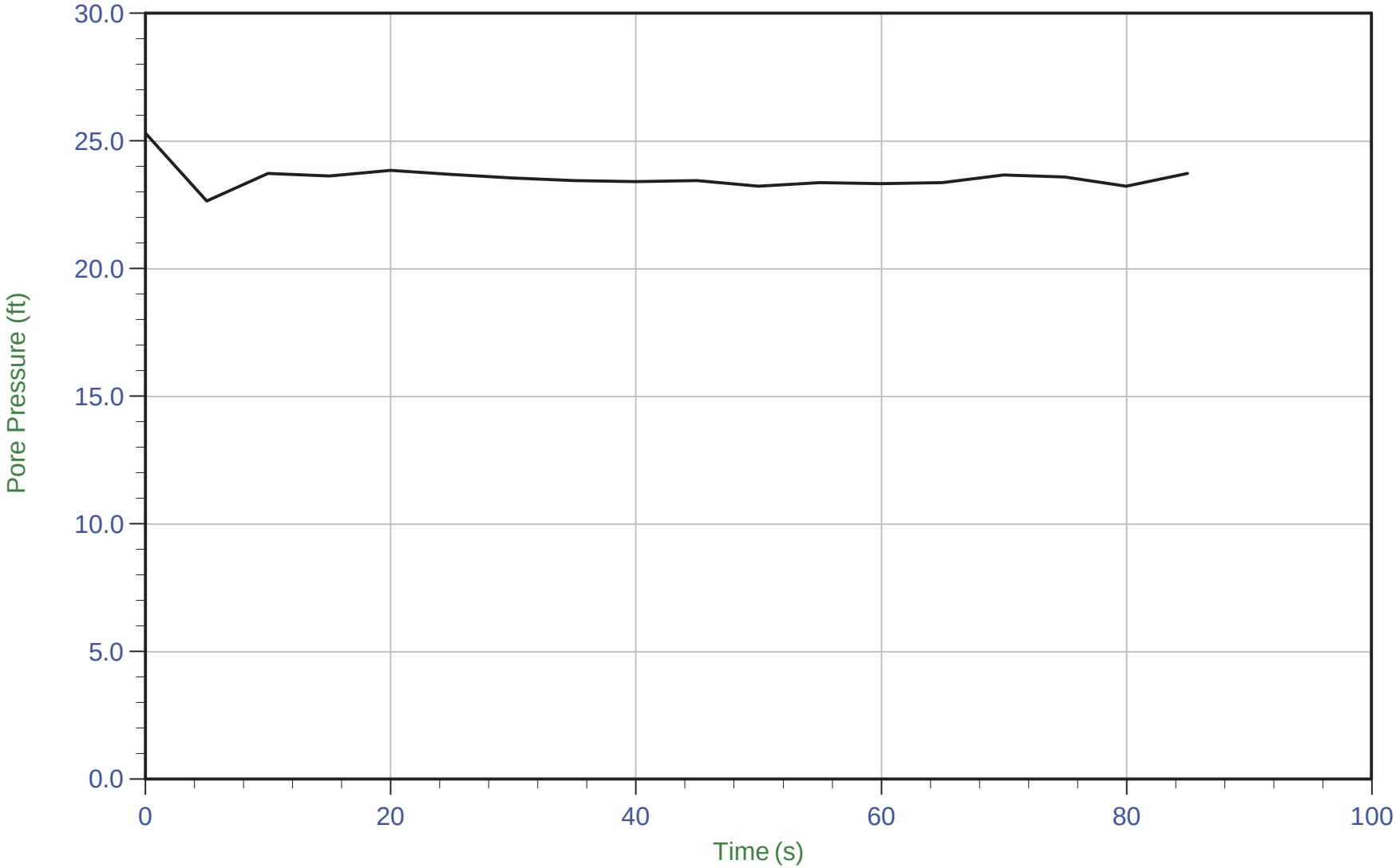
Trace Summary:

Filename: 16-53041_CPHA-6-C1.PPD
Depth: 29.000 m / 95.143 ft
Duration: 100.0 s

U Min: 25.6 ft
U Max: 45.1 ft

WT: 15.419 m / 50.587 ft
Ueq: 44.6 ft

Haley & Aldrich	Job No: 16-53041 Date: 24-May-2016 16:31:50 Site: DP&L JM Stuart Station, Aberdeen, OH	Sounding: CPT16-HA-7-C1B Cone: AD419 Cone Area: 15 sq cm



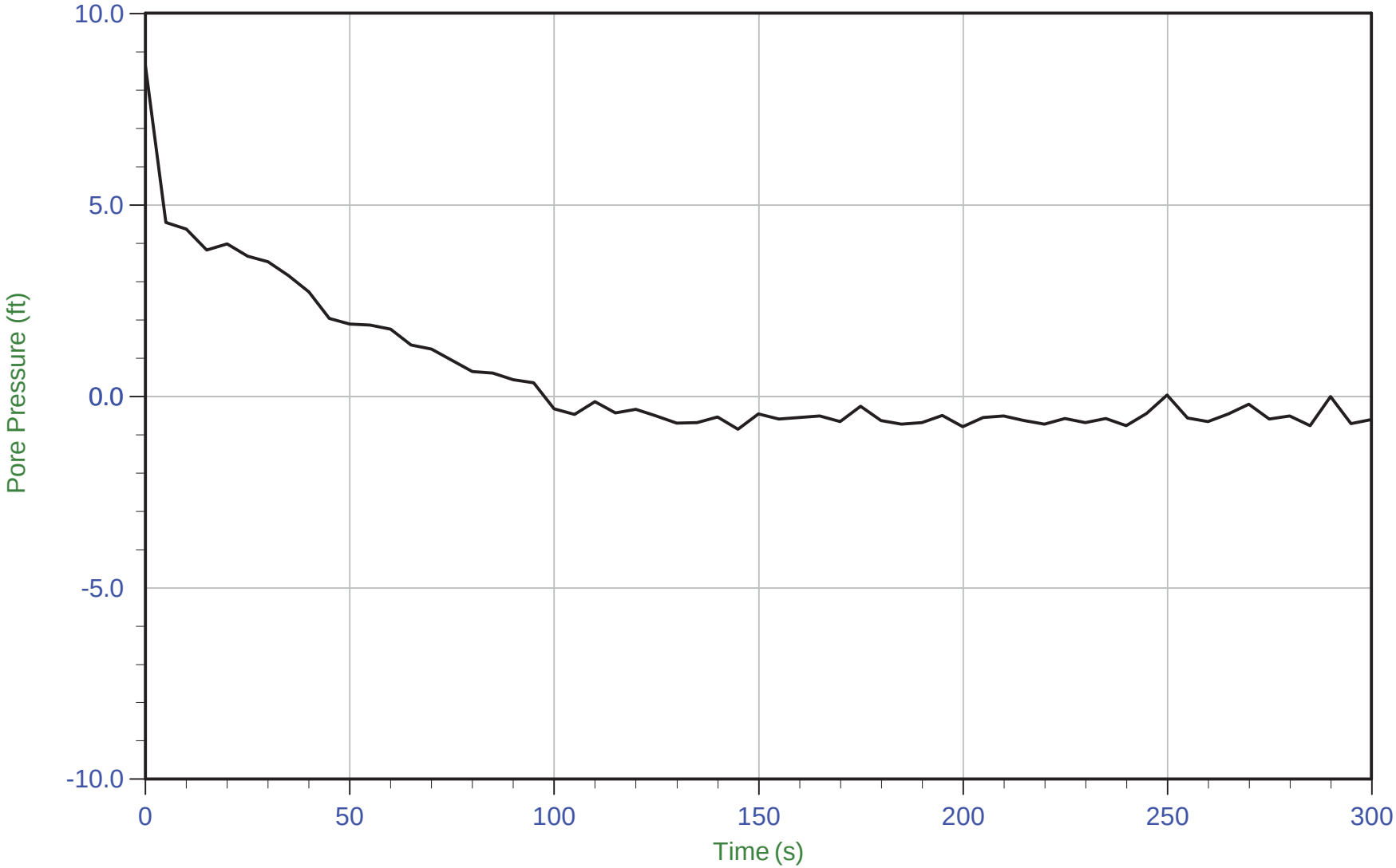
Trace Summary:

Filename: 16-53041_CPHA-7-C1B.PPD
Depth: 21.350 m / 70.045 ft
Duration: 85.0 s

U Min: 22.6 ft
U Max: 25.3 ft

WT: 14.246 m / 46.738 ft
Ueq: 23.3 ft

CONETEC	Haley & Aldrich	Job No: 16-53041 Date: 24-May-2016 08:58:03 Site: DP&L JM Stuart Station, Aberdeen, OH
		Sounding: CPT16-HA-7-C2 Cone: AD419 Cone Area: 15 sq cm

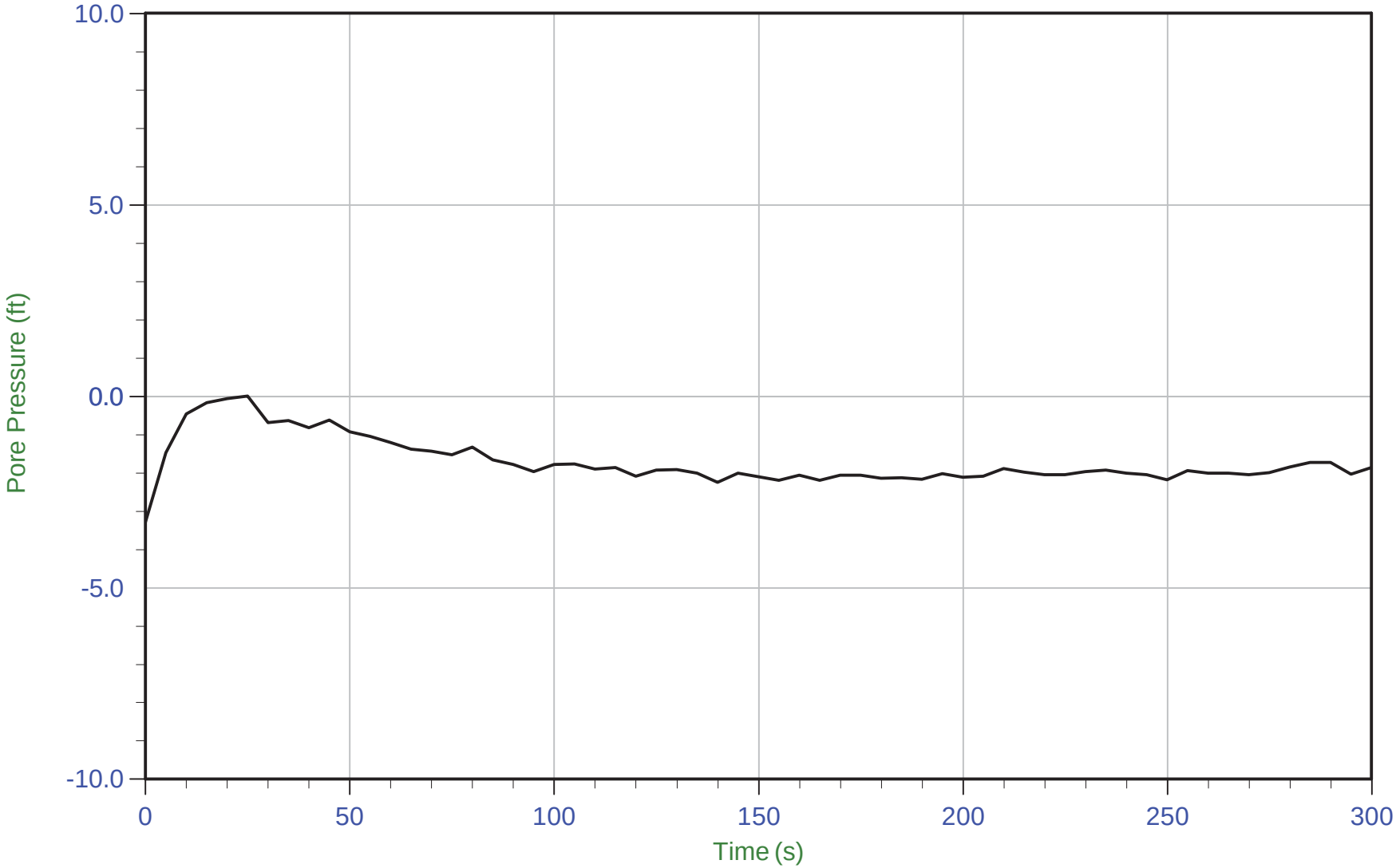


Trace Summary:

Filename: 16-53041_CPHA-7-C2.PPD
Depth: 0.350 m / 1.148 ft
Duration: 300.0 s

U Min: -0.9 ft
U Max: 8.6 ft

CONETEC	Haley & Aldrich	Job No: 16-53041 Date: 24-May-2016 08:58:03 Site: DP&L JM Stuart Station, Aberdeen, OH
		Sounding: CPT16-HA-7-C2 Cone: AD419 Cone Area: 15 sq cm

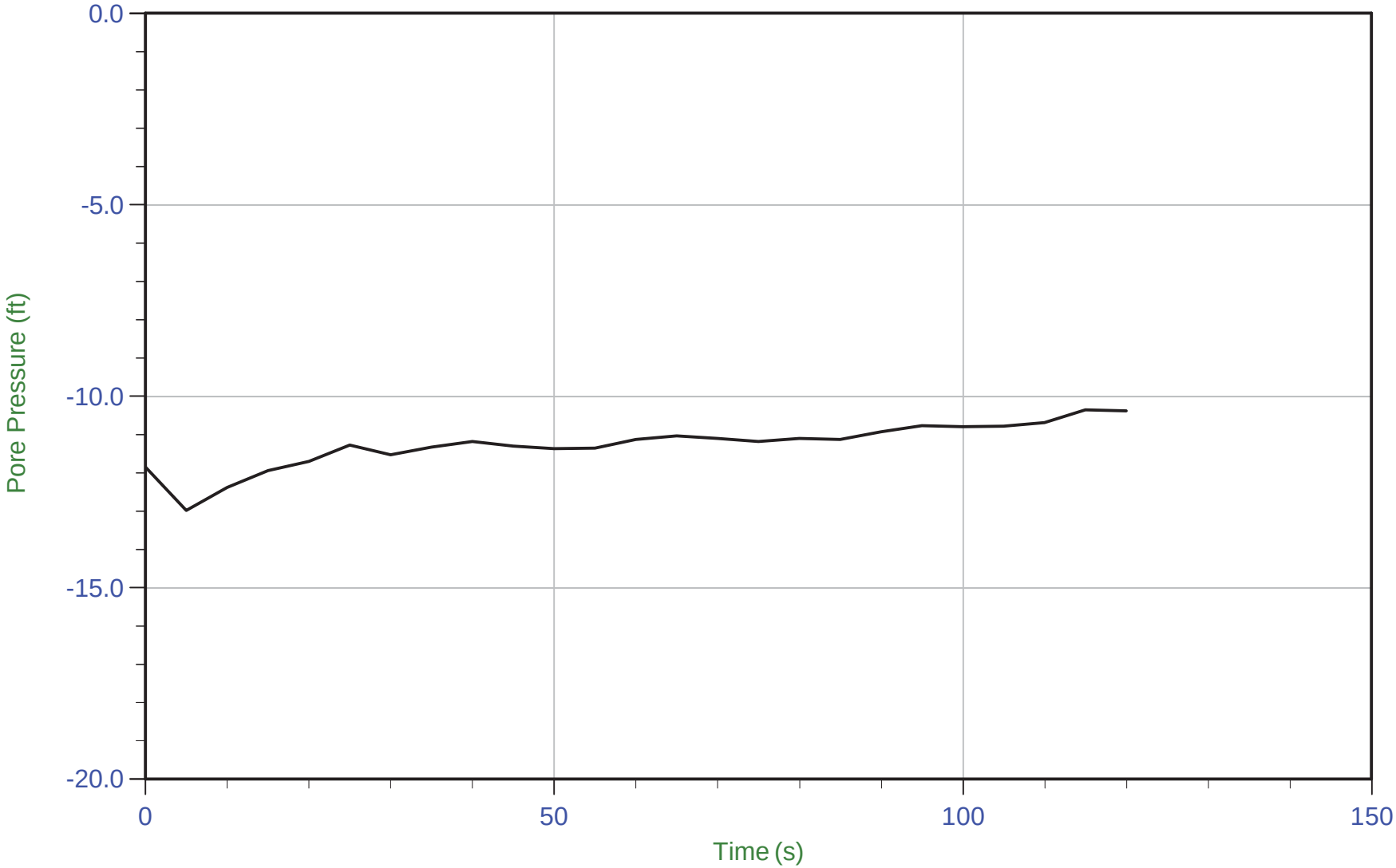


Trace Summary:

Filename: 16-53041_CPHA-7-C2.PPD
Depth: 2.350 m / 7.710 ft
Duration: 300.0 s

U Min: -3.3 ft
U Max: 0.0 ft

CONETEC	Haley & Aldrich	Job No: 16-53041 Date: 24-May-2016 08:58:03 Site: DP&L JM Stuart Station, Aberdeen, OH
		Sounding: CPT16-HA-7-C2 Cone: AD419 Cone Area: 15 sq cm



Trace Summary:

Filename: 16-53041_CPHA-7-C2.PPD
Depth: 4.350 m / 14.271 ft
Duration: 120.0 s

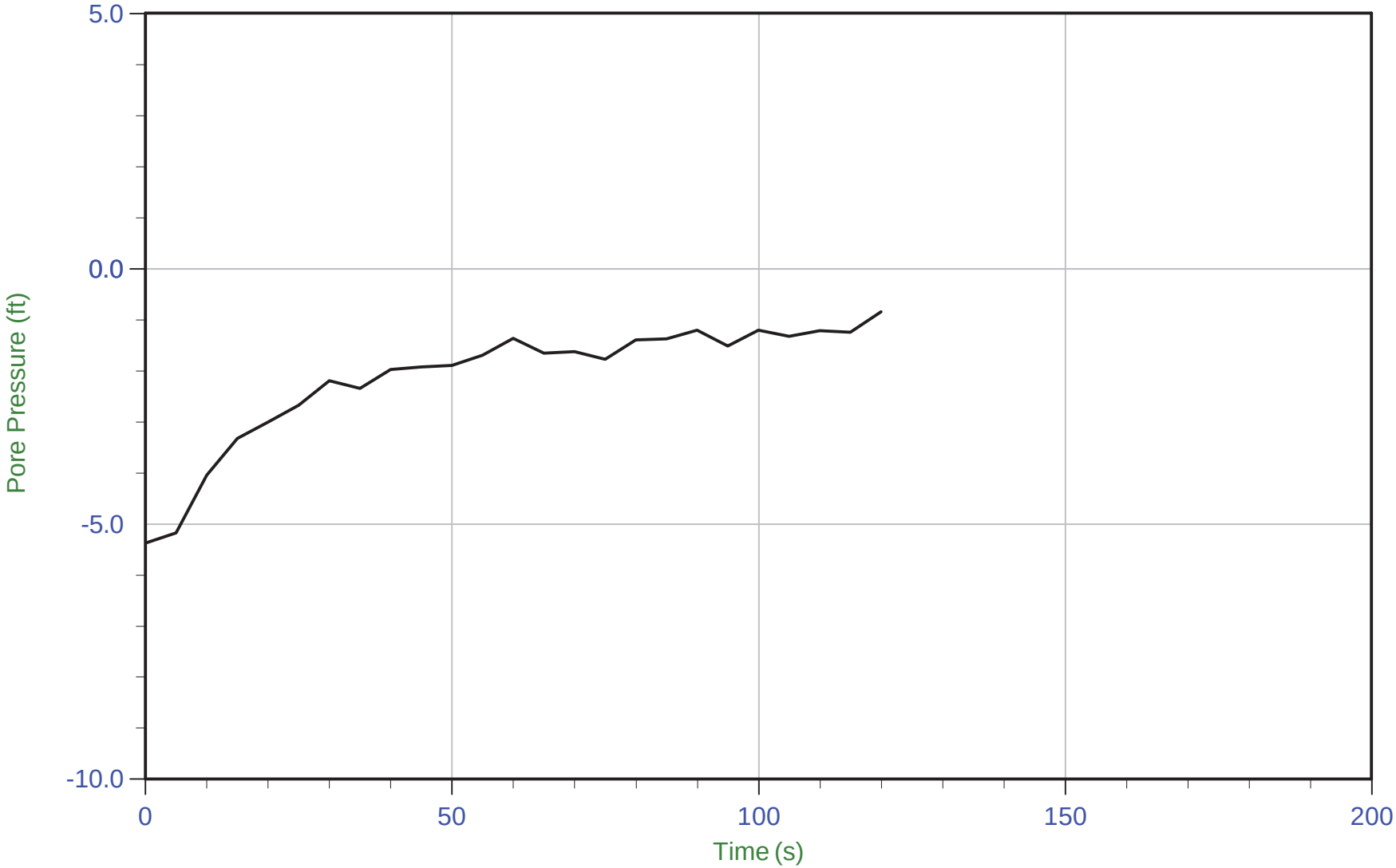
U Min: -13.0 ft
U Max: -10.4 ft

CONETEC

Haley & Aldrich

Job No: 16-53041
Date: 24-May-2016 08:58:03
Site: DP&L JM Stuart Station, Aberdeen, OH

Sounding: CPT16-HA-7-C2
Cone: AD419
Cone Area: 15 sq cm

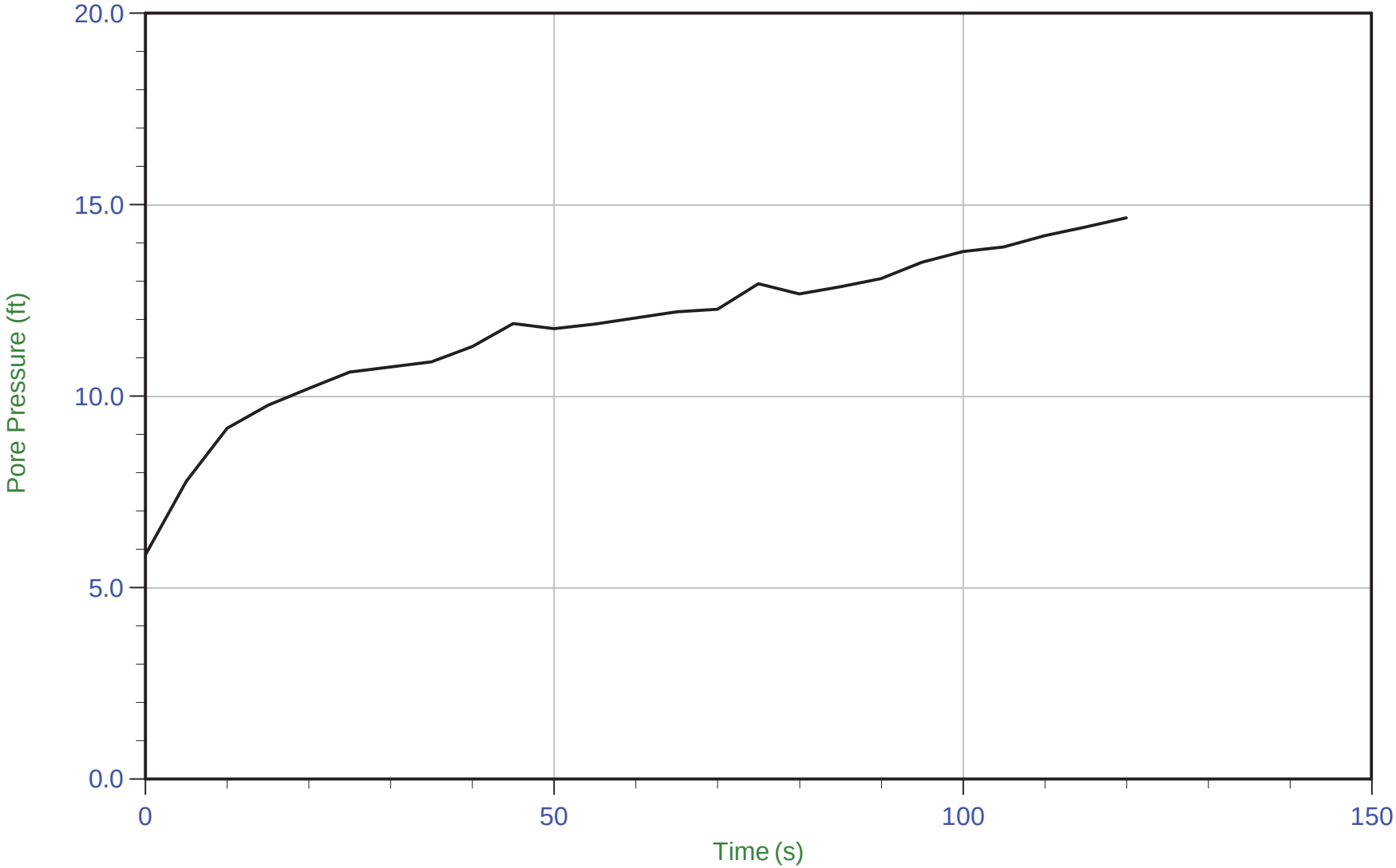


Trace Summary:

Filename: 16-53041_CPHA-7-C2.PPD
Depth: 6.350 m / 20.833 ft
Duration: 120.0 s

U Min: -5.4 ft
U Max: -0.8 ft

CONETEC	Haley & Aldrich	Job No: 16-53041 Date: 24-May-2016 08:58:03 Site: DP&L JM Stuart Station, Aberdeen, OH
		Sounding: CPT16-HA-7-C2 Cone: AD419 Cone Area: 15 sq cm



Trace Summary:

Filename: 16-53041_CPHA-7-C2.PPD
Depth: 8.350 m / 27.395 ft
Duration: 120.0 s

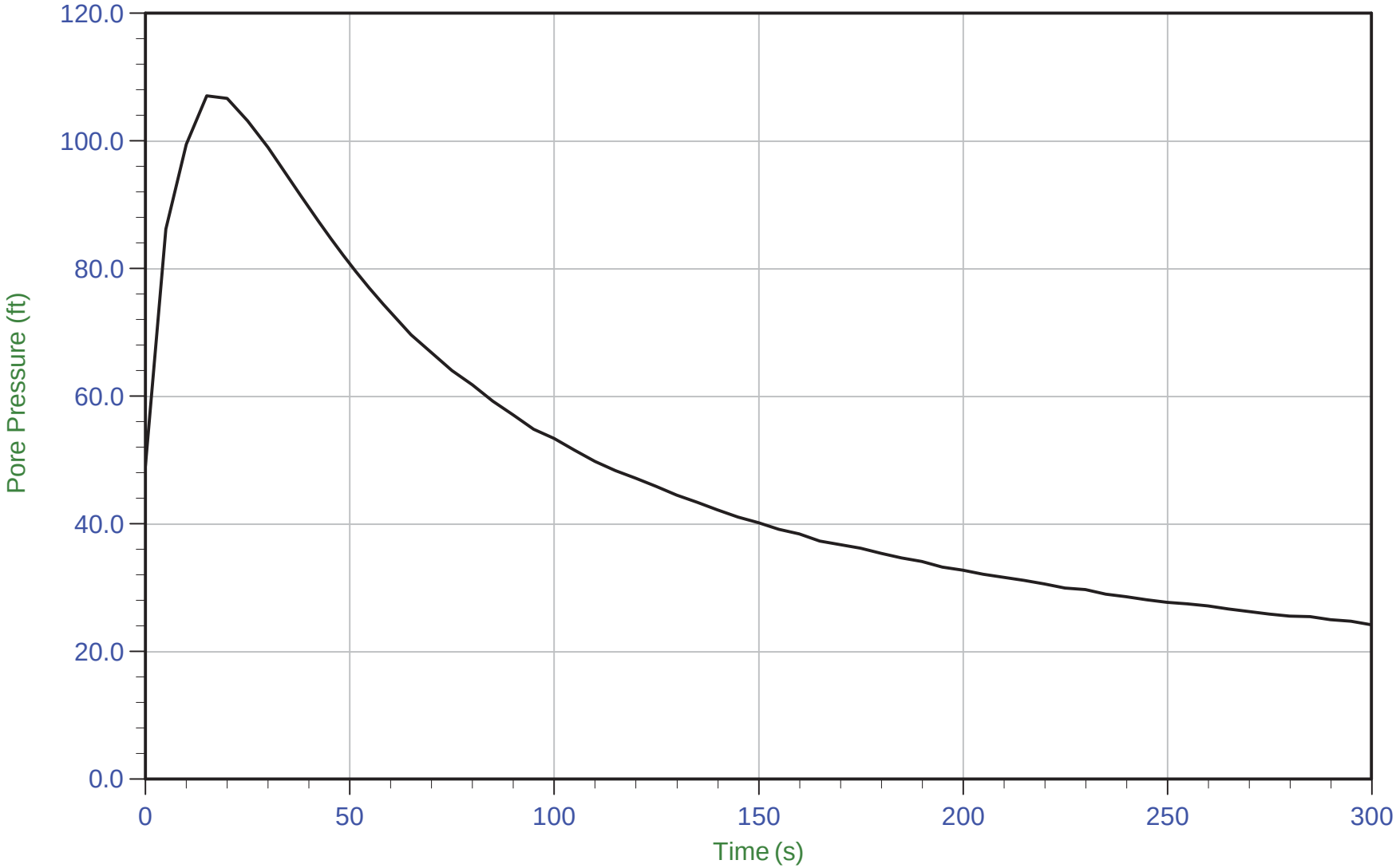
U Min: 5.9 ft
U Max: 14.7 ft

CONETEC

Haley & Aldrich

Job No: 16-53041
Date: 24-May-2016 08:58:03
Site: DP&L JM Stuart Station, Aberdeen, OH

Sounding: CPT16-HA-7-C2
Cone: AD419
Cone Area: 15 sq cm



Trace Summary:

Filename: 16-53041_CPHA-7-C2.PPD
Depth: 10.350 m / 33.956 ft
Duration: 300.0 s

U Min: 24.2 ft
U Max: 107.0 ft

WT: 13.961 m / 45.803 ft
Ueq: -11.8 ft
U(50): 47.60 ft

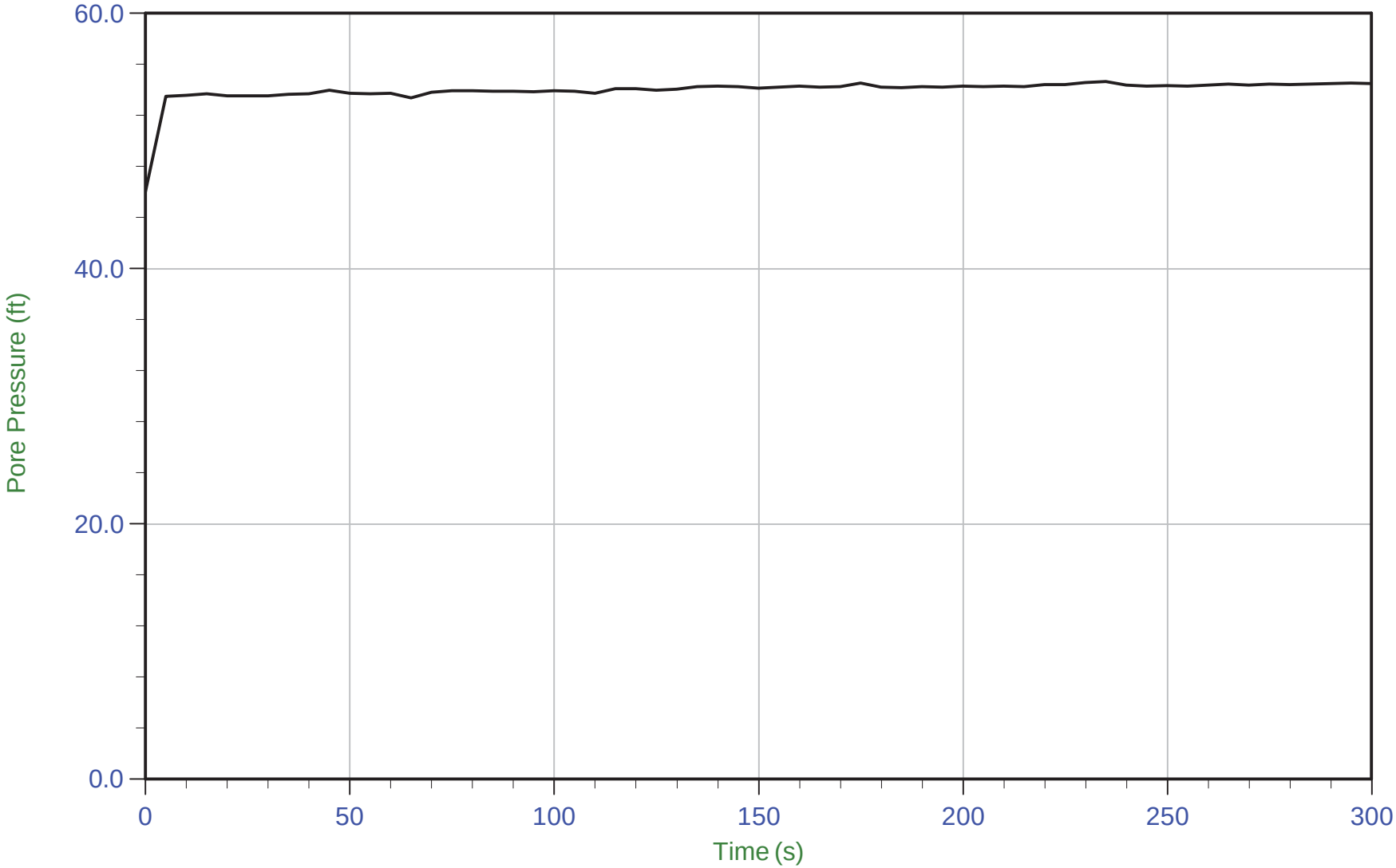
T(50): 103.2 s
Ir: 100
Ch: 6.8 sq cm/min

CONETEC

Haley & Aldrich

Job No: 16-53041
Date: 24-May-2016 08:58:03
Site: DP&L JM Stuart Station, Aberdeen, OH

Sounding: CPT16-HA-7-C2
Cone: AD419
Cone Area: 15 sq cm



Trace Summary:

Filename: 16-53041_CPHA-7-C2.PPD
Depth: 30.500 m / 100.064 ft
Duration: 300.0 s

U Min: 46.0 ft
U Max: 54.7 ft

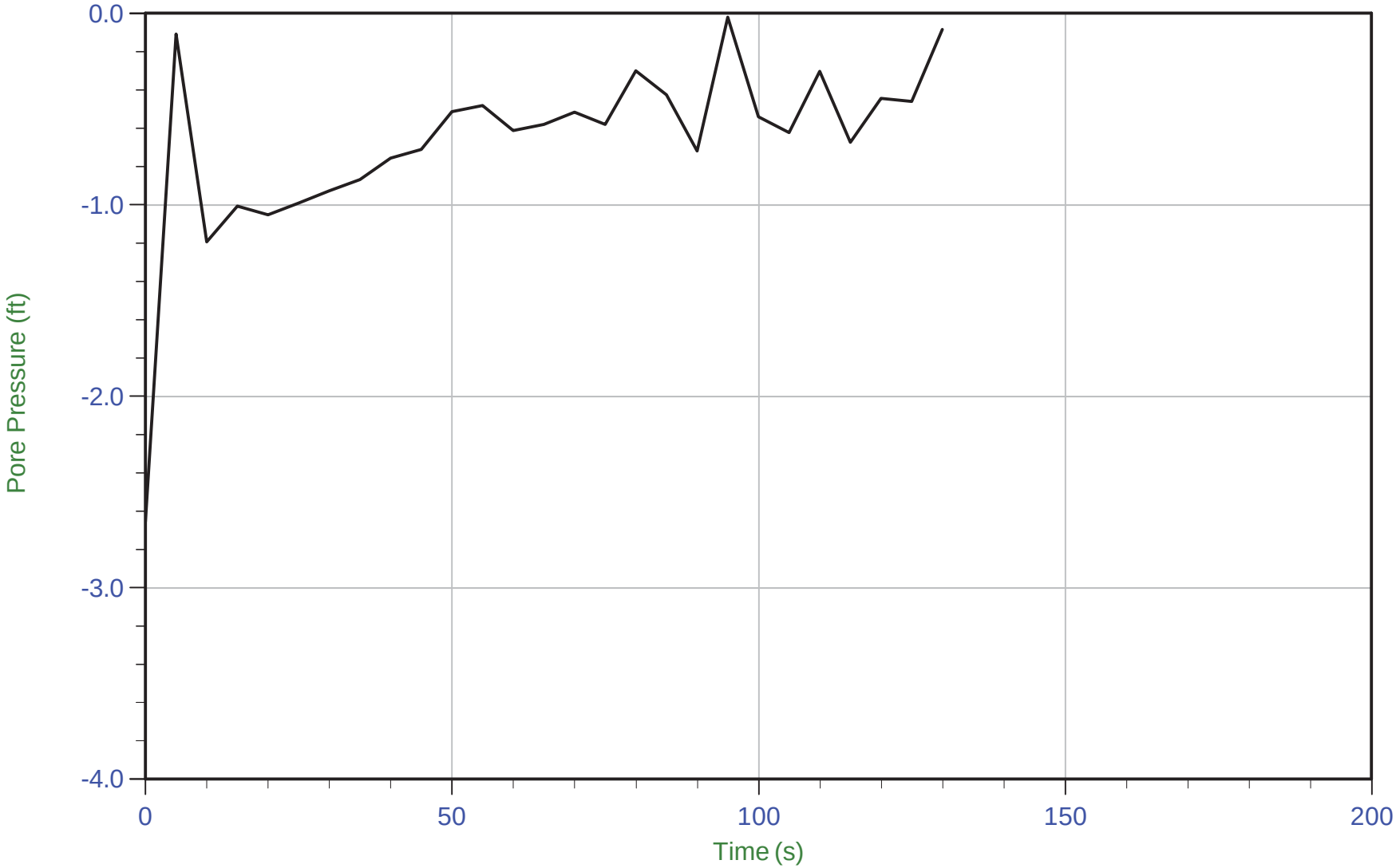
WT: 13.961 m / 45.803 ft
Ueq: 54.3 ft

CONETEC

Haley & Aldrich

Job No: 16-53041
Date: 19-May-2016 10:06:34
Site: DP&L JM Stuart Station, Aberdeen, OH

Sounding: SCPT16-HA-10-C1
Cone: AD419
Cone Area: 15 sq cm



Trace Summary:

Filename: 16-53041_SPHA-10-C1.PPD
Depth: 0.350 m / 1.148 ft
Duration: 130.0 s

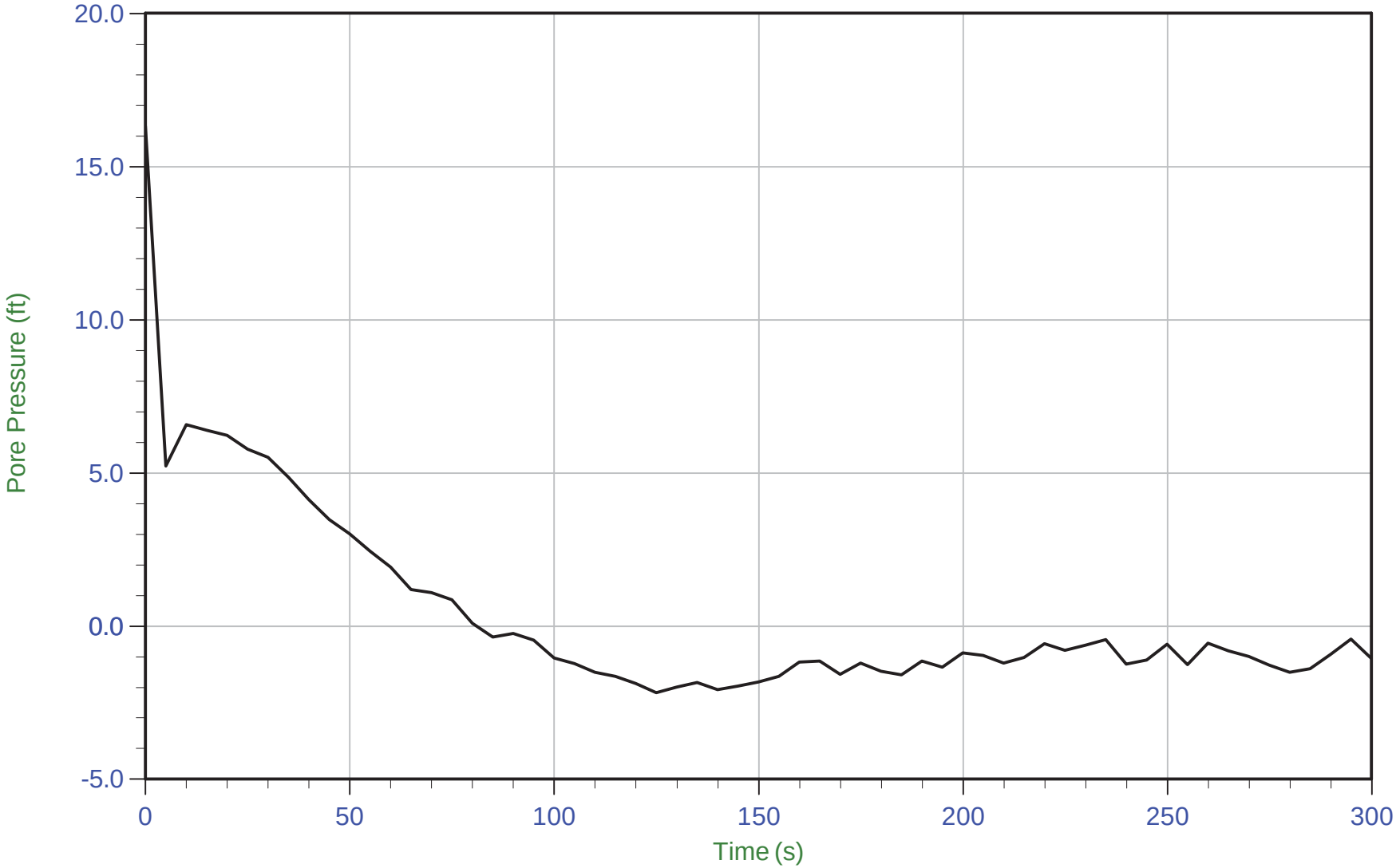
U Min: -2.7 ft
U Max: -0.0 ft

CONETEC

Haley & Aldrich

Job No: 16-53041
Date: 19-May-2016 10:06:34
Site: DP&L JM Stuart Station, Aberdeen, OH

Sounding: SCPT16-HA-10-C1
Cone: AD419
Cone Area: 15 sq cm

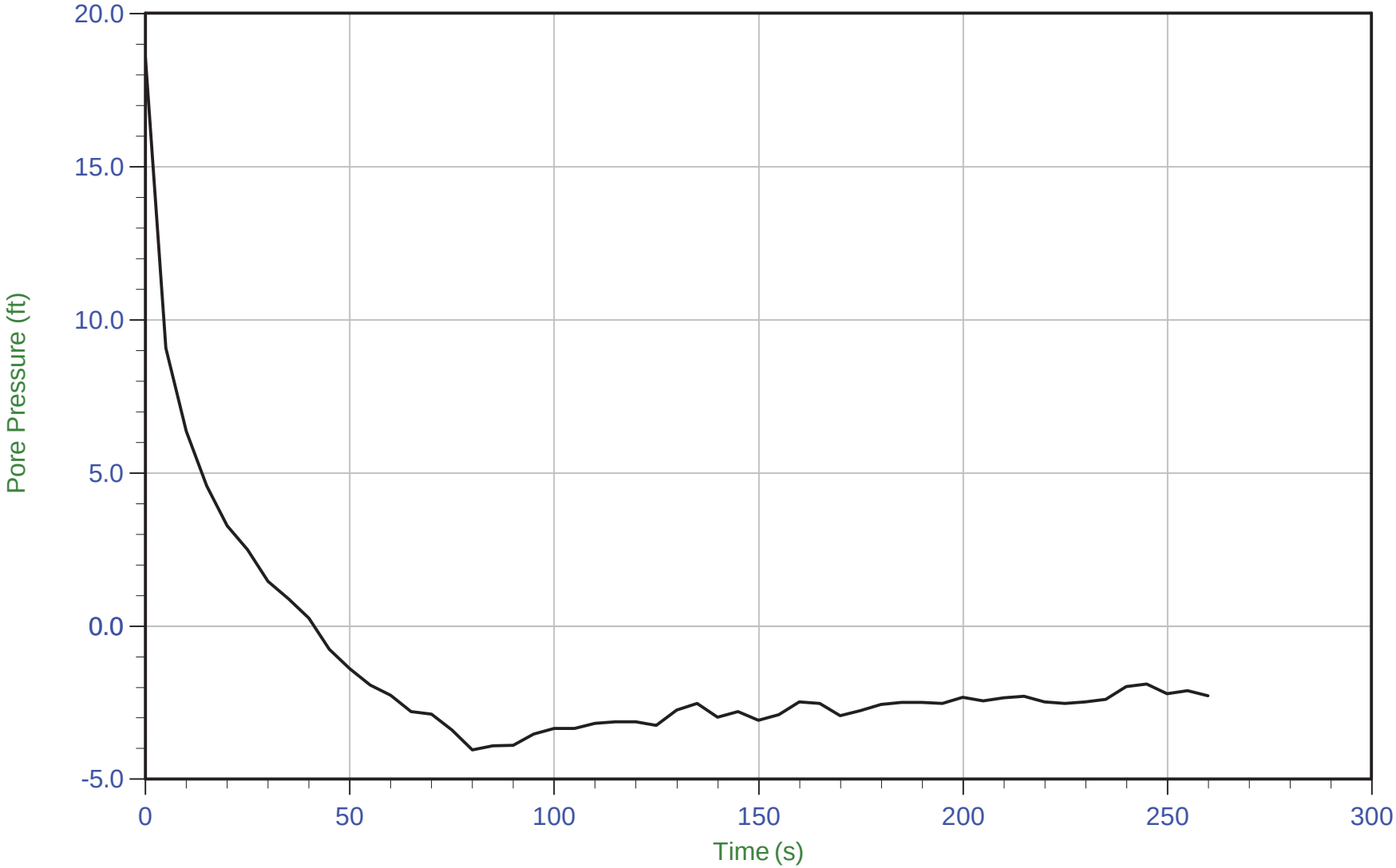


Trace Summary:

Filename: 16-53041_SPHA-10-C1.PPD
Depth: 2.350 m / 7.710 ft
Duration: 300.0 s

U Min: -2.2 ft
U Max: 16.3 ft

CONETEC	Haley & Aldrich	Job No: 16-53041 Date: 19-May-2016 10:06:34 Site: DP&L JM Stuart Station, Aberdeen, OH
		Sounding: SCPT16-HA-10-C1 Cone: AD419 Cone Area: 15 sq cm



Trace Summary:

Filename: 16-53041_SPHA-10-C1.PPD
Depth: 4.350 m / 14.271 ft
Duration: 260.0 s

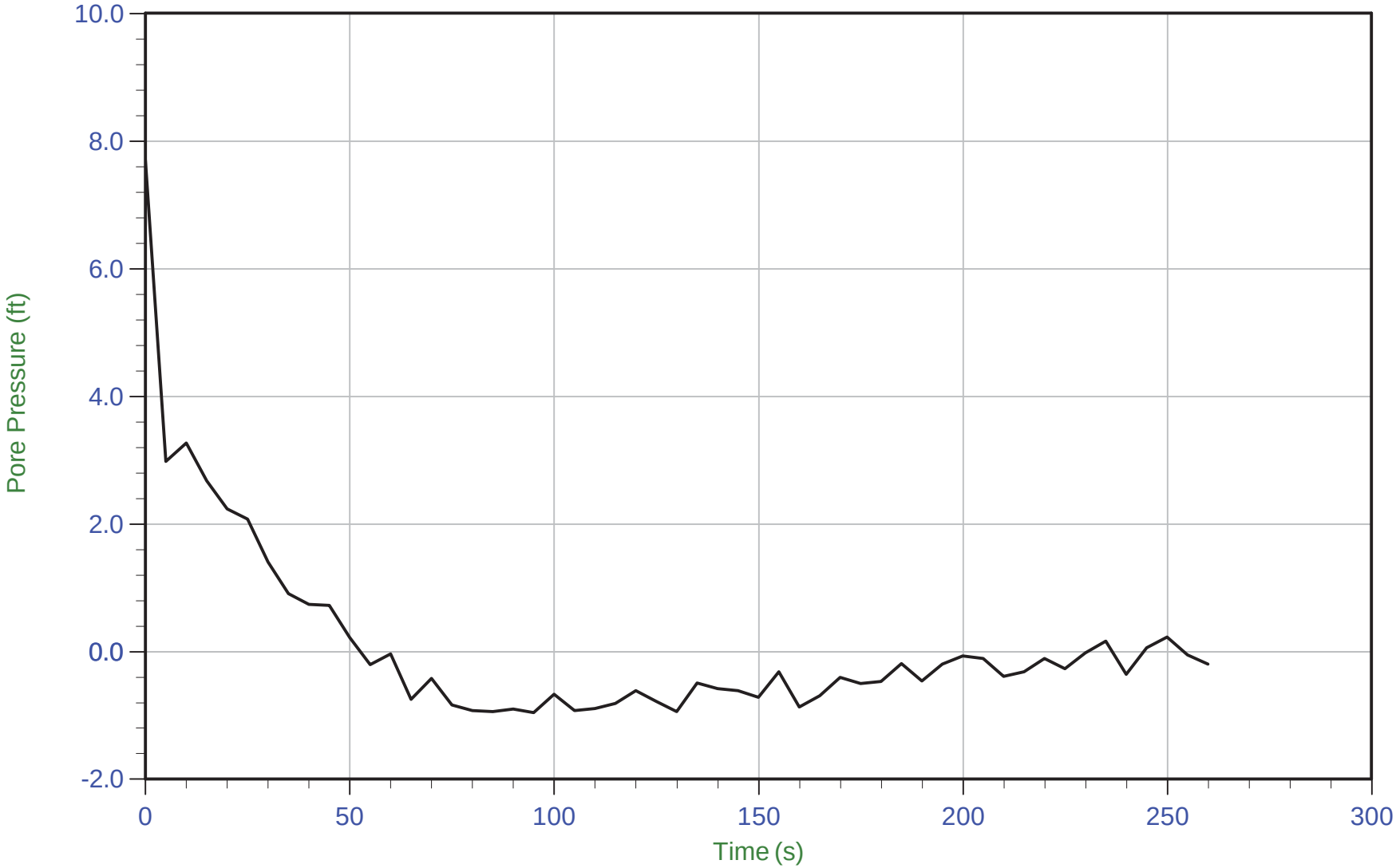
U Min: -4.0 ft
U Max: 18.6 ft

CONETEC

Haley & Aldrich

Job No: 16-53041
Date: 19-May-2016 10:06:34
Site: DP&L JM Stuart Station, Aberdeen, OH

Sounding: SCPT16-HA-10-C1
Cone: AD419
Cone Area: 15 sq cm



Trace Summary:

Filename: 16-53041_SPHA-10-C1.PPD
Depth: 6.350 m / 20.833 ft
Duration: 260.0 s

U Min: -1.0 ft
U Max: 7.7 ft

Cone Penetration Test Summary and

Standard Cone Penetration Test Plots

CONETEC

Job No:	16-53041
Client:	Haley & Aldrich
Project:	DP&L JM Stuart Station, Aberdeen, OH
Start Date:	25-May-2016
End Date:	26-May-2016

CONE PENETRATION TEST SUMMARY

Sounding ID	File Name	Date	Cone	Assumed Phreatic Surface[1] (ft)	Final Depth (ft)	Shear Wave Velocity Tests	Northing[2] (m)	Easting (m)	Elevation (ft)	Refer to Notation Number
SCPT16-HA-5-C3	16-53041_SPHA-5-C3	26-May-2016	419:T1500F15U500	43.7	100.06	11	235594	1625243	530	
CPT16-HA-5-C4	16-53041_CPHA-5-C4	25-May-2016	419:T1500F15U500	20.0	100.06		235336	1625605	532	
CPT16-HA-5-C5A	16-53041_CPHA-5-C5A	26-May-2016	419:T1500F15U500	15.0	100.06		235493	1625553	529	
CPT16-HA-5-C6	16-53041_CPHA-5-C6	26-May-2016	419:T1500F15U500	50.0	100.06		235358	1625845	529	
Totals	4 soundings				400.26	11				

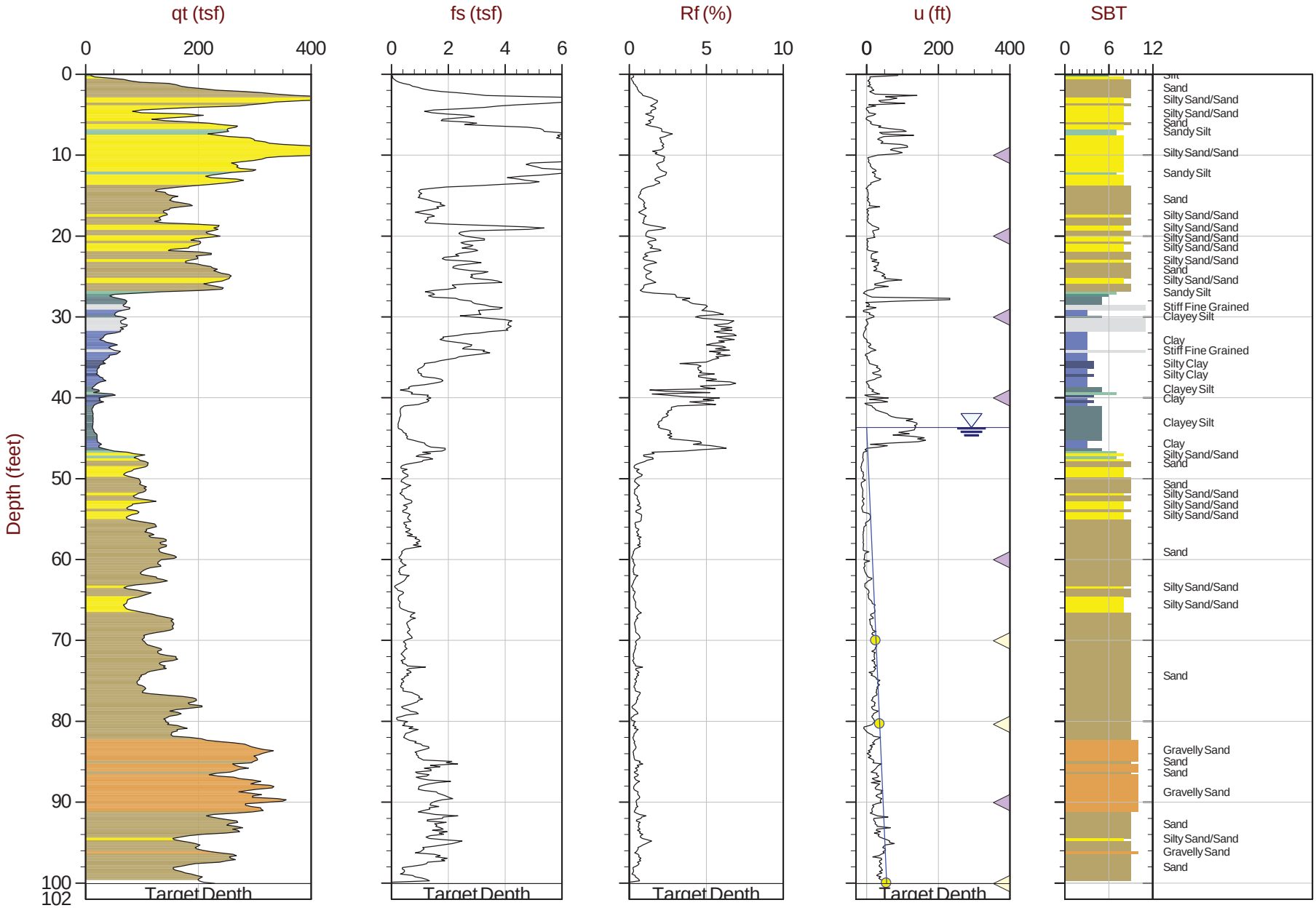
1. Assumed phreatic surface depths were determined from the pore pressure data unless otherwise noted. Hydrostatic data were used for calculated parameters.
2. Coordinates are NAD83 / Ohio State Plane Coordinates South and were provided to us by the client.
3. Assumed phreatic surface estimated from dynamic pore pressure response.
4. No phreatic surface detected

CONETEC

Haley & Aldrich

Job No: 16-53041
Date: 05:26:16 13:07
Site: DP&L JM Stuart Station, Aberdeen, OH

Sounding: SCPT16-HA-5-C3
Cone: 419:T1500F15U500



Max Depth: 30.500 m / 100.06 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.100 m

File: 16-53041_SPHA-5-C3.COR

SBT: Robertson and Campanella, 1986
Coords: Ohio SPC South N: 235594m E: 1625243m Elev: 529.58

Hydrostatic Line · Ueq · Assumed Ueq · PPD, Ueq achieved · PPD, Ueq not achieved

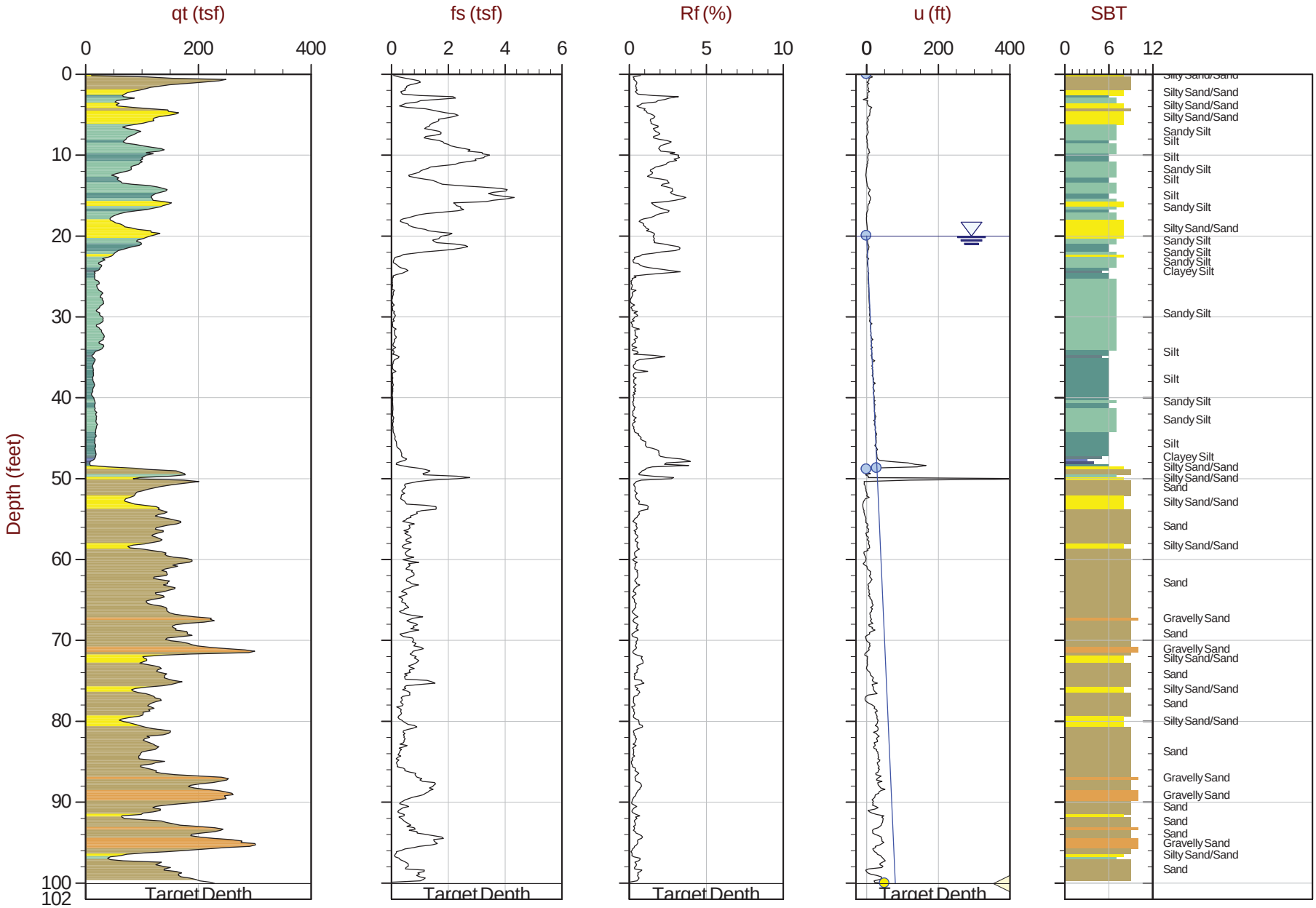
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Haley & Aldrich

Job No: 16-53041
Date: 05:25:16 12:22
Site: DP&L JM Stuart Station, Aberdeen, OH

Sounding: CPT16-HA-5-C4
Cone: 419:T1500F15U500



Max Depth: 30.500 m / 100.06 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.100 m

File: 16-53041_CPHA-5-C4.COR

SBT: Robertson and Campanella, 1986
Coords: Ohio SPC South N: 235336m E: 1625605m Elev: 532.14

Hydrostatic Line · Ueq · Assumed Ueq · PPD, Ueq achieved · PPD, Ueq not achieved

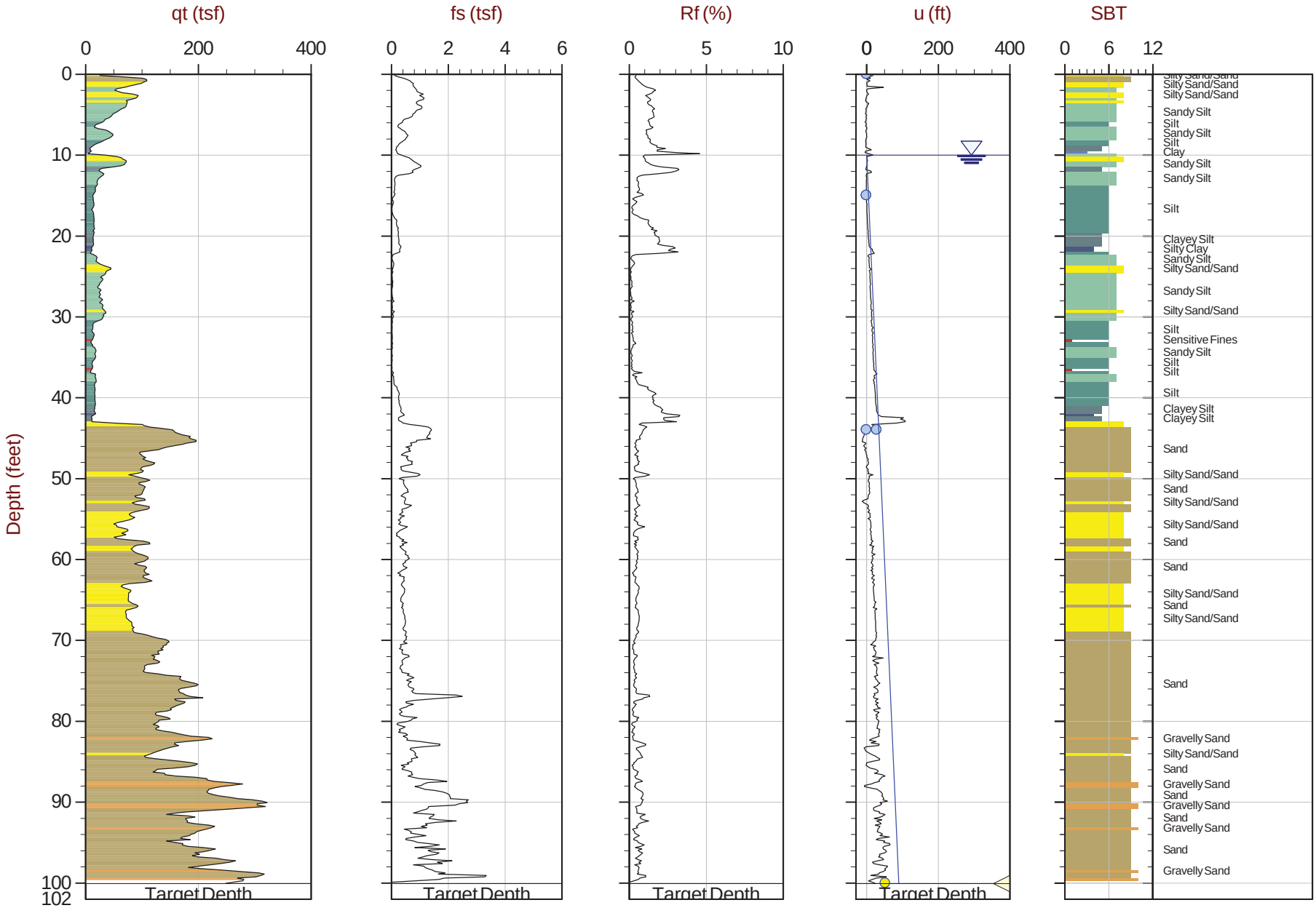
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Haley & Aldrich

Job No: 16-53041
Date: 05:26:16 08:38
Site: DP&L JM Stuart Station, Aberdeen, OH

Sounding: CPT16-HA-5-C5A
Cone: 419:T1500F15U500



Max Depth: 30.500 m / 100.06 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.100 m

File: 16-53041_CPHA-5-C5A.COR

SBT: Robertson and Campanella, 1986
Coords: Ohio SPC South N: 235493m E: 1625553m Elev: 529.21

Hydrostatic Line · Ueq · Assumed Ueq · PPD, Ueq achieved · PPD, Ueq not achieved

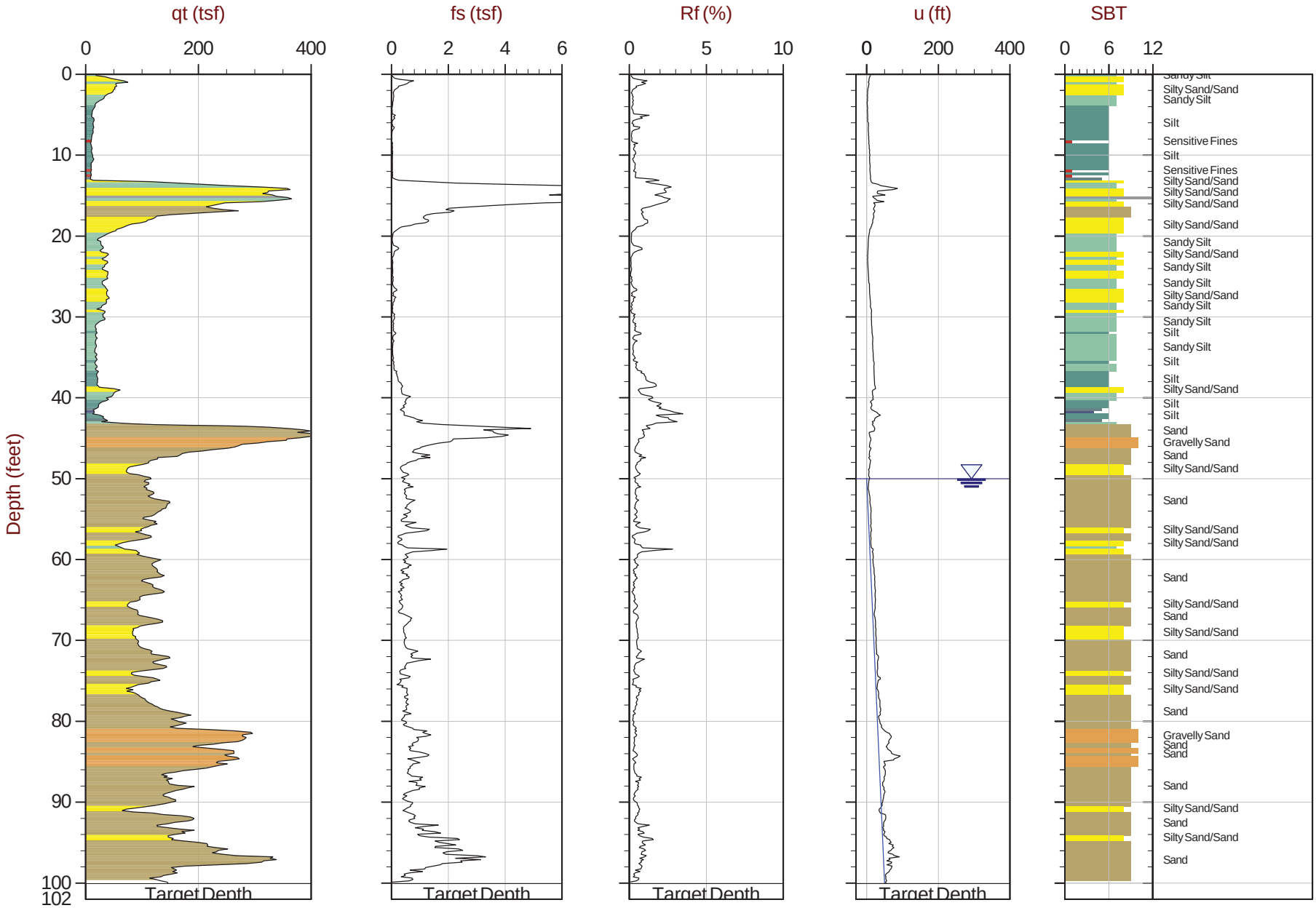
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Haley & Aldrich

Job No: 16-53041
Date: 05:26:16 08:39
Site: DP&L JM Stuart Station, Aberdeen, OH

Sounding: CPT16-HA-5-C6
Cone: 419:T1500F15U500



Max Depth: 30.500 m / 100.06 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.100 m

File: 16-53041_CPHA-5-C6.COR

SBT: Robertson and Campanella, 1986
Coords: Ohio SPC South N: 235358m E: 1625845m Elev: 529.26

Hydrostatic Line · Ueq · Assumed Ueq · PPD, Ueq achieved · PPD, Ueq not achieved

The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

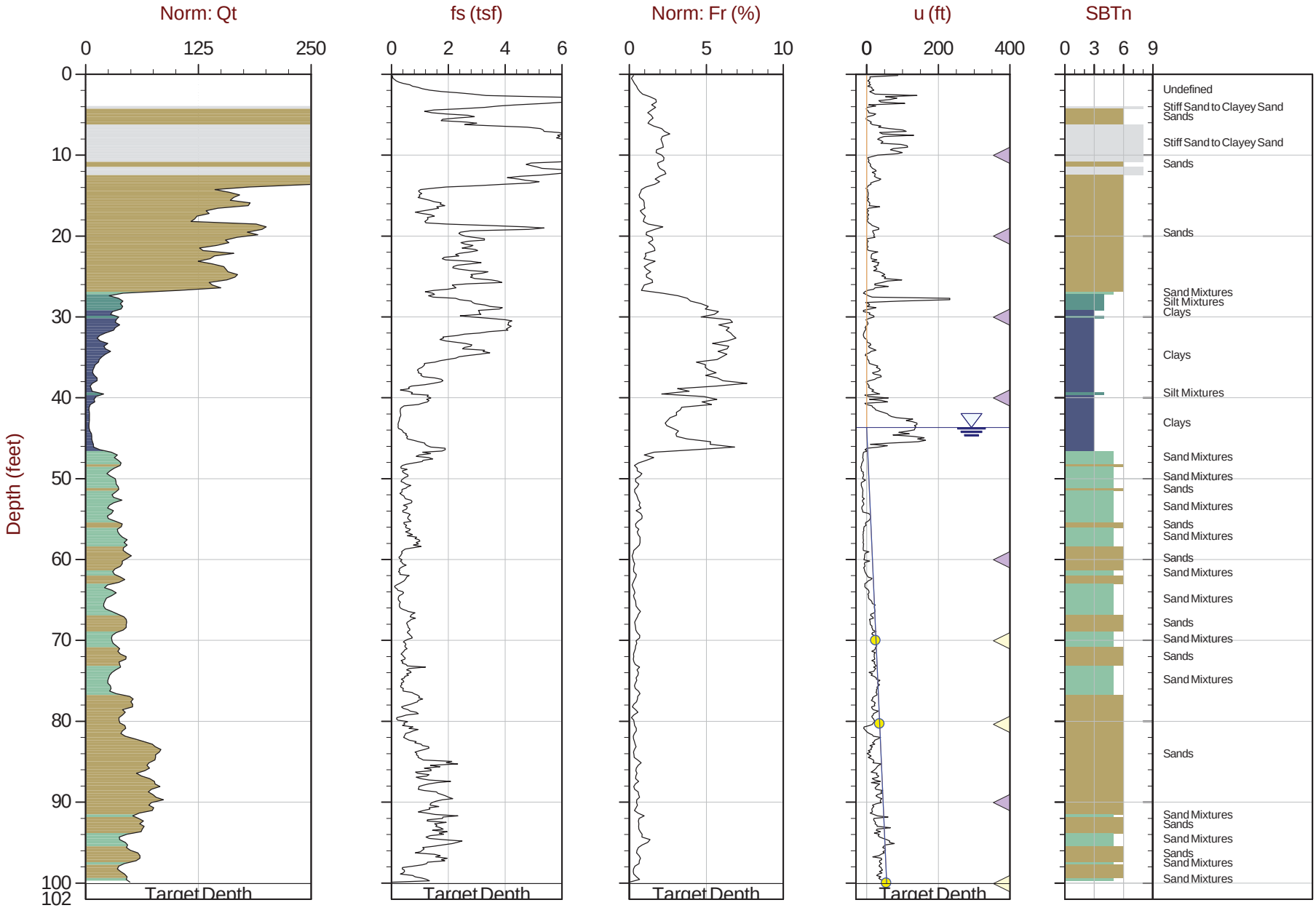
Normalized Cone Penetration Test Plots

CONETEC

Haley & Aldrich

Job No: 16-53041
Date: 05:26:16 13:07
Site: DP&L JM Stuart Station, Aberdeen, OH

Sounding: SCPT16-HA-5-C3
Cone: 419:T1500F15U500



Max Depth: 30.500 m / 100.06 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.100 m

File: 16-53041_SPHA-5-C3.COR

SBT: Robertson, 1990
Coords: Ohio SPC South N: 235594m E: 1625243m Elev: 529.58

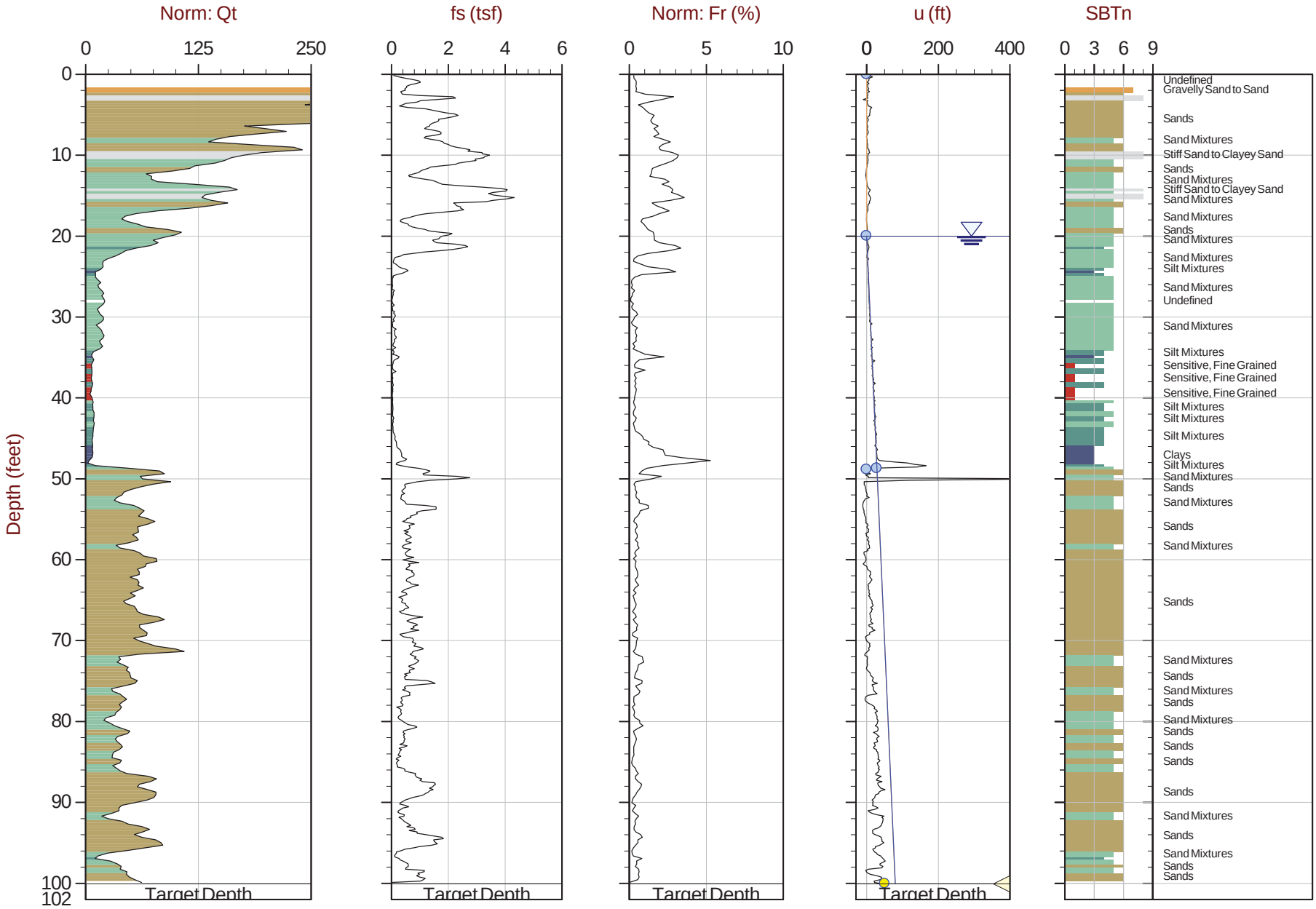
Hydrostatic Line · Ueq · Assumed Ueq · PPD, Ueq achieved · PPD, Ueq not achieved

The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

Haley & Aldrich

Job No: 16-53041
Date: 05:25:16 12:22
Site: DP&L JM Stuart Station, Aberdeen, OH

Sounding: CPT16-HA-5-C4
Cone: 419:T1500F15U500



Max Depth: 30.500 m / 100.06 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.100 m

File: 16-53041_CPHA-5-C4.COR

SBT: Robertson, 1990
Coords: Ohio SPC South N: 235336m E: 1625605m Elev: 532.14

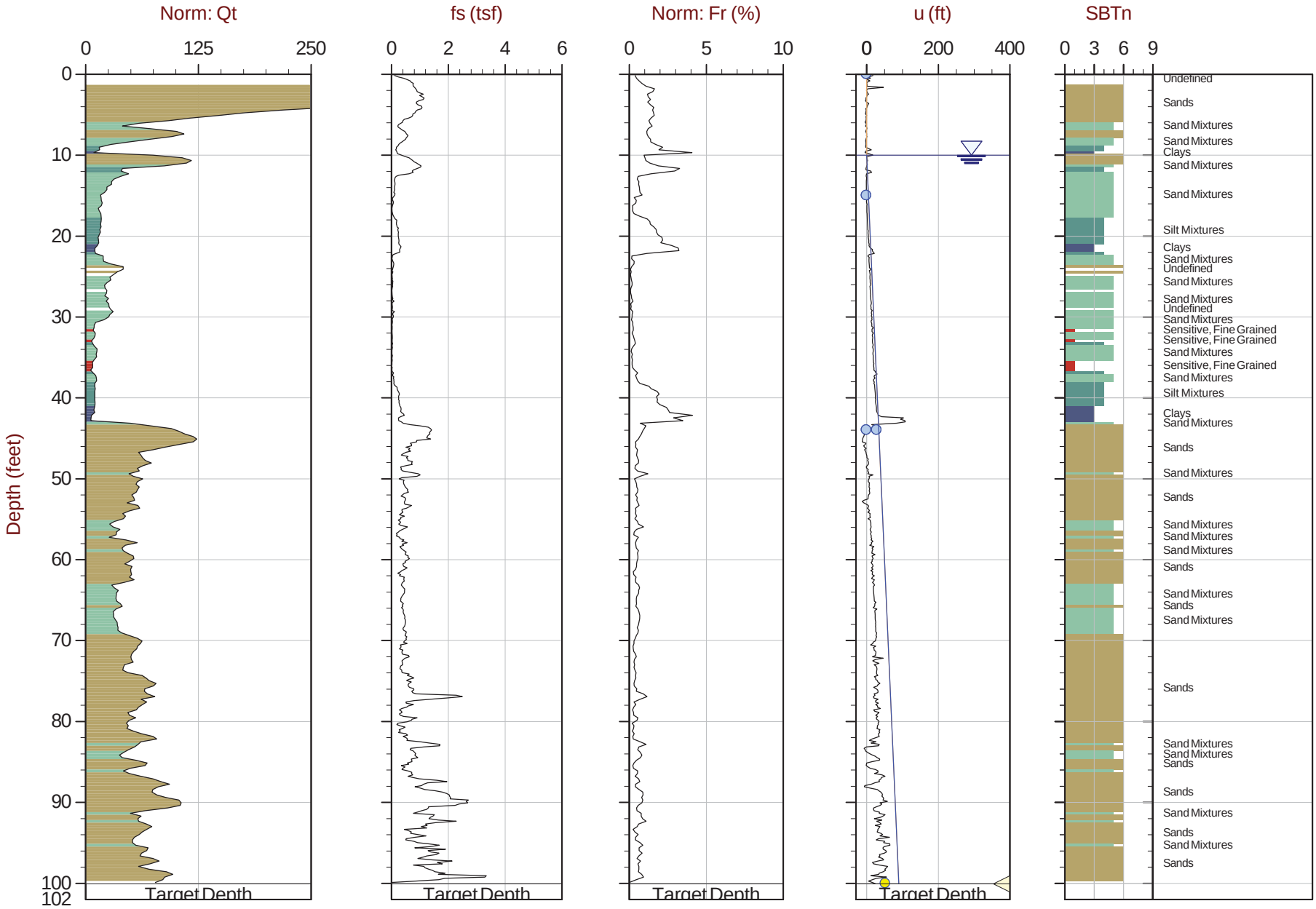
Hydrostatic Line · Ueq · Assumed Ueq · PPD, Ueq achieved · PPD, Ueq not achieved

The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

Haley & Aldrich

Job No: 16-53041
Date: 05:26:16 08:38
Site: DP&L JM Stuart Station, Aberdeen, OH

Sounding: CPT16-HA-5-C5A
Cone: 419:T1500F15U500



Max Depth: 30.500 m / 100.06 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.100 m

File: 16-53041_CPHA-5-C5A.COR

SBT: Robertson, 1990
Coords: Ohio SPC South N: 235493m E: 1625553m Elev: 529.21

Hydrostatic Line · Ueq · Assumed Ueq · PPD, Ueq achieved · PPD, Ueq not achieved

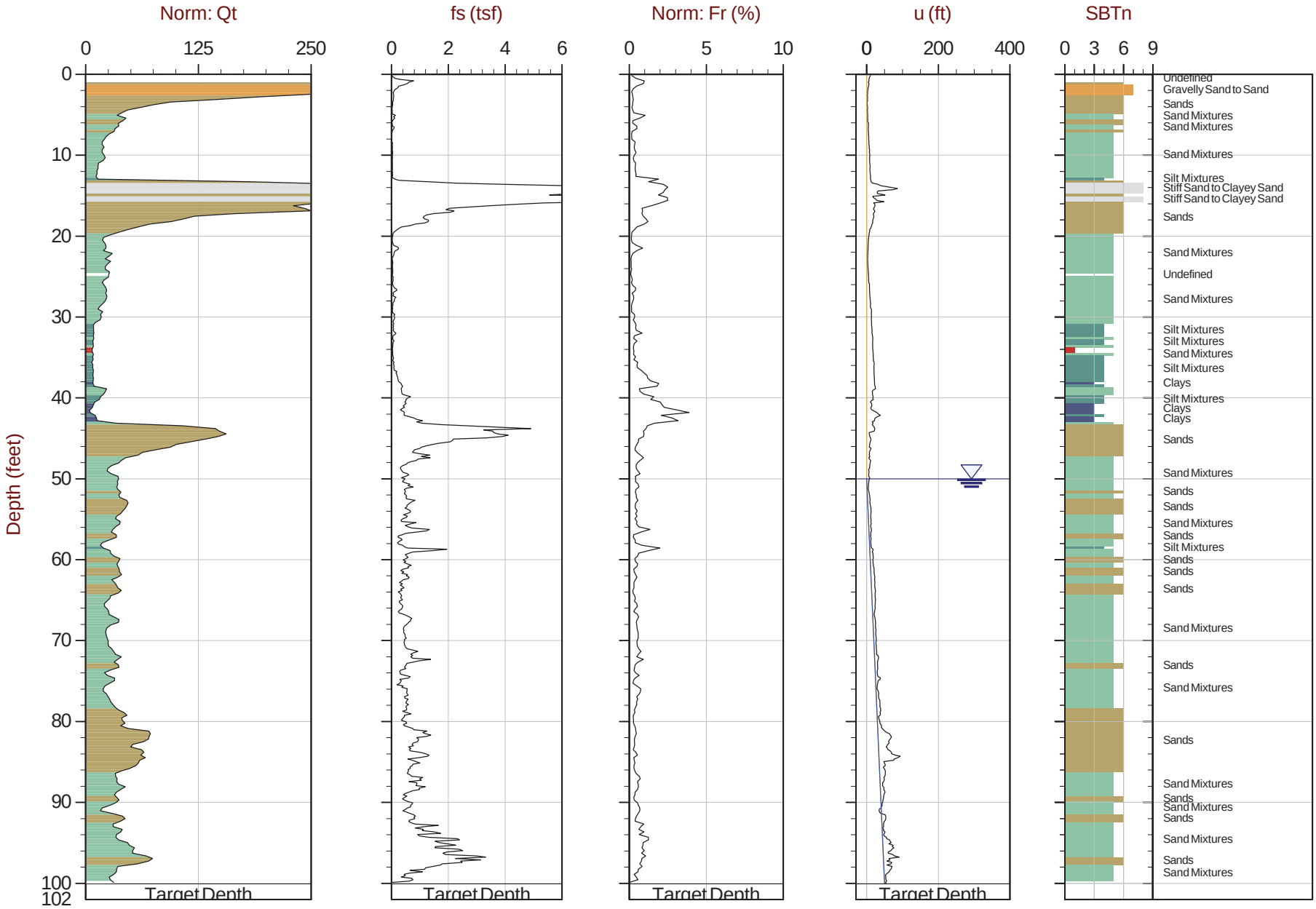
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Haley & Aldrich

Job No: 16-53041
Date: 05:26:16 08:39
Site: DP&L JM Stuart Station, Aberdeen, OH

Sounding: CPT16-HA-5-C6
Cone: 419:T1500F15U500



Max Depth: 30.500 m / 100.06 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.100 m

File: 16-53041_CPHA-5-C6.COR

SBT: Robertson, 1990
Coords: Ohio SPC South N: 235358m E: 1625845m Elev: 529.26

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

Seismic Cone Penetration Test Plots

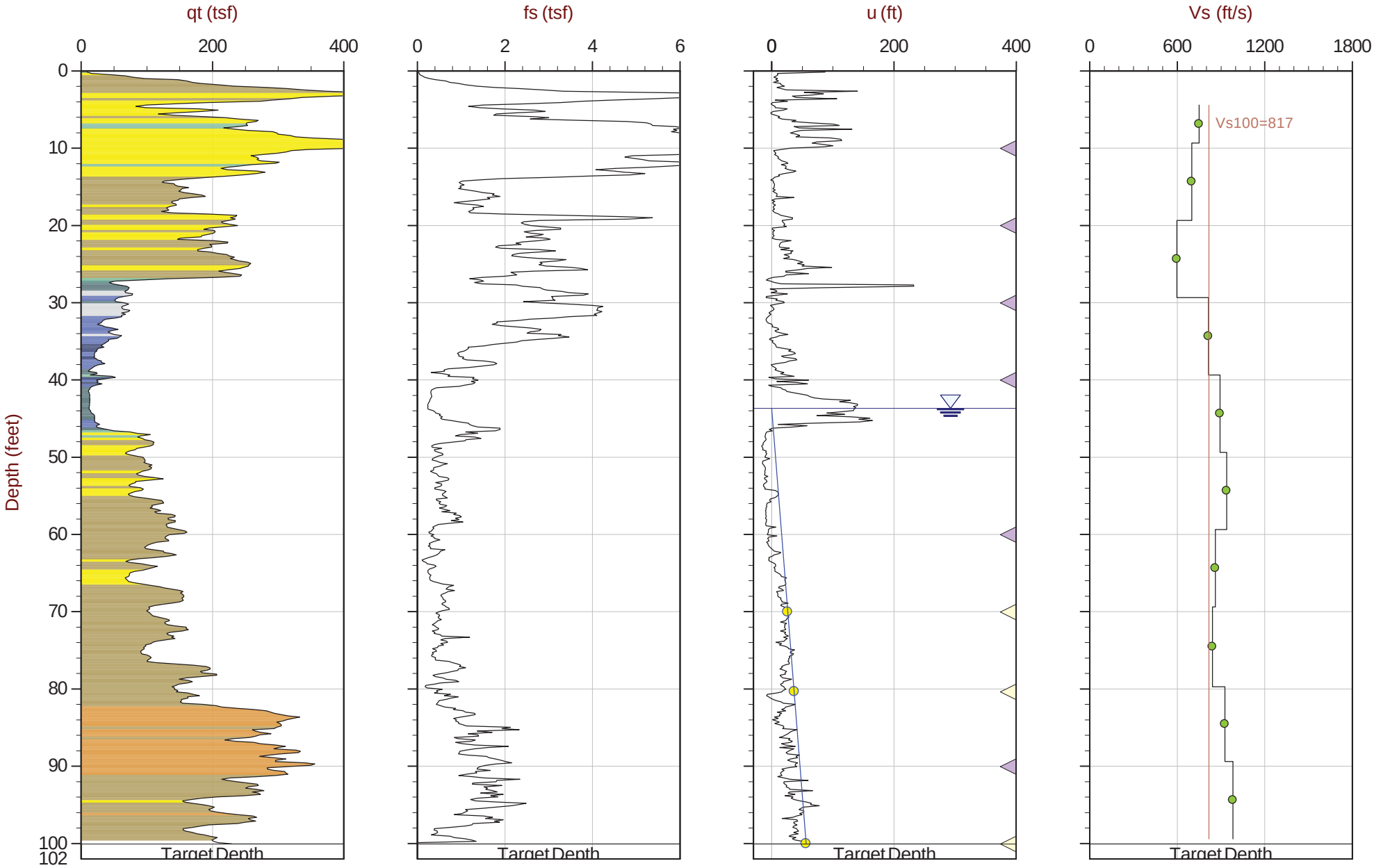
CONETEC

CONETEC

Haley & Aldrich

Job No: 16-53041
Date: 05:26:16 13:07
Site: DP&L JM Stuart Station, Aberdeen, OH

Sounding: SCPT16-HA-5-C3
Cone: 419:T1500F15U500



Max Depth: 30.500 m / 100.06 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: 0.100 m

File: 16-53041_SPHA-5-C3.COR

SBT: Robertson and Campanella, 1986
Coords: Ohio SPC South N: 235594m E: 1625243m Elev: 529.58

Hydrostatic Line · Ueq · Assumed Ueq · PPD, Ueq achieved · PPD, Ueq not achieved

The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

Seismic Cone Penetration Test Tabular Results (Vs)

CONETEC

Job No:	16-53041
Client:	Haley & Aldrich
Project:	DP&L JM Stuart Station, Aberdeen, OH
Sounding ID:	SCPT16-HA-5-C3
Date:	26-May-2016

Seismic Source:	Beam
Source Offset (ft):	1.97
Source Depth (ft):	0.00
Geophone Offset (ft):	0.66

SCPTu SHEAR WAVE VELOCITY TEST RESULTS - Vs

Tip Depth (ft)	Geophone Depth (ft)	Ray Path (ft)	Ray Path Difference (ft)	Travel Time Interval (ms)	Interval Velocity (ft/s)
5.08	4.43	4.85			
10.01	9.35	9.56	4.71	6.28	750
20.01	19.36	19.46	9.90	14.14	700
30.02	29.36	29.43	9.97	16.68	598
40.03	39.37	39.42	9.99	12.26	815
50.03	49.38	49.42	10.00	11.19	894
60.04	59.38	59.42	10.00	10.65	939
70.05	69.39	69.42	10.00	11.61	862
80.38	79.72	79.75	10.33	12.27	842
90.06	89.40	89.42	9.68	10.44	927
100.07	99.41	99.43	10.00	10.18	983

Pore Pressure Dissipation Summary and

Pore Pressure Dissipation Plots

CONETEC

Job No:	16-53041
Client:	Haley & Aldrich
Project:	DP&L JM Stuart Station, Aberdeen, OH
Start Date:	25-May-2016
End Date:	26-May-2016

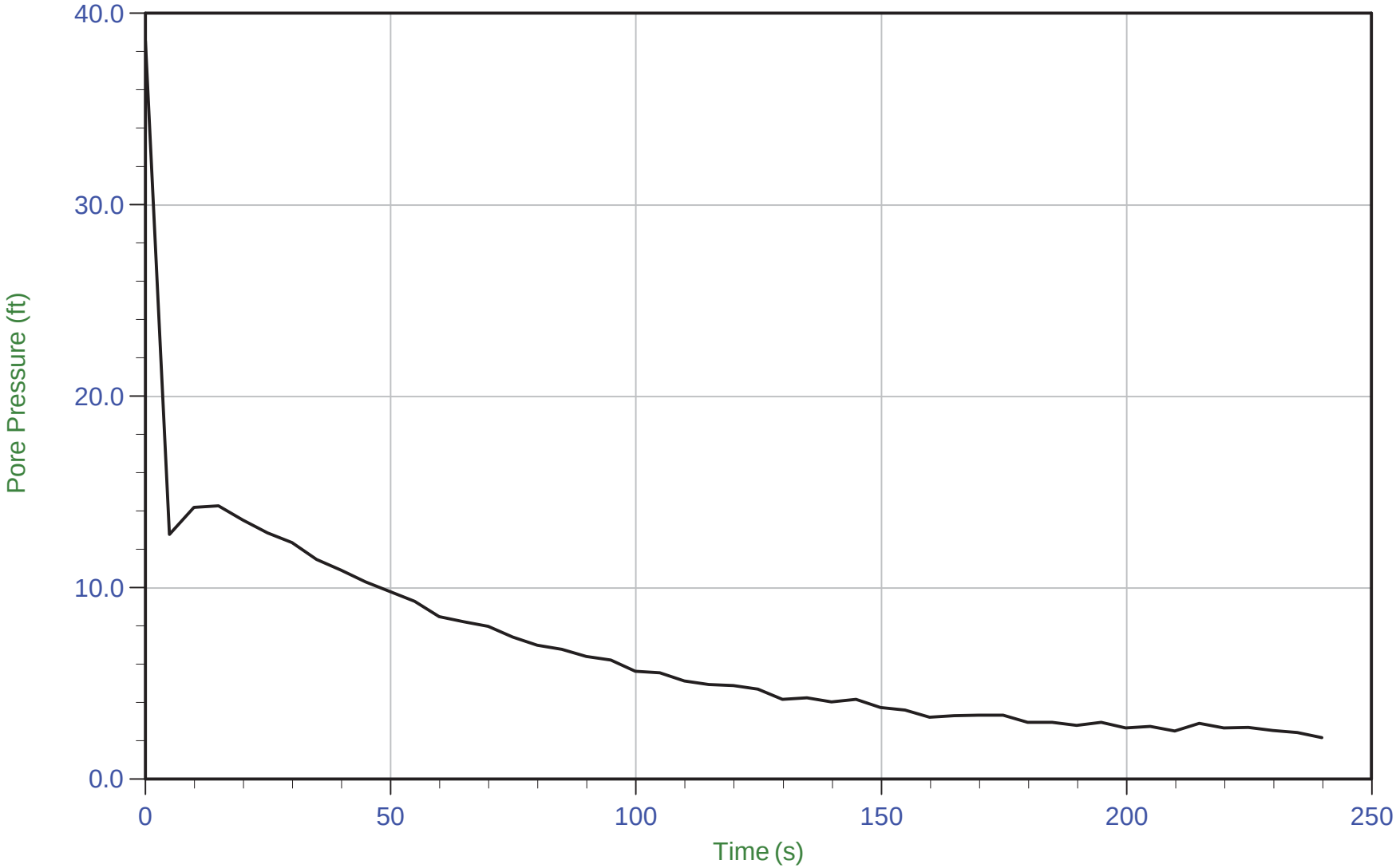
CPTu PORE PRESSURE DISSIPATION SUMMARY

Sounding ID	File Name	Cone Area (cm^2)	Duration (s)	Test Depth (ft)	Estimated Equilibrium Pore Pressure U_{eq} (ft)	Calculated Phreatic Surface (ft)	Estimated Phreatic Surface (ft)	t_{50} [a] (s)	Assumed Rigidity Index (I_r)	c_h [b] (cm^2/min)
SCPT16-HA-5-C3	16-53041_SPHA-5-C3	15	240	10.01						
SCPT16-HA-5-C3	16-53041_SPHA-5-C3	15	240	20.01						
SCPT16-HA-5-C3	16-53041_SPHA-5-C3	15	300	30.02						
SCPT16-HA-5-C3	16-53041_SPHA-5-C3	15	1620	40.03						
SCPT16-HA-5-C3	16-53041_SPHA-5-C3	15	260	60.04						
SCPT16-HA-5-C3	16-53041_SPHA-5-C3	15	200	70.05	26.37	43.67				
SCPT16-HA-5-C3	16-53041_SPHA-5-C3	15	285	80.38	37.10	43.28				
SCPT16-HA-5-C3	16-53041_SPHA-5-C3	15	170	90.06						
SCPT16-HA-5-C3	16-53041_SPHA-5-C3	15	215	100.06	56.37	43.69				
CPT16-HA-5-C4	16-53041_CPHA-5-C4	15	180	100.06	50.99	49.08				
CPT16-HA-5-C5A	16-53041_CPHA-5-C5A	15	105	100.06	52.74	47.32				
Totals	11 dissipations		63.6 min							

a. Time is relative to where umax occurred

b. Houlsby and Teh, 1991

CONETEC	Haley & Aldrich	Job No: 16-53041 Date: 26-May-2016 13:07:41 Site: DP&L JM Stuart Station, Aberdeen, OH
		Sounding: SCPT16-HA-5-C3 Cone: AD419 Cone Area: 15 sq cm

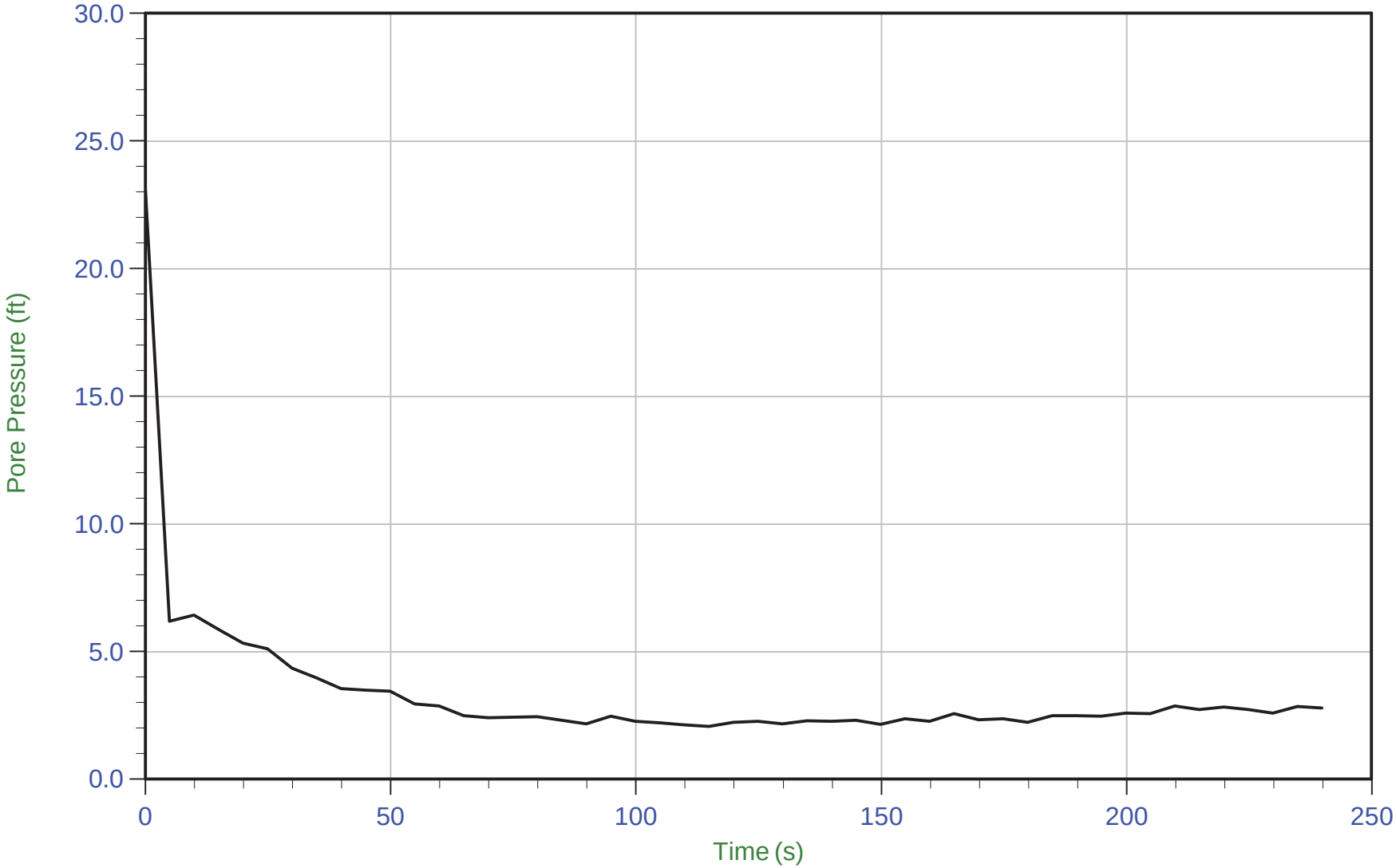


Trace Summary:

Filename: 16-53041_SPHA-5-C3.PPD
Depth: 3.050 m / 10.006 ft
Duration: 240.0 s

U Min: 2.2 ft
U Max: 38.6 ft

CONETEC	Haley & Aldrich	Job No: 16-53041
		Date: 26-May-2016 13:07:41
		Site: DP&L JM Stuart Station, Aberdeen, OH
		Sounding: SCPT16-HA-5-C3
		Cone: AD419
		Cone Area: 15 sq cm



Trace Summary:

Filename: 16-53041_SPHA-5-C3.PPD
Depth: 6.100 m / 20.013 ft
Duration: 240.0 s

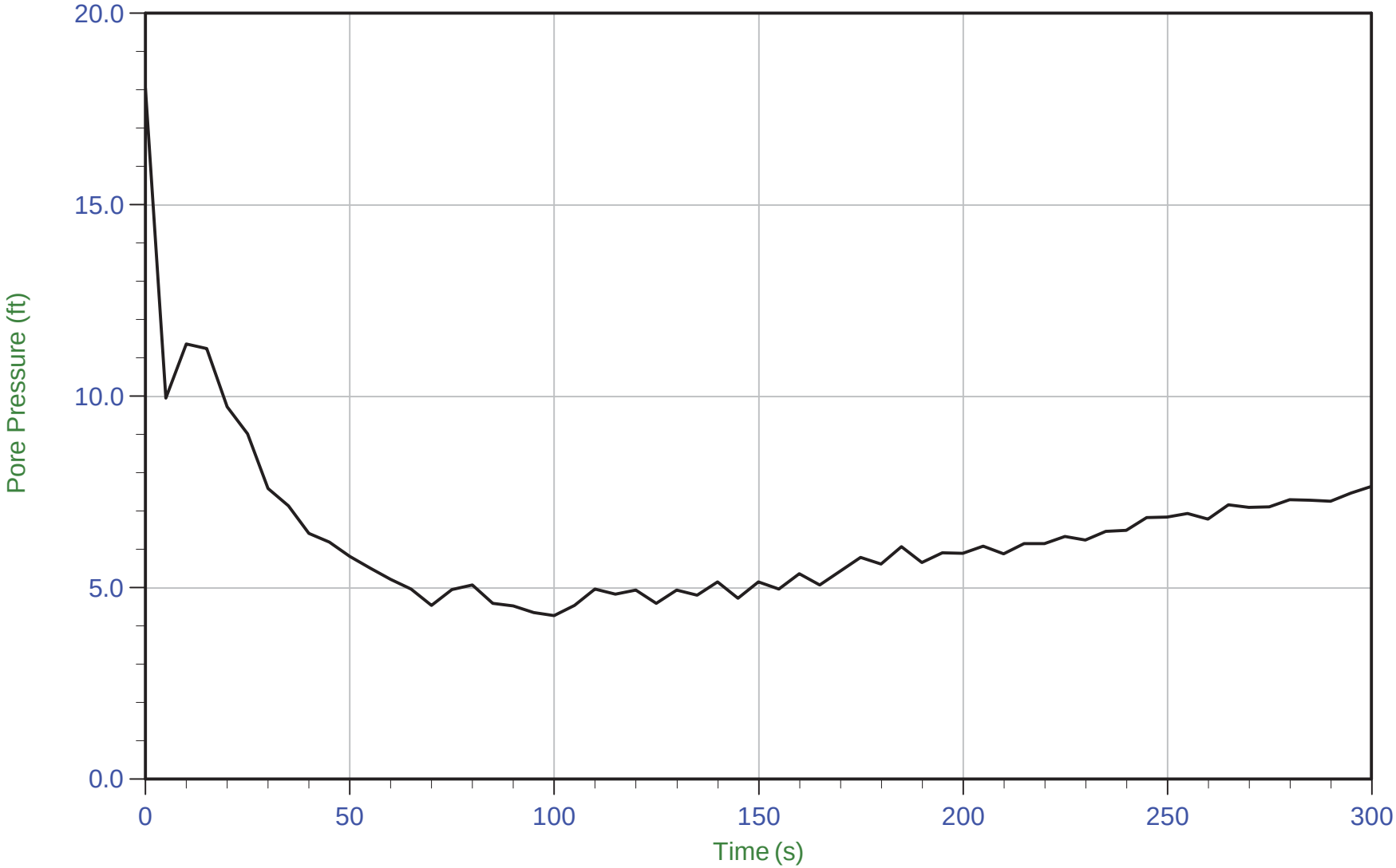
U Min: 2.1 ft
U Max: 23.1 ft

CONETEC

Haley & Aldrich

Job No: 16-53041
Date: 26-May-2016 13:07:41
Site: DP&L JM Stuart Station, Aberdeen, OH

Sounding: SCPT16-HA-5-C3
Cone: AD419
Cone Area: 15 sq cm



Trace Summary:

Filename: 16-53041_SPHA-5-C3.PPD
Depth: 9.150 m / 30.019 ft
Duration: 300.0 s

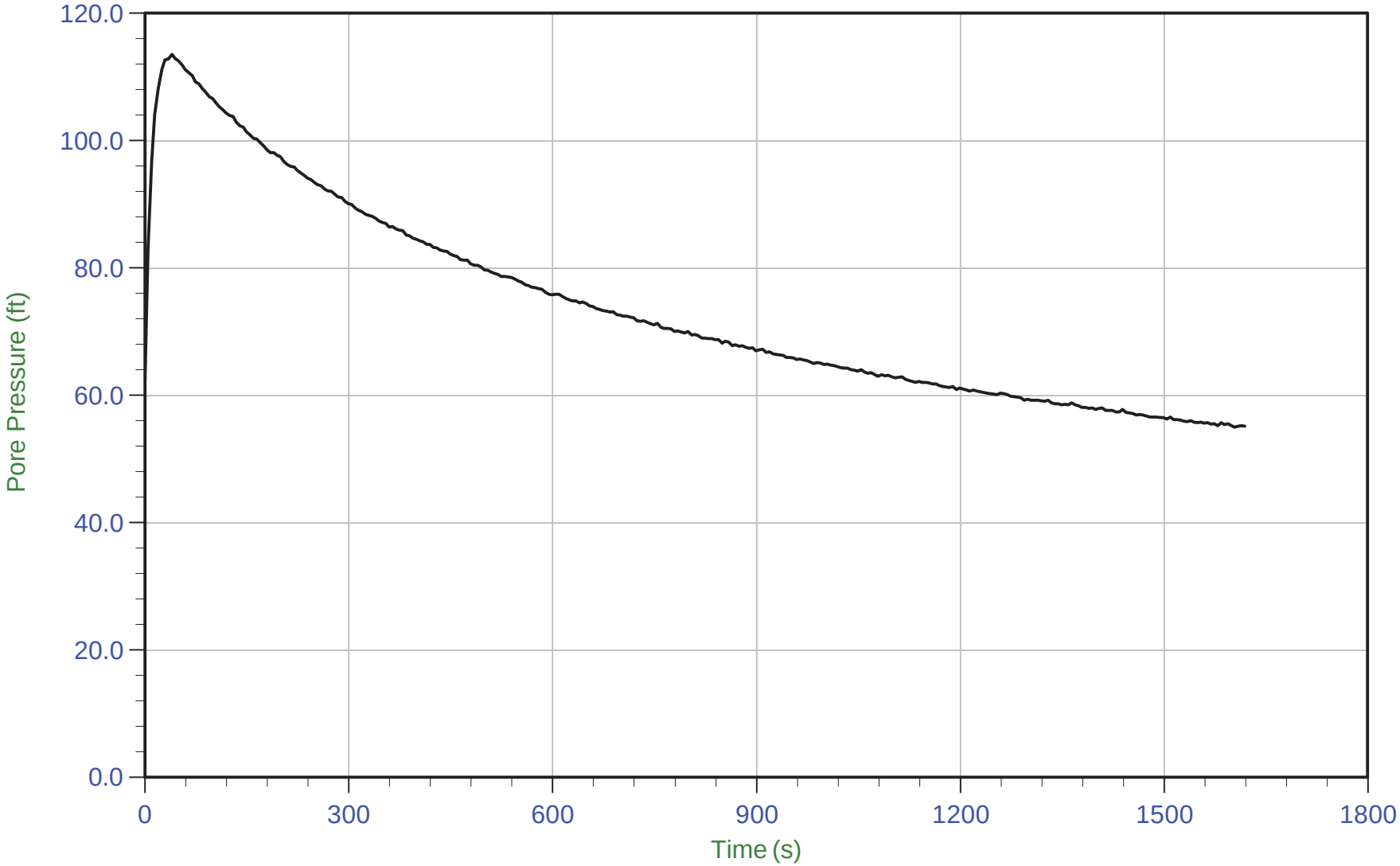
U Min: 4.3 ft
U Max: 18.0 ft

CONETEC

Haley & Aldrich

Job No: 16-53041
Date: 26-May-2016 13:07:41
Site: DP&L JM Stuart Station, Aberdeen, OH

Sounding: SCPT16-HA-5-C3
Cone: AD419
Cone Area: 15 sq cm



Trace Summary:

Filename: 16-53041_SPHA-5-C3.PPD
Depth: 12.200 m / 40.026 ft
Duration: 1620.0 s

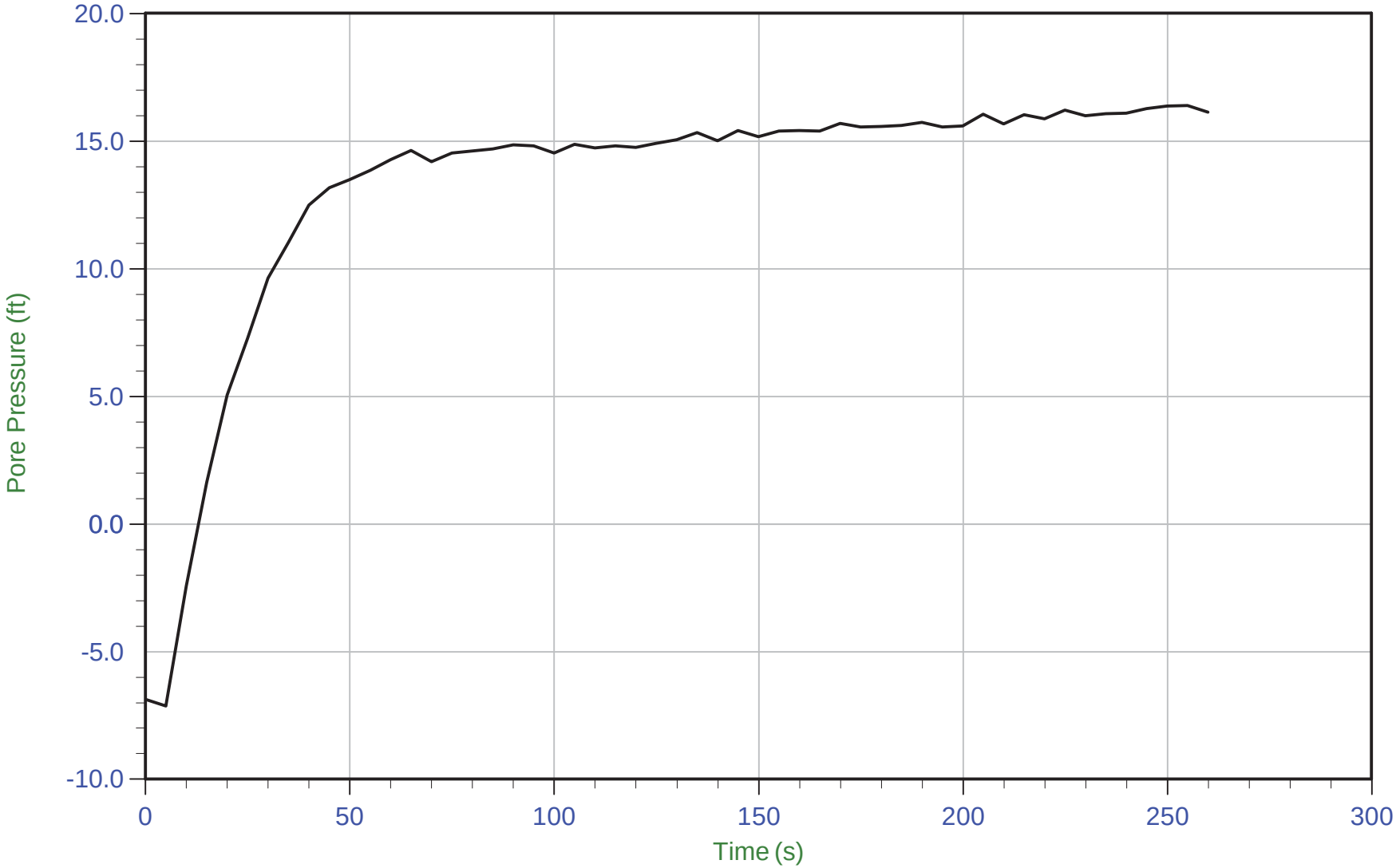
U Min: 55.0 ft
U Max: 113.6 ft

CONETEC

Haley & Aldrich

Job No: 16-53041
Date: 26-May-2016 13:07:41
Site: DP&L JM Stuart Station, Aberdeen, OH

Sounding: SCPT16-HA-5-C3
Cone: AD419
Cone Area: 15 sq cm

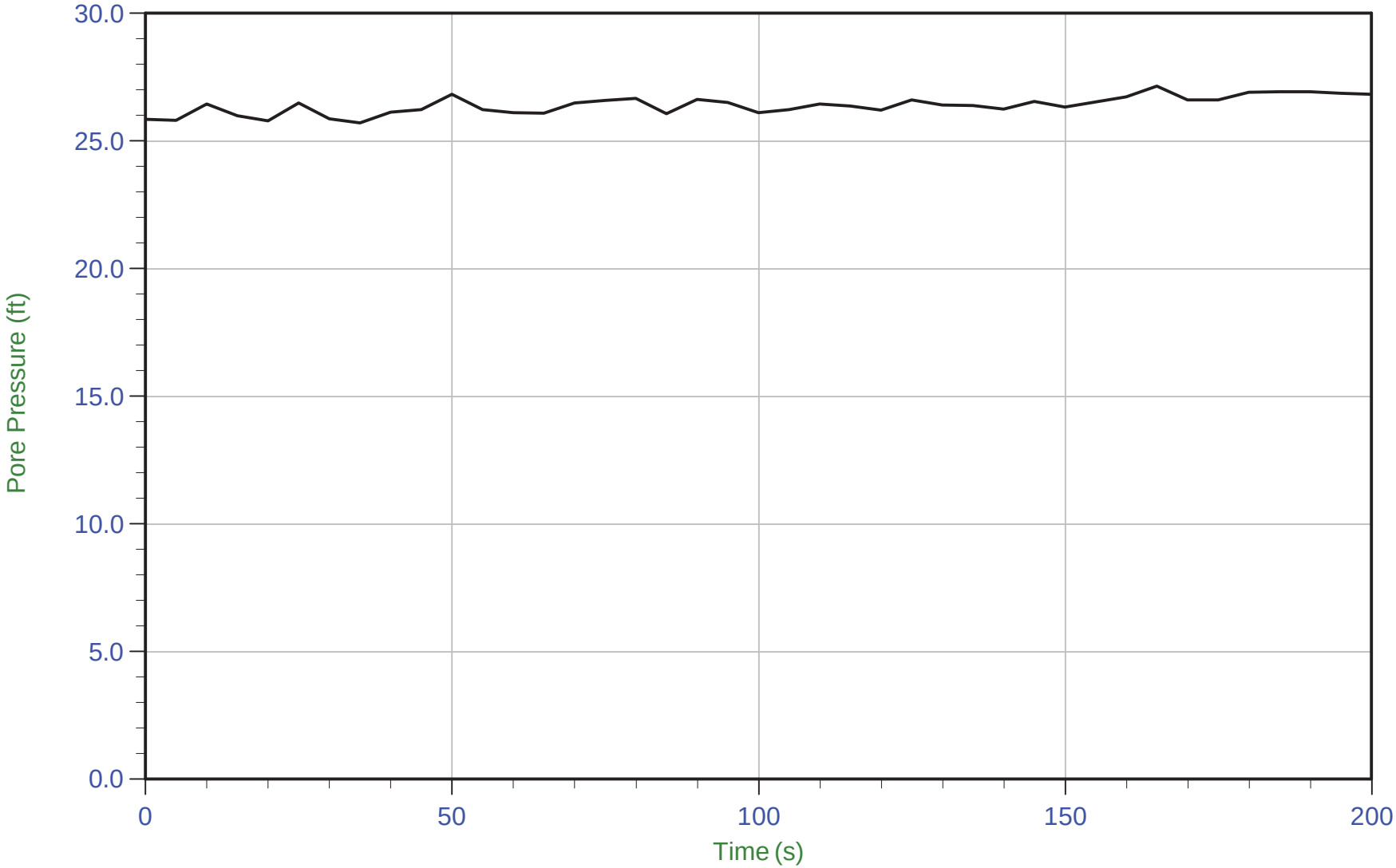


Trace Summary:

Filename: 16-53041_SPHA-5-C3.PPD
Depth: 18.300 m / 60.039 ft
Duration: 260.0 s

U Min: -7.1 ft
U Max: 16.4 ft

Haley & Aldrich	Job No: 16-53041 Date: 26-May-2016 13:07:41 Site: DP&L JM Stuart Station, Aberdeen, OH	Sounding: SCPT16-HA-5-C3 Cone: AD419 Cone Area: 15 sq cm



Trace Summary:

Filename: 16-53041_SPHA-5-C3.PPD
Depth: 21.350 m / 70.045 ft
Duration: 200.0 s

U Min: 25.7 ft
U Max: 27.2 ft

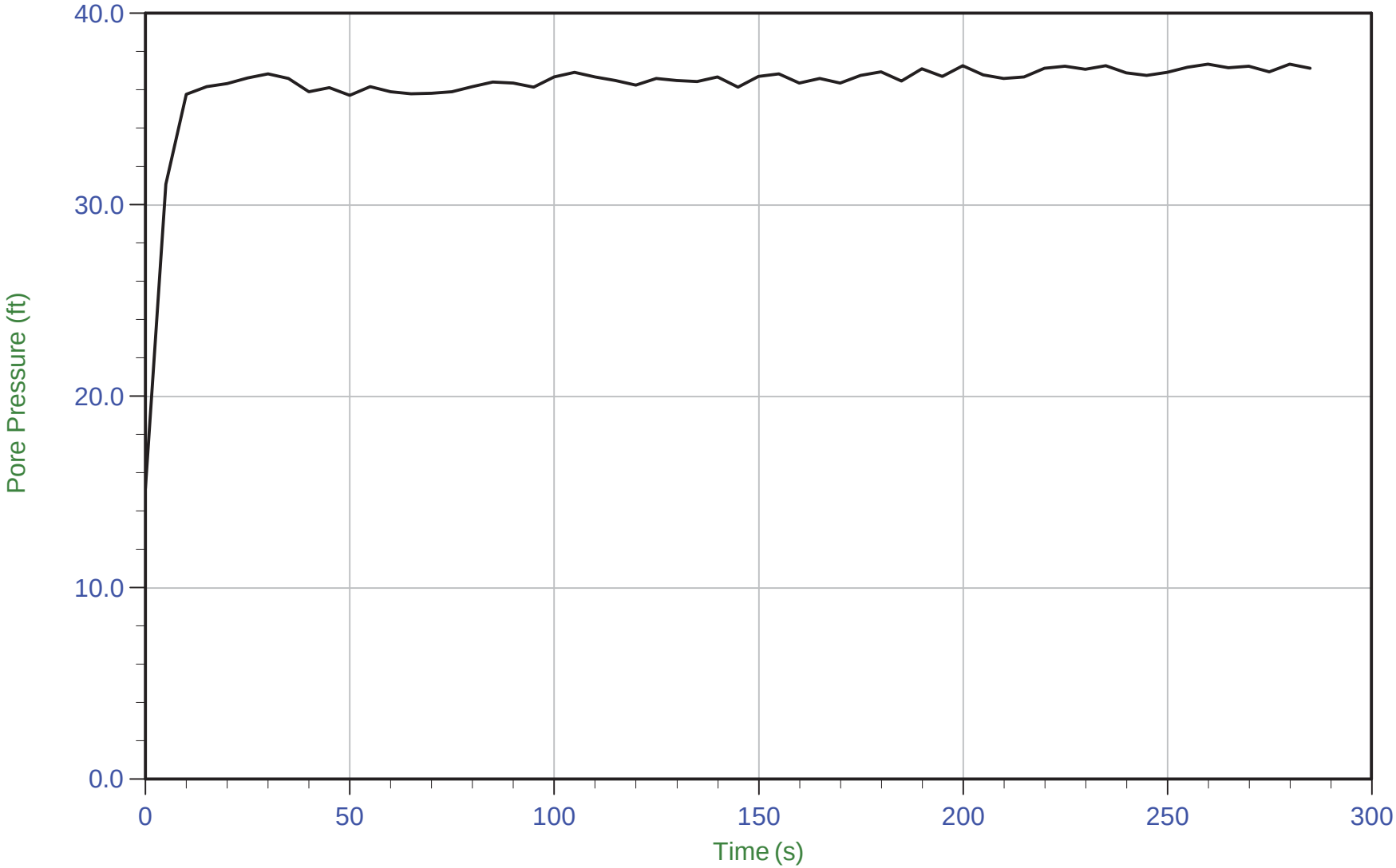
WT: 13.312 m / 43.674 ft
Ueq: 26.4 ft

CONETEC

Haley & Aldrich

Job No: 16-53041
Date: 26-May-2016 13:07:41
Site: DP&L JM Stuart Station, Aberdeen, OH

Sounding: SCPT16-HA-5-C3
Cone: AD419
Cone Area: 15 sq cm



Trace Summary:

Filename: 16-53041_SPHA-5-C3.PPD
Depth: 24.500 m / 80.380 ft
Duration: 285.0 s

U Min: 15.2 ft
U Max: 37.3 ft

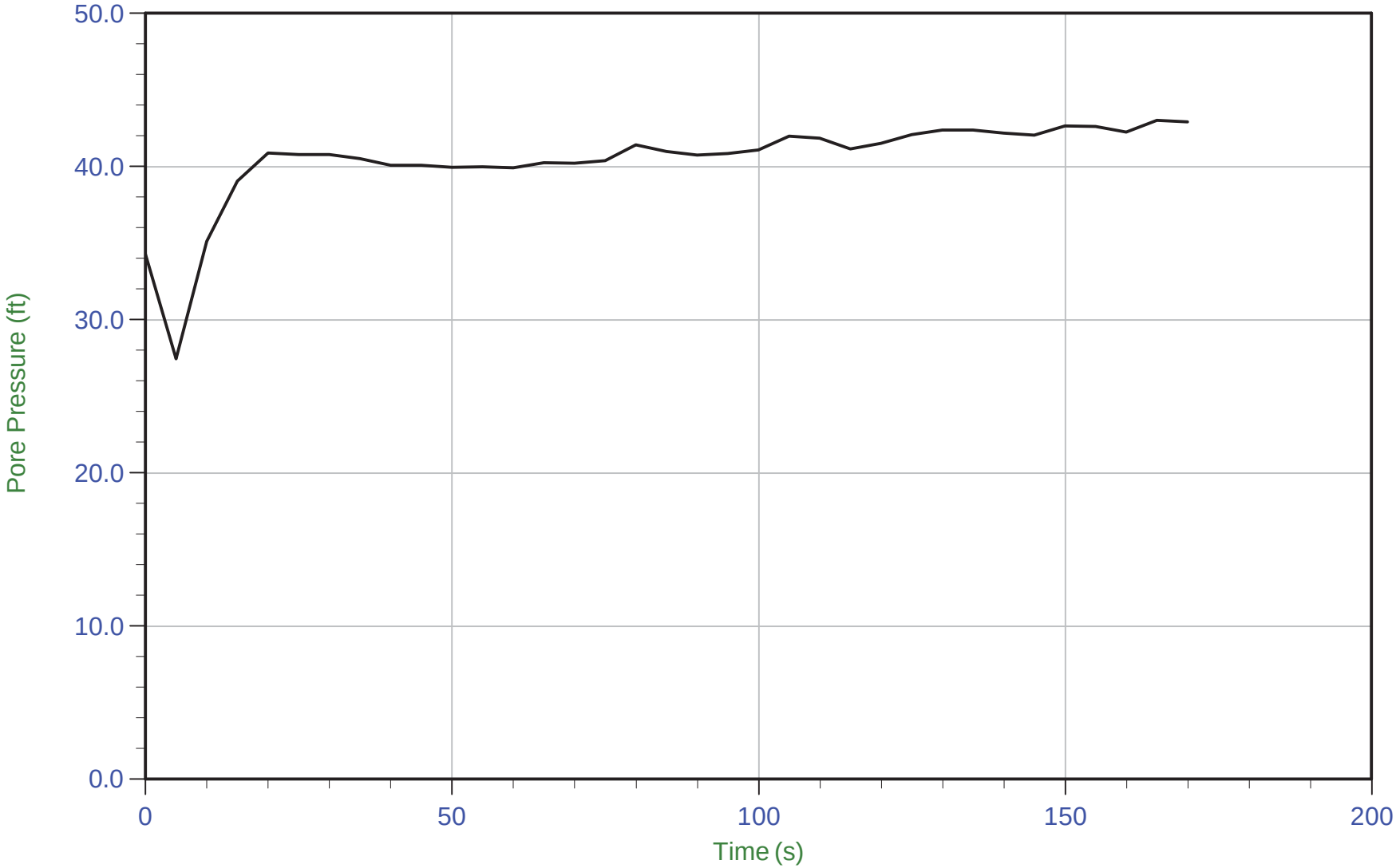
WT: 13.193 m / 43.283 ft
Ueq: 37.1 ft

CONETEC

Haley & Aldrich

Job No: 16-53041
Date: 26-May-2016 13:07:41
Site: DP&L JM Stuart Station, Aberdeen, OH

Sounding: SCPT16-HA-5-C3
Cone: AD419
Cone Area: 15 sq cm



Trace Summary:

Filename: 16-53041_SPHA-5-C3.PPD
Depth: 27.450 m / 90.058 ft
Duration: 170.0 s

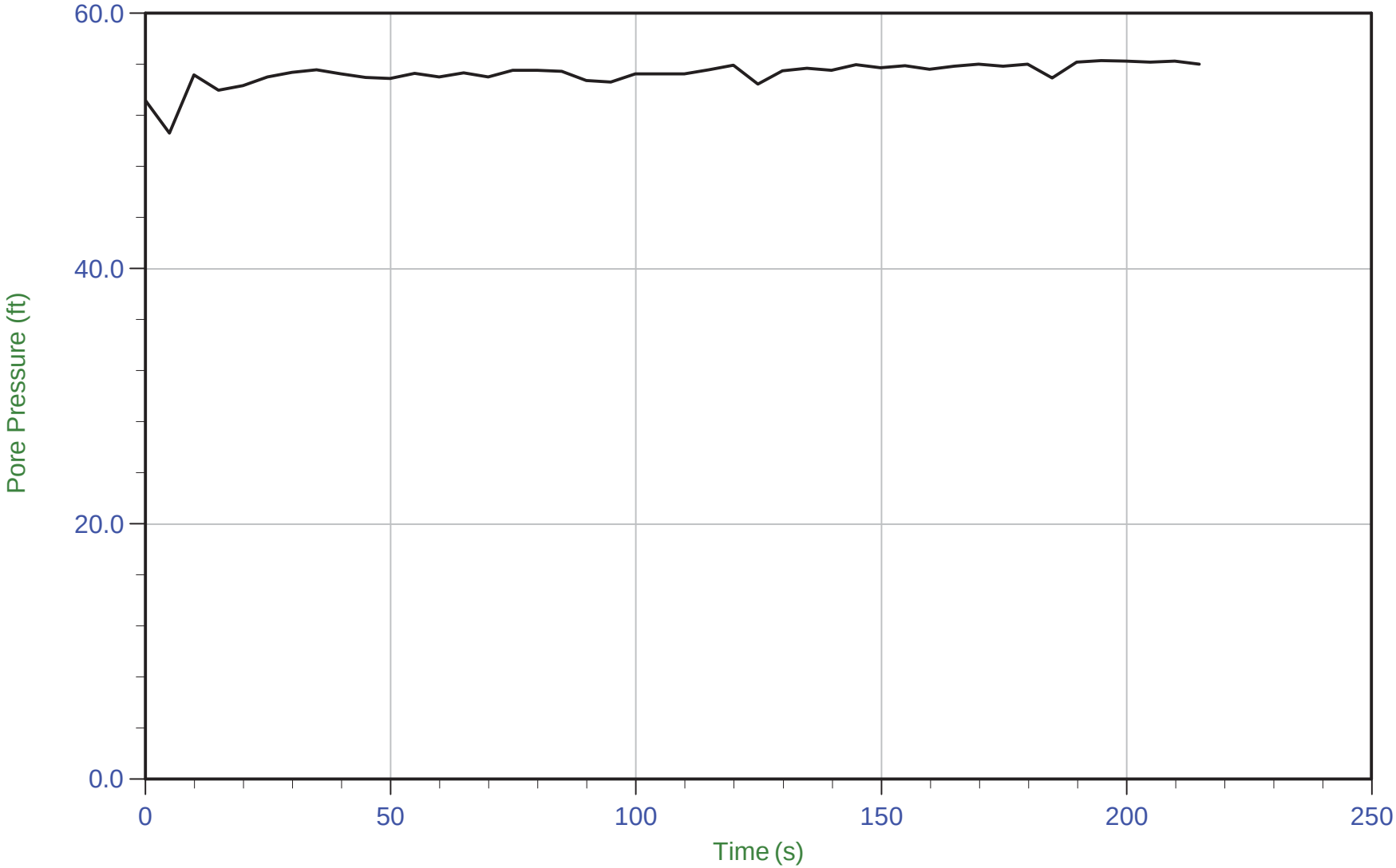
U Min: 27.4 ft
U Max: 43.0 ft

CONETEC

Haley & Aldrich

Job No: 16-53041
Date: 26-May-2016 13:07:41
Site: DP&L JM Stuart Station, Aberdeen, OH

Sounding: SCPT16-HA-5-C3
Cone: AD419
Cone Area: 15 sq cm



Trace Summary:

Filename: 16-53041_SPHA-5-C3.PPD
Depth: 30.500 m / 100.064 ft
Duration: 215.0 s

U Min: 50.6 ft
U Max: 56.3 ft

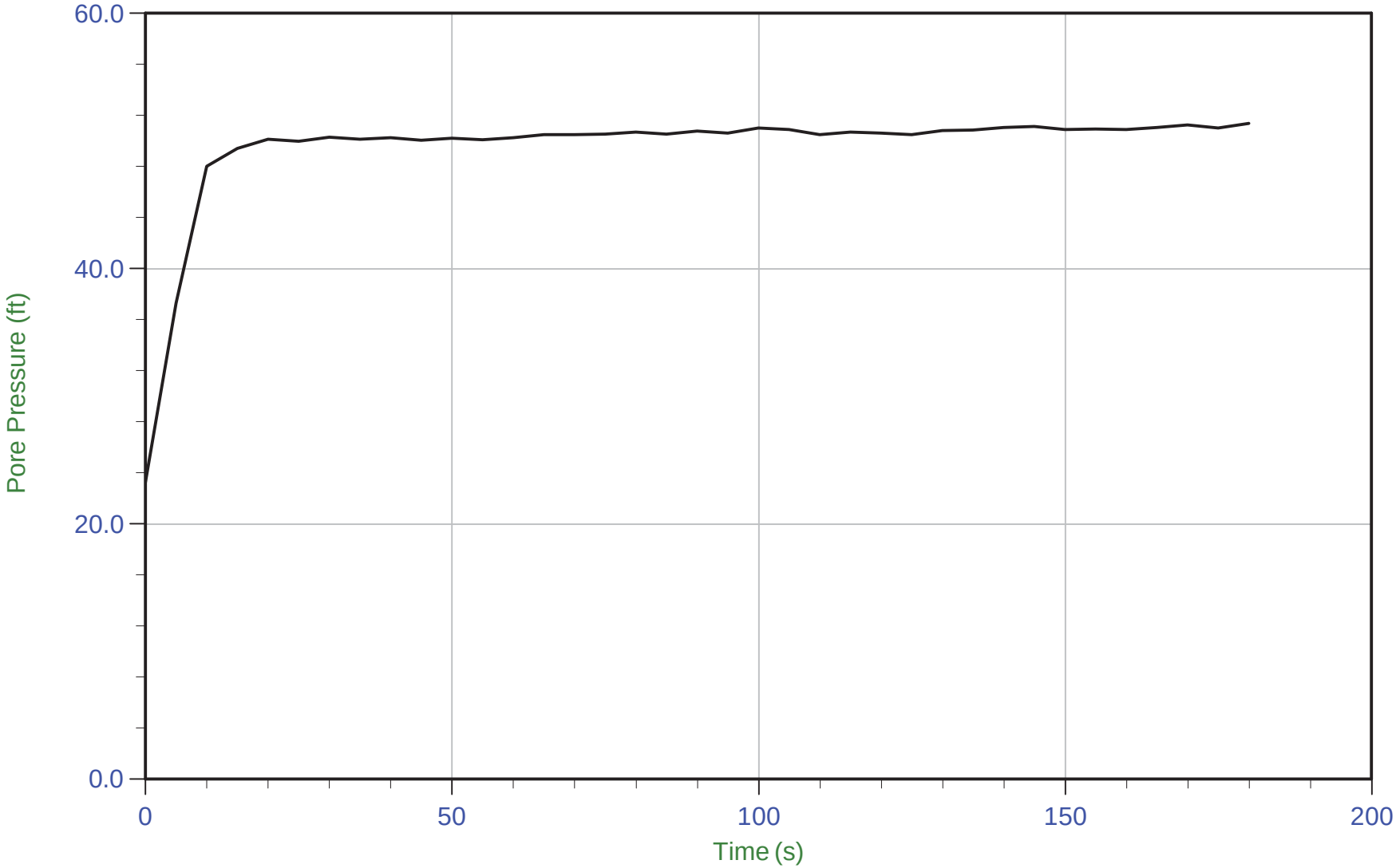
WT: 13.318 m / 43.694 ft
Ueq: 56.4 ft

CONETEC

Haley & Aldrich

Job No: 16-53041
Date: 25-May-2016 12:22:46
Site: DP&L JM Stuart Station, Aberdeen, OH

Sounding: CPT16-HA-5-C4
Cone: AD419
Cone Area: 15 sq cm



Trace Summary:

Filename: 16-53041_CPHA-5-C4.PPD
Depth: 30.500 m / 100.064 ft
Duration: 180.0 s

U Min: 23.2 ft
U Max: 51.4 ft

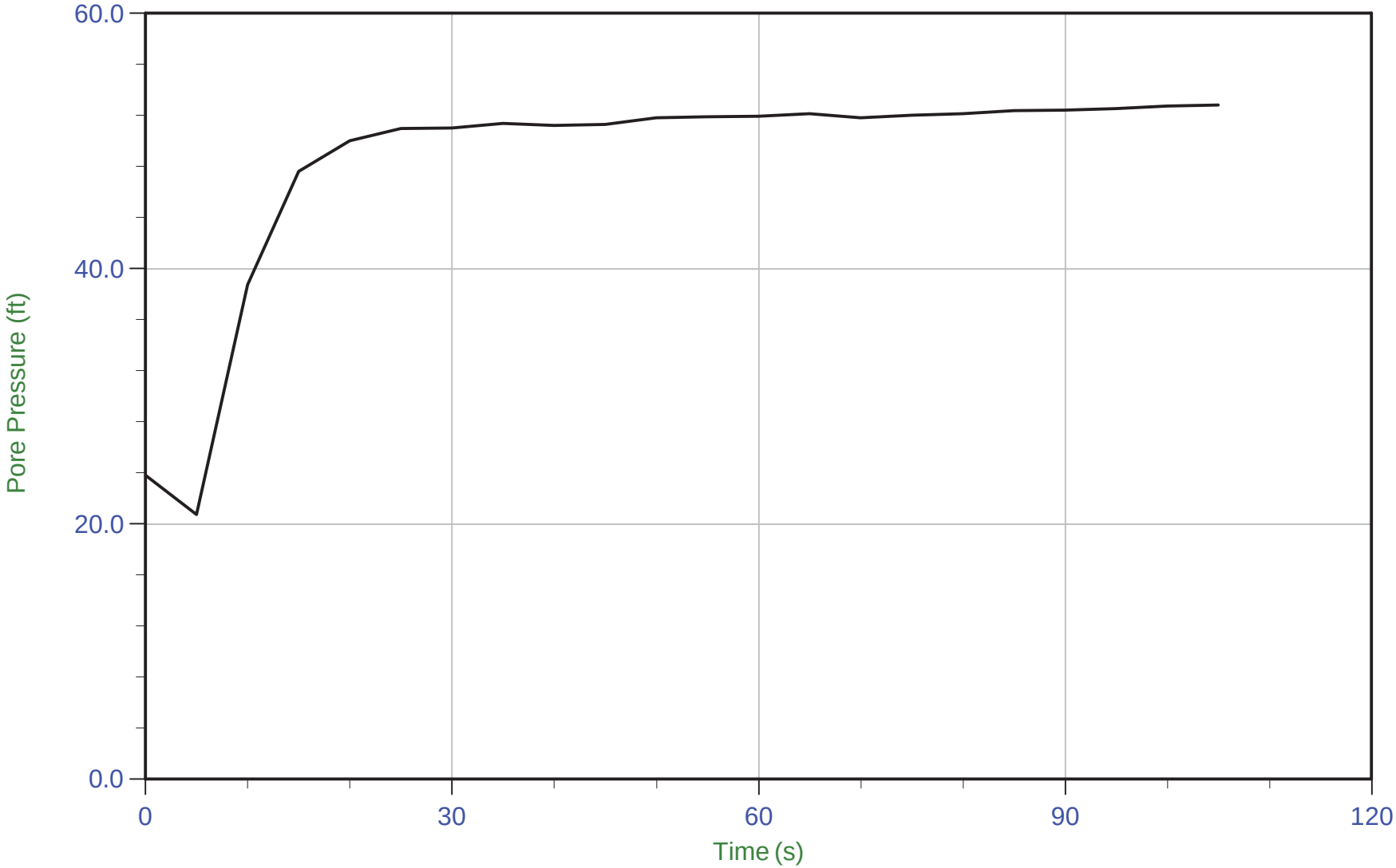
WT: 14.959 m / 49.077 ft
Ueq: 51.0 ft

CONETEC

Haley & Aldrich

Job No: 16-53041
Date: 26-May-2016 08:38:54
Site: DP&L JM Stuart Station, Aberdeen, OH

Sounding: CPT16-HA-5-C5A
Cone: AD419
Cone Area: 15 sq cm



Trace Summary:

Filename: 16-53041_CPHA-5-C5A.PPD
Depth: 30.500 m / 100.064 ft
Duration: 105.0 s

U Min: 20.8 ft
U Max: 52.8 ft

WT: 14.424 m / 47.323 ft
Ueq: 52.7 ft

APPENDIX B

Laboratory Test Results

Summary of Laboratory Results

Borehole	Depth	Sample Type	Liquid Limit	Plastic Limit	Plasticity Index	Classification	Water Content (%)	Unconfined Compressive Strength (tsf)	Dry Density (pcf)	Wet Density (pcf)	Max. Dry Density (pcf)	Opt. Water Content (%)	CBR	Swell (%)	RQD	Percent Recovery	Percent Finer (No. 200)
HA-5-B1	1.0		28	19	9	SANDY LEAN CLAY (CL)	14.5										58
HA-5-B1	4.0					* CLAYEY SAND W/ GRAVEL (SC)	14.2										34
HA-5-B1	29.0		43	25	18	LEAN CLAY (CL)	22.6										99
HA-5-B2	4.0					* SANDY CLAY (CL)	20.8										55
HA-5-B2	19.0					* SANDY CLAY (CL)	25.6										24
HA-5-B2	24.0					* SANDY CLAY (CL)	33.3										45
HA-5-B2	30.0		30	20	10	SANDY LEAN CLAY (CL)	14.5										65
HA-5-B2	36.0		60	32	28	ELASTIC SILT (MH)	35.1										93
HA-5-B2	48.0					* POORLY GRADED SAND W/ CLAY (SP-SC)	23.5										7
HA-5-B3	9.0					* SANDY CLAY (CL)	28.0										27
HA-5-B3	41.0					POORLY GRADED SAND (SP)	25.0										3
HA-5-B4OW	9.0					* SANDY CLAY (CL)	29.4										23
HA-5-B4OW	29.0					* WELL GRADED SAND W/ CLAY (SW-SC)	37.7										7
HA-5-B4OW	39.0					* SANDY CLAY (CL)	56.1										21
HA-5-B4OW	54.0					* POORLY GRADED SAND W/ CLAY (SP-SC)	23.6										5
HA-6-B1	1.0		28	21	7	SANDY SILTY CLAY (CL-ML)	11.2										59
HA-6-B1	4.0		32	20	12	LEAN CLAY with SAND (CL)	18.3										70
HA-6-B1	39.0					* CLAYEY SAND WITH GRAVEL (SC)	14.3										18
HA-6-B1	54.0					* POORLY GRADED SAND W/ CLAY (SP-SC)	23.2										6
HA-7-B1	9.0		35	21	14	LEAN CLAY with SAND (CL)	12.7										80
HA-7-B1	34.0					* SILTY SAND (SM)	18.5										
HA-7-B1	36.0		22	19	3	SILTY SAND (SM)	15.6										34
HA-7-B1	54.0					* SILTY CLAYEY SAND (SC-SM)	20.1										37
HA-7-B2	4.0		28	19	9	SANDY LEAN CLAY (CL)	17.5										64
HA-7-B2	13.0		27	21	6	SILTY CLAY with SAND (CL-ML)	25.3										71
HA-7-B2	23.0					POORLY GRADED SAND (SP)	20.5										3

CSI of Cincinnati
11162 Luschek Drive
Cincinnati, Ohio 45241
Phone: 513.252.2059
Fax: 888.792.3121

SS - Split Spoon Sample
GRAB - Bulk Grab Sample

PROJECT INFORMATION

Client: Haley & Aldrich
Project Name: JM Stuart Station
Project Number: CN160050
Project Location: Abeerdeen, OH

Summary of Laboratory Results

Borehole	Depth	Sample Type	Liquid Limit	Plastic Limit	Plasticity Index	Classification	Water Content (%)	Unconfined Compressive Strength (tsf)	Dry Density (pcf)	Wet Density (pcf)	Max. Dry Density (pcf)	Opt. Water Content (%)	CBR	Swell (%)	RQD	Percent Recovery	Percent Finer (No. 200)
HA-10-B1	0.0		38	22	16	CLAYEY SAND (SC)	13.6										34
HA-10-B1	9.0		N/A	N/A	N/A	* SILTY SAND (SM)	15.4										28
HA-10-B1	14.0		N/A	N/A	N/A	* SILTY SAND (SM)	16.4										24
HA-10-B1	24.0					* SILTY SAND (SM)	17.2										29
HA-10-B1	29.0					* SILTY SAND W/ GRAVEL (SM)	5.2										14

NOTES:

*** INDICATES VISUALLY CLASSIFIED SAMPLES**
BORINGS HA-10-B1 SAMPLES S3 (9') & S4 (14') ARE NON-PLASTIC

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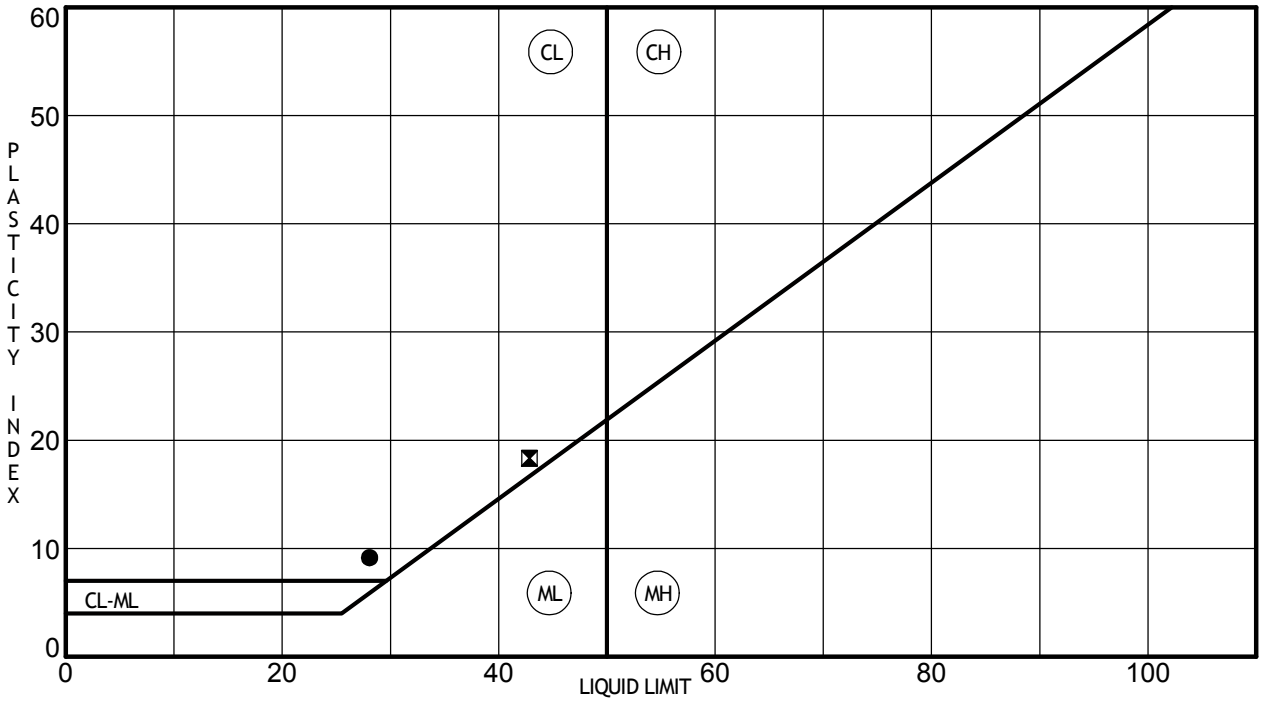
11162 Luschek Drive
Cincinnati, Ohio 45241
Phone: 513.252.2059
Fax: 888.792.3121

SS - Split Spoon Sample
GRAB - Bulk Grab Sample

PROJECT INFORMATION

Client: Haley & Aldrich
Project Name: JM Stuart Station
Project Number: CN160050
Project Location: Abeerdeen, OH

Liquid and Plastic Limits Test Report



	Boring	Depth (ft)	LL	PL	PI	Water Content	% < #40	% < #200	USCS	Description
●	HA-5-B1	1.0	28	19	9	14.5		58	(CL)	SANDY LEAN CLAY (CL)
⧗	HA-5-B1	29.0	43	25	18	22.6	100	99	(CL)	LEAN CLAY (CL)

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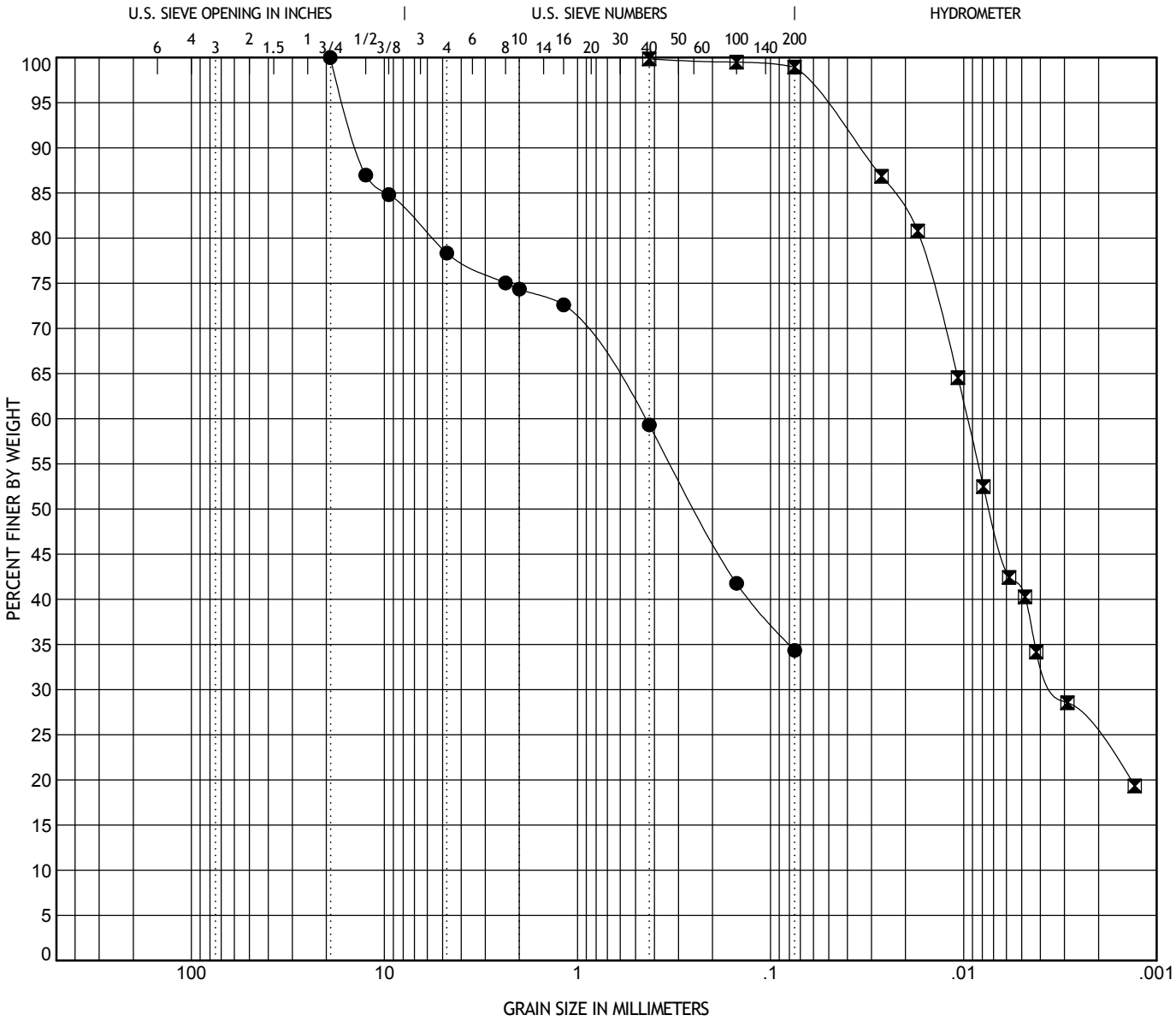
11162 Luschek Drive
Cincinnati, Ohio 45241
Phone: 513.252.2059
Fax: 888.792.3121

PROJECT INFORMATION

Client: Haley & Aldrich
Project Name: JM Stuart Station
Project Number: CN160050
Project Location: Abeerdeen, OH

GRAIN SIZE DISTRIBUTION



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Boring	Depth (ft)	Classification	LL	PL	PI	Cc	Cu
●	HA-5-B1	4.0	* CLAYEY SAND W/ GRAVEL (SC)					
⊠	HA-5-B1	29.0	LEAN CLAY (CL)	43	25	18		

	Boring	Depth (ft)	D95	D60	D50	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	HA-5-B1	4.0	16.231	.448	.245			21.7	44.0	34.3	
⊠	HA-5-B1	29.0	.054	.01	.007	.003			0.9	58.2	40.7

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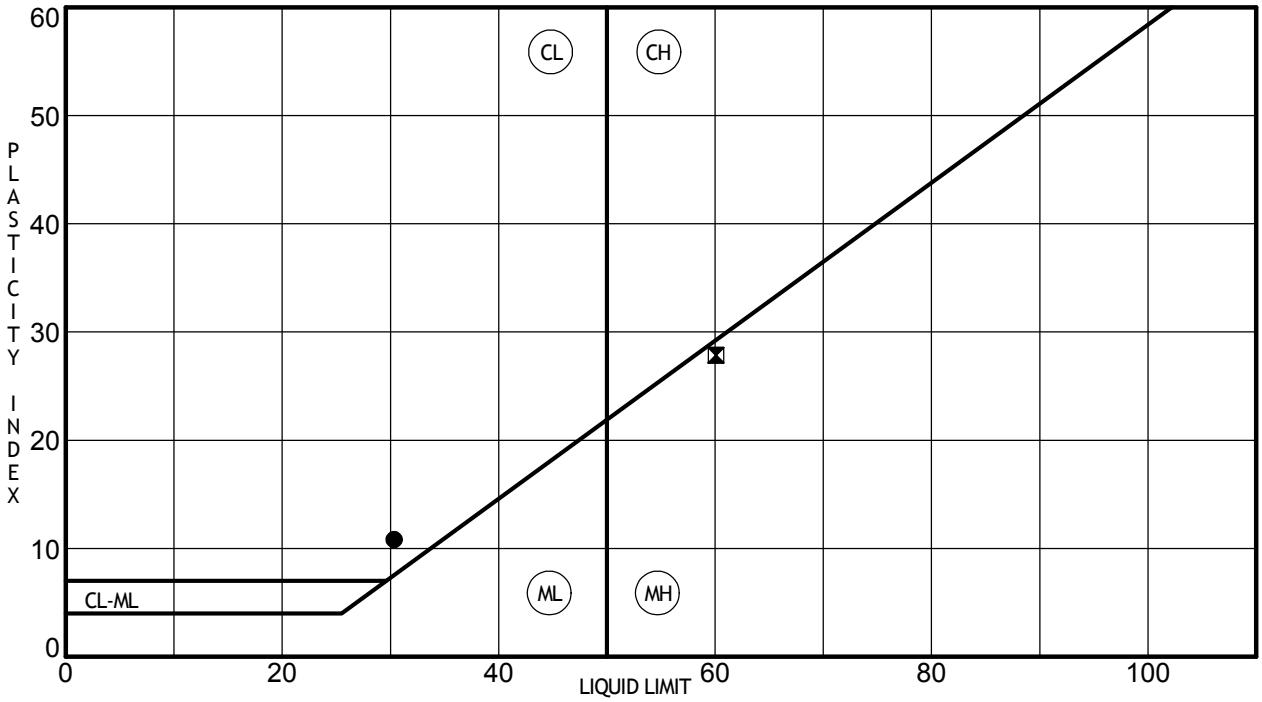
PROJECT INFORMATION

Client: Haley & Aldrich
Project Name: JM Stuart Station
Project Number: CN160050
Project Location: Abeerdeen, OH

NOTE: * INDICATES VISUALLY CLASSIFIED SAMPLE

Liquid and Plastic Limits Test Report



	Boring	Depth (ft)	LL	PL	PI	Water Content	% < #40	% < #200	USCS	Description
●	HA-5-B2	30.0	30	20	10	14.5		65	(CL)	SANDY LEAN CLAY (CL)
⊠	HA-5-B2	36.0	60	32	28	35.1	94	93	(MH)	ELASTIC SILT (MH)

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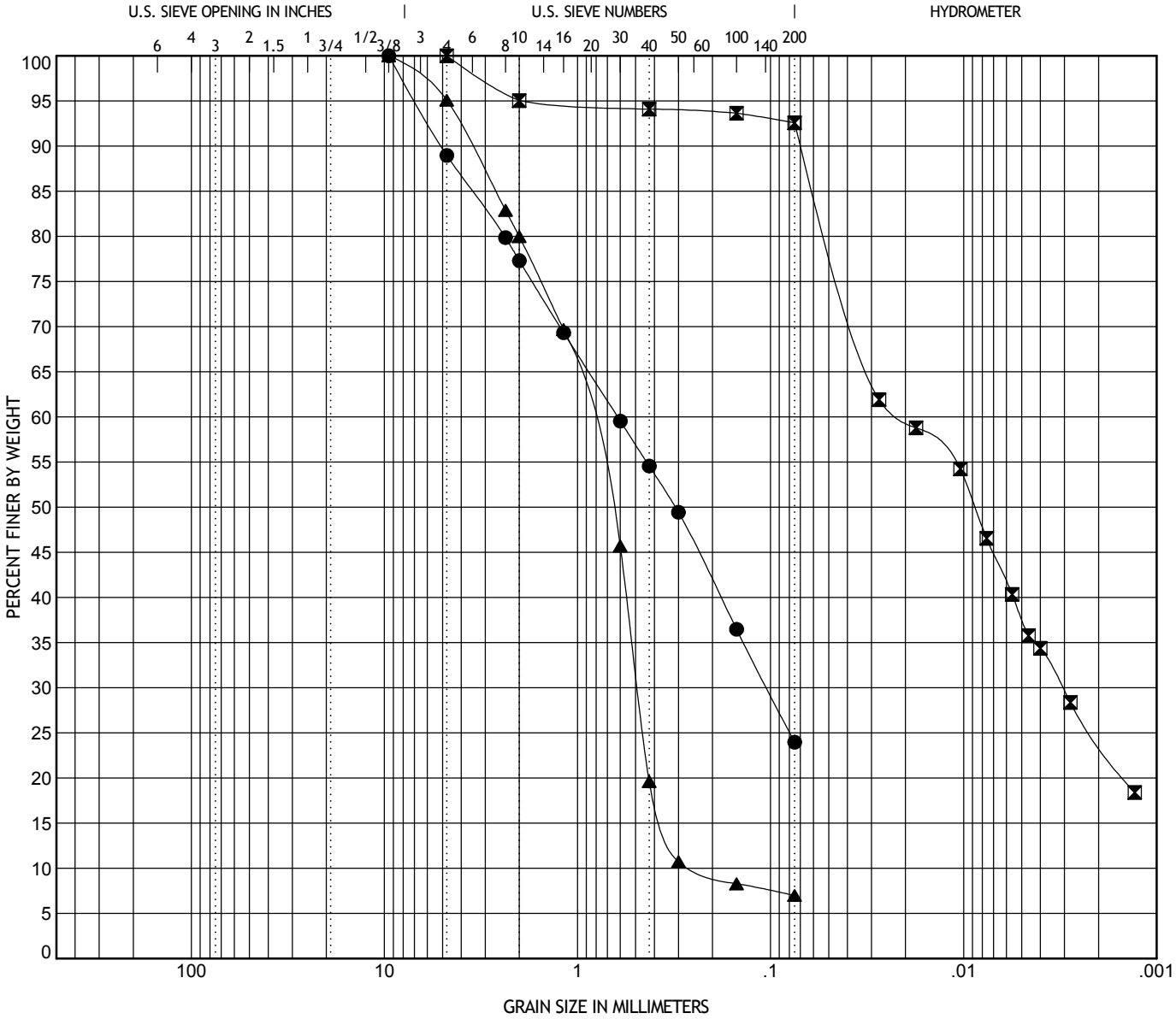
GRAIN SIZE DISTRIBUTION



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Boring	Depth (ft)	Classification	LL	PL	PI	Cc	Cu
●	HA-5-B2	19.0	* SANDY CLAY (CL)					
⊠	HA-5-B2	36.0	ELASTIC SILT (MH)	60	32	28		
▲	HA-5-B2	48.0	* POORLY GRADED SAND WITH CLAY (SP-SC)				1.09	3.68

	Boring	Depth (ft)	D95	D60	D50	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	HA-5-B2	19.0	6.94	.62	.312	.105		11.0	65.0	24.0	
⊠	HA-5-B2	36.0	1.916	.021	.009	.003		0.0	7.4	54.9	37.7
▲	HA-5-B2	48.0	4.728	.898	.677	.488	.244	4.9	88.1	7.0	

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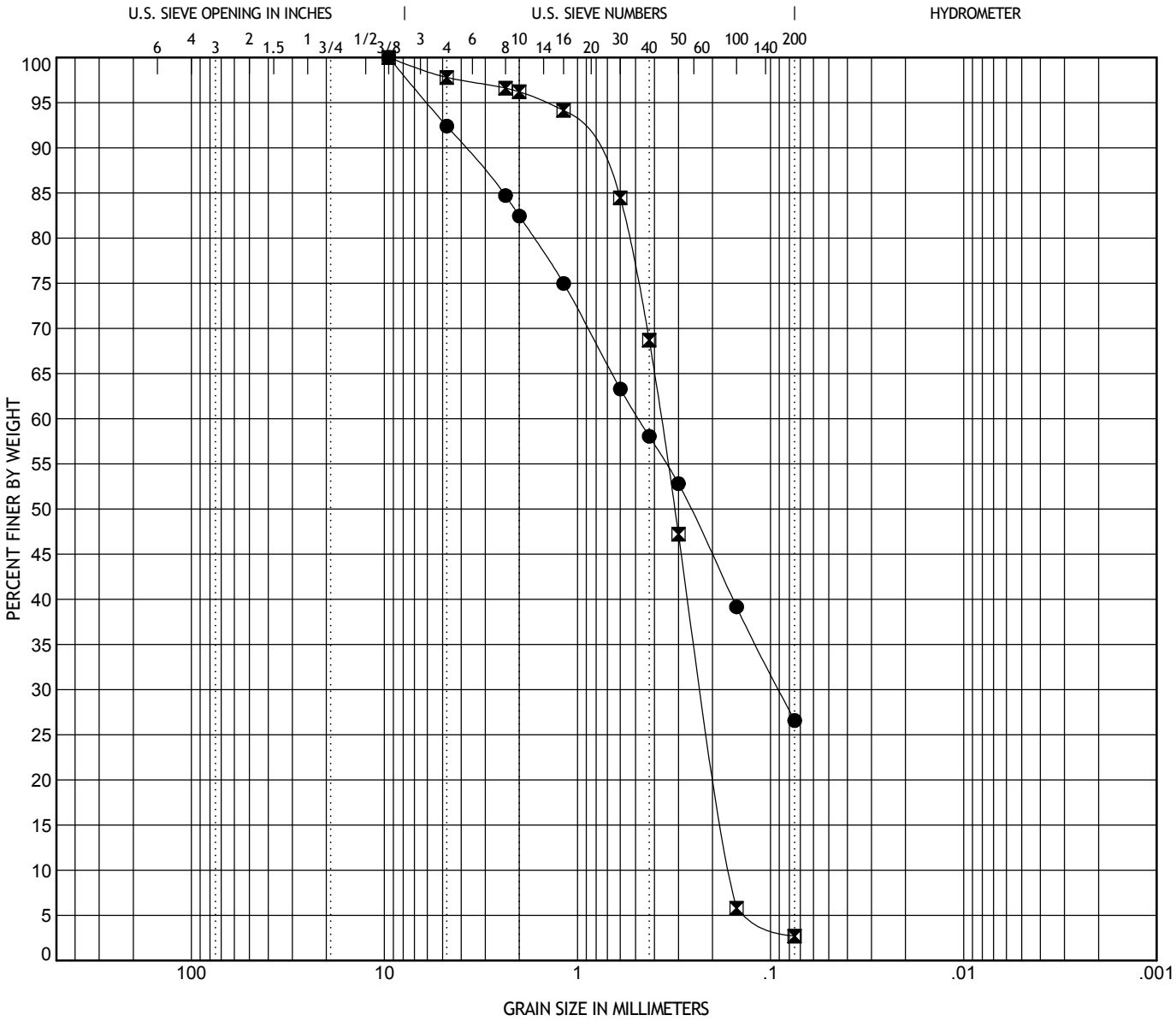
NOTE: * INDICATES VISUALLY CLASSIFIED SAMPLES

GRAIN SIZE DISTRIBUTION



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Boring	Depth (ft)	Classification	LL	PL	PI	Cc	Cu
●	HA-5-B3	9.0	* SANDY CLAY (CL)					
⊠	HA-5-B3	41.0	POORLY GRADED SAND (SP)				0.85	2.29

	Boring	Depth (ft)	D95	D60	D50	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	HA-5-B3	9.0	6.021	.483	.26	.091		7.6	65.8	26.6	
⊠	HA-5-B3	41.0	1.469	.369	.314	.225	.161	2.2	95.1	2.7	

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PROJECT INFORMATION

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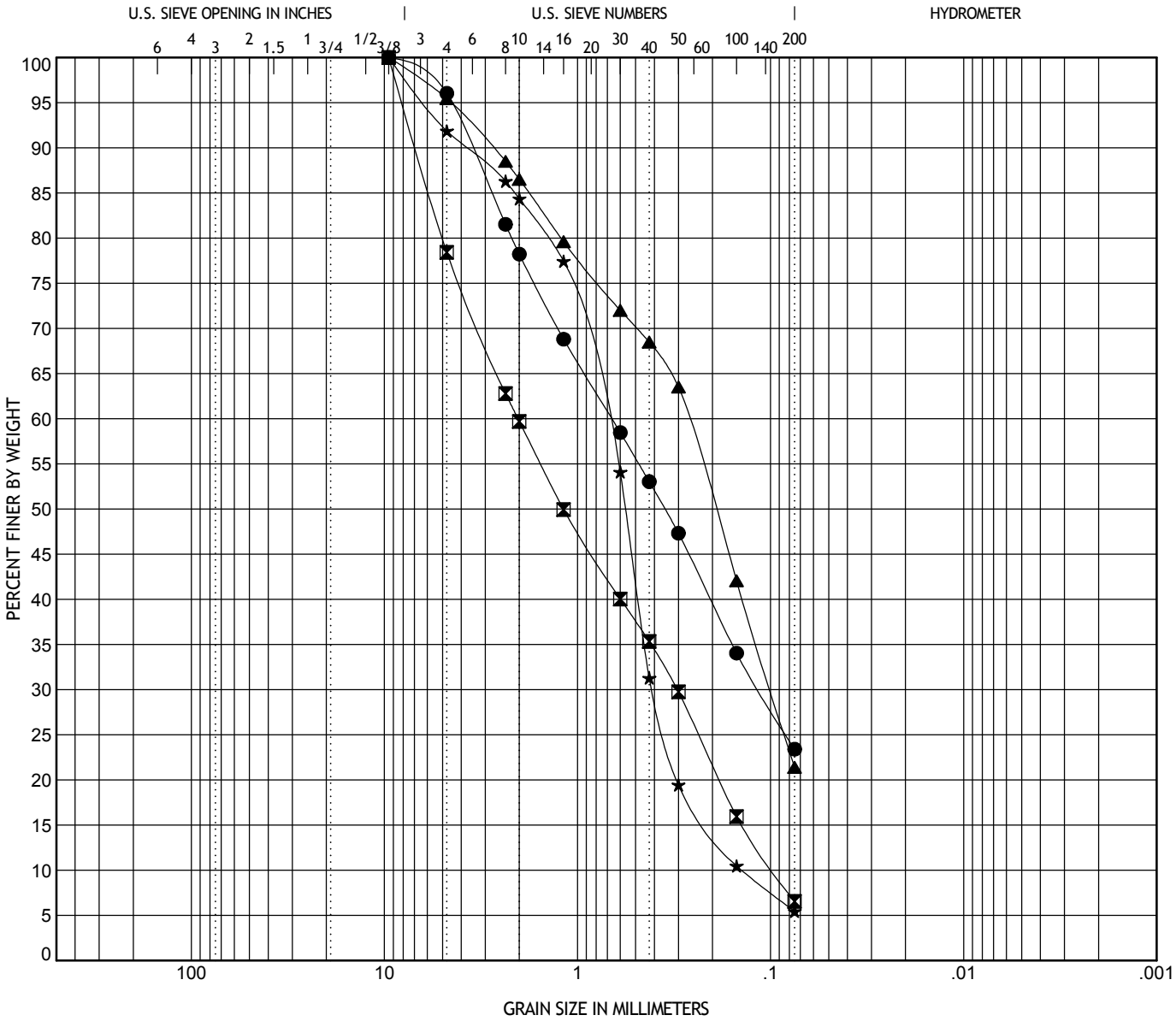
Project Number: CN160050
Project Location: Abeerdeen, OH

NOTE: * INDICATES VISUALLY CLASSIFIED SAMPLES

GRAIN SIZE DISTRIBUTION



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Boring	Depth (ft)	Classification	LL	PL	PI	Cc	Cu
●	HA-5-B4OW	9.0	* SANDY CLAY (CL)					
⊠	HA-5-B4OW	29.0	* WELL GRADED SAND W/ CLAY (SW-SC)				0.47	21.01
▲	HA-5-B4OW	39.0	* SANDY CLAY (CL)					
★	HA-5-B4OW	54.0	* POORLY GRADED SAND W/ CLAY (SP-SC)				1.68	5.07

	Boring	Depth (ft)	D95	D60	D50	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	HA-5-B4OW	9.0	4.518	.663	.353	.115		4.0	72.6	23.4	
⊠	HA-5-B4OW	29.0	8.09	2.032	1.183	.305	.097	21.6	71.9	6.5	
▲	HA-5-B4OW	39.0	4.539	.268	.194	.1		4.5	74.0	21.4	
★	HA-5-B4OW	54.0	6.205	.712	.564	.409	.14	8.1	86.4	5.5	

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PROJECT INFORMATION

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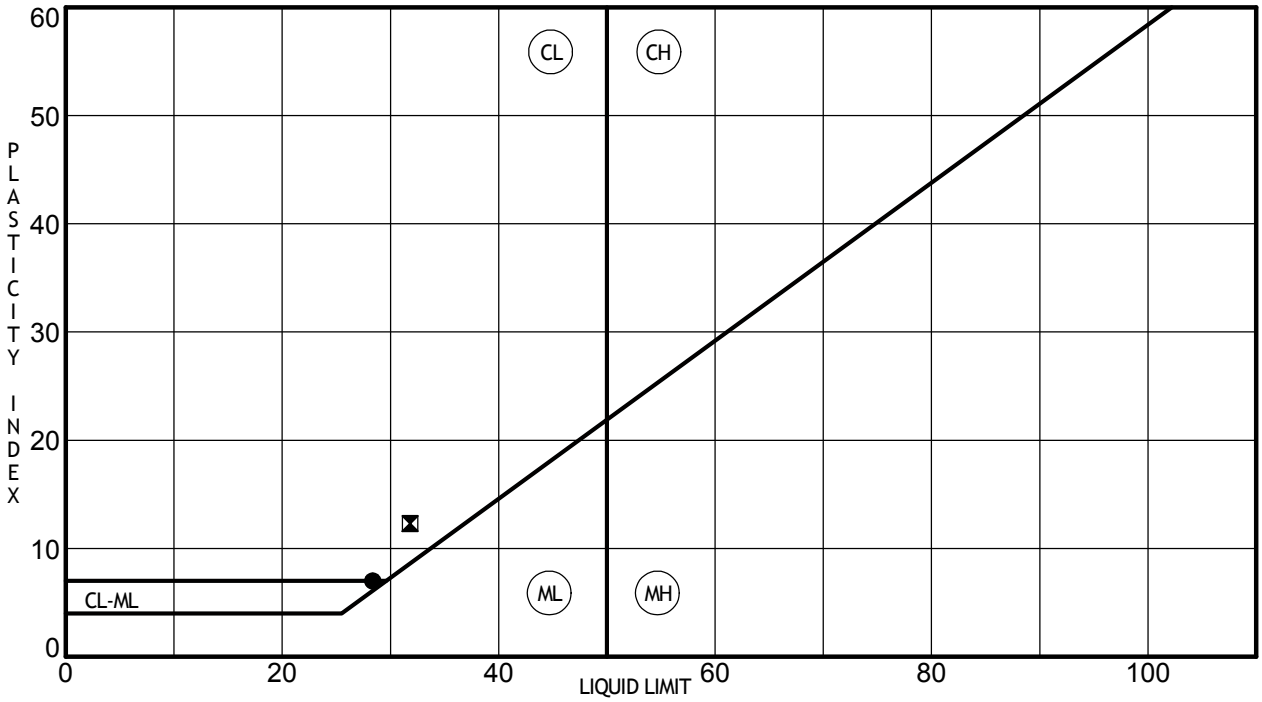
NOTE: * INDICATES VISUALLY CLASSIFIED SAMPLES

Liquid and Plastic Limits Test Report



	Boring	Depth (ft)	LL	PL	PI	Water Content	% < #40	% < #200	USCS	Description
●	HA-6-B1	1.0	28	21	7	11.2		59	(CL-ML)	SANDY SILTY CLAY (CL-ML)
⧗	HA-6-B1	4.0	32	20	12	18.3	90	70	(CL)	LEAN CLAY with SAND (CL)

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PROJECT INFORMATION

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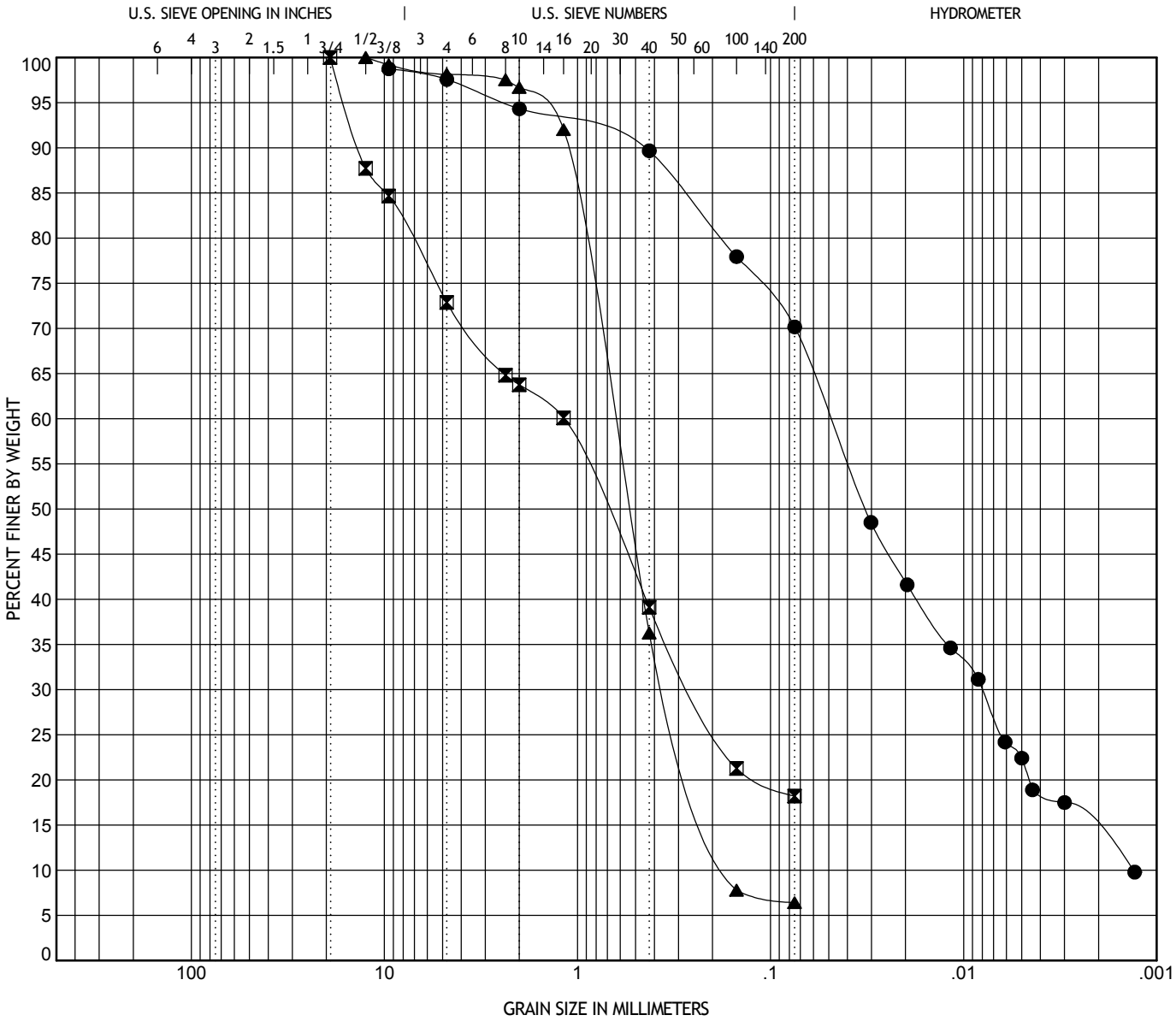
GRAIN SIZE DISTRIBUTION



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Boring	Depth (ft)	Classification	LL	PL	PI	Cc	Cu
●	HA-6-B1	4.0	LEAN CLAY with SAND (CL)	32	20	12	0.98	36.79
⊠	HA-6-B1	39.0	* CLAYEY SAND W/ GRAVEL (SC)					
▲	HA-6-B1	54.0	* POORLY GRADED SAND W/ CLAY (SP-SC)				1.07	4.04

	Boring	Depth (ft)	D95	D60	D50	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	HA-6-B1	4.0	2.398	.049	.032	.008	.001	1.2	27.4	47.7	22.4
⊠	HA-6-B1	39.0	16.071	1.174	.722	.25		27.1	54.7	18.2	
▲	HA-6-B1	54.0	1.654	.656	.546	.338	.163	1.8	91.8	6.4	

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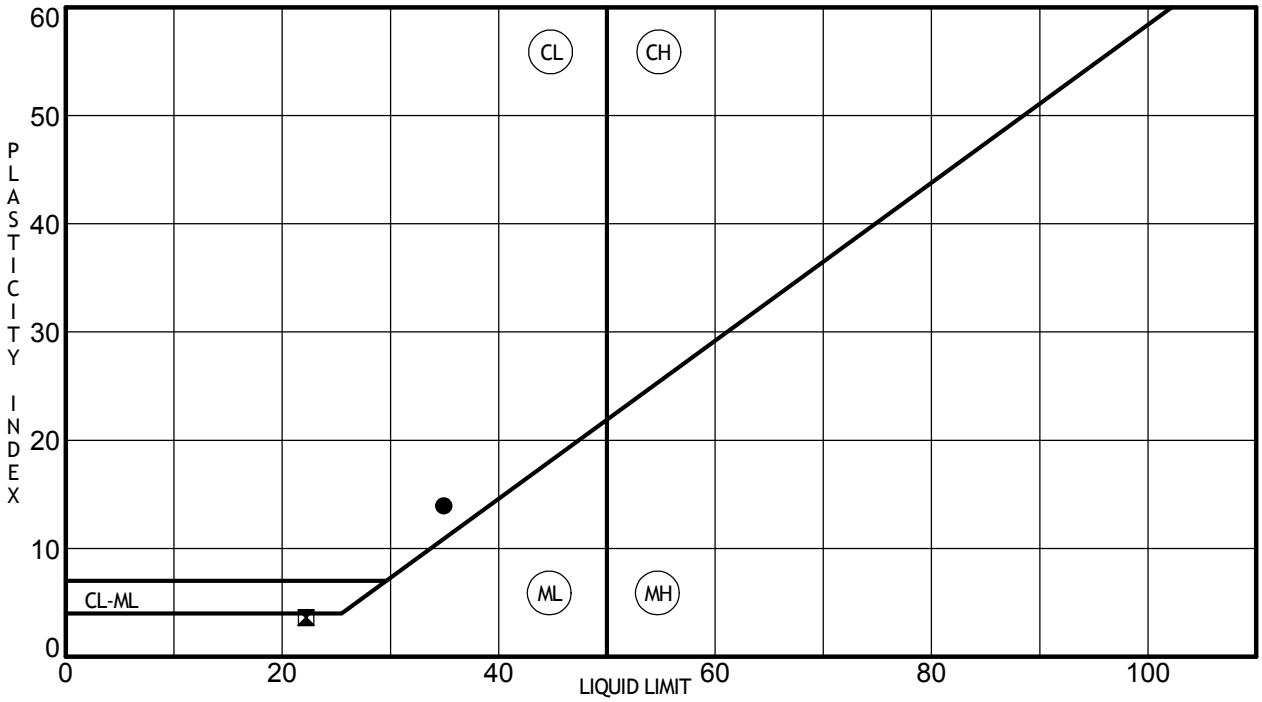
NOTE: * INDICATES VISUALLY CLASSIFIED SAMPLE

Liquid and Plastic Limits Test Report



	Boring	Depth (ft)	LL	PL	PI	Water Content	% < #40	% < #200	USCS	Description
●	HA-7-B1	9.0	35	21	14	12.7	98	80	(CL)	LEAN CLAY with SAND (CL)
⊠	HA-7-B1	36.0	22	19	3	15.6	98	34	(SM)	SILTY SAND (SM)

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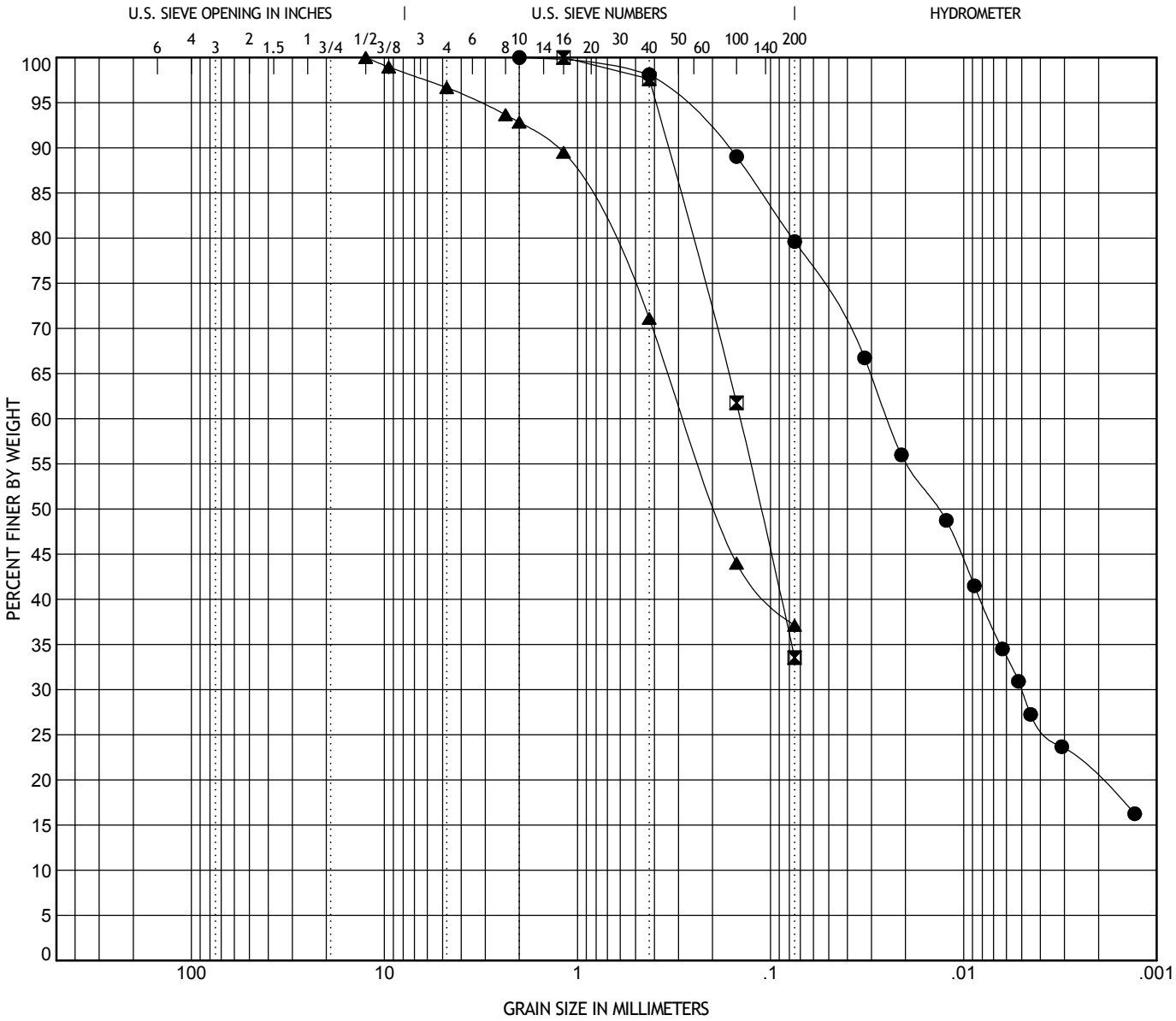
GRAIN SIZE DISTRIBUTION



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Boring	Depth (ft)	Classification	LL	PL	PI	Cc	Cu
●	HA-7-B1	9.0	LEAN CLAY with SAND (CL)	35	21	14		
⊠	HA-7-B1	36.0	SILTY SAND (SM)	22	19	3		
▲	HA-7-B1	54.0	* SILTY CLAYEY SAND (SC-SM)					

	Boring	Depth (ft)	D95	D60	D50	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	HA-7-B1	9.0	.298	.025	.013	.005		0.0	20.4	49.7	29.9
⊠	HA-7-B1	36.0	.394	.144	.112			0.0	66.4	33.6	
▲	HA-7-B1	54.0	3.221	.277	.189			3.3	59.6	37.1	

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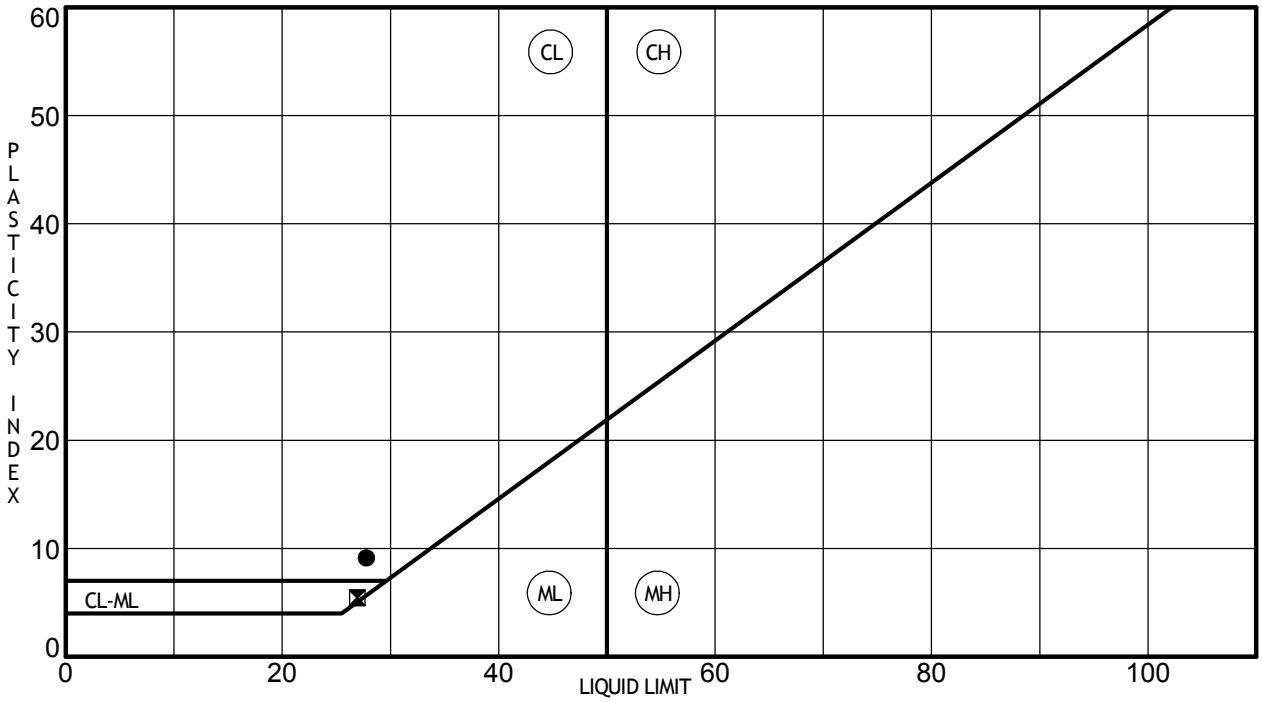
NOTE: * INDICATES VISUALLY CLASSIFIED SAMPLE

Liquid and Plastic Limits Test Report



	Boring	Depth (ft)	LL	PL	PI	Water Content	% < #40	% < #200	USCS	Description
●	HA-7-B2	4.0	28	19	9	17.5	100	64	(CL)	SANDY LEAN CLAY (CL)
⧗	HA-7-B2	13.0	27	21	6	25.3	99	71	(CL-ML)	SILTY CLAY with SAND (CL-ML)

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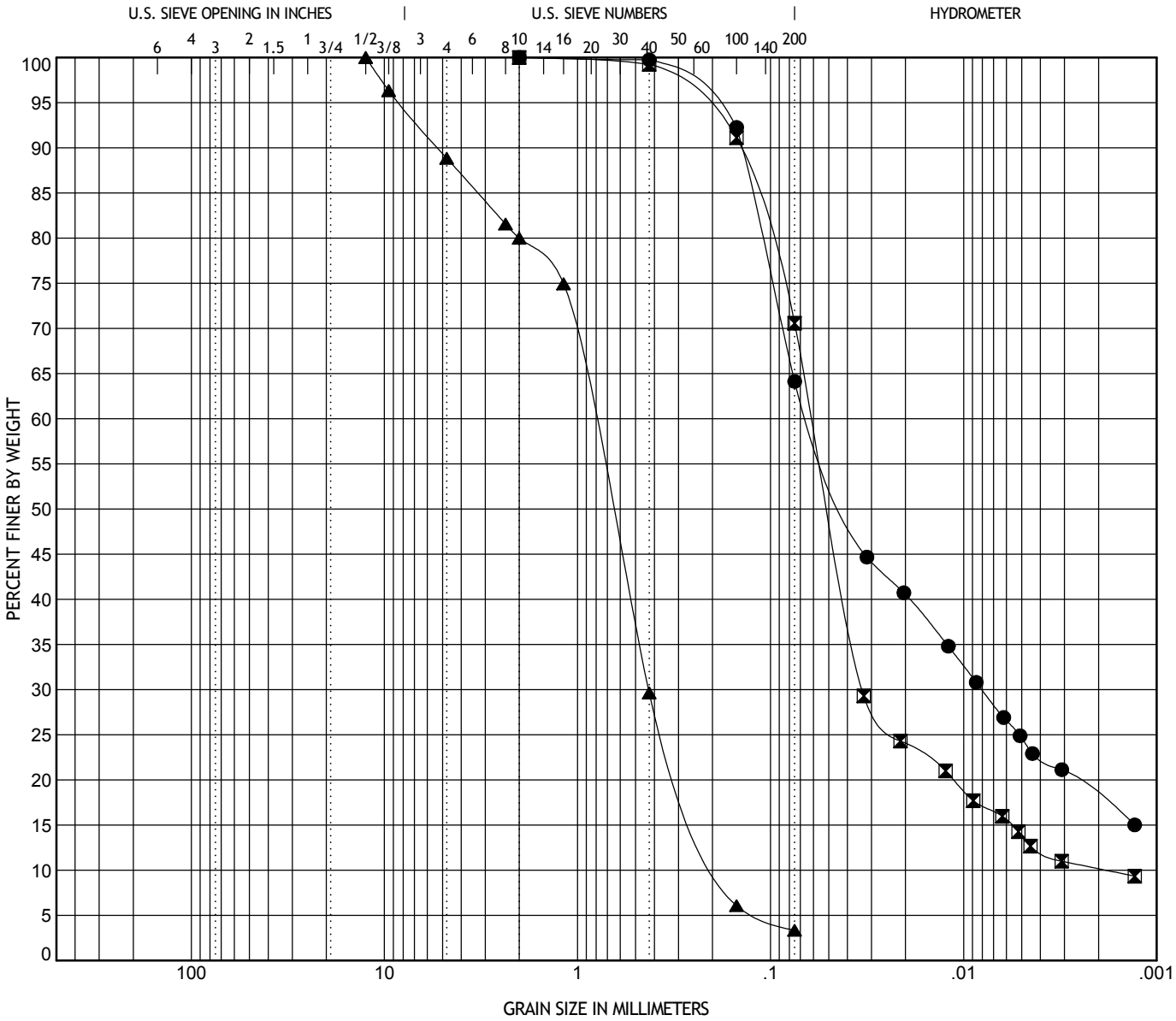
GRAIN SIZE DISTRIBUTION



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Boring	Depth (ft)	Classification	LL	PL	PI	Cc	Cu
●	HA-7-B2	4.0	SANDY LEAN CLAY (CL)	28	19	9		
⊠	HA-7-B2	13.0	SILTY CLAY with SAND (CL-ML)	27	21	6	9.94	32.92
▲	HA-7-B2	23.0	POORLY GRADED SAND (SP)				1.22	4.72

	Boring	Depth (ft)	D95	D60	D50	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	HA-7-B2	4.0	.22	.062	.04	.008		0.0	35.9	39.5	24.6
⊠	HA-7-B2	13.0	.247	.061	.05	.033	.002	0.0	29.4	56.7	13.8
▲	HA-7-B2	23.0	8.397	.843	.673	.429	.178	11.2	85.5	3.3	

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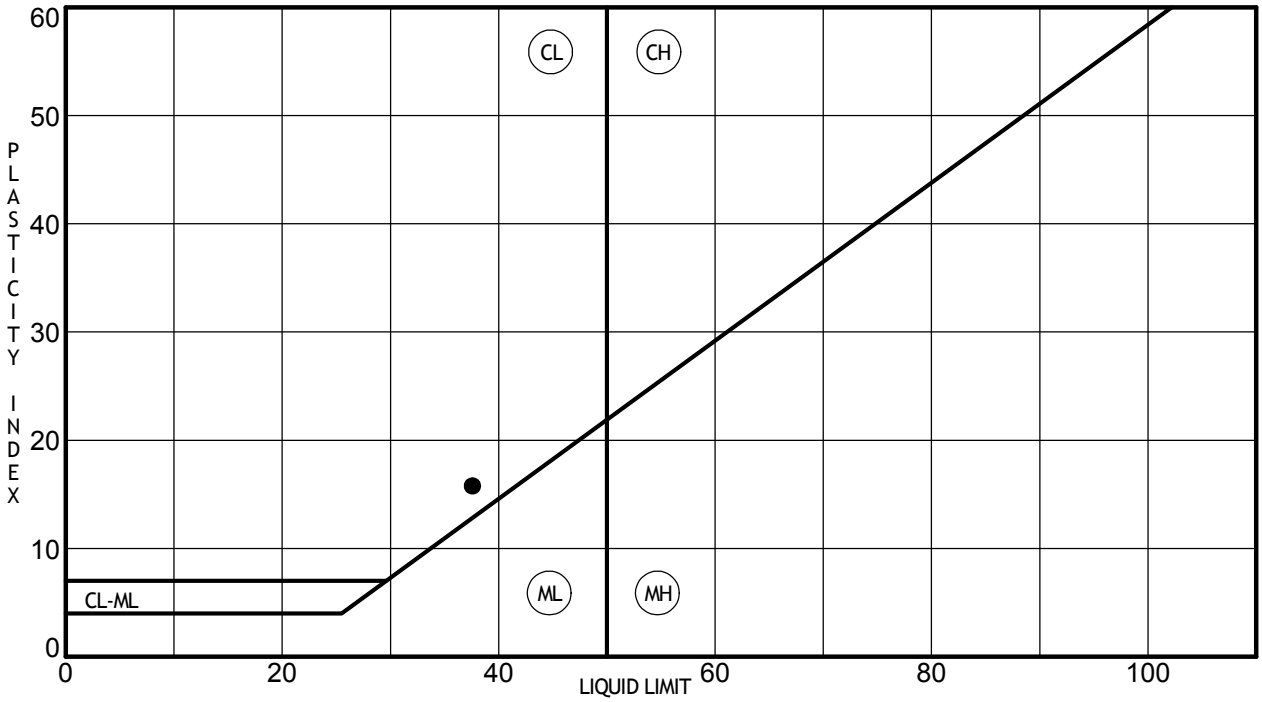
Liquid and Plastic Limits Test Report



	Boring	Depth (ft)	LL	PL	PI	Water Content	% < #40	% < #200	USCS	Description
●	HA-10-B1	0.0	38	22	16	13.6		34	(SC)	CLAYEY SAND (SC)

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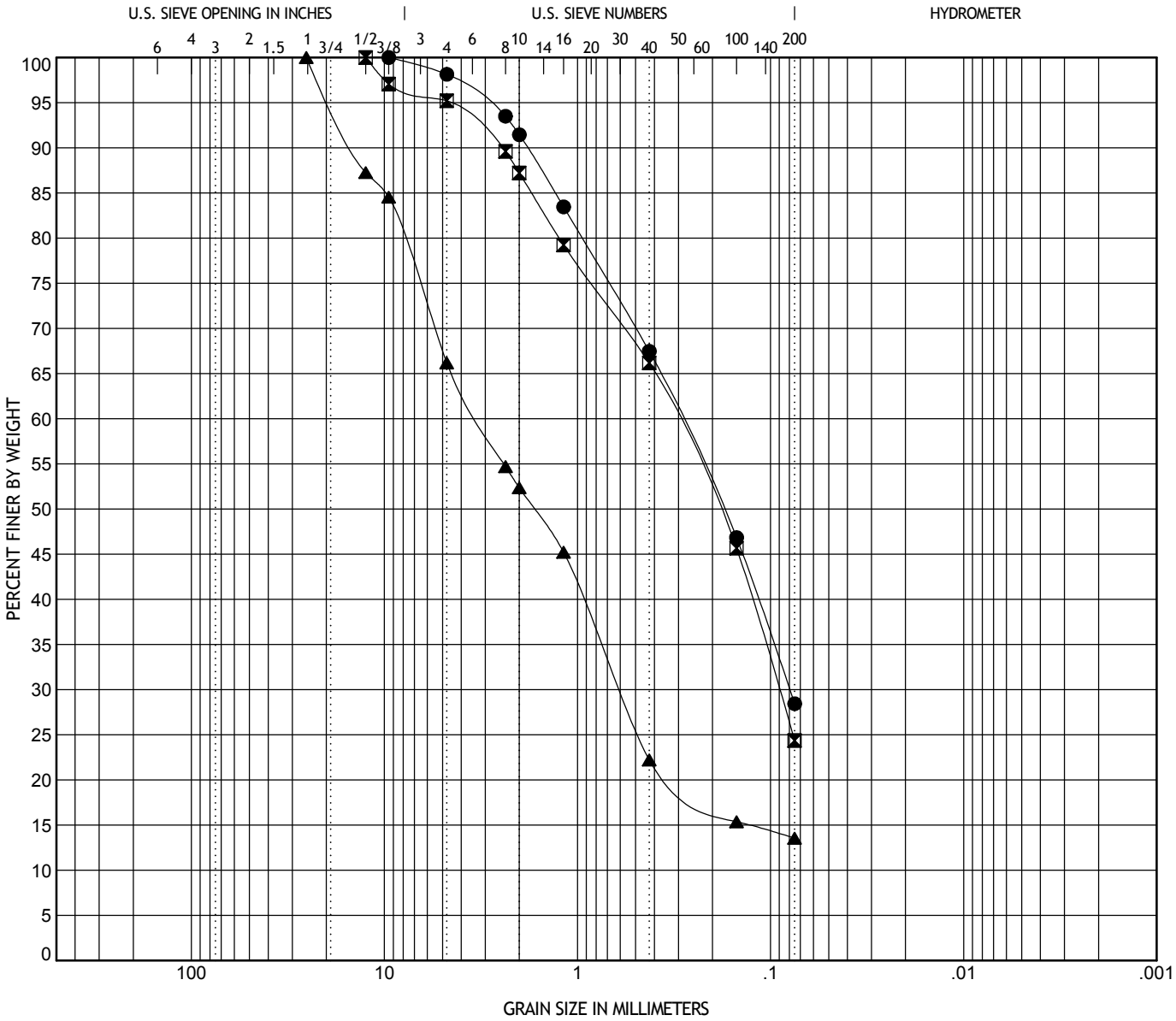
GRAIN SIZE DISTRIBUTION



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Boring	Depth (ft)	Classification	LL	PL	PI	Cc	Cu
●	HA-10-B1	9.0	* SILTY SAND (SM)	N/A	N/A	N/A		
⊠	HA-10-B1	14.0	* SILTY SAND (SM)	N/A	N/A	N/A		
▲	HA-10-B1	29.0	* SILTY SAND (SM)					

	Boring	Depth (ft)	D95	D60	D50	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	HA-10-B1	9.0	2.96	.291	.176	.08		1.9	69.7	28.4	
⊠	HA-10-B1	14.0	4.629	.311	.187	.09		4.8	70.8	24.4	
▲	HA-10-B1	29.0	19.231	3.26	1.682	.601		33.8	52.6	13.5	

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Project Location: Abeerdeen, OH

NOTE: * INDICATES VISUALLY CLASSIFIED SAMPLE
BORINGS HA-10-B1 SAMPLES S3 (9') & S4 (19') ARE NON-PLASTIC

Client:	Haley & Aldrich, Inc.				
Project:	JM Stuart Station - DP&L				
Location:	Aberdeen, OH			Project No:	GTX-304889
Boring ID:	---	Sample Type:	---	Tested By:	GA
Sample ID:	---	Test Date:	06/21/16	Checked By:	emm
Depth :	---	Test Id:	381386		

Amount of Material Passing #200 Sieve - ASTM D1140

Boring ID	Sample ID	Depth	Visual Description	Fines, %
HA-5-B1	U1	10.0-12.0 ft	Moist, brown clay	97.0
HA-5-B1	U2	34.0-36.0 ft	Moist, olive clay with sand	82.9
HA-5-B1	U3	43.0-45.0 ft	Moist, gray sandy silt	52.4
HA-6-B1	U1	12.0-14.0 ft	Moist, brown sandy clay	61.2
HA-6-B1	U2	21.0-23.0 ft	Moist, brown sandy, silty clay	53.4
HA-6-B1	U3	36.0-38.0 ft	Moist, grayish brown clayey sand	20.6
HA-7-B1	U2	20.0-22.0 ft	Moist, brown clay	96.2
HA-7-B1	U3	42.0-44.0 ft	Moist, dark yellowish brown sandy, silty clay	61.2
HA-7-B2A	U2	8.0-10.0 ft	Moist, brown clay with sand	72.4

Notes: Tests performed using Method B - washing using a wetting agent
Dry mass of test specimen was determined directly

Client:	Haley & Aldrich, Inc.				
Project:	JM Stuart Station HA-5-B2				
Location:	Aberdeen, OH			Project No:	GTX-304937
Boring ID:	HA-5-B2	Sample Type:	tube	Tested By:	jbr
Sample ID:	U1	Test Date:	07/06/16	Checked By:	emm
Depth :	40-42	Test Id:	382356		
Test Comment:	---				
Visual Description:	Moist, olive sand with silt and gravel				
Sample Comment:	---				

Amount of Material Passing #200 Sieve - ASTM D1140

Boring ID	Sample ID	Depth	Visual Description	Fines, %
HA-5-B2	U1	40-42	Moist, olive sand with silt and gravel	7.9

Notes: Tests performed using Method B - washing using a wetting agent

Dry mass of test specimen was determined directly

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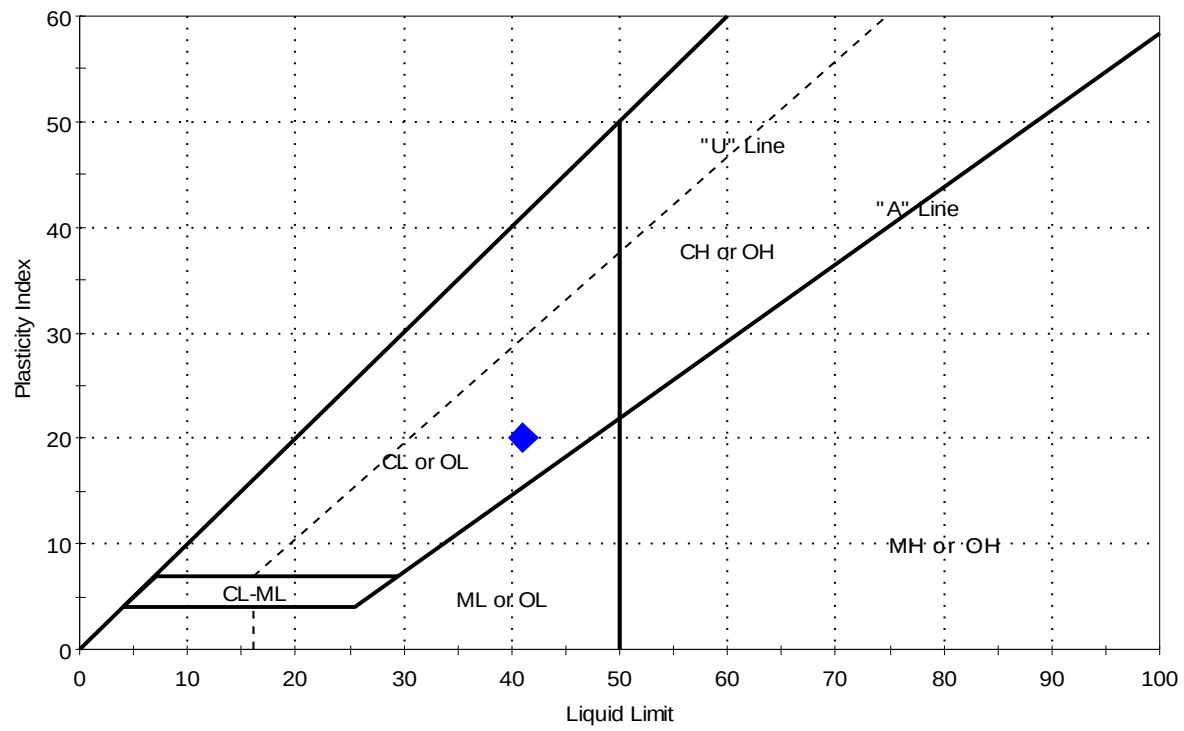
Client:	Haley & Aldrich, Inc.				
Project:	JM Stuart Station - DP&L				
Location:	Aberdeen, OH			Project No:	GTX-304889
Boring ID:	HA-5-B1	Sample Type:	tube	Tested By:	GA
Sample ID:	U1	Test Date:	06/23/16	Checked By:	emm
Depth :	10.0-12.0 ft	Test Id:	381366		
Test Comment:	---				
Visual Description:	Moist, brown clay				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	U1	HA-5-B1	10.0-12.0 ft	21	41	21	20	0	

Sample Prepared using the WET method

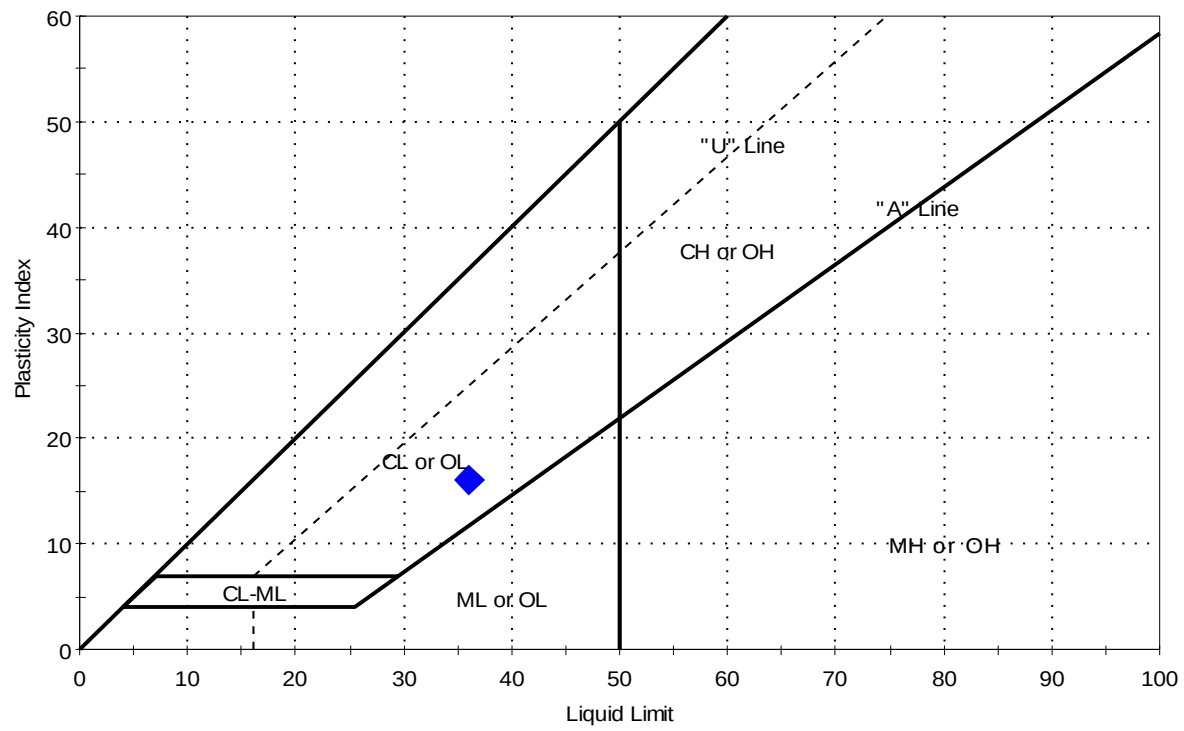
Dry Strength: HIGH

Dilatancy: NONE

Toughness: MEDIUM

Client:	Haley & Aldrich, Inc.				
Project:	JM Stuart Station - DP&L				
Location:	Aberdeen, OH			Project No:	GTX-304889
Boring ID:	HA-5-B1	Sample Type:	tube	Tested By:	GA
Sample ID:	U2	Test Date:	06/23/16	Checked By:	emm
Depth :	34.0-36.0 ft	Test Id:	381367		
Test Comment:	---				
Visual Description:	Moist, olive clay with sand				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	U2	HA-5-B1	34.0-36.0 ft	34	36	20	16	0.9	

Sample Prepared using the WET method

Dry Strength: HIGH

Dilatancy: NONE

Toughness: MEDIUM

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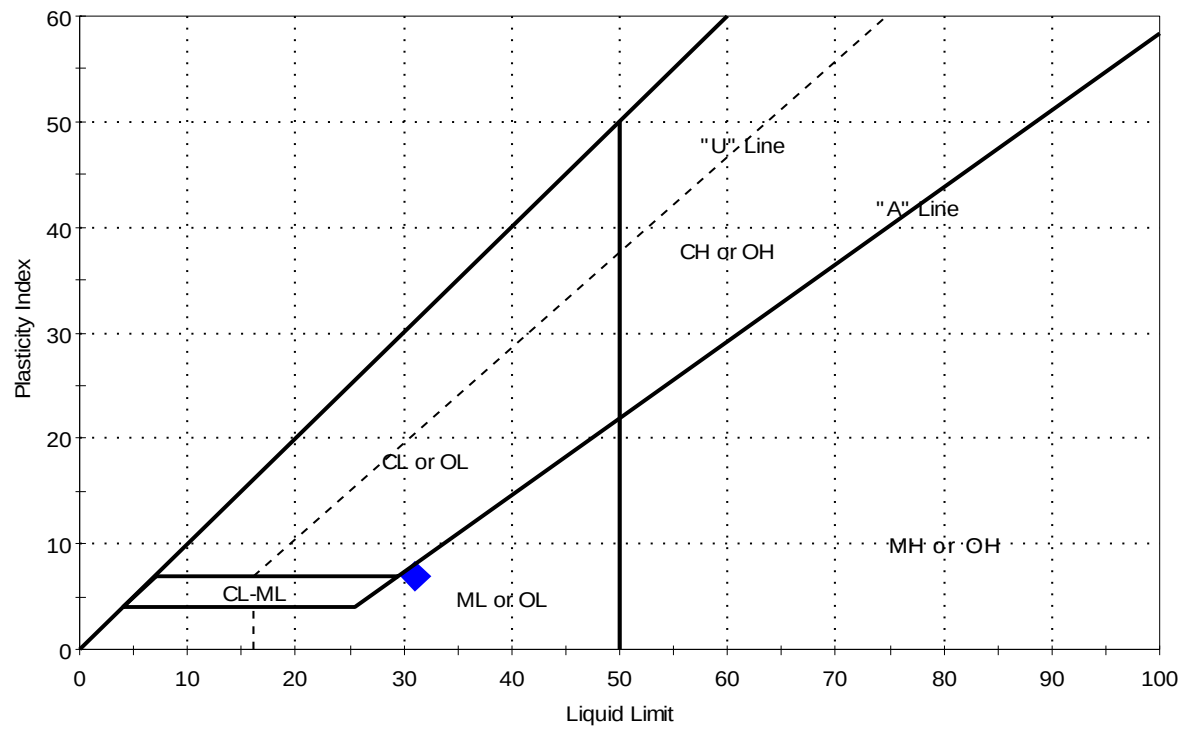
Client:	Haley & Aldrich, Inc.				
Project:	JM Stuart Station - DP&L				
Location:	Aberdeen, OH			Project No:	GTX-304889
Boring ID:	HA-5-B1	Sample Type:	tube	Tested By:	GA
Sample ID:	U3	Test Date:	06/21/16	Checked By:	emm
Depth :	43.0-45.0 ft	Test Id:	381368		
Test Comment:	---				
Visual Description:	Moist, gray sandy silt				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	U3	HA-5-B1	43.0-45.0 ft	29	31	24	7	0.7	

Sample Prepared using the WET method

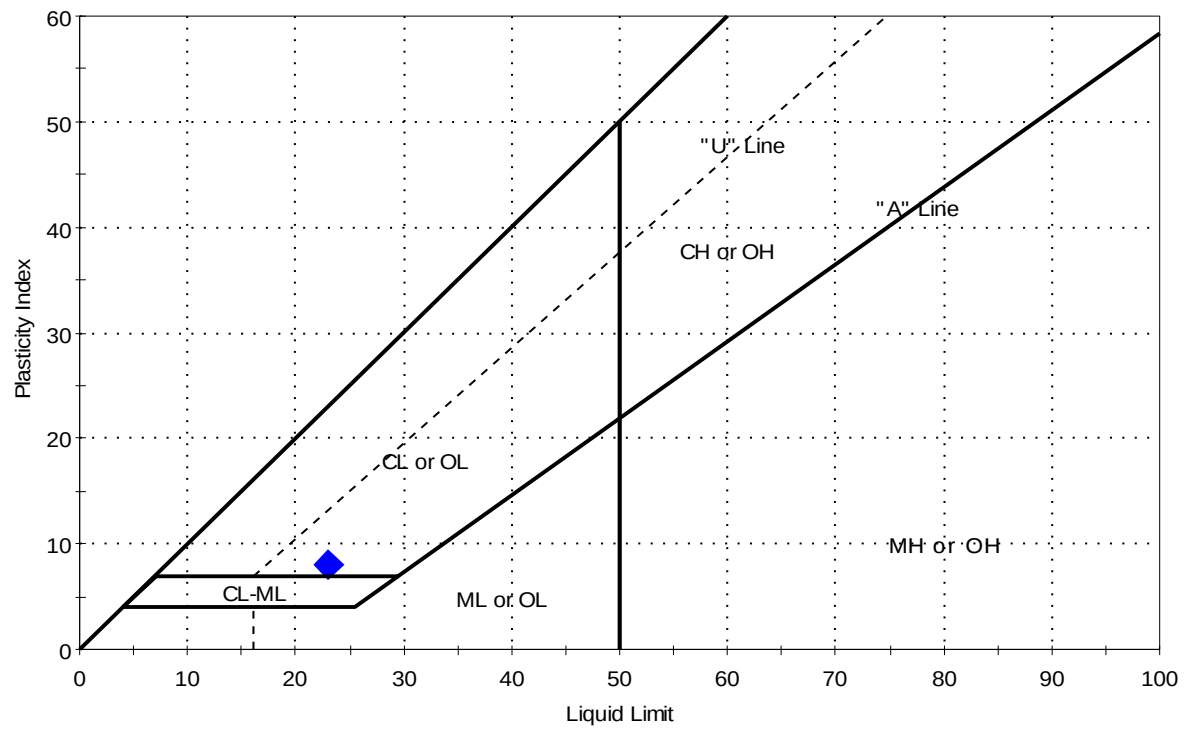
Dry Strength: HIGH

Dilatancy: RAPID

Toughness: MEDIUM

Client:	Haley & Aldrich, Inc.				
Project:	JM Stuart Station - DP&L				
Location:	Aberdeen, OH			Project No:	GTX-304889
Boring ID:	HA-6-B1	Sample Type:	tube	Tested By:	GA
Sample ID:	U1	Test Date:	06/23/16	Checked By:	emm
Depth :	12.0-14.0 ft	Test Id:	381369		
Test Comment:	---				
Visual Description:	Moist, brown sandy clay				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	U1	HA-6-B1	12.0-14.0 ft	13	23	15	8	-0.2	

Sample Prepared using the WET method

Dry Strength: HIGH

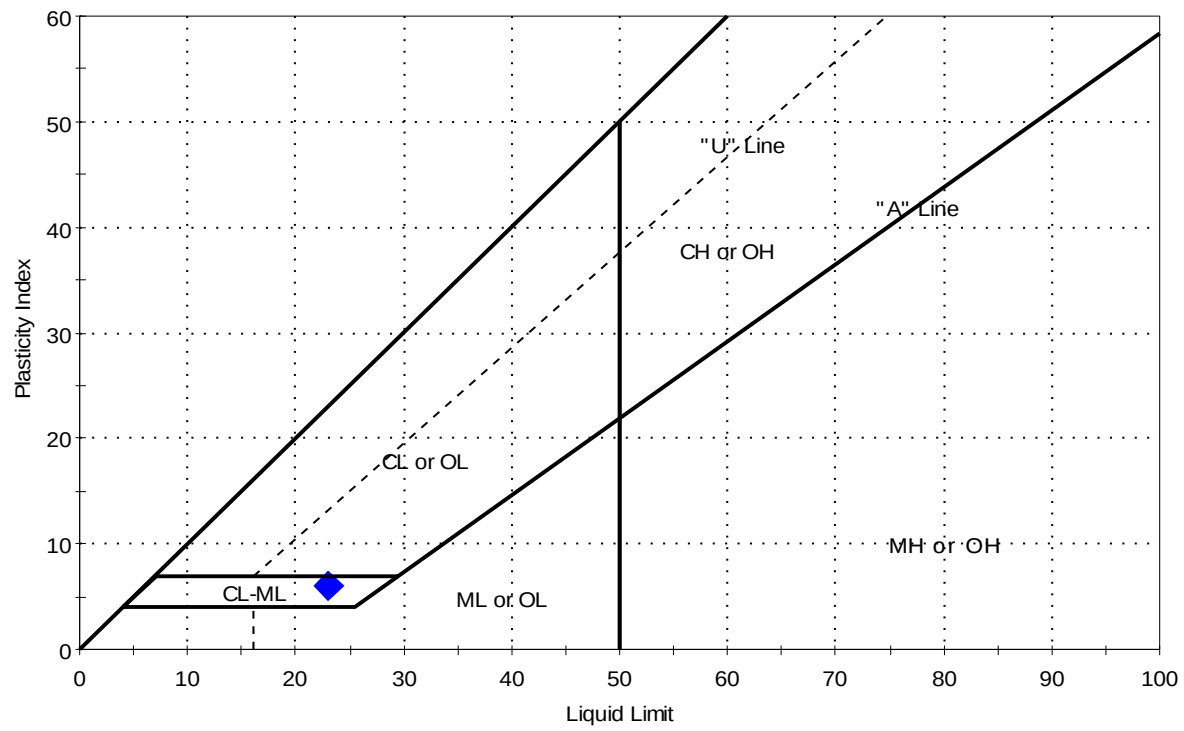
Dilatancy: NONE

Toughness: MEDIUM

printed 6/27/2016 9:42:32 AM

Client:	Haley & Aldrich, Inc.				
Project:	JM Stuart Station - DP&L				
Location:	Aberdeen, OH			Project No:	GTX-304889
Boring ID:	HA-6-B1	Sample Type:	tube	Tested By:	GA
Sample ID:	U2	Test Date:	06/23/16	Checked By:	emm
Depth :	21.0-23.0 ft	Test Id:	381370		
Test Comment:	---				
Visual Description:	Moist, brown sandy, silty clay				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	U2	HA-6-B1	21.0-23.0 ft	14	23	17	6	-0.5	

Sample Prepared using the WET method

Dry Strength: HIGH

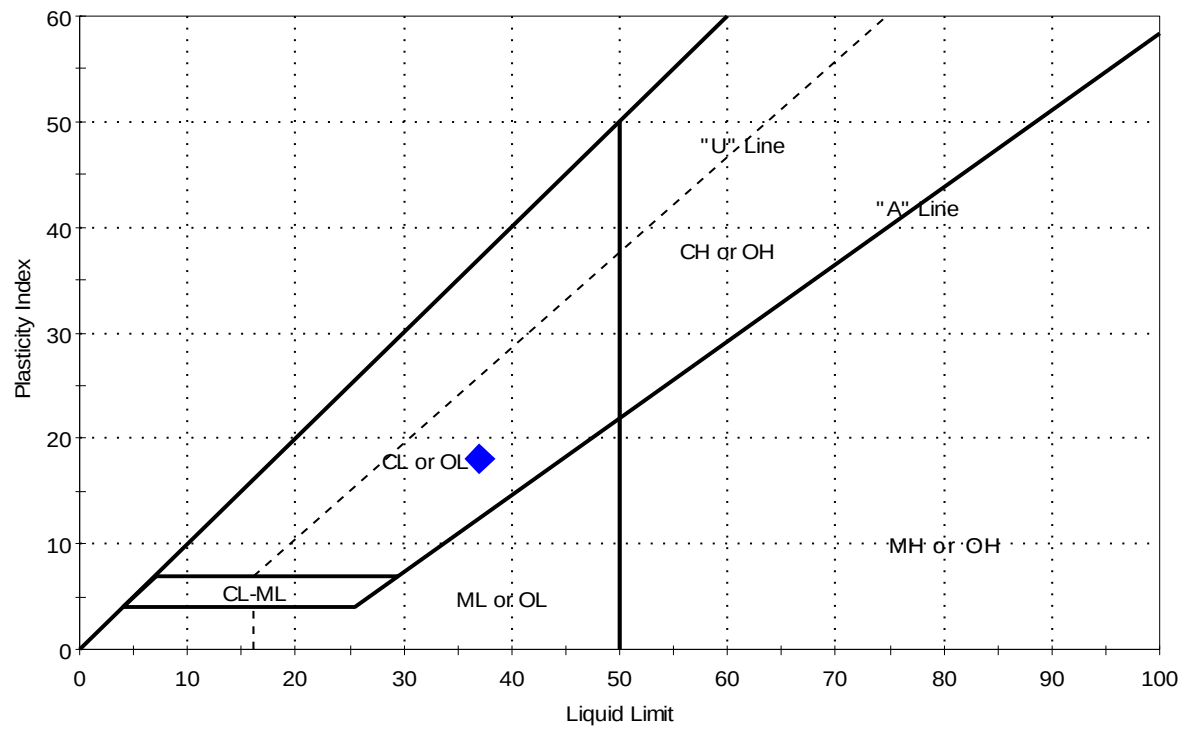
Dilatancy: SLOW

Toughness: MEDIUM

printed 6/27/2016 9:42:32 AM

Client:	Haley & Aldrich, Inc.				
Project:	JM Stuart Station - DP&L				
Location:	Aberdeen, OH			Project No:	GTX-304889
Boring ID:	HA-6-B1	Sample Type:	tube	Tested By:	GA
Sample ID:	U3	Test Date:	06/23/16	Checked By:	emm
Depth :	36.0-38.0 ft	Test Id:	381371		
Test Comment:	---				
Visual Description:	Moist, grayish brown clayey sand				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	U3	HA-6-B1	36.0-38.0 ft	11	37	19	18	-0.4	

Sample Prepared using the WET method

Dry Strength: HIGH

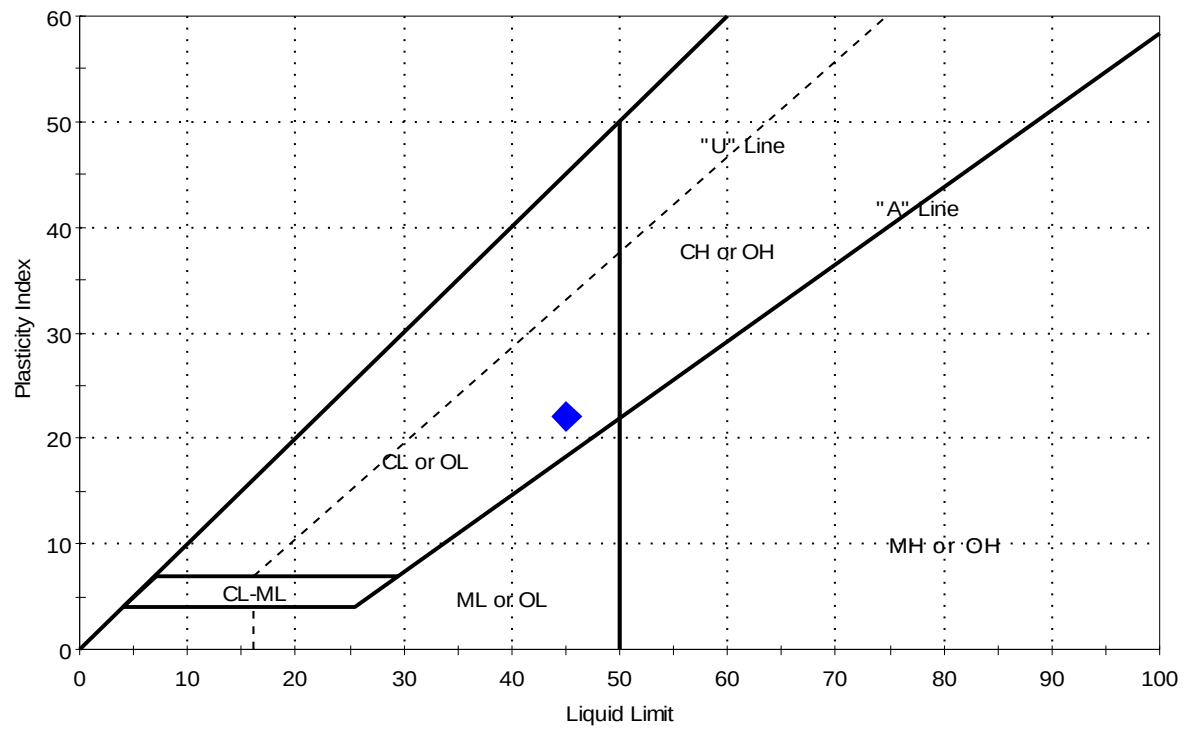
Dilatancy: NONE

Toughness: HIGH

printed 6/27/2016 9:42:32 AM

Client:	Haley & Aldrich, Inc.				
Project:	JM Stuart Station - DP&L				
Location:	Aberdeen, OH			Project No:	GTX-304889
Boring ID:	HA-7-B1	Sample Type:	tube	Tested By:	GA
Sample ID:	U2	Test Date:	06/23/16	Checked By:	emm
Depth :	20.0-22.0 ft	Test Id:	381373		
Test Comment:	---				
Visual Description:	Moist, brown clay				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	U2	HA-7-B1	20.0-22.0 ft	23	45	23	22	0	

Sample Prepared using the WET method

Dry Strength: HIGH

Dilatancy: NONE

Toughness: MEDIUM

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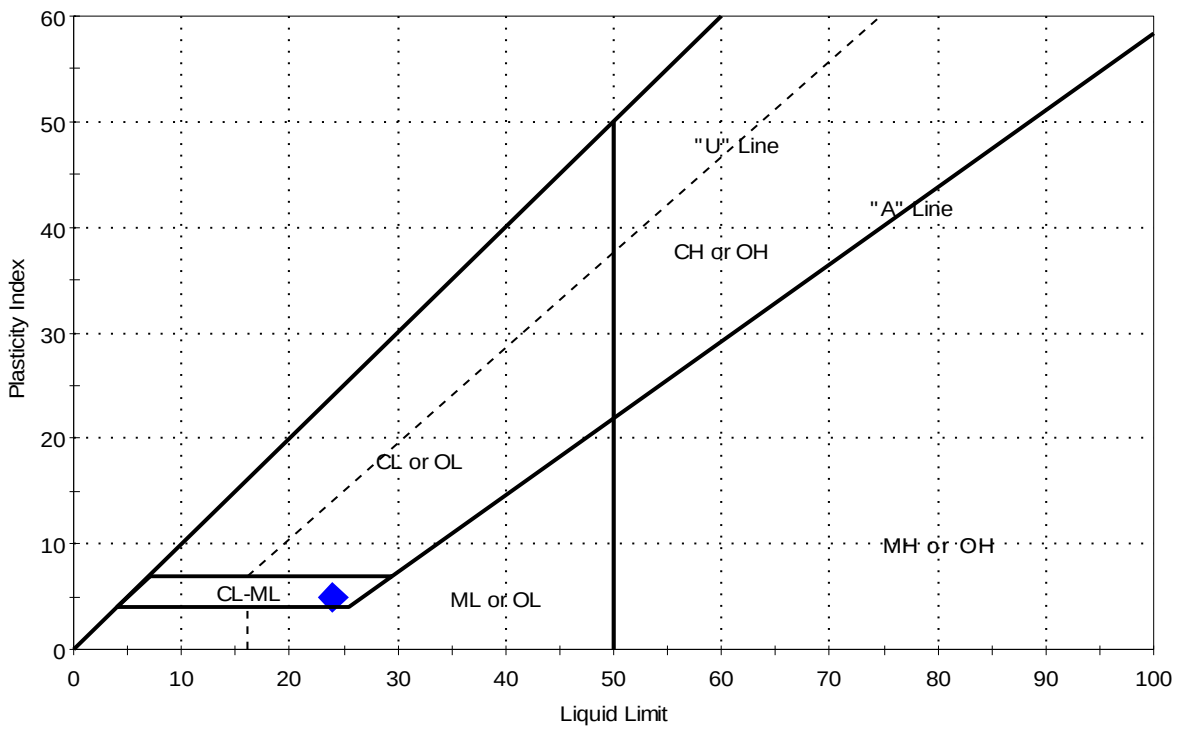
Client:	Haley & Aldrich, Inc.				
Project:	JM Stuart Station - DP&L				
Location:	Aberdeen, OH			Project No:	GTX-304889
Boring ID:	HA-7-B1	Sample Type:	tube	Tested By:	GA
Sample ID:	U3	Test Date:	06/23/16	Checked By:	emm
Depth :	42.0-44.0 ft	Test Id:	381374		
Test Comment:	---				
Visual Description:	Moist, dark yellowish brown sandy, silty clay				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	U3	HA-7-B1	42.0-44.0 ft	25	24	19	5	1.2	

Sample Prepared using the WET method

Dry Strength: HIGH

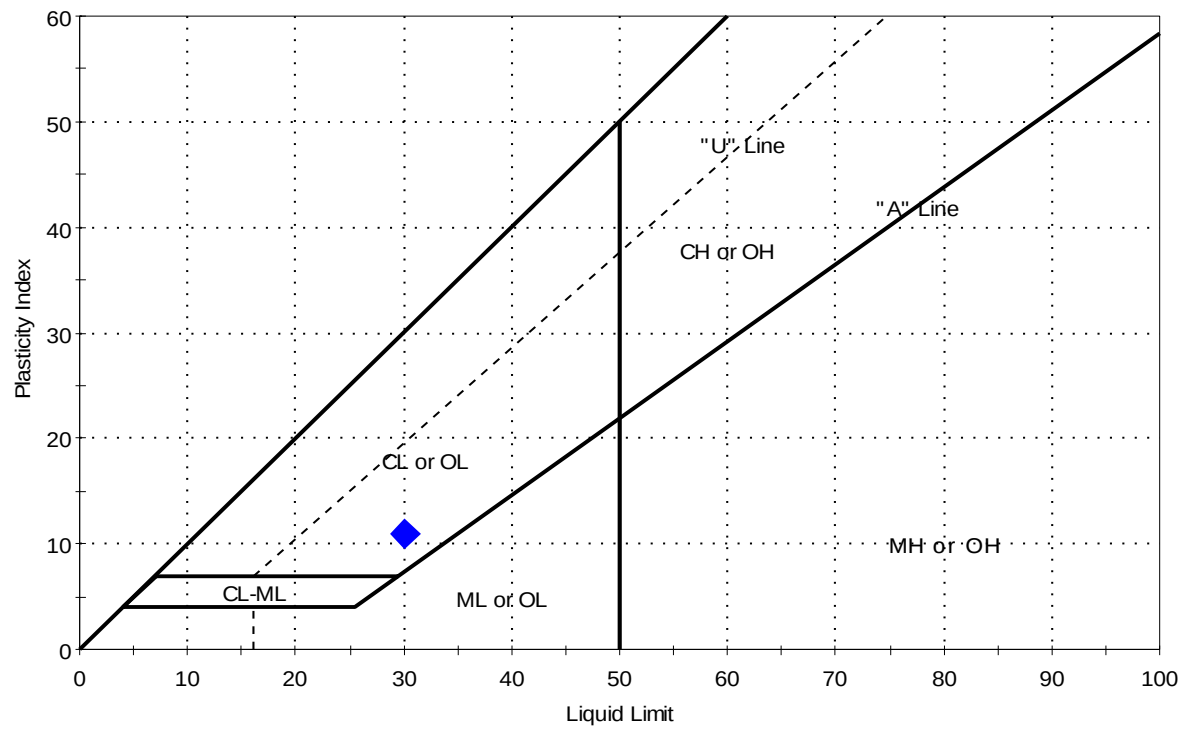
Dilatancy: RAPID

Toughness: LOW

printed 6/27/2016 9:42:33 AM

Client:	Haley & Aldrich, Inc.				
Project:	JM Stuart Station - DP&L				
Location:	Aberdeen, OH			Project No:	GTX-304889
Boring ID:	HA-7-B2A	Sample Type:	tube	Tested By:	GA
Sample ID:	U2	Test Date:	06/23/16	Checked By:	emm
Depth :	8.0-10.0 ft	Test Id:	381376		
Test Comment:	---				
Visual Description:	Moist, brown clay with sand				
Sample Comment:	---				

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content, %	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	U2	HA-7-B2A	8.0-10.0 ft	26	30	19	11	0.6	

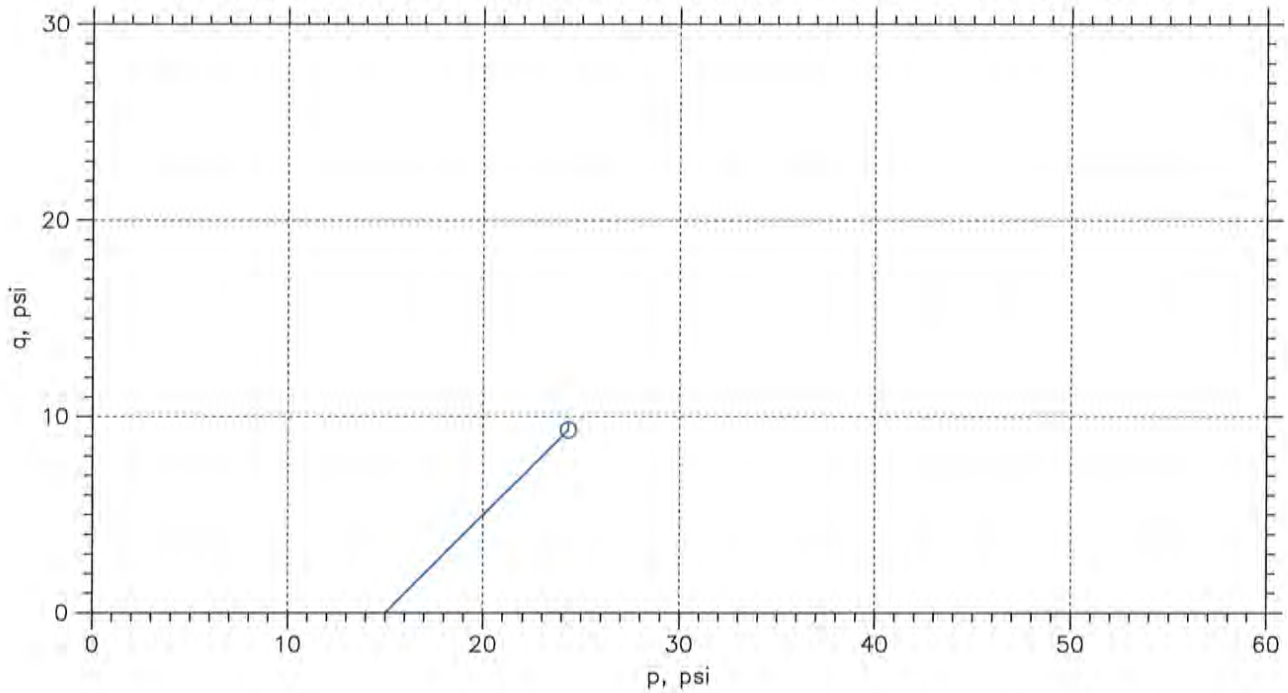
Sample Prepared using the WET method

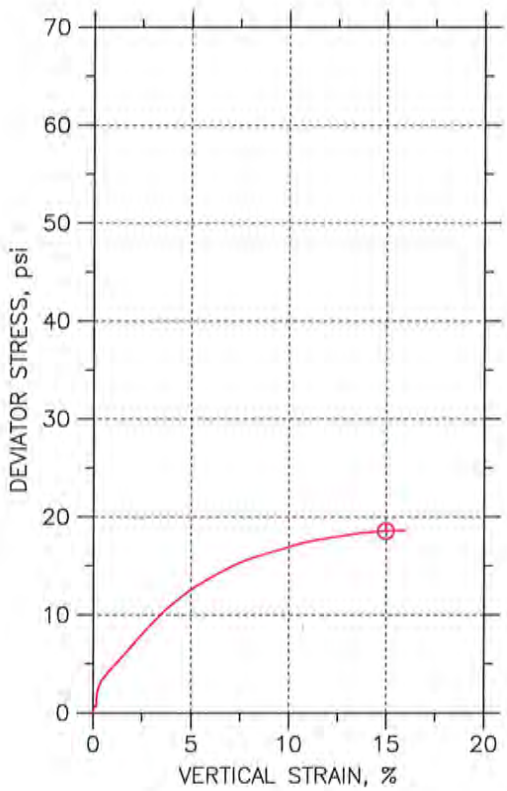
Dry Strength: HIGH

Dilatancy: NONE

Toughness: MEDIUM

UNCONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D2850





Symbol	⦶			
Sample No.	U2			
Test No.	UU-2			
Depth	34-36 ft			
Tested by	dd			
Test Date	6/30/16			
Checked by	njh			
Check Date	07/07/16			
Diameter, in	2.86			
Height, in	6.3			
Water Content, %	25.5			
Dry Density, kN/m^3	15.66			
Saturation, %	99.6			
Void Ratio	0.69			
Confining Stress, psi	15			
Undrained Strength, psi	9.287			
Max. Dev. Stress, psi	18.57			
Strain at Failure, %	15			
Strain Rate, %/min	1			
Estimated Specific Gravity	2.7			
Liquid Limit	36			
Plastic Limit	20			
Plasticity Index	16			

GeoTesting EXPRESS

Project: JM Stuart Station-DP&L

Location: Aberdeen, OH

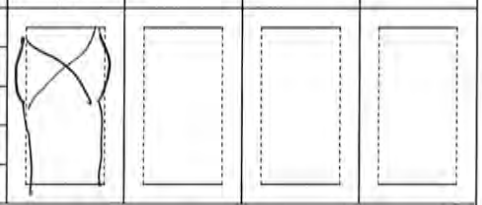
Project No.: GTX-304889

Boring No.: HA-5-B1

Sample Type: intact

Description: Moist, olive clay with sand

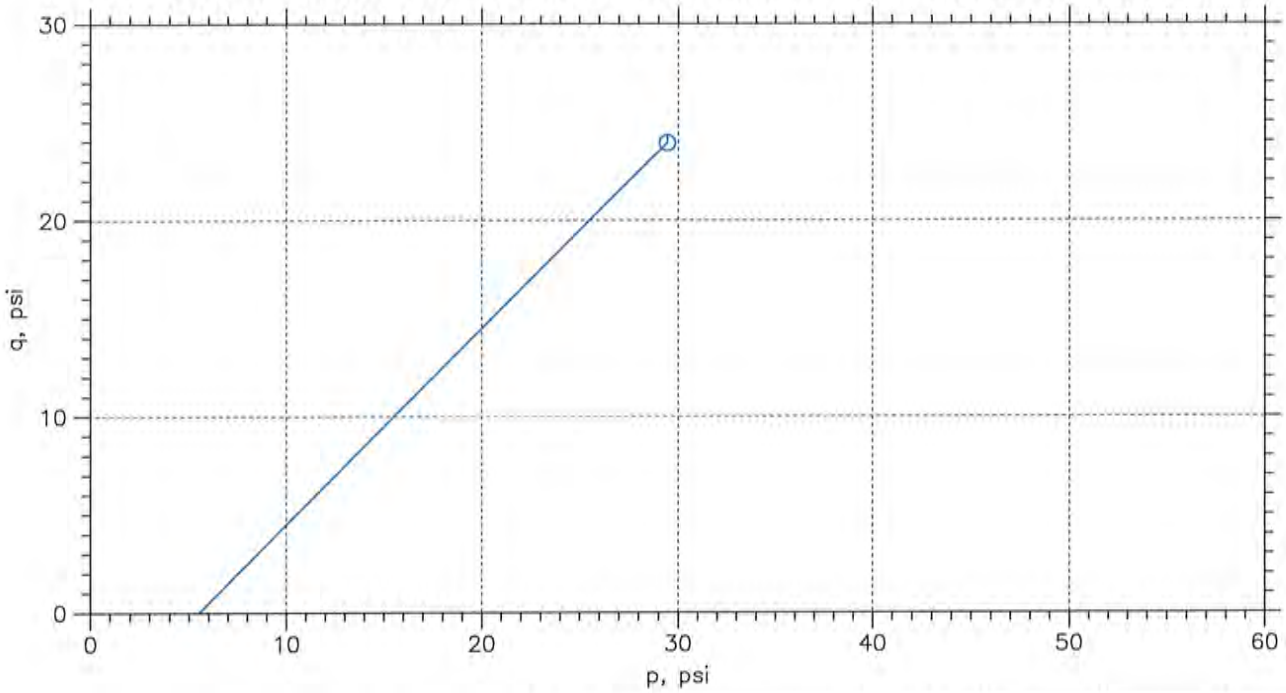
Remarks: System T

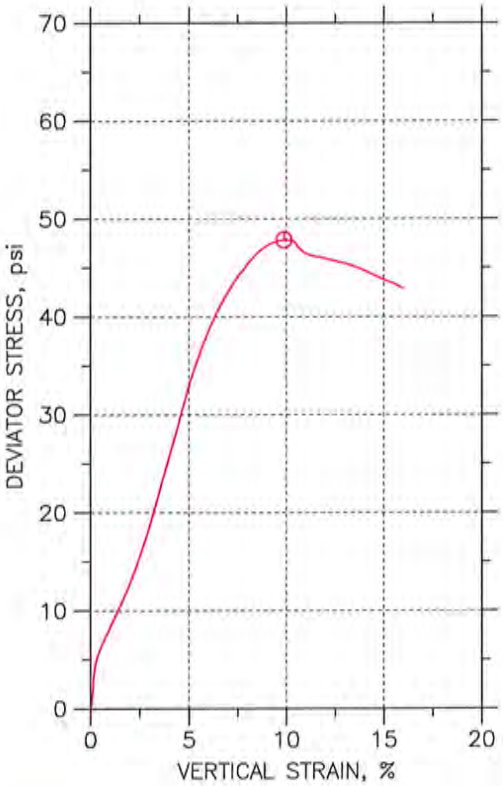


Phase calculations based on start and end of test.

Thu, 07-JUL-2016 13:25:59

UNCONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D2850





Symbol	⊖			
Sample No.	U1			
Test No.	UU-1			
Depth	12-14 ft			
Tested by	dd			
Test Date	6/30/16			
Checked by	njh			
Check Date	07/07/16			
Diameter, in	2.84			
Height, in	6.3			
Water Content, %	16.5			
Dry Density, kN/m^3	18.27			
Saturation, %	99.4			
Void Ratio	0.449			
Confining Stress, psi	5.5			
Undrained Strength, psi	23.93			
Max. Dev. Stress, psi	47.87			
Strain at Failure, %	9.9			
Strain Rate, %/min	1			
Estimated Specific Gravity	2.7			
Liquid Limit	23			
Plastic Limit	15			
Plasticity Index	8			

GeoTesting EXPRESS

Project: JM Stuart Station-DP&L

Location: Aberdeen, OH

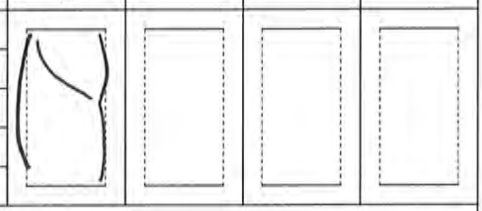
Project No.: GTX-304889

Boring No.: HA-6-B1

Sample Type: intact

Description: Moist, brown sandy clay

Remarks: System T

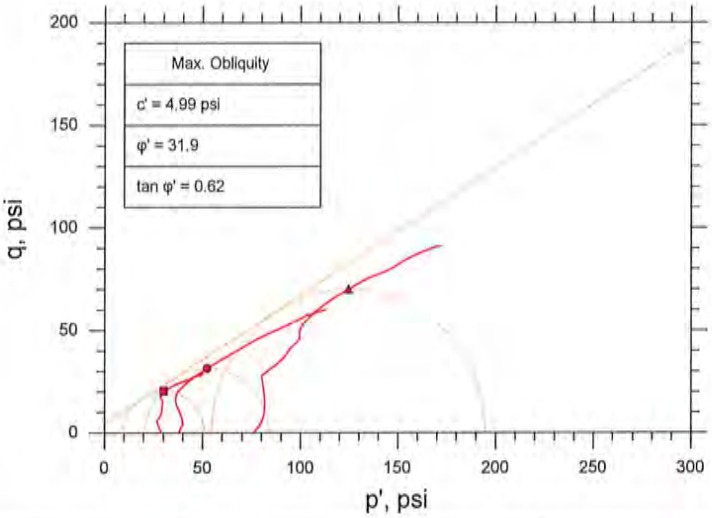


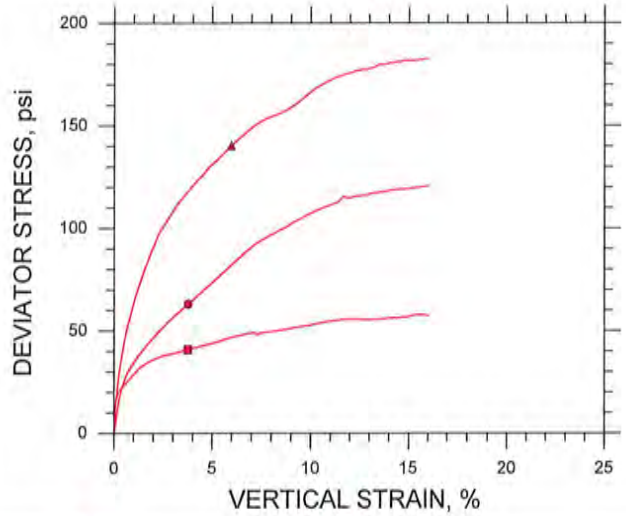
Phase calculations based on start and end of test.

Thu, 07-JUL-2016 13:15:31

Client: Haley & Aldrich, Inc	
Project Name: JM Stuart Station - DP&L	
Project Location: Aberdeen, OH	
Project Number: GTX-304889	
Tested By: md	Checked By: mcm
Boring ID: HA-6-B1	
Preparation: intact	
Description: Moist, brown sandy, silty clay	
Classification: ---	
Group Symbol: ---	
Liquid Limit: 23	Plastic Limit: 17
Plasticity Index: 6	Estimated Specific Gravity: 2.7

CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767





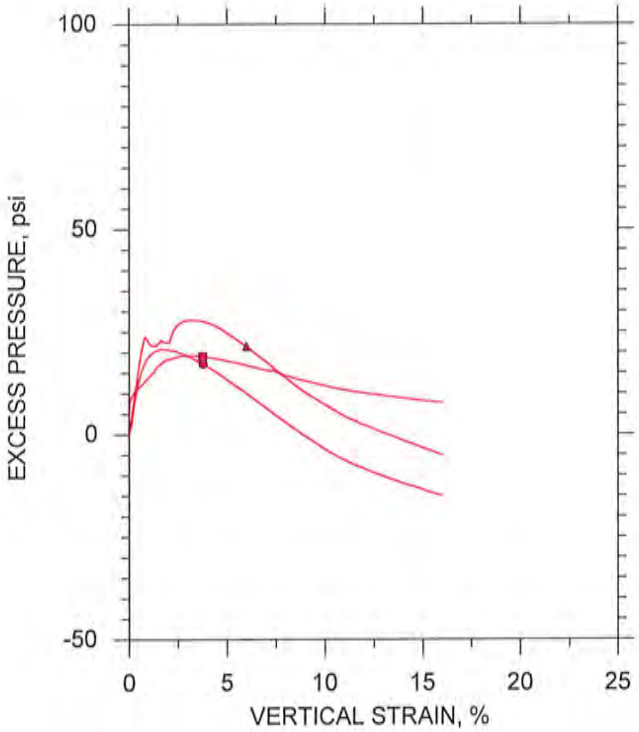
Symbol		■	●	▲
Sample ID		U2	U2	U2
Depth, ft		21-23 ft	21-23 ft	21-23 ft
Test Number		CU-5-1	CU-5-2	CU-5-3
Initial	Height, in	4.410	4.430	4.310
	Diameter, in	2.030	2.030	2.030
	Moisture Content (from Cuttings), %	15.4	13.6	14.1
	Dry Density, pcf	111.	116.	115.
	Saturation (Wet Method), %	79.8	81.9	82.7
	Void Ratio	0.522	0.447	0.460
Before Shear	Moisture Content, %	11.9	15.4	15.9
	Dry Density, pcf	128.	119.	118.
	Cross-sectional Area (Method A), in²	2.871	3.183	3.195
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.321	0.416	0.428
	Back Pressure, psi	33.00	150.7	160.7
Vertical Effective Consolidation Stress, psi		28.83	37.92	75.94
Horizontal Effective Consolidation Stress, psi		28.99	37.96	75.99
Vertical Strain after Consolidation, %		2.135	0.5107	0.7116
Volumetric Strain after Consolidation, %		13.10	2.148	1.626
Time to 50% Consolidation, min		324.0	36.00	20.25
Shear Strength, psi		20.44	31.56	70.14
Strain at Failure, %		3.76	3.78	5.98
Strain Rate, %/min		0.01600	0.01600	0.01600
Deviator Stress at Failure, psi		40.89	63.12	140.3
Effective Minor Principal Stress at Failure, psi		9.807	20.73	54.49
Effective Major Principal Stress at Failure, psi		50.69	83.84	194.8
B-Value		0.98	0.95	0.96

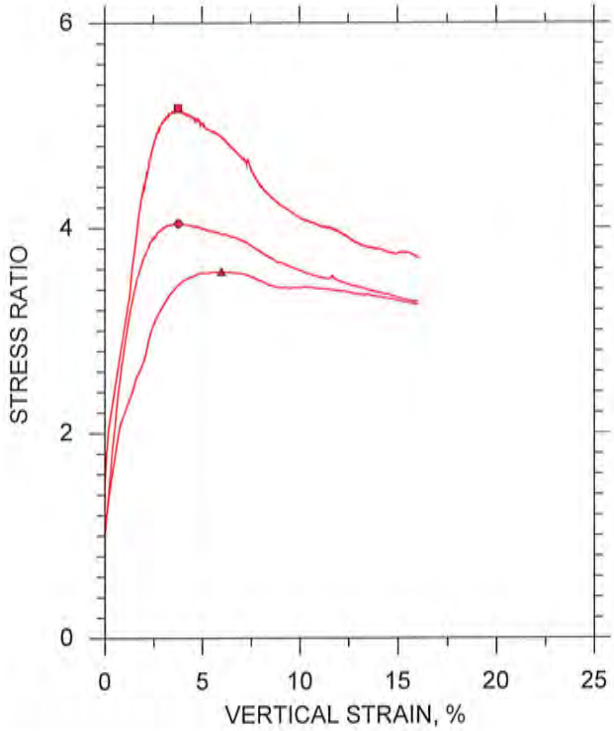
Notes:
- Before Shear Saturation set to 100% for phase calculation.
- Moisture Content determined by ASTM D2216.
- Atterberg Limits determined by ASTM D4318.
- Deviator Stress includes membrane correction.
- Values for c and φ determined from best-fit straight line for the specific test conditions. Actual strength parameters may vary and should be determined by an engineer for site conditions.

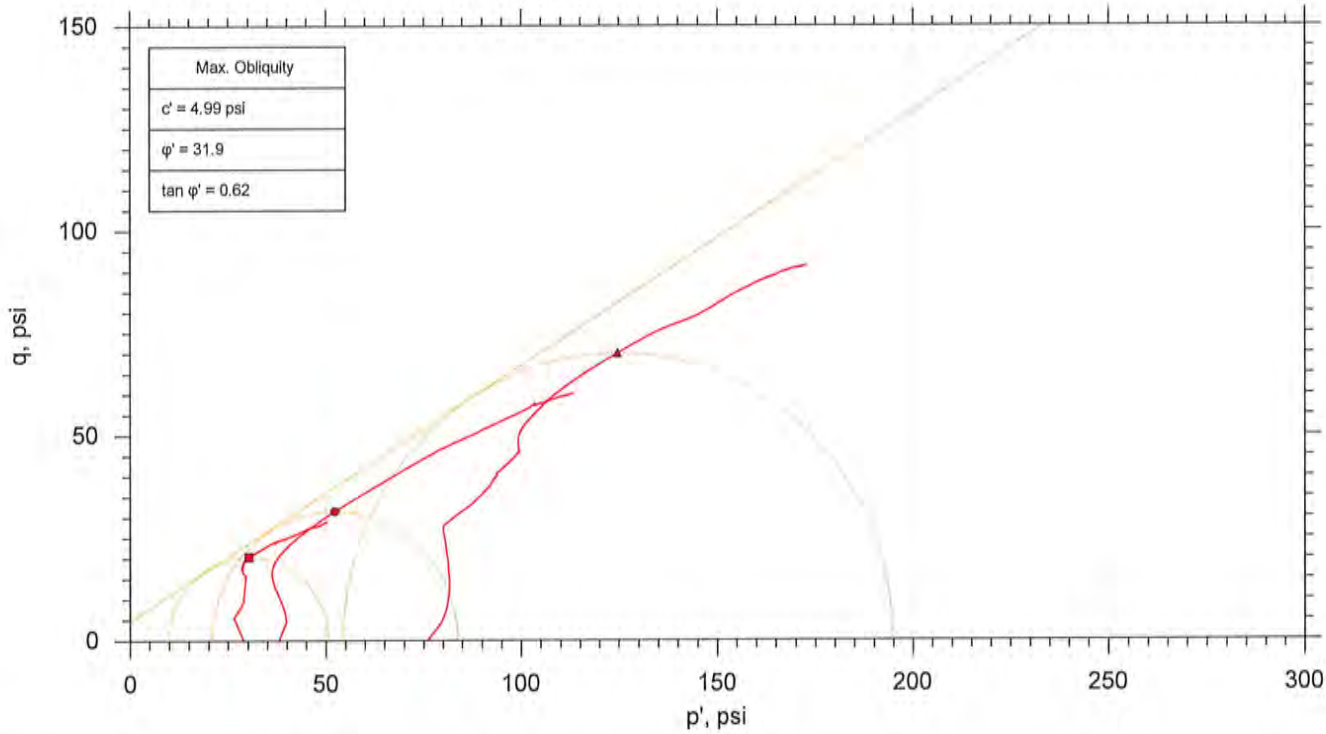
Remarks:

System Q

CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767







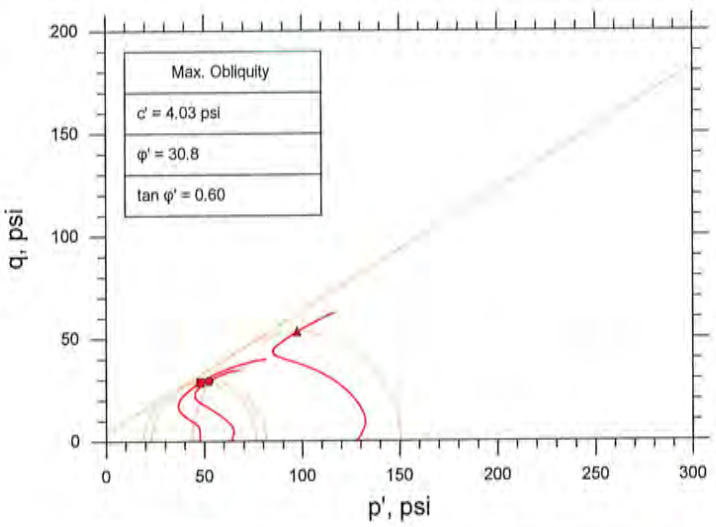
	Sample No.	Test No.	Depth	Tested By	Test Date	Checked By	Check Date	Test File
■	U2	CU-5-1	21-23 ft	md	6/29/16	mcm	7/7/16	304889-CU-5-1.m.dat
●	U2	CU-5-2	21-23 ft	md	6/29/16	mcm	7/17/16	304889-CU-5-2m.dat
▲	U2	CU-5-3	21-23 ft	md	6/29/16	mcm	7/7/16	304889-CU-5-3m.dat

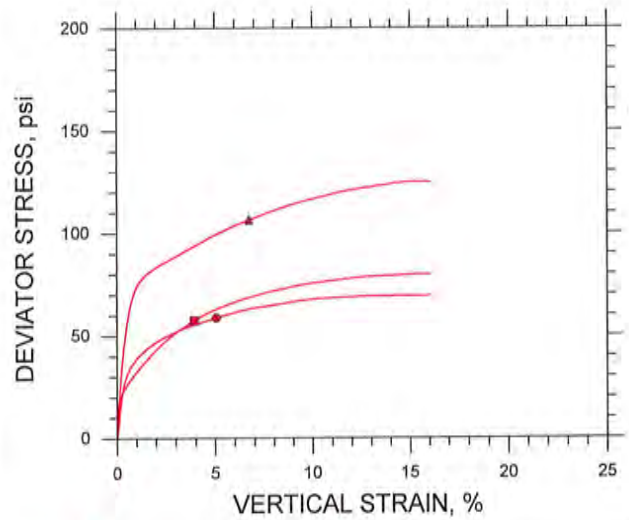
GeoTesting EXPRESS

Project: JM Stuart Station - DP&L	Location: Aberdeen, OH	Project No.: GTX-304889
Boring No.: HA-6-B1	Sample Type: intact	
Description: Moist, brown sandy, silty clay		
Remarks: System Q		

Client: Haley & Aldrich, Inc.	
Project Name: JM Stuart Station - DP&L	
Project Location: Aberdeen, OH	
Project Number: GTX-304889	
Tested By: md	Checked By: mcm
Boring ID: HA-6-B1	
Preparation: intact	
Description: Moist, grayish brown clayey sand	
Classification: ---	
Group Symbol: ---	
Liquid Limit: 37	Plastic Limit: 19
Plasticity Index: 18	Estimated Specific Gravity: 2.7

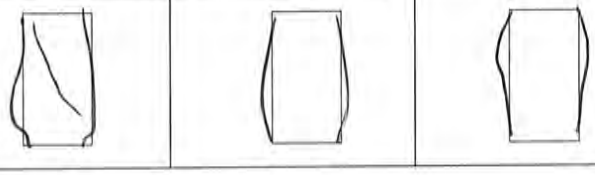
CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767





Symbol		■	●	▲
Sample ID		U3	U3	U3
Depth, ft		36-38 ft	36-38 ft	36-38 ft
Test Number		CU-4-1	CU-4-2	CU-4-3
Initial	Height, in	6.290	6.100	6.400
	Diameter, in	2.870	2.870	2.870
	Moisture Content (from Cuttings), %	17.9	14.2	10.2
	Dry Density, pcf	111.	119.	115.
	Saturation (Wet Method), %	93.3	93.4	59.3
	Void Ratio	0.519	0.412	0.467
Before Shear	Moisture Content, %	17.5	13.1	14.9
	Dry Density, pcf	114.	124.	120.
	Cross-sectional Area (Method A), in²	6.384	6.283	6.284
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.473	0.355	0.402
	Back Pressure, psi	140.9	133.0	138.9
Vertical Effective Consolidation Stress, psi		47.93	63.94	127.9
Horizontal Effective Consolidation Stress, psi		48.01	63.98	128.0
Vertical Strain after Consolidation, %		1.660	0.9992	1.547
Volumetric Strain after Consolidation, %		2.819	3.521	4.287
Time to 50% Consolidation, min		82.81	36.00	2.890
Shear Strength, psi		28.78	29.41	53.30
Strain at Failure, %		3.94	5.05	6.73
Strain Rate, %/min		0.01600	0.01600	0.01600
Deviator Stress at Failure, psi		57.55	58.83	106.6
Effective Minor Principal Stress at Failure, psi		19.22	22.91	43.94
Effective Major Principal Stress at Failure, psi		76.77	81.73	150.5
B-Value		0.95	0.95	0.95

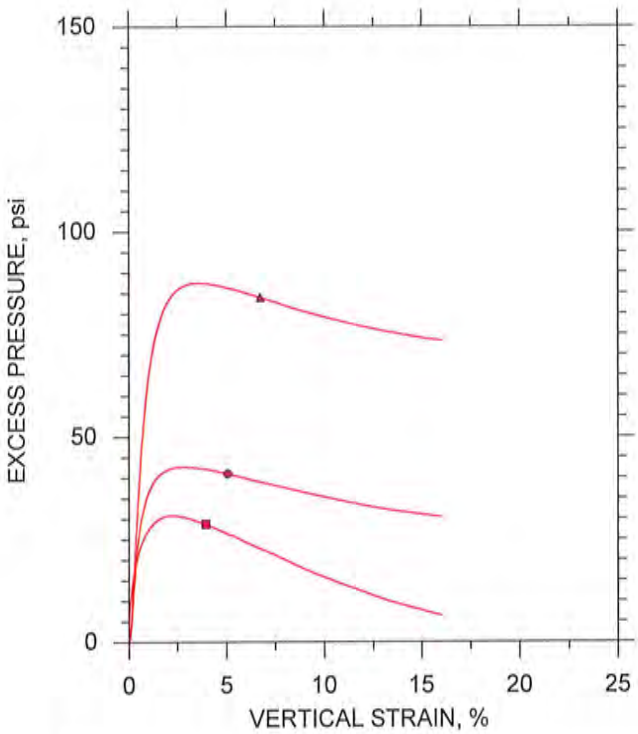
Notes:
- Before Shear Saturation set to 100% for phase calculation.
- Moisture Content determined by ASTM D2216.
- Atterberg Limits determined by ASTM D4318.
- Deviator Stress includes membrane correction.
- Values for c and φ determined from best-fit straight line for the specific test conditions. Actual strength parameters may vary and should be determined by an engineer for site conditions.

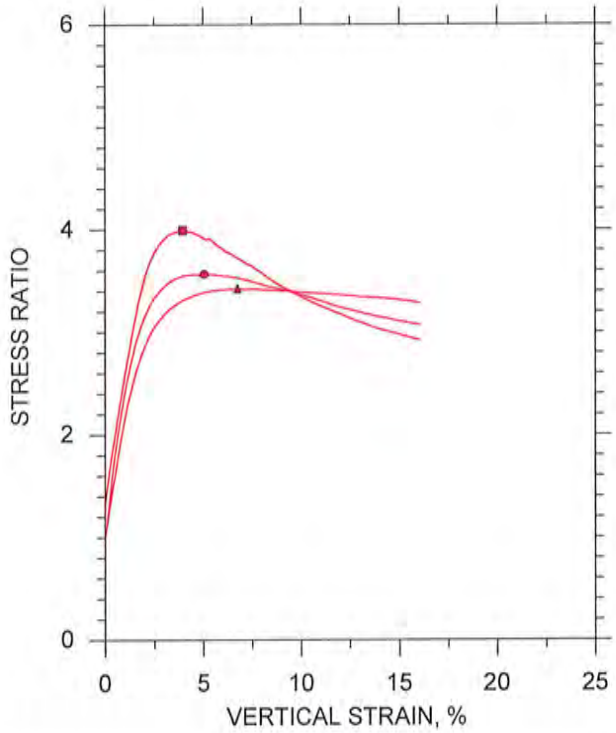


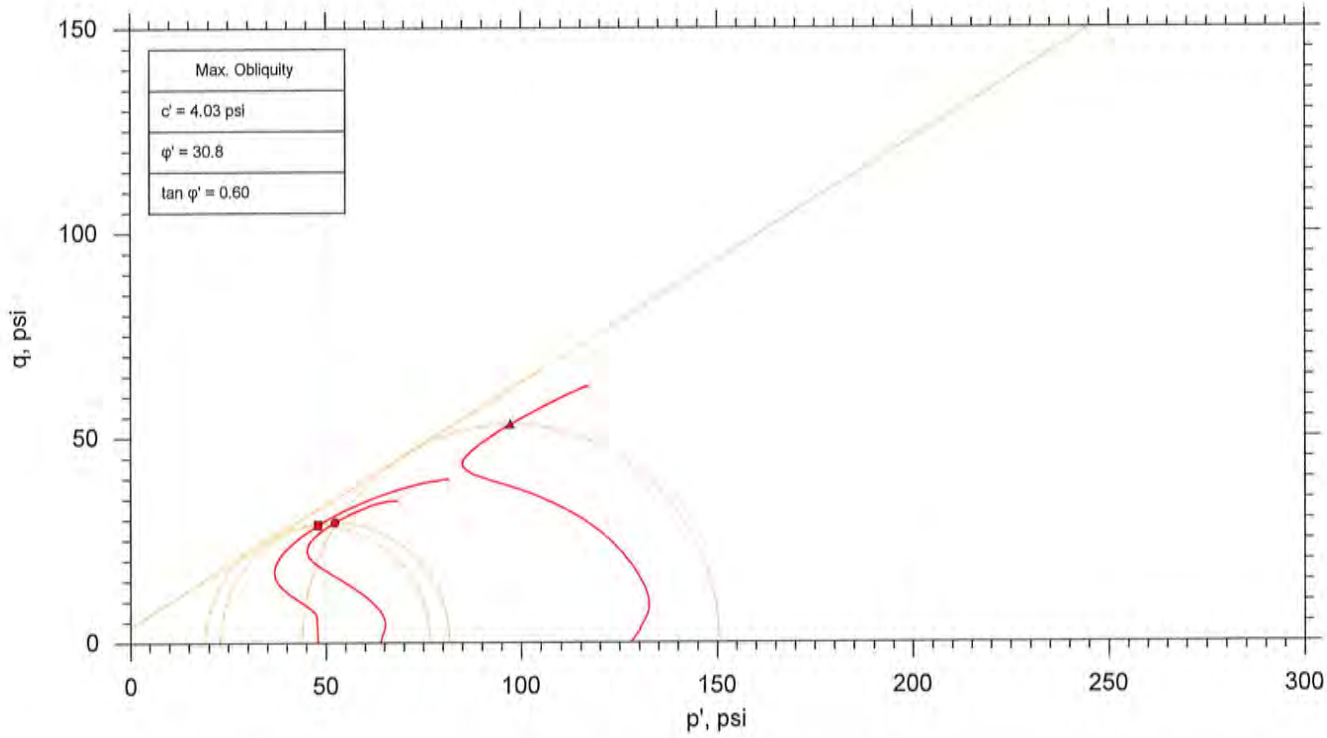
Remarks:

System E

CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767







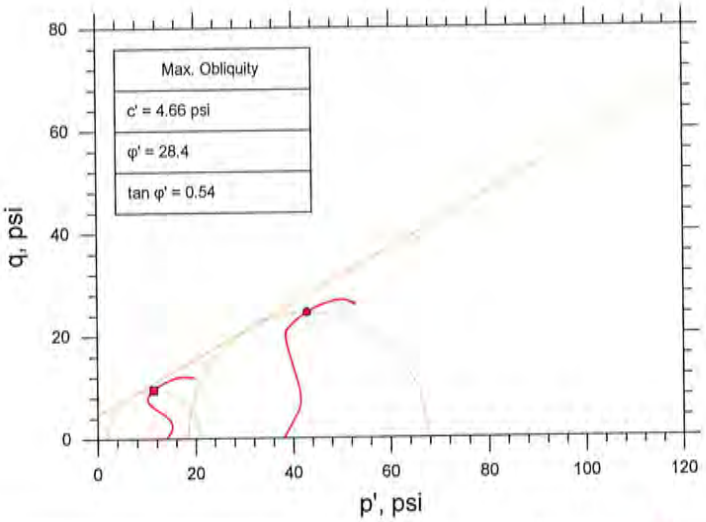
	Sample No.	Test No.	Depth	Tested By	Test Date	Checked By	Check Date	Test File
■	U3	CU-4-1	36-38 ft	md	6/27/16	mcm	7/7/16	304889-CU-4-1m.dat
●	U3	CU-4-2	36-38 ft	md	6/27/16	mcm	7/7/16	304889-CU-4-2.m.dat
▲	U3	CU-4-3	36-38 ft	md	6/27/16	mcm	7/7/16	304889-CU-4-3m.dat

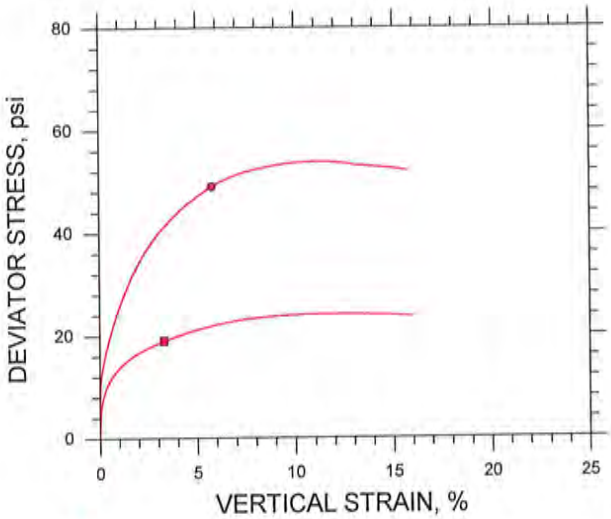
GeoTesting EXPRESS

Project: JM Stuart Station - DP&L	Location: Aberdeen, OH	Project No.: GTX-304889
Boring No.: HA-6-B1	Sample Type: intact	
Description: Moist, grayish brown clayey sand		
Remarks: System E		

Client: Haley & Aldrich, Inc.	
Project Name: JM Stuart Station - DP&L	
Project Location: Aberdeen, OH	
Project Number: GTX-304889	
Tested By: md	Checked By: mcm
Boring ID: HA-5-B1	
Preparation: intact	
Description: Moist, brown clay	
Classification: ---	
Group Symbol: ---	
Liquid Limit: 41	Plastic Limit: 21
Plasticity Index: 20	Estimated Specific Gravity: 2.7

CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767





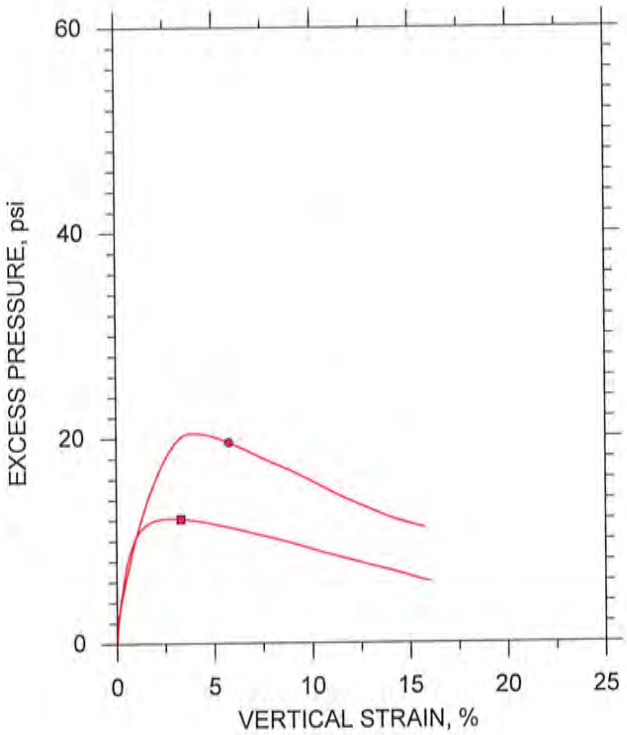
Symbol		■	●		
Sample ID		U1	U1		
Depth, ft		10-12 ft	10-12 ft		
Test Number		CU-3-1	CU-3-3		
Initial	Height, in	4.550	4.330		
	Diameter, in	2.020	2.030		
	Moisture Content (from Cuttings), %	19.5	21.1		
	Dry Density, pcf	103.	99.3		
	Saturation (Wet Method), %	83.3	81.7		
	Void Ratio	0.632	0.698		
Before Shear	Moisture Content, %	19.3	15.2		
	Dry Density, pcf	111.	120.		
	Cross-sectional Area (Method A), in²	2.994	2.749		
	Saturation, %	100.0	100.0		
	Void Ratio	0.522	0.409		
	Back Pressure, psi	97.00	56.99		
Vertical Effective Consolidation Stress, psi		13.99	37.81		
Horizontal Effective Consolidation Stress, psi		14.00	38.00		
Vertical Strain after Consolidation, %		0.09806	2.352		
Volumetric Strain after Consolidation, %		6.541	17.21		
Time to 50% Consolidation, min		259.2	259.2		
Shear Strength, psi		9.507	24.53		
Strain at Failure, %		3.30	5.77		
Strain Rate, %/min		0.01600	0.01600		
Deviator Stress at Failure, psi		19.01	49.05		
Effective Minor Principal Stress at Failure, psi		1.855	18.42		
Effective Major Principal Stress at Failure, psi		20.87	67.47		
B-Value		0.95	0.95		

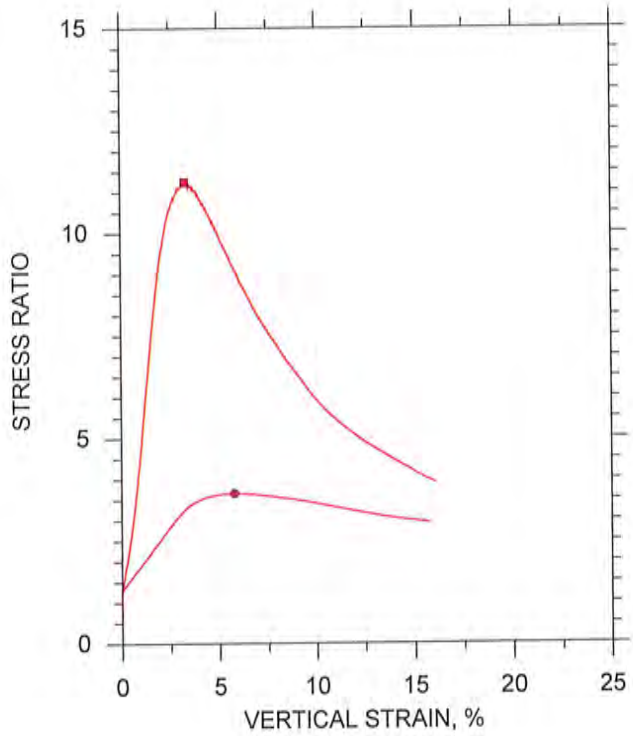
Notes:
- Before Shear Saturation set to 100% for phase calculation.
- Moisture Content determined by ASTM D2216.
- Atterberg Limits determined by ASTM D4318.
- Deviator Stress includes membrane correction.
- Values for c and φ determined from best-fit straight line for the specific test conditions. Actual strength parameters may vary and should be determined by an engineer for site conditions.

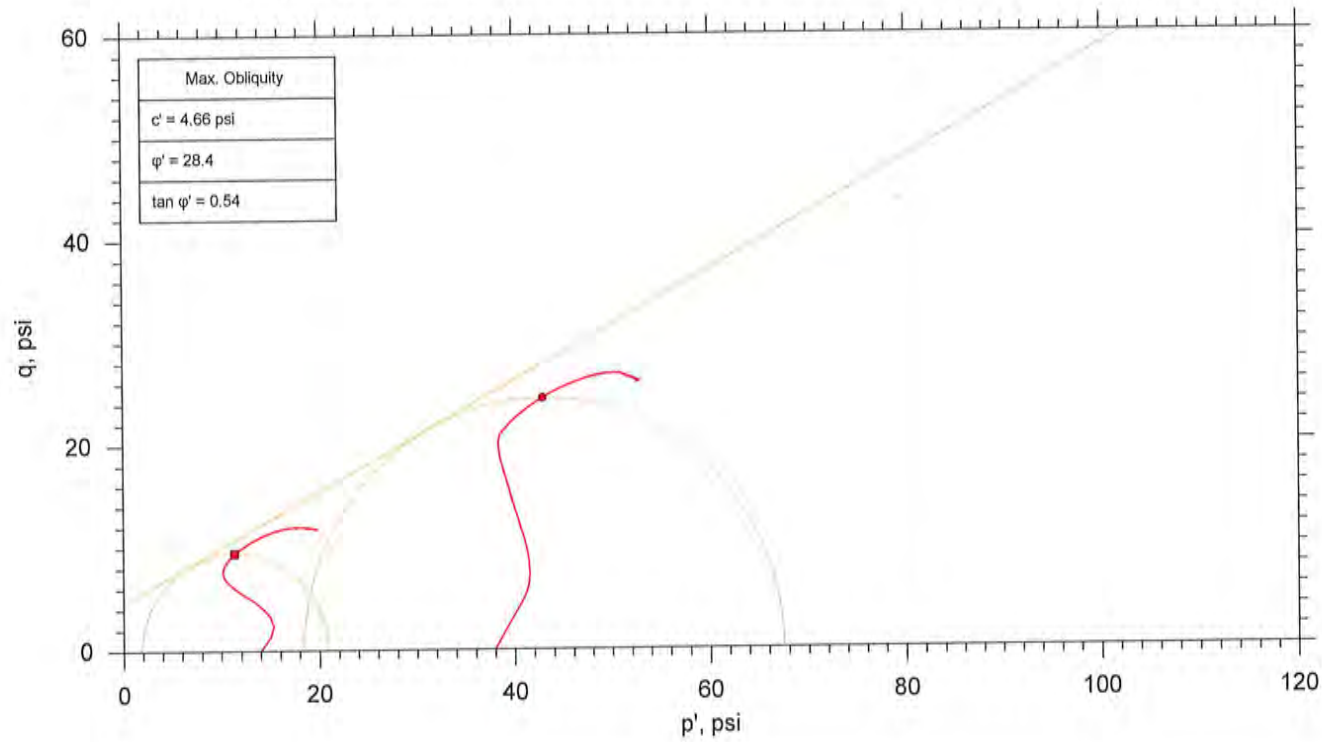
Remarks:

System S

CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767







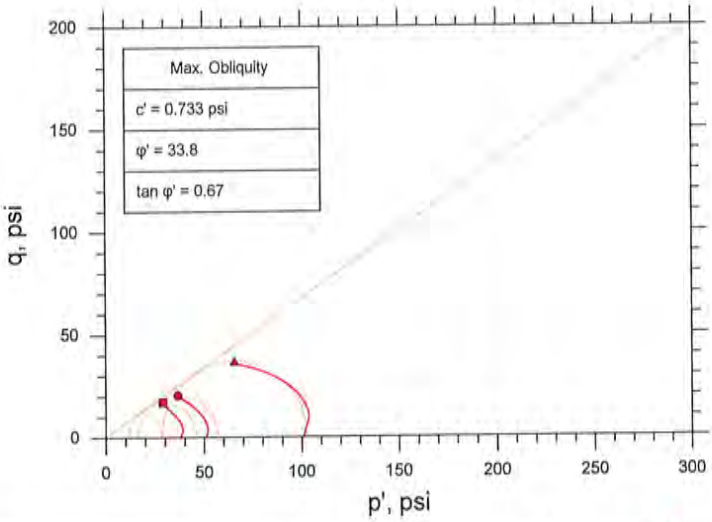
	Sample No.	Test No.	Depth	Tested By	Test Date	Checked By	Check Date	Test File
■	U1	CU-3-1	10-12 ft	md	6/27/16	mcm	7/7/16	304889-CU-3-1m.dat
●	U1	CU-3-3	10-12 ft	md	6/27/16	mcm	7/7/16	304889-CU-3-3m.dat

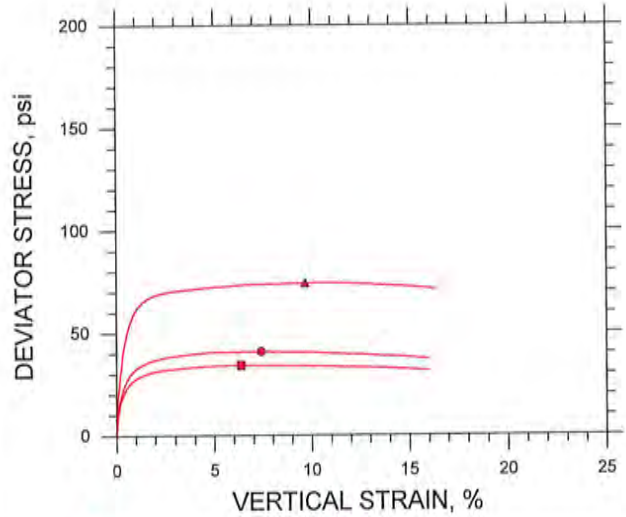
GeoTesting EXPRESS

Project: JM Stuart Station - DP&L	Location: Aberdeen, OH	Project No.: GTX-304889
Boring No.: HA-5-B1	Sample Type: intact	
Description: Moist, brown clay		
Remarks: System S		

Client: Haley & Aldrich, Inc.	
Project Name: JM Stuart Station - DP&L	
Project Location: Aberdeen ,OH	
Project Number: GTX-304889	
Tested By: md	Checked By: njh
Boring ID: HA-5-B1	
Preparation: intact	
Description: Moist, gray sandy silt	
Classification: ---	
Group Symbol: ---	
Liquid Limit: 31	Plastic Limit: 24
Plasticity Index: 7	Estimated Specific Gravity: 2.7

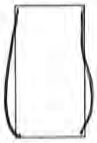
CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767





		■	●	▲
Symbol		■	●	▲
Sample ID		U3	U3	U3
Depth, ft		43-45 ft	43-45 ft	43-45 ft
Test Number		CU-2-1	CU-2-2	CU-2-3
Initial	Height, in	4.680	4.280	4.470
	Diameter, in	2.030	2.020	2.020
	Moisture Content (from Cuttings), %	33.5	33.6	29.5
	Dry Density, pcf	86.7	86.6	88.7
	Saturation (Wet Method), %	95.8	96.0	88.5
	Void Ratio	0.944	0.946	0.900
Before Shear	Moisture Content, %	31.6	28.4	27.2
	Dry Density, pcf	91.0	95.4	97.2
	Cross-sectional Area (Method A), in²	3.122	2.991	2.984
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.853	0.768	0.735
	Back Pressure, psi	152.9	144.9	160.9
Vertical Effective Consolidation Stress, psi		37.89	50.85	100.8
Horizontal Effective Consolidation Stress, psi		37.99	50.99	101.0
Vertical Strain after Consolidation, %		1.296	1.857	1.963
Volumetric Strain after Consolidation, %		5.064	6.849	8.834
Time to 50% Consolidation, min		12.25	9.000	2.250
Shear Strength, psi		17.13	20.47	37.14
Strain at Failure, %		6.38	7.40	9.67
Strain Rate, %/min		0.01600	0.01600	0.01600
Deviator Stress at Failure, psi		34.27	40.95	74.29
Effective Minor Principal Stress at Failure, psi		11.84	16.14	28.32
Effective Major Principal Stress at Failure, psi		46.11	57.08	102.6
B-Value		0.95	0.95	0.95

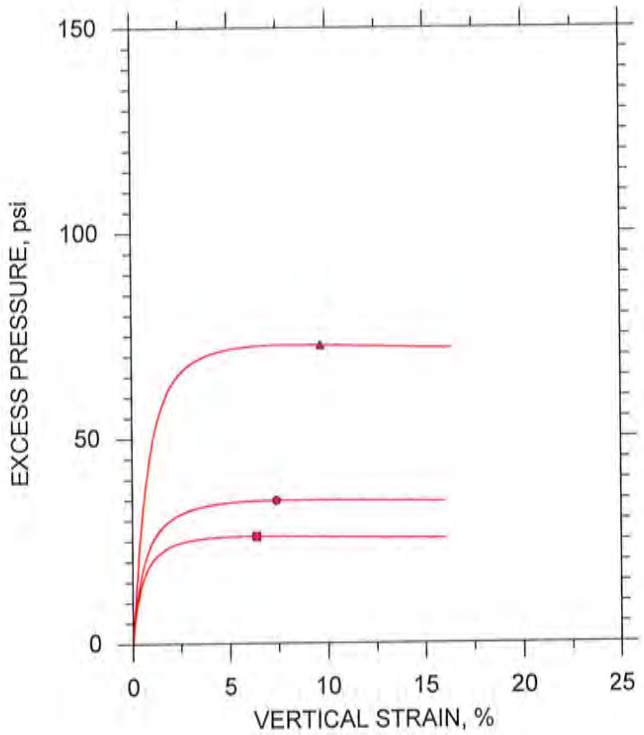
Notes:
- Before Shear Saturation set to 100% for phase calculation.
- Moisture Content determined by ASTM D2216.
- Atterberg Limits determined by ASTM D4318.
- Deviator Stress includes membrane correction.
- Values for c and φ determined from best-fit straight line for the specific test conditions. Actual strength parameters may vary and should be determined by an engineer for site conditions.

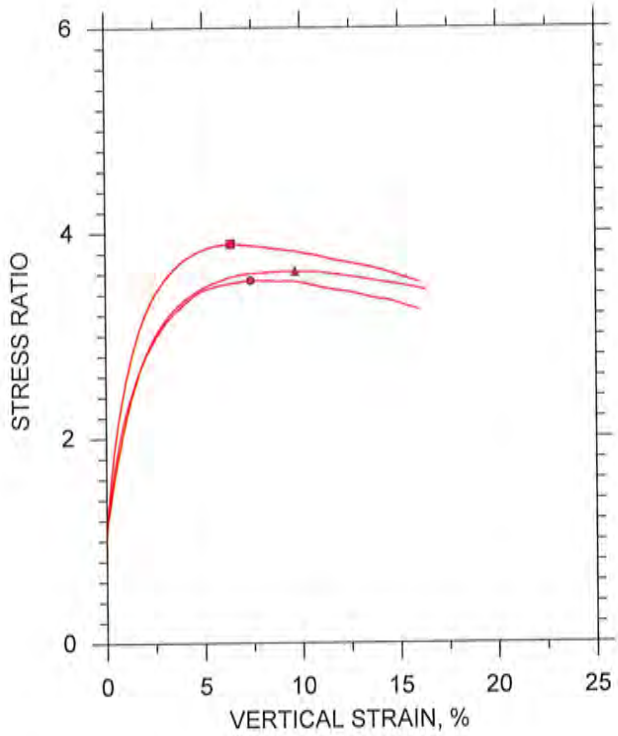


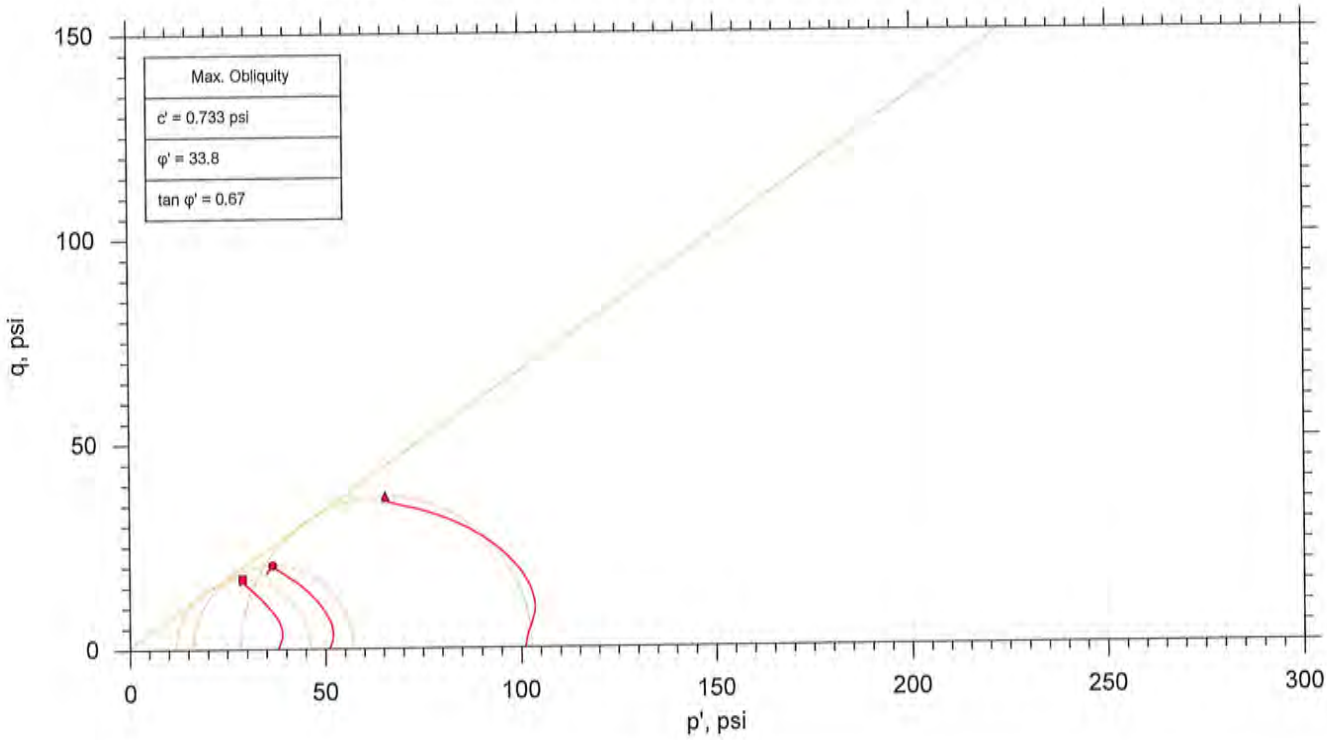
Remarks:

System S

CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767







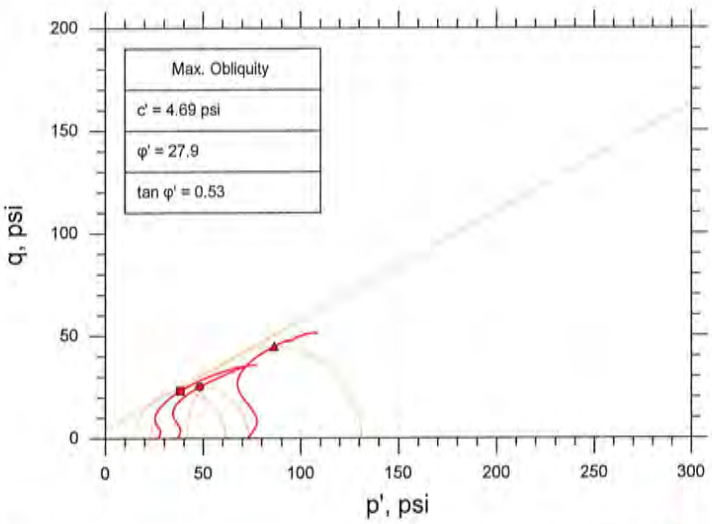
	Sample No.	Test No.	Depth	Tested By	Test Date	Checked By	Check Date	Test File
■	U3	CU-2-1	43-45 ft	md	06/16/16	njh	6/24/16	304889-CU-2-1n.dat
●	U3	CU-2-2	43-45 ft	md	06/16/16	njh	6/24/16	304889-CU-2-2n.dat
▲	U3	CU-2-3	43-45 ft	md	06/16/16	njh	6/24/16	304889-CU-2-3n.dat

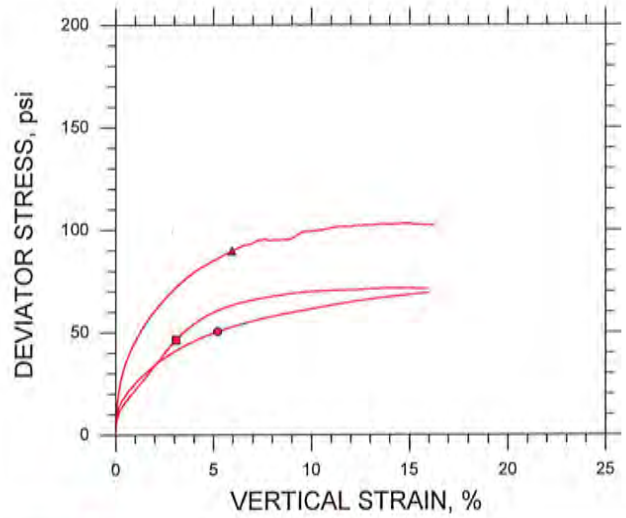
GeoTesting EXPRESS

Project: JM Stuart Station - DP&L	Location: Aberdeen ,OH	Project No.: GTX-304889
Boring No.: HA-5-B1	Sample Type: intact	
Description: Moist, gray sandy silt		
Remarks: System S		

Client: Haley & Aldrich, Inc.	
Project Name: JM Stuart Station - DP&L	
Project Location: Aberdeen, OH	
Project Number: GTX-304889	
Tested By: md	Checked By: njh
Boring ID: HA-7-B1	
Preparation: intact	
Description: Moist, brown clay	
Classification: ---	
Group Symbol: ---	
Liquid Limit: 45	Plastic Limit: 23
Plasticity Index: 22	Estimated Specific Gravity: 2.7

CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767





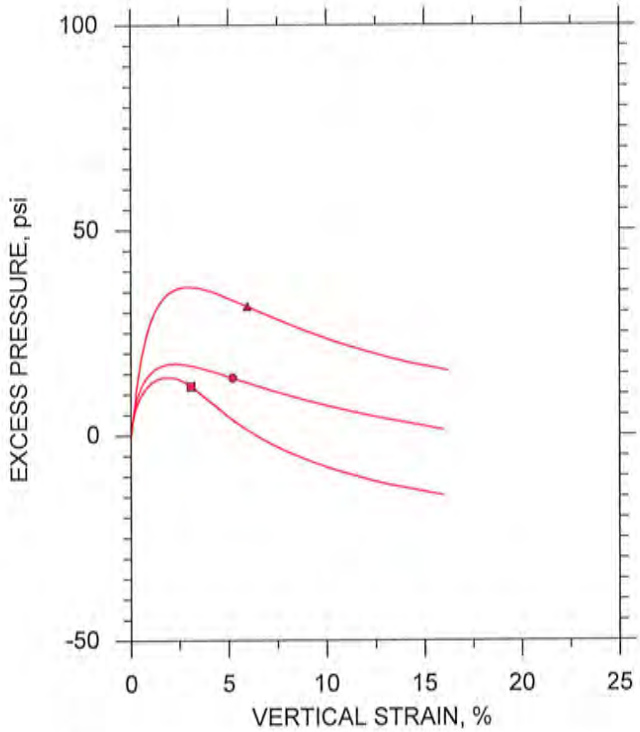
Symbol		■	●	▲
Sample ID		U2	U2	U2
Depth, ft		20-22 ft	20-22 ft	20-22 ft
Test Number		CU-1-1	CU-1-2	CU-1-3
Initial	Height, in	4.620	4.730	4.540
	Diameter, in	2.020	2.020	2.020
	Moisture Content (from Cuttings), %	20.0	19.9	21.7
	Dry Density, pcf	107.	110.	104.
	Saturation (Wet Method), %	93.5	99.8	94.8
	Void Ratio	0.578	0.539	0.617
Before Shear	Moisture Content, %	20.3	17.9	21.0
	Dry Density, pcf	109.	114.	108.
	Cross-sectional Area (Method A), in²	3.182	3.144	3.149
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.549	0.485	0.567
	Back Pressure, psi	156.9	146.6	148.5
Vertical Effective Consolidation Stress, psi		26.89	36.93	72.88
Horizontal Effective Consolidation Stress, psi		27.00	37.00	72.99
Vertical Strain after Consolidation, %		1.402	1.212	1.481
Volumetric Strain after Consolidation, %		2.577	2.199	3.411
Time to 50% Consolidation, min		96.04	84.64	56.25
Shear Strength, psi		23.21	25.24	44.87
Strain at Failure, %		3.09	5.20	5.94
Strain Rate, %/min		0.01600	0.01600	0.01600
Deviator Stress at Failure, psi		46.42	50.48	89.75
Effective Minor Principal Stress at Failure, psi		15.00	22.99	41.46
Effective Major Principal Stress at Failure, psi		61.42	73.47	131.2
B-Value		0.95	0.95	0.95

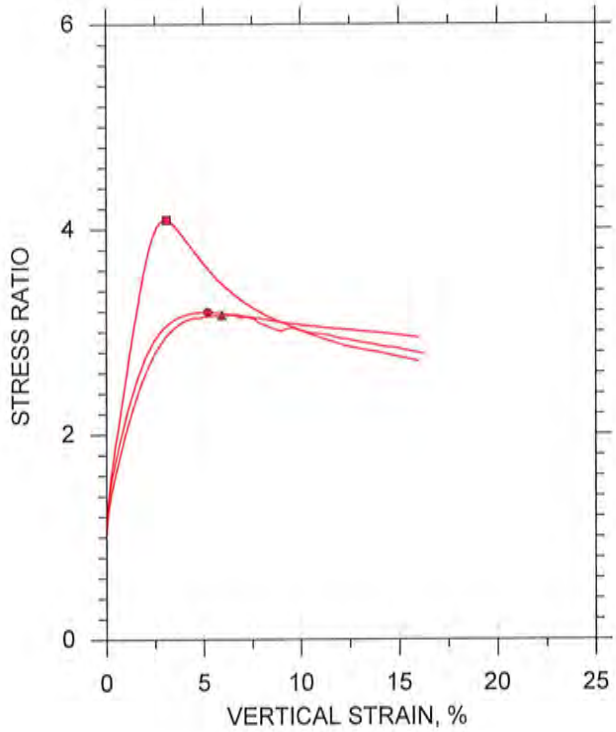
Notes:
- Before Shear Saturation set to 100% for phase calculation.
- Moisture Content determined by ASTM D2216.
- Atterberg Limits determined by ASTM D4318.
- Deviator Stress includes membrane correction.
- Values for c and φ determined from best-fit straight line for the specific test conditions. Actual strength parameters may vary and should be determined by an engineer for site conditions.

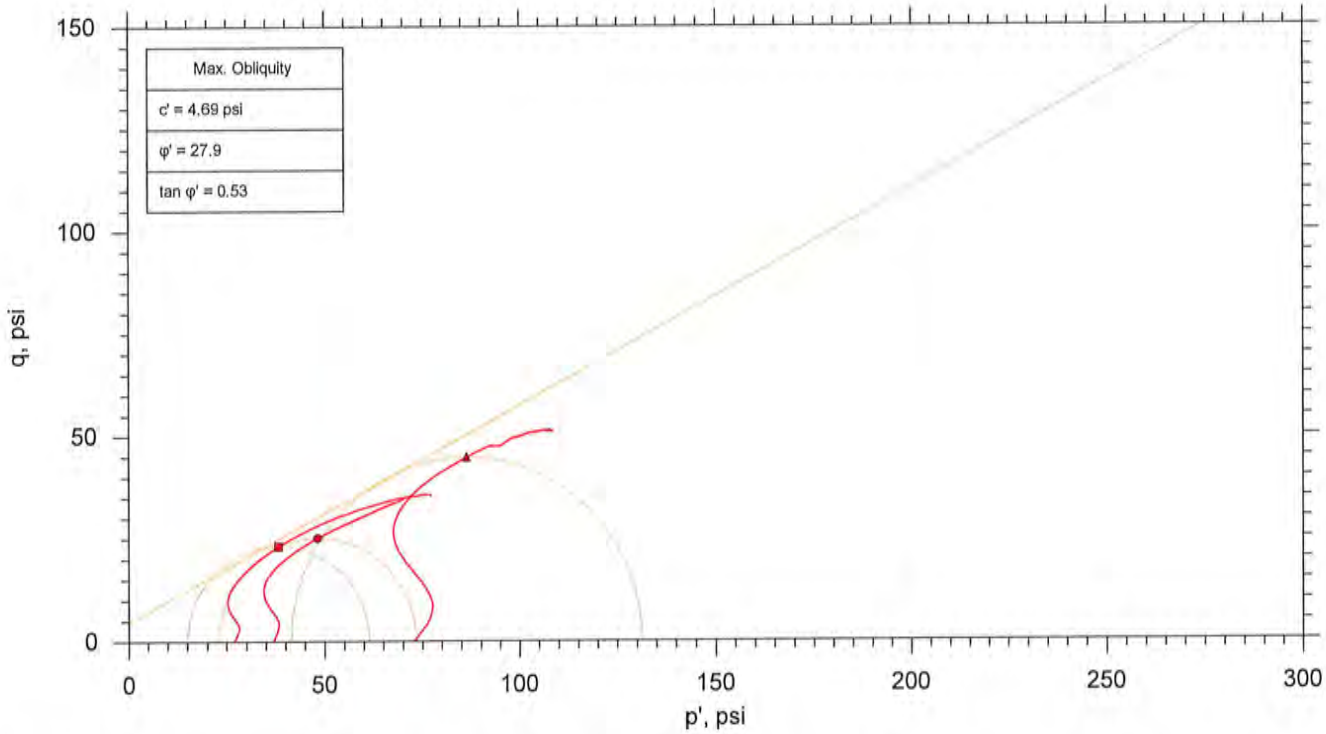
Remarks:

System O

CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767







	Sample No.	Test No.	Depth	Tested By	Test Date	Checked By	Check Date	Test File
■	U2	CU-1-1	20-22 ft	md	06/16/16	njh	6/23/16	304889-CU-1-1n.dat
●	U2	CU-1-2	20-22 ft	md	06/16/16	njh	6/23/16	304889-CU-1-2n.dat
▲	U2	CU-1-3	20-22 ft	md	06/16/16	njh	6/23/16	304889-CU-1-3n.dat

GeoTesting EXPRESS

Project: JM Stuart Station - DP&L	Location: Aberdeen, OH	Project No.: GTX-304889
Boring No.: HA-7-B1	Sample Type: intact	
Description: Moist, brown clay		
Remarks: System O		

Client:	Haley & Aldrich, Inc.		
Project Name:	JM Stuart Station - DP&L		
Project Location:	Aberdeen, OH		
GTX #:	304889	Tested By:	md
Test Date:	06/16/16-06/30/16	Checked By:	emm

Tube Handling with Moisture Content (ASTM D2216), Density of Soil (ASTM D7263), Hand-Held Torvane, and Visual Description

Boring ID	Sample ID	Depth, ft	Section	Visual Description	Bulk Density, lb/ft^3	Moisture Content, %	Dry Density, lb/ft^3	Hand Held Torvane Readings, tsf			
								1	2	3	Average
HA-5-B1	U1	10-12	Top	Moist, brown clay	131.9	19.7	110.2	1.55	1.75	1.60	1.63
			Middle	Moist, brown clay	116.4	21.2	96.1	1.33	1.35	1.28	1.32
			Bottom	Moist, brown clay	124.0	21.1	102.4	1.25	1.25	1.25	1.25
HA-5-B1	U2	34-36	Top	Moist, olive clay with sand	125.1	17.9	106.1	1.65	1.25	1.53	1.48
			Middle	Moist, olive clay with sand	124.3	24.4	99.9	0.58	0.80	0.60	0.66
			Bottom	Moist, olive clay with sand	124.8	25.5	99.5	0.85	0.90	0.93	0.89
HA-5-B1	U3	43-45	Top	Moist, gray sandy silt	116.7	33.5	87.4	0.20	0.21	0.20	0.20
			Middle	Moist, gray sandy silt	114.5	33.6	85.7	0.30	0.50	0.41	0.40
			Bottom	Moist, gray sandy silt	110.0	29.5	85.0	0.25	0.27	0.25	0.26
HA-6-B1	U1	12-14	Top	Moist, brown sandy clay	126.1	20.3	104.8	1.05	1.03	0.70	0.93
			Middle	Moist, brown sandy clay	135.3	16.5	116.1	1.25	1.08	1.18	1.17
			Bottom	Moist, brown sandy clay	140.8	13.4	124.2	2.13	2.00	2.00	2.04

Client:	Haley & Aldrich, Inc.		
Project Name:	JM Stuart Station - DP&L		
Project Location:	Aberdeen, OH		
GTX #:	304889	Tested By:	md
Test Date:	06/16/16-06/30/16	Checked By:	emm

Tube Handling with Moisture Content (ASTM D2216), Density of Soil (ASTM D7263), Hand-Held Torvane, and Visual Description

Boring ID	Sample ID	Depth, ft	Section	Visual Description	Bulk Density, lb/ft^3	Moisture Content, %	Dry Density, lb/ft^3	Hand Held Torvane Readings, tsf			
								1	2	3	Average
HA-6-B1	U2	21-23	Top	Moist, brown sandy, silty clay	132.2	15.4	114.5	1.00	0.98	0.83	0.93
			Middle	Moist, brown sandy, silty clay	132.0	13.6	116.2	0.85	0.85	0.88	0.86
			Bottom	Moist, brown sandy, silty clay	131.4	14.1	115.2	1.00	1.15	1.35	1.17
HA-6-B1	U3	36-38	Top	Moist, grayish brown clayey sand	130.6	17.9	110.7	---	---	---	---
			Middle	Moist, grayish brown clayey sand	136.1	14.2	119.2	---	---	---	---
			Bottom	Moist, grayish brown clayey sand	126.4	10.2	114.7	---	---	---	---
HA-7-B1	U2	20-22	Top	Moist, brown clay	129.8	20.0	108.1	---	---	---	---
			Middle	Moist, brown clay	126.0	21.6	103.6	---	---	---	---
			Bottom	Moist, brown clay	126.4	21.7	103.9	---	---	---	---

Client:	Haley & Aldrich, Inc.		
Project Name:	JM Stuart Station - DP&L		
Project Location:	Aberdeen, OH		
GTX #:	304889	Tested By:	md
Test Date:	06/16/16-06/30/16	Checked By:	emm

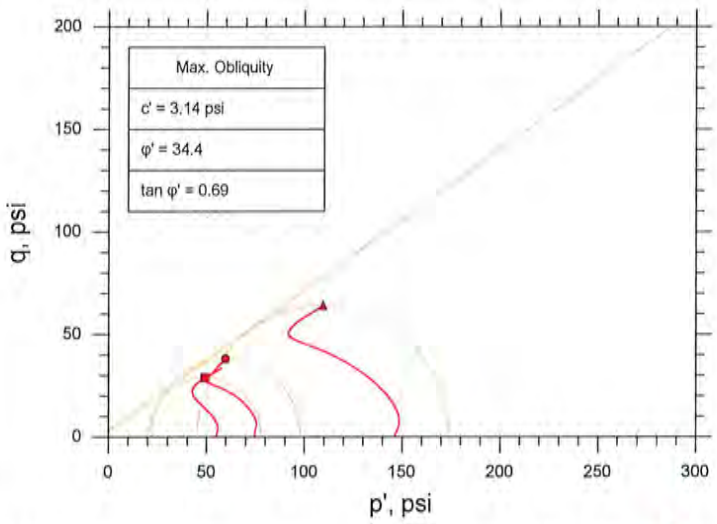
Tube Handling with Moisture Content (ASTM D2216), Density of Soil (ASTM D7263), Hand-Held Torvane, and Visual Description

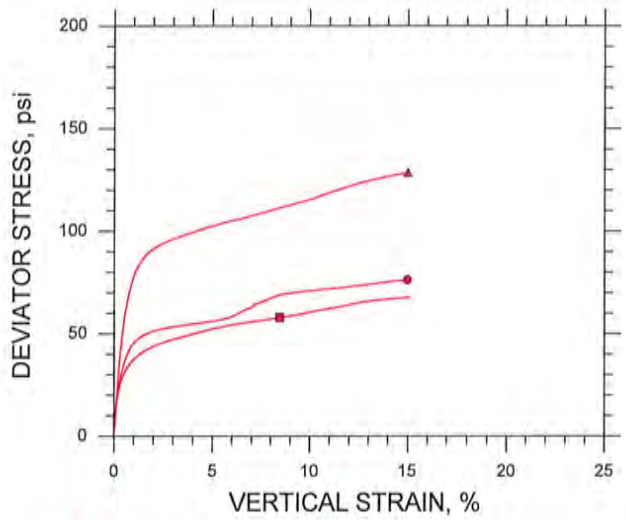
Boring ID	Sample ID	Depth, ft	Section	Visual Description	Bulk Density, lb/ft^3	Moisture Content, %	Dry Density, lb/ft^3	Hand Held Torvane Readings, tsf			
								1	2	3	Average
HA-7-B1	U3	42-44	Top	Moist, dark yellowish brown sandy, silty clay	120.3	23.3	97.6	0.25	0.23	0.18	0.22
			Middle	Moist, dark yellowish brown sandy, silty clay	126.0	23.0	102.5	0.38	0.35	0.20	0.31
			Bottom	Moist, dark yellowish brown sandy, silty clay	122.1	27.0	96.1	0.33	0.25	0.28	0.28
HA-7-B2A	U2	8-10	Top	Moist, brown clay with sand	118.1	26.6	93.3	0.10	0.12	0.10	0.11
			Middle	Moist, brown clay with sand	121.1	26.6	95.7	0.15	0.16	0.11	0.14
			Bottom	Moist, brown clay with sand	125.7	26.5	99.4	0.17	0.15	0.15	0.16

Notes: Density determined on undisturbed tube samples provided to GeoTesting Express in Shelby tubes
Moisture content determined by ASTM D2216 at 110° C

Client: Haley & Aldrich, Inc.	
Project Name: JM Stuart Station - DP&L	
Project Location: Aberdeen, OH	
Project Number: GTX-304889	
Tested By: md	Checked By: njh
Boring ID: HA-7-B1	
Preparation: intact	
Description: Moist, dark yellowish brown sandy, silty clay	
Classification: ---	
Group Symbol: ---	
Liquid Limit: 24	Plastic Limit: 19
Plasticity Index: 5	Estimated Specific Gravity: 2.7

CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767





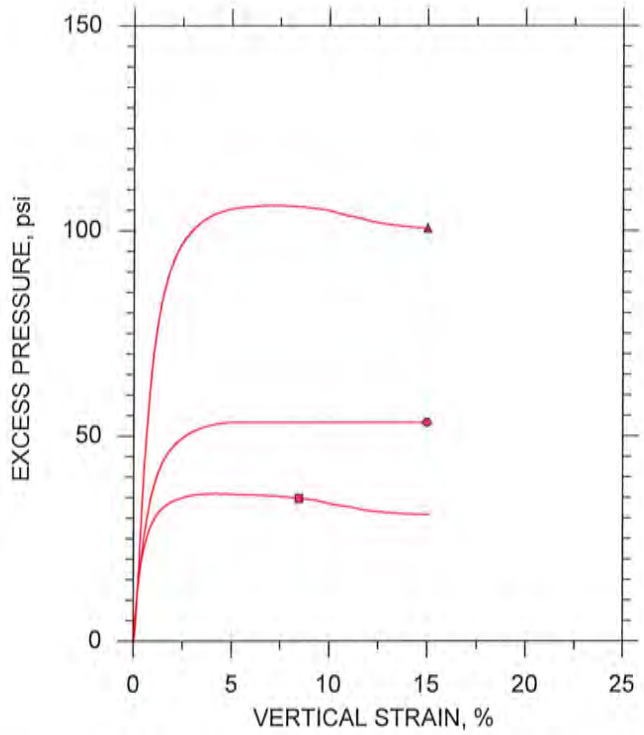
Symbol		■	●	▲
Sample ID		U3	U3	U3
Depth, ft		42-44 ft	42-44 ft	42-44 ft
Test Number		CU-7-1	CU-7-2	CU-7-3
Initial	Height, in	4.330	4.610	6.000
	Diameter, in	2.040	2.030	2.860
	Moisture Content (from Cuttings), %	24.3	26.0	26.5
	Dry Density, pcf	97.0	94.5	99.9
	Saturation (Wet Method), %	88.9	89.7	103.9
	Void Ratio	0.737	0.783	0.687
Before Shear	Moisture Content, %	23.8	25.1	19.7
	Dry Density, pcf	103.	101.	110.
	Cross-sectional Area (Method A), in²	3.112	3.070	6.004
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.644	0.677	0.533
	Back Pressure, psi	117.0	147.0	82.98
Vertical Effective Consolidation Stress, psi		54.95	74.90	145.9
Horizontal Effective Consolidation Stress, psi		55.00	74.98	146.0
Vertical Strain after Consolidation, %		0.7042	0.9882	2.657
Volumetric Strain after Consolidation, %		5.708	6.367	8.746
Time to 50% Consolidation, min		2.560	6.250	12.96
Shear Strength, psi		28.97	38.13	64.27
Strain at Failure, %		8.46	15.0	15.0
Strain Rate, %/min		0.01600	0.01600	0.01600
Deviator Stress at Failure, psi		57.93	76.26	128.5
Effective Minor Principal Stress at Failure, psi		20.19	21.68	45.35
Effective Major Principal Stress at Failure, psi		78.12	97.94	173.9
B-Value		0.95	0.95	0.95

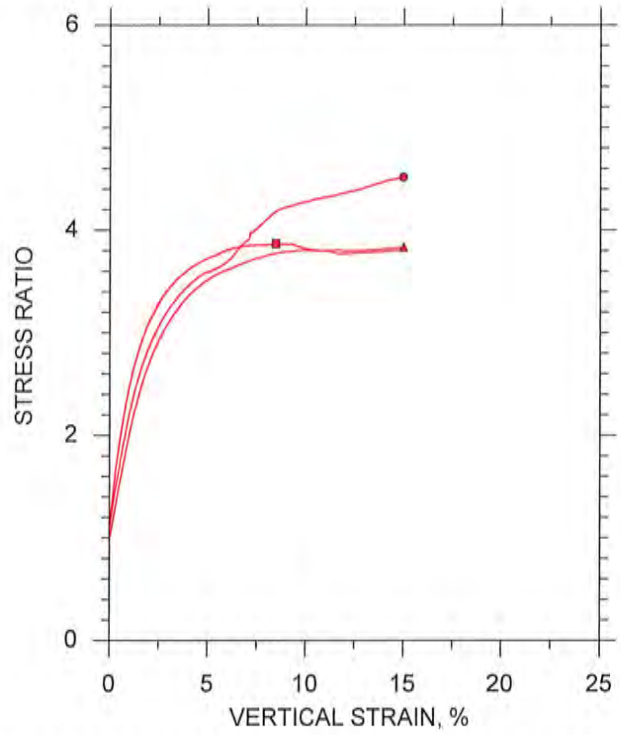
Notes:
- Before Shear Saturation set to 100% for phase calculation.
- Moisture Content determined by ASTM D2216.
- Atterberg Limits determined by ASTM D4318.
- Deviator Stress includes membrane correction.
- Values for c and φ determined from best-fit straight line for the specific test conditions. Actual strength parameters may vary and should be determined by an engineer for site conditions.

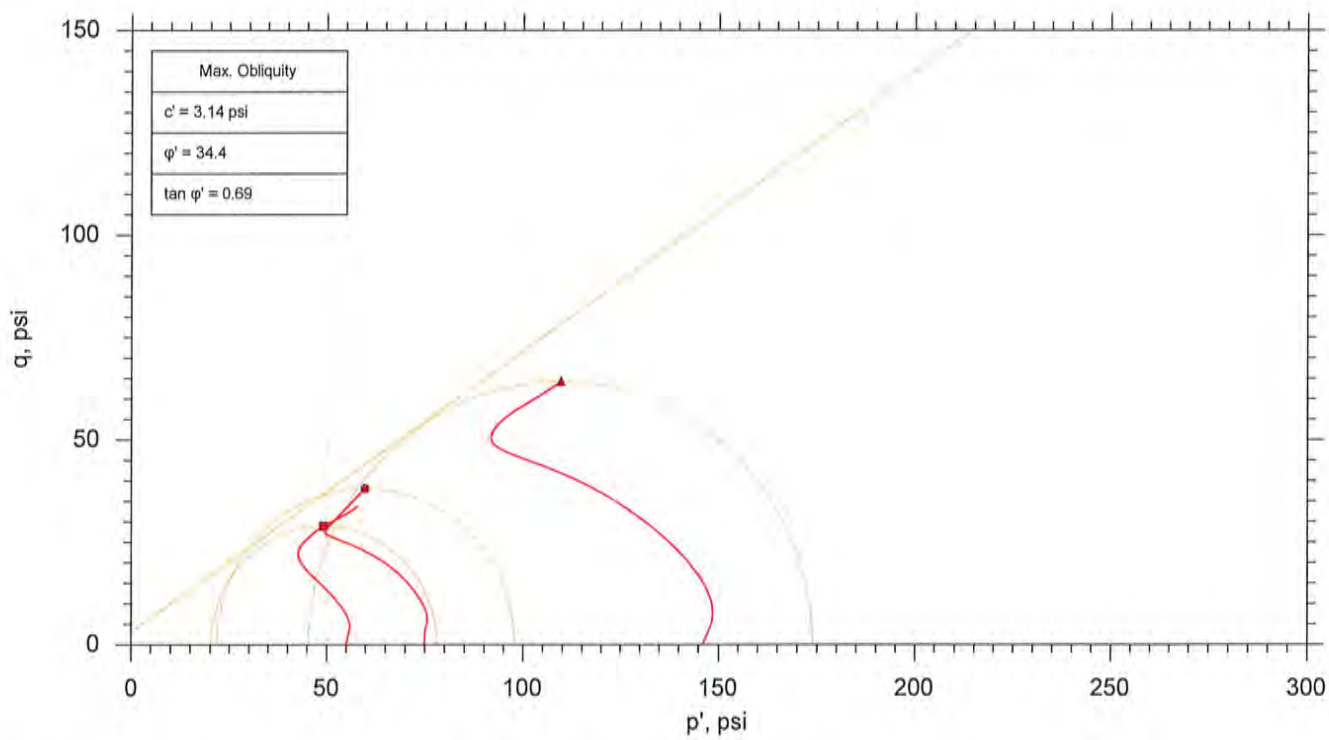
Remarks:

System O

CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767







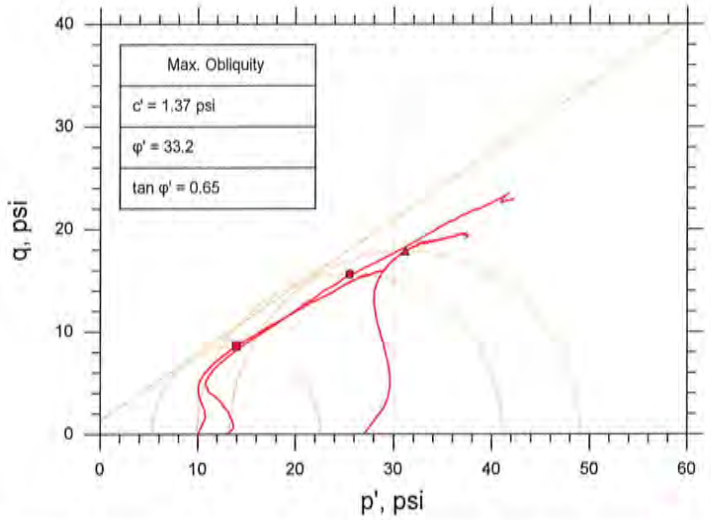
	Sample No.	Test No.	Depth	Tested By	Test Date	Checked By	Check Date	Test File
■	U3	CU-7-1	42-44 ft	md	07/05/16	njh	7/12/16	304889-CU-7-1n.dat
●	U3	CU-7-2	42-44 ft	md	07/05/16	njh	7/12/16	304889-CU-7-2n.dat
▲	U3	CU-7-3	42-44 ft	md	07/05/16	njh	7/12/16	304889-CU-7-3n.dat

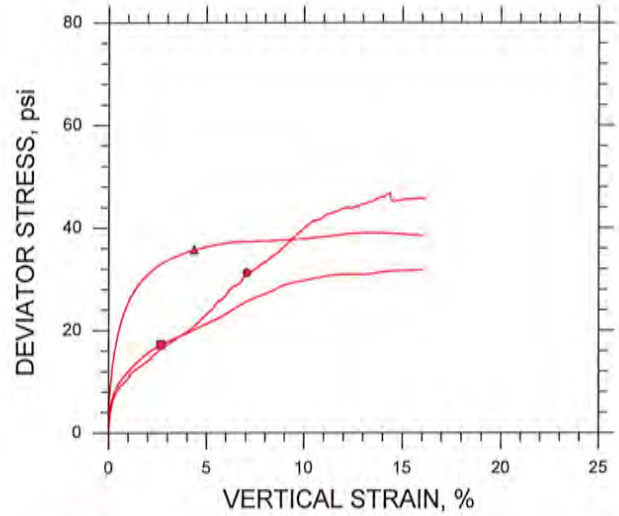
GeoTesting EXPRESS

Project: JM Stuart Station - DP&L	Location: Aberdeen, OH	Project No.: GTX-304889
Boring No.: HA-7-B1	Sample Type: intact	
Description: Moist, dark yellowish brown sandy, silty clay		
Remarks: System O		

Client: Haley & Aldrich, Inc.	
Project Name: JM Stuart Station - DP&L	
Project Location: Aberdeen, OH	
Project Number: GTX-304889	
Tested By: md	Checked By: mcm
Boring ID: HA-7-B2A	
Preparation: intact	
Description: Moist, brown clay with sand	
Classification: ---	
Group Symbol: ---	
Liquid Limit: 30	Plastic Limit: 19
Plasticity Index: 11	Estimated Specific Gravity: 2.7

CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767





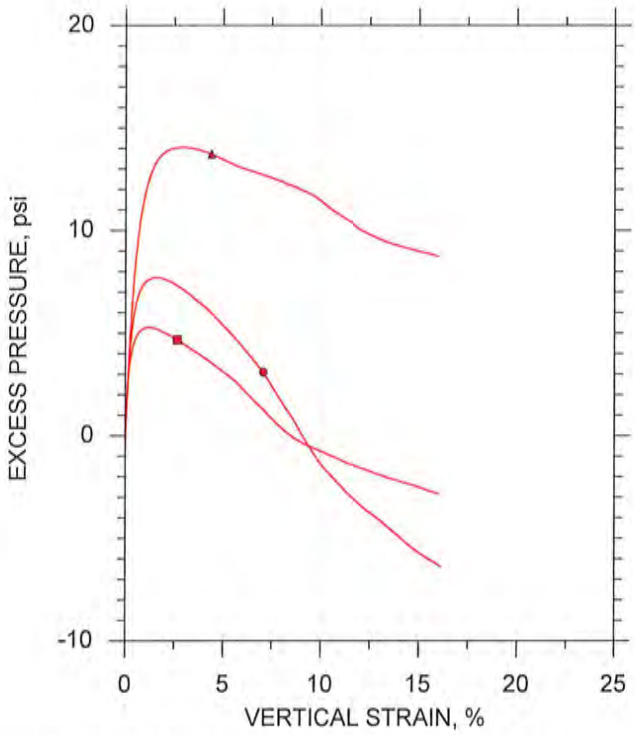
Symbol		■	●	▲
Sample ID		U2	U2	U2
Depth, ft		8-10 ft	8-10 ft	8-10 ft
Test Number		CU-6-1	CU-6-2	CU-6-3
Initial	Height, in	4.410	4.220	4.210
	Diameter, in	1.980	1.980	2.030
	Moisture Content (from Cuttings), %	26.6	26.6	26.5
	Dry Density, pcf	93.3	95.9	99.3
	Saturation (Wet Method), %	89.1	94.9	102.6
	Void Ratio	0.806	0.757	0.697
Before Shear	Moisture Content, %	28.8	25.1	22.9
	Dry Density, pcf	94.9	101.	104.
	Cross-sectional Area (Method A), in²	3.031	2.985	3.101
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.777	0.677	0.619
	Back Pressure, psi	134.7	127.0	38.99
Vertical Effective Consolidation Stress, psi		10.02	12.96	27.02
Horizontal Effective Consolidation Stress, psi		9.991	13.00	27.00
Vertical Strain after Consolidation, %		0.1262	0.7166	0.3366
Volumetric Strain after Consolidation, %		1.733	2.071	4.347
Time to 50% Consolidation, min		2.560	1.000	1.000
Shear Strength, psi		8.625	15.63	17.88
Strain at Failure, %		2.65	7.05	4.36
Strain Rate, %/min		0.01600	0.01600	0.01600
Deviator Stress at Failure, psi		17.25	31.26	35.75
Effective Minor Principal Stress at Failure, psi		5.319	9.908	13.28
Effective Major Principal Stress at Failure, psi		22.57	41.17	49.03
B-Value		0.95	1.84	0.96

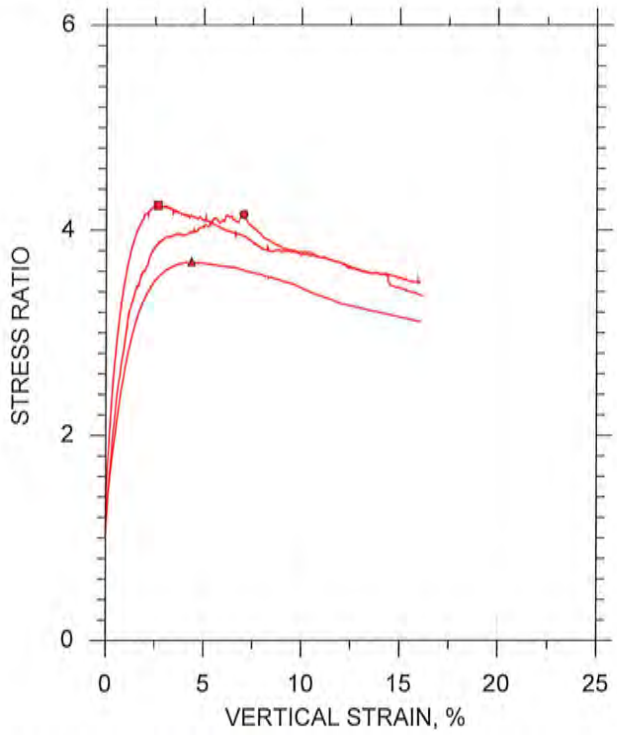
Notes:
- Before Shear Saturation set to 100% for phase calculation.
- Moisture Content determined by ASTM D2216.
- Atterberg Limits determined by ASTM D4318.
- Deviator Stress includes membrane correction.
- Values for c and φ determined from best-fit straight line for the specific test conditions. Actual strength parameters may vary and should be determined by an engineer for site conditions.

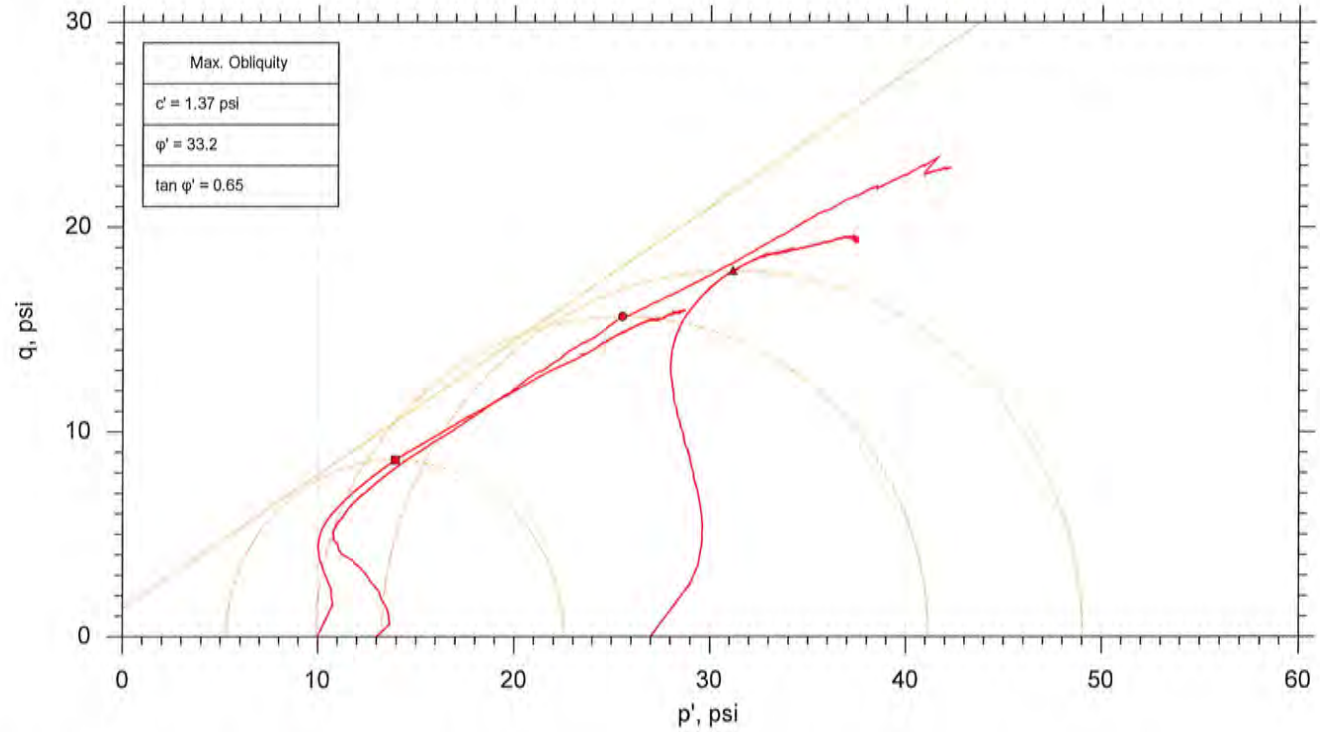
Remarks:

System B

CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767







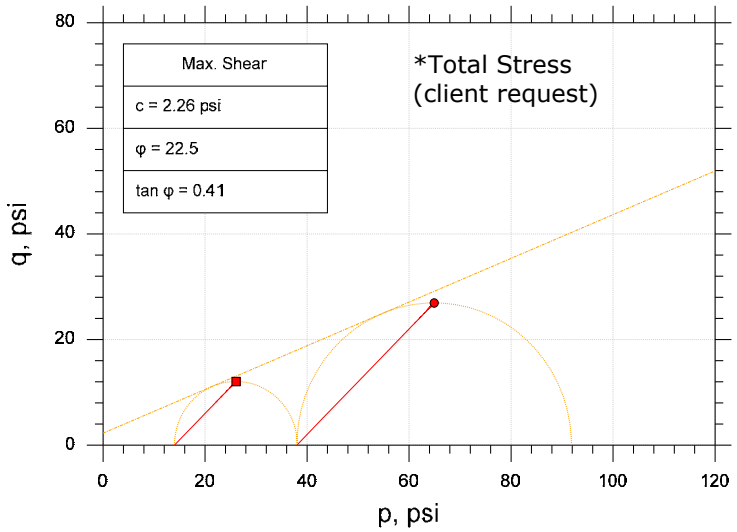
	Sample No.	Test No.	Depth	Tested By	Test Date	Checked By	Check Date	Test File
■	U2	CU-6-1	8-10 ft	md	7/5/16	mcm	7/12/16	304889-CU-6-1m.dat
●	U2	CU-6-2	8-10 ft	md	07/05/16	njh	7/12/16	304889-CU-6-2n.dat
▲	U2	CU-6-3	8-10 ft	md	07/05/16	njh	7/12/16	304889-CU-6-3n.dat

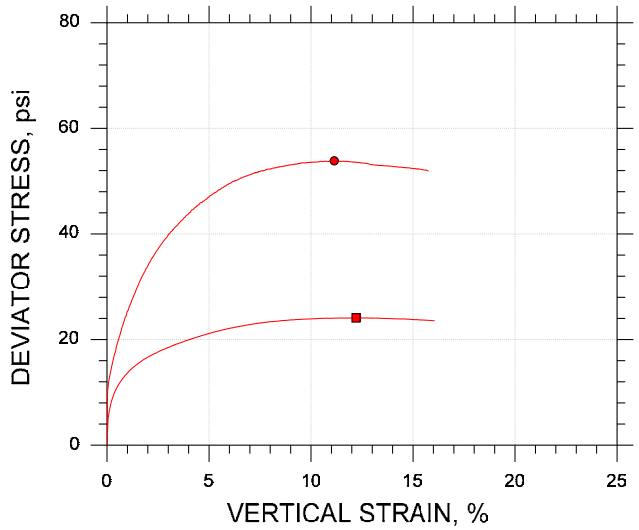
GeoTesting EXPRESS

Project: JM Stuart Station - DP&L	Location: Aberdeen, OH	Project No.: GTX-304889
Boring No.: HA-7-B2A	Sample Type: intact	
Description: Moist, brown clay with sand		
Remarks: System B		

Client: Haley & Aldrich, Inc.	
Project Name: JM Stuart Station - DP&L	
Project Location: Aberdeen, OH	
Project Number: GTX-304889	
Tested By: md	Checked By: mcm
Boring ID: HA-5-B1	
Preparation: intact	
Description: Moist, brown clay	
Classification: ---	
Group Symbol: ---	
Liquid Limit: 41	Plastic Limit: 21
Plasticity Index: 20	Estimated Specific Gravity: 2.7

CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767





Symbol		■	●		
Sample ID		U1	U1		
Depth, ft		10-12 ft	10-12 ft		
Test Number		CU-3-1	CU-3-3		
Initial	Height, in	4.550	4.330		
	Diameter, in	2.020	2.030		
	Moisture Content (from Cuttings), %	19.5	21.1		
	Dry Density, pcf	103.	99.3		
	Saturation (Wet Method), %	83.3	81.7		
	Void Ratio	0.632	0.698		
Before Shear	Moisture Content, %	19.3	15.2		
	Dry Density, pcf	111.	120.		
	Cross-sectional Area (Method A), in²	2.994	2.749		
	Saturation, %	100.0	100.0		
	Void Ratio	0.522	0.409		
	Back Pressure, psi	97.00	56.99		
Vertical Effective Consolidation Stress, psi		13.99	37.81		
Horizontal Effective Consolidation Stress, psi		14.00	38.00		
Vertical Strain after Consolidation, %		0.09806	2.352		
Volumetric Strain after Consolidation, %		6.541	17.21		
Time to 50% Consolidation, min		259.2	259.2		
Shear Strength, psi		12.05	26.92		
Strain at Failure, %		12.2	11.1		
Strain Rate, %/min		0.01600	0.01600		
Deviator Stress at Failure, psi		24.10	53.84		
Effective Minor Principal Stress at Failure, psi		6.013	23.38		
Effective Major Principal Stress at Failure, psi		30.12	77.22		
B-Value		0.95	0.95		

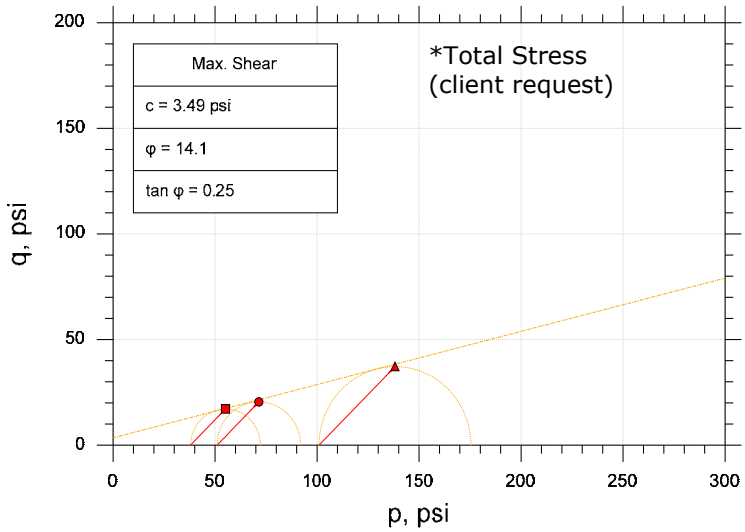
Notes:
- Before Shear Saturation set to 100% for phase calculation.
- Moisture Content determined by ASTM D2216.
- Atterberg Limits determined by ASTM D4318.
- Deviator Stress includes membrane correction.
- Values for c and φ determined from best-fit straight line for the specific test conditions. Actual strength parameters may vary and should be determined by an engineer for site conditions.

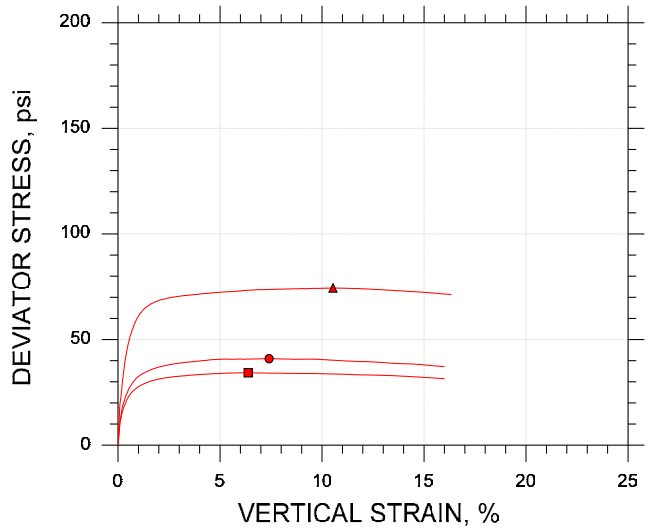
Remarks:

System S

Client: Haley & Aldrich, Inc.	
Project Name: JM Stuart Station - DP&L	
Project Location: Aberdeen ,OH	
Project Number: GTX-304889	
Tested By: md	Checked By: njh
Boring ID: HA-5-B1	
Preparation: intact	
Description: Moist, gray sandy silt	
Classification: ---	
Group Symbol: ---	
Liquid Limit: 31	Plastic Limit: 24
Plasticity Index: 7	Estimated Specific Gravity: 2.7

CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767





Symbol		■	●	▲
Sample ID		U3	U3	U3
Depth, ft		43-45 ft	43-45 ft	43-45 ft
Test Number		CU-2-1	CU-2-2	CU-2-3
Initial	Height, in	4.680	4.280	4.470
	Diameter, in	2.030	2.020	2.020
	Moisture Content (from Cuttings), %	33.5	33.6	29.5
	Dry Density, pcf	86.7	86.6	88.7
	Saturation (Wet Method), %	95.8	96.0	88.5
	Void Ratio	0.944	0.946	0.900
Before Shear	Moisture Content, %	31.6	28.4	27.2
	Dry Density, pcf	91.0	95.4	97.2
	Cross-sectional Area (Method A), in²	3.122	2.991	2.984
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.853	0.768	0.735
	Back Pressure, psi	152.9	144.9	160.9
Vertical Effective Consolidation Stress, psi		37.89	50.85	100.8
Horizontal Effective Consolidation Stress, psi		37.99	50.99	101.0
Vertical Strain after Consolidation, %		1.296	1.857	1.963
Volumetric Strain after Consolidation, %		5.064	6.849	8.834
Time to 50% Consolidation, min		12.25	9.000	2.250
Shear Strength, psi		17.13	20.47	37.21
Strain at Failure, %		6.38	7.40	10.5
Strain Rate, %/min		0.01600	0.01600	0.01600
Deviator Stress at Failure, psi		34.27	40.95	74.41
Effective Minor Principal Stress at Failure, psi		11.84	16.14	28.40
Effective Major Principal Stress at Failure, psi		46.11	57.08	102.8
B-Value		0.95	0.95	0.95

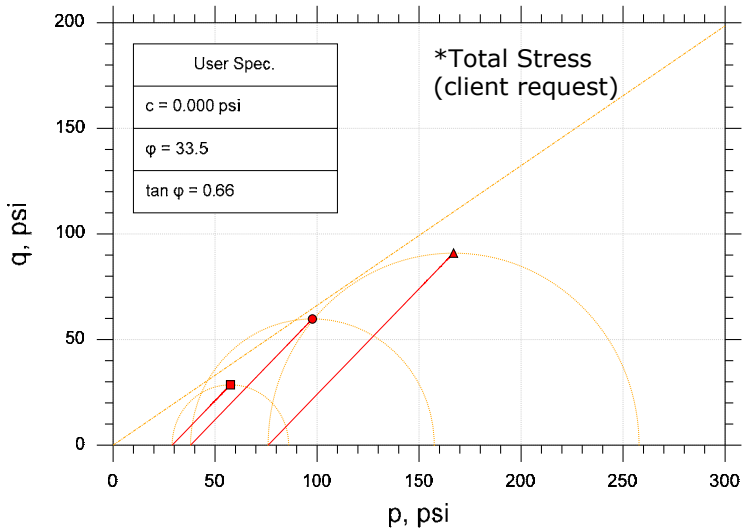
Notes:
- Before Shear Saturation set to 100% for phase calculation.
- Moisture Content determined by ASTM D2216.
- Atterberg Limits determined by ASTM D4318.
- Deviator Stress includes membrane correction.
- Values for c and φ determined from best-fit straight line for the specific test conditions. Actual strength parameters may vary and should be determined by an engineer for site conditions.

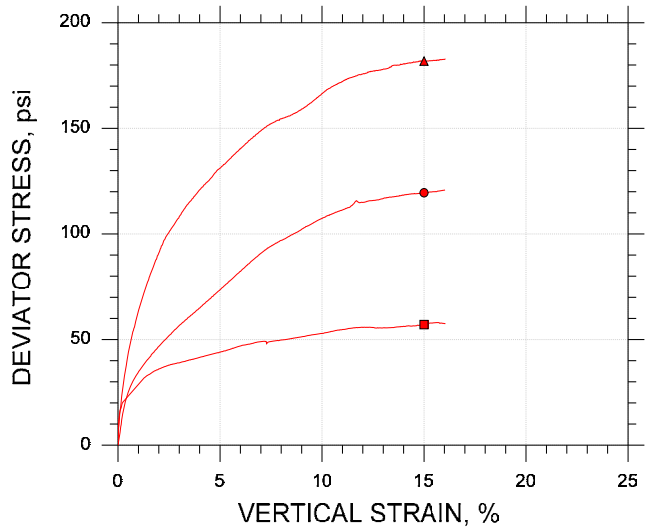
Remarks:

System S

Client: Haley & Aldrich, Inc	
Project Name: JM Stuart Station - DP&L	
Project Location: Aberdeen, OH	
Project Number: GTX-304889	
Tested By: md	Checked By: mcm
Boring ID: HA-6-B1	
Preparation: intact	
Description: Moist, brown sandy, silty clay	
Classification: ---	
Group Symbol: ---	
Liquid Limit: 23	Plastic Limit: 17
Plasticity Index: 6	Estimated Specific Gravity: 2.7

CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767





Symbol		■	●	▲	
Sample ID		U2	U2	U2	
Depth, ft		21-23 ft	21-23 ft	21-23 ft	
Test Number		CU-5-1	CU-5-2	CU-5-3	
Initial	Height, in	4.410	4.430	4.310	
	Diameter, in	2.030	2.030	2.030	
	Moisture Content (from Cuttings), %	15.4	13.6	14.1	
	Dry Density, pcf	111.	116.	115.	
	Saturation (Wet Method), %	79.8	81.9	82.7	
	Void Ratio	0.522	0.447	0.460	
Before Shear	Moisture Content, %	11.9	15.4	15.9	
	Dry Density, pcf	128.	119.	118.	
	Cross-sectional Area (Method A), in²	2.871	3.183	3.195	
	Saturation, %	100.0	100.0	100.0	
	Void Ratio	0.321	0.416	0.428	
	Back Pressure, psi	33.00	150.7	160.7	
Vertical Effective Consolidation Stress, psi		28.83	37.92	75.94	
Horizontal Effective Consolidation Stress, psi		28.99	37.96	75.99	
Vertical Strain after Consolidation, %		2.135	0.5107	0.7116	
Volumetric Strain after Consolidation, %		13.10	2.148	1.626	
Time to 50% Consolidation, min		324.0	36.00	20.25	
Shear Strength, psi		28.55	59.74	90.92	
Strain at Failure, %		15.0	15.0	15.0	
Strain Rate, %/min		0.01600	0.01600	0.01600	
Deviator Stress at Failure, psi		57.10	119.5	181.8	
Effective Minor Principal Stress at Failure, psi		20.74	51.39	79.25	
Effective Major Principal Stress at Failure, psi		77.83	170.9	261.1	
B-Value		0.98	0.95	0.96	

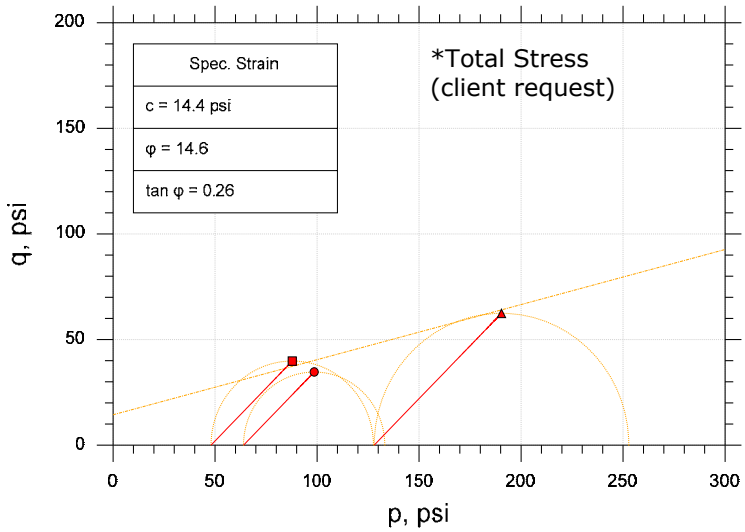
Notes:
- Before Shear Saturation set to 100% for phase calculation.
- Moisture Content determined by ASTM D2216.
- Atterberg Limits determined by ASTM D4318.
- Deviator Stress includes membrane correction.
- Values for c and φ determined from best-fit straight line for the specific test conditions. Actual strength parameters may vary and should be determined by an engineer for site conditions.

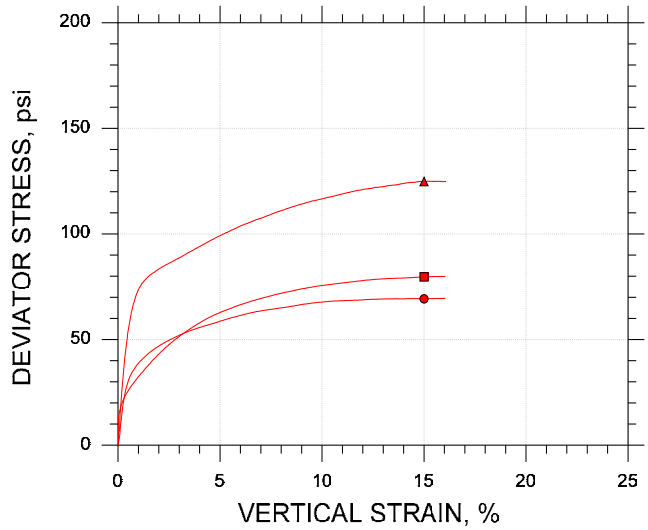
Remarks:

System Q

Client: Haley & Aldrich, Inc.	
Project Name: JM Stuart Station - DP&L	
Project Location: Aberdeen, OH	
Project Number: GTX-304889	
Tested By: md	Checked By: mcm
Boring ID: HA-6-B1	
Preparation: intact	
Description: Moist, grayish brown clayey sand	
Classification: ---	
Group Symbol: ---	
Liquid Limit: 37	Plastic Limit: 19
Plasticity Index: 18	Estimated Specific Gravity: 2.7

CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767





Symbol		■	●	▲
Sample ID		U3	U3	U3
Depth, ft		36-38 ft	36-38 ft	36-38 ft
Test Number		CU-4-1	CU-4-2	CU-4-3
Initial	Height, in	6.290	6.100	6.400
	Diameter, in	2.870	2.870	2.870
	Moisture Content (from Cuttings), %	17.9	14.2	10.2
	Dry Density, pcf	111.	119.	115.
	Saturation (Wet Method), %	93.3	93.4	59.3
	Void Ratio	0.519	0.412	0.467
Before Shear	Moisture Content, %	17.5	13.1	14.9
	Dry Density, pcf	114.	124.	120.
	Cross-sectional Area (Method A), in²	6.384	6.283	6.284
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.473	0.355	0.402
	Back Pressure, psi	140.9	133.0	138.9
Vertical Effective Consolidation Stress, psi		47.93	63.94	127.9
Horizontal Effective Consolidation Stress, psi		48.01	63.98	128.0
Vertical Strain after Consolidation, %		1.660	0.9992	1.547
Volumetric Strain after Consolidation, %		2.819	3.521	4.287
Time to 50% Consolidation, min		82.81	36.00	2.890
Shear Strength, psi		39.82	34.63	62.40
Strain at Failure, %		15.0	15.0	15.0
Strain Rate, %/min		0.01600	0.01600	0.01600
Deviator Stress at Failure, psi		79.63	69.26	124.8
Effective Minor Principal Stress at Failure, psi		40.20	32.86	53.91
Effective Major Principal Stress at Failure, psi		119.8	102.1	178.7
B-Value		0.95	0.95	0.95

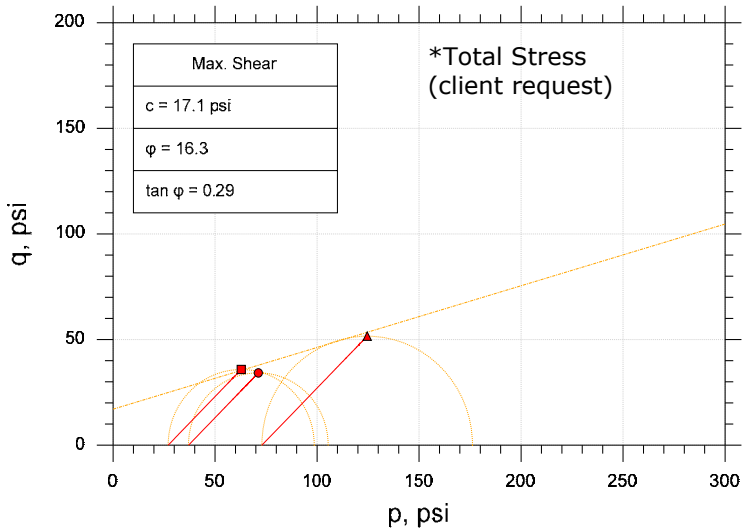
Notes:
- Before Shear Saturation set to 100% for phase calculation.
- Moisture Content determined by ASTM D2216.
- Atterberg Limits determined by ASTM D4318.
- Deviator Stress includes membrane correction.
- Values for c and φ determined from best-fit straight line for the specific test conditions. Actual strength parameters may vary and should be determined by an engineer for site conditions.

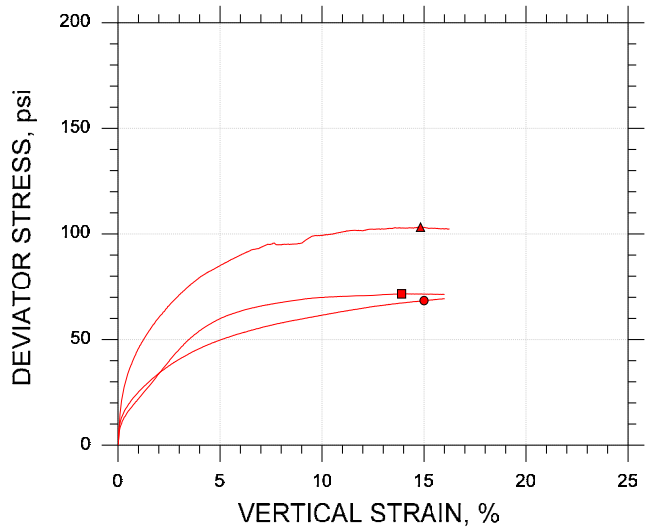
Remarks:

System E

Client: Haley & Aldrich, Inc.	
Project Name: JM Stuart Station - DP&L	
Project Location: Aberdeen, OH	
Project Number: GTX-304889	
Tested By: md	Checked By: njh
Boring ID: HA-7-B1	
Preparation: intact	
Description: Moist, brown clay	
Classification: ---	
Group Symbol: ---	
Liquid Limit: 45	Plastic Limit: 23
Plasticity Index: 22	Estimated Specific Gravity: 2.7

CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767





Symbol		■	●	▲	
Sample ID		U2	U2	U2	
Depth, ft		20-22 ft	20-22 ft	20-22 ft	
Test Number		CU-1-1	CU-1-2	CU-1-3	
Initial	Height, in	4.620	4.730	4.540	
	Diameter, in	2.020	2.020	2.020	
	Moisture Content (from Cuttings), %	20.0	19.9	21.7	
	Dry Density, pcf	107.	110.	104.	
	Saturation (Wet Method), %	93.5	99.8	94.8	
	Void Ratio	0.578	0.539	0.617	
Before Shear	Moisture Content, %	20.3	17.9	21.0	
	Dry Density, pcf	109.	114.	108.	
	Cross-sectional Area (Method A), in²	3.182	3.144	3.149	
	Saturation, %	100.0	100.0	100.0	
	Void Ratio	0.549	0.485	0.567	
	Back Pressure, psi	156.9	146.6	148.5	
Vertical Effective Consolidation Stress, psi		26.89	36.93	72.88	
Horizontal Effective Consolidation Stress, psi		27.00	37.00	72.99	
Vertical Strain after Consolidation, %		1.402	1.212	1.481	
Volumetric Strain after Consolidation, %		2.577	2.199	3.411	
Time to 50% Consolidation, min		96.04	84.64	56.25	
Shear Strength, psi		35.83	34.21	51.61	
Strain at Failure, %		13.9	15.0	14.8	
Strain Rate, %/min		0.01600	0.01600	0.01600	
Deviator Stress at Failure, psi		71.65	68.42	103.2	
Effective Minor Principal Stress at Failure, psi		39.68	34.74	55.91	
Effective Major Principal Stress at Failure, psi		111.3	103.2	159.1	
B-Value		0.95	0.95	0.95	

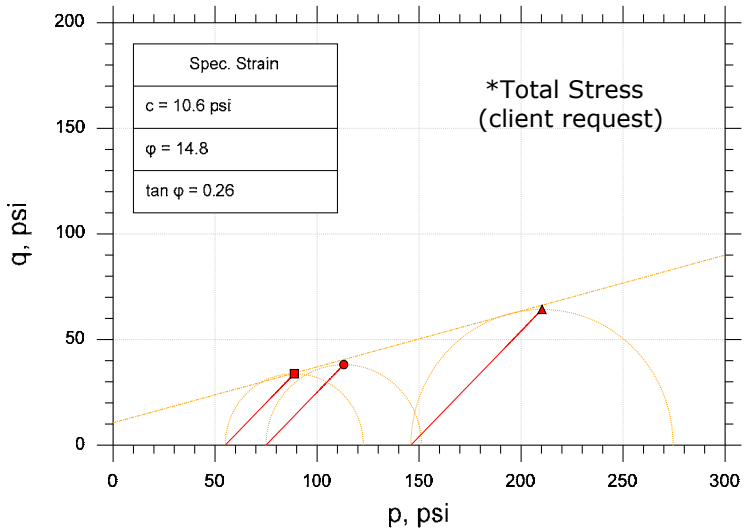
Notes:
- Before Shear Saturation set to 100% for phase calculation.
- Moisture Content determined by ASTM D2216.
- Atterberg Limits determined by ASTM D4318.
- Deviator Stress includes membrane correction.
- Values for c and φ determined from best-fit straight line for the specific test conditions. Actual strength parameters may vary and should be determined by an engineer for site conditions.

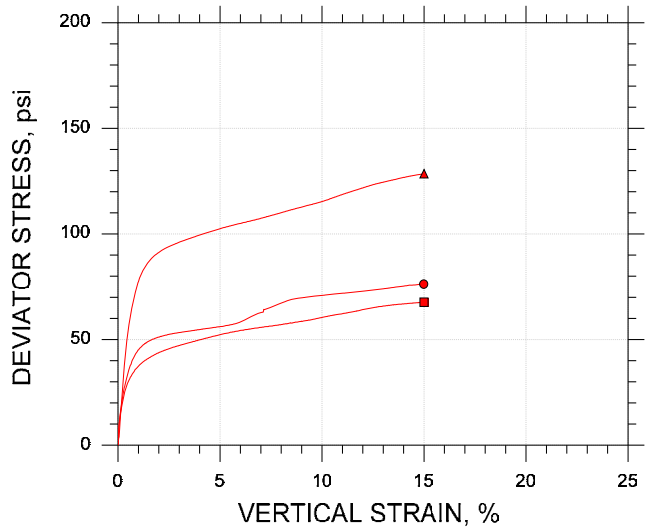
Remarks:

System O

Client: Haley & Aldrich, Inc.	
Project Name: JM Stuart Station - DP&L	
Project Location: Aberdeen, OH	
Project Number: GTX-304889	
Tested By: md	Checked By: njh
Boring ID: HA-7-B1	
Preparation: intact	
Description: Moist, dark yellowish brown sandy, silty clay	
Classification: ---	
Group Symbol: ---	
Liquid Limit: 24	Plastic Limit: 19
Plasticity Index: 5	Estimated Specific Gravity: 2.7

CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767





Symbol		■	●	▲
Sample ID		U3	U3	U3
Depth, ft		42-44 ft	42-44 ft	42-44 ft
Test Number		CU-7-1	CU-7-2	CU-7-3
Initial	Height, in	4.330	4.610	6.000
	Diameter, in	2.040	2.030	2.860
	Moisture Content (from Cuttings), %	24.3	26.0	26.5
	Dry Density, pcf	97.0	94.5	99.9
	Saturation (Wet Method), %	88.9	89.7	103.9
	Void Ratio	0.737	0.783	0.687
Before Shear	Moisture Content, %	23.8	25.1	19.7
	Dry Density, pcf	103.	101.	110.
	Cross-sectional Area (Method A), in²	3.112	3.070	6.004
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.644	0.677	0.533
	Back Pressure, psi	117.0	147.0	82.98
Vertical Effective Consolidation Stress, psi		54.95	74.90	145.9
Horizontal Effective Consolidation Stress, psi		55.00	74.98	146.0
Vertical Strain after Consolidation, %		0.7042	0.9882	2.657
Volumetric Strain after Consolidation, %		5.708	6.367	8.746
Time to 50% Consolidation, min		2.560	6.250	12.96
Shear Strength, psi		33.83	38.13	64.27
Strain at Failure, %		15.0	15.0	15.0
Strain Rate, %/min		0.01600	0.01600	0.01600
Deviator Stress at Failure, psi		67.66	76.26	128.5
Effective Minor Principal Stress at Failure, psi		24.12	21.68	45.35
Effective Major Principal Stress at Failure, psi		91.78	97.94	173.9
B-Value		0.95	0.95	0.95

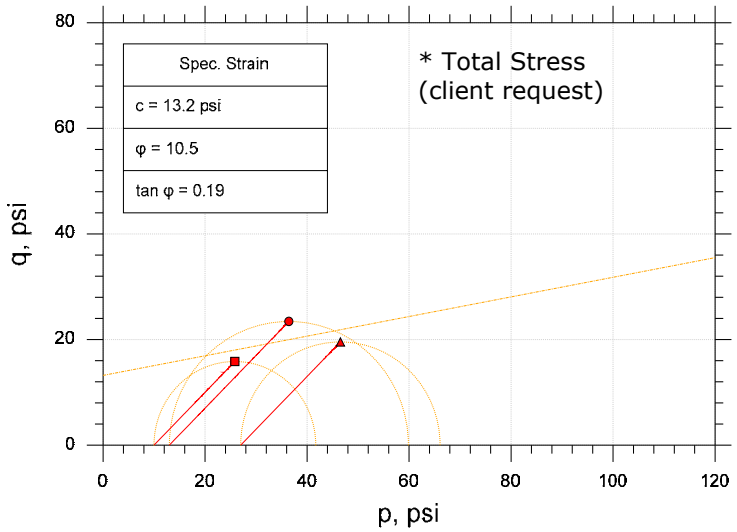
Notes:
- Before Shear Saturation set to 100% for phase calculation.
- Moisture Content determined by ASTM D2216.
- Atterberg Limits determined by ASTM D4318.
- Deviator Stress includes membrane correction.
- Values for c and φ determined from best-fit straight line for the specific test conditions. Actual strength parameters may vary and should be determined by an engineer for site conditions.

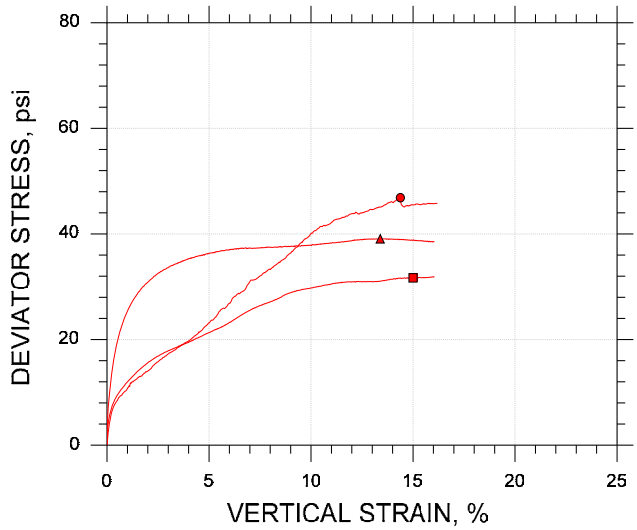
Remarks:

System O

Client: Haley & Aldrich, Inc.	
Project Name: JM Stuart Station - DP&L	
Project Location: Aberdeen, OH	
Project Number: GTX-304889	
Tested By: md	Checked By: mcm
Boring ID: HA-7-B2A	
Preparation: intact	
Description: Moist, brown clay with sand	
Classification: ---	
Group Symbol: ---	
Liquid Limit: 30	Plastic Limit: 19
Plasticity Index: 11	Estimated Specific Gravity: 2.7

CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767





Symbol		■	●	▲	
Sample ID		U2	U2	U2	
Depth, ft		8-10 ft	8-10 ft	8-10 ft	
Test Number		CU-6-1	CU-6-2	CU-6-3	
Initial	Height, in	4.410	4.220	4.210	
	Diameter, in	1.980	1.980	2.030	
	Moisture Content (from Cuttings), %	26.6	26.6	26.5	
	Dry Density, pcf	93.3	95.9	99.3	
	Saturation (Wet Method), %	89.1	94.9	102.6	
	Void Ratio	0.806	0.757	0.697	
Before Shear	Moisture Content, %	28.8	25.1	22.9	
	Dry Density, pcf	94.9	101.	104.	
	Cross-sectional Area (Method A), in²	3.031	2.985	3.101	
	Saturation, %	100.0	100.0	100.0	
	Void Ratio	0.777	0.677	0.619	
	Back Pressure, psi	134.7	127.0	38.99	
Vertical Effective Consolidation Stress, psi		10.02	12.96	27.02	
Horizontal Effective Consolidation Stress, psi		9.991	13.00	27.00	
Vertical Strain after Consolidation, %		0.1262	0.7166	0.3366	
Volumetric Strain after Consolidation, %		1.733	2.071	4.347	
Time to 50% Consolidation, min		2.560	1.000	1.000	
Shear Strength, psi		15.84	23.44	19.54	
Strain at Failure, %		15.0	14.4	13.4	
Strain Rate, %/min		0.01600	0.01600	0.01600	
Deviator Stress at Failure, psi		31.69	46.87	39.08	
Effective Minor Principal Stress at Failure, psi		12.49	18.20	17.56	
Effective Major Principal Stress at Failure, psi		44.18	65.07	56.65	
B-Value		0.95	1.84	0.96	

Notes:
- Before Shear Saturation set to 100% for phase calculation.
- Moisture Content determined by ASTM D2216.
- Atterberg Limits determined by ASTM D4318.
- Deviator Stress includes membrane correction.
- Values for c and φ determined from best-fit straight line for the specific test conditions. Actual strength parameters may vary and should be determined by an engineer for site conditions.

Remarks:

System B

APPENDIX C

Analyses

Design Soil Properties

SOIL PROPERTY CHARACTERIZATION - POND 3A

DAYTON POWER AND LIGHT
J.M. STUART STATION
ABERDEEN, OHIO

Material	Location	Total Unit Weight, γ_T				Undrained Shear Strength, S_u						Drained Shear Strength										
		CPT	Laboratory		Design	SPT	CPT		Lab Torvane	Lab UU and CIU Trx	Design	SPT	CPT Correlations		Laboratory CIU Trx						Design	
		avg	Test Avg.	Tube Avg.		avg	avg	avg - 1σ	avg	avg		avg	avg	avg - 1σ	avg		min.		max.			
		γ_T	γ_T	γ_T	γ_T	S_u	S_u	S_u	S_u	S_u	S_u	ϕ'	ϕ'	ϕ'	c'	ϕ'	c'	ϕ'	c'	ϕ'	c'	ϕ'
Embankment Fill (Cohesive)	Pond 3 Only	116 pcf	--	--	**130 pcf**	--	5,300 psf	3,460 psf	--	S_u/p' = 0.47	**S_u/p' = 0.47**	--	--	--	--	--	--	--	--	--	**500**	**28°**
	Site Wide	115 pcf	128 pcf	129 pcf		2,771 psf	4,340 psf	2,980 psf	2,388 psf	min = 1,300 psf	**min = 1,300 psf**	--	--	--	688 psf	29°	671 psf	28°	719 psf	32°		
Fly Ash Fill	Pond 3 Only	114 pcf	--	--	**100 pcf**	--	3,680 psf	1,800 psf	--	--	**S_u/p' = 0.47**	--	36°	35°	--	--	--	--	--	--	**--**	**29°**
	Site Wide	114 pcf	--	--		--	3,680 psf	1,800 psf	--		**min = 1,000 psf**	--	36°	35°	--	--	--	--	--	--		
Alluvial Clay/Silt	Pond 3 Only	113 pcf	--	--	**120 pcf**	--	4,060 psf	2,580 psf	--	S_u/p' = 0.30	**S_u/p' = 0.30**	--	--	--	--	--	--	--	--	--	**50**	**32°**
	Site Wide	115 pcf	120 pcf	119 pcf		1,723 psf	3,760 psf	2,220 psf	462 psf	min = 1,000 psf	**min = 1,000 psf**	--	--	--	252 psf	34°	106 psf	33°	452 psf	34°		
Alluvial Sand	Pond 3 Only	124 pcf	--	127 psf	**125 pcf**	--	--	--	--	--	**32°**	--	37°	35°	--	--	--	--	--	--	**--**	**32°**
	Site Wide	123 pcf	--	--		--	--	--	--	--		32°	37°	35°	580°	31°	580°	31°	580°	31°		

SOIL PROPERTY CHARACTERIZATION - POND 5

DAYTON POWER AND LIGHT
J.M. STUART STATION
ABERDEEN, OHIO

Material	Location	Total Unit Weight, γ_T				Undrained Shear Strength, S_u						Drained Shear Strength										
		CPT	Laboratory		Design	SPT	CPT		Lab Torvane	Lab UU and CIU Trx	Design	SPT	CPT Correlations		Laboratory CIU Trx						Design	
		avg	Test Avg.	Tube Avg.		avg	avg	avg - 1σ	avg	avg		avg	avg	avg - 1σ	avg		min.		max.			
		γ_T	γ_T	γ_T	γ_T	S_u	S_u	S_u	S_u	S_u	S_u	ϕ'	ϕ'	ϕ'	c'	ϕ'	c'	ϕ'	c'	ϕ'	c'	ϕ'
Embankment Fill (Cohesive)	Pond 5 Only	115 pcf	124 pcf	124 pcf	**130 pcf**	2,095 psf	4020 pcf	2,580 psf	2,410 psf	S_u/p' = 0.47	**S_u/p' = 0.47**	--	--	--	671 psf	28°	671 psf	28°	671 psf	28°	**500**	**28°**
	Site Wide	115 pcf	128 pcf	129 pcf		2,771 psf	4,340 psf	2,980 psf	2,388 psf	min = 1,300 psf	**min = 1,300 psf**	--	--	--	688 psf	29°	671 psf	28°	719 psf	32°		
Embankment Fill (Granular)	Pond 5 Only	116 pcf	--	--	**120 pcf**	--	--	--	--	--	**34°**	37°	39°	37°	--	--	--	--	--	--	**--**	**34°**
	Site Wide	115 psf	--	--		--	--	--	--	--		--	38°	36°	--	--	--	--	--	--		
Alluvial Clay/Silt	Pond 5 Only	115 pcf	115 pcf	114 pcf	**120 pcf**	1,363 psf	3,680 psf	2,440 psf	573 psf	S_u/p' = 0.30	**S_u/p' = 0.30**	--	--	--	106 psf	34°	106 psf	34°	106 psf	34°	**50**	**32°**
	Site Wide	115 pcf	120 pcf	119 pcf		1,723 psf	3,760 psf	2,220 psf	462 psf	min = 1,000 psf	**min = 1,000 psf**	--	--	--	252 psf	34°	106 psf	33°	452 psf	34°		
Alluvial Sand	Pond 5 Only	124 pcf	--	127 pcf	**125 pcf**	--	--	--	--	--	**32°**	33°	40°	38°	--	--	--	--	--	--	**--**	**32°**
	Site Wide	123 pcf	--	127 pcf		--	--	--	--	--		32°	37°	35°	580°	31°	580°	31°	580°	31°		

SOIL PROPERTY CHARACTERIZATION - POND 6

DAYTON POWER AND LIGHT
J.M. STUART STATION
ABERDEEN, OHIO

Material	Location	Total Unit Weight, γ_T				Undrained Shear Strength, S_u						Drained Shear Strength										
		CPT	Laboratory		Design	SPT	CPT		Lab Torvane	Lab UU and CIU Trx	Design	SPT	CPT Correlations		Laboratory CIU Trx						Design	
		avg	Test Avg.	Tube Avg.		avg	avg	avg - 1σ	avg	avg		avg	avg	avg - 1σ	avg		min.		max.			
		γ_T	γ_T	γ_T	γ_T	S_u	S_u	S_u	S_u	S_u	S_u	ϕ'	ϕ'	ϕ'	c'	ϕ'	c'	ϕ'	c'	ϕ'	c'	ϕ'
Embankment Fill (Cohesive)	Pond 6 Only	116 pcf	132 pcf	133 pcf	**130 pcf**	2,936 psf	5,060 psf	3,760 psf	2,367 psf	S_u/p' = 0.47	**S_u/p' = 0.47**	--	--	--	719 psf	32°	719 psf	32°	719 psf	32°	**500**	**28°**
	Site Wide	115 pcf	128 pcf	129 pcf		2,771 psf	4,340 psf	2,980 psf	2,388 psf	min = 1,300 psf	**min = 1,300 psf**	--	--	--	688 psf	29°	671 psf	28°	719 psf	32°		
Alluvial Clay/Silt	Pond 6 Only	115 pcf	--	--	**120 pcf**	4,190 psf	5,300 psf	4,560 psf		S_u/p' = 0.30	**S_u/p' = 0.30**	--	--	--							**50**	**32°**
	Site Wide	115 pcf	120 pcf	119 pcf		1,723 psf	3,760 psf	2,220 psf	462 psf	min = 1,000 psf	**min = 1,000 psf**	--	--	--	252 psf	34°	106 psf	33°	452 psf	34°		
Alluvial Sand	Pond 6 Only	122 pcf	131 psf	127 pcf	**125 pcf**	--	--	--	--	--	**32°**	31°	36°	34°	580°	31°	580°	31°	580°	31°	**--**	**32°**
	Site Wide	123 pcf	--	--		--	--	--	--	--		32°	37°	35°	580°	31°	580°	31°	580°	31°		

SOIL PROPERTY CHARACTERIZATION - POND 7/7A

DAYTON POWER AND LIGHT
J.M. STUART STATION
ABERDEEN, OHIO

Material	Location	Total Unit Weight, γ_T				Undrained Shear Strength, S_u						Drained Shear Strength										
		CPT	Laboratory		Design	SPT	CPT		Lab Torvane	Lab UU and CIU Trx	Design	SPT	CPT Correlations		Laboratory CIU Trx						Design	
		avg	Test Avg.	Tube Avg.		avg	avg	avg - 1σ	avg	avg		avg	avg	avg - 1σ	avg		min.		max.			
		γ_T	γ_T	γ_T	γ_T	S_u	S_u	S_u	S_u	S_u	S_u	ϕ'	ϕ'	ϕ'	c'	ϕ'	c'	ϕ'	c'	ϕ'	c'	ϕ'
Embankment Fill (Cohesive)	Pond 7 Only	114 pcf	129 pcf	127 pcf	**130 pcf**	2,084 psf	4,180 psf	2,960 psf	--	S_u/p' = 0.47	**S_u/p' = 0.47**	--	--	--	675 psf	28°	675 psf	28°	675 psf	28°	**500**	**28°**
	Site Wide	115 pcf	128 pcf	129 pcf		2,771 psf	4,340 psf	2,980 psf	2,388 psf	min = 1,300 psf	**min = 1,300 psf**	--	--	--	688 psf	29°	671 psf	28°	719 psf	32°		
Alluvial Clay/Silt	Pond 7 Only	114 pcf	122 pcf	122 pcf	**120 pcf**	1,363 psf	3,760 psf	2,200 psf	407 psf	S_u/p' = 0.30	**S_u/p' = 0.30**	--	--	--	325 psf	34°	197 psf	33°	452 psf	34°	**50**	**32°**
	Site Wide	115 pcf	120 pcf	119 pcf		1,723 psf	3,760 psf	2,220 psf	462 psf	min = 1,000 psf	**min = 1,000 psf**	--	--	--	252 psf	34°	106 psf	33°	452 psf	34°		
Alluvial Sand	Pond 7 Only	123 pcf	--	--	**125 pcf**	--	--	--	--	--	**32°**	33°	37°	36°	--	--	--	--	--	--	**--**	**32°**
	Site Wide	123 pcf	--	127 pcf		--	--	--	--	--		32°	37°	35°	580°	31°	580°	31°	580°	31°		

SOIL PROPERTY CHARACTERIZATION - POND 10
DAYTON POWER AND LIGHT
J.M. STUART STATION
ABERDEEN, OHIO

Material	Location	Total Unit Weight, γ_T				Undrained Shear Strength, S_u						Drained Shear Strength										
		CPT	Laboratory		Design	SPT	CPT		Lab Torvane	Lab UU and CIU Trx	Design	SPT	CPT Correlations		Laboratory CIU Trx						Design	
		avg	Test Avg.	Tube Avg.		avg	avg	avg - 1σ	avg	avg		avg	avg	avg - 1σ	avg		min.		max.			
		γ_T	γ_T	γ_T	γ_T	S_u	S_u	S_u	S_u	S_u	S_u	ϕ'	ϕ'	ϕ'	c'	ϕ'	c'	ϕ'	c'	ϕ'	c'	ϕ'
Bottom Ash Fill	Pond 10 Only	118 pcf	--	--	**90 pcf**	--	--	--	--	--	**--**	41°	43°	40°	--	--	--	--	--	--	**--**	**40°**
	Site Wide	118 pcf	--	--		--	--	--	--			41°	43°	40°	--	--	--	--	--	--		
Alluvial Clay/Silt	Pond 10 Only	116 pcf	--	--	**120 pcf**	--	2,660 psf	2,180 psf	--	S_u/p' = 0.30	**S_u/p' = 0.30**	--	--	--	--	--	--	--	--	--	**50**	**32°**
	Site Wide	115 pcf	120 pcf	119 pcf		1,723 psf	3,760 psf	2,220 psf	462 psf	min = 1,000 psf	**min = 1,000 psf**	--	--	--	252 psf	34°	106 psf	33°	452 psf	34°		
Alluvial Sand	Pond 10 Only	122 pcf	--	127 psf	**125 pcf**	--	--	--	--	--	**32°**	33°	38°	36°	--	--	--	--	--	--	**--**	**32°**
	Site Wide	123 pcf	--	--		--	--	--	--			32°	37°	35°	580°	31°	580°	31°	580°	31°		

HALEY ALDRICH	CALCULATIONS	File No.	40373-345
		Sheet	1 of 1
Client	Dayton Power and Light	Date	17-Aug-16
Project	J.M. Stuart Station	Computed by	D. Shelton
Subject	Typical Values for Drained Strength of Clay Liner	Checked by	n/a

Objective:

-Determine design values for undrained strength of clay based on USCS classification and Atterberg Limits

Available Information:

-Historic lab testing on borrow samples by URS Greiner in 1999 indicate clay liner material is lean CLAY (CL)

-Lab test results also indicates plasticity indeces ranges from 13 to 22

Reference Information:

- From "Soil Strength and Slope Stability," by J. Michael Duncan and Stephen G. Wright, 2005, p. 49

Table 5.7 Typical Values of Peak Friction Angle (ϕ') for Normally Consolidated Clays[a]

Plasticity index	ϕ' (deg)
10	33 ± 5
20	31 ± 5
30	29 ± 5
40	27 ± 5
60	24 ± 5
80	22 ± 5

Source: Data from Bjerrum and Simons (1960).
[a]$c' = 0$ for these materials.

- From "Soil Strength and Slope Stability," by J. Michael Duncan and Stephen G. Wright, 2005, pp. 51 - 52

Table 5.8 Typical Peak Drained Strengths for Compacted Cohesive Soils

Unified classification	Relative compaction, RC[a] (%)	Effective stress cohesion, c' (kPa)	Effective stress friction angle, ϕ' (deg)
SM-SC	100	15	33
SC	100	12	31
ML	100	9	32
CL-ML	100	23	32
CL	100	14	28
MH	100	21	25
CH	100	12	19

Source: After U.S. Dept. Interior (1973).
[a]RC, relative compaction by USBR standard method, same energy as the Standard Proctor compaction test.

Drained strengths of compacted clays. Values of c' and ϕ' for compacted clays can be measured using consolidated–undrained triaxial tests with pore pressure measurements or drained direct shear tests. The values determined from either type of test are the same for practical purposes. The effective stress strength parameters for compacted clays, measured using samples that have been saturated before testing, are not strongly affected by compaction water content.

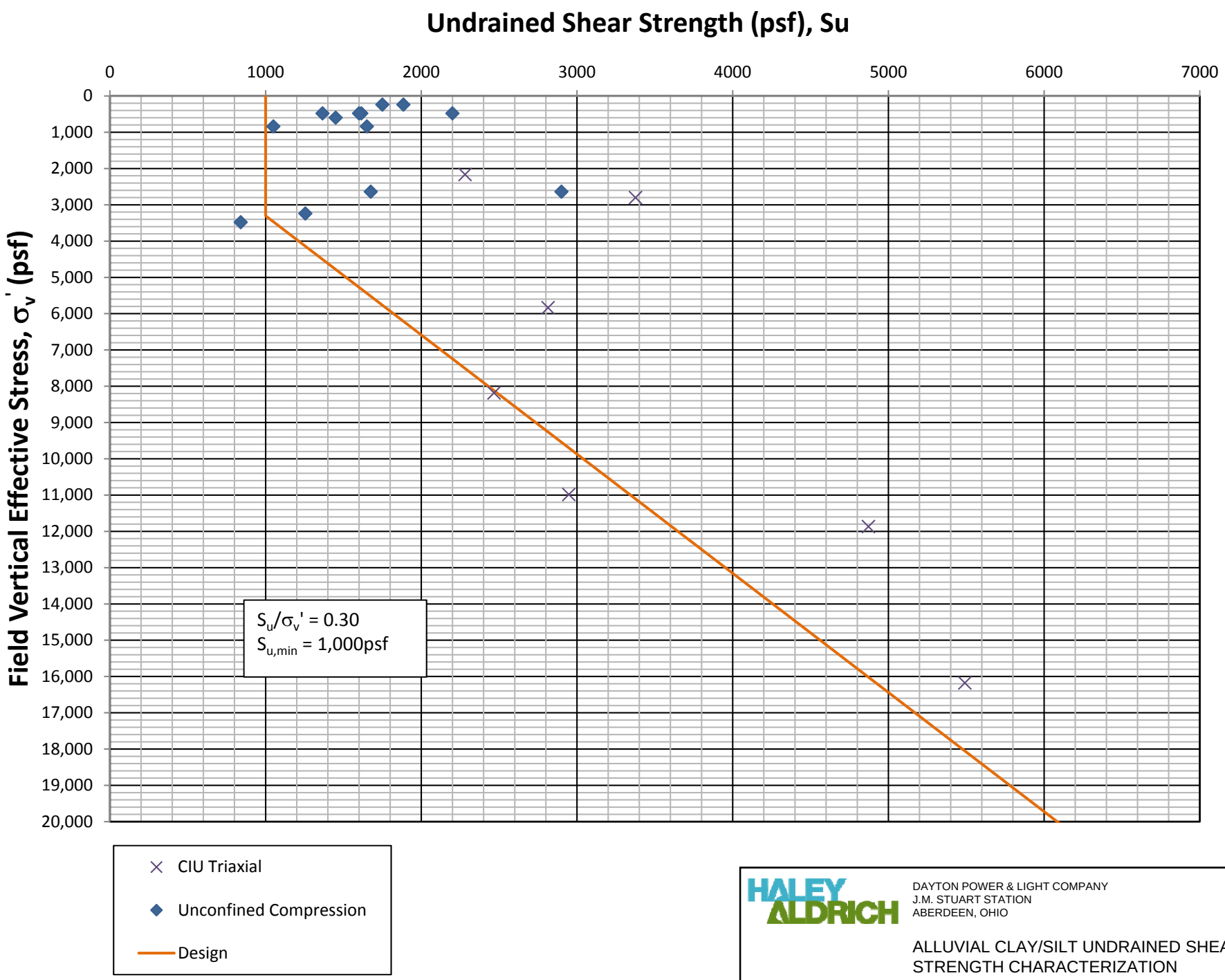
Table 5.8 lists typical values of c' and ϕ' for cohesive soils compacted to RC = 100% of the Standard Proctor maximum dry density. As the value of RC decreases below 100%, values of ϕ' remain about the same, and the value of c' decreases. For RC = 90%, values of c' are about half the values shown in Table 5.8.

Solution:

- Using results of lab tests and references above, conservative drained properties are:

Clay Liner: c'= 0 psf

ϕ'= 28°



HALEY ALDRICH

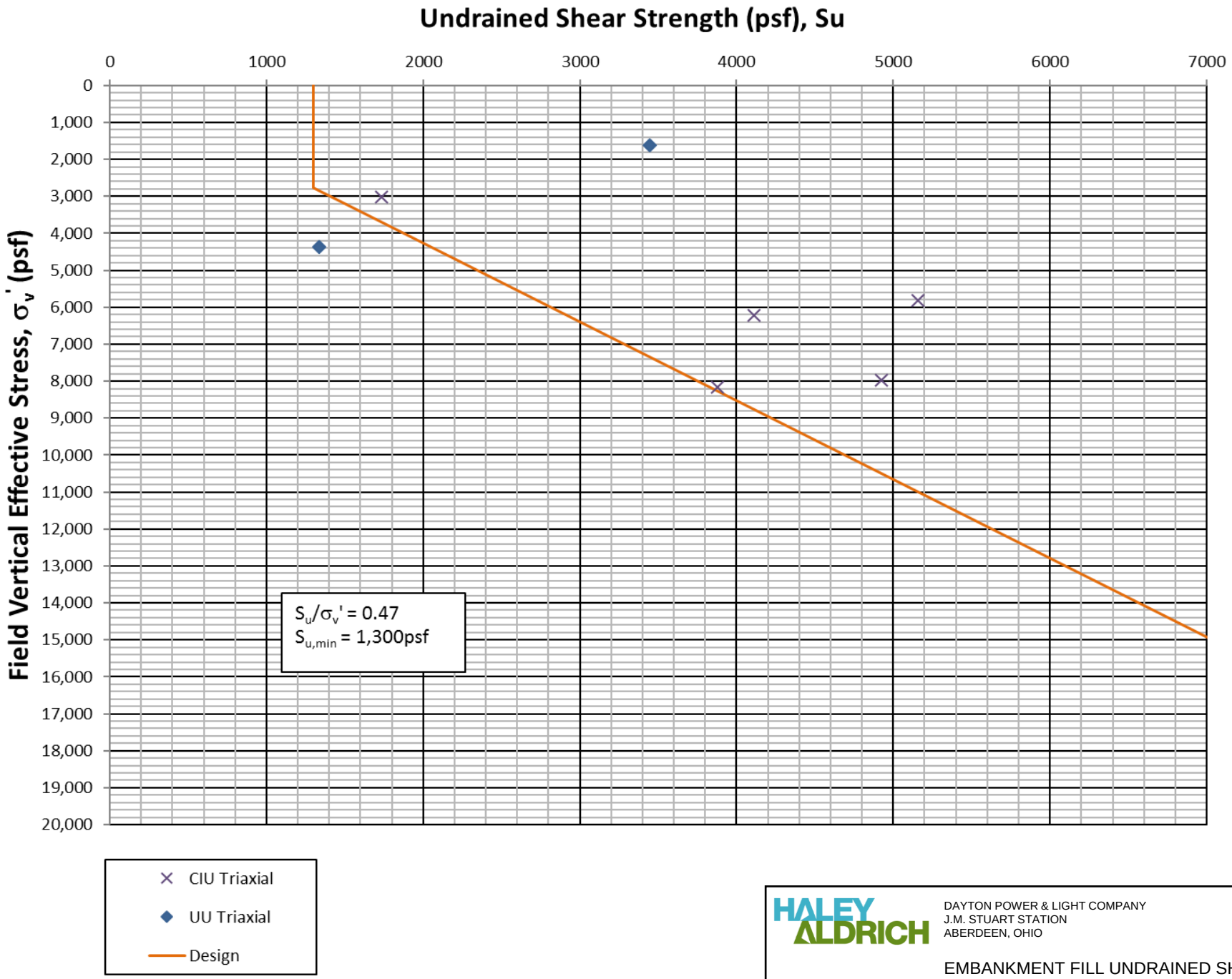
DAYTON POWER & LIGHT COMPANY
J.M. STUART STATION
ABERDEEN, OHIO

ALLUVIAL CLAY/SILT UNDRAINED SHEAR STRENGTH CHARACTERIZATION

SCALE : AS SHOWN
AUGUST 2016

FIGURE D1

40373-347_FIG D2.PPT



HALEY ALDRICH

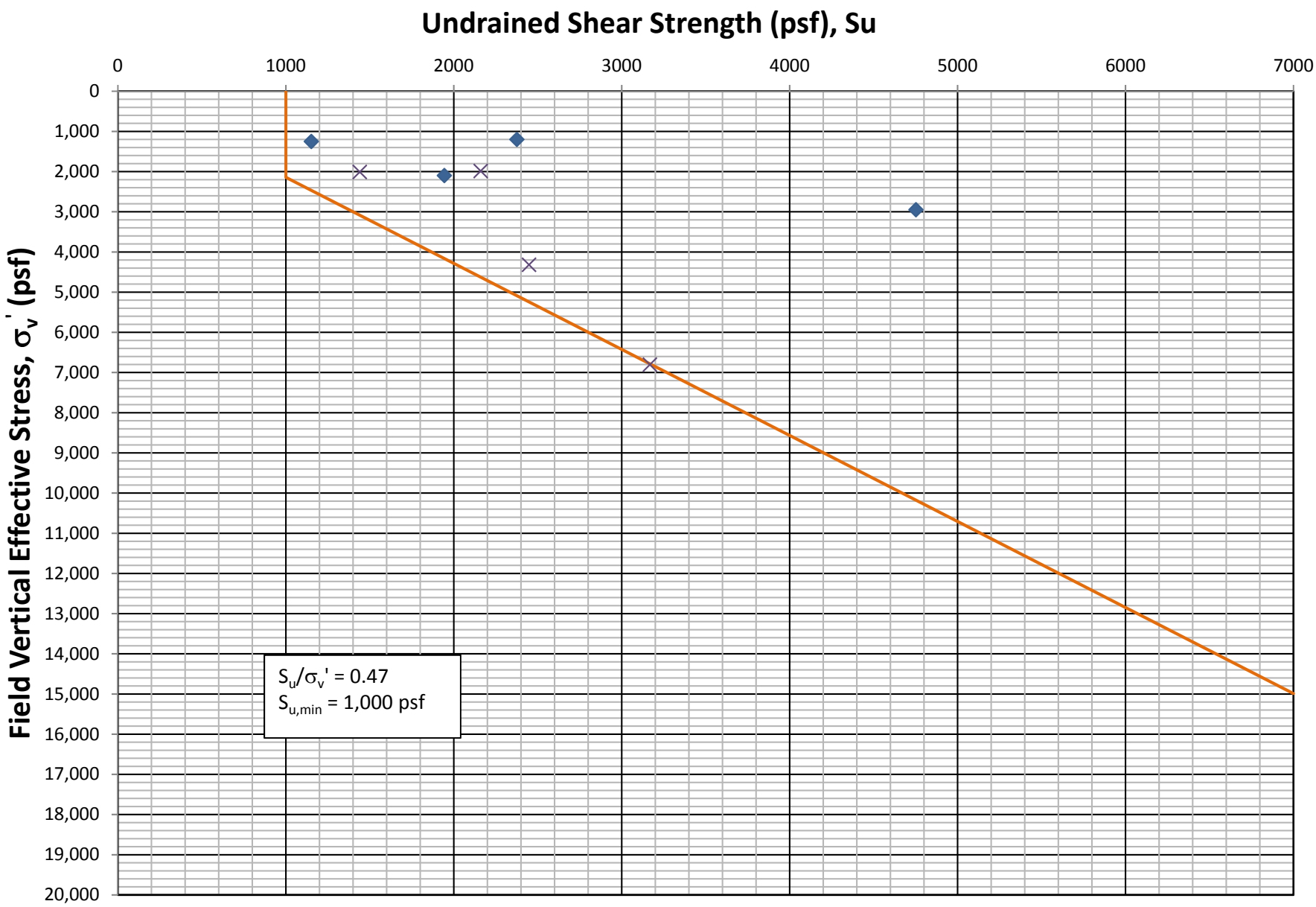
DAYTON POWER & LIGHT COMPANY
J.M. STUART STATION
ABERDEEN, OHIO

EMBANKMENT FILL UNDRAINED SHEAR STRENGTH CHARACTERIZATION

SCALE : AS SHOWN
AUGUST 2016

FIGURE D2

40373-347_FIG D1.PPT



CIU Triaxial

UU Triaxial

Design

HALEY ALDRICH

DAYTON POWER & LIGHT COMPANY
J.M. STUART STATION
ABERDEEN, OHIO

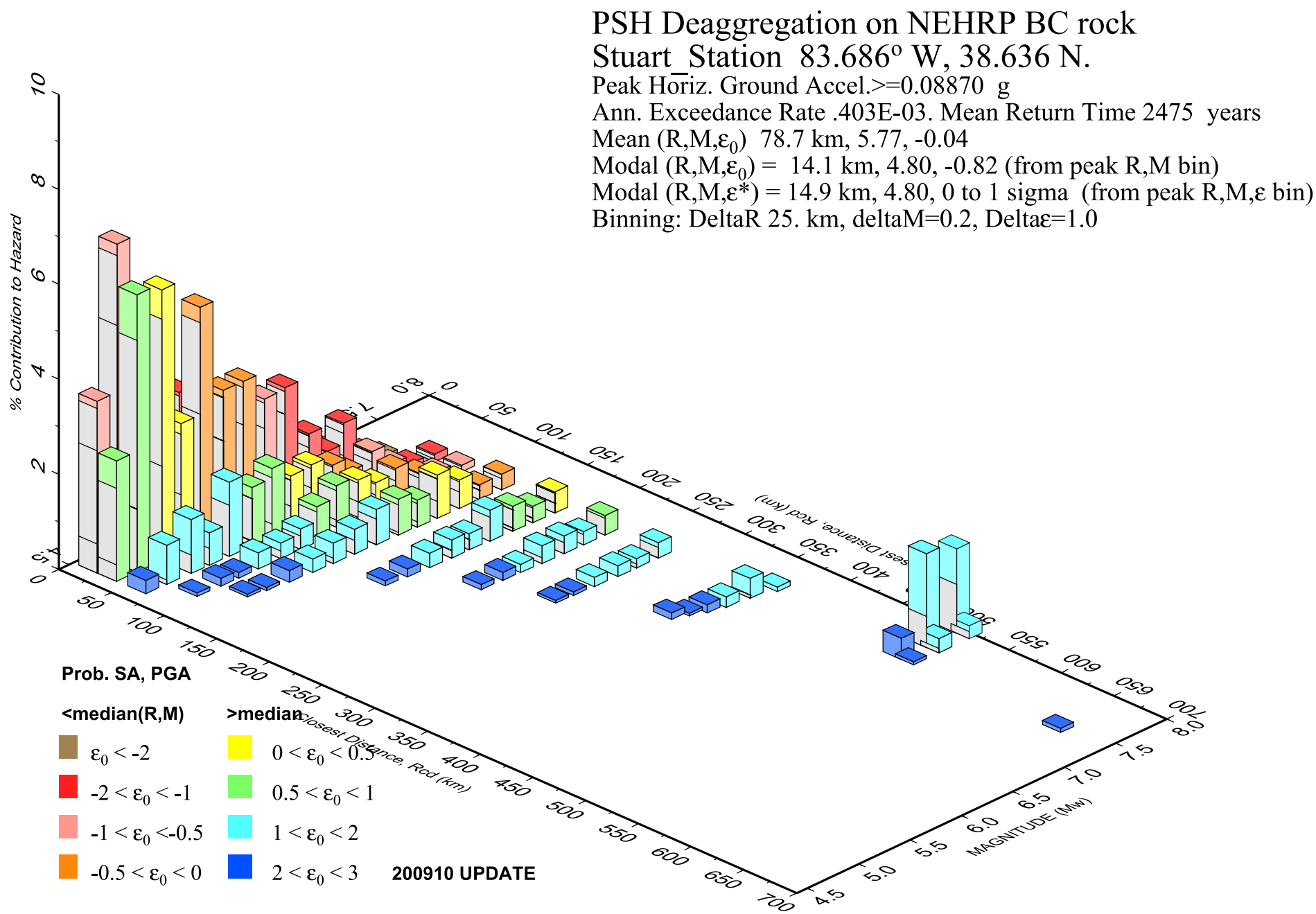
FLY ASH UNDRAINED SHEAR STRENGTH CHARACTERIZATION

SCALE : AS SHOWN
AUGUST 2016

FIGURE D3

40373-347_FIG D3.PPT

Seismic Documents



GMT 2016 Mar 10 13:33:19 Distance (R), magnitude (M), epsilon (E0,E) deaggregation for a site on rock with average vs= 760. m/s top 30 m. USGS CGHT PSHA2008 UPDATE Bins with lt 0.05% contrib. omitted

FIGURE D4

SITE SPECIFIC SEISMIC RESPONSE ANALYSIS

INTRODUCTION

Haley & Aldrich, Inc. (Haley & Aldrich) has been contracted by Dayton Power & Light (DP&L) to perform a site-specific seismic analysis for the Coal Combustion Residuals (CCR) surface impoundments at Stuart Station in Aberdeen, Ohio. The analyses discussed herein provide data to assist with establishing the pseudo-static seismic coefficient to use for evaluating seismic stability of the impoundment embankments.

OVERVIEW OF SITE-SPECIFIC SEISMIC ANALYSIS

A one-dimensional ground response analysis was performed to estimate the subsurface response to an earthquake event at DP&L Stuart Station. It is important that the rock and soil characteristics used to develop the ground response model match the engineering and seismic characteristics of the soil and rock at the DP&L Power Plant. Properly conditioned bedrock strong ground motions (acceleration time histories) are required to perform a site-specific seismic analysis. These rock motions should match the spectral response of characteristic ground motions with respect to the dominant seismic sources affecting Stuart Station. Unfortunately, strong motion records from large magnitude events are not available for Central U.S. (Romero and Rix, 2001). Therefore, records were obtained from other sources that approximate the spectral response characteristics at the site.

A site-specific target response spectrum was created for the site to be used as a guide in selecting the proper ground motions for the study. This target spectrum was developed following well established criteria developed for building and infrastructure standards. The common design parameters are based on the maximum critical risk-targeted (MCE_R) spectral response acceleration. Two different design methods (probabilistic and deterministic) are used to approximate the MCE_R spectrum and the lesser of the spectral response accelerations from each method at each period is used to create the site-specific target spectrum. Ground motions scaled to the target spectrum will be use as input motions applied to the base of the soil column in a one-dimensional Shake 2000 ground response model to evaluate how the ground motions affect the ground response within the impoundment.

The probabilistic target spectrum is created from the uniform hazard spectrum (UHS) by performing a probabilistic seismic hazard analysis (PSHA). [1] It is then adjusted for maximum ground motion and targeted risk. The adjusted 2500-year uniform hazard spectrum (UHS) for the DP&L site is shown in Figure 1. The deterministic target spectrum which will be discussed in the following section is calculated from 84th-percentile ground motions representing a characteristic earthquake on a known or perceived active fault within the region.

[1] The uniform hazard spectrum is calculated by research on potential sources of earthquakes (e.g., faults and locations of past earthquakes), the potential magnitudes of earthquakes from these sources and their frequencies of occurrence, and the potential ground motions generated by these earthquakes. Uncertainty and randomness in each of these components is accounted for in the computation.

USGS DEAGGREGATION AND DETERMINISTIC TARGET SPECTRUM

Unlike the west coast, central and eastern U.S. does not have a well-defined fault system and associated seismic sources needed to properly develop a deterministic spectral response. Therefore, it is common practice to use pseudo fault locations to develop the deterministic target[2]. Deaggregation data obtained from a probabilistic seismic hazard analysis (PSHA) for DP&L is used to provide the relevant information needed to develop the deterministic target. The NSHMP PSHA interactive deaggregation web site was used to obtain the characteristics of the most significant earthquakes deemed to contribute the most to the seismic activity at the DP&L Power Plant. It should be noted that USGS has not yet released the deaggregation data for the 2014 hazard maps, therefore the 2008 deaggregation data available on the USGS website were used to determine the most significant earthquakes that are considered for the seismic hazard for DP&L (Figure 2). The deaggregation data suggests that the representative design earthquake for ground motions with a return period of 2,500 years should be between magnitude 4.8 and 6.21 at a distance of approximately 13.8 to 35 km from the site.

The deterministic target spectrum is based on ground motion prediction equations (GMPEs) that use magnitude and distance for scenario events to predict the spectral response of the ground motion. For the DP&L site, the magnitude 4.8 earthquake and the magnitude 6.21 earthquake were used for the GMPE evaluation. The 6.21 magnitude event was chosen to develop the deterministic portion for the evaluation of the target spectrum. The computer software program Shake 2000, developed by GeoMotions, provided GMPEs for central and eastern U.S. (CEUS) were used to create the deterministic spectrum. The site-specific spectral responses generated from the CEUS ground attenuation relationships for the 6.21 magnitude earthquake are shown in Figure 3. The GMPE representing the Campbell 2003 attenuation relationship was selected to produce the deterministic target spectrum for the site because it had the larger spectral response in the periods of significance.

The lesser of the spectral response accelerations from the probabilistic and deterministic methods at all periods was used to develop the Design spectrum. This spectrum was further adjusted so that the spectral response at all periods is within 80 percent of the MCE_R curve developed from the hazard maps (Figure 4).

A special type of target spectrum, called the conditional mean spectrum (CMS), was created for the study because it focuses the mean spectral response of all the ground motions to a particular period along the target spectrum (Baker, 2011). A technical report by NIST and NEHRP on the use of the CMS for earthquake design presented the following limitations of using the UHS for earthquake design:[3]

> *"The Uniform Hazard Spectrum (UHS) is constructed by enveloping the spectral amplitudes at all periods that are exceeded with a given probability, computed using probabilistic seismic hazard analysis. However, those spectral values at each period are unlikely to all occur in a single ground motion. These conditional spectra instead condition the spectrum calculation on spectral acceleration at a single period, and then compute associated spectral acceleration*

---

[2] S. Dickenson; "Recommended guidelines for liquefaction evaluations using ground motions from probabilistic seismic hazard analyses", Report to Oregon DOT, 2005

[3] Selecting and Scaling Earthquake Ground Motions for Performing Response-History Analyses; joint venture NEHRP Consultants and NIST, NIST GCR 11-917-15, 2011

> *values at all other periods. This conditional calculation assures that ground motions selected to match that spectrum have appropriate properties for naturally occurring ground motions that would occur at the site of interest."*

Generally, the particular target period selected is related to fundamental period of the structure being analyzed. The fundamental period for the impoundment at DP&L is related to the anticipated height of the sliding mass should failure occur and predicted to be around T* = 0.1s (short period). However, it can be argued that at least until a slide is triggered the appropriate value to use for the target period is the resonant period of the soil layer itself as there is no impedance contrast to trigger the slide.[4] Therefore, CMS target was generated for the longer (T*= 0.75 s) period related to the fundamental period of the soil column. Previous experience indicates that CMS corresponding to the long period was shown to be the most conservative. The remaining portion of this report will focus on results obtained from using the long period CMS.

CONDITIONAL MEAN SPECTRUM GROUND MOTIONS SCALED TO TARGET PERIOD T=0.75S

The CMS is to be constructed with the ground motions scaled so that its mean spectral response at the target period, T* matches the spectral response of the uniform hazard spectrum at the same period. The target period, T*= 0.75s is chosen to approximate the fundamental frequency of the soil column. The difference between the mean response of the ground motion at T* and the mean value of the UHS at the same period is the standard deviation. The mean values of all points on the UHS are then mathematically conditioned to the standard deviation of the ground motion at T*= 0.75s in order to create the CMS for DP&L.

Shake 2000 by Geomotion, Inc. was used to provide the CMS spectrum for Campbell 2003 CEUS GMPE using a target period T* = 0.75s. The standard deviation between the Campbell GMPE and UHS spectral response at T* was estimated to be 0.02. Figure 4 presents the CMS target spectrum that was used for the DP&L Power Plant.

ROCK MOTIONS FOR THE CMS

Seven time-history records were selected to match the target response spectrum for the site. A primary focus was to match the ground motion spectra to the CMS target spectrum, as suggested by NEHRP (2011) when considering magnitude, distance, and focal mechanism. Rock motion records were selected from the Pacific Earthquake Engineering Research (PEER) Center's Strong Motion Database. The motions are summarized below in Table IV. The rock motions were then scaled linearly to coincide with the UHS at T*. As shown on Figure 5, the arithmetic mean spectrum of the generated records closely matches the CMS bedrock spectrum over the period range of significance.

[4] Conversation with Edward Kavazanjian

TABLE IV EARTHQUAKE RECORDS (Long Period CMS)						
Event	Return Period	PEER File Name	Earthquake Record Used			
			Earthquake	M	Mechanism	Distance (km)
Conditional Mean Response	2,500-year	RSN7_NWCALIF.C_C-FRN045.AT2	Northwest Calif-02	6.6	strike slip	91.15
		RSN21_IMPVALL.BG_E-ELC000.AT2	Imperial Valley-05	5.4	strike slip	13.78
		RSN25_NCALIF.AG_B-FRN224.AT2	Northern Calif-04	5.7	strike slip	56.94
		RSN30_PARKF_C05085.AT2	Parkfield	6.19	strike slip	9.58
		RSN34_NCALIF.AG_C-FRN224.AT2	Northern Calif-05	5.6	strike slip	27.36
		RSN62_SFERN_CLN090.AT2	San Fernando	6.61	Reverse	96.81
		RSN95_MANAGUA_A-ESO090.AT2	Managua, Nicaragua-01	6.24	strike slip	3.51

ONE-DIMENSIONAL GROUND RESPONSE ANALYSIS

As mentioned previously, a one-dimensional ground response analysis was performed to estimate the surface ground motion at the site. The soil column used as input into the model was constructed from the shear wave velocities of individual soil layers at the site. This shear wave velocity profile was developed from test boring logs of Stuart Station using the average properties determined by empirical relationships provided by Pacific Earthquake Engineering Research[5] (Figure 6).

The computer software program Shake 2000 Version 9.6 by Geomotions was used to numerically simulate the propagation of rock motions up through the soil layers to the top of the ground surface. Shake2000 uses an equivalent linear numerical technique to model the non-linear dynamic soil behavior in the soil column. The dynamic geotechnical properties (damping, modulus-damping curves, density, etc.) used in the ground response model were obtained from EPRI (1993) and are based on extensive laboratory testing and literature review. These modulus reduction and damping curves were developed for various confining pressures corresponding to depths ranging from 0 to 305 meters. These curves are shown in Figure 7. The results of the Shake ground response analysis for the seven representative rock motions are shown in Figure 8. This figure compares the spectral response of the scaled bedrock motions to the surface ground response and shows the transformation in response caused by wave propagation through the 110-ft thick soil column. Table V summarizes the scaled PGA estimates at the ground surface and the surface PGA estimates at the top of the impoundment embankment.

[5] Wair,B.R., DeJong,J.T., and Shantz,T.; "Guidelines for Estimation of Shear Wave Velocity Profile", PEER, 2012

TABLE V
PREDICTED SURFACE PGA AND NEWMARK MAGNITUDE CORRECTION FACTOR

Earthquake	Original Magnitude	CMS Scaled PGA[1]	Shake Surface PGA[2]	Newmark Magnitude Correction Factor[3]
Northwest Calif-02	6.6	0.08 g	0.14 g	0.90
Imperial Valley-05	5.4	0.08g	0.11 g	1.25
Northern Calif-04	5.7	0.10 g	0.14 g	1.15
Parkfield	6.19	0.14 g	0.20 g	1.01
Northern Calif-05	5.6	0.12 g	0.14 g	1.18
San Fernando	6.61	0.11 g	0.16 g	0.89
Managua_ Nicaragua-01	6.24	0.07 g	0.15 g	0.99

[1] CMS scaled to period range of significance at T*=0.75s and is the PGA at ground surface (bottom of embankment)
[2] The surface PGA corresponds to the top of the embankment.
[3] Determined using the method developed by Bray and Traversarou

NEWMARK DISPLACEMENT ANALYSIS

Slope stability analysis considers the yield acceleration of the ground in response to a seismic event. The Newmark block displacement method predicts the amount of permanent displacement within a slope for a block of known height and a specific yield acceleration. The Newmark displacement analysis is based on the shear stress time history acting along a failure plane at the base of the block. The yield acceleration is the minimum amount of ground acceleration necessary to initiate motion along the failure surface and is used to determine the appropriate pseudo-static coefficient for seismic stability analyses.

Shake 2000 was used to perform the Newmark displacement analysis by incorporating the results of the one-dimensional ground response analysis. Shake 2000 incorporates several different variants of the Newmark block displacement method and the numerical approach known as YSLIP developed by Kavazanjian and Matasovic (1996) was chosen for our analysis. All seven site-specific bedrock motions were used to evaluate relationships between the Newmark permanent displacements and the associated yield acceleration. Several impoundment cross-sections were evaluated and the most conservative location of the failure plane was determined to be approximately 20 ft below the top of slope.

After performing the Newmark displacement analysis to predict block displacement it was necessary to adjust the displacement predictions to correspond to the difference between the magnitudes of the ground motions used in the analysis and the magnitude of the representative earthquake event established for the DP&L Power Plant. Correction factors were applied to scale the displacements to the target magnitude 6.21 event (Figure 9). The correction factors were determined using the approach developed by Bray and Travasarou (2007), which relates permanent displacement from a Newmark analysis with the magnitude of the earthquake event (Bray, 2007). Figure 10 presents the magnitude scaled permanent displacement versus yield acceleration provided by the Newmark analyses. When

seven or more ground motions are used in the analyses, it is standard practice to use the average of the scaled relationships as the representative displacement.[6]

[6] ASCE/SEI 7-10; "Minimum Design Loads for Buildings and Other Structures"

FIGURES

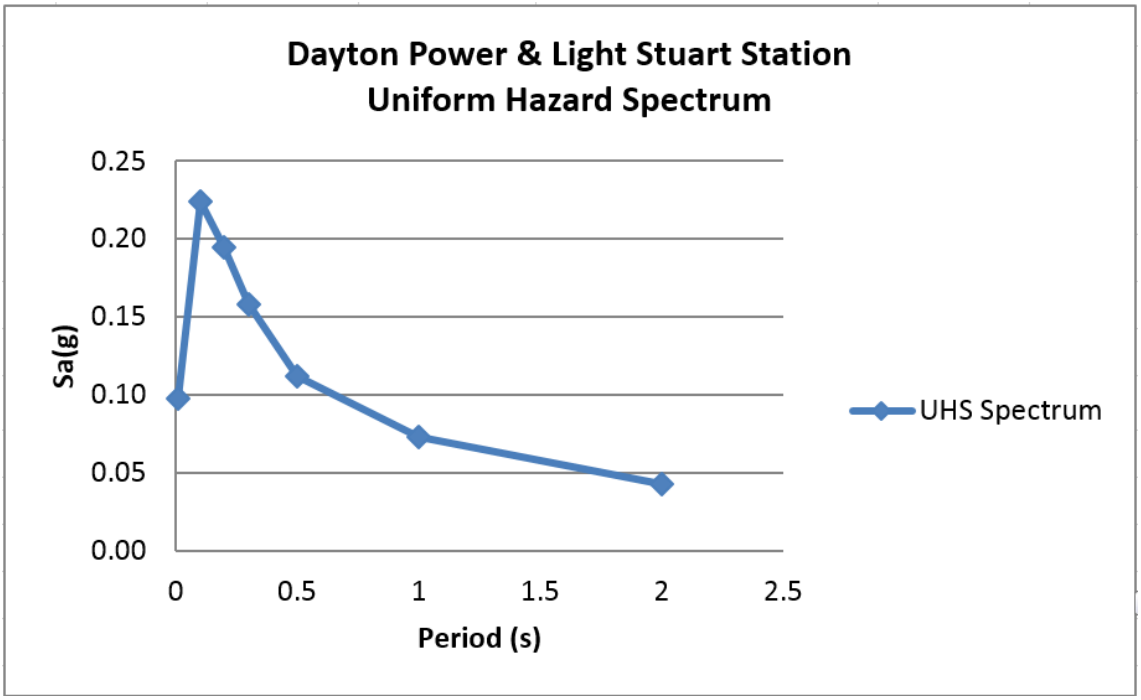


Figure 1: Uniform Hazard Spectrum for Dayton Power & Light - Stuart Station. Based on Site Class B bedrock and 2500-year return period

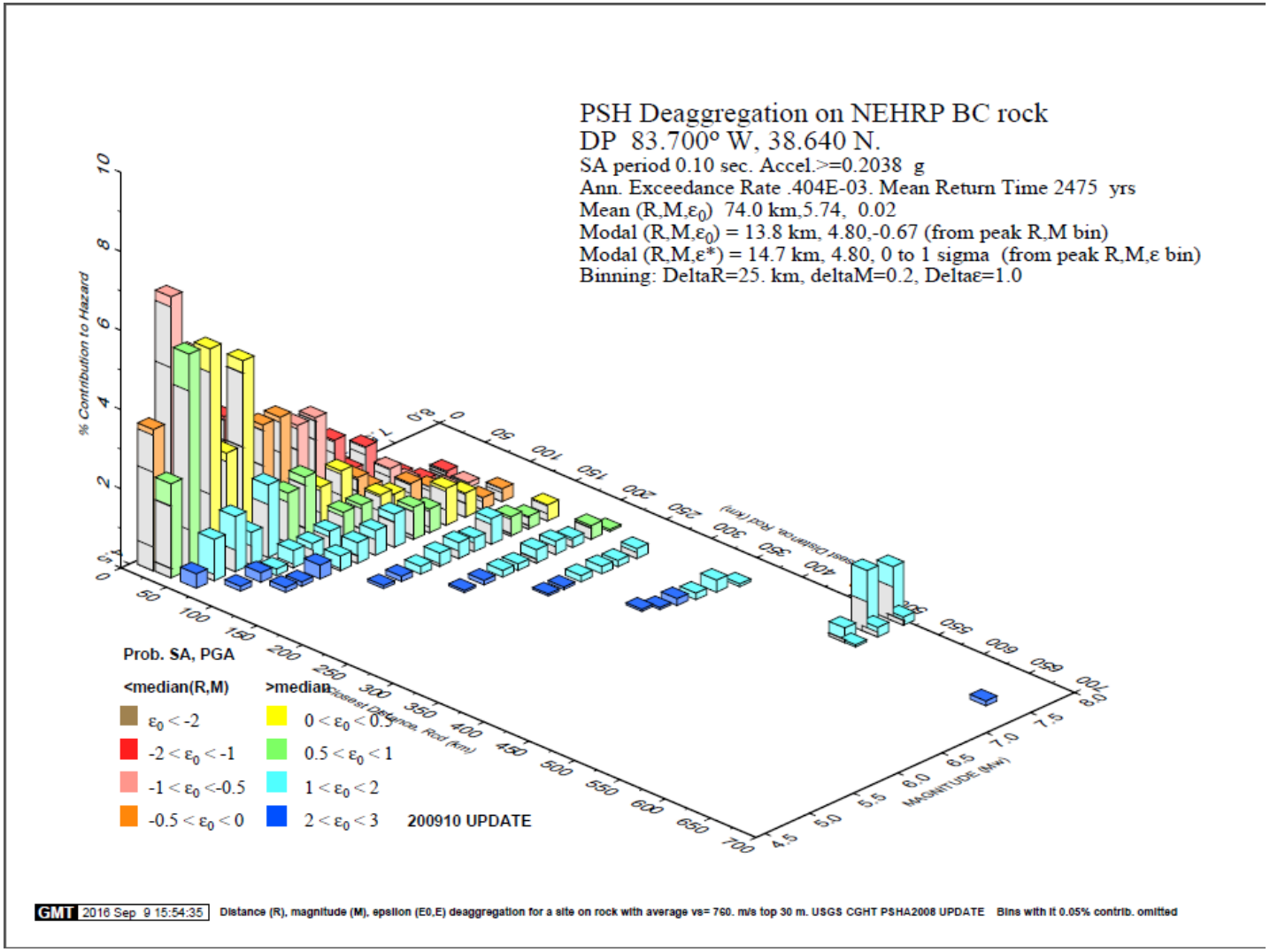


Figure 2: Deaggregation Plot for DP&L

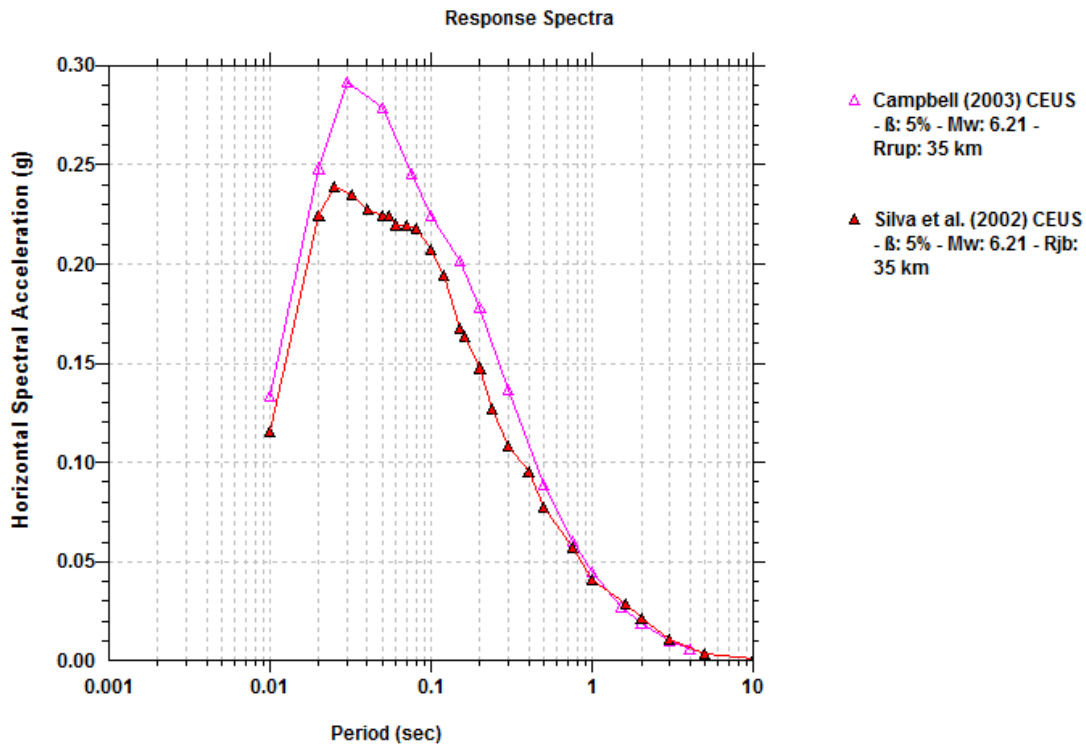


Figure 3: GMPE's -Attenuation models for DP&L

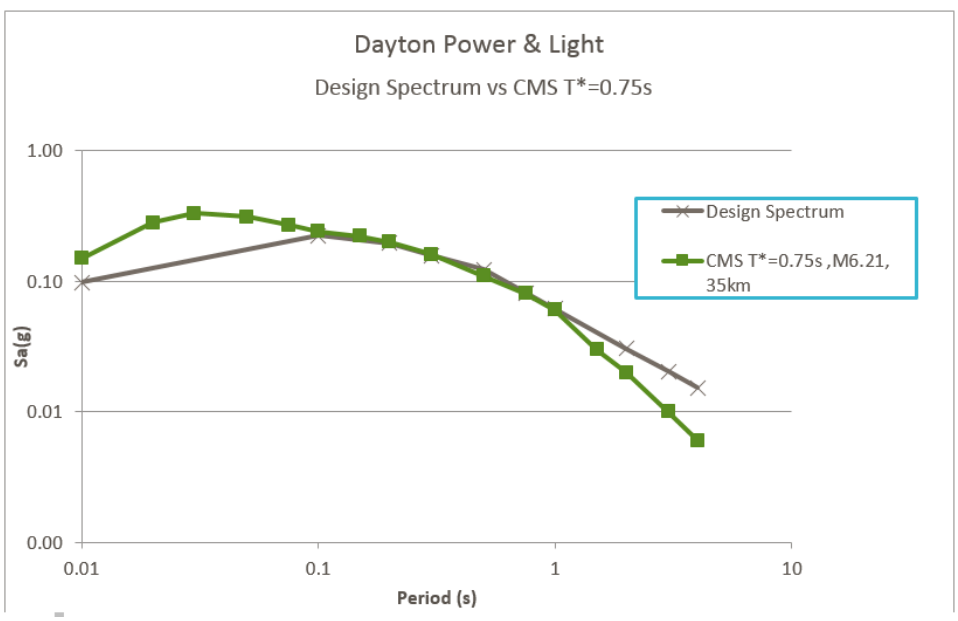


Figure 4: Design Spectrum and Conditional Mean Spectrum for DP&L Power Plant

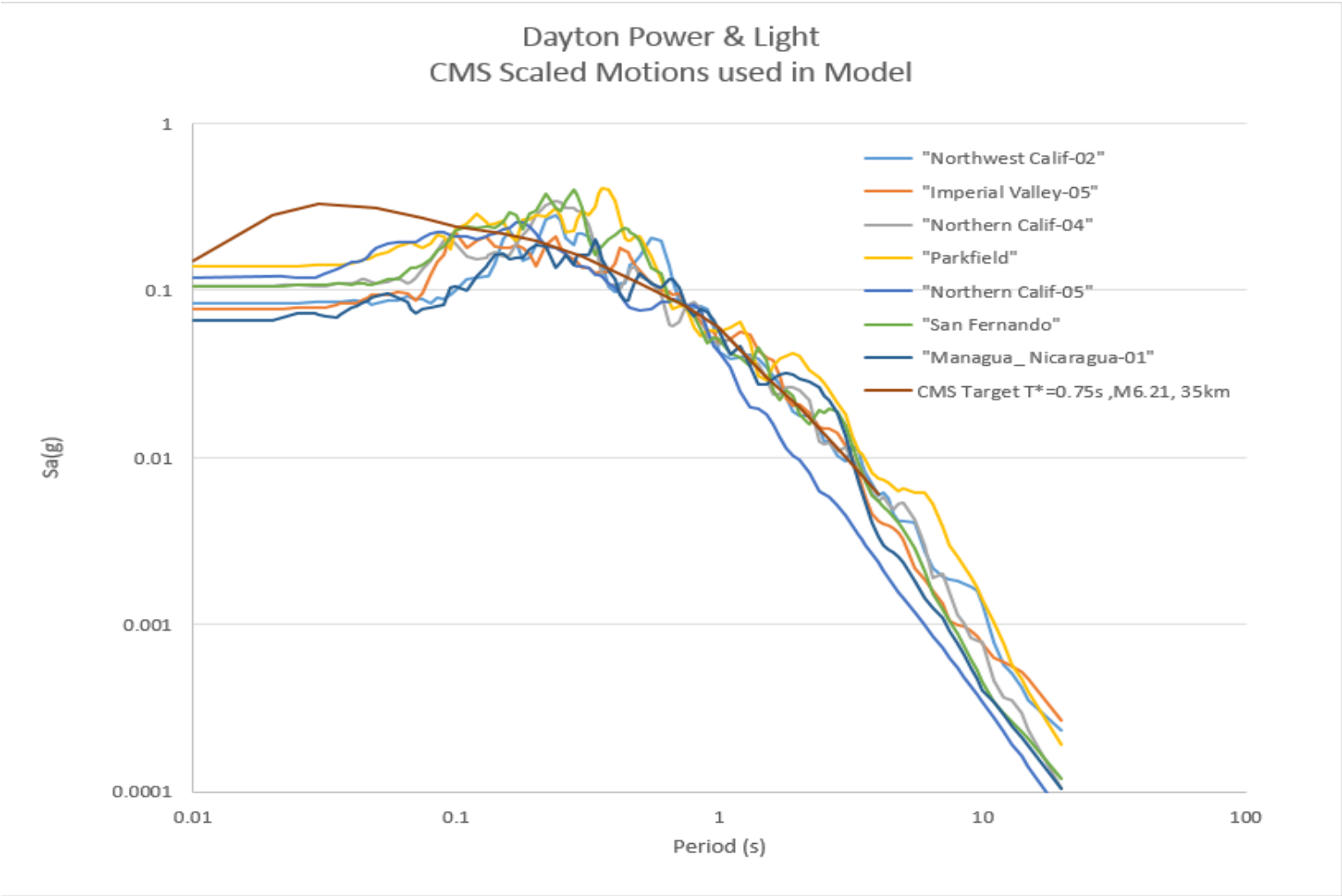


Figure 5: Ground motions scaled to CMS at target T=0.75s*

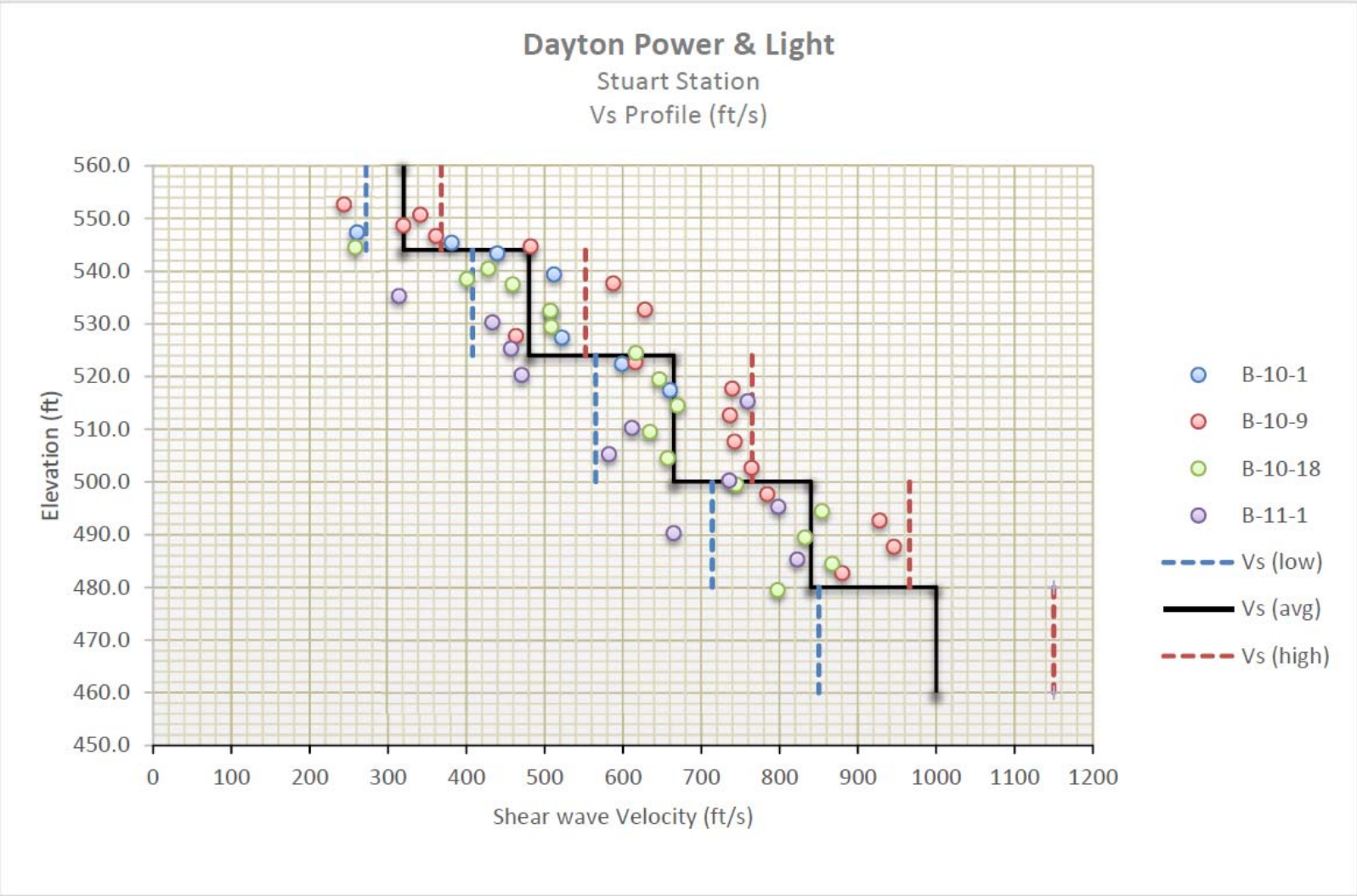


Figure 6: DP&L Shear wave velocity profile at DP&L based on local boring logs and empirical relationships developed at Pacific Earthquake Engineering Research

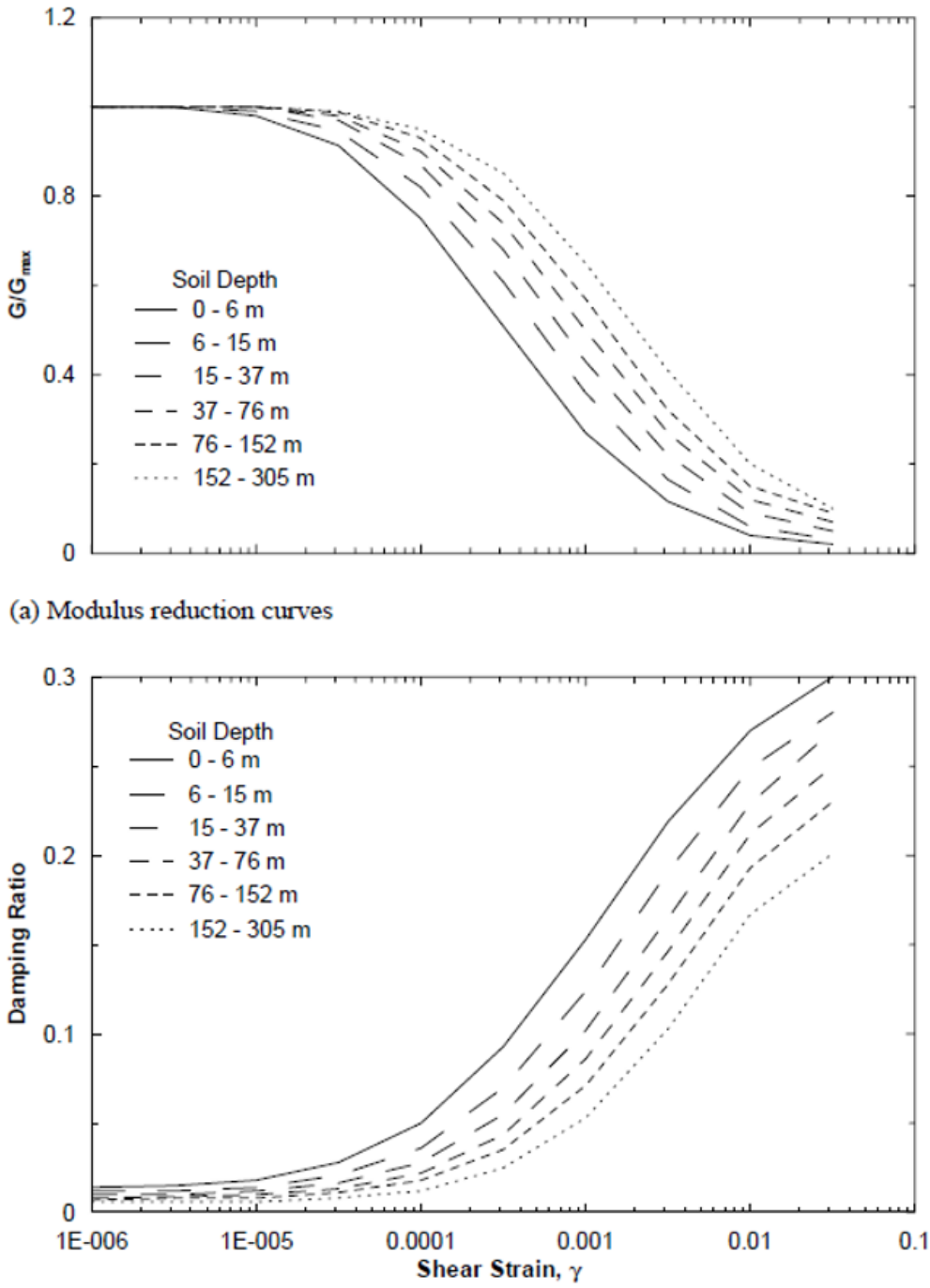


Figure 7: EPRI (1993) (a) modulus reduction and (b) damping curves

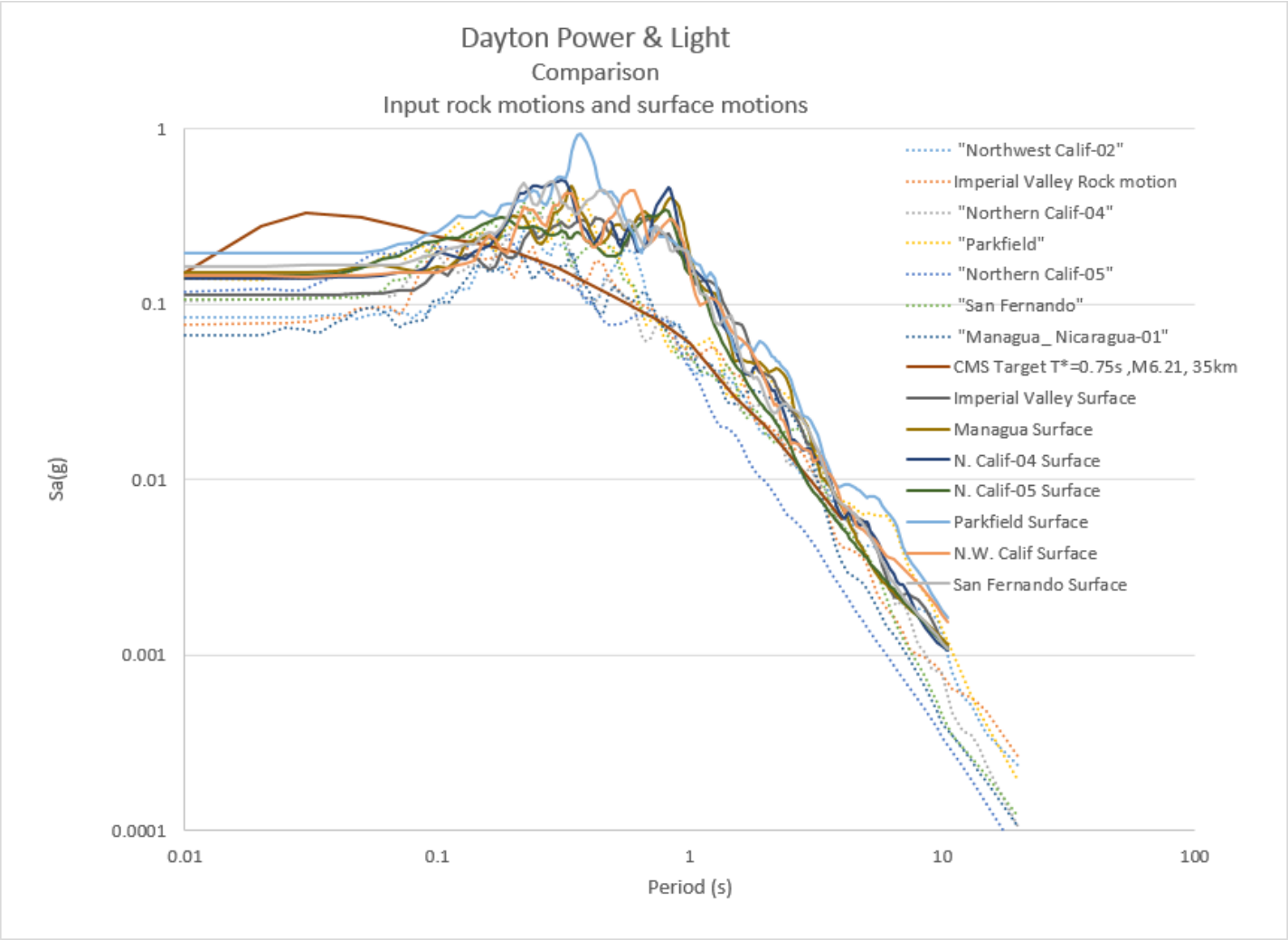


Figure 8: Comparison between input rock motions to Shake surface motions. Note that spectral response is amplified and has shifted to longer periods

HALEY ALDRICH

Created by: JMK DATE: 9/21/2016
Checked by JLL DATE: 9/28/2016

- Seismic displacement of impoundment based on Newmark method using Bray and Travasarou relationship to compensate for magnitude differences between ground motion and target earthquake
- Non-zero displacement (not biased due to magnitude): Bray and Travasarou(2007)
- Fundamental period ($T_1 \geq 0.05$s): $\ln(D) = -1.10 - 2.83\ln(k_y) - 0.333(\ln(k_y))^2 - 0.566\ln(k_y)\ln(S_a(1.5T_s)) + 3.04\ln(S_a(1.5T_s)) - 0.244(\ln(S_a(1.5T_s)))^2 + 1.5T_s + 0.278(M-7) \pm \varepsilon$
- Assumed Rigid Sliding Block ($T_1 < 0.05$s): $\ln(D) = -0.22 - 2.83\ln(k_y) - 0.333(\ln(k_y))^2 - 0.566\ln(k_y)\ln(PGA) + 3.04\ln(PGA) - 0.244(\ln(PGA))^2 + 0.278(M-7) \pm \varepsilon$
- where :
  - D = non-zero displacement (cm)
  - k_y = yield coefficient
  - T_s = initial fundamental period of sliding mass (s)
  - $S_a(1.5T_s)$ = spectral acceleration of the input ground motion at a period of $1.5T_s$ (g)
  - ε = normally distributed random variable with zero mean and standard deviation $\sigma = 0.67$
- Fundamental Period Sliding Mass = $4H/V_s$
- where:
  - H = height of sliding mass
  - V_s = average shear wave velocity of sliding mass

Bray and Traversarou

Magnitude Correction Factor for M8 target

$$\frac{e^{0.278(8-7)}}{e^{0.278(M-7)}} = \frac{1.32}{e^{0.278(M-7)}}$$

Seismic displacement of a slope based on Newmark method using Bray and Travasarous relationship to compensate for magnitude

20 ft Sliding Mass Height

Long Period Motions (scaled to soil column resonance)

DP&L Target Magnitude 6.21

Ground Motion	Magnitude	Distance (km)	Depth Sliding Mass (ft)	Shear wave Velocity (ft/s)	Yield Coefficient, k_y (g)	Bray and Travasarou Magnitude Correction Factor	Newmark Analysis Displacement (Inches)** Min (in)	Avg (in)	Maximum (in)	Adjusted Newmark Displacement (Inches) Min (in)	Avg (in)	Maximum (in)
N.W. California (1941	6.6	91.15	20	600	0.01	0.90	12.20	12.60	13.00	10.95	11.31	11.66
					0.02	0.90	5.20	5.50	5.70	4.67	4.93	5.11
					0.03	0.90	2.50	2.60	2.70	2.24	2.33	2.42
					0.04	0.90	1.30	1.40	1.50	1.17	1.26	1.35
					0.05	0.90	0.70	0.80	0.90	0.63	0.72	0.81
					0.06	0.90	0.40	0.40	0.50	0.36	0.36	0.45
					0.07	0.90	0.10	0.20	0.30	0.09	0.18	0.27
					0.08	0.90	0.00	0.10	0.20	0.00	0.09	0.18
					0.1	0.90	0.00	0.00	0.00	0.00	0.00	0.00
Imperial Valley	5.4	13.78	20	600	0.01	1.25	8.60	8.60	8.70	10.77	10.77	10.90
					0.02	1.25	3.40	3.70	4.00	4.26	4.63	5.01
					0.03	1.25	1.60	1.90	2.10	2.00	2.38	2.63
					0.04	1.25	0.80	0.90	1.00	1.00	1.13	1.25
					0.05	1.25	0.40	0.40	0.40	0.50	0.50	0.50
					0.06	1.25	0.10	0.10	0.20	0.13	0.13	0.25
					0.07	1.25	0.00	0.00	0.10	0.00	0.00	0.13
					0.08	1.25	0.00	0.00	0.00	0.00	0.00	0.00
					0.1	1.25	0.00	0.00	0.00	0.00	0.00	0.00
										0.00	0.00	0.00
San Fernando	6.61	96.81	20	600	0.01	0.89	10.50	10.60	10.60	9.39	9.48	9.48
					0.02	0.89	5.10	5.30	5.40	4.56	4.74	4.83
					0.03	0.89	2.40	2.60	2.80	2.15	2.33	2.51
					0.04	0.89	1.10	1.40	1.60	0.98	1.25	1.43
					0.05	0.89	0.50	0.80	1.00	0.45	0.72	0.89
					0.06	0.89	0.20	0.40	0.70	0.18	0.36	0.63
					0.07	0.89	0.00	0.30	0.50	0.00	0.27	0.45
					0.08	0.89	0.00	0.20	0.30	0.00	0.18	0.27
					0.1	0.89	0.00	0.00	0.10	0.00	0.00	0.09
Parkfield	6.19	9.58	20	600	0.01	1.01	11.50	11.50	11.60	11.56	11.56	11.66
					0.02	1.01	5.40	5.50	5.60	5.43	5.53	5.63
					0.03	1.01	2.60	3.00	3.40	2.61	3.02	3.42
					0.04	1.01	1.40	1.80	2.10	1.41	1.81	2.11
					0.05	1.01	0.90	1.10	1.40	0.91	1.11	1.41
					0.06	1.01	0.50	0.80	1.00	0.50	0.80	1.01
					0.07	1.01	0.30	0.50	0.70	0.30	0.50	0.70
					0.08	1.01	0.20	0.40	0.50	0.20	0.40	0.50
					0.1	1.01	0.00	0.10	0.20	0.00	0.10	0.20
Northern Calif-04	5.7	56.94	20	600	0.01	1.15	20.50	21.00	21.40	23.62	24.20	24.66
					0.02	1.15	8.30	8.40	8.50	9.56	9.68	9.79
					0.03	1.15	3.30	3.30	3.40	3.80	3.80	3.92
					0.04	1.15	1.50	1.50	1.50	1.73	1.73	1.73
					0.05	1.15	0.60	0.70	0.70	0.69	0.81	0.81
					0.06	1.15	0.30	0.30	0.30	0.35	0.35	0.35
					0.07	1.15	0.10	0.10	0.10	0.12	0.12	0.12
					0.08	1.15	0.00	0.00	0.00	0.00	0.00	0.00
					0.1	1.15	0.00	0.00	0.00	0.00	0.00	0.00
Managua, Nicaragua-(	6.24	3.51	20	600	0.01	0.99	11.90	12.00	12.10	11.80	11.90	12.00
					0.02	0.99	5.80	5.90	6.00	5.75	5.85	5.95
					0.03	0.99	2.80	3.00	3.10	2.78	2.98	3.07
					0.04	0.99	1.50	1.50	1.50	1.49	1.49	1.49
					0.05	0.99	0.80	0.80	0.80	0.79	0.79	0.79
					0.06	0.99	0.40	0.40	0.40	0.40	0.40	0.40
					0.07	0.99	0.20	0.20	0.20	0.20	0.20	0.20
					0.08	0.99	0.00	0.10	0.20	0.00	0.10	0.20
					0.1	0.99	0.00	0.00	0.00	0.00	0.00	0.00
Northern Calif-05	5.6	27.36	20	600	0.01	1.18	5.30	5.90	6.50	6.28	6.99	7.70
					0.02	1.18	1.90	2.40	2.90	2.25	2.84	3.44
					0.03	1.18	0.90	1.30	1.70	1.07	1.54	2.01
					0.04	1.18	0.50	0.80	1.10	0.59	0.95	1.30
					0.05	1.18	0.30	0.50	0.60	0.36	0.59	0.71
					0.06	1.18	0.20	0.20	0.30	0.24	0.24	0.36
					0.07	1.18	0.00	0.10	0.20	0.00	0.12	0.24
					0.08	1.18	0.00	0.00	0.00	0.00	0.00	0.00
					0.1	1.18	0.00	0.00	0.00	0.00	0.00	0.00
AVERAGE					0.01						12.32	
					0.02						5.46	
					0.03						2.62	
					0.04						1.37	
					0.05						0.75	
					0.06						0.38	
					0.07						0.20	
					0.08						0.11	
					0.1						0.01	

Figure 9: Results of Newmark analysis with Bray and Traversarou Corrections

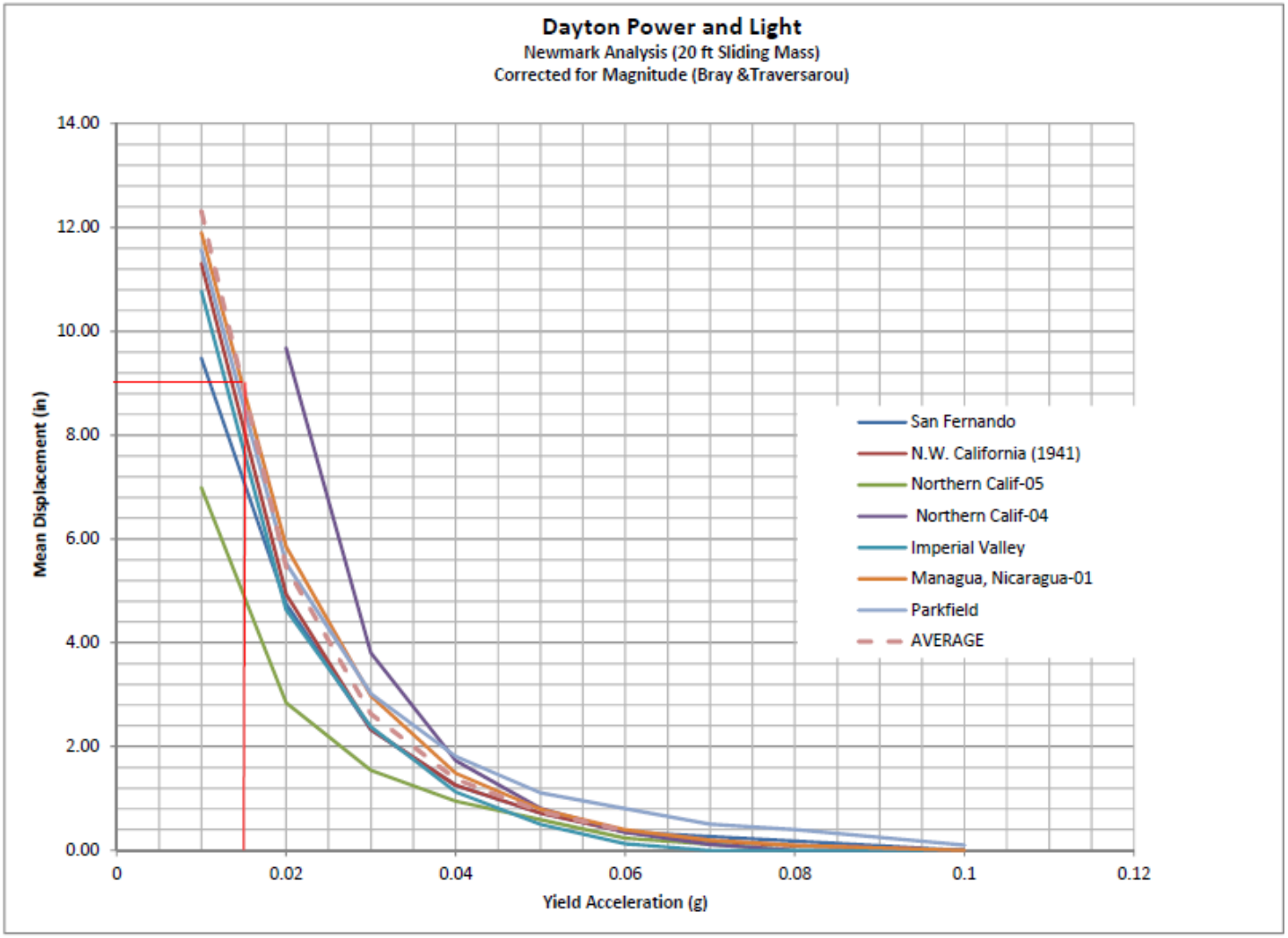


Figure 10: Newmark Block Displacement Analysis for DP&L

Liquefaction Analysis

LIQUEFACTION POTENTIAL EVALUATIONS

The soils observed in the cone penetrometer test (CPT) soundings were evaluated for liquefaction potential since the degree of saturation is unknown and research has shown that materials with degrees of saturation as low as 90 percent can potentially liquefy. The liquefaction potential of these materials was evaluated using the following three methods:

1) Normalized Shear Wave Velocity Evaluation
2) CPT-Based State Parameter Evaluation
3) CPT-Based Liquefaction Triggering Evaluation

A summary of each evaluation method is further described below. Note that in our overall evaluation of liquefaction potential, we have given the greatest weight to the results of the CPT-based liquefaction triggering evaluation and the least weight to the results of the normalized shear wave velocity evaluations.

CPT-Based Liquefaction Triggering Evaluations

Simplified CPT-based liquefaction triggering evaluations were performed using the methods described in Idriss & Boulanger (2008). Triggering evaluations were performed to evaluate the liquefaction potential of the soils for an earthquake with a return period of 2,500-years. The earthquake magnitude used in this analysis was 5.0g based on the USGS deaggregation and the PGA used in this analysis was 0.14g.

Based on guidance from Idriss and Boulanger (2008), clay-like soil behavior is defined in a material having over 35% fines and having a PI value of greater than 7. If both of these criteria are not met, the soil is then anticipated to have sand-like behavior. We understand that the fill soils generally meet these criteria based on the results of laboratory tests completed on samples collected in test borings performed at the impoundment embankments. The soil behavior can also be estimated based on the Soil Behavior Type Index, I_c, which is a function of the normalized CPT tip resistance and the normalized friction ratio. Soil Behavior Type Index, I_c, values of less than 2.5 are anticipated to have sand-like behavior and I_c values of greater than 2.7 are anticipated to have clay-like behavior. Based on the I_c method, a portion of the embankment fill soils are anticipated to have sand-like behavior. Therefore, we took a conservative approach and performed liquefaction triggering evaluations using both “sand-like” and “clay-like” soil behavior methods.

Results of the CPT-Based liquefaction triggering evaluations are presented graphically in Figures D5 through D12. With the exception of soils encountered at CPT HA-6-C1, embankment fill soils encountered by the CPTs have Factors of Safety of greater than 1.2 against liquefaction using both sand-like and clay-like evaluations and conservative estimations of the fines contents. This indicates that the embankment materials at impoundments 3A, 5, 7/7A, and 10 are not anticipated to liquefy and lose strength during the design earthquake event. However, embankment fill soils encountered from a depth of 14 to 35.5 feet in CPT HA-6-C1 are estimated to have factors of safety of less than 1.2 during the evaluated earthquake. This indicates that the soils used to construct the embankment at Pond 6 may be prone to liquefaction.

CPT-Based State Parameter Evaluation

The state parameter (ψ) is defined as the difference between the current void ratio and the critical state void ratio. Jefferies and Been (2006) suggested that soils with a state parameter value of less than -0.05 are dilative at large strains and are less likely to be prone to liquefaction. Robertson (2009) developed state parameter contours for the SBT_n Q_{tn}-F_R for uncemented, Holocene-age soils.

Data points from the embankment fill materials encountered in each of the CPT soundings were plotted on the SBT_n Q_{tn}-F_R chart and were compared to the state parameter contours developed by Robertson as shown in Figures D13 through D20. As shown on these figures, the estimated state parameter difference for the fill soils at each of the sites is less than -0.05, indicating that the embankment fill materials are dilative and not prone to liquefaction.

Normalized Shear Wave Velocity Evaluation

Normalized shear wave velocity threshold values for the liquefaction resistance of the soil have been developed by Andrus and Stokoe (2000). Three threshold normalized shear wave have been identified based on the fines content of the soils as indicated below:

- Soils with fines contents of less than 5%: 220 m/sec
- Soils with fines contents of approximately 20%: 210 m/sec
- Soils with fines content of greater than 35%: 200 m/sec

Normalized shear wave velocities lower than the threshold values shown above are more susceptible to liquefaction while normalized shear wave velocities higher than the threshold values are less susceptible to liquefaction.

Shear wave velocities measured by the CPT were normalized using the following equation:

$$V_{s1} = V_s \left(\frac{P_a}{\sigma'_{vo}}\right)^{0.25}$$

Where: v_s = CPT measured shear wave velocity
P_a = 1 atmosphere of pressure
σ'_{vo} = effective overburden pressure at average interval depth

The effective overburden pressure at the average interval depth was calculated assuming an average soil unit weight of 125 pcf and assuming that the soil profile is partially saturated above the depth at which water was encountered at each CPT location. Normalized shear wave velocities measured in the CPT soundings relative to the threshold shear wave velocities are shown in Figure D21.

Fill material within the impoundment embankments at CPT soundings HA-10-C1, HA-3-C1, and HA-5-C1 are estimated to have fines contents greater than 35 percent based the results of laboratory tests performed on samples collected from adjacent soil borings. Normalized shear wave velocities of fill soils measured in CPTs HA-3-C1 from a depth of approximately 14 to 25 feet and CPT HA-10-C1 from a depth of approximately 20 to 24 feet are lower than the threshold value for soils with greater than 35 percent fines, indicating that these soils are potentially liquefiable.

Conclusions

The following conclusions are made based on the results of the liquefaction evaluations described above:

1) Normalized shear wave velocities of embankment fill soils measured in CPTs HA-3-C1 from a depth of approximately 14 to 25 feet and CPT HA-10-C1 from a depth of approximately 20 to 24 feet are lower than the threshold value for soils with greater than 35 percent fines, indicating that these soils are potentially liquefiable.

2) CPT-based state parameter evaluations indicate the embankment fill soils encountered at each of the CPT locations are dilative and not prone to liquefaction.

3) CPT-based liquefaction triggering evaluations indicate the embankment fill soils at impoundments 3A, 5, 7/7A, and 10 have calculated factors of safety greater than 1.2 indicating that these soils <u>are not</u> prone to liquefaction. Embankment fill soils encountered from a depth of 14 to 35.5 feet in CPT HA-6-C1 have calculated factors of safety of less than 1.2 using sand-like evaluations, indicating that these soils may be prone to liquefaction

In consideration of the results of the three evaluations mentioned above, we anticipate that the embankment fill soils at impoundments 3A, 5, 7/7A, and 10 are not prone to liquefaction. However, the results of the triggering analysis indicate that the embankment fill soils at Pond 6 from a depth of 14 to 35.5 ft may be prone to liquefaction. Accordingly slope stability analyses at Pond 6 should be performed to evaluate post-liquefaction stability using residual undrained strengths in the portion of the embankment fill that has been determined to be potentially liquefiable.

References

a. Andrus, R.D. and Stokoe, K.H., II, (2000). "Liquefaction Resistance of Soils from Shear-Wave Velocity," Journal of Geotechnical and Geoenvironmental Engineering, American Society of Civil Engineers, Vol. 126, No. 11, November, pp. 1015-1025.
b. Idriss, I. M., and Boulanger, R. W. (2008). "Soil Liquefaction during Earthquakes," EERI Monograph, MNO-12, Richmond, CA
c. Jefferies, M.G. and Been, K., (2006). Soil Liquefaction – A critical state approach. Taylor & Francis, ISBN 0-419-16170-8 478 pages.
d. Robertson, P.K., (2009a). Interpretation of cone penetration tests – a unified approach. Canadian Geotechnical Journal, 46:1337-1355.

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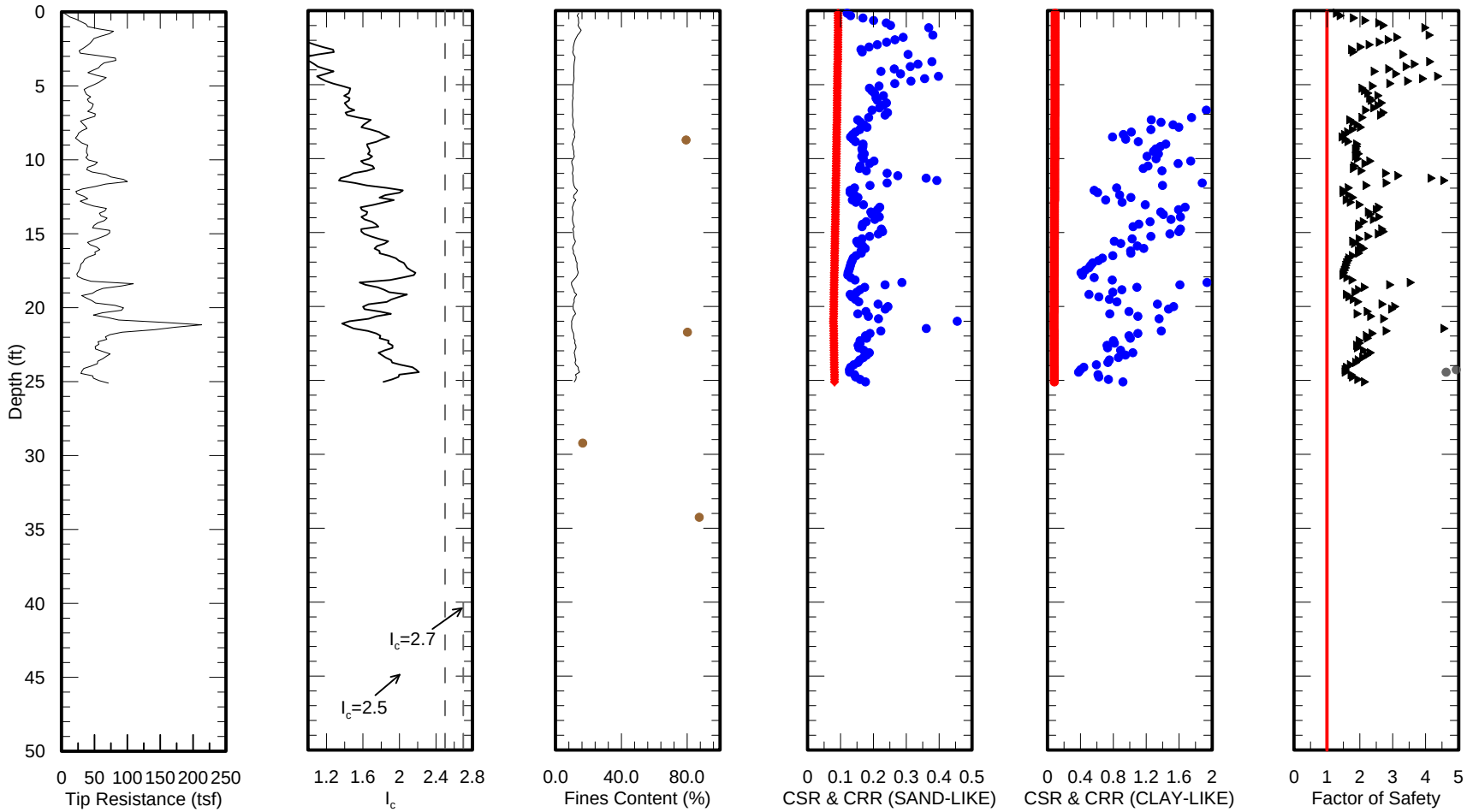

LEGEND

- Cyclic Stress Ratio$_{M,\sigma'vc}$
- Cyclic Resistance Ratio$_{M,\sigma'vc}$
- Clay-Like Factor of Safety
- Sand-Like Factor of Safety
- Laboratory Measured Fines Content

NOTES:
1) Cyclic Stress Ratio (CSR), Cyclic Resistance Ratio (CRR) and Factor of Safety (FS) values calculated using methods described in EERI's "Soil Liquefaction during Earthquakes" [Idriss & Boulanger, 2008].
2) Effective stresses used in CRR equations calculated based on depth to water at time of CPT sounding. Effective stresses used in CSR equations based on depth to water at maximum storage.
3) CSR values calculated for an earthquake having a PGA of 0.142g and a magnitude of 5.0.
4) Sand-like CRR values were calculated using corrected tip resistances (qt). Fines contents estimated using correlations developed by Syms (2001).
5) Clay-like CRR values were calculated using an Nkt value of 35.
6) Clay-like factors of safety exceeding 5 are not shown.

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JM Stuart Station

Liquefaction Triggering Evaluation
HA-3-C1
2,500-Year Return Period

August 2016

FIGURE D5

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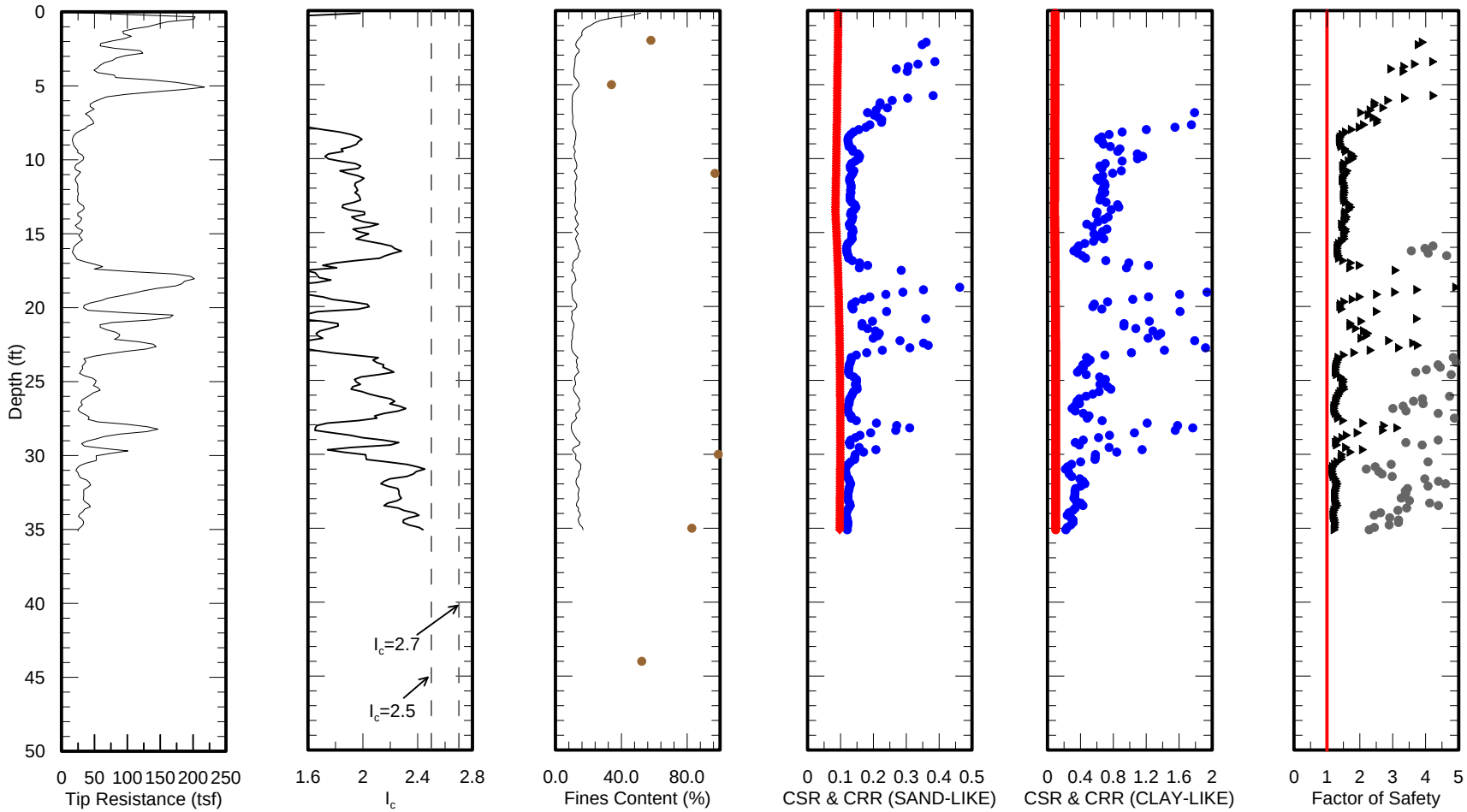

LEGEND

- Cyclic Stress Ratio$_{M,\sigma'vc}$
- Cyclic Resistance Ratio$_{M,\sigma'vc}$
- Clay-Like Factor of Safety
- Sand-Like Factor of Safety
- Laboratory Measured Fines Content

NOTES:
1) Cyclic Stress Ratio (CSR), Cyclic Resistance Ratio (CRR) and Factor of Safety (FS) values calculated using methods described in EERI's "Soil Liquefaction during Earthquakes" [Idriss & Boulanger, 2008].
2) Effective stresses used in CRR equations calculated based on depth to water at time of CPT sounding. Effective stresses used in CSR equations based on depth to water at maximum storage.
3) CSR values calculated for an earthquake having a PGA of 0.142g and a magnitude of 5.0.
4) Sand-like CRR values were calculated using corrected tip resistances (qt). Fines contents estimated using correlations developed by Syms (2001).
5) Clay-like CRR values were calculated using an Nkt value of 35.
6) Clay-like factors of safety exceeding 5 are not shown.

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Liquefaction Triggering Evaluation
HA-5-C1
2,500-Year Return Period

August 2016

FIGURE D6

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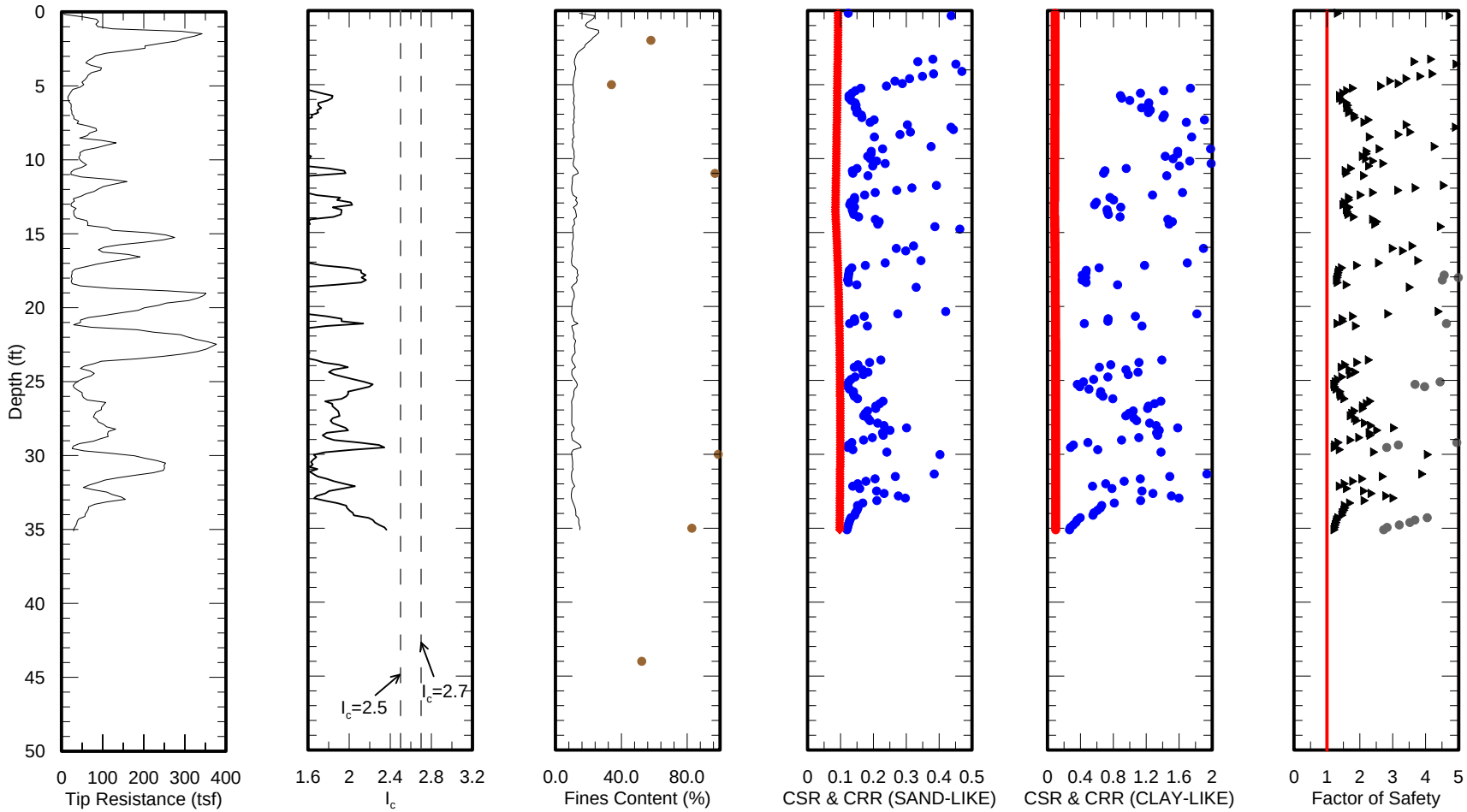

LEGEND

- Cyclic Stress Ratio$_{M,\sigma'vc}$
- Cyclic Resistance Ratio$_{M,\sigma'vc}$
- Clay-Like Factor of Safety
- Sand-Like Factor of Safety
- Laboratory Measured Fines Content

NOTES:
1) Cyclic Stress Ratio (CSR), Cyclic Resistance Ratio (CRR) and Factor of Safety (FS) values calculated using methods described in EERI's "Soil Liquefaction during Earthquakes" [Idriss & Boulanger, 2008].
2) Effective stresses used in CRR equations calculated based on depth to water at time of CPT sounding. Effective stresses used in CSR equations based on depth to water at maximum storage.
3) CSR values calculated for an earthquake having a PGA of 0.142g and a magnitude of 5.0.
4) Sand-like CRR values were calculated using corrected tip resistances (qt). Fines contents estimated using correlations developed by Syms (2001).
5) Clay-like CRR values were calculated using an Nkt value of 35.
6) Clay-like factors of safety exceeding 5 are not shown.

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Liquefaction Triggering Evaluation
HA-5-C2
2,500-Year Return Period

August 2016

FIGURE D7

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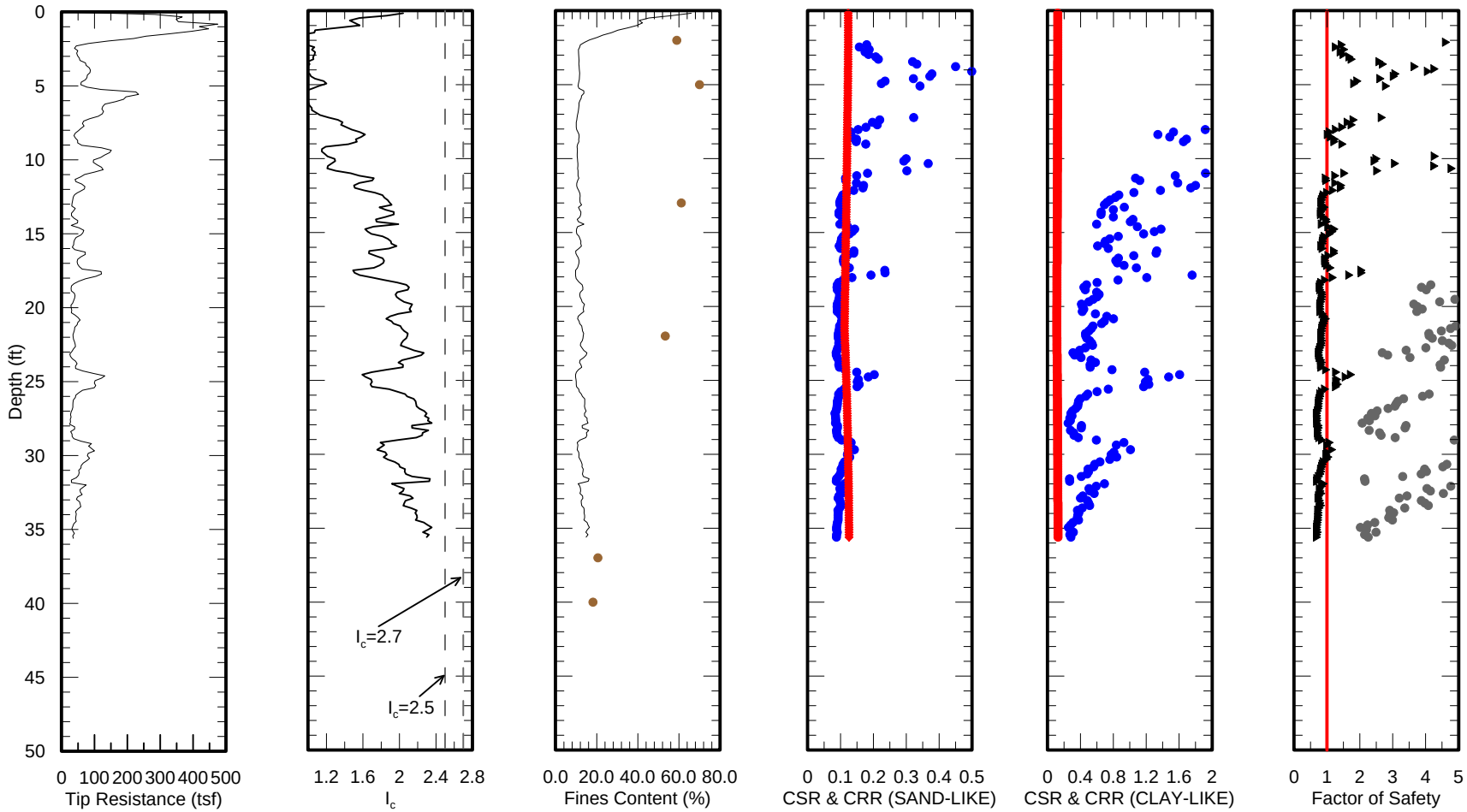

LEGEND

- Cyclic Stress Ratio$_{M,\sigma'vc}$
- Cyclic Resistance Ratio$_{M,\sigma'vc}$
- Clay-Like Factor of Safety
- Sand-Like Factor of Safety
- Laboratory Measured Fines Content

NOTES:
1) Cyclic Stress Ratio (CSR), Cyclic Resistance Ratio (CRR) and Factor of Safety (FS) values calculated using methods described in EERI's "Soil Liquefaction during Earthquakes" [Idriss & Boulanger, 2008].
2) Effective stresses used in CRR equations calculated based on depth to water at time of CPT sounding. Effective stresses used in CSR equations based on depth to water at maximum storage.
3) CSR values calculated for an earthquake having a PGA of 0.142g and a magnitude of 5.0.
4) Sand-like CRR values were calculated using corrected tip resistances (qt). Fines contents estimated using correlations developed by Syms (2001).
5) Clay-like CRR values were calculated using an Nkt value of 35.
6) Clay-like factors of safety exceeding 5 are not shown.

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Liquefaction Triggering Evaluation
HA-6-C1
2,500-Year Return Period

August 2016

FIGURE D8

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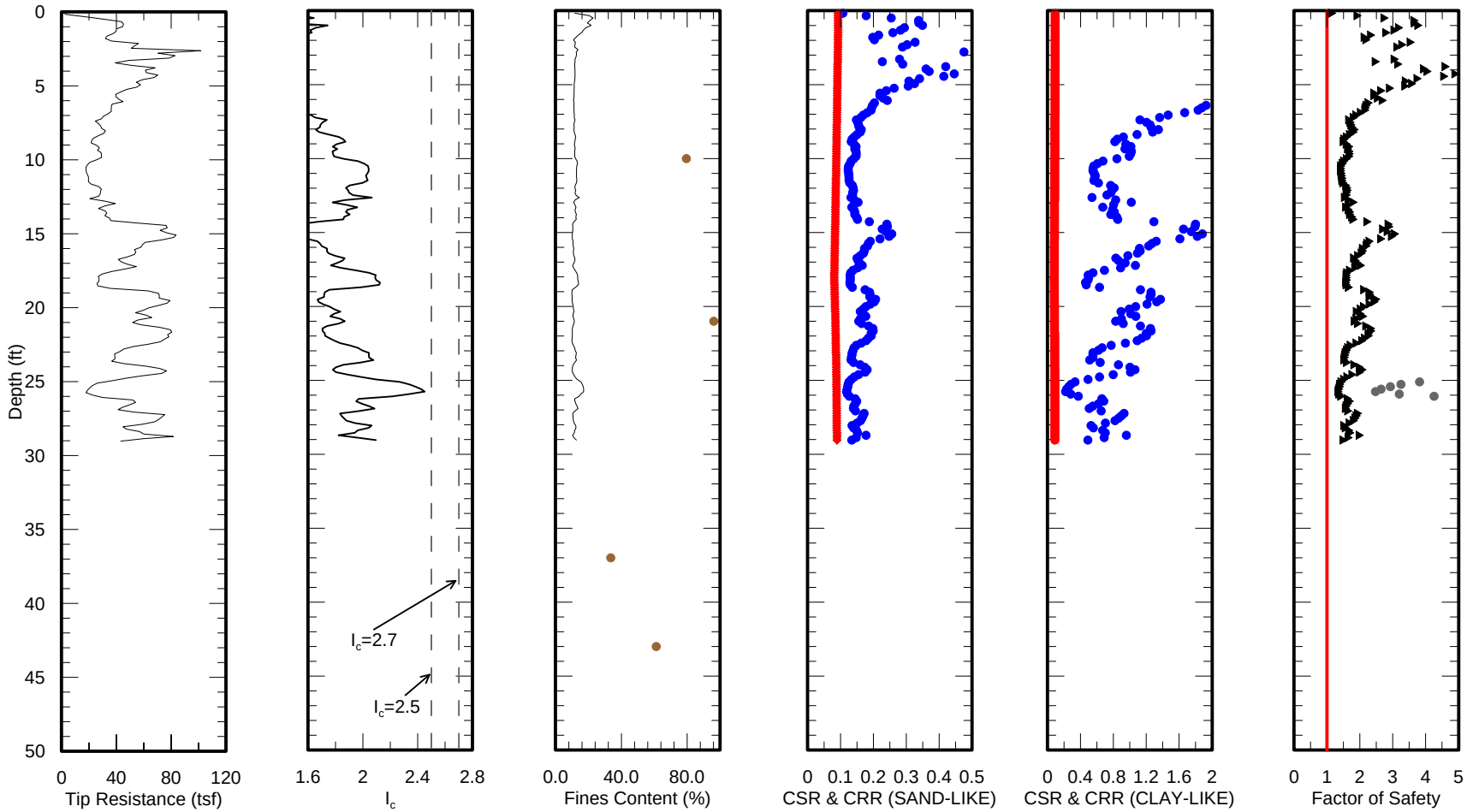

LEGEND

- Cyclic Stress Ratio$_{M,\sigma'vc}$
- Cyclic Resistance Ratio$_{M,\sigma'vc}$
- Clay-Like Factor of Safety
- Sand-Like Factor of Safety
- Laboratory Measured Fines Content

NOTES:
1) Cyclic Stress Ratio (CSR), Cyclic Resistance Ratio (CRR) and Factor of Safety (FS) values calculated using methods described in EERI's "Soil Liquefaction during Earthquakes" [Idriss & Boulanger, 2008].
2) Effective stresses used in CRR equations calculated based on depth to water at time of CPT sounding. Effective stresses used in CSR equations based on depth to water at maximum storage.
3) CSR values calculated for an earthquake having a PGA of 0.142g and a magnitude of 5.0.
4) Sand-like CRR values were calculated using corrected tip resistances (qt). Fines contents estimated using correlations developed by Syms (2001).
5) Clay-like CRR values were calculated using an Nkt value of 35.
6) Clay-like factors of safety exceeding 5 are not shown.

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JM Stuart Station

Liquefaction Triggering Evaluation
HA-7-C1b
2,500-Year Return Period

August 2016

FIGURE D9

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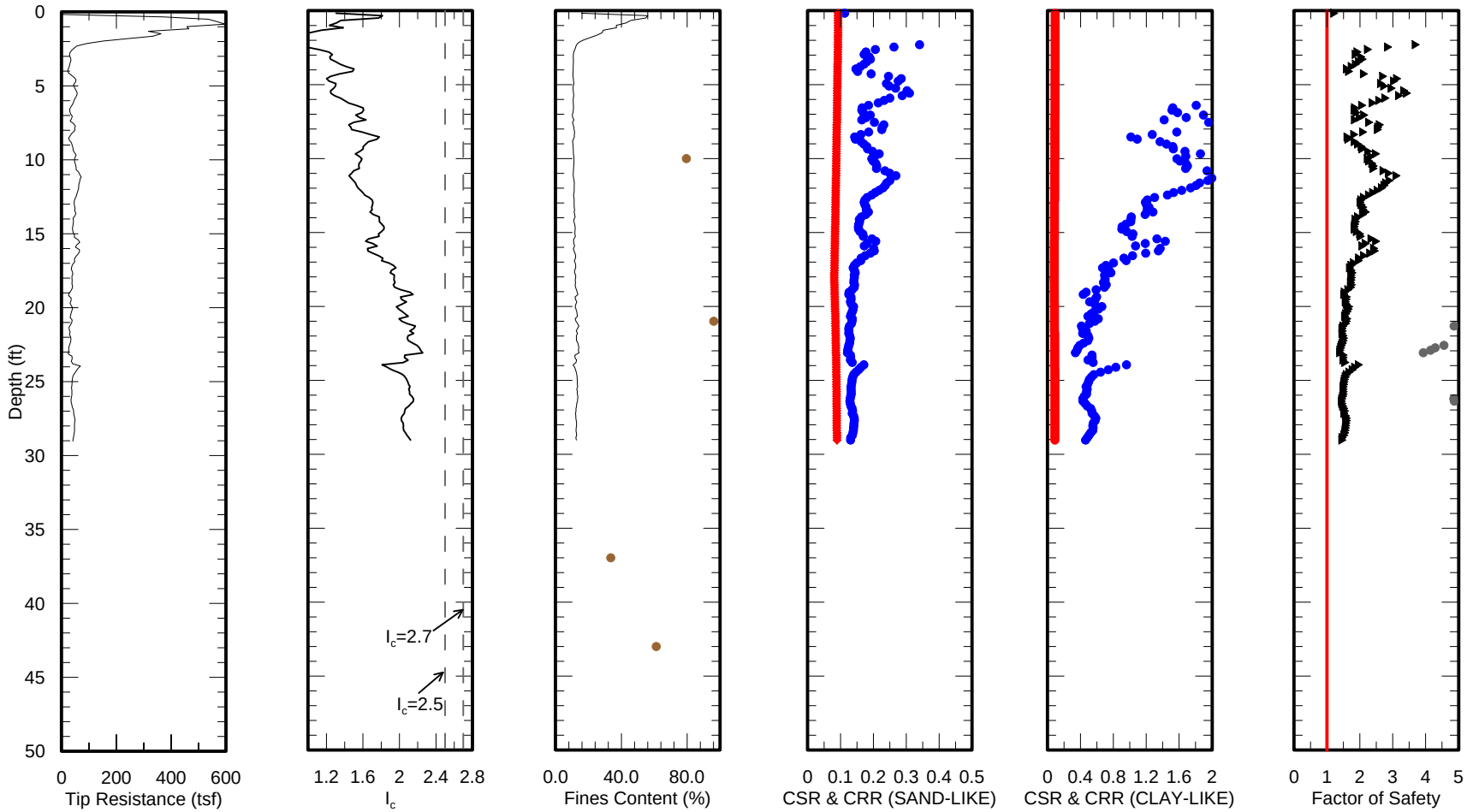

LEGEND

- Cyclic Stress Ratio$_{M,\sigma'vc}$
- Cyclic Resistance Ratio$_{M,\sigma'vc}$
- Clay-Like Factor of Safety
- Sand-Like Factor of Safety
- Laboratory Measured Fines Content

NOTES:
1) Cyclic Stress Ratio (CSR), Cyclic Resistance Ratio (CRR) and Factor of Safety (FS) values calculated using methods described in EERI's "Soil Liquefaction during Earthquakes" [Idriss & Boulanger, 2008].
2) Effective stresses used in CRR equations calculated based on depth to water at time of CPT sounding. Effective stresses used in CSR equations based on depth to water at maximum storage.
3) CSR values calculated for an earthquake having a PGA of 0.142g and a magnitude of 5.0.
4) Sand-like CRR values were calculated using corrected tip resistances (qt). Fines contents estimated using correlations developed by Syms (2001).
5) Clay-like CRR values were calculated using an Nkt value of 35.
6) Clay-like factors of safety exceeding 5 are not shown.

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Liquefaction Triggering Evaluation
HA-7-C2
2,500-Year Return Period

August 2016

FIGURE D10

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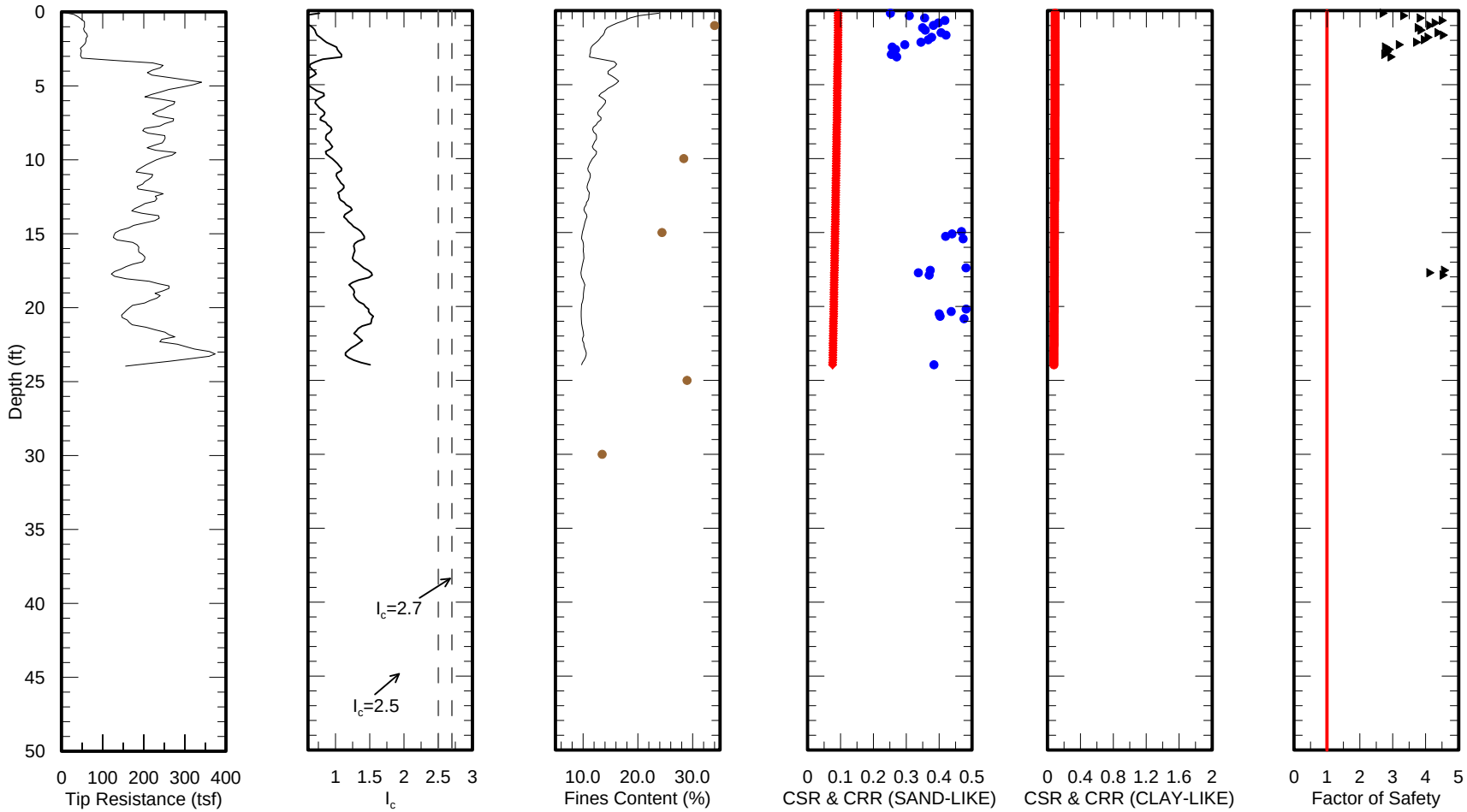

LEGEND

- Cyclic Stress Ratio$_{M,\sigma'vc}$
- Cyclic Resistance Ratio$_{M,\sigma'vc}$
- Clay-Like Factor of Safety
- Sand-Like Factor of Safety
- Laboratory Measured Fines Content

NOTES:
1) Cyclic Stress Ratio (CSR), Cyclic Resistance Ratio (CRR) and Factor of Safety (FS) values calculated using methods described in EERI's "Soil Liquefaction during Earthquakes" [Idriss & Boulanger, 2008].
2) Effective stresses used in CRR equations calculated based on depth to water at time of CPT sounding. Effective stresses used in CSR equations based on depth to water at maximum storage.
3) CSR values calculated for an earthquake having a PGA of 0.142g and a magnitude of 5.0.
4) Sand-like CRR values were calculated using corrected tip resistances (qt). Fines contents estimated using correlations developed by Syms (2001).
5) Clay-like CRR values were calculated using an Nkt value of 35.
6) Clay-like factors of safety exceeding 5 are not shown.

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Liquefaction Triggering Evaluation
HA-10-C1
2,500-Year Return Period

August 2016

FIGURE D11

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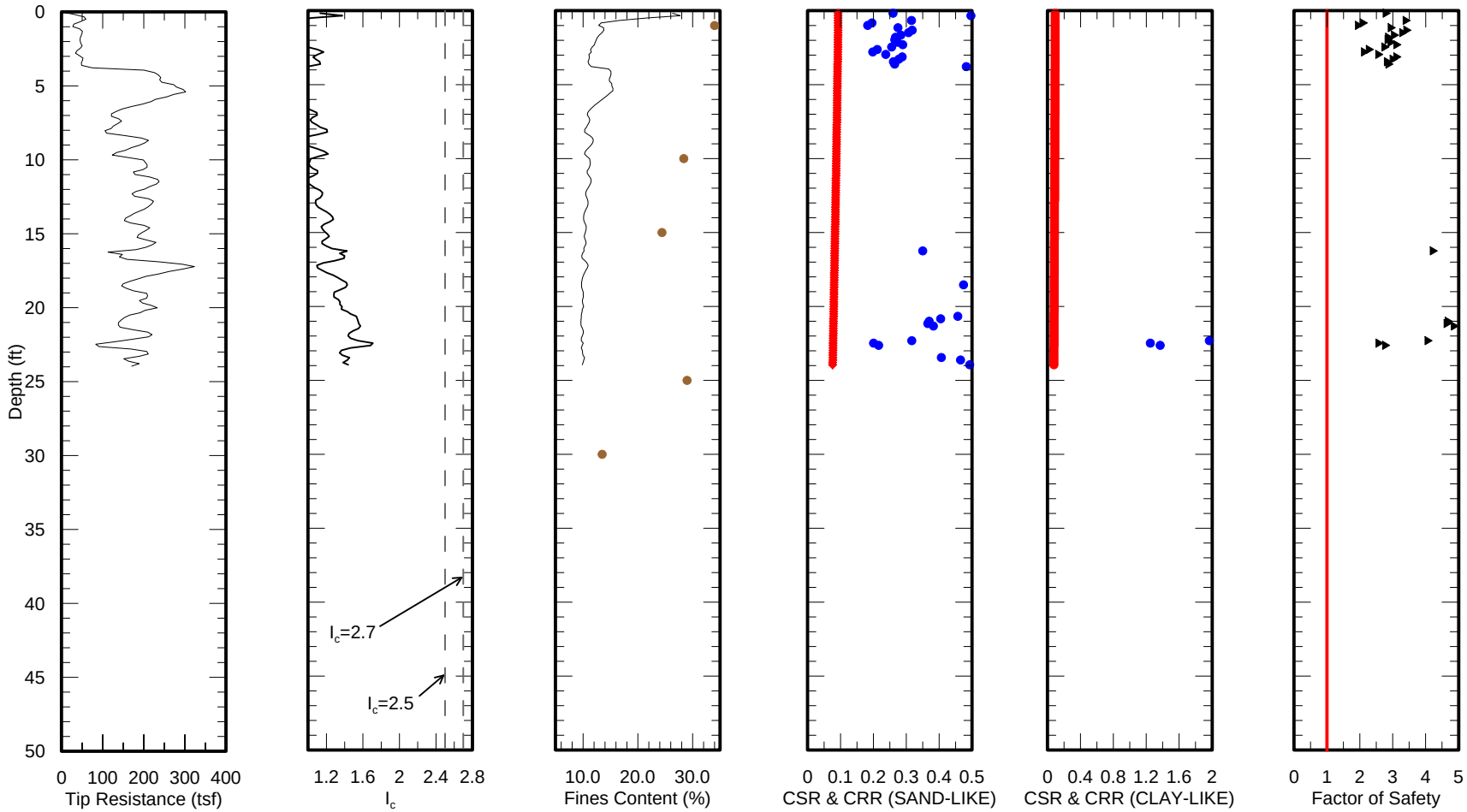

LEGEND

- Cyclic Stress Ratio$_{M,\sigma'vc}$
- Cyclic Resistance Ratio$_{M,\sigma'vc}$
- Clay-Like Factor of Safety
- Sand-Like Factor of Safety
- Laboratory Measured Fines Content

NOTES:
1) Cyclic Stress Ratio (CSR), Cyclic Resistance Ratio (CRR) and Factor of Safety (FS) values calculated using methods described in EERI's "Soil Liquefaction during Earthquakes" [Idriss & Boulanger, 2008].
2) Effective stresses used in CRR equations calculated based on depth to water at time of CPT sounding. Effective stresses used in CSR equations based on depth to water at maximum storage.
3) CSR values calculated for an earthquake having a PGA of 0.142g and a magnitude of 5.0.
4) Sand-like CRR values were calculated using corrected tip resistances (qt). Fines contents estimated using correlations developed by Syms (2001).
5) Clay-like CRR values were calculated using an Nkt value of 35.
6) Clay-like factors of safety exceeding 5 are not shown.

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Liquefaction Triggering Evaluation
HA-10-C2
2,500-Year Return Period

August 2016

FIGURE D12

HALEY ALDRICH

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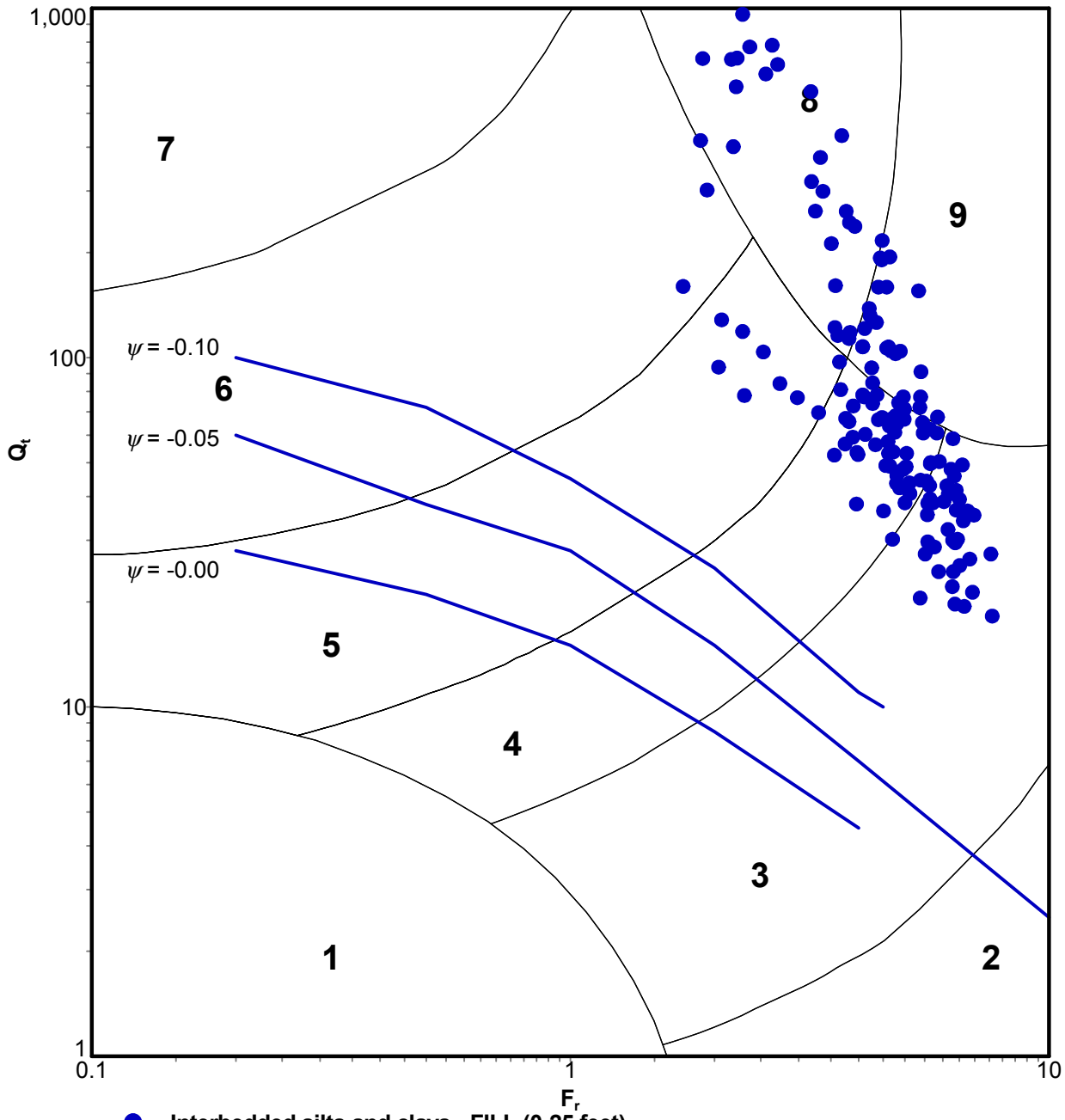
SBT Q_t vs F_r

Northing: 232292.0 **Date:** May 24, 2016
Easting: 1630730.0 **Test ID:** CPT16-HA-3-C1
Project Number: **Elevation:** 556.2 **Estimated Water Depth:** 69 ft



● Interbedded silts and clays - FILL (0-25 feet)

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CPT16-HA-3-C1

Electronic File Name: 16-53041_SPHA-3-C1.COR

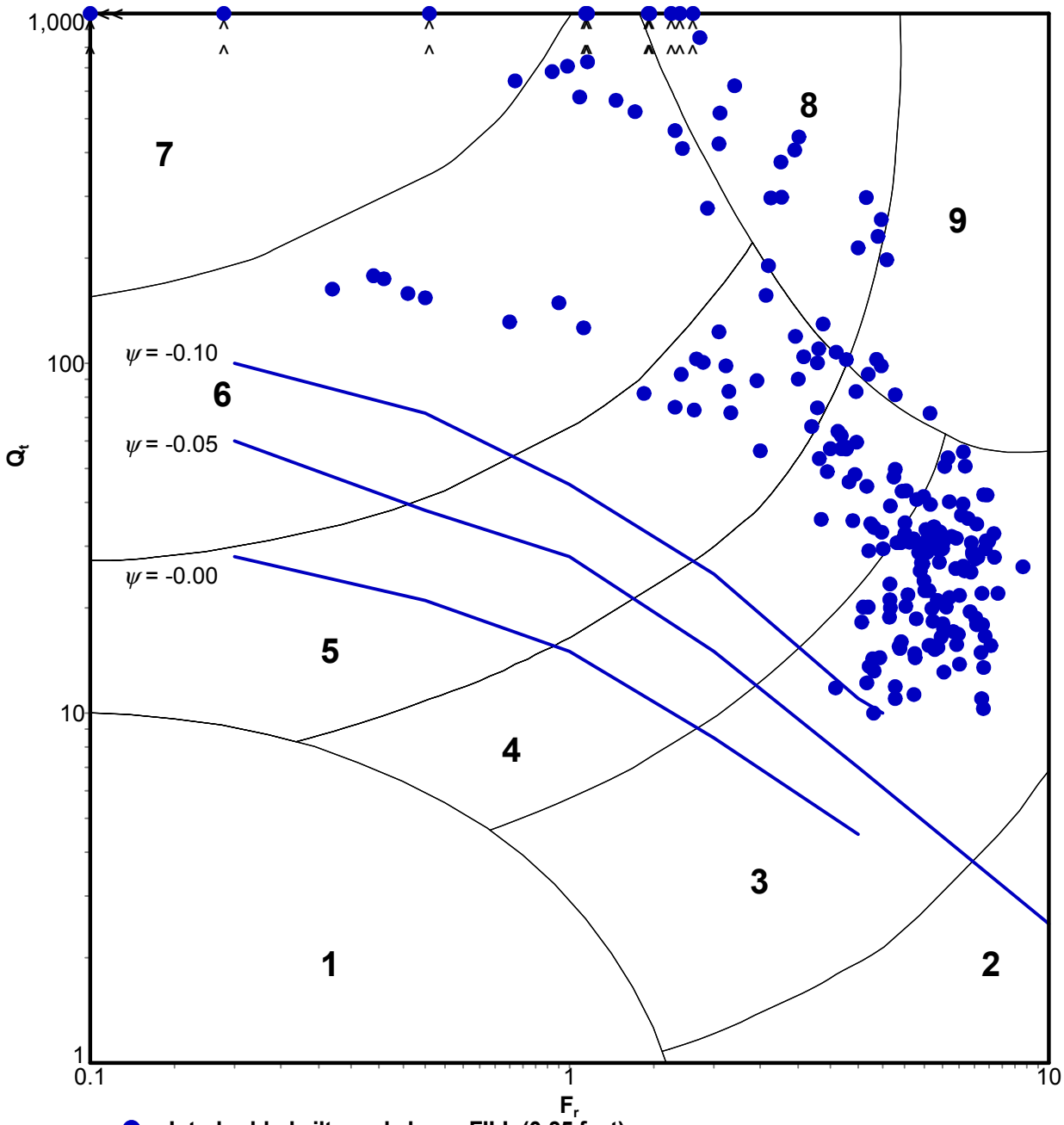
FIGURE D13

HALEY ALDRICH

DP&L JM Stuart

SBT Q_t vs F_r

Northing: 235791.0 **Date:** May 19, 2016
Easting: 1624140.0 **Test ID:** CPT16-HA-5-C1
Project Number: **Elevation:** 529.1 **Estimated Water Depth:** 45.2 ft



● Interbedded silts and clays - FILL (0-35 feet)

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CPT16-HA-5-C1

Electronic File Name: 16-53041_SPHA-5-C1.COR

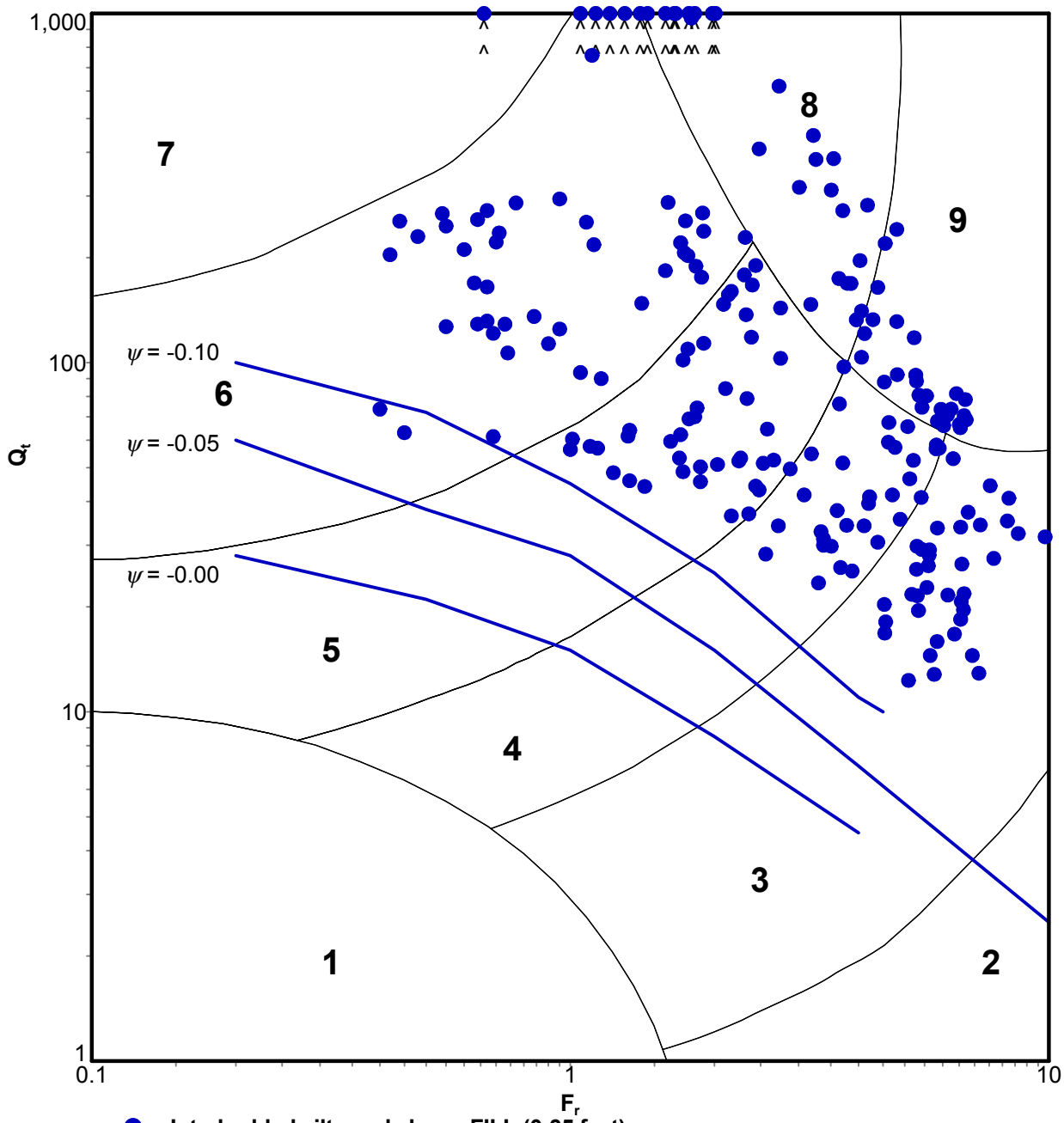
FIGURE D14

HALEY ALDRICH

DP&L JM Stuart

SBT Q_t vs F_r

Northing: 236306.0 **Date:** May 20, 2016
Easting: 1625230.0 **Test ID:** PT16-HA-5-C2
Project Number: **Elevation:** 530.0 **Estimated Water Depth:** 45 ft



● Interbedded silts and clays - FILL (0-35 feet)

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PT16-HA-5-C2

Electronic File Name: 16-53041_CPHA-5-C2.COR

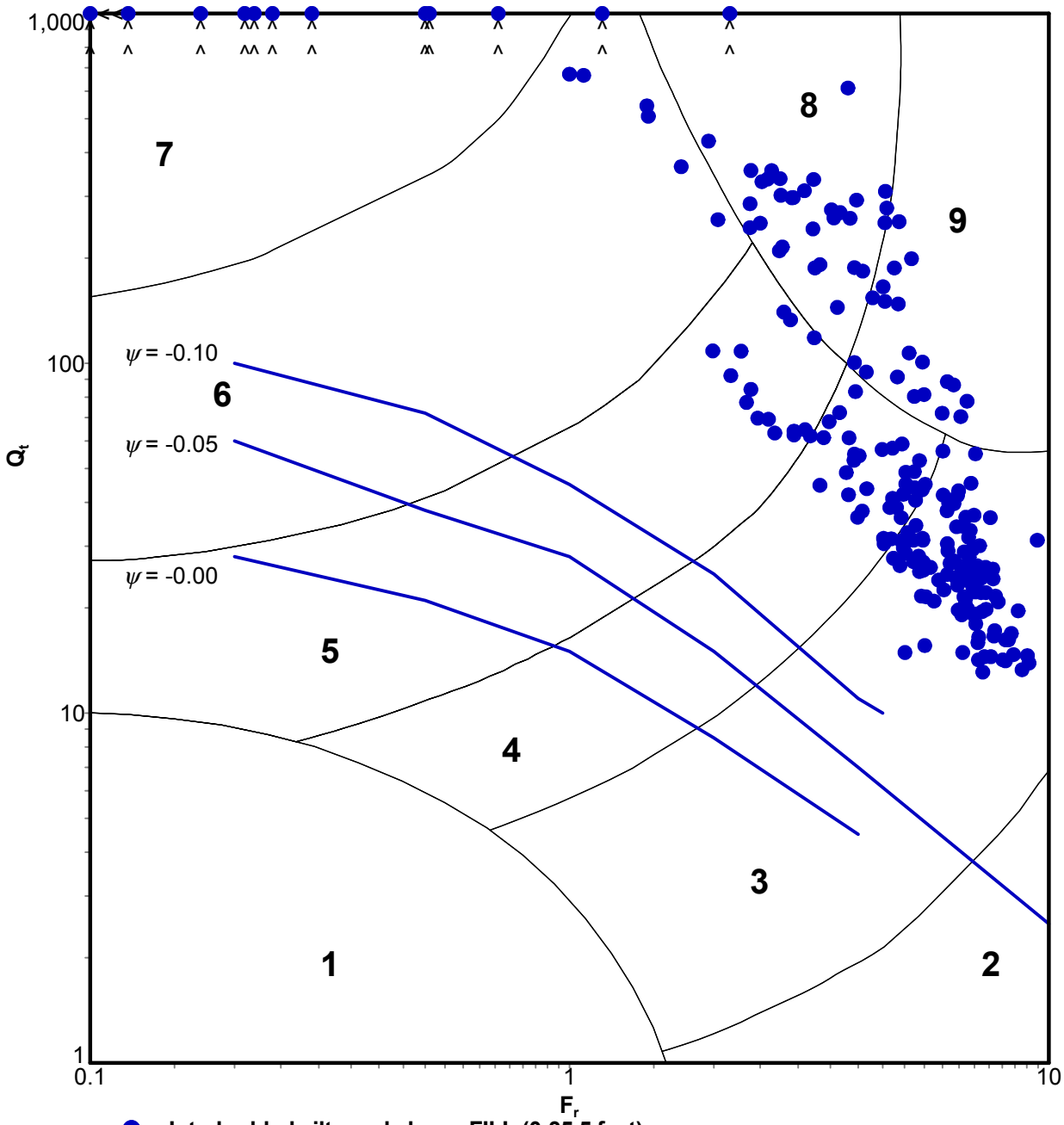
FIGURE D15

HALEY ALDRICH

DP&L JM Stuart

SBT Q_t vs F_r

Northing: 232303.0 **Date:** May 20, 2016
Easting: 1633766.0 **Test ID:** PT16-HA-6-C1
Project Number: **Elevation:** 532.9 **Estimated Water Depth:** 50.6 ft



● Interbedded silts and clays - FILL (0-35.5 feet)

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PT16-HA-6-C1

Electronic File Name: 16-53041_CPHA-6-C1.COR

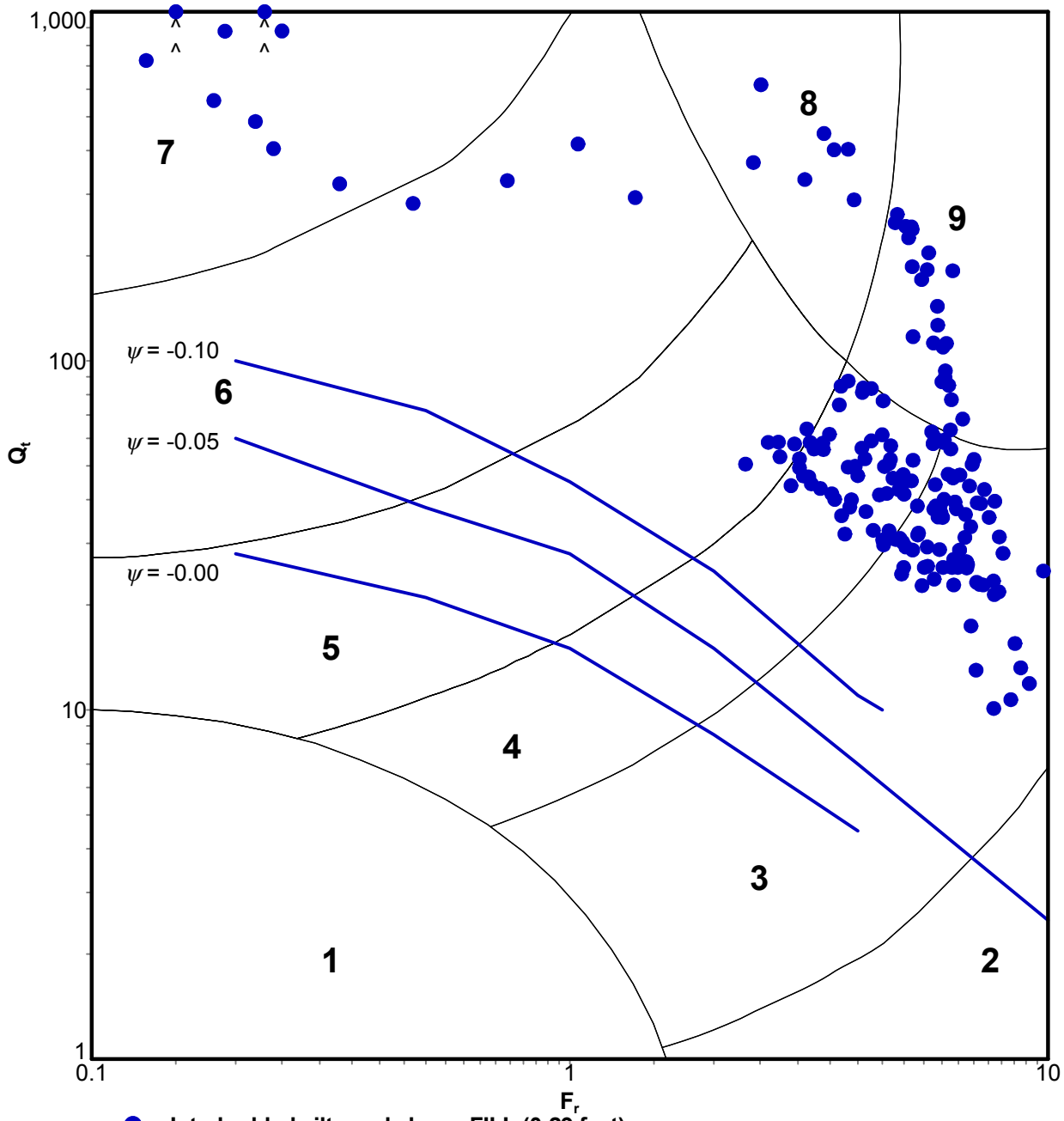
FIGURE D16

HALEY ALDRICH

DP&L JM Stuart

SBT Q_t vs F_r

Northing: 231682.0 **Date:** May 24, 2016
Easting: 1633466.0 **Test ID:** PT16-HA-7-C1B
Project Number: **Elevation:** 531.8 **Estimated Water Depth:** 46.7 ft



● Interbedded silts and clays - FILL (0-29 feet)

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PT16-HA-7-C1B

Electronic File Name: 16-53041_CPHA-7-C1B.COR

FIGURE D17

HALEY ALDRICH

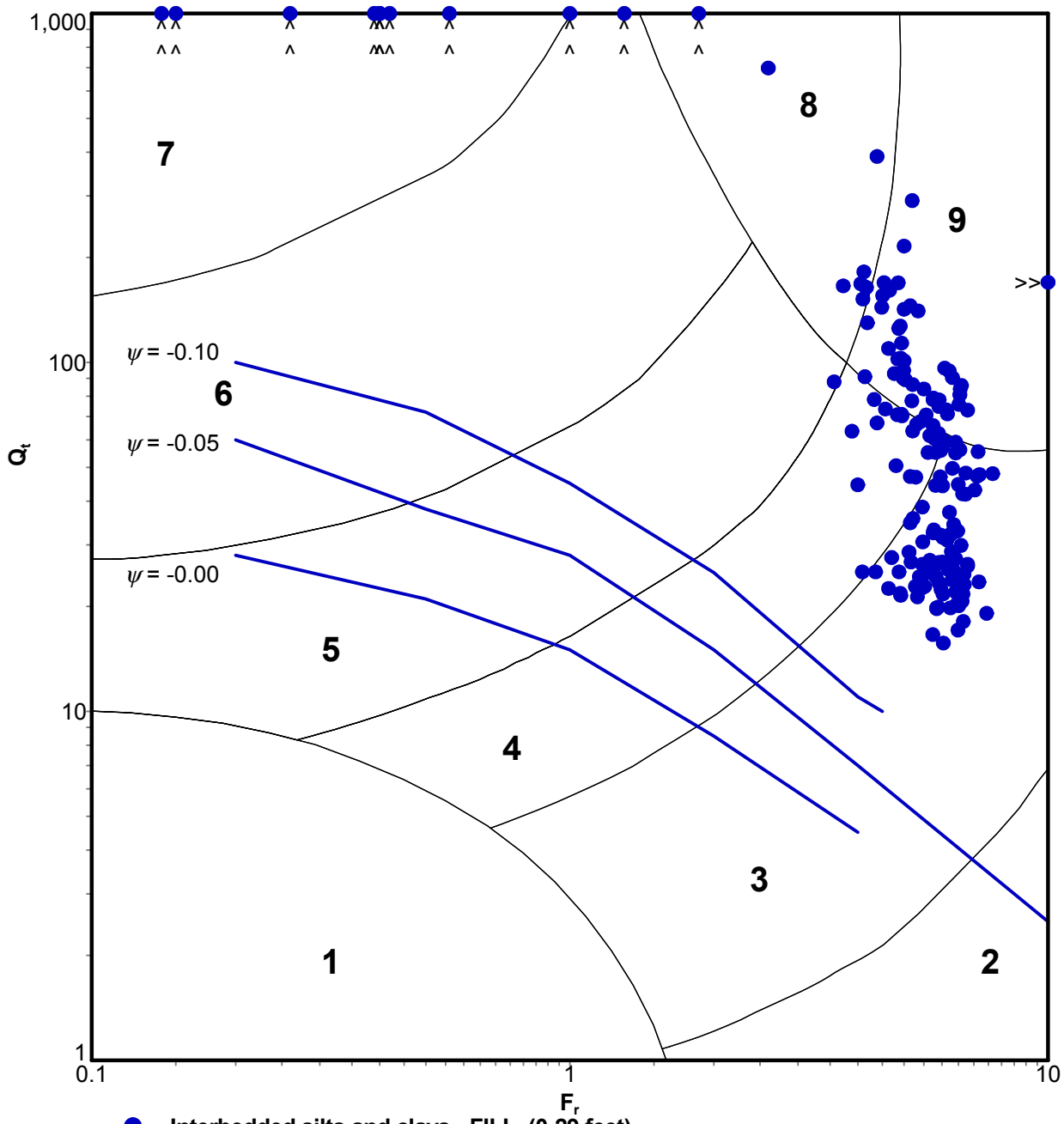
DP&L JM Stuart

SBT Q_t vs F_r

Project Number:

Northing: 231916.0
Easting: 1631438.0
Elevation: 532.5

Date: May 24, 2016
Test ID: PT16-HA-7-C2
Estimated Water Depth: 45.8 ft



● **Interbedded silts and clays - FILL (0-29 feet)**

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PT16-HA-7-C2

Page 8 of 8

Electronic File Name: 16-53041_CPHA-7-C2.COR

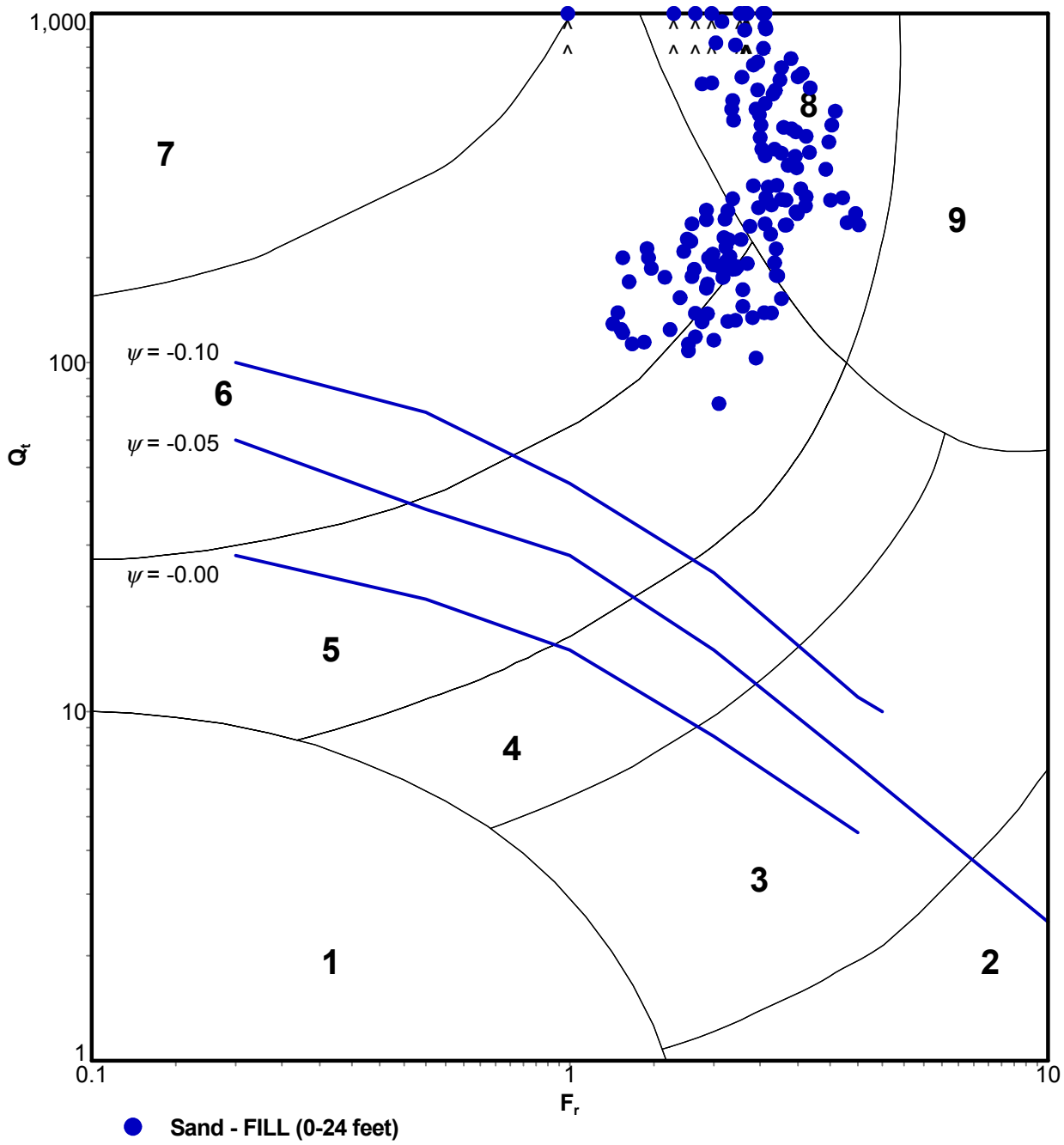
FIGURE D18

HALEY ALDRICH

DP&L JM Stuart

SBT Q_t vs F_r

Northing:	235339.0	**Date:**	May 19, 2016
Easting:	1629133.0	**Test ID:**	CPT16-HA-10-C1
Project Number:	**Elevation:** 568.0	**Estimated Water Depth:**	Not Encountered



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CPT16-HA-10-C1

Electronic File Name: 16-53041_SPHA-10-C1.COR

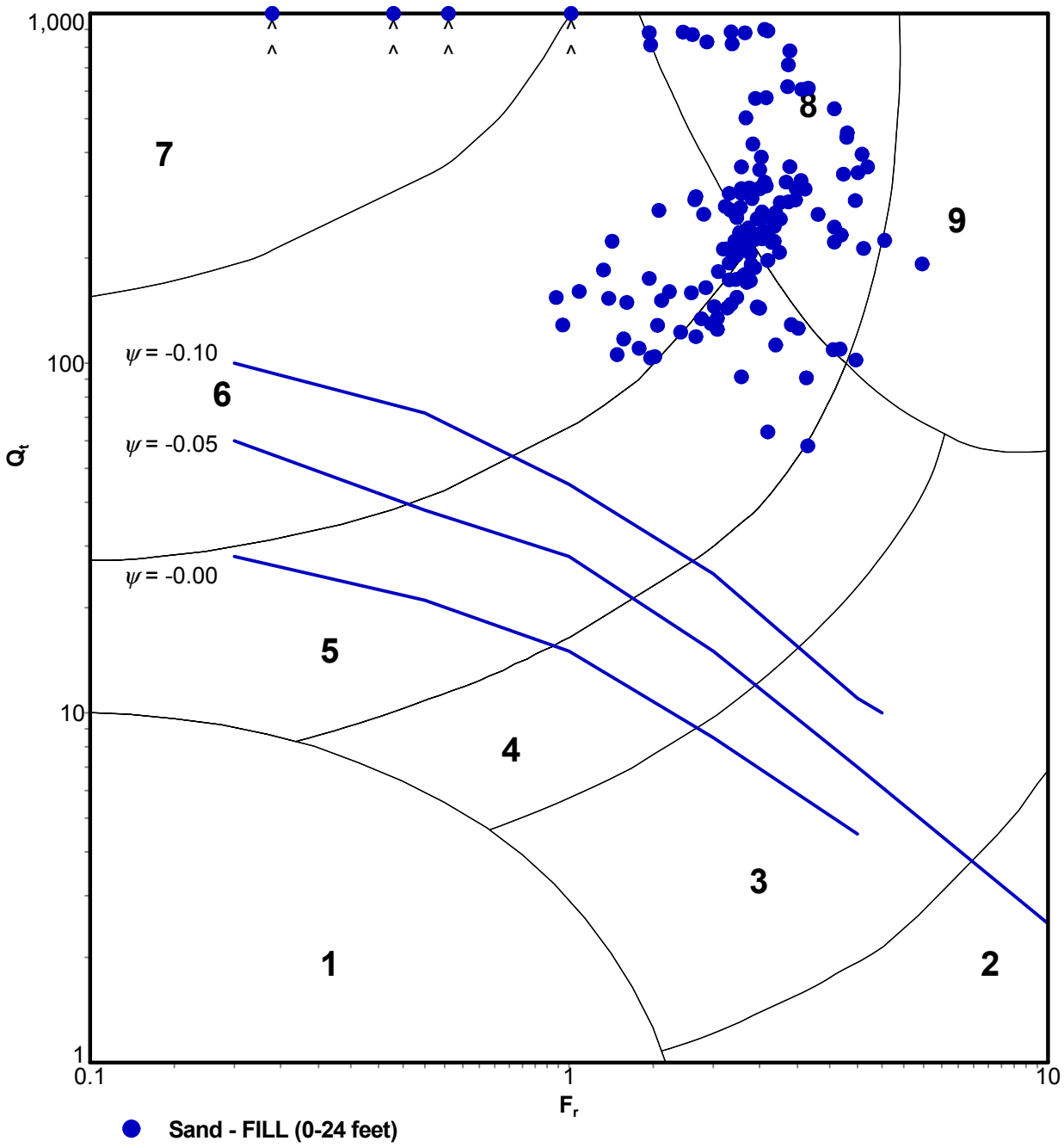
FIGURE D19

HALEY ALDRICH

DP&L JM Stuart

SBT Q_t vs F_r

Northing: 235455.0 **Date:** May 23, 2016
Easting: 1630444.0 **Test ID:** PT16-HA-10-C2
Project Number: **Elevation:** 568.3 **Estimated Water Depth:** Not Encountered

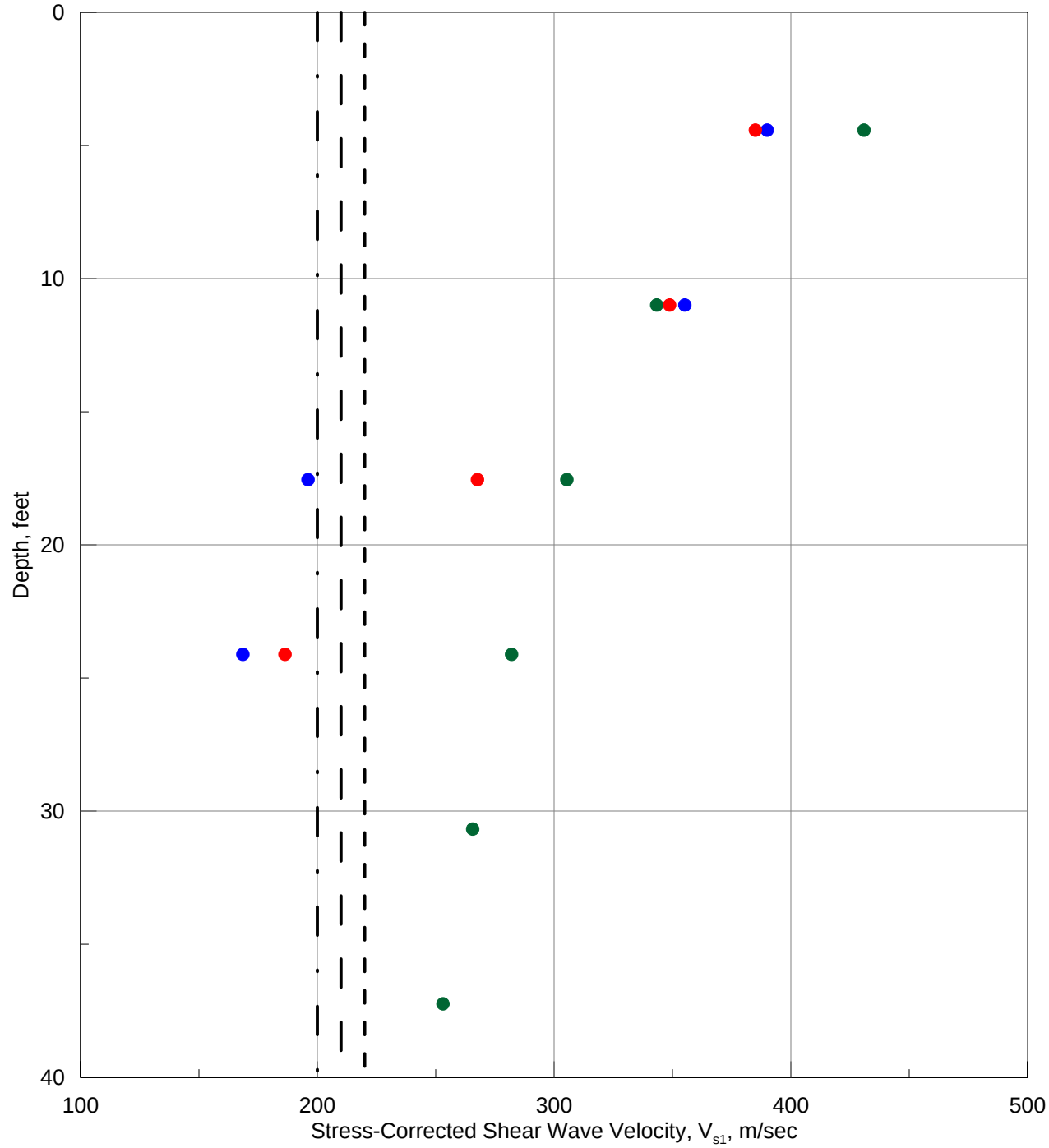


H&A_CPT_DF_STD_20160405.GLB CPT - SBT QT FR NORM INTERPRETED C:\USERS\PDUV\GNEAUD\DESKTOP\JM STUART STATION CPT DATA\STUART STATION.GPJ Aug 12, 16

PT16-HA-10-C2

Electronic File Name: 16-53041_CPHA-10-C2.COR

FIGURE D20



NOTES:
1) Liquefaction thresholds based on data developed by Andrus and Stokoe (2000)
2) Shear wave velocities normalized using equations developed by Andurs and Stokoe (2000).
3) Shear wave velocites normalized assuming 100% hydrostatic pore pressures at depth to water identified by ConeTec.

LEGEND

- SCPT16-HA-10-C1
- SCPT16-HA-3-C1
- SCPT16-HA-5-C1
- Liquefaction Threshold; FC<5%
- Liquefaction Threshold; FC=20%
- Liquefaction Threshold; FC>35%

HALEY ALDRICH

DP&L JM Stuart

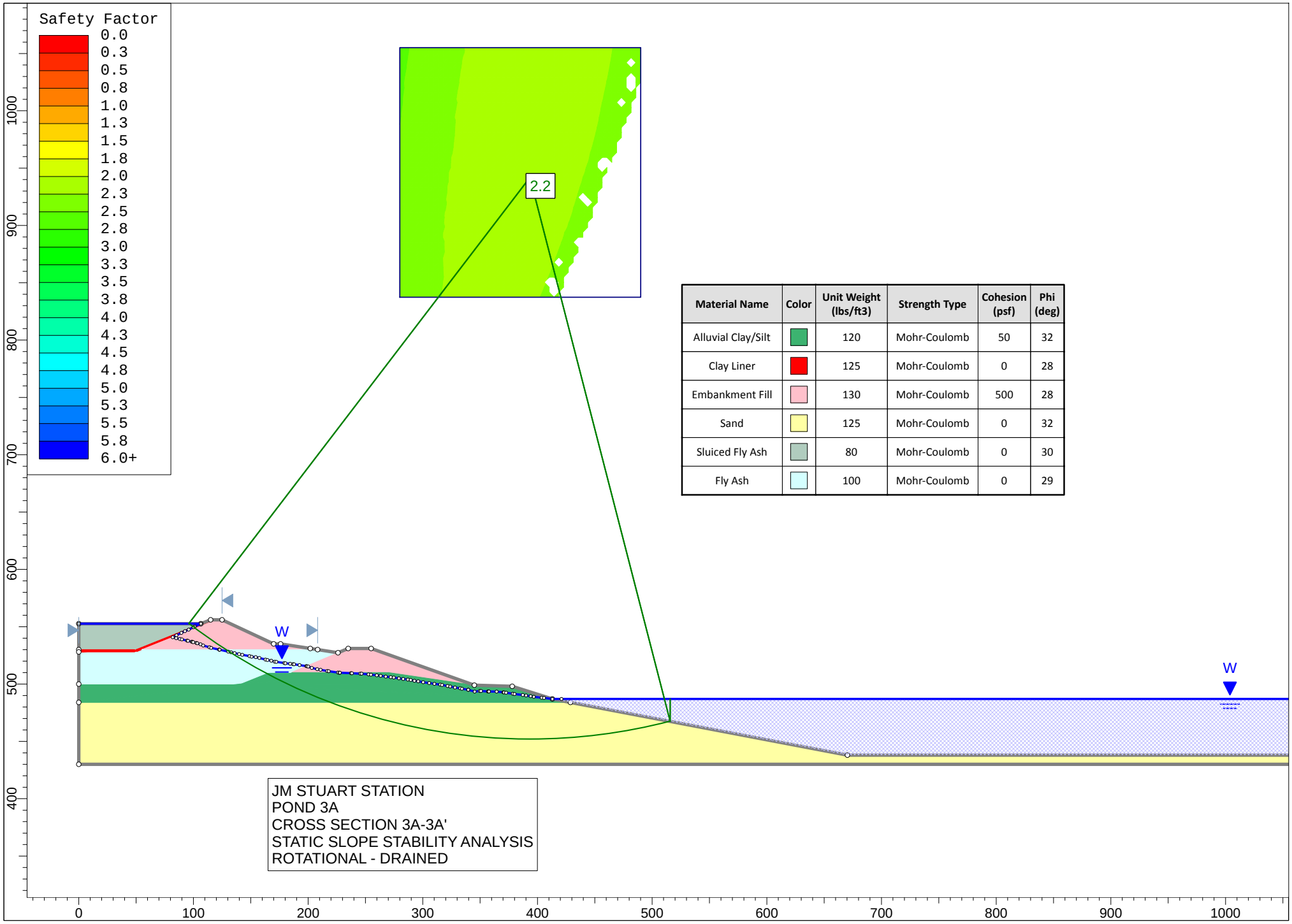
Normalized Shear Wave Velocity vs. Liqufaction Resistance

AUGUST 2016

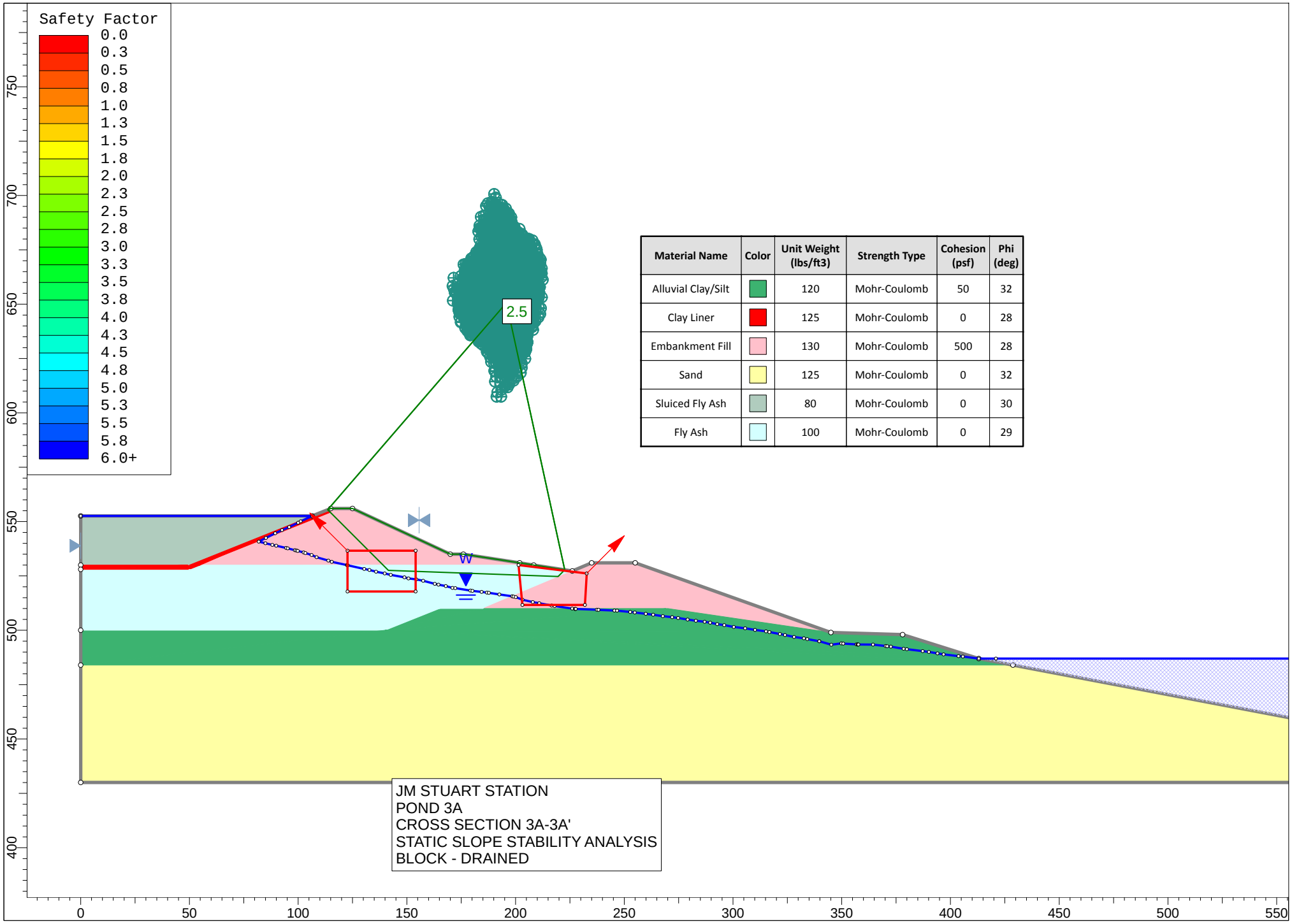
FIGURE D21

C:\Users\pduvigneaud\Desktop\JM Stuart Station CPT Data\dpl_jm stuart_Normalized Shear Wave Velocity Profile.grf

Slope Stability



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Alluvial Clay/Silt		120	Mohr-Coulomb	50	32
Clay Liner		125	Mohr-Coulomb	0	28
Embankment Fill		130	Mohr-Coulomb	500	28
Sand		125	Mohr-Coulomb	0	32
Sluiced Fly Ash		80	Mohr-Coulomb	0	30
Fly Ash		100	Mohr-Coulomb	0	29



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
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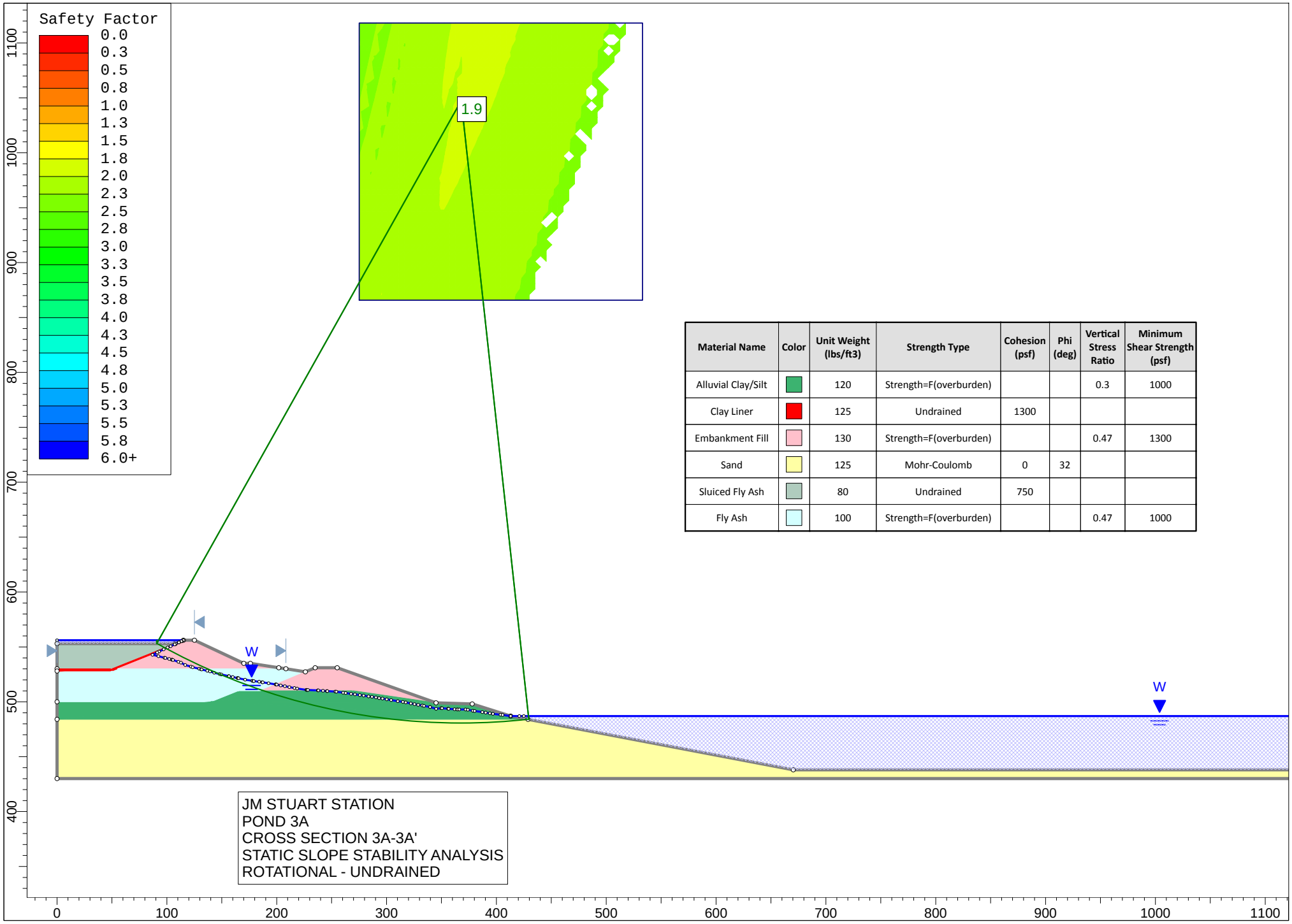
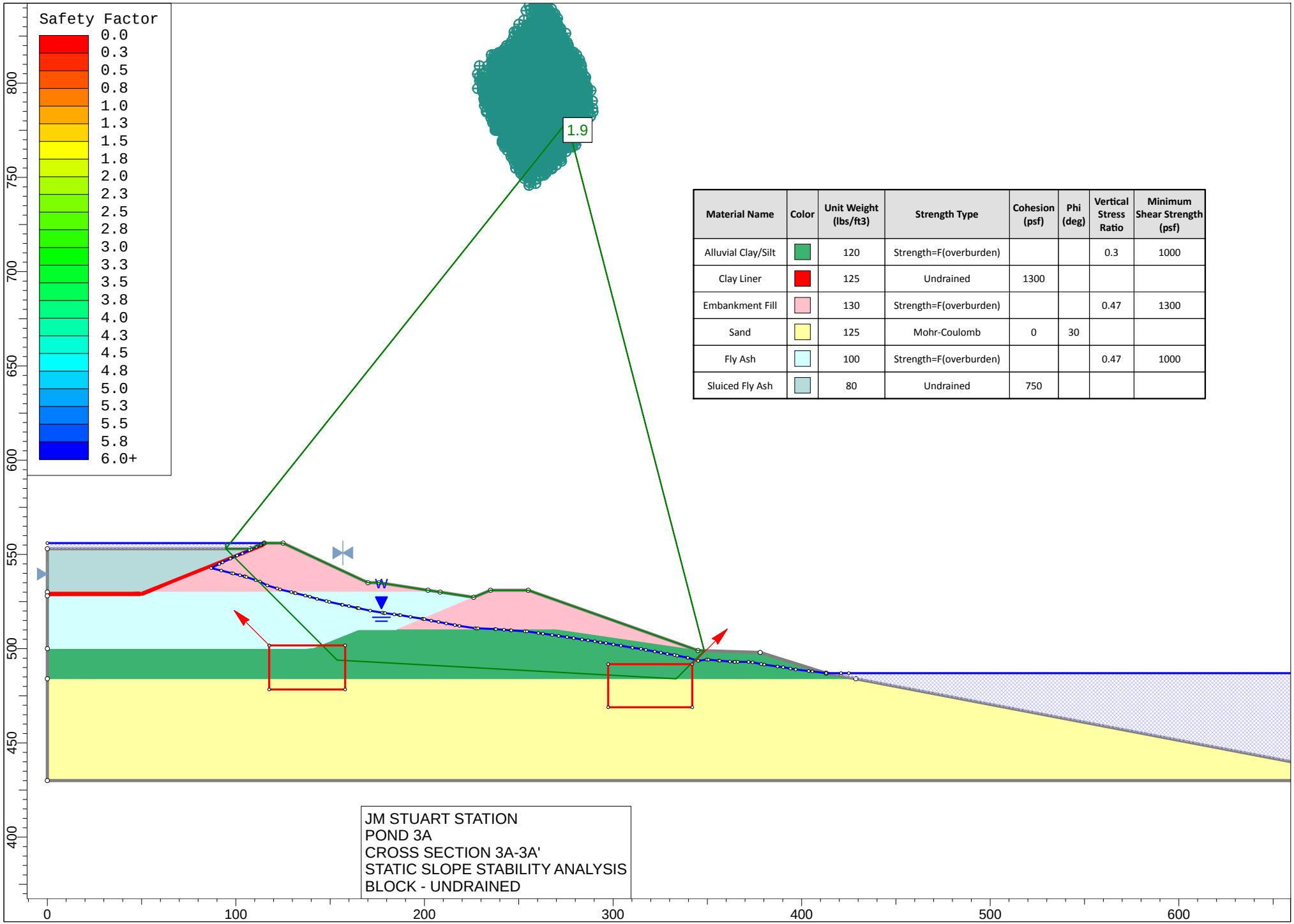
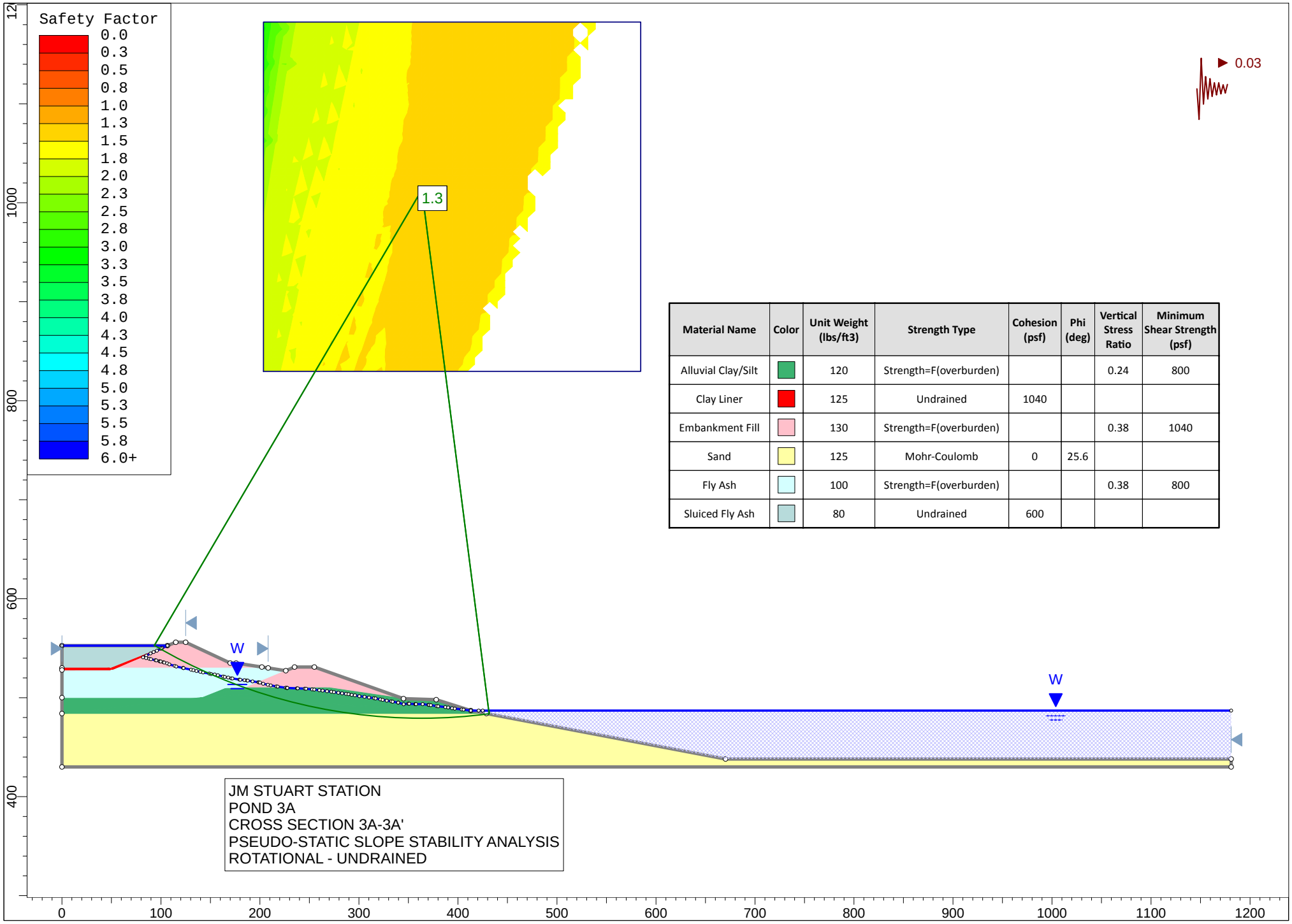


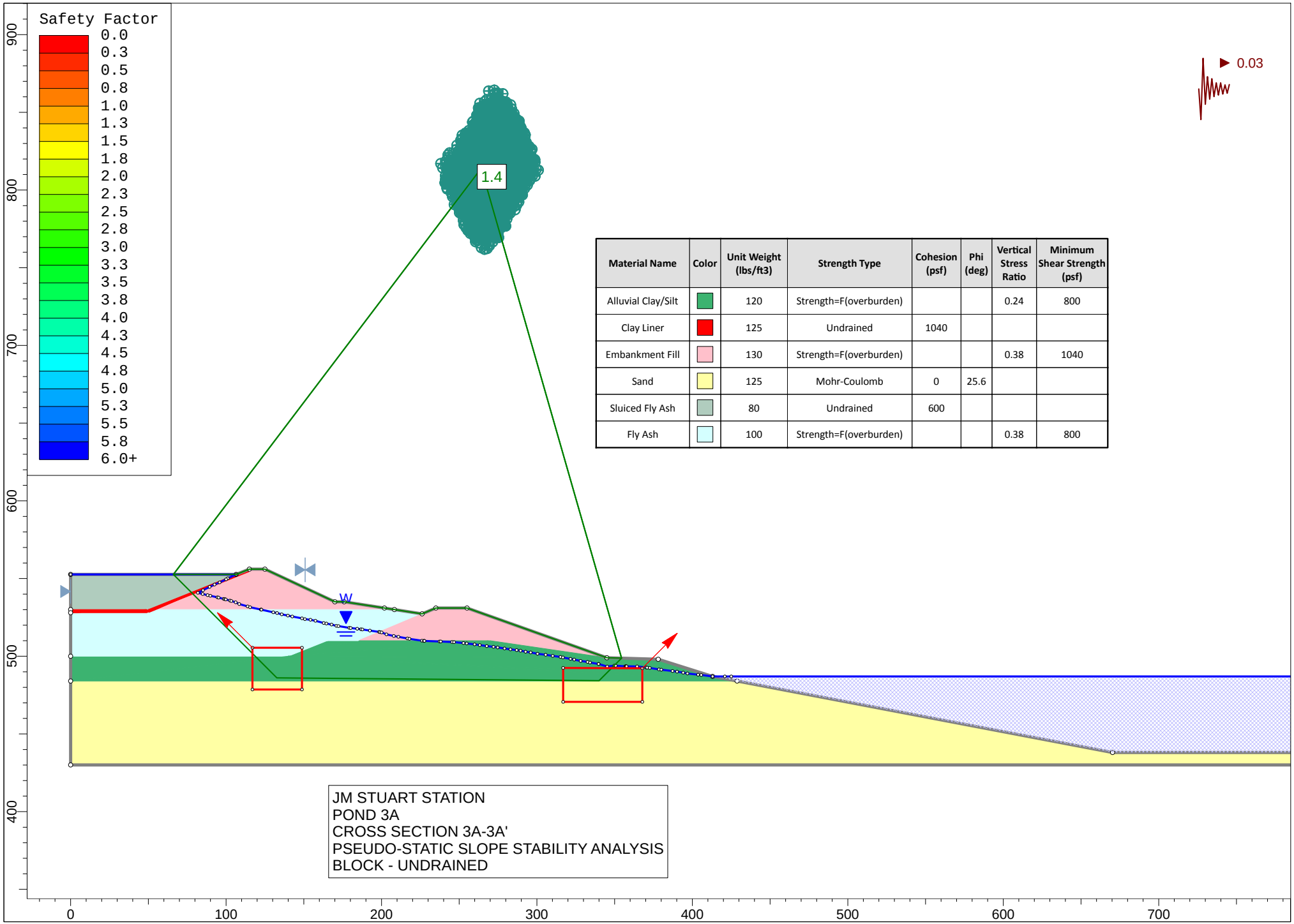
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Vertical Stress Ratio	Minimum Shear Strength (psf)
Alluvial Clay/Silt		120	Strength=F(overburden)			0.3	1000
Clay Liner		125	Undrained	1300			
Embankment Fill		130	Strength=F(overburden)			0.47	1300
Sand		125	Mohr-Coulomb	0	32		
Sluiced Fly Ash		80	Undrained	750			
Fly Ash		100	Strength=F(overburden)			0.47	1000



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Vertical Stress Ratio	Minimum Shear Strength (psf)
Alluvial Clay/Silt		120	Strength=F(overburden)			0.3	1000
Clay Liner		125	Undrained	1300			
Embankment Fill		130	Strength=F(overburden)			0.47	1300
Sand		125	Mohr-Coulomb	0	30		
Fly Ash		100	Strength=F(overburden)			0.47	1000
Sluiced Fly Ash		80	Undrained	750			



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Vertical Stress Ratio	Minimum Shear Strength (psf)
Alluvial Clay/Silt		120	Strength=F(overburden)			0.24	800
Clay Liner		125	Undrained	1040			
Embankment Fill		130	Strength=F(overburden)			0.38	1040
Sand		125	Mohr-Coulomb	0	25.6		
Fly Ash		100	Strength=F(overburden)			0.38	800
Sluiced Fly Ash		80	Undrained	600			



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Vertical Stress Ratio	Minimum Shear Strength (psf)
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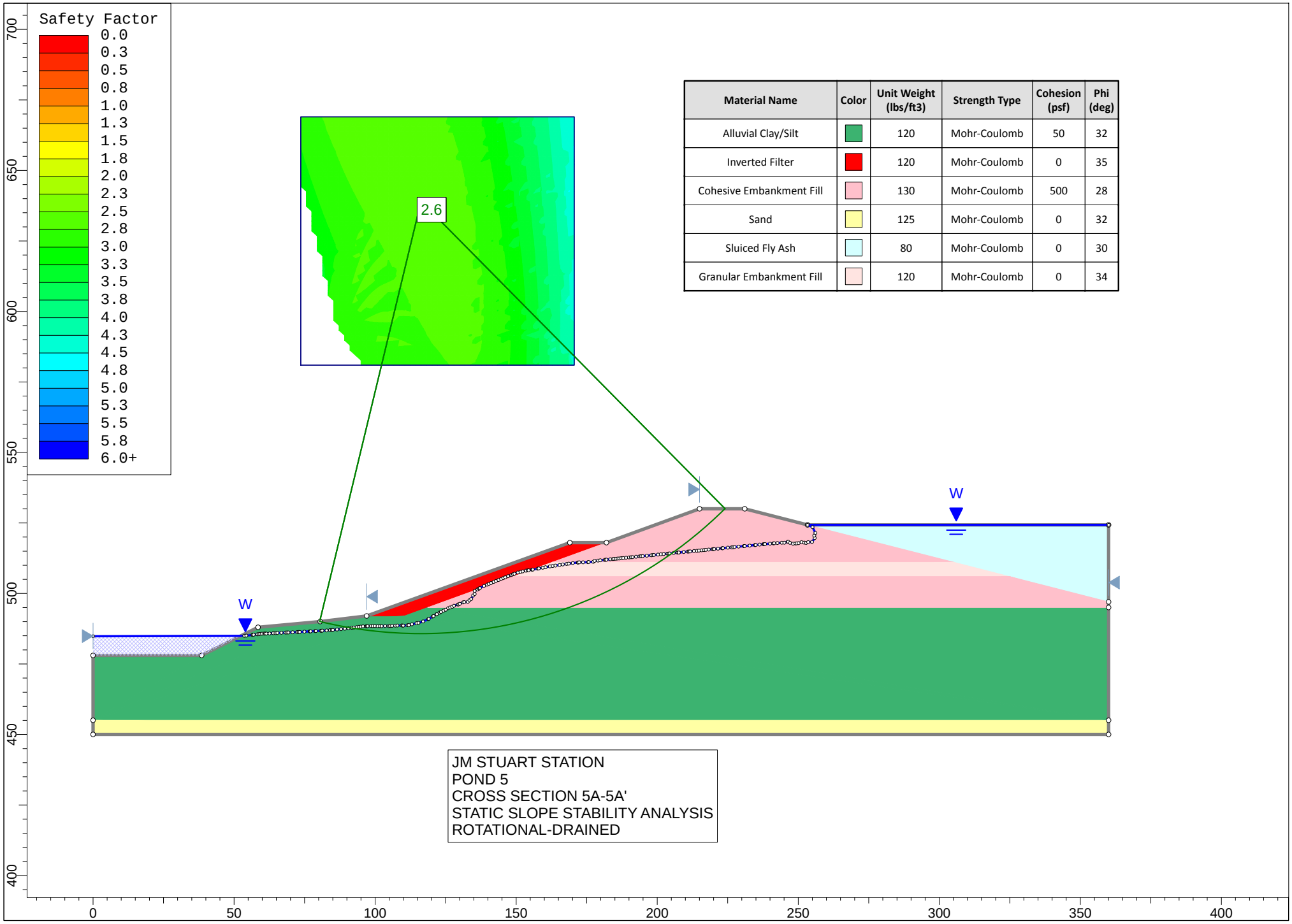
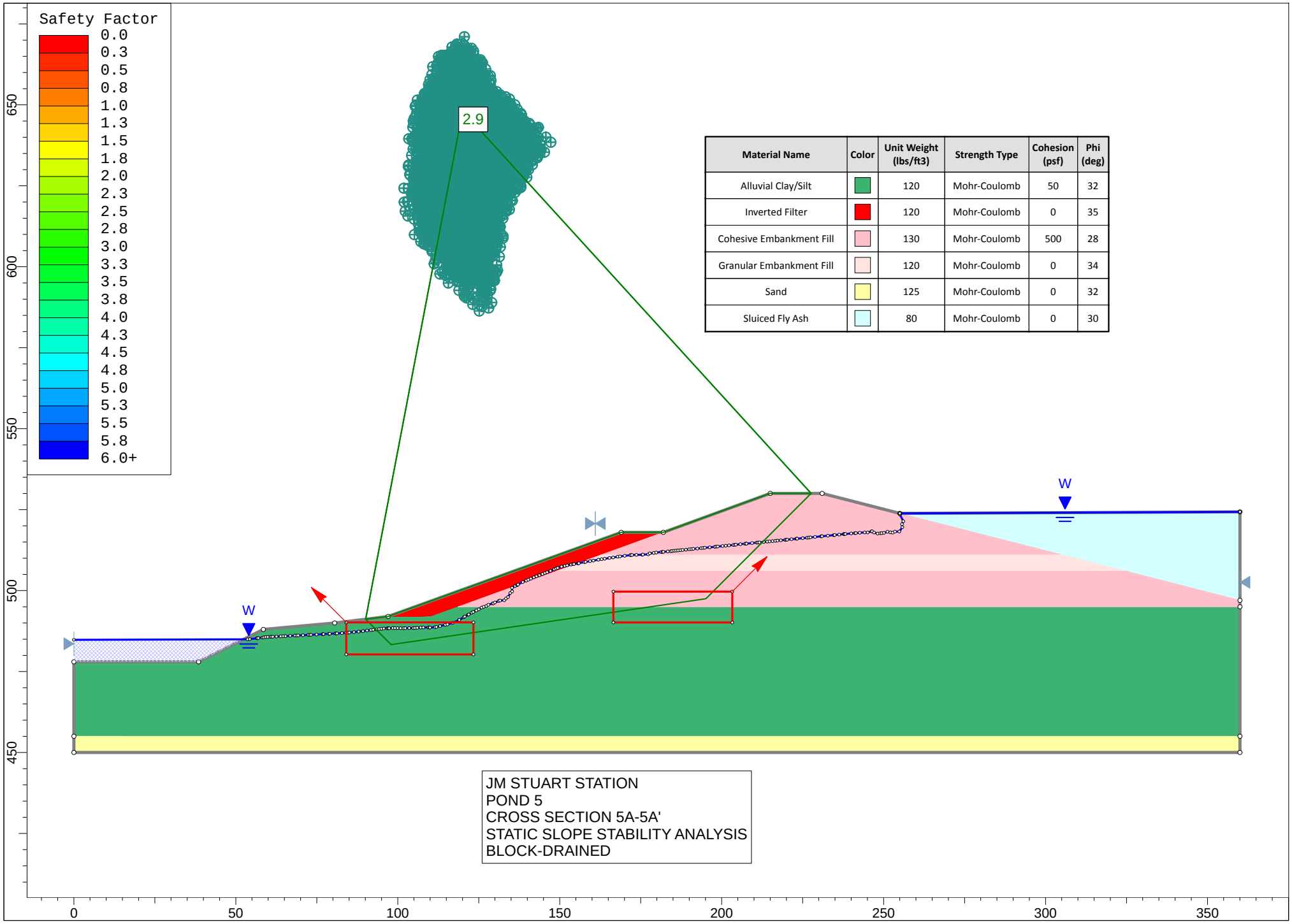
Sand		125	Mohr-Coulomb	0	25.6		
Sluiced Fly Ash		80	Undrained	600			
Fly Ash		100	Strength=F(overburden)			0.38	800



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Alluvial Clay/Silt		120	Mohr-Coulomb	50	32
Inverted Filter		120	Mohr-Coulomb	0	35
Cohesive Embankment Fill		130	Mohr-Coulomb	500	28
Sand		125	Mohr-Coulomb	0	32
Sluiced Fly Ash		80	Mohr-Coulomb	0	30
Granular Embankment Fill		120	Mohr-Coulomb	0	34

JM STUART STATION
POND 5
CROSS SECTION 5A-5A'
STATIC SLOPE STABILITY ANALYSIS
ROTATIONAL-DRAINED



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
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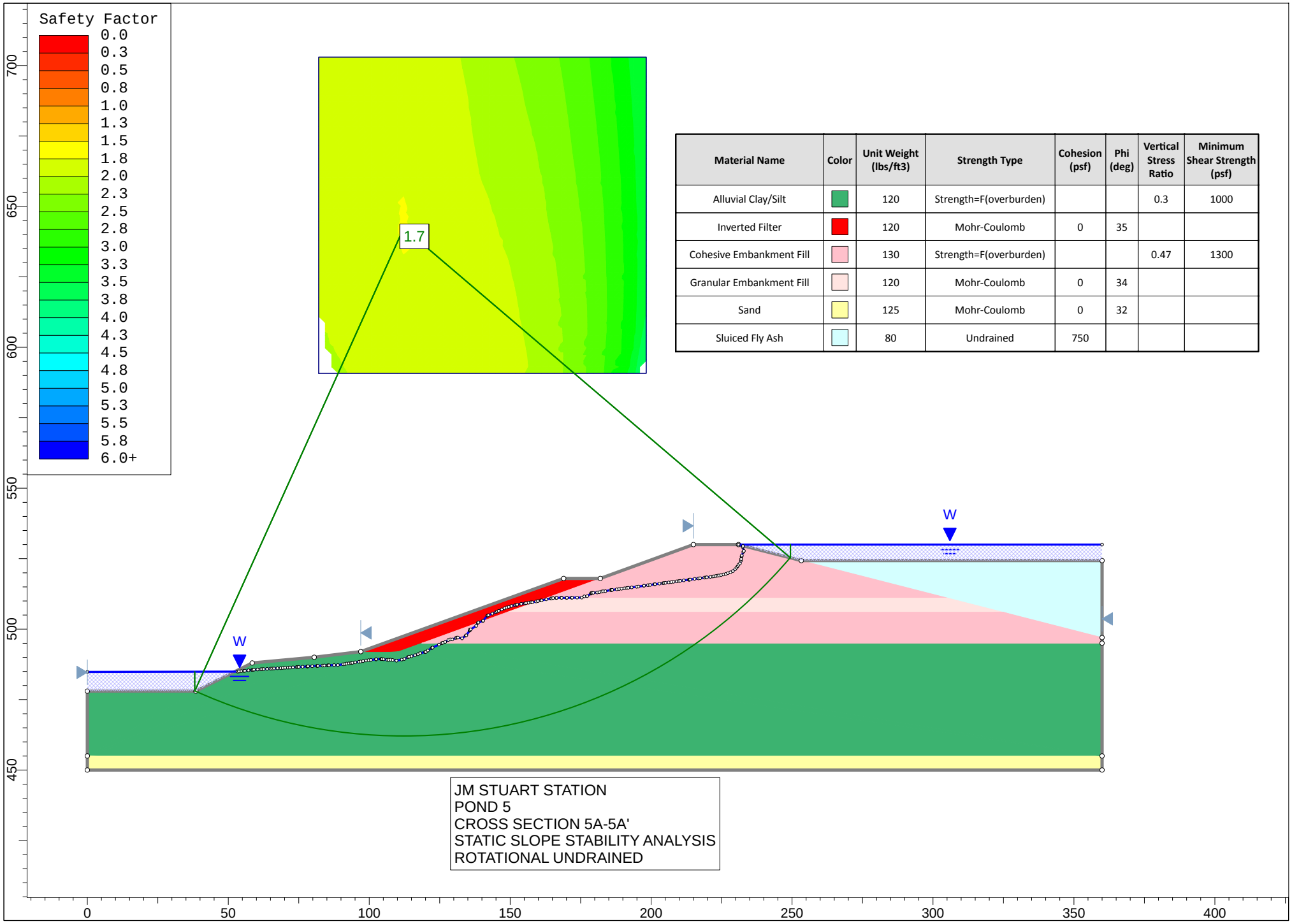
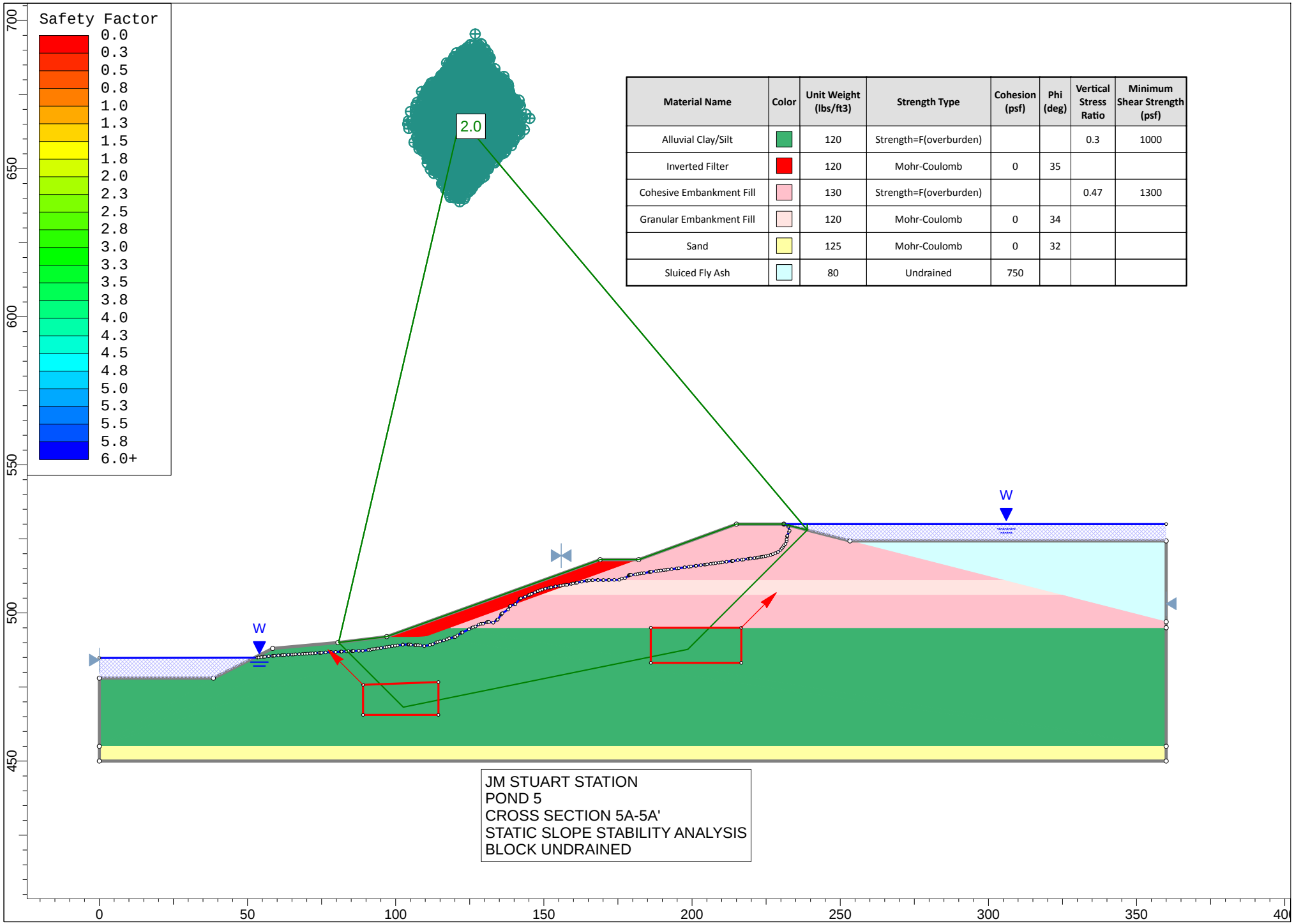
Granular Embankment Fill		120	Mohr-Coulomb	0	34
Sand		125	Mohr-Coulomb	0	32
Sluiced Fly Ash		80	Mohr-Coulomb	0	30

JM STUART STATION
POND 5
CROSS SECTION 5A-5A'
STATIC SLOPE STABILITY ANALYSIS
BLOCK-DRAINED



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Vertical Stress Ratio	Minimum Shear Strength (psf)
Alluvial Clay/Silt		120	Strength=F(overburden)			0.3	1000
Inverted Filter		120	Mohr-Coulomb	0	35		
Cohesive Embankment Fill		130	Strength=F(overburden)			0.47	1300
Granular Embankment Fill		120	Mohr-Coulomb	0	34		
Sand		125	Mohr-Coulomb	0	32		
Sluiced Fly Ash		80	Undrained	750			

JM STUART STATION
POND 5
CROSS SECTION 5A-5A'
STATIC SLOPE STABILITY ANALYSIS
ROTATIONAL UNDRAINED



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Vertical Stress Ratio	Minimum Shear Strength (psf)
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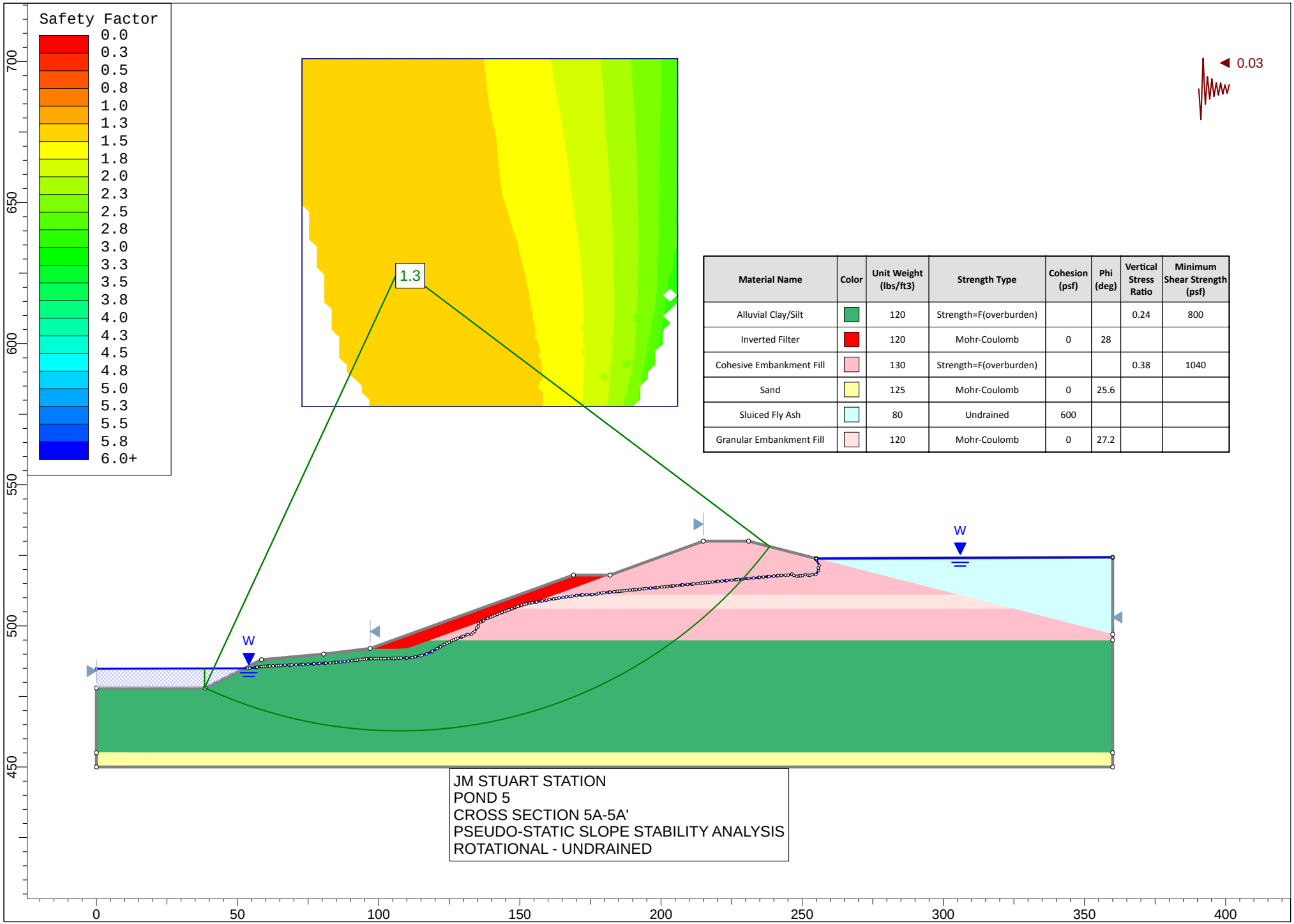
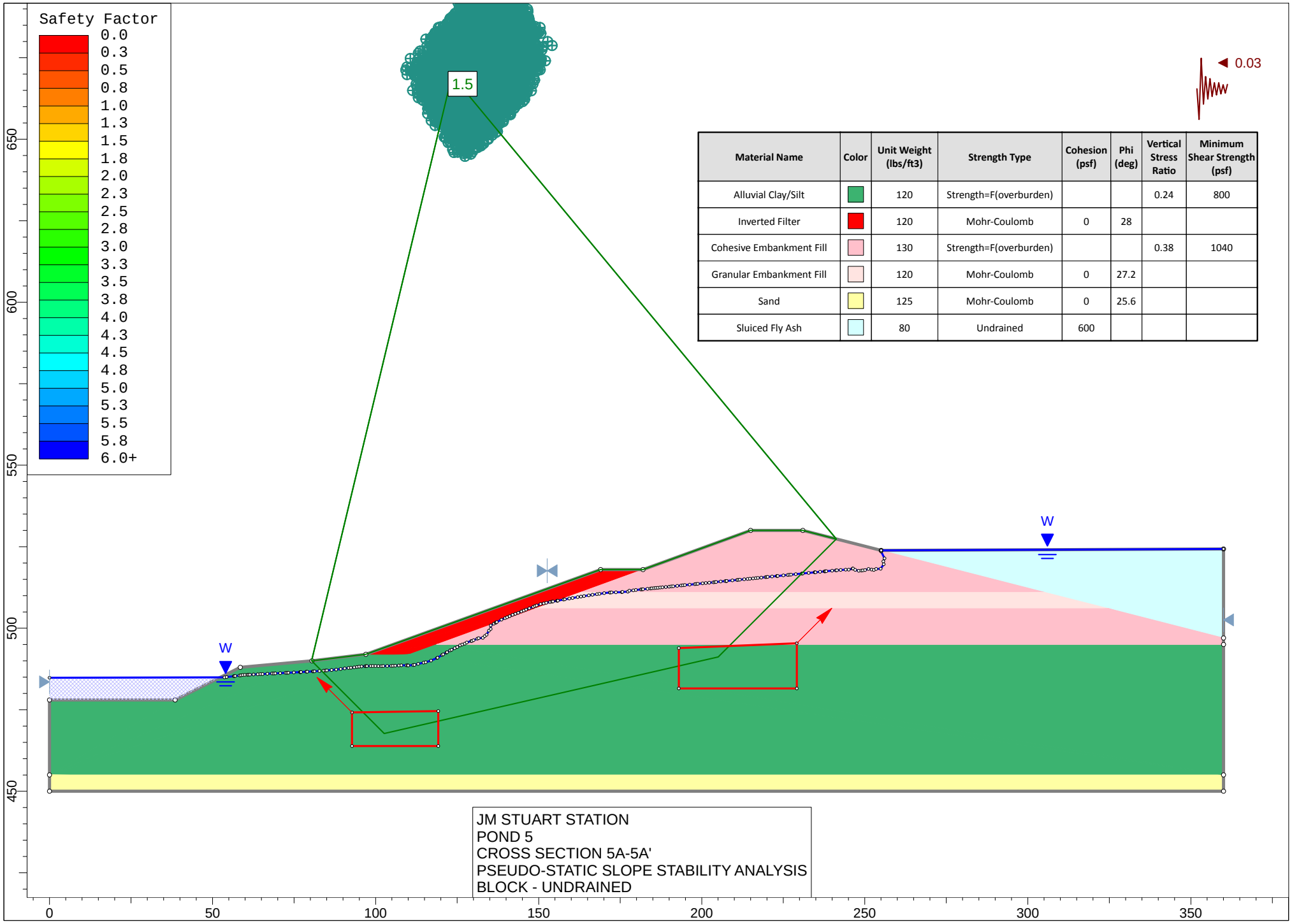
Inverted Filter		120	Mohr-Coulomb	0	35		
Cohesive Embankment Fill		130	Strength=F(overburden)			0.47	1300
Granular Embankment Fill		120	Mohr-Coulomb	0	34		
Sand		125	Mohr-Coulomb	0	32		
Sluiced Fly Ash		80	Undrained	750			

JM STUART STATION
POND 5
CROSS SECTION 5A-5A'
STATIC SLOPE STABILITY ANALYSIS
BLOCK UNDRAINED



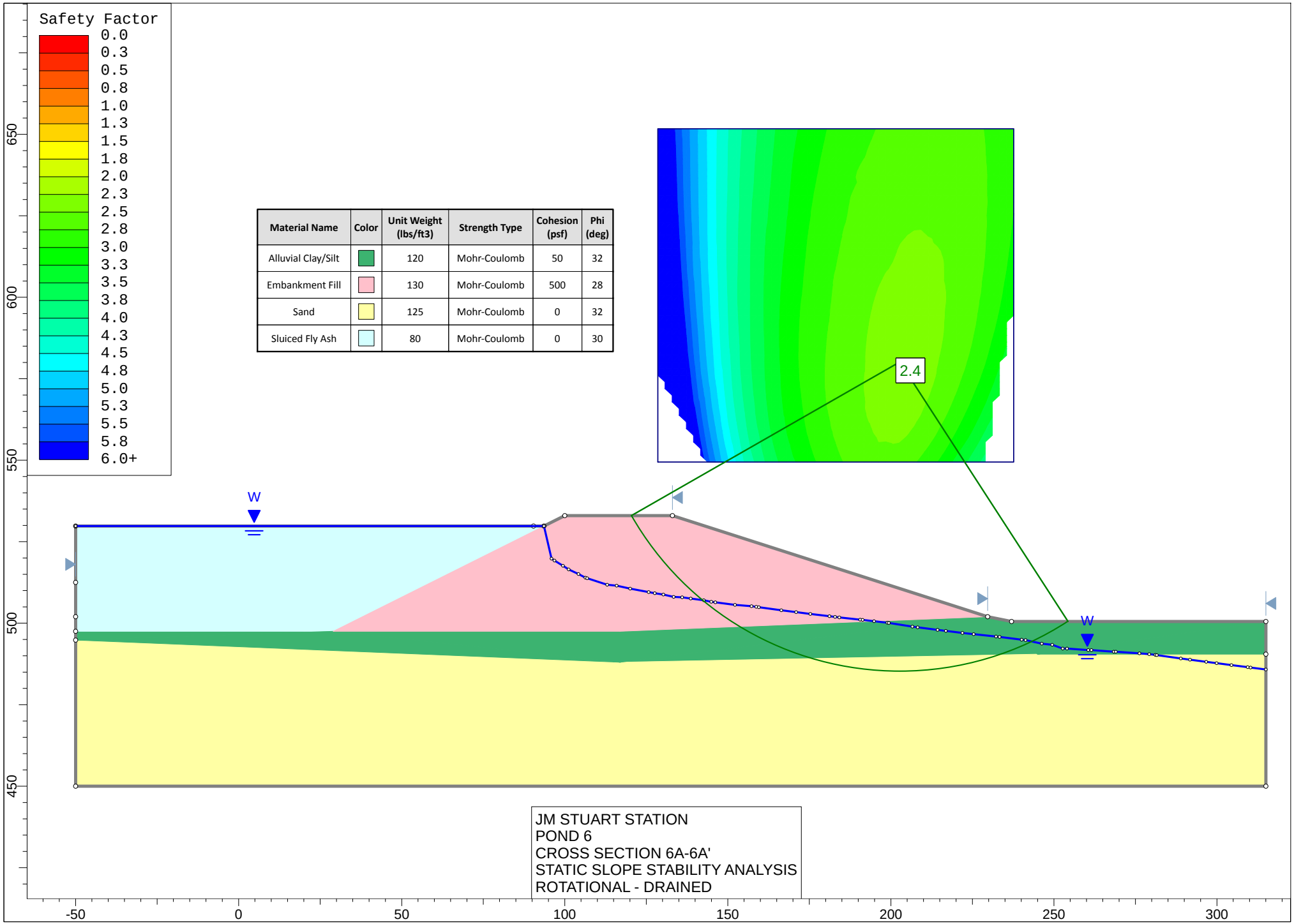
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Vertical Stress Ratio	Minimum Shear Strength (psf)
Alluvial Clay/Silt		120	Strength=F(overburden)			0.24	800
Inverted Filter		120	Mohr-Coulomb	0	28		
Cohesive Embankment Fill		130	Strength=F(overburden)			0.38	1040
Sand		125	Mohr-Coulomb	0	25.6		
Sluiced Fly Ash		80	Undrained	600			
Granular Embankment Fill		120	Mohr-Coulomb	0	27.2		

JM STUART STATION
POND 5
CROSS SECTION 5A-5A'
PSEUDO-STATIC SLOPE STABILITY ANALYSIS
ROTATIONAL - UNDRAINED



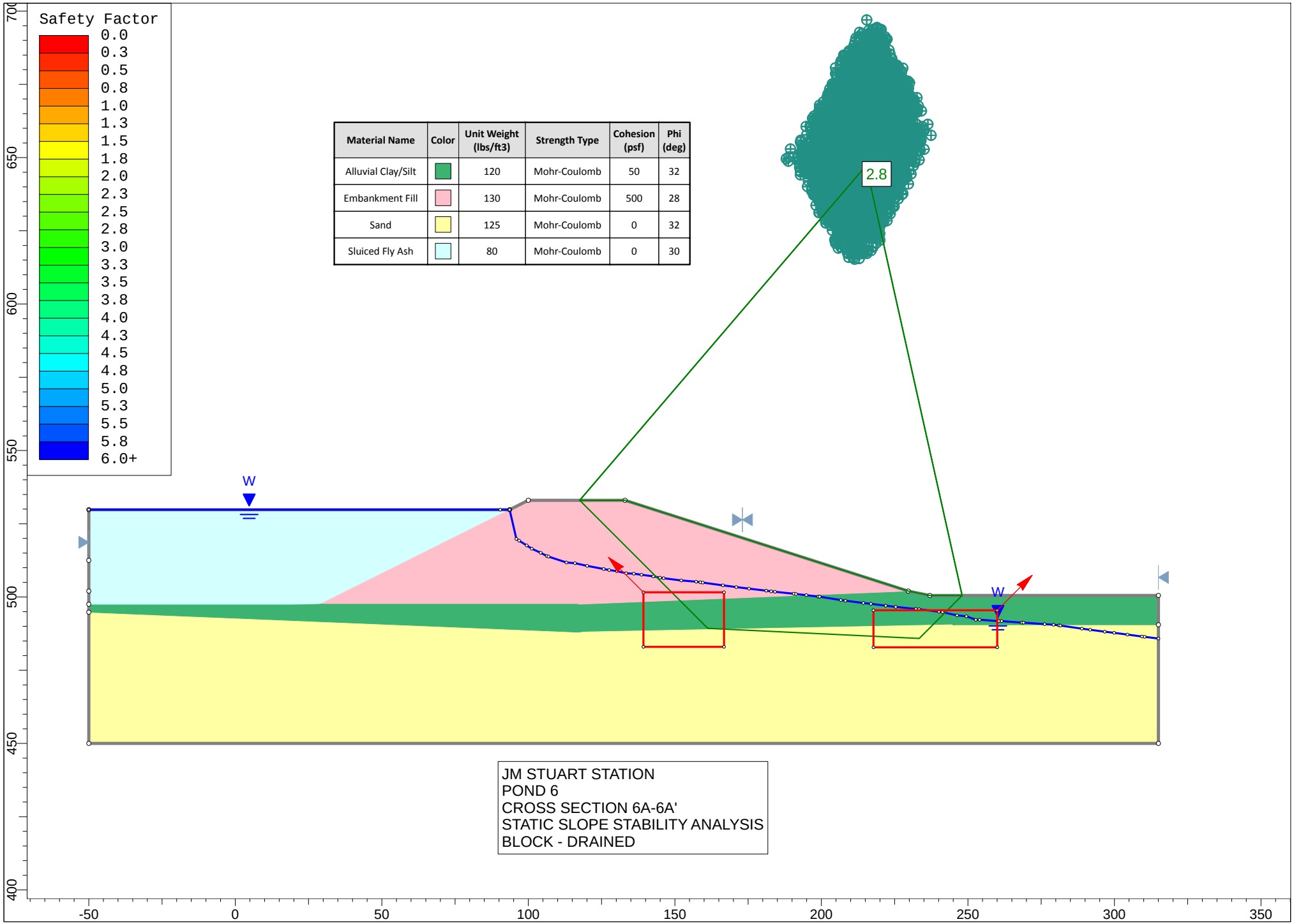
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Vertical Stress Ratio	Minimum Shear Strength (psf)
Alluvial Clay/Silt		120	Strength=F(overburden)			0.24	800
Inverted Filter		120	Mohr-Coulomb	0	28		
Cohesive Embankment Fill		130	Strength=F(overburden)			0.38	1040
Granular Embankment Fill		120	Mohr-Coulomb	0	27.2		
Sand		125	Mohr-Coulomb	0	25.6		
Sluiced Fly Ash		80	Undrained	600			

JM STUART STATION
POND 5
CROSS SECTION 5A-5A'
PSEUDO-STATIC SLOPE STABILITY ANALYSIS
BLOCK - UNDRAINED



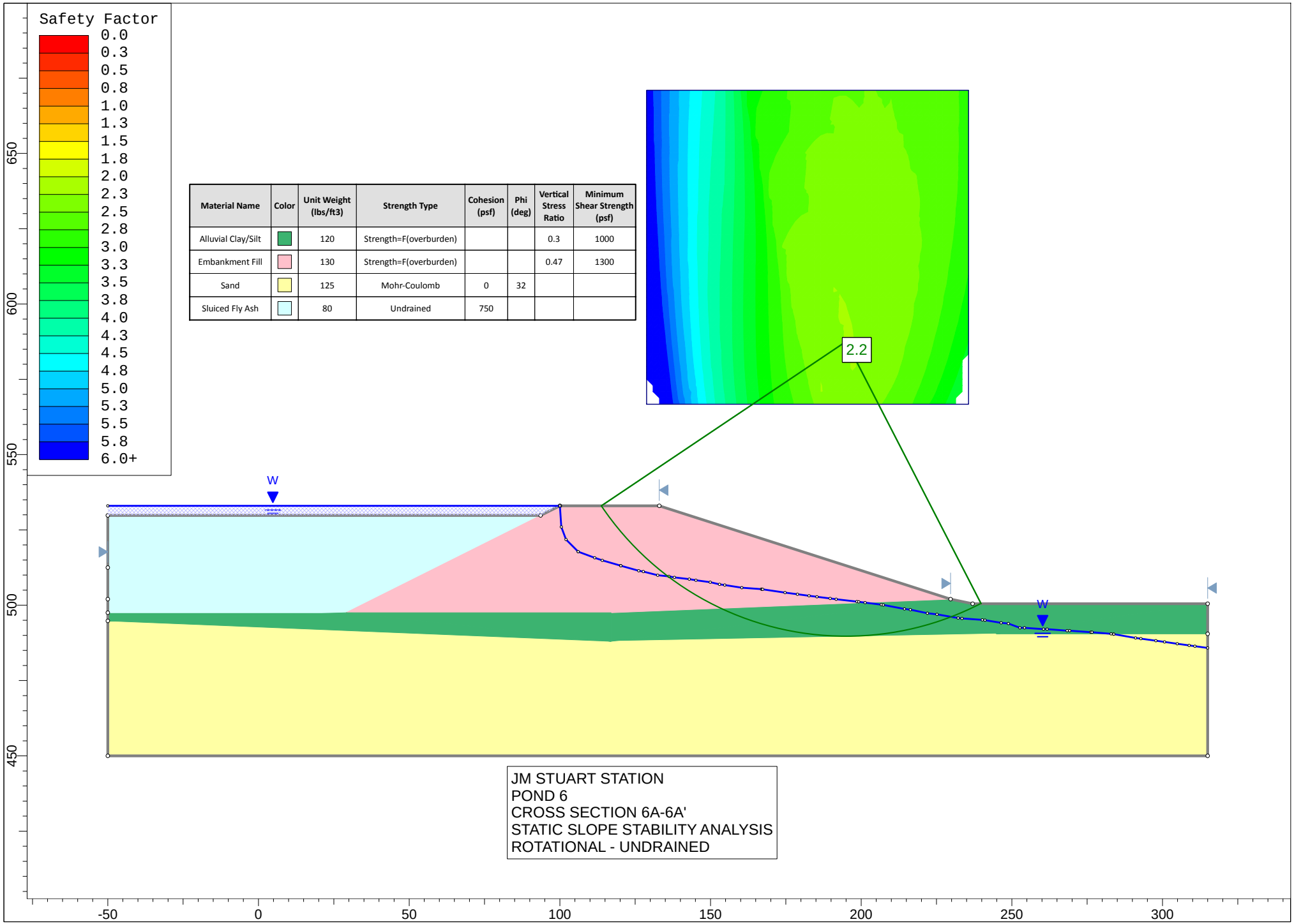
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Alluvial Clay/Silt		120	Mohr-Coulomb	50	32
Embankment Fill		130	Mohr-Coulomb	500	28
Sand		125	Mohr-Coulomb	0	32
Sluiced Fly Ash		80	Mohr-Coulomb	0	30

JM STUART STATION
POND 6
CROSS SECTION 6A-6A'
STATIC SLOPE STABILITY ANALYSIS
ROTATIONAL - DRAINED



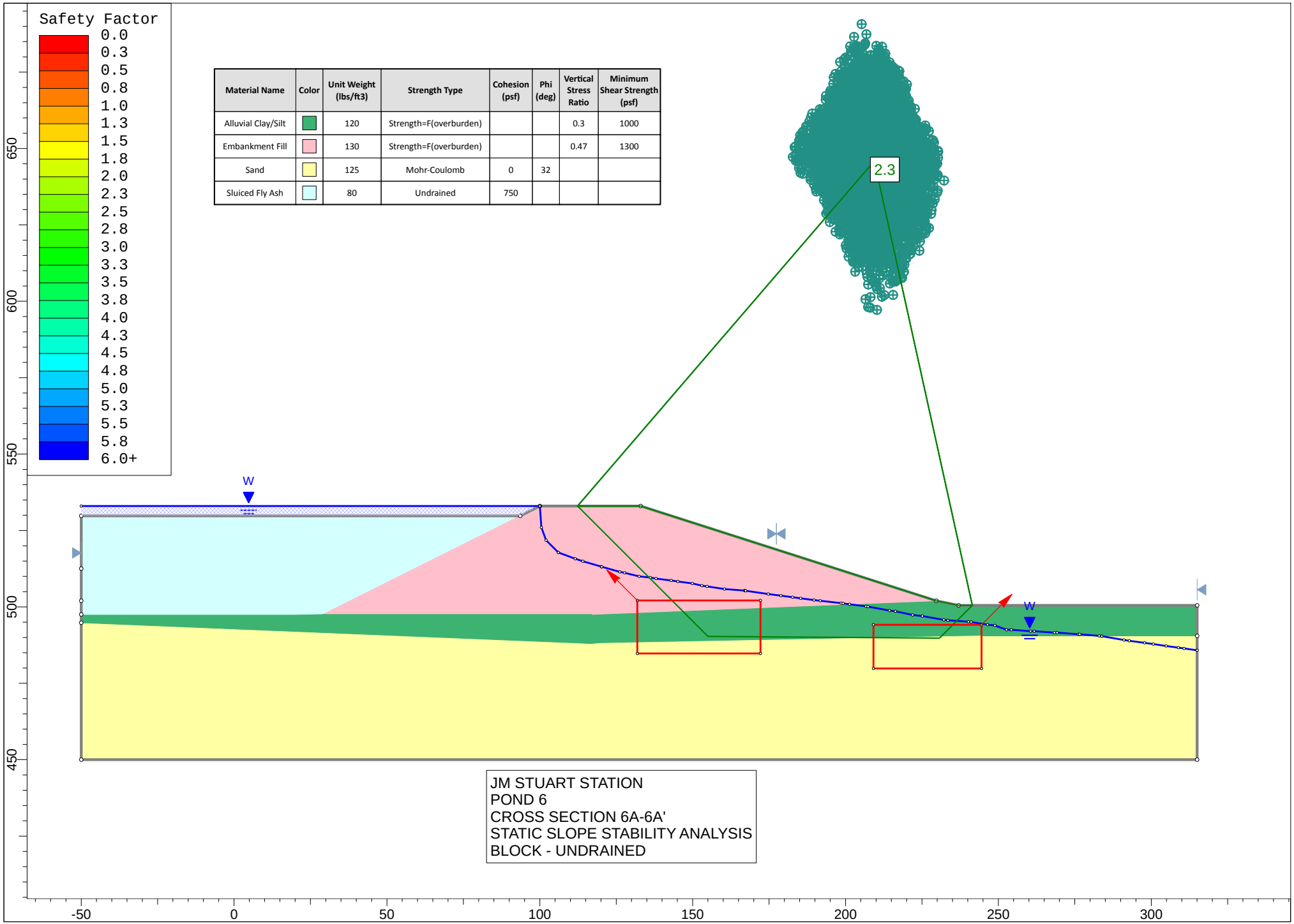
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Alluvial Clay/Silt		120	Mohr-Coulomb	50	32
Embankment Fill		130	Mohr-Coulomb	500	28
Sand		125	Mohr-Coulomb	0	32
Sluiced Fly Ash		80	Mohr-Coulomb	0	30

JM STUART STATION
POND 6
CROSS SECTION 6A-6A'
STATIC SLOPE STABILITY ANALYSIS
BLOCK - DRAINED



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Vertical Stress Ratio	Minimum Shear Strength (psf)
Alluvial Clay/Silt		120	Strength=F(overburden)			0.3	1000
Embankment Fill		130	Strength=F(overburden)			0.47	1300
Sand		125	Mohr-Coulomb	0	32		
Sluiced Fly Ash		80	Undrained	750			

JM STUART STATION
POND 6
CROSS SECTION 6A-6A'
STATIC SLOPE STABILITY ANALYSIS
ROTATIONAL - UNDRAINED



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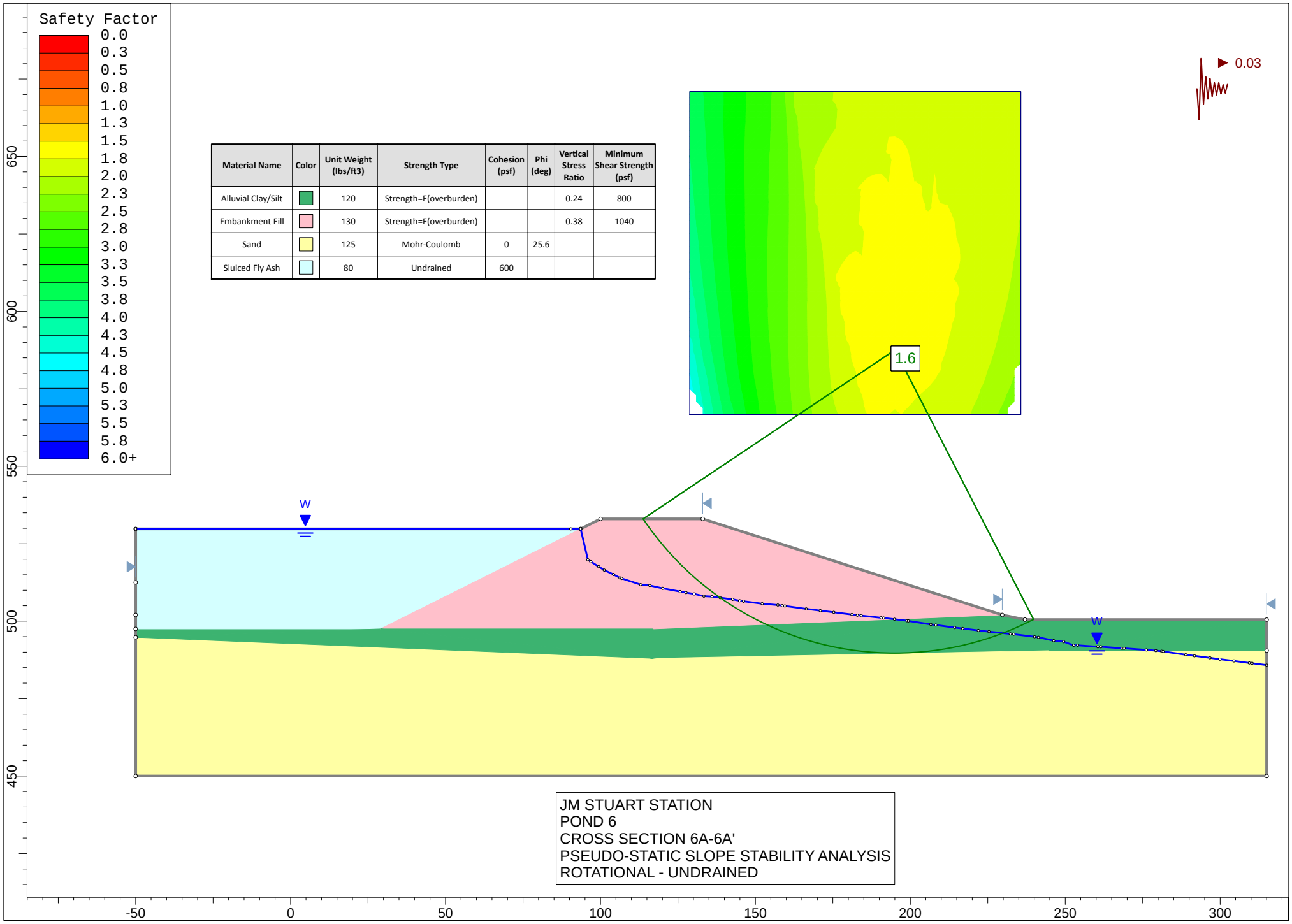
Sluiced Fly Ash		80	Undrained	750			

JM STUART STATION
POND 6
CROSS SECTION 6A-6A'
STATIC SLOPE STABILITY ANALYSIS
BLOCK - UNDRAINED



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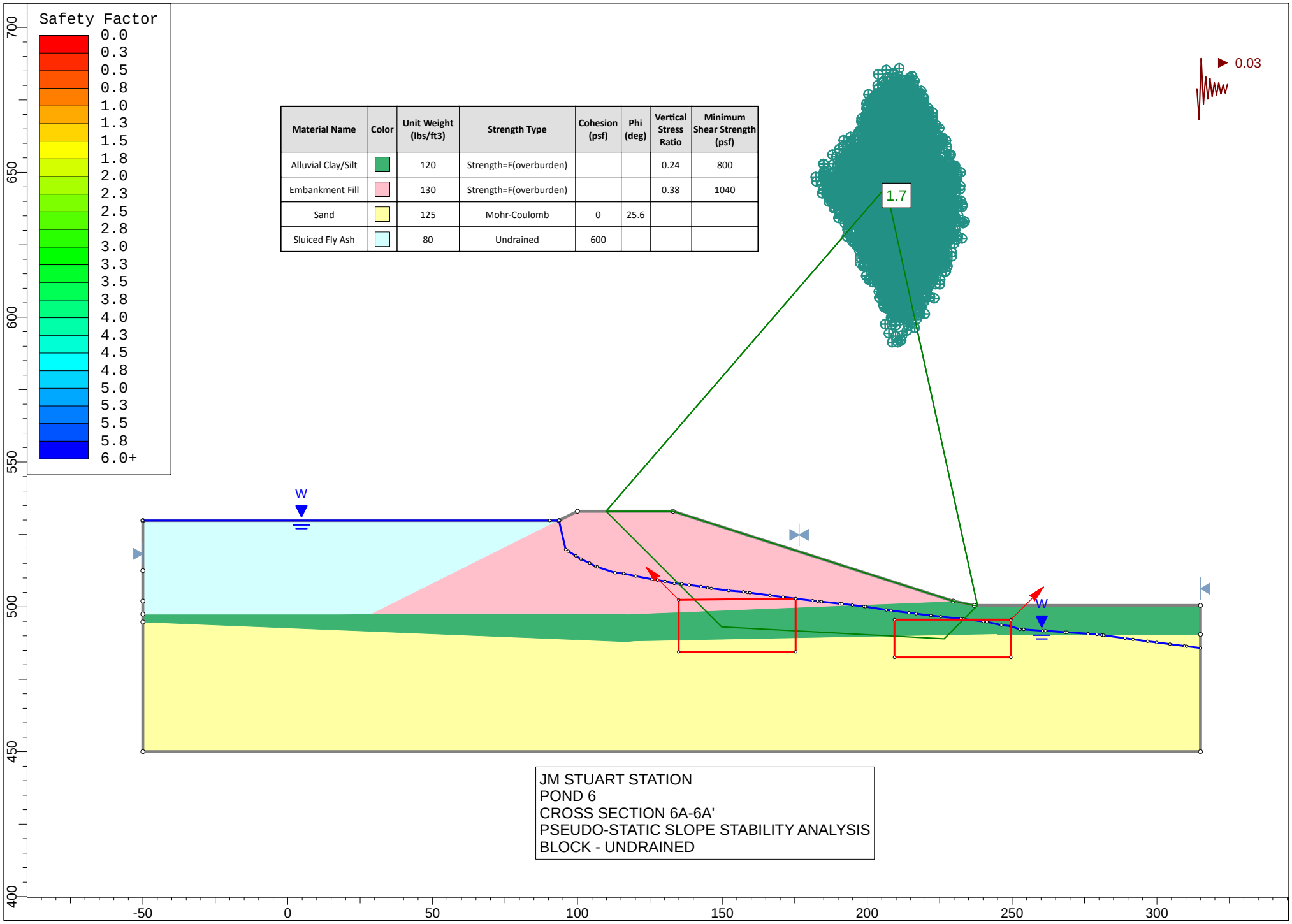
Sluiced Fly Ash		80	Undrained	600			

JM STUART STATION
POND 6
CROSS SECTION 6A-6A'
PSEUDO-STATIC SLOPE STABILITY ANALYSIS
ROTATIONAL - UNDRAINED



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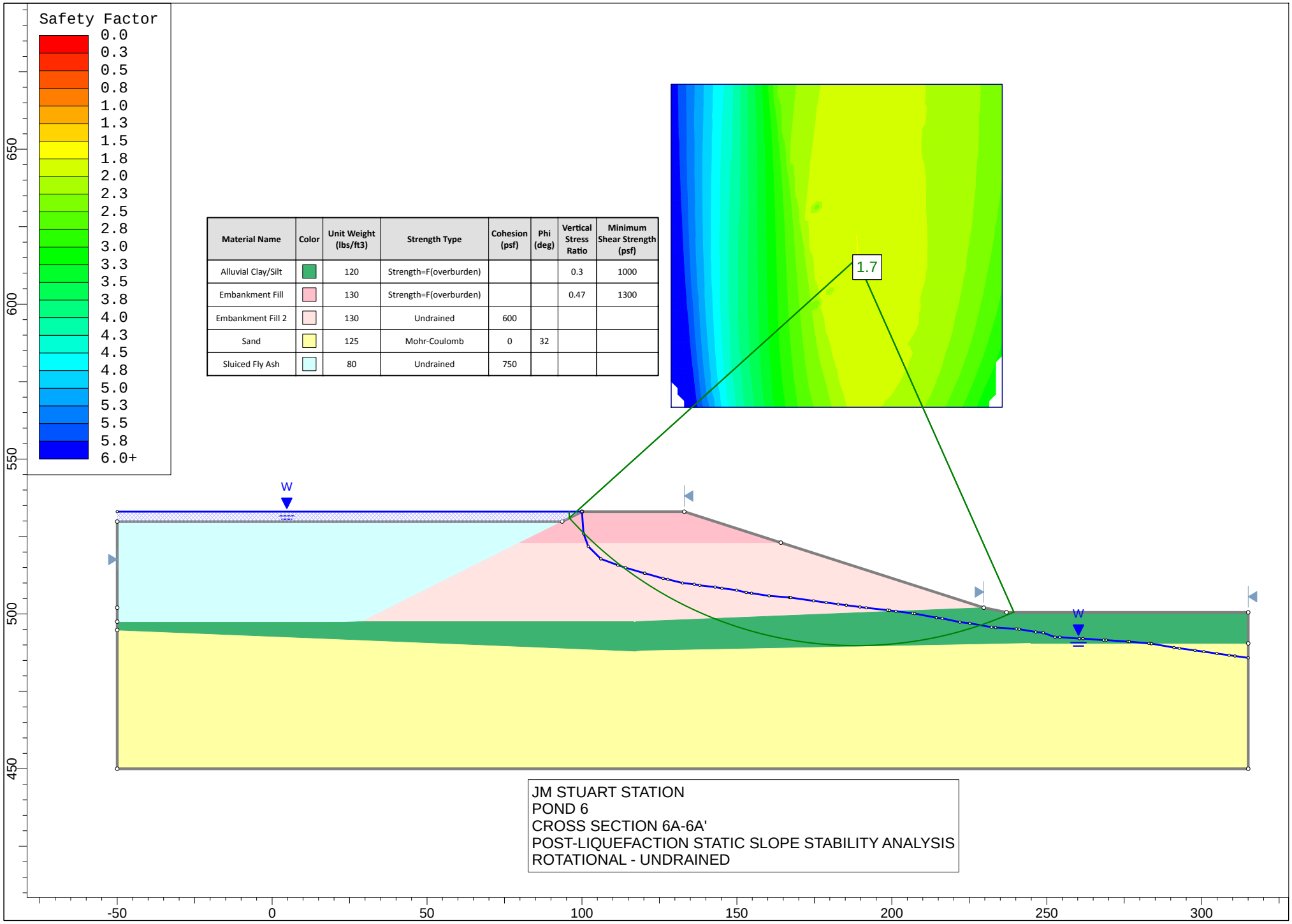
Sand		125	Mohr-Coulomb	0	25.6		
Sluiced Fly Ash		80	Undrained	600			

JM STUART STATION
POND 6
CROSS SECTION 6A-6A'
PSEUDO-STATIC SLOPE STABILITY ANALYSIS
BLOCK - UNDRAINED



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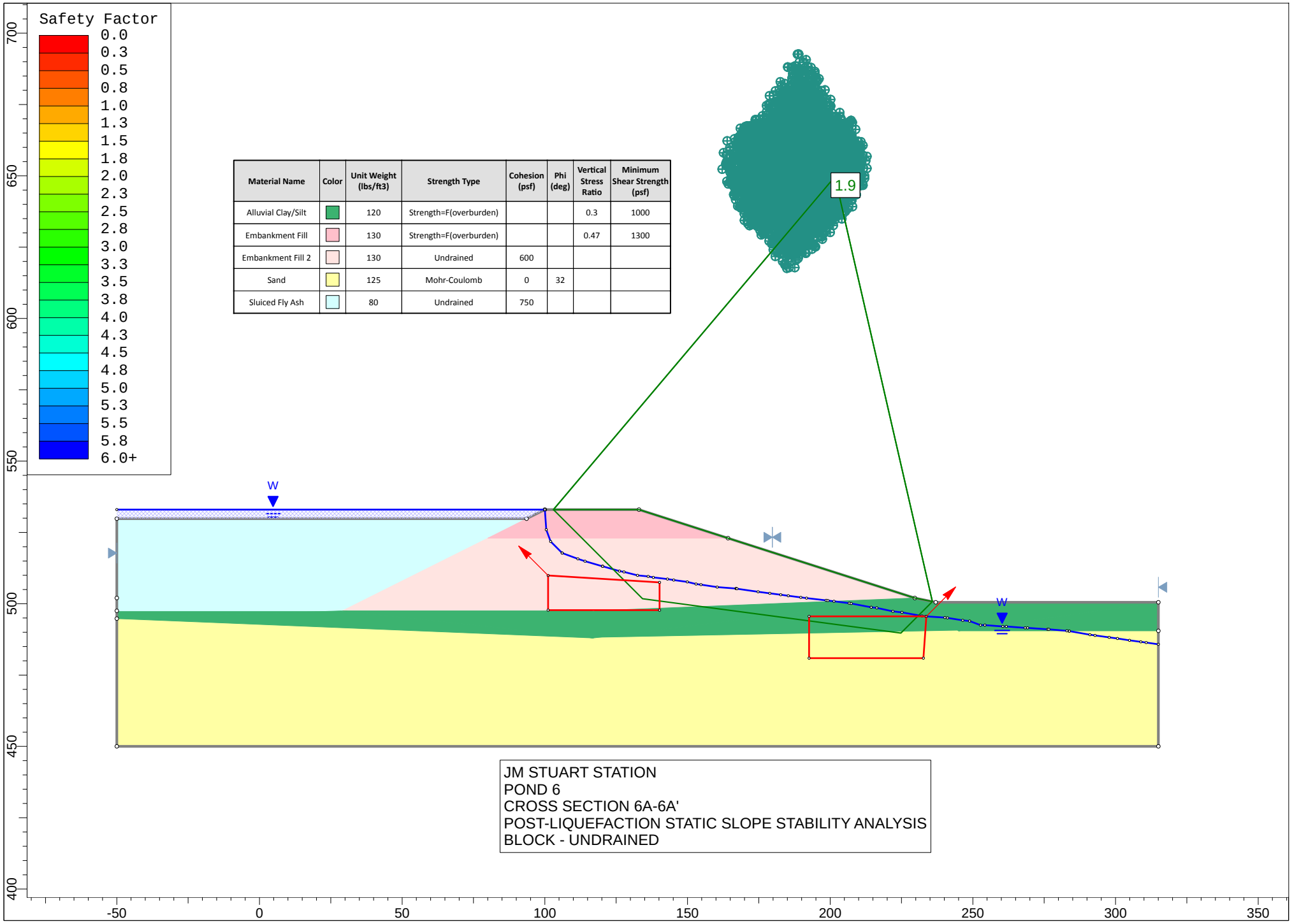
Embankment Fill		130	Strength=F(overburden)			0.47	1300
Embankment Fill 2		130	Undrained	600			
Sand		125	Mohr-Coulomb	0	32		
Sluiced Fly Ash		80	Undrained	750			

JM STUART STATION
POND 6
CROSS SECTION 6A-6A'
POST-LIQUEFACTION STATIC SLOPE STABILITY ANALYSIS
ROTATIONAL - UNDRAINED



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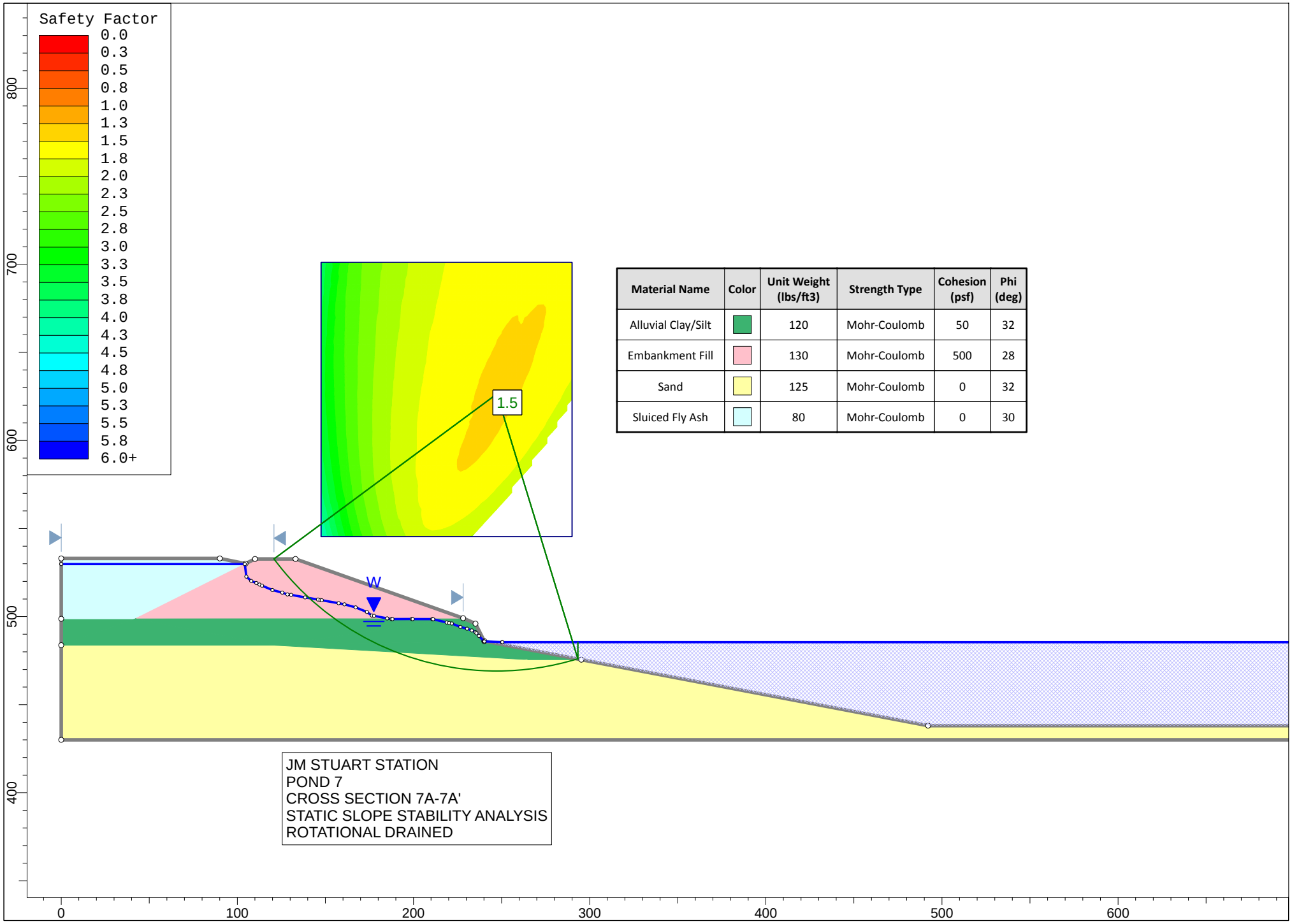
Alluvial Clay/Silt		120	Strength=F(overburden)			0.3	1000
Embankment Fill		130	Strength=F(overburden)			0.47	1300
Embankment Fill 2		130	Undrained	600			
Sand		125	Mohr-Coulomb	0	32		
Sluiced Fly Ash		80	Undrained	750			

JM STUART STATION
POND 6
CROSS SECTION 6A-6A'
POST-LIQUEFACTION STATIC SLOPE STABILITY ANALYSIS
BLOCK - UNDRAINED



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Alluvial Clay/Silt		120	Mohr-Coulomb	50	32
Embankment Fill		130	Mohr-Coulomb	500	28
Sand		125	Mohr-Coulomb	0	32
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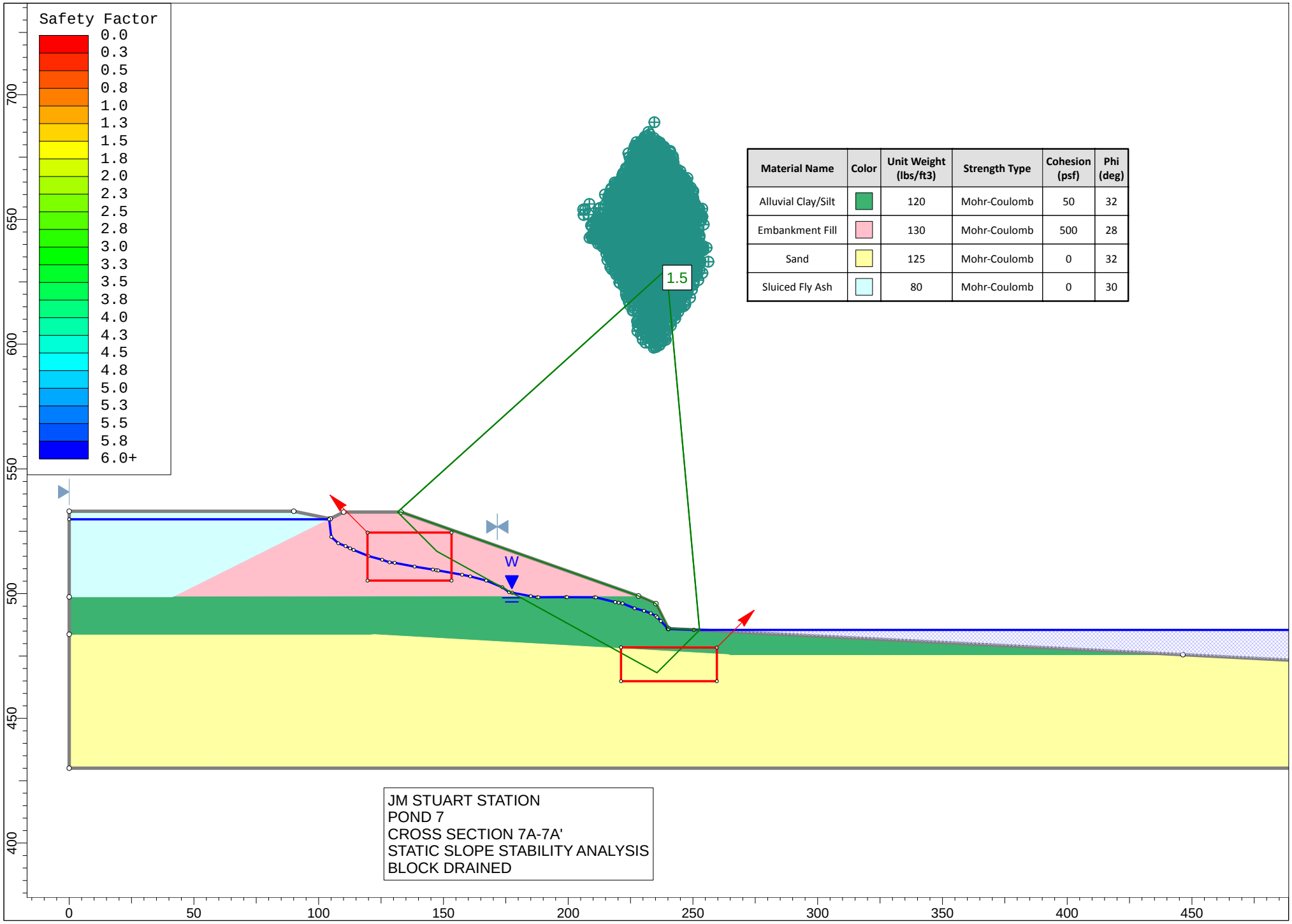
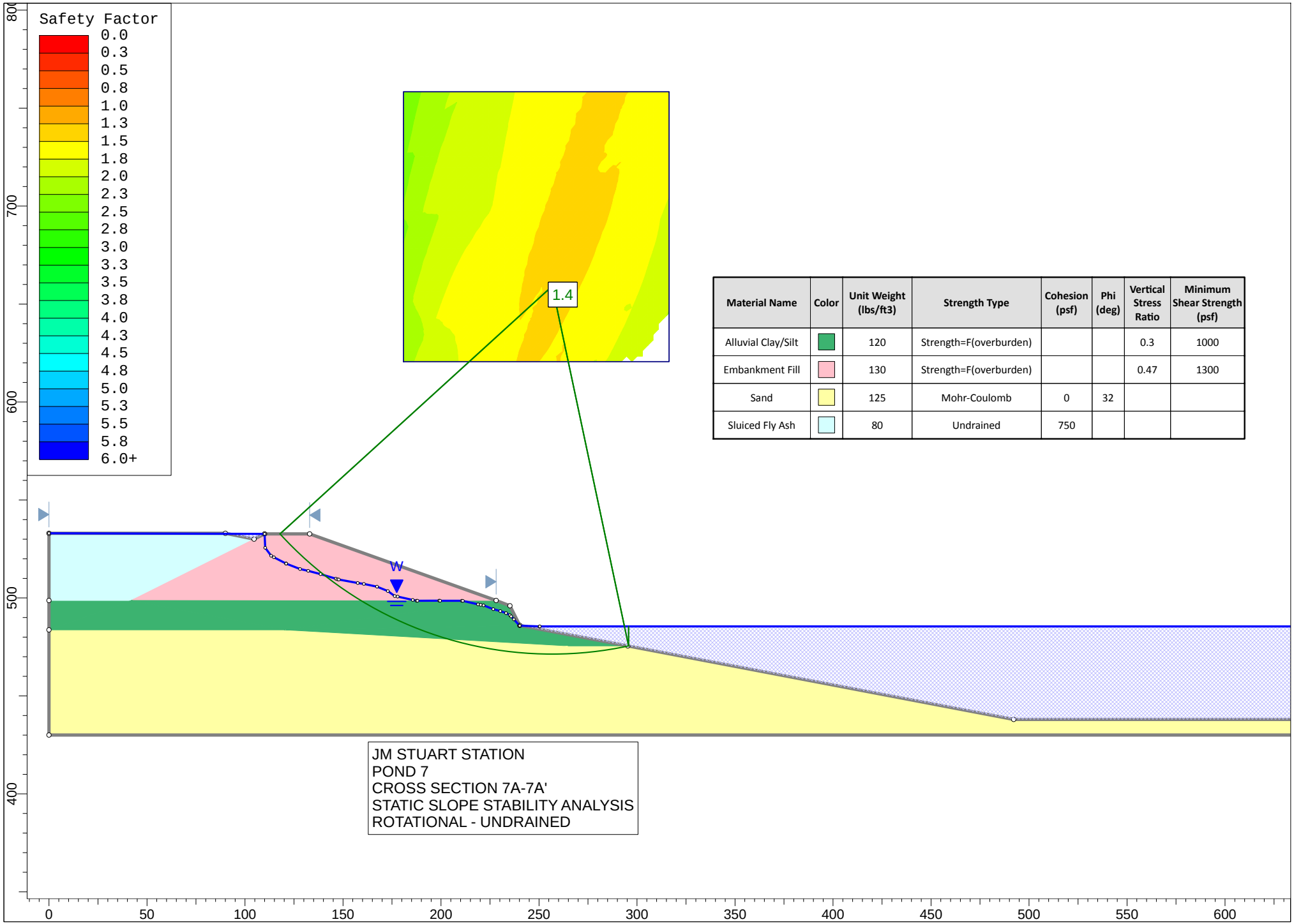


Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Alluvial Clay/Silt		120	Mohr-Coulomb	50	32
Embankment Fill		130	Mohr-Coulomb	500	28
Sand		125	Mohr-Coulomb	0	32
Sluiced Fly Ash		80	Mohr-Coulomb	0	30

JM STUART STATION
POND 7
CROSS SECTION 7A-7A'
STATIC SLOPE STABILITY ANALYSIS
BLOCK DRAINED



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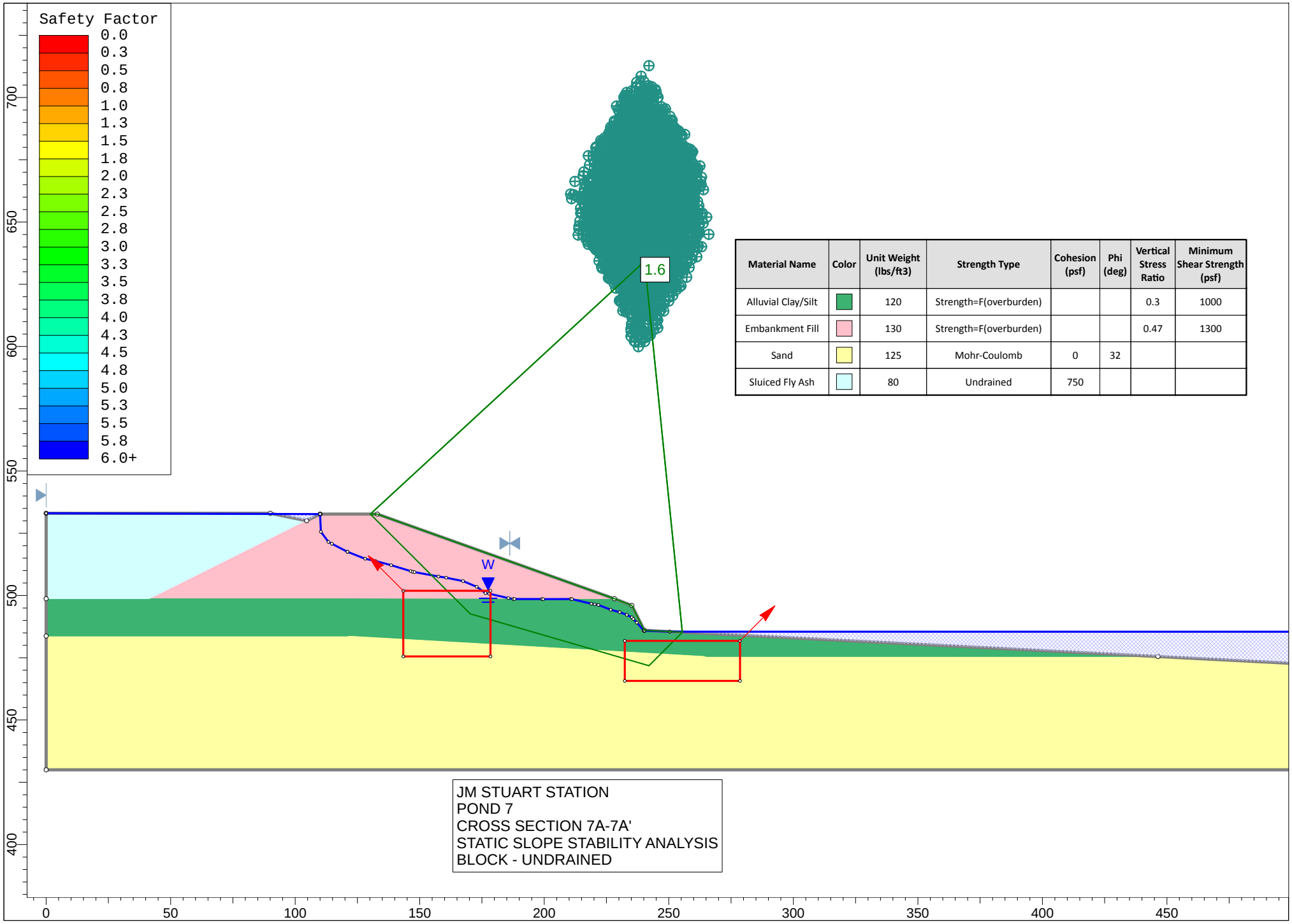
Alluvial Clay/Silt		120	Strength=F(overburden)			0.3	1000
Embankment Fill		130	Strength=F(overburden)			0.47	1300
Sand		125	Mohr-Coulomb	0	32		
Sluiced Fly Ash		80	Undrained	750			

JM STUART STATION
POND 7
CROSS SECTION 7A-7A'
STATIC SLOPE STABILITY ANALYSIS
ROTATIONAL - UNDRAINED



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Embankment Fill		130	Strength=F(overburden)			0.47	1300
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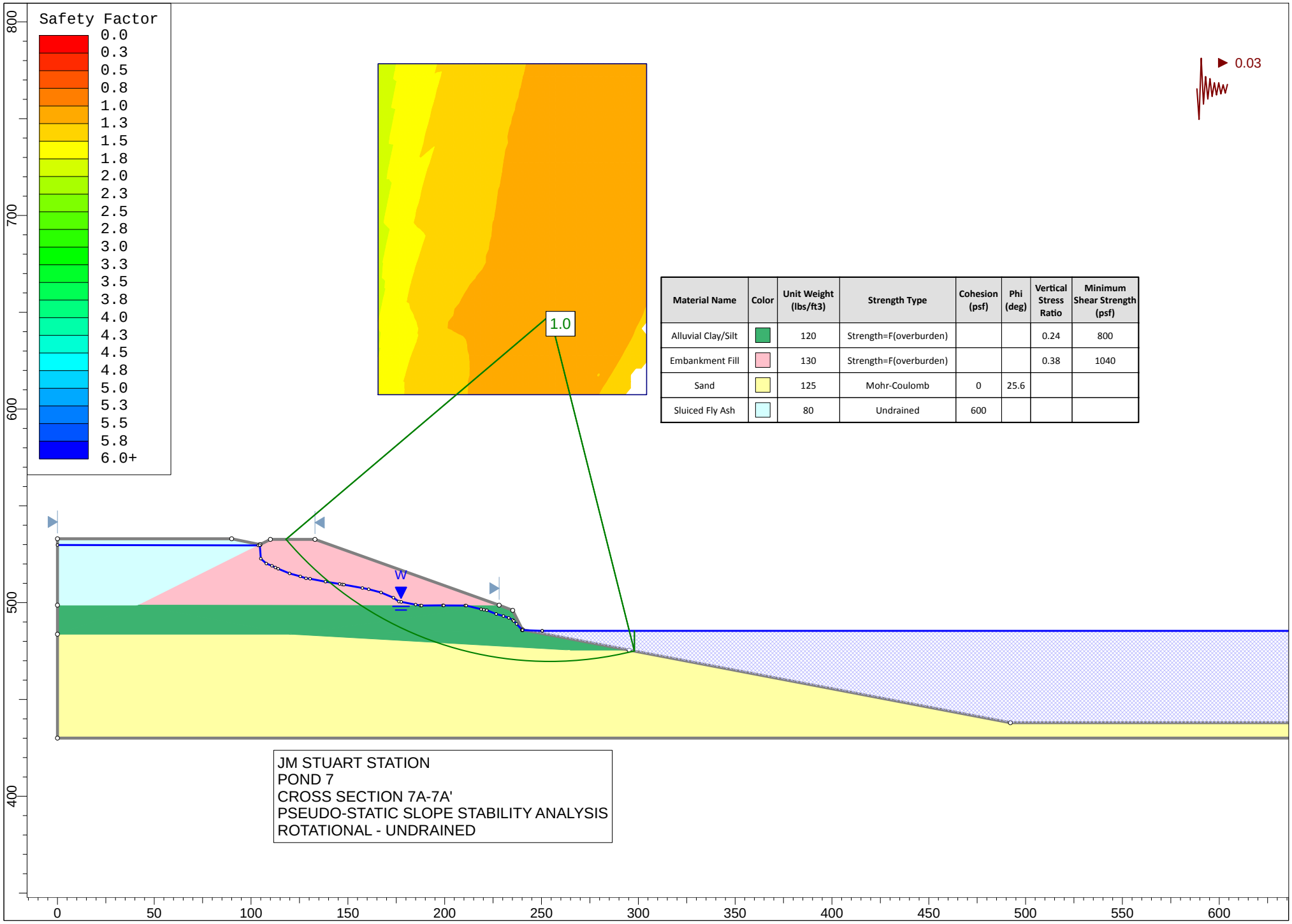
Sluiced Fly Ash		80	Undrained	750			

JM STUART STATION
POND 7
CROSS SECTION 7A-7A'
STATIC SLOPE STABILITY ANALYSIS
BLOCK - UNDRAINED



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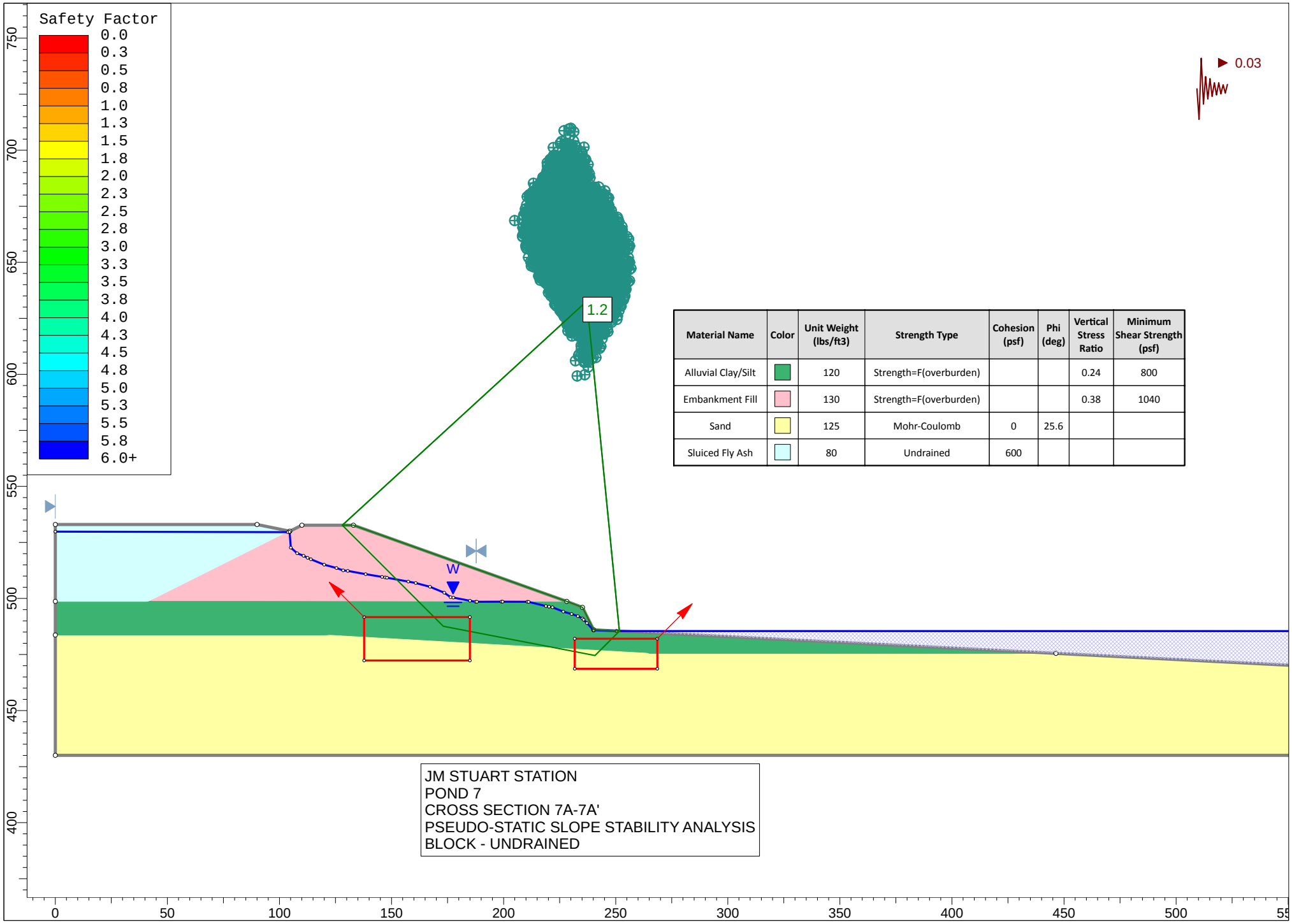
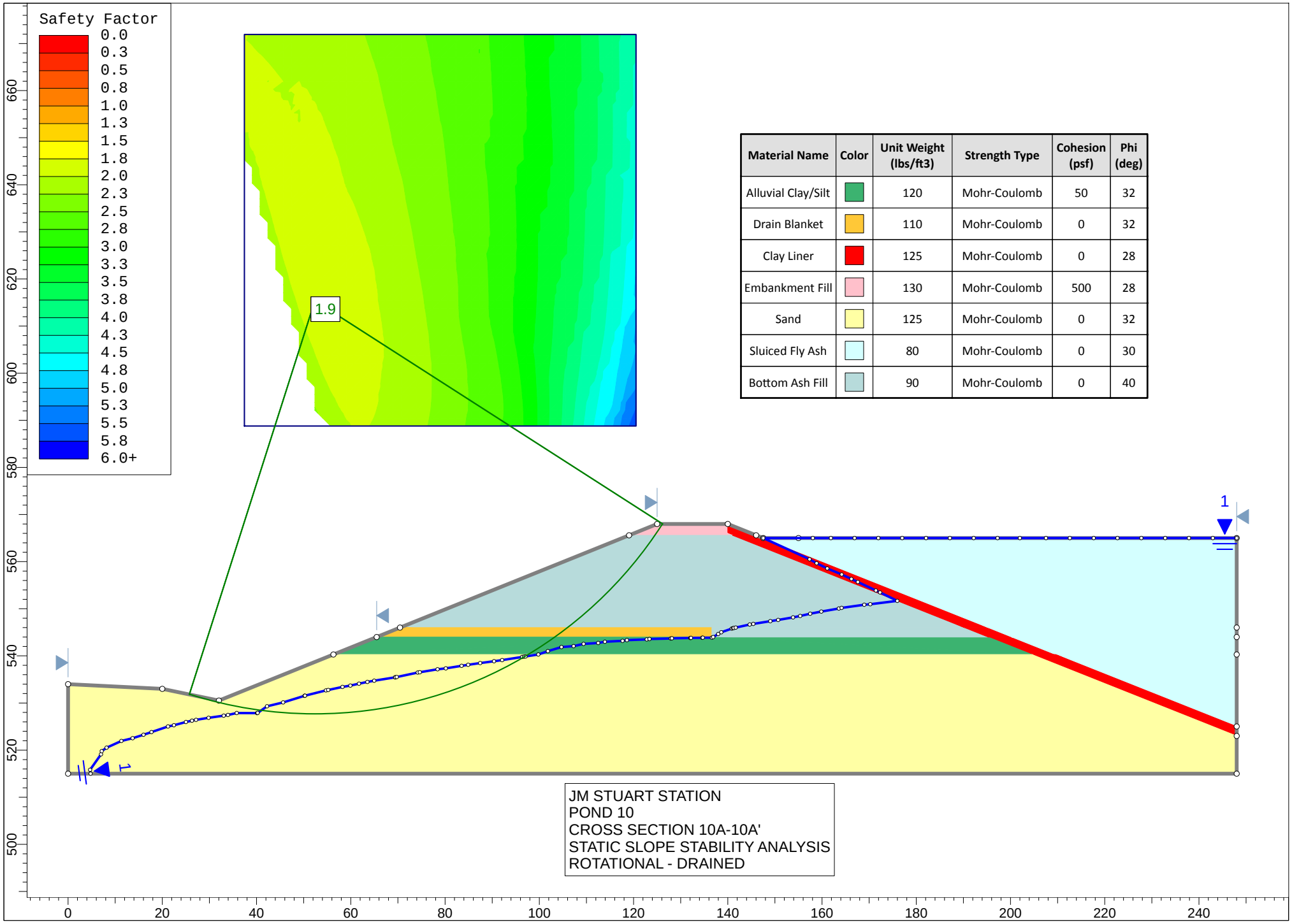
Sand		125	Mohr-Coulomb	0	25.6		
Sluiced Fly Ash		80	Undrained	600			

JM STUART STATION
POND 7
CROSS SECTION 7A-7A'
PSEUDO-STATIC SLOPE STABILITY ANALYSIS
ROTATIONAL - UNDRAINED

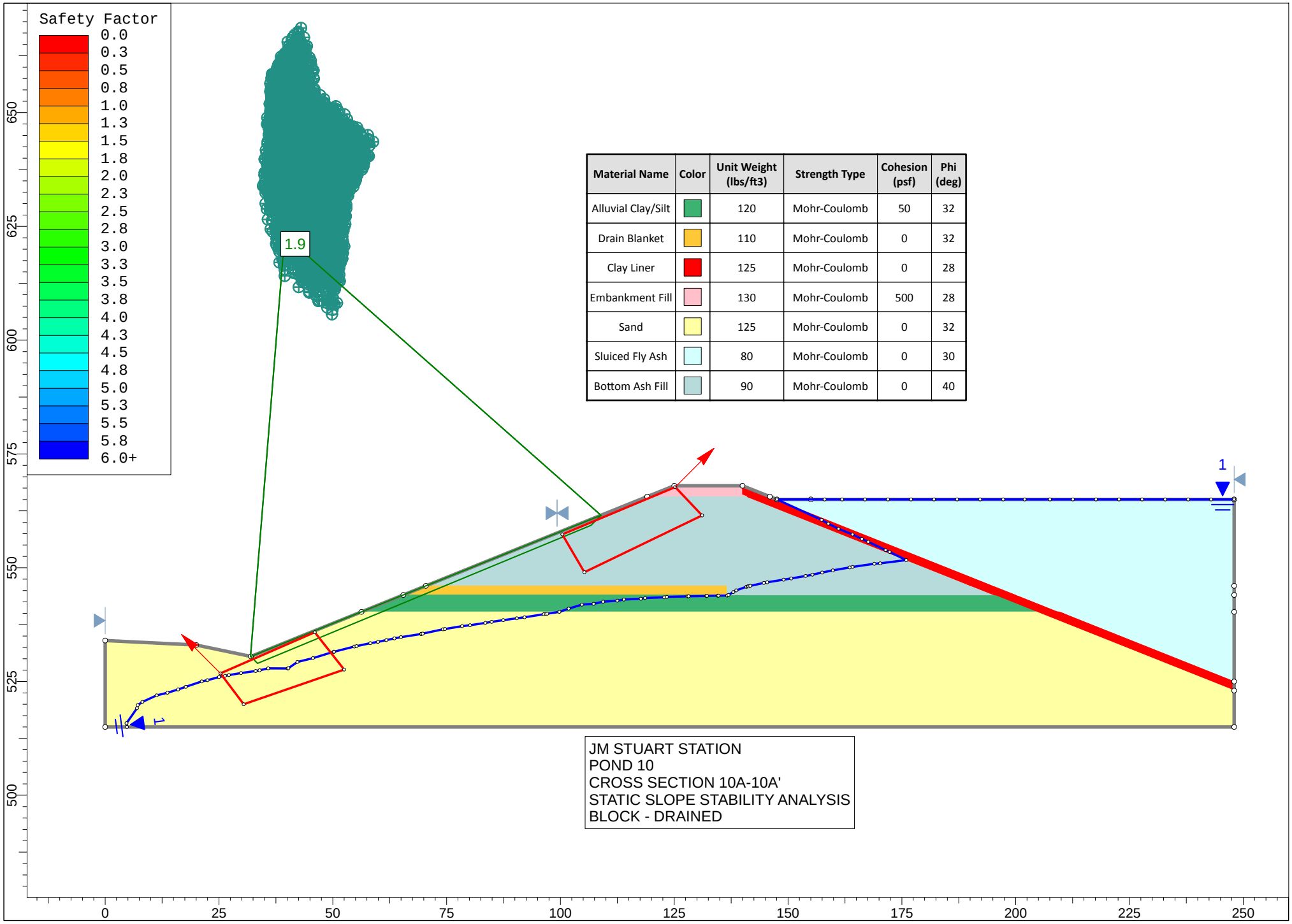


Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Vertical Stress Ratio	Minimum Shear Strength (psf)
Alluvial Clay/Silt		120	Strength=F(overburden)			0.24	800
Embankment Fill		130	Strength=F(overburden)			0.38	1040
Sand		125	Mohr-Coulomb	0	25.6		
Sluiced Fly Ash		80	Undrained	600			

JM STUART STATION
POND 7
CROSS SECTION 7A-7A'
PSEUDO-STATIC SLOPE STABILITY ANALYSIS
BLOCK - UNDRAINED

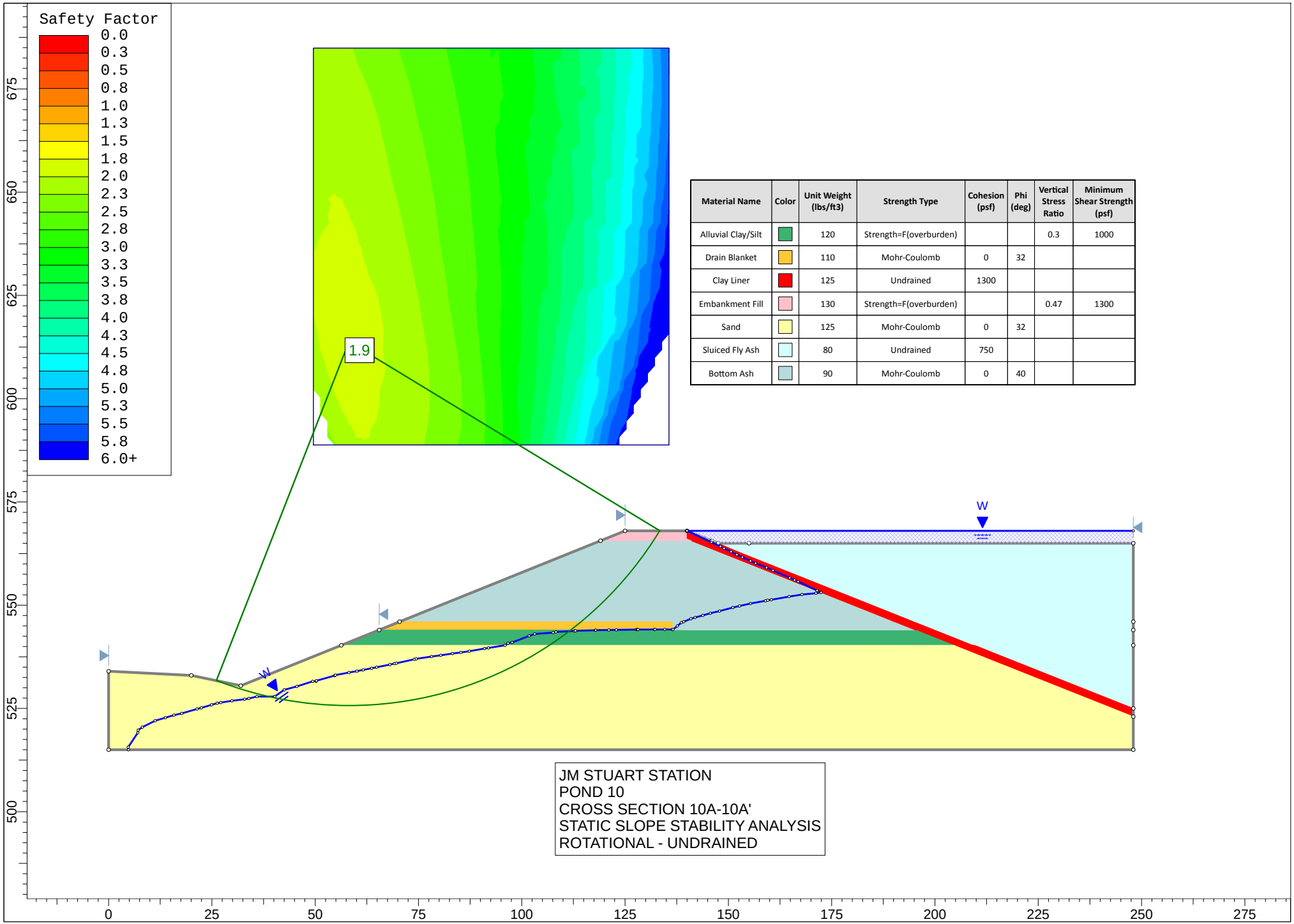


Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Alluvial Clay/Silt		120	Mohr-Coulomb	50	32
Drain Blanket		110	Mohr-Coulomb	0	32
Clay Liner		125	Mohr-Coulomb	0	28
Embankment Fill		130	Mohr-Coulomb	500	28
Sand		125	Mohr-Coulomb	0	32
Sluiced Fly Ash		80	Mohr-Coulomb	0	30
Bottom Ash Fill		90	Mohr-Coulomb	0	40



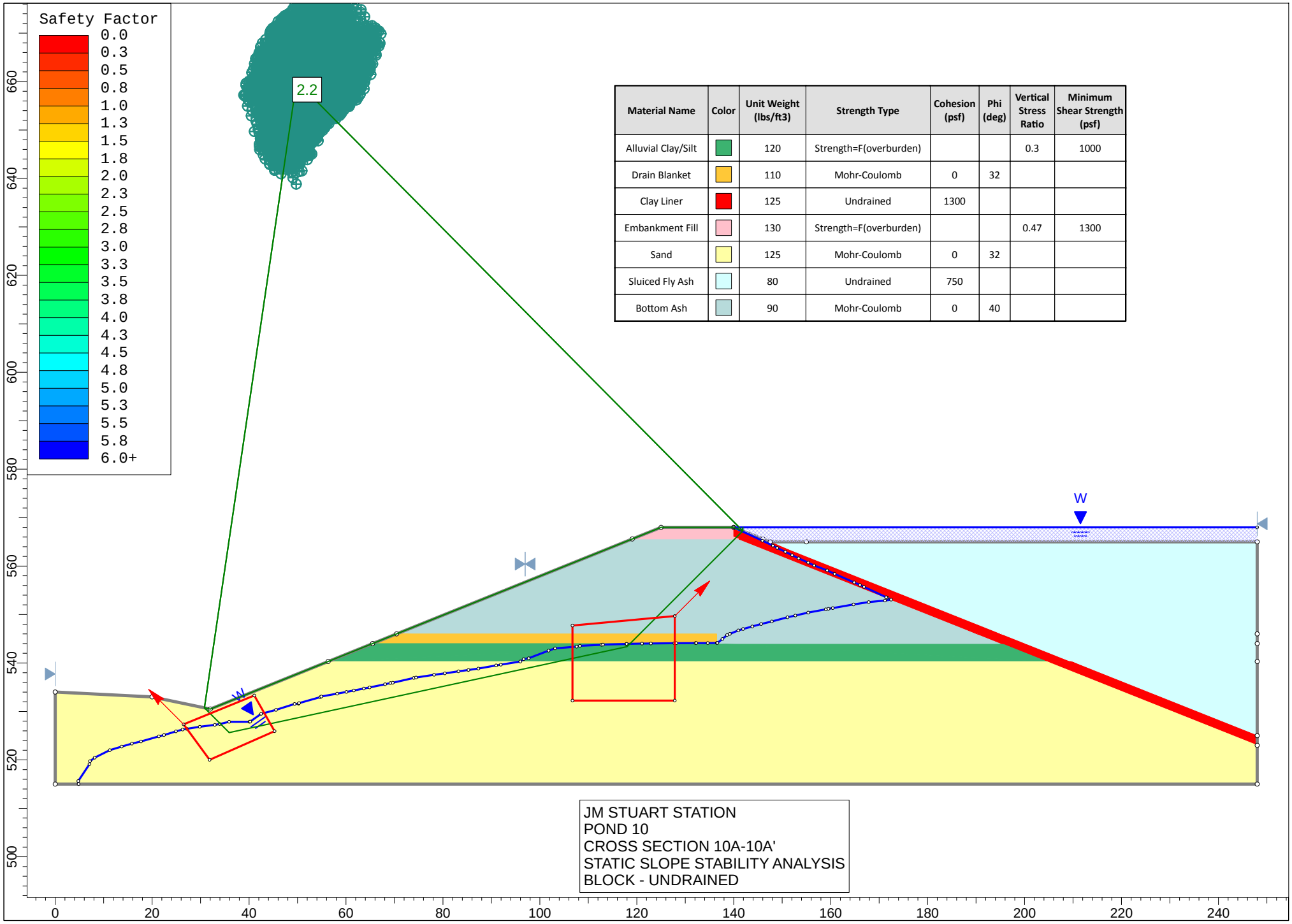
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Alluvial Clay/Silt		120	Mohr-Coulomb	50	32
Drain Blanket		110	Mohr-Coulomb	0	32
Clay Liner		125	Mohr-Coulomb	0	28
Embankment Fill		130	Mohr-Coulomb	500	28
Sand		125	Mohr-Coulomb	0	32
Sluiced Fly Ash		80	Mohr-Coulomb	0	30
Bottom Ash Fill		90	Mohr-Coulomb	0	40

JM STUART STATION
POND 10
CROSS SECTION 10A-10A'
STATIC SLOPE STABILITY ANALYSIS
BLOCK - DRAINED

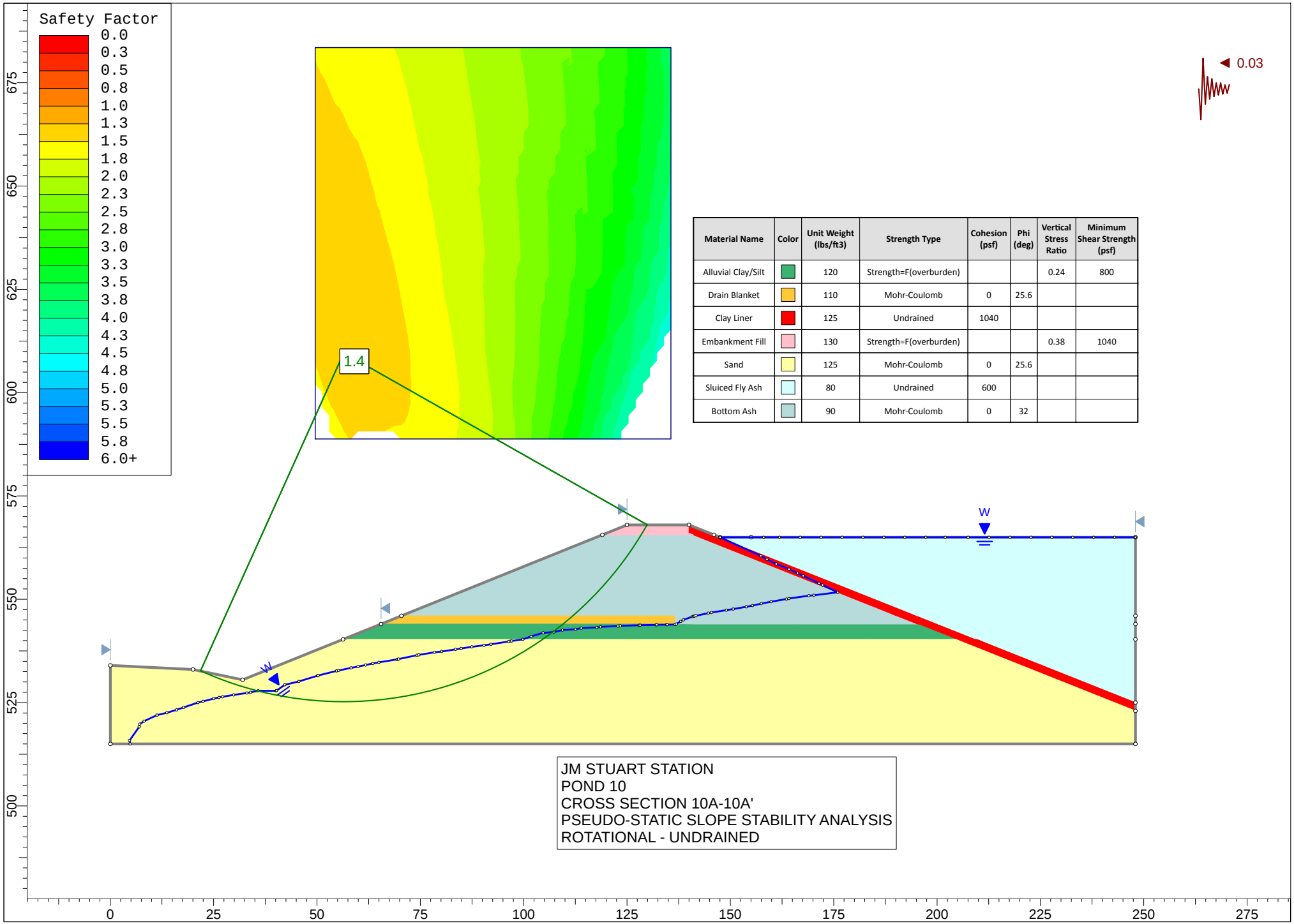


Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Vertical Stress Ratio	Minimum Shear Strength (psf)
Alluvial Clay/Silt		120	Strength=F(overburden)			0.3	1000
Drain Blanket		110	Mohr-Coulomb	0	32		
Clay Liner		125	Undrained	1300			
Embankment Fill		130	Strength=F(overburden)			0.47	1300
Sand		125	Mohr-Coulomb	0	32		
Sluiced Fly Ash		80	Undrained	750			
Bottom Ash		90	Mohr-Coulomb	0	40		

JM STUART STATION
POND 10
CROSS SECTION 10A-10A'
STATIC SLOPE STABILITY ANALYSIS
ROTATIONAL - UNDRAINED

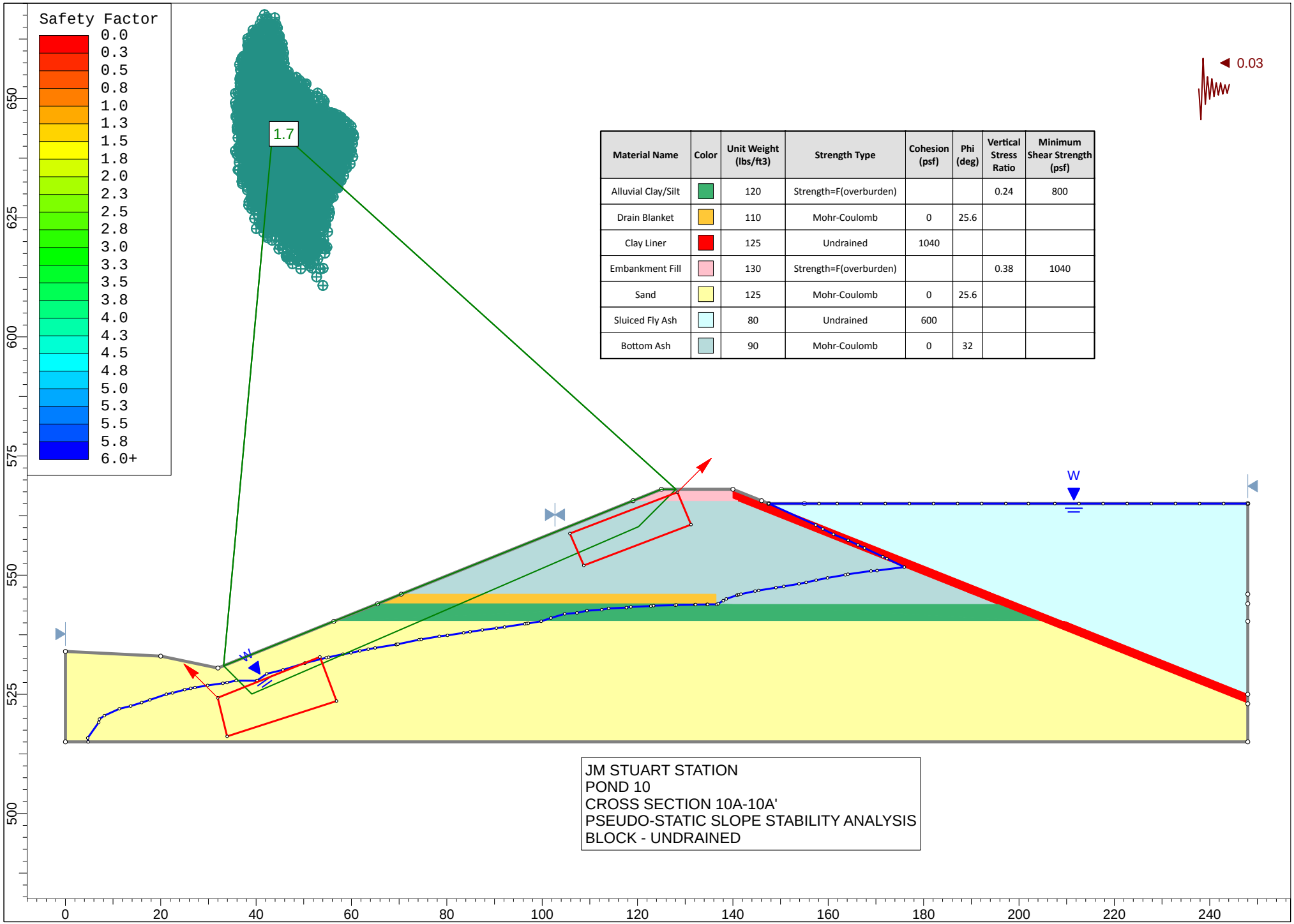


Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Vertical Stress Ratio	Minimum Shear Strength (psf)
Alluvial Clay/Silt		120	Strength=F(overburden)			0.3	1000
Drain Blanket		110	Mohr-Coulomb	0	32		
Clay Liner		125	Undrained	1300			
Embankment Fill		130	Strength=F(overburden)			0.47	1300
Sand		125	Mohr-Coulomb	0	32		
Sluiced Fly Ash		80	Undrained	750			
Bottom Ash		90	Mohr-Coulomb	0	40		



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Vertical Stress Ratio	Minimum Shear Strength (psf)
Alluvial Clay/Silt		120	Strength=F(overburden)			0.24	800
Drain Blanket		110	Mohr-Coulomb	0	25.6		
Clay Liner		125	Undrained	1040			
Embankment Fill		130	Strength=F(overburden)			0.38	1040
Sand		125	Mohr-Coulomb	0	25.6		
Sluiced Fly Ash		80	Undrained	600			
Bottom Ash		90	Mohr-Coulomb	0	32		

JM STUART STATION
POND 10
CROSS SECTION 10A-10A'
PSEUDO-STATIC SLOPE STABILITY ANALYSIS
ROTATIONAL - UNDRAINED



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Vertical Stress Ratio	Minimum Shear Strength (psf)
Alluvial Clay/Silt		120	Strength=F(overburden)			0.24	800
Drain Blanket		110	Mohr-Coulomb	0	25.6		
Clay Liner		125	Undrained	1040			
Embankment Fill		130	Strength=F(overburden)			0.38	1040
Sand		125	Mohr-Coulomb	0	25.6		
Sluiced Fly Ash		80	Undrained	600			
Bottom Ash		90	Mohr-Coulomb	0	32		

JM STUART STATION
POND 10
CROSS SECTION 10A-10A'
PSEUDO-STATIC SLOPE STABILITY ANALYSIS
BLOCK - UNDRAINED

APPENDIX D

Historic Subsurface Explorations and Laboratory Test Results

LOG OF BORING NO. 1A

PROPOSED DP&L DIKES - STUART STATION - ABERDEEN, OHIO
FLY ASH PIT

BORING LOCATION: As Shown on Boring Location Plan **DATE STARTED:** 10-17-74

SURFACE ELEVATION: 532.4' **DATE COMPLETED:** 10-17-74

STRATUM DEPTH	DESCRIPTION OF MATERIAL	SAMPLE NO. & TYPE	SAMPLE DEPTH	BLOWS PER 6" ON SAMPLER	"N" BLOWS /FT. OR CORE REC.
0.0'	(Fill) Medium Dense Brown Sand and Gravel, trace of Silt - Damp				
1.5'	(Fill) Dense Fly Ash	1A	1.0- 2.5'	13-20-25	45
	(Becomes Medium Dense at 3.5')	2A	3.5- 5.0'	5-7-6	13
		3A	6.0- 7.5'	6-12-13	25
10.0'		1C	8.5-10.5'		13"
	(Becomes Loose at 10.5')	4A	10.5-12.0'	5-5-5	10
	(Becomes Very Loose at 13.5')	5A	13.5-15.0'	4-1-1	2
	(Becomes Medium Dense at 18.5')	6A	16.0-17.5'	1-0-0	0
20.0'		8A	18.5-20.0'	4-8-10	18
		9A	21.0-22.5'	6-6-6	12
	(Becomes Very Loose at 23.5')	10A	23.5-25.0'	8-1-1	2
		2C	25.5-27.5'		3"
30.0'		3C	28.5-30.5'		19"
31.0'	(Original) Stiff Brown Clay, some Silt, some Sand with 1" to 3" Sand Seams - Moist	11A	30.5-32.0'	2-3-8	11
	(Becomes Very Stiff at 33.5')	12A	33.5-35.0'	6-10-16	26
38.0'	(Becomes Stiff at 36.0')	13A	36.0-37.5'	4-6-8	14
40.0	Very Stiff Brown Clay and Sand, trace of Silt with 1" to 3" Sand Seams - Moist	14A	38.5-40.0'	5-8-12	20
	Bottom of Boring at 40.0'				

METHOD: Hollow Auger

TECHNICIAN: BC-BK-MF

JOB NO.: 03985

WATER OBSERVATIONS

INITIAL DEPTH: 16.5'/23.5'

COMPLETION DEPTH: 23.5'

DEPTH AFTER: _____ HRS. _____

TYPE SAMPLER:

X A. SPLIT SPOON

_____ B.

X C. SHELBY TUBE

BOWSER – MORNER
TESTING LABORATORIES, INC.

LOG OF BORING NO. 2A

PROPOSED DP&L DIKES - STUART STATION - ABERDEEN, OHIO

FLY ASH PIT

BORING LOCATION: As Shown on Boring Location Plan **DATE STARTED:** 10-4-74

SURFACE ELEVATION: 532.6' **DATE COMPLETED:** 10-4-74

STRATUM DEPTH	DESCRIPTION OF MATERIAL	SAMPLE NO. & TYPE	SAMPLE DEPTH	BLOWS PER 6" ON SAMPLER	"N" BLOWS /FT. OR CORE REC.
0.0'	(Fill) Loose Brown Sand				
2.0'	(Fill) Medium Dense Gray Fly Ash - Damp	1A	1.0- 2.5'	3-6-11	17
		1C	3.5- 5.5'		24"
		2A	6.0- 7.5'	6-7-13	20
10.0'	(Becomes Very Loose at 11.0')	2C	8.5-10.5'		24"
		3A	11.0-12.5'	3-2-3	5
		3C	13.5-15.5'		8"
		4A	16.0-17.5'	1-0-1	1
20.0'	(Becomes Loose at 21.0')	4C	18.5-20.5'		24"
		5A	21.0-22.5'	2-3-3	6
	(Becomes Very Loose at 26.0')	5C	23.5-25.5'		10"
		6A	26.0-27.5'	1-1-2	3
30.0'		6C	28.5-30.5'		0"
31.0'					
32.5'	(Original) Hard Brown Clay and Sand, some Silt - Moist	7A	31.0-32.5'	15-16-23	39
	Medium Dense Brown Sand, trace of Silt with 1" to 3" Clay and Sand Seams - Moist	8A	33.5-35.0'	10-12-13	25
		9A	36.0-37.5'	4-7-5	12
40.0'		10A	38.5-40.0'	5-6-8	14
	Bottom of Boring at 40.0'				

METHOD: Hollow Auger

TECHNICIAN: BC-RK

JOB NO.: 03985

WATER OBSERVATIONS

INITIAL DEPTH: 16.0'/26.0'

COMPLETION DEPTH: Unknown

DEPTH AFTER: _____ HRS. _____

TYPE SAMPLER:

X A. SPLIT SPOON

_____ B.

X C. SHELBY TUBE

BOWSER – MORNER
TESTING LABORATORIES, INC.

LOG OF BORING NO. 3A

PROPOSED DP&L DIKES - STUART STATION - ABERDEEN, OHIO
FLY ASH PIT

BORING LOCATION: As Shown on Boring Location Plan **DATE STARTED:** 10-7-74

SURFACE ELEVATION: 532.4' **DATE COMPLETED:** 10-7-74

STRATUM DEPTH	DESCRIPTION OF MATERIAL	SAMPLE NO. & TYPE	SAMPLE DEPTH	BLOWS PER 6" ON SAMPLER	"N" BLOWS /FT. OR CORE REC.
0.0'	(Fill) Brown Sand				
1.0'	(Fill) Loose Gray Fly Ash	1C	1.0- 3.0'		24"
		1A	3.5- 5.0'	7-3-6	9
	(Becomes Medium Dense at 8.5')	2C	6.0- 8.0'		24"
10.0'		2A	8.5-10.0'	10-6-5	11
		3C	11.0-13.0'		8"
	(Becomes Very Loose at 13.5')	3A	13.5-15.0'	2-2-1	3
		4C	16.0-18.0'		15"
20.0'	(Becomes Medium Dense at 18.5')	4A	18.5-20.0'	5-5-6	11
		5C	21.0-23.0'		12"
	(Becomes Very Loose at 23.5')	5A	23.5-25.0'	1-0-1	1
		6C	26.0-28.0'		0"
30.0'		7C	28.0-30.0'		24"
	(Original) Very Stiff Brown Clay and Sand, trace of Silt with 1" to 3" Sand Seams - Moist	6A	30.0-31.5'	11-13-13	26
	(Becomes Stiff at 36.0')	7A	33.5-35.0'	6-10-14	24
		8A	36.0-37.5'	3-6-9	15
40.0'	(Becomes Very Stiff at 38.5')	9A	38.5-40.0'	5-9-10	19
	Bottom of Boring at 40.0'				

METHOD: Hollow Auger
TECHNICIAN: BC-RK
JOB NO.: 03985

WATER OBSERVATIONS
INITIAL DEPTH: 18.0'/23.0'
COMPLETION DEPTH: *
DEPTH AFTER: ____ HRS. ____

TYPE SAMPLER:
X A. SPLIT SPOON
___ B.
X C. SHELBY TUBE

* Filled in to 22.0'

BOWSER – MORNER
TESTING LABORATORIES, INC.

LOG OF BORING NO. 4A

PROPOSED DP&L DIKES - STUART STATION - ABERDEEN, OHIO
FLY ASH PIT

BORING LOCATION: As Shown on Boring Location Plan **DATE STARTED:** 10-7-74

SURFACE ELEVATION: 532.9' **DATE COMPLETED:** 10-8-74

STRATUM DEPTH	DESCRIPTION OF MATERIAL	SAMPLE NO. & TYPE	SAMPLE DEPTH	BLOWS PER 6" ON SAMPLER	"N" BLOWS /FT. OR CORE REC.
0.0'	(Fill) Medium Dense Brown Sand				
2.0'	(Fill) Medium Dense Gray Fly Ash	1A	1.0- 2.5'	10-11-12	23
		1C	3.5- 5.5'		19"
		2A	5.5- 7.0'	4-4-7	11
10.0'	(Becomes Loose at 10.5')	2C	8.5-10.5'		24"
		3A	10.5-12.0'	3-3-3	6
	(Becomes Very Loose at 15.5')	3C	13.5-15.5'		23"
		4A	15.5-17.0'	1-0-0	0
20.0'		5A	18.5-20.0'	3-2-3	5
		4C	23.0-25.0'		22"
		6A	25.0-26.5'	1-0-0	0
30.0'		5C	28.5-30.5'		10"
30.5'	(Original) Hard Brown Clay and Sand, trace of Silt with 1" to 3" Sand Seams - Moist	7A	30.5-32.0'	13-26-22	48
	(Becomes Stiff at 36.0')	8A	33.5-35.0'	4-14-21	35
		9A	36.0-37.5'	4-6-8	14
40.0'	(Becomes Medium Stiff at 38.5')	10A	38.5-40.0'	2-2-6	8
	(Becomes Very Stiff at 41.0')	11A	41.0-42.5'	5-14-14	28
	(Becomes Stiff at 43.5')	12A	43.5-45.0'	4-6-7	13
	Bottom of Boring at 45.0'				

METHOD: Hollow Auger

TECHNICIAN: BC-RK

JOB NO.: 03985

WATER OBSERVATIONS

INITIAL DEPTH: *

COMPLETION DEPTH: 23.0'

DEPTH AFTER: 24 HRS. 23.0

TYPE SAMPLER:

X A. SPLIT SPOON

___ B.

X C. SHELBY TUBE

* 15.5'(tr)/24.0'/43.5'

BOWSER – MORNER
TESTING LABORATORIES, INC.

LOG OF BORING NO. 5A

PROPOSED DP&L DIKES - STUART STATION - ABERDEEN, OHIO

FLY ASH PIT

BORING LOCATION: As Shown on Boring Location Plan **DATE STARTED:** 10-8-74

SURFACE ELEVATION: 532.8' **DATE COMPLETED:** 10-8-74

STRATUM DEPTH	DESCRIPTION OF MATERIAL	SAMPLE NO. & TYPE	SAMPLE DEPTH	BLOWS PER 6" ON SAMPLER	"N" BLOWS /FT. OR CORE REC.
0.0'	(Fill) Dense Brown Sand				
		1A	1.0- 2.5'	8-16-20	36
3.0'	(Fill) Loose Gray Fly Ash	2A	3.5- 5.0'	3-4-6	10
	(Becomes Medium Dense at 8.5')	1C	6.5- 8.5'		24"
10.0'		3A	8.5-10.0'	5-7-8	15
	(Becomes Loose at 11.0')	4A	11.0-12.5'	3-4-3	7
		5A	13.5-15.0'	4-1-2	7
	(Becomes Very Loose at 18.5')	2C	16.5-18.5'		0"
20.0'		6A	18.5-20.0'	1-0-4	4
		3C	21.5-23.5'		16"
		7A	23.5-25.0'	1-0-0	0
30.0'		4C	29.0-31.0'		8"
32.0'		8A	31.0-32.5'	1-2-10	12
	(Original) Very Stiff Brown Clay and Sand, trace of Silt with 1" to 4" Sand Seams - Moist	9A	33.5-35.0'	4-9-8	17
	(Becomes Stiff at 36.0')	10A	36.0-37.5'	2-5-8	13
40.0'	(Becomes Very Stiff at 38.5')	11A	38.5-40.0'	5-6-16	22
	Bottom of Boring at 40.0'				

METHOD: Hollow Auger

TECHNICIAN: BC-RK

JOB NO.: 03985

WATER OBSERVATIONS

INITIAL DEPTH: 18.5'/23.5'

COMPLETION DEPTH: *

DEPTH AFTER: _____ HRS. _____

TYPE SAMPLER:

X A. SPLIT SPOON

_____ B.

X C. SHELBY TUBE

* Filled in to 26.0'

BOWSER – MORNER
TESTING LABORATORIES, INC.

LOG OF BORING NO. 6A

PROPOSED DP&L DIKES - STUART STATION - ABERDEEN, OHIO

FLY ASH PIT

BORING LOCATION: As Shown on Boring Location Plan **DATE STARTED:** 10-8-74

SURFACE ELEVATION: 534.3' **DATE COMPLETED:** 10-8-74

STRATUM DEPTH	DESCRIPTION OF MATERIAL	SAMPLE NO. & TYPE	SAMPLE DEPTH	BLOWS PER 6" ON SAMPLER	"N" BLOWS /FT. OR CORE REC.
0.0'	(Fill) Medium Dense Brown Sand				
		1A	1.0- 2.5'	5-6-9	15
4.5'		2A	3.5- 5.0'	3-9-10	19
	(Fill) Medium Dense Gray Fly Ash	3A	6.0- 7.5'	4-6-6	12
10.0'	(Becomes Loose at 8.5')	4A	8.5-10.0'	1-2-5	7
	(Becomes Very Loose at 13.0')	1C	11.0-13.0'		24"
		5A	13.0-14.5'	3-2-1	3
		2C	16.0-18.0'		20"
20.0'		6A	18.0-19.5'	1-1-3	4
		3C	21.0-23.0'		24"
		7A	23.0-24.5'	3-1-1	2
29.0'	(Becomes Medium Dense at 28.0')	4C	26.0-28.0'		11"
30.0'	(Original) Stiff Brown Clay and Sand, some Silt with 1" to 4" Sand Seams - Moist	8A	28.0-29.5'	5-7-7	14
		9A	31.0-32.5'	1-1-4	5
36.0'	(Becomes Soft at 31.0')	10A	33.5-35.0'	1-2-3	5
38.0'	Medium Dense Brown Sand, trace of Silt with 1" to 3" Clay and Sand Layers - Moist	11A	36.0-37.5'	9-7-7	14
40.0'					
	Stiff Brown Clay and Sand, some Silt with 1" to 4" Sand Seams - Moist	12A	38.5-40.0'	5-7-7	14
		13A	41.0-42.5'	4-4-10	14
		14A	43.5-45.0'	4-6-6	12
		15A	46.0-47.5'	4-6-9	15
49.5'		16A	48.5-50.0'	4-7-19	26
50.0'	Medium Dense Brown Sand, some Gravel, trace of Silt - Wet	17A	51.0-52.5'	3-6-9	15
		18A	53.5-55.0'	9-14-16	30
	Bottom of Boring at 55.0'				

METHOD: Hollow Auger

TECHNICIAN: BC-RK

JOB NO.: 03985

WATER OBSERVATIONS

INITIAL DEPTH: 3.0'(tr)/26.0'

COMPLETION DEPTH: *

DEPTH AFTER: _____ HRS. _____

TYPE SAMPLER:

X A. SPLIT SPOON

_____ B.

X C. SHELBY TUBE

*Filled in to 30.0'

BOWSER – MORNER
TESTING LABORATORIES, INC.

LOG OF BORING NO. 7A

PROPOSED DP&L DIKES - STUART STATION - ABERDEEN, OHIO
FLY ASH PIT

BORING LOCATION: As Shown on Boring Location Plan **DATE STARTED:** 10-9-74

SURFACE ELEVATION: 532.0' **DATE COMPLETED:** 10-9-74

STRATUM DEPTH	DESCRIPTION OF MATERIAL	SAMPLE NO. & TYPE	SAMPLE DEPTH	BLOWS PER 6" ON SAMPLER	"N" BLOWS /FT. OR CORE REC.
0.0'	(Fill) Very Dense Sand, Gravel, Clay trace of Silt	1A	1.0- 2.5'	10-60+	70+
3.0'	(Fill) Very Loose Gray Fly Ash	1C	4.0- 6.0'		24"
		2A	6.0- 7.5'	1-2-2	4
10.0'		2C	8.0-10.0'		24"
		3A	10.0-11.5'	2-2-2	4
		3C	12.5-14.5'		10"
		4A	14.5-16.0'	2-1-2	3
	(Becomes Loose at 19.0')	4C	17.0-19.0'		12"
20.0'		5A	19.0-20.5'	3-4-4	8
	(Becomes Very Loose at 23.5')	5C	21.5-23.5'		6"
		6A	23.5-25.0'	1-0-0	0
		7A	26.0-27.5'	0-0-0	0
30.0'		8A	28.5-30.0'	0-0-0	0
31.0'	(Original) Stiff Brown Clay, some Sand, some Silt - Moist	9A	31.0-32.5'	4-6-7	13
		6C	33.5-35.5'		24"
	(With 1" to 3" Sand Seams at 35.5')	10A	35.5-37.0'	3-4-7	11
40.0'		7C	38.5-40.5'		24"
		11A	40.5-42.0'	4-5-6	11
	(Becomes Medium Stiff at 45.5') (With 1' Sand Seam at 46.0')	8C	43.5-45.5'		22"
		12A	45.5-47.0'	2-2-4	6
50.0'		9C	48.5-50.5'		24"
	Medium Dense Brown Sand, trace of Silt, trace of Gravel - Wet	13A	50.5-52.0'	2-5-8	13
		14A	53.5-55.0'	5-8-9	17
		15A	56.0-57.5'	11-15-10	25
60.0'	(Becomes Dense at 58.5')	16A	58.5-60.0'	14-19-20	39
	Bottom of Boring at 60.0'				

METHOD: Hollow Auger
TECHNICIAN: BC-RK
JOB NO.: 03985

WATER OBSERVATIONS
INITIAL DEPTH: *
COMPLETION DEPTH: **
DEPTH AFTER: ____ HRS. ____

TYPE SAMPLER:
X A. SPLIT SPOON
___ B.
X C. SHELBY TUBE

*15.0' (tr)/19.0'/23.5'/43.5'
** Filled in to 24.0'

BOWSER – MORNER
TESTING LABORATORIES, INC.

LOG OF BORING NO. 8A

PROPOSED DP&L DIKES - STUART STATION - ABERDEEN, OHIO

FLY ASH PIT

BORING LOCATION: As Shown on Boring Location Plan **DATE STARTED:** 10-10-74

SURFACE ELEVATION: 531.2' **DATE COMPLETED:** 10-10-74

STRATUM DEPTH	DESCRIPTION OF MATERIAL	SAMPLE NO. & TYPE	SAMPLE DEPTH	BLOWS PER 6" ON SAMPLER	"N" BLOWS /FT. OR CORE REC.
0.0'	(Fill) Medium Dense Sand, some Gravel, some Silt				
2.0'	(Fill) Medium Dense Gray Fly Ash (Becomes Loose at 3.5') (Becomes Very Loose at 6.0')	1A	1.0- 2.5'	5-6-7	13
		2A	3.5- 5.0'	3-3-5	8
		3A	6.0- 7.5'	1-1-1	2
10.0'		4A	8.5-10.0'	2-1-1	2
		5A	11.0-12.5'	4-3-2	5
		1C	15.0-17.0'		17"
		6A	17.0-18.5'	3-1-1	2
20.0'		2C	20.0-22.0'		20"
		7A	22.0-23.5'	2-1-0	1
		3C	25.0-27.0'		0"
		8A	27.0-28.5'	0-0-0	0
30.0'		4C	30.0-32.0'		0"
31.0'	(Original) Very Soft Brown Clay, some Sand, some Silt with 1" to 3" Sand Seams - Moist (Becomes Very Stiff at 36.0') (Becomes Stiff at 38.5')	9A	32.0-33.5'	0-0-1	1
		10A	36.0-37.5'	4-8-10	18
40.0'		11A	38.5-40.0'	4-5-7	12
		12A	41.0-42.5'	4-3-12	15
	(Becomes Medium Stiff at 46.0')	13A	43.5-45.0'	3-6-9	15
		14A	46.0-47.5'	3-3-3	6
49.0'					
50.0'	Medium Dense Brown Sand, trace of Silt, trace of Gravel - Wet	15A	48.5-50.0'	7-11-14	25
		16A	51.0-52.5'	4-6-8	14
		17A	53.5-55.0'	5-9-9	18
	Bottom of Boring at 55.0'				

METHOD: Hollow Auger

TECHNICIAN: BC-RK

JOB NO.: 03985

WATER OBSERVATIONS

INITIAL DEPTH: (tr)4.0'/17.0'

COMPLETION DEPTH: *

DEPTH AFTER: _____ HRS. _____

TYPE SAMPLER:

X A. SPLIT SPOON

_____ B.

X C. SHELBY TUBE

* Filled in to 21.0'

BOWSER – MORNER
TESTING LABORATORIES, INC.

LOG OF BORING NO. 9A

PROPOSED DP&L DIKES - STUART STATION - ABERDEEN, OHIO

FLY ASH PIT

BORING LOCATION: As Shown on Boring Location Plan **DATE STARTED:** 10-17-74

SURFACE ELEVATION: 531.7' **DATE COMPLETED:** 10-17-74

STRATUM DEPTH	DESCRIPTION OF MATERIAL	SAMPLE NO. & TYPE	SAMPLE DEPTH	BLOWS PER 6" ON SAMPLER	"N" BLOWS /FT. OR CORE REC.
0.0'	(Fill) Brown Sand and Gravel, trace of Silt - Dry				
1.0'	(Fill) Stiff Brown Clay, some Silt, some Sand - Moist	1A	1.0- 2.5'	6-4-7	11
3.0'	(Fill) Loose Fly Ash	2A	3.5-5.0'	4-6-4	10
	(Becomes Very Loose at 6.0')	3A	6.0-7.5'	1-1-1	2
10.0'	(Becomes Loose at 8.5')	4A	8.5-10.0'	2-3-3	6
		1C	11.5-13.5'		22"
	(Becomes Very Loose at 13.5')	5A	13.5-15.0'	2-2-2	4
	(Becomes Loose at 16.0')	6A	16.0-17.5'	7-4-4	8
20.0'	(Becomes Very Loose at 18.5')	7A	18.5-20.0'	0-1-0	1
		2C	22.5-24.5'		0"
		8A	24.5-26.0'	0-0-0	0
30.0'		3C	28.5-30.5'		0"
31.0'		9A	30.5-32.0'	10-9-13	22
	(Original) Very Stiff Brown Clay and Sand, trace of Silt - Moist (Becomes Stiff at 33.5')	10A	33.5-35.0'	4-5-9	14
		11A	36.0-37.5'	4-5-7	12
40.0'		12A	38.5-40.0'	5-6-8	14
	Bottom of Boring at 40.0'				

METHOD: Hollow Auger

TECHNICIAN: BC-BK-MF

JOB NO.: 03985

WATER OBSERVATIONS

INITIAL DEPTH: 8.0/21.0'

COMPLETION DEPTH: 20.0'

DEPTH AFTER: _____ HRS. _____

TYPE SAMPLER:

X A. SPLIT SPOON

___ B.

X C. SHELBY TUBE

BOWSER – MORNER
TESTING LABORATORIES, INC.

LOG OF BORING NO. 10A

PROPOSED DP&L DIKES - STUART STATION - ABERDEEN, OHIO

FLY ASH PIT

BORING LOCATION: As Shown on Boring Location Plan **DATE STARTED:** 10-22-74

SURFACE ELEVATION: 533.2' **DATE COMPLETED:** 10-22-74

STRATUM DEPTH	DESCRIPTION OF MATERIAL	SAMPLE NO. & TYPE	SAMPLE DEPTH	BLOWS PER 6" ON SAMPLER	"N" BLOWS /FT. OR CORE REC.
0.0'	(Fill) Medium Dense Brown Sand, trace of Silt with 1" to 3" Clay Layers - Damp	1A	1.0- 2.5'	5-11-14	25
	(Becomes Loose at 3.5')	2A	3.5- 5.0'	4-4-4	8
	(Becomes Very Loose at 6.0')	3A	6.0- 7.5'	2-2-3	5
10.0'		4A	8.5-10.0'	1-1-3	4
	(Becomes Loose at 11.0')	5A	11.0-12.5'	4-4-2	6
13.0'	(Fill) Loose Fly Ash	6A	13.5-15.0'	1-4-3	7
	(Becomes Very Loost at 18.0')	1C	16.0-18.0'		10"
20.0'		7A	18.0-19.5'	1-1-1	2
		2C	20.5-22.5'		19"
		8A	22.5-24.0'	0-0-0	0
		3C	26.0-28.0'		17"
30.0'		9A	28.0-29.5'	0-0-0	0
31.0'					
33.0'	(Original) Stiff Brown Clay, some Silt, some Sand with 1" to 3" Sand Seams - Moist	10A	31.0-32.5'	3-6-9	15
40.0'	Stiff Brown Clay and Sand, trace of Silt with 1" to 3" Sand Seams - Moist (Becomes Very Stiff at 38.5')	11A	33.5-35.0'	4-6-7	13
		12A	36.0-37.5'	6-7-7	14
		13A	38.5-40.0'	5-4-13	17
	Bottom of Boring at 40.0'				

METHOD: Hollow Auger

TECHNICIAN: BC-BK-MF

JOB NO.: 03985

WATER OBSERVATIONS

INITIAL DEPTH: 13.0'

COMPLETION DEPTH: *

DEPTH AFTER: ____ HRS ____

TYPE SAMPLER:

X A. SPLIT SPOON

___ B.

X C. SHELBY TUBE

* Filled in to 8.0'

BOWSER – MORNER
TESTING LABORATORIES, INC.

LOG OF BORING NO. 11A

PROPOSED DP&L DIKES - STUART STATION - ABERDEEN, OHIO

FLY ASH PIT

BORING LOCATION: As Shown on Boring Location Plan **DATE STARTED:** 10-21-74

SURFACE ELEVATION: 533.3' **DATE COMPLETED:** 10-22-74

STRATUM DEPTH	DESCRIPTION OF MATERIAL	SAMPLE NO. & TYPE	SAMPLE DEPTH	BLOWS PER 6" ON SAMPLER	"N" BLOWS /FT. OR CORE REC.
0.0'	(Fill) Medium Dense Brown Sand, trace of Gravel, trace of Silt - Moist	1A	1.0- 2.5'	4-7-15	22
5.5'		2A	3.5- 5.0'	6-8-12	20
8.0'	(Fill) Loose Brown Sand, some Silt - Moist	3A	6.0- 7.5'	3-4-5	9
10.0'	(Fill) Very Loose Brown Sand, trace of Silt - Damp (Becomes Loose at 11.0') (Becomes Very Loose at 13.5')	4A	8.5-10.0'	1-2-2	4
		5A	11.0-12.5'	3-4-4	8
		6A	13.5-15.0'	1-1-1	2
16.0'	(Fill) Very Loose Fly Ash (With 6" Brown Clay Layer at 19.0')	7A	16.0-17.5'	1-0-1	1
20.0'		1C	18.5-20.5'		23"
		8A	20.5-22.0'	1-2-3	5
		2C	23.5-25.5'		0"
		9A	25.5-27.0'	0-0-0	0
30.0'		3C	28.5-30.5'		17"
30.5'	(Original) Very Stiff Brown Clay and Sand, trace of Silt - Moist	10A	30.5-32.0'	4-8-8	16
33.0'	Stiff Brown Clay, some Sand, some Silt with 1" to 4" Sand Seams - Moist	11A	33.5-35.0'	4-7-8	15
		12A	36.0-37.5'	4-8-6	14
40.0'		13A	38.5-40.0'	2-6-9	15
	Bottom of Boring at 40.0'				

METHOD: Hollow Auger

TECHNICIAN: BC-BK-MF

JOB NO.: 03985

WATER OBSERVATIONS

INITIAL DEPTH: 16.0'

COMPLETION DEPTH: *

DEPTH AFTER _____ HRS. _____

TYPE SAMPLER:

X A. SPLIT SPOON

___ B.

X C. SHELBY TUBE

* Filled in to 16.5'

BOWSER – MORNER
TESTING LABORATORIES, INC.

LOG OF BORING NO. 12A

PROPOSED DP&L DIKES - STUART STATION - ABERDEEN, OHIO
FLY ASH PIT

BORING LOCATION: As Shown on Boring Location Plan **DATE STARTED:** 10-21-74

SURFACE ELEVATION: 533.4' **DATE COMPLETED:** 10-21-74

STRATUM DEPTH	DESCRIPTION OF MATERIAL	SAMPLE NO. & TYPE	SAMPLE DEPTH	BLOWS PER 6" ON SAMPLER	"N" BLOWS /FT. OR CORE REC.
0.0'	(Fill) Stiff Brown Clay and Sand, some Silt, trace of Gravel with 1" to 4" Sand Seams - Moist	1A	1.0- 2.5'	6-6-7	13
5.5'	(Becomes Very Soft at 3.5')	2A	3.5- 5.0'	1-1-2	3
	(Fill) Medium Dense Brown Sand, trace of Gravel, trace of Silt - Moist	3A	6.0- 7.5'	4-5-6	11
10.0'		4A	8.5-10.0'	1-2-3	5
10.5'	(Becomes Very Loose at 8.5')				
	(Fill) Very Loose Brown Sand, some Silt - Wet	5A	11.0-12.5'	2-2-2	4
		6A	13.5-15.0'	1-2-1	3
16.0'	(Fill) Very Loose Fly Ash	7A	16.0-17.5'	1-1-1	2
20.0'		1C	18.5-20.5'		0"
		8A	20.5-22.0'	1-2-1	3
		2C	23.5-25.5'		8"
		9A	25.5-27.0'	0-0-0	0
29.0'					
30.0	(Original) Stiff Brown Clay, some Silt, some Sand with 1" to 3" Sand Seams - Moist	10A	28.5-30.0'	4-5-6	11
	(Becomes Medium Stiff at 31.0')	11A	31.0-32.5'	2-4-5	9
	(Becomes Very Stiff at 33.5')	12A	33.5-35.0'	6-8-13	21
		13A	36.0-37.5'	6-7-9	16
40.0'		14A	38.5-40.0'	4-8-8	16
	Bottom of Boring at 40.0'				

METHOD: Hollow Auger

TECHNICIAN: BC-BK-MF

JOB NO.: 03985

WATER OBSERVATIONS

INITIAL DEPTH: (tr)3.5'/10.5'

COMPLETION DEPTH: *

DEPTH AFTER: _____ HRS. _____

TYPE SAMPLER:

X A. SPLIT SPOON

_____ B.

X C. SHELBY TUBE

* Filled in to 12'

BOWSER – MORNER
TESTING LABORATORIES, INC.

LOG OF BORING NO. 13A

PROPOSED DP&L DIKES - STUART STATION - ABERDEEN, OHIO
FLY ASH PIT

BORING LOCATION: As Shown on Boring Location Plan **DATE STARTED:** 10-21-74

SURFACE ELEVATION: 534.1' **DATE COMPLETED:** 10-21-74

STRATUM DEPTH	DESCRIPTION OF MATERIAL	SAMPLE NO. & TYPE	SAMPLE DEPTH	BLOWS PER 6" ON SAMPLER	"N" BLOWS /FT. OR CORE REC.
0.0'	(Fill) Medium Dense Brown Sand, some Gravel, some Silt - Moist				
		1A	1.0- 2.5'	6-6-14	20
5.5'		2A	3.5- 5.0'	9-10-14	24
	(Fill) Loose Brown Sand, trace of Gravel, trace of Silt - Damp	3A	6.0- 7.5'	2-4-5	9
10.0'		4A	8.5-10.0'	2-3-6	9
		5A	11.0-12.5'	1-2-4	6
	(Becomes Very Loose at 13.5')	6A	13.5-15.0'	1-2-3	5
16.0'					
20.0'	(Fill) Very Loose Fly Ash (With 6" Clay Layer at 19.0')	7A	16.0-17.5'	2-2-2	4
		1C	18.5-20.5'		17"
		8A	20.5-22.0'	1-1-1	2
		2C	23.5-25.5'		22"
	(Becomes Medium Dense at 25.5')	9A	25.5-27.0'	18-10-4	14
29.5'					
30.0	(Original) Stiff Brown Clay, some Silt, some Sand - Moist	3C	28.5-30.5'		24"
		10A	30.5-32.0'	4-6-6	12
33.0'					
35.5'	Medium Dense Brown Sand, trace of Gravel, trace of Silt - Damp	11A	33.5-35.0'	6-10-12	22
		12A	36.0-37.5'	11-11-12	23
40.0'	Medium Dense Brown Sand and Gravel, trace of Silt - Moist	13A	38.5-40.0'	7-10-15	25
	Bottom of Boring at 40.0'				

METHOD: Hollow Auger

TECHNICIAN: BC-BK-MF

JOB NO.: 03985

WATER OBSERVATIONS

INITIAL DEPTH (tr) 11.0'

COMPLETION DEPTH: *

DEPTH AFTER _____ HRS. _____

TYPE SAMPLER:

X A. SPLIT SPOON

_____ B.

X C. SHELBY TUBE

* Filled in to 14.0'

BOWSER – MORNER
TESTING LABORATORIES, INC.

LOG OF BORING NO. 14A

PROPOSED DP&L DIKES - STUART STATION - ABERDEEN, OHIO

FLY ASH PIT

BORING LOCATION: As Shown on Boring Location Plan **DATE STARTED:** 10-17-74

SURFACE ELEVATION: 533.7' **DATE COMPLETED:** 10-18-74

STRATUM DEPTH	DESCRIPTION OF MATERIAL	SAMPLE NO. & TYPE	SAMPLE DEPTH	BLOWS PER 6" ON SAMPLER	"N" BLOWS /FT. OR CORE REC.
0.0'	(Fill) Dense Brown Sand, some Silt - Moist				
3.0'		1A	1.0- 2.5'	11-15-15	30
	(Fill) Medium Dense Brown Sand, trace of Silt - Moist	2A	3.5- 5.0'	10-9-9	18
	(Becomes Loose at 6.0')	3A	6.0- 7.5'	2-3-4	7
10.0'	(Becomes Very Loose at 8.5')	4A	8.5-10.0'	1-2-3	5
		5A	11.0-12.5'	2-3-1	4
16.0'		6A	13.5-15.0'	2-2-2	4
	(Fill) Very Loose Fly Ash	7A	16.0-17.5'	0-1-0	1
20.0'		8A	18.5-20.0'	0-1-0	1
		1C	21.0-23.0'		20"
26.0'		2C	25.0-27.0'		21"
	(Original) Very Stiff Brown Clay and Sand, trace of Silt with 1" to 4" Sand Seams - Moist	9A	27.0-28.5'	7-13-27	30
30.0'	(Becomes Stiff at 31.0')	10A	31.0-32.5'	4-4-10	14
35.0'	(Becomes Very Stiff at 33.5')	11A	33.5-35.0'	5-9-13	22
	Dense Brown Sand and Gravel, trace of Silt - Wet	12A	36.0-37.5'	2-16-18	34
40.0'	(Becomes Medium Dense at 38.5')	13A	38.5-40.0'	9-10-13	23
	Bottom of Boring at 40.0'				

METHOD: Hollow Auger

TECHNICIAN: BC-BK-MF

JOB NO.: 03985

WATER OBSERVATIONS

INITIAL DEPTH: 16.0'/35.0'

COMPLETION DEPTH: None

DEPTH AFTER: _____ HRS. _____

TYPE SAMPLER:

X A. SPLIT SPOON

_____ B.

X C. SHELBY TUBE

BOWSER – MORNER
TESTING LABORATORIES, INC.

LOG OF BORING NO. 1B

PROPOSED DP&L DIKES - STUART STATION - ABERDEEN, OHIO
EXISTING DIKE

BORING LOCATION: As Shown on Boring Location Plan **DATE STARTED:** 10-28-74

SURFACE ELEVATION: 535.1' **DATE COMPLETED:** 10-28-74

STRATUM DEPTH	DESCRIPTION OF MATERIAL	SAMPLE NO. & TYPE	SAMPLE DEPTH	BLOWS PER 6" ON SAMPLER	"N" BLOWS /FT. OR CORE REC.
0.0'	(Fill) Medium Dense Brown Sand and Gravel, trace of Silt - Damp	1A	1.0- 2.5'	5-3-9	12
4.0'	(Fill) Dense Fly Ash (Becomes Medium Dense at 8.5')	2A	3.5- 5.0'	23-21-25	46
		3A	6.0- 7.5'	8-12-21	33
10.0'		4A	8.5-10.0'	10-13-10	23
		5A	11.0-12.5'	6-6-8	14
	(Becomes Loose at 13.5')	6A	13.5-15.0'	4-4-5	9
17.0'	(Becomes Very Loose at 16.0')	7A	16.0-17.5'	2-2-2	4
20.0'	(Fill) Soft Brown Clay, some Silt, some Sand - Moist (Becomes Medium Stiff at 20.5')	1C	18.5-20.5'		23"
		8A	20.5-22.0'	2-4-6	10
25.5'		2C	23.5-25.5'		22"
	(Original) Hard Brown Clay, some Silt, some Sand - Moist (Becomes Very Stiff at 28.5')	9A	25.5-27.0'	6-13-23	36
30.0'		10A	28.5-30.0'	6-13-17	30
		11A	31.0-32.5'	7-11-14	25
		12A	33.5-35.0'	6-12-16	28
	Bottom of Boring at 35.0'				

METHOD: Hollow Auger

TECHNICIAN: BC-BK-MF

JOB NO.: 03985

WATER OBSERVATIONS

INITIAL DEPTH: 15.5'

COMPLETION DEPTH: None

DEPTH AFTER: _____ HRS. _____

TYPE SAMPLER:

X A. SPLIT SPOON

_____ B.

X C. SHELBY TUBE

BOWSER – MORNER
TESTING LABORATORIES, INC.

LOG OF BORING NO. 2B

PROPOSED DP&L DIKES - STUART STATION - ABERDEEN, OHIO
EXISTING DIKE

BORING LOCATION: As Shown on Boring Location Plan **DATE STARTED:** 10-28-74

SURFACE ELEVATION: 534.9' **DATE COMPLETED:** 10-28-74

STRATUM DEPTH	DESCRIPTION OF MATERIAL	SAMPLE NO. & TYPE	SAMPLE DEPTH	BLOWS PER 6" ON SAMPLER	"N" BLOWS /FT. OR CORE REC.
0.0'	(Fill) Brown Sand and Gravel, trace of Silt - Moist				
1.0'	(Fill) Medium Dense Brown Sand and Gravel, some Silt with 1" to 4" Clay Layers - Damp (Becomes Dense at 3.5')	1A	1.0- 2.5'	4-6-7	13
		2A	3.5- 5.0'	12-23-18	41
5.5'					
10.0'	(Fill) Medium Dense Fly Ash (Becomes Loose at 8.5') (Becomes Very Loose at 13.5')	3A	6.0-7.5'	8-9-11	20
		4A	8.5-10.0'	1-2-8	10
		5A	11.0-12.5'	4-5-4	9
		6A	13.5-15.0'	1-1-2	3
		7A	16.0-17.5'	2-2-3	5
20.0'		8A	18.5-20.0'	0-0-0	0
		9A	21.0-22.5'	4-2-2	4
24.5'		10A	23.5-25.0'	1-8-14	22
	(Original) Very Stiff Brown Clay, some Silt, some Sand - Moist (Becomes Hard at 26.0')	11A	26.0-27.5'	14-18-14	32
28.5'					
30.0	Stiff Brown Clay and Sand, trace of Silt - Moist	1C	28.5-30.5'		18"
		12A	30.5-32.0'	5-6-7	13
		13A	33.5-35.0'	6-6-7	13
	Bottom of Boring at 35.0'				

METHOD: Hollow Auger

TECHNICIAN: BC-BK-MF

JOB NO.: 03985

WATER OBSERVATIONS

INITIAL DEPTH: 8.0'

COMPLETION DEPTH: None

DEPTH AFTER: _____ HRS. _____

TYPE SAMPLER:

X A. SPLIT SPOON

_____ B.

X C. SHELBY TUBE

BOWSER – MORNER
TESTING LABORATORIES, INC.

LOG OF BORING NO. 3B

PROPOSED DP&L DIKES - STUART STATION - ABERDEEN, OHIO

EXISTING DIKE

BORING LOCATION: As Shown on Boring Location Plan **DATE STARTED:** 10-28-74

SURFACE ELEVATION: 532.6' **DATE COMPLETED:** 10-29-74

STRATUM DEPTH	DESCRIPTION OF MATERIAL	SAMPLE NO. & TYPE	SAMPLE DEPTH	BLOWS PER 6" ON SAMPLER	"N" BLOWS /FT. OR CORE REC.
0.0'	(Fill) Medium Dense Brown Sand, trace of Gravel, trace of Silt - Damp	1A	1.0- 2.5'	6-7-8	15
3.5'	(Fill) Medium Dense Fly Ash	2A	3.5- 5.0'	5-5-6	11
	(Becomes Very Loose at 6.0')	3A	6.0- 7.5'	1-2-2	4
10.0'	(Becomes Loose at 8.5')	4A	8.5-10.0'	3-3-5	8
	(Becomes Very Loose at 11.0')	5A	11.0-12.5'	2-1-2	3
		6A	13.5-15.0'	3-3-2	5
		7A	16.0-17.5'	1-1-1	2
20.0'		8A	18.5-20.0'	0-0-0	0
		9A	21.0-22.5'	1-1-2	3
24.0'		10A	23.5-25.0'	8-11-14	25
28.5'	(Fill) Very Stiff Brown Clay, some Silt, some Sand with 1" to 3" Sand Seams - Moist	11A	26.0-27.5'	4-6-6	12
30.0'	(Becomes Stiff at 26.0')				
	(Original) Hard Brown Clay, some Silt, some Sand - Moist	12A	28.5-30.0'	13-21-27	48
	(Becomes Very Stiff at 31.0')	13A	31.0-32.5'	9-12-16	28
	(Becomes Hard at 33.5')	14A	33.5-35.0'	9-12-21	33
40.0'	(Becomes Very Stiff at 36.0')	15A	36.0-37.5'	9-7-20	27
		16A	38.5-40.0'	7-9-12	21
		17A	41.0-42.5'	5-9-13	22
		18A	43.5-45.0'	6-7-17	24
		19A	46.0-47.5'	6-8-10	18
48.0'					
50.0'	Dense Brown Sand and Gravel, trace of Silt - Wet	20A	48.5-50.0'	27-22-25	47
50.5'	Medium Dense Brown Sand, trace of Silt - Wet	21A	51.0-52.5'	6-9-11	20
		22A	53.5-55.0'	11-13-15	28
	Bottom of Boring at 55.0'				

METHOD: Hollow Auger

TECHNICIAN: BC-BK-MF

JOB NO.: 03985

WATER OBSERVATIONS

INITIAL DEPTH: *

COMPLETION DEPTH: 44.0'

DEPTH AFTER: _____ HRS _____

TYPE SAMPLER:

X A. SPLIT SPOON

_____ B.

_____ C. SHELBY TUBE

* (tr) 6.0'/18.5'/46.0'

BOWSER – MORNER
TESTING LABORATORIES, INC.

LOG OF BORING NO. 4B

PROPOSED DP&L DIKES - STUART STATION - ABERDEEN, OHIO

EXISTING DIKE

BORING LOCATION: As Shown on Boring Location Plan **DATE STARTED:** 10-29-74

SURFACE ELEVATION: 532.4' **DATE COMPLETED:** 10-29-74

STRATUM DEPTH	DESCRIPTION OF MATERIAL	SAMPLE NO. & TYPE	SAMPLE DEPTH	BLOWS PER 6" ON SAMPLER	"N" BLOWS /FT. OR CORE REC.
0.0'	(Fill) Medium Dense Brown Sand, some Silt - Moist	1A	1.0- 2.5'	4-6-8	14
		2A	3.5- 5.0'	7-7-5	12
5.5'		3A	6.0- 7.5'	1-3-4	7
8.0'	(Fill) Loose Brown Sand, trace of Silt - Damp				
9.5'	(Fill) Soft Brown Clay, some Silt, some Sand - Moist				
10.5'	(Fill) Very Loose Fly Ash	4A	8.5-10.0'	1-3-1	4
	(Fill) Very Stiff Brown Clay, some Silt, some Sand - Moist (Becomes Hard at 15.5')	5A	11.0-12.5'	8-10-11	21
		1C	13.5-15.5'		18"
20.0'		6A	15.5-17.0'	14-15-20	35
		2C	18.5-20.5'		20"
23.0'	(Original) Hard Brown Clay and Sand, trace of Silt - Damp (Becomes Very Stiff and Moist with 1" to 4" Sand Seams at 26.0')	7A	20.5-22.0'	9-14-19	33
		8A	23.5-25.0'	4-18-18	36
		9A	26.0-27.5'	9-10-9	19
30.0'		10A	28.5-30.0'	7-9-11	20
		11A	31.0-32.5'	5-9-8	17
		12A	33.5-35.0'	8-10-12	22
	Bottom of Boring at 35.0'				

METHOD: Hollow Auger

TECHNICIAN: BC-BK

JOB NO.: 03985

WATER OBSERVATIONS

INITIAL DEPTH: None

COMPLETION DEPTH: None

DEPTH AFTER: _____ HRS. _____

TYPE SAMPLER:

X A. SPLIT SPOON

_____ B.

X C. SHELBY TUBE

BOWSER – MORNER
TESTING LABORATORIES, INC.

LOG OF BORING NO. 5B

PROPOSED DP&L DIKES - STUART STATION - ABERDEEN, OHIO
EXISTING DIKE

BORING LOCATION: As Shown on Boring Location Plan **DATE STARTED:** 10-29-74

SURFACE ELEVATION: 534.1' **DATE COMPLETED:** 10-29-74

STRATUM DEPTH	DESCRIPTION OF MATERIAL	SAMPLE NO. & TYPE	SAMPLE DEPTH	BLOWS PER 6" ON SAMPLER	"N" BLOWS /FT. OR CORE REC.
0.0'	(Fill) Soft Brown Clay and Sand, trace of Silt - Moist	1A	1.0-2.5'	4-3-2	5
4.5'	(Becomes Hard at 3.5')	2A	3.5-5.0'	18-16-16	32
9.5'	(Fill) Medium Dense Brown Sand, some Gravel, some Silt - Moist	3A	6.0-7.5'	8-5-6	11
10.0'	(Becomes Very Loose at 8.5')	4A	8.5-10.0'	2-1-3	4
10.5'	(Fill) Medium Stiff Brown Clay, some Sand, trace of Gravel, trace of Silt - Moist				
12.0'	(Fill) Loose Brown Sand, some Silt - Moist	5A	11.0-12.5'	3-7-10	17
20.0'	(Fill) Very Stiff Brown Clay, some Silt, some Sand - Moist	6A	13.5-15.0'	4-9-14	23
		1C	17.0-19.0'		10"
	(Becomes Hard at 19.0')	7A	19.0-20.5'	6-12-21	33
	(Original) Hard Brown Clay, some Silt, some Sand - Moist	2C	21.5-23.5'		24"
		8A	23.5-25.0'	13-19-25	44
		9A	26.0-27.5'	9-13-17	30
30.0'	(Becomes Very Stiff at 26.0')	10A	28.5-30.0'	7-8-10	18
30.5'	Very Stiff Brown Clay and Sand, trace of Silt with 1" to 4" Sand Seams - Moist	11A	31.0-32.5'	7-11-14	25
		12A	33.5-35.0'	5-8-13	21
	Bottom of Boring at 35.0'				

METHOD: Hollow Auger
TECHNICIAN: BC-BK
JOB NO.: 03985

WATER OBSERVATIONS
INITIAL DEPTH: None
COMPLETION DEPTH: None
DEPTH AFTER _____ HRS _____

TYPE SAMPLER:
X A. SPLIT SPOON
_____ B.
X C. SHELBY TUBE

BOWSER – MORNER
TESTING LABORATORIES, INC.

LOG OF BORING NO. 6B

PROPOSED DP&L DIKES - STUART STATION - ABERDEEN, OHIO

EXISTING DIKE

BORING LOCATION: As Shown on Boring Location Plan **DATE STARTED:** 10-29-74

SURFACE ELEVATION: 531.6' **DATE COMPLETED:** 10-29-74

STRATUM DEPTH	DESCRIPTION OF MATERIAL	SAMPLE NO. & TYPE	SAMPLE DEPTH	BLOWS PER 6" ON SAMPLER	"N" BLOWS /FT. OR CORE REC.
0.0'	(Fill) Brown Silt and Sand - Moist				
1.5'	(Fill) Medium Dense Fly Ash	1A	1.0- 2.5'	4-4-7	11
	(Becomes Loose at 3.5')	2A	3.5- 5.0'	2-2-4	6
	(Becomes Very Loose at 6.0')	3A	6.0- 7.5'	1-1-1	2
10.0'	(Becomes Loose at 8.5')	4A	8.5-10.0'	1-2-4	6
		5A	11.0-12.5'	3-3-6	9
14.0'	(Fill) Very Stiff Brown Clay, some Silt, some Sand - Moist	6A	13.5-15.0'	2-8-17	25
	(Becomes Hard at 19.0')	1C	17.0-19.0'		24"
20.0'		7A	19.0-20.5'	9-16-21	37
		2C	21.5-23.5'		24"
24.0'	(Original) Very Stiff Brown Clay, some Silt, some Sand - Moist	8A	23.5-25.0'	9-10-12	22
		3C	26.5-28.5'		24"
29.0'	Stiff Brown Clay and Sand, trace of Silt with 1" to 3" Sand Seams - Moist	9A	28.5-30.0'	6-4-7	11
30.0'		10A	31.0-32.5'	5-5-8	13
	(Becomes Very Stiff at 33.5')	11A	33.5-35.0'	4-8-8	16
	Bottom of Boring at 35.0'				

METHOD: Hollow Auger

TECHNICIAN: BC-BK

JOB NO.: 03985

WATER OBSERVATIONS

INITIAL DEPTH 3.0'

COMPLETION DEPTH: *

DEPTH AFTER: ____ HRS ____

TYPE SAMPLER:

X A. SPLIT SPOON

___ B.

X C. SHELBY TUBE

* Filled in to 31.0'

BOWSER – MORNER
TESTING LABORATORIES, INC.

LOG OF BORING NO. 1C

PROPOSED DP&L DIKES - STUART STATION - ABERDEEN, OHIO

COAL STORAGE FILL

BORING LOCATION: As Shown on Boring Location Plan **DATE STARTED:** 10-23-74

SURFACE ELEVATION: 533.2' **DATE COMPLETED:** 10-23-74

STRATUM DEPTH	DESCRIPTION OF MATERIAL	SAMPLE NO. & TYPE	SAMPLE DEPTH	BLOWS PER 6" ON SAMPLER	"N" BLOWS /FT. OR CORE REC.
0.0'	(Fill) Medium Dense Brown Sand, trace of Gravel, trace of Silt - Damp				
2.5'		1A	1.0- 2.5'	10-12-14	26
	(Fill) Medium Dense Fly Ash	2A	3.5- 5.0'	4-6-6	12
		3A	6.0- 7.5'	4-6-6	12
10.0'	(Becomes Loose at 8.5')	4A	8.5-10.0'	5-5-5	10
		5A	11.0-12.5'	2-4-6	10
		6A	13.5-15.0'	2-3-3	6
	(Becomes Very Loose at 16.0')	7A	16.0-17.5'	4-1-4	5
20.0'	(Becomes Loose at 18.5')	8A	18.5-20.0'	2-3-4	7
		9A	21.0-22.5'	6-5-5	10
	(Becomes Very Loose at 23.5')	10A	23.5-25.0'	4-2-3	5
	(Becomes Loose at 26.0')	11A	26.0-27.5'	2-5-5	10
30.0'		12A	28.5-30.0'	2-3-4	7
31.0'		13A	31.0-32.5'	7-6-10	16
	(Original) Very Stiff Brown Clay and Sand, trace of Silt with 1" to 4" Sand Seams - Moist	14A	33.5-35.0'	5-7-9	16
	Bottom of Boring at 35.0'				

METHOD: Hollow Auger

TECHNICIAN: BC-BK-MF

JOB NO.: 03985

WATER OBSERVATIONS

INITIAL DEPTH: 18.5'/33.0'

COMPLETION DEPTH: 26.0'

DEPTH AFTER _____ HRS. _____

TYPE SAMPLER:

X A. SPLIT SPOON

___ B.

X C. SHELBY TUBE

BOWSER – MORNER
TESTING LABORATORIES, INC.

LOG OF BORING NO. 2C

PROPOSED DP&L DIKES - STUART STATION - ABERDEEN, OHIO

COAL STORAGE FILL

BORING LOCATION: As Shown on Boring Location Plan **DATE STARTED:** 10-18-74

SURFACE ELEVATION: 533.4' **DATE COMPLETED:** 10-18-74

STRATUM DEPTH	DESCRIPTION OF MATERIAL	SAMPLE NO. & TYPE	SAMPLE DEPTH	BLOWS PER 6" ON SAMPLER	"N" BLOWS /FT. OR CORE REC.
0.0'	(Fill) Medium Dense Brown Sand, trace of Gravel, trace of Silt - Damp	1A	1.0- 2.5'	5-8-15	23
3.0'					
3.5'	(Fill) Fly Ash				
	(Fill) Medium Dense Coal and Brown Clay	2A	3.5-5.0'	7-10-13	23
8.0'		3A	6.0-7.5'	5-7-11	18
10.0'	(Fill) Very Stiff Brown Clay, some Silt, some Sand - Moist	4A	8.5-10.0'	3-8-13	21
	(Becomes Soft at 13.5')	1C	11.5-13.5'		21"
	(With Fly Ash at 16.0')	5A	13.5-15.0'	0-1-3	4
		6A	16.0-17.5'	4-2-2	4
19.0'					
20.0'	(Original) Hard Brown Clay, some Silt, some Sand - Damp	7A	18.5-20.0'	10-17-36	53
		8A	21.0-22.5'	13-14-19	33
		9A	23.5-25.0'	10-19-20	39
		10A	26.0-27.5'	10-17-25	42
30.0'		11A	28.5-30.0'	9-15-18	33
30.5'					
33.0'	Hard Brown Clay and Sand, trace of Silt, trace of Gravel with 1" to 4" Sand and Gravel Seams - Moist	12A	31.0-32.5'	11-19-22	41
	Dense Brown Sand, some Silt, trace of Gravel - Moist	13A	33.5-35.0'	12-14-20	34
	Bottom of Boring at 35.0'				

METHOD: Hollow Auger

TECHNICIAN: BC-BK-MF

JOB NO.: 03985

WATER OBSERVATIONS

INITIAL DEPTH: None

COMPLETION DEPTH: None

DEPTH AFTER: _____ HRS. _____

TYPE SAMPLER:

X A. SPLIT SPOON

___ B.

X C. SHELBY TUBE

BOWSER – MORNER
TESTING LABORATORIES, INC.

LOG OF BORING NO. 3C

PROPOSED DP&L DIKES - STUART STATION - ABERDEEN, OHIO
COAL STORAGE FILL

BORING LOCATION: As Shown on Boring Location Plan **DATE STARTED:** 10-30-74

SURFACE ELEVATION: 543.5' **DATE COMPLETED:** 10-30-74

STRATUM DEPTH	DESCRIPTION OF MATERIAL	SAMPLE NO. & TYPE	SAMPLE DEPTH	BLOWS PER 6" ON SAMPLER	"N" BLOWS /FT. OR CORE REC.
0.0'	(Fill) Medium Dense Coal				
		1A	1.0- 2.5'	6-5-8	13
		2A	3.5- 5.0'	7-7-7	14
	(Becomes Loose at 6.0')	3A	6.0- 7.5'	3-4-2	6
10.0'	(Becomes Medium Dense at 8.5')	4A	8.5-10.0'	6-7-6	13
13.0'	(Becomes Dense at 11.0')	5A	11.0-12.5'	4-13-24	37
	(Fill) Hard Brown Clay, some Silt, some Sand, trace of Gravel - Moist	6A	13.5-15.0'	21-26-24	50
16.0'	(Original) Very Stiff Brown Clay, some Silt, some Sand - Moist (Becomes Hard at 18.5')	7A	16.0-17.5'	13-13-14	27
20.0'		8A	18.5-20.0'	8-11-21	32
		1C	21.5-23.5'		22"
26.0'	(Becomes Very Stiff at 23.5')	9A	23.5-25.0'	6-12-15	27
	Hard Brown Clay and Sand, trace of Silt with 1" to 3" Sand Seams - Damp	10A	26.0-27.5'	6-12-19	31
30.0'		11A	28.5-30.0'	7-11-14	25
33.0'	(Becomes Very Stiff at 28.5')	12A	31.0-32.5'	8-10-17	27
	Medium Dense Brown Sand, trace of Silt with 1" to 4" Clay Seams - Dry	13A	33.5-35.0'	9-12-15	27
38.0'		14A	36.0-37.5'	6-11-13	24
40.0'	Very Stiff Brown Clay and Sand, trace of Silt with 1" to 4" Sand Seams - Moist	15A	38.5-40.0'	5-7-9	16
	Bottom of Boring at 40.0'				

METHOD: Hollow Auger

TECHNICIAN: BC-BK

JOB NO.: 03985

WATER OBSERVATIONS

INITIAL DEPTH: 13.0'

COMPLETION DEPTH: 10.5'

DEPTH AFTER: _____ HRS. _____

TYPE SAMPLER:

X A. SPLIT SPOON

_____ B.

X C. SHELBY TUBE

BOWSER – MORNER
TESTING LABORATORIES, INC.

LOG OF BORING NO. 1D

PROPOSED DP&L DIKES - STUART STATION - ABERDEEN, OHIO
ORIGINAL GROUND AREA

BORING LOCATION: As Shown on Boring Location Plan **DATE STARTED:** 10-22-74

SURFACE ELEVATION: 535.7' **DATE COMPLETED:** 10-22-74

STRATUM DEPTH	DESCRIPTION OF MATERIAL	SAMPLE NO. & TYPE	SAMPLE DEPTH	BLOWS PER 6" ON SAMPLER	"N" BLOWS /FT. OR CORE REC.
0.0'	Very Stiff Brown Clay, some Silt, some Sand, trace of Gravel - Moist	1A	1.0- 2.5'	9-12-17	29
	(Becomes Stiff at 5.0')	1C 2A	3.0- 5.0' 5.0- 6.5'	4-6-7	20" 13
10.0	(Becomes Medium Stiff at 8.5')	3A	8.5-10.0'	2-4-3	7
13.0'	Medium Dense Brown Sand and Gravel, trace of Silt - Moist	4A	13.5-15.0'	5-7-18	25
20.0'	(Becomes Dense at 18.5')	5A	18.5-20.0'	13-19-23	42
22.0'	Medium Dense Brown Sand, trace of Silt, trace of Gravel - Damp	6A	23.5-25.0'	9-9-19	28
30.0'	(Becomes Dense at 28.5')	7A	28.5-30.0'	9-16-18	34
	Bottom of Boring at 30.0'				

METHOD: Hollow Auger

TECHNICIAN: BC-BK-MF

JOB NO.: 03985

WATER OBSERVATIONS

INITIAL DEPTH: None

COMPLETION DEPTH: None

DEPTH AFTER _____ HRS. _____

TYPE SAMPLER:

X A. SPLIT SPOON

___ B.

X C. SHELBY TUBE

BOWSER – MORNER
TESTING LABORATORIES, INC.

LOG OF BORING NO. 2D

PROPOSED DP&L DIKES - STUART STATION - ABERDEEN, OHIO
ORIGINAL GROUND AREA

BORING LOCATION: As Shown on Boring Location Plan **DATE STARTED:** 10-15-74

SURFACE ELEVATION: 540' ± **DATE COMPLETED:** 10-15-74

STRATUM DEPTH	DESCRIPTION OF MATERIAL	SAMPLE NO. & TYPE	SAMPLE DEPTH	BLOWS PER 6" ON SAMPLER	"N" BLOWS /FT. OR CORE REC.
0.0'	(Fill) Coal				
1.5'	(Original) Stiff Brown Clay, some Silt, some Sand, trace of Gravel - Moist	1A	1.5- 3.0'	5-5-6	11
		1C	4.0- 6.0'		24"
	(Becomes Very Stiff at 6.0')	2A	6.0- 7.5'	5-7-11	18
10.0'	(Becomes Medium Stiff at 8.5')	3A	8.5-10.0'	3-3-5	8
12.0'	Soft Brown Clay and Sand, some Silt, trace of Gravel - Moist	4A	13.5-15.0'	2-3-2	5
19.5'	Medium Dense Brown Sand and Gravel, some Silt - Wet	5A	18.5-20.0'	1-8-8	16
20.0'	(Becomes Very Loose at 23.5')	6A	23.5-25.0'	3-2-2	4
28.5'	Dense Brown Sand and Gravel, trace of Silt - Moist	7A	28.5-30.0'	8-13-20	33
30.0	Bottom of Boring at 30.0'				

METHOD: Hollow Auger
TECHNICIAN: BC-BK-MF
JOB NO.: 03985

WATER OBSERVATIONS
INITIAL DEPTH: 19.5'*
COMPLETION DEPTH: 19.5'
DEPTH AFTER: ____ HRS. ____

TYPE SAMPLER:
X A. SPLIT SPOON
___ B.
X C. SHELBY TUBE

* With traces of water at 1.0' and 15.0'

BOWSER – MORNER
TESTING LABORATORIES, INC.

LOG OF BORING NO. 3D

PROPOSED DP&L DIKES - STUART STATION - ABERDEEN, OHIO
ORIGINAL GROUND AREA

BORING LOCATION: As Shown on Boring Location Plan **DATE STARTED:** 10-10-74

SURFACE ELEVATION: 544.0' **DATE COMPLETED:** 10-10-74

STRATUM DEPTH	DESCRIPTION OF MATERIAL	SAMPLE NO. & TYPE	SAMPLE DEPTH	BLOWS PER 6" ON SAMPLER	"N" BLOWS /FT. OR CORE REC.
0.0'	Soft Brown Clay, some Silt, some Sand, trace of Gravel				
2.0'	Medium Stiff Gray Clay, some Silt, some Sand, trace of Gravel - Damp	1A	1.0- 2.5'	2-3-4	7
		1C	3.0- 5.0'		24"
		2A	5.0- 6.5'	3-4-6	10
8.5'					
10.0'	Stiff Brown Gray Clay, some Silt, some Sand - Damp	3A	8.5-10.0'	3-6-8	14
13.5'	Very Stiff Brown Clay, some Silt, some Sand - Moist	4A	13.5-15.0'	6-7-9	16
19.5'					
20.0'	Medium Dense Brown Sand, trace of Silt, trace of Gravel - Wet (Becomes Very Loose at 23.5')	5A	18.5-20.0'	7-8-8	16
		6A	23.5-25.0'	3-1-4	5
30.0'		7A	28.5-30.0'	1-1-3	4
	Bottom of Boring at 30.0'				

METHOD: Hollow Auger

TECHNICIAN: BC-RK

JOB NO.: 03985

WATER OBSERVATIONS

INITIAL DEPTH: 19.0'

COMPLETION DEPTH: *

DEPTH AFTER _____ HRS. _____

TYPE SAMPLER:

X A. SPLIT SPOON

___ B.

X C. SHELBY TUBE

* Filled in to 23.0'

BOWSER – MORNER
TESTING LABORATORIES, INC.

LOG OF BORING NO. 4D

PROPOSED DP&L DIKES - STUART STATION - ABERDEEN, OHIO
ORIGINAL GROUND AREA

BORING LOCATION: As Shown on Boring Location Plan **DATE STARTED:** 10-11-74

SURFACE ELEVATION: 544.9' **DATE COMPLETED:** 10-11-74

STRATUM DEPTH	DESCRIPTION OF MATERIAL	SAMPLE NO. & TYPE	SAMPLE DEPTH	BLOWS PER 6" ON SAMPLER	"N" BLOWS /FT. OR CORE REC.
0.0'	Topsoil				
0.5'	Stiff Brown Clay, some Silt, some Sand - Damp	1A	1.0- 2.5'	3-5-6	11
		2A	3.5- 5.0'	4-4-8	12
	(Becomes Very Stiff, with 1" to 3" Sand Seams, at 8.0')	1C	6.0- 8.0'		24"
10.0'		3A	8.0- 9.5'	4-8-10	18
13.0'	Very Loose Brown Sand, some Gravel, trace of Silt - Moist	4A	13.5-15.0'	4-2-1	3
20.0'	(Becomes Loose at 18.5')	5A	18.5-20.0'	2-2-4	6
21.0'	Medium Dense Brown Sand, trace of Silt, trace of Gravel - Moist	6A	23.5-25.0'	10-11-11	22
30.0'		7A	28.5-30.0'	4-5-10	15
	Bottom of Boring at 30.0'				

METHOD: Hollow Auger

TECHNICIAN: BC-RK

JOB NO.: 03985

WATER OBSERVATIONS

INITIAL DEPTH (tr) 13.5'

COMPLETION DEPTH *

DEPTH AFTER ____ HRS ____

TYPE SAMPLER:

X A. SPLIT SPOON

___ B.

X C. SHELBY TUBE

* Filled in to 23.0'

BOWSER – MORNER
TESTING LABORATORIES, INC.

LOG OF BORING NO. 5D

PROPOSED DP&L DIKES - STUART STATION - ABERDEEN, OHIO

ORIGINAL GROUND AREA

BORING LOCATION: As Shown on Boring Location Plan **DATE STARTED:** 10-11-74

SURFACE ELEVATION: 545.3' **DATE COMPLETED:** 10-11-74

STRATUM DEPTH	DESCRIPTION OF MATERIAL	SAMPLE NO. & TYPE	SAMPLE DEPTH	BLOWS PER 6" ON SAMPLER	"N" BLOWS /FT. OR CORE REC.
0.0'	Topsoil				
1.5'	Stiff Brown Clay, some Silt, some Sand - Damp (Becomes Very Stiff at 3.5')	1A	1.0- 2.5'	5-5-10	15
		2A	3.5- 5.0'	5-7-10	17
7.0'		3A	6.0- 7.5'	10-8-7	15
10.0'	Medium Dense Brown Sand and Gravel, trace of Silt - Moist (Becomes Loose at 8.5')	4A	8.5-10.0'	6-4-5	9
12.0'	Very Loose Brown Sand, trace of Silt, trace of Gravel - Moist (Becomes Medium Dense at 18.5')	5A	13.5-15.0'	2-2-2	4
20.0'		6A	18.5-20.0'	7-9-7	16
		7A	23.5-25.0'	8-10-15	25
30.0'	(Becomes Dense at 28.5')	8A	28.5-30.0'	17-17-18	35
	Bottom of Boring at 30.0'				

METHOD: Hollow Auger

TECHNICIAN: BC-RK

JOB NO.: 03985

WATER OBSERVATIONS

INITIAL DEPTH: None

COMPLETION DEPTH: *

DEPTH AFTER: ____ HRS ____

TYPE SAMPLER:

X A. SPLIT SPOON

___ B.

___ C. SHELBY TUBE

* Filled in to 19.5'

BOWSER – MORNER
TESTING LABORATORIES, INC.

LOG OF BORING NO. 6D

PROPOSED DP&L DIKES - STUART STATION - ABERDEEN, OHIO
ORIGINAL GROUND AREA

BORING LOCATION: As Shown on Boring Location Plan **DATE STARTED:** 10-11-74

SURFACE ELEVATION: 547.1' **DATE COMPLETED:** 10-11-74

STRATUM DEPTH	DESCRIPTION OF MATERIAL	SAMPLE NO. & TYPE	SAMPLE DEPTH	BLOWS PER 6" ON SAMPLER	"N" BLOWS /FT. OR CORE REC.
0.0'	Topsoil				
1.0'	Stiff Brown Clay, some Silt, some Sand - Moist (Becomes Very Stiff at 6.0')	1C	1.0- 3.0'		24"
		1A	3.0- 4.5'	4-5-7	12
		2A	6.0- 7.5'	10-13-10	23
8.0'					
10.0'	Loose Brown Sand and Gravel, some Silt - Moist	3A	8.5-10.0'	7-5-5	10
14.5'	(Becomes Medium Dense at 13.5')	4A	13.5-15.0'	8-10-8	18
	Medium Dense Brown Sand, trace of Silt, trace of Gravel - Moist				
20.0'	(Becomes Loose at 18.5')	5A	18.5-20.0'	3-3-5	8
	(Becomes Medium Dense at 23.5')	6A	23.5-25.0'	7-6-6	12
	Bottom of Boring at 25.0'				

METHOD: Hollow Auger

TECHNICIAN: BC-RK

JOB NO.: 03985

WATER OBSERVATIONS

INITIAL DEPTH (tr) 14.5'

COMPLETION DEPTH: *

DEPTH AFTER ____ HRS. ____

TYPE SAMPLER:

X A. SPLIT SPOON

___ B.

X C. SHELBY TUBE

* Filled into 23.5'

BOWSER – MORNER
TESTING LABORATORIES, INC.

LOG OF BORING NO. 7D

PROPOSED DP&L DIKES - STUART STATION - ABERDEEN, OHIO
ORIGINAL GROUND AREA

BORING LOCATION: As Shown on Boring Location Plan **DATE STARTED:** 10-11-74

SURFACE ELEVATION: 545.2' **DATE COMPLETED:** 10-11-74

STRATUM DEPTH	DESCRIPTION OF MATERIAL	SAMPLE NO. & TYPE	SAMPLE DEPTH	BLOWS PER 6" ON SAMPLER	"N" BLOWS /FT. OR CORE REC.
0.0'	Topsoil				
1.5'	Very Stiff Brown Clay, some Silt, some Sand - Damp (Becomes Stiff at 5.5')	1A	1.0- 2.5'	5-7-9	16
		1C	3.5- 5.5'		20"
		2A	5.5- 7.0'	5-7-8	15
8.5'	Loose Brown Sand and Gravel, trace of Silt - Moist	3A	8.5-10.0'	5-5-3	8
10.0'					
13.5'	Loose Brown Sand, trace of Silt, trace of Gravel - Moist (Becomes Dense at 18.5')	4A	13.5-15.0'	4-5-5	10
20.0'		5A	18.5-20.0'	8-14-17	31
	(Becomes Loose at 23.5')	6A	23.5-25.0'	8-4-2	6
	Bottom of Boring at 25.0'				

METHOD: Hollow Auger
TECHNICIAN: BC-RK
JOB NO.: 03985

WATER OBSERVATIONS
INITIAL DEPTH: None
COMPLETION DEPTH: *
DEPTH AFTER: _____ HRS. _____

TYPE SAMPLER:
X A. SPLIT SPOON
___ B.
X C. SHELBY TUBE

* Filled into 22.0'

BOWSER – MORNER
TESTING LABORATORIES, INC.

LOG OF BORING NO. 8D

PROPOSED DP&L DIKES - STUART STATION - ABERDEEN, OHIO

ORIGINAL GROUND AREA

BORING LOCATION: As Shown on Boring Location Plan **DATE STARTED:** 10-11-74

SURFACE ELEVATION: 544.9' **DATE COMPLETED:** 10-11-74

STRATUM DEPTH	DESCRIPTION OF MATERIAL	SAMPLE NO. & TYPE	SAMPLE DEPTH	BLOWS PER 6" ON SAMPLER	"N" BLOWS /FT. OR CORE REC.
0.0'	Topsoil				
1.5'	Stiff Brown Clay, some Silt, some Sand - Damp	1A	1.0- 2.5'	4-5-7	12
		2A	3.5- 5.0'	4-5-7	12
7.0'		3A	6.0- 7.5'	5-5-4	9
10.0'	Loose Brown Sand and Gravel, trace of Silt - Moist (Becomes Very Loose at 8.5') (Becomes Medium Dense at 13.5')	4A	8.5-10.0'	1-1-1	2
		5A	13.5-15.0'	2-5-6	11
17.5'					
20.0'	Medium Dense Brown Sand, trace of Silt, trace of Gravel - Moist	6A	18.5-20.0'	6-6-5	11
		7A	23.5-25.0'	6-9-11	20
	Bottom of Boring at 25.0'				

METHOD: Hollow Auger

TECHNICIAN: BC-RK

JOB NO.: 03985

WATER OBSERVATIONS

INITIAL DEPTH: (tr) 7.0'

COMPLETION DEPTH: *

DEPTH AFTER: ____ HRS. ____

TYPE SAMPLER:

X A. SPLIT SPOON

___ B.

___ C. SHELBY TUBE

* Filled in to 22.5'

BOWSER – MORNER
TESTING LABORATORIES, INC.

LOG OF BORING NO. 9D

PROPOSED DP&L DIKES - STUART STATION - ABERDEEN, OHIO

ORIGINAL GROUND AREA

BORING LOCATION: As Shown on Boring Location Plan **DATE STARTED:** 10-12-74

SURFACE ELEVATION: 544.8' **DATE COMPLETED:** 10-12-74

STRATUM DEPTH	DESCRIPTION OF MATERIAL	SAMPLE NO. & TYPE	SAMPLE DEPTH	BLOWS PER 6" ON SAMPLER	"N" BLOWS /FT. OR CORE REC.
0.0'	Topsoil				
1.0'	Very Stiff Brown Clay, some Silt, some Sand - Moist	1C	1.0- 3.0'		24"
		1A	3.0- 4.5'	7-9-13	22
5.5'	Very Stiff Brown Silt, some Sand, some Clay - Moist	2A	6.0- 7.5'	6-11-13	24
8.0'					
10.0'	Loose Brown Sand and Gravel, trace of Silt - Moist	3A	8.5-10.0'	5-3-4	7
14.0'	Loose Brown Sand, trace of Gravel, trace of Silt - Moist	4A	13.5-15.0'	3-4-4	8
20.0'		5A	18.5-20.0'	2-3-5	8
		6A	23.5-25.0'	4-4-5	9
	Bottom of Boring at 25.0'				

METHOD: Hollow Auger

TECHNICIAN: BC-RK

JOB NO.: 03985

WATER OBSERVATIONS

INITIAL DEPTH: None

COMPLETION DEPTH: *

DEPTH AFTER: _____ HRS. _____

TYPE SAMPLER:

X A. SPLIT SPOON

_____ B.

X C. SHELBY TUBE

* Filled in to 18.5'

BOWSER – MORNER
TESTING LABORATORIES, INC.

LOG OF BORING NO. 10D

PROPOSED DP&L DIKES - STUART STATION - ABERDEEN, OHIO

ORIGINAL GROUND AREA

BORING LOCATION: As Shown on Boring Location Plan **DATE STARTED:** 10-12-74

SURFACE ELEVATION: 544.6' **DATE COMPLETED:** 10-12-74

STRATUM DEPTH	DESCRIPTION OF MATERIAL	SAMPLE NO. & TYPE	SAMPLE DEPTH	BLOWS PER 6" ON SAMPLER	"N" BLOWS /FT. OR CORE REC.
0.0'	Topsoil				
1.0'	Stiff Brown Clay, some Silt, some Sand - Damp	1A	1.0- 2.5'	3-5-7	12
	(Becomes Very Stiff at 3.5')	2A	3.5- 5.0'	5-8-8	16
	(Becomes Medium Stiff at 6.0')	3A	6.0- 7.5'	3-4-5	9
8.5'	Very Loose Brown Sand and Gravel, trace of Silt - Moist	4A	8.5-10.0'	3-3-2	5
10.0'	Loose Brown Sand, trace of Gravel, trace of Silt - Moist	5A	13.5-15.0'	3-3-5	8
14.0'		6A	18.5-20.0'	3-4-5	9
20.0'	(Becomes Medium Dense at 23.5')	7A	23.5-25.0'	4-4-9	13
	Bottom of Boring at 25.0'				

METHOD: Hollow Auger

TECHNICIAN: BC-RK

JOB NO.: 03985

WATER OBSERVATIONS

INITIAL DEPTH: None

COMPLETION DEPTH: *

DEPTH AFTER _____ HRS. _____

TYPE SAMPLER:

X A. SPLIT SPOON

___ B.

___ C. SHELBY TUBE

* Filled in to 19.5'

BOWSER – MORNER
TESTING LABORATORIES, INC.

LOG OF BORING NO. 11D

PROPOSED DP&L DIKES - STUART STATION - ABERDEEN, OHIO
ORIGINAL GROUND AREA

BORING LOCATION: As Shown on Boring Location Plan **DATE STARTED:** 10-12-74

SURFACE ELEVATION: 545.7' **DATE COMPLETED:** 10-12-74

STRATUM DEPTH	DESCRIPTION OF MATERIAL	SAMPLE NO. & TYPE	SAMPLE DEPTH	BLOWS PER 6" ON SAMPLER	"N" BLOWS /FT. OR CORE REC.
0.0'	Topsoil				
1.0'	Stiff Brown Clay, some Sand, some Silt - Damp	1A	1.0- 2.5'	3-5-8	13
		1C	3.0- 5.0'		20"
		2A	5.0- 6.5'	3-5-6	11
8.0'					
10.0'	Stiff Brown Silt, some Sand, some Clay - Moist	3A	8.5-10.0'	5-5-10	15
11.5'	Loose Brown Sand and Gravel, trace of Silt - Moist	4A	13.5-15.0'	3-3-6	9
18.0'					
20.0'	Loose Brown Sand, trace of Gravel, trace of Silt - Moist	5A	18.5-20.0'	3-3-5	8
	(Becomes Very Loose at 23.5')	6A	23.5-25.0'	3-2-2	4
	Bottom of Boring at 25.0'				

METHOD: Hollow Auger

TECHNICIAN: BC-RK

JOB NO.: 03985

WATER OBSERVATIONS

INITIAL DEPTH: None

COMPLETION DEPTH: *

DEPTH AFTER: _____ HRS. _____

TYPE SAMPLER:

X A. SPLIT SPOON

_____ B.

X C. SHELBY TUBE

* Filled in to 20.0'

BOWSER – MORNER
TESTING LABORATORIES, INC.

LOG OF BORING NO. 12D

PROPOSED DP&L DIKES - STUART STATION - ABERDEEN, OHIO

ORIGINAL GROUND AREA

BORING LOCATION: As Shown on Boring Location Plan **DATE STARTED:** 10-15-74

SURFACE ELEVATION: 546.0' **DATE COMPLETED:** 10-15-74

STRATUM DEPTH	DESCRIPTION OF MATERIAL	SAMPLE NO. & TYPE	SAMPLE DEPTH	BLOWS PER 6" ON SAMPLER	"N" BLOWS /FT. OR CORE REC.
0.0'	Topsoil				
0.5'	Stiff Brown Clay, some Silt, some Sand - Moist	1A	1.0- 2.5'	6-7-8	15
		1C	3.5- 5.5'		24"
6.5'		2A	5.5- 7.0'	6-8-12	20
10.0'	Very Stiff Brown Clay and Sand, trace of Silt with 1" to 3" Sand Seams - Moist	3A	8.5-10.0'	6-10-13	23
14.0'		4A	13.5-15.0'	4-4-4	8
16.0'	Loose Brown Sand and Gravel, trace of Silt - Dry				
20.0'	Medium Dense Brown Sand, trace of Gravel, trace of Silt - Dry	5A	18.5-20.0'	10-13-16	29
	(Becomes Dense at 23.5')	6A	23.5-25.0'	14-21-20	41
30.0'		7A	28.5-30.0'	11-18-32	50
	Bottom of Boring at 30.0'				

METHOD: Hollow Auger

TECHNICIAN: BC-BK-MF

JOB NO.: 03985

WATER OBSERVATIONS

INITIAL DEPTH: None

COMPLETION DEPTH: None

DEPTH AFTER _____ HRS _____

TYPE SAMPLER:

X A. SPLIT SPOON

_____ B.

X C. SHELBY TUBE

BOWSER – MORNER
TESTING LABORATORIES, INC

LOG OF BORING NO. 13D

PROPOSED DP&L DIKES - STUART STATION - ABERDEEN, OHIO

ORIGINAL GROUND AREA

BORING LOCATION: As Shown on Boring Location Plan **DATE STARTED:** 10-15-74

SURFACE ELEVATION: 541.6' **DATE COMPLETED:** 10-15-74

STRATUM DEPTH	DESCRIPTION OF MATERIAL	SAMPLE NO. & TYPE	SAMPLE DEPTH	BLOWS PER 6" ON SAMPLER	"N" BLOWS /FT. OR CORE REC.
0.0'	Topsoil				
0.5'	Very Stiff Brown Clay, some Silt, some Sand, trace of Roots - Moist (Becomes Stiff at 6.0')	1C	1.0- 3.0'		23"
		1A	3.0- 4.5'	3-8-11	19
		2A	6.0- 7.5'	4-5-9	14
10.0'	(With 1" to 3" Moist Sand Seams from 8.5')	3A	8.5-10.0'	3-5-8	13
	(Becomes Very Stiff at 13.5')	4A	13.5-15.0'	3-13-17	30
16.0'	Loose Brown Sand and Gravel, trace of Silt - Moist				
20.0'		5A	18.5-20.0'	1-2-5	7
	(Becomes Dense at 23.5')	6A	23.5-25.0'	11-17-15	32
30.0'		7A	28.5-30.0'	12-14-20	34
	Bottom of Boring at 30.0'				

METHOD: Hollow Auger

TECHNICIAN: BC-BK-MF

JOB NO.: 03985

WATER OBSERVATIONS

INITIAL DEPTH: None

COMPLETION DEPTH: None

DEPTH AFTER: _____ HRS. _____

TYPE SAMPLER:

X A. SPLIT SPOON

_____ B.

X C. SHELBY TUBE

BOWSER – MORNER
TESTING LABORATORIES, INC.

LOG OF BORING NO. 14D

PROPOSED DP&L DIKES - STUART STATION - ABERDEEN, OHIO
ORIGINAL GROUND AREA

BORING LOCATION: As Shown on Boring Location Plan **DATE STARTED:** 10-12-74

SURFACE ELEVATION: 541.3' **DATE COMPLETED:** 10-12-74

STRATUM DEPTH	DESCRIPTION OF MATERIAL	SAMPLE NO. & TYPE	SAMPLE DEPTH	BLOWS PER 6" ON SAMPLER	"N" BLOWS /FT. OR CORE REC.
0.0'	Topsoil				
1.0'					
3.0'	Stiff Brown Clay, some Sand, some Silt - Damp	1A	1.0- 2.5'	7-5-8	13
		2A	3.5- 5.0'	4-4-6	10
	Medium Stiff Brown Silt, some Sand, some Clay - Damp	3A	6.0- 7.5'	3-3-6	9
10.0'		4A	8.5-10.0'	2-3-4	7
12.0'					
	Very Dense Brown Sand and Gravel, trace of Silt - Moist	5A	13.5-15.0'	19-35-42	77
16.0'					
20.0'	Medium Dense Brown Sand, trace of Gravel, trace of Silt - Moist	6A	18.5-20.0'	7-10-15	25
	(Becomes Dense at 23.5')	7A	23.5-25.0'	13-22-23	45
30.0'		8A	28.5-30.0'	14-14-19	33
	Bottom of Boring at 30.0'				

METHOD: Hollow Auger
TECHNICIAN: BC-RK
JOB NO.: 03985

WATER OBSERVATIONS
INITIAL DEPTH (tr) 14.0'
COMPLETION DEPTH: *
DEPTH AFTER ____ HRS ____

TYPE SAMPLER:
X A. SPLIT SPOON
___ B.
___ C. SHELBY TUBE

* Filled into 21.0'

BOWSER – MORNER
TESTING LABORATORIES, INC.

LOG OF BORING NO. 15D

PROPOSED DP&L DIKES - STUART STATION - ABERDEEN, OHIO

ORIGINAL GROUND AREA

BORING LOCATION: As Shown on Boring Location Plan **DATE STARTED:** 10-14-74

SURFACE ELEVATION: 540.0' **DATE COMPLETED:** 10-14-74

STRATUM DEPTH	DESCRIPTION OF MATERIAL	SAMPLE NO. & TYPE	SAMPLE DEPTH	BLOWS PER 6" ON SAMPLER	"N" BLOWS /FT. OR CORE REC.
0.0'	(Fill)				
2.5'		1A	1.0- 2.5'	5-8-8	16
3.5'	(Original) Brown Silt, some Clay, some Sand, some Gravel - Moist				
	Very Stiff Brown Clay, some Silt, some Sand - Moist (Becomes Stiff at 8.0')	2A	3.5- 5.0'	7-8-9	17
10.0'		1C	6.0- 8.0'		18"
		3A	8.0- 9.5'	9-6-6	12
13.5'	Medium Dense Brown Sand, trace of Gravel, trace of Silt - Moist (Becomes Very Loose at 18.5')	4A	13.5-15.0'	3-4-8	12
20.0'		5A	18.5-20.0'	2-1-1	2
		6A	23.5-25.0'	2-2-2	4
30.0'		7A	28.5-30.0'	3-2-2	4
	Bottom of Boring at 30.0'				

METHOD: Hollow Auger

TECHNICIAN: BC-BK-MF

JOB NO.: 03985

WATER OBSERVATIONS

INITIAL DEPTH: (tr) 25.0'

COMPLETION DEPTH: None

DEPTH AFTER: _____ HRS. _____

TYPE SAMPLER:

X A. SPLIT SPOON

_____ B.

X C. SHELBY TUBE

BOWSER – MORNER
TESTING LABORATORIES, INC.

LOG OF BORING NO. 16D

PROPOSED DP&L DIKES - STUART STATION - ABERDEEN, OHIO

ORIGINAL GROUND AREA

BORING LOCATION: As Shown on Boring Location Plan **DATE STARTED:** 10-18-74

SURFACE ELEVATION: 531.6' **DATE COMPLETED:** 10-18-74

STRATUM DEPTH	DESCRIPTION OF MATERIAL	SAMPLE NO. & TYPE	SAMPLE DEPTH	BLOWS PER 6" ON SAMPLER	"N" BLOWS /FT. OR CORE REC.
0.0'	(Fill) Brown Sand and Gravel, trace of Silt - Moist				
1.5'	(Original) Soft Brown Clay, some Sand, some Silt - Moist	1A	1.0- 2.5'	1-1-3	4
	(Becomes Very Stiff at 5.0')	1C	3.0- 5.0'		24"
		2A	5.0- 6.5'	4-7-10	17
10.0'	(Becomes Hard at 8.5')	3A	8.5-10.0'	10-11-30	41
11.0'	Very Stiff Brown Clay and Sand, trace of Silt with 1" to 3" Sand Seams - Moist	4A	13.5-15.0'	4-12-16	28
20.0'		5A	18.5-20.0'	6-7-10	17
22.0'	Medium Dense Brown Sand, trace of Gravel, trace of Silt - Damp	6A	23.5-25.0'	9-15-12	27
30.0'	(Becomes Dense at 28.5')	7A	28.5-30.0'	16-17-22	39
	Bottom of Boring at 30.0'				

METHOD: Hollow Auger

TECHNICIAN: BC-BK-MF

JOB NO.: 03985

WATER OBSERVATIONS

INITIAL DEPTH: None

COMPLETION DEPTH: None

DEPTH AFTER: _____ HRS _____

TYPE SAMPLER:

X A. SPLIT SPOON

_____ B.

X C. SHELBY TUBE

BOWSER – MORNER
TESTING LABORATORIES, INC.

LOG OF BORING NO. 1E

PROPOSED DP&L DIKES - STUART STATION - ABERDEEN, OHIO

BORROW AREA

BORING LOCATION: As Shown on Boring Location Plan **DATE STARTED:** 10-23-74

SURFACE ELEVATION: 544.5' **DATE COMPLETED:** 10-23-74

STRATUM DEPTH	DESCRIPTION OF MATERIAL	SAMPLE NO. & TYPE	SAMPLE DEPTH	BLOWS PER 6" ON SAMPLER	"N" BLOWS /FT. OR CORE REC.
0.0'	Topsoil				
0.5'	Medium Stiff Brown Clay, some Silt, some Sand - Moist (Becomes Very Stiff at 3.5')	1A	1.0- 2.5'	2-4-5	9
		2A	3.5- 5.0'	4-7-12	19
6.0'	Very Stiff Brown Clay and Sand, trace of Silt - Moist	3A	6.0- 7.5'	6-10-15	25
8.0'	Loose Brown Sand, some Gravel, trace of Silt - Damp (Becomes Medium Dense at 13.5')	4A	8.5-10.0'	3-3-5	8
10.0'		5A	13.5-15.0'	6-6-8	14
20.0'	(Becomes Loose at 23.5')	6A	18.5-20.0'	4-5-6	11
		7A	23.5-25.0'	5-4-6	10
	Bottom of Boring at 25.0'				

METHOD: Hollow Auger

TECHNICIAN: BC-BK-MF

JOB NO.: 03985

WATER OBSERVATIONS

INITIAL DEPTH: (tr) 8.0'

COMPLETION DEPTH: None

DEPTH AFTER: ____ HRS. ____

TYPE SAMPLER:

X A. SPLIT SPOON

___ B.

___ C. SHELBY TUBE

Note: Bag Sample taken at this location

BOWSER – MORNER
TESTING LABORATORIES, INC.

LOG OF BORING NO. 2E

PROPOSED DP&L DIKES - STUART STATION - ABERDEEN, OHIO

BORROW AREA

BORING LOCATION: As Shown on Boring Location Plan **DATE STARTED:** 10-23-74

SURFACE ELEVATION: 545.8' **DATE COMPLETED:** 10-23-74

STRATUM DEPTH	DESCRIPTION OF MATERIAL	SAMPLE NO. & TYPE	SAMPLE DEPTH	BLOWS PER 6" ON SAMPLER	"N" BLOWS /FT. OR CORE REC.
0.0'	Topsoil				
0.5'	Stiff Brown Clay, some Silt, some Sand - Moist (Becomes Very Stiff at 6.0')	1A	1.0- 2.5'	5-6-6	12
		2A	3.5- 5.0'	4-6-9	15
8.0'		3A	6.0- 7.5'	6-9-11	20
10.0'	Stiff Brown Clay and Sand, trace of Silt - Moist	4A	8.5-10.0'	3-6-9	15
12.0'	Medium Dense Brown Sand and Gravel, trace of Silt - Damp	5A	13.5-15.0'	3-5-10	15
20.0'		6A	18.5-20.0'	8-11-14	25
		7A	23.5-25.0'	12-12-12	24
	Bottom of Boring at 25.0'				

METHOD: Hollow Auger

TECHNICIAN: BC-BK-MF

JOB NO.: 03985

WATER OBSERVATIONS

INITIAL DEPTH: None

COMPLETION DEPTH: None

DEPTH AFTER: _____ HRS _____

TYPE SAMPLER:

X A. SPLIT SPOON

___ B.

___ C. SHELBY TUBE

Note: Bag Sample taken at this location

BOWSER – MORNER
TESTING LABORATORIES, INC.

LOG OF BORING NO. 3E

PROPOSED DP&L DIKES - STUART STATION - ABERDEEN, OHIO

BORROW AREA

BORING LOCATION: As Shown on Boring Location Plan **DATE STARTED:** 10-23-74

SURFACE ELEVATION: 543.9' **DATE COMPLETED:** 10-23-74

STRATUM DEPTH	DESCRIPTION OF MATERIAL	SAMPLE NO. & TYPE	SAMPLE DEPTH	BLOWS PER 6" ON SAMPLER	"N" BLOWS /FT. OR CORE REC.
0.0'	Topsoil				
0.5'	Stiff Brown Clay, some Silt, some Sand - Moist (Becomes Very Stiff at 6.0')	1A	1.0- 2.5'	3-4-7	11
		2A	3.5- 5.0'	4-7-8	15
		3A	6.0- 7.5'	4-8-10	18
8.0'					
10.0'	Very Stiff Brown Clay and Sand, trace of Silt - Moist	4A	8.5-10.0'	4-7-10	17
11.5'	Dense Brown Sand and Gravel, trace of Silt - Damp	5A	13.5-15.0'	12-16-17	33
17.0'					
20.0'	Medium Dense Brown Sand, trace of Silt - Damp	6A	18.5-20.0'	8-14-15	29
		7A	23.5-25.0'	9-9-11	20
	Bottom of Boring at 25.0'				

METHOD: Hollow Auger

TECHNICIAN: BC-BK-MF

JOB NO.: 03985

WATER OBSERVATIONS

INITIAL DEPTH: None

COMPLETION DEPTH: None

DEPTH AFTER: _____ HRS. _____

TYPE SAMPLER:

X A. SPLIT SPOON

_____ B.

_____ C. SHELBY TUBE

BOWSER – MORNER
TESTING LABORATORIES, INC.

LOG OF BORING NO. 4E

PROPOSED DP&L DIKES - STUART STATION - ABERDEEN, OHIO

BORROW AREA

BORING LOCATION: As Shown on Boring Location Plan **DATE STARTED:** 10-30-74

SURFACE ELEVATION: 543.4' **DATE COMPLETED:** 10-30-74

STRATUM DEPTH	DESCRIPTION OF MATERIAL	SAMPLE NO. & TYPE	SAMPLE DEPTH	BLOWS PER 6" ON SAMPLER	"N" BLOWS /FT. OR CORE REC.
0.0'	Topsoil				
1.5'	Medium Stiff Brown Clay, some Silt, some Sand - Moist (Becomes Very Stiff at 3.5')	1A	1.0- 2.5'	3-4-5	9
		2A	3.5- 5.0'	5-8-13	21
		3A	6.0- 7.5'	8-12-17	29
8.5'					
10.0'	Very Stiff Brown Clay and Sand, trace of Silt with 1" to 4" Sand Seams - Moist	4A	8.5-10.0'	5-8-10	18
14.5'	(Becomes Medium Stiff at 13.5')	5A	13.5-15.0'	3-4-2	6
16.5'	Very Loose Brown Sand and Gravel, trace of Silt - Moist				
20.0'	Loose Brown Sand, trace of Silt - Damp (Becomes Very Loose at 23.5')	6A	18.5-20.0'	3-3-3	6
		7A	23.5-25.0'	3-2-2	4
	Bottom of Boring at 25.0'				

METHOD: Hollow Auger

TECHNICIAN: BC-BK

JOB NO.: 03985

WATER OBSERVATIONS

INITIAL DEPTH: None

COMPLETION DEPTH: None

DEPTH AFTER: _____ HRS _____

TYPE SAMPLER:

X A. SPLIT SPOON

___ B.

___ C. SHELBY TUBE

BOWSER – MORNER
TESTING LABORATORIES, INC.

LOG OF BORING NO. 5E

PROPOSED DP&L DIKES - STUART STATION - ABERDEEN, OHIO

BORROW AREA

BORING LOCATION: As Shown on Boring Location Plan **DATE STARTED:** 10-30-74

SURFACE ELEVATION: 541.6' **DATE COMPLETED:** 10-30-74

STRATUM DEPTH	DESCRIPTION OF MATERIAL	SAMPLE NO. & TYPE	SAMPLE DEPTH	BLOWS PER 6" ON SAMPLER	"N" BLOWS /FT. OR CORE REC.
0.0'	Topsoil				
1.0'	Stiff Gray Clay, some Silt, some Sand - Moist	1A	1.0- 2.5'	5-5-6	11
3.0'	Stiff Brown and Gray Clay, some Silt, some Sand - Moist	2A	3.5- 5.0'	3-5-7	12
8.0'	(Becomes Medium Stiff at 6.0')	3A	6.0- 7.5'	3-4-5	9
10.0'	Very Stiff Brown Clay and Sand, trace of Silt with 1" to 4" Sand Seams - Wet	4A	8.5-10.0'	4-6-11	17
14.0'	Loose Brown Sand and Gravel, trace of Silt - Damp	5A	13.5-15.0'	4-4-4	8
17.0'	Medium Dense Brown Sand, trace of Silt - Damp	6A	18.5-20.0'	2-5-7	12
20.0'		7A	23.5-25.0'	4-7-8	15
	Bottom of Boring at 25.0'				

METHOD: Hollow Auger

TECHNICIAN: BC-BK

JOB NO.: 03985

WATER OBSERVATIONS

INITIAL DEPTH: 9.0'

COMPLETION DEPTH: None

DEPTH AFTER: ____ HRS. ____

TYPE SAMPLER:

X A. SPLIT SPOON

___ B.

___ C. SHELBY TUBE

BOWSER – MORNER
TESTING LABORATORIES, INC.

LOG OF BORING NO. 6E

PROPOSED DP&L DIKES - STUART STATION - ABERDEEN, OHIO

BORROW AREA

BORING LOCATION: As Shown on Boring Location Plan **DATE STARTED:** 10-23-74

SURFACE ELEVATION: 541.4' **DATE COMPLETED:** 10-23-74

STRATUM DEPTH	DESCRIPTION OF MATERIAL	SAMPLE NO. & TYPE	SAMPLE DEPTH	BLOWS PER 6" ON SAMPLER	"N" BLOWS /FT. OR CORE REC.
0.0'	(Fill) Dense Brown Sand and Gravel, trace of Clay - Moist	1A	1.0- 2.5'	10-15-16	31
3.5'					
4.0'	(Original) Topsoil				
5.5'	Very Stiff Brown and Gray Clay, some Silt, some Sand - Moist	2A	3.5- 5.0'	6-9-9	18
9.0'					
10.0'	Very Stiff Brown Clay, some Silt, some Sand - Moist	3A	6.0- 7.5'	5-8-11	19
	Very Stiff Brown Clay and Sand, trace of Silt - Moist	4A	8.5-10.0'	5-10-10	20
18.0'	(Becomes Stiff at 13.5')	5A	13.5-15.0'	3-4-7	11
20.0'	Medium Dense Brown Sand and Gravel, some Silt - Moist	6A	18.5-20.0'	5-5-10	15
22.0'					
	Very Loose Brown Sand, trace of Silt - Damp	7A	23.5-25.0'	2-2-1	3
	Bottom of Boring at 25.0'				

METHOD: Hollow Auger

TECHNICIAN: BC-BK-MF

JOB NO.: 03985

WATER OBSERVATIONS

INITIAL DEPTH: None

COMPLETION DEPTH: None

DEPTH AFTER: _____ HRS. _____

TYPE SAMPLER:

X A. SPLIT SPOON

_____ B.

_____ C. SHELBY TUBE

BOWSER – MORNER
TESTING LABORATORIES, INC.

LOG OF BORING NO. 7E

PROPOSED DP&L DIKES - STUART STATION - ABERDEEN, OHIO

BORROW AREA

BORING LOCATION: As Shown on Boring Location Plan **DATE STARTED:** 10-30-74

SURFACE ELEVATION: 545.4' **DATE COMPLETED:** 10-30-74

STRATUM DEPTH	DESCRIPTION OF MATERIAL	SAMPLE NO. & TYPE	SAMPLE DEPTH	BLOWS PER 6" ON SAMPLER	"N" BLOWS /FT. OR CORE REC.
0.0'	(Fill) Very Dense Brown Sand, trace of Gravel, trace of Silt - Damp (Becomes Dense at 3.5')	1A	1.0- 2.5'	18-23-32	55
		2A	3.5- 5.0'	21-22-20	42
6.0' 6.5'	(Original) Topsoil				
10.0'	Very Stiff Brown Clay, some Silt, some Sand with 1" to 4" Sand Seams - Damp (Becomes Stiff at 13.5')	3A	6.0- 7.5'	7-12-15	27
		4A	8.5-10.0'	3-6-10	16
		5A	13.5-15.0'	4-5-7	12
19.5' 20.0'	Medium Dense Brown Sand and Gravel, trace of Silt - Damp	6A	18.5-20.0'	4-8-11	19
		7A	23.5-25.0'	6-8-13	21
	Bottom of Boring at 25.0'				

METHOD: Hollow Auger

TECHNICIAN: BC-BK

JOB NO.: 03985

WATER OBSERVATIONS

INITIAL DEPTH: None

COMPLETION DEPTH: None

DEPTH AFTER ____ HRS. ____

TYPE SAMPLER:

X A. SPLIT SPOON

___ B.

___ C. SHELBY TUBE

BOWSER – MORNER
TESTING LABORATORIES, INC.

LOG OF BORING NO. 8E

PROPOSED DP&L DIKES - STUART STATION - ABERDEEN, OHIO

BORROW AREA

BORING LOCATION: As Shown on Boring Location Plan **DATE STARTED:** 10-30-74

SURFACE ELEVATION: 538.7' **DATE COMPLETED:** 10-30-74

STRATUM DEPTH	DESCRIPTION OF MATERIAL	SAMPLE NO. & TYPE	SAMPLE DEPTH	BLOWS PER 6" ON SAMPLER	"N" BLOWS /FT. OR CORE REC.
0.0'	(Fill) Brown Sand and Gravel, trace of Silt - Moist				
1.5'		1A	1.0- 2.5'	8-8-8	16
2.0'	(Original) Topsoil				
	Very Stiff Brown Clay, some Silt, some Sand - Moist (Becomes Stiff at 3.5')	2A	3.5- 5.0'	3-7-8	15
		3A	6.0- 7.5'	4-6-9	15
8.0'					
10.0'	Stiff Brown Clay and Sand, trace of Silt - Moist	4A	8.5-10.0'	5-7-5	12
12.5'					
	Medium Dense Brown Sand, trace of Silt - Damp	5A	13.5-15.0'	7-10-9	19
17.0'					
20.0'	Medium Dense Brown Sand and Gravel, trace of Silt - Damp	6A	18.5-20.0'	18-15-9	24
21.0'					
	Medium Dense Brown Sand, trace of Silt - Damp	7A	23.5-25.0'	5-5-9	14
	Bottom of Boring at 25.0'				

METHOD: Hollow Auger

TECHNICIAN: BC-BK

JOB NO.: 03985

WATER OBSERVATIONS

INITIAL DEPTH: None

COMPLETION DEPTH: None

DEPTH AFTER: _____ HRS. _____

TYPE SAMPLER:

X A. SPLIT SPOON

_____ B.

_____ C. SHELBY TUBE

BOWSER – MORNER
TESTING LABORATORIES, INC.

LOG OF BORING NO. B-3A-1
PHASE 2 - STABILITY INVESTIGATION
DP&L STUART STATION - ABERDEEN, OHIO

BBCM

LOCATION: **N. 2336, E. 162** ELEVATION: **557.3** DATE: **4/1/10**

DRILLING METHOD: **3-1/4" I.D. Hollow-stem Auger** COMPLETION DEPTH: **35.0'**

SAMPLER(S): **2" O.D. Split-barrel Sampler 2" and 2-1/2" O.D. Split-barrel Samplers**

ELEV.	DEPTH, FEET	SAMPLE NUMBER	SAMPLE	SAMPLE EFFORT	N_{60}	SAMPLE REC-%	DESCRIPTION	NATURAL CONSISTENCY INDEX / NATURAL MOISTURE CONTENT / PLASTIC LIMIT / LIQUID LIMIT (10 20 30 40)	TEST RESULTS
556.8	0						ROADWAY GRAVEL - 6 INCHES		
		1	■	9/12/8	28	93	FILL: Hard brown and gray silty clay, some becoming trace fine to coarse sand, trace fine gravel, damp.		H=4.5+
		2A	■	3/6/8	20	60			H=4.5+
	5	2B	■		20				H=4.25
551.3									
550.9		3A	■	5/7/7	20	27	FILL: Medium-dense brown fine to coarse sand, some fine to coarse gravel, trace silt, damp.		
		3B	■			47	FILL: Hard brown and gray silty clay, some fine to coarse sand, trace fine gravel, damp.		H=4.5+
	10	4	■	3/4/7	16	87			H=4.5+ G
		5	■	5/9/10	27	20			H=4.5+
544.8		2S	■	16			FILL: Hard brown and gray silty clay, trace fine to coarse sand, trace fine gravel, damp.		
	15	6	■	5/7/10	24	87			H=4.0-4.5
		7	■	4/6/8	20	93			H=4.5+
538.8									
	20	8	■	2/8/12	28	87	FILL: Hard brown mottled with gray silty clay, some fine to medium sand, trace coarse sand, damp, contains sand seam at 19.4'.		H=4.25-4.5
		9	■	3/5/7	17	80			H=4.5+
533.8									
	25	10	■	2/4/8	17	73	FILL: Hard brown silty clay, "and" fine to coarse sand, trace fine gravel, damp.		H=4.0-4.5 G

WATER LEVEL:	"Dry"	"Dry"
WATER NOTE:	Inside HSA	Caved at 30.0'
DATE:	4/1/10	4/1/10 PM

SYMBOLS USED TO INDICATE TEST RESULTS
G - Gradation, Q - Uncon Comp, T - Triax Comp, C - Consol. — See Separate Curves
H - Penetrometer (tsf), W - Unit Dry Wt (pcf), D - Relative Dens (%)

Drill Rod Energy Ratio : 0.85
Last Calibration Date : 02/17/09
Drill Rig Number : ATV 550X

2010 NEW DEFAULT BORING LOG-W/ N60 112608000.GPJ BBCM.GDT 5/28/10

LOG OF BORING NO. B-3A-1
PHASE 2 - STABILITY INVESTIGATION
DP&L STUART STATION - ABERDEEN, OHIO

BBCM

LOCATION: **N. 2336, E. 162** ELEVATION: **557.3** DATE: **4/1/10**

DRILLING METHOD: **3-1/4" I.D. Hollow-stem Auger** COMPLETION DEPTH: **35.0'**

SAMPLER(S): **2" O.D. Split-barrel Sampler 2" and 2-1/2" O.D. Split-barrel Samplers**

ELEV.	DEPTH, FEET	SAMPLE NUMBER	SAMPLE	SAMPLE EFFORT	N_{60}	SAMPLE REC-%	DESCRIPTION	NATURAL CONSISTENCY INDEX / NATURAL MOISTURE CONTENT (PLASTIC LIMIT – LIQUID LIMIT; 10 20 30 40)	TEST RESULTS
531.3	25								
		11	■	2 / 3 / 5	11	73	FILL: Very-stiff to hard brown mottled with gray silty clay, little to some fine to coarse sand, damp.		H=2.5-4.0
528.8									
		12	■	10 / 20 / 15	50	93	FILL: Dense brown fine to coarse sand, trace fine gravel, some silty clay, damp.		
526.3	30								
		13	■	2 / 6 / 9	21	80	Hard brown mottled with gray silty clay, trace fine sand, damp.		H=4.0-4.5+
524.3									
		14	■	P		67	Hard brown mottled with gray silty clay, trace fine sand, contains silt seams, damp.		G
521.8	35								
							- Boring backfilled with grout. - Boring location and elevation provided by DP&L. - DATUM: NAD 83, Ohio South.		
	40								
	45								
	50								

WATER LEVEL:	▽ "Dry"	▼ "Dry"
WATER NOTE:	Inside HSA	Caved at 30.0'
DATE:	4/1/10	4/1/10 PM

SYMBOLS USED TO INDICATE TEST RESULTS

G - Gradation, Q - Uncon Comp, T - Triax Comp, C - Consol. } See Separate Curves

H - Penetrometer (tsf)
W - Unit Dry Wt (pcf)
D - Relative Dens (%)

Drill Rod Energy Ratio : 0.85
Last Calibration Date : 02/17/09
Drill Rig Number : ATV 550X

2010 NEW DEFAULT BORING LOG-W/ N60 112608000.GPJ BBCM.GDT 5/28/10

LOG OF BORING NO. B-3A-2
PHASE 2 - STABILITY INVESTIGATION
DP&L STUART STATION - ABERDEEN, OHIO

BBCM

LOCATION: **N. 2325, E. 163** ELEVATION: **557.2** DATE: **4/1/10**

DRILLING METHOD: **3-1/4" I.D. Hollow-stem Auger** COMPLETION DEPTH: **35.0'**

SAMPLER(S): **2" O.D. Split-barrel Sampler 2" and 2-1/2" O.D. Split-barrel Samplers**

ELEV.	DEPTH, FEET	SAMPLE NUMBER	SAMPLE	SAMPLE EFFORT	N_{60}	SAMPLE REC-%	DESCRIPTION	NATURAL CONSISTENCY INDEX / NATURAL MOISTURE CONTENT / PLASTIC LIMIT / LIQUID LIMIT (10 20 30 40)	TEST RESULTS
556.9	0						TOPSOIL - 3 INCHES		
		1		2/2/3	7	73	FILL: Stiff to very-stiff brown mottled with gray silty clay, little fine to coarse sand, contains roots near top of stratum, damp.		H=1.0-3.5
553.7									
		2		4/4/6	14	87	FILL: Very-stiff to hard brown mottled with silty clay, trace to some fine to coarse sand (% varies), trace fine gravel, damp.		H=4.25-4.5
	5								
		3A		5/6/8	20	100			H=3.5-4.0
		3B							H=3.5
549.2									
		4		P		67	FILL: Hard brown mottled with gray silty clay, trace fine to coarse sand, contains silt seams, damp.		G H=4.5+
	10								
		5A		4/6/9	21	100			H=4.5
545.3		5B					FILL: Hard brown and gray silty clay, some fine to coarse sand, trace fine gravel.		H=4.5+
543.7									
		6A		5/8/8	23	100	FILL: Hard brown and brown mottled with gray silty clay, trace fine to coarse sand, trace fine gravel, damp.		H=4.5+
		6B							H=4.5+
	15								
541.2									
		7		5/9/8	24	100	FILL: Hard brown silty clay, "and" fine to coarse sand, little fine gravel, damp.		H=4.5+
538.7									
		8		5/8/10	26	100	FILL: Hard brown and gray silty clay, little to some fine to coarse sand, trace fine gravel, damp. Sand pocket at 24.2'.		H=4.5+
	20								
		9		3/8/11	27	93			H=4.5+ G
		10		4/8/12	28	93			H=4.5+
	25								

WATER LEVEL: **32.0**
WATER NOTE: **Inside HSA**
DATE: **4/1/10**

SYMBOLS USED TO INDICATE TEST RESULTS
G - Gradation, Q - Uncon Comp, T - Triax Comp, C - Consol. (See Separate Curves)
H - Penetrometer (tsf), W - Unit Dry Wt (pcf), D - Relative Dens (%)

Drill Rod Energy Ratio : 0.85
Last Calibration Date : 02/17/09
Drill Rig Number : ATV 550X

2010 NEW DEFAULT BORING LOG-W/ N60 112608000.GPJ BBCM.GDT 5/28/10

LOG OF BORING NO. B-3A-2
PHASE 2 - STABILITY INVESTIGATION
DP&L STUART STATION - ABERDEEN, OHIO

BBCM

LOCATION: **N. 2325, E. 163** ELEVATION: **557.2** DATE: **4/1/10**

DRILLING METHOD: **3-1/4" I.D. Hollow-stem Auger** COMPLETION DEPTH: **35.0'**

SAMPLER(S): **2" O.D. Split-barrel Sampler 2" and 2-1/2" O.D. Split-barrel Samplers**

ELEV.	DEPTH, FEET	SAMPLE NUMBER	SAMPLE	SAMPLE EFFORT	N_{60}	SAMPLE REC-%	DESCRIPTION	NATURAL CONSISTENCY INDEX / NATURAL MOISTURE CONTENT / PLASTIC LIMIT / LIQUID LIMIT (10 20 30 40)	TEST RESULTS
531.2	25								
		11		16/35/34	98	100	FILL: Dense to very-dense brown fine to coarse sand, trace fine gravel, trace silt, trace clay, damp.		
		12		7/13/10	33	100			G
	30								
526.2							FILL: Very-loose to loose gray fly ash, moist.		
		13		1/3/3	9	93			
		14		1/1/1	3	100			G
522.2	35						- Encountered seepage at 28.5'. - Boring backfilled with grout. - Boring location and elevation provided by DP&L. - DATUM: NAD 83, Ohio South.		
	40								
	45								
	50								

WATER LEVEL: **32.0**
WATER NOTE: **Inside HSA**
DATE: **4/1/10**

SYMBOLS USED TO INDICATE TEST RESULTS
G - Gradation
Q - Uncon Comp
T - Triax Comp
C - Consol.
See Separate Curves
H - Penetrometer (tsf)
W - Unit Dry Wt (pcf)
D - Relative Dens (%)

Drill Rod Energy Ratio : 0.85
Last Calibration Date : 02/17/09
Drill Rig Number : ATV 550X

2010 NEW DEFAULT BORING LOG-W/ N60 112608000.GPJ BBCM.GDT 5/28/10

LOG OF BORING NO. B-3A-3
PHASE 2 - STABILITY INVESTIGATION
DP&L STUART STATION - ABERDEEN, OHIO

BBCM

LOCATION: **N. 2324, E. 163** ELEVATION: **556.6** DATE: **4/1/10**

DRILLING METHOD: **3-1/4" I.D. Hollow-stem Auger** COMPLETION DEPTH: **35.0'**

SAMPLER(S): **2" O.D. Split-barrel Sampler 2" and 2-1/2" O.D. Split-barrel Samplers**

ELEV.	DEPTH, FEET	SAMPLE NUMBER	SAMPLE	SAMPLE EFFORT	N_{60}	SAMPLE REC-%	DESCRIPTION	NATURAL CONSISTENCY INDEX / NATURAL MOISTURE CONTENT / PLASTIC LIMIT / LIQUID LIMIT (10 20 30 40)	TEST RESULTS
556.2	0						TOPSOIL - 4 INCHES		
		1		4/4/6	14	93	FILL: Hard brown silty clay, trace to some (% varies) fine to coarse sand, trace fine gravel, damp.		H=4.5+
		2		3/3/6	13	87			H=4.0-4.5
551.1	5								
		3		2/4/7	16	93	FILL: Very-stiff to hard brown mottled with gray clayey silt, trace fine to coarse sand, damp.		H=3.5-4.25 G
548.1									
547.3		4A		1/5/8	18	100	FILL: Very-stiff gray and brown silty clay, trace fine to coarse sand, damp.		H=3.5
	10	4B					FILL: Hard brown mottled with gray silty clay, some fine to coarse sand, damp.		H=4.5+
545.6									
		5		2/4/4	11	87	FILL: Very-stiff to hard brown mottled with gray silty clay, trace fine to coarse sand, trace fine gravel, contains silt seams, contains decayed roots near bottom of stratum, damp.		H=3.25-4.5
	15	6		P		50			G H=4.5
		7A		6/9/15	34	100			H=4.5+
539.3		7B							
538.6							FILL: Dense brown fine to coarse sand, trace fine gravel.		
		8A		5/8/9	24	100	FILL: Hard brown mottled with gray silty clay, some fine to coarse sand, trace fine gravel, intermixed with brown fine to coarse sand near top of stratum, damp.		H=4.5
	20	8B							H=4.0
		9A		4/10/12	31	100			H=4.5+
534.3		9B							H=4.5+
533.1							FILL: Hard brown mottled with gray silty clay, trace fine to coarse sand.		
	25	10		5/10/12	31	93	FILL: Dense fine to coarse sand, trace fine gravel, "and" clayey silt		G

WATER LEVEL: "Dry" "Dry"
WATER NOTE: Inside HSA Caved at 26.0'
DATE: 4/1/10 4/1/10 PM

SYMBOLS USED TO INDICATE TEST RESULTS
G - Gradation, Q - Uncon Comp, T - Triax Comp, C - Consol. — See Separate Curves
H - Penetrometer (tsf)
W - Unit Dry Wt (pcf)
D - Relative Dens (%)

Drill Rod Energy Ratio : 0.85
Last Calibration Date : 02/17/09
Drill Rig Number : ATV 550X

2010 NEW DEFAULT BORING LOG-W/ N60 11260800O.GPJ BBCM.GDT 5/28/10

LOG OF BORING NO. B-3A-3
PHASE 2 - STABILITY INVESTIGATION
DP&L STUART STATION - ABERDEEN, OHIO

BBCM

LOCATION: **N. 2324, E. 163** ELEVATION: **556.6** DATE: **4/1/10**

DRILLING METHOD: **3-1/4" I.D. Hollow-stem Auger** COMPLETION DEPTH: **35.0'**

SAMPLER(S): **2" O.D. Split-barrel Sampler 2" and 2-1/2" O.D. Split-barrel Samplers**

ELEV.	DEPTH, FEET	SAMPLE NUMBER	SAMPLE	SAMPLE EFFORT	N_{60}	SAMPLE REC-%	DESCRIPTION	NATURAL CONSISTENCY INDEX / NATURAL MOISTURE CONTENT / PLASTIC LIMIT / LIQUID LIMIT (10 20 30 40)	TEST RESULTS
530.6	25								
		11		6 / 10 / 11	30	87	FILL: Medium-dense brown fine to coarse sand, trace fine gravel, some silt, little clay, damp to moist.		
		12		8 / 8 / 8	23	87			G
	30								
525.6									
		13		1 / 3 / 4	10	80	Stiff to hard brown clayey silt, "and" fine to coarse sand, trace fine gravel, damp.		H=1.25-2.25
		14		1 / 3 / 4	10	73			H=3.5-4.5
521.6	35						- Encountered seepage at 26.0'. - Boring backfilled with grout. - Boring location and elevation provided by DP&L. - DATUM: NAD 83, Ohio South.		
	40								
	45								
	50								

WATER LEVEL:	"Dry"	"Dry"
WATER NOTE:	Inside HSA	Caved at 26.0'
DATE:	4/1/10	4/1/10 PM

SYMBOLS USED TO INDICATE TEST RESULTS

G - Gradation, Q - Uncon Comp, T - Triax Comp, C - Consol. — See Separate Curves

H - Penetrometer (tsf)
W - Unit Dry Wt (pcf)
D - Relative Dens (%)

Drill Rod Energy Ratio : 0.85
Last Calibration Date : 02/17/09
Drill Rig Number : ATV 550X

2010 NEW DEFAULT BORING LOG-W/ N60 112608000.GPJ BBCM.GDT 5/28/10

Project: DP&L, Pond 5A Investigation
Project Location: Aberdeen, Ohio
Project Number: 38-08E06133.09

Log of Boring A-1

Date(s) Drilled	1/16/01	Logged By	T. George	Checked By	M.D. Rokoff
Drilling Method	Hollow Stem Auger	Auger Size	4-1/4-inch ID 8-inch OD	Total Depth of Borehole	46.0 feet
Drill Rig Type	Brainard Kilman 81 - truck mounted	Drilling Contractor	AEP Pro Serve	Approximate Surface Elevation	~530.2 ft
Groundwater Depth and Date Measured	@ 15.2 ft ATD 13.5 ft on 2/2/01	Hammer Weight/ Drop (lbs./in.)	Automatic	Backfill	
Diameter of Hole (inches)	8-inch OD	Diameter of Well (inches)	2 inches	Type of Well Casing	PVC - .10 slot
		Screen Perforation	~43.9-3.9		
Type of Sand Pack	Silica No. 4 @ (4'-46')	Location	Pond 5, southside, top of slope above inclinometer, 36 ft West of survey Point, P5A15		

Elevation feet	Depth, feet	SAMPLES Type	Number	Sampling Resistance, blows / 6 in.	Recovery, %	Pocket Pene-trometer, tsf	Graphic Log	MATERIAL DESCRIPTION	Well or Hole Completion	FIELD NOTES AND WELL DETAILS
530	0							Stiff, moist, brown, sandy silty CLAY (CL-ML)		bentonite
			SS1	1 3 6 6	75	1.5 1.5 1.75		Medium dense, moist, brown, silty SAND (SM) with trace gravel		# 4 Silica
								Becomes with increasing silt/clay		
			SS2	3 6 7 8	88	1.5 2.25 4.5 4.5		Stiff, moist, brown, lean CLAY (CL) with sand, trace gravel		
525	5		SS3	4 6 7 8	88	4.5 3.5 2.5		Becomes with less gravel, with less sand		
			SS4	2 4 6 7	79	1.75 1.75 2.0 2.5				WC=21.8 LL=41; PL=23; PI=18
			SS5	3 6 6 7	88	1.75 4.25 3.25 2.5				
520	10							Becomes very stiff		
			SS6	3 7 9 11	92	3.5 4.5 4.5 4.25				
								Becomes stiff		
			SS7	2 5 6 9	88	4.25 4.5 4.5 4.5				
								Becomes gray		
515	15		SS8	2 5 13 14	83	1.0 1.5				Becomes wet at 15.2-ft
								Medium dense, wet, brown, medium to coarse, silty SAND (SM) with well graded SAND with silt and gravel (SW-SM)		%G=29.1; %S=58.2; %M=2.7; %C=9.9
								Becomes loose		
			SS9	6 5 5 13	83	1.5 4.5		Stiff to very stiff, moist, brown sandy Silty CLAY (CL-ML) with seams of fine silty SND and sandy SILT		Beginning of a 2-foot transition zone
			SS10	5 7 11 11	83	4.5		Medium dense, moist to wet, brown, fine to coarse, well graded SAND with silt (SW-SM) to silty SAND (SM) trace gravel		
510	20							Very stiff, moist, brown, lean CLAY (CL) with sand		
			SS11	5 9 10 11	100	4.5 4.5 4.5 4.5		Moist, silty SAND (SM) with gravel		Note: the outside surface of sample is wet from water in borehole going into spoon. middle of sample is moist.
								Becomes sandy silty CLAY (CL-ML) transitioning to lean CLAY (CL) with sand		
			SS12	5 7 8 10	100	4.5 3.5 2.5 4.5		Becomes with less sand		

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Log of Boring A-1

Elevation feet	Depth, feet	SAMPLES Type Number	Sampling Resistance, blows / 6 in.	Recovery, %	Pocket Penetrometer, tsf	Graphic Log	MATERIAL DESCRIPTION	Well or Hole Completion	FIELD NOTES AND WELL DETAILS
505	25	SS13	3, 7, 13, 11	83	2.75, 4.5				
							Dense, moist, dark brown, medium to fine, silty SAND (SM) trace gravel		
							Very stiff, moist, brown, sandy silty CLAY (CL-ML) trace gravel		
		SS14	4, 7, 9, 13	96	4.5, 4.5, 4.5, 4.5		Very stiff, moist, brown to brown with gray mottling, lean CLAY (CL) with sand and occasional fine sand laminae (<1/4-inch)		
		SS15	5, 8, 12, 14	100	3.75, 4.5, 4.5, 4.5				
500	30	SS16	3, 8, 10, 12	96	4.5, 4.5, 3.5, 2.75		10-inch grayish brown seam		
		SS17	2, 4, 7, 12	96	3.5, 4.5, 4.5, 4.25		Becomes very stiff		
495	35	SS18	4, 6, 10, 11	100	3.0, 3.5, 4.5, 4.5		Becomes stiff		
		SS19	3, 5, 8, 8	92	1.75, 2.5, 3.5, 4.25		8-inch seam with trace gravel, increased sand content		WC=11.8 LL=27; PL=16; PI=11
		SS20	3, 6, 8, 15	96	4.0, 3.0, 2.0				
							Moist, brown, sandy silty CLAY (CL-ML) to sandy SILT (ML)		
490	40	SS21	6, 9, 11, 11		4.0, 3.5, 3.0, 2.5		Very stiff, moist, brown and gray sandy silty CLAY (CL-ML)		
							Interbedded, stiff, moist, gray silty CLAY (CL-ML) SILT (ML) and fine SAND (SP-SM) to poorly graded SAND with silt (SP)		
		SS22	3, 6, 5, 6	100	3.5, 2.5, 1.5, 1.5		Becomes medium stiff and sand seams become moist to wet		Soil @ 43.9 to 46 ft
485	45	SS23	1, 3, 3, 4		1.25, 1.25, 1.25, 1.25				Bottom screen @43.9 Install monitoring point and pull augers
							End of boring at 46.0 ft bgs		
480	50								

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Project: DP&L, Pond 5A Investigation
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Log of Boring A-2

Date(s) Drilled	1/18/01	Logged By	T. George	Checked By	M.D. Rokoff
Drilling Method	Hollow Stem Auger	Auger Size	4-1/4-inch ID 8-inch OD	Total Depth of Borehole	23.7 feet
Drill Rig Type	Brainard Kilman 81 - truck mounted	Drilling Contractor	AEP Pro Serve	Approximate Surface Elevation	~530.5 ft
Groundwater Depth and Date Measured	Encountered @ 11.7 ft	Hammer Weight/ Drop (lbs./in.)	Automatic	Backfill	Borehole backfilled with Quick Grout
Diameter of Hole (inches)	8-inch OD; Diameter of Well (inches) N/A	Type of Well Casing	N/A; Screen Perforation N/A		
Type of Sand Pack	N/A	Location	24 FT East of Survey point, P5A17 @ top of slope (~24 ft east and upwards of most eastern seepage zone on slope face)		

Elevation feet	Depth, feet	SAMPLES Type	Number	Sampling Resistance, blows / 6 in.	Recovery, %	Pocket Penetrometer, tsf	Graphic Log	MATERIAL DESCRIPTION	Well or Hole Completion	FIELD NOTES AND WELL DETAILS
530	0							Medium stiff, moist, brown lean CLAY (CL) to silty CLAY (CL-ML)		
			SS1	2, 3, 4, 7	88	1.5, 1.5, 2.0, 4.5				
525	5		ST2		75					350 lbs down pressure to push shelby tube 11 Seconds/2 ft
			SS3	4, 7, 10, 10	88	4.0, 4.25, 4.5, 3.5		Very stiff, moist, brown lean CLAY (CL) with sand, trace gravel		
520	10							Dense, wet, brown, coarse to medium SAND (SW)		
			SS4	6, 6, 5, 6	75	4.5, 4.5		1-inch gray CLAY (CL)		
								Stiff, moist, brown silty CLAY (CL-ML) with sand to lean CLAY (CL) with sand, trace gravel		
515	15		SS5	2, 6, 7, 7	100	4.5, 4.5, 4.25				
								← Increasing gravel content		
			SS6	6, 9, 11, 17	100	4.5, 4.5		} 6-inches dense, moist, brown, coarse to fine SAND (SW) with gravel		
			SS7	4, 6, 6, 6	88	2.5, 2.5		} 6-inches dense, moist, brown, coarse to fine SAND (SW) with gravel		
510	20		SS8	2, 4, 7, 10	100	4.0, 3.5, 4.5, 4.5		← Becomes very stiff		

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Log of Boring A-2

Elevation feet	Depth, feet	SAMPLES Type	Number	Sampling Resistance, blows / 6 in.	Recovery, %	Pocket Penetrometer, tsf	Graphic Log	MATERIAL DESCRIPTION	Well or Hole Completion	FIELD NOTES AND WELL DETAILS
			SS9	6 13 8 8	100	4.5 4.5 4.5		6-inches dense, moist, brown to dark brown, coarse to fine SAND (SW) with gravel Becomes more sandy		
								End of boring at 23.7 ft bgs		
505	25									
500	30									
495	35									
490	40									
485	45									

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Project: DP&L, Pond 5A Investigation
Project Location: Aberdeen, Ohio
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Log of Boring A-3

Date(s) Drilled **1/22/01**	Logged By **T. George**	Checked By **M.D. Rokoff**
Drilling Method **Hollow Stem Auger**	Auger Size **4-1/4-inch ID 8-inch OD**	Total Depth of Borehole **31.4 feet**
Drill Rig Type **Brainard Kilman 81 - truck mounted**	Drilling Contractor **AEP Pro Serve**	Approximate Surface Elevation **~530.5 ft**
Groundwater Depth and Date Measured **Encountered @ 27.4 FT**	Hammer Weight/ Drop (lbs./in.) **Automatic**	Backfill **Borehole backfilled with Bentonite Quick Grout**
Diameter of Hole (inches) **8-inch OD** Diameter of Well (inches) **N/A**	Type of Well Casing **N/A** Screen Perforation **N/A**	
Type of Sand Pack **N/A**	Location **~262-FT west of boring A-1 @ top of slope along road and ~20-ft east of the point @ the top of slope that is perpendicular to P5A2 Survey Point**	

Elevation feet	Depth, feet	SAMPLES Type	Number	Sampling Resistance, blows / 6 in.	Recovery, %	Pocket Penetrometer, tsf	Graphic Log	MATERIAL DESCRIPTION	Well or Hole Completion	FIELD NOTES AND WELL DETAILS
530	0							Stiff, moist, brown sandy lean CLAY (CL) with gravel		
			SS1	5 6 8 5	13					Gravel (1-1/2-inch) blocking shoe of split spoon
525	5							Dense, moist, brown, fine to coarse silty SAND (SM) to well-graded SAND with silt (SW-SM) with gravel		
			SS2	5 10 10 10	88			Becomes medium to coarse, moist		
520	10							Medium stiff, moist, brown, lean CLAY (CL) with sand, trace gravel		WC=23.0 LL=41; PL=23; PI=18
			SS3	3 2 5 4	75	2.25 2.0 2.25				
			SS4	1 3 4 5	83	2.5 3.0 2.5				
515	15							Becomes stiff		WC=21.9
			SS5	1 4 6 8	100	3.0 2.5 2.0				
			SS6	3 6 9 12	100	4.5 3.5 4.5 3.5				
510	20		SS7	3 7 11 14	88	4.5 4.5 4.5 4.5		Very stiff, moist, brown lean CLAY (CL) with sand, trace gravel		
			SS8	4 7 9 10	100	4.5 4.5 4.0 4.25		1-inch moist, brown, coarse to fine silty SAND (SM) with silt to well-graded SAND with silt (SW-SM) with trace gravel; 1-inch sandy lean CLAY (CL) seam		
505	25		SS9	3 8 7 8		4.5 4.5 3.0 2.0				

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Log of Boring A-3

Elevation feet	Depth, feet	SAMPLES Type Number	Sampling Resistance, blows / 6 in.	Recovery, %	Pocket Penetrometer, tsf	Graphic Log	MATERIAL DESCRIPTION	Well or Hole Completion	FIELD NOTES AND WELL DETAILS
505		ST10		94	4.5				Survey Point P5A2 @ 504.1-ft some seepage at inslope observed 15-ft east of P5A2
		SS11	4 7 8 14	75	2.5 4.0		Dense, wet, brown, medium to coarse, well-graded SAND with silt (SW-SM) to silty SAND (SM), trace gravel; 6-inches lean CLAY (CL) @27.8-28.3 ft		
500	30	SS12	3 6 8 12	88	2.0 4.25 4.5		Stiff, moist, brown, lean CLAY (CL) with sand, trace gravel		
							End of boring at 31.4 ft bgs		
495	35								
490	40								
485	45								
480	50								
	55								

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Log of Boring A-4

Sheet 1 of 2

Date(s) Drilled	1/30/01	Logged By	T. George	Checked By	M.D. Rokoff
Drilling Method	Hollow Stem Auger	Auger Size	4-1/4-inch ID 8-inch OD	Total Depth of Borehole	27.9 feet
Drill Rig Type	CME 45 Rubber tracked ATV	Drilling Contractor	Midwest Env. Drill/AEP for inclinometer installation	Approximate Surface Elevation	513.4 ft
Groundwater Depth and Date Measured	Encountered @ 26.9 ft	Hammer Weight/ Drop (lbs./in.)	140 lbs / 30-inches	Backfill	Borehole backfilled with Bentonite / Grout / 6x6x5 inch protective casing
Diameter of Hole (inches)	8-inch OD; Diameter of Well (inches) N/A	Type of Well Casing	INCLINOMETER; Screen Perforation N/A		
Type of Sand Pack	N/A	Location	Pond 5 along mid slope of 1 ft below top of seepage zone (~5-ft W/4.5-ft south of survey point PSA16)		

Elevation feet	Depth, feet	Type	Number	Sampling Resistance, blows / 6 in.	Recovery, %	Pocket Penetrometer, tsf	Graphic Log	MATERIAL DESCRIPTION	Inclinometer	FIELD NOTES AND WELL DETAILS
	0			0				Wet topsoil		
			SS1	0, 0, 1	50			Very loose, wet, medium to coarse, well-graded SAND with silt (SW-SM) to silty SAND (SM)		
				1		0.75		Very soft, moist, gray, lean CLAY (CL) with sand, root fragments and organics		
	2			2				Medium dense, moist to wet, brown, medium to coarse silty SAND (SM) with gravel		
			SS2	7, 6	75					
510				9						
	4			8						%G=24.7; %S=62.1; %F=13.2
			SS3	13, 13	75					
	6			16						
			SS4	4, 3	63			1-inch fine silty SAND		
				4		2.5		Medium stiff, moist, brown and gray mottled lean CLAY (CL) with sand, trace wood fragments		
	8			5		3.0		Becomes without wood fragments		WC=18.3 LL=31; PL=20; PI=11
505			SS5	2, 3, 3	63	1.5, 4.5				
	10			7		3.5		Becomes with trace gravel		Shelby tube pushed @ Elv. 503.7 - 505.7
			SS6	2, 3, 5	63	1.5, 4.5		1-inch sandy CLAY seam (pp=1.5)		A newly drilled borehole located from A-4 as follows: 18-ft West along slope; 9-ft North up slope; pocket pen was 4.5+ on bottom of Tube
	12			9		4.5				
			SS7	6, 5, 6	63	3.0, 3.25		3-inches medium dense, moist silty SAND (SM)		
500				7		3.0				
	14			5				Stiff, moist, brown, sandy SILT (ML) to fine silty SAND (SM) trace gravel		
			SS8	6, 6	63			Stiff, moist, brown with gray mottling lean CLAY (CL) with sand		
				11		4.5				
	16			3		4.5				WC=22.6
			SS9	6, 6	75	1.75		2-inches moist, organic CLAY (OL) to silty CLAY (CL-ML), trace root fibers		
				10		1.75		Stiff, moist, dark brown with gray mottling lean CLAY (CL) with sand		
	18			3				Becomes with fine sand partings (<1/16-inch)		
495			SS10	4, 7	63	3.25				
	20			9		3.5				

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Log of Boring A-4

Elevation feet	Depth, feet	SAMPLES Type	Number	Sampling Resistance, blows / 6 in.	Recovery, %	Pocket Penetrometer, tsf	Graphic Log	MATERIAL DESCRIPTION	Inclinometer	FIELD NOTES AND WELL DETAILS
	20			4				Stiff, moist, dark brown with gray mottling lean CLAY (CL) with sand		
			SS11	5	75	3.5				
				7		2.5		Becomes trace black, decayed organic fiber		
				11		2.5				
	22			7				Loose, moist, greenish-brown interbedded, fine silty SAND (SM) to sandy SILT (ML)		
			SS12	4	50			Becomes gray		
490				4						
	24			4				Becomes trace inclined organic seams (<1/8-inch)		
				2						
			SS13	2	100					
				4				6-inches SILT (ML) with organics		
	26			4						
				2						
			SS14	2	100			Loose, wet, gray, medium to fine SAND with silt (SP-SM) to silty sand (SM)		
				4						
				4						
	28							End of Boring at 27.9 ft bgs		
485										
	30									
	32									
480										
	34									
	36									
	38									
475										
	40									
	42									

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Log of Boring A-5

Sheet 1 of 1

Date(s) Drilled **1/30/01**	Logged By **T. George**	Checked By **M.D. Rokoff**
Drilling Method **Hollow Stem Auger**	Auger Size **4-1/4-inch ID 8-inch OD**	Total Depth of Borehole **14.2 feet**
Drill Rig Type **CME 45 Rubber tracked ATV**	Drilling Contractor **Midwest Environmental Drilling**	Approximate Surface Elevation **497.10 ft**
Groundwater Depth and Date Measured **11.0 ft ATD on 2/2/01** **11.2 ft**	Hammer Weight/ Drop (lbs./in.) **140 lbs / 30-inches**	Backfill
Diameter of Hole (inches) **8-inch OD** Diameter of Well (inches) **2 inches**	Type of Well Casing **PVC** Screen Perforation **0.10-inch slot**	
Type of Sand Pack **Silica No. 4 @ (14.1-3.2 ft)**	Location **22-ft down or South / 28-ft west of Survey point P5A12 (toe) located in close alighment with A-4 and A-1, perpendicular to slope**	

Elevation feet	Depth, feet	Type	Number	Sampling Resistance, blows / 6 in.	Recovery, %	Pocket Penetrometer, tsf	Graphic Log	MATERIAL DESCRIPTION	Well or Hole Completion	FIELD NOTES AND WELL DETAILS
	0			2				Topsoil		Concrete
			SS1	2, 3, 4	100			Loose, moist, dark brown, silty SAND (SM) to sandy SILT (ML) with organics		Bentonite pellets
495	2			4				Becomes laminated without organics		
			SS2	4, 4, 5	75			Light brown, fine silty SAND (SM) with laminations		Riser @ 4.2 - 2.83; Screen @ 14.1 - 4.2
	4			2				Becomes interbedded gray, fine silty SAND (SM+SP-SM) and brown fine sandy SILT (ML)		
			SS3	3, 2, 2	75					
	6			2				Loose, brown, fine, poorly graded SAND with silt (SP-SM) with coalaceous laminations		
490			SS4	3, 2, 2	50					
	8			3						%G=0.0; %S=90.9; %F=9.1
			SS5	3, 3, 2	50					
	10			3						
			SS6	3, 3, 2	50			Becomes wet (unsaturated)		
485	12			2				Becomes very loose, wet (saturated)		
			SS7	2, 2, 4	75					
	14							End of boring at 14.2 ft bgs		
	16									

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Log of Boring B-1

Date(s) Drilled	1/16/01 / 1/17/01	Logged By	T. George	Checked By	M.D. Rokoff
Drilling Method	Hollow Stem Auger	Auger Size	4-1/4-inch ID 8-inch OD	Total Depth of Borehole	46.0 feet
Drill Rig Type	Brainard Kilman 81 - truck mount	Drilling Contractor	AEP Pro Serve	Approximate Surface Elevation	~530.2 ft
Groundwater Depth and Date Measured	23.5 ft ATD on 2/2/01 — 19.57 ft	Hammer Weight/ Drop (lbs./in.)	Automatic	Backfill	
Diameter of Hole (inches)	8-inch OD — Diameter of Well (inches) 2 inches	Type of Well Casing	PVC — Screen Perforation 0.10-inch slot/	30.5-21.5	
Type of Sand Pack	Silica No. 4 @ (31.2-19.5 ft)	Location	76-ft along road from survey point P5B15; directly upslope from Piezometer P5B10; 68.5-ft from P5B15		

Elevation feet	Depth, feet	SAMPLES Type	Number	Sampling Resistance, blows / 6 in.	Recovery, %	Pocket Penetrometer, tsf	Graphic Log	MATERIAL DESCRIPTION	Well or Hole Completion	FIELD NOTES AND WELL DETAILS
530	0							5-inches Topsoil		Borehole drilled to 46-ft, then grouted to surface. Another borehole drilled 3-ft North of original borehole in order to set monitor point. PVC pipe was encountered at 2nd borehole, which was then grouted.
			SS1	1 2 3 3	58	0.5 1.5 1.5		Medium stiff, moist, brown silty CLAY (CL-ML) to lean CLAY (CL) with sand and silt		
								Becomes brown and dark brown		
			SS2	2 2 5 5	92	1.75 3.5 3.5				Bentonite grout 1.0 - 16.8 ft
525	5									A third boreholee was drilled 7.5-ft Southeast of original borehole. The monitoring point was set there.
			SS3	2 4 5 8	100	1.75 4.5 3.5		Stiff, moist, brown lean CLAY (CL) with sand		
520	10									
			SS4	2 3 6 8	92	2.0 2.0 3.5 4.0		Becomes brown and gray and trace gravel		WC=18.1 LL=35; PL=20; PI=15
515	15									
			SS5	3 6 8 9	92	4.0 4.0 3.75 3.75				Bentonite 16.8 - 19.4
			SS6	2 5 6 10	92	2.5 4.25 4.5				No. 4 Sand
510	20		SS7	4 8 10 10	100	4.5 4.5 4.5 4.5		Very stiff, moist, brown silty CLAY (CL-ML) with sand to lean CLAY (CL) with sand, trace gravel with increased gravel		

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Log of Boring B-1

Elevation feet	Depth, feet	Type	Number	Sampling Resistance, blows / 6 in.	Recovery, %	Pocket Penetrometer, tsf	Graphic Log	MATERIAL DESCRIPTION	Well or Hole Completion	FIELD NOTES AND WELL DETAILS
		SS	SS8	2, 5, 6, 12	88	4.25, 4.5, 4.5		Stiff, moist, brown lean CLAY (CL) with sand		
								1-inch wet, coarse to medium sand		
								1-inch wet, medium sand		
505	25	SS	SS9	3, 7, 7, 8	75	1.75, 3.25		6-inch seam of wet, medium to fine SANDwith silt (SP-SM) to silty SAND (SM) with trace gravel		
								Becomes very stiff 1-4-inch fine sand seam		
		SS	SS10	3, 9, 11, 11	75	2.0, 4.5		6-inch seam of wet, fine to coarse SAND with silt (SW-SP) to silty SAND (SM) trace gravel		3-inch CLAY-SAND transition zone (wet)
								Loose, wet, brown, coarse to fine, well-graded SAND with silt (SW-SM) to silty SAND (SM), trace gravel		%G=7.2; %S=71.7; %F=21.1
		SS	SS11	2, 4, 5, 5	88	4.0		2-inch seam sandy lean CLAY (CL)		
								Stiff, moist, brown lean CLAY (CL) with sand		Transition SAND to CLAY
500	30	SS	SS12	3, 10, 13, 11	83	2.25		Very stiff, moist, brown sandy SILT (ML)		Monitoring point installed 7.5-ft Southeast of borehole
		SS	SS13	2, 4, 6, 9	92	3.75, 2.75, 2.25		Stiff, moist, brown, lean CLAY (CL) with sand		Transitions to lean CLAY
								1/2-inch sand seam 1/2-inch sand seam		
495	35	SS	SS14	3, 6, 10, 12	100	2.25, 3.75, 3.25, 2.5		Becomes very stiff		
								1-inch seam gray lean CLAY (CL) with trace gravel Becomes with increasing sand		
		SS	SS15	3, 8, 11, 9	100	1.75, 3.25, 3.0		Wet, brown, coarse to fine SAND with silt (SW-SM), with gravel to silty SAND (SM)		
								Very stiff, moist, dark brown lean CLAY (CL) with sand, trace root fibers [NATURAL ALLUVIUM]		
		SS	SS16	3, 3, 6, 9	100	1.0, 1.5, 3.0, 2.75		Becomes stiff, light brown		
490	40							Becomes with trace gravel		
		SS	SS17	3, 6, 8, 10	100	3.5, 2.75, 2.25, 1.75		Color grades from dark brown to gray		
								Becomes very stiff		
		SS	SS18	2, 5, 12, 12	100	1.0, 3.75, 1.5				
								Medium dense, wet, dark brown, medium to fine SAND with silt (SP-SM) to silty SAND (SM)		
								Very stiff, moist, gray lean CLAY (CL) with sand, trace gravel		
485	45	SS	SS19	5, 9, 14, 11	100	3.0, 2.0		Wet, brown and gray, coarse to medium silty SAND (SM)		
								Moist, brown and gray, sandy lean CLAY (CL) to lean CLAY (CL) with sand		
								End of Boring at 46.0 ft bgs		

Report: ENV_13W_DPL File: DPL_P5.GPJ 4/12/2001 B-1

URS

Project: DP&L, Pond 5A Investigation
Project Location: Aberdeen, Ohio
Project Number: 38-08E06133.09

Log of Boring C-1

Date(s) Drilled	1/17/01 / 1/18/01	Logged By	T. George	Checked By	M.D. Rokoff
Drilling Method	Hollow Stem Auger	Auger Size	4-1/4-inch ID 8-inch OD	Total Depth of Borehole	44.6 feet
Drill Rig Type	Brainard Kilman 81 - truck mount	Drilling Contractor	AEP Pro Serve	Approximate Surface Elevation	~531.0 ft
Groundwater Depth and Date Measured	14.4 ft ATD/10.3 ft on 1/24/01 11.44 ft on 2/2/01	Hammer Weight/ Drop (lbs./in.)	Automatic	Backfill	
Diameter of Hole (inches)	8-inch OD	Diameter of Well (inches)	2 inches	Type of Well Casing: PVC	Screen Perforation: 0.10 inch slot
Type of Sand Pack	Silica No. 4 @ (25-13.2 ft)	Location	Piezometer relocated 2.5 ft east of (original) borehole/North side of Pond 5 - upslope from P5C10/~38 ft east of survey point P5C6, @ top of slope		

Elevation feet	Depth, feet	SAMPLES Type	Number	Sampling Resistance, blows / 6 in.	Recovery, %	Pocket Penetrometer, tsf	Graphic Log	MATERIAL DESCRIPTION	Well or Hole Completion	FIELD NOTES AND WELL DETAILS
	0							Stiff, moist, brown lean CLAY (CL) with sand, trace gravel		Grout - Original borehole grouted after completion. Additional borehole located 2.5-feet East of original borehole, was drilled to 25-ft in order to set piezometer
530										
	2		SS1	3 5 5 4	88	2.25 2.5 2.75		1-inch moist sand seam		
	4									
525	6									
			SS2	7 13 13 13	88			Medium dense, moist, brown, medium to fine, poorly graded SAND with silt (SP-SM), trace gravel		
	8									Transitions to a silty SAND (SM)
			SS3	3 5 5 7	96	3.25		Stiff, moist, brown, lean CLAY (CL) with sand		
	10					2.5		Medium stiff, moist, brown sandy SILT (ML) to silty SAND (SM)		
520			SS4	3 3 5 14	100	2.0 2.5 4.5		Stiff, moist, brown lean CLAY (CL) with sand, trace gravel		Bentonite Transition to silty CLAY (CL-ML) with sand
	12									Transition to silty CLAY (CL-ML)
			SS5	3 10 8 10	88			Medium dense, moist, brown, medium to fine silty SAND (SM) to poorly graded SAND with silt (SP-SM)		Sand
	14							5-inches moist, sandy silty CLAY (CL-ML) with gravel Becomes wet Becomes medium to coarse SAND (SP) trace gravel		
			SS6	4 10 13 9	88					
515	16							2-inch sandy SILT (ML) seam Becomes wet, medium to coarse silty SAND (SM) to well-graded SAND with silt (SW-SM) with gravel		%G=19.2; %S=55.7; %F=25.1
			SS7	2 5 10 10	71					
	18							Becomes moist, sandy SILT (ML) with coal fragments		

URS

Project: DP&L, Pond 5A Investigation
Project Location: Aberdeen, Ohio
Project Number: 38-08E06133.09

Log of Boring C-1

Elevation feet	Depth, feet	SAMPLES Type	Number	Sampling Resistance, blows / 6 in.	Recovery, %	Pocket Penetrometer, tsf	Graphic Log	MATERIAL DESCRIPTION	Well or Hole Completion	FIELD NOTES AND WELL DETAILS
				5						
				11				Becomes wet silty SAND (SM)		
			SS8	9	83					
	20			7				6-inch moist sandy SILT (ML) with gravel		
				5				10-inches stiff, moist, brown lean CLAY (CL)		
510				13				Becomes medium coarse with gravel		
			SS9	10	100	2.75				
	22			12				4-inches wet sandy silty SAND to sandy SILT		
				5				Medium dense, wet, brown, medium to coarse silty SAND (SM) with gravel to well-graded SAND and SILT (SP-SM)		
				12						
			SS10	11	100					
	24			9				4-inches coarse to medium, well-graded SAND with silt to silty SAND (SP-SM) with gravel		Screen @ 24.3-ft; Bottom @ 24.6; Sand @ 24.6-25.0
				2				Becomes loose, moist to wet		
				4				4-inch lean CLAY (CL) with sand		
			SS11	6	100	1.75				
505	26			12						
				3				4-inch lean CLAY (CL) with sand		
				4				2-inch medium to fine, poorly graded SAND with silt (SP-SM)		
			SS12	4	100	1.75				
	28			7				Medium stiff, moist, grayish brown lean CLAY (CL) with sand, trace gravel, trace organics		
				4		1.0				
				8				4-inches wet, coarse to fine SAND		
			SS13	8	100					
	30			10		3.5		4-inches medium dense, wet, brown clayey SAND (SC)		
				5				Becomes very stiff to stiff, grayish-brown		
500				8		1.75				
			SS14	8	75	2.25		2-inches medium to fine SAND		
	32			11		1.75		Becomes brown		
				3		1.5		Becomes medium stiff and gray		WC=27.5 LL=49; PL=24; PI=25
				3		1.0				
			SS15	5	100	1.25				
	34			7		1.25		Becomes very stiff		
				3		2.0				WC=15.2
				6		2.75				
			SS16	10	100	3.0				
495	36			12		2.5				
				2		3.0				WC=22.8
				6		4.25				
			SS17	10	100	3.0				
	38			12		2.0				
				3		2.0				
				6		2.0				
			SS18	10	100	2.75				
	40									

Report: ENV_13W_DPL; File: DPL_P5.GPJ; 4/12/2001 C-1

URS

Project: DP&L, Pond 5A Investigation
Project Location: Aberdeen, Ohio
Project Number: 38-08E06133.09

Log of Boring C-1

Elevation feet	Depth, feet	SAMPLES Type	Number	Sampling Resistance, blows / 6 in.	Recovery, %	Pocket Penetrometer, tsf	Graphic Log	MATERIAL DESCRIPTION	Well or Hole Completion	FIELD NOTES AND WELL DETAILS
				12				6-inch seam medium dense, moist, gray, medium to fine silty SAND (SM)		
490				6						
			SS19	12	100			Very stiff, moist, brown, sandy SILT (ML) to fine silty SAND (SM)		
	42			14						
				16				Becomes interbedded with loose, moist to wet, brown, fine, silty SAND (SM) to sandy SILT (ML) and silty CLAY (CL-ML)		
				4						
			SS20	4	100					
	44			3						
				2						
								End of Boring at 44.6 ft bgs		
485	46									
	48									
	50									
480										
	52									
	54									
475	56									
	58									
	60									
470										
	62									

URS

LOG OF BORING NO. HS-B-3
PHASE 1 - POND 5 SEEPAGE ANALYSIS
J.M. STUART STATION - ABERDEEN, OHIO

BBCM

LOCATION: **See Plate 2 of Appendix** ELEVATION: **500** DATE: **3/18/10**

DRILLING METHOD: **Hand Auger** COMPLETION DEPTH: **6.0'**

SAMPLER(S): **2" O.D. Split-barrel Sampler**

ELEV.	DEPTH, FEET	SAMPLE NUMBER	SAMPLE	SAMPLE EFFORT	N-Value	SAMPLE REC-%	DESCRIPTION	TEST RESULTS
499.8	0						TOPSOIL - 2 INCHES	
		1		4/9/13	22	60	FILL: Stiff to very-stiff brown mottled with gray and dark-brown silty clay, trace fine to medium sand, contains roots, damp.	H=1.0-4.2
		2A		8/16/16	32	100		H=2.5-3.0
497.8							FILL: Stiff to very-stiff brown mottled with gray becoming gray mottled with brown silty clay, little to some fine sand, trace to little medium to coarse sand, trace fine gravel, few seams of silt, damp.	
		2B						G H=2.3-2.6
		3A		11/13/17	30	100		H=1.8-3.5
496.4							FILL: Very-stiff gray mottled with brown silty clay, little fine to coarse sand, trace fine gravel, few seams of silt, damp.	
		3B						G H=2.5-2.75
495.5							FILL: Stiff gray mottled with brown silty clay, trace fine to medium sand, contains decayed wood, slightly organic, damp.	
		4A		9/10/17	27	100		H=1.8
495.0	5						FILL: Stiff gray mottled with brown and dark-gray silty clay, little fine to coarse sand, trace fine gravel, slightly organic, damp.	
		4B						H=1.0-1.2
494.5							FILL: Very-stiff brown mottled with dark-brown and gray silty clay, trace fine to medium sand, few seams of fine to coarse sand, trace fine gravel, damp.	
		4C						H=2.8
494.0								
	10							

NATURAL CONSISTENCY INDEX — NATURAL MOISTURE CONTENT — PLASTIC LIMIT — LIQUID LIMIT — 10 20 30 40

- Seepage encountered at 6'.
-Boring performed with hand sampling equipment.
- Ohio River gage height at 47.7 feet (approximate elevation 498.6).

WATER LEVEL: "Dry"
WATER NOTE:
DATE: 3/18/10

SYMBOLS USED TO INDICATE TEST RESULTS

G - Gradation, Q - Uncon Comp, T - Triax Comp, C - Consol. — See Separate Curves

H - Penetrometer (tsf)
W - Unit Dry Wt (pcf)
D - Relative Dens (%)

2009 NEW DEFAULT BORING LOG - N VALUE 11260800O.GPJ BBCM.GDT 3/31/10

LOG OF BORING NO. HS-C-2
PHASE 1 - POND 5 SEEPAGE ANALYSIS
J.M. STUART STATION - ABERDEEN, OHIO

BBCM

LOCATION: **See Plate 2 of Appendix** ELEVATION: **499** DATE: **3/18/10**

DRILLING METHOD: **Hand Auger** COMPLETION DEPTH: **6.0'**

SAMPLER(S): **2" O.D. Split-barrel Sampler**

ELEV.	DEPTH, FEET	SAMPLE NUMBER	SAMPLE	SAMPLE EFFORT	N-Value	SAMPLE REC-%	DESCRIPTION	TEST RESULTS
498.9	0						TOPSOIL - 1 INCH	
498.6		1A		2/5/8	13	100	FILL: Very-loose brown and dark-brown fine to medium sand, trace coarse sand, trace fine gravel, some silty clay, contains roots, damp to moist.	
		1B					FILL: Stiff to very-stiff brown mottled with dark-brown silty clay, little fine to coarse sand, trace fine gravel, few lenses of silt, contains 1" sand seams at 0.8', damp to moist.	H=1.75-2.5
497.0		2A		9/18/30	48	100		H=1.25-1.5
		2B					FILL: Hard brown mottled with gray and dark-brown silty clay, little fine to coarse sand, trace fine gravel, few seams of silt, contains sand and gravel seams at 2.5', damp to moist.	H=4.0-4.5+
496.0								
		3		20/22/34	56	93	FILL: Stiff to very-stiff brown mottled with dark-brown silty clay, little fine to coarse sand, trace fine gravel, contains many seams of fine to coarse sand, moist to wet.	G H=1.25-2.75
494.5								
	5	4A		13/26/26	52	100	FILL: Medium-dense brown fine to medium sand, trace coarse sand, trace fine gravel, "and" silty clay, contains 3" seam of very-stiff brown mottled with gray silty clay at 5.4', moist to wet.	H=2.8 G
		4B						
493.0								
	10						- Encountered water at 2.8'. - Boring performed with hand sampling equipment. - Ohio River gage height at 47.7 feet (approximate elevation 498.6).	

NATURAL CONSISTENCY INDEX — NATURAL MOISTURE CONTENT — PLASTIC LIMIT — LIQUID LIMIT — 10 20 30 40

WATER LEVEL: 3.0
WATER NOTE: At Completion
DATE: 3/18/10

SYMBOLS USED TO INDICATE TEST RESULTS

G - Gradation, Q - Uncon Comp, T - Triax Comp, C - Consol. — See Separate Curves

H - Penetrometer (tsf)
W - Unit Dry Wt (pcf)
D - Relative Dens (%)

2009 NEW DEFAULT BORING LOG - N VALUE 11260800O.GPJ BBCM.GDT 3/31/10

LOG OF TEST PIT NO. TP-A-1
PHASE 1 - POND 5 SEEPAGE ANALYSIS
J.M. STUART STATION - ABERDEEN, OHIO

TYPE: **Hand Auger**

LOCATION: **See Plate 2 of Appendix**

COMPLETION DEPTH: **2.0'** **ELEVATION:** **511** **DATE:** **3/18/10**

DEPTH, FEET	SAMPLE NO.	SAMPLES	SAMPLING EFFORT	HAND PENE-TROMETER (tsf)	MOISTURE CONTENT (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	DESCRIPTION
0								TOPSOIL - 6 INCHES
	1			H=0-0.5				FILL: Very-soft to medium-stiff dark-gray organic clayey silt, trace fine to medium sand, many roots, damp to moist.
	2			H=0.5-0.75				FILL: Medium-stiff gray silty clay interbedded with brown fine to medium sand, trace coarse sand, trace fine gravel, few roots, damp to moist.
	3							FILL: Loose to medium-dense (estimated) brown fine to coarse sand, "and" fine to coarse gravel, little clayey silt, damp to moist.
2								
								- No seepage encountered.
4								
6								

WATER LEVEL:
WATER NOTE:
DATE:

LOG OF TEST PIT NO. TP-A-2
PHASE 1 - POND 5 SEEPAGE ANALYSIS
J.M. STUART STATION - ABERDEEN, OHIO

TYPE: **Hand Auger**

LOCATION: **See Plate 2 of Appendix**

COMPLETION DEPTH: **2.0'** **ELEVATION:** **515** **DATE:** **3/18/10**

DEPTH, FEET	SAMPLE NO.	SAMPLES	SAMPLING EFFORT	HAND PENE-TROMETER (tsf)	MOISTURE CONTENT (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	DESCRIPTION
0								TOPSOIL - 6 INCHES
	1	■		H=0.5-1.0				FILL: Medium-stiff to stiff brown silty clay, little fine to coarse sand, trace fine gravel, few roots, moist.
	2	■						FILL: Loose to medium-dense (estimated) brown and gray fine to coarse sand, some fine gravel, little clayey silt, wet.
	3	■						FILL: Medium-dense gray fine to coarse sand, "and" fine to coarse gravel, little silty clay.
2								
								- Encountered seepage at 1.2'.
4								
6								

WATER LEVEL: ▽ ▼ ▼ ▼ ▽ ▼
WATER NOTE:
DATE:

PITLJ 112608000.GPJ BBCM.GDT 3/31/10

LOG OF TEST PIT NO. TP-B-1
PHASE 1 - POND 5 SEEPAGE ANALYSIS
J.M. STUART STATION - ABERDEEN, OHIO

TYPE: **Hand Auger**

LOCATION: **See Plate 2 of Appendix**

COMPLETION DEPTH: **2.0'** **ELEVATION:** **504** **DATE:** **3/18/10**

DEPTH, FEET	SAMPLE NO.	SAMPLES	SAMPLING EFFORT	HAND PENE-TROMETER (tsf)	MOISTURE CONTENT (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	DESCRIPTION
0								TOPSOIL - 2 INCHES
								FILL: Very-soft to soft brown mottled with gray and dark-brown silty clay, trace fine to coarse sand, trace fine gravel, few roots, slightly organic, damp.
	1			H=0-0.25				
								FILL: Stiff to very-stiff brown mottled with gray clayey silt, some fine sand, trace medium to coarse sand, trace fine gravel, few roots, damp.
	2			H=1.0-2.5	21	30	20	
2								
								- No seepage encountered.
4								
6								

WATER LEVEL:
WATER NOTE:
DATE:

PITLJ 112608000.GPJ BBCM.GDT 3/31/10

LOG OF TEST PIT NO. TP-B-2
PHASE 1 - POND 5 SEEPAGE ANALYSIS
J.M. STUART STATION - ABERDEEN, OHIO

TYPE: **Hand Auger**

LOCATION: **See Plate 2 of Appendix**

COMPLETION DEPTH: **1.4'** **ELEVATION:** **504** **DATE:** **3/18/10**

DEPTH, FEET	SAMPLE NO.	SAMPLES	SAMPLING EFFORT	HAND PENE-TROMETER (tsf)	MOISTURE CONTENT (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	DESCRIPTION
0								TOPSOIL - 2 INCHES
	1			H=0.0				FILL: Very-soft gray mottled with brown and dark-gray silty clay, trace fine to coarse sand, trace fine gravel, few roots.
	2			H=1.5				FILL: Stiff brown mottled with dark-brown and gray silty clay, trace fine to medium sand, few roots.
2								- Standing water ran into hole.
4								
6								

WATER LEVEL:
WATER NOTE:
DATE:

PITLJ 112608000.GPJ BBCM.GDT 3/31/10

LOG OF TEST PIT NO. TP-C-1
PHASE 1 - POND 5 SEEPAGE ANALYSIS
J.M. STUART STATION - ABERDEEN, OHIO

TYPE: **Hand Auger**

LOCATION: **See Plate 2 of Appendix**

COMPLETION DEPTH: **2.0'** **ELEVATION:** **515** **DATE:** **3/18/10**

DEPTH, FEET	SAMPLE NO.	SAMPLES	SAMPLING EFFORT	HAND PENE-TROMETER (tsf)	MOISTURE CONTENT (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	DESCRIPTION
0								TOPSOIL - 4 INCHES
	1							FILL: Very-soft gray mottled with brown and dark-gray silty clay, little fine to coarse sand, trace fine gravel, few roots, slightly organic, moist.
	2			H=1.0-2.0				FILL: Loose (estimated) gray and brown fine to medium sand, trace coarse sand, trace fine gravel, trace silt, moist to wet.
	3							FILL: Loose to medium-dense (estimated) brown and gray fine to medium sand, trace coarse sand, some fine to coarse gravel, little silt, moist to wet.
2								
								- Encountered seepage at 1.0'.
4								
6								

WATER LEVEL:
WATER NOTE:
DATE:

PITLJ 112608000.GPJ BBCM.GDT 3/31/10

LOG OF TEST PIT NO. TP-C-2
PHASE 1 - POND 5 SEEPAGE ANALYSIS
J.M. STUART STATION - ABERDEEN, OHIO

TYPE: **Hand Auger**

LOCATION: **See Plate 2 of Appendix**

COMPLETION DEPTH: **1.4'** **ELEVATION:** **512** **DATE:** **3/18/10**

DEPTH, FEET	SAMPLE NO.	SAMPLES	SAMPLING EFFORT	HAND PENE-TROMETER (tsf)	MOISTURE CONTENT (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	DESCRIPTION
0								TOPSOIL - 3 INCHES
	1							FILL: Loose (estimated) gray and brown fine to medium sand, trace coarse sand, trace fine to coarse gravel, interbedded with gray silty clay, many roots, moist.
	2							FILL: Medium-dense (estimated) brown and gray fine sand, trace medium to coarse sand, trace fine gravel, "and" silt, few roots, damp.
				H=1.0-2.0				
	3							FILL: Medium-dense (estimated) brown fine to coarse gravel, "and" fine to coarse sand, little silt, wet.
2								- Encountered seepage at 1.4'.
4								
6								

WATER LEVEL:
WATER NOTE:
DATE:

PITLJ 112608000.GPJ BBCM.GDT 3/31/10

LOG OF TEST PIT NO. TP-D-1
PHASE 1 - POND 5 SEEPAGE ANALYSIS
J.M. STUART STATION - ABERDEEN, OHIO

TYPE: **Hand Auger**

LOCATION: **See Plate 2 of Appendix**

COMPLETION DEPTH: **2.0'** **ELEVATION:** **509** **DATE:** **3/18/10**

DEPTH, FEET	SAMPLE NO.	SAMPLES	SAMPLING EFFORT	HAND PENE-TROMETER (tsf)	MOISTURE CONTENT (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	DESCRIPTION
0								TOPSOIL - 3 INCHES
	1			H=1.25				FILL: Stiff brown mottled with dark-brown clayey silt, trace fine sand, many seams of fine and fine to medium sand, few roots.
	2			H=1.0-1.6				FILL: Very-stiff brown mottled with dark-brown silty clay interbedded with silt, little fine sand.
2								- Encountered seepage at 1.0'.
4								
6								

WATER LEVEL:
WATER NOTE:
DATE:

PITLJ 112608000.GPJ BBCM.GDT 3/31/10

LOG OF TEST PIT NO. TP-D-2
PHASE 1 - POND 5 SEEPAGE ANALYSIS
J.M. STUART STATION - ABERDEEN, OHIO

TYPE: **Hand Auger**

LOCATION: **See Plate 2 of Appendix**

COMPLETION DEPTH: **2.0'** **ELEVATION:** **509** **DATE:** **3/18/10**

DEPTH, FEET	SAMPLE NO.	SAMPLES	SAMPLING EFFORT	HAND PENE-TROMETER (tsf)	MOISTURE CONTENT (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	DESCRIPTION
0								TOPSOIL - 1 INCH
	1			H=0.7				FILL: Very-soft gray organic clayey silt, some fine sand, trace medium to coarse sand, trave fine gravel, contains decayed roots.
					22	26	18	FILL: Medium-stiff to stiff gray mottled with brown organic clayey silt, little fine sand, trace medium to coarse sand, trace fine gravel, contains decayed roots, many seams of silt.
2	2			H=0.7-1.5				
								- No seepage encountered.
4								
6								

WATER LEVEL:
WATER NOTE:
DATE:

PITLJ 112608000.GPJ BBCM.GDT 3/31/10

LOG OF BORING NO. B-6-1
PHASE 2 - STABILITY INVESTIGATION
DP&L STUART STATION - ABERDEEN, OHIO

BBCM

LOCATION: **N. 2322, E. 163** ELEVATION: **533.6** DATE: **3/30/10**

DRILLING METHOD: **3-1/4" I.D. Hollow-stem Auger** COMPLETION DEPTH: **55.2'**

SAMPLER(S): **2" O.D. Split-barrel Sampler 2" and 2-1/2" O.D. Split-barrel Samplers**

ELEV.	DEPTH, FEET	SAMPLE NUMBER	SAMPLE	SAMPLE EFFORT	N_{60}	SAMPLE REC-%	DESCRIPTION	NATURAL CONSISTENCY INDEX / NATURAL MOISTURE CONTENT (PLASTIC LIMIT, LIQUID LIMIT; 10 20 30 40)	TEST RESULTS
	0						ROADWAY GRAVEL - 17 INCHES		
532.0		1A		32 / 12 / 23	50				
		1B				100	FILL: Hard brown and gray silty clay, little to some fine to coarse sand, trace fine gravel, damp.		H=4.5+
		2		4 / 6 / 10	23	80			H=4.5+
	5								
527.6									
		3		8 / 9 / 7	23	100	FILL: Medium-dense brown fine to coarse sand, trace fine gravel, "and" silty clay, damp.		H=4.5+
525.6									
		4		3 / 5 / 10	21	100	FILL: Hard brown silty clay, some fine sand, trace medium-to coarse sand, trace fine gravel, damp.		H=4.5+
523.1	10								
		5		5 / 7 / 6	18	100	FILL: Medium-dense brown fine to coarse sand, trace fine gravel, some silt, little clay, damp.	●	H=4.5+ G
520.6									
		6		4 / 6 / 7	18	87	FILL: Very-stiff to hard brown and gray silty clay, little to "and" fine to coarse sand (% varies), trace fine gravel, contains few pockets of medium-dense brown fine to coarse sand, contains roots near bottom of stratum, damp.		H=3.0-4.5+
	15								
		7		4 / 6 / 6	17	100			H=2.5-4.5+
				P					
	20								
		8		4 / 6 / 7	18	67			H=2.25-2.7
				P					
	25								
		9		8 / 10 / 11	30	100			H=4.5+
		10		3 / 5 / 10	21	60		●—×	G
	30								

WATER LEVEL: ▽ **45.5** ▼ **42.5**
WATER NOTE: **Inside HSA**
DATE: **3/30/10** **3/31/10**

SYMBOLS USED TO INDICATE TEST RESULTS
G - Gradation, Q - Uncon Comp, T - Triax Comp, C - Consol. — See Separate Curves
H - Penetrometer (tsf)
W - Unit Dry Wt (pcf)
D - Relative Dens (%)

Drill Rod Energy Ratio : **0.85**
Last Calibration Date : **02/17/09**
Drill Rig Number : **ATV 550X**

2010 NEW DEFAULT BORING LOG-W/ N60 112608000.GPJ BBCM.GDT 5/28/10

LOG OF BORING NO. B-7-1
PHASE 2 - STABILITY INVESTIGATION
DP&L STUART STATION - ABERDEEN, OHIO

BBCM

LOCATION: **N. 2315, E. 163** ELEVATION: **531.7** DATE: **3/30/10**

DRILLING METHOD: **3-1/4" I.D. Hollow-stem Auger** COMPLETION DEPTH: **50.0'**

SAMPLER(S): **2" O.D. Split-barrel Sampler 2" and 2-1/2" O.D. Split-barrel Samplers**

ELEV.	DEPTH, FEET	SAMPLE NUMBER	SAMPLE	SAMPLE EFFORT	N_{60}	SAMPLE REC-%	DESCRIPTION	NATURAL CONSISTENCY INDEX / NATURAL MOISTURE CONTENT (PLASTIC LIMIT – LIQUID LIMIT; 10 20 30 40)	TEST RESULTS
	0						ROADWAY GRAVEL - 26 INCHES		
529.5		1		42/32/14	65	80			
							FILL: Very-stiff to hard brown and brown mottled with gray silty clay, trace to some fine to coarse sand (% varies), dry to damp.		
		2		4/4/7	16	47			H=3.0-4.5+
526.2	5								
							FILL: Very-stiff to hard brown and brown mottled with gray silty clay, some fine to coarse sand, trace fine gravel, dry to damp.		
		3		5/7/7	20	100			H=3.0-4.5+
		4		P		74			H=2.25-4.25
521.2	10								
							FILL: Very-stiff to hard brown and brown mottled with gray silty clay, trace to little fine to coarse sand, trace fine gravel, contains fine sand lenses near bottom of stratum, dry to damp.		
		5		3/4/6	14	93			H=2.75-3.5
		6A		2/3/4	10	100			H=3.25-4.25
		6B							H=3.5-4.5+
	15								
		7		2/3/6	13	93			H=3.0-3.5 G
		8		4/4/6	14	80			H=4.5+
511.2	20								
							FILL: Very-stiff to hard brown mottled with gray silty clay, some fine to medium sand, trace coarse sand, trace fine gravel, dry to damp.		
		9		2/3/6	13	100			H=3.25-4.5+
		10		3/4/5	13	100			H=3.25-4.5+
	25								
		11		2/4/8	17	80			H=3.5-4.5+
		12		4/5/7	17	73			H=3.75-4.5+
501.7	30								

WATER LEVEL: 48.0 "Dry"
WATER NOTE: Inside HSA Caved at 43.0'
DATE: 3/30/10 4/1/10

SYMBOLS USED TO INDICATE TEST RESULTS
G - Gradation, Q - Uncon Comp, T - Triax Comp, C - Consol. — See Separate Curves
H - Penetrometer (tsf)
W - Unit Dry Wt (pcf)
D - Relative Dens (%)

Drill Rod Energy Ratio : 0.85
Last Calibration Date : 02/17/09
Drill Rig Number : ATV 550X

2010 NEW DEFAULT BORING LOG-W/ N60 11260800.GPJ BBCM.GDT 5/28/10

LOG OF BORING NO. B-7-1
PHASE 2 - STABILITY INVESTIGATION
DP&L STUART STATION - ABERDEEN, OHIO

BBCM

LOCATION: **N. 2315, E. 163** ELEVATION: **531.7** DATE: **3/30/10**

DRILLING METHOD: **3-1/4" I.D. Hollow-stem Auger** COMPLETION DEPTH: **50.0'**

SAMPLER(S): **2" O.D. Split-barrel Sampler 2" and 2-1/2" O.D. Split-barrel Samplers**

ELEV.	DEPTH, FEET	SAMPLE NUMBER	SAMPLE	SAMPLE EFFORT	N_{60}	SAMPLE REC-%	DESCRIPTION	NATURAL CONSISTENCY INDEX / NATURAL MOISTURE CONTENT / PLASTIC LIMIT / LIQUID LIMIT (10 20 30 40)	TEST RESULTS
	30						Dense brown fine to coarse sand, trace fine gravel, little silt, damp.		
		13	■	4 / 10 / 15	35	93			
497.6		14A	■	4 / 7 / 6	18				
496.7	35	14B				100	Very-stiff to hard brown silty clay, "and" fine to coarse sand, trace fine gravel, damp.		H=3.75-4.5+
		15	■	2 / 3 / 5	11	100	Medium-stiff to stiff brown mottled with gray silty clay, some fine sand, trace medium to coarse sand, damp.		H=1.5-2.75
493.7		16	■	3 / 6 / 8	20	100	Very-stiff to hard brown mottled with gray silty clay, trace fine to coarse sand, contains fine sand lenses, damp.		H=3.0-4.5+
	40								
490.7		17	■	1 / 2 / 4	9	100	Stiff brown mottled with gray silty clay, trace fine to coarse sand, trace fine gravel, damp.		H=1.5+
		18	■	1 / 2 / 4	9	100			H=1.5-2.0
	45								
485.2		19	■	1 / 3 / 4	10	100	Stiff gray silty clay, trace to little fine to coarse sand (% varies), contains fine sand lenses and seams, contains silt lenses near top of stratum, damp becoming moist.		H=1.0 G
		20	■	1 / 3 / 3	9	100			H=1.5-2.0
481.7	50						- Encountered water at 48.0'. - Boring backfilled with grout. - Boring location and elevation provided by DP&L. - DATUM: NAD 83, Ohio South.		
	55								
	60								

WATER LEVEL:	48.0	"Dry"
WATER NOTE:	Inside HSA	Caved at 43.0'
DATE:	3/30/10	4/1/10

SYMBOLS USED TO INDICATE TEST RESULTS

G - Gradation, Q - Uncon Comp, T - Triax Comp, C - Consol. (See Separate Curves)

H - Penetrometer (tsf)
W - Unit Dry Wt (pcf)
D - Relative Dens (%)

Drill Rod Energy Ratio : 0.85
Last Calibration Date : 02/17/09
Drill Rig Number : ATV 550X

2010 NEW DEFAULT BORING LOG-W/ N60 11260800O.GPJ BBCM.GDT 5/28/10

LOG OF BORING NO. B-7-2
PHASE 2 - STABILITY INVESTIGATION
DP&L STUART STATION - ABERDEEN, OHIO

BBCM

LOCATION: **N. 2315, E. 163** ELEVATION: **495.6** DATE: **4/1/10**

DRILLING METHOD: **3-1/4" I.D. Hollow-stem Auger** COMPLETION DEPTH: **25.0'**

SAMPLER(S): **2" O.D. Split-barrel Sampler 2" and 2-1/2" O.D. Split-barrel Samplers**

ELEV.	DEPTH, FEET	SAMPLE NUMBER	SAMPLE	SAMPLE EFFORT	N_{60}	SAMPLE REC-%	DESCRIPTION	NATURAL CONSISTENCY INDEX / NATURAL MOISTURE CONTENT / PLASTIC LIMIT / LIQUID LIMIT (10 20 30 40)	TEST RESULTS
	0	1		1 / 1 / 3	6	73	Loose to medium-dense brown fine to medium sand, "and" silt becoming "and" silty clay, trace to some coarse sand (% varies) near bottom of stratum, moist becoming dry.		
		2		4 / 6 / 6	17	100			H=3.5-4.5+
490.1	5								
488.7		3A		3 / 4 / 6	14	100	Very-stiff brown silty clay, "and" fine to medium sand, trace coarse sand, dry.		H=3.0-3.75
		3B					Stiff to very-stiff gray silty clay, trace fine to coarse sand, trace fine gravel, contains brown fine to medium sand seams and lenses, damp to moist.		H=3.5-4.0
		4		P		46			H=1.75
485.1	10								
483.7		5A		3 / 2 / 3	7	100	Loose gray fine to coarse sand, trace fine gravel, little silt, wet.		
		5B					Medium-stiff to stiff gray silty clay, trace to some fine to coarse sand (% varies), trace fine gravel, wet.		H=0.50-1.25
		6		SH / 1 / 2	4	73			H=1.0-2.0 G
480.1	15								
		7		SH / 2 / 2	6	80	Stiff gray mottled with brown silty clay, some fine to coarse sand, trace fine gravel, wet.		H=1.0-1.75
477.6									
		8		2 / 2 / 5	10	53	Medium-dense brown fine to coarse sand, trace fine gravel, trace to little silt, wet.		G
	20								
		9		2 / 3 / 4	10	60			
		10		3 / 4 / 4	11	53			
470.6	25								
	30						- Encountered seepage at 8.0'. - Encountered water at 11.0'. - Boring backfilled with grout. - Boring location and elevation provided by DP&L. - DATUM: NAD 83, Ohio South.		

WATER LEVEL:	14.7	8.4
WATER NOTE:	Inside HSA	Caved at 17.4'
DATE:	4/1/10	4/1/10 PM

SYMBOLS USED TO INDICATE TEST RESULTS

G - Gradation, Q - Uncon Comp, T - Triax Comp, C - Consol. — See Separate Curves

H - Penetrometer (tsf)
W - Unit Dry Wt (pcf)
D - Relative Dens (%)

Drill Rod Energy Ratio : 0.85
Last Calibration Date : 02/17/09
Drill Rig Number : ATV 550X

2010 NEW DEFAULT BORING LOG-W/ N60 11260800O.GPJ BBCM.GDT 5/28/10

LOG OF BORING NO. B-7-3
PHASE 2 - STABILITY INVESTIGATION
DP&L STUART STATION - ABERDEEN, OHIO

BBCM

LOCATION: **N. 2317, E. 163** ELEVATION: **533.0** DATE: **3/31/10**

DRILLING METHOD: **3-1/4" I.D. Hollow-stem Auger** COMPLETION DEPTH: **50.0'**

SAMPLER(S): **2" O.D. Split-barrel Sampler 2" and 2-1/2" O.D. Split-barrel Samplers**

ELEV.	DEPTH, FEET	SAMPLE NUMBER	SAMPLE	SAMPLE EFFORT	N_{60}	SAMPLE REC-%	DESCRIPTION	TEST RESULTS
	0						GRAVEL - 12 INCHES	
532.0								
531.0		1A	■	16/13/7	28	100	FILL: Medium-dense brown fine to coarse sand, little fine to coarse gravel, little silt, damp.	
		1B	■				FILL: Hard brown mottled with gray silty clay, trace fine to coarse sand, trace fine gravel, damp.	H=4.5+
		2	■	2/4/5	13	60		H=4.5+
	5							
527.0								
		3	■	3/6/5	16	100	FILL: Hard brown mottled with gray silty clay, some fine to medium sand, trace coarse sand, trace fine gravel near bottom of stratum, damp.	H=4.5+
		4	■	5/7/8	21	93		H=4.5+
	10							
		5	■	4/9/12	30	100		H=4.5+
519.5								
		6	■	P		33	FILL: Hard brown mottled with gray silty clay, trace fine sand, contains silt seams, damp.	H=4.5+
	15							
517.0								
		7	■	3/5/8	18	73	FILL: Hard brown and brown mottled with gray silty clay, some fine to medium sand, trace coarse sand, damp.	H=4.5+
		8	■	3/6/5	16	80		H=4.5+
	20							
512.0								
		9	■	3/4/7	16	87	FILL: Hard brown mottled with gray silty clay, trace fine to medium sand, damp.	H=4.5-4.5
509.0								
		10	■	3/6/9	21	87	FILL: Hard brown silty clay, "and" fine to medium sand, damp.	H=4.5+
	25							
		11	■	3/4/6	14	93		H=3.5-3.75
504.5					11			
		12	■	1/4/4		93	FILL: Very-stiff brown silty clay, little to some fine to medium sand, damp.	H=3.25-3.5
	30							

NATURAL CONSISTENCY INDEX — NATURAL MOISTURE CONTENT — PLASTIC LIMIT — LIQUID LIMIT — 10 20 30 40

WATER LEVEL: 45.0 "Dry"
WATER NOTE: Inside HSA Caved at 44.0'
DATE: 4/1/10 4/1/10 PM

SYMBOLS USED TO INDICATE TEST RESULTS
G - Gradation, Q - Uncon Comp, T - Triax Comp, C - Consol. — See Separate Curves
H - Penetrometer (tsf)
W - Unit Dry Wt (pcf)
D - Relative Dens (%)

Drill Rod Energy Ratio : 0.85
Last Calibration Date : 02/17/09
Drill Rig Number : ATV 550X

2010 NEW DEFAULT BORING LOG-W/ N60 11260800O.GPJ BBCM.GDT 5/28/10

LOG OF BORING NO. B-7-3
PHASE 2 - STABILITY INVESTIGATION
DP&L STUART STATION - ABERDEEN, OHIO

BBCM

LOCATION: **N. 2317, E. 163** ELEVATION: **533.0** DATE: **3/31/10**

DRILLING METHOD: **3-1/4" I.D. Hollow-stem Auger** COMPLETION DEPTH: **50.0'**

SAMPLER(S): **2" O.D. Split-barrel Sampler 2" and 2-1/2" O.D. Split-barrel Samplers**

ELEV.	DEPTH, FEET	SAMPLE NUMBER	SAMPLE	SAMPLE EFFORT	N_{60}	SAMPLE REC-%	DESCRIPTION	NATURAL CONSISTENCY INDEX / NATURAL MOISTURE CONTENT / PLASTIC LIMIT / LIQUID LIMIT (10 20 30 40)	TEST RESULTS
	30								
		13		2 / 2 / 3	7	100	FILL: Very-stiff brown silty clay, little to some fine to medium sand, damp.		H=2.5
499.5									
498.5		14A		1 / 3 / 4	10	100	FILL: Medium-stiff brown silty clay, "and" fine to medium sand, moist.		H=0.75
	35	14B					Medium-dense fine to medium sand, trace coarse sand, "and" silty clay, moist.		
497.0									
		15		1 / 1 / 1	3	93	Very-soft brown clayey silt, "and" fine sand, trace medium sand, moist.		H=0.0-0.25
495.0									
		16		1 / 1 / 3	6	100	Loose brown fine to coarse sand, little to "and" silt (% varies), little clay, moist becoming wet.		
	40								
		17		1 / 2 / 2	6	67			
		18		1 / 2 / 3	7	87			
487.5	45								
		19		1 / 1 / 1	3	100	Very-loose brown fine to coarse sand, interbedded with many thin silty clay seams, wet.		
485.0									
		20		1 / 1 / 2	4	100	Very-soft brown mottled with gray silty clay, interbedded with fine to medium sand seams, wet.		H=0.25
483.0	50								
							- Encountered seepage at 41.0'. - Sand seams at 39.0' and 46.5'. - Boring backfilled with grout. - Boring location and elevation provided by DP&L. - DATUM: NAD 83, Ohio South.		
	55								
	60								

WATER LEVEL:	45.0	"Dry"
WATER NOTE:	Inside HSA	Caved at 44.0'
DATE:	4/1/10	4/1/10 PM

SYMBOLS USED TO INDICATE TEST RESULTS

G - Gradation, Q - Uncon Comp, T - Triax Comp, C - Consol. — See Separate Curves

H - Penetrometer (tsf)
W - Unit Dry Wt (pcf)
D - Relative Dens (%)

Drill Rod Energy Ratio : 0.85
Last Calibration Date : 02/17/09
Drill Rig Number : ATV 550X

2010 NEW DEFAULT BORING LOG-W/ N60 11260800O.GPJ BBCM.GDT 5/28/10

LOG OF BORING NO. B-7-4
PHASE 2 - STABILITY INVESTIGATION
DP&L STUART STATION - ABERDEEN, OHIO

BBCM

LOCATION: **N. 2317, E. 163** ELEVATION: **509.0** DATE: **4/1/10**

DRILLING METHOD: **3-1/4" I.D. Hollow-stem Auger** COMPLETION DEPTH: **25.0'**

SAMPLER(S): **2" O.D. Split-barrel Sampler 2" and 2-1/2" O.D. Split-barrel Samplers**

ELEV.	DEPTH, FEET	SAMPLE NUMBER	SAMPLE	SAMPLE EFFORT	N_{60}	SAMPLE REC-%	DESCRIPTION	TEST RESULTS
	0						FILL: Hard brown mottled with gray silty clay, trace fine to coarse sand, moist.	
		1		3 / 3 / 4	10	80		H=4.0-4.5+
506.0								
		2		5 / 6 / 9	21	40	FILL: Stiff to very-stiff brown mottled with gray silty clay, some fine to coarse sand, trace fine gravel, contains decayed roots, damp.	H=1.5-3.0
	5							
503.0								
		3		4 / 5 / 8	18	80	FILL: Very-stiff brown mottled with gray silty clay, some fine sand, trace medium to coarse sand, damp.	H=2.75-3.5
501.0								
		4		P		67	Medium-stiff to stiff brown silty clay, little to "and" fine to medium sand, (% varies), contains silt seams, moist to wet.	H=0.50-1.0
	10							
		5		2 / 3 / 4	10	87		H=0.50-1.25
496.0								
		6		2 / 4 / 5	13	100	Loose to medium-dense brown fine to medium sand, little becoming "and" silt, wet.	G
	15							
		7		2 / 4 / 6	14	100		
		8		3 / 3 / 3	9	87		
	20							
488.0								
		9		3 / 2 / 2	6	100	Very-soft brown silty clay, interbedded with fine to medium sand and silt seams, wet.	H=0.0
486.0								
		10		3 / 1 / 2	4	100	Loose brown fine sand, trace medium to coarse sand, "and" silt, little clay, wet.	
484.0	25							
							- Encountered seepage at 21.0'. - Encountered water at 23.5'. - Boring backfilled with grout. - Boring location and elevation provided by DP&L. - DATUM: NAD 83, Ohio South.	
	30							

NATURAL CONSISTENCY INDEX — NATURAL MOISTURE CONTENT — PLASTIC LIMIT — LIQUID LIMIT — 10 20 30 40

WATER LEVEL: 21.0 (▽) 6.6 (▼)
WATER NOTE: Inside HSA — Caved at 15.6'
DATE: 4/1/10 — 4/1/10 PM

SYMBOLS USED TO INDICATE TEST RESULTS
G - Gradation, Q - Uncon Comp, T - Triax Comp, C - Consol. — See Separate Curves
H - Penetrometer (tsf)
W - Unit Dry Wt (pcf)
D - Relative Dens (%)

Drill Rod Energy Ratio : 0.85
Last Calibration Date : 02/17/09
Drill Rig Number : ATV 550X

2010 NEW DEFAULT BORING LOG-W/ N60 11260800O.GPJ BBCM.GDT 5/28/10

LOG OF BORING NO. B-6-1
PHASE 2 - STABILITY INVESTIGATION
DP&L STUART STATION - ABERDEEN, OHIO

BBCM

LOCATION: **N. 2322, E. 163** ELEVATION: **533.6** DATE: **3/30/10**

DRILLING METHOD: **3-1/4" I.D. Hollow-stem Auger** COMPLETION DEPTH: **55.2'**

SAMPLER(S): **2" O.D. Split-barrel Sampler 2" and 2-1/2" O.D. Split-barrel Samplers**

ELEV.	DEPTH, FEET	SAMPLE NUMBER	SAMPLE	SAMPLE EFFORT	N_{60}	SAMPLE REC-%	DESCRIPTION	NATURAL CONSISTENCY INDEX / NATURAL MOISTURE CONTENT (PLASTIC LIMIT – LIQUID LIMIT; 10 20 30 40)	TEST RESULTS
	30						FILL: Very-stiff to hard brown and gray silty clay, little to "and" fine to coarse sand (% varies), trace fine gravel, contains few pockets of medium-dense brown fine to coarse sand, contains roots near bottom of stratum, damp.		
		11		3 / 4 / 5	13	53			H=3.75-4.5+
500.6							Very-stiff to hard brown and gray silty clay, trace fine to coarse sand, trace fine gravel, many roots.		
		12		4 / 9 / 8	24	33			H=3.5-4.5+
	35	2S							
		13		3 / 5 / 9	20	87			H=4.5+
495.6							Medium-dense brown fine to coarse sand, trace fine gravel, trace silt, little clay, damp.		
		14		4 / 5 / 8	18	67			G
493.6	40						Very-stiff to hard brown silty clay, "and" fine to coarse sand, trace fine gravel, damp.		
		15		4 / 6 / 8	20	60			H=3.8-4.5+
490.6							Medium-dense brown fine to coarse sand, trace fine gravel, trace silt, trace clay, moist becoming wet.		
		16		3 / 3 / 5	11	80			
	45								
		17		3 / 4 / 4	11	67			G
		18		3 / 4 / 5	13	60			
	50								
		19		7 / 4 / 5	13	100			
478.6	55						- Encountered seepage at 43.0'. - Encountered water at 46.0'. - Boring backfilled with grout. - Boring location and elevation provided by DP&L. - DATUM: NAD 83, Ohio South.		
	60								

WATER LEVEL:	45.5	42.5
WATER NOTE:	Inside HSA	
DATE:	3/30/10	3/31/10

SYMBOLS USED TO INDICATE TEST RESULTS

G - Gradation, Q - Uncon Comp, T - Triax Comp, C - Consol. — See Separate Curves

H - Penetrometer (tsf)
W - Unit Dry Wt (pcf)
D - Relative Dens (%)

Drill Rod Energy Ratio : 0.85
Last Calibration Date : 02/17/09
Drill Rig Number : ATV 550X

2010 NEW DEFAULT BORING LOG-W/ N60 11260800O.GPJ BBCM.GDT 5/28/10

LOG OF BORING NO. B-6-2
PHASE 2 - STABILITY INVESTIGATION
DP&L STUART STATION - ABERDEEN, OHIO

BBCM

LOCATION: **N. 2321, E. 163** ELEVATION: **503.0** DATE: **4/1/10**

DRILLING METHOD: **3-1/4" I.D. Hollow-stem Auger** COMPLETION DEPTH: **25.0'**

SAMPLER(S): **2" O.D. Split-barrel Sampler 2" and 2-1/2" O.D. Split-barrel Samplers**

ELEV.	DEPTH, FEET	SAMPLE NUMBER	SAMPLE	SAMPLE EFFORT	N_{60}	SAMPLE REC-%	DESCRIPTION	NATURAL CONSISTENCY INDEX / NATURAL MOISTURE CONTENT (PLASTIC LIMIT – LIQUID LIMIT; 10 20 30 40)	TEST RESULTS
502.4	0						TOPSOIL - 7 INCHES		
		1		2 / 5 / 3	11	100	FILL: Stiff to very-stiff brown and gray silty clay, some fine to coarse sand, trace fine gravel, damp.		H=1.25-2.5
		2		6 / 9 / 8	24	100			H=3.75
	5								
497.0		3		4 / 3 / 7	14	93	Very-stiff gray mottled with brown silty clay, trace fine to coarse sand, trace fine gravel, damp.		H=2.5-3.5 LL=52
495.0									
		4		P		43	Stiff to very-stiff brown silty clay, "and" fine to coarse sand, trace fine gravel, moist.		H=1.75-2.0
492.5	10								
		5		5 / 6 / 5	16	60	Medium-dense brown fine to coarse sand, trace fine gravel, little silt, wet.		
490.0									
488.9		6A		2 / 3 / 2	7	100	Loose brown fine to coarse sand, trace fine gravel, "and" silty clay, wet.		
		6B					Stiff brown and orange-brown silty clay, "and" fine to coarse sand, trace fine gravel, wet.		H=1.0-1.25
	15								
487.0									
		7		1 / 3 / 3	9	80	Loose brown fine to coarse sand, trace fine gravel, little silt, wet.		
485.0									
		8		SH / 1 / 2	4	47	Very-loose to loose brown fine to medium sand, trace coarse sand, trace fine gravel, trace silt, wet.		G
	20								
		9		SH / SH / 1	0	53			
		10		1 / 1 / 3	6	87			
478.0	25								
							- Encountered seepage at 8.0'. - Encountered water at 11.0'. - Boring backfilled with grout. - Boring location and elevation provided by DP&L. - DATUM: NAD 83, Ohio South.		
	30								

WATER LEVEL:	17.5	6.2
WATER NOTE:	Inside HSA	Caved at 14.8'
DATE:	4/1/10	4/1/10 PM

SYMBOLS USED TO INDICATE TEST RESULTS

G - Gradation, Q - Uncon Comp, T - Triax Comp, C - Consol. — See Separate Curves

H - Penetrometer (tsf)
W - Unit Dry Wt (pcf)
D - Relative Dens (%)

Drill Rod Energy Ratio : 0.85
Last Calibration Date : 02/17/09
Drill Rig Number : ATV 550X

2010 NEW DEFAULT BORING LOG-W/ N60 11260800O.GPJ BBCM.GDT 5/28/10

Project: DP&L J.M. Stuart Station Project Location: Aberdeen, Ohio Project Number: 38-08E06133.00	Log of Boring B10-1 Sheet 1 of 2

Date(s) Drilled	2/4/99	Logged By	T.A. George	Checked By	T.A. George / P.J. Kusky
Drilling Method	Hollow-Stem Auger	Drill Bit Size/Type	4-1/4-inch-ID / 8-inch-OD auger	Total Depth of Borehole	37.3 feet
Drill Rig Type	CME 750 ATV	Drilling Contractor	Summit Drilling Co.	Approximate Surface Elevation	548.4 feet MSL
Groundwater Level and Date Measured	30 ft BGS on 2/4/99 ATD; 31 ft inside auger after drilling	Sampling Method(s)	SPT split spoon, Shelby tube	Hammer Data	140 lbs / 30-inch drop
Borehole Completion	Borehole collapsed to 19.4 ft; cuttings 19.4-15 ft, cement-bentonite grout 15-0 ft			Coordinate Location	N 235,399 E 1,631,067

Elevation, feet	Depth, feet	SAMPLES Type	Number	Sampling Resistance, blows/foot	Recovery, %	Pocket Penetrometer, tsf	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	REMARKS AND OTHER TESTS
	0		S-1	17	25			Topsoil		
								Medium dense, moist to wet, brown, clayey SAND (SC) with gravel [Fill]		Large gravel in sampler shoe blocked recovery.
			S-2	24	71	4.5+		Very stiff to hard, moist, brown, lean CLAY (CL) with sand, trace gravel [Possible Compacted Clay Fill]		Samples S-2, S-3, and S-5 used in Ashpond 10 composite.
545										
			S-3	24	75	2.5		Very stiff, moist, brown with gray mottling, lean CLAY (CL), trace sand [Possible Compacted Clay Fill]	22.0	LL=45, PL=19, PI=26 %G=0, %S=7.1, %F=92.9
	5		T-4	Push		4.5				
						4.5+			22.0	DUW=102.9 pcf
540			S-5	24	100	4.5 2.5 1.5		Very stiff, moist, brown, silty CLAY (CL-ML) with sand; increasing silt with depth		
	10		S-6	23	100			Very stiff / medium dense, moist, brown, sandy SILT to silty SAND (ML/SM)		
								Medium dense, moist, brown, poorly graded SAND with silt (SP-SM)		
535										
	15		S-7	11	100			Becomes coarser-grained with trace gravel and organic material (weathered coal?)		%G=7.1, %S=85.6, %F=7.3
530										
	20		S-8	9	89			Becomes loose		
								Becomes finer-grained		
525										
	25		S-9	13	--			Becomes medium dense; no organic material		
								Wet seam 1 inch thick		
520	30									

Report: GEO_1 ...OLON; File: DPL.JMSTU.GPJ; 6/17/99

URS Greiner Woodward Clyde

Project: DP&L J.M. Stuart Station
Project Location: Aberdeen, Ohio
Project Number: 38-08E06133.00

Log of Boring B10-1

Elevation, feet	Depth, feet	SAMPLES Type	Number	Sampling Resistance, blows/foot	Recovery, %	Pocket Penetrometer, tsf	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	REMARKS AND OTHER TESTS
	30		S-10	18	89	4.5+		Medium dense, wet, brown, poorly graded SAND with silt (SP-SM), trace gravel (continued)		
								Hard, moist, olive brown, lean CLAY (CL), trace organic material [Completely Weathered Shale]		%G=0, %S=3.5, %F=96.5
515										
	35		S-11	50/4"	40			SHALE, olive brown		Rough augering from 35-37 ft.
			S-12	50/4"	100			Becomes olive gray		
510								Bottom of boring at 37.3 feet		Groundwater encountered at 30 ft during drilling; measured at 31 ft inside auger after drilling completed.
	40									
505										
	45									
500										
	50									
495										
	55									
490										
	60									
485										
	65									

Project: DP&L J.M. Stuart Station Project Location: Aberdeen, Ohio Project Number: 38-08E06133.00	Log of Boring B10-2 Sheet 1 of 2

Date(s) Drilled	2/3/99	Logged By	T.A. George	Checked By	T.A. George / P.J. Kusky
Drilling Method	Hollow-Stem Auger	Drill Bit Size/Type	3-1/4-inch-ID / 7-inch-OD auger	Total Depth of Borehole	31.5 feet
Drill Rig Type	CME 750 ATV	Drilling Contractor	Summit Drilling Co.	Approximate Surface Elevation	547.6 feet MSL
Groundwater Level and Date Measured	No measurable water in borehole on 2/17/99 after collapse to 24 ft	Sampling Method(s)	SPT split spoon, Shelby tube	Hammer Data	140 lbs / 30-inch drop
Borehole Completion	Borehole collapsed to 24 ft; cuttings 24-14.2 ft, cement-bentonite grout 14.2-0 ft			Coordinate Location	N 235,445 E 1,630,541

Elevation, feet	Depth, feet	SAMPLES Type	Number	Sampling Resistance, blows/foot	Recovery, %	Pocket Penetrometer, tsf	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	REMARKS AND OTHER TESTS
	0		S-1	6	79			Topsoil		Start sampling at 1640.
						1.5		Medium stiff to stiff, moist, brown, lean CLAY (CL), trace root fibers; 45° fracture observed in sample		Samples S-1, T-2, S-3, and S-4 used in Ashpond 10 composite.
545			T-2	Push				Medium stiff, moist, brown, silty CLAY with sand (CL-ML)	23.6	DUW=99.8 pcf LL=27, PL=20, PI=7 %G=0, %S=19.3, %F=80.7
						1.0				
			S-3	9	88	0.50		Becomes stiff, wet	22.5	
	5					3.5		Silty sand seam 1 inch thick		
			S-4	9	100	3.5		Stiff, moist, brown, lean CLAY (CL)		
540								Stiff, moist to wet, brown, silty CLAY to SILT (CL-ML/ML) with sand		
			S-5	7	75			Loose, moist to wet, brown, silty SAND (SM) with gravel, trace coal fragments		
	10									
535										
	15		S-6	7	89			Loose, moist, brown, poorly graded SAND with silt (SP-SM), trace coal fragments		%G=1.7, %S=93.0, %F=5.3
530										
	20		S-7	11	67			Becomes medium dense, with some coal fragments		
525										
	25		S-8	9	100			Becomes loose, with trace coal fragments		
520										
	30							Becomes medium dense; no coal fragments		

Project: DP&L J.M. Stuart Station
Project Location: Aberdeen, Ohio
Project Number: 38-08E06133.00

Log of Boring B10-2

Elevation, feet	Depth, feet	SAMPLES Type	Number	Sampling Resistance, blows/foot	Recovery, %	Pocket Penetrometer, tsf	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	REMARKS AND OTHER TESTS
	30		S-9	11	78			Poorly graded SAND with silt (SP-SM) (continued)		
								← Wet silt seam 1 inch thick		End sampling at 1726.
515								Bottom of boring at 31.5 feet		
	35									
510										
	40									
505										
	45									
500										
	50									
495										
	55									
490										
	60									
485										
	65									

Report: GEO_1 JOLON; File: DPLJMSTU.GPJ; 6/17/99

Project: DP&L J.M. Stuart Station Project Location: Aberdeen, Ohio Project Number: 38-08E06133.00	Log of Boring B10-3 Sheet 1 of 2

Date(s) Drilled	2/3/99	Logged By	T.A. George	Checked By	T.A. George / P.J. Kusky
Drilling Method	Hollow-Stem Auger	Drill Bit Size/Type	3-1/4-inch-ID / 7-inch-OD auger	Total Depth of Borehole	41.5 feet
Drill Rig Type	CME 750 ATV	Drilling Contractor	Summit Drilling Co.	Approximate Surface Elevation	547.7 feet MSL
Groundwater Level and Date Measured	No measurable water in borehole on 2/17/99 after collapse to 30.3 ft	Sampling Method(s)	SPT split spoon, Shelby tube	Hammer Data	140 lbs / 30-inch drop
Borehole Completion	Borehole collapsed to 30.3 ft; cuttings 30.3-15 ft, cement-bentonite grout 15-0 ft			Coordinate Location	N 235,489 E 1,630,204

Elevation, feet	Depth, feet	SAMPLES Type	Number	Sampling Resistance, blows/foot	Recovery, %	Pocket Penetrometer, tsf	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	REMARKS AND OTHER TESTS
	0		S-1	4	63			Topsoil; organic clay with root fibers		Start sampling at 1510.
								Loose, moist to wet, brown, silty SAND (SM)		
545			S-2	14	100	1.5				
						1.0 2.0		Stiff, moist, brown, silty CLAY (CL-ML)		
			T-3	Push						
	5							Very loose, moist to wet, brown, silty SAND (SM), trace gravel		
540			S-4	4	75					
	10		S-5	2	33					
535										
	15		S-6	3	67			Very loose, moist, brown, poorly graded SAND with silt and gravel (SP-SM)		%G=21.8, %S=74.8, %F=3.4
530										
	20		S-7	9	100			Becomes loose; no gravel		
525										
	25		S-8	19	100			Becomes medium dense, with trace coal fragments		
520										
	30									

Project: DP&L J.M. Stuart Station
Project Location: Aberdeen, Ohio
Project Number: 38-08E06133.00

Log of Boring B10-3

Elevation, feet	Depth, feet	SAMPLES Type	Number	Sampling Resistance, blows/foot	Recovery, %	Pocket Penetrometer, tsf	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	REMARKS AND OTHER TESTS
	30		S-9	14	100			Wet, brown silt seam 6 inches thick With trace gravel Medium dense, moist, brown, poorly graded SAND with silt (SP-SM), trace gravel and coal fragments (continued)		
515										
	35		S-10	15	100					
510										
	40		S-11	21	89					End sampling at 1612.
505								Bottom of boring at 41.5 feet		
	45									
500										
	50									
495										
	55									
490										
	60									
485										
	65									

Project: DP&L J.M. Stuart Station Project Location: Aberdeen, Ohio Project Number: 38-08E06133.00	Log of Boring B10-4 Sheet 1 of 3

Date(s) Drilled	2/3/99	Logged By	T.A. George	Checked By	T.A. George / P.J. Kusky
Drilling Method	Hollow-Stem Auger	Drill Bit Size/Type	3-1/4-inch-ID / 7-inch-OD auger	Total Depth of Borehole	71.5 feet
Drill Rig Type	CME 750 ATV	Drilling Contractor	Summit Drilling Co.	Approximate Surface Elevation	549.7 feet MSL
Groundwater Level and Date Measured	60 ft BGS on 2/3/99 ATD; 68.5 ft inside auger after drilling	Sampling Method(s)	SPT split spoon, Shelby tube	Hammer Data	140 lbs / 30-inch drop
Borehole Completion	Borehole collapsed to 49.5 ft; cuttings 49.5-15 ft, cement-bentonite grout 15-0 ft			Coordinate Location	N 235,655 E 1,629,881

Elevation, feet	Depth, feet	SAMPLES Type	Number	Sampling Resistance, blows/foot	Recovery, %	Pocket Penetrometer, tsf	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	REMARKS AND OTHER TESTS
	0		S-1	11	100	2.5		Topsoil		Start sampling at 1114.
						1.0		Stiff, moist, brown, lean CLAY (CL) with root fibers and organic material; two 45-50° fractures observed		
			T-2	Push				Moist, brown, silty SAND (SM)	16.6	
						3.0		Very stiff, moist, brown SILT (ML)	24.7	LL=31, PL=23, PI=8
545	5		S-3	12	100			Stiff, moist, brown with gray mottling, lean CLAY (CL)		
			S-4	11	100	1.0		Increased fine sand; contains wet seam 1 inch thick		
			S-5	4	100			Medium dense, wet, brown, silty SAND (SM)		
540	10		S-6	3	50			Becomes very loose, moist to wet, coarser-grained, with gravel, trace coal fragments		
535	15		S-7	8	83			Loose, moist to wet, brown, poorly graded SAND with silt (SP-SM)		
530	20		S-8	12	83			Becomes medium dense, moist		
525	25		S-9	9	--			Loose, moist, brown, silty SAND (SM), trace coal fragments; finer-grained with depth		
520	30									

Report: GEO_1 JOLON; File: DPLJMSTU.GPJ; 6/17/99

URS Greiner Woodward Clyde

Project: DP&L J.M. Stuart Station
Project Location: Aberdeen, Ohio
Project Number: 38-08E06133.00

Log of Boring B10-4

Elevation, feet	Depth, feet	SAMPLES Type	Number	Sampling Resistance, blows/foot	Recovery, %	Pocket Penetrometer, tsf	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	REMARKS AND OTHER TESTS
	30		S-10	23	100			Becomes medium dense Wet silt seam 1 inch thick Medium dense, moist, brown, silty SAND (SM), trace coal fragments (continued)		
515	35		S-11	33	100			Dense, moist, brown, poorly graded SAND with silt (SP-SM)		
510	40		S-12	21	100			Becomes medium dense, with trace coal fragments		
505	45		S-12	29	100					
500	50		S-13	22	100			With trace gravel; no coal fragments		
495	55		S-14	18	100			No gravel Lean clay seam 1/2 inch thick		
490	60		S-15	28	100			Becomes wet, with trace gravel and coal fragments	▽	
485	65									

Project: DP&L J.M. Stuart Station
Project Location: Aberdeen, Ohio
Project Number: 38-08E06133.00

Log of Boring B10-4

Elevation, feet	Depth, feet	SAMPLES Type	Number	Sampling Resistance, blows/foot	Recovery, %	Packet Penetrometer, tsf	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	REMARKS AND OTHER TESTS
	65		S-16	50	100			Dense to very dense, wet, brown, silty SAND (SM), iron oxide-stained, trace gravel and coal fragments		About 1 ft heave after split spoon removed.
480	70		S-17	15	100	1.5 to 2.0		Stiff, moist, brown with gray mottling, lean CLAY (CL), trace gravel		End sampling at 1430.
								Bottom of boring at 71.5 feet		Groundwater encountered at 60 ft during drilling; measured at 68.5 ft inside auger immediately after drilling.
475	75									
470	80									
465	85									
460	90									
455	95									
450	100									

Project: DP&L J.M. Stuart Station Project Location: Aberdeen, Ohio Project Number: 38-08E06133.00	Log of Boring B10-5 Sheet 1 of 2

Date(s) Drilled	2/3/99	Logged By	T.A. George	Checked By	T.A. George / P.J. Kusky
Drilling Method	Hollow-Stem Auger	Drill Bit Size/Type	3-1/4-inch-ID / 7-inch-OD auger	Total Depth of Borehole	51.5 feet
Drill Rig Type	CME 750 ATV	Drilling Contractor	Summit Drilling Co.	Approximate Surface Elevation	549.4 feet MSL
Groundwater Level and Date Measured	No measurable water in borehole on 2/17/99 after collapse to 36 ft	Sampling Method(s)	SPT split spoon, Shelby tube	Hammer Data	140 lbs / 30-inch drop
Borehole Completion	Borehole collapsed to 36 ft; cuttings 36-15 ft, cement-bentonite grout 15-0 ft			Coordinate Location	N 235,715 E 1,629,698

Elevation, feet	Depth, feet	SAMPLES Type	Number	Sampling Resistance, blows/foot	Recovery, %	Pocket Penetrometer, tsf	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	REMARKS AND OTHER TESTS
	0		S-1	6	83	2.5		Topsoil		Start sampling at 0858.
								Medium stiff, moist, brown, lean CLAY with sand (CL), trace root fragments		
			T-2	Push						LL=31, PL=20, PI=11 %G=0, %S=15.4, %F=84.6 UC q_u=2155 psf
								Moist to wet, brown, silty SAND (SM), trace coal fragments		
545			S-3	10	--	1.5		Stiff, wet, brown, lean CLAY (CL), trace sand		Material appears dilatant.
	5		S-4	14	100	1.5 to 2.5			24.6	LL=32, PL=20, PI=12 %G=0, %S=7.2, %F=92.8
			S-5	5	100	1.0		Becomes medium stiff, moist, with increased silt and sand content (variably sandy silty clay and silty sand with lean clay)		Transition zone from silty/clayey to sandy soil.
								Loose, moist to wet, brown, silty SAND (SM), trace gravel and coal fragments		
540	10		S-6	6	100			Loose, moist to wet, brown, poorly graded SAND with silt (SP-SM), trace gravel		
535	15		S-7	20	100			Becomes medium dense, moist		
530	20		S-8	14	83			With trace coal fragments		Driller reports odor of natural gas coming from augers and drill rods; not noticeable to field personnel.
525	25		S-9	13	--					
520	30							Becomes dense		

Project: DP&L J.M. Stuart Station
Project Location: Aberdeen, Ohio
Project Number: 38-08E06133.00

Log of Boring B10-5

Elevation, feet	Depth, feet	SAMPLES Type	Number	Sampling Resistance, blows/foot	Recovery, %	Pocket Penetrometer, tsf	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	REMARKS AND OTHER TESTS
	30		S-10	34	100			Dense, moist, brown, poorly graded SAND with silt (SP-SM), trace gravel and coal fragments (continued)		
								Silt to silty clay seam 1 inch thick		
515	35		S-11	23	100			Becomes medium dense; no coal fragments		
510	40		S-12	34	--			Becomes dense		
505	45		S-13	56	--			Becomes very dense, horizontally bedded; no gravel		
500	50		S-14	27	--			Becomes medium dense, with trace gravel and coal fragments		
										End sampling at 1039.
								Bottom of boring at 51.5 feet		
495	55									
490	60									
485	65									

Report: GEO_1 SOLON; File: DPLJMSTU.GPJ; 6/17/99

Project: DP&L J.M. Stuart Station Project Location: Aberdeen, Ohio Project Number: 38-08E06133.00	Log of Boring B10-6 Sheet 1 of 3

Date(s) Drilled	2/2/99	Logged By	T.A. George	Checked By	T.A. George / P.J. Kusky
Drilling Method	Hollow-Stem Auger	Drill Bit Size/Type	3-1/4-inch-ID / 7-inch-OD auger	Total Depth of Borehole	100.0 feet
Drill Rig Type	CME 750 ATV	Drilling Contractor	Summit Drilling Co.	Approximate Surface Elevation	548.0 feet MSL
Groundwater Level and Date Measured	60 ft BGS on 2/2/99 ATD; 63.6 ft inside auger 2.5 hr after drilling	Sampling Method(s)	SPT split spoon	Hammer Data	140 lbs / 30-inch drop
Borehole Completion	Borehole collapsed to 55 ft; cement-bentonite grout 55-0 ft			Coordinate Location	N 235,577 E 1,629,329

Elevation, feet	Depth, feet	SAMPLES Type	Number	Sampling Resistance, blows/foot	Recovery, %	Pocket Penetrometer, tsf	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	REMARKS AND OTHER TESTS
	0		S-1	8	78	1.5 to 3.0		Topsoil Medium stiff to stiff, moist, brown, lean CLAY with sand (CL)	17.2	Start sampling at 0900. LL=26, PL=18, PI=8 %G=0, %S=16.1, %F=83.9
545										
	5		S-2	7	94	1.5		Loose, moist, brown, silty SAND (SM), trace gravel		
540										
	10		S-3	3	67			Becomes very loose With gravel		
535										
	15		S-4	6	44			Becomes loose, with trace gravel		
530										
	20		S-5	15	78			Medium dense, moist, brown, poorly graded SAND with silt (SP-SM)		
525										
	25		S-6	16	72			With trace gravel		
520										
	30									

Project: DP&L J.M. Stuart Station
Project Location: Aberdeen, Ohio
Project Number: 38-08E06133.00

Log of Boring B10-6

Elevation, feet	Depth, feet	SAMPLES Type	Number	Sampling Resistance, blows/foot	Recovery, %	Pocket Penetrometer, tsf	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	REMARKS AND OTHER TESTS
	30		S-7	23	83			Medium dense, moist, brown, poorly graded SAND with silt (SP-SM), trace gravel (continued)		Pause in drilling to repair cable pulley from 1005-1015.
515										
	35		S-8	22	100			With trace coal fragments		
510										
	40		S-9	28	--			No gravel or coal fragments		
505										
	45		S-10	18	100			With trace gravel and coal fragments		
500										
	50		S-11	33	100			Becomes dense		
495										
	55		S-12	26	100			Becomes medium dense		
490										
	60		S-13	25	78			Becomes wet	▽	
								Silty sand seam 1 inch thick		
485										
	65									

Project: DP&L J.M. Stuart Station
Project Location: Aberdeen, Ohio
Project Number: 38-08E06133.00

Log of Boring B10-6

Elevation, feet	Depth, feet	SAMPLES Type	Number	Sampling Resistance, blows/foot	Recovery, %	Pocket Penetrometer, tsf	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	REMARKS AND OTHER TESTS
	65		S-14	16	78			Medium dense, wet, brown, poorly graded SAND with silt (SP-SM) (continued)		
								← Lean clay seam 1/2 inch thick		About 2 ft of heave in auger after split spoon removed. End sampling at 1146; start augering to find bedrock.
								Borehole below 66.5 feet was augered without collecting samples. Drilling was continued to 100 feet without encountering bedrock.		
480										
	70									
475										
	75									
470										
	80									
465										
	85									
460										
	90									
455										
	95									
450										Finish augering to 100 ft at 1233; no bedrock encountered. Insufficient auger to continue drilling. About 13 ft of soil in augers: bluish gray lean clay on bottom auger (97-100 ft).
	100							Bottom of boring at 100.0 feet		

Project: DP&L J.M. Stuart Station Project Location: Aberdeen, Ohio Project Number: 38-08E06133.00	Log of Boring B10-7 Sheet 1 of 2

Date(s) Drilled	2/14/99	Logged By	T.A. George	Checked By	T.A. George / P.J. Kusky
Drilling Method	Hollow-Stem Auger	Drill Bit Size/Type	3-1/4-inch-ID / 7-inch-OD auger	Total Depth of Borehole	31.5 feet
Drill Rig Type	CME 750 ATV	Drilling Contractor	Summit Drilling Co.	Approximate Surface Elevation	568.8 feet MSL
Groundwater Level and Date Measured	No water observed in borehole on 2/17/99 after collapse to 3.2 ft	Sampling Method(s)	SPT split spoon	Hammer Data	140 lbs / 30-inch drop
Borehole Completion	Borehole collapsed to 3.2 ft; cement-bentonite grout 3.2-0 ft			Coordinate Location	N 234,937 E 1,630,466

Elevation, feet	Depth, feet	SAMPLES Type	Number	Sampling Resistance, blows/foot	Recovery, %	Pocket Penetrometer, tsf	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	REMARKS AND OTHER TESTS
	0		S-1	25	78			Gravel and sand road material about 4 inches thick		Setup and start sampling at 1530.
								Very stiff, moist, brown, lean CLAY (CL) [Fill]		
			S-2	36	58			Becomes hard, with trace gravel [Compacted Fill]		
565										
	5		S-3	31	100	2.25 4.5+ 4.5+		Becomes very stiff to hard		
560										
	10		S-4	27	67	4.5 3.25		Becomes very stiff		
555										
	15		S-5	17	100	4.5 2.25 3.5			18.6	LL=37, PL=19, PI=18 %G=0, %S=3.5, %F=96.5 Steam emanating from auger.
550										
	20		S-6	53	100			Very dense, moist, brown, silty SAND (SM) with gravel [Compacted Fill]		
545										Steam emanating from auger.
	25		S-7	20	--	3.5 2.5 2.5		Very stiff, moist, brown, lean CLAY(CL) [Compacted Fill] Silt seam 3 inches thick, with trace carbonaceous material		
540										
	30									

Report: GEO_1 JOLON; File: DPLJMSTU.GPJ; 6/17/99

Project: DP&L J.M. Stuart Station
Project Location: Aberdeen, Ohio
Project Number: 38-08E06133.00

Log of Boring B10-7

Elevation, feet	Depth, feet	SAMPLES Type	Number	Sampling Resistance, blows/foot	Recovery, %	Pocket Penetrometer, tsf	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	REMARKS AND OTHER TESTS
	30		S-8	9	--			Loose, moist, brown, silty SAND (SM) with gravel [Fill?]		End sampling at 1655.
								Bottom of boring at 31.5 feet		Groundwater not encountered during drilling.
535										
	35									
530										
	40									
525										
	45									
520										
	50									
515										
	55									
510										
	60									
505										
	65									

Project: DP&L J.M. Stuart Station Project Location: Aberdeen, Ohio Project Number: 38-08E06133.00	Log of Boring B10-8 Sheet 1 of 1

Date(s) Drilled	2/13/99	Logged By	T.A. George	Checked By	T.A. George / P.J. Kusky
Drilling Method	Hollow-Stem Auger	Drill Bit Size/Type	3-1/4-inch-ID / 7-inch-OD auger	Total Depth of Borehole	17.0 feet
Drill Rig Type	CME 750 ATV	Drilling Contractor	Summit Drilling Co.	Approximate Surface Elevation	546.9 feet MSL
Groundwater Level and Date Measured	No measurable water in borehole on 2/17/99 after collapse to 11.8 ft	Sampling Method(s)	SPT split spoon	Hammer Data	140 lbs / 30-inch drop
Borehole Completion	Borehole collapsed to 11.8 ft; cement-bentonite grout 11.8-0 ft			Coordinate Location	N 235,075 E 1,630,376

Elevation, feet	Depth, feet	SAMPLES Type	Number	Sampling Resistance, blows/foot	Recovery, %	Pocket Penetrometer, tsf	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	REMARKS AND OTHER TESTS
	0		S-1	15	63			Wet topsoil and silty sand [Fill]		Setup at 1615; start sampling at 1630.
						1.25		Medium dense, moist, brown, silty SAND (SM) with gravel [Fill]		
545								Stiff, moist, brown, lean CLAY (CL) [Fill]	19.0	LL=28, PL=16, PI=12
			S-2	15	100			Increasing silt content, trace organic material		Samples S-1 and S-2 used in Ashpond 10 composite.
						1.0 1.25		Stiff, moist, brown, sandy SILT (ML), trace gravel [Fill]		
			S-3	9	63			Loose to medium dense, moist, brown, silty SAND (SM) with gravel, coal or ash fragments [Fill]		
	5									
			S-4	15	0					No sample recovery; rock in sampler shoe.
540										
			S-5	5	0			Becomes loose		No sample recovery; rock in sampler shoe.
	10		S-6	4	58			Very loose, moist, brown, silty SAND (SM), trace carbonaceous material		
535										
	15		S-7	17	75			Becomes medium dense, with trace gravel; no carbonaceous material		
530										End sampling at 1703.
								Bottom of boring at 17.0 feet		Groundwater not encountered during drilling.
	20									
525										
	25									
520										
	30									

Report: GEO_1 JOLON; File: DPLJMSTU.GPJ, 6/17/99

URS Greiner Woodward Clyde

Project: DP&L J.M. Stuart Station **Project Location:** Aberdeen, Ohio **Project Number:** 38-08E06133.00	**Log of Boring B10-9** Sheet 1 of 3

Date(s) Drilled	2/15/99	Logged By	T.A. George	Checked By	T.A. George / P.J. Kusky
Drilling Method	Hollow-Stem Auger	Drill Bit Size/Type	4-1/4-inch-ID / 8-inch-OD auger	Total Depth of Borehole	75.0 feet
Drill Rig Type	CME 750 ATV	Drilling Contractor	Summit Drilling Co.	Approximate Surface Elevation	553.7 feet MSL
Groundwater Level and Date Measured	65 ft BGS on 2/15/99 ATD	Sampling Method(s)	SPT split spoon	Hammer Data	140 lbs / 30-inch drop
Borehole Completion	Well constructed of 2-in.-dia. PVC, 0.010-in. screen 74.8-54.8 ft; collapsed sand 75-64.2 ft, Best #620 sand 64.2-51.8 ft, bentonite pellets 51.8-47 ft, cement-bentonite grout 47-0 ft			Coordinate Location	N 235,343 E 1,629,870

Elevation feet	Depth, feet	SAMPLES Type	Number	Sampling Resistance, blows/foot	Recovery, %	Pocket Penetrometer, tsf	Graphic Log	MATERIAL DESCRIPTION	Well Completion Schematic	Water Content, %	REMARKS AND OTHER TESTS
	0		S-1	13	75			Topsoil and sand [Fill]			Setup and start sampling at 0815.
								Medium dense, moist, brown, clayey SAND (SC) with gravel [Fill]			
			S-2	15	88			Medium dense, moist, brown, silty SAND (SM) with gravel, trace carbonaceous material [Fill]			Large piece of gravel in sampler shoe.
550			S-3	6	75	0.25					Samples S-3 and S-4 used in Ashpond 10 composite.
	5					1.0		Soft to medium stiff, moist to wet, brown SILT (ML)			
			S-4	7	50	0.75				25.1	Samples S-3 and S-4 composited for analysis: LL=26, PL=22, PI=4 %G=0.3, %S=8.3, %F=91.4
545			S-5	19	71			Loose, moist, brown, silty SAND (SM) with gravel Becomes medium dense			
	10										
540											
	15		S-6	22	75			Medium dense, moist, brown, well-graded SAND with silt and gravel (SW-SM), trace carbonaceous material			%G=23.8, %S=68.7, %F=7.5
535											
	20		S-7	21	75						
530											
	25		S-8	4	54			Becomes very loose; no carbonaceous material			
525											
	30										

Project: DP&L J.M. Stuart Station
Project Location: Aberdeen, Ohio
Project Number: 38-08E06133.00

Log of Boring B10-9

Elevation feet	Depth, feet	SAMPLES Type	Number	Sampling Resistance, blows/foot	Recovery, %	Pocket Penetrometer, tsf	Graphic Log	MATERIAL DESCRIPTION	Well Completion Schematic	Water Content, %	REMARKS AND OTHER TESTS
	30		S-9	12	100			Medium dense, moist, brown, poorly graded SAND with silt (SP-SM), finer-grained than above			
520											
	35		S-10	23	100			Becomes coarser-grained, with trace gravel			
515											
	40		S-11	19	72			Becomes finer-grained; no gravel			%G=0.2, %S=94.1, %F=5.7
510											
	45		S-12	17	78						
505											
	50		S-13	17	83			With trace gravel			
500											
	55		S-14	17	--			No gravel			
495											
	60		S-15	33	78			Becomes dense			
490											
	65										

Project: DP&L J.M. Stuart Station
Project Location: Aberdeen, Ohio
Project Number: 38-08E06133.00

Log of Boring B10-9

Elevation feet	Depth, feet	SAMPLES Type	Number	Sampling Resistance, blows/foot	Recovery, %	Pocket Penetrometer, tsf	Graphic Log	MATERIAL DESCRIPTION	Well Completion Schematic	Water Content, %	REMARKS AND OTHER TESTS
	65		S-16	34	78			Dense, wet, brown, poorly graded SAND with silt (SP-SM), trace gravel ← Free water in bottom 2 inches of sample			Pause in drilling to obtain more auger.
485											
	70		S-17	23	--			← Becomes medium dense, with trace coal fragments			%G=0.7, %S=88.9, %F=10.4
480											End sampling at 1118. 23 inches of heave in augers; remove heaved sand and reauger to 70 ft. Add water to augers to control heave, and auger to 75 ft for well installation.
	75							Bottom of boring at 75.0 feet			Well installed through auger; casing pushed through 6 ft of heaved sand. Borehole collapsed to 64.2 ft when augers pulled.
475											
	80										
470											
	85										
465											
	90										
460											
	95										
455											
	100										

Project: DP&L J.M. Stuart Station Project Location: Aberdeen, Ohio Project Number: 38-08E06133.00	Log of Boring B10-10 Sheet 1 of 1

Date(s) Drilled	2/14/99	Logged By	T.A. George	Checked By	T.A. George / P.J. Kusky
Drilling Method	Hollow-Stem Auger	Drill Bit Size/Type	3-1/4-inch-ID / 7-inch-OD auger	Total Depth of Borehole	12.0 feet
Drill Rig Type	CME 750 ATV	Drilling Contractor	Summit Drilling Co.	Approximate Surface Elevation	550.0 feet MSL
Groundwater Level and Date Measured	No measurable water in borehole on 2/17/99 after collapse to 6 ft	Sampling Method(s)	SPT split spoon	Hammer Data	140 lbs / 30-inch drop
Borehole Completion	Borehole collapsed to 6 ft; cement-bentonite grout 6-0 ft			Coordinate Location	N 235,368 E 1,629,532

Elevation, feet	Depth, feet	SAMPLES Type	Number	Sampling Resistance, blows/foot	Recovery, %	Pocket Penetrometer, tsf	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	REMARKS AND OTHER TESTS
550	0		S-1	15	67			Medium dense, moist to wet, gray, silty SAND (SM) with ash(?) [Fill]		Setup and start sampling at 1455.
								Medium dense, moist, brown, silty SAND (SM)		
			S-2	6	71	1.75 1.25		Medium stiff, moist to wet, brown, silty CLAY to SILT (CL-ML/ML); increasing silt content with depth	25.3	Sample S-2 used in Ashpond 10 composite.
			S-3	7	63			Loose, moist to wet, brown, silty SAND (SM)		
545	5							Loose, moist to wet, brown, clayey SAND (SC), trace gravel		
								Loose, moist to wet, brown, silty SAND (SM)		
540	10		S-4	5	50			Increasing moisture content; trace gravel and carbonaceous material		End sampling at 1515.
								Bottom of boring at 12.0 feet		Groundwater not encountered during drilling.
535	15									
530	20									
525	25									
520	30									

Report: GEO_1 JOLON, File: DPLJMSTU.GPJ; 6/17/99

URS Greiner Woodward Clyde

Project: DP&L J.M. Stuart Station Project Location: Aberdeen, Ohio Project Number: 38-08E06133.00	Log of Boring B10-11 Sheet 1 of 4

Date(s) Drilled	2/8/99	Logged By	T.A. George	Checked By	T.A. George / P.J. Kusky
Drilling Method	Hollow-Stem Auger	Drill Bit Size/Type	4-1/4-inch-ID / 8-inch-OD auger	Total Depth of Borehole	107.0 feet
Drill Rig Type	CME 750 ATV	Drilling Contractor	Summit Drilling Co.	Approximate Surface Elevation	546.3 feet MSL
Groundwater Level and Date Measured	60 ft in auger after drilling; none on 2/17/99 after collapse to 45 ft	Sampling Method(s)	SPT split spoon	Hammer Data	140 lbs / 30-inch drop
Borehole Completion	Borehole collapsed to 45 ft; cuttings 45-15 ft, cement-bentonite grout 15-0 ft			Coordinate Location	N 235,461 E 1,628,920

Elevation, feet	Depth, feet	SAMPLES Type	Number	Sampling Resistance, blows/foot	Recovery, %	Pocket Penetrometer, tsf	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	REMARKS AND OTHER TESTS
	0		S-1	50/5"	64			Topsoil		Setup and start sampling at 0835. Split spoon refusal on scrap steel at 0.9 ft. Move borehole 4.5 ft south; encounter concrete at 1 ft at second location. Move rig 22 ft southwest of original location and redrill.
545								Loose, moist, brown, silty SAND (SM) with scrap steel and debris [Fill]		
			S-2	8	8			With concrete fragments		
	5									
540			S-3	12	25			With brick and wood fragments		
			S-4	8	29			Wet		
						1.25		Medium stiff to stiff, moist, gray, lean CLAY (CL) with black organic fragments [Fill]		Augers descending non-vertically; realign rig.
	10		S-5	50/3"	67			With metal chips, concrete and brick fragments, and sand.		
535								Medium dense, moist to wet, brown, poorly graded SAND with silt (SP-SM), trace gravel		Smoother drilling at 11.5 ft.
			S-6	14	71					
	15		S-7	7	67			Becomes loose, with trace coal fragments		
530										
	20		S-8	16	94			Becomes medium dense; no gravel		
525										
	25		S-9	5	100			Becomes loose		
520										
	30									

Project: DP&L J.M. Stuart Station
Project Location: Aberdeen, Ohio
Project Number: 38-08E06133.00

Log of Boring B10-11

Elevation, feet	Depth, feet	SAMPLES Type	Number	Sampling Resistance, blows/foot	Recovery, %	Pocket Penetrometer, tsf	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	REMARKS AND OTHER TESTS
	30		S-10	5	78			With trace gravel Loose, moist to wet, brown, poorly graded SAND with silt (SP-SM), trace gravel and coal fragments (continued)		
515										
	35		S-11	6	94			Becomes moist		
510										
	40		S-12	17	100			Becomes medium dense; no coal fragments		
505										End sampling at 1111. Begin augering to bedrock without sampling at 1210.
								Borehole below 41.5 feet augered without collecting samples. Drilling continued to auger refusal at 107 feet, inferred top of bedrock.		
	45									
500										
	50									
495										
	55									
490										
	60									
485										
	65									

Project: DP&L J.M. Stuart Station
Project Location: Aberdeen, Ohio
Project Number: 38-08E06133.00

Log of Boring B10-11

Elevation, feet	Depth, feet	SAMPLES Type	Number	Sampling Resistance, blows/foot	Recovery, %	Pocket Penetrometer, tsf	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	REMARKS AND OTHER TESTS
	65							Borehole below 41.5 feet augered without collecting samples. Drilling continued to auger refusal at 107 feet, inferred top of bedrock.		
480										
	70									
475										
	75									
470										
	80									
465										
	85									
460										
	90									
455										
	95									
450										
	100									

Project: DP&L J.M. Stuart Station
Project Location: Aberdeen, Ohio
Project Number: 38-08E06133.00

Log of Boring B10-11

Elevation, feet	Depth, feet	SAMPLES Type	SAMPLES Number	Sampling Resistance, blows/foot	Recovery, %	Pocket Penetrometer, tsf	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	REMARKS AND OTHER TESTS
445								Borehole below 41.5 feet augered without collecting samples. Drilling continued to auger refusal at 107 feet, inferred top of bedrock.		
	105									Inferred top of bedrock from auger refusal at 107 ft. About 15 ft of sand in augers after removal from borehole; retain sample of bluish gray, sandy lean clay on lead auger (possibly shale cuttings).
440										
								Bottom of boring at 107.0 feet		
	110									
435										
	115									
430										
	120									
425										
	125									
420										
	130									
415										
	135									

Project: DP&L J.M. Stuart Station **Project Location:** Aberdeen, Ohio **Project Number:** 38-08E06133.00	**Log of Boring B10-12** Sheet 1 of 2

Date(s) Drilled	2/4/99	Logged By	T.A. George	Checked By	T.A. George / P.J. Kusky
Drilling Method	Hollow-Stem Auger	Drill Bit Size/Type	3-1/4-inch-ID / 7-inch-OD auger	Total Depth of Borehole	31.5 feet
Drill Rig Type	CME 750 ATV	Drilling Contractor	Summit Drilling Co.	Approximate Surface Elevation	545.7 feet MSL
Groundwater Level and Date Measured	No measurable water in borehole on 2/17/99 after collapse to 3.2 ft	Sampling Method(s)	SPT split spoon, Shelby tube	Hammer Data	140 lbs / 30-inch drop
Borehole Completion	Borehole collapsed to 3.2 ft; cement-bentonite grout 3.2-0 ft			Coordinate Location	N 234,928 E 1,629,740

Elevation, feet	Depth, feet	SAMPLES Type	Number	Sampling Resistance, blows/foot	Recovery, %	Pocket Penetrometer, tsf	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	REMARKS AND OTHER TESTS
545	0		S-1	24	67			Wet, black cinder sand [Fill]		Setup and start sampling at 1642.
						4.5+		Very stiff to hard, moist, brown, lean CLAY (CL) with sand and gravel [Fill]		LL=28, PL=17, PI=11 Samples S-1 and S-2 used in Ashpond 10 composite.
	5		S-2	22	100	4.5 3.5 2.5 1.5		Very stiff to hard, moist, gray, sandy SILT to sandy silty CLAY (ML/CL-ML) with organic odor [Fill]		
540								Very stiff, moist, brown, lean CLAY (CL)	21.1	LL=45, PL=23, PI=22 %G=0, %S=5.0, %F=95.0
			T-3	Push				Loose, moist, brown, silty SAND (SM), trace gravel and coal fragments	10.3	DUW=117.5 pcf
	10		S-4	8	75					
535										
	15		S-5	5	100			Loose, moist, brown, poorly graded SAND with silt (SP-SM), trace coal fragments; finer-grained sand than above		%G=0.9, %S=91.3, %F=7.8
530										
	20		S-6	6	--					
525										
	25		S-7	3	--			Becomes very loose; no coal fragments		
520										
								Becomes medium dense, with trace gravel		
	30									

Report: GEO_1 JOLON: File: DPLJMSTU.GPJ; 6/17/99

URS Greiner Woodward Clyde

Project: DP&L J.M. Stuart Station
Project Location: Aberdeen, Ohio
Project Number: 38-08E06133.00

Log of Boring B10-12

Elevation, feet	Depth, feet	SAMPLES Type	Number	Sampling Resistance, blows/foot	Recovery, %	Pocket Penetrometer, tsf	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	REMARKS AND OTHER TESTS
515	30		S-8	24	--			Medium dense, moist, brown, poorly graded SAND with silt (SP-SM), trace gravel (continued)		End sampling at 1735.
								Bottom of boring at 31.5 feet		Groundwater not encountered during drilling.
510	35									
505	40									
500	45									
495	50									
490	55									
485	60									
	65									

Project: DP&L J.M. Stuart Station **Project Location:** Aberdeen, Ohio **Project Number:** 38-08E06133.00	**Log of Boring B10-13** Sheet 1 of 1

Date(s) Drilled	2/14/99	Logged By	T.A. George	Checked By	T.A. George / P.J. Kusky
Drilling Method	Hollow-Stem Auger	Drill Bit Size/Type	3-1/4-inch-ID / 7-inch-OD auger	Total Depth of Borehole	12.0 feet
Drill Rig Type	CME 750 ATV	Drilling Contractor	Summit Drilling Co.	Approximate Surface Elevation	543.5 feet MSL
Groundwater Level and Date Measured	No measurable water in borehole on 2/17/99 after collapse to 8.5 ft	Sampling Method(s)	SPT split spoon	Hammer Data	140 lbs / 30-inch drop
Borehole Completion	Borehole collapsed to 8.5 ft; cement-bentonite grout 8.5-0 ft			Coordinate Location	N 235,063 E 1,629,407

Elevation, feet	Depth, feet	SAMPLES Type	Number	Sampling Resistance, blows/foot	Recovery, %	Pocket Penetrometer, tsf	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	REMARKS AND OTHER TESTS
	0							Topsoil		Setup, start sampling at 1408.
			S-1	11	63	3.0 2.75		Stiff to very stiff, moist, brown, lean CLAY with sand (CL), trace root fibers		
			S-2	13	100	2.25 2.0		Becomes stiff; no root fibers	19.9	LL=29, PL=16, PI=13 %G=0, %S=25.8, %F=74.2
540						1.5 1.25		Stiff, moist, brown, lean CLAY (CL) with interbedded sandy SILT (ML) seams		Samples S-1, S-2, and S-3 used in Ashpond 10 composite.
			S-3	8	100	1.25 1.25 1.5		With trace gravel		
	5							Loose, moist to wet, brown, clayey SAND (SC), trace gravel		
535										
	10		S-4	4	--			Very loose, moist to wet, brown, silty SAND (SM)		End sampling at 1427.
530								Bottom of boring at 12.0 feet		Groundwater not encountered during drilling.
	15									
525										
	20									
520										
	25									
515										
	30									

Project: DP&L J.M. Stuart Station Project Location: Aberdeen, Ohio Project Number: 38-08E06133.00	Log of Boring B10-14 Sheet 1 of 1

Date(s) Drilled	2/8/99	Logged By	T.A. George	Checked By	T.A. George / P.J. Kusky
Drilling Method	Hollow-Stem Auger	Drill Bit Size/Type	4-1/4-inch-ID / 8-inch-OD auger	Total Depth of Borehole	26.5 feet
Drill Rig Type	CME 750 ATV	Drilling Contractor	Summit Drilling Co.	Approximate Surface Elevation	542.6 feet MSL
Groundwater Level and Date Measured	No measurable water in borehole on 2/17/99 after collapse to 18 ft	Sampling Method(s)	SPT split spoon, Shelby tube	Hammer Data	140 lbs / 30-inch drop
Borehole Completion	Borehole collapsed to 18 ft; cuttings 18-15 ft, cement-bentonite grout 15-0 ft			Coordinate Location	N 235,226 E 1,629,003

Elevation, feet	Depth, feet	SAMPLES Type	Number	Sampling Resistance, blows/foot	Recovery, %	Pocket Penetrometer, tsf	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	REMARKS AND OTHER TESTS
	0							Topsoil		Setup at 1500 and start sampling at 1509.
			S-1	17	75	4.5 2.75		Very stiff, moist, brown, lean CLAY (CL) with thin sand seams (<1/16 inch), trace root fibers and black organic material [Fill?]	21.7	
540			T-2	Push	79			Loose, moist, brown, silty SAND (SM), trace gravel [Fill]		Samples S-1 and T-2 used in Ashpond 10 composite.
			S-3	8	75					
	5		S-4	5	--			With some gravel, trace organic fragments (possibly coal or ash)		
535										
								Loose, moist to wet, brown, poorly graded SAND with silt (SP-SM), trace gravel and black organic fragments		Possible fill / native contact between S-4 and S-5 sampling intervals. %G=5.0, %S=88.1, %F=6.9
	10		S-5	7	--					
530			S-6	4	75					
	15		S-7	5	100			No gravel or organic material		
525										
	20		S-8	6	100			With trace gravel		
520										
	25		S-9	7	100					
										End sampling at 1610.
515								Bottom of boring at 26.5 feet		Groundwater not encountered during drilling.
	30									

Report: GEO_1 JOLON; File: DPLJMSTU.GPJ; 6/17/99

URS Greiner Woodward Clyde

Project: DP&L J.M. Stuart Station Project Location: Aberdeen, Ohio Project Number: 38-08E06133.00	Log of Boring B10-15 Sheet 1 of 1

Date(s) Drilled	2/12/99	Logged By	T.A. George	Checked By	T.A. George / P.J. Kusky
Drilling Method	Hollow-Stem Auger	Drill Bit Size/Type	3-1/4-inch-ID / 7-inch-OD auger	Total Depth of Borehole	21.5 feet
Drill Rig Type	CME 750 ATV	Drilling Contractor	Summit Drilling Co.	Approximate Surface Elevation	545.8 feet MSL
Groundwater Level and Date Measured	No measurable water in borehole on 2/17/99 after collapse to 10 ft	Sampling Method(s)	SPT split spoon	Hammer Data	140 lbs / 30-inch drop
Borehole Completion	Borehole collapsed to 10 ft; cement-bentonite grout 10-0 ft			Coordinate Location	N 234,672 E 1,629,605

Elevation, feet	Depth, feet	SAMPLES Type	Number	Sampling Resistance, blows/foot	Recovery, %	Pocket Penetrometer, tsf	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	REMARKS AND OTHER TESTS
545	0		S-1	17	58			Medium dense, wet, black, brown, and gray (mixed), silty SAND (SM) with gravel and ash [Fill]		Setup and start sampling at 1700.
			S-2	10	79			Becomes loose, moist to wet		Samples are coated with gray water ponded at surface and draining into borehole.
			S-3	14	100	3.75 2.5 2.5 2.25		Stiff to very stiff, moist, brown with gray mottling, lean CLAY (CL)	22.6	Samples S-2, S-3, and S-4 used in Ashpond 10 composite. LL=35, PL=21, PI=14 %G=0, %S=4.2, %F=95.8
540	5		S-4	12	100	2.0 1.5		Becomes stiff; increasing sand content	24.5	
			S-5	9	100	1.25 0.75 1.0		Medium stiff to stiff, moist to wet, brown SILT (ML) Becomes interbedded with silty SAND (SM) seams 1 inch thick		
535	10									
530	15		S-6	5	33			Loose, moist to wet, brown, poorly graded SAND with silt (SP-SM), trace gravel and organic material		Sample S-6 possibly from cuttings in bottom auger.
525	20		S-7	12	--			Becomes medium dense; no organic material		End sampling at 1741.
520	25							Bottom of boring at 21.5 feet		Groundwater not encountered during drilling.
	30									

Report: GEO_1 JOLON; File: DPLJMSTU.GPJ; 6/17/99

URS Greiner Woodward Clyde

Project: DP&L J.M. Stuart Station Project Location: Aberdeen, Ohio Project Number: 38-08E06133.00	Log of Boring B10-16 Sheet 1 of 1

Date(s) Drilled	2/8/99	Logged By	T.A. George	Checked By	T.A. George / P.J. Kusky
Drilling Method	Hollow-Stem Auger	Drill Bit Size/Type	4-1/4-inch-ID / 8-inch-OD auger	Total Depth of Borehole	26.5 feet
Drill Rig Type	CME 750 ATV	Drilling Contractor	Summit Drilling Co.	Approximate Surface Elevation	543.9 feet MSL
Groundwater Level and Date Measured	No measurable water in borehole on 2/17/99 after collapse to 17 ft	Sampling Method(s)	SPT split spoon	Hammer Data	140 lbs / 30-inch drop
Borehole Completion	Borehole collapsed to 17 ft; cuttings 17-13.8 ft, cement-bentonite grout 13.8-0 ft			Coordinate Location	N 234,923 E 1,629,030

Elevation, feet	Depth, feet	SAMPLES Type	Number	Sampling Resistance, blows/foot	Recovery, %	Pocket Penetrometer, tsf	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	REMARKS AND OTHER TESTS
	0		S-1	14	75	4.5		Topsoil		Setup and start sampling at 1440.
						4.0		Very stiff to hard, moist, brown, lean CLAY (CL) [Fill?]		Samples S-1, S-2, S-3, and S-4 used in Ashpond 10 composite.
			S-2	16	88	2.5 2.5 1.0		Becomes very stiff, with trace organic material		
540			S-3	12	100	2.5 1.5 1.25 1.5		Stiff, moist, brown with gray mottling, lean CLAY (CL), trace organic material		
	5		S-4	8	100	1.5		Becomes medium stiff, brown (no mottling); increasing sand content		
						0.75		Medium stiff, wet, brown, silty CLAY to SILT (CL-ML/ML)		
			S-5	4	50			Very loose, moist to wet, brown, silty SAND (SM), trace gravel		
535										
	10		S-6	3	25			With some gravel and black organic material		
			S-7	4	46			Very loose, moist to wet, brown, silty SAND to poorly graded SAND with silt (SM/SP-SM)		
530										
	15		S-8	9	100			Loose, moist to wet, brown, silty SAND (SM) Silty clay seam 2 inches thick		
								Loose, moist to wet, brown, poorly graded SAND with silt (SP-SM), trace organic material		
525										
	20		S-9	8	67			Becomes moist		
520										
	25		S-10	3	67			Becomes very loose		End sampling at 1732.
								Bottom of boring at 26.5 feet		Groundwater not encountered during drilling.
515										
	30									

Report: GEO_1 ...OLON; File: DPLJMSTU.GPJ; 6/17/99

URS Greiner Woodward Clyde

Project: DP&L J.M. Stuart Station **Project Location:** Aberdeen, Ohio **Project Number:** 38-08E06133.00	**Log of Boring B10-17** Sheet 1 of 2

Date(s) Drilled	2/4/99	Logged By	T.A. George	Checked By	T.A. George / P.J. Kusky
Drilling Method	Hollow-Stem Auger	Drill Bit Size/Type	3-1/4-inch-ID / 7-inch-OD auger	Total Depth of Borehole	56.5 feet
Drill Rig Type	CME 750 ATV	Drilling Contractor	Summit Drilling Co.	Approximate Surface Elevation	532.1 feet MSL
Groundwater Level and Date Measured	44.3 ft in auger after drilling; <1 in. on 2/17/99 after collapse	Sampling Method(s)	SPT split spoon	Hammer Data	140 lbs / 30-inch drop
Borehole Completion	Borehole collapsed to 7.2 ft; cement-bentonite grout 7.2-0 ft			Coordinate Location	N 235,204 E 1,628,580

Elevation, feet	Depth, feet	SAMPLES Type	Number	Sampling Resistance, blows/foot	Recovery, %	Pocket Penetrometer, tsf	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	REMARKS AND OTHER TESTS
	0		S-1	40	50			Wet topsoil		Setup and start sampling at 1330.
								Wet limestone and gravel [Fill]		
530			S-2	24	13					
	5		S-3	28	83			Medium dense, moist, grayish brown, clayey SAND (SC) and sandy SILT (ML), trace gravel [Fill]		
								Medium dense, moist, brown, poorly graded SAND with silt (SP-SM)		
525										
	10		S-4	10	83			Becomes loose, with trace gravel		
520										
	15		S-5	25	89			Becomes medium dense, with trace coal fragments		
515										
	20		S-6	20	89			No gravel or coal fragments		
510										
	25		S-7	16	78					
505										
	30									

Report: GEO_1 SOLON: File: DPLJMSTU.GPJ; 6/17/99

URS Greiner Woodward Clyde

Project: DP&L J.M. Stuart Station
Project Location: Aberdeen, Ohio
Project Number: 38-08E06133.00

Log of Boring B10-17

Elevation, feet	Depth, feet	SAMPLES Type	Number	Sampling Resistance, blows/foot	Recovery, %	Pocket Penetrometer, tsf	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	REMARKS AND OTHER TESTS
	30		S-8	17	--			Medium dense, moist, brown, well-graded SAND with silt (SW-SM), trace gravel		%G=5.4, %S=86.0, %F=8.6 About 1 ft of heave in augers at 30.5-31.5 ft after S-8.
500										
	35		S-9	26	--			Medium dense, moist, brown, poorly graded SAND with silt (SP-SM), trace gravel		
495										
	40		S-10	27	--			Becomes moist to wet, with black organic seams <1/16 inch thick; no gravel		
490										
	45		S-11	25	89			Becomes wet, with trace gravel		Soil in S-11 appears saturated, but no free water. About 1 ft of heave in augers after split spoon removed.
485										
	50		S-12	18	100			Becomes coarser-grained, with free water		Heave in augers at 49.2-50 ft before S-12. Sampler pounded through heaving sand. Heave in augers at 50.5-51.5 ft after sampler removed.
480										
	55		S-13	25	17			Becomes finer-grained		Heave in augers at 54-55 ft before S-13. End sampling at 1539; split spoon difficult to remove.
475								Bottom of boring at 56.5 feet		Groundwater in auger at 44.3 ft immediately after drilling.
	60									
470										
	65									

Project: DP&L J.M. Stuart Station **Project Location:** Aberdeen, Ohio **Project Number:** 38-08E06133.00	**Log of Boring B10-18** Sheet 1 of 4

Date(s) Drilled	2/5/99	Logged By	T.A. George	Checked By	T.A. George / P.J. Kusky
Drilling Method	Hollow-Stem Auger	Drill Bit Size/Type	3-1/4-inch-ID / 7-inch-OD auger	Total Depth of Borehole	123.0 feet
Drill Rig Type	CME 750 ATV	Drilling Contractor	Summit Drilling Co.	Approximate Surface Elevation	545.5 feet MSL
Groundwater Level and Date Measured	60 ft on 2/5/99 ATD; 7.2 ft on 2/17/99 after collapse to 8.6 ft	Sampling Method(s)	SPT split spoon, Shelby tube	Hammer Data	140 lbs / 30-inch drop
Borehole Completion	Borehole collapsed to 8.6 ft; cement-bentonite grout 8.6-0 ft			Coordinate Location	N 234,464 E 1,629,460

Elevation, feet	Depth, feet	SAMPLES Type	Number	Sampling Resistance, blows/foot	Recovery, %	Pocket Penetrometer, tsf	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	REMARKS AND OTHER TESTS
545	0		S-1	15	100	2.5 3.0		Topsoil Very stiff, moist, brown, lean CLAY to sandy lean CLAY (CL), trace organic material [Fill]		Setup and start sampling at 0800.
			T-2	Push					21.4	%G=0, %S=9.0, %F=91.0 UC q_u=3161 psf
			S-3	20	100	4.5+ 2.0 3.5		Becomes very stiff to hard, grayish brown With topsoil		
540	5		S-4	10	100	1.25		Becomes stiff; no topsoil		
			S-5	16	100	3.5 4.0 2.0 3.5		Very stiff, moist, brown, lean CLAY (CL), trace organic material Becomes brown with gray mottling		
535	10		T-6	Push						
			S-7	14	88	1.5		Stiff, moist, brown, lean CLAY to silty CLAY (CL/CL-ML), trace gravel and organic material Sandy CLAY to clayey SAND (CL/SC)		
530	15		S-8	11	100			Medium dense, moist, brown, silty SAND (SM), trace gravel Medium dense, moist, brown, clayey SAND (SC), trace gravel and coal fragments		
525	20		S-9	19	78			With gravel		
520	25		S-10	18	-			Medium dense, moist, brown, poorly graded SAND with silt (SP-SM)		
	30									

Report: GEO_1 .3OLON; File: DPLJMSTU.GPJ; 6/17/99

URS Greiner Woodward Clyde

Project: DP&L J.M. Stuart Station
Project Location: Aberdeen, Ohio
Project Number: 38-08E06133.00

Log of Boring B10-18

Elevation, feet	Depth, feet	SAMPLES Type	Number	Sampling Resistance, blows/foot	Recovery, %	Pocket Penetrometer, tsf	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	REMARKS AND OTHER TESTS
515	30		S-11	17	100			Medium dense, moist, brown, poorly graded SAND with silt (SP-SM) (continued)		
510	35		S-12	11	100					
505	40		S-13	11	83					
500	45		S-14	17	89			With trace coal fragments		
495	50		S-15	28	100			With trace gravel; no coal fragments		
490	55		S-16	22	--			No gravel Increasing moisture content		
485	60		S-17	25	100			Becomes wet		About 1 ft of heave in augers at 60.5-61.5 ft after S-17.
	65									

Report: GEO_1, SOLON, File: DPLJMSTU.GPJ; 6/17/99

Project: DP&L J.M. Stuart Station
Project Location: Aberdeen, Ohio
Project Number: 38-08E06133.00

Log of Boring B10-18

Elevation, feet	Depth, feet	SAMPLES Type	Number	Sampling Resistance, blows/foot	Recovery, %	Pocket Penetrometer, tsf	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	REMARKS AND OTHER TESTS
480	65		S-18	16	100			Medium dense, wet, brown, poorly graded SAND with silt (SP-SM), trace gravel (continued)		End sampling at 1110; about 2 ft of heave in augers after S-18, at 63.5-65.5 ft. Begin augering to bedrock without sampling.
								Borehole below 66.5 feet augered without collecting samples. Drilling continued to auger refusal at 123 feet, inferred top of bedrock at 122 feet.		
475	70									
470	75									
465	80									
460	85									
455	90									
450	95									
	100									

Project: DP&L J.M. Stuart Station
Project Location: Aberdeen, Ohio
Project Number: 38-08E06133.00

Log of Boring B10-18

Elevation, feet	Depth, feet	SAMPLES: Type	Number	Sampling Resistance, blows/foot	Recovery, %	Pocket Penetrometer, tsf	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	REMARKS AND OTHER TESTS
445								Borehole below 66.5 feet augered without collecting samples. Drilling continued to auger refusal at 123 feet, inferred top of bedrock at 122 feet.		
440	105									
435	110									
430	115									
425	120									Augers turn noticeably slower at 122 ft; drill rig rear jacks lift off ground at 123 ft. Bedrock inferred at 122 ft; bluish gray, lean clay with shale fragments on lead auger when retrieved.
420	125							Bottom of boring at 123.0 feet		
415	130									
	135									

Project: DP&L J.M. Stuart Station Project Location: Aberdeen, Ohio Project Number: 38-08E06133.00	Log of Test Pit TP-1

Date(s) Excavated	5/27/99	Logged By	P.J. Kusky	Checked By	S.F. Putrich
Approximate Length (feet)	20	Approximate Width (feet)	2	Approximate Depth (feet)	15
Excavation Equipment	CAT 220	Excavation Contractor	Waterland / DP&L	Approximate Pit Trend	N - S
Groundwater Level and Date Measured	Not encountered during excavation			Approximate Surface Elevation	545 feet MSL
Comments	Refer to site plan for location				

Elevation feet	Depth, feet	Sample Type	Sample Number	Graphic Log	MATERIAL DESCRIPTION	REMARKS
545	0				Topsoil	
	2				Dry to moist, black, brown, and gray ASH, trace coal	
	4		S-1		Moist, brown with gray mottling, lean CLAY (CL), trace to some fine sand	
540	6				With trace to some silt	
	8		S-2		Moist to wet, brown SILT (ML), trace to some gravel	
535	10		S-3		Wet, brown, silty SAND (SM), trace to some gravel	
	12					
	14		S-4		Wet, brown, poorly graded SAND with silt (SP-SM), trace to some gravel	Test pit caved to 14 ft.
530	16				Bottom of test pit at 15 feet	
	18					
525	20					

Report: GEO_5D_TEST_PIT; File: DPLJMSTU.GPJ; 6/17/99

URS Greiner Woodward Clyde

Project: DP&L J.M. Stuart Station **Project Location:** Aberdeen, Ohio **Project Number:** 38-08E06133.00	**Log of Test Pit TP-2**

Date(s) Excavated	5/27/99	Logged By	P.J. Kusky	Checked By	S.F. Putrich
Approximate Length (feet)	15	Approximate Width (feet)	2	Approximate Depth (feet)	6
Excavation Equipment	CAT 220	Excavation Contractor	Waterland / DP&L	Approximate Pit Trend	SW - NE
Groundwater Level and Date Measured	Not encountered during excavation			Approximate Surface Elevation	545 feet MSL
Comments	Refer to site plan for location				

Elevation feet	Depth, feet	Sample Type	Sample Number	Graphic Log	MATERIAL DESCRIPTION	REMARKS
545	0				Topsoil	
	2		S-1		Moist, brown with gray mottling, lean CLAY (CL) to silty CLAY (CL-ML), trace to some fine sand	
540	4		S-2		Moist to wet, brown, silty SAND (SM), trace to some gravel	
	6				Bottom of test pit at 6 feet	
535	8					
	10					
	12					
530	14					
	16					
	18					
525	20					

Report: GEO_5D_TEST_PIT; File: DPLJMSTU.GPJ; 6/17/99

URS Greiner Woodward Clyde

Project: DP&L J.M. Stuart Station Project Location: Aberdeen, Ohio Project Number: 38-08E06133.00	Log of Test Pit TP-3

Date(s) Excavated	5/27/99	Logged By	P.J. Kusky	Checked By	S.F. Putrich
Approximate Length (feet)	10	Approximate Width (feet)	1	Approximate Depth (feet)	6
Excavation Equipment	Backhoe	Excavation Contractor	DP&L	Approximate Pit Trend	SW - NE
Groundwater Level and Date Measured	Not encountered during excavation			Approximate Surface Elevation	545 feet MSL
Comments	Refer to site plan for location				

Elevation feet	Depth, feet	Sample Type	Sample Number	Graphic Log	MATERIAL DESCRIPTION	REMARKS
545	0				Topsoil	
	2		S-1		Moist to wet, brown SILT (ML)	
	4		S-2		Moist to wet, brown, poorly graded SAND with silt (SP-SM), trace to some gravel	
540	6				Bottom of test pit at 6 feet	
	8					
535	10					
	12					
	14					
530	16					
	18					
525	20					

Report: GEO_SD_TEST_PIT; File: DPLJMSTU.GPJ; 6/17/99

URS Greiner Woodward Clyde

In-Situ Soil Testing, L.C. CPTU Sounding Data

Project	J.M. Stuart Station			Sounding	CPT-6
Location	Aberdeen, Ohio	Cone Number	DSG0296	Date/Time	1/15/2011 7:01:55 AM
Operator	R. Failmezger	Ground Elev.		Water Depth	15.00 m
Engineer	R. Failmezger	File Name	2011-03CPT-6.cpt	Total Depth	12.80 m

CPT DATA

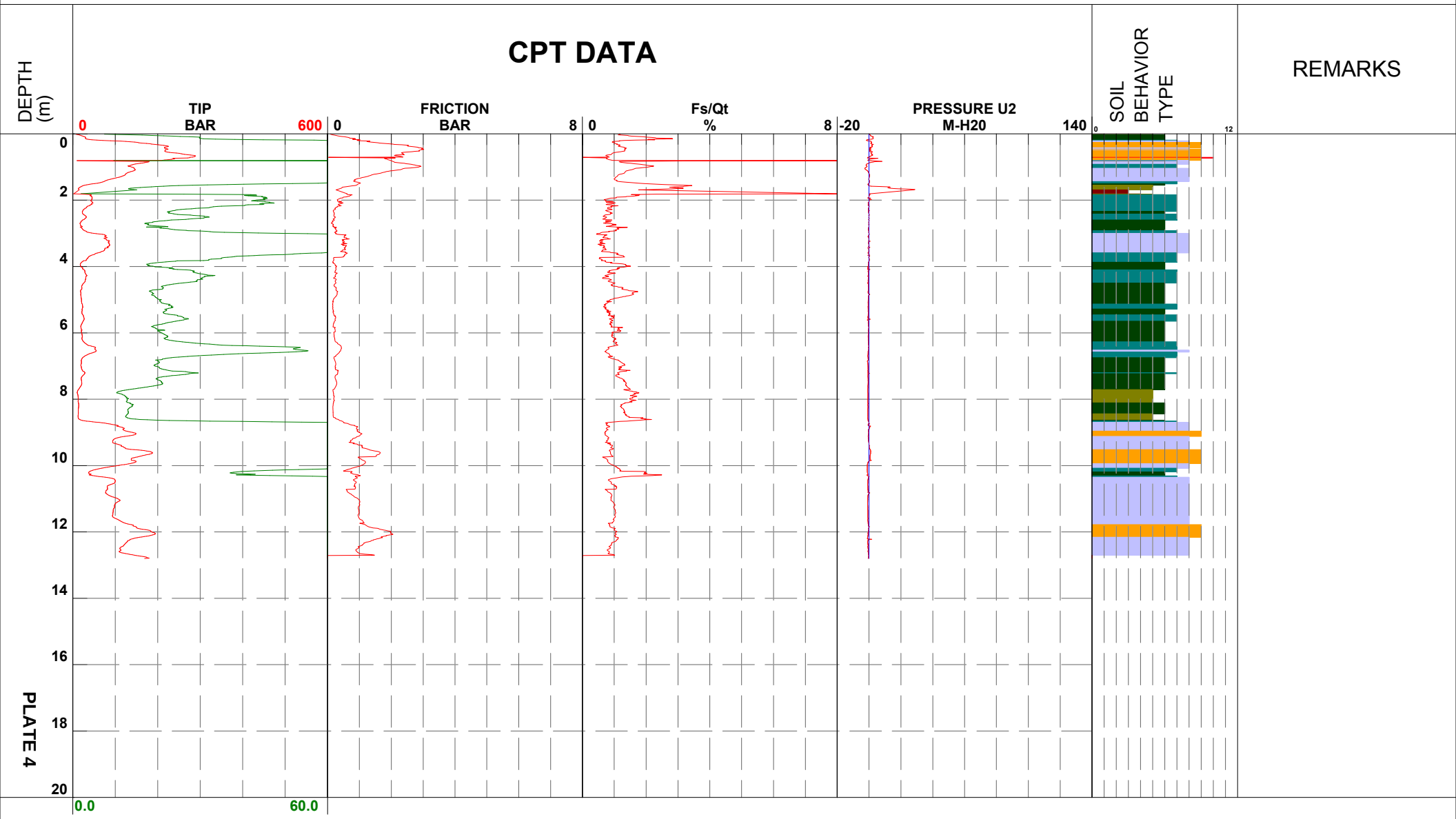

PLATE 4

- 1 - sensitive fine grained
- 2 - organic material
- 3 - clay
- 4 - silty clay to clay
- 5 - clayey silt to silty clay
- 6 - sandy silt to clayey silt
- 7 - silty sand to sandy silt
- 8 - sand to silty sand
- 9 - sand
- 10 - gravelly sand to sand
- 11 - very stiff fine grained (*)
- 12 - sand to clayey sand (*)

In-Situ Soil Testing, L.C. Seismic Sounding Data

Project	J.M. Stuart Station			Sounding	CPT-6
Location	Aberdeen, Ohio	Cone Number	DSG0296	Time/Date	1/15/2011 7:11:56 AM
Operator	R. Failmezger	Ground Elev.		Water Depth	
Engineer		File Name		Total Depth	

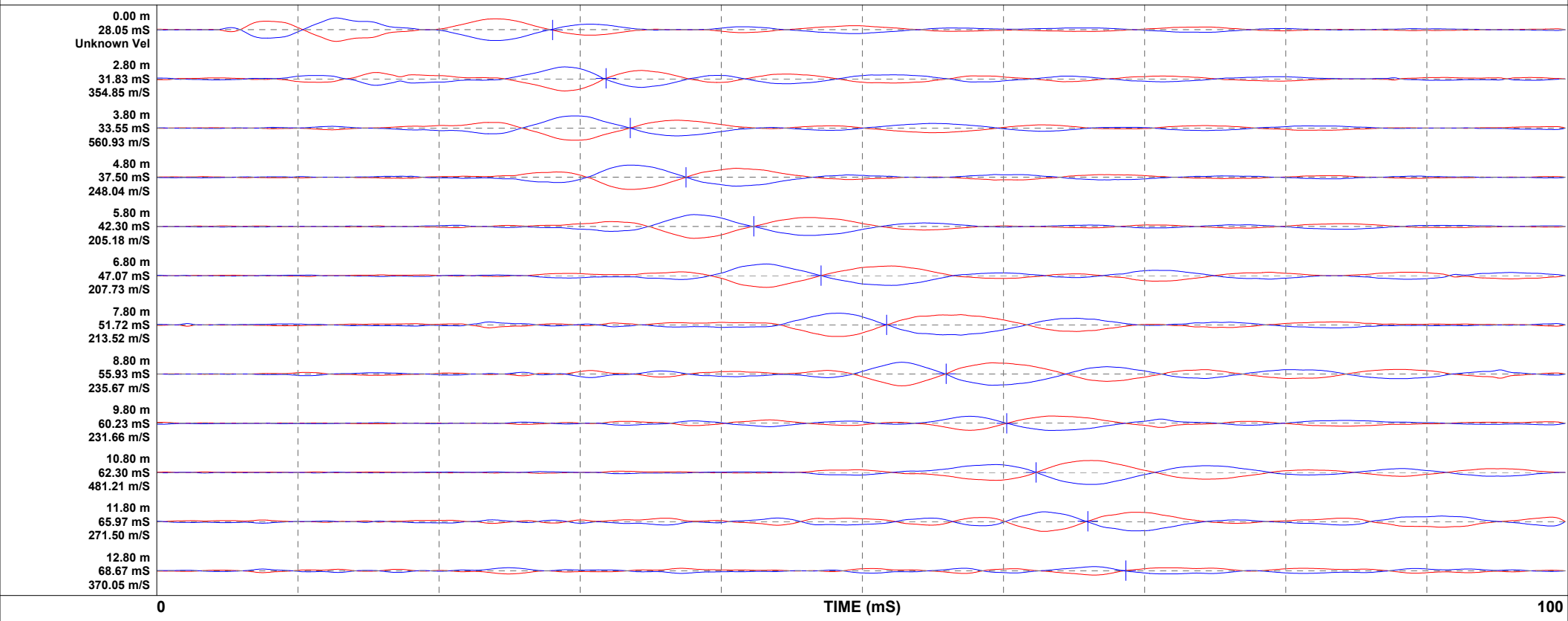

PLATE 5

CPTINT Analysis
Sounding CPT-6

```
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"Output file from CPTINT - Version 5.2
"=====================================
"INPUT FILE: c:\insitu\cpt\2011\dp&lst~1\CPT-6.TXT
"-------------------------------------------------
"
"Licensed to:  UBC In-Situ Testing FREEWARE
"    Address:  Piezocone Interpretation
"       City:  www.civil.ubc.ca/home/in-situ
"
"Interpreter Name: Roger A. Failmezger
"
"
"SUMMARY SHEET
"-------------
"'a' for calculating Qt:                 0.800
"Value for Water Table (in m):           15.000
"Valid Zone Classification based on:     Rf
"Missing unit weight to start depth:     18.860
"Method for calculating Su:              Nkt
"Value of the constant Nkt:              14.000
"'alpha' for Modulus in clay:            4.000
"Method used to calculate OCR:           Su/EOS
"(Su/EOS) for normal consolidation:      0.350
"Define Zone 6 for Sand Parameters?      YES
"Sand Compressibility for calc Dr:       High
"Method for Friction Angle:              Robertson & Campanella
"Initial guess of OCR for sand:          1.000
"Method for Modulus in sand:             'alpha' x Qt
"'alpha' for Modulus in sand (Qt mthd):  4.000
"Silty sand correction for CSR (Qc)?     YES
"EQ magnitudes for CSR (Qc):             7.500
"'a max/g' value for calc CSR (Eq):      0.300
"Graph used for calculating rd:          Fraser Delta
"Vertical Flow Gradient, i (- up):       +0.000
"Constant Volume Friction Angle:         33.000
"CPT to SPT N60 Conversion:              Jeffries & Davies
"
"Soil Behavior Type Zone Numbers
"For Rf Zone & Bq Zone Classification
"------------------------------------
"Zone #1=Sensitive fine grained     Zone #7 =Sand with some Silt
"Zone #2=Organic material           Zone #8 =Fine sand
"Zone #3=Clay                       Zone #9 =Sand
"Zone #4=Silty clay                 Zone #10=Gravelly sand
"Zone #5=Clayey silt                Zone #11=Very stiff fine grained *
"Zone #6=Silty sand                 Zone #12=Sand to clayey sand *
"   * Overconsolidated and/or cemented
"
"NOTE:
"-----
"For soil classification, Rf values > 8 are assumed to be 8.
"
"( Note: 9E9 means Out Of Range )
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```

CPTINT Analysis
Sounding CPT-6

6.875	20.230	1.169	19.650	0.000	-0.733	6	7	1.317	1.317	-0.004	2.457	49.346	-0.010	4	5	31	9E9	9E9	9E9	0.041	0.154	80.919	22.556
7.125	23.668	1.200	19.650	0.000	-0.594	6	7	1.366	1.366	-0.003	2.423	47.900	-0.023	5	10	31	9E9	9E9	9E9	0.049	0.152	94.674	23.376
7.375	21.236	1.208	19.650	0.000	-0.617	6	7	1.416	1.416	-0.003	2.478	50.251	-0.010	5	5	31	9E9	9E9	9E9	0.049	0.150	84.944	24.196
7.625	17.080	1.397	18.860	0.000	-0.675	6	6	1.464	1.464	-0.004	2.628	56.623	0.006	4	-2	28	9E9	9E9	9E9	0.041	0.149	68.319	25.016
7.875	11.813	1.611	18.860	0.000	-0.694	5	6	1.511	1.511	-0.007	2.844	65.792	0.041	3	9E9	9E9	0.736	0.487	1.511	9E9	9E9	47.254	25.836
8.125	13.391	1.360	18.860	0.000	-0.709	6	6	1.558	1.558	-0.006	2.743	61.475	0.040	3	-12	28	9E9	9E9	9E9	0.033	0.145	53.565	26.656
8.375	12.971	1.320	18.860	0.000	-0.720	6	6	1.605	1.605	-0.006	2.758	62.141	0.048	3	-14	28	9E9	9E9	9E9	0.033	0.144	51.882	27.477
8.625	34.640	1.094	18.860	0.000	-0.479	7	8	1.652	1.652	-0.001	2.319	43.517	-0.035	7	20	33	9E9	9E9	9E9	0.128	0.142	138.558	28.297
8.875	116.927	0.770	19.650	0.000	-0.087	9	9	1.700	1.700	-0.000	1.794	21.237	-0.120	22	64	39	9E9	9E9	9E9	0.150	0.141	467.709	29.117
9.125	120.620	0.759	19.650	0.000	-0.407	9	9	1.750	1.750	-0.000	1.787	20.949	-0.119	22	64	39	9E9	9E9	9E9	0.150	0.139	482.479	29.937
9.375	109.124	0.877	19.650	0.000	0.011	8	9	1.799	1.799	0.000	1.887	25.167	-0.119	21	60	39	9E9	9E9	9E9	0.139	0.138	436.496	30.757
9.625	169.450	0.876	19.650	0.000	0.843	9	9	1.848	1.848	0.000	1.771	20.256	-0.157	31	76	41	9E9	9E9	9E9	0.204	0.136	677.799	31.578
9.875	136.270	0.813	19.650	0.000	-0.137	9	9	1.897	1.897	-0.000	1.805	21.695	-0.128	25	67	39	9E9	9E9	9E9	0.161	0.135	545.082	32.398
10.125	57.414	1.298	18.860	0.000	-1.075	7	8	1.945	1.945	-0.002	2.272	41.515	-0.082	12	35	35	9E9	9E9	9E9	0.150	0.133	229.658	33.218
10.375	78.873	1.130	19.650	0.000	-0.612	8	9	1.993	1.993	-0.001	2.123	35.180	-0.100	16	47	37	9E9	9E9	9E9	0.096	0.132	315.490	34.038
10.625	85.588	0.959	19.650	0.000	-0.760	8	9	2.042	2.042	-0.001	2.036	31.517	-0.092	17	49	37	9E9	9E9	9E9	0.096	0.130	342.351	34.859
10.875	86.446	0.881	19.650	0.000	-0.551	8	9	2.092	2.092	-0.001	2.006	30.236	-0.084	17	49	37	9E9	9E9	9E9	0.096	0.129	345.785	35.679
11.125	103.208	0.964	19.650	0.000	-0.861	8	9	2.141	2.141	-0.001	1.995	29.776	-0.105	20	55	37	9E9	9E9	9E9	0.118	0.127	412.832	36.499
11.375	95.178	1.023	19.650	0.000	-0.790	8	9	2.190	2.190	-0.001	2.052	32.182	-0.100	19	52	37	9E9	9E9	9E9	0.107	0.126	380.711	37.319
11.625	106.916	0.973	19.650	0.000	-0.685	8	9	2.239	2.239	-0.001	2.002	30.066	-0.105	21	55	37	9E9	9E9	9E9	0.118	0.125	427.662	38.139
11.875	157.540	0.957	19.650	0.000	-0.296	9	9	2.288	2.288	-0.000	1.888	25.234	-0.138	30	69	39	9E9	9E9	9E9	0.161	0.123	630.162	38.959
12.125	168.015	1.059	19.650	0.000	-0.630	9	9	2.337	2.337	-0.000	1.922	26.664	-0.151	33	71	39	9E9	9E9	9E9	0.183	0.122	672.059	39.780
12.375	120.951	0.923	19.650	0.000	-0.702	8	9	2.386	2.386	-0.001	1.962	28.364	-0.106	24	59	37	9E9	9E9	9E9	0.128	0.121	483.805	40.600
12.625	127.182	-5152.273	9E9	-2.375	-0.439	9E9	9E9	9E9	9E9	9E9	1.962	28.364	9E9	9E9	9E9	9E9	9E9	9E9	9E9	9E9	9E9	9E9	41.420
12.875	174.623	-18765.035	9E9	-2.125	-0.350	9E9	9E9	9E9	9E9	9E9	0.000	0.000	9E9	9E9	9E9	9E9	9E9	9E9	9E9	9E9	9E9	9E9	42.240

In-Situ Soil Testing, L.C. CPTU Sounding Data

Project	J.M. Stuart Station			Sounding	CPT-7
Location	Aberdeen, Ohio	Cone Number	DSG0296	Date/Time	1/15/2011 8:21:24 AM
Operator	R. Failmezger	Ground Elev.		Water Depth	15.00 m
Engineer	R. Failmezger	File Name	2011-03CPT-7.cpt	Total Depth	12.64 m

CPT DATA

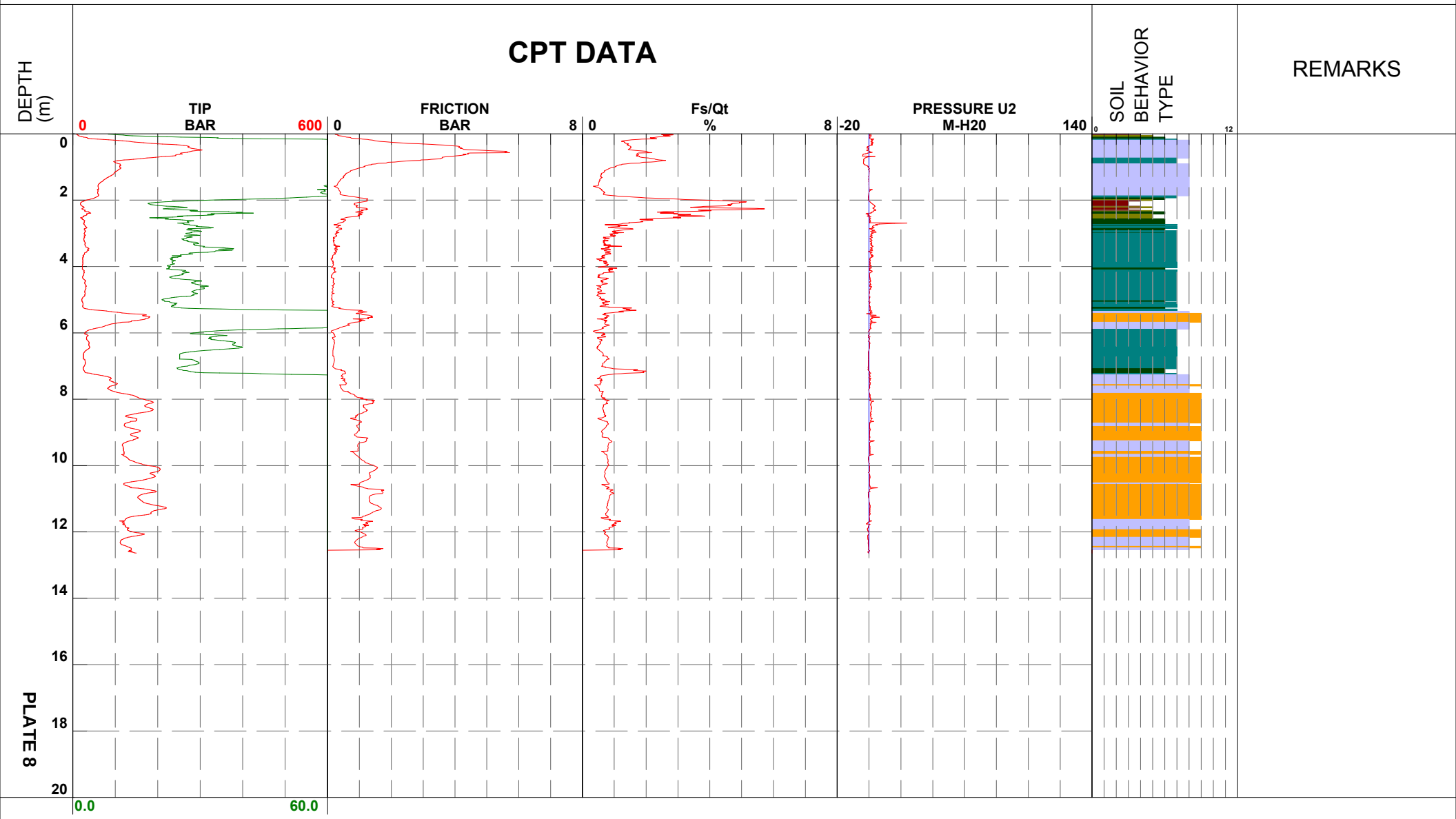


PLATE 8

1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

In-Situ Soil Testing, L.C. Seismic Sounding Data

Project	J.M. Stuart Station			Sounding	CPT-7
Location	Aberdeen, Ohio	Cone Number	DSG0296	Time/Date	1/15/2011 8:21:24 AM
Operator	R. Failmezger	Ground Elev.		Water Depth	
Engineer		File Name		Total Depth	

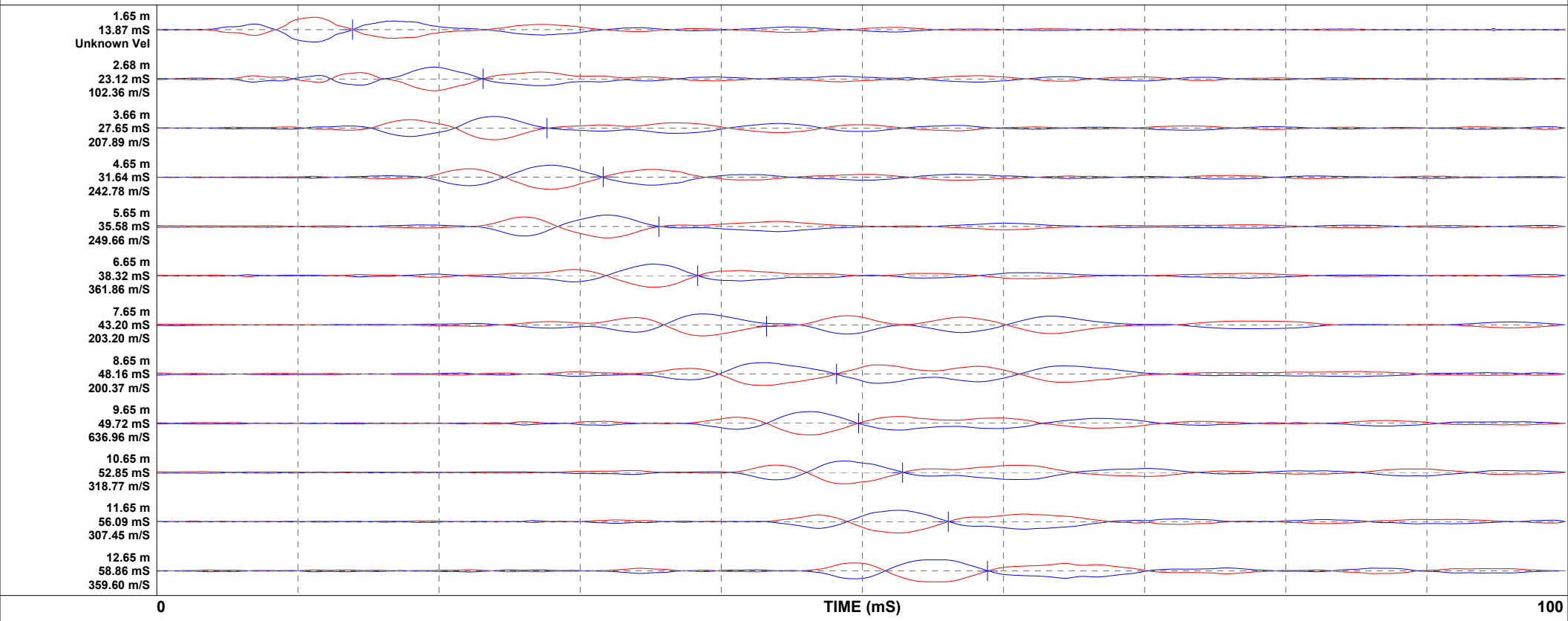


PLATE 9

CPTINT Analysis
Sounding CPT-7

```
"
"Output file from CPTINT - Version 5.2
"=====================================
"INPUT FILE: c:\insitu\cpt\2011\dp&lst~1\CPT-7.TXT
"-------------------------------------------------
"
"Licensed to:  UBC In-Situ Testing FREEWARE
"    Address:  Piezocone Interpretation
"       City:  www.civil.ubc.ca/home/in-situ
"
"Interpreter Name: Roger A. Failmezger
"
"
"SUMMARY SHEET
"-------------
"'a' for calculating Qt:                 0.800
"Value for Water Table (in m):           15.000
"Valid Zone Classification based on:     Rf
"Missing unit weight to start depth:     18.860
"Method for calculating Su:              Nkt
"Value of the constant Nkt:              14.000
"'alpha' for Modulus in clay:            4.000
"Method used to calculate OCR:           Su/EOS
"(Su/EOS) for normal consolidation:      0.350
"Define Zone 6 for Sand Parameters?      YES
"Sand Compressibility for calc Dr:       High
"Method for Friction Angle:              Robertson & Campanella
"Initial guess of OCR for sand:          1.000
"Method for Modulus in sand:             'alpha' x Qt
"'alpha' for Modulus in sand (Qt mthd):  4.000
"Silty sand correction for CSR (Qc)?     YES
"EQ magnitudes for CSR (Qc):             7.500
"'a max/g' value for calc CSR (Eq):      0.300
"Graph used for calculating rd:          Fraser Delta
"Vertical Flow Gradient, i (- up):       +0.000
"Constant Volume Friction Angle:         33.000
"CPT to SPT N60 Conversion:              Jeffries & Davies
"
"Soil Behavior Type Zone Numbers
"For Rf Zone & Bq Zone Classification
"------------------------------------
"Zone #1=Sensitive fine grained     Zone #7 =Sand with some Silt
"Zone #2=Organic material           Zone #8 =Fine sand
"Zone #3=Clay                       Zone #9 =Sand
"Zone #4=Silty clay                 Zone #10=Gravelly sand
"Zone #5=Clayey silt                Zone #11=Very stiff fine grained *
"Zone #6=Silty sand                 Zone #12=Sand to clayey sand *
"   * Overconsolidated and/or cemented
"
"NOTE:
"-----
"For soil classification, Rf values > 8 are assumed to be 8.
"
"( Note: 9E9 means Out Of Range )
"
"--|  INPUT FILE: c:\insitu\cpt\2011\dp&lst~1\CPT-7.TXT  |-------------------------------------------------
```

CPTINT Analysis
Sounding CPT-7

6.875	28.172	0.702	18.860	0.000	-0.389	7	7	1.318	1.318	-0.001	2.149	36.316	-0.005	6	17	33	9E9	9E9	9E9	0.128	0.154	112.689	22.556
7.125	29.801	1.324	18.860	0.000	-0.141	7	7	1.365	1.365	-0.000	2.380	46.113	-0.054	7	18	33	9E9	9E9	9E9	0.128	0.152	119.203	23.376
7.375	84.212	0.584	19.650	0.000	0.481	8	9	1.414	1.414	0.001	1.725	18.294	-0.084	15	55	39	9E9	9E9	9E9	0.118	0.150	336.846	24.196
7.625	91.810	0.508	19.650	0.000	0.286	8	9	1.463	1.463	0.000	1.653	15.245	-0.077	16	58	39	9E9	9E9	9E9	0.128	0.149	367.241	25.016
7.875	134.304	0.630	19.650	0.000	0.472	9	9	1.512	1.512	0.000	1.633	14.431	-0.126	24	71	41	9E9	9E9	9E9	0.183	0.147	537.217	25.836
8.125	177.518	0.724	19.650	0.000	1.256	9	9	1.561	1.561	0.001	1.628	14.189	-0.161	31	81	41	9E9	9E9	9E9	0.226	0.145	710.073	26.656
8.375	165.648	0.670	19.650	0.000	1.168	9	9	1.610	1.610	0.001	1.619	13.810	-0.145	29	78	41	9E9	9E9	9E9	0.204	0.144	662.594	27.477
8.625	137.432	0.673	19.650	0.000	1.089	9	9	1.659	1.659	0.001	1.682	16.499	-0.125	25	70	41	9E9	9E9	9E9	0.172	0.142	549.729	28.297
8.875	139.439	0.683	19.650	0.000	0.442	9	9	1.708	1.708	0.000	1.693	16.947	-0.125	25	70	41	9E9	9E9	9E9	0.172	0.141	557.758	29.117
9.125	143.827	0.717	19.650	0.000	0.420	9	9	1.758	1.758	0.000	1.713	17.785	-0.130	26	71	41	9E9	9E9	9E9	0.172	0.139	575.307	29.937
9.375	120.430	0.833	19.650	0.000	0.638	9	9	1.807	1.807	0.001	1.837	23.065	-0.123	23	64	39	9E9	9E9	9E9	0.150	0.138	481.721	30.757
9.625	120.525	0.740	19.650	0.000	0.489	9	9	1.856	1.856	0.000	1.794	21.240	-0.111	22	63	39	9E9	9E9	9E9	0.139	0.136	482.099	31.578
9.875	146.739	0.805	19.650	0.000	-0.170	9	9	1.905	1.905	-0.000	1.780	20.666	-0.134	27	70	39	9E9	9E9	9E9	0.172	0.135	586.955	32.398
10.125	196.785	0.739	19.650	0.000	0.173	9	9	1.954	1.954	0.000	1.669	15.923	-0.151	35	80	41	9E9	9E9	9E9	0.215	0.133	787.141	33.218
10.375	175.189	0.723	19.650	0.000	0.358	9	9	2.003	2.003	0.000	1.698	17.154	-0.136	32	75	41	9E9	9E9	9E9	0.193	0.132	700.755	34.038
10.625	141.615	0.805	19.650	0.000	0.661	9	9	2.052	2.052	0.000	1.812	22.011	-0.124	26	67	39	9E9	9E9	9E9	0.150	0.130	566.458	34.859
10.875	168.422	0.886	19.650	0.000	-0.255	9	9	2.101	2.101	-0.000	1.812	22.000	-0.146	32	73	41	9E9	9E9	9E9	0.183	0.129	673.689	35.679
11.125	178.088	0.796	19.650	0.000	0.277	9	9	2.151	2.151	0.000	1.755	19.607	-0.140	33	75	41	9E9	9E9	9E9	0.193	0.127	712.351	36.499
11.375	193.255	0.770	19.650	0.000	0.502	9	9	2.200	2.200	0.000	1.724	18.277	-0.142	35	77	41	9E9	9E9	9E9	0.193	0.126	773.020	37.319
11.625	126.367	0.869	19.650	0.000	-0.007	9	9	2.249	2.249	-0.000	1.905	25.955	-0.111	24	61	39	9E9	9E9	9E9	0.128	0.125	505.469	38.139
11.875	127.860	0.848	19.650	0.000	-0.542	9	9	2.298	2.298	-0.000	1.898	25.640	-0.108	25	61	39	9E9	9E9	9E9	0.139	0.123	511.439	38.959
12.125	140.909	0.762	19.650	0.000	-0.515	9	9	2.347	2.347	-0.000	1.830	22.773	-0.106	26	65	39	9E9	9E9	9E9	0.139	0.122	563.636	39.780
12.375	120.274	0.819	19.650	0.000	-0.400	9	9	2.396	2.396	-0.000	1.915	26.374	-0.096	23	58	37	9E9	9E9	9E9	0.128	0.121	481.098	40.600
12.625	138.681	-16876.986	9E9	-2.375	-0.223	9E9	9E9	9E9	9E9	9E9	1.915	26.374	9E9	9E9	9E9	9E9	9E9	9E9	9E9	9E9	9E9	9E9	41.420

In-Situ Soil Testing, L.C. CPTU Sounding Data

Project	J.M. Stuart Station			Sounding	CPT-8
Location	Aberdeen, Ohio	Cone Number	DSG0296	Date/Time	1/15/2011 9:29:34 AM
Operator	R. Failmezger	Ground Elev.		Water Depth	15.00 m
Engineer	R. Failmezger	File Name	2011-03CPT-8.cpt	Total Depth	12.14 m

CPT DATA

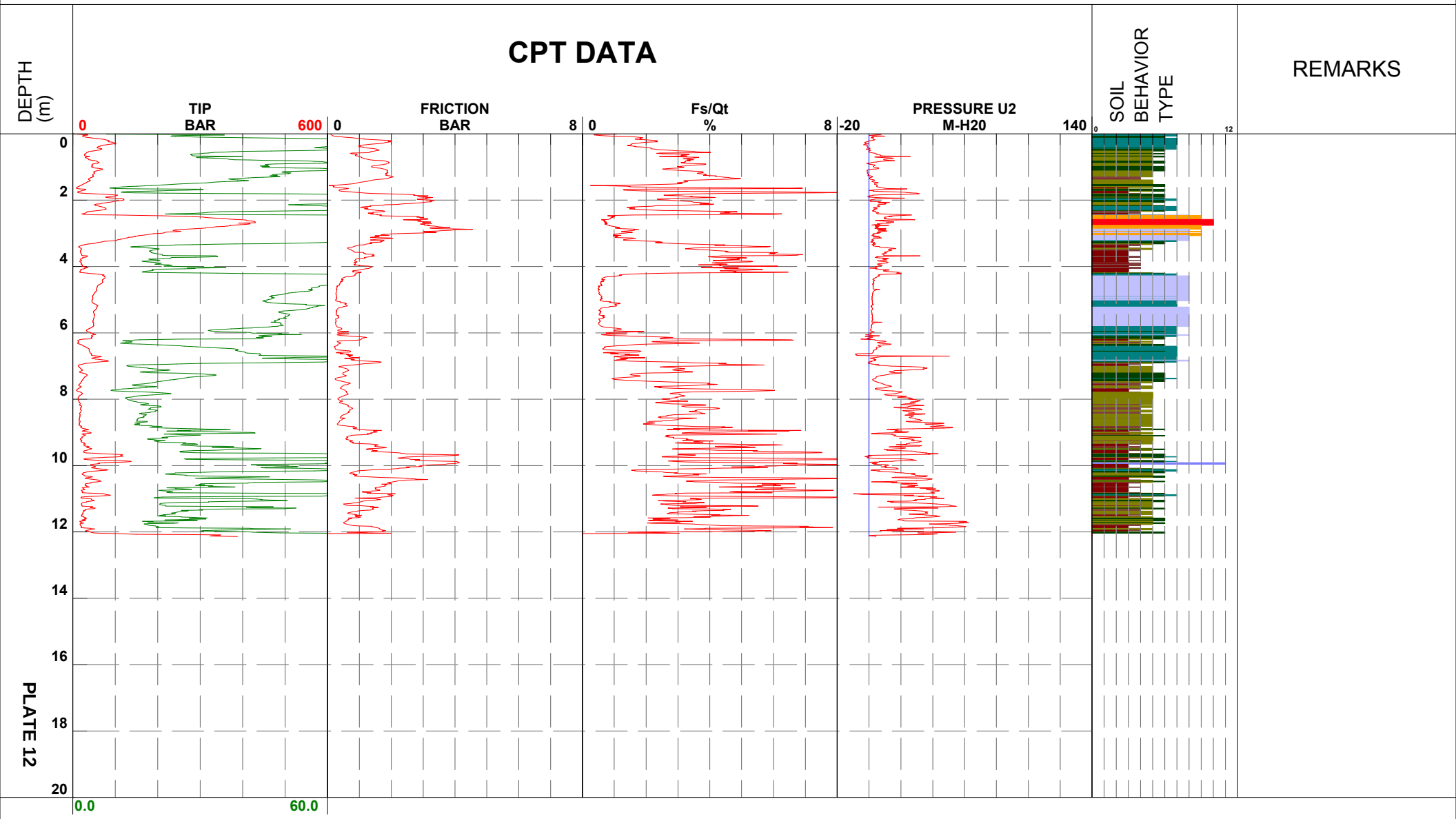


PLATE 12

- 1 - sensitive fine grained
- 2 - organic material
- 3 - clay
- 4 - silty clay to clay
- 5 - clayey silt to silty clay
- 6 - sandy silt to clayey silt
- 7 - silty sand to sandy silt
- 8 - sand to silty sand
- 9 - sand
- 10 - gravelly sand to sand
- 11 - very stiff fine grained (*)
- 12 - sand to clayey sand (*)

In-Situ Soil Testing, L.C. Seismic Sounding Data

Project	J.M. Stuart Station			Sounding	CPT-8
Location	Aberdeen, Ohio	Cone Number	DSG0296	Time/Date	1/15/2011 9:29:34 AM
Operator	R. Failmezger	Ground Elev.		Water Depth	
Engineer		File Name		Total Depth	

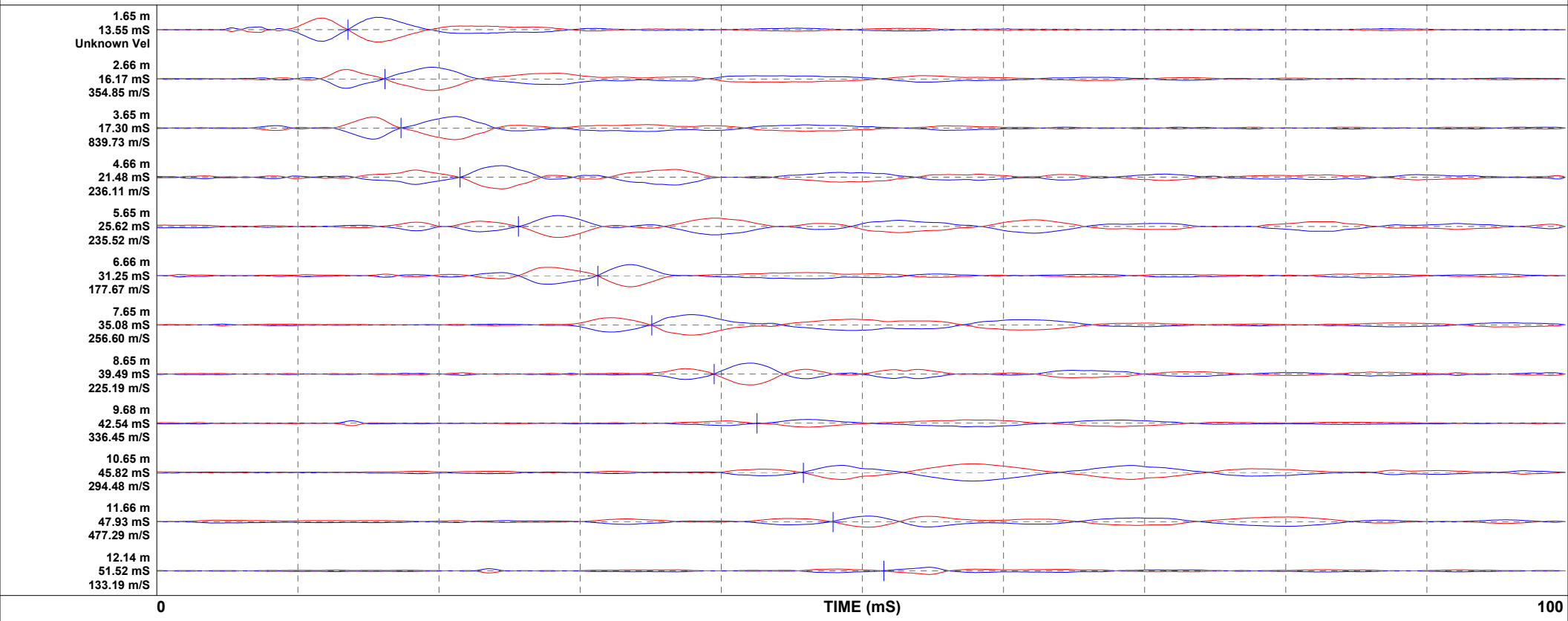


PLATE 13

CPTINT Analysis
Sounding CPT-8

```
"
"Output file from CPTINT - Version 5.2
"=====================================
"INPUT FILE: c:\insitu\cpt\2011\dp&lst~1\CPT-8.TXT
"-------------------------------------------------
"
"Licensed to:  UBC In-Situ Testing FREEWARE
"    Address:  Piezocone Interpretation
"       City:  www.civil.ubc.ca/home/in-situ
"
"Interpreter Name: Roger A. Failmezger
"
"
"SUMMARY SHEET
"-------------
"'a' for calculating Qt:                 0.800
"Value for Water Table (in m):           15.000
"Valid Zone Classification based on:     Rf
"Missing unit weight to start depth:     18.860
"Method for calculating Su:              Nkt
"Value of the constant Nkt:              14.000
"'alpha' for Modulus in clay:            4.000
"Method used to calculate OCR:           Su/EOS
"(Su/EOS) for normal consolidation:      0.350
"Define Zone 6 for Sand Parameters?      YES
"Sand Compressibility for calc Dr:       High
"Method for Friction Angle:              Robertson & Campanella
"Initial guess of OCR for sand:          1.000
"Method for Modulus in sand:             'alpha' x Qt
"'alpha' for Modulus in sand (Qt mthd):  4.000
"Silty sand correction for CSR (Qc)?     YES
"EQ magnitudes for CSR (Qc):             7.500
"'a max/g' value for calc CSR (Eq):      0.300
"Graph used for calculating rd:          Fraser Delta
"Vertical Flow Gradient, i (- up):       +0.000
"Constant Volume Friction Angle:         33.000
"CPT to SPT N60 Conversion:              Jeffries & Davies
"
"Soil Behavior Type Zone Numbers
"For Rf Zone & Bq Zone Classification
"------------------------------------
"Zone #1=Sensitive fine grained     Zone #7 =Sand with some Silt
"Zone #2=Organic material           Zone #8 =Fine sand
"Zone #3=Clay                       Zone #9 =Sand
"Zone #4=Silty clay                 Zone #10=Gravelly sand
"Zone #5=Clayey silt                Zone #11=Very stiff fine grained *
"Zone #6=Silty sand                 Zone #12=Sand to clayey sand *
"   * Overconsolidated and/or cemented
"
"NOTE:
"-----
"For soil classification, Rf values > 8 are assumed to be 8.
"
"( Note: 9E9 means Out Of Range )
"
"--|  INPUT FILE: c:\insitu\cpt\2011\dp&lst~1\CPT-8.TXT  |-----------------------------------------------------
```

CPTINT Analysis
Sounding CPT-8

6.875	46.271	2.193	19.650	0.000	3.071	6	8	1.339	1.339	0.007	2.454	49.247	-0.147	11	35	35	9E9	9E9	9E9	0.085	0.154	185.086	22.556
7.125	20.094	2.629	19.650	0.000	23.172	5	5	1.388	1.388	0.122	2.840	65.597	-0.048	5	9E9	9E9	1.336	0.962	3.541	9E9	9E9	80.378	23.376
7.375	25.772	1.627	19.650	0.000	4.941	6	7	1.437	1.437	0.020	2.537	52.745	-0.047	6	12	31	9E9	9E9	9E9	0.049	0.150	103.087	24.196
7.625	14.547	3.583	18.860	0.000	9.173	4	6	1.485	1.485	0.069	3.092	76.290	-0.028	4	9E9	9E9	0.933	0.628	2.077	9E9	9E9	58.187	25.016
7.875	16.499	3.067	18.860	0.000	19.043	5	5	1.533	1.533	0.125	3.011	72.847	-0.021	5	9E9	9E9	1.069	0.697	2.368	9E9	9E9	65.995	25.836
8.125	16.665	3.094	18.860	0.000	27.166	5	5	1.580	1.580	0.177	3.040	74.094	-0.010	5	9E9	9E9	1.078	0.682	2.303	9E9	9E9	66.661	26.656
8.375	17.898	3.579	18.860	0.000	27.298	4	5	1.627	1.627	0.165	3.080	75.801	-0.029	5	9E9	9E9	1.162	0.714	2.440	9E9	9E9	71.592	27.477
8.625	15.790	2.527	18.860	0.000	31.573	5	5	1.674	1.674	0.219	3.019	73.198	0.024	5	9E9	9E9	1.008	0.602	1.971	9E9	9E9	63.160	28.297
8.875	24.708	3.906	19.650	0.000	32.401	4	6	1.722	1.722	0.138	3.016	73.078	-0.086	7	9E9	9E9	1.642	0.953	3.499	9E9	9E9	98.834	29.117
9.125	24.553	3.392	19.650	0.000	19.168	5	6	1.771	1.771	0.083	2.949	70.247	-0.072	7	9E9	9E9	1.627	0.919	3.341	9E9	9E9	98.213	29.937
9.375	29.902	4.266	19.650	0.000	24.278	4	6	1.820	1.820	0.085	2.995	72.164	-0.133	9	9E9	9E9	2.006	1.102	4.193	9E9	9E9	119.609	30.757
9.625	66.177	3.612	19.650	0.000	19.099	5	8	1.870	1.870	0.029	2.684	58.985	-0.224	17	9E9	9E9	4.593	2.457	11.426	9E9	9E9	264.709	31.578
9.875	65.506	4.991	21.220	0.000	11.023	11	8	1.921	1.921	0.017	2.844	65.797	-0.328	19	9E9	9E9	9E9	9E9	9E9	9E9	9E9	9E9	32.398
10.125	48.907	3.332	19.650	0.000	12.954	5	8	1.972	1.972	0.027	2.743	61.511	-0.159	13	9E9	9E9	3.353	1.700	7.212	9E9	9E9	195.629	33.218
10.375	42.211	4.309	19.650	0.000	27.333	4	7	2.021	2.021	0.067	2.921	69.039	-0.179	12	9E9	9E9	2.871	1.421	5.761	9E9	9E9	168.846	34.038
10.625	30.395	5.632	19.650	0.000	29.120	3	6	2.070	2.070	0.101	3.159	79.123	-0.192	10	9E9	9E9	2.023	0.977	3.610	9E9	9E9	121.580	34.859
10.875	44.096	3.636	19.650	0.000	30.362	5	7	2.119	2.119	0.071	2.847	65.887	-0.143	12	9E9	9E9	2.998	1.415	5.732	9E9	9E9	176.386	35.679
11.125	32.063	3.274	19.650	0.000	33.773	5	6	2.168	2.168	0.111	2.921	69.060	-0.073	9	9E9	9E9	2.135	0.985	3.644	9E9	9E9	128.253	36.499
11.375	29.909	3.503	19.650	0.000	29.834	5	6	2.217	2.217	0.106	2.980	71.535	-0.068	9	9E9	9E9	1.978	0.892	3.220	9E9	9E9	119.635	37.319
11.625	24.363	2.879	19.650	0.000	38.525	5	5	2.267	2.267	0.171	3.002	72.471	-0.009	7	9E9	9E9	1.578	0.696	2.363	9E9	9E9	97.453	38.139
11.875	28.774	4.652	19.650	0.000	38.583	3	6	2.316	2.316	0.143	3.142	78.406	-0.087	9	9E9	9E9	1.890	0.816	2.882	9E9	9E9	115.096	38.959
12.125	208.074	-11248.547	9E9	-2.875	24.383	9E9	9E9	9E9	9E9	9E9	3.142	78.406	9E9	9E9	9E9	9E9	9E9	9E9	9E9	9E9	9E9	9E9	39.780

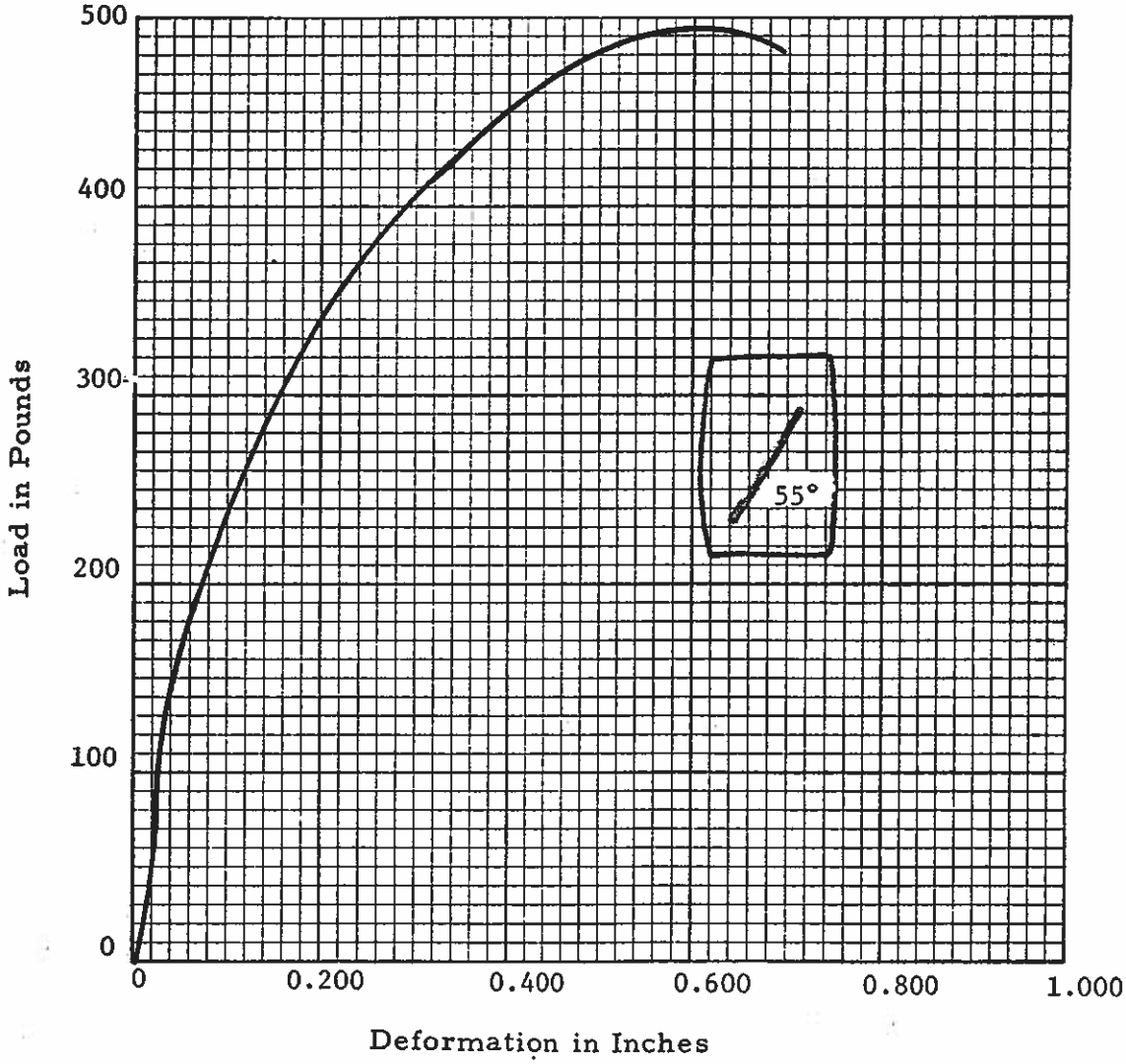
UNCONFINED COMPRESSION TEST

Project:	EXISTING DIKE, ASH PIT NO. 3, Stuart Station
Boring No:	1B
Sample No:	2C
Surface Elevation:	535.1'
Depth Interval of Sample:	23.5' - 25.5'
Depth Interval of Strata:	17.0' - 31.0'
Depth of Interval of Test Sample:	24.1' - 24.6'
Sample Recovery:	22"

SPECIMEN DATA

Initial Diameter	2.843"
Initial Height	5.950"
Test Specimen Weight	2.94 lbs.
Moisture Content	15.5%
Wet Unit Weight	134.6 pcf
Dry Unit Weight	116.6 pcf
Unconfined Compression Strength	10180 psf
Load Increment at Failure	499.4 lbs.
Height at Failure	5.350"
Test Method	ASTM-D2166-66
Soil Classification	Fill of Brown Clay, some Silt, some Sand

FAILURE SKETCH



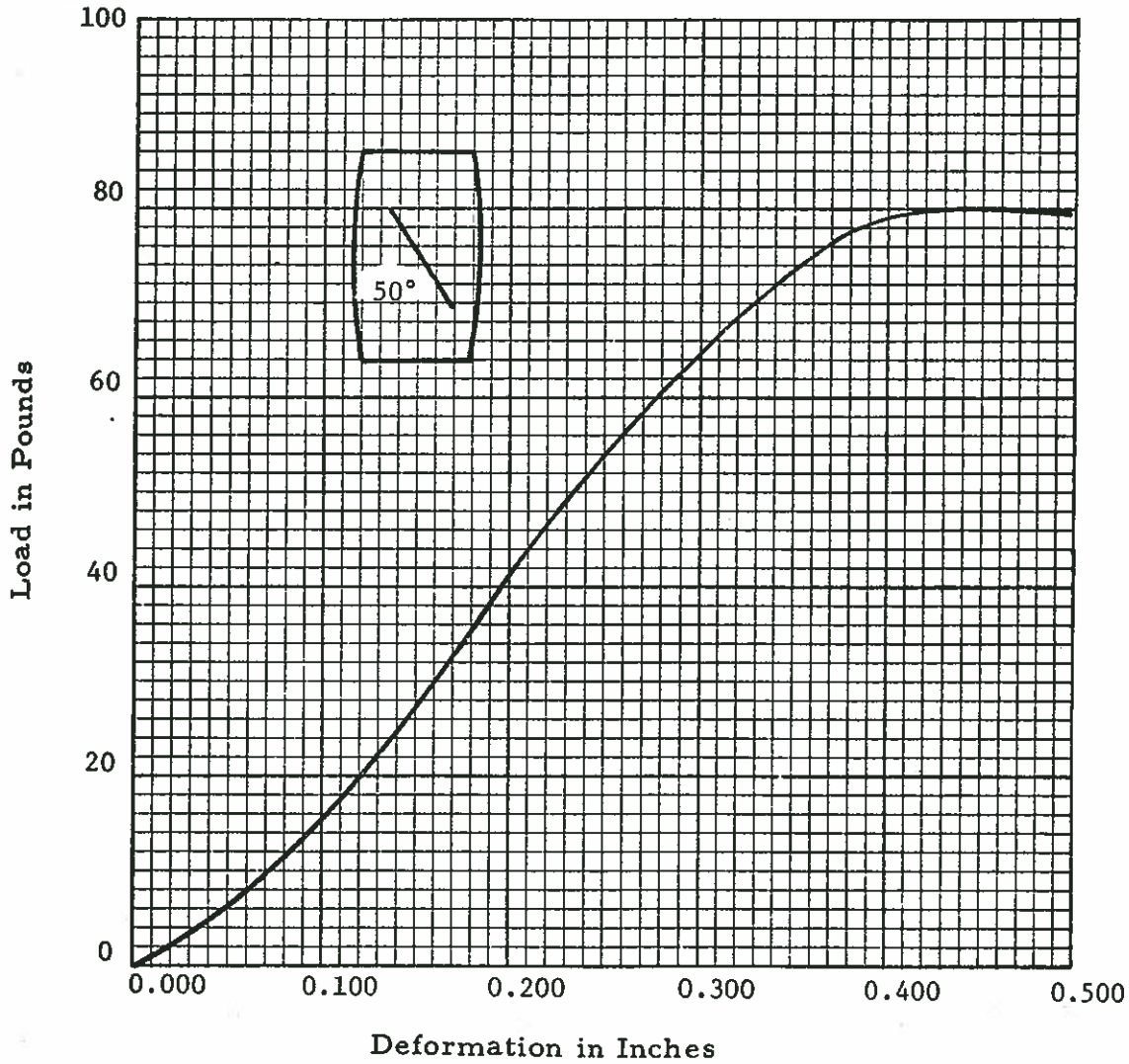
UNCONFINED COMPRESSION TEST

Project:	EXISTING DIKE, ASH PIT NO. 3, Stuart Station
Boring No:	2B
Sample No:	1C
Surface Elevation:	534.9'
Depth Interval of Sample:	28.5' - 30.5'
Depth Interval of Strata:	28.5' - 35.0'
Depth of Interval of Test Sample:	28.8' - 29.3'
Sample Recovery:	18"

SPECIMEN DATA

Initial Diameter	2.843"
Initial Height	5.950"
Test Specimen Weight	2.81 lbs.
Moisture Content	16.6%
Wet Unit Weight	128.7 pcf
Dry Unit Weight	110.4 pcf
Unconfined Compression Strength	1680 psf
Load Increment at Failure	79.9 lbs.
Height at Failure	5.525"
Test Method	ASTM-D2166-66
Soil Classification	Brown Clay, and Sand, trace Silt

FAILURE SKETCH



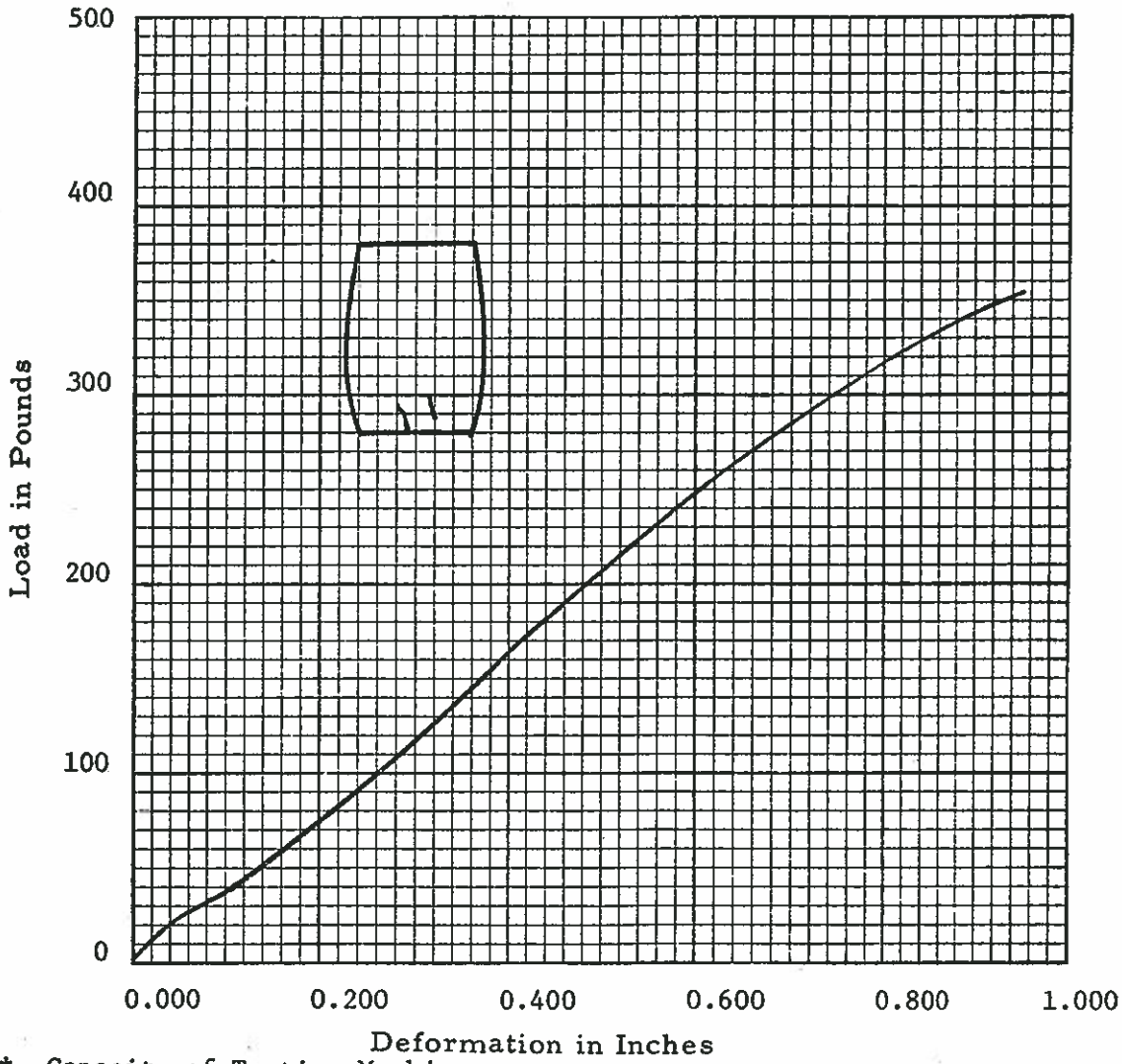
UNCONFINED COMPRESSION TEST

Project: EXISTING DIKE, ASH PIT NO. 3, Stuart Station	
Boring No:	4B
Sample No:	1C
Surface Elevation:	532.4"
Depth Interval of Sample:	13.5' - 15.5'
Depth Interval of Strata:	10.5' - 23.0'
Depth of Interval of Test Sample:	13.6' - 14.1'
Sample Recovery:	18"

SPECIMEN DATA

Initial Diameter	2.843"
Initial Height	5.950"
Test Specimen Weight	2.85 lbs.
Moisture Content	19.2%
Wet Unit Weight	130.5 pcf
Dry Unit Weight	109.5 pcf
Unconfined Compression Strength	6720 + psf *
Load Increment at Failure	352.7 lbs.
Height at Failure	5.000"
Test Method	ASTM-D2166-66
Soil Classification	Fill of Brown Clay, some Silt, some Sand

FAILURE SKETCH



* Capacity of Testing Machine

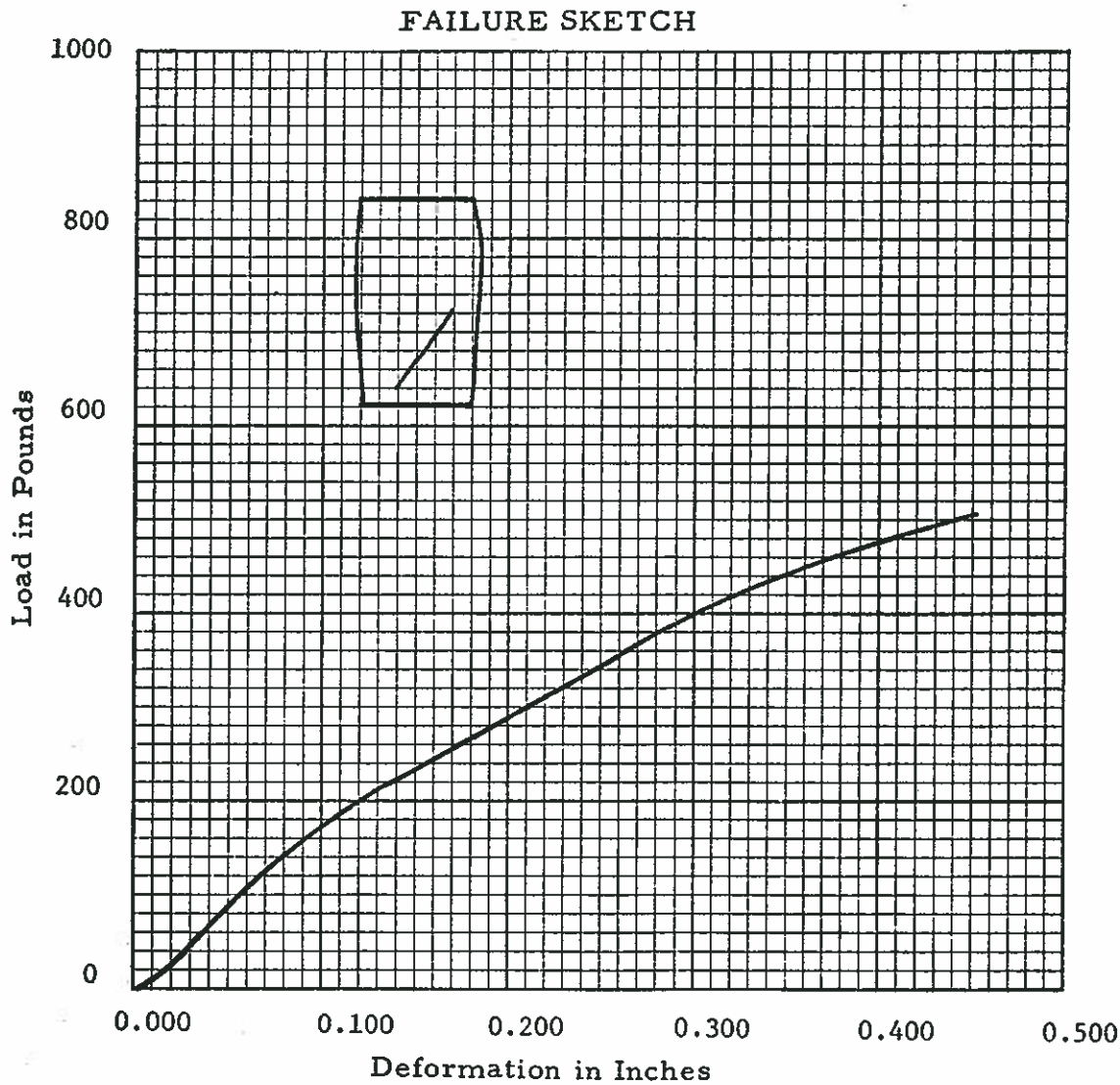
UNCONFINED COMPRESSION TEST

Project: EXISTING DIKE, ASH PIT NO. 3, Stuart Station	
Boring No:	4B
Sample No:	2C
Surface Elevation:	532.4'
Depth Interval of Sample:	18.5' - 20.5'
Depth Interval of Strata:	10.5' - 23.0'
Depth of Interval of Test Sample:	19.9' - 20.4'
Sample Recovery:	20"

SPECIMEN DATA

Initial Diameter	2.843"
Initial Height	5.950"
Test Specimen Weight	2.84 lbs.
Moisture Content	19.1%
Wet Unit Weight	130.1 pcf
Dry Unit Weight	109.2 pcf
Unconfined Compression Strength	10,610 + psf *
Load Increment at Failure	506.0 lbs.
Height at Failure	5.500"
Test Method	ASTM-D2166-66
Soil Classification	Fill of Brown Clay, some Silt, some Sand

FAILURE SKETCH



* Capacity of Testing Machine

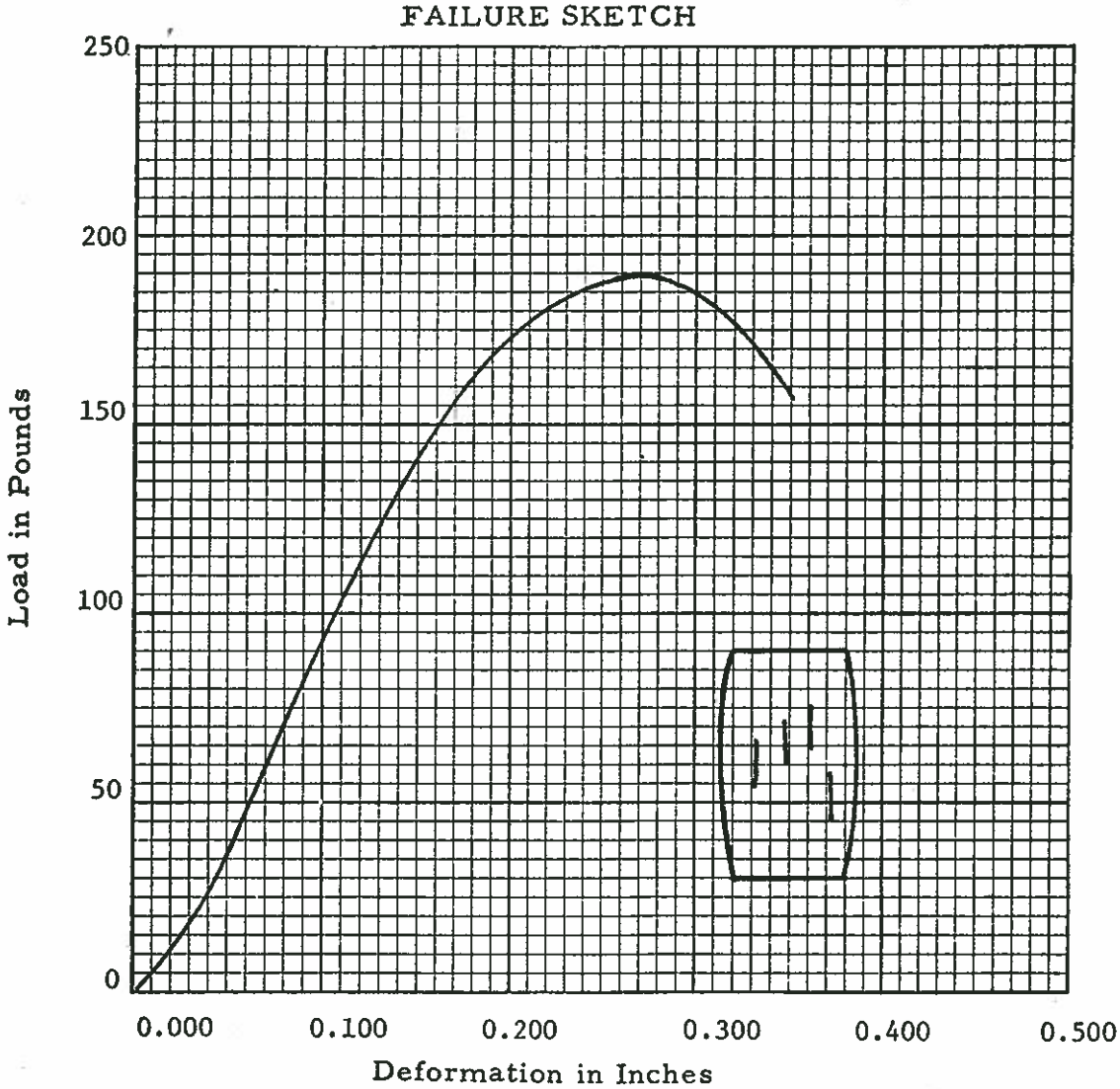
UNCONFINED COMPRESSION TEST

Project:	EXISTING DIKE, ASH PIT NO. 3, Stuart Station
Boring No:	5B
Sample No:	1C
Surface Elevation:	534.1'
Depth Interval of Sample:	17.0' - 19.0'
Depth Interval of Strata:	12.0' - 28.5'
Depth of Interval of Test Sample:	17.1' - 17.6'
Sample Recovery:	10"

SPECIMEN DATA

Initial Diameter	2.843"
Initial Height	5.950"
Test Specimen Weight	2.80 lbs.
Moisture Content	17.0%
Wet Unit Weight	128.2 pcf
Dry Unit Weight	109.6 pcf
Unconfined Compression Strength	4110 psf
Load Increment at Failure	190.2 lbs.
Height at Failure	5.675"
Test Method	ASTM-D2166-66
Soil Classification	Fill of Brown Clay, some Silt, some Sand

FAILURE SKETCH



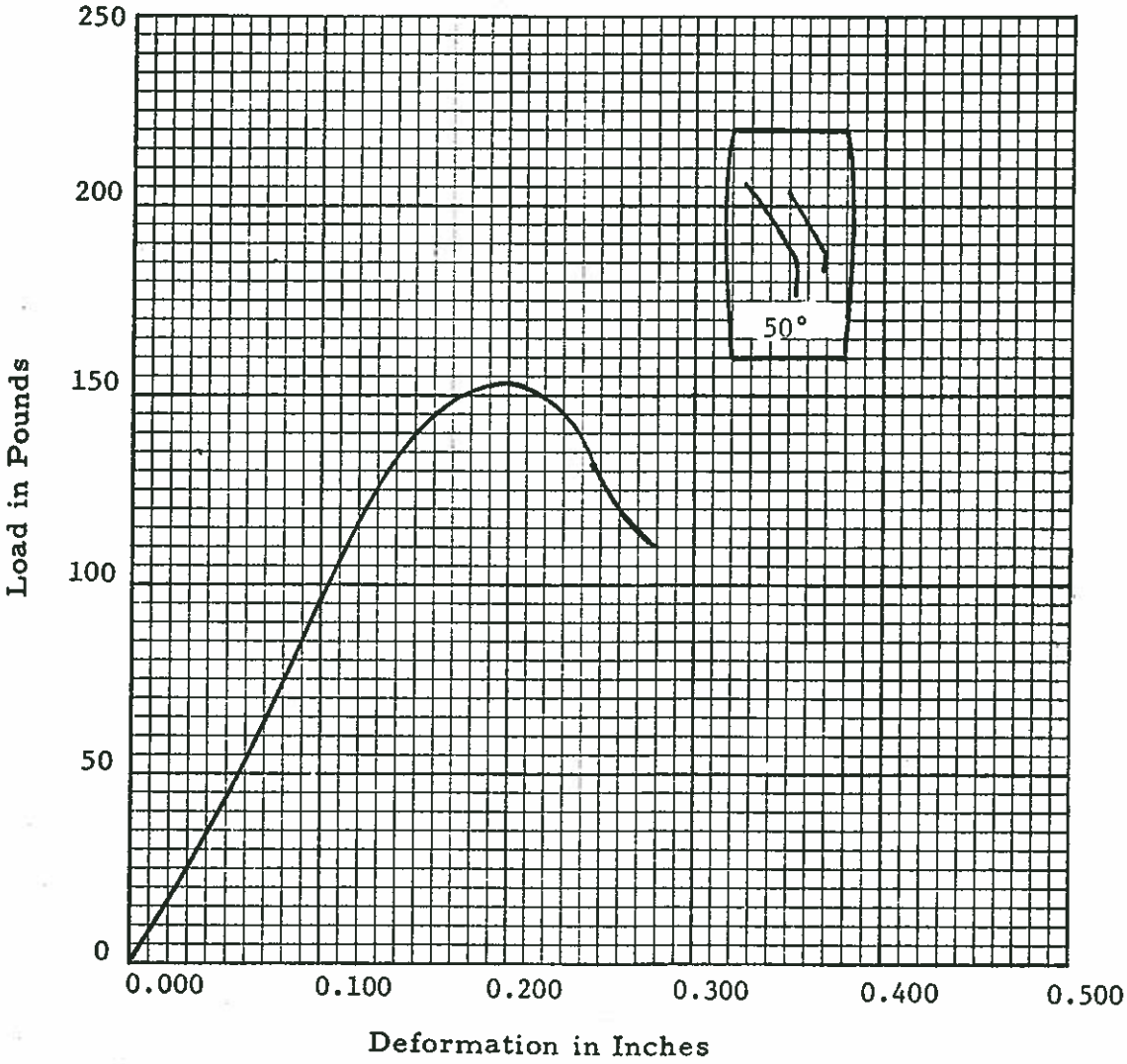
UNCONFINED COMPRESSION TEST

Project:	EXISTING DIKE, ASH PIT NO. 3, Stuart Station
Boring No:	5B
Sample No:	2C
Surface Elevation:	534.1'
Depth Interval of Sample:	21.5' - 23.5'
Depth Interval of Strata:	12.0' - 28.5'
Depth of Interval of Test Sample:	22.9' - 23.4'
Sample Recovery:	24"

SPECIMEN DATA

Initial Diameter	2.843"
Initial Height	5.950"
Test Specimen Weight	2.83 lbs.
Moisture Content	22.6%
Wet Unit Weight	129.4 pcf
Dry Unit Weight	105.5 pcf
Unconfined Compression Strength	3350 psf
Load Increment at Failure	152.8 lbs.
Height at Failure	5.700"
Test Method	ASTM-D2166-66
Soil Classification	Fill of Brown Clay, some Silt, some Sand

FAILURE SKETCH



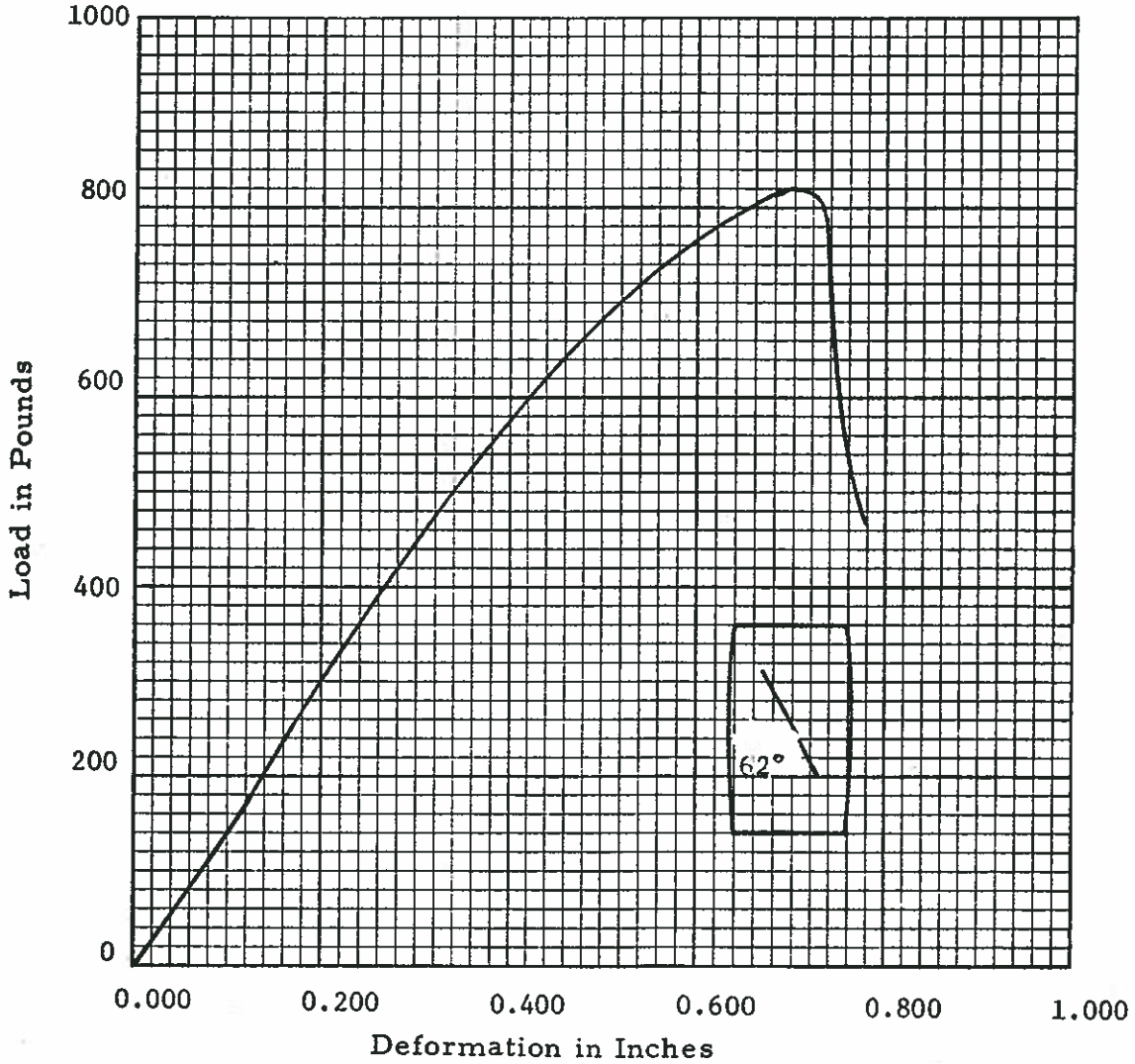
UNCONFINED COMPRESSION TEST

Project:	EXISTING DIKE, ASH PIT NO. 3, Stuart Station
Boring No:	6B
Sample No:	1C
Surface Elevation:	531.6'
Depth Interval of Sample:	17.0' - 19.0'
Depth Interval of Strata:	14.0' - 29.0'
Depth of Interval of Test Sample:	18.3' - 18.8'
Sample Recovery:	24"

SPECIMEN DATA

Initial Diameter	2.843"
Initial Height	5.950"
Test Specimen Weight	3.02 lbs.
Moisture Content	18.7%
Wet Unit Weight	138.3 pcf
Dry Unit Weight	116.5 pcf
Unconfined Compression Strength	16390 psf
Load Increment at Failure	819.1 lbs.
Height at Failure	5.250"
Test Method	ASTM-D2166-66
Soil Classification	Fill of Brown Clay, some Silt, some Sand

FAILURE SKETCH



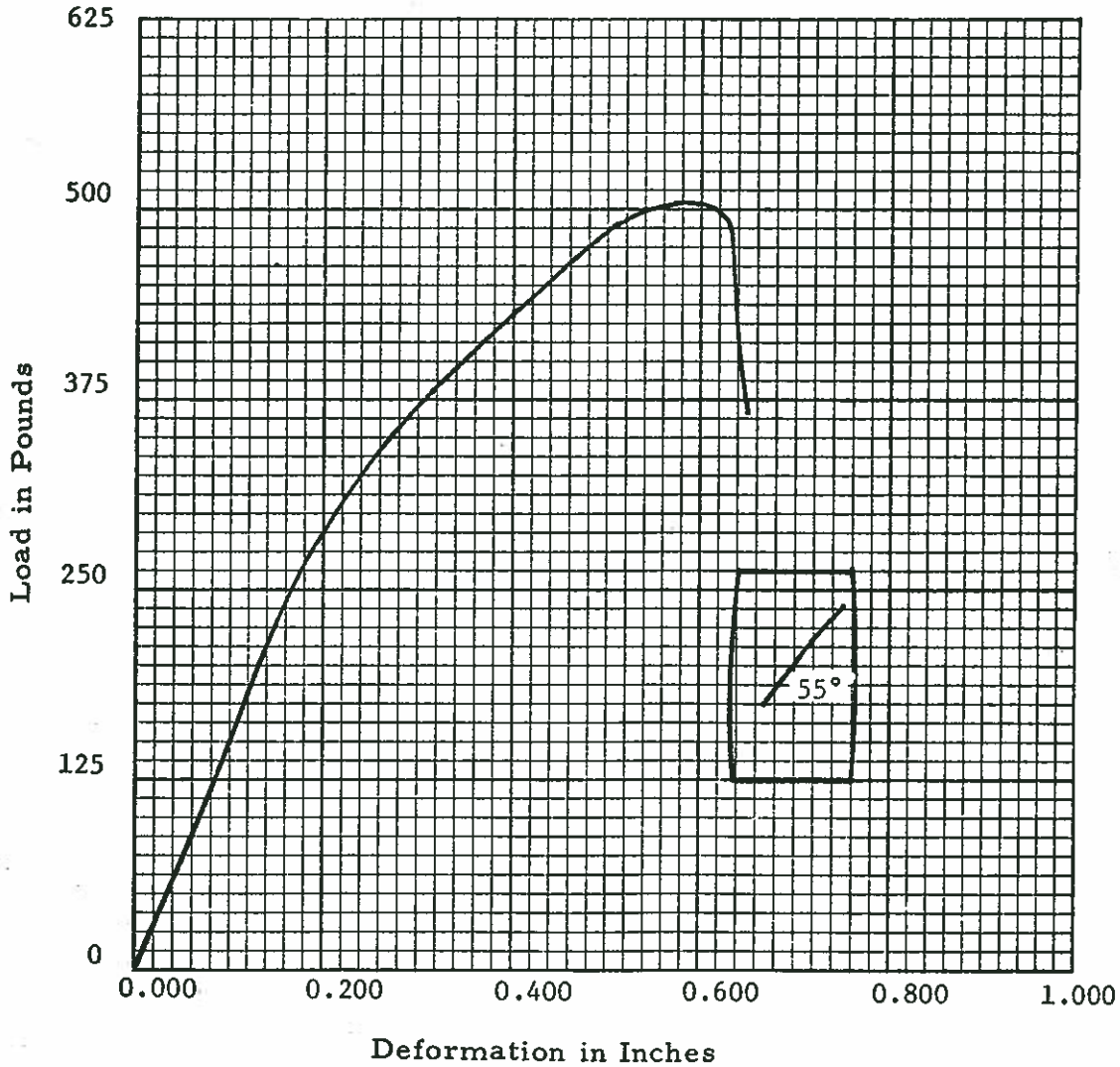
UNCONFINED COMPRESSION TEST

Project:	EXISTING DIKE, ASH PIT NO. 3, Stuart Station
Boring No:	6B
Sample No:	2C
Surface Elevation:	531.6'
Depth Interval of Sample:	21.5' - 23.5'
Depth Interval of Strata:	14.0' - 29.0'
Depth of Interval of Test Sample:	22.0' - 22.5'
Sample Recovery:	24"

SPECIMEN DATA

Initial Diameter	2.843"
Initial Height	5.950"
Test Specimen Weight	2.81 lbs.
Moisture Content	21.4%
Wet Unit Weight	128.7 pcf
Dry Unit Weight	106.0 pcf
Unconfined Compression Strength	10270 psf
Load Increment at Failure	503.8 lbs.
Height at Failure	5.350"
Test Method	ASTM-D2166-66
Soil Classification	Fill of Brown Clay, some Silt, some Sand

FAILURE SKETCH



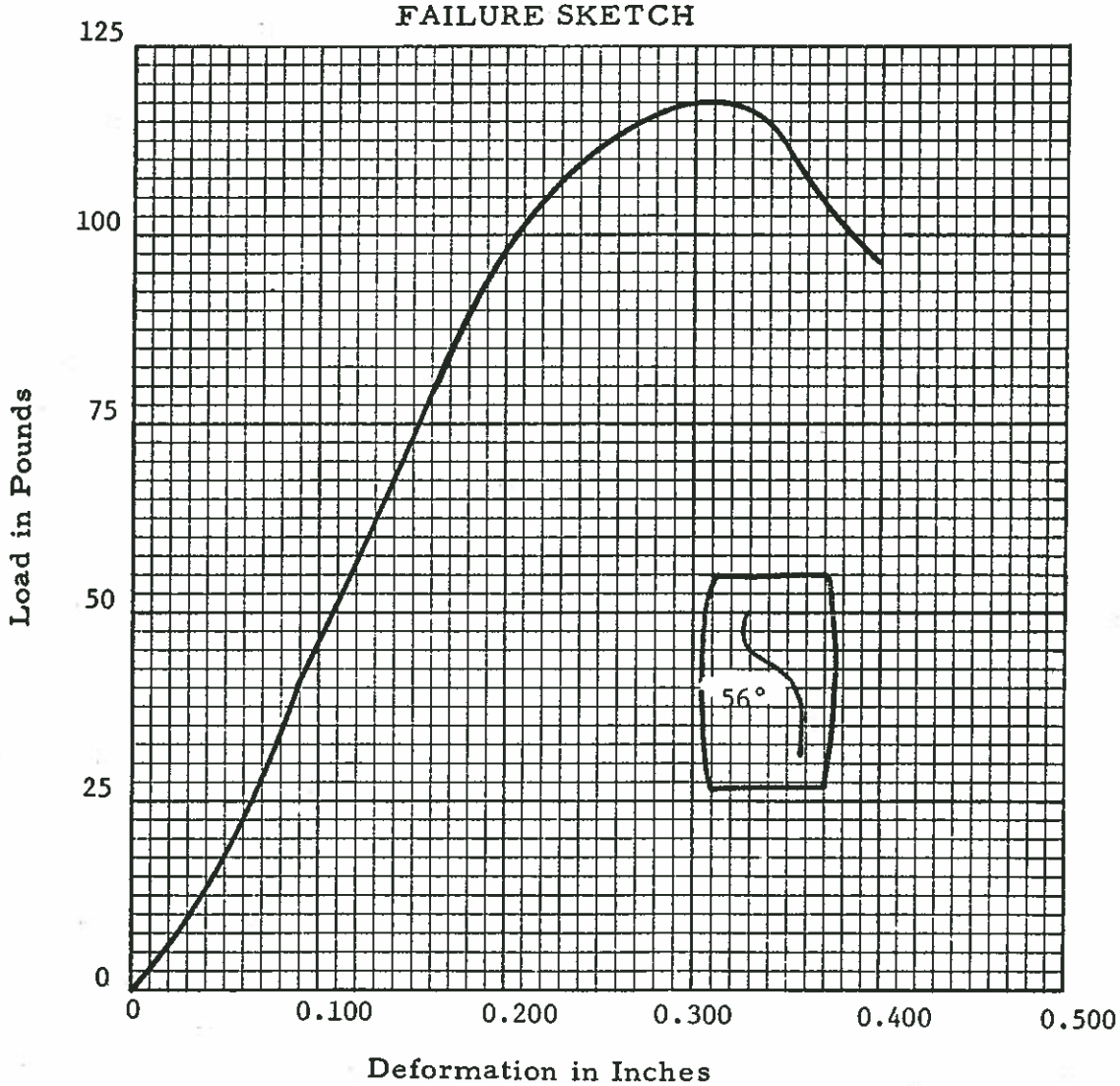
UNCONFINED COMPRESSION TEST

Project:	EXISTING DIKE, ASH PIT NO. 3, Stuart Station
Boring No:	6B
Sample No:	3C
Surface Elevation:	531.6'
Depth Interval of Sample:	26.5' - 28.5'
Depth Interval of Strata:	14.0' - 29.0'
Depth of Interval of Test Sample:	27.9' - 28.4'
Sample Recovery:	24"

SPECIMEN DATA

Initial Diameter	2.843"
Initial Height	5.950"
Test Specimen Weight	2.89 lbs.
Moisture Content	19.9%
Wet Unit Weight	132.4 pcf
Dry Unit Weight	110.4 pcf
Unconfined Compression Strength	2,510 psf
Load Increment at Failure	117.2 lbs.
Height at Failure	5.625"
Test Method	ASTM-D2166-66
Soil Classification	Fill of Brown Clay, some Silt, some Sand

FAILURE SKETCH



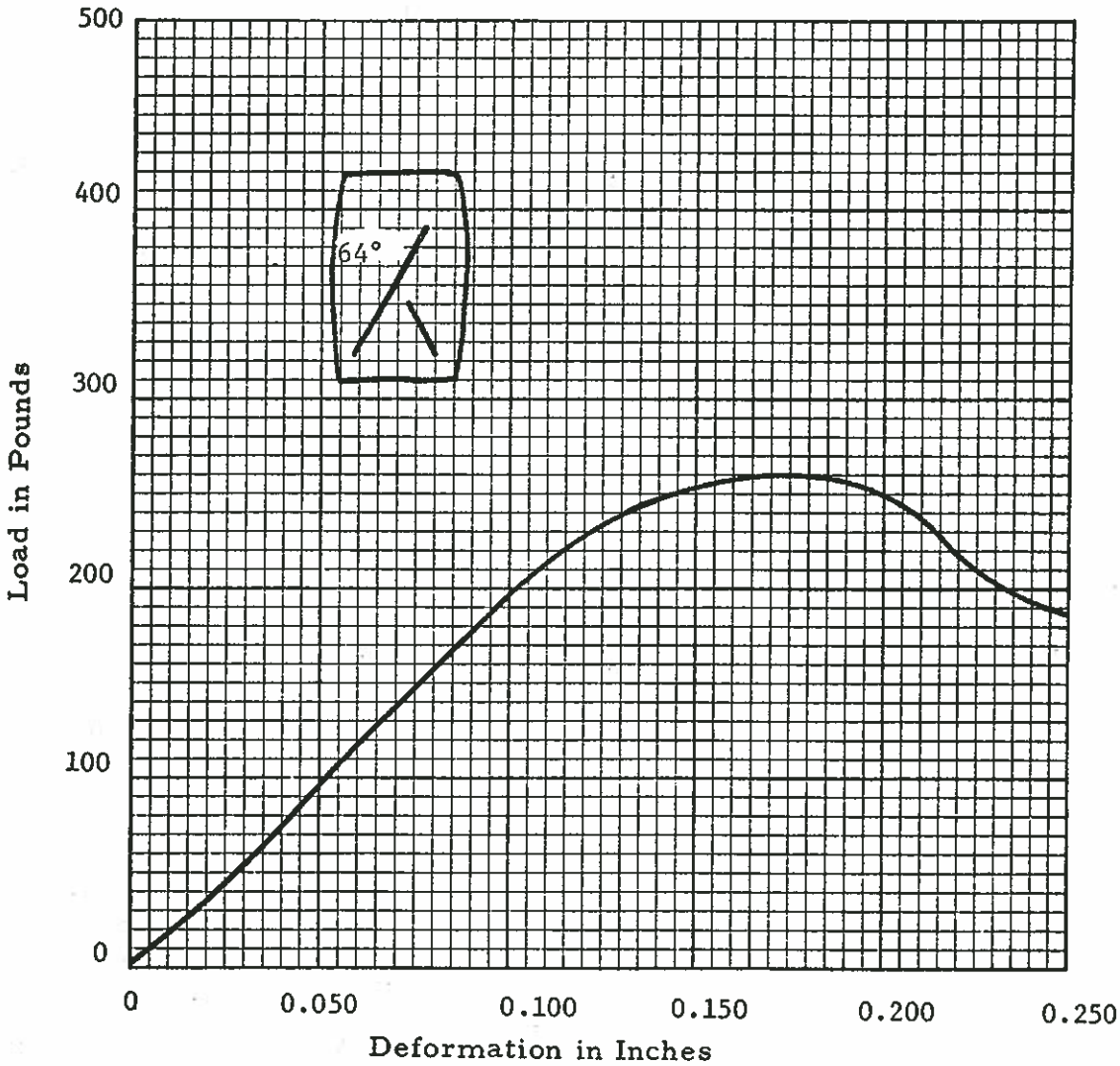
UNCONFINED COMPRESSION TEST

Project:	COAL STORAGE FILL, ASH PIT NO. 3, Stuart Station
Boring No:	3C
Sample No:	1C
Surface Elevation:	543.5'
Depth Interval of Sample:	21.5' - 23.5'
Depth Interval of Strata:	16.0' - 26.0'
Depth of Interval of Test Sample:	23.0' - 23.5'
Sample Recovery:	22"

SPECIMEN DATA

Initial Diameter	2.843"
Initial Height	5.950"
Test Specimen Weight	2.86 lbs.
Moisture Content	19.3%
Wet Unit Weight	131.0 pcf
Dry Unit Weight	109.7 pcf
Unconfined Compression Strength	5800 psf
Load Increment at Failure	258.8 lbs.
Height at Failure	5.775"
Test Method	ASTM-D2166-66
Soil Classification	Brown Clay, some Silt, some Sand

FAILURE SKETCH



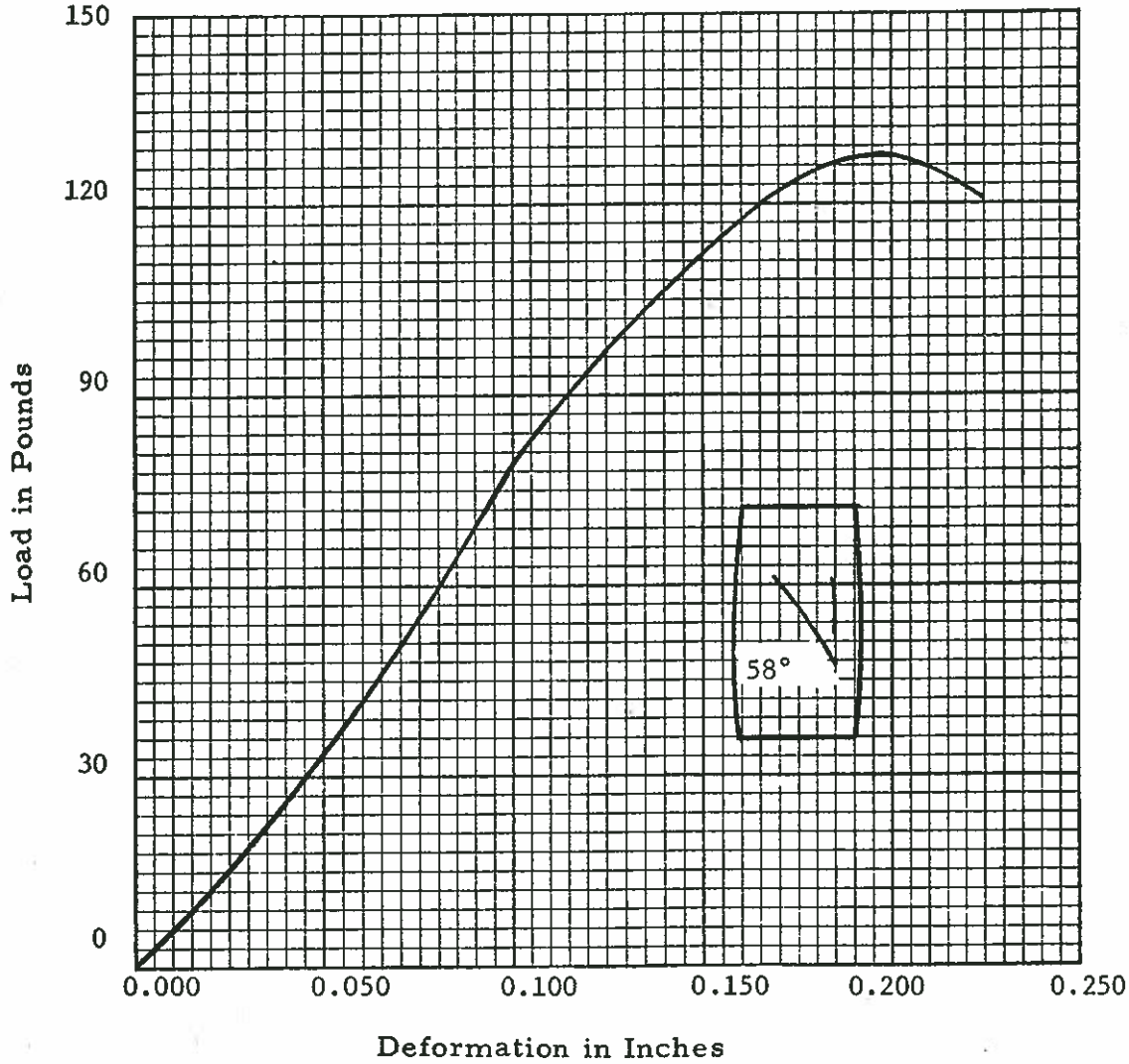
UNCONFINED COMPRESSION TEST

Project: ORIGINAL GROUND AREA, ASH PIT NO. 3, STUART STATION	
Boring No:	1D
Sample No:	1C
Surface Elevation:	555.7
Depth Interval of Sample:	18.5' - 20.5'
Depth Interval of Strata:	0.0' - 13.0'
Depth of Interval of Test Sample:	19.8' - 20.3'
Sample Recovery:	25"

SPECIMEN DATA

Initial Diameter	2.843"
Initial Height	5.950"
Test Specimen Weight	2.84 lbs.
Moisture Content	18.6%
Wet Unit Weight	130.1 pcf
Dry Unit Weight	109.7 pcf
Unconfined Compression Strength	8860 psf
Load Increment at Failure	127.8 lbs.
Height at Failure	5.750"
Test Method	ASTM-D2166-66
Soil Classification	Brown Clay and Sand, trace Silt, trace Grave

FAILURE SKETCH



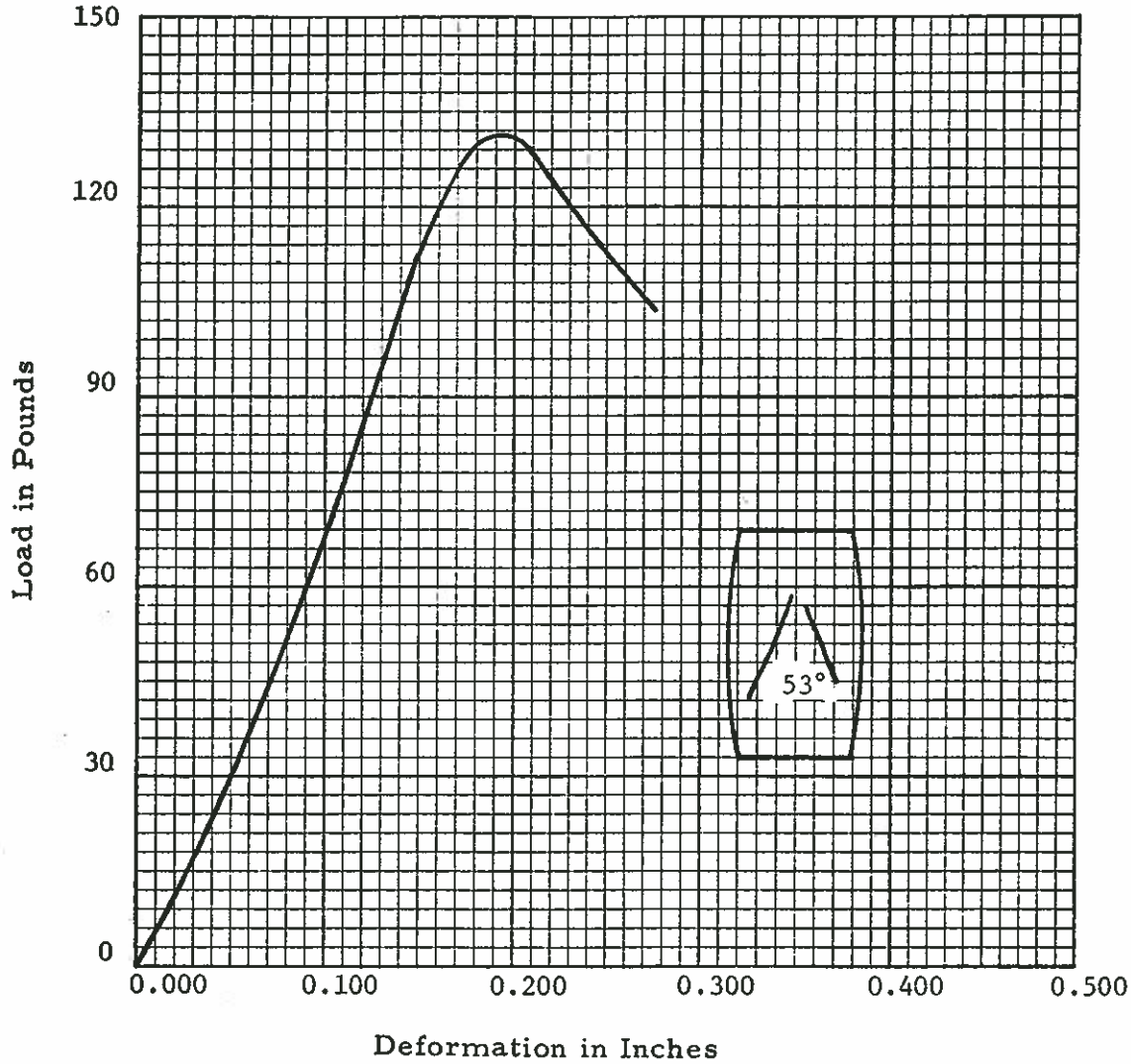
UNCONFINED COMPRESSION TEST

Project:	ORIGINAL GROUND AREA, ASH PIT NO. 3, Stuart Station
Boring No:	2D
Sample No:	1C
Surface Elevation:	
Depth Interval of Sample:	4.0' - 6.0'
Depth Interval of Strata:	1.5' - 12.0'
Depth of Interval of Test Sample:	5.2' - 5.7'
Sample Recovery:	24"

SPECIMEN DATA

Initial Diameter	2.843"
Initial Height	5.950"
Test Specimen Weight	2.77 lbs.
Moisture Content	22.0%
Wet Unit Weight	126.9 pcf
Dry Unit Weight	103.9 pcf
Unconfined Compression Strength	2900 psf
Load Increment at Failure	130.9 lbs.
Height at Failure	5.750"
Test Method	ASTM-D2166-66
Soil Classification	Brown Clay, some Silt, some Sand

FAILURE SKETCH



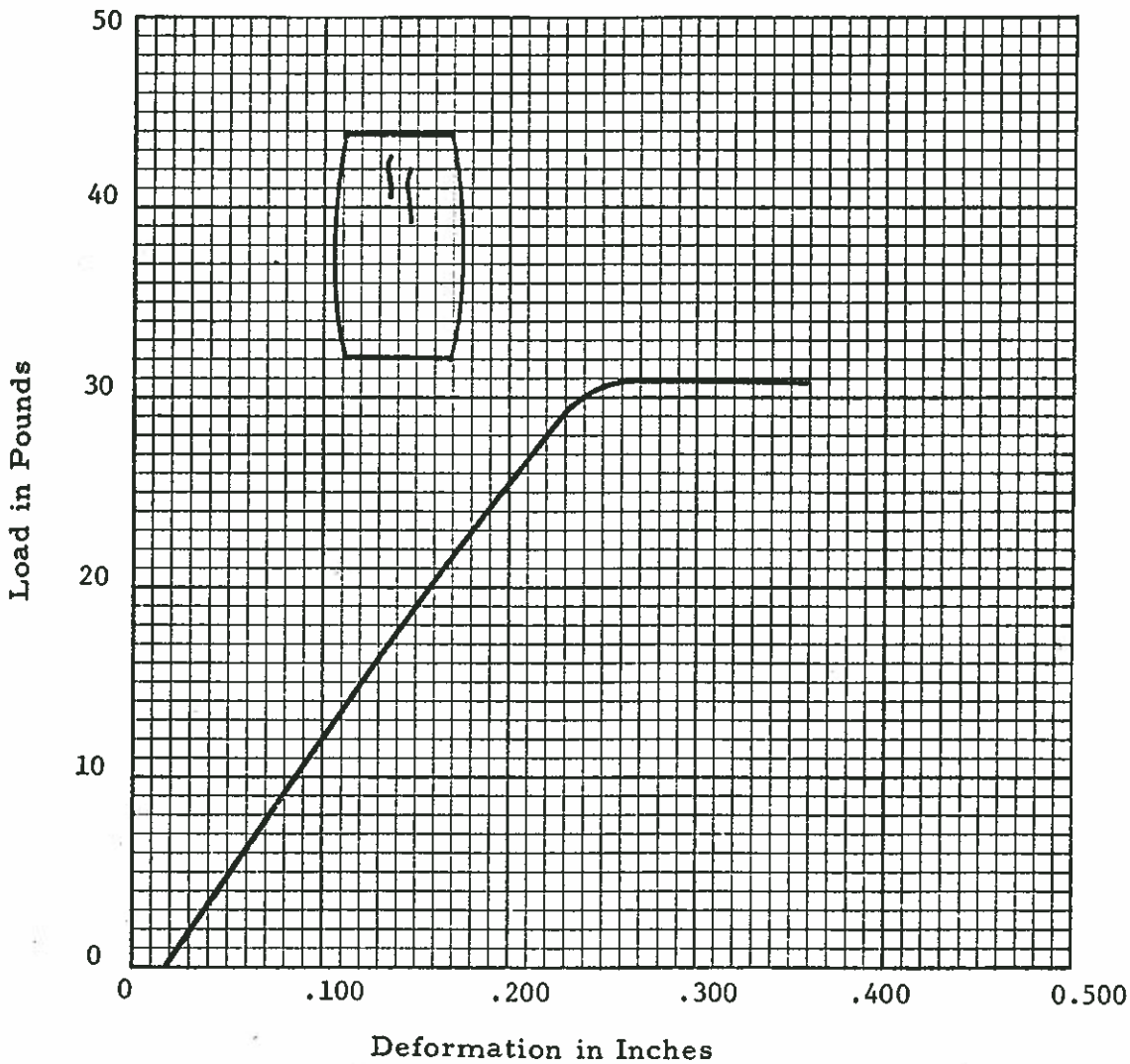
UNCONFINED COMPRESSION TEST

Project:	ORIGINAL GROUND AREA, ASH PIT NO. 3, Stuart Station
Boring No:	3D
Sample No:	1C
Surface Elevation:	544.2'
Depth Interval of Sample:	3.0' - 5.0'
Depth Interval of Strata:	2.0' - 8.5'
Depth of Interval of Test Sample:	3.5' - 4.0'
Sample Recovery:	24"

SPECIMEN DATA

Initial Diameter	2.843"
Initial Height	5.950"
Test Specimen Weight	2.59 lbs.
Moisture Content	26.2%
Wet Unit Weight	118.6 pcf
Dry Unit Weight	94.0 pcf
Unconfined Compression Strength	660 psf
Load Increment at Failure	30.4 lbs.
Height at Failure	5.700"
Test Method	ASTM-D2166-66
Soil Classification	Gray Clay, some Silt, some Sand, trace Grav

FAILURE SKETCH



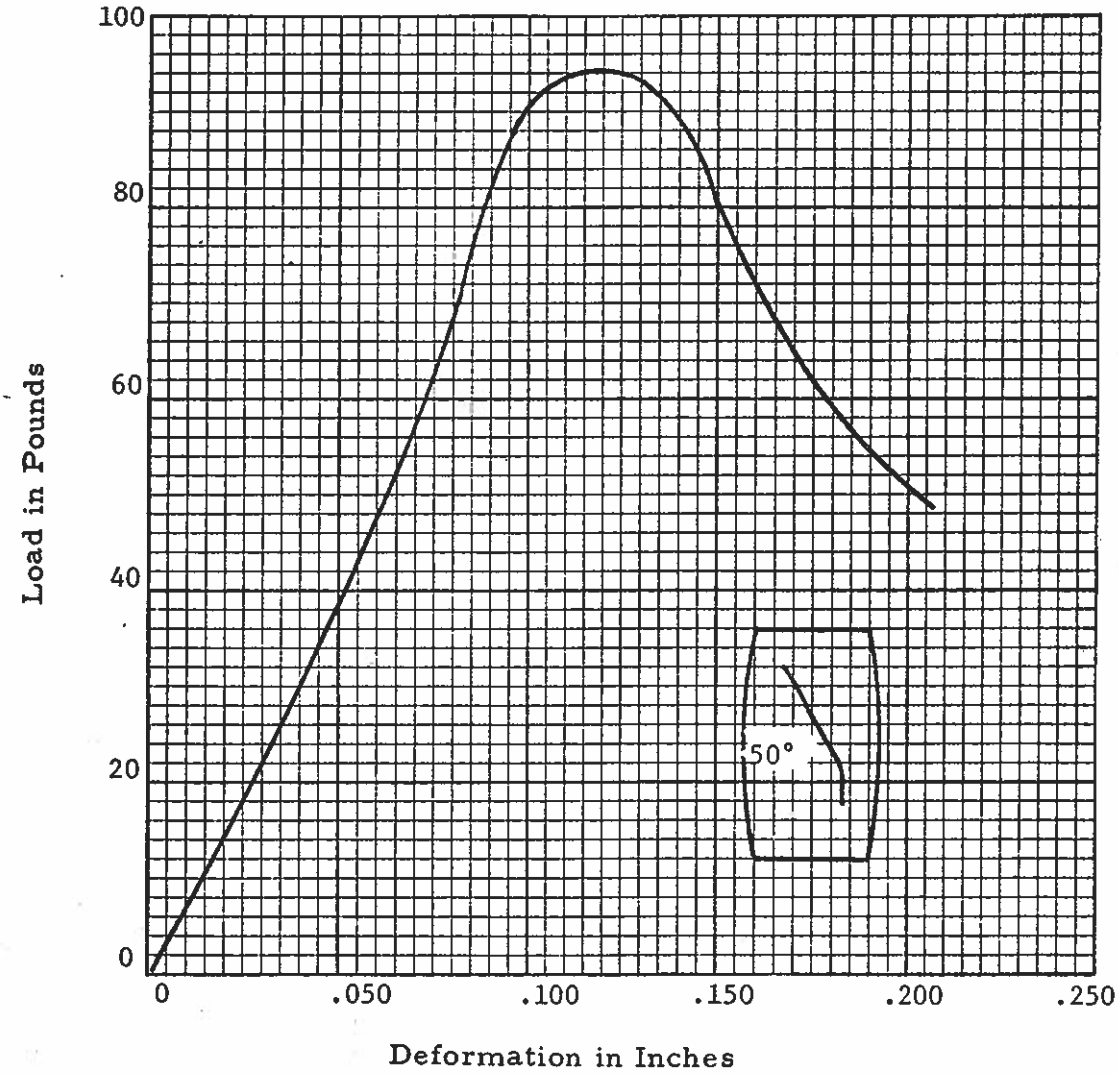
UNCONFINED COMPRESSION TEST

Project:	ORIGINAL GROUND AREA, ASH PIT NO. 3, Stuart Station
Boring No:	4D
Sample No:	1C
Surface Elevation:	544.9'
Depth Interval of Sample:	6.0' - 8.0'
Depth Interval of Strata:	0.5' - 13.0'
Depth of Interval of Test Sample:	7.0' - 7.5'
Sample Recovery:	24"

SPECIMEN DATA

Initial Diameter	2.843"
Initial Height	5.950"
Test Specimen Weight	2.74 lbs.
Moisture Content	23.7%
Wet Unit Weight	125.5 pcf
Dry Unit Weight	101.4 pcf
Unconfined Compression Strength	2100 psf
Load Increment at Failure	94.4 lbs.
Height at Failure	5.825"
Test Method	ASTM-D2166-66
Soil Classification	Brown Clay, some Silt, some Sand

FAILURE SKETCH



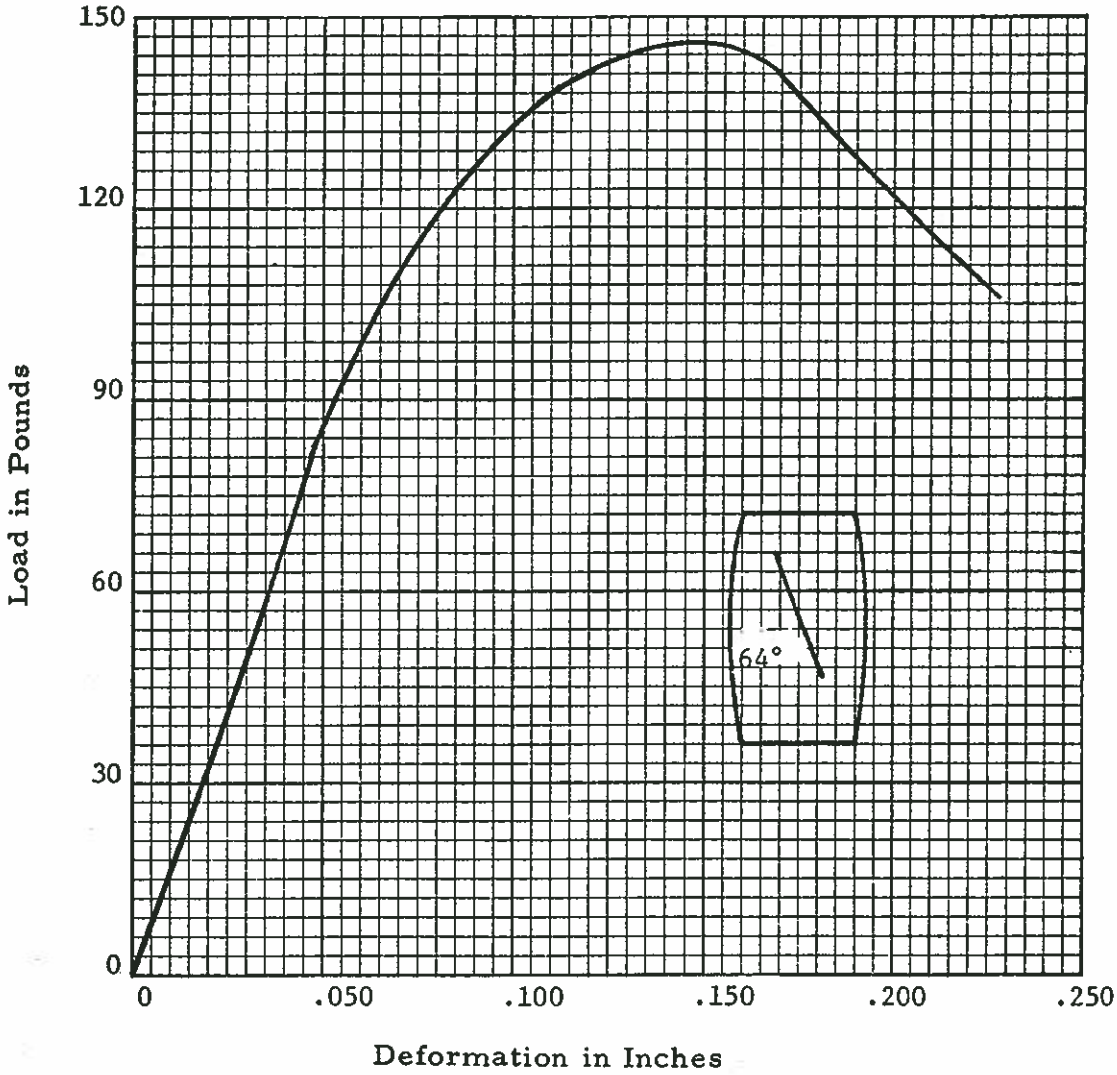
UNCONFINED COMPRESSION TEST

Project:	ORIGINAL GROUND AREA, ASH PIT NO. 3, Stuart Station
Boring No:	7D
Sample No:	1C
Surface Elevation:	545.2'
Depth Interval of Sample:	3.5' - 5.5'
Depth Interval of Strata:	1.5' - 8.5'
Depth of Interval of Test Sample:	4.6' - 5.1'
Sample Recovery:	20"

SPECIMEN DATA

Initial Diameter	2.843"
Initial Height	5.950"
Test Specimen Weight	2.74 lbs.
Moisture Content	24.2%
Wet Unit Weight	125.5 pcf
Dry Unit Weight	101.1 pcf
Unconfined Compression Strength	3230 psf
Load Increment at Failure	146.2 lbs.
Height at Failure	5.800"
Test Method	ASTM-D2166-66
Soil Classification	Brown Clay, some Silt, some Sand

FAILURE SKETCH



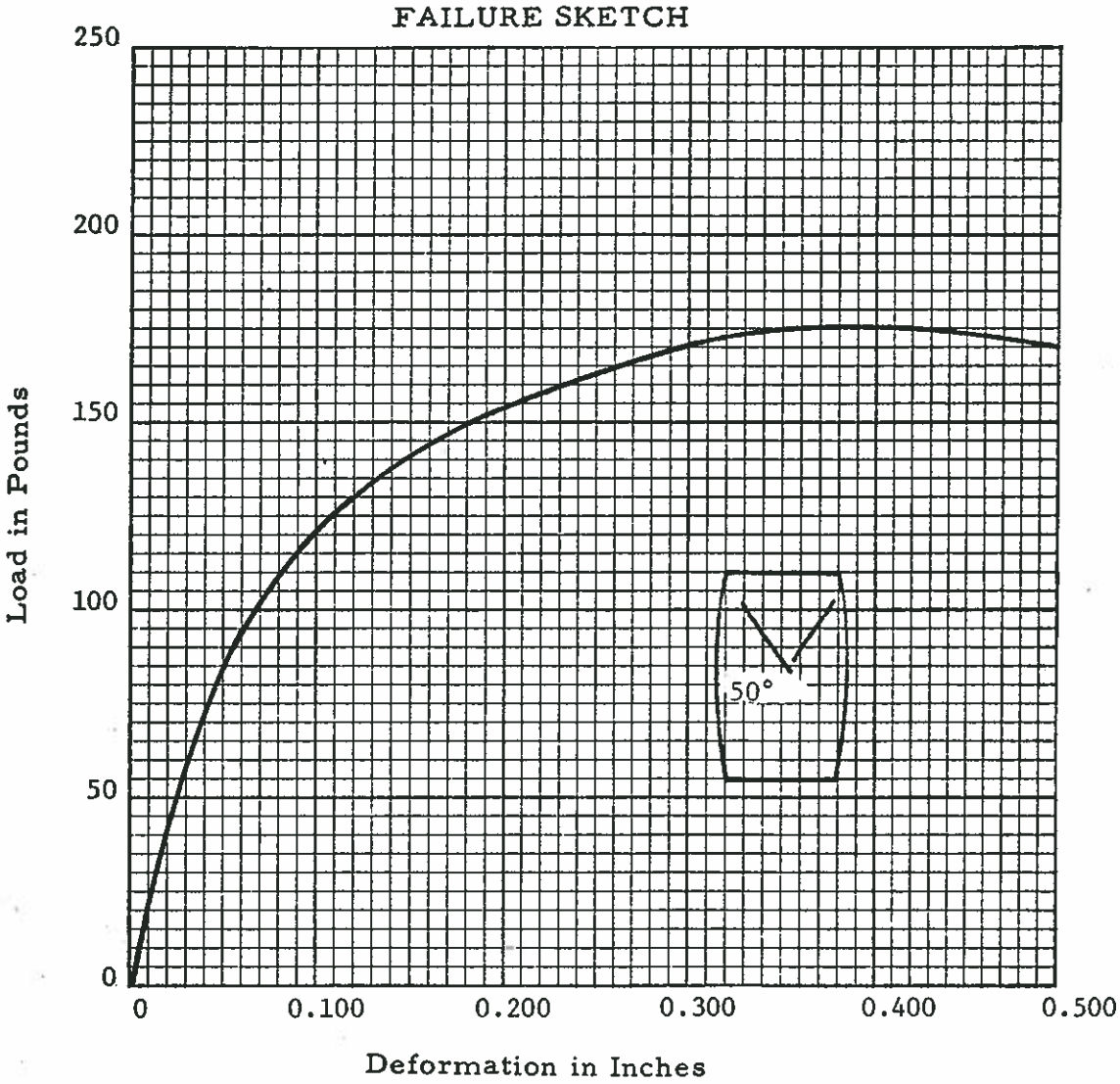
UNCONFINED COMPRESSION TEST

Project:	ORIGINAL GROUND AREA, ASH PIT NO. 3, Stuart Station
Boring No:	9D
Sample No:	1C
Surface Elevation:	544.8'
Depth Interval of Sample:	1.0' - 3.0'
Depth Interval of Strata:	1.0' - 5.5'
Depth of Interval of Test Sample:	2.0' - 2.5'
Sample Recovery:	24"

SPECIMEN DATA

Initial Diameter	2.843"
Initial Height	5.950"
Test Specimen Weight	2.81 lbs.
Moisture Content	21.7%
Wet Unit Weight	128.7 pcf
Dry Unit Weight	105.8 pcf
Unconfined Compression Strength	3770 psf
Load Increment at Failure	176.6 lbs.
Height at Failure	5.600"
Test Method	ASTM-D2166-66
Soil Classification	Brown Clay, some Silt, some Sand

FAILURE SKETCH



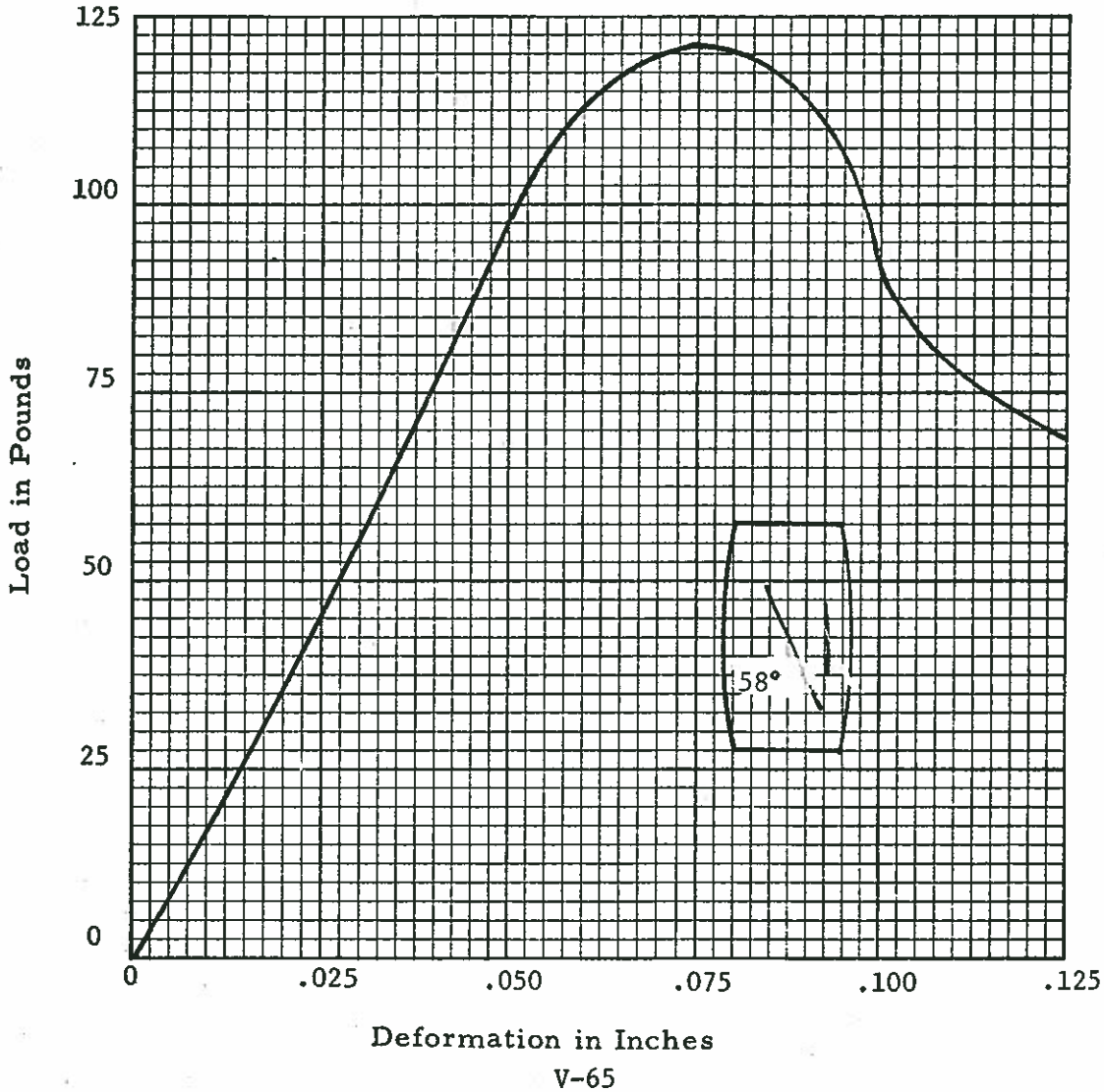
UNCONFINED COMPRESSION TEST

Project:	ORIGINAL GROUND AREA, ASH PIT NO. 3, Stuart Station
Boring No:	11D
Sample No:	1C
Surface Elevation:	545.7'
Depth Interval of Sample:	3.0' - 5.0'
Depth Interval of Strata:	1.0' - 8.0'
Depth of Interval of Test Sample:	4.0' - 4.5'
Sample Recovery:	19"

SPECIMEN DATA

Initial Diameter	2.843"
Initial Height	5.950"
Test Specimen Weight	2.63 lbs.
Moisture Content	22.7%
Wet Unit Weight	120.4 pcf
Dry Unit Weight	98.1 pcf
Unconfined Compression Strength	2730 psf
Load Increment at Failure	121.8 lbs.
Height at Failure	5.875"
Test Method	ASTM-D2166-66
Soil Classification	Brown Clay, some Sand, some Silt

FAILURE SKETCH



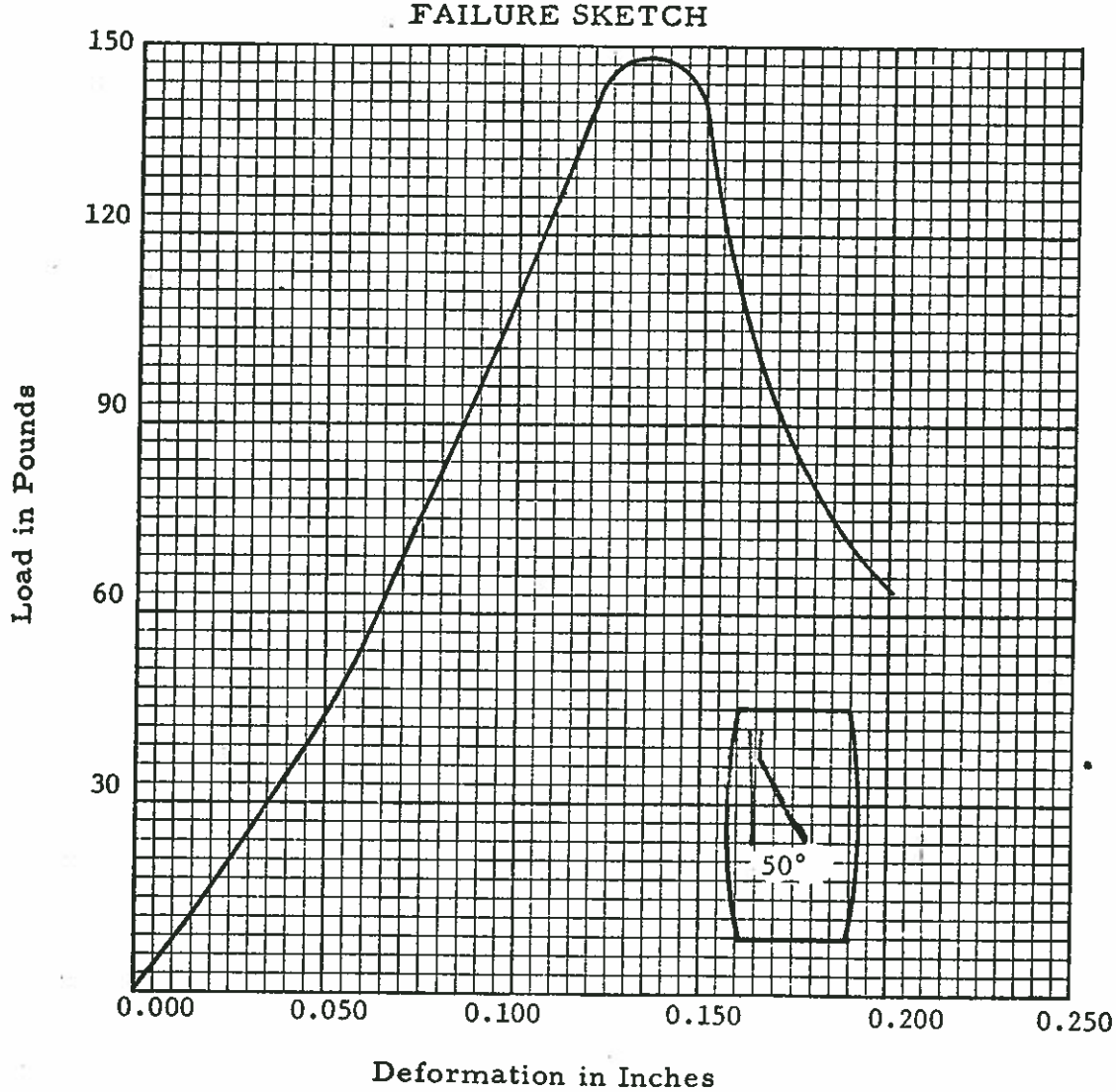
UNCONFINED COMPRESSION TEST

Project: ORIGINAL GROUND AREA, ASH PIT NO. 3, Stuart Station	
Boring No:	12D
Sample No:	1C
Surface Elevation:	546.0'
Depth Interval of Sample:	3.5' - 5.5'
Depth Interval of Strata:	0.5' - 6.5'
Depth of Interval of Test Sample:	4.7' - 5.2'
Sample Recovery:	24"

SPECIMEN DATA

Initial Diameter	2.843"
Initial Height	5.950"
Test Specimen Weight	2.80 lbs.
Moisture Content	20.9%
Wet Unit Weight	128.2 pcf
Dry Unit Weight	106.0 pcf
Unconfined Compression Strength	3200 psf
Load Increment at Failure	146.2 lbs.
Height at Failure	5.825"
Test Method	ASTM-D2166-66
Soil Classification	Brown Clay, some Silt, some Sand

FAILURE SKETCH



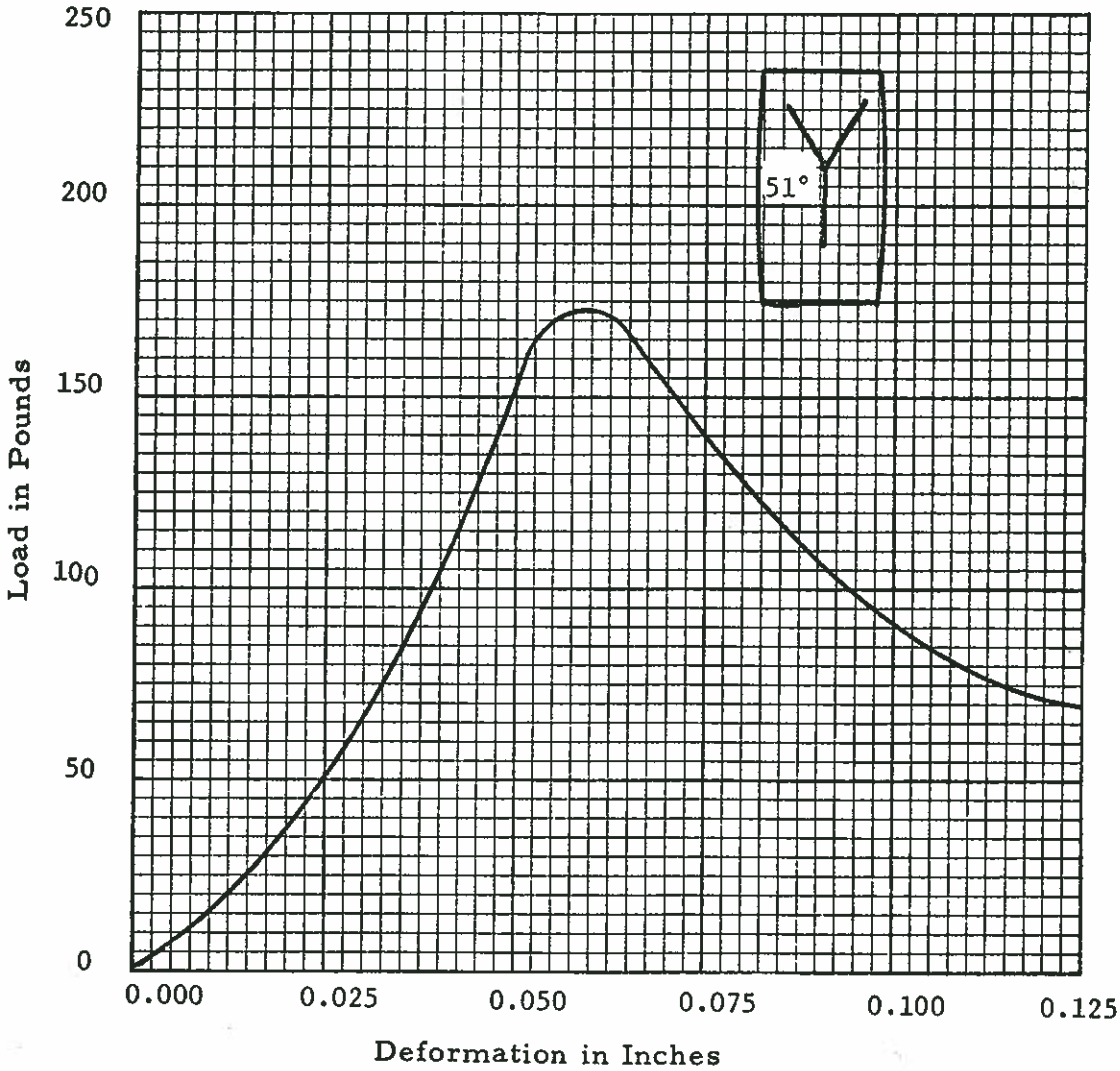
UNCONFINED COMPRESSION TEST

Project:	ORIGINAL GROUND AREA, ASH PIT NO. 3, Stuart Station
Boring No:	13D
Sample No:	1C
Surface Elevation:	541.6'
Depth Interval of Sample:	1.0' - 3.0'
Depth Interval of Strata:	0.5' - 16.0'
Depth of Interval of Test Sample:	2.2' - 2.7'
Sample Recovery:	23"

SPECIMEN DATA

Initial Diameter	2.843"
Initial Height	5.950"
Test Specimen Weight	2.63 lbs.
Moisture Content	16.7%
Wet Unit Weight	120.4 pcf
Dry Unit Weight	103.2 pcf
Unconfined Compression Strength	3500 psf
Load Increment at Failure	155.3 lbs.
Height at Failure	5.900"
Test Method	ASTM-D2166-66
Soil Classification	Brown Clay, some Silt, some Sand

FAILURE SKETCH



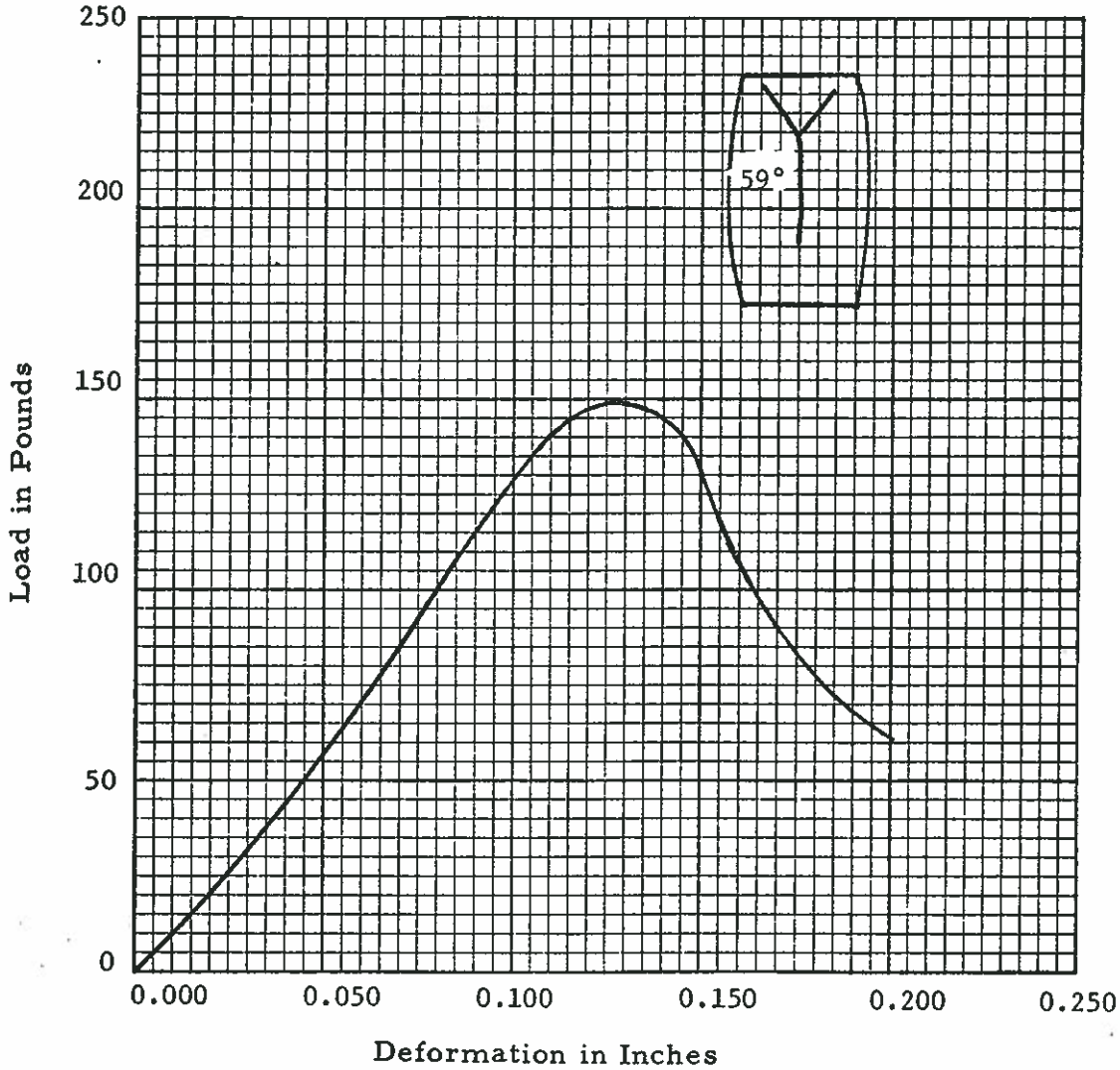
UNCONFINED COMPRESSION TEST

Project:	ORIGINAL GROUND AREA, ASH PIT NO. 3, Stuart Station
Boring No:	15D
Sample No:	1C
Surface Elevation:	540.0'
Depth Interval of Sample:	6.0' - 8.0'
Depth Interval of Strata:	3.5' - 13.5'
Depth of Interval of Test Sample:	6.8' - 7.3'
Sample Recovery:	18"

SPECIMEN DATA

Initial Diameter	2.843"
Initial Height	5.950"
Test Specimen Weight	2.72 lbs.
Moisture Content	21.1%
Wet Unit Weight	124.6 pcf
Dry Unit Weight	102.8 pcf
Unconfined Compression Strength	3300 psf
Load Increment at Failure	149.2 lbs.
Height at Failure	5.825"
Test Method	ASTM-D2166-66
Soil Classification	Brown Clay, some Silt, some Sand

FAILURE SKETCH



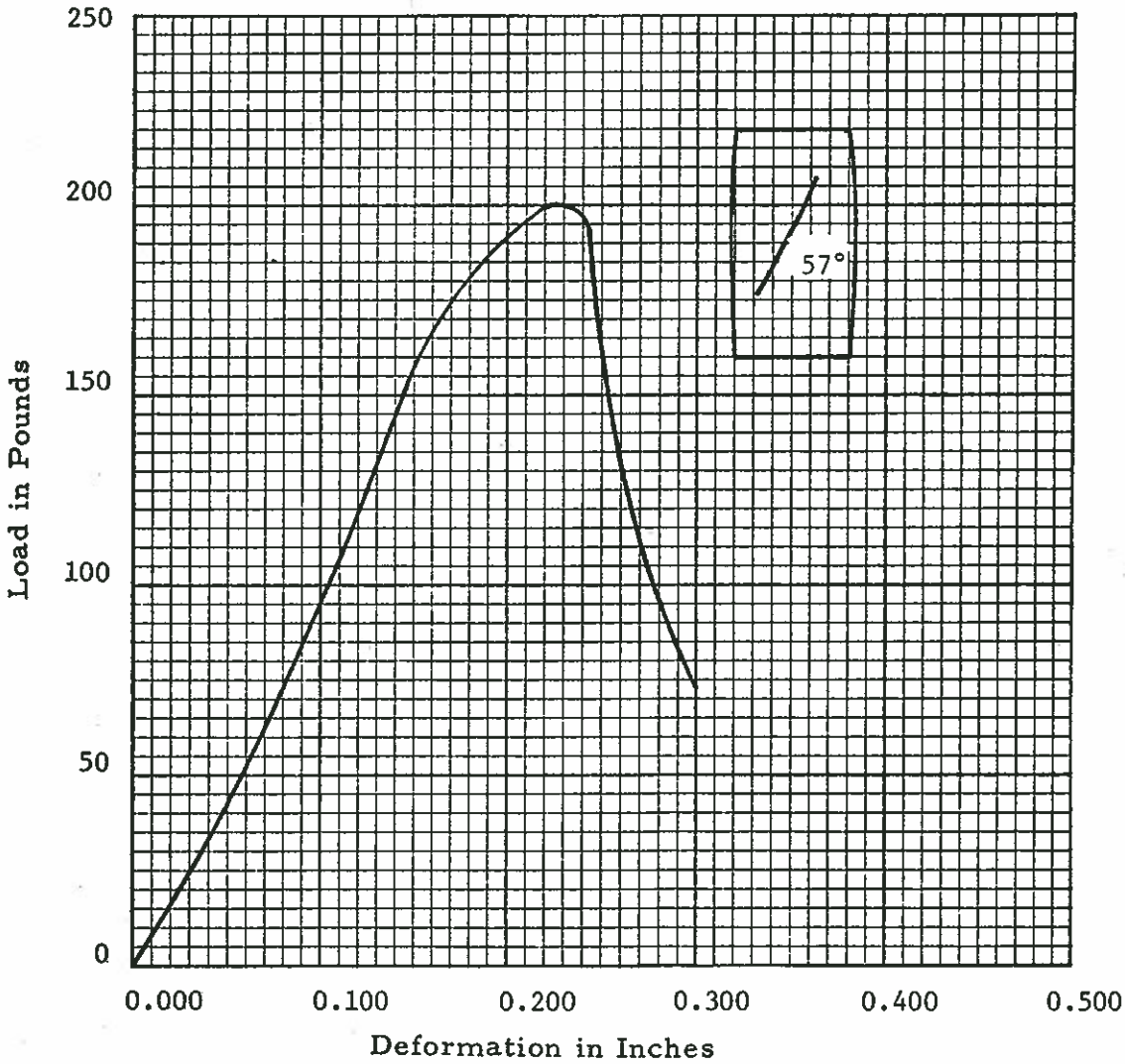
UNCONFINED COMPRESSION TEST

Project:	ORIGINAL GROUND AREA, ASH PIT NO. 3, Stuart Station
Boring No:	16D
Sample No:	1C
Surface Elevation:	531.6'
Depth Interval of Sample:	3.0' - 5.0'
Depth Interval of Strata:	1.5' - 11.0'
Depth of Interval of Test Sample:	4.4' - 4.9'
Sample Recovery:	24"

SPECIMEN DATA

Initial Diameter	2.843"
Initial Height	5.950"
Test Specimen Weight	2.86 lbs.
Moisture Content	18.9%
Wet Unit Weight	131.0 pcf
Dry Unit Weight	110.2 pcf
Unconfined Compression Strength	4400 psf
Load Increment at Failure	201.0 lbs.
Height at Failure	5.725"
Test Method	ASTM-D2166-66
Soil Classification	Brown Clay, some Sand, some Silt

FAILURE SKETCH



NATURAL UNIT WEIGHT TEST

Project:	FLY ASH PIT, ASH PIT NO. 3, STEWART STATION
Boring No.:	2A
Sample No.:	4C
Surface Elevation:	532.6'
Depth Interval of Sample:	18.5' - 20.5'
Depth Interval of Strata:	2.0' - 31.0'
Depth of Interval of Test Sample:	19.0' - 19.5'
Sample Recovery:	24"

SPECIMEN DATA:

Initial Diameter:	2.843"
Initial Height:	5.950"
Test Specimen Weight:	2.13 lbs.
Moisture Content:	39.9%
Wet Unit Weight:	97.5 pcf
Dry Unit Weight:	69.7 pcf
Soil Classification:	Fill of Fly Ash

NATURAL UNIT WEIGHT TEST

Project:	COAL STORAGE FILL, ASH PIT NO. 3, STUART STATION
Boring No.:	7A
Sample No.:	7C
Surface Elevation:	532.0'
Depth Interval of Sample:	38.5' - 40.5'
Depth Interval of Strata:	31.0' - 50.0'
Depth of Interval of Test Sample:	40.0' - 40.3'
Sample Recovery:	24"

SPECIMEN DATA:

Initial Diameter:	2.843"
Initial Height:	3.593"
Test Specimen Weight:	1.68 lbs.
Moisture Content:	9.4%
Wet Unit Weight:	127.4 pcf
Dry Unit Weight:	116.4 pcf
Soil Classification:	Brown Clay, some Sand, some Silt

NATURAL UNIT WEIGHT TEST

Project:	FLY ASH PIT, ASH PIT NO. 3, STUART STATION
Boring No.:	8A
Sample No.:	1C
Surface Elevation:	531.2'
Depth Interval of Sample:	15.0' - 17.0'
Depth of Interval of Strata:	2.0' - 31.0'
Depth of Interval of Test Sample:	15.0' - 15.3'
Sample Recovery:	4"

SPECIMEN DATA:

Initial Diameter:	2.843"
Initial Height:	3.687"
Test Specimen Weight:	1.41 lbs.
Moisture Content:	30.7%
Wet Unit Weight:	104.2 pcf
Dry Unit Weight:	79.7 pcf
Soil Classification:	Fill of Fly Ash

NATURAL UNIT WEIGHT TEST

Project: FLY ASH PIT, ASH PIT NO. 3, STUART STATION

Boring No.:	11A
Sample No.:	3C
Surface Elevation:	533.3'
Depth Interval of Sample:	28.5' - 30.5'
Depth Interval of Strata:	16.0' - 30.5'
Depth of Interval of Test Sample:	29.0' - 29.5'
Sample Recovery:	17"

SPECIMEN DATA:

Initial Diameter:	2.843"
Initial Height:	5.950"
Test Specimen Weight:	2.47 lbs.
Moisture Content:	21.3%
Wet Unit Weight:	113.1 pcf
Dry Unit Weight:	93.3 pcf
Soil Classification:	Fill of Fly Ash

NATURAL UNIT WEIGHT TEST

Project: FLY ASH PIT, ASH PIT NO. 3, Stuart Station	
Boring No.:	12A
Sample No.:	2C
Surface Elevation:	533.4'
Depth Interval of Sample:	23.5' - 25.5'
Depth Interval of Strata:	16.0' - 29.0'
Depth of Interval of Test Sample:	23.5' - 24.0'
Sample Recovery:	7"

SPECIMEN DATA:

Initial Diameter:	1.843"
Initial Height:	5.950"
Test Specimen Weight:	2.52 lbs.
Moisture Content:	20.6%
Wet Unit Weight:	115.4 pcf
Dry Unit Weight:	95.7pcf
Soil Classification:	Fill of Fly Ash

NATURAL UNIT WEIGHT TEST

Project:	FLY ASH PIT, ASH PIT NO. 3, STUART STATION
Boring No.:	13A
Sample No.:	1C
Surface Elevation:	534.1'
Depth Interval of Sample:	18.5' - 20.5'
Depth Interval of Strata:	16.0' - 28.0'
Depth of Interval of Test Sample:	19.5' - 20.0'
Sample Recovery:	17"

SPECIMEN DATA:

Initial Diameter:	2.843"
Initial Height:	5.950"
Test Specimen Weight:	2.62 lbs.
Moisture Content:	21.8%
Wet Unit Weight:	120.0 pcf
Dry Unit Weight:	98.5 pcf
Soil Classification:	Fill of Fly Ash

NATURAL UNIT WEIGHT TEST

Project: FLY ASH PIT, ASH PIT NO. 3, Stuart Station

Boring No.:	14A
Sample No.:	2C
Surface Elevation:	533.7'
Depth Interval of Sample:	25.0' - 27.0'
Depth Interval of Strata:	25.0' - 35.0'
Depth of Interval of Test Sample:	26.4' - 26.9'
Sample Recovery:	24"

SPECIMEN DATA:

Initial Diameter:	2.843"
Initial Weight:	5.950"
Test Specimen Weight:	2.90 lbs.
Moisture Content:	18.0%
Wet Unit Weight:	132.8 pcf
Dry Unit Weight:	112.6 pcf
Soil Classification:	Brown Clay and Sand, trace Silt

NATURAL UNIT WEIGHT TEST

Project: ORIGINAL GROUND AREA, ASH PIT NO. 3, Stuart Station	
Boring No.:	6D
Sample No.:	1C
Surface Elevation:	547.1'
Depth Interval of Sample:	1.0' - 3.0'
Depth of Interval of Strata:	1.0' - 8.0'
Depth of Interval of Test Sample:	2.5' - 2.7'
Sample Recovery:	24"

SPECIMEN DATA:

Initial Diameter:	2.843"
Initial Height:	2.344"
Test Specimen Weight:	1.148 lbs.
Moisture Content:	23.2%
Wet Unit Weight:	133.3 pcf
Dry Unit Weight:	102.4 pcf
Soil Classification:	Brown Clay, some Silt, some Sand

CONSOLIDATED-UNDRAINED TRIAXIAL TEST SUMMARY

ASH PIT NO. 3 - STUART STATION

TEST NO. 1

Test Conditions:
- Drainage - Double (Top-Bottom) with filter strips
- Axial Stress Application - Strain controlled (Karol-Warner Model 530)
- Deformation Rate - 0.02 inches per minute
- Chamber Fluid - De-aired water
- Pore Pressure Measurement - Zero volume change pore water pressure gage (Karol-Warner Model 53-PP)

Sample Conditions:	Test Sample 1	Test Sample 2	Test Sample 3
Sample Preparation:	- Laboratory compacted -		
Material:	Brown Silt and Clay, trace of Sand (Proposed New Dike Material)		
Source of Material:	- Boring 2E -		
Optimum Moisture Content (%):	14.2	14.2	14.2
Maximum Dry Unit Weight (pcf):	117.1	117.1	117.1
Lateral Pressure (psi):	56.5	69.6	78.6
Back Pressure (psi):	46.2	49.1	48.5
Effective Consolidation Pressure (psi):	10.3	20.5	30.1
B-Value at Initiation of Axial Stress Application:	0.86	0.86	0.91
Specimen Weight (lbs):	2.430	2.431	2.431
Specimen Height (in),			
Initial:	6.000	6.000	6.000
Consolidated:	5.959	5.944	5.923
End of Test:	4.759	4.744	4.723
Specimen Diameter (in),			
Initial:	2.675	2.675	2.675
Consolidated:	2.657	2.650	2.641
Moisture Content (%),			
Initial:	19.6	19.6	19.6
Final:	22.7	--	--
Initial Wet Unit Weight (pcf):	124.6	124.5	124.7
Dry Unit Weight (pcf),			
Initial:	104.2	104.1	104.3
(% Compaction):	(88.9)	(88.9)	(89.1)
Consolidated:	106.3	107.1	108.4
(% Compaction):	(90.8)	(91.4)	(92.6)

Measured Strength Parameters:

Effective ϕ' = 31.5°
C' = 1.2 psi
Total ϕ = 10.0°
C = 2.9 psi

BOWSER-MORNER
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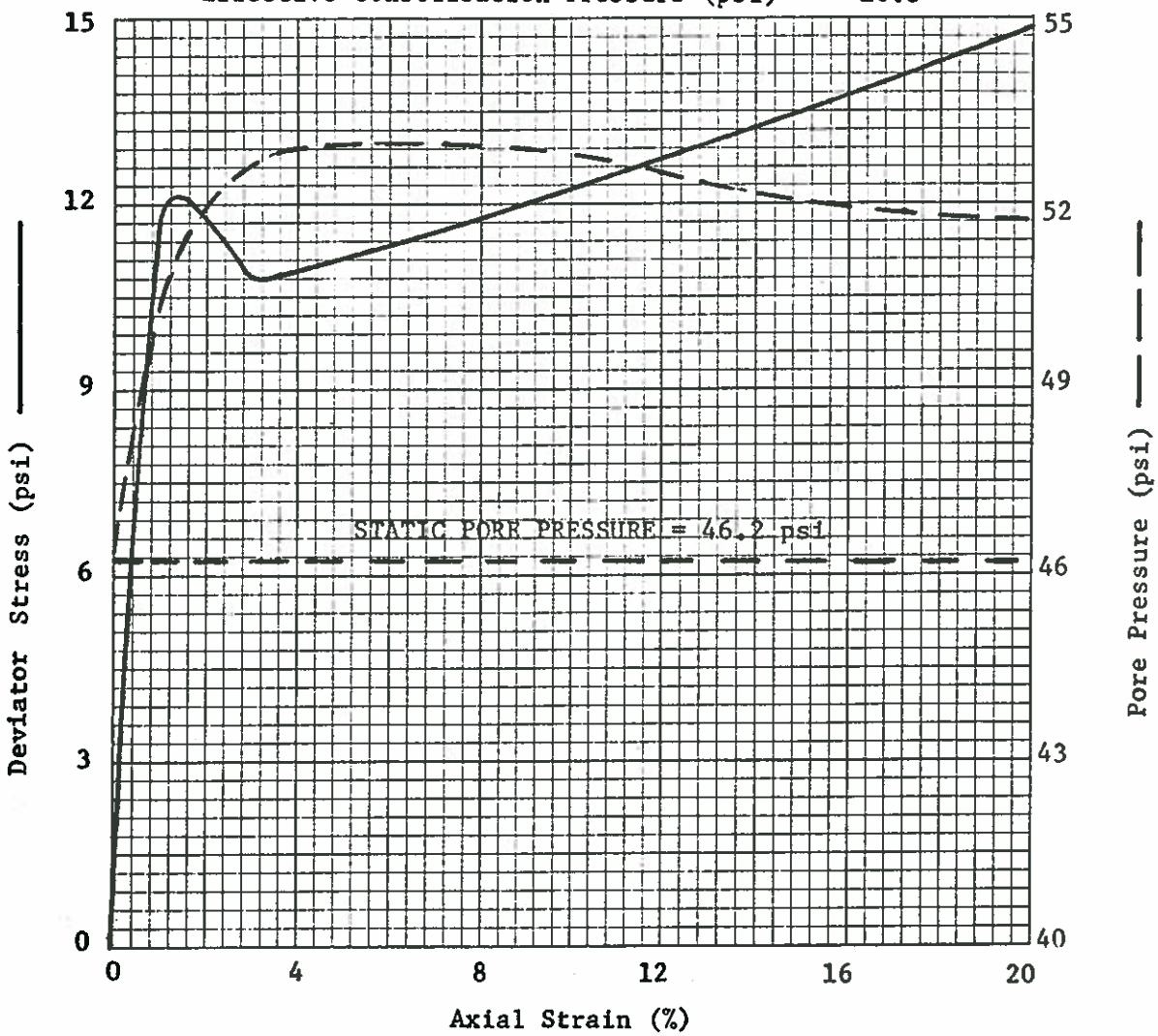
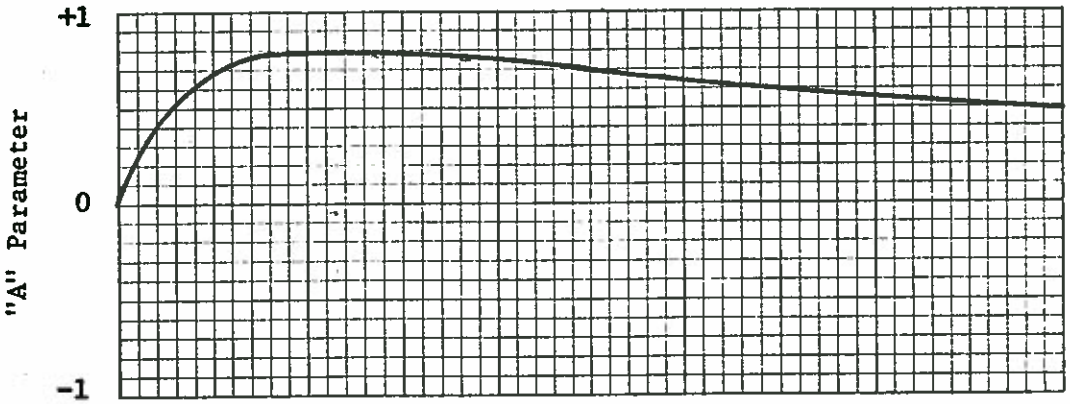
CONSOLIDATED-UNDRAINED TRIAXIAL TEST

Test No. 1
Sample No. 1

Project: Ash Pit No. 3 - Stuart Station
Material: Brown Silt and Clay, trace of Sand
Source of Material: Boring 2E

Lateral Pressure (psi) = 56.5
Back Pressure (psi) = 46.2
Effective Consolidation Pressure (psi) = 10.3





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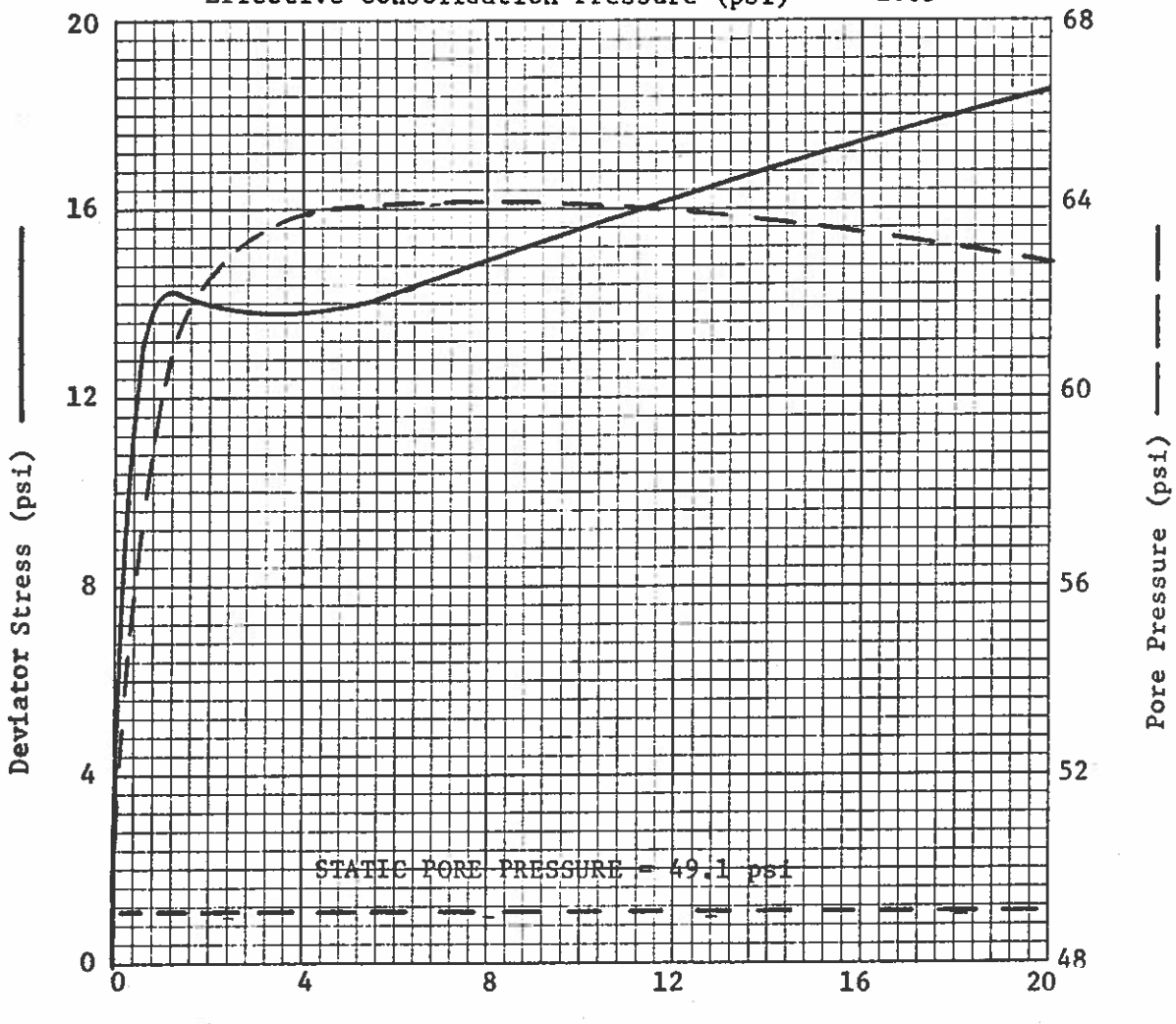
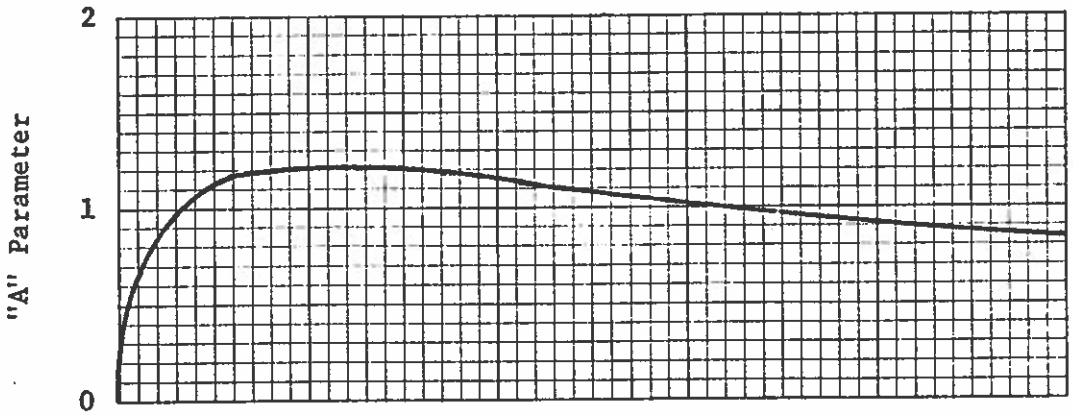
CONSOLIDATED-UNDRAINED TRIAXIAL TEST

Test No. 1
Sample No. 2

Project: Ash Pit No. 3 - Stuart Station
Material: Brown Silt and Clay, trace of Sand
Source of Material: Boring 2E

Lateral Pressure (psi) = 69.6
Back Pressure (psi) = 49.1
Effective Consolidation Pressure (psi) = 20.5





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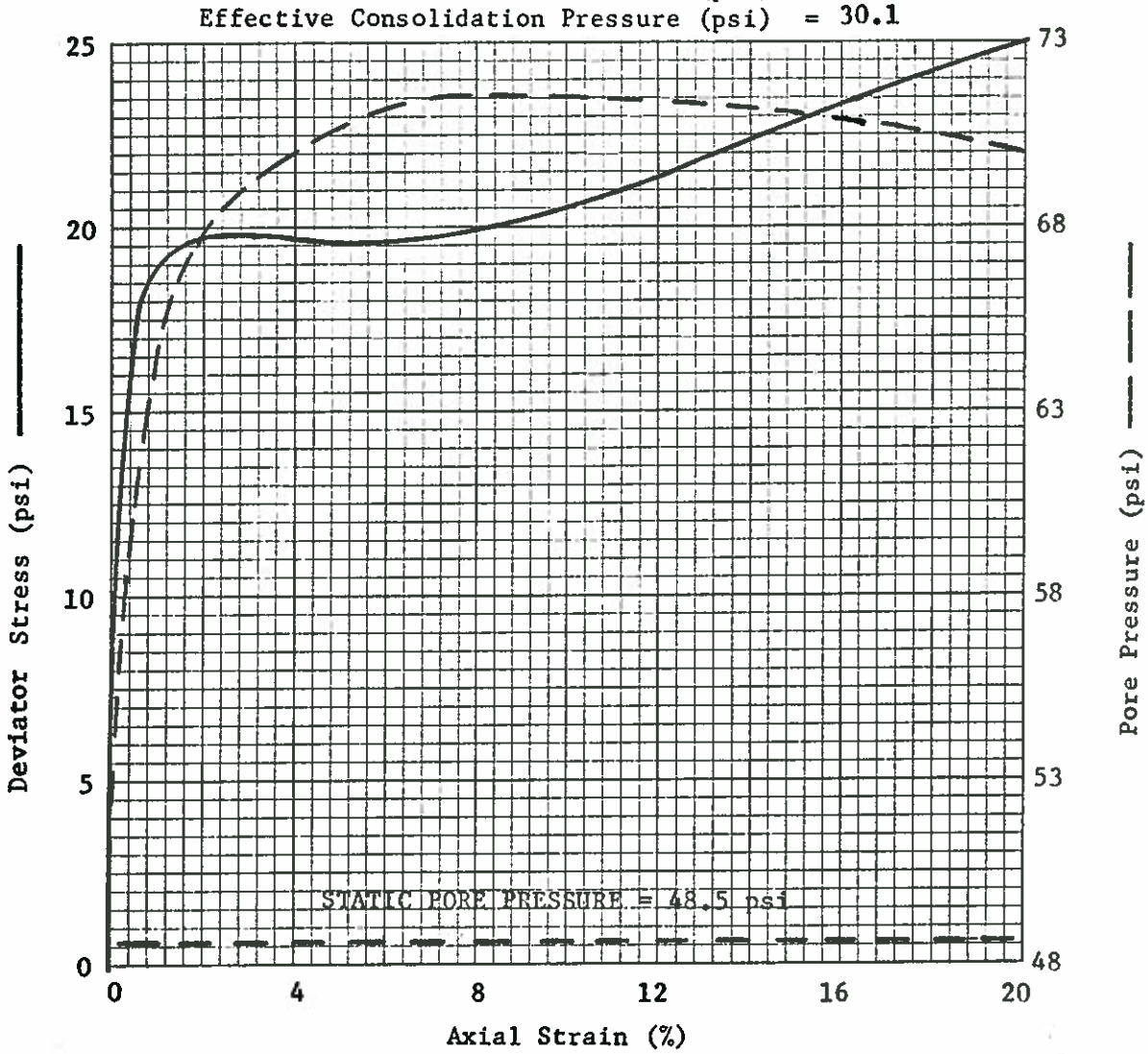
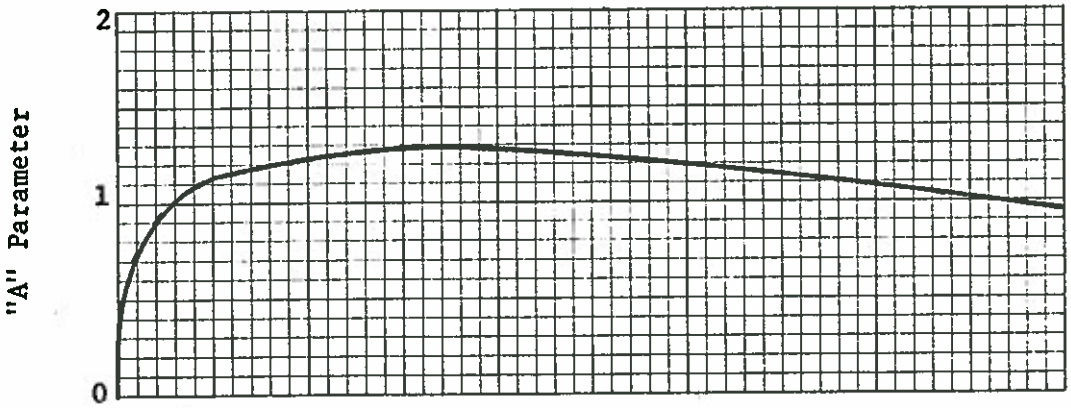
CONSOLIDATED-UNDRAINED TRIAXIAL TEST

Test No. 1
Sample No. 3

Project: Ash Pit No. 3 - Stuart Station
Material: Brown Silt and Clay, trace of Sand
Source of Material: Boring 2E

Lateral Pressure (psi) = 78.6
Back Pressure (psi) = 48.5
Effective Consolidation Pressure (psi) = 30.1





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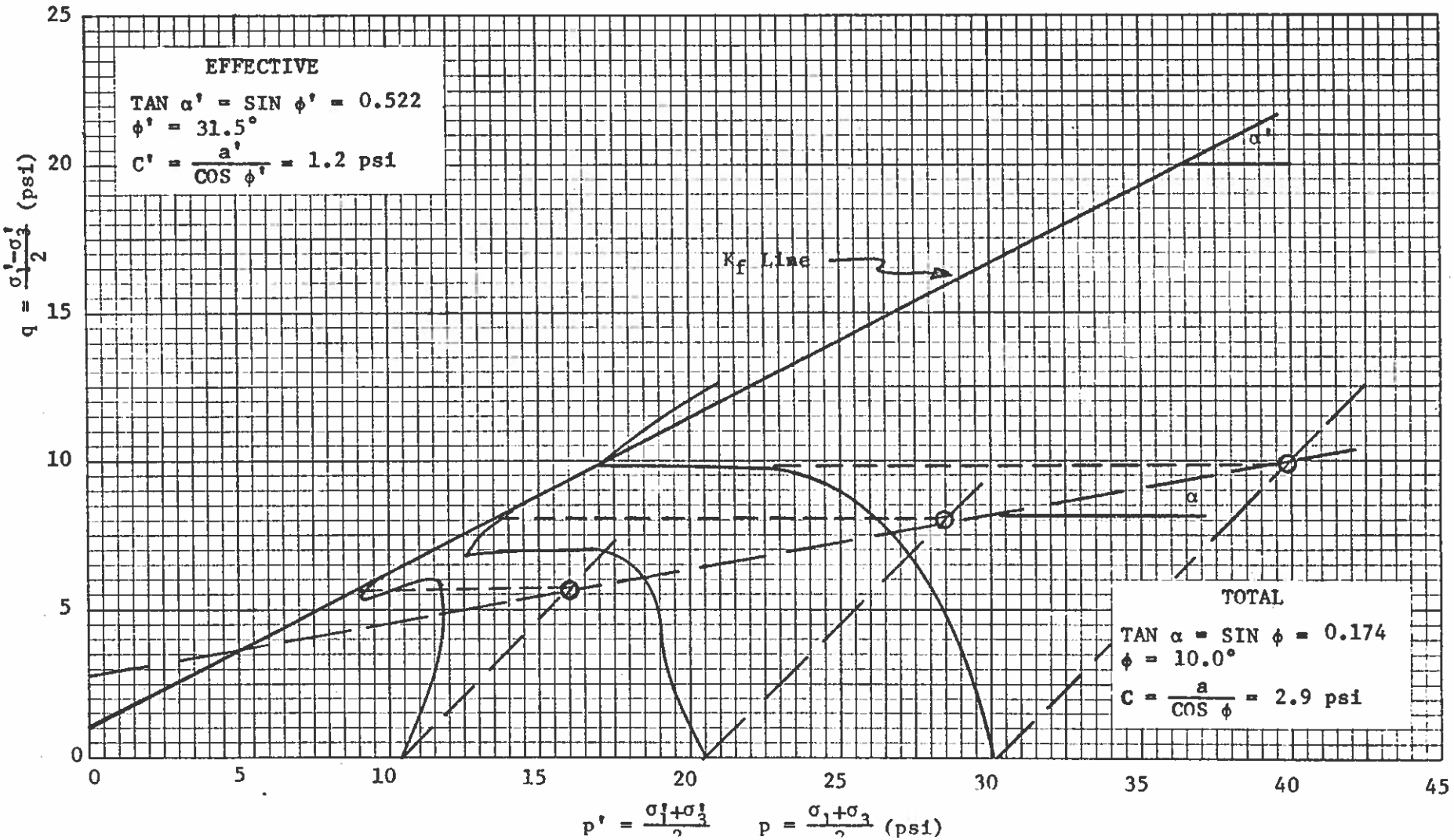
CONSOLIDATED-UNDRAINED TRIAXIAL STRESS PATHS

TEST NO. 1

Project: Ash Pit No. 3 - Stuart Station
Material: Brown Silt and Clay, trace of Sand
Source of Material: Boring 2E

——— = Effective Stress Paths
— — — = (Total-Static Pore Pressure) Stress Paths



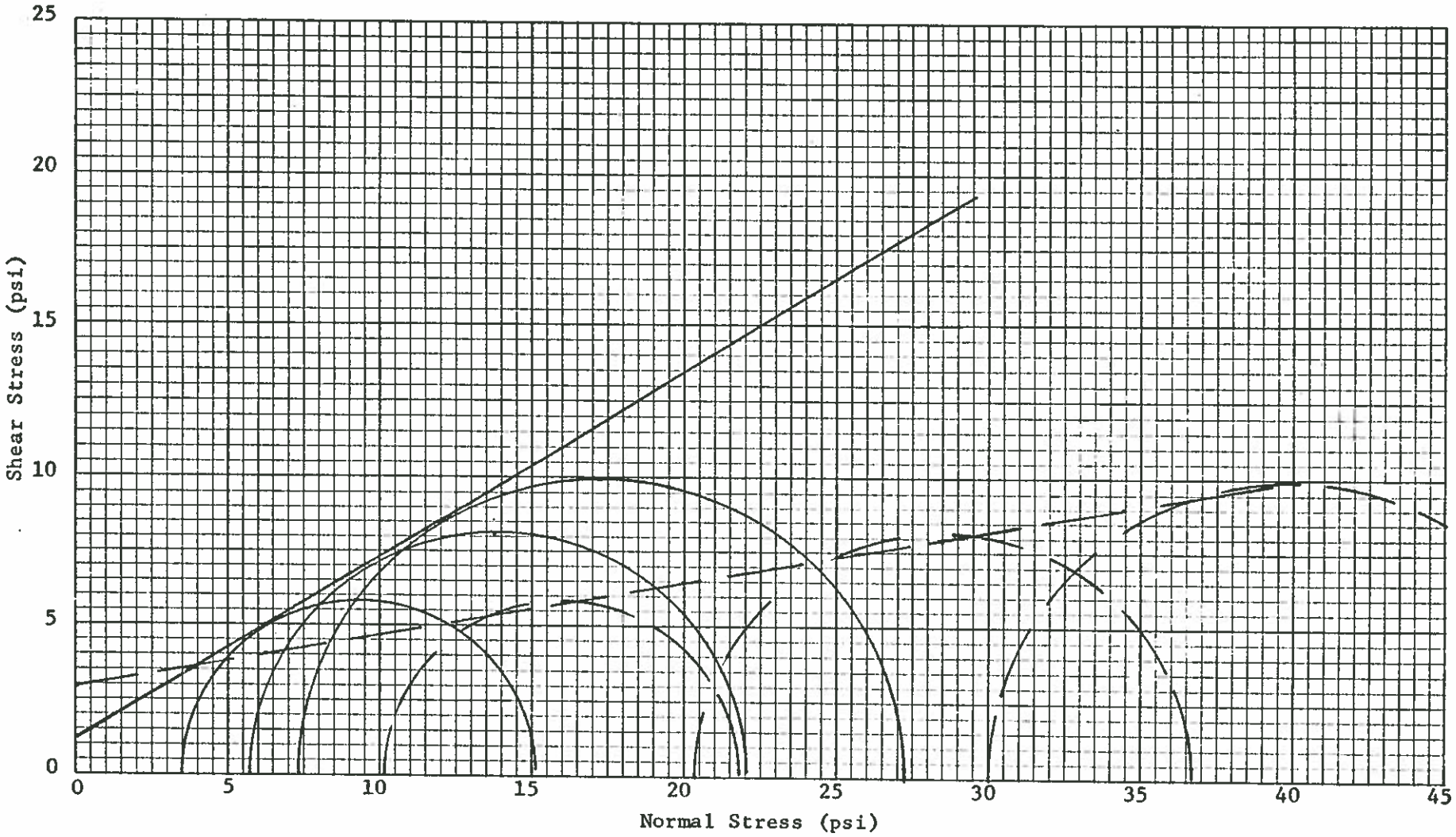
CONSOLIDATED-UNDRAINED TRIAXIAL TEST
MOHR PLOTS OF FAILURE STATES

TEST NO. 1

Project: Ash Pit No. 3 - Stuart Station
Material: Brown Silt and Clay, trace of Sand

——— = Effective
— — — = Total

Strength Parameters:	C (psi)	ϕ (°)
Effective	1.2	31.5
Total	2.9	10.0



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CONSOLIDATED-UNDRAINED TRIAXIAL TEST SUMMARY

ASH PIT NO. 3 - STUART STATION

TEST NO. 2

Test Conditions:

Drainage - Double (Top-Bottom)
Axial Stress Application - Strain controlled (Karol-Warner Model 530)
Deformation Rate - 0.02 inches per minute
Chamber Fluid - De-aired water
Pore Pressure Measurement - Zero volume change pore water pressure gage (Karol-Warner Model 53-PP)

Sample Conditions:

	Test Sample 1	Test Sample 2	Test Sample 3
Material:	- Fill of Fly Ash -		
Source of Material,			
Boring No.:	1A	1A	1A
Sample No.:	3C	3C	3C
Lateral Pressure (psi):	58.2	76.9	80.1
Back Pressure (psi):	49.0	57.0	50.3
Effective Consolidation Pressure (psi):	9.2	19.9	29.8
B-Value at Initiation of Axial Stress Application:	--	0.65	0.93
Specimen Weight (lbs):	2.310	2.618	2.304
Specimen Height (in),			
Initial:	6.000	5.937	6.000
Consolidated:	5.984	5.889	5.962
End of Test:	4.784	4.689	4.762
Specimen Diameter (in),			
Initial:	2.843	2.843	2.843
Consolidated:	2.835	2.820	2.825
Moisture Content (%),			
Initial:	31.5	31.5	31.5
Final:	33.2	25.3	33.2
Initial Wet Unit Weight (pcf):	104.8	120.0	104.6
Dry Unit Weight (pcf),			
Initial:	79.7	91.3	79.5
Consolidated:	80.4	93.5	81.0

Measured Strength Parameters:

Effective ϕ' = 35.0°
C' = 0.0 psi
Total ϕ = 33.5°
C = 0.0 psi

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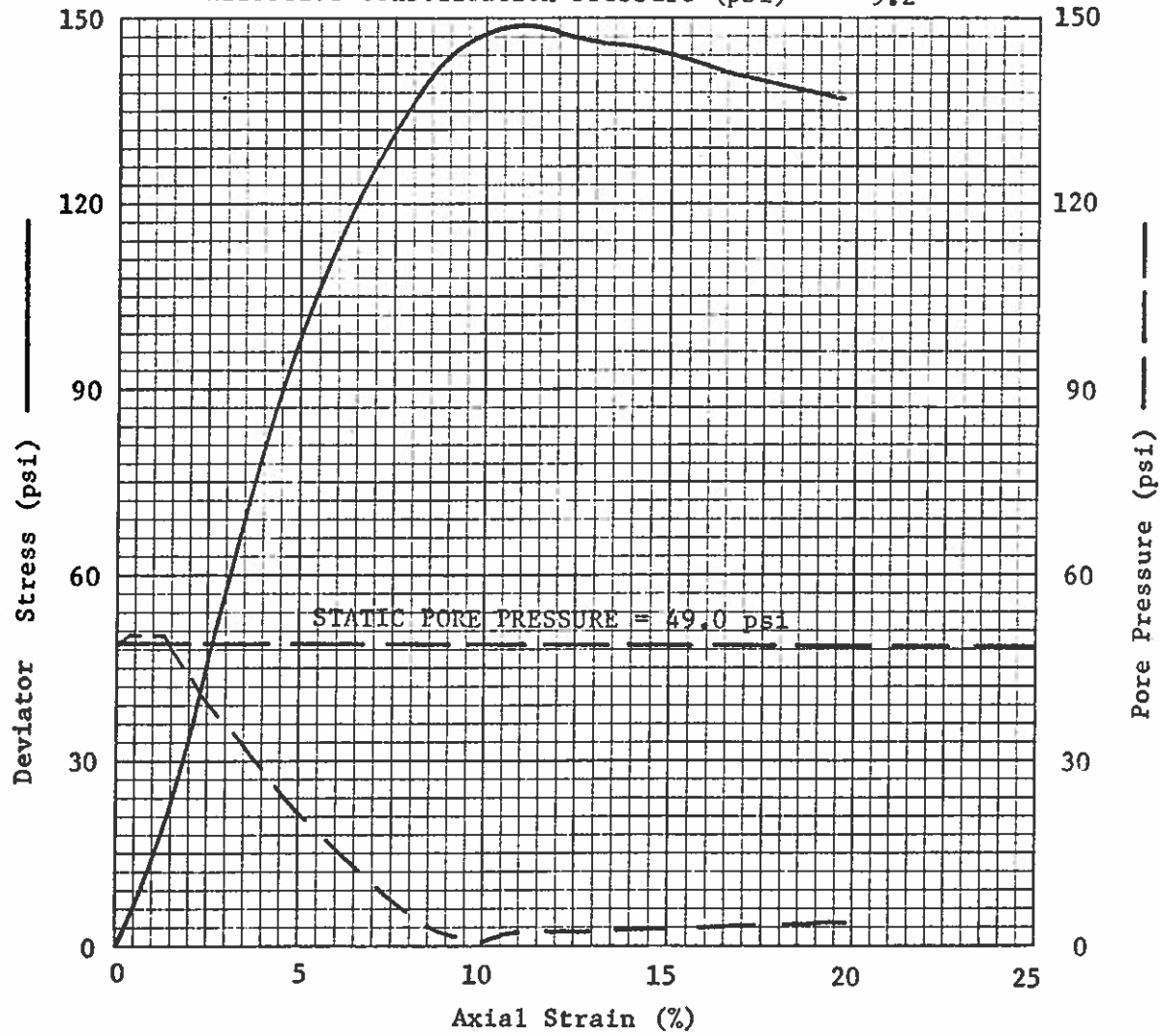
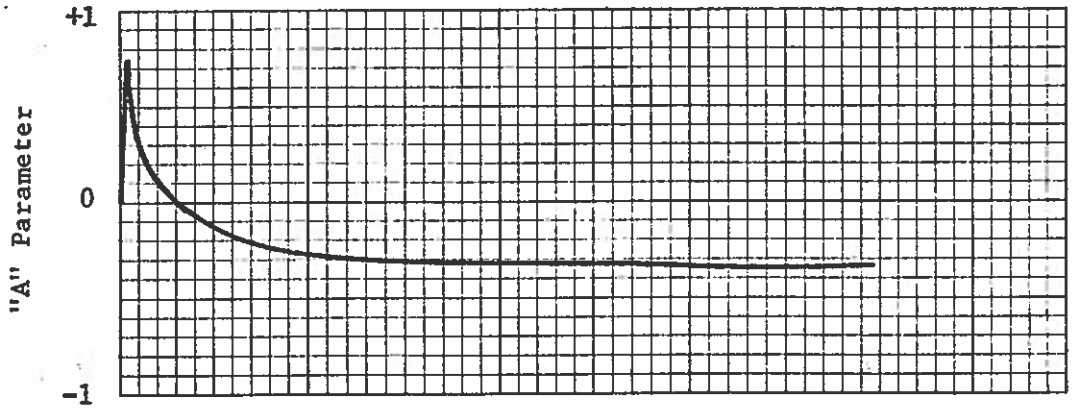
CONSOLIDATED-UNDRAINED TRIAXIAL TEST

Test No. 2
Sample No. 1

Project: Ash Pit No. 3 - Stuart Station
Material: Fill of Fly Ash
Source of Material: Boring 1A, Sample 3C

Lateral Pressure (psi) = 58.2
Back Pressure (psi) = 49.0
Effective Consolidation Pressure (psi) = 9.2





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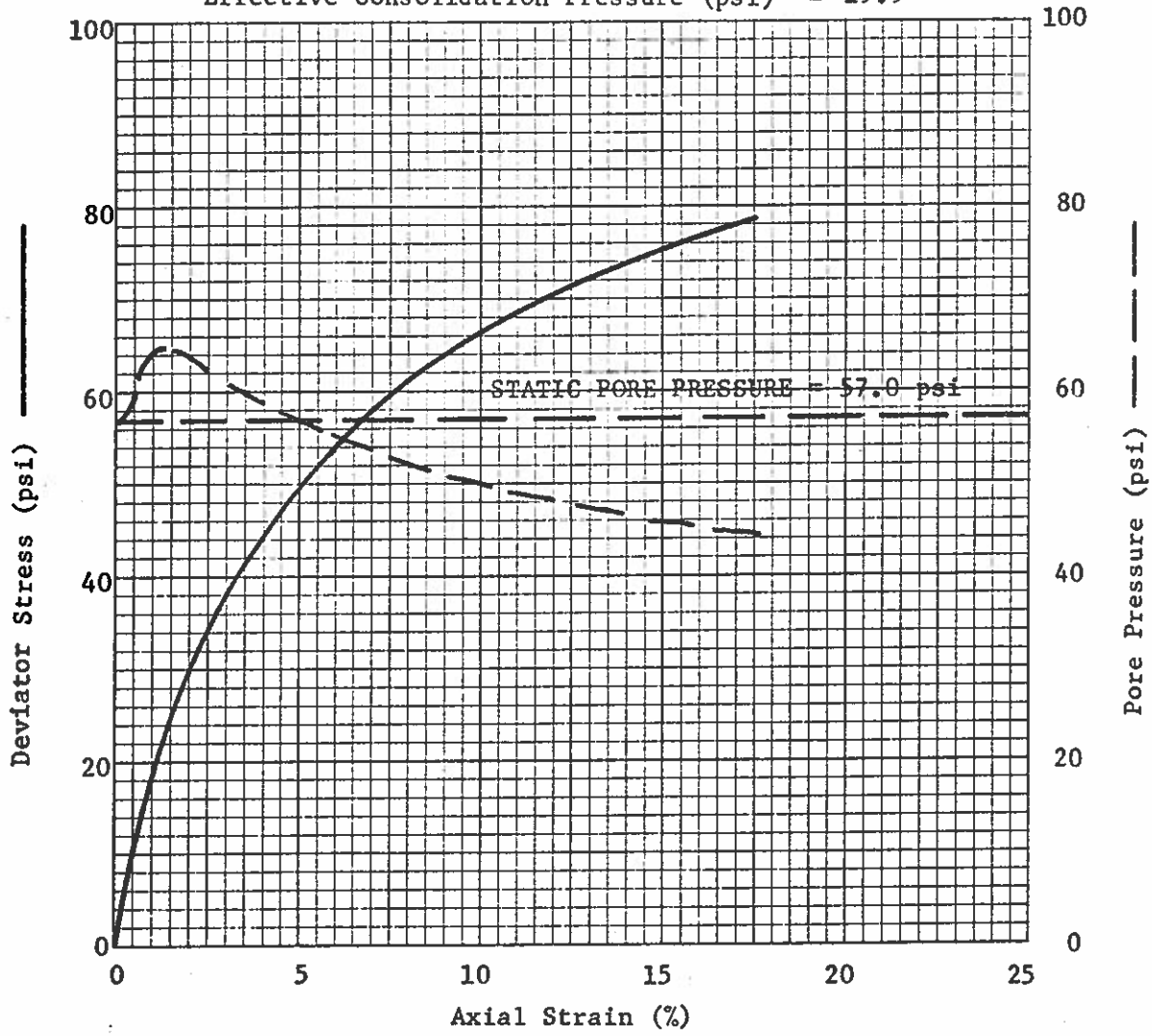
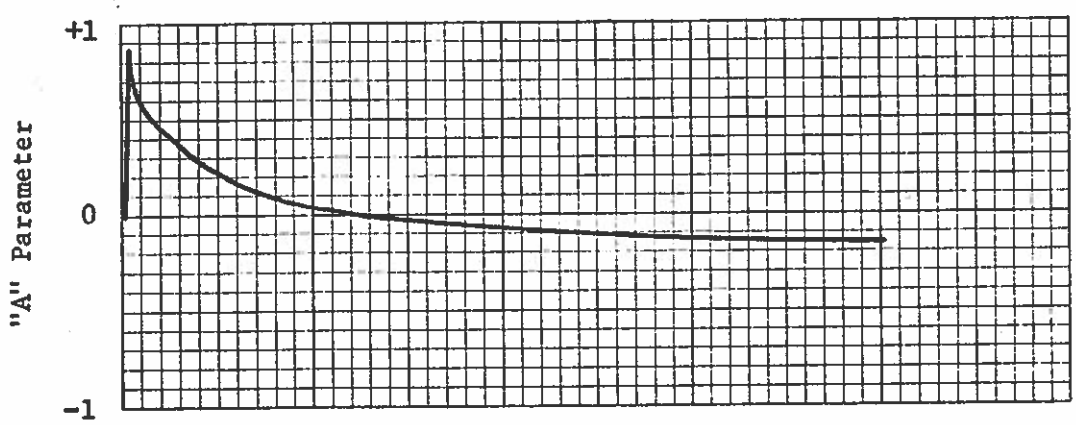
CONSOLIDATED-UNDRAINED TRIAXIAL TEST

Test No. 2
Sample No. 2

Project: Ash Pit No. 3 - Stuart Station
Material: Fill of Fly Ash
Source of Material: Boring 1A, Sample 3C

Lateral Pressure (psi) = 76.9
Back Pressure (psi) = 57.0
Effective Consolidation Pressure (psi) = 19.9





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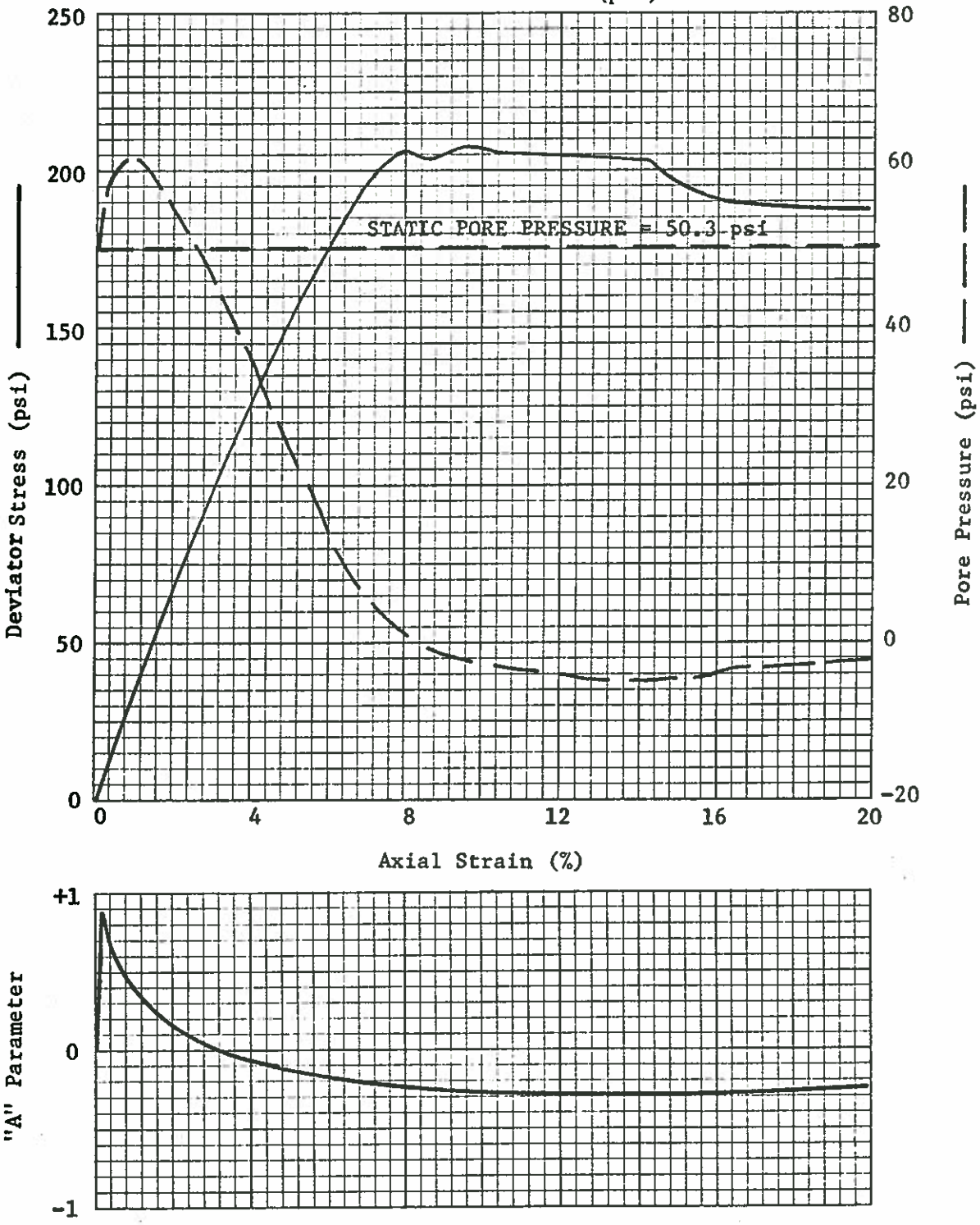
CONSOLIDATED-UNDRAINED TRIAXIAL TEST

Test No. 2
Sample No. 3

Project: Ash Pit No. 3 - Stuart Station
Material: Fill of Fly Ash
Source of Material: Boring 1A, Sample 3C

Lateral Pressure (psi) = 80.1
Back Pressure (psi) = 50.3
Effective Consolidation Pressure (psi) = 29.8



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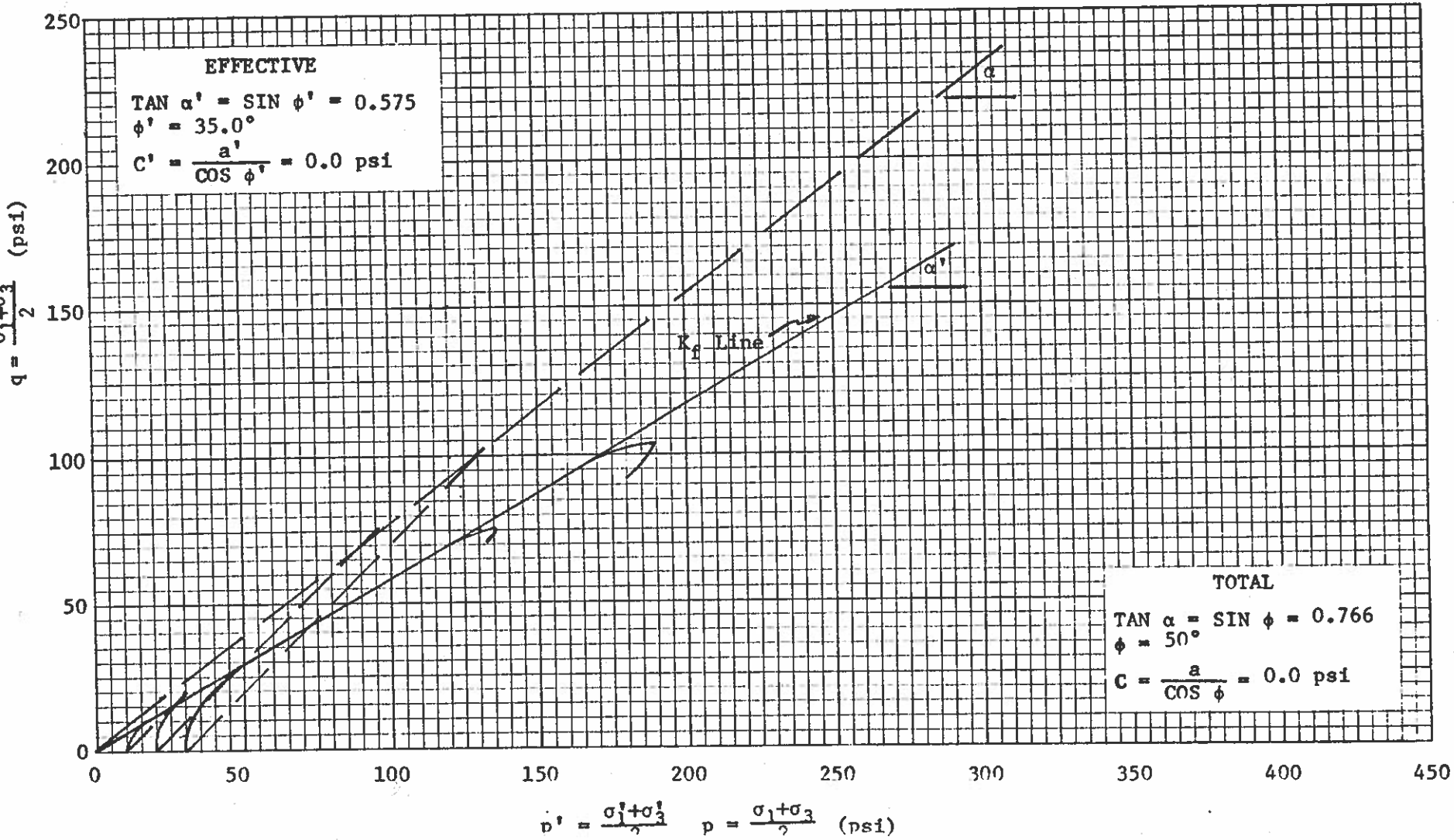
CONSOLIDATED-UNDRAINED TRIAXIAL STRESS PATHS
TEST NO. 2

Project: Ash Pit No. 3 - Stuart Station
Material: Fill of Fly Ash

——————— = Effective Stress Paths
—— —— —— = (Total-Static Pore Pressure) Stress Paths



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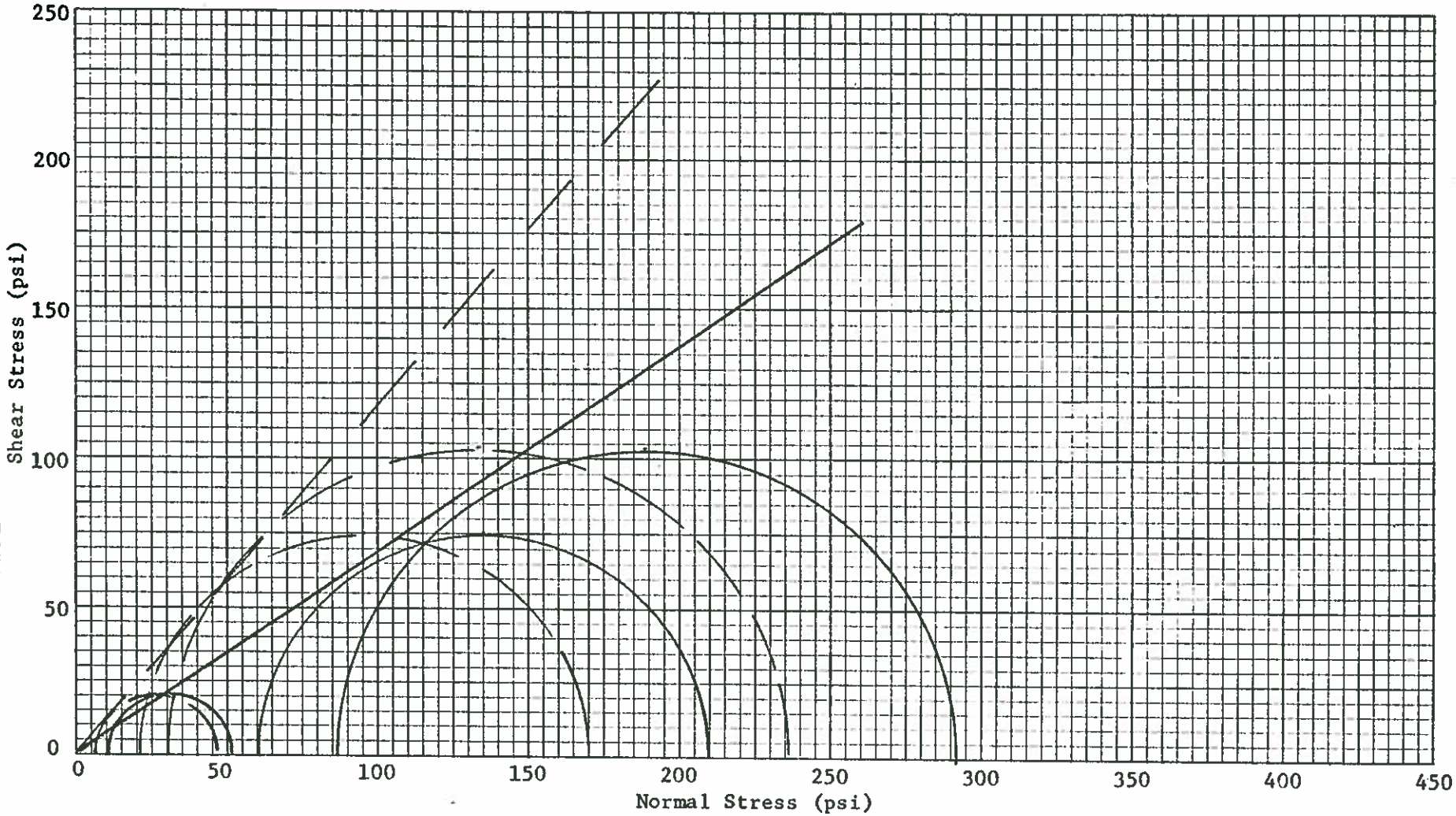
CONSOLIDATED-UNDRAINED TRIAXIAL TEST
MOHR PLOTS OF FAILURE STATES
TEST NO. 2

Project: Ash Pit No. 3 - Stuart Station
Material: Fill of Fly Ash

——— = Effective
— — — = Total

Strength Parameters:	C (psi)	ϕ (°)
Effective	0.0	35.0
Total	0.0	50.0



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UNCONSOLIDATED-UNDRAINED TRIAXIAL TEST SUMMARY

ASH PIT NO. 3 - STUART STATION

TEST NO. 3

Test Conditions:
- Drainage - Double (Top-Bottom)
- Axial Stress Application - Strain controlled (Karol-Warner Model 530)
- Deformation Rate - 0.02 inches per minute
- Chamber Fluid - De-aired water
- Pore Pressure Measurement - Zero volume change pore water pressure gage (Karol-Warner Model 53-PP)

Sample Conditions:	Test Sample 1	Test Sample 2	Test Sample 3	Test Sample 4
Material:		- Fill of Fly Ash -		
Source of Material,				
Boring No.:	8A	13A	13A	6A
Sample No.:	2C	3C	3C	3C
Lateral Pressure (psi):	9.5	19.5	29.6	8.2
Initial Pore Pressure (psi):	6.0	6.0	11.5	0.0
Effective Confining Pressure (psi):	3.5	13.5	18.1	8.2
Specimen Weight (lbs):	2.309	2.422	2.487	2.272
Specimen Height (in),				
Initial:	6.0	5.937	5.937	5.687
End of Test:	5.175	5.412	5.112	5.187
Specimen Diameter (in):	2.843	2.843	2.843	2.843
Moisture Content (%):	30.2	25.9	26.6	38.8
Wet Unit Weight (pcf):	104.7	111.1	114.0	108.7
Dry Unit Weight (pcf):	80.4	88.2	90.1	78.3

Measured Strength Parameters:

Effective ϕ' = 35.1°
C' = 0.0 psi
Total = 42.9°
ϕ = 2.0 psi

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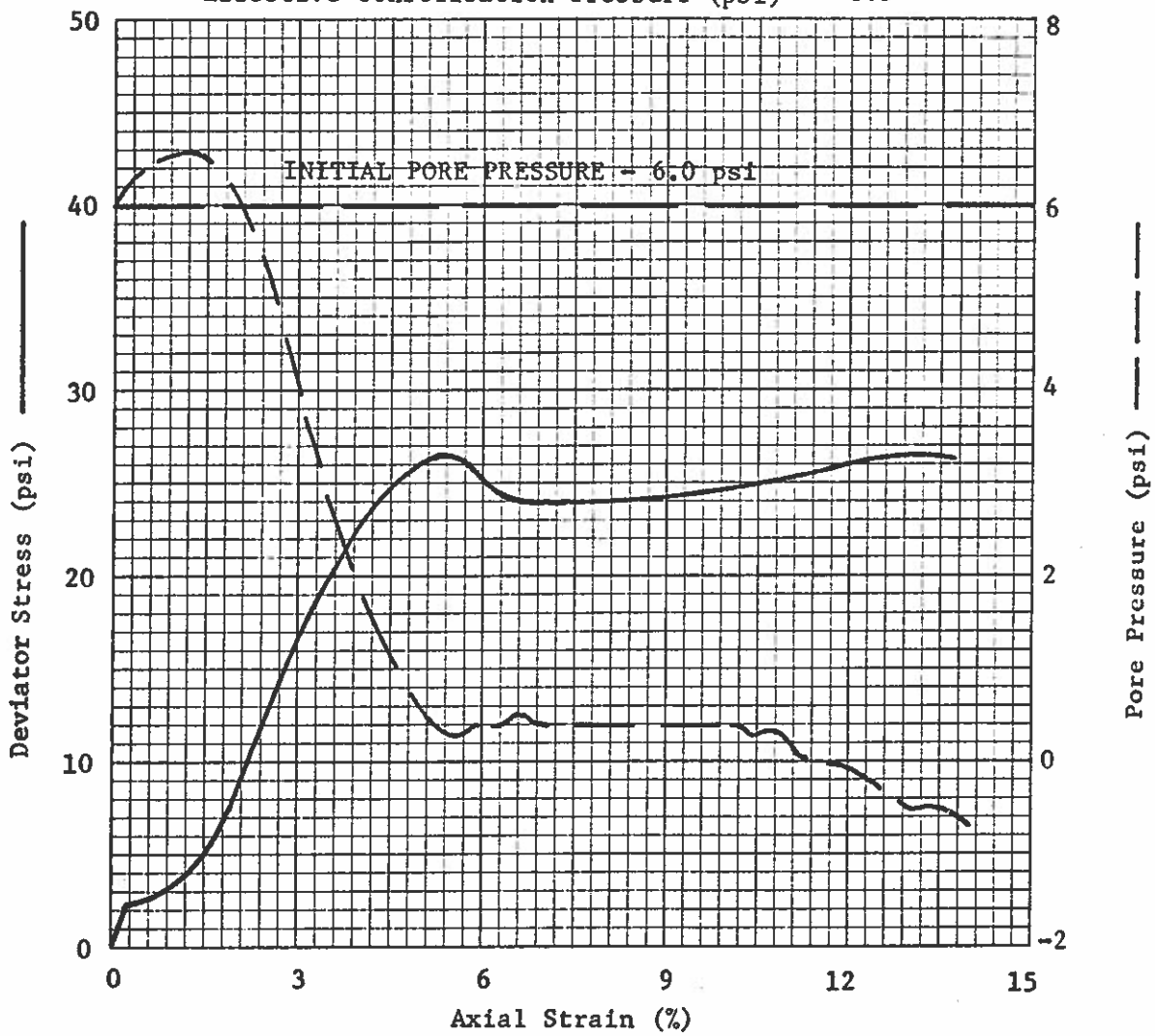
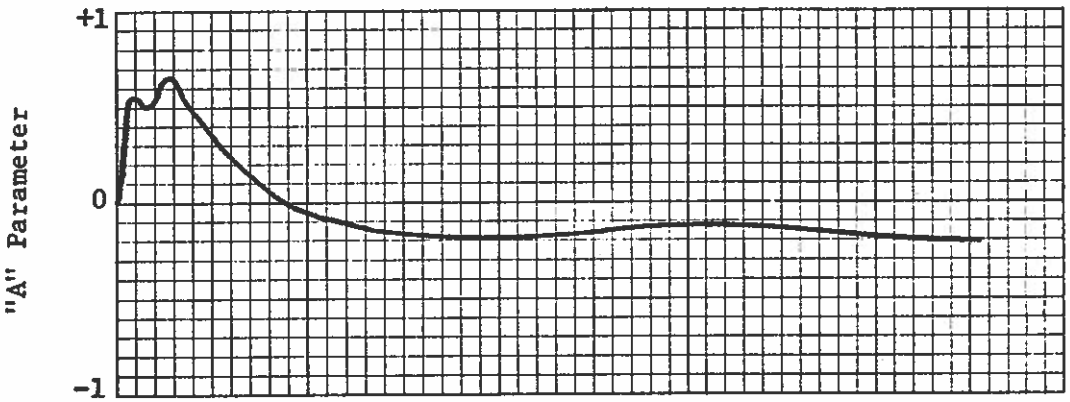
UNCONSOLIDATED-UNDRAINED TRIAXIAL TEST

Test No. 3
Sample No. 1

Project: Ash Pit No. 3 - Stuart Station
Material: Fill of Fly Ash
Source of Material: Boring 8A, Sample 2C

Lateral Pressure (psi) = 9.5
Back Pressure (psi) = 6.0
Effective Consolidation Pressure (psi) = 3.5





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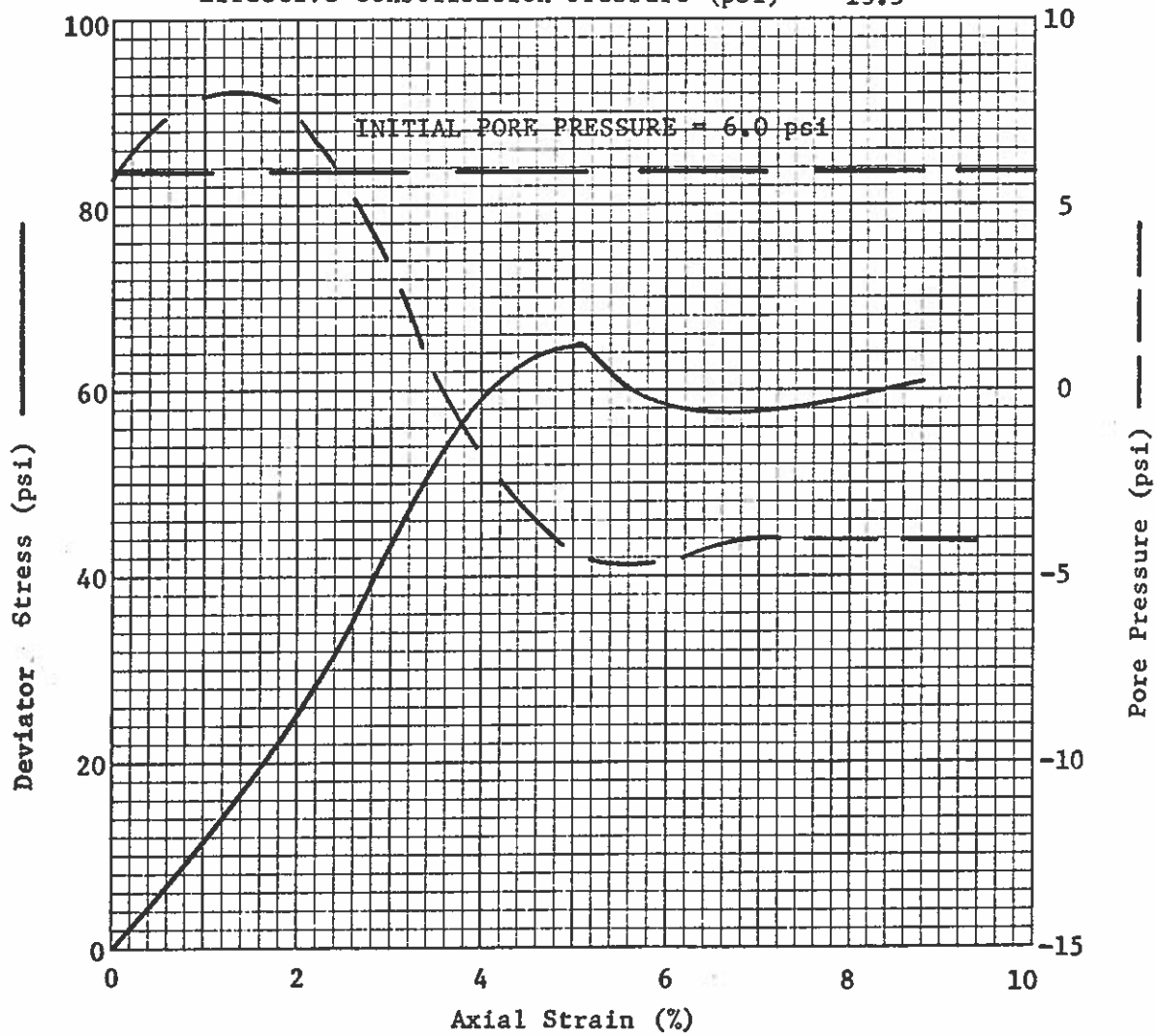
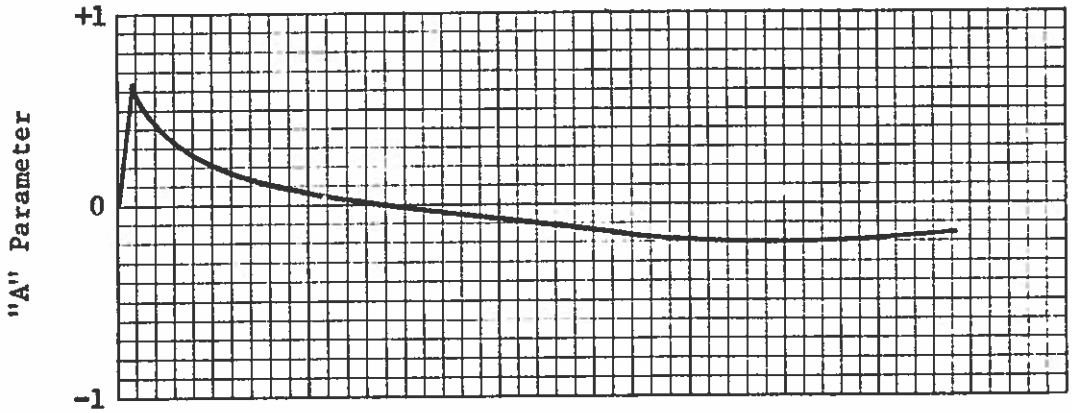
UNCONSOLIDATED-UNDRAINED TRIAXIAL TEST

Test No. 3
Sample No. 2

Project: Ash Pit No. 3 - Stuart Station
Material: Fill of Fly Ash
Source of Material: Boring 13A, Sample 3C

Lateral Pressure (psi) = 19.5
Back Pressure (psi) = 6.0
Effective Consolidation Pressure (psi) = 13.5





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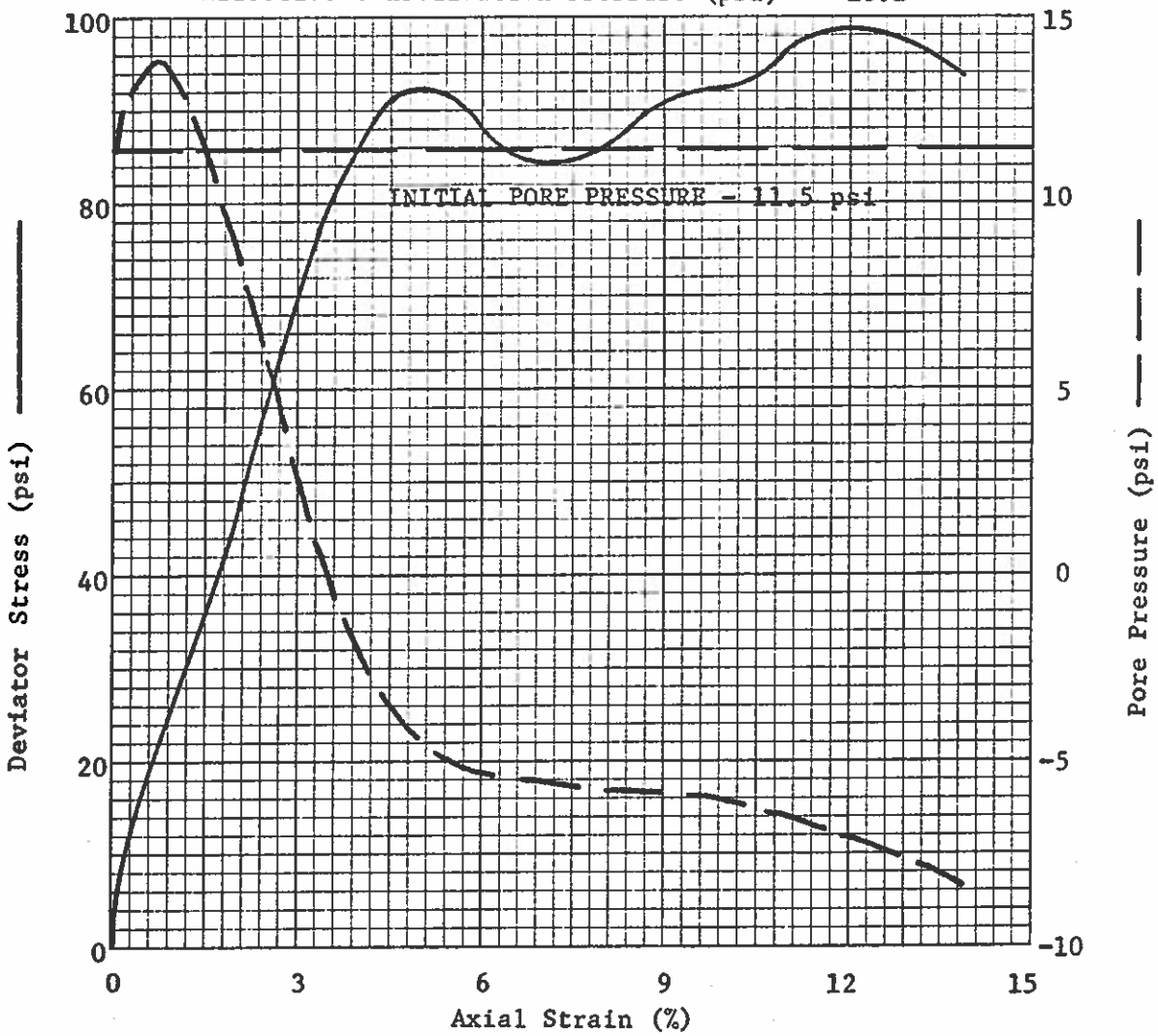
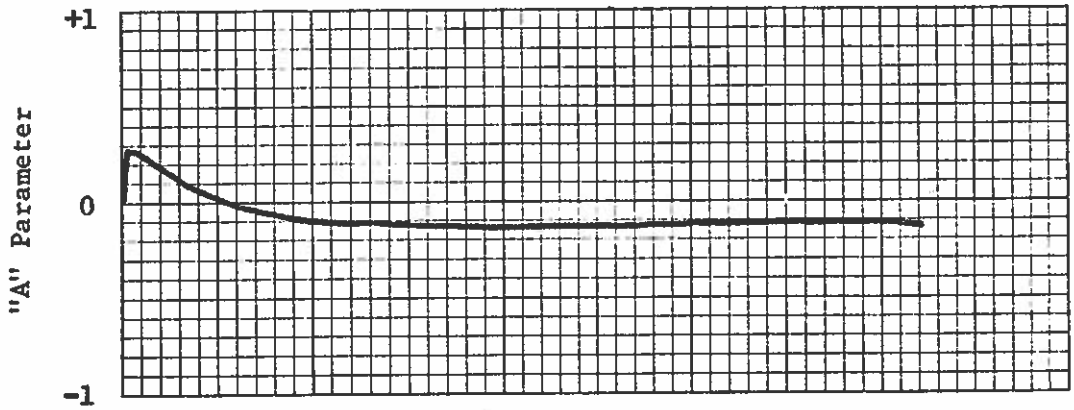
UNCONSOLIDATED-UNDRAINED TRIAXIAL TEST

Test No. 3
Sample No. 3

Project: Ash Pit No. 3 - Stuart Station
Material: Fill of Fly Ash
Source of Material: Boring 13A, Sample 3C

Lateral Pressure (psi) = 29.6
Back Pressure (psi) = 11.5
Effective Consolidation Pressure (psi) = 18.1





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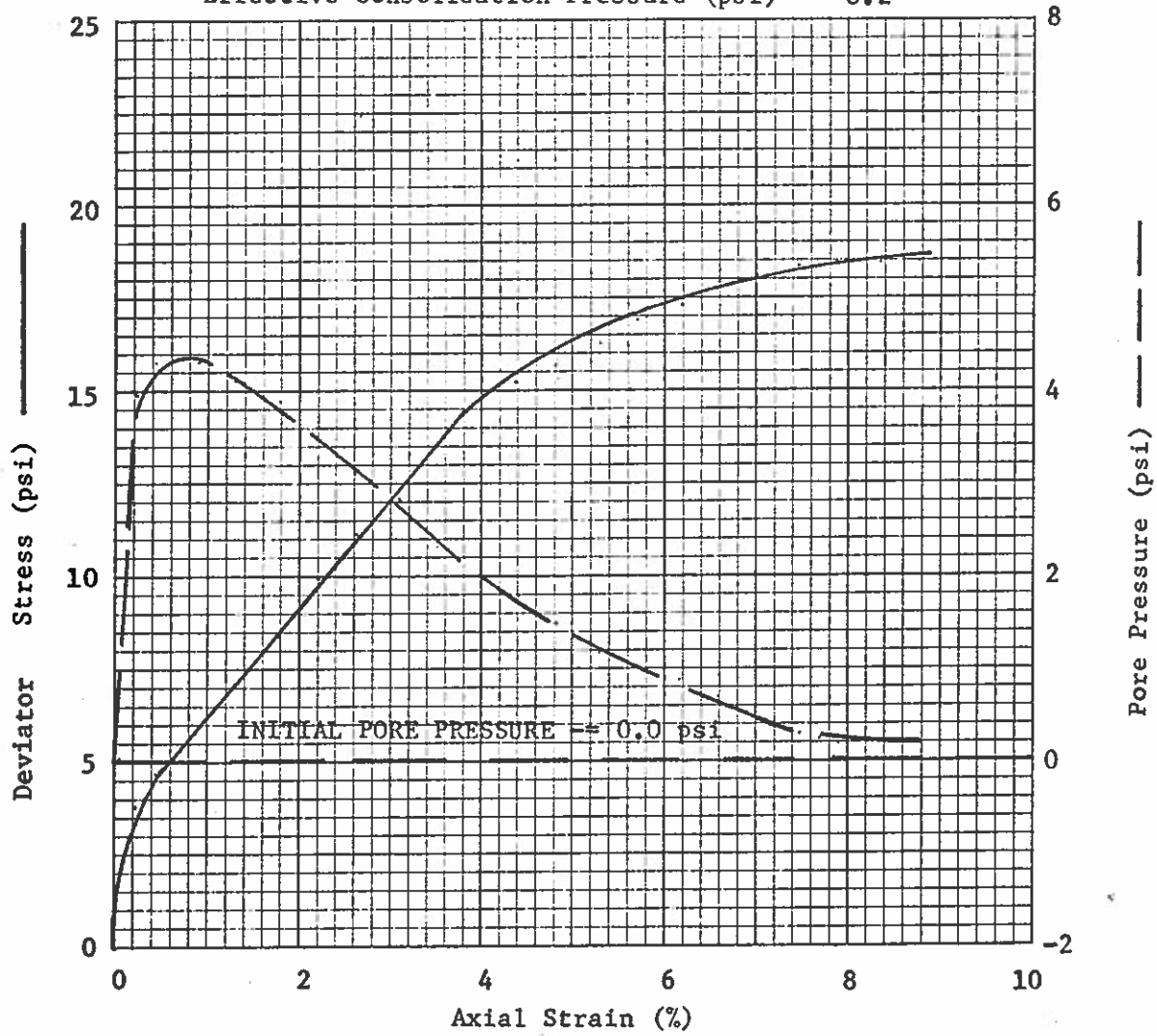
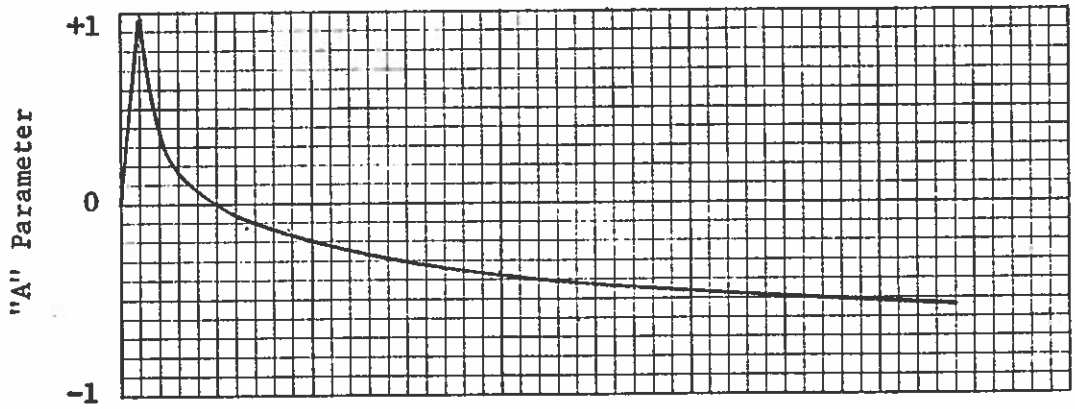
UNCONSOLIDATED-UNDRAINED TRIAXIAL TEST

Test No. 3
Sample No. 4

Project: Ash Pit No. 3 - Stuart Station
Material: Fill of Fly Ash
Source of Material: Boring 6A, Sample 3C

Lateral Pressure (psi) = 8.2
Back Pressure (psi) = 0.0
Effective Consolidation Pressure (psi) = 8.2





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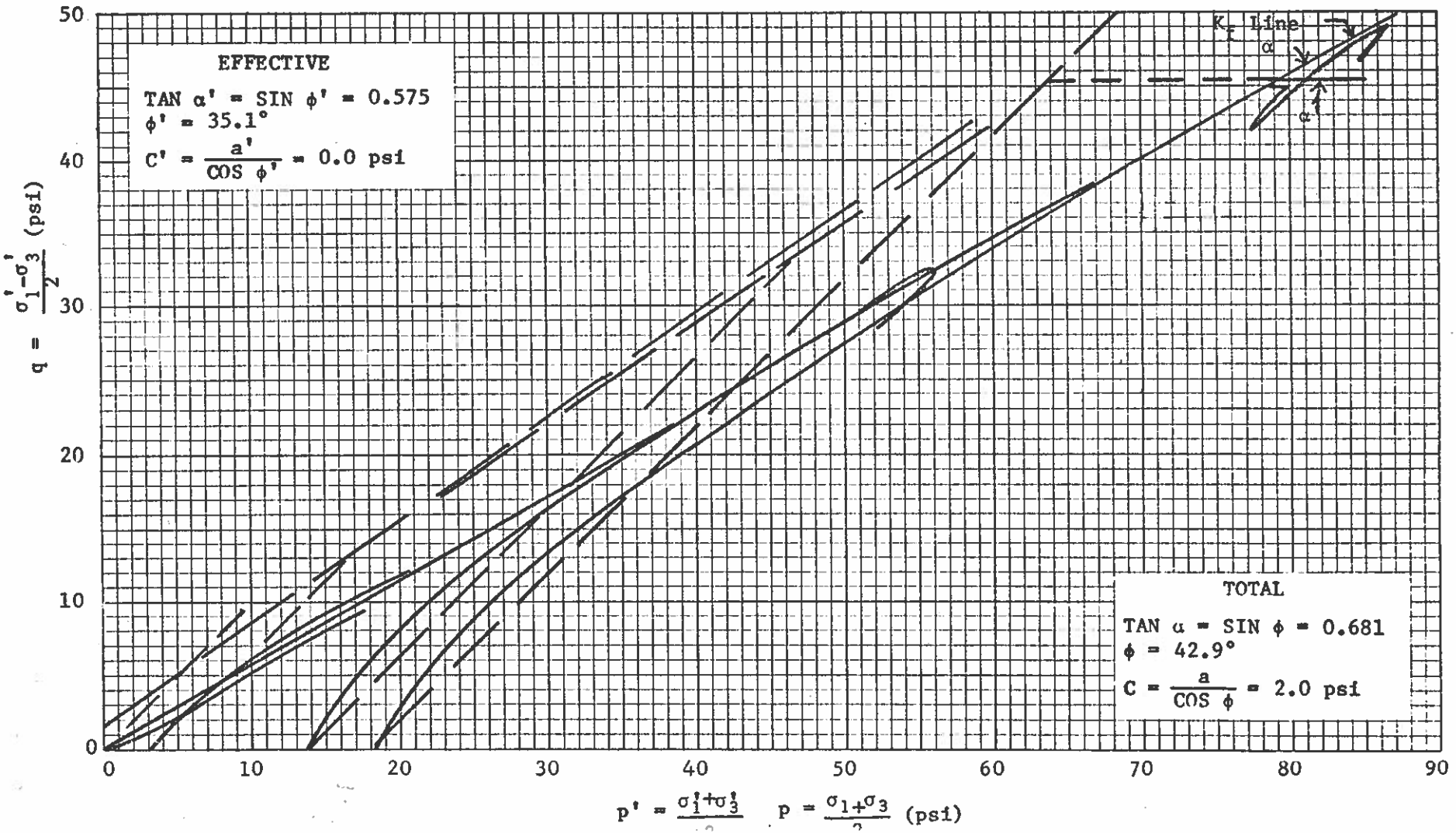
UNCONSOLIDATED-UNDRAINED TRIAXIAL STRESS PATHS

TEST NO. 3

Project: Ash Pit No. 3 - Stuart Station
Material: Fill of Fly Ash

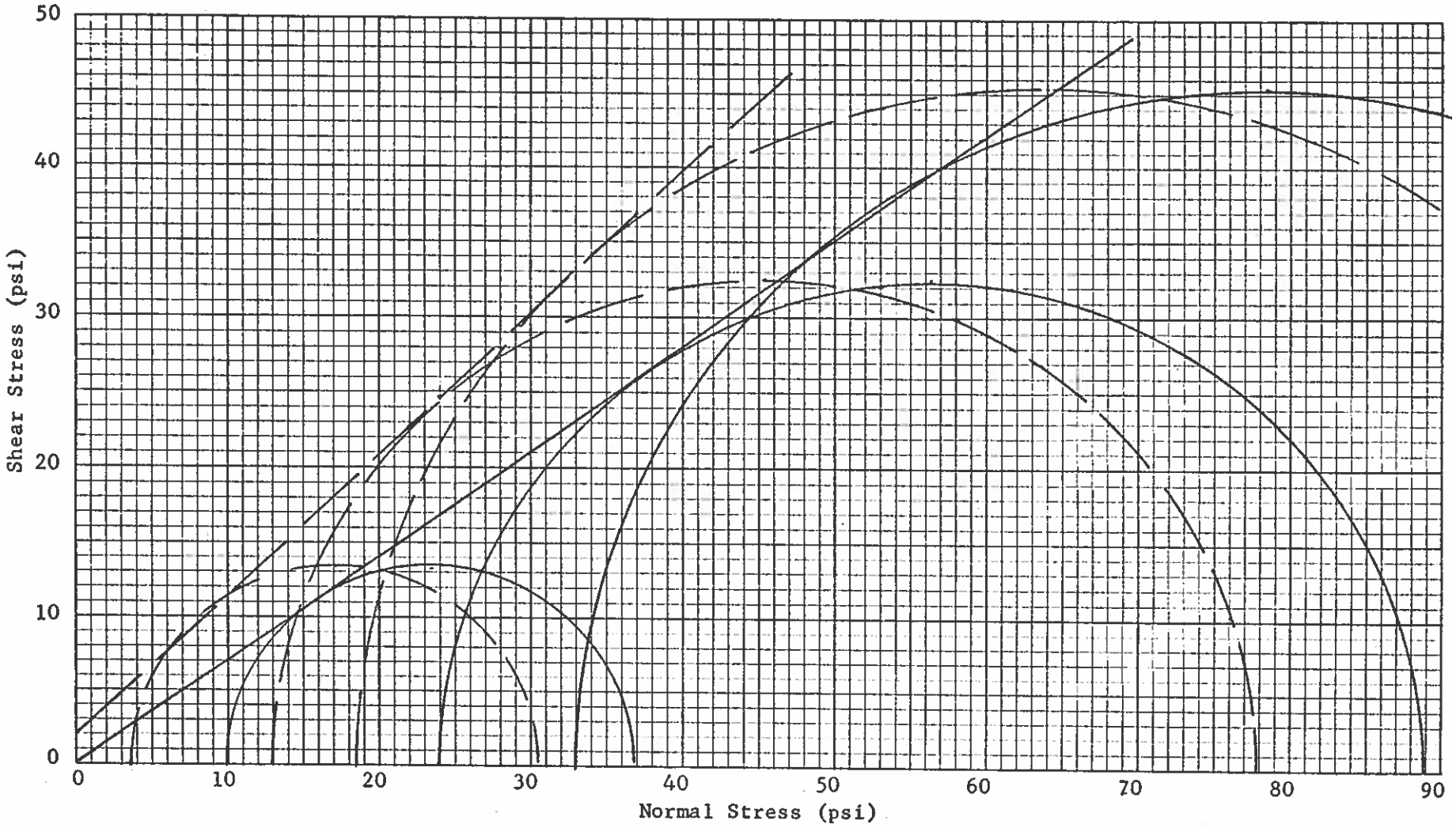
——— = Effective Stress Paths
— — — = (Total-Static Pore Pressure) Stress Paths



UNCONSOLIDATED-UNDRAINED TRIAXIAL TEST

MOHR PLOTS OF FAILURE STATES
TEST NO. 3

Project: Ash Pit No. 3 - Stuart Station
Material: Fill of Fly Ash



Strength Parameters:	C (psi)	ϕ (°)
Effective	0.0	35.1
Total	2.0	42.9

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CONSOLIDATED-UNDRAINED TRIAXIAL TEST SUMMARY

ASH PIT NO. 3 - STUART STATION

TEST NO. 4

Test Conditions:

Drainage - Double (Top-Bottom)
Axial Stress Application - Strain controlled (Karol-Warner Model 530)
Deformation Rate - 0.02 inches per minute
Chamber Fluid - De-aired water
Pore Pressure Measurement - Zero volume change pore water pressure gage (Karol-Warner Model 53-PP)

Sample Conditions:	Test Sample 1	Test Sample 2	Test Sample 3
Material:	- Fill of Fly Ash -		
Source of Material,			
Boring No.:	4A	5A	4A
Sample No.:	4C	3C	5C
Lateral Pressure (psi):	18.8	30.0	41.0
Back Pressure (psi):	9.5	10.0	9.5
Effective Consolidation Pressure (psi):	9.3	20.0	31.5
Specimen Weight (lbs):	2.148	2.280	2.076
Specimen Height (in),			
Initial:	5.938	5.925	5.552
Consolidated:	5.938	5.925	5.552
End of Test:	4.738	5.150	4.352
Specimen Diameter (in),			
Initial:	2.843	2.843	2.843
Moisture Content (%),			
Initial:	35.0	30.3	55.2
Final:	41.9	28.9	43.8
Initial Wet Unit Weight (pcf):	98.5	104.7	101.8
Dry Unit Weight (pcf),			
Initial:	73.0	80.4	65.6
Consolidated:	73.0	80.4	65.6

Measured Strength Parameters:

Effective ϕ' = 35.6°
C' = 0.0 psi
Total ϕ = 31.2°
C = 13.1 psi

BOWSER-MORNER
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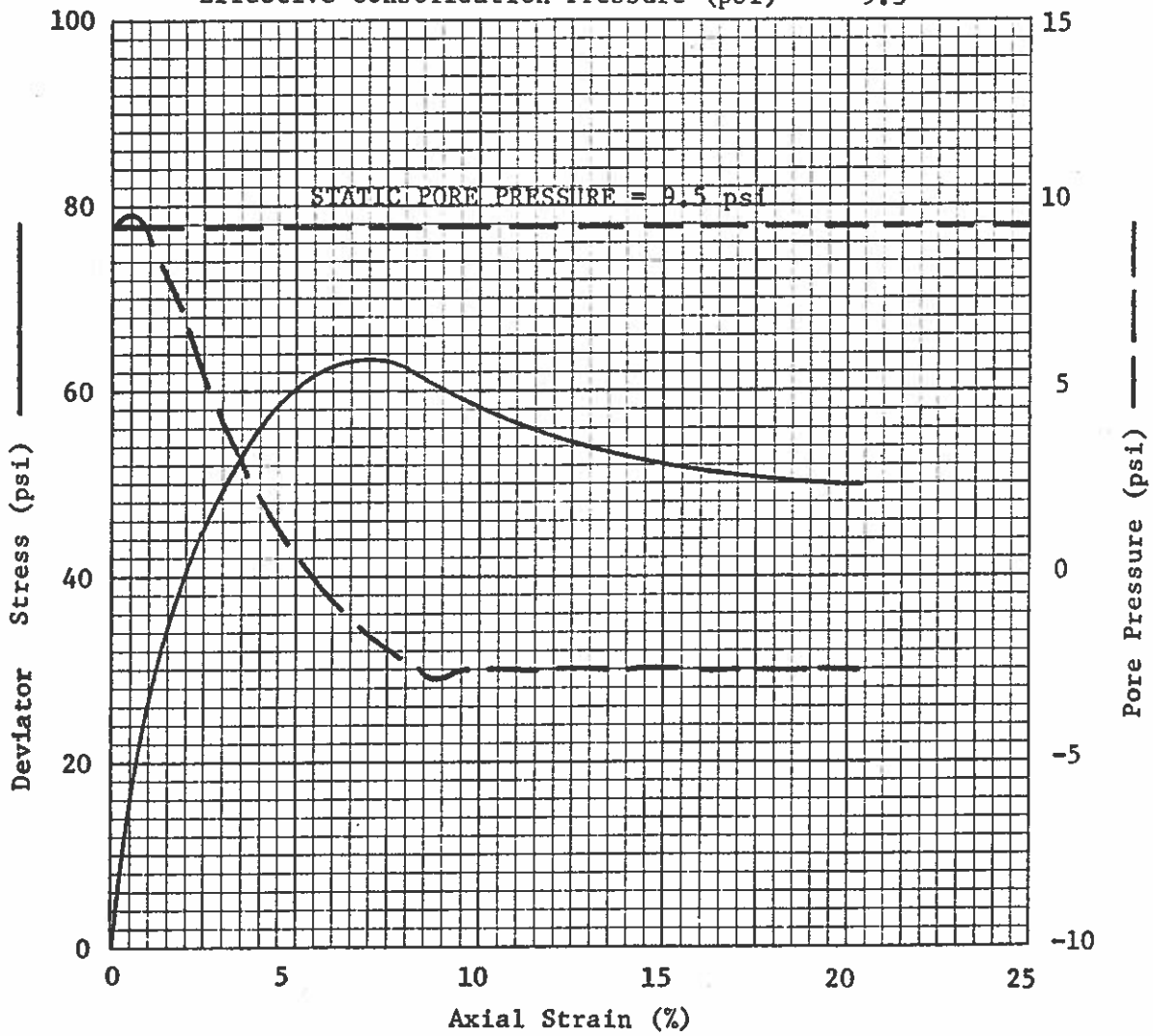
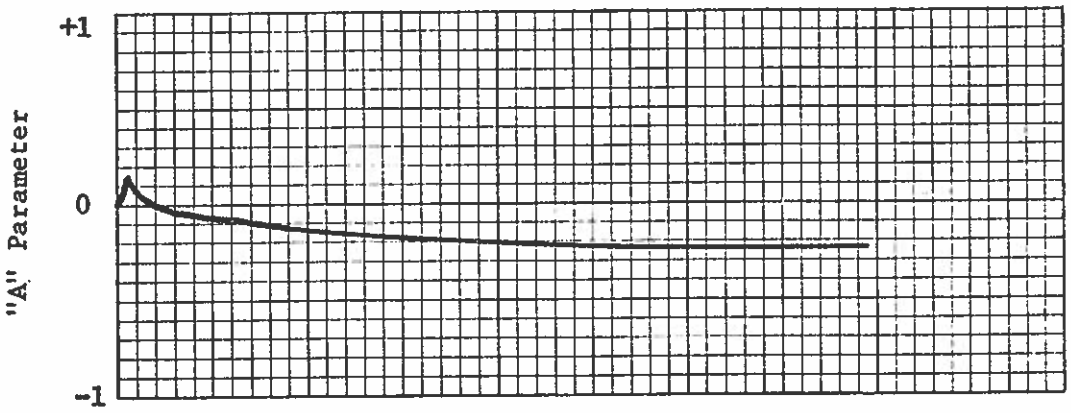
CONSOLIDATED-UNDRAINED TRIAXIAL TEST

Test No. 4
Sample No. 1

Project: Ash Pit No. 3 - Stuart Station
Material: Fill of Fly Ash
Source of Material: Boring 4A, Sample 4C

Lateral Pressure (psi) = 18.8
Back Pressure (psi) = 9.5
Effective Consolidation Pressure (psi) = 9.3





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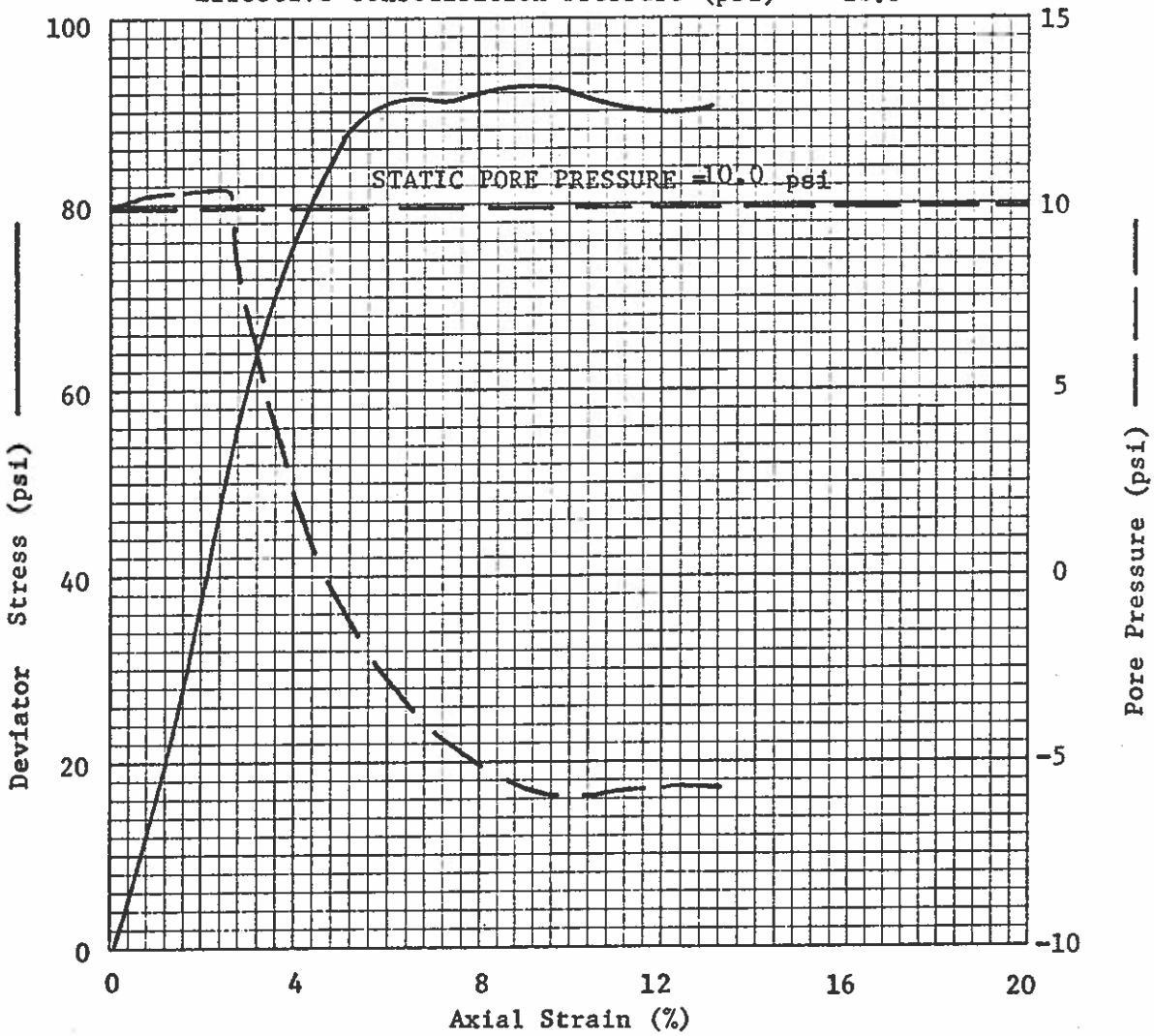
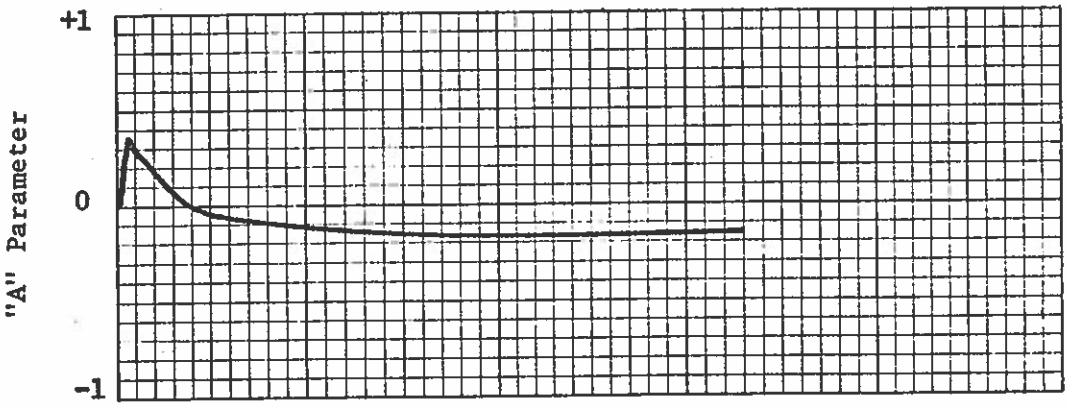
CONSOLIDATED-UNDRAINED TRIAXIAL TEST

Test No. 4
Sample No. 2

Project: Ash Pit No. 3 - Stuart Station
Material: Fill of Fly Ash
Source of Material: Boring 5A, Sample 3C

Lateral Pressure (psi) = 30.0
Back Pressure (psi) = 10.0
Effective Consolidation Pressure (psi) = 20.0





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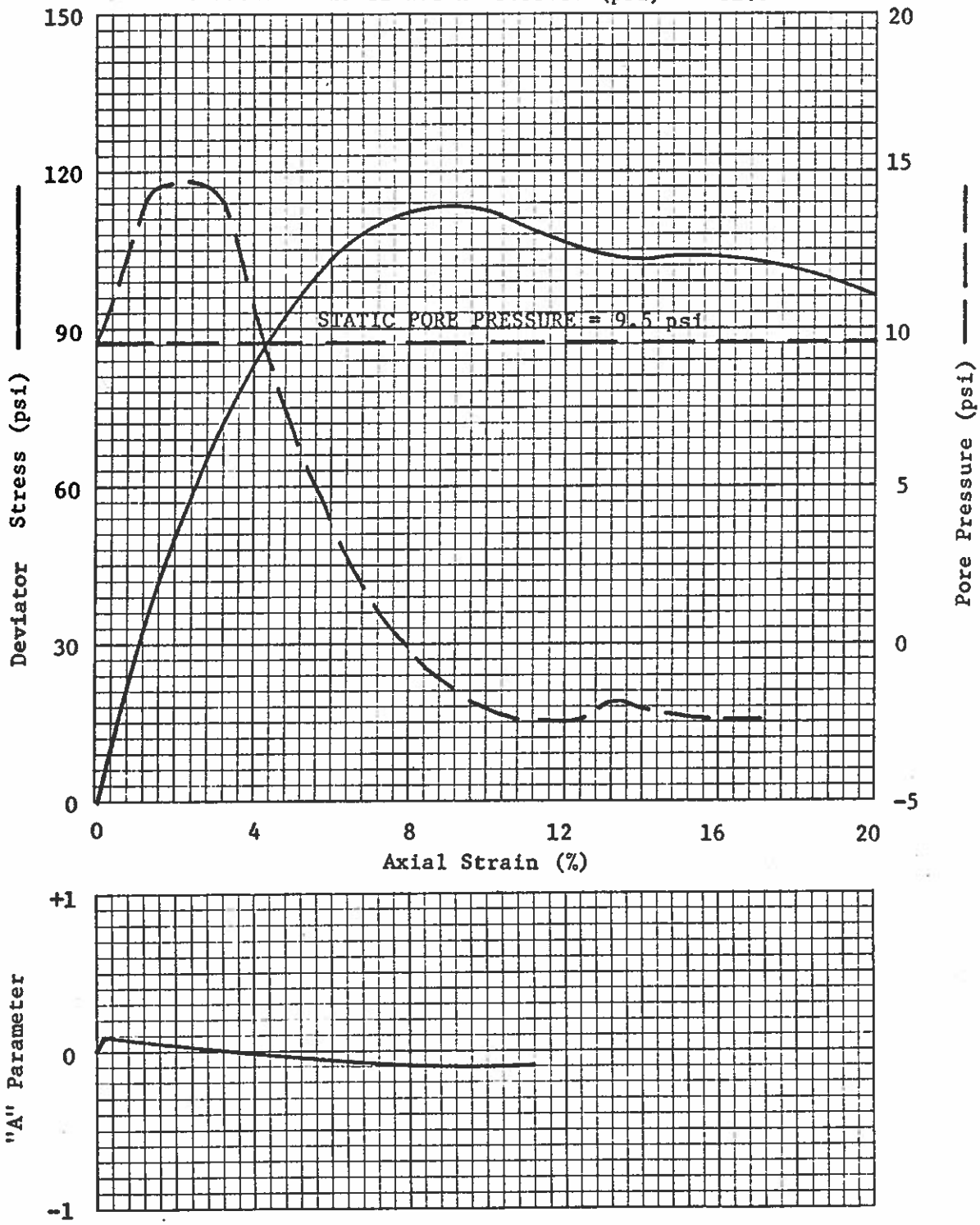
CONSOLIDATED-UNDRAINED TRIAXIAL TEST

Test No. 4
Sample No. 3

Project: Ash Pit No. 3 - Stuart Station
Material: Fill of Fly Ash
Source of Material: Boring 4A, Sample 5C

Lateral Pressure (psi) = 41.0
Back Pressure (psi) = 9.5
Effective Consolidation Pressure (psi) = 31.5



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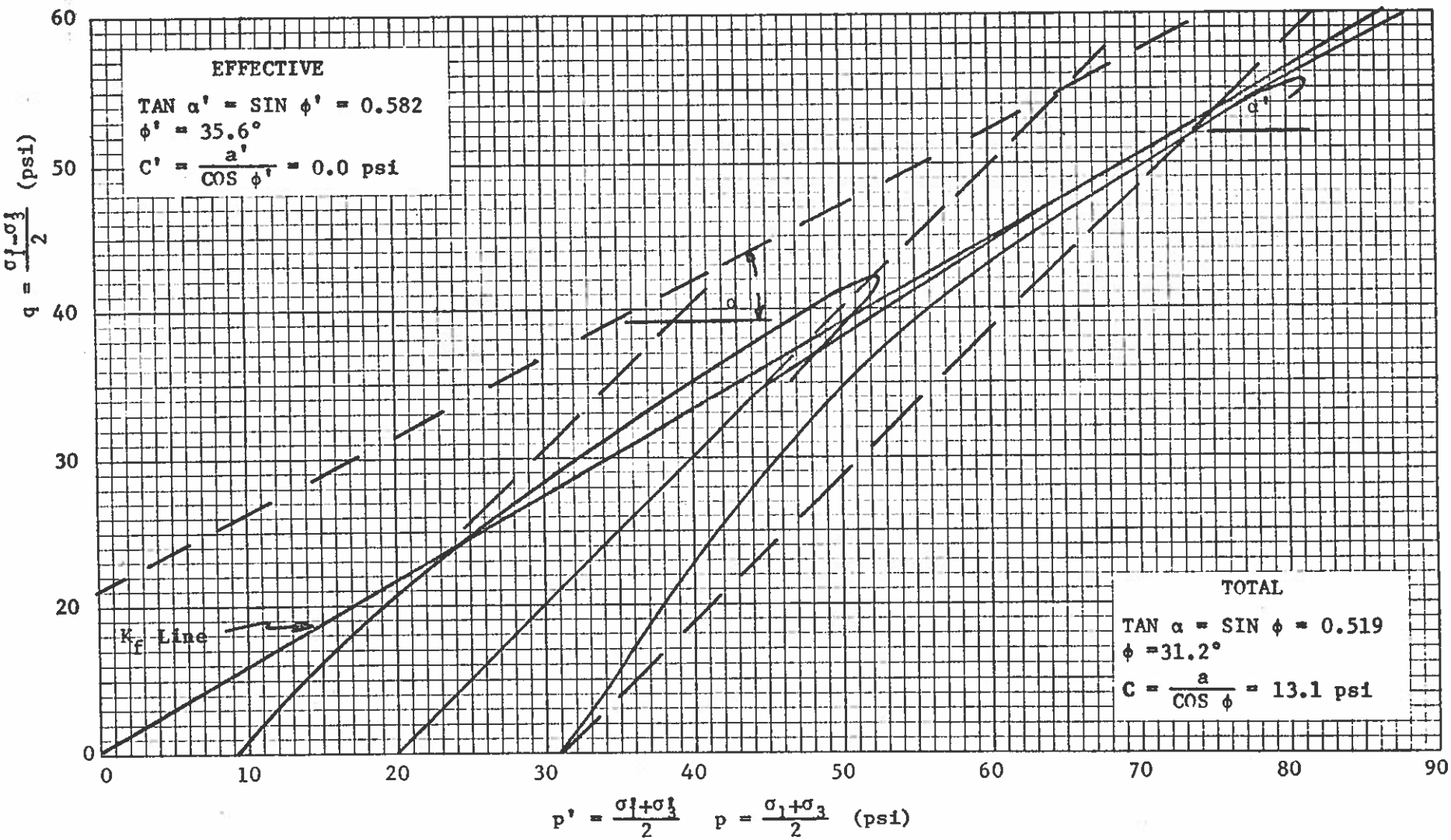
CONSOLIDATED-UNDRAINED TRIAXIAL STRESS PATHS
TEST NO. 4

Project: Ash Pit No. 3 - Stuart Station
Material: Fill of Fly Ash

——— = Effective Stress Paths
— — — = (Total-Static Pore Pressure) Stress Paths

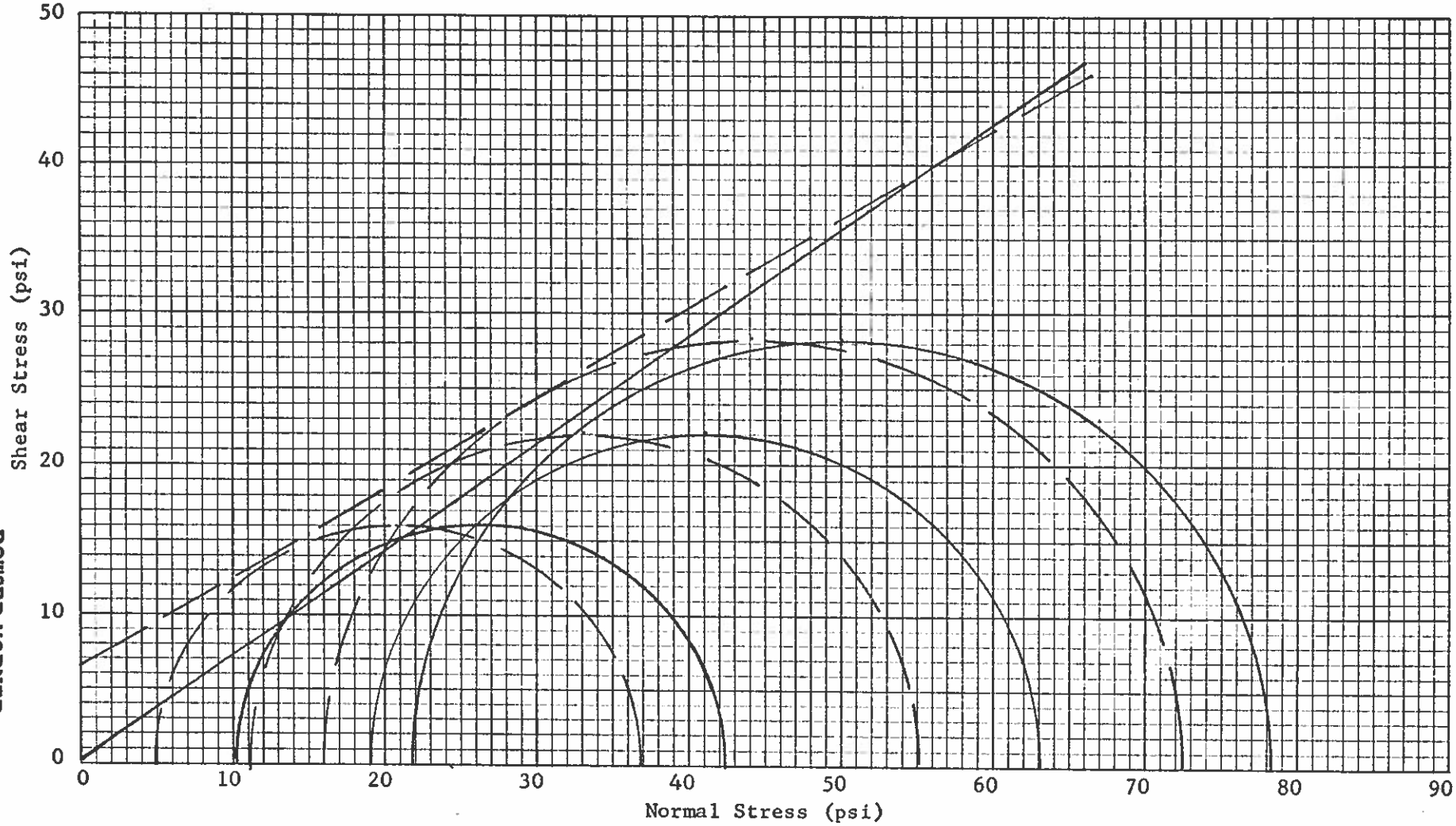


CONSOLIDATED-UNDRAINED TRIAXIAL TEST
MOHR PLOTS OF FAILURE STATES
TEST NO. 4

Project: Ash Pit No. 3 - Stuart Station
Material: Fill of Fly Ash

——— = Effective
— — — = Total

Strength Parameters:	C (psi)	ϕ (°)
Effective	0.0	35.6
Total	13.1	31.2



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UNCONSOLIDATED-UNDRAINED (WITH PORE PRESSURE) TRIAXIAL TEST SUMMARY

ASH PIT NO. 3 - STUART STATION

TEST NO. 5

Test Conditions:

Drainage - Double (Top-Bottom) with filter strips
Axial Stress Application - Strain controlled (Karol-Warner Model 530)
Deformation Rate - 0.02 inches per minute
Chamber Fluid - De-aired water
Pore Pressure Measurement - Zero volume change pore water pressure gage (Karol-Warner Model 53-PP)

Sampel Conditions:

	Test Sample 1	Test Sample 2
Material:	Brown Clay, some Silt, some Sand - Existing Dike -	
Source of Material,		
Boring No.:	1B	1B
Sample No.:	1C	1C
Lateral Pressure (psi):	10.0	20.0
Back Pressure (psi):	0.0	0.0
Effective Confining Pressure (psi):	10.0	20.0
Specimen Weight (lbs):	2.875	2.873
Specimen Height (in),		
Initial:	5.95	5.95
End of Test:	4.75	4.75
Specimen Diameter (in):	2.843	2.843
Moisture Content (%):	18.7	18.7
Wet Unit Weight (pcf):	131.5	131.5
Dry Unit Weight (pcf):	110.8	110.8

Measured Strength Parameters:

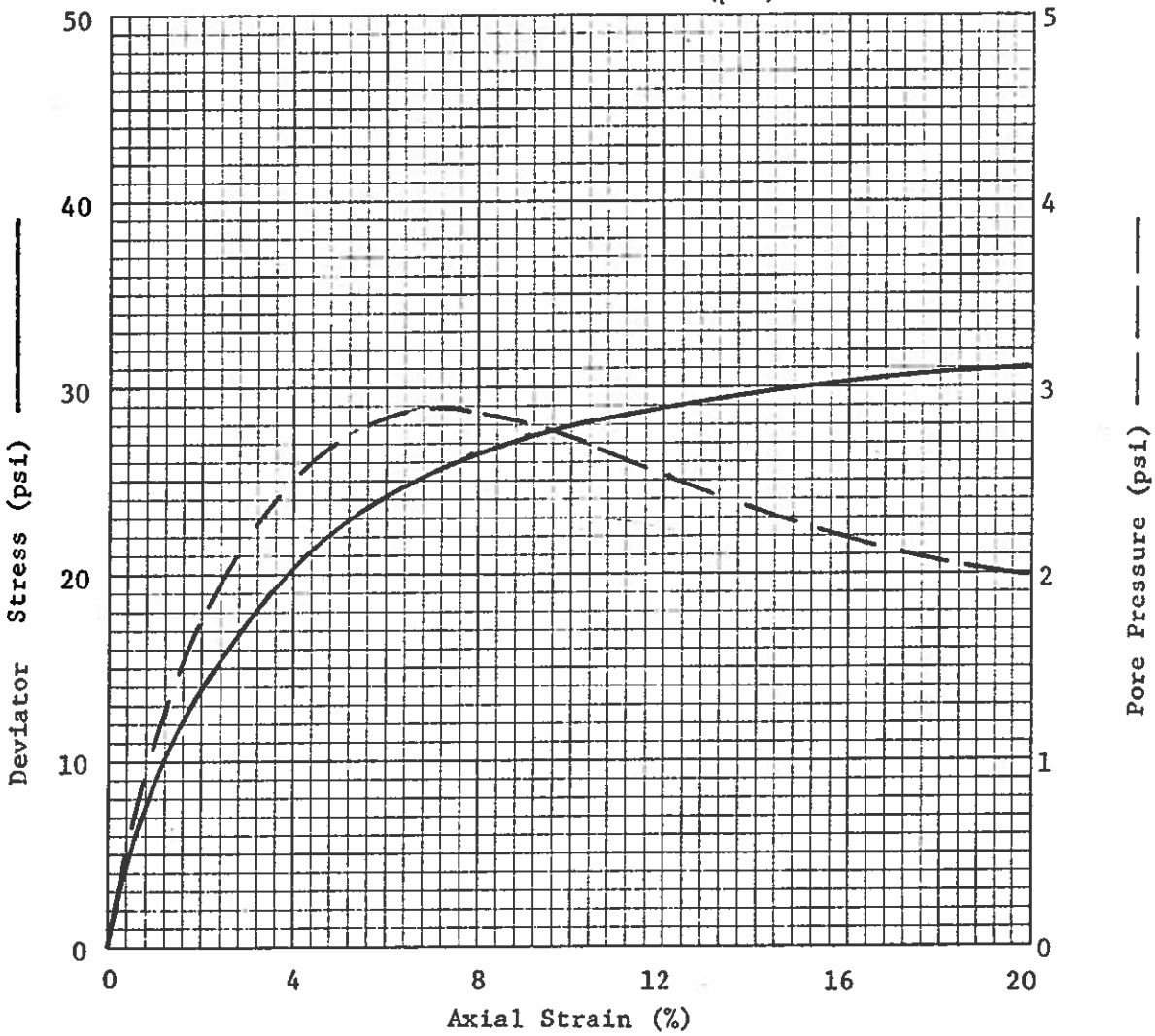
Effective ϕ' = 30.5°
C' = 3.4 psi
Total ϕ = 5.0°
C = 13.4 psi

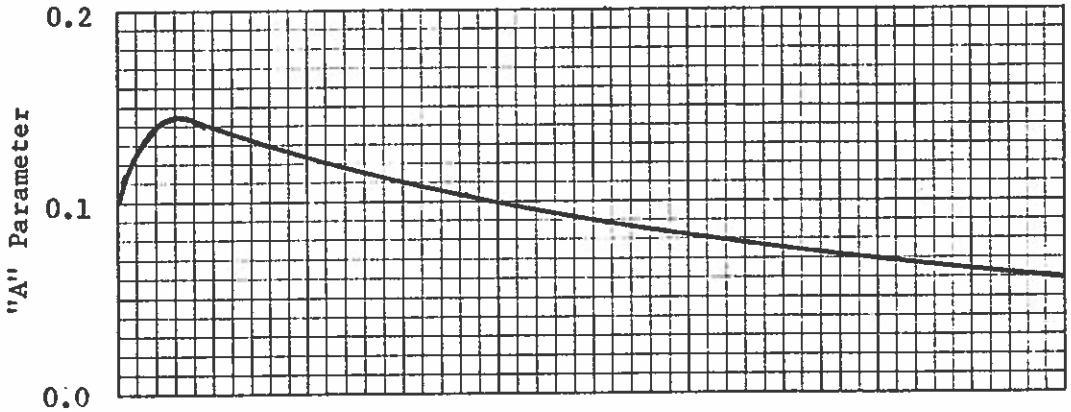
UNCONSOLIDATED-UNDRAINED TRIAXIAL TEST

Test No. 5
Sample No. 1

Project: Ash Pit No. 3 - Stuart Station
Material: Fill of Brown Clay, some Silt, some Sand
Source of Material: Boring 1B, Sample 1C

Lateral Pressure (psi) = 10.0
Back Pressure (psi) = 0.0
Effective Consolidation Pressure (psi) = 10.0





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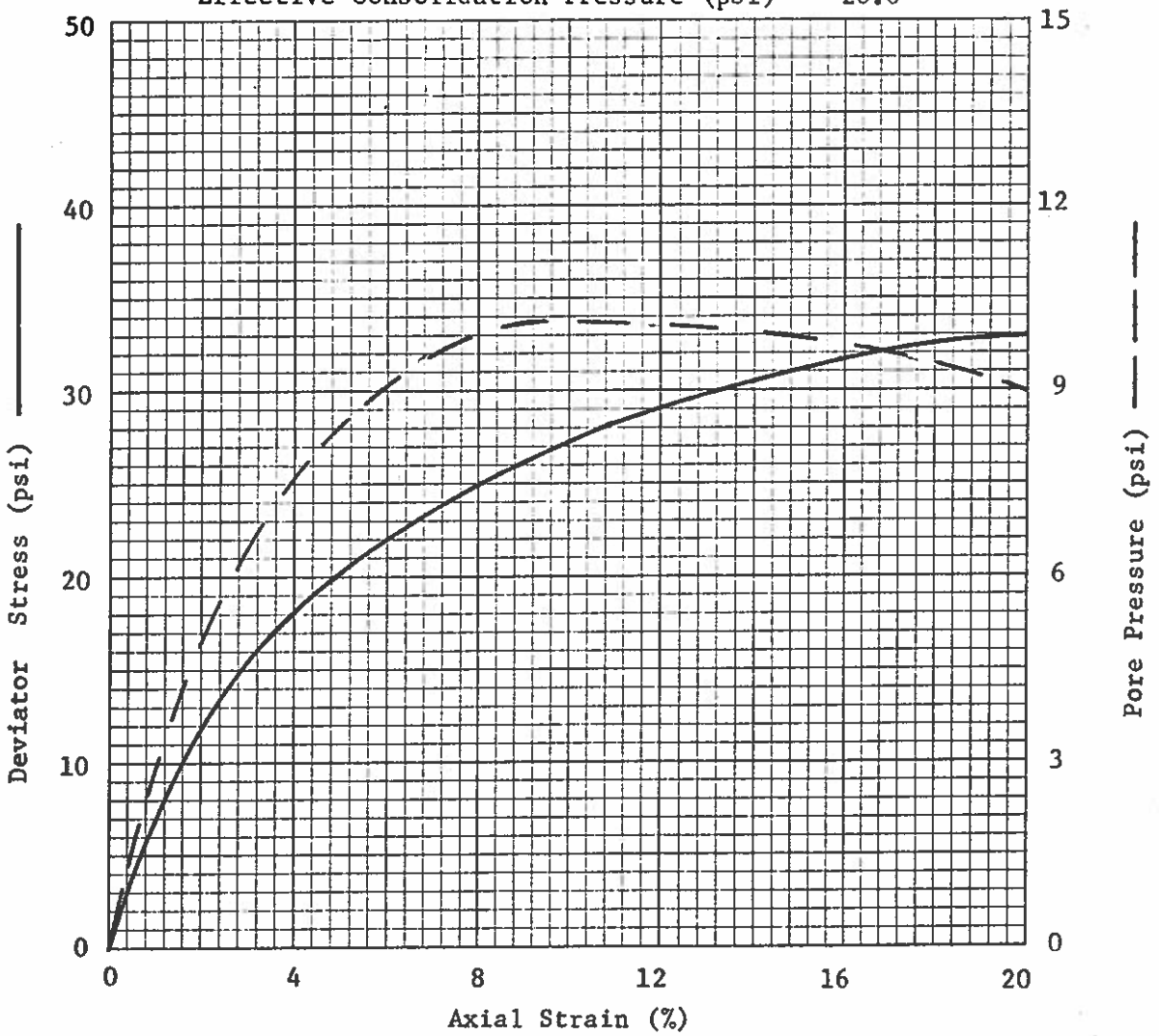
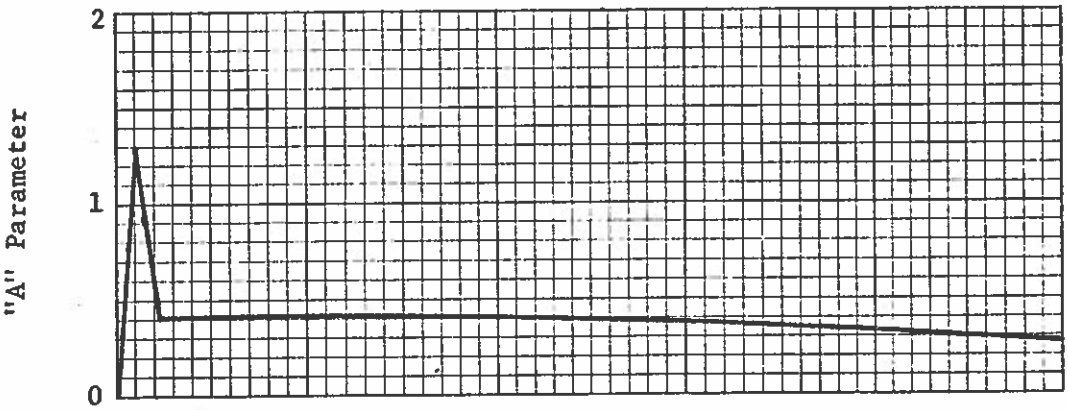
UNCONSOLIDATED-UNDRAINED TRIAXIAL TEST

Test No. 5
Sample No. 2

Project: Ash Pit No. 3 - Stuart Station
Material: Fill of Brown Clay, some Silt, some Sand
Source of Material: Boring 1B, Sample 1C

Lateral Pressure (psi) = 20.0
Back Pressure (psi) = 0.0
Effective Consolidation Pressure (psi) = 20.0





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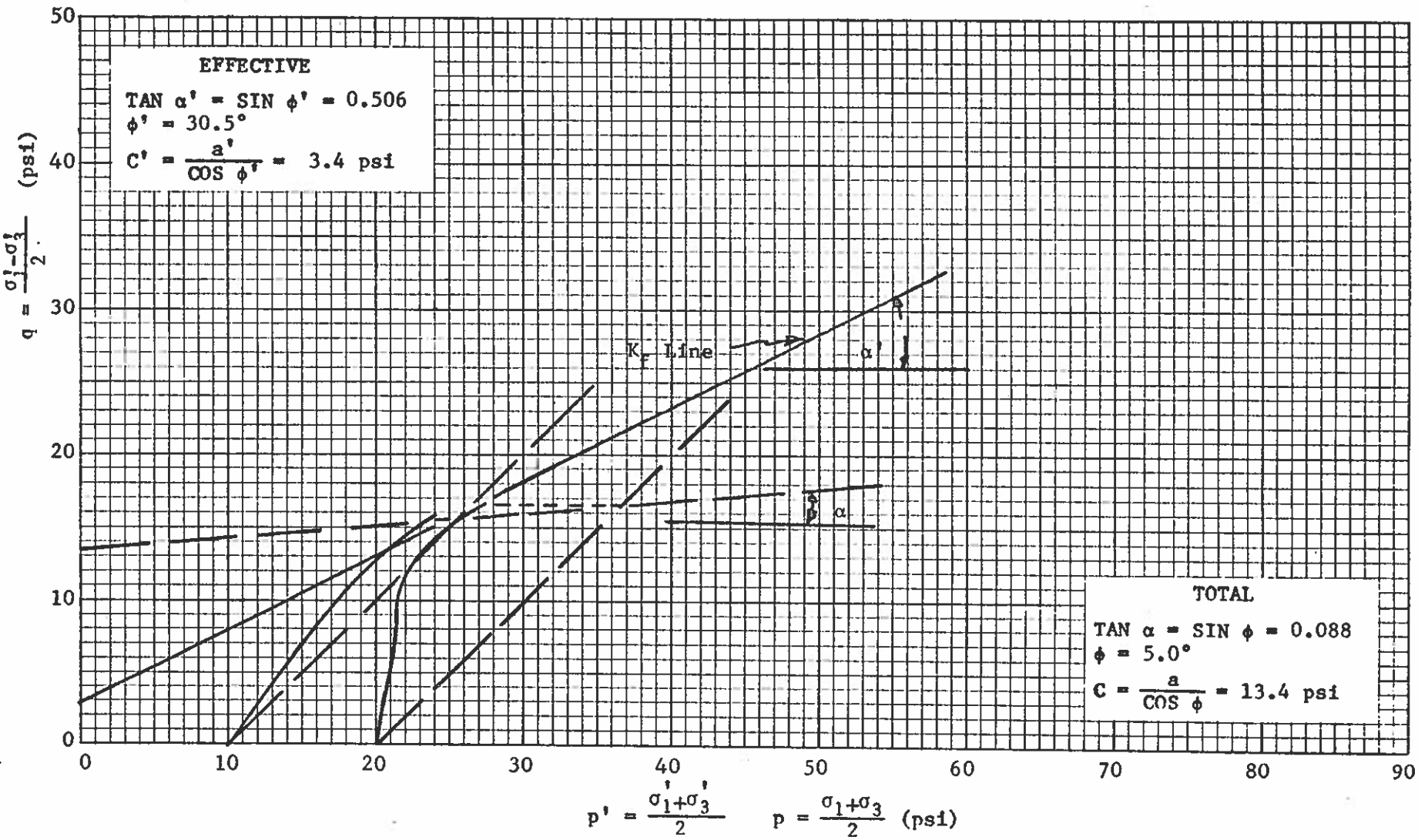
UNCONSOLIDATED-UNDRAINED TRIAXIAL STRESS PATHS

TEST NO. 5

Project: Ash Pit No. 3 - Stuart Station
Material: Fill of Brown Clay, some Silt, some Sand

——— = Effective Stress Paths
— — — = (Total-Static Pore Pressure) Stress Paths



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Testing Laboratories, Inc.

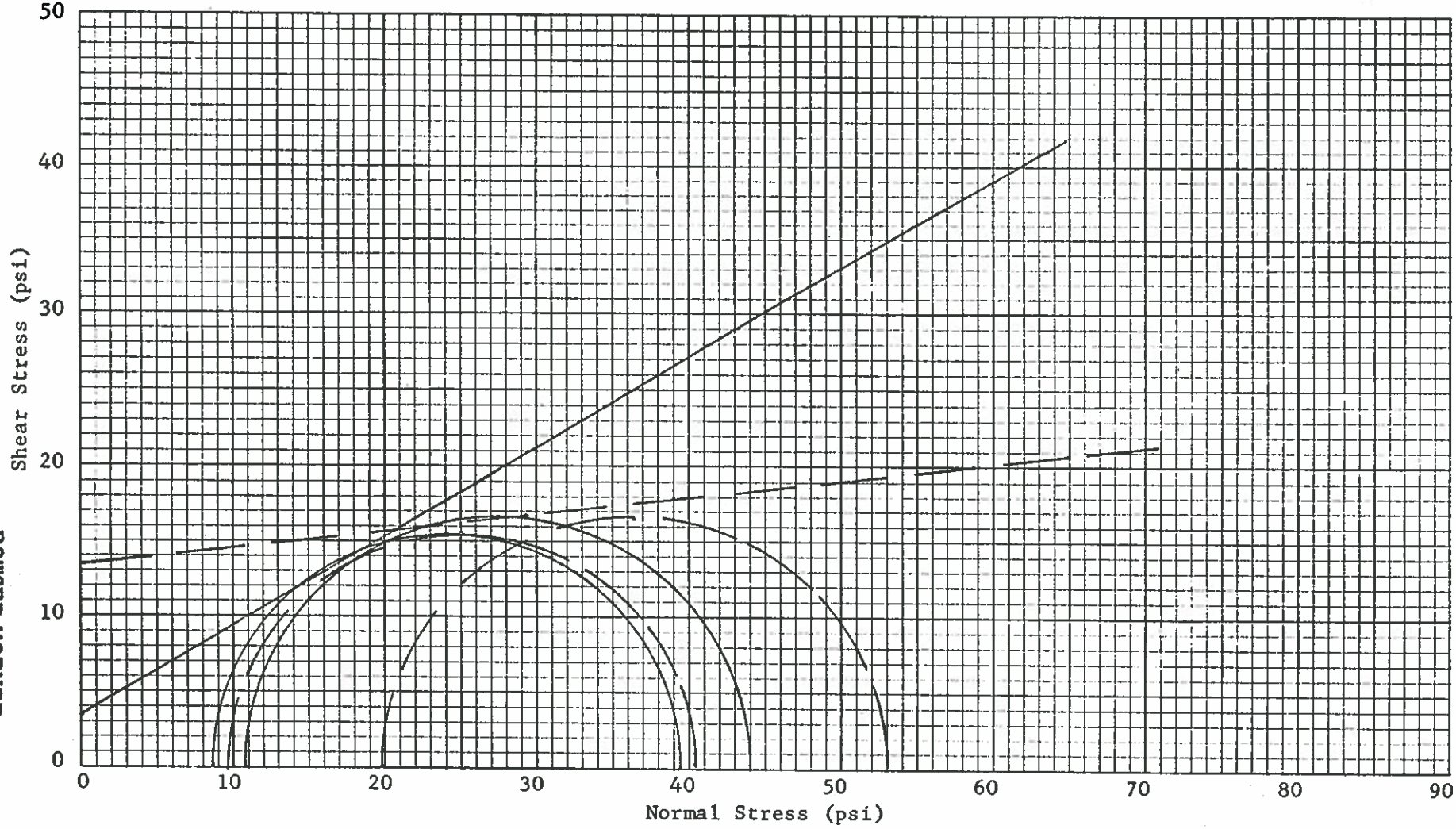
UNCONSOLIDATED-UNDRAINED TRIAXIAL TEST
MOHR PLOTS OF FAILURE STATES

TEST NO. 5

Project: Ash Pit No. 3 - Stuart Station
Material: Fill of Brown Clay, some Silt, some Sand

——— = Effective
—·—·— = Total

Strength Parameters:	C (psi)	ϕ (°)
Effective	3.4	30.5
Total	13.4	5.0



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UNCONSOLIDATED-UNDRAINED TRIAXIAL TEST SUMMARY

ASH PIT NO. 3 - STUART STATION

TEST NO. 6

Test Conditions:

Axial Stress Application - Strain controlled (Karol-Warner Model 530)
Deformation Rate - 0.05 inches per minute
Chamber Fluid - De-aired water

Sample Conditions:

	Test Sample 1	Test Sample 2	Test Sample 3
Material:	- Fill of Fly Ash -		
Source of Material,			
Boring No.:	9A	3A	4A
Sample No.:	1C	1C	3C
Lateral Pressure (psi):	10.0	19.5	30.0
Back Pressure (psi):	0.0	0.0	0.0
Effective Confining Pressure (psi):	10.0	19.5	30.0
Specimen Weight (lbs):	1.51	1.92	1.80
Specimen Height (in):	5.343	5.859	6.000
Specimen Diameter (in):	2.843	2.843	2.843
Moisture Content (%):	33.5	8.9	21.1
Initial Wet Unit Weight (pcf):	77.01	89.29	81.70
Dry Unit Weight (pcf):	57.67	81.99	67.46

Measured Strength Parameters:

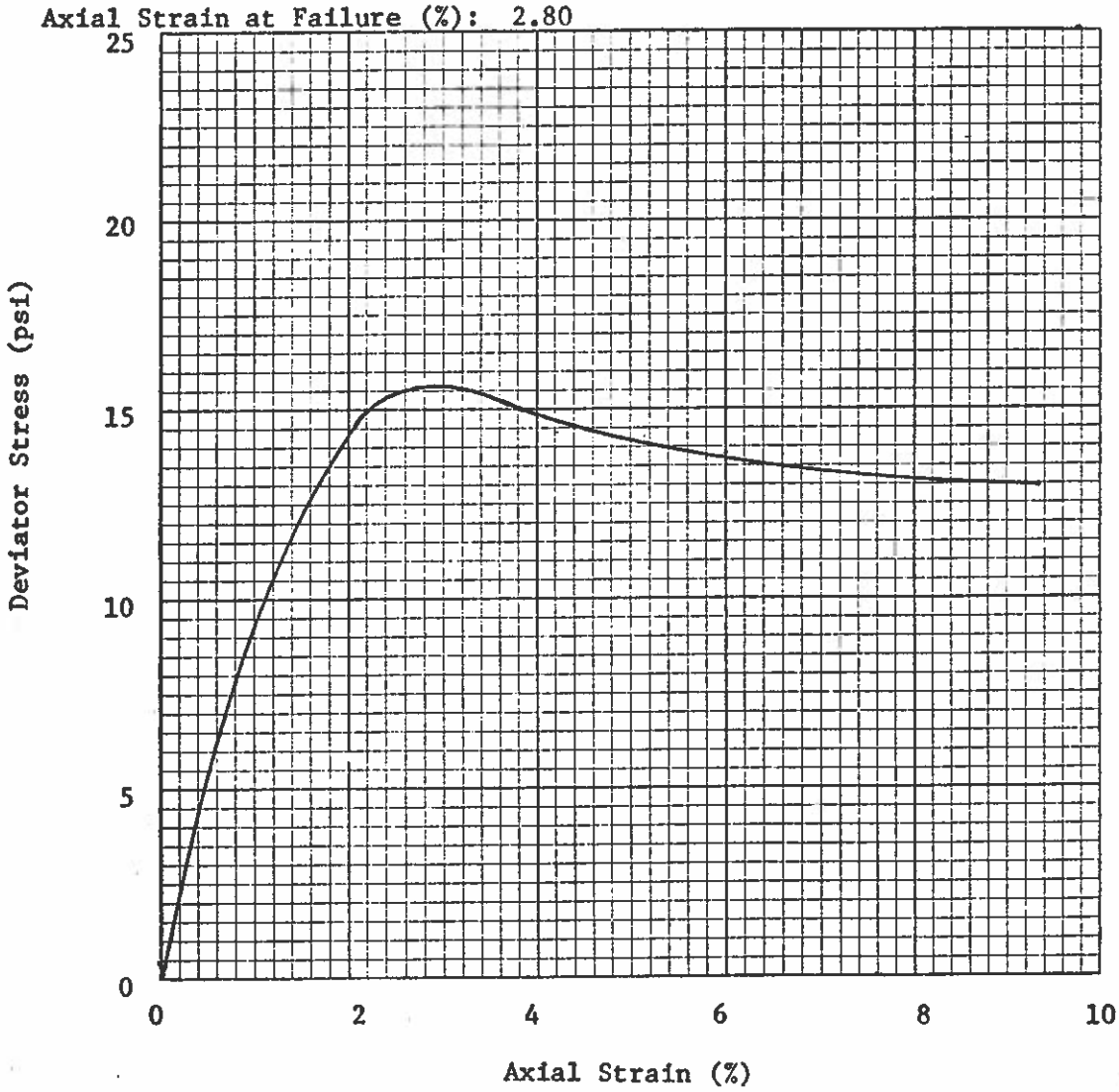
Total ϕ = 30.1°
C = 0.0 psi

UNCONSOLIDATED-UNDRAINED TRIAXIAL TEST
Test No. 6
Sample No. 1

Project: Ash Pit No. 3 - Stuart Station
Boring No.: 9A
Sample No.: 1C
Depth Interval of Test Sample: 11.9 - 12.4'

Test Conditions:
Drainage - None
Axial Stress Application - Strain controlled (Karol-Warner Model 530)
Deformation Rate - 0.05 inches per minute
Chamber Fluid - De-aired water

SPECIMEN DATA
Diameter (inches): 2.843
Height (inches): 5.343
Test Specimen Weight (lbs): 1.51
Wet Unit Weight (pcf): 77.01
Dry Unit Weight (pcf): 57.67
Moisture Content (%): 33.5
Lateral Pressure (psi): 10.0
Back Pressure (psi): None
Soil Classification: Fill of Fly Ash
Deviator Stress at Failure (psi): 15.753
Axial Strain at Failure (%): 2.80

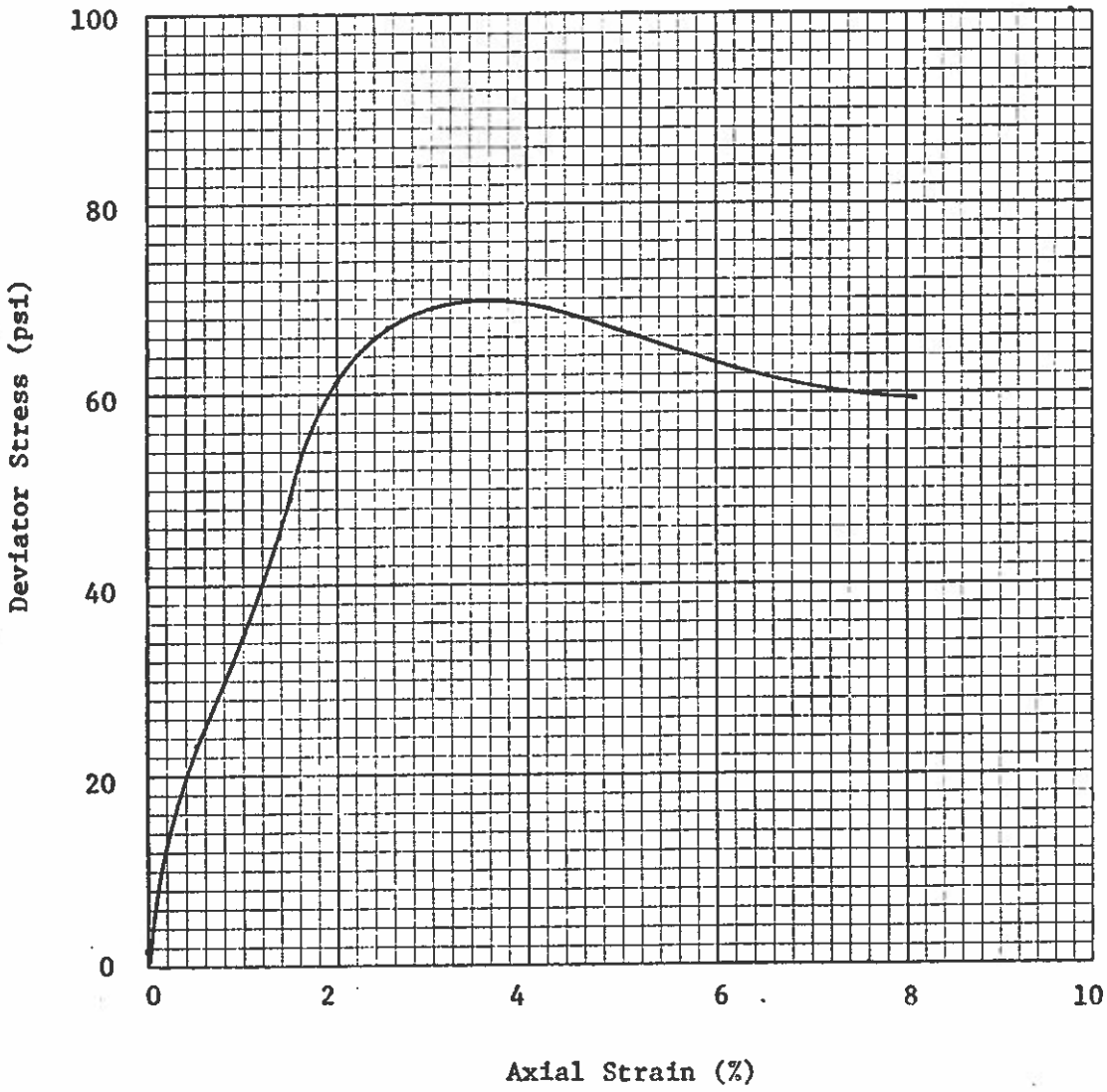


UNCONSOLIDATED-UNDRAINED TRIAXIAL TEST
Test No. 6
Sample No. 2

Project: Ash Pit No. 3 - Stuart Station
Boring No.: 3A
Sample No.: 1C
Depth Interval of Test Sample: 1.0 - 3.0'

Test Conditions:
Drainage - None
Axial Stress Application - Strain controlled (Karol-Warner Model 530)
Deformation Rate - 0.05 inches per minute
Chamber Fluid - De-aired water

SPECIMEN DATA
Diameter (inches): 2.843
Height (inches): 5.859
Test Specimen Weight (lbs): 1.92
Wet Unit Weight (pcf): 89.29
Dry Unit Weight (pcf): 81.99
Moisture Content (%): 8.9
Lateral Pressure (psi): 19.5
Back Pressure (psi): None
Soil Classification: Fill of Fly Ash
Deviator Stress at Failure (psi): 68.73
Axial Strain at Failure (%): 3.41

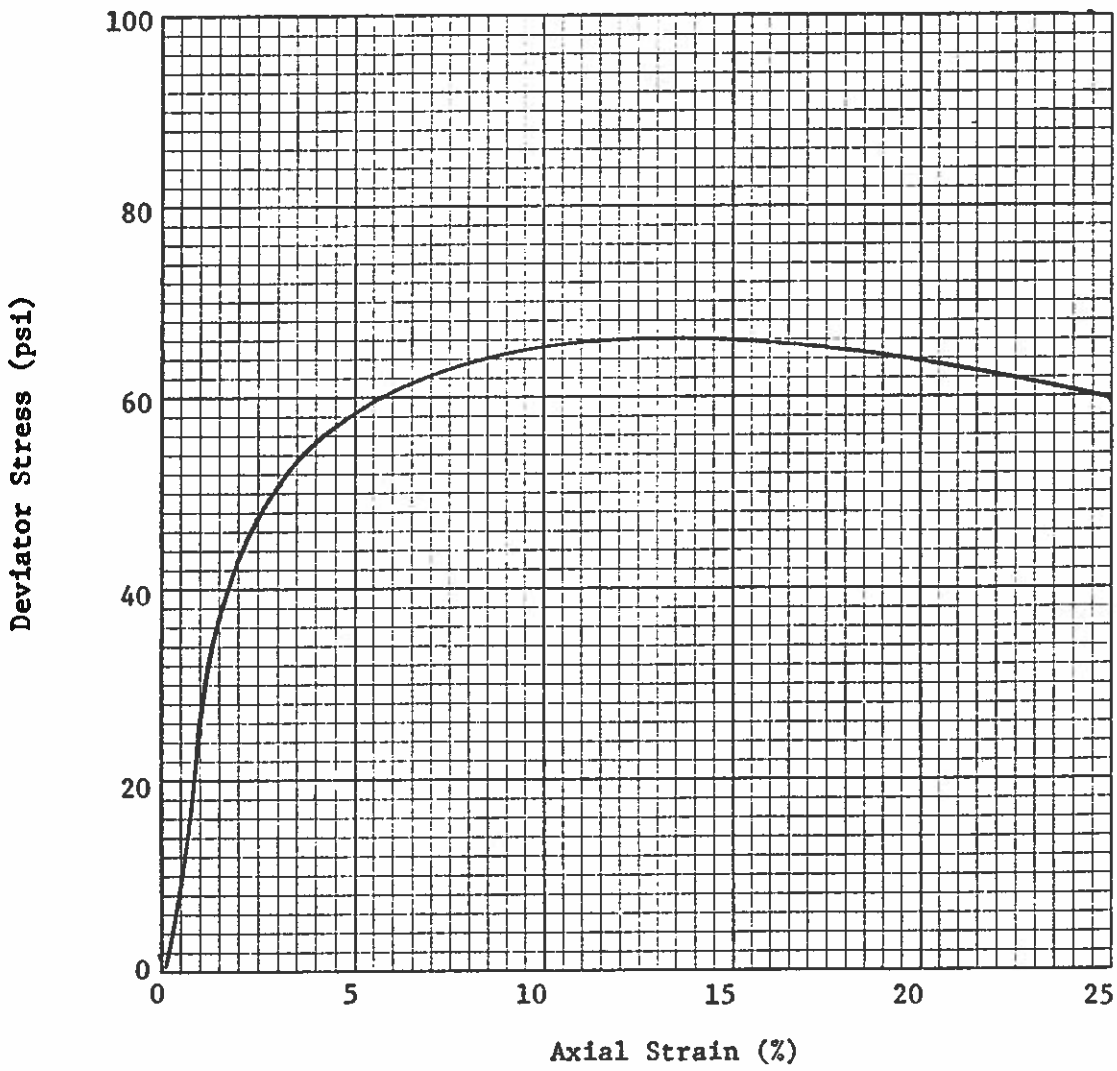


UNCONSOLIDATED-UNDRAINED TRIAXIAL TEST
Test No. 6
Sample No. 3

Project: Ash Pit No. 3 - Stuart Station
Boring No: 4A
Sample No: 3C
Depth Interval of Test Sample: 13.7 - 14.2'

Test Conditions:
Drainage - None
Axial Stress Application - Strain controlled (Karol-Warner Model 530)
Deformation Rate - 0.05 inches per minute
Chamber Fluid - De-aired water

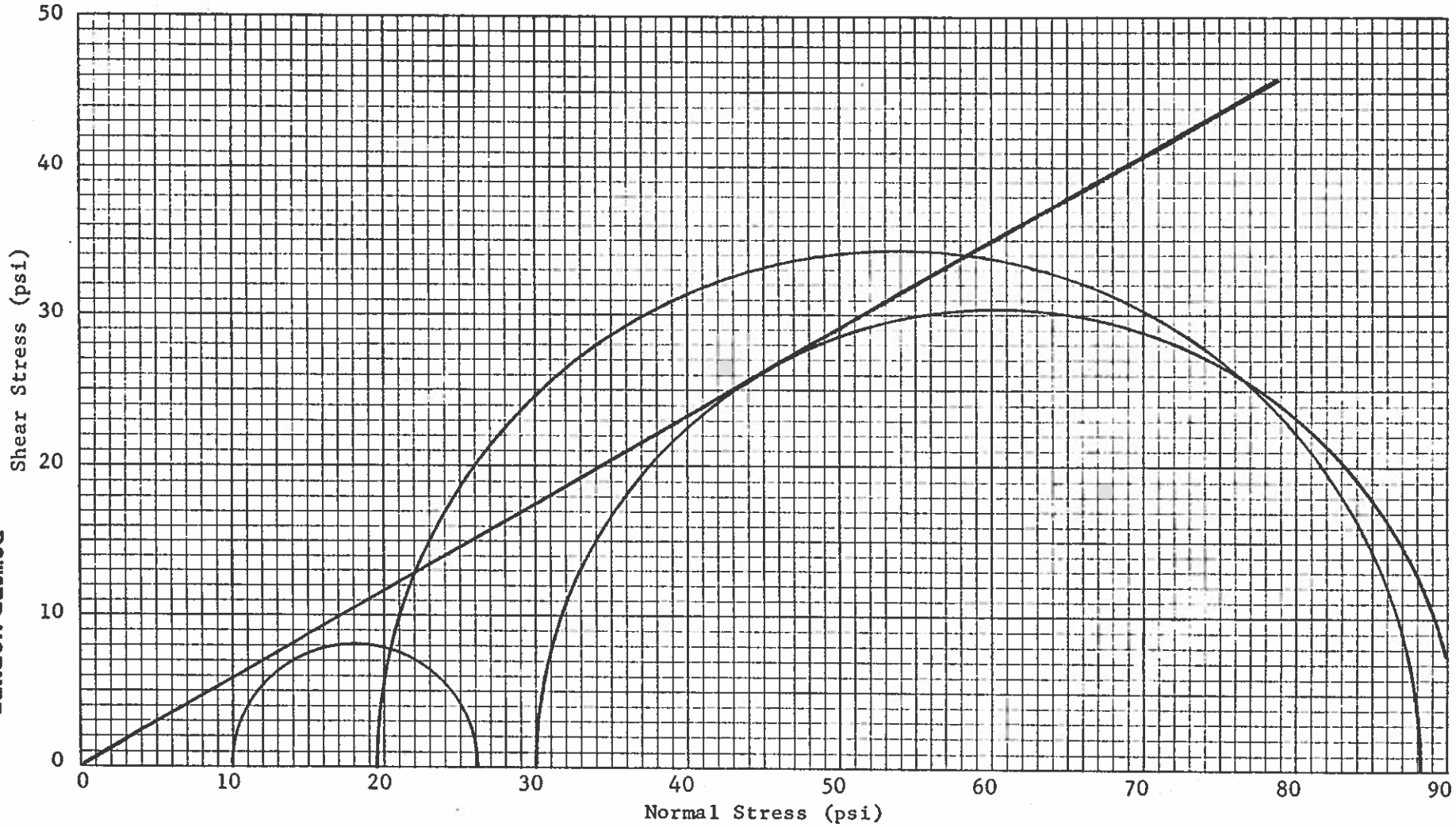
SPECIMEN DATA
Daimater (inches): 2.843
Height (inches): 6.0
Test Specimen Weight (lbs): 1.80
Wet Unit Weight (pcf): 81.70
Dry Unit Weight (pcf): 67.46
Moisture Content (%): 21.1
Lateral Pressure (psi): 30.0
Back Pressure (psi): None
Soil Classification: Fill of Fly Ash
Deviator Stress at Failure (psi): 61.019
Axial Strain at Failure (%): 24.16



UNCONSOLIDATED-UNDRAINED TRIAXIAL TEST
MOHR PLOTS OF FAILURE STATES
TEST NO. 6

Project: Ash Pit No. 3 - Stuart Station
Material: Fill of Fly Ash

Strength Parameters:	C (psi)	ϕ (°)
	0.0	30.1



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UNCONSOLIDATED-UNDRAINED TRIAXIAL TEST SUMMARY

ASH PIT NO. 3 - STUART STATION

TEST NO. 7

Test Conditions:

Axial Stress Application - Strain controlled (Karol-Warner Model 530)
Deformation Rate - 0.05 inches per minute
Chamber Fluid - De-aired water

Sample Conditions:

	Test Sample 1	Test Sample 2	Test Sample 3
Material:	- Fill of Fly Ash -		
Source of Material,			
Boring No.:	3A	4A	5A
Sample No.:	2C	2C	1C
Lateral Pressure (psi):	9.5	20.0	30.0
Back Pressure (psi):	0.0	0.0	0.0
Effective Confining Pressure (psi):	9.5	20.0	30.0
Specimen Weight (lbs):	2.37	2.20	2.29
Specimen Height (in):	6.062	6.000	5.937
Specimen Diameter (in):	2.843	2.843	2.843
Moisture Content (%):	11.9	33.3	29.2
Initial Wet Unit Weight (pcf):	106.5	99.91	105.1
Dry Unit Weight (pcf):	95.2	74.9	81.3

Measured Strength Parameters:

Total ϕ = 30.2°
C = 5.5 psi

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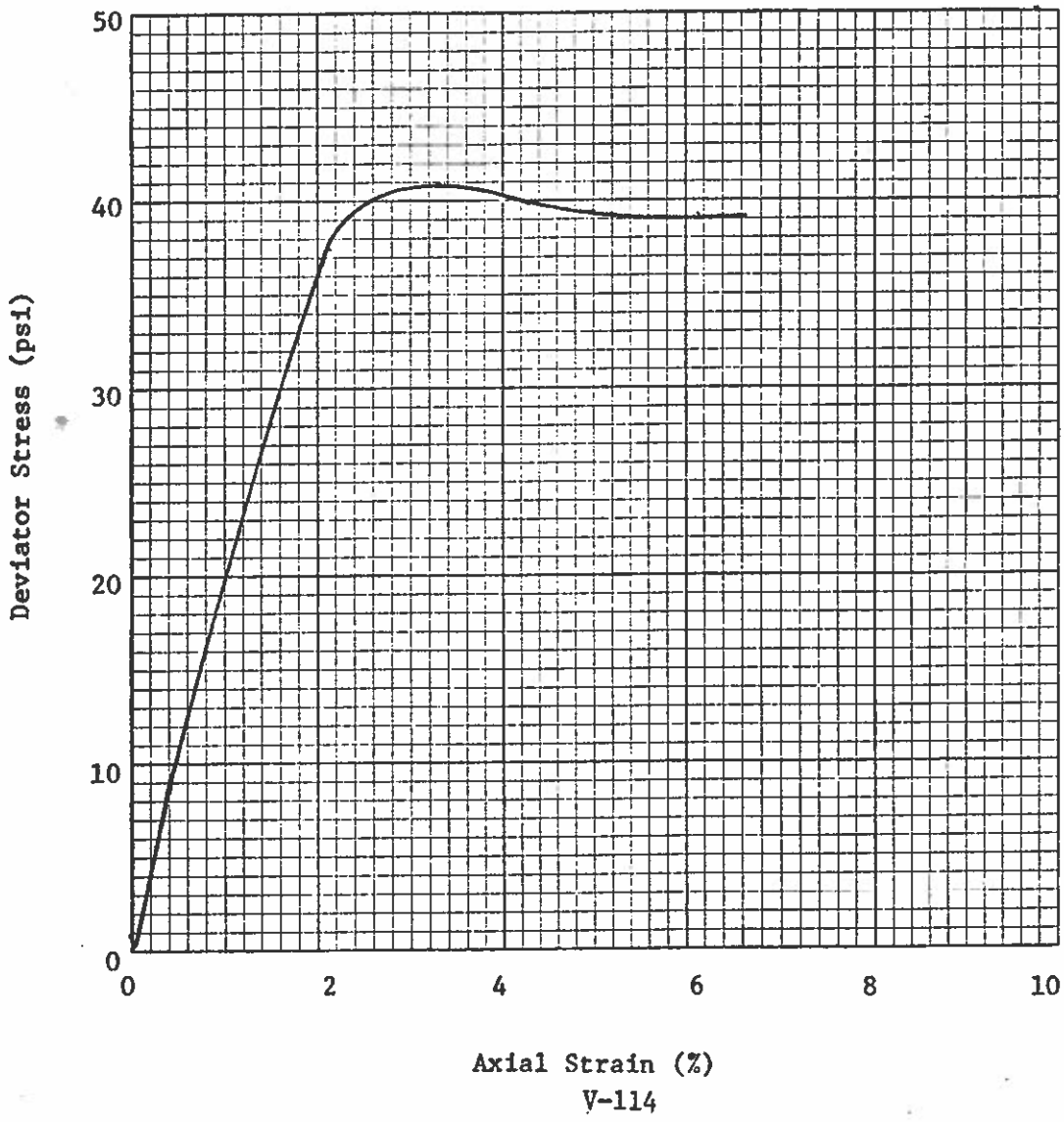
Testing Laboratories, Inc.

UNCONSOLIDATED-UNDRAINED TRIAXIAL TEST
Test No. 7
Sample No. 1

Project: Ash Pit No. 3 - Stuart Station
Boring No: 3A
Sample No: 2C
Depth Interval of Test Sample: 6.0 - 8.0'

Test Conditions:
Drainage - None
Axial Stress Application - Strain controlled (Karol-Warner Model 530)
Deformation Rate - 0.05 inches per minute
Chamber Fluid - De-aired water

SPECIMEN DATA
Diameter (inches): 2.843
Height (inches): 6.062
Test Specimen Weight (lbs): 2.37
Wet Unit Weight (pcf): 106.53
Dry Unit Weight (pcf): 95.20
Moisture Content (%): 11.9
Lateral Pressure (psi): 9.5
Back Pressure (psi): None
Soil Classification: Fill of Fly Ash
Deviator Stress at Failure (psi): 41.13
Axial Strain at Failure (%): 2.96

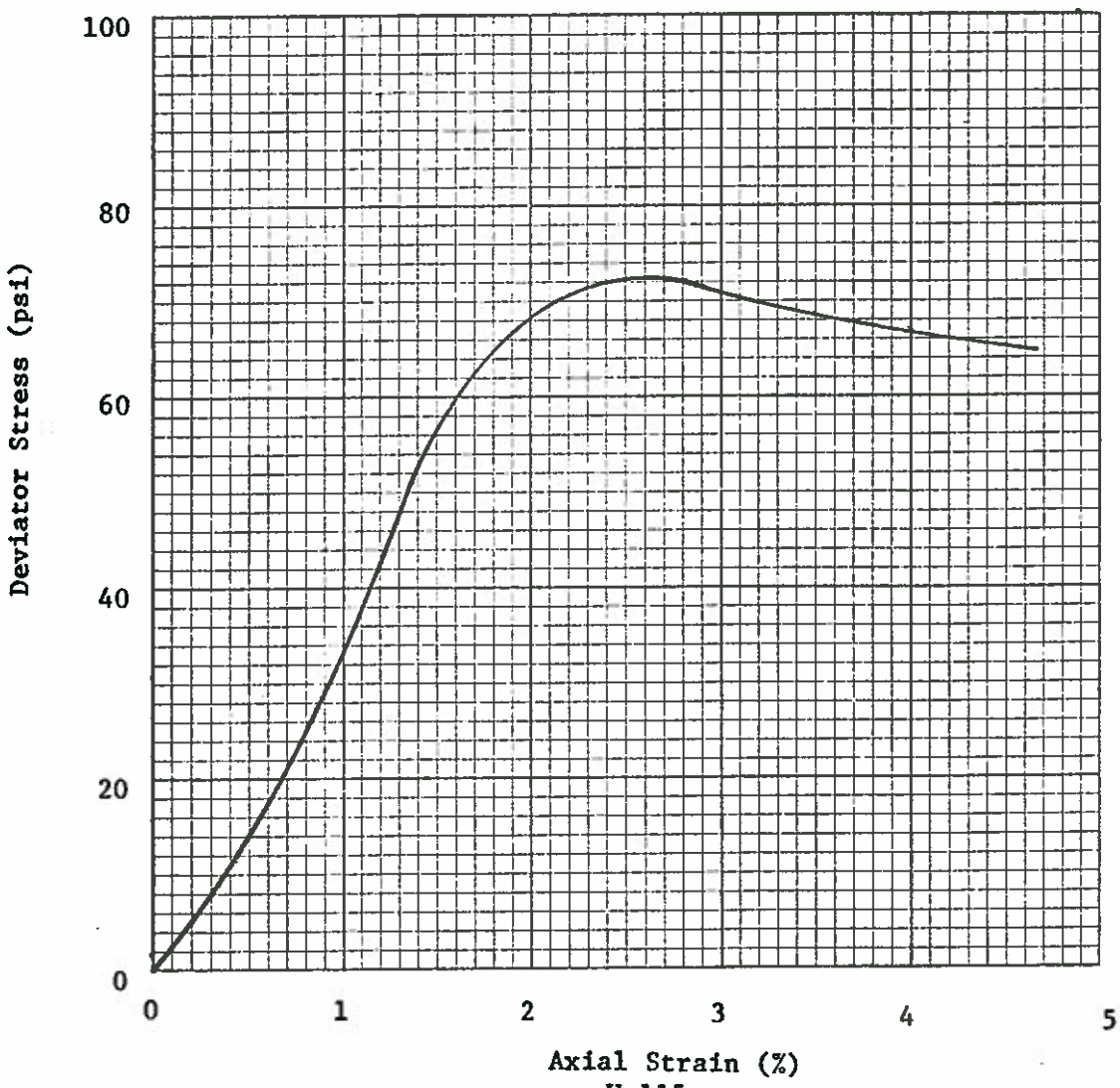


UNCONSOLIDATED-UNDRAINED TRIAXIAL TEST
Test No. 7
Sample No. 2

Project: Ash Pit No. 3 - Stuart Station
Boring No: 4A
Sample No: 2C
Depth Interval of Test Sample: 8.5 - 10.5'

Test Conditions:
Drainage - None
Axial Stress Application - Strain controlled (Karol-Warner Model 530)
Deformation Rate - 0.05 inches per minute
Chamber Fluid - De-aired water

SPECIMEN DATA
Diameter (inches): 2.843
Height (inches): 6.0
Test Specimen Weight (lbs): 2.20
Wet Unit Weight (pcf): 99.91
Dry Unit Weight (pcf): 74.95
Moisture Content (%): 33.3
Lateral Pressure psi): 20.0
Back Pressure (psi): None
Soil Classification: Fill of Fly Ash
Deviator Stress at Failure (psi): 72.56
Axial Strain at Failure (%): 2.50

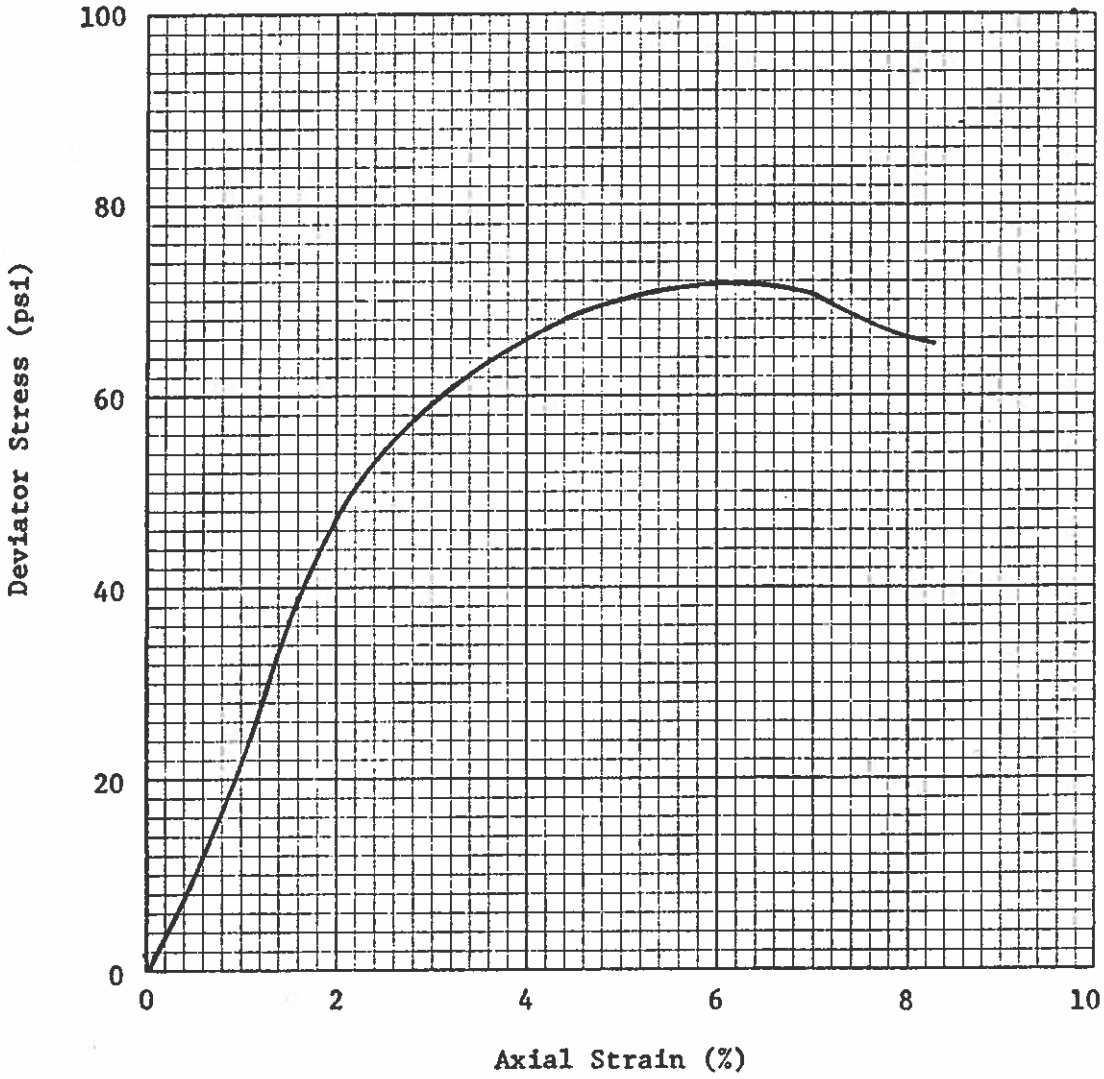


UNCONSOLIDATED-UNDRAINED TRIAXIAL TEST
Test No. 7
Sample No. 3

Project: Ash Pit No. 3 - Stuart Station
Boring No: 5A
Sample No: 1C
Depth Interval of Test Sample: 6.5 - 8.5'

Test Conditions:
Drainage - None
Axial Stress Application - Strain controlled (Karol-Warner Model 530)
Deformation Rate - 0.05 inches per minute
Chamber Fluid - De-aired water

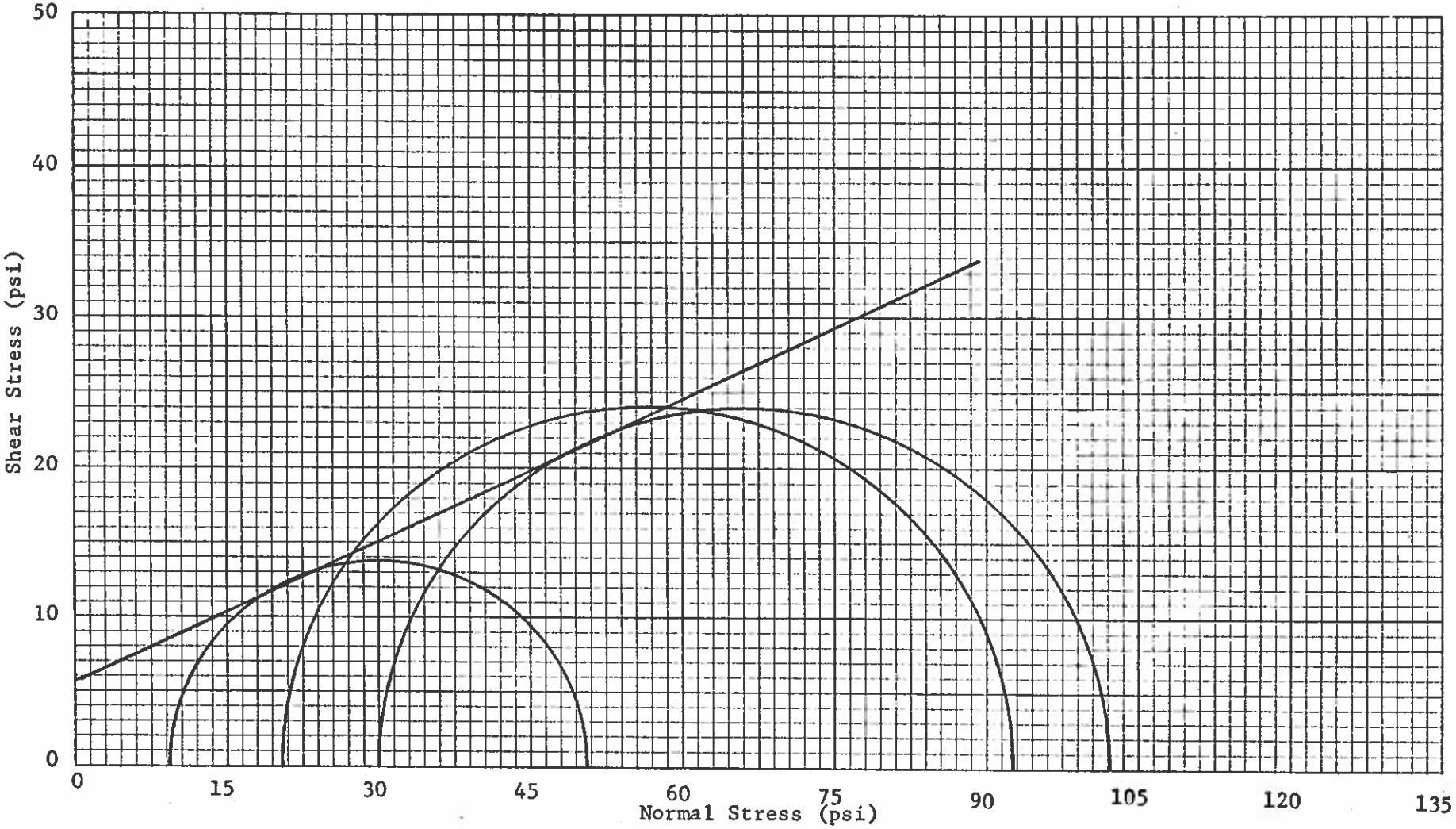
SPECIMEN DATA
Diameter (inches): 2.843
Height (inches): 5.937
Test Specimen Weight (lbs): 2.29
Wet Unit Weight (pcf): 105.10
Dry Unit Weight (pcf): 81.32
Moisture Content (%): 29.2
Lateral Pressure (psi): 30.0
Back Pressure (psi): None
Soil Classification: Fill of Fly Ash
Deviator Stress at Failure (psi): 71.95
Axial Strain at Failure (%): 6.56



UNCONSOLIDATED-UNDRAINED TRIAXIAL TEST
MOHR PLOTS OF FAILURE STATES
TEST NO. 7

Project: Ash Pit No. 3 - Stuart Station
Material: Fill of Fly Ash

Strength Parameters:	C (psi)	ϕ (°)
	5.5	30.2



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UNCONSOLIDATED-UNDRAINED TRIAXIAL TEST SUMMARY

ASH PIT NO. 3 - STUART STATION

TEST NO. 8

Test Conditions:

Axial Stress Application - Strain controlled (Karol-Warner Model 530)
Deformation Rate - 0.05 inches per minute
Chamber Fluid - De-aired water

Sample Conditions:

	Test Sample 1	Test Sample 2	Test Sample 3
Material:	- Fill of Fly Ash -		
Source of Material,			
Boring No.:	6A	4A	7A
Sample No.:	1C	1C	1C
Lateral Pressure (psi):	10.0	20.0	29.8
Back Pressure (psi):	0.0	0.0	0.0
Effective Confining Pressure (psi):	10.0	20.0	29.8
Specimen Weight (lbs):	2.43	2.02	2.24
Specimen Height (in):	6.062	5.875	5.593
Specimen Diameter (in):	2.843	2.843	2.843
Moisture Content (%):	30.0	26.6	22.6
Initial Wet Unit Weight (pcf):	109.2	93.7	109.5
Dry Unit Weight)pcf):	84.0	74.0	89.7

Measured Strength Parameters:

Total ϕ = 37.5°
C = 0.4 psi

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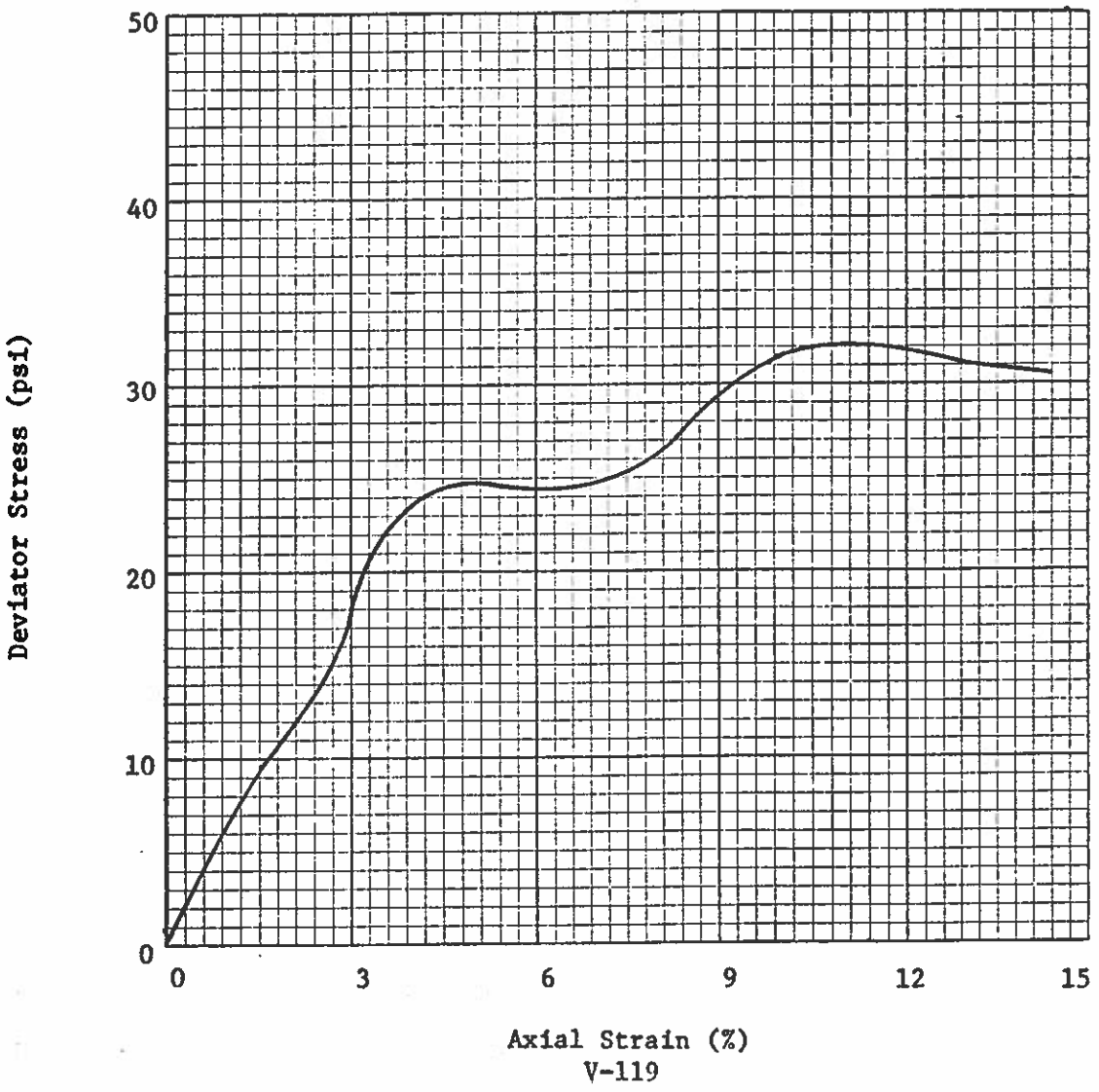
UNCONSOLIDATED-UNDRAINED TRIAXIAL TEST
Test No. 8
Sample No. 1

Project: Ash Pit No. 3 - Stuart Station
Boring No: 6A
Sample No: 1C
Depth Interval of Test Sample: 11.0 - 13.0'

Test Conditions:
Drainage - None
Axial Stress Application - Strain controlled (Karol-Warner Model 530)
Deformation Rate - 0.05 inches per minute
Chamber Fluid - De-aired water

SPECIMEN DATA
Diameter (inches): 2.843
Height (inches): 6.062
Test Specimen Weight (lbs): 2.43
Wet Unit Weight (pcf): 109.23
Dry Unit Weight (pcf): 84.02
Moisture Content (%): 30.0
Lateral Pressure (psi): 10.0
Back Pressure (psi): None
Soil Classification: Fill of Fly Ash
Deviator Stress at Failure (psi): 32.74
Axial Strain at Failure (%): 11.54

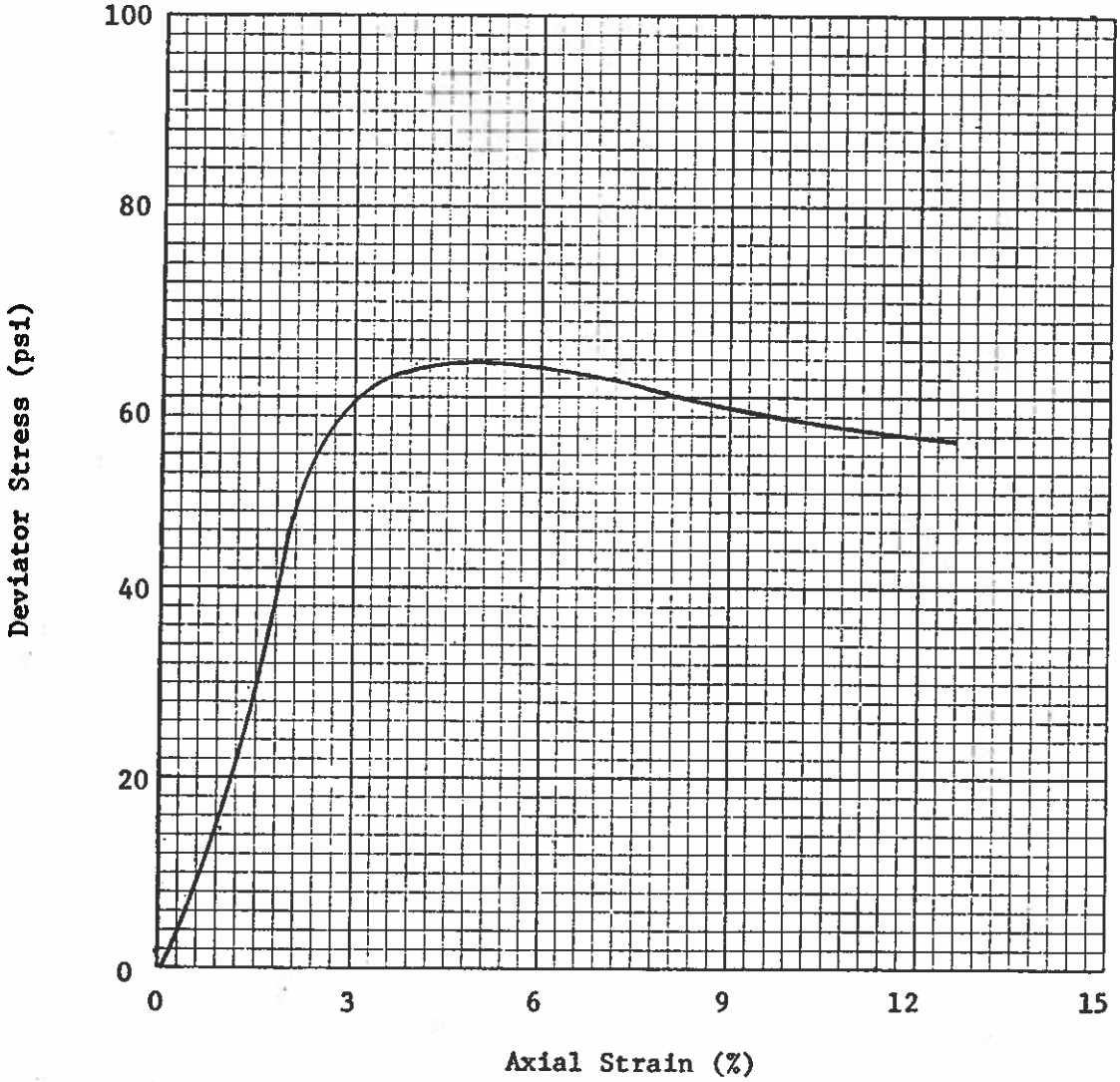


UNCONSOLIDATED-UNDRAINED TRIAXIAL TEST
Test No. 8
Sample No. 2

Project: Ash Pit No. 3 - Stuart Station
Boring No: 4A
Sample No: 1C
Depth Interval of Test Sample: 3.9 - 4.4'

Test Conditions:
DRainage - None
Axial Stress Application - Strain controlled (Karol-Warner Model 530)
Deformation Rate - 0.05 inches per minute
Chamber Fluid - De-aired water

SPECIMEN DATA
Diameter (inches): 2.843
Height (inches): 5.875
Test Specimen Weight (lbs): 2.02
Wet Unit Weight (pcf): 93.69
Dry Unit Weight (pcf): 74.01
Moisture Content (%): 26.6
Lateral Pressure (psi): 20.0
Back Pressure (psi): None
Soil Classification: Fill of Fly Ash
Deviator Stress at Failure (psi): 63.359
Axial Strain at Failure (%): 4.25

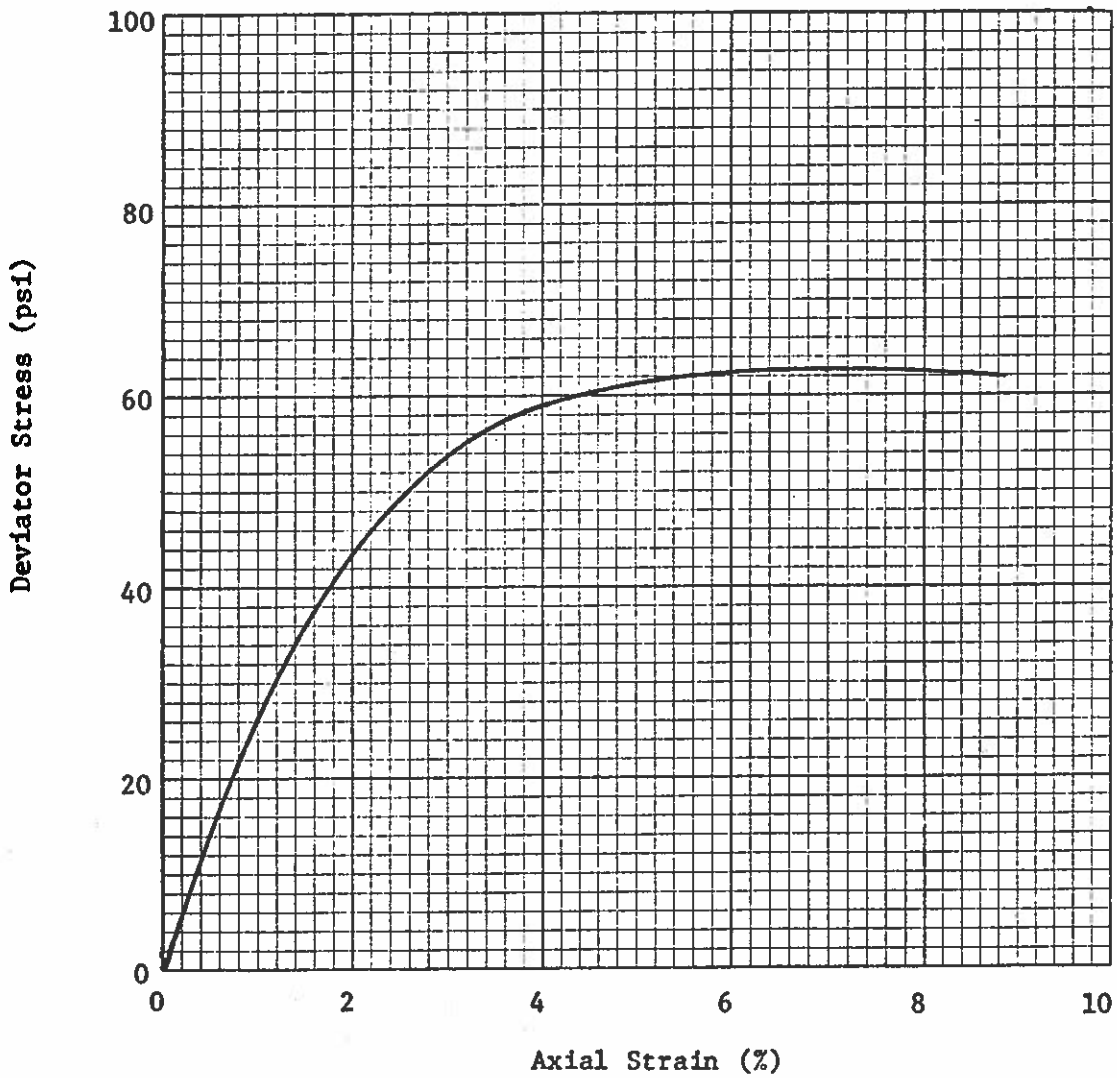


UNCONSOLIDATED-UNDRAINED TRIAXIAL TEST
Test No. 8
Sample No. 3

Project: Ash Pit No. 3 - Stuart Station
Boring No: 7A
Sample No: 1C
Depth Interval of Test Sample: 4.0 - 6.0'

Test Conditions:
Drainage - None
Axial Stress Application - Strain controlled (Karol-Warner Model 530)
Deformation Rate - 0.05 inches per minute
Chamber Fluid - De-aired water

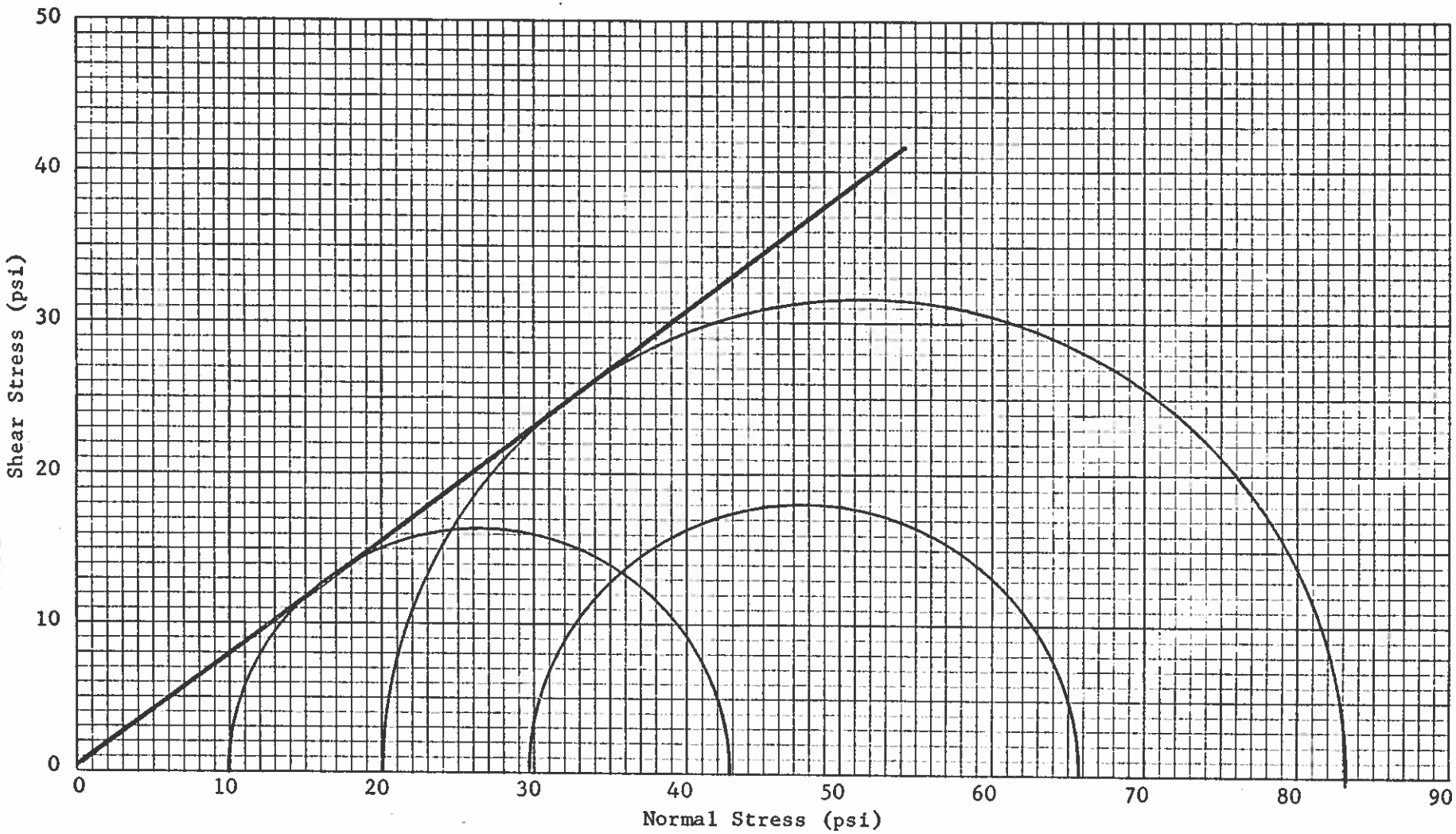
SPECIMEN DATA
Diameter (inches): 2.843
Height (inches): 5.593
Test Specimen Weight (lbs): 2.24
Wet Unit Weight (pcf): 109.54
Dry Unit Weight (pcf): 89.68
Moisture Content (%); 22.6
Lateral Pressure (psi): 29.8
Back Pressure (psi): None
Soil Classification: Fill of Fly Ash
Deviator Stress at Failure (psi): 62.49
Axial Strain at Failure (%): 8.22



UNCONSOLIDATED-UNDRAINED TRIAXIAL TEST
MOHR PLOTS OF FAILURE STATES
TEST NO. 8

Project: Ash Pit No. 3 - Stuart Station
Material: Fill of Fly Ash

Strength Parameters:	C (psi)	ϕ (°)
	0.4	37.5



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5247 Secor Road • P.O. Box 5847 • Toledo, Ohio 43613 • 419/473-2566

REPORT OF PROCTOR CURVE

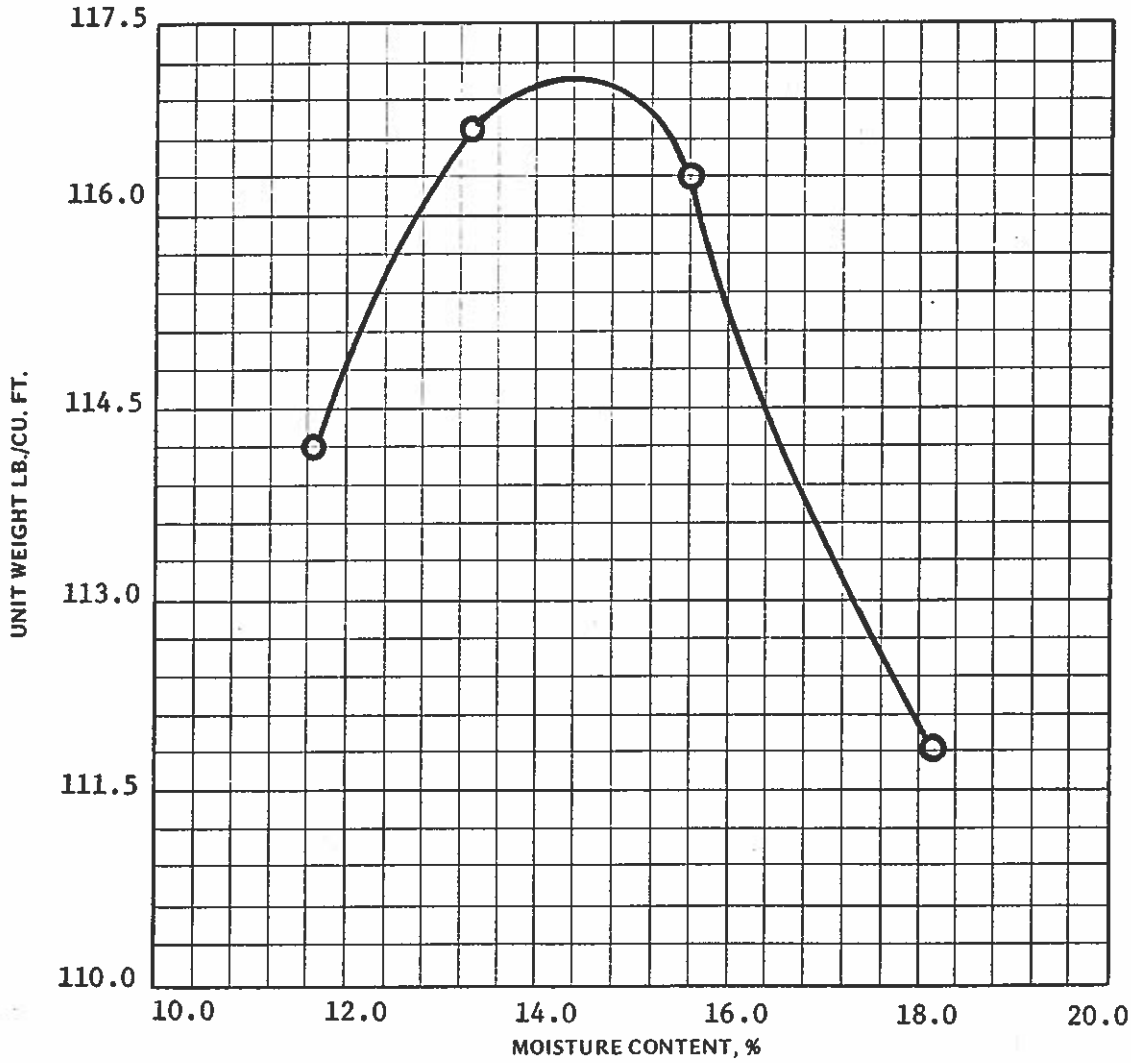
CLIENT: The Dayton Power and Light Company DATE 10-30-74

LAB NO.

PROJECT: BORROW AREA, ASH PIT NO. 3, Stuart Station

MATERIAL: Brown Clay, some Silt, some Sand

SOURCE OF MATERIAL: 2E



Type Proctor ASTM-D1557-70-Method "C" - Modified

Maximum Dry Density 117.1 Lbs./cu. ft. Optimum Moisture Content 14.2 %

2A11b

As a Mutual Protection to Clients, the Public and Ourselves, All Reports Are Submitted as the Confidential Property of Clients, and Authorization for Publication of Statements, Conclusions or Extracts from or Regarding Our Reports is Reserved Pending Our Written Approval.

BOWSER-MORNER Testing Laboratories, Inc.

420 Davis Ave. • P.O. Box 51 • Dayton, Ohio 45401 • 513/253-8805

5247 Secor Road • P.O. Box 5847 • Toledo, Ohio 43613 • 419/473-2566

REPORT OF PROCTOR CURVE

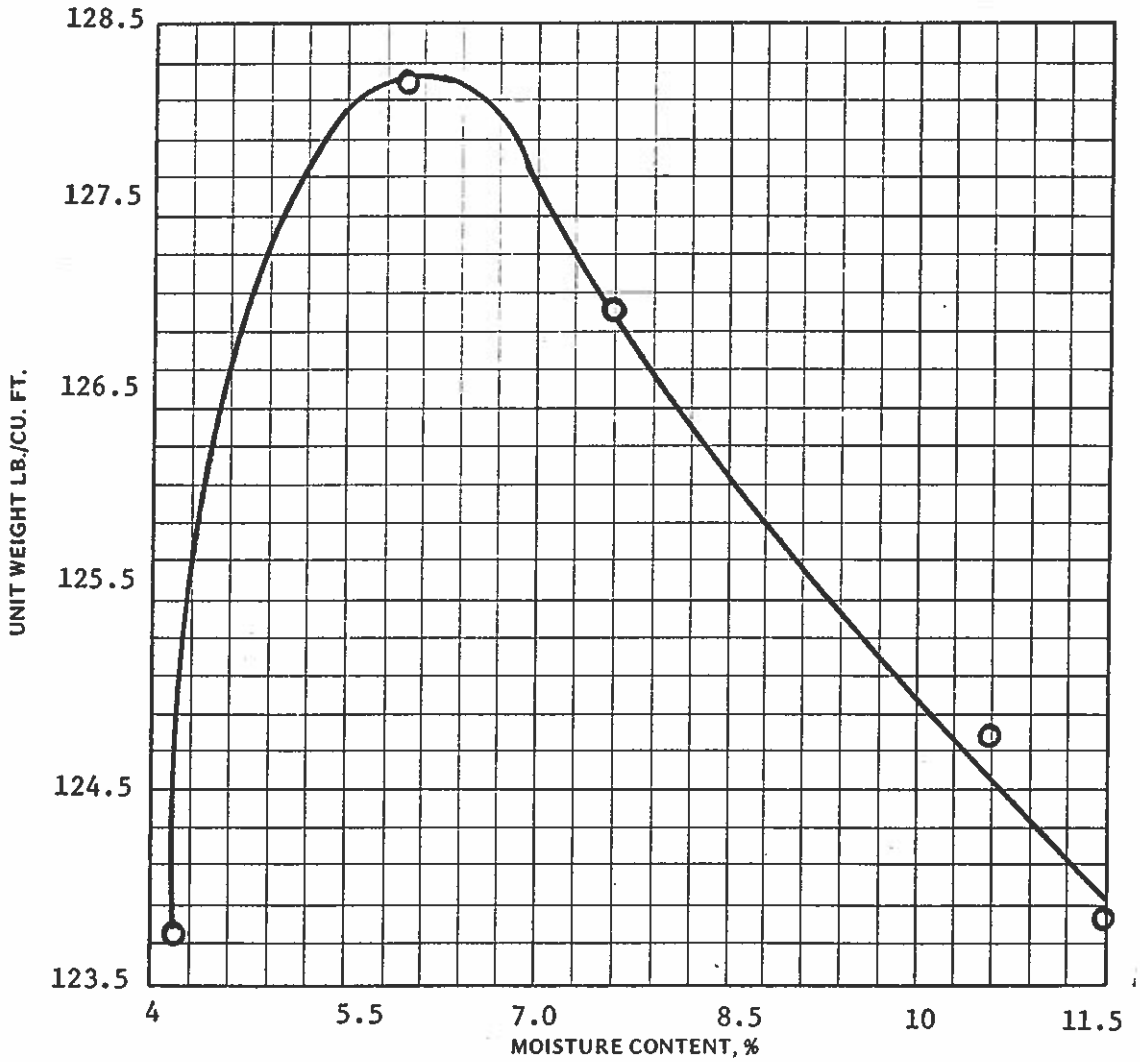
CLIENT: The Dayton Power and Light Company DATE 12-1-74

LAB NO.

PROJECT: BORROW AREA, ASH PIT NO. 3, Stuart Station

MATERIAL: Brown Sand, some Silt, trace Gravel

SOURCE OF MATERIAL: 1E



Type Proctor ASTM-D1557-70-Method "C" - Modified

Maximum Dry Density 128.2 Lbs./cu. ft. Optimum Moisture Content 5.9 %

2A11b

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CONSOLIDATION TEST

Project: FLY ASH PIT, ASH PIT NO. 3, Stuart Station

Material: Gray Fly Ash

Boring No: 6A
Sample No: 2C
Depth: 16.0' - 18.0'

Tested by: JLH, JAC
Date: 12-18-74

Specific Gravity: 2.23

Moisture Content, Before: -
After: -
Natural: 32.3%

Degree of Saturation, Start of Test:
End of Test:

Applied Load (tons/ft.^{2})	Final Dial Reading (in.)	Dial Change (in.)	2H from Dial Change (in.)	Void Ratio	Fitting Time (sec.) t_{90}	Fitting Time (sec.) t_{50}	Coef. of Consolidation (in.^{2}/sec.) $.848\ H^2/t_{90}$	Coef. of Consolidation (in.^{2}/sec.) $.197\ H^2/t_{50}$
0	0.02420							
.25	0.03853	0.01433						
			0.98567	1.5248				
.5	0.04599	0.02179						
			0.97821	1.5057				
1	0.05739	0.03319						
			0.96681	1.4765				
2	0.09000	0.06580						
			0.93420	1.3930				
4	0.13198	0.10778						
			0.89222	1.2855				
8	0.19991	0.17571						
			0.82429	1.1115				
16	0.27888	0.25468						
			0.74532	0.9092				
8	0.27586	0.25166						
			0.74834	0.9169				

2A44

CONSOLIDATION TEST

Project: FLY ASH PIT, ASH PIT NO. 3, Stuart Station

Material: Gray Fly Ash

Boring No: 6A
Sample No: 2C
Depth: 16.0' - 18.0'

Tested by: JLH, JAC
Date: 12-18-74

Specific Gravity: 2.23

Moisture Content, Before:
After:
Natural: 32.3%

Degree of Saturation, Start of Test:
End of Test:

Applied Load (tons/ft.^{2})	Final Dial Reading (in.)	Dial Change (in.)	2H from Dial Change (in.)	Void Ratio	Fitting Time (sec.) t_{90}	Fitting Time (sec.) t_{50}	Coef. of Consolidation (in.^{2}/sec.) $.848\ H^2/t_{90}$	Coef. of Consolidation (in.^{2}/sec.) $.197\ H^2/t_{50}$
4	0.27259	0.24839	0.75161	0.9253				
2	0.26949	0.24529	0.75471	0.9332				
1	0.26599	0.24179	0.75821	0.9422				
1/2	0.26261	0.23841	0.76159	0.9508				
1/4	0.25882	0.23462	0.76538	0.9606				
1/2	0.26082	0.23662	0.76338	0.9554				
1	0.26455	0.24035	0.75965	0.9459				
2	0.26818	0.24398	0.75602	0.9366				
4	0.27400	0.24980	0.75020	0.9217				

2A44

CONSOLIDATION TEST

Project: FLY ASH PIT, ASH PIT NO. 3, Stuart Station

Material: Gray Fly Ash

Boring No: 6A
Sample No: 2C
Depth: 16.0' - 18.0'

Tested by: JLH, JAC
Date: 12-18-74

Specific Gravity: 2.23

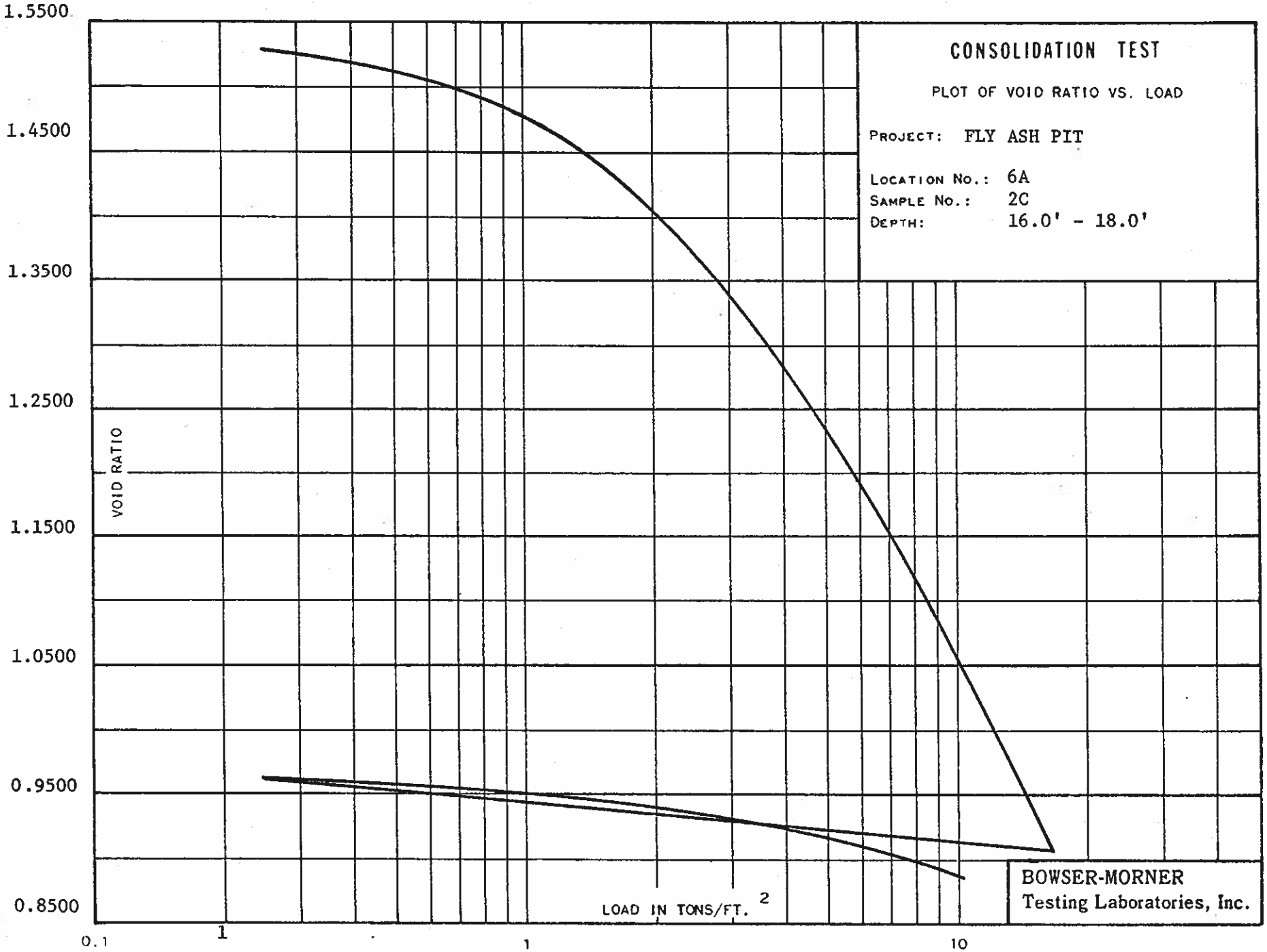
Moisture Content, Before:
After:
Natural: 32.3%

Degree of Saturation, Start of Test:
End of Test:

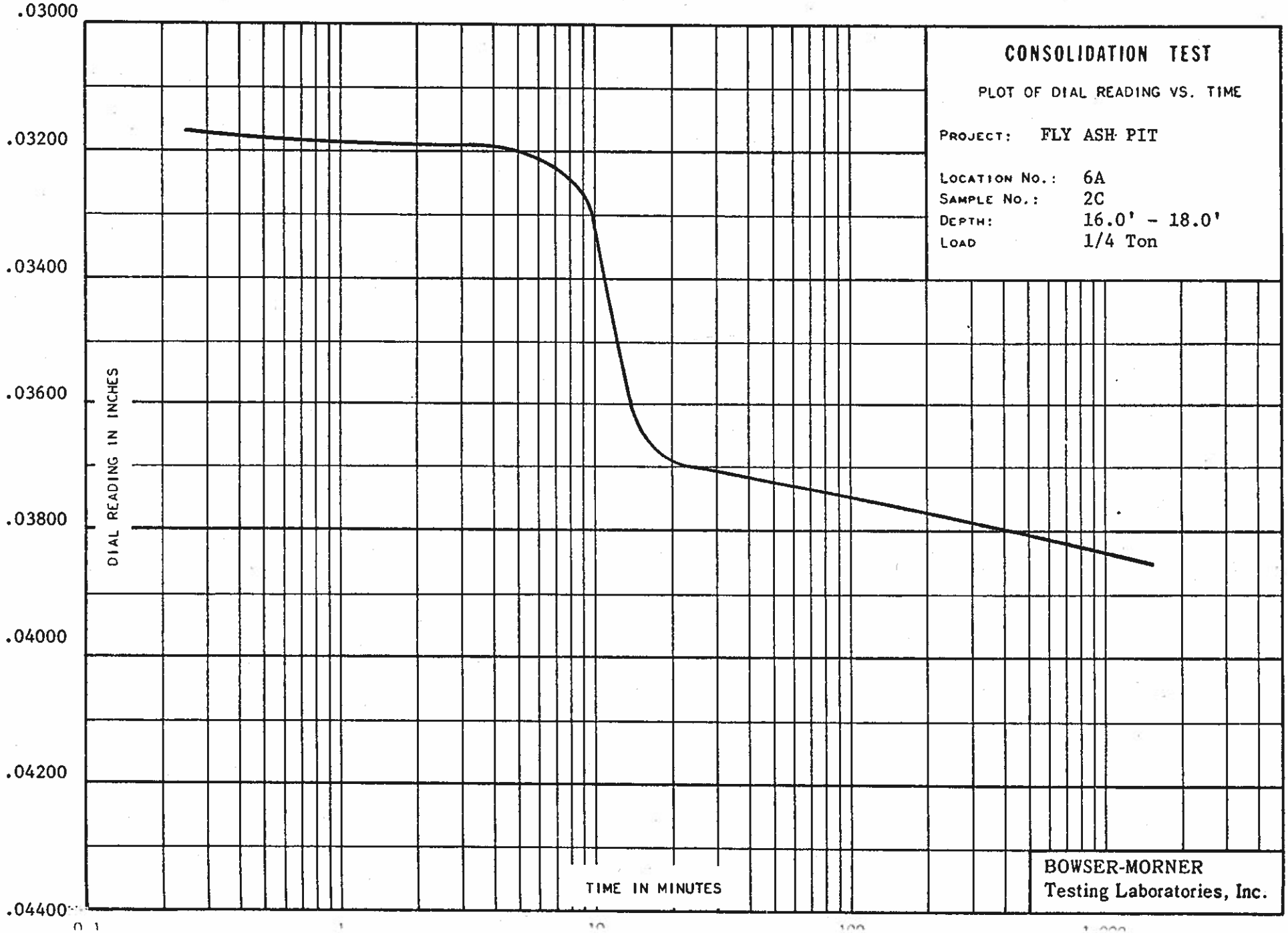
Applied Load (tons/ft.^{2})	Final Dial Reading (in.)	Dial Change (in.)	2H from Dial Change (in.)	Void Ratio	Fitting Time (sec.) t_{90}	Fitting Time (sec.) t_{50}	Coef. of Consolidation (in.^{2}/sec.) $.848\ H^2/t_{90}$	Coef. of Consolidation (in.^{2}/sec.) $.197\ H^2/t_{50}$
		0.26248						
8	0.28668		0.73752	0.8892				

2A44

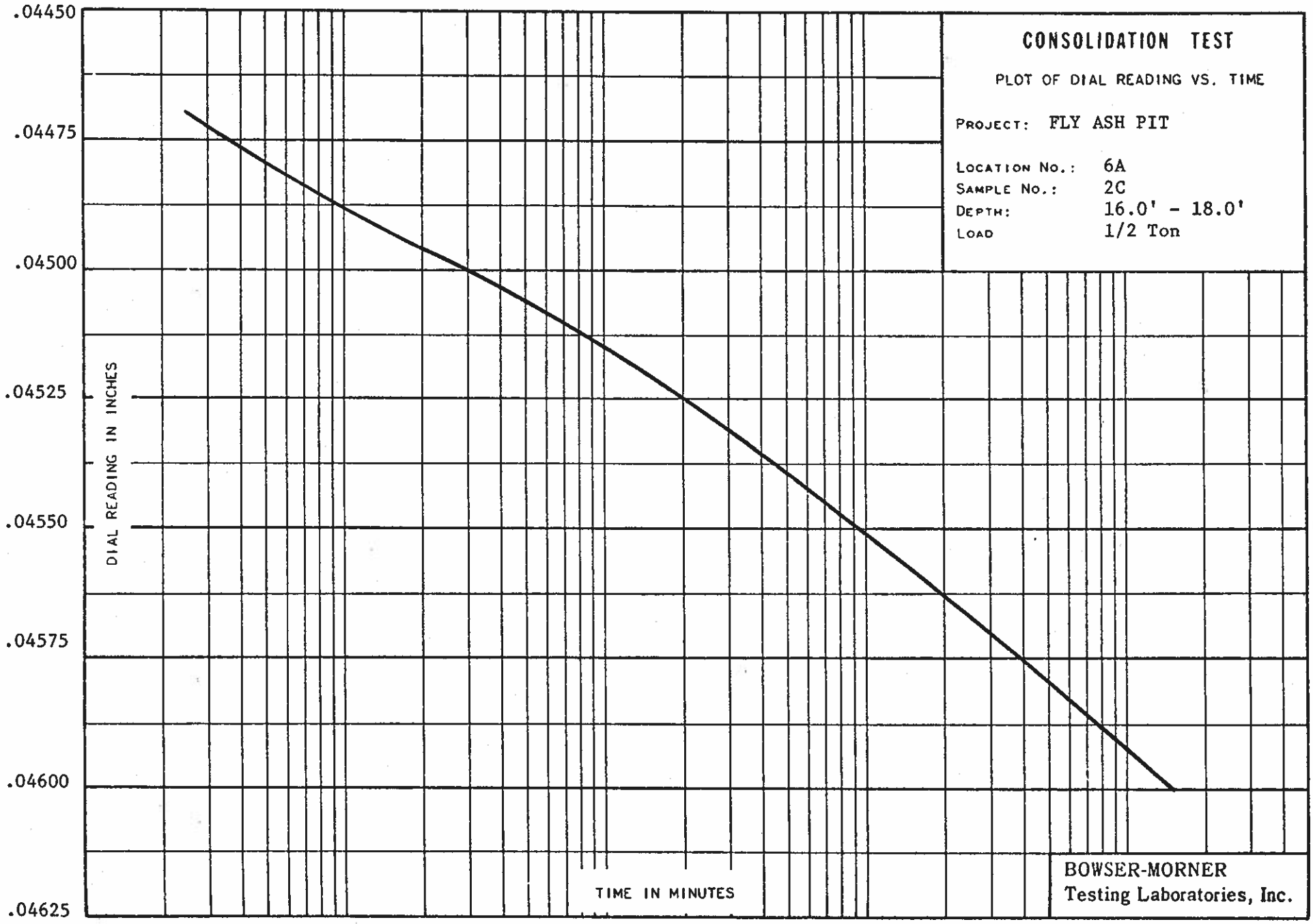
Form 2A86

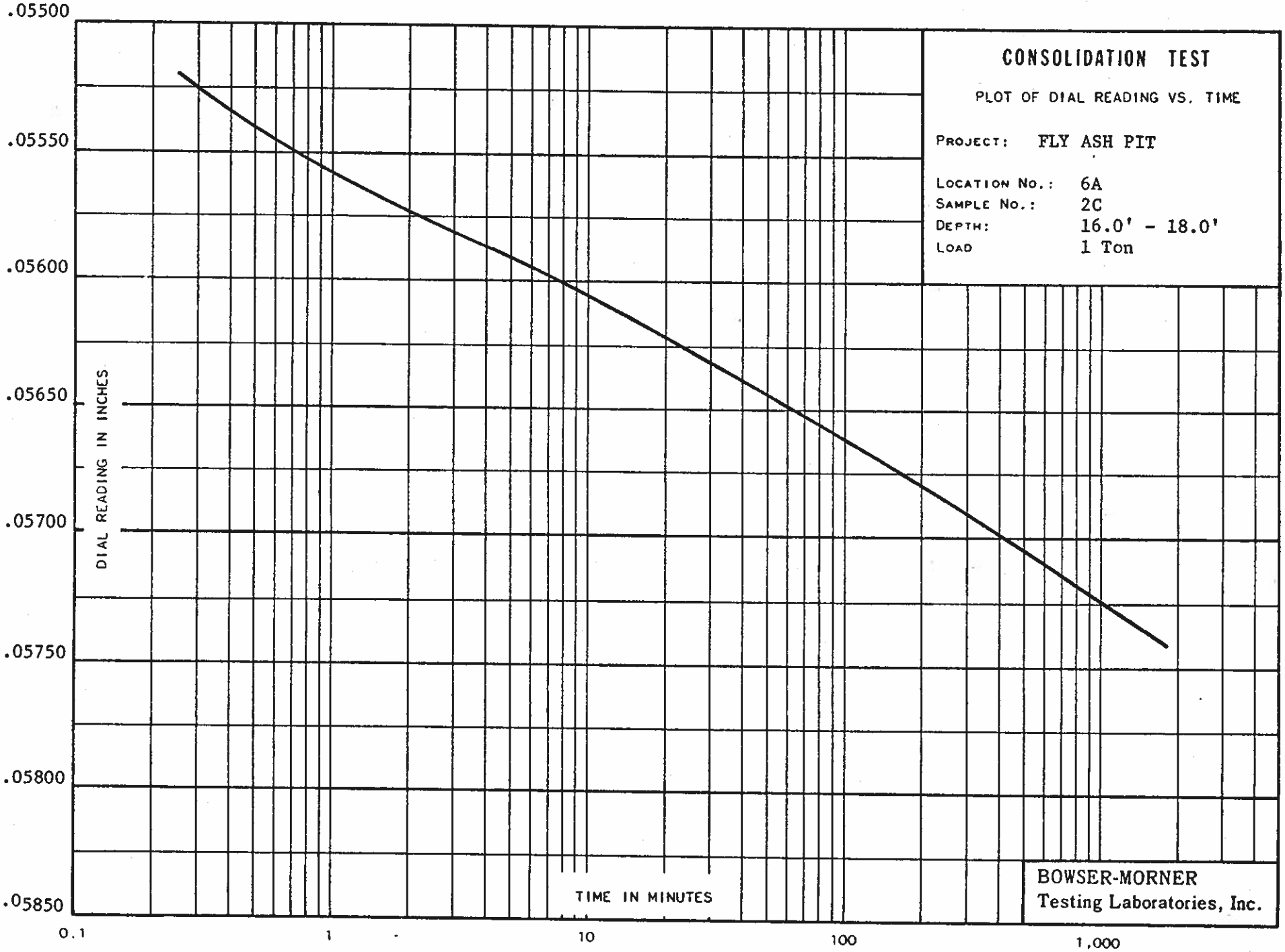

CONSOLIDATION TEST
PLOT OF VOID RATIO VS. LOAD
PROJECT: FLY ASH PIT
LOCATION NO.: 6A
SAMPLE NO.: 2C
DEPTH: 16.0' - 18.0'
VOID RATIO
1.5500
1.4500
1.3500
1.2500
1.1500
1.0500
0.9500
0.8500
0.1
1
10
LOAD IN TONS/FT.2
BOWSER-MORNER
Testing Laboratories, Inc.

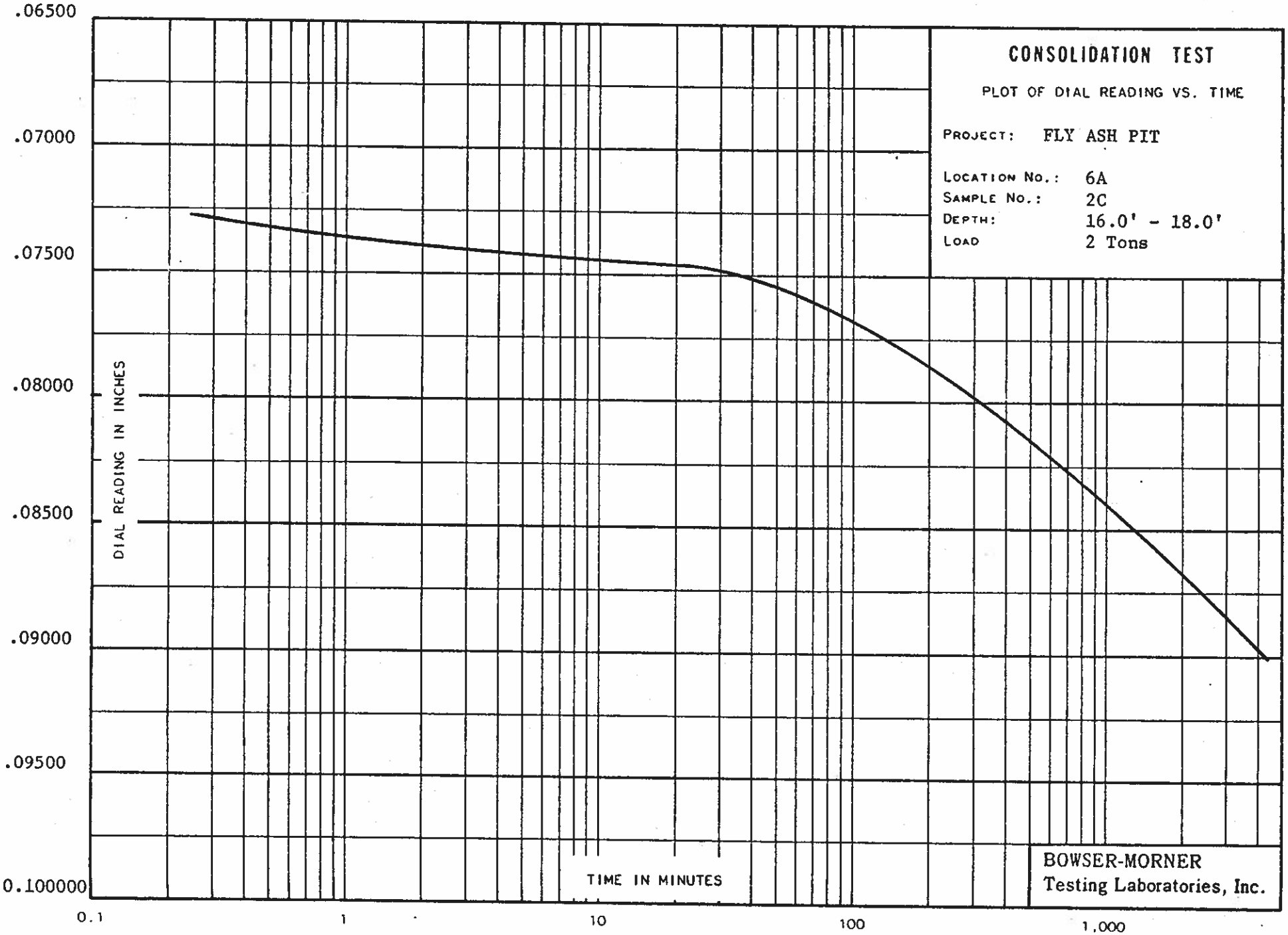
FORM 2A88

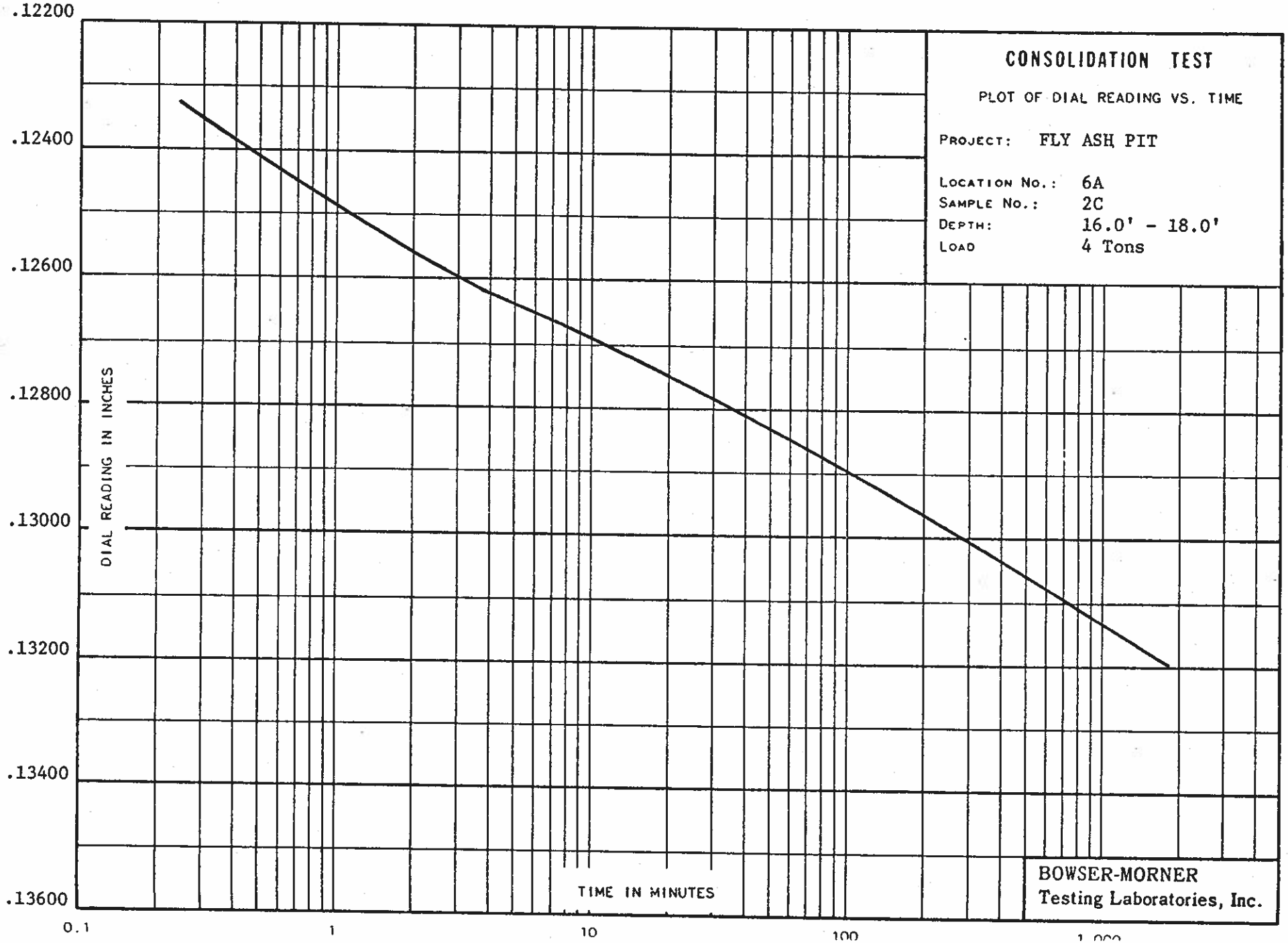

CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: FLY ASH PIT
LOCATION NO.: 6A
SAMPLE NO.: 2C
DEPTH: 16.0' - 18.0'
LOAD 1/4 Ton
DIAL READING IN INCHES
.03000
.03200
.03400
.03600
.03800
.04000
.04200
.04400
TIME IN MINUTES
0.1
1
10
100
1,000
BOWSER-MORNER
Testing Laboratories, Inc.

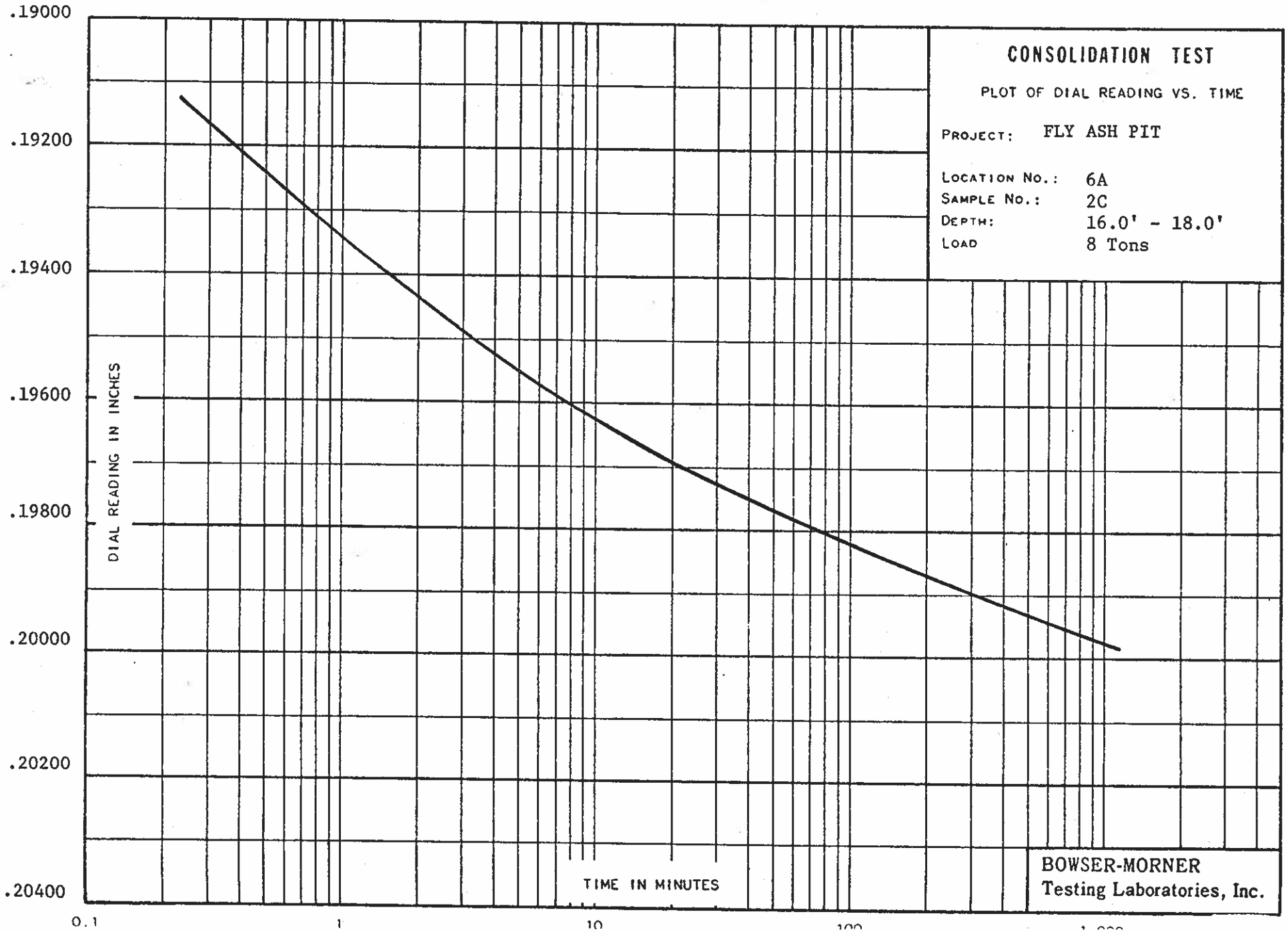
FORM 2A66

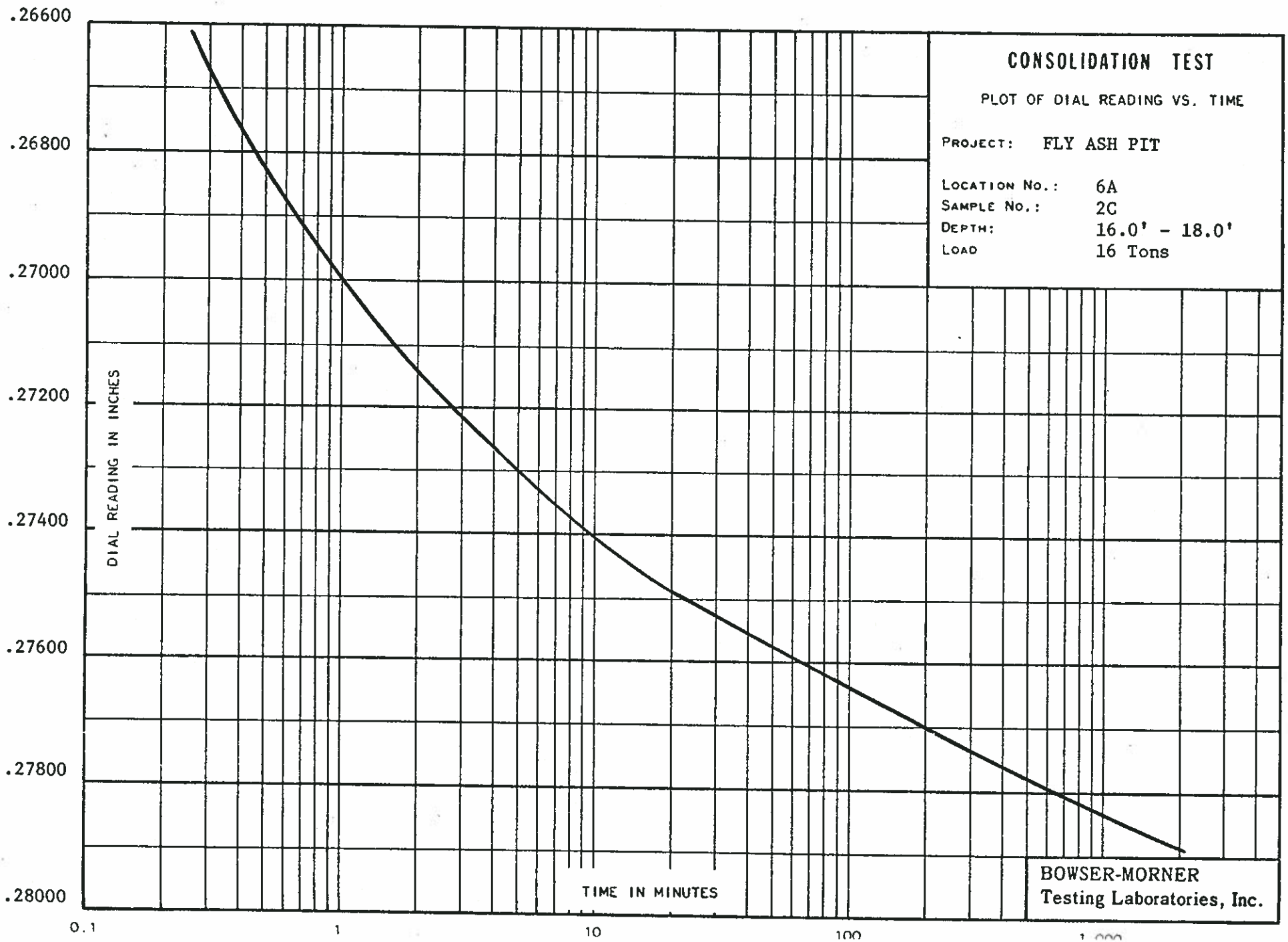

CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: FLY ASH PIT
LOCATION NO.: 6A
SAMPLE NO.: 2C
DEPTH: 16.0' - 18.0'
LOAD 1/2 Ton
.04450
.04475
.04500
.04525
.04550
.04575
.04600
.04625
DIAL READING IN INCHES
TIME IN MINUTES
BOWSER-MORNER
Testing Laboratories, Inc.

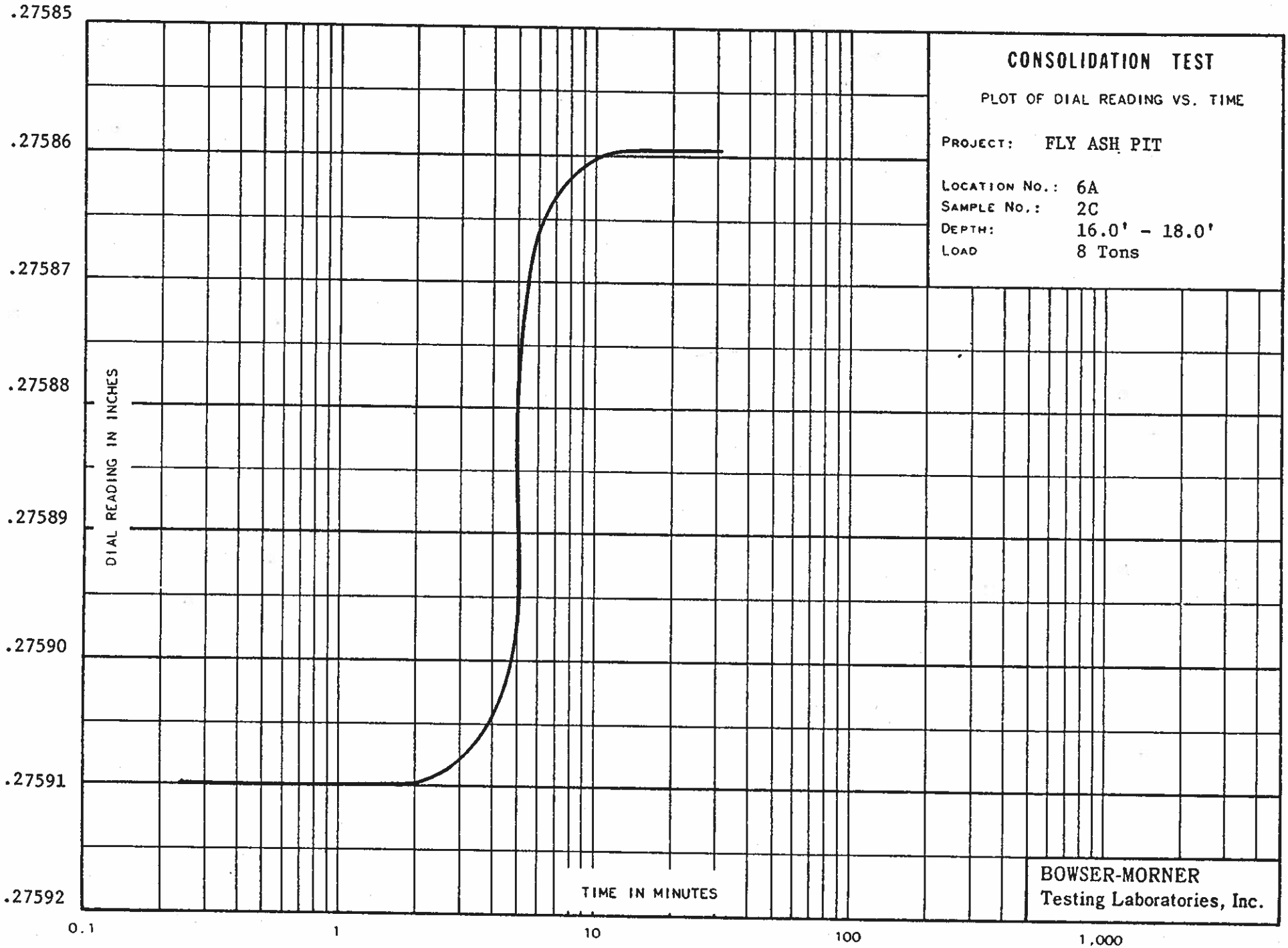

CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: FLY ASH PIT
LOCATION NO.: 6A
SAMPLE NO.: 2C
DEPTH: 16.0' - 18.0'
LOAD 1 Ton
DIAL READING IN INCHES
.05500
.05550
.05600
.05650
.05700
.05750
.05800
.05850
TIME IN MINUTES
0.1
1
10
100
1,000
BOWSER-MORNER
Testing Laboratories, Inc.


CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: FLY ASH PIT
LOCATION NO.: 6A
SAMPLE NO.: 2C
DEPTH: 16.0' - 18.0'
LOAD 2 Tons
DIAL READING IN INCHES
.06500
.07000
.07500
.08000
.08500
.09000
.09500
0.100000
TIME IN MINUTES
0.1
1
10
100
1,000
BOWSER-MORNER
Testing Laboratories, Inc.

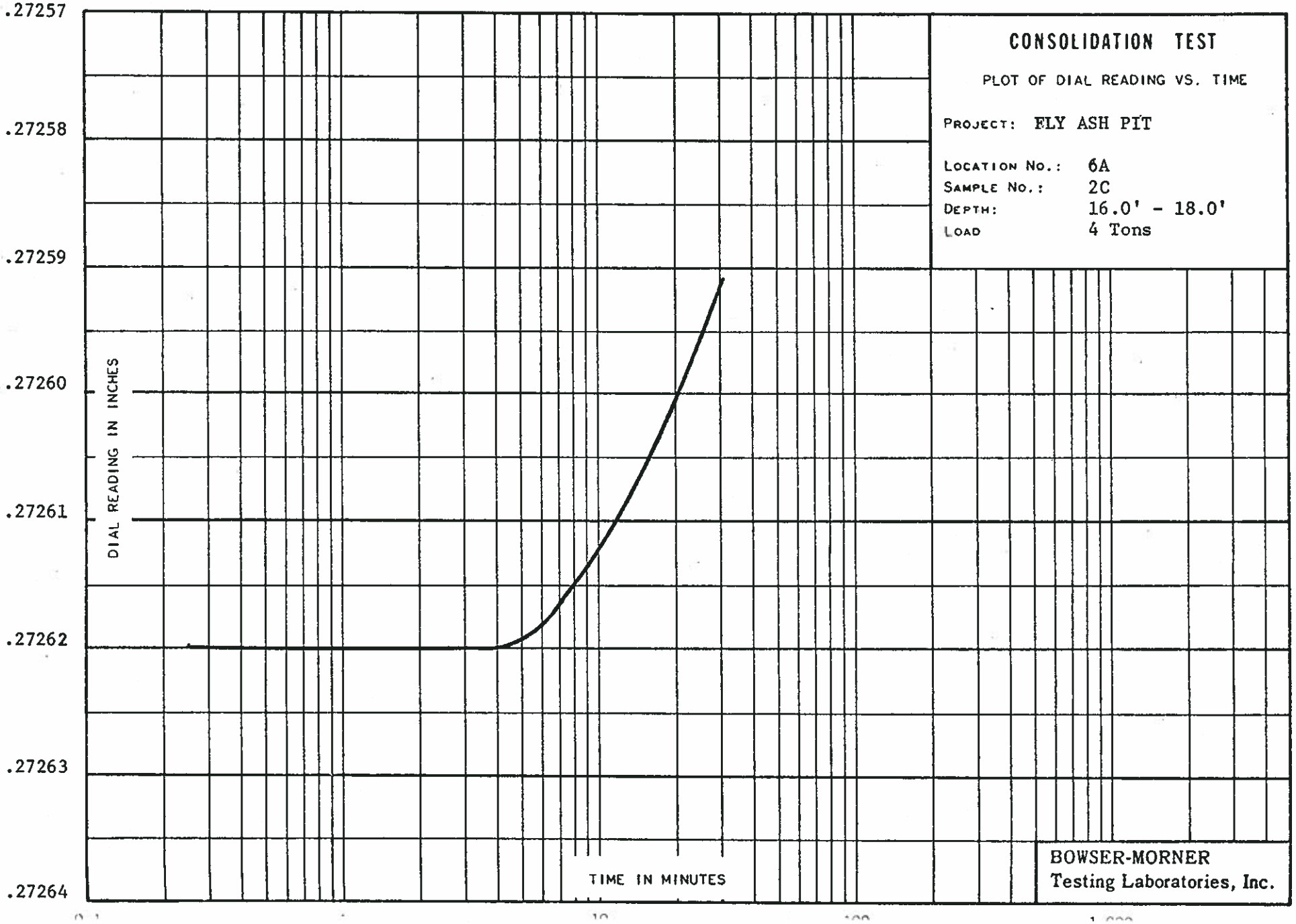

CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: FLY ASH PIT
LOCATION NO.: 6A
SAMPLE NO.: 2C
DEPTH: 16.0' - 18.0'
LOAD 4 Tons
DIAL READING IN INCHES
.12200
.12400
.12600
.12800
.13000
.13200
.13400
.13600
TIME IN MINUTES
0.1
1
10
100
1,000
BOWSER-MORNER
Testing Laboratories, Inc.

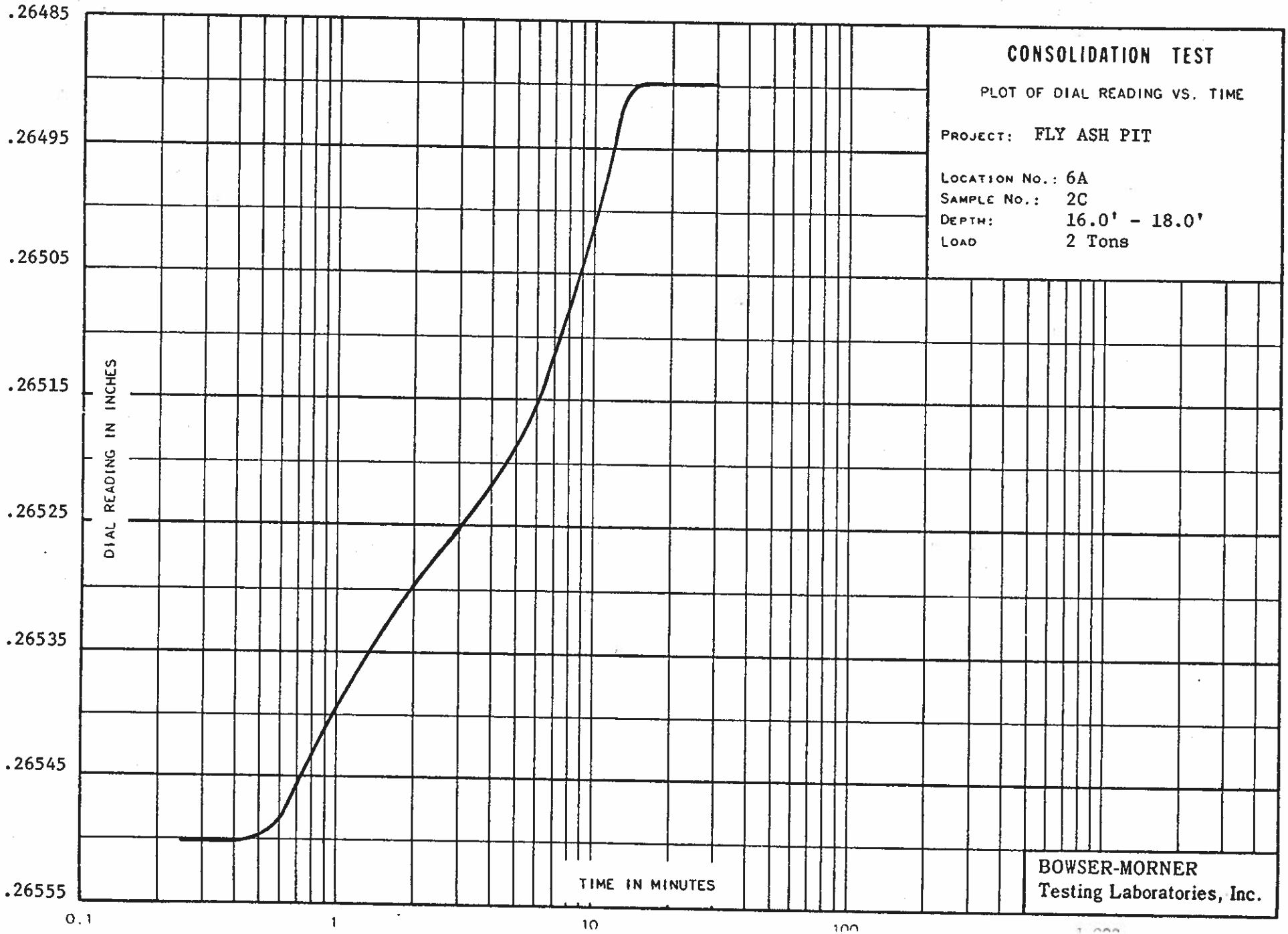

CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: FLY ASH PIT
LOCATION NO.: 6A
SAMPLE NO.: 2C
DEPTH: 16.0' - 18.0'
LOAD 8 Tons
DIAL READING IN INCHES
.19000
.19200
.19400
.19600
.19800
.20000
.20200
.20400
TIME IN MINUTES
0.1
1
10
100
BOWSER-MORNER
Testing Laboratories, Inc.

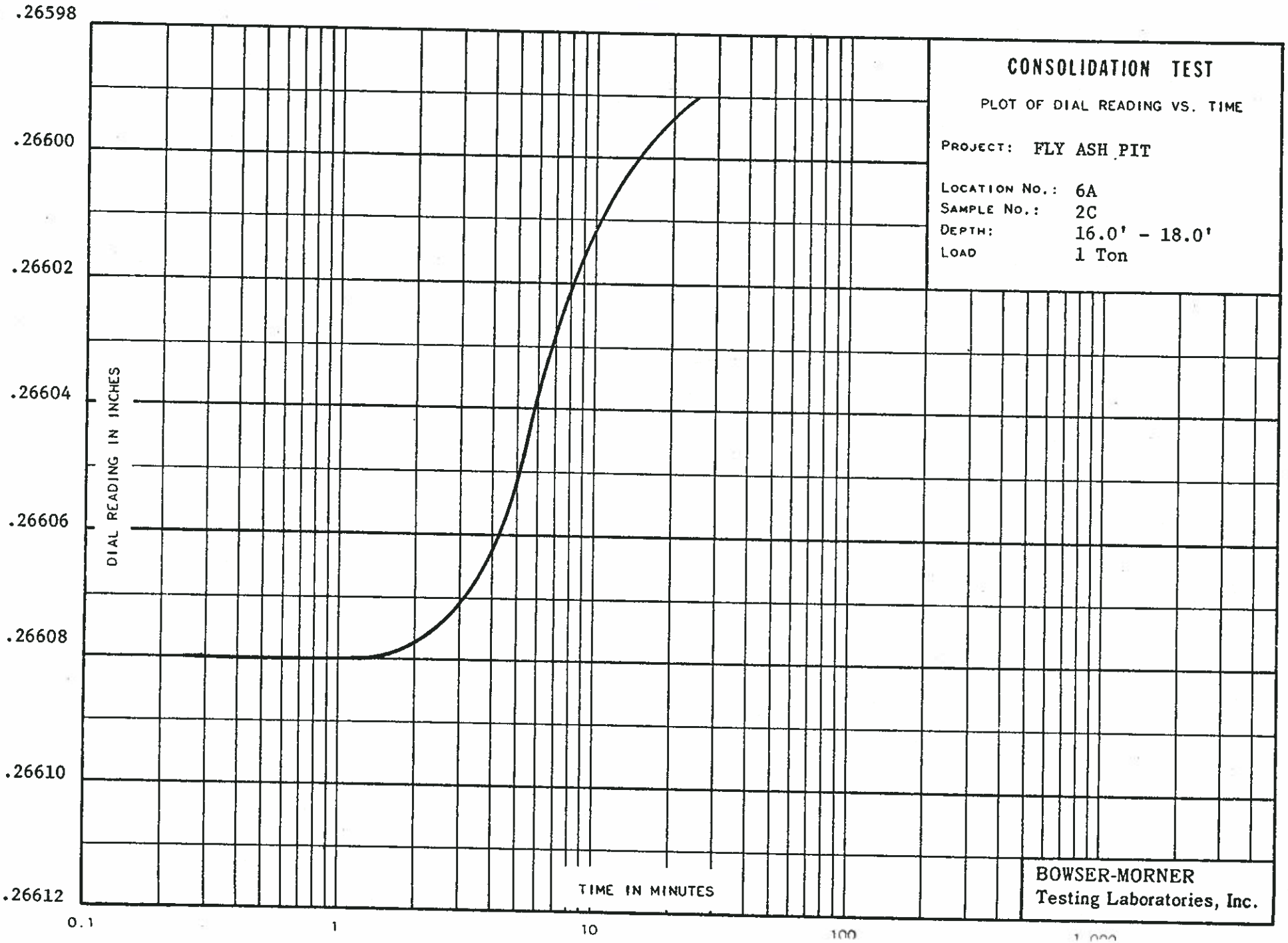

CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: FLY ASH PIT
LOCATION NO.: 6A
SAMPLE NO.: 2C
DEPTH: 16.0' - 18.0'
LOAD 16 Tons
DIAL READING IN INCHES
.26600
.26800
.27000
.27200
.27400
.27600
.27800
.28000
TIME IN MINUTES
0.1
1
10
100
1,000
BOWSER-MORNER
Testing Laboratories, Inc.


CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: FLY ASH PIT
LOCATION NO.: 6A
SAMPLE NO.: 2C
DEPTH: 16.0' - 18.0'
LOAD 8 Tons
DIAL READING IN INCHES
.27585
.27586
.27587
.27588
.27589
.27590
.27591
.27592
TIME IN MINUTES
0.1
1
10
100
1,000
BOWSER-MORNER
Testing Laboratories, Inc.

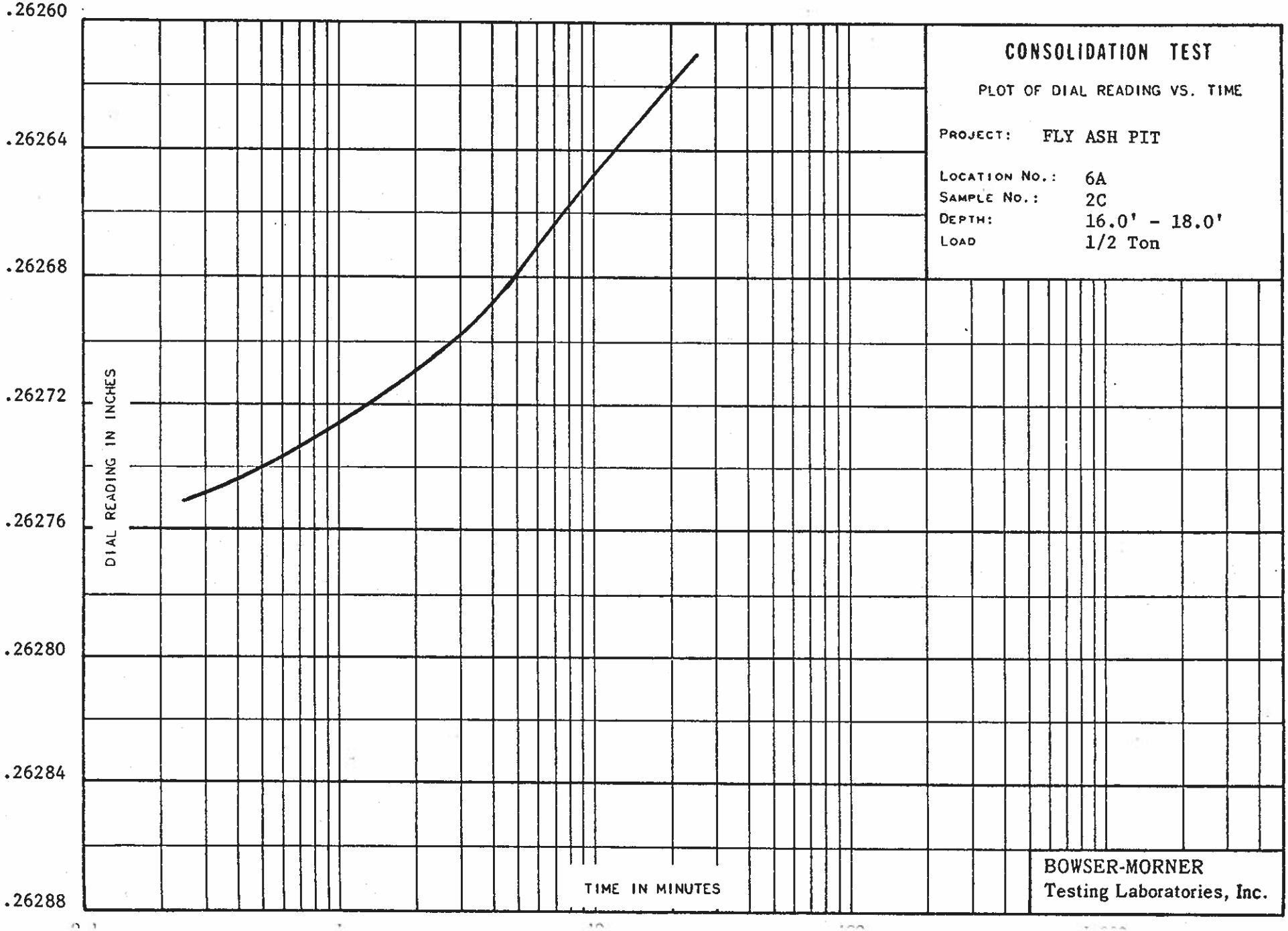
FORM 2A88

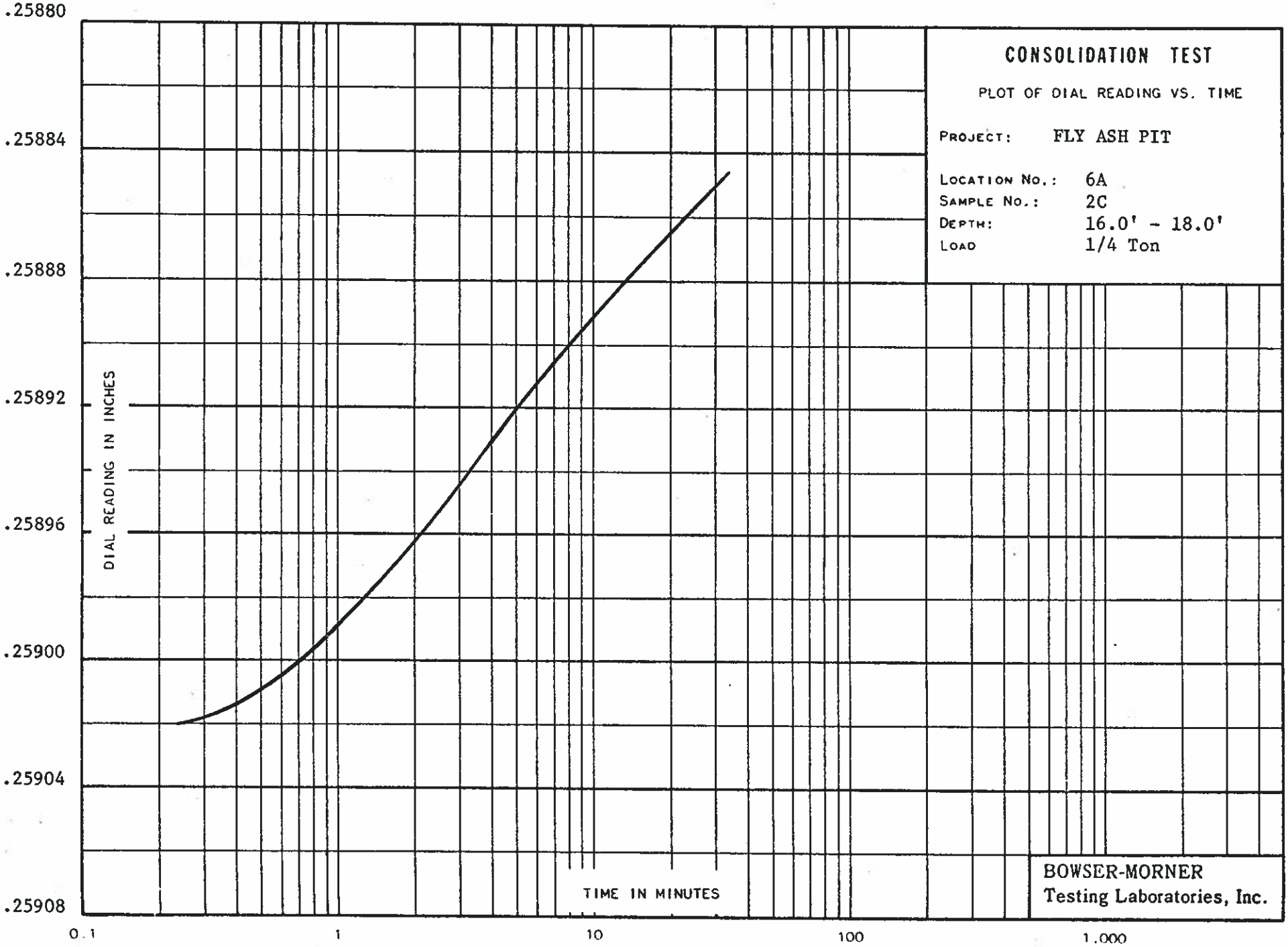

.27257
.27258
.27259
.27260
.27261
.27262
.27263
.27264
DIAL READING IN INCHES
TIME IN MINUTES
CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: FLY ASH PIT
LOCATION NO.: 6A
SAMPLE NO.: 2C
DEPTH: 16.0' - 18.0'
LOAD 4 Tons
BOWSER-MORNER
Testing Laboratories, Inc.

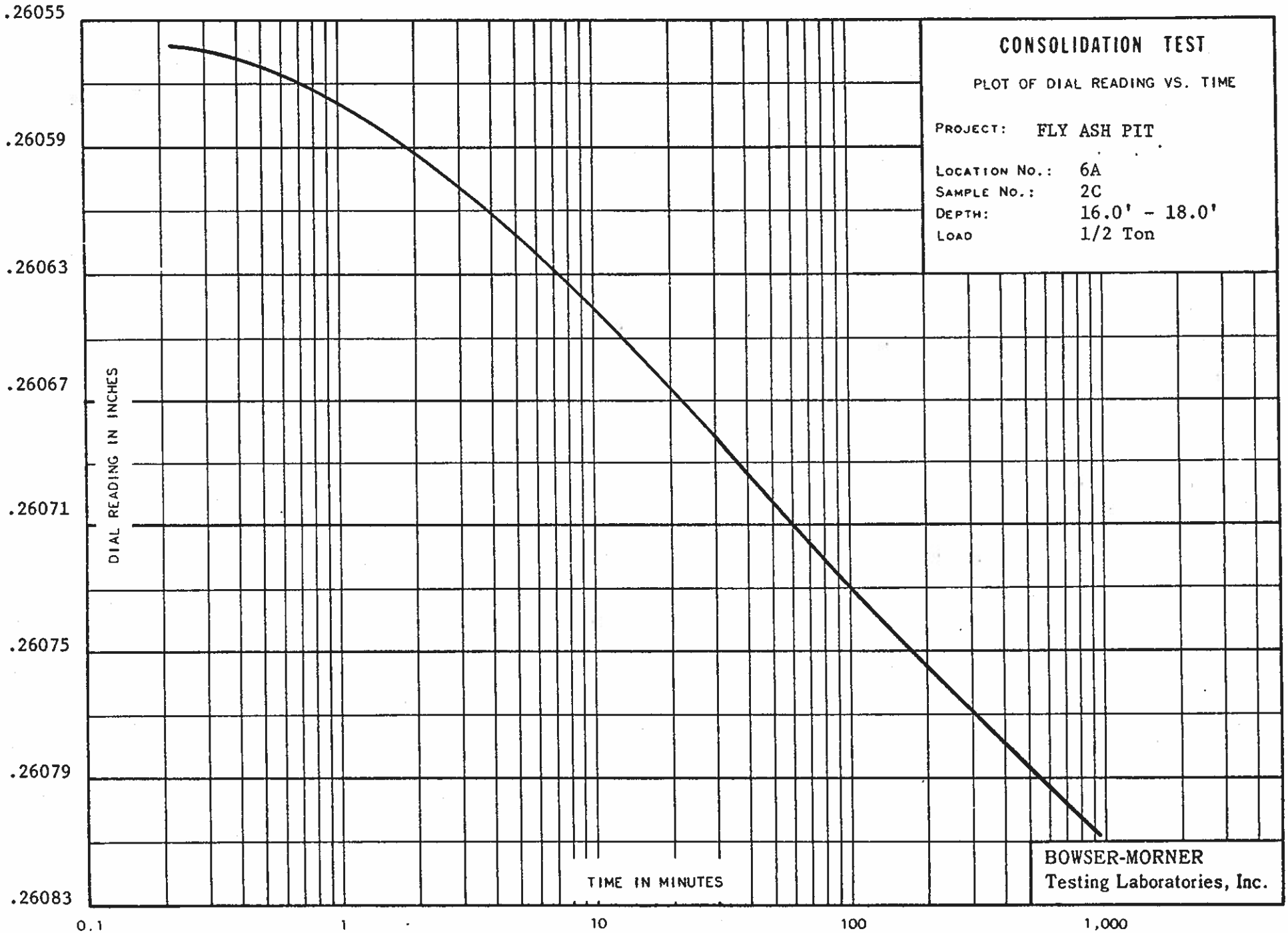

CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: FLY ASH PIT
LOCATION NO.: 6A
SAMPLE NO.: 2C
DEPTH: 16.0' - 18.0'
LOAD 2 Tons
DIAL READING IN INCHES
.26485
.26495
.26505
.26515
.26525
.26535
.26545
.26555
TIME IN MINUTES
0.1
1
10
100
BOWSER-MORNER
Testing Laboratories, Inc.

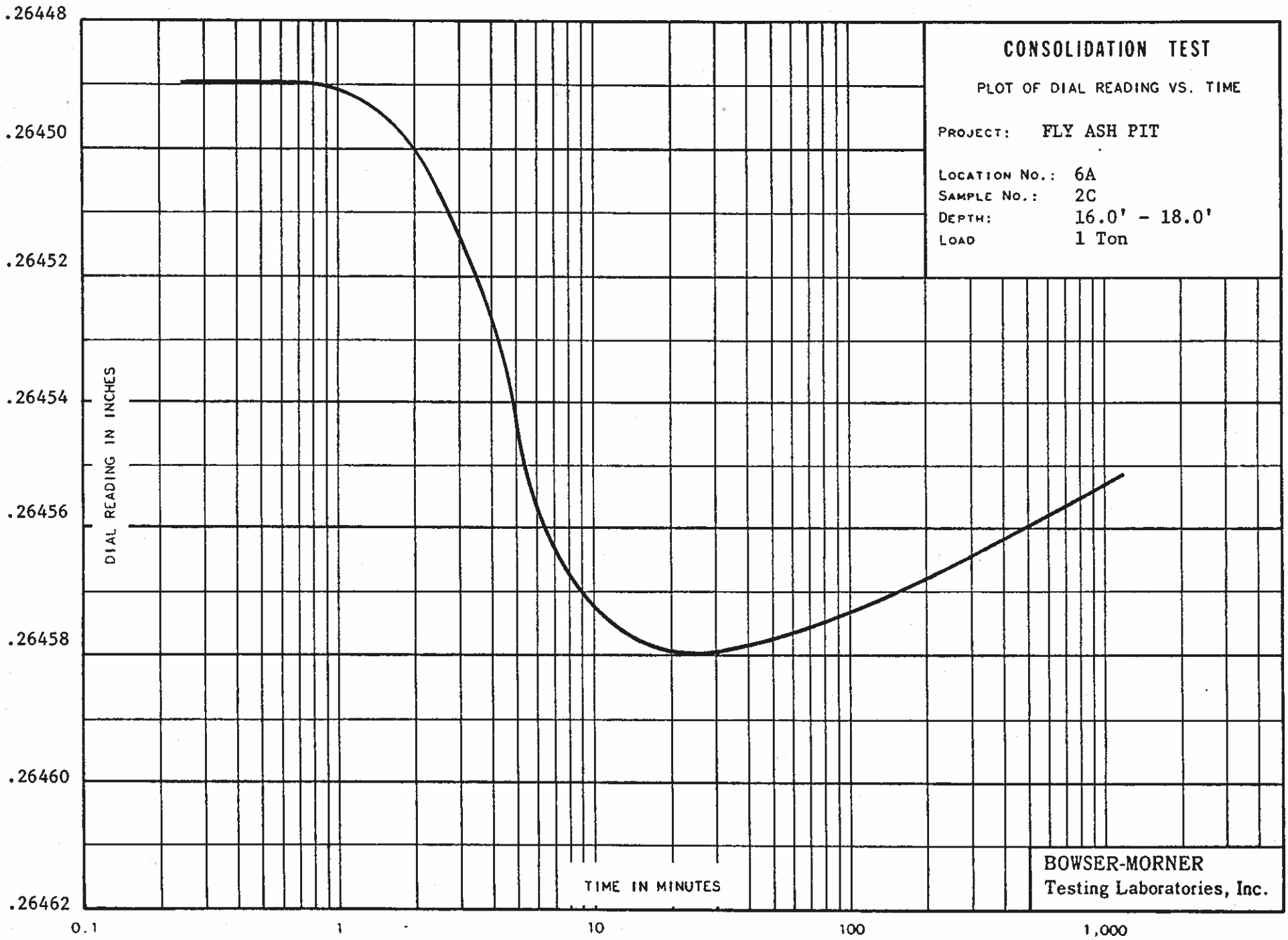

CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: FLY ASH PIT
LOCATION NO.: 6A
SAMPLE NO.: 2C
DEPTH: 16.0' - 18.0'
LOAD 1 Ton
DIAL READING IN INCHES
.26598
.26600
.26602
.26604
.26606
.26608
.26610
.26612
TIME IN MINUTES
0.1
1
10
100
1,000
BOWSER-MORNER
Testing Laboratories, Inc.

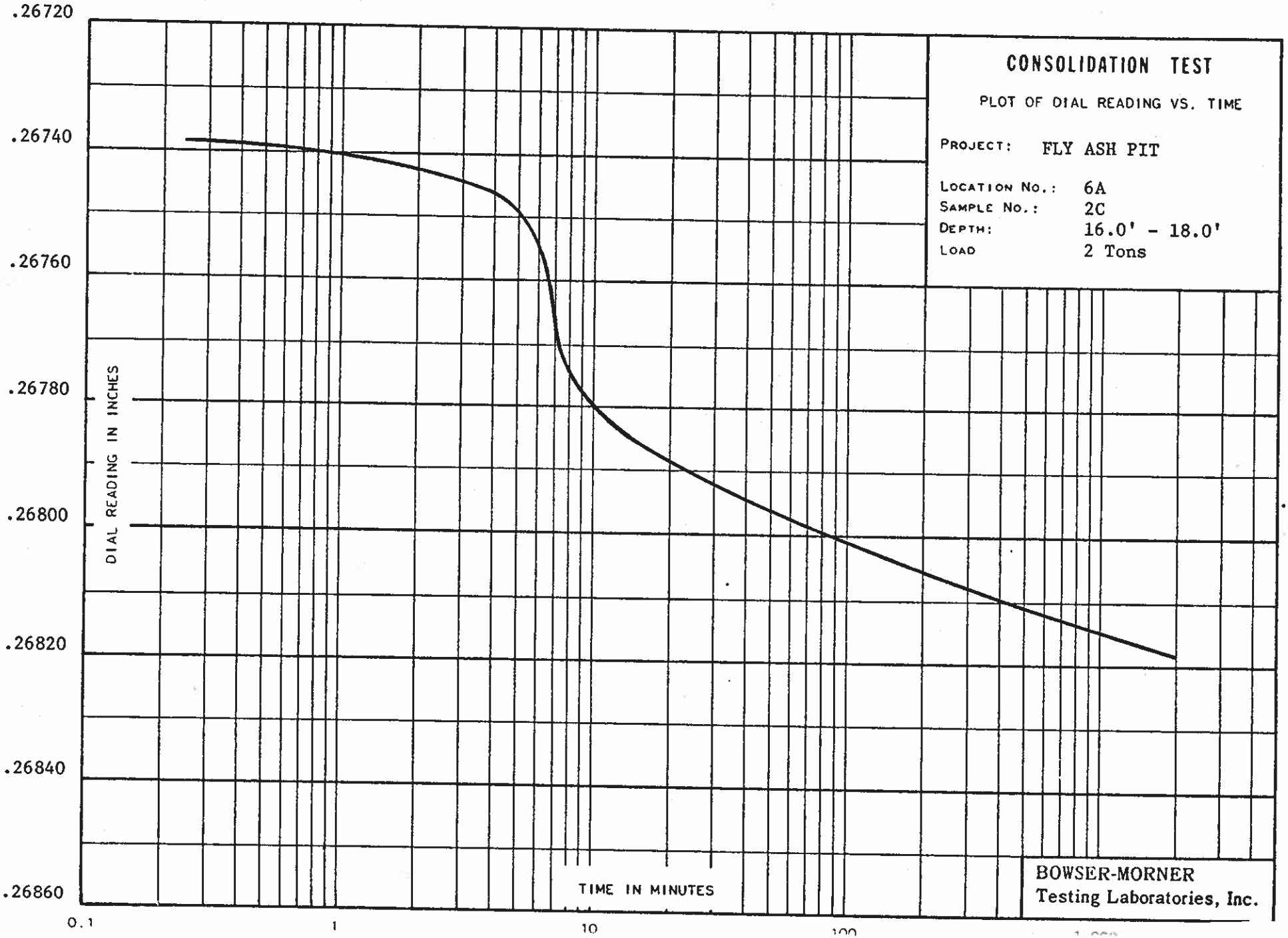
FORM 2A00

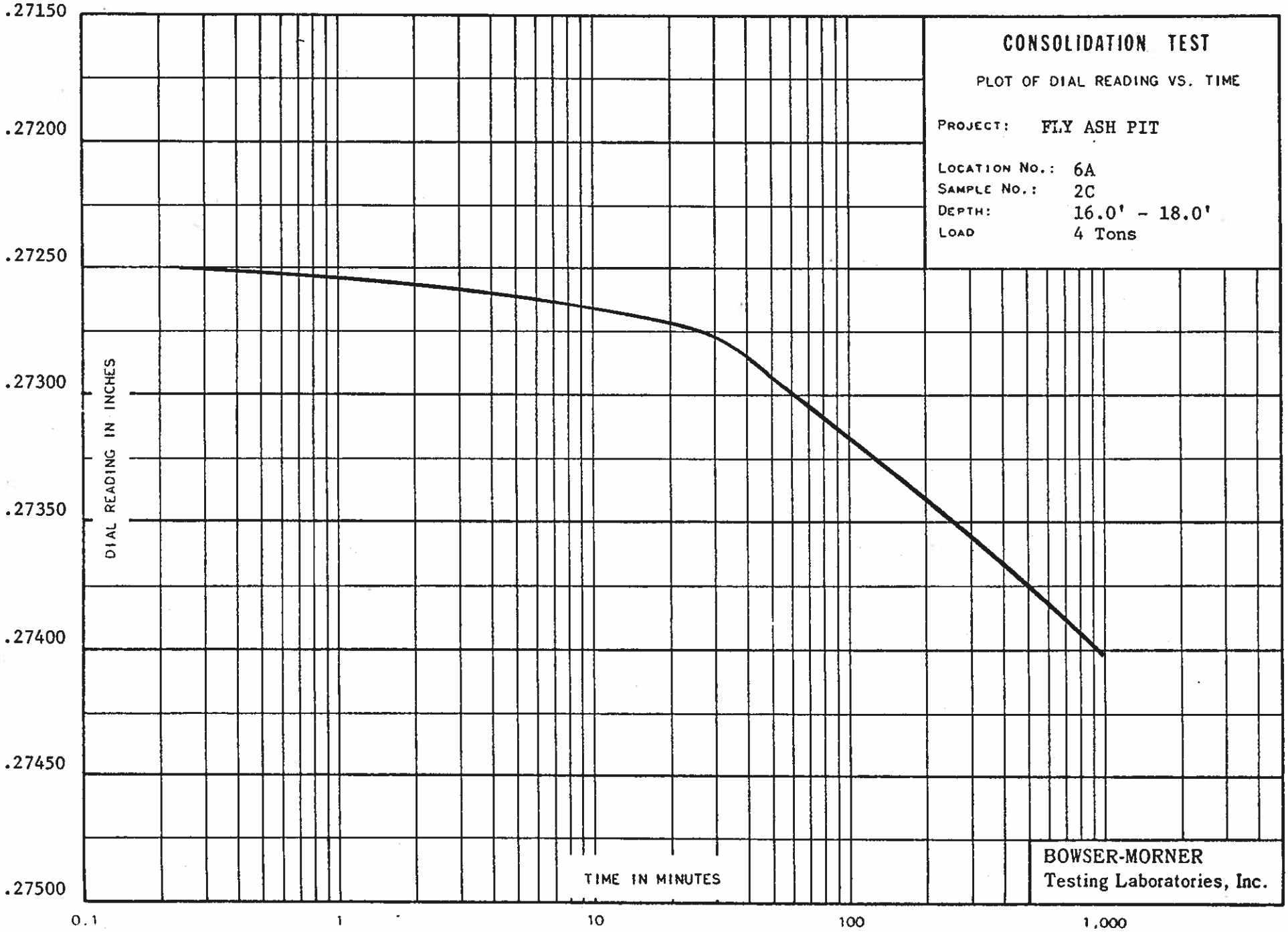

.26260
.26264
.26268
.26272
.26276
.26280
.26284
.26288
DIAL READING IN INCHES
TIME IN MINUTES
CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: FLY ASH PIT
LOCATION NO.: 6A
SAMPLE NO.: 2C
DEPTH: 16.0' - 18.0'
LOAD 1/2 Ton
BOWSER-MORNER
Testing Laboratories, Inc.

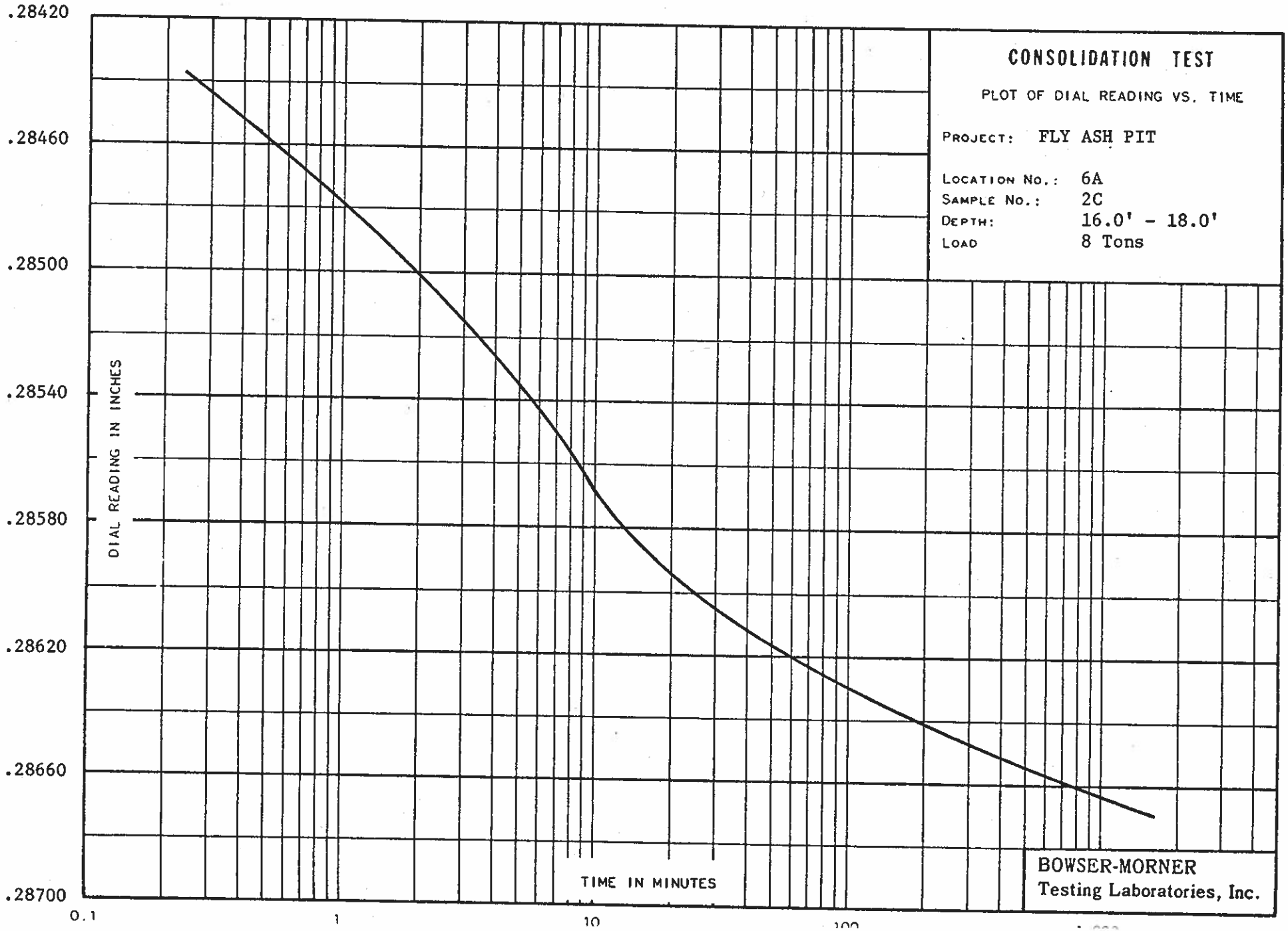

CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: FLY ASH PIT
LOCATION NO.: 6A
SAMPLE NO.: 2C
DEPTH: 16.0' - 18.0'
LOAD 1/4 Ton
DIAL READING IN INCHES
.25880
.25884
.25888
.25892
.25896
.25900
.25904
.25908
TIME IN MINUTES
0.1
1
10
100
1,000
BOWSER-MORNER
Testing Laboratories, Inc.


CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: FLY ASH PIT
LOCATION NO.: 6A
SAMPLE NO.: 2C
DEPTH: 16.0' - 18.0'
LOAD 1/2 Ton
DIAL READING IN INCHES
.26055
.26059
.26063
.26067
.26071
.26075
.26079
.26083
TIME IN MINUTES
0.1
1
10
100
1,000
BOWSER-MORNER
Testing Laboratories, Inc.


CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: FLY ASH PIT
LOCATION NO.: 6A
SAMPLE NO.: 2C
DEPTH: 16.0' - 18.0'
LOAD 1 Ton
DIAL READING IN INCHES
.26448
.26450
.26452
.26454
.26456
.26458
.26460
.26462
TIME IN MINUTES
0.1
1
10
100
1,000
BOWSER-MORNER
Testing Laboratories, Inc.


CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: FLY ASH PIT
LOCATION NO.: 6A
SAMPLE NO.: 2C
DEPTH: 16.0' - 18.0'
LOAD 2 Tons
DIAL READING IN INCHES
.26720
.26740
.26760
.26780
.26800
.26820
.26840
.26860
TIME IN MINUTES
0.1
1
10
100
BOWSER-MORNER
Testing Laboratories, Inc.


CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: FLY ASH PIT
LOCATION NO.: 6A
SAMPLE NO.: 2C
DEPTH: 16.0' - 18.0'
LOAD 4 Tons
DIAL READING IN INCHES
.27150
.27200
.27250
.27300
.27350
.27400
.27450
.27500
TIME IN MINUTES
0.1
1
10
100
1,000
BOWSER-MORNER
Testing Laboratories, Inc.


CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: FLY ASH PIT
LOCATION NO.: 6A
SAMPLE NO.: 2C
DEPTH: 16.0' - 18.0'
LOAD 8 Tons
DIAL READING IN INCHES
.28420
.28460
.28500
.28540
.28580
.28620
.28660
.28700
TIME IN MINUTES
0.1
1
10
100
BOWSER-MORNER
Testing Laboratories, Inc.

CONSOLIDATION TEST

Project: FLY ASH PIT, ASH PIT NO. 3, Stuart Station

Material: Gray Fly Ash

Boring No: 7A
Sample No: 1C
Depth: 4.0' - 6.0'

Tested by: JLH, JAC
Date: 12-18-74

Specific Gravity: 2.28

Moisture Content, Before: 37.3%
After: 33.6%
Natural: 37.2%

Degree of Saturation, Start of Test: 100%
End of Test: 100%

Applied Load (tons/ft.^{2})	Final Dial Reading (in.)	Dial Change (in.)	2H from Dial Change (in.)	Void Ratio	Fitting Time (sec.) t_{90}	Fitting Time (sec.) t_{50}	Coef. of Consolidation (in.^{2}/sec.) $.848\ H^2/t_{90}$	Coef. of Consolidation (in.^{2}/sec.) $.197\ H^2/t_{50}$
0	0.02130							
		0.01299						
.25	0.03429		0.98701	0.8059				
		0.01560						
.5	0.03690		0.98440	0.8013				
		0.01888						
1	0.04018		0.98112	0.7951				
		0.02341						
2	0.04471		0.97659	0.7868				
		0.02891						
4	0.05021		0.97109	0.7768				
		0.03845						
8	0.05975		0.96155	0.7593				
		0.05061						
16	0.07191		0.94939	0.7370				
		0.04960						
8	0.07090		0.95040	0.7389				

2A44

CONSOLIDATION TEST

Project: FLY ASH PIT, ASH PIT NO. 3, Stuart Station

Material: Gray Fly Ash

Boring No: 7A
Sample No: 1C
Depth: 4.0' - 6.0'

Tested by: JLH, JAC
Date: 12-18-74

Specific Gravity: 2.28

Moisture Content, Before: 37.2%
After: 33.6%
Natural: 37.2%

Degree of Saturation, Start of Test: 100%
End of Test: 100%

Applied Load (tons/ft.^{2})	Final Dial Reading (in.)	Dial Change (in.)	2H from Dial Change (in.)	Void Ratio	Fitting Time (sec.) t_{90}	Fitting Time (sec.) t_{50}	Coef. of Consolidation (in.^{2}/sec.) $.848\ H^2/t_{90}$	Coef. of Consolidation (in.^{2}/sec.) $.197\ H^2/t_{50}$
4	0.06881	0.04751	0.95249	0.7428				
2	0.06673	0.04543	0.95457	0.7465				
1	0.06482	0.04352	0.95648	0.7500				
1/2	0.06309	0.04179	0.95821	0.7532				
1/4	0.06136	0.04006	0.95994	0.7564				
1/2	0.06220	0.04090	0.95910	0.7548				
1	0.06358	0.04228	0.95772	0.7523				
2	0.06550	0.04420	0.95580	0.7488				
4	0.06791	0.04661	0.95339	0.7444				

2A44

CONSOLIDATION TEST

Project: FLY ASH PIT, ASH PIT NO. 3, Stuart Station

Material: Gray Fly Ash

Boring No: 7A
Sample No: 1C
Depth: 4.0' - 6.0'

Tested by: JLH, JAC
Date: 12-18-74

Specific Gravity: 2.28

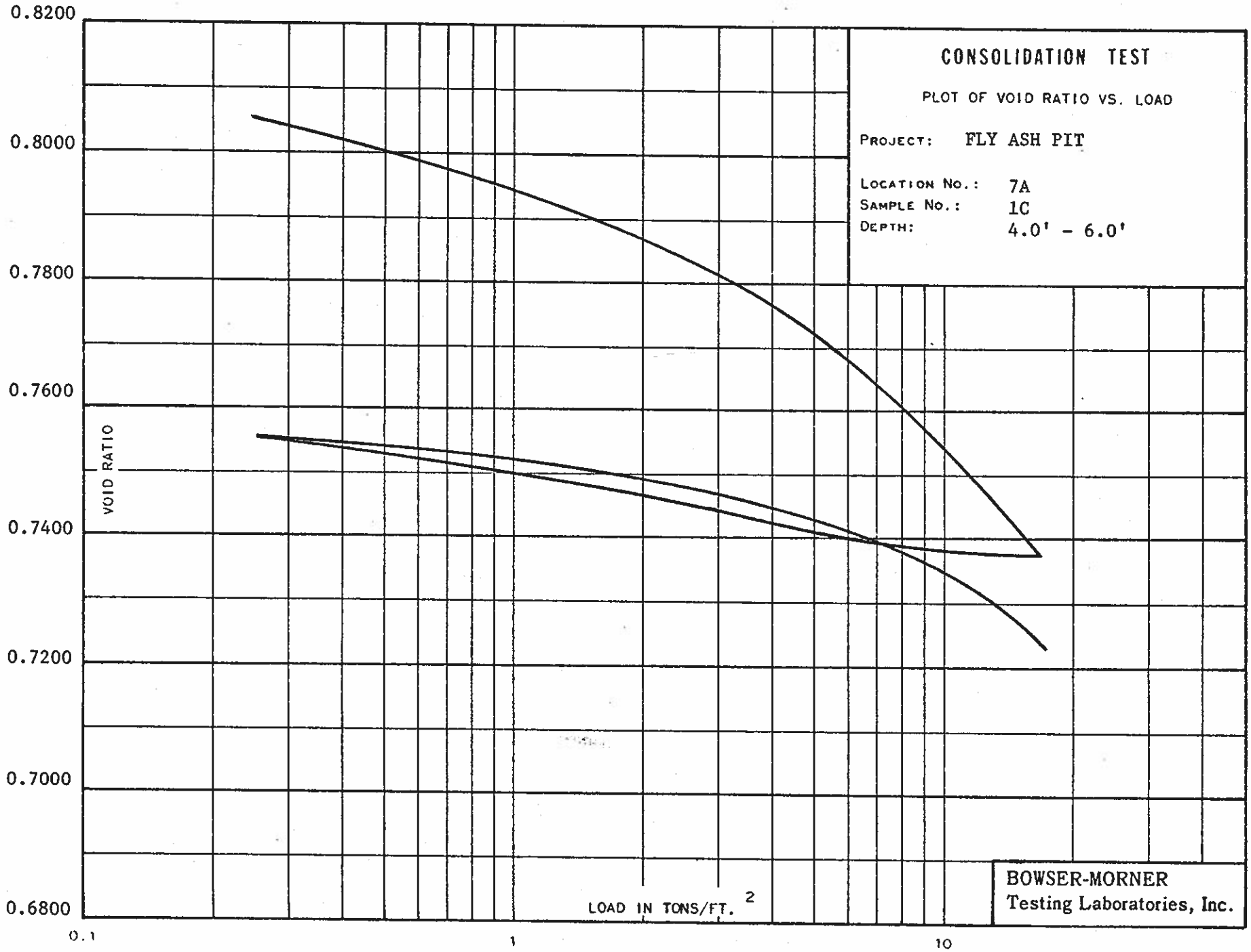
Moisture Content, Before: 37.2%
After: 33.6%
Natural: 37.2%

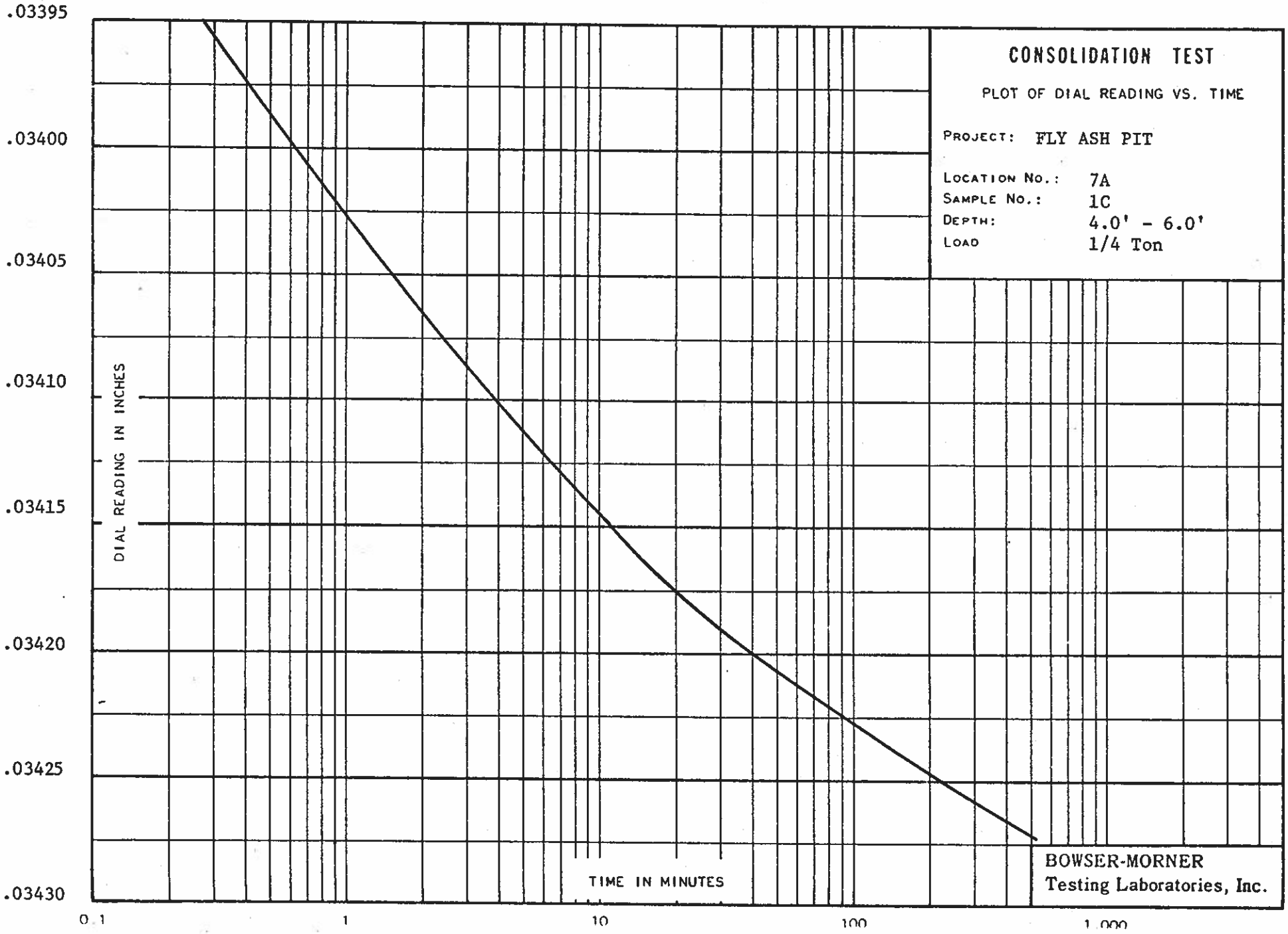
Degree of Saturation, Start of Test: 100%
End of Test: 100%

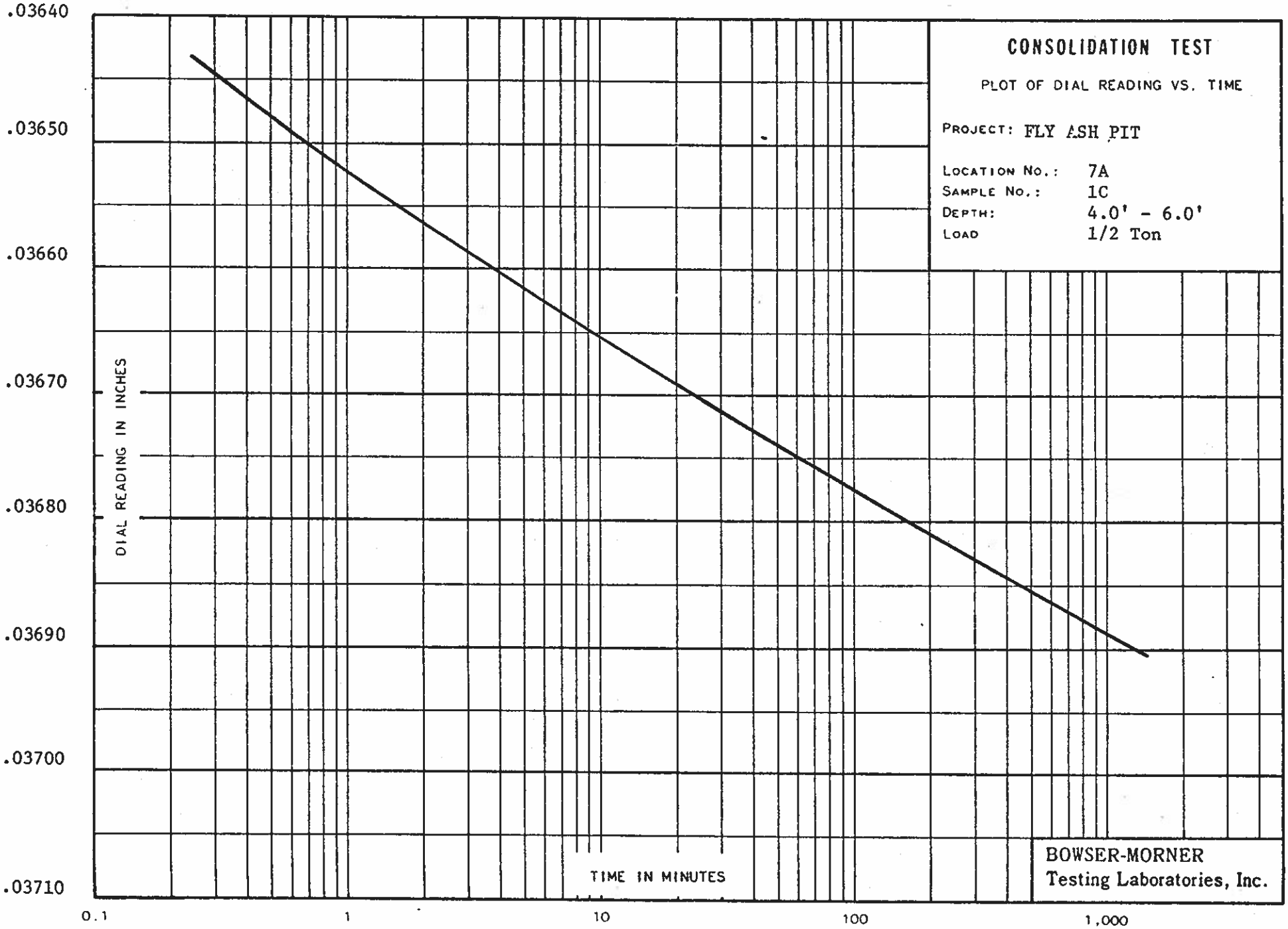
Applied Load (tons/ft.^{2})	Final Dial Reading (in.)	Dial Change (in.)	2H from Dial Change (in.)	Void Ratio	Fitting Time (sec.) t_{90}	Fitting Time (sec.) t_{50}	Coef. of Consolidation (in.^{2}/sec.) $.848\ H^2/t_{90}$	Coef. of Consolidation (in.^{2}/sec.) $.197\ H^2/t_{50}$
		0.05019						
8	0.07149		0.94981	0.7378				
		0.05830						
16	0.07960		0.94170	0.7230				

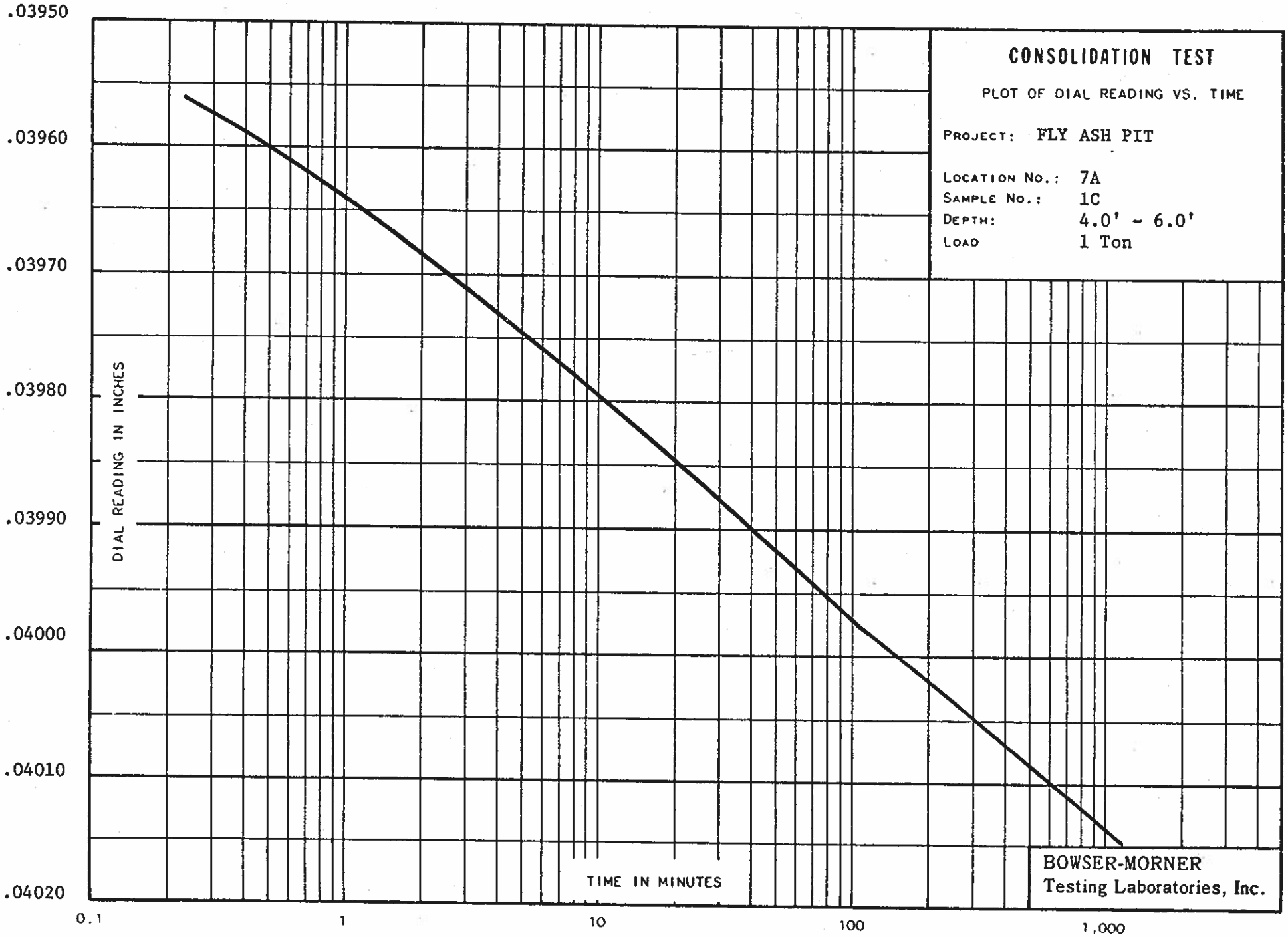
2A44

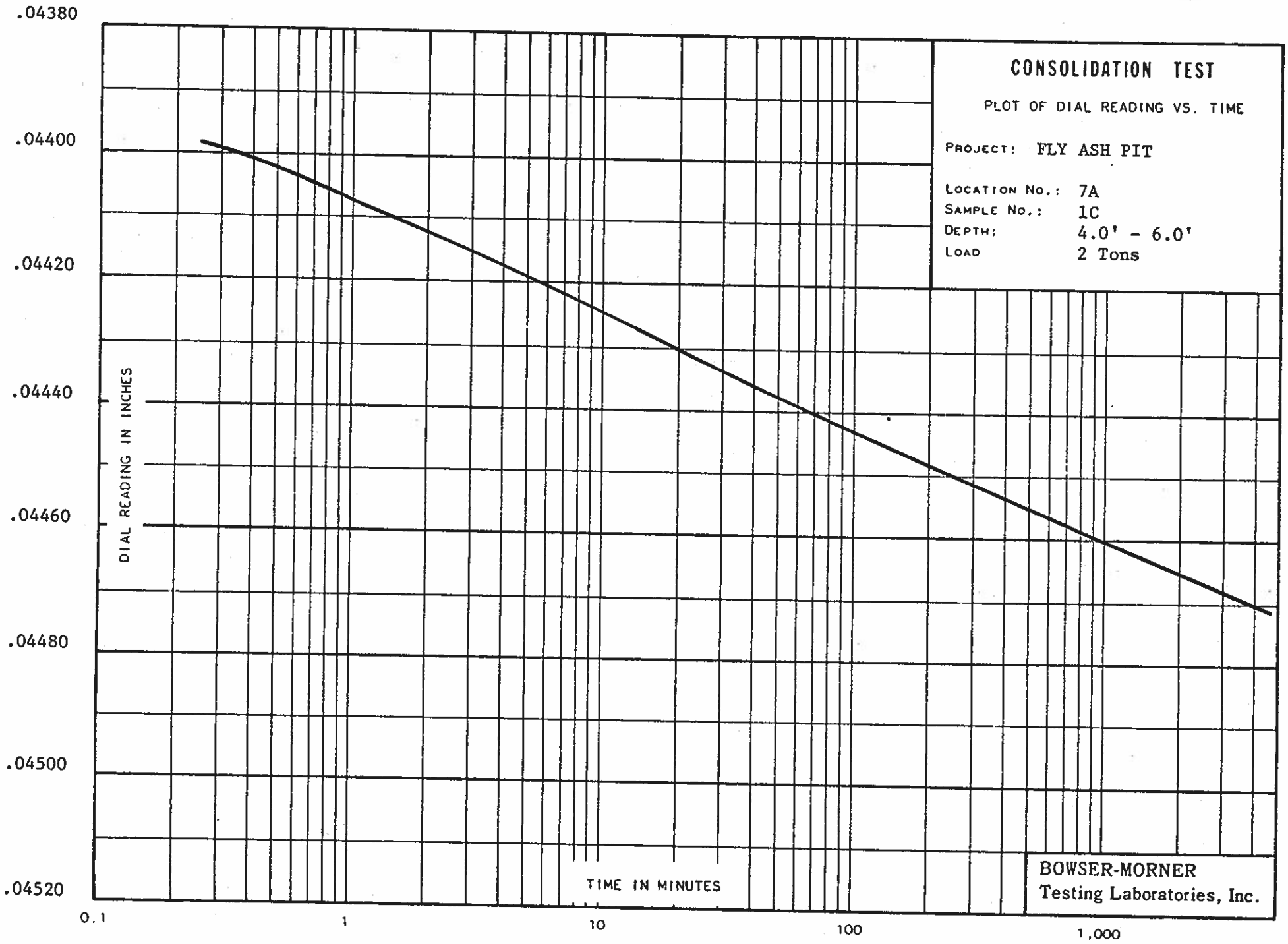
FORM 2A86

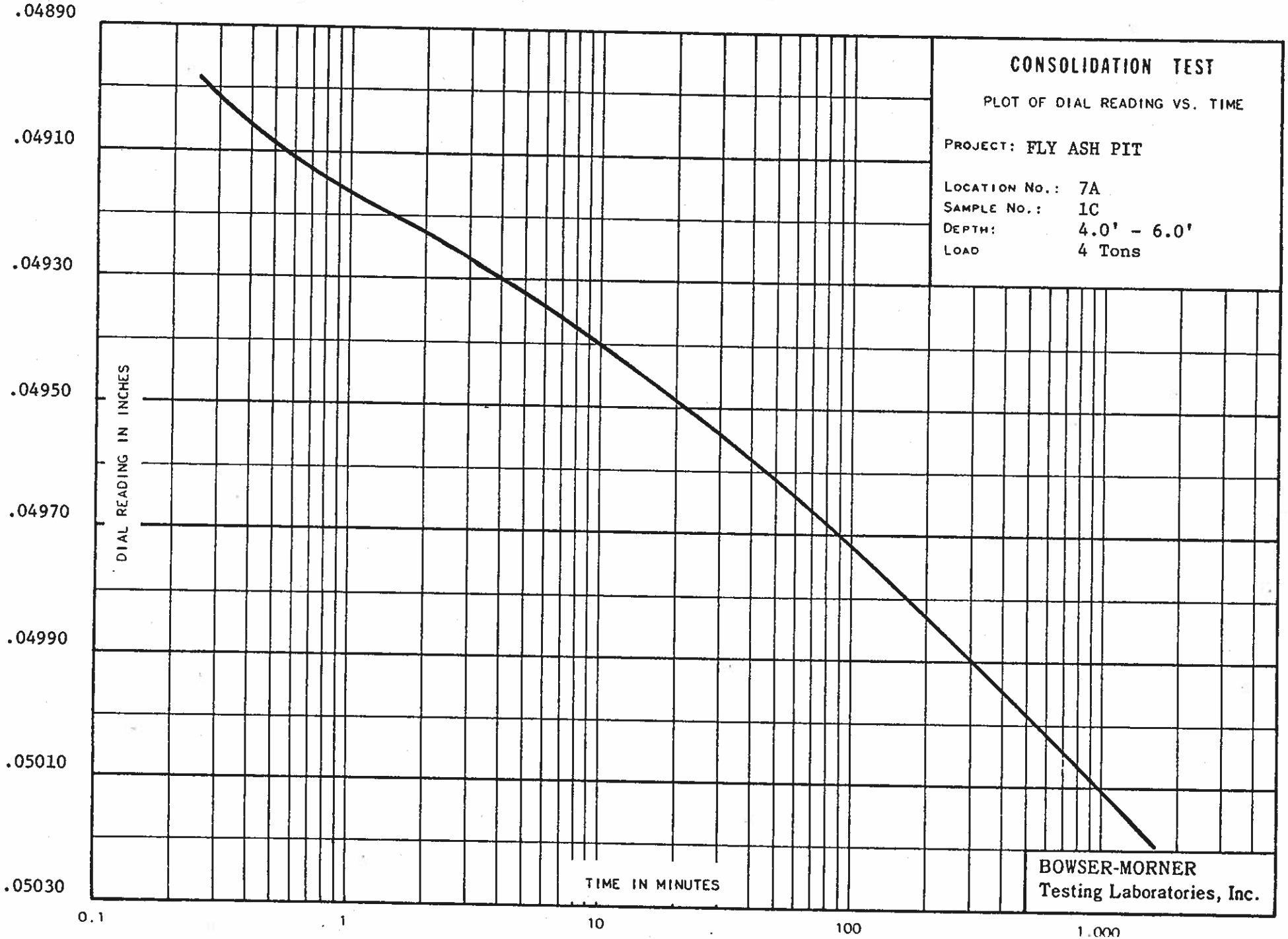

CONSOLIDATION TEST
PLOT OF VOID RATIO VS. LOAD
PROJECT: FLY ASH PIT
LOCATION NO.: 7A
SAMPLE NO.: 1C
DEPTH: 4.0' - 6.0'
VOID RATIO
0.8200
0.8000
0.7800
0.7600
0.7400
0.7200
0.7000
0.6800
0.1
1
10
LOAD IN TONS/FT.2
BOWSER-MORNER
Testing Laboratories, Inc.


CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: FLY ASH PIT
LOCATION NO.: 7A
SAMPLE NO.: 1C
DEPTH: 4.0' - 6.0'
LOAD 1/4 Ton
DIAL READING IN INCHES
.03395
.03400
.03405
.03410
.03415
.03420
.03425
.03430
TIME IN MINUTES
0.1
1
10
100
1,000
BOWSER-MORNER
Testing Laboratories, Inc.

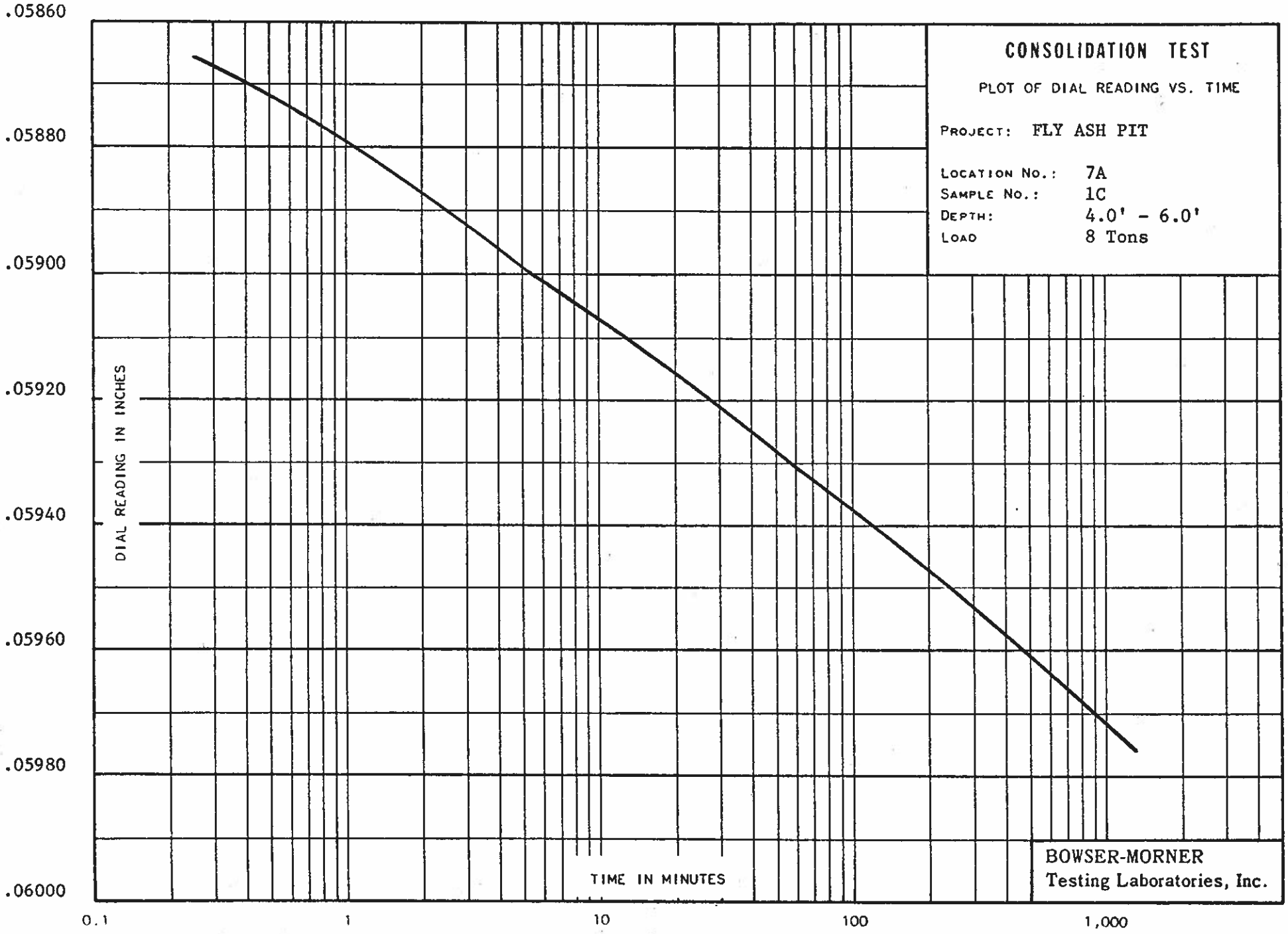

CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: FLY ASH PIT
LOCATION NO.: 7A
SAMPLE NO.: 1C
DEPTH: 4.0' - 6.0'
LOAD 1/2 Ton
DIAL READING IN INCHES
.03640
.03650
.03660
.03670
.03680
.03690
.03700
.03710
TIME IN MINUTES
0.1
1
10
100
1,000
BOWSER-MORNER
Testing Laboratories, Inc.


CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: FLY ASH PIT
LOCATION NO.: 7A
SAMPLE NO.: 1C
DEPTH: 4.0' - 6.0'
LOAD 1 Ton
DIAL READING IN INCHES
.03950
.03960
.03970
.03980
.03990
.04000
.04010
.04020
TIME IN MINUTES
0.1
1
10
100
1,000
BOWSER-MORNER
Testing Laboratories, Inc.

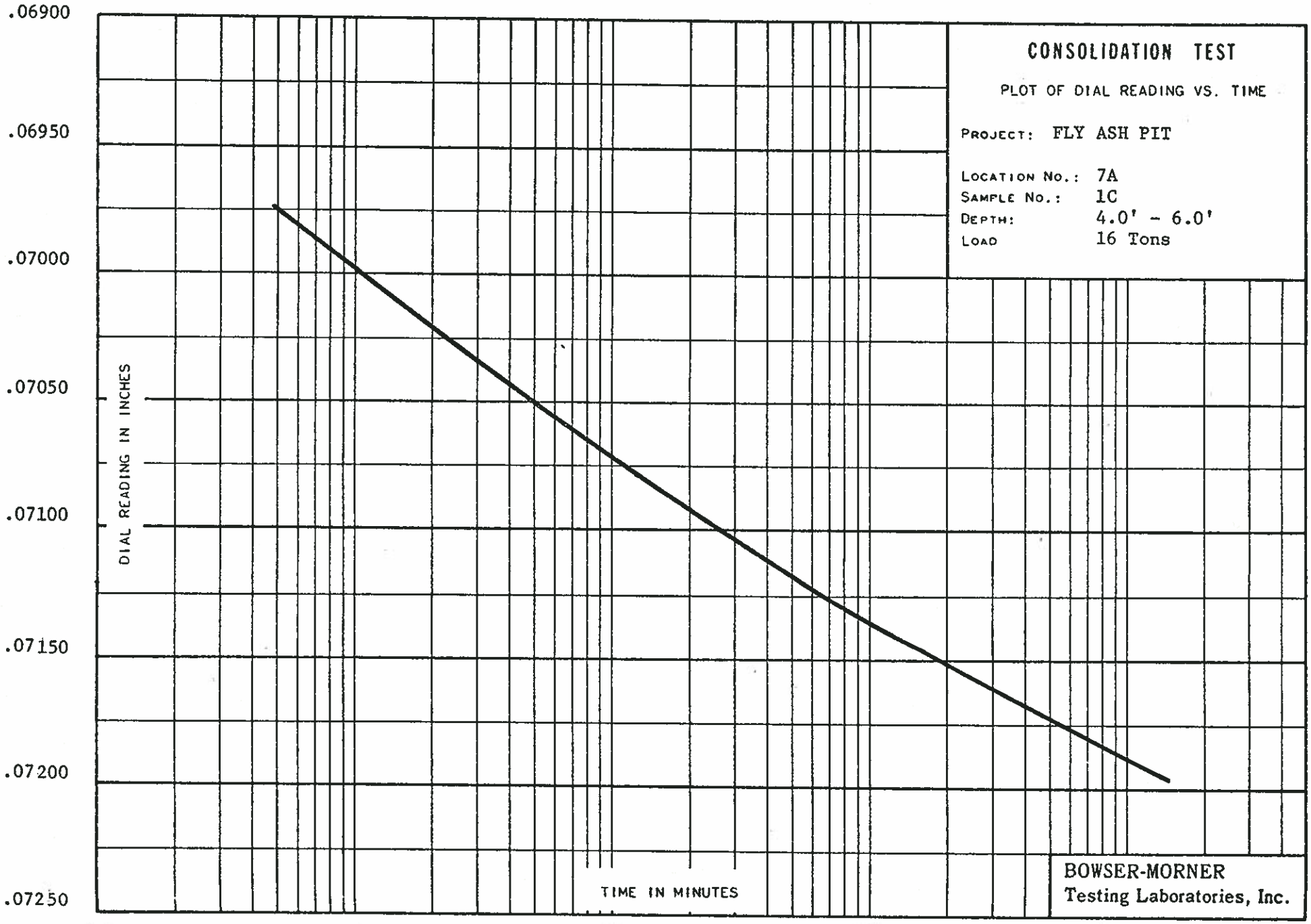

CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: FLY ASH PIT
LOCATION NO.: 7A
SAMPLE NO.: 1C
DEPTH: 4.0' - 6.0'
LOAD 2 Tons
DIAL READING IN INCHES
.04380
.04400
.04420
.04440
.04460
.04480
.04500
.04520
TIME IN MINUTES
0.1
1
10
100
1,000
BOWSER-MORNER
Testing Laboratories, Inc.

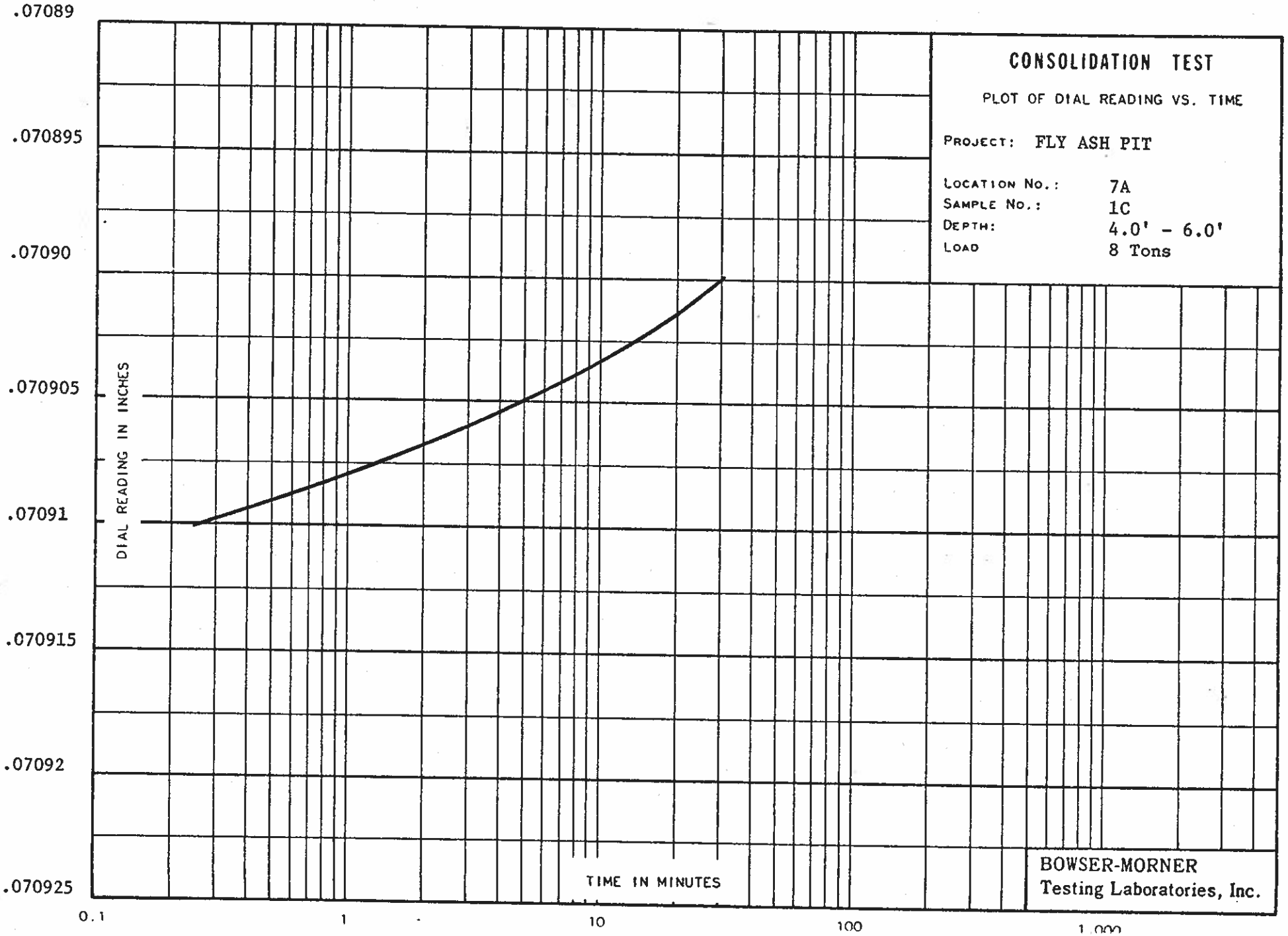

CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: FLY ASH PIT
LOCATION NO.: 7A
SAMPLE NO.: 1C
DEPTH: 4.0' - 6.0'
LOAD 4 Tons
DIAL READING IN INCHES
.04890
.04910
.04930
.04950
.04970
.04990
.05010
.05030
TIME IN MINUTES
0.1
1
10
100
1,000
BOWSER-MORNER
Testing Laboratories, Inc.

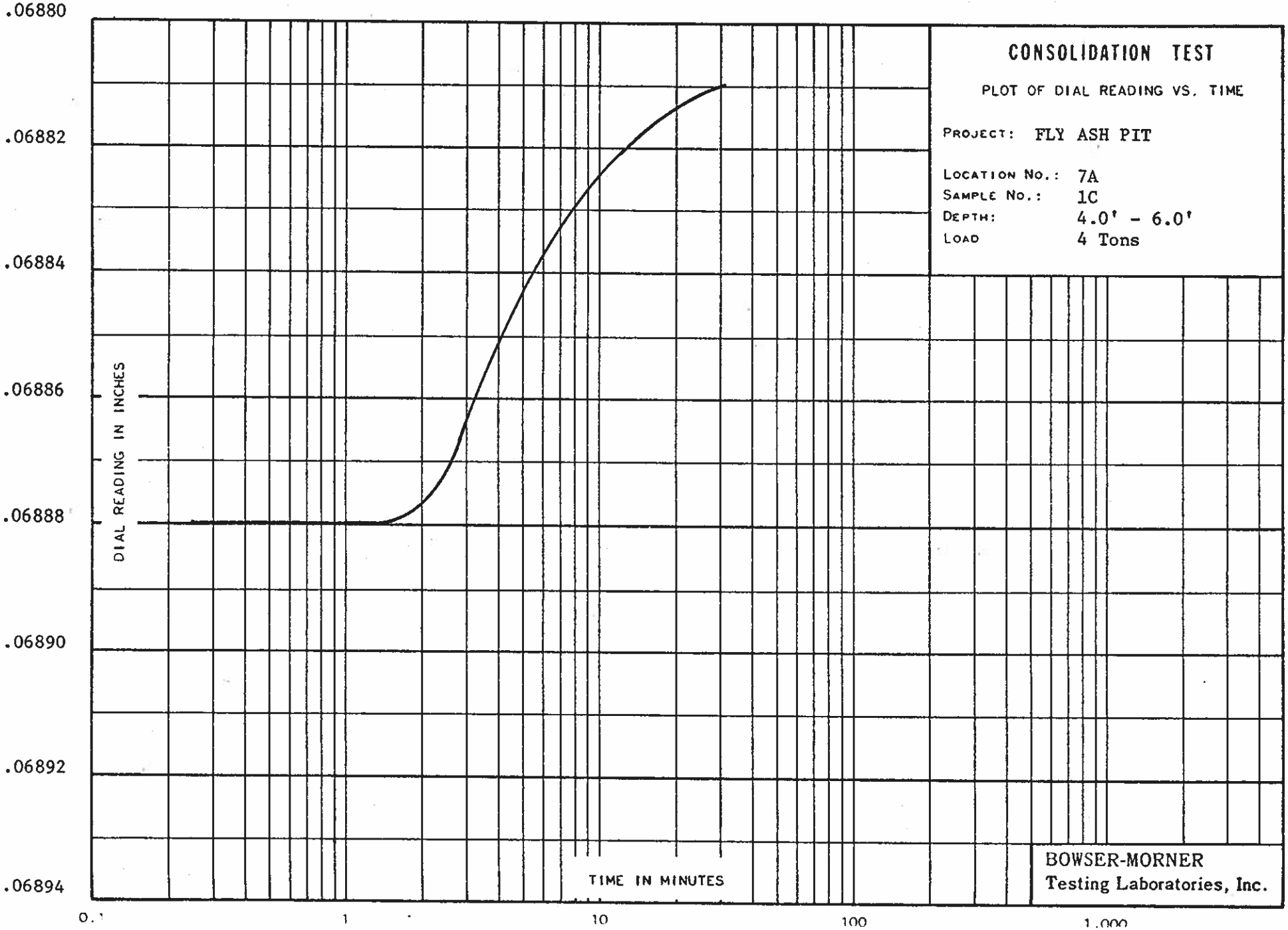
FORM 2A88

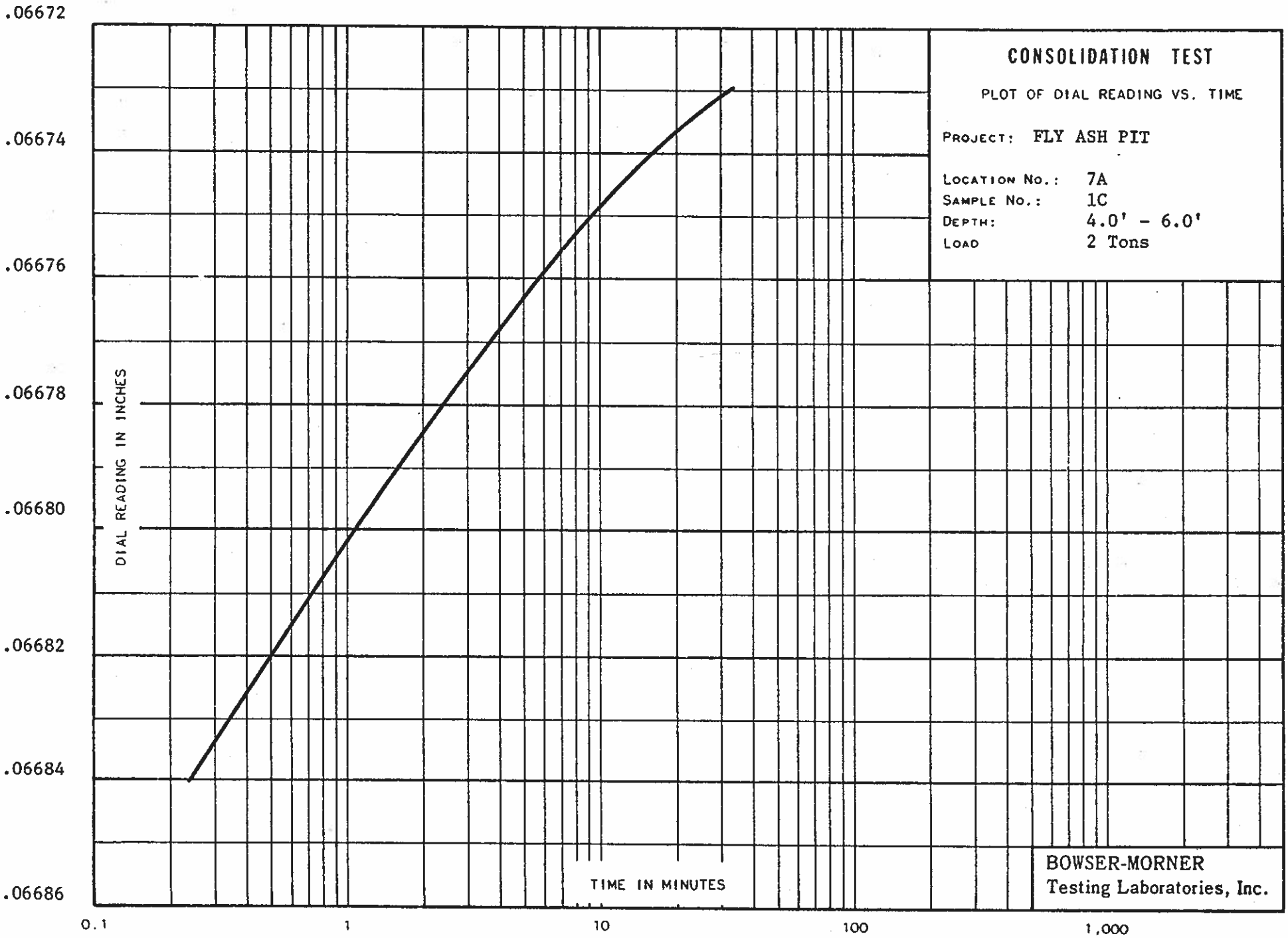

CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: FLY ASH PIT
LOCATION NO.: 7A
SAMPLE NO.: 1C
DEPTH: 4.0' - 6.0'
LOAD 8 Tons
DIAL READING IN INCHES
.05860
.05880
.05900
.05920
.05940
.05960
.05980
.06000
TIME IN MINUTES
0.1
1
10
100
1,000
BOWSER-MORNER
Testing Laboratories, Inc.

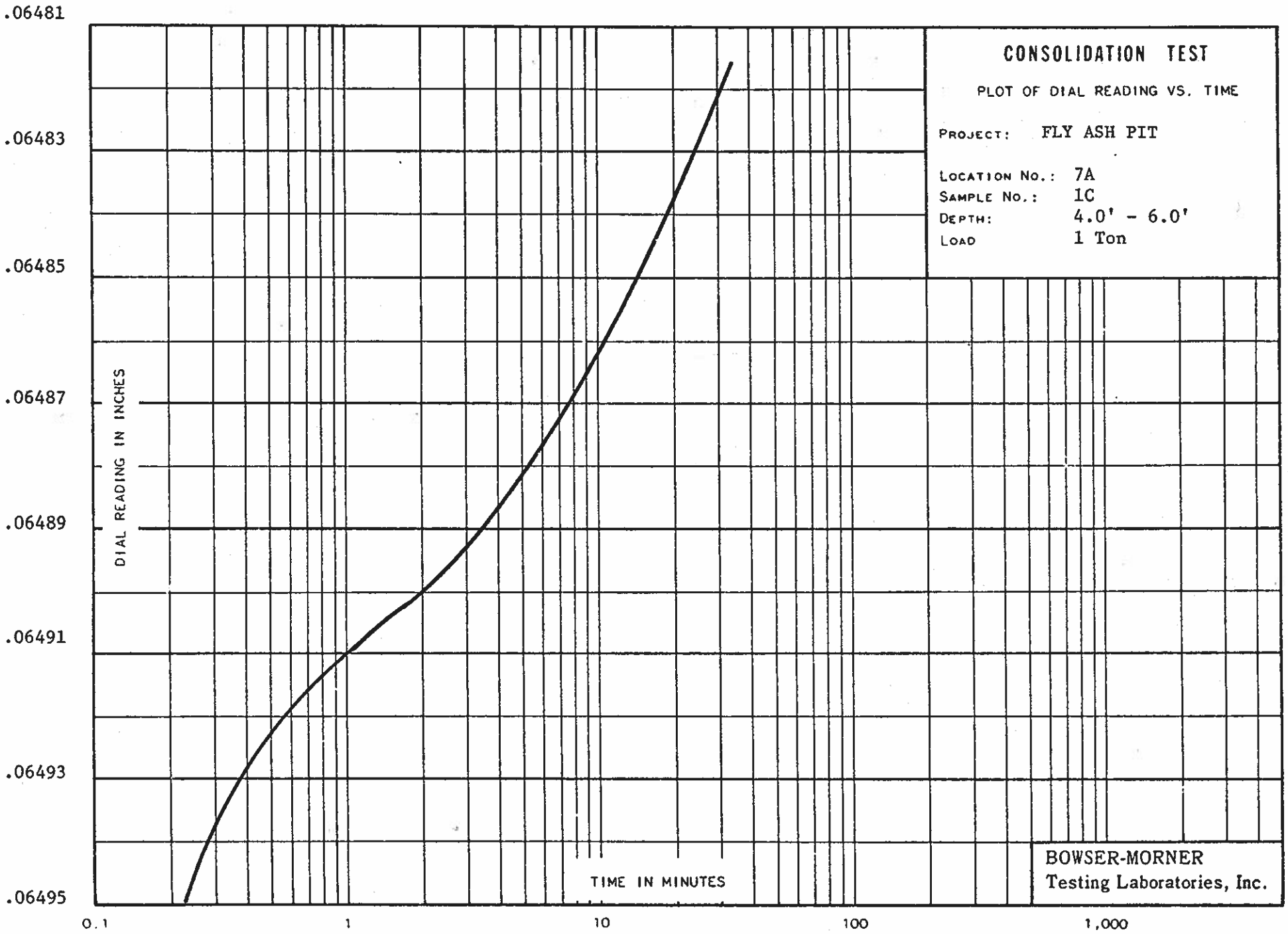
FORM 2A00

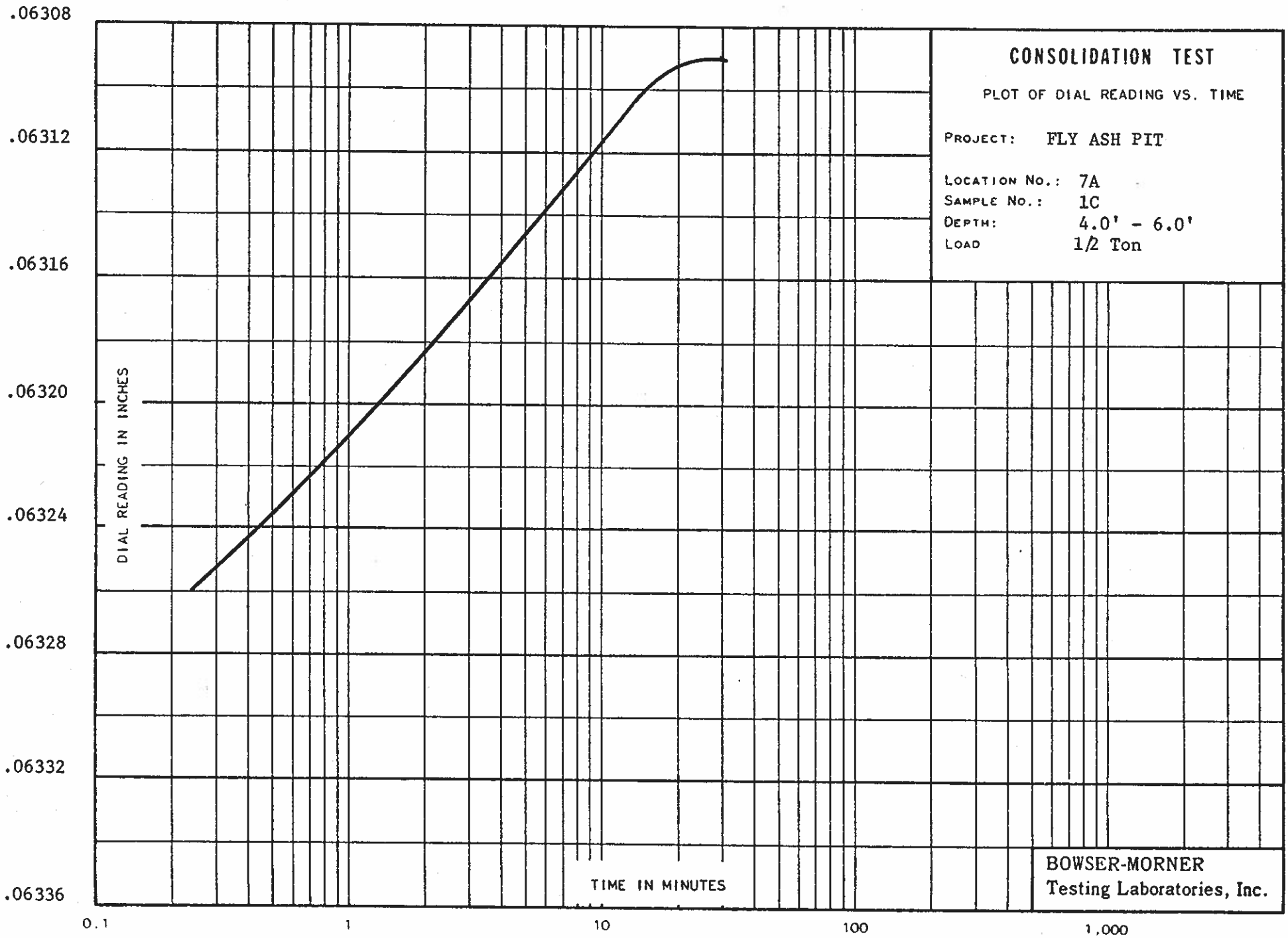

CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: FLY ASH PIT
LOCATION NO.: 7A
SAMPLE NO.: 1C
DEPTH: 4.0' - 6.0'
LOAD 16 Tons
.06900
.06950
.07000
.07050
.07100
.07150
.07200
.07250
DIAL READING IN INCHES
TIME IN MINUTES
BOWSER-MORNER
Testing Laboratories, Inc.

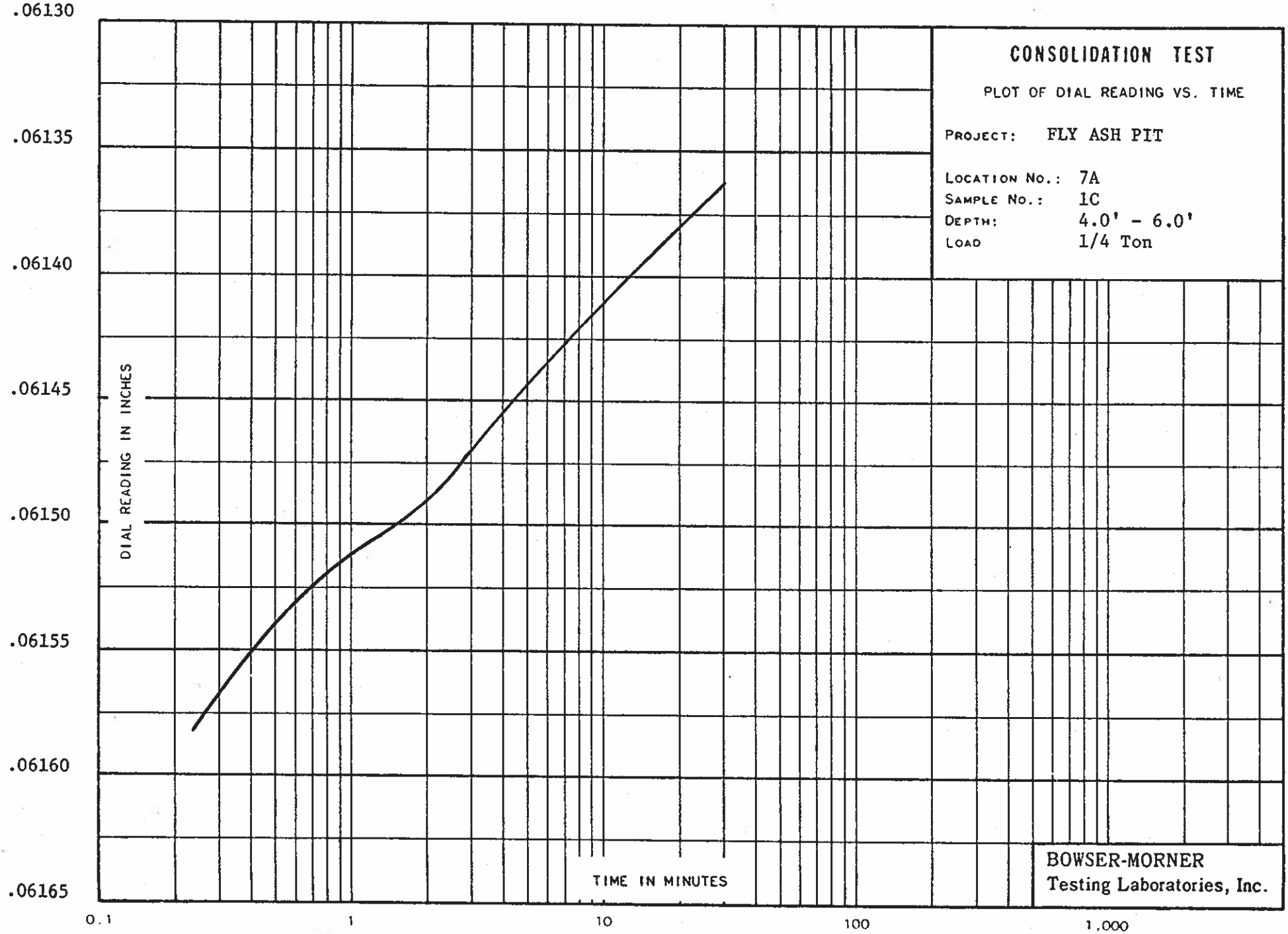

CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: FLY ASH PIT
LOCATION NO.: 7A
SAMPLE NO.: 1C
DEPTH: 4.0' - 6.0'
LOAD 8 Tons
DIAL READING IN INCHES
.07089
.070895
.07090
.070905
.07091
.070915
.07092
.070925
TIME IN MINUTES
0.1
1
10
100
1,000
BOWSER-MORNER
Testing Laboratories, Inc.

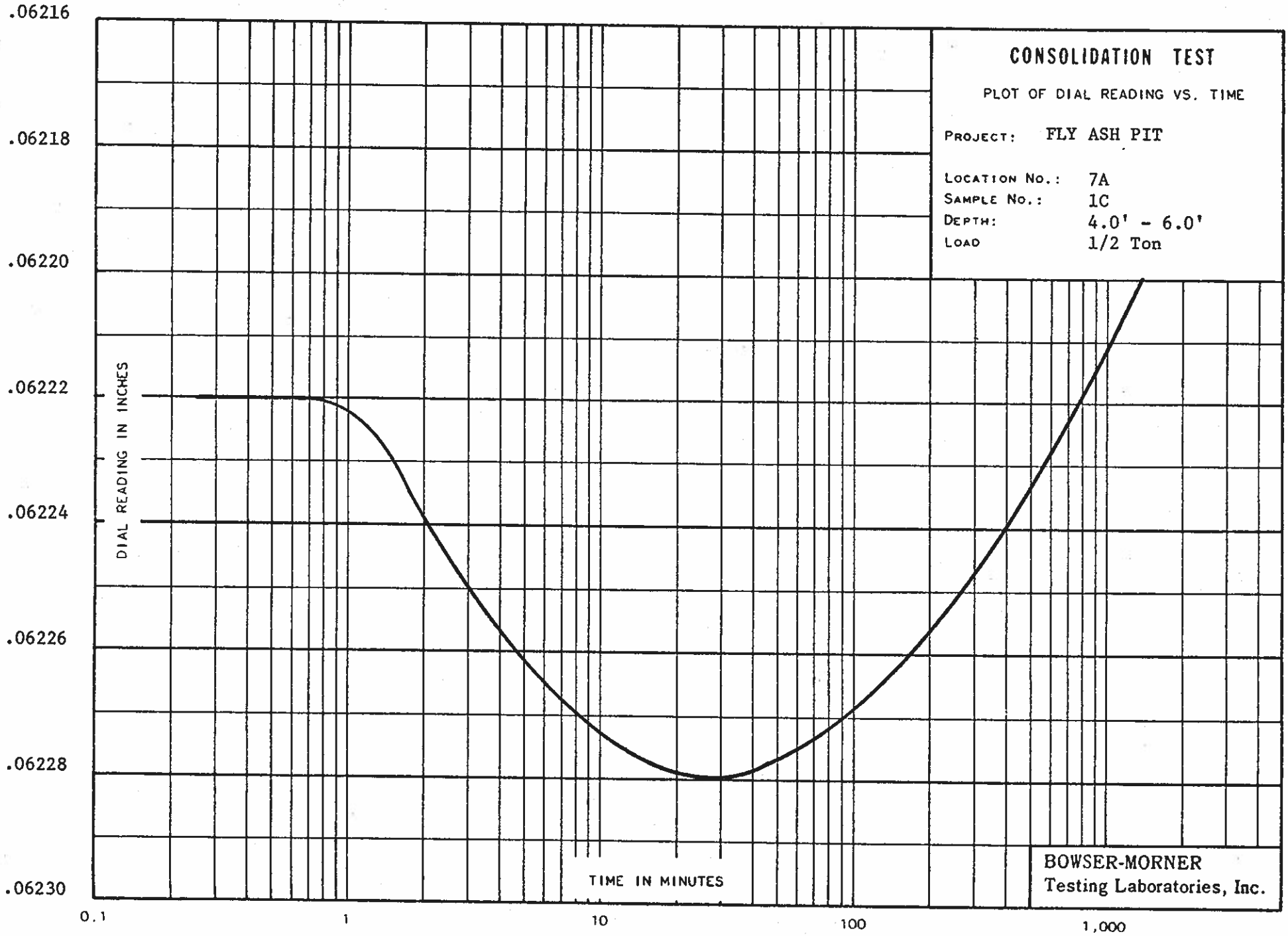

CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: FLY ASH PIT
LOCATION NO.: 7A
SAMPLE NO.: 1C
DEPTH: 4.0' - 6.0'
LOAD 4 Tons
DIAL READING IN INCHES
.06880
.06882
.06884
.06886
.06888
.06890
.06892
.06894
TIME IN MINUTES
0.1
1
10
100
1,000
BOWSER-MORNER
Testing Laboratories, Inc.

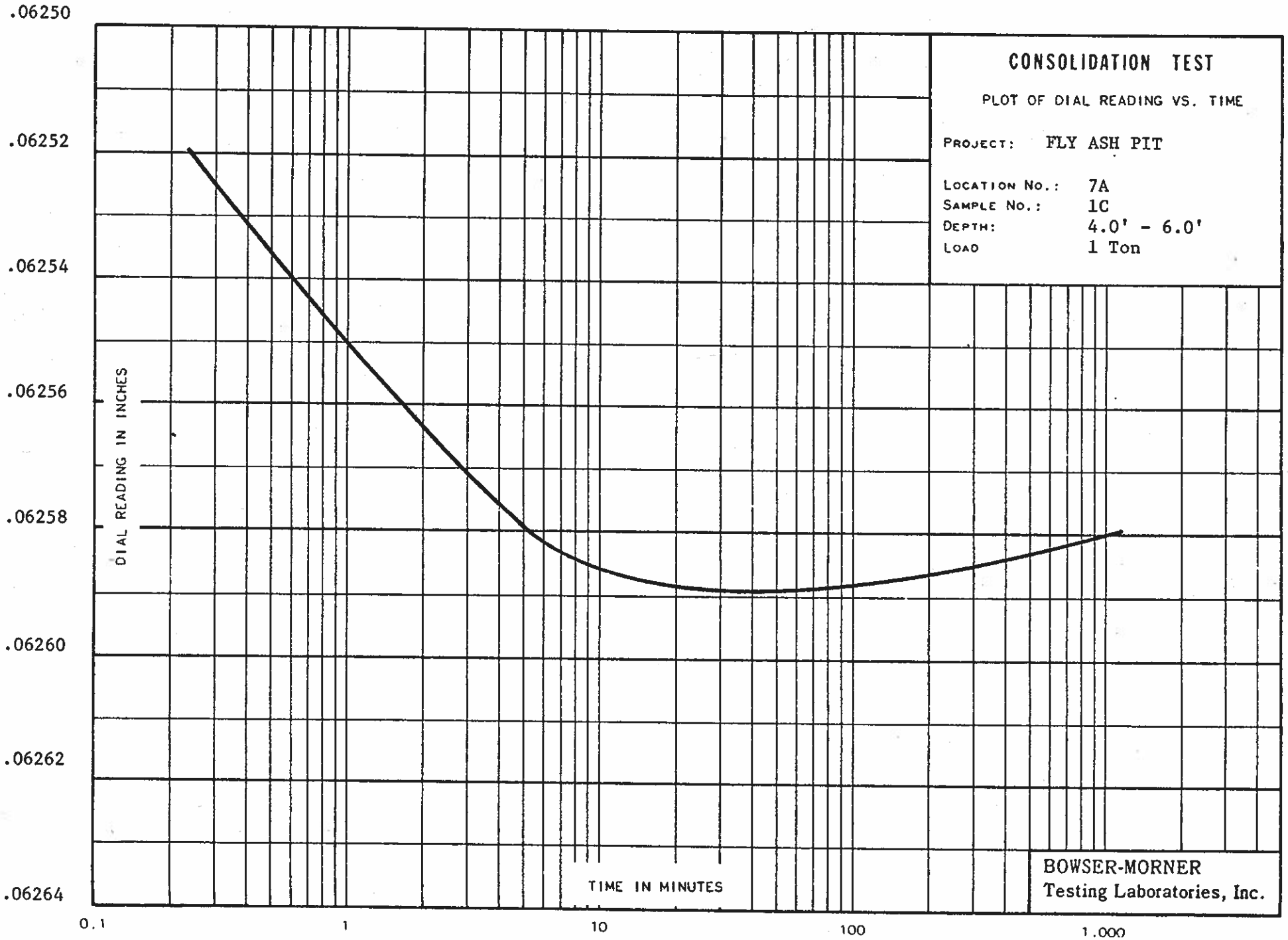

CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: FLY ASH PIT
LOCATION NO.: 7A
SAMPLE NO.: 1C
DEPTH: 4.0' - 6.0'
LOAD 2 Tons
DIAL READING IN INCHES
.06672
.06674
.06676
.06678
.06680
.06682
.06684
.06686
TIME IN MINUTES
0.1
1
10
100
1,000
BOWSER-MORNER
Testing Laboratories, Inc.

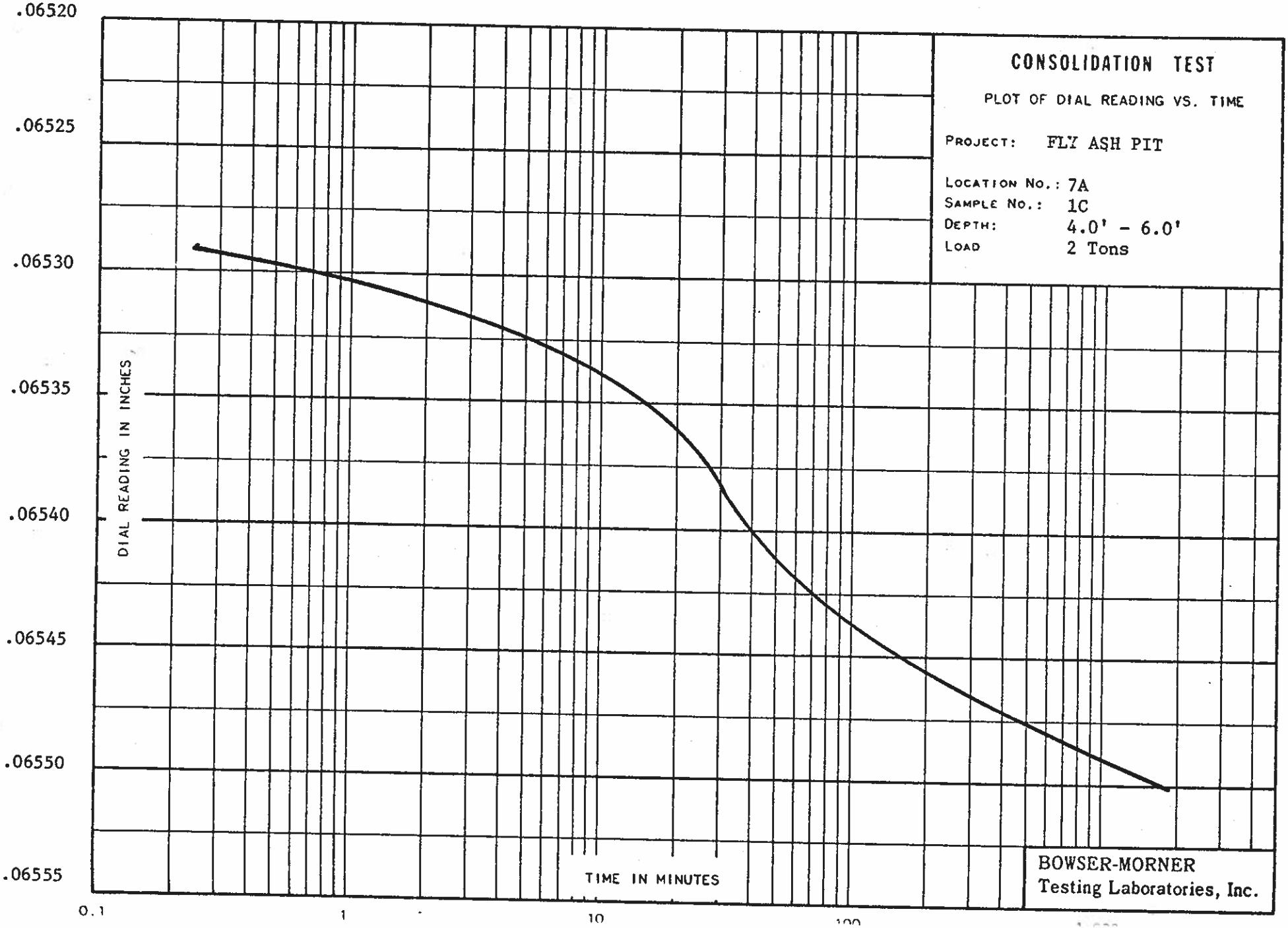

CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: FLY ASH PIT
LOCATION NO.: 7A
SAMPLE NO.: 1C
DEPTH: 4.0' - 6.0'
LOAD 1 Ton
DIAL READING IN INCHES
.06481
.06483
.06485
.06487
.06489
.06491
.06493
.06495
TIME IN MINUTES
0.1
1
10
100
1,000
BOWSER-MORNER
Testing Laboratories, Inc.

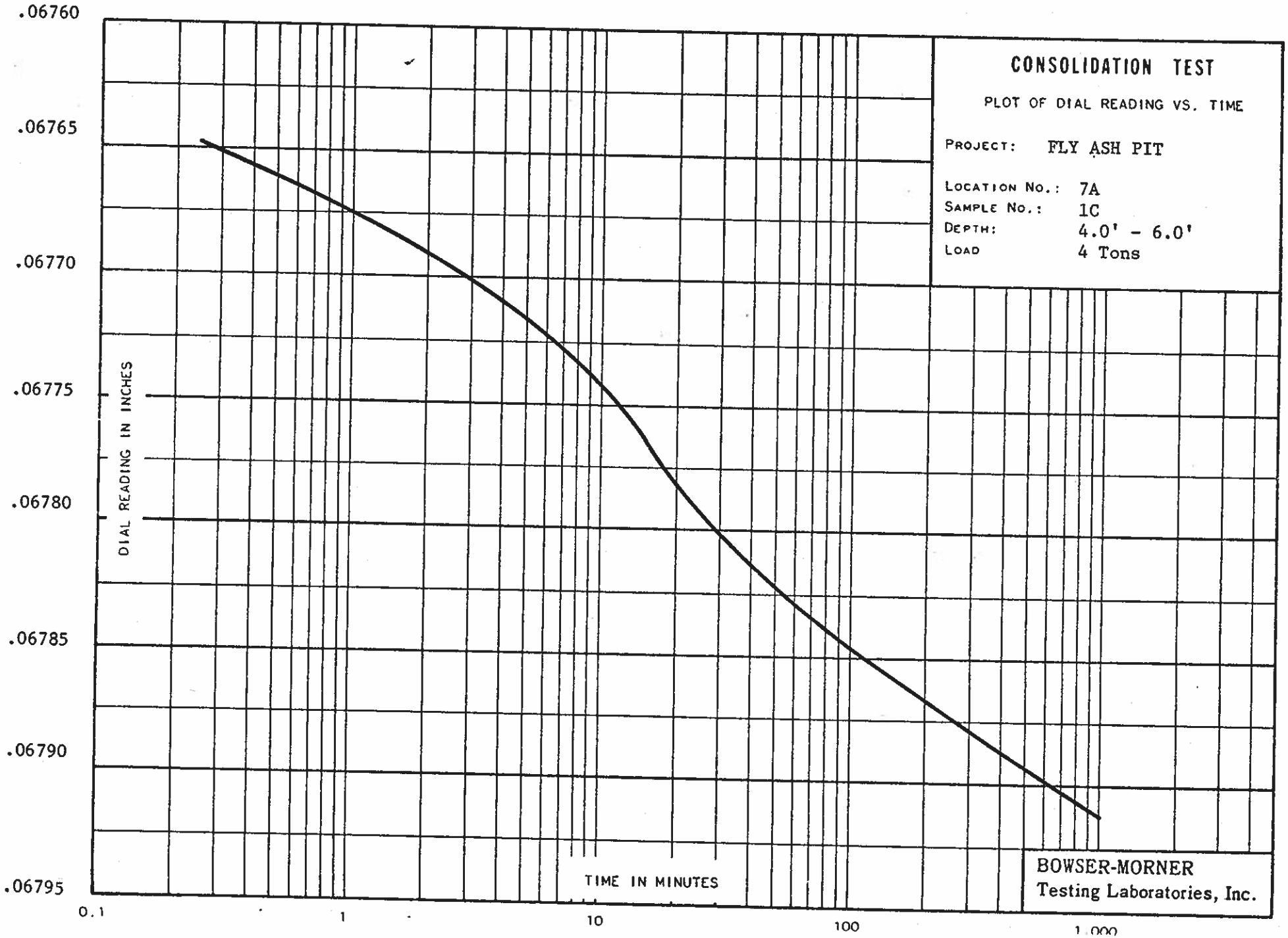

CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: FLY ASH PIT
LOCATION NO.: 7A
SAMPLE NO.: 1C
DEPTH: 4.0' - 6.0'
LOAD 1/2 Ton
DIAL READING IN INCHES
.06308
.06312
.06316
.06320
.06324
.06328
.06332
.06336
TIME IN MINUTES
0.1
1
10
100
1,000
BOWSER-MORNER
Testing Laboratories, Inc.

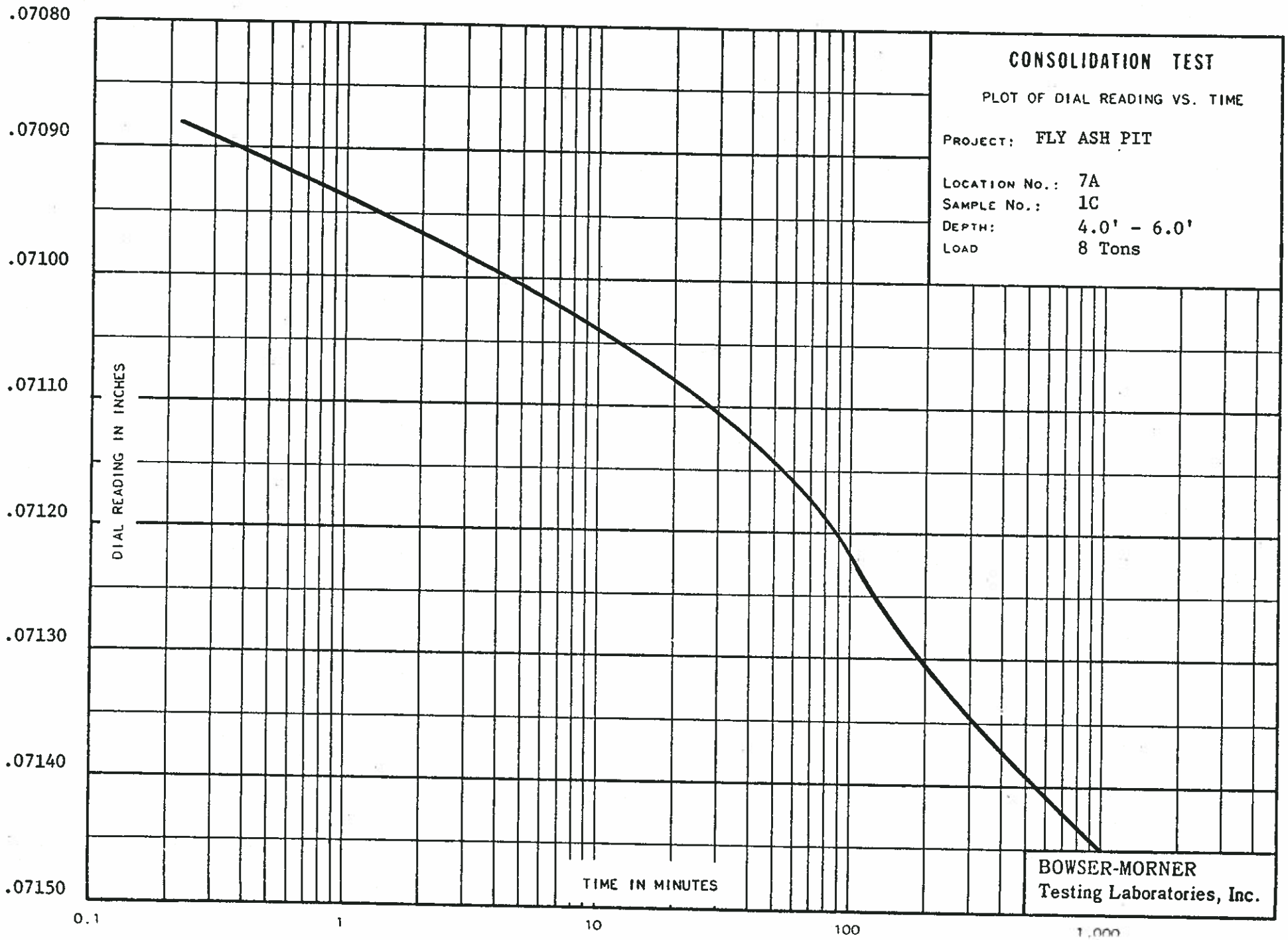

CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: FLY ASH PIT
LOCATION NO.: 7A
SAMPLE NO.: 1C
DEPTH: 4.0' - 6.0'
LOAD 1/4 Ton
DIAL READING IN INCHES
.06130
.06135
.06140
.06145
.06150
.06155
.06160
.06165
TIME IN MINUTES
0.1
1
10
100
1,000
BOWSER-MORNER
Testing Laboratories, Inc.

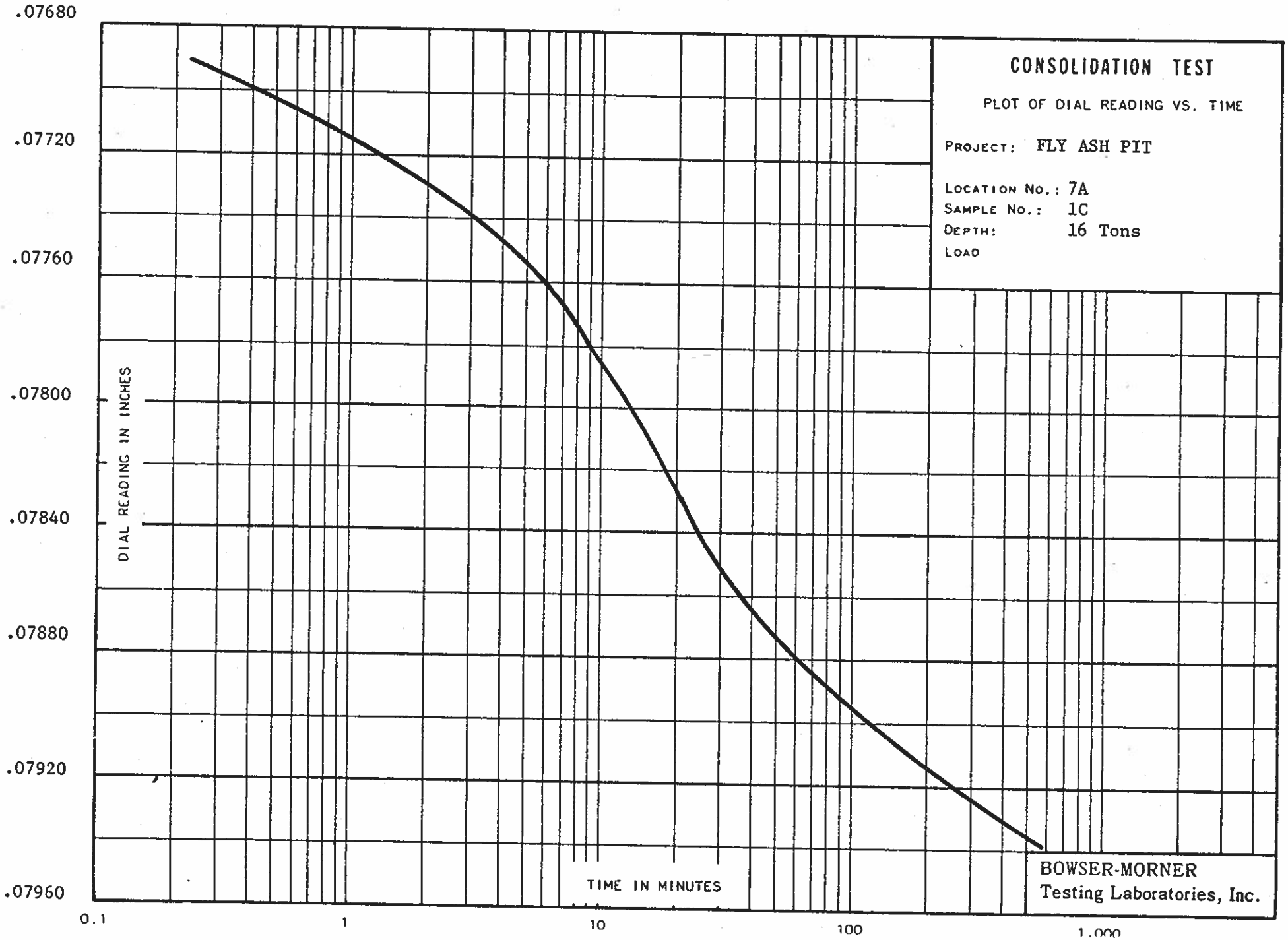

CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: FLY ASH PIT
LOCATION NO.: 7A
SAMPLE NO.: 1C
DEPTH: 4.0' - 6.0'
LOAD 1/2 Ton
DIAL READING IN INCHES
.06216
.06218
.06220
.06222
.06224
.06226
.06228
.06230
TIME IN MINUTES
0.1
1
10
100
1,000
BOWSER-MORNER
Testing Laboratories, Inc.


CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: FLY ASH PIT
LOCATION NO.: 7A
SAMPLE NO.: 1C
DEPTH: 4.0' - 6.0'
LOAD 1 Ton
DIAL READING IN INCHES
.06250
.06252
.06254
.06256
.06258
.06260
.06262
.06264
TIME IN MINUTES
0.1
1
10
100
1,000
BOWSER-MORNER
Testing Laboratories, Inc.


CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: FLY ASH PIT
LOCATION NO.: 7A
SAMPLE NO.: 1C
DEPTH: 4.0' - 6.0'
LOAD 2 Tons
DIAL READING IN INCHES
.06520
.06525
.06530
.06535
.06540
.06545
.06550
.06555
TIME IN MINUTES
0.1
1
10
100
BOWSER-MORNER
Testing Laboratories, Inc.


CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: FLY ASH PIT
LOCATION NO.: 7A
SAMPLE NO.: 1C
DEPTH: 4.0' - 6.0'
LOAD 4 Tons
DIAL READING IN INCHES
.06760
.06765
.06770
.06775
.06780
.06785
.06790
.06795
TIME IN MINUTES
0.1
1
10
100
1,000
BOWSER-MORNER
Testing Laboratories, Inc.


CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: FLY ASH PIT
LOCATION NO.: 7A
SAMPLE NO.: 1C
DEPTH: 4.0' - 6.0'
LOAD 8 Tons
DIAL READING IN INCHES
.07080
.07090
.07100
.07110
.07120
.07130
.07140
.07150
TIME IN MINUTES
0.1
1
10
100
1,000
BOWSER-MORNER
Testing Laboratories, Inc.


CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: FLY ASH PIT
LOCATION No.: 7A
SAMPLE No.: 1C
DEPTH: 16 Tons
LOAD
DIAL READING IN INCHES
.07680
.07720
.07760
.07800
.07840
.07880
.07920
.07960
TIME IN MINUTES
0.1
1
10
100
1,000
BOWSER-MORNER
Testing Laboratories, Inc.

CONSOLIDATION TEST

Project: FLY ASH PIT, ASH PIT NO. 3, Stuart Station

Material: Gray Fly Ash

Boring No: 8A
Sample No: 2C
Depth: 20.0' - 22.0'

Tested by: JLH, JAC
Date: 12-18-74

Specific Gravity: 2.50

Moisture Content, Before: 30.4%
After: 27.5%
Natural: 30.2%

Degree of Saturation, Start of Test: 78%
End of Test: 78%

Applied Load (tons/ft.^{2})	Final Dial Reading (in.)	Dial Change (in.)	2H from Dial Change (in.)	Void Ratio	Fitting Time (sec.) t_{90}	Fitting Time (sec.) t_{50}	Coef. of Consolidation (in.^{2}/sec.) $.848\ H^2/t_{90}$	Coef. of Consolidation (in.^{2}/sec.) $.197\ H^2/t_{50}$
0	0.02269							
.25	0.03516	0.01247						
			0.98753	0.9403				
.5	0.03768	0.01499						
			0.98501	0.9353				
1	0.04097	0.01828						
			0.98172	0.9289				
2	0.04515	0.02246						
			0.97754	0.9207				
4	0.05030	0.02761						
			0.97239	0.9106				
8	0.06310	0.04041						
			0.95959	0.8854				
16	0.06506	0.04237						
			0.95763	0.8816				
8	0.06339	0.04070						
			0.95930	0.8848				

2A44

CONSOLIDATION TEST

Project: FLY ASH PIT, ASH PIT NO. 3, Stuart Station

Material: Gray Fly Ash

Boring No: 8A
Sample No: 2C
Depth: 20.0' - 22.0'

Tested by: JLH, JAC
Date: 12-18-74

Specific Gravity: 2.50

Moisture Content, Before: 30.4%
After: 27.5%
Natural: 30.2%

Degree of Saturation, Start of Test: 78%
End of Test: 78%

Applied Load (tons/ft.^{2})	Final Dial Reading (in.)	Dial Change (in.)	2H from Dial Change (in.)	Void Ratio	Fitting Time (sec.) t_{90}	Fitting Time (sec.) t_{50}	Coef. of Consolidation (in.^{2}/sec.) $.848\ H^2/t_{90}$	Coef. of Consolidation (in.^{2}/sec.) $.197\ H^2/t_{50}$
4	0.06144	0.03875	0.96125	0.8887				
2	0.05951	0.03682	0.96318	0.8924				
1	0.05786	0.03517	0.96483	0.8957				
1/2	0.05643	0.03374	0.96626	0.8985				
1/4	0.05518	0.03249	0.96751	0.9010				
1/2	0.05584	0.03315	0.96685	0.8997				
1	0.05702	0.03433	0.96567	0.8973				
2	0.05856	0.03587	0.96413	0.8943				
4	0.06058	0.03789	0.96211	0.8904				

2A44

CONSOLIDATION TEST

Project: FLY ASH PIT, ASH PIT NO. 3, Stuart Station

Material: Gray Fly Ash

Boring No: 8A
Sample No: 2C
Depth: 20.0' - 22.0'

Tested by: JLH, JAC
Date: 12-18-74

Specific Gravity: 2.50

Moisture Content, Before: 30.4%
After: 27.5%
Natural: 30.2%

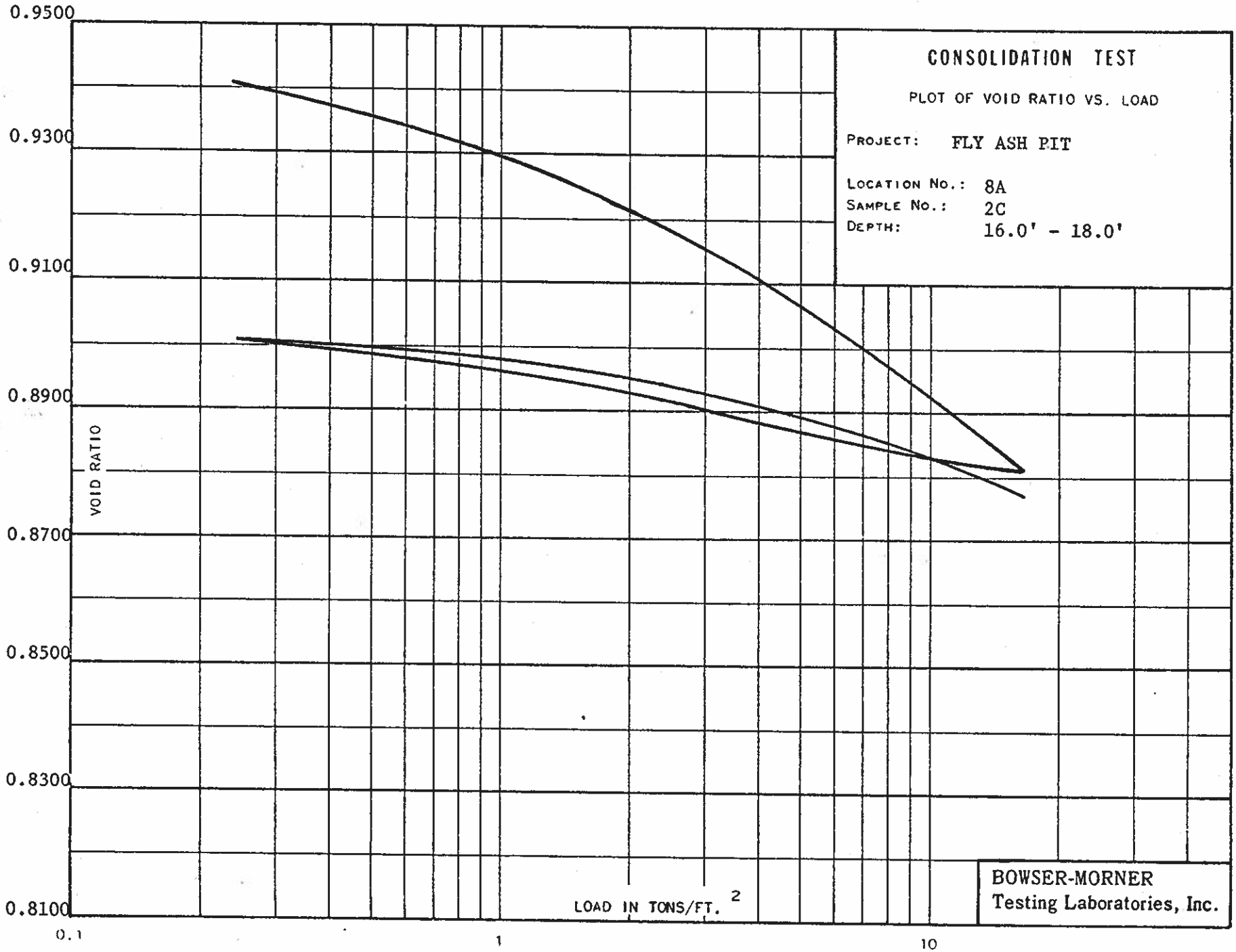
Degree of Saturation, Start of Test: 78%
End of Test: 78%

Applied Load (tons/ft.^{2})	Final Dial Reading (in.)	Dial Change (in.)	2H from Dial Change (in.)	Void Ratio	Fitting Time (sec.) t_{90}	Fitting Time (sec.) t_{50}	Coef. of Consolidation (in.^{2}/sec.) $.848\ H^2/t_{90}$	Coef. of Consolidation (in.^{2}/sec.) $.197\ H^2/t_{50}$
		0.04046						
8	0.06315		0.95954	0.8853				
		0.04473						
16	0.06742		0.95527	0.8769				

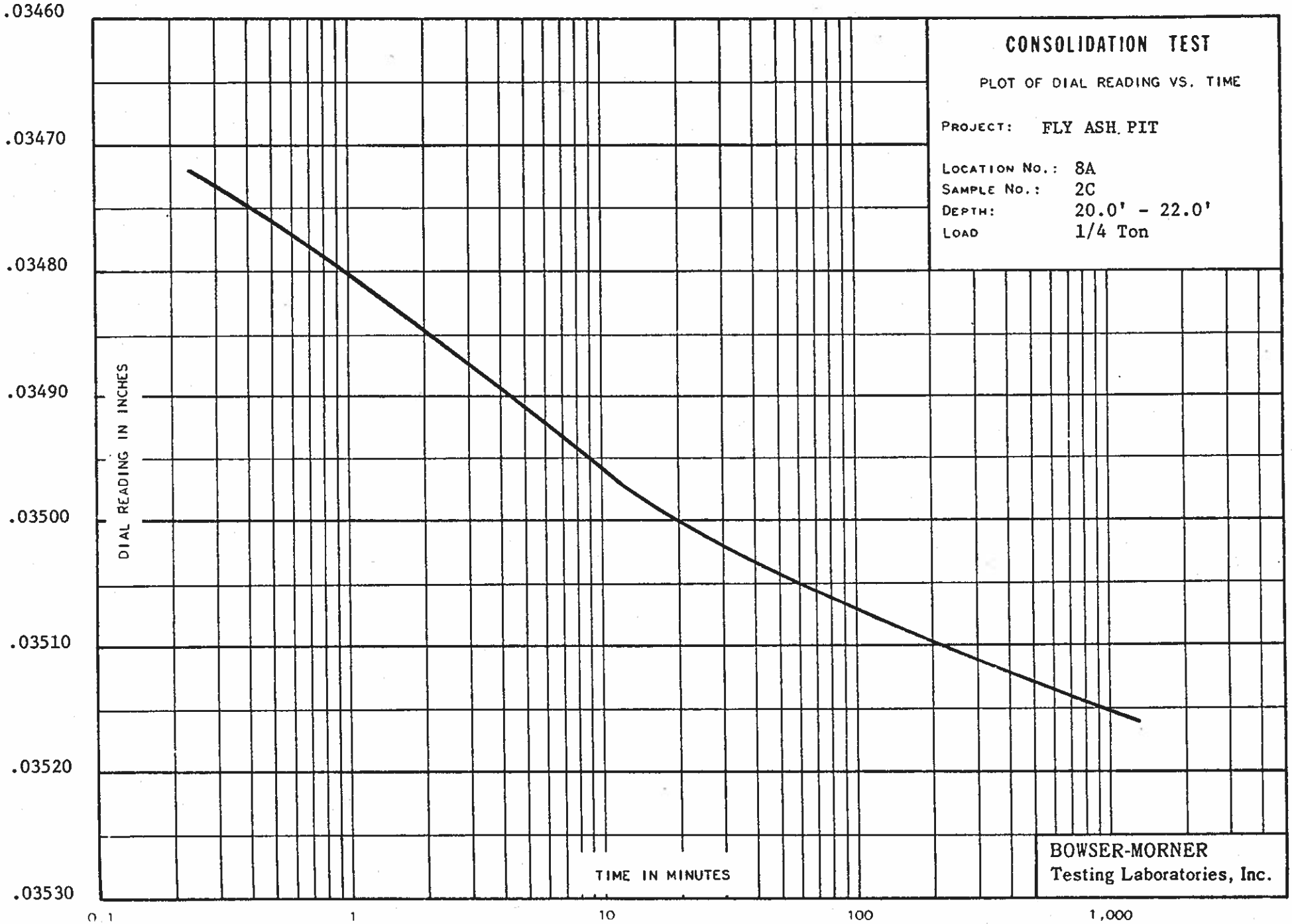
2A44

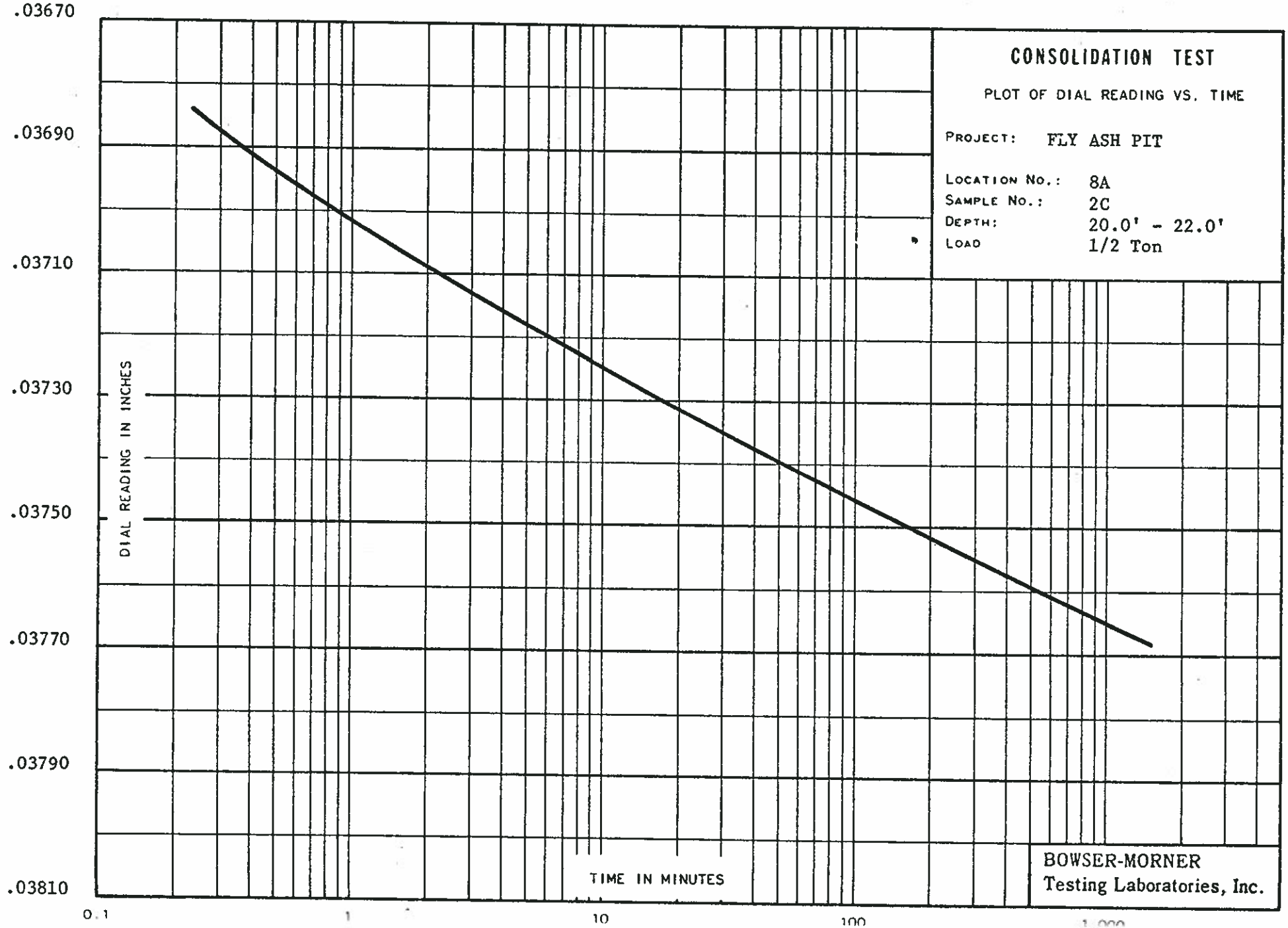
BOWSER-MORNER
Testing Laboratories, Inc.

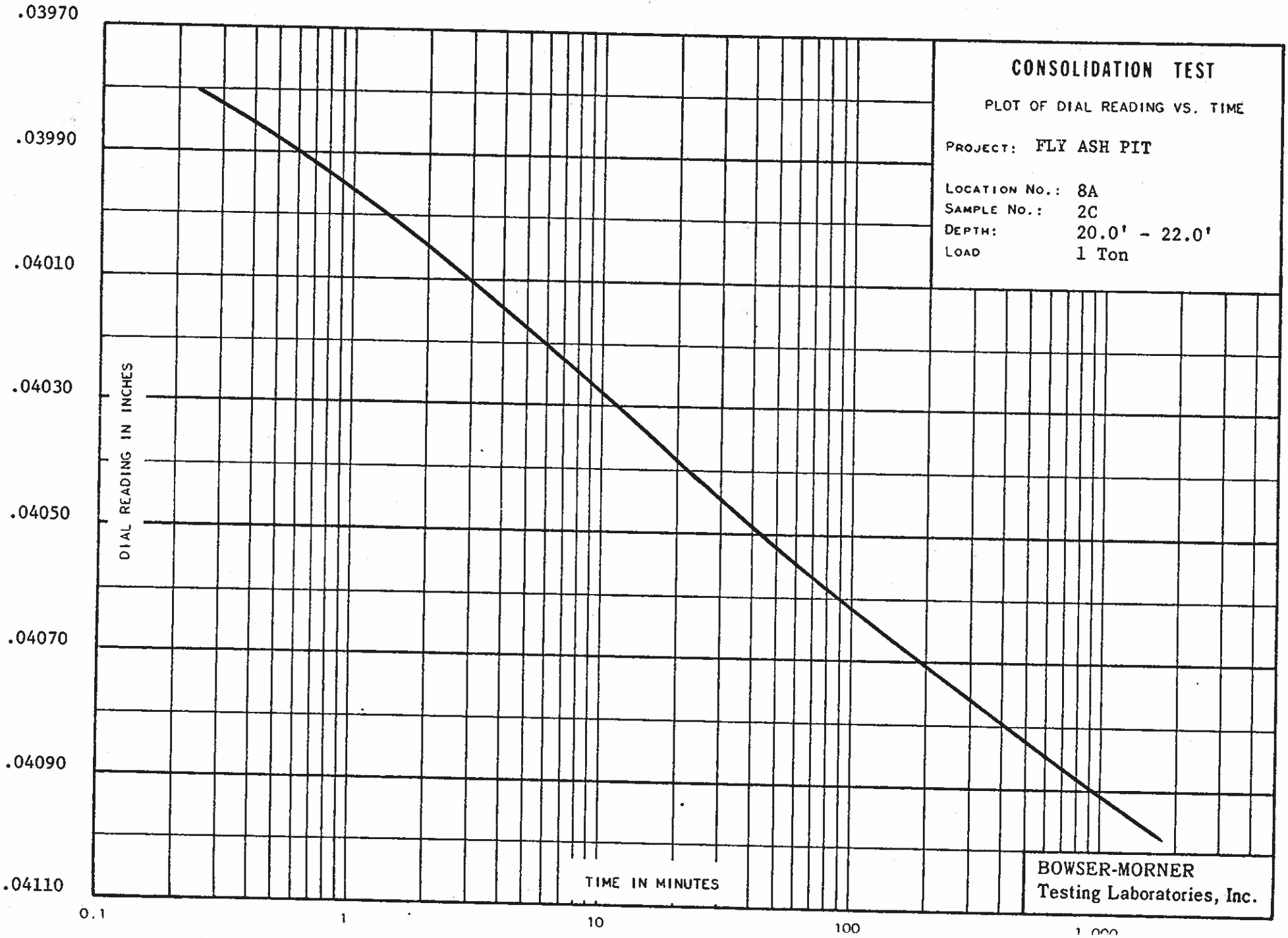
FORM 2AB

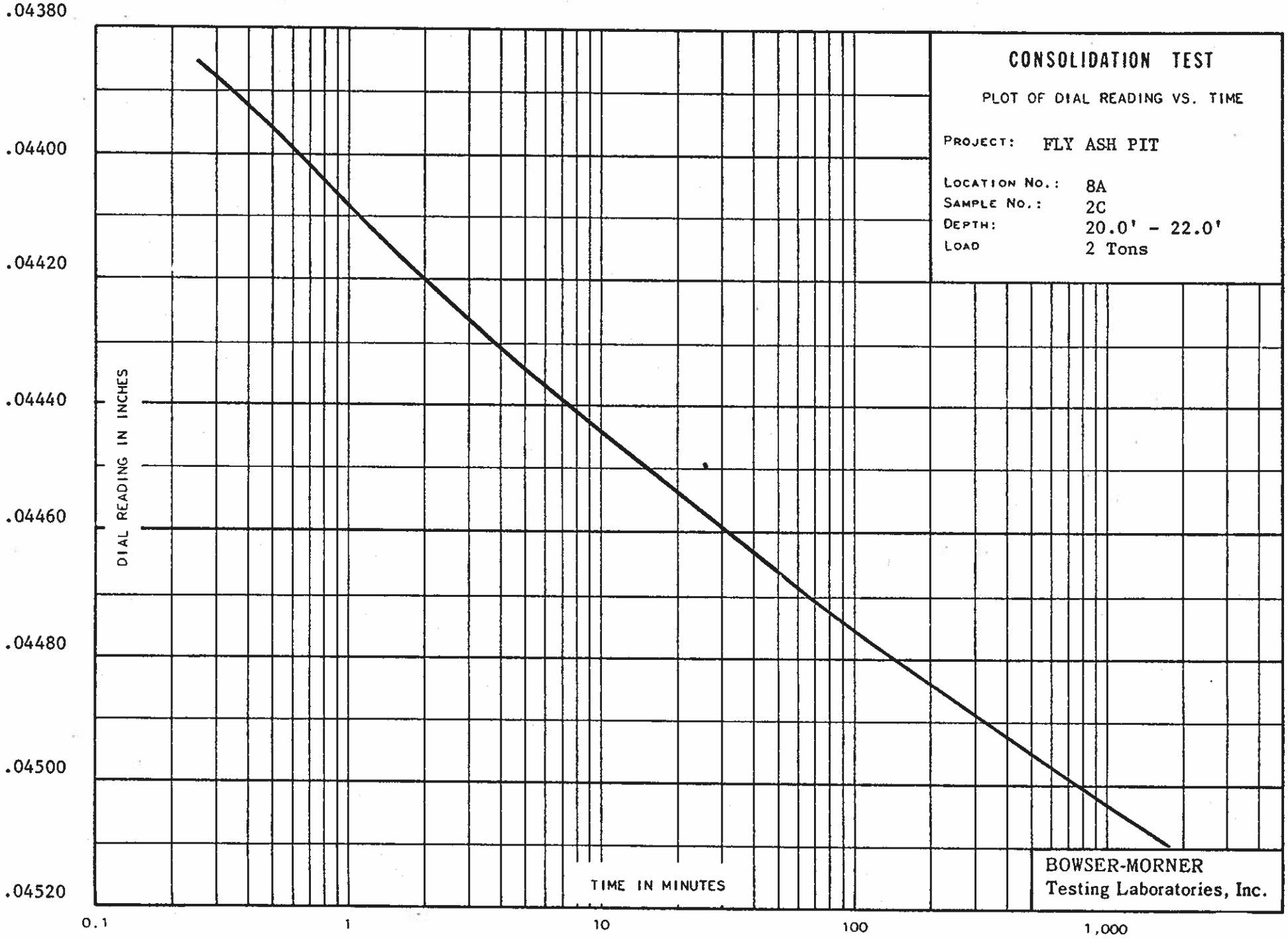

CONSOLIDATION TEST
PLOT OF VOID RATIO VS. LOAD
PROJECT: FLY ASH PIT
LOCATION NO.: 8A
SAMPLE NO.: 2C
DEPTH: 16.0' - 18.0'
0.9500
0.9300
0.9100
0.8900
0.8700
0.8500
0.8300
0.8100
VOID RATIO
0.1
1
10
LOAD IN TONS/FT.2
BOWSER-MORNER
Testing Laboratories, Inc.

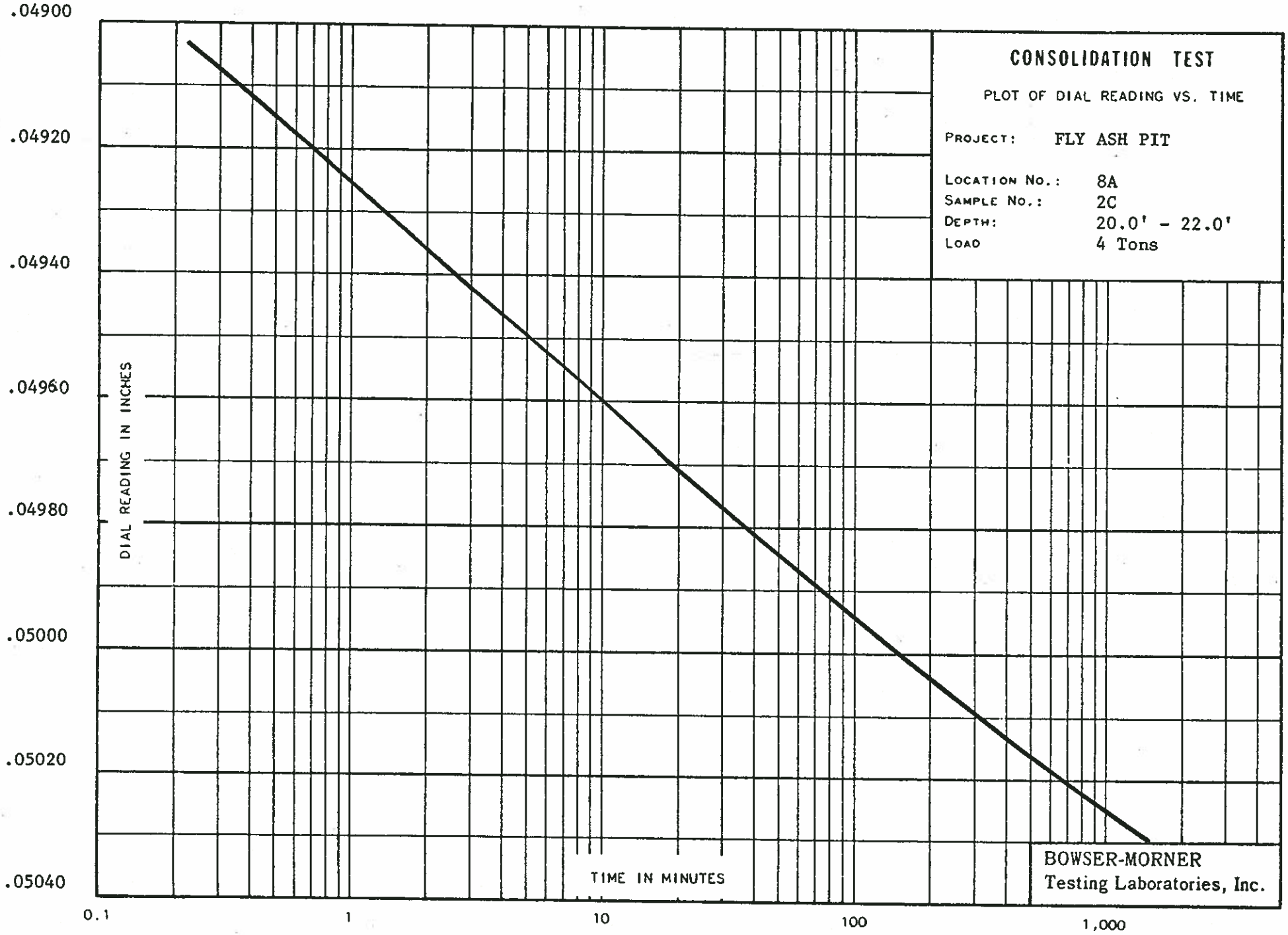
FORM 2A66

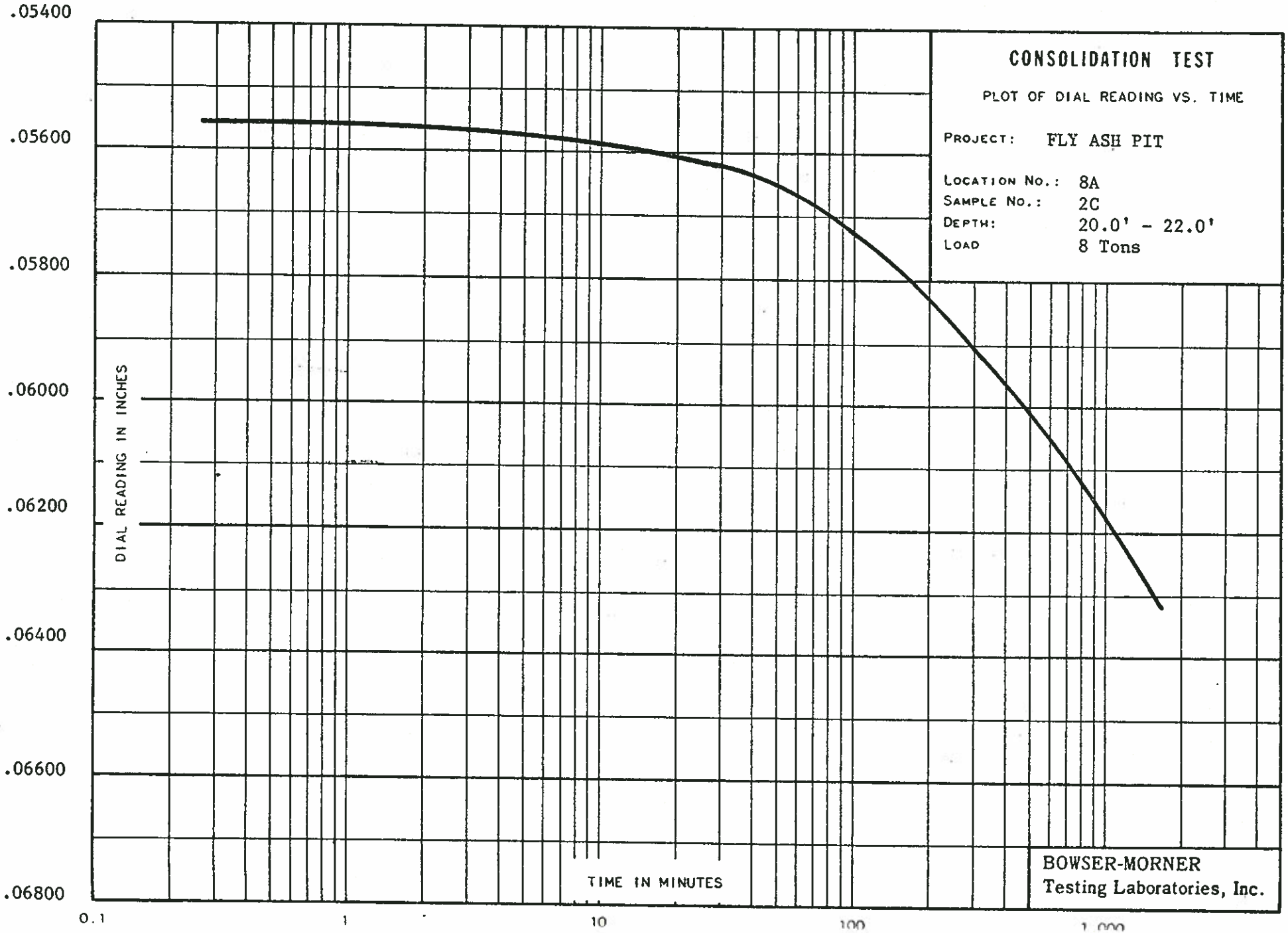

CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: FLY ASH PIT
LOCATION NO.: 8A
SAMPLE NO.: 2C
DEPTH: 20.0' - 22.0'
LOAD 1/4 Ton
DIAL READING IN INCHES
.03460
.03470
.03480
.03490
.03500
.03510
.03520
.03530
TIME IN MINUTES
0.1
1
10
100
1,000
BOWSER-MORNER
Testing Laboratories, Inc.

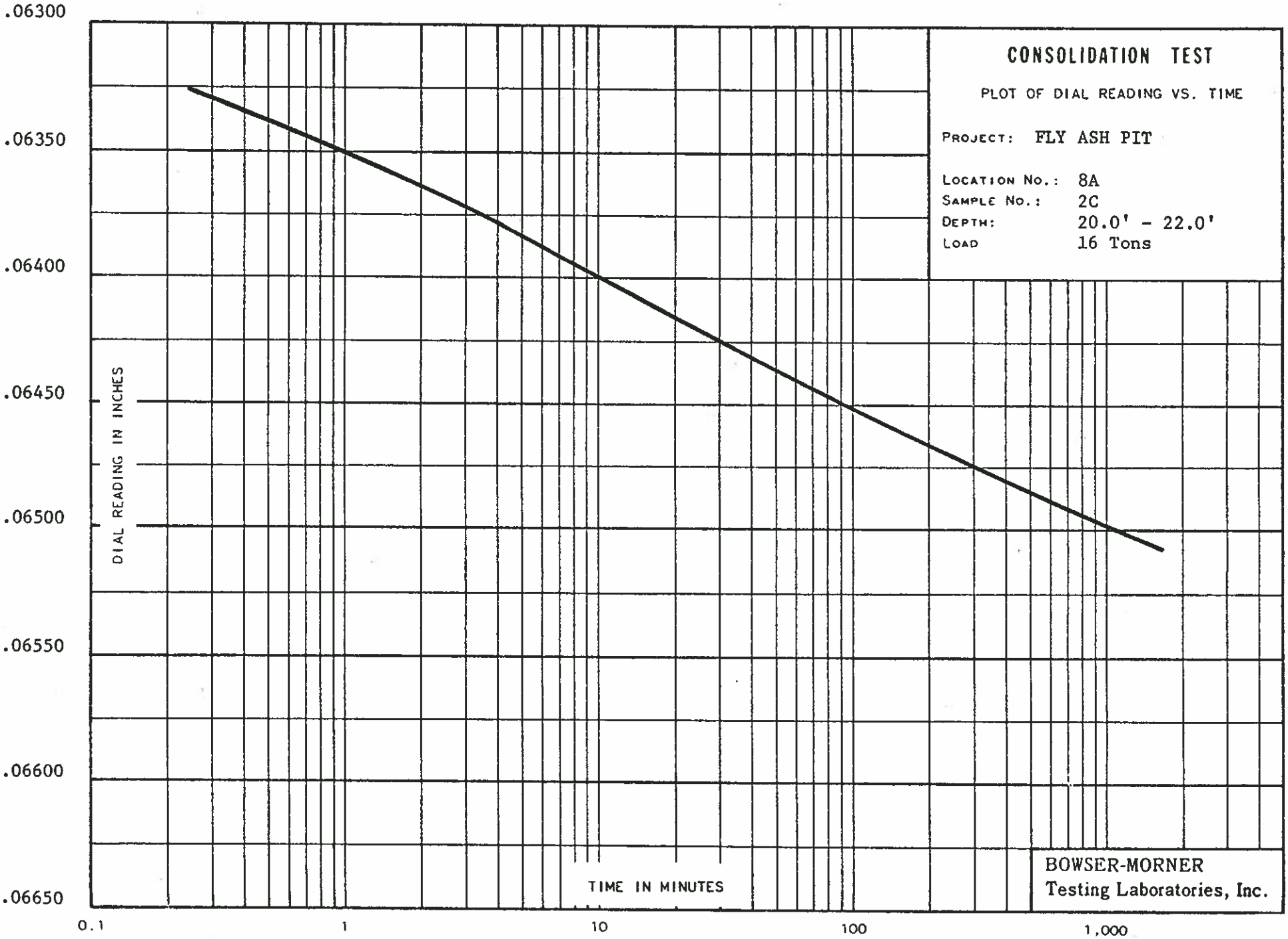

CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: FLY ASH PIT
LOCATION NO.: 8A
SAMPLE NO.: 2C
DEPTH: 20.0' - 22.0'
LOAD 1/2 Ton
DIAL READING IN INCHES
.03670
.03690
.03710
.03730
.03750
.03770
.03790
.03810
TIME IN MINUTES
0.1
1
10
100
1,000
BOWSER-MORNER
Testing Laboratories, Inc.

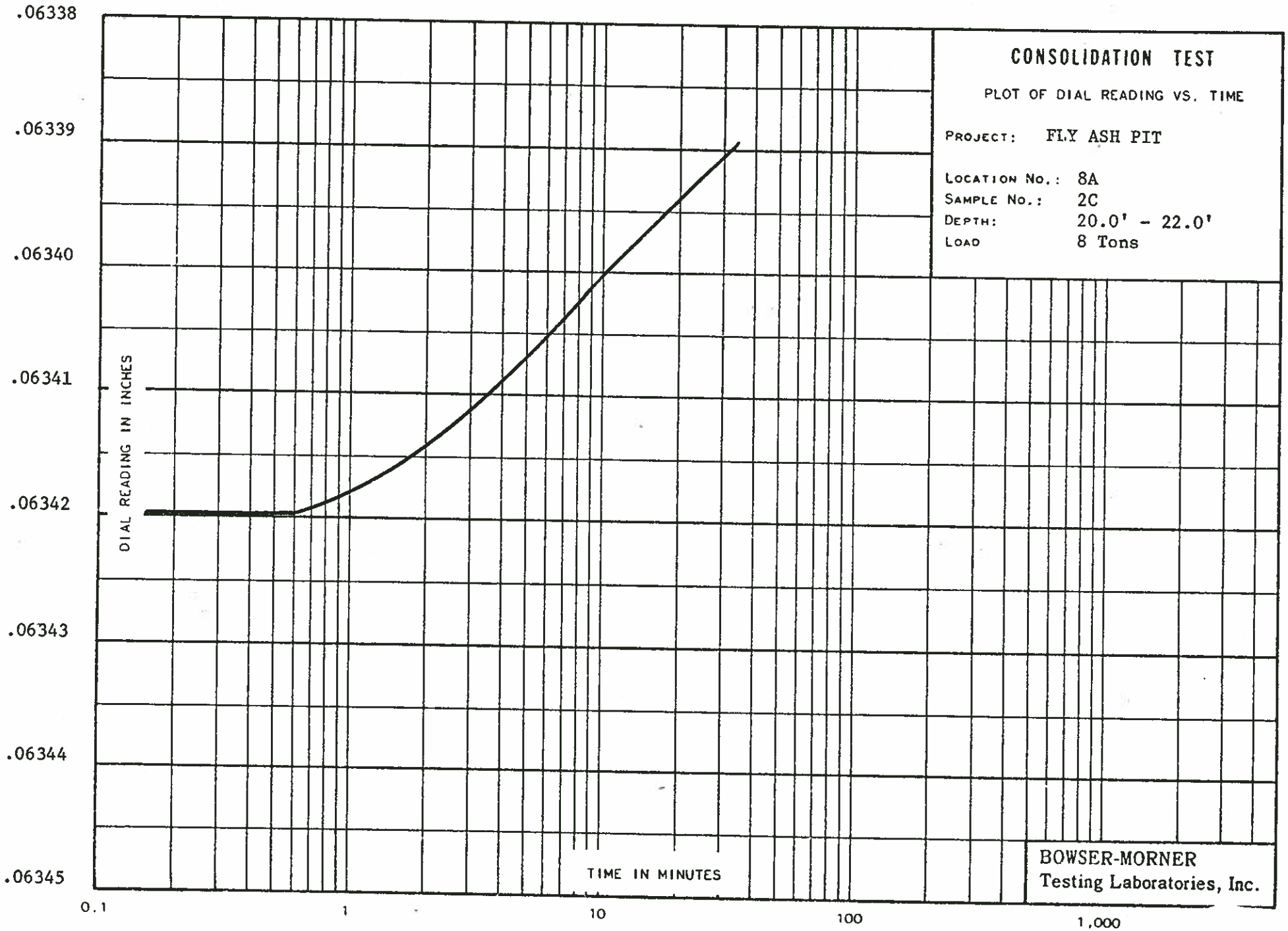

CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: FLY ASH PIT
LOCATION NO.: 8A
SAMPLE NO.: 2C
DEPTH: 20.0' - 22.0'
LOAD 1 Ton
DIAL READING IN INCHES
.03970
.03990
.04010
.04030
.04050
.04070
.04090
.04110
TIME IN MINUTES
0.1
1
10
100
1,000
BOWSER-MORNER
Testing Laboratories, Inc.

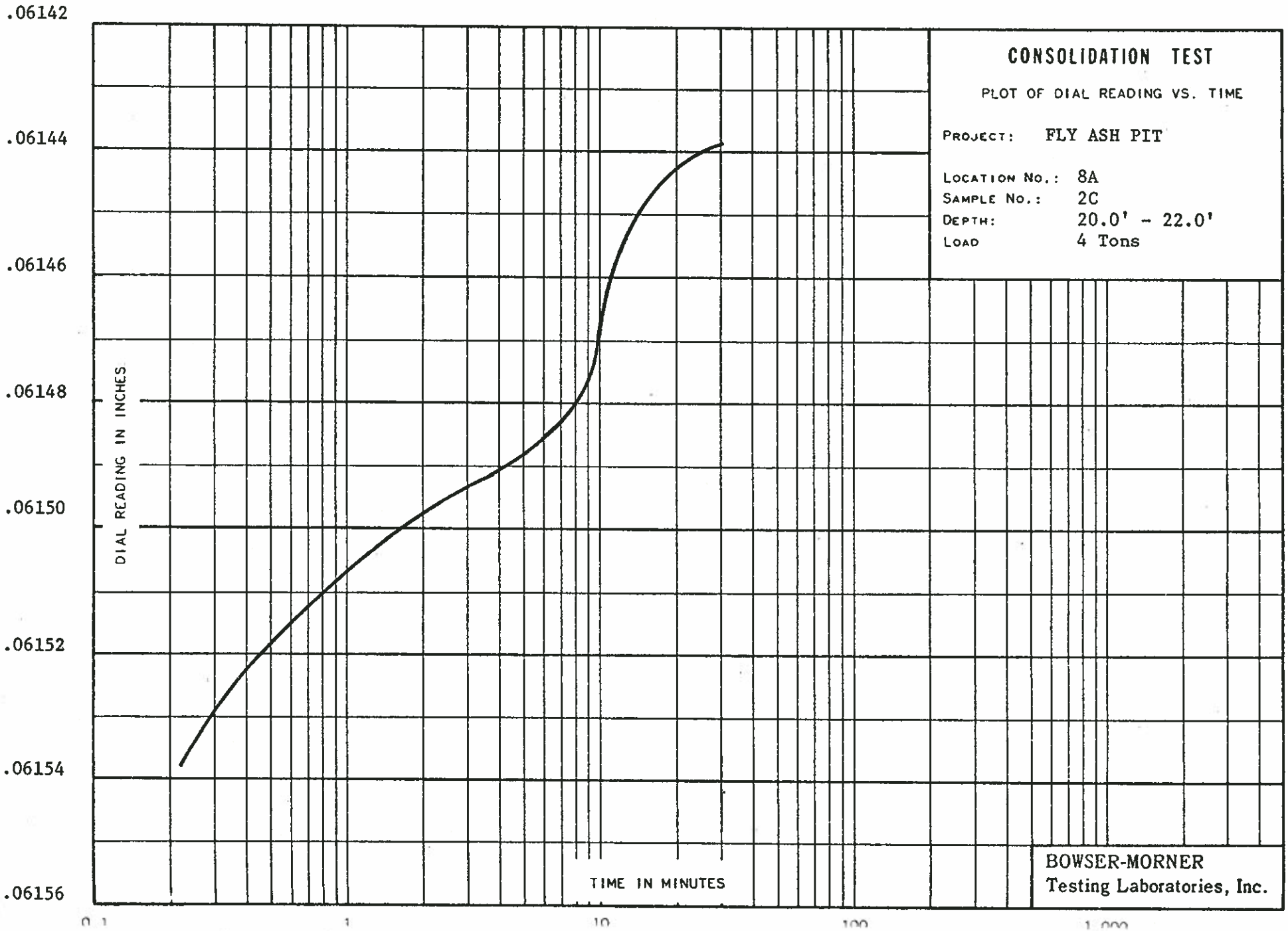

CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: FLY ASH PIT
LOCATION NO.: 8A
SAMPLE NO.: 2C
DEPTH: 20.0' - 22.0'
LOAD 2 Tons
DIAL READING IN INCHES
.04380
.04400
.04420
.04440
.04460
.04480
.04500
.04520
TIME IN MINUTES
0.1
1
10
100
1,000
BOWSER-MORNER
Testing Laboratories, Inc.

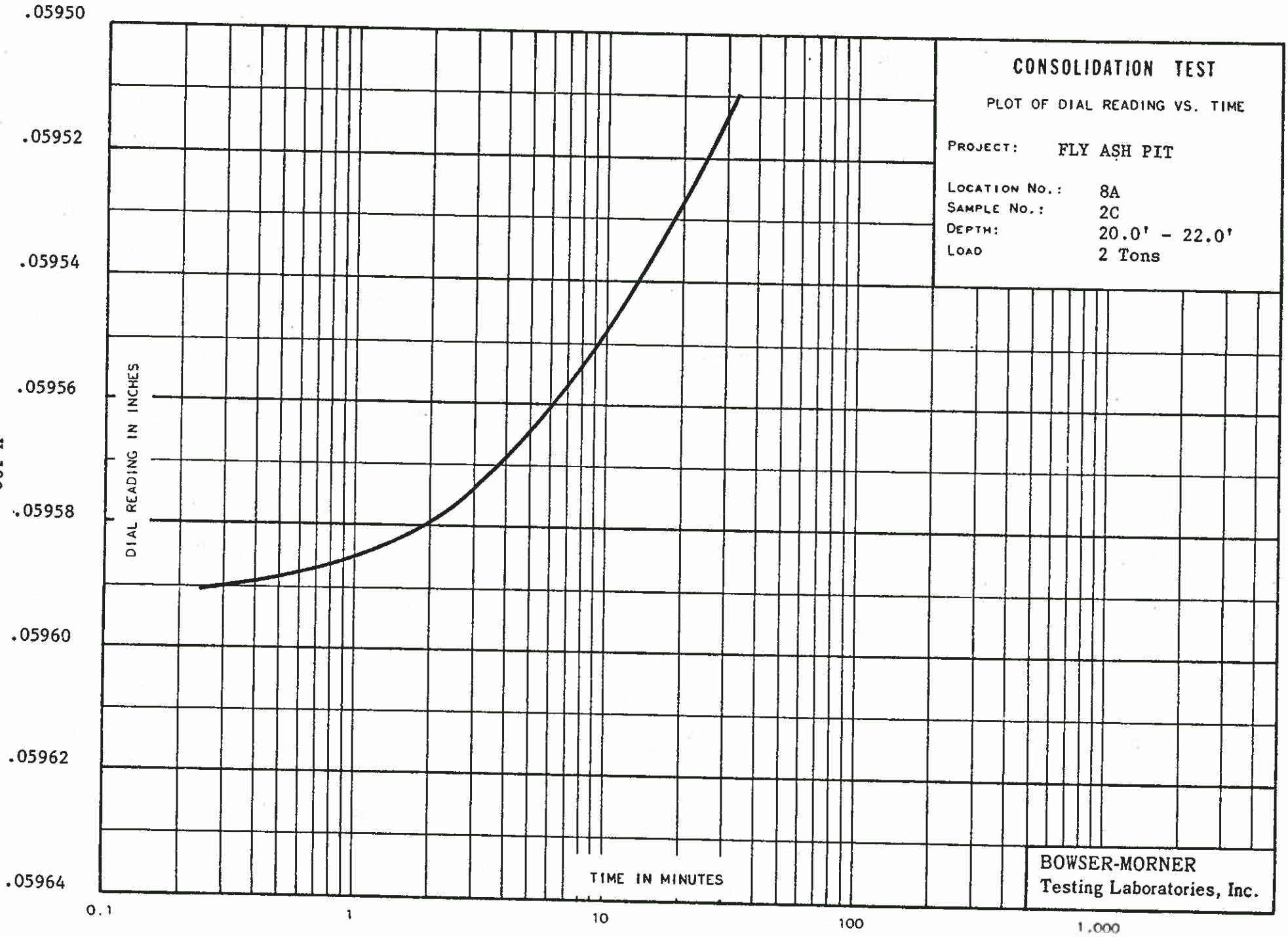

CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: FLY ASH PIT
LOCATION NO.: 8A
SAMPLE NO.: 2C
DEPTH: 20.0' - 22.0'
LOAD 4 Tons
DIAL READING IN INCHES
.04900
.04920
.04940
.04960
.04980
.05000
.05020
.05040
TIME IN MINUTES
0.1
1
10
100
1,000
BOWSER-MORNER
Testing Laboratories, Inc.

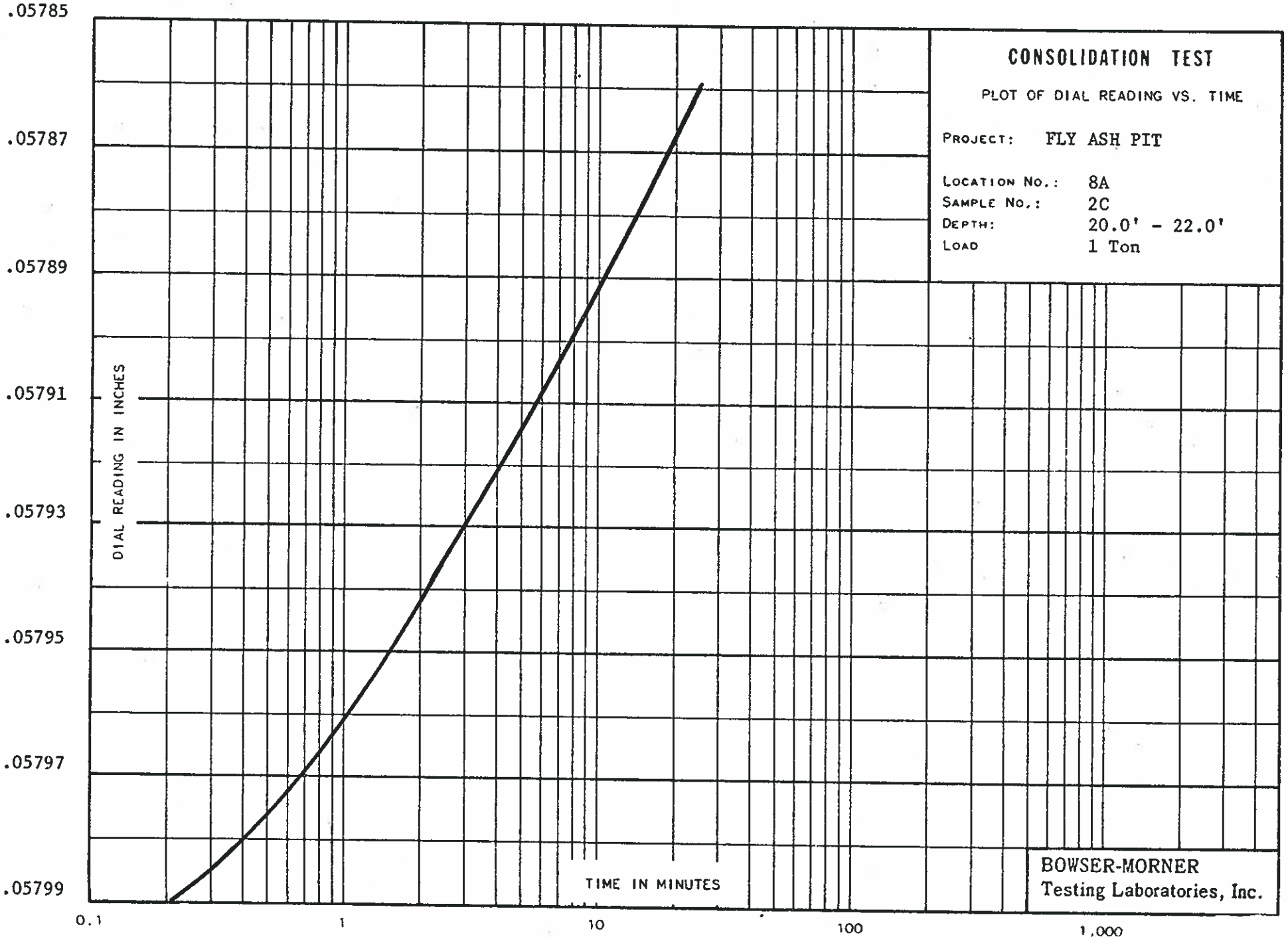

CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: FLY ASH PIT
LOCATION NO.: 8A
SAMPLE NO.: 2C
DEPTH: 20.0' - 22.0'
LOAD 8 Tons
DIAL READING IN INCHES
.05400
.05600
.05800
.06000
.06200
.06400
.06600
.06800
TIME IN MINUTES
0.1
1
10
100
1,000
BOWSER-MORNER
Testing Laboratories, Inc.

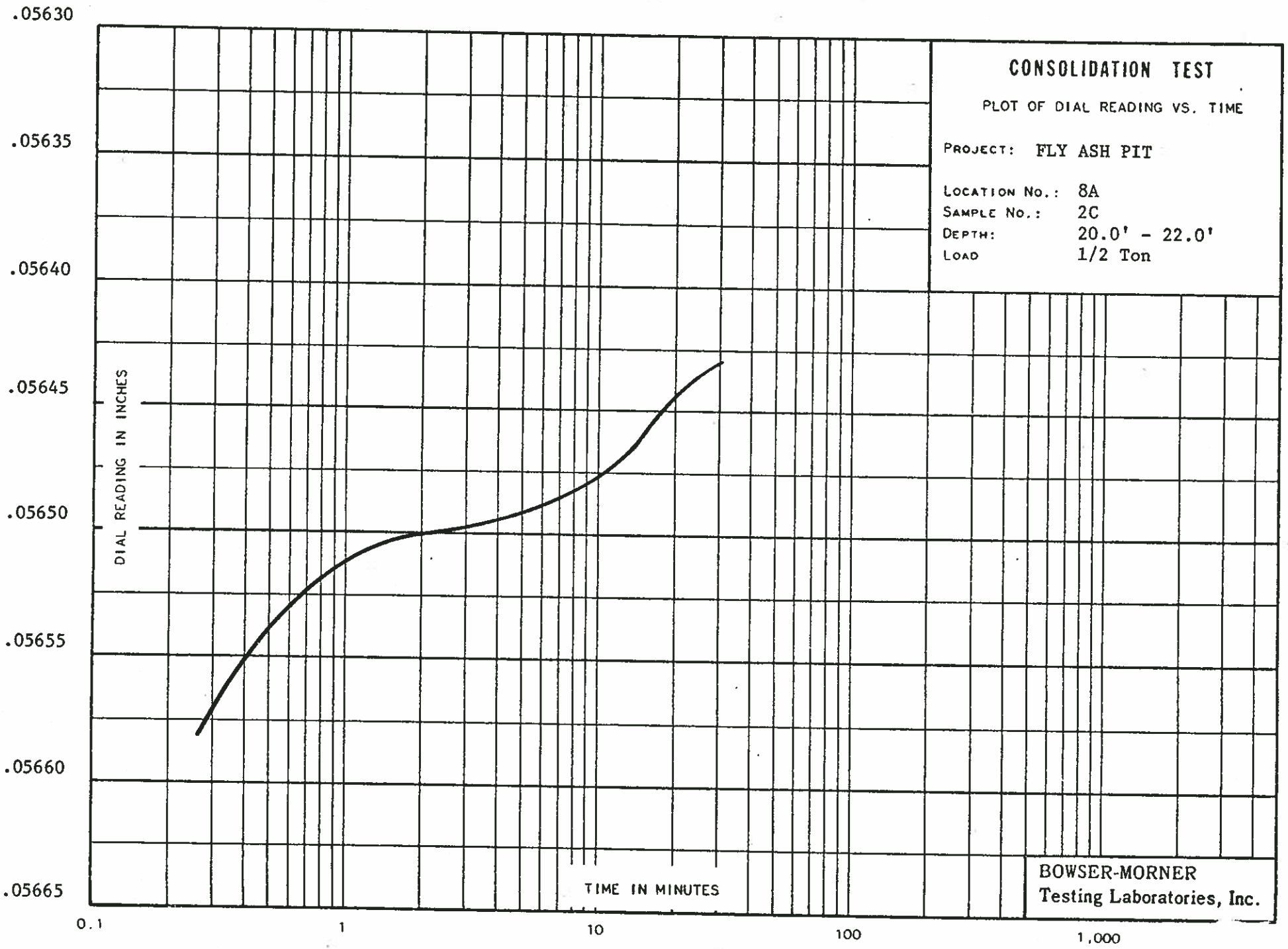

CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: FLY ASH PIT
LOCATION NO.: 8A
SAMPLE NO.: 2C
DEPTH: 20.0' - 22.0'
LOAD 16 Tons
DIAL READING IN INCHES
.06300
.06350
.06400
.06450
.06500
.06550
.06600
.06650
TIME IN MINUTES
0.1
1
10
100
1,000
BOWSER-MORNER
Testing Laboratories, Inc.

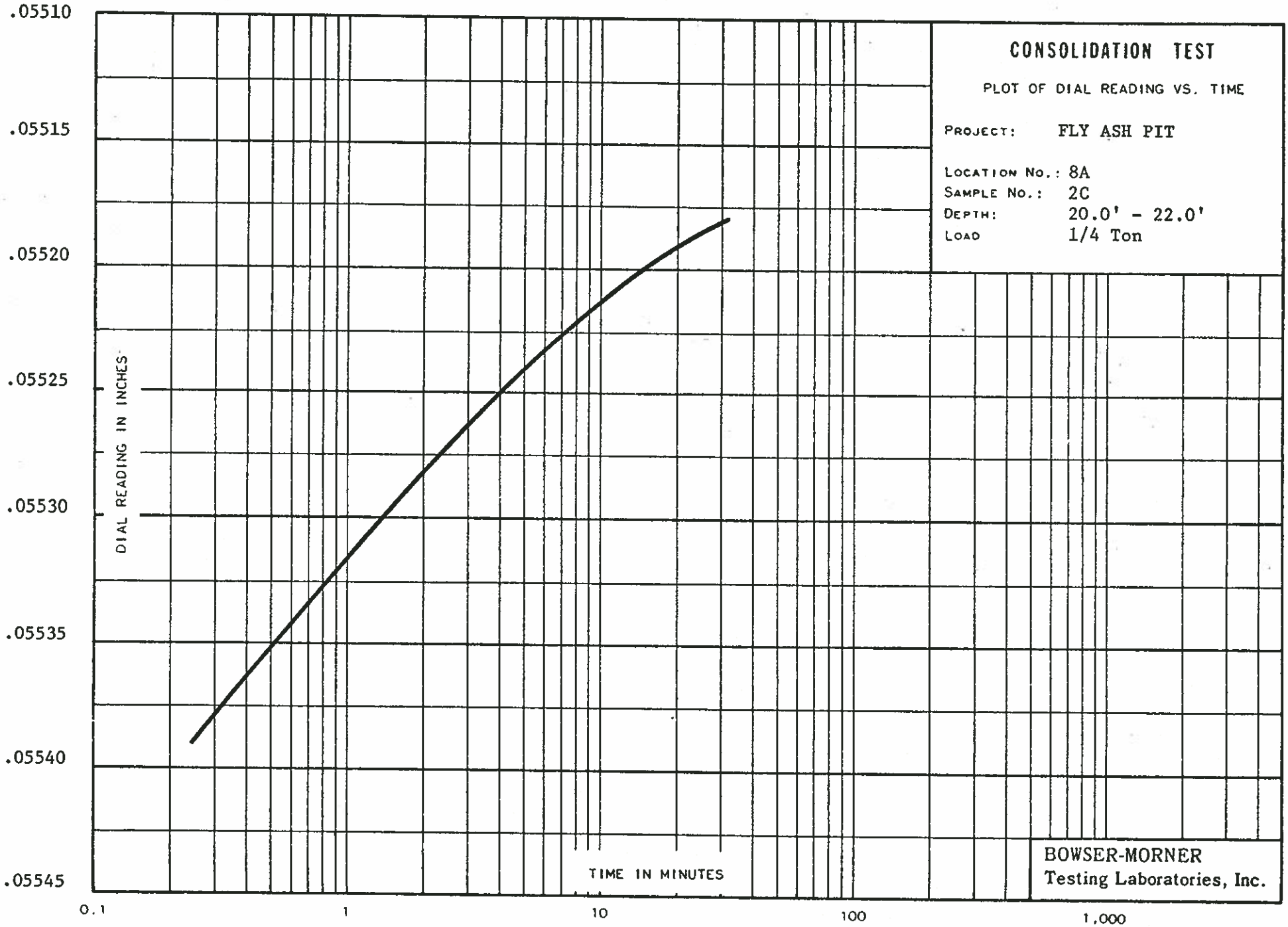

CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: FLY ASH PIT
LOCATION NO.: 8A
SAMPLE NO.: 2C
DEPTH: 20.0' - 22.0'
LOAD 8 Tons
DIAL READING IN INCHES
.06338
.06339
.06340
.06341
.06342
.06343
.06344
.06345
TIME IN MINUTES
0.1
1
10
100
1,000
BOWSER-MORNER
Testing Laboratories, Inc.

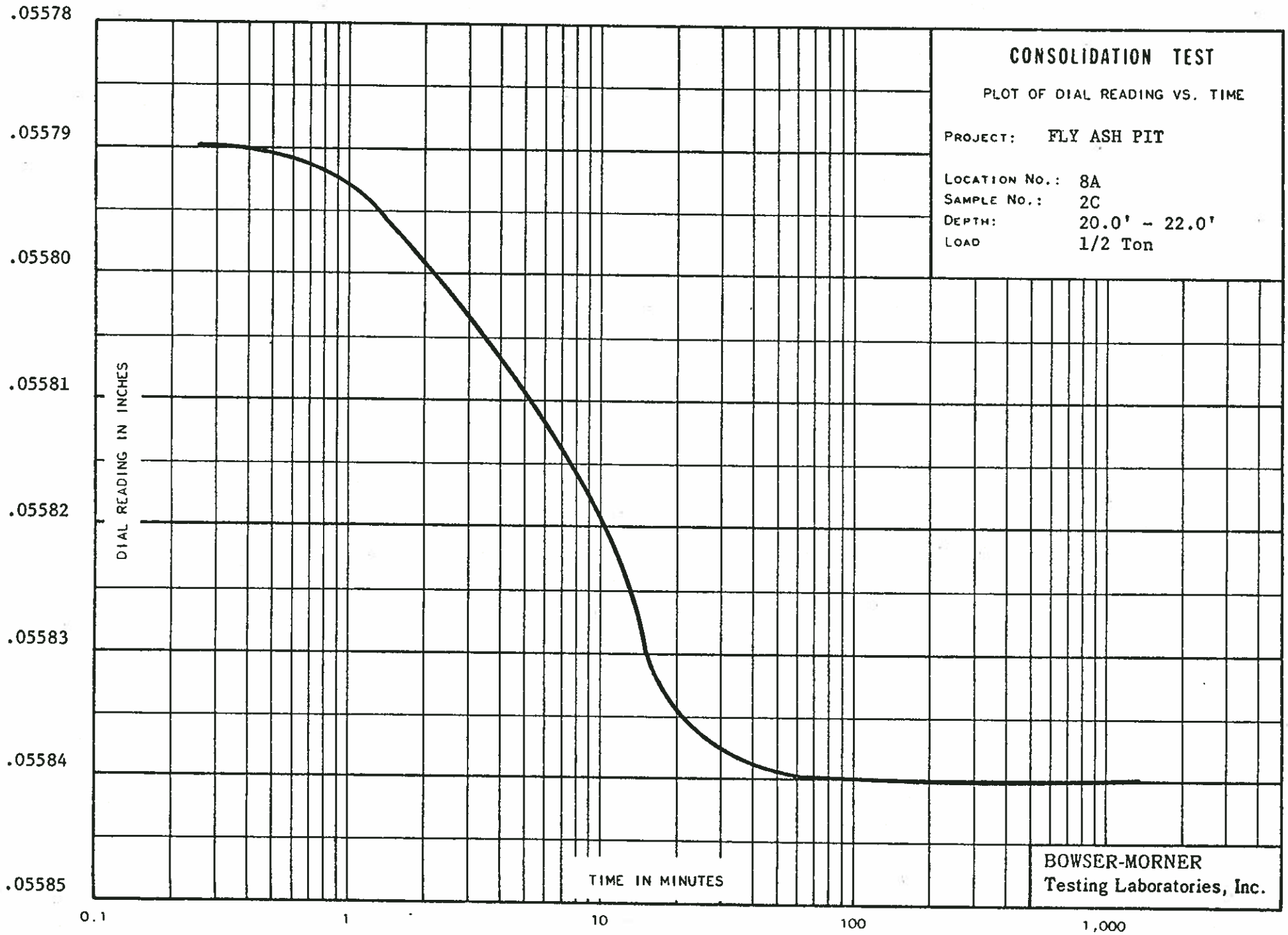

CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: FLY ASH PIT
LOCATION NO.: 8A
SAMPLE NO.: 2C
DEPTH: 20.0' - 22.0'
LOAD 4 Tons
DIAL READING IN INCHES
.06142
.06144
.06146
.06148
.06150
.06152
.06154
.06156
TIME IN MINUTES
0.1
1
10
100
1,000
BOWSER-MORNER
Testing Laboratories, Inc.

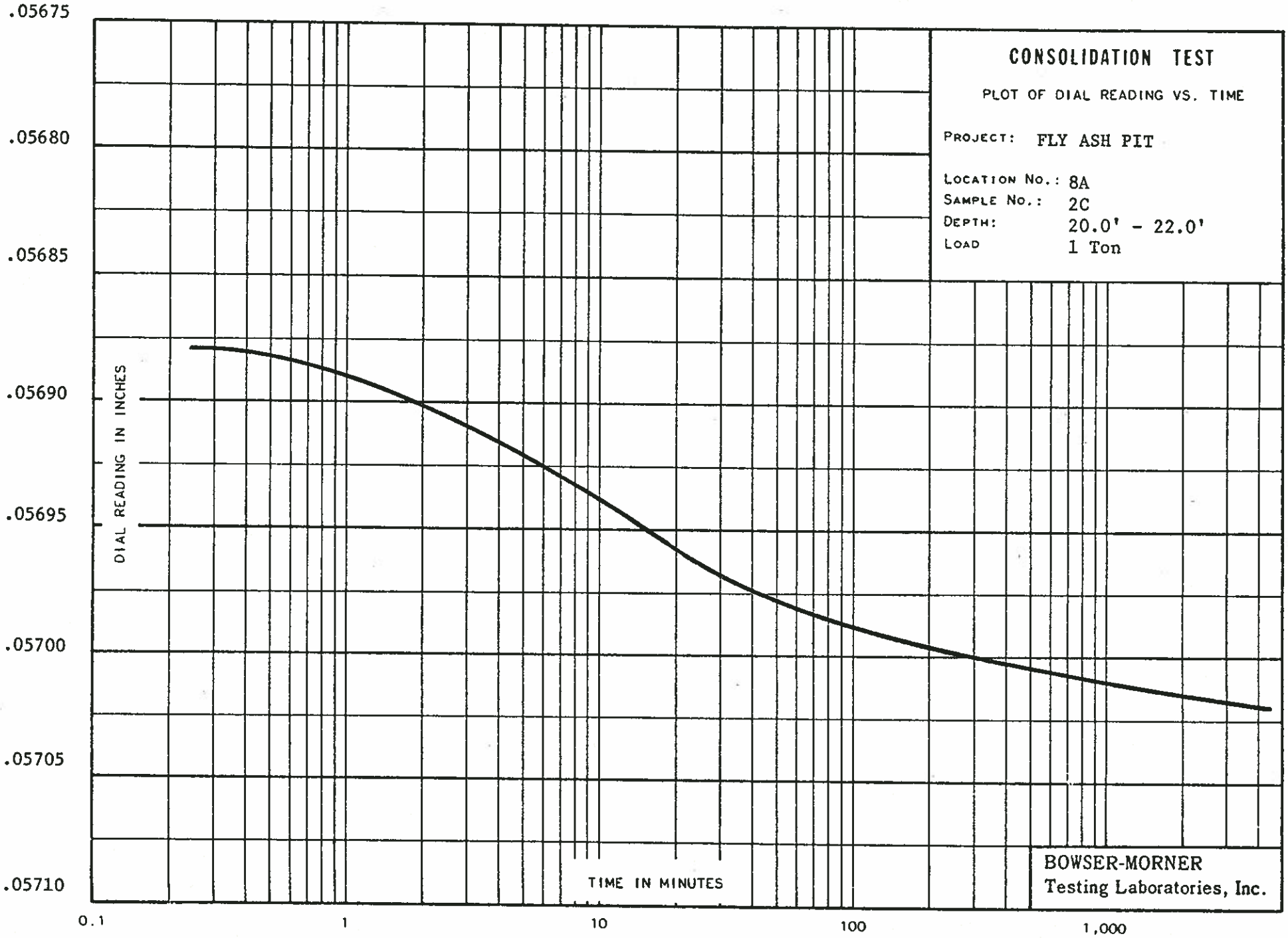

CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: FLY ASH PIT
LOCATION NO.: 8A
SAMPLE NO.: 2C
DEPTH: 20.0' - 22.0'
LOAD 2 Tons
DIAL READING IN INCHES
.05950
.05952
.05954
.05956
.05958
.05960
.05962
.05964
TIME IN MINUTES
0.1
1
10
100
1,000
BOWSER-MORNER
Testing Laboratories, Inc.

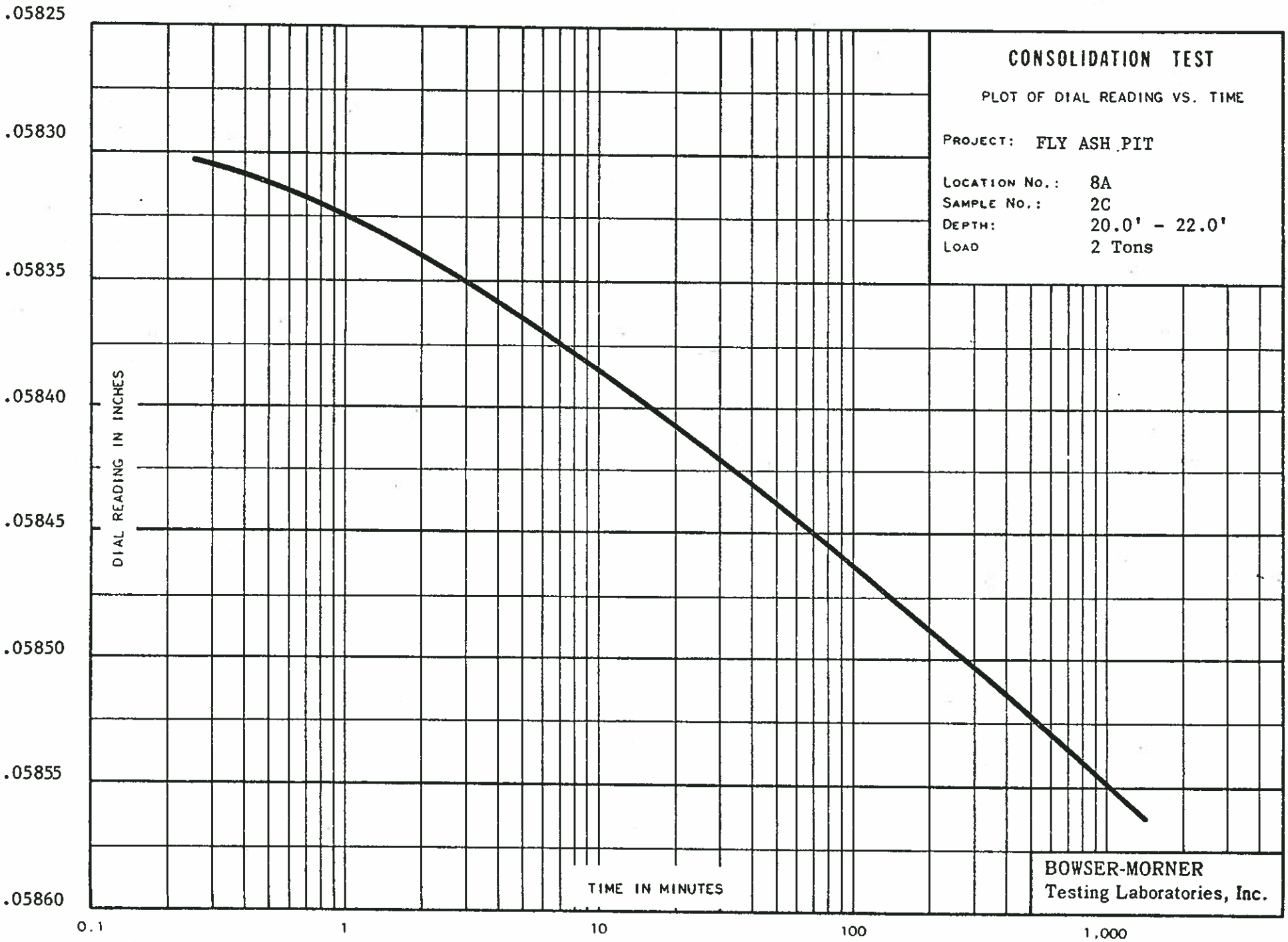

CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: FLY ASH PIT
LOCATION NO.: 8A
SAMPLE NO.: 2C
DEPTH: 20.0' - 22.0'
LOAD 1 Ton
DIAL READING IN INCHES
.05785
.05787
.05789
.05791
.05793
.05795
.05797
.05799
TIME IN MINUTES
0.1
1
10
100
1,000
BOWSER-MORNER
Testing Laboratories, Inc.

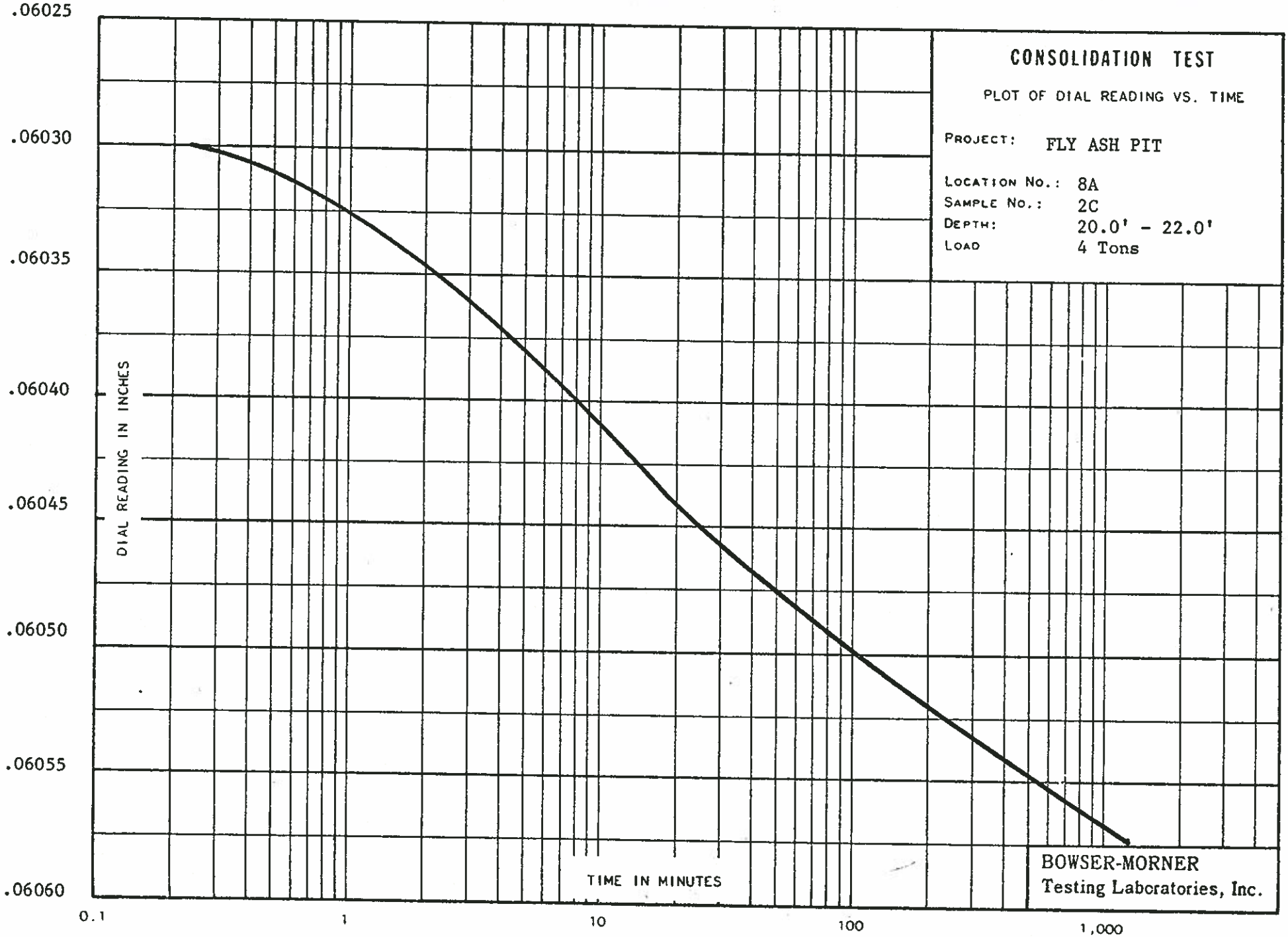

CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: FLY ASH PIT
LOCATION NO.: 8A
SAMPLE NO.: 2C
DEPTH: 20.0' - 22.0'
LOAD 1/2 Ton
DIAL READING IN INCHES
.05630
.05635
.05640
.05645
.05650
.05655
.05660
.05665
TIME IN MINUTES
0.1
1
10
100
1,000
BOWSER-MORNER
Testing Laboratories, Inc.

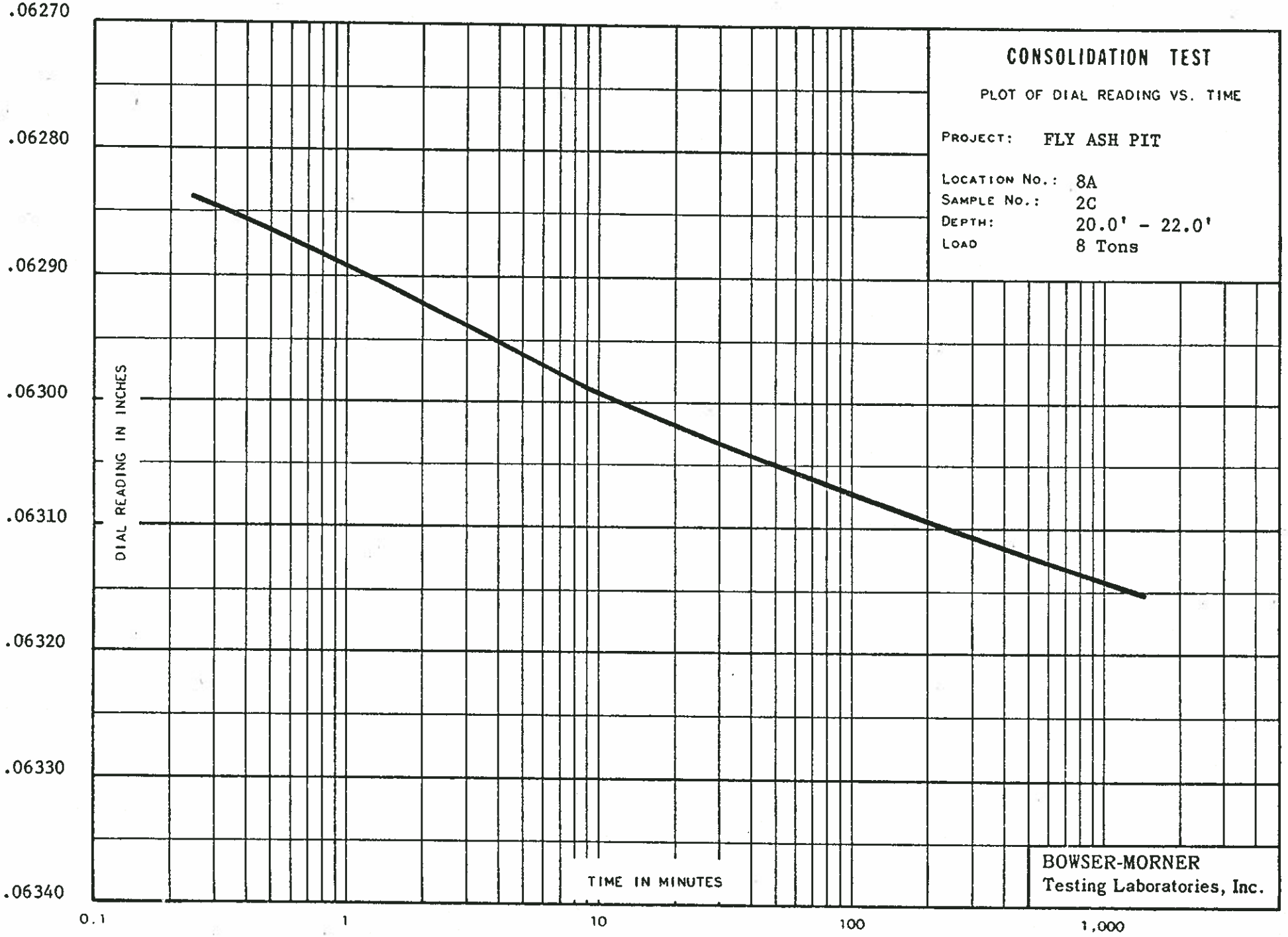

CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: FLY ASH PIT
LOCATION NO.: 8A
SAMPLE NO.: 2C
DEPTH: 20.0' - 22.0'
LOAD 1/4 Ton
DIAL READING IN INCHES
.05510
.05515
.05520
.05525
.05530
.05535
.05540
.05545
TIME IN MINUTES
0.1
1
10
100
1,000
BOWSER-MORNER
Testing Laboratories, Inc.

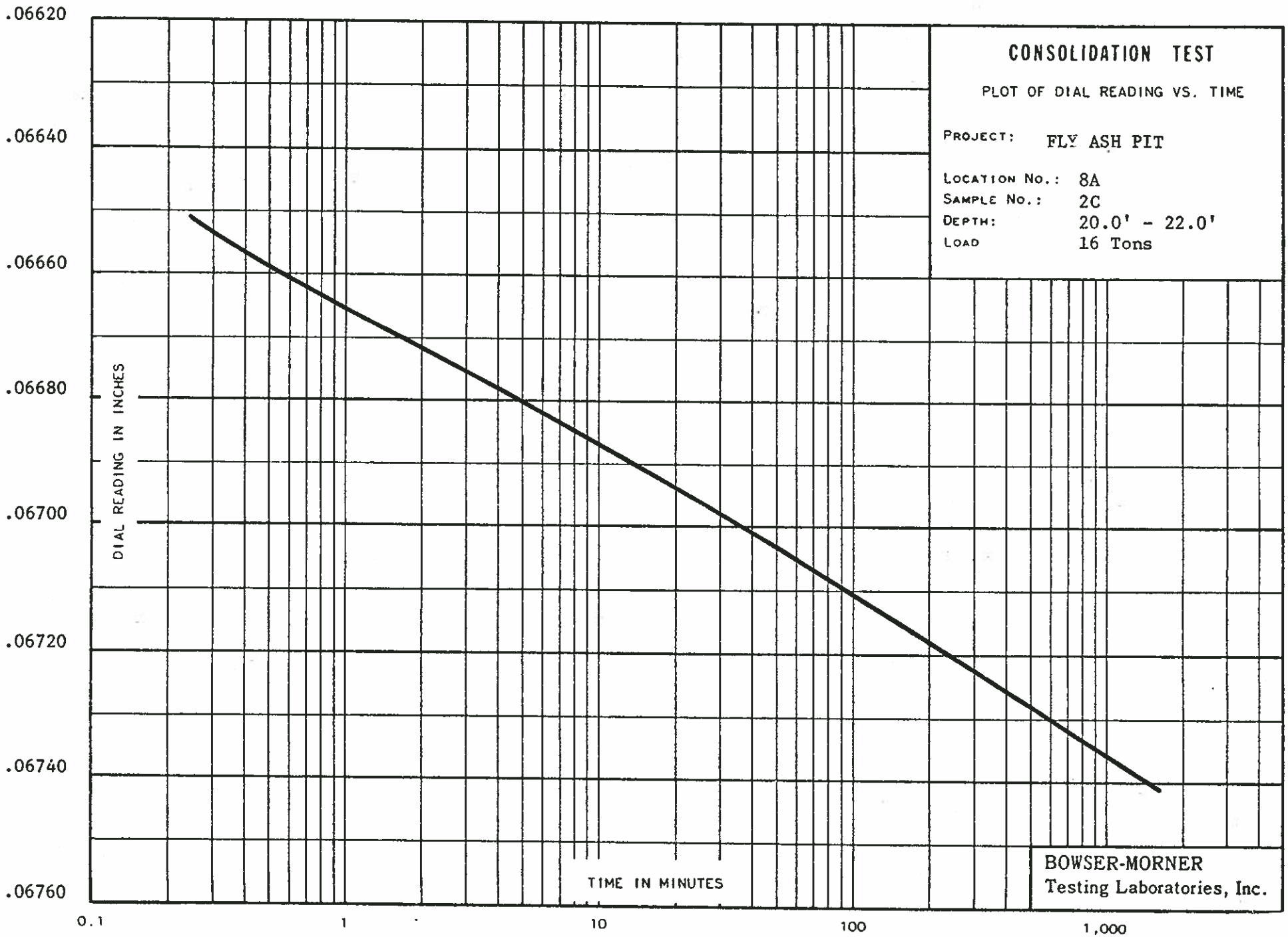

CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: FLY ASH PIT
LOCATION NO.: 8A
SAMPLE NO.: 2C
DEPTH: 20.0' - 22.0'
LOAD 1/2 Ton
DIAL READING IN INCHES
.05578
.05579
.05580
.05581
.05582
.05583
.05584
.05585
TIME IN MINUTES
0.1
1
10
100
1,000
BOWSER-MORNER
Testing Laboratories, Inc.


CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: FLY ASH PIT
LOCATION NO.: 8A
SAMPLE NO.: 2C
DEPTH: 20.0' - 22.0'
LOAD 1 Ton
DIAL READING IN INCHES
.05675
.05680
.05685
.05690
.05695
.05700
.05705
.05710
TIME IN MINUTES
0.1
1
10
100
1,000
BOWSER-MORNER
Testing Laboratories, Inc.


CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: FLY ASH PIT
LOCATION NO.: 8A
SAMPLE NO.: 2C
DEPTH: 20.0' - 22.0'
LOAD 2 Tons
DIAL READING IN INCHES
.05825
.05830
.05835
.05840
.05845
.05850
.05855
.05860
TIME IN MINUTES
0.1
1
10
100
1,000
BOWSER-MORNER
Testing Laboratories, Inc.


CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: FLY ASH PIT
LOCATION NO.: 8A
SAMPLE NO.: 2C
DEPTH: 20.0' - 22.0'
LOAD 4 Tons
DIAL READING IN INCHES
.06025
.06030
.06035
.06040
.06045
.06050
.06055
.06060
TIME IN MINUTES
0.1
1
10
100
1,000
BOWSER-MORNER
Testing Laboratories, Inc.


CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: FLY ASH PIT
LOCATION NO.: 8A
SAMPLE NO.: 2C
DEPTH: 20.0' - 22.0'
LOAD 8 Tons
DIAL READING IN INCHES
.06270
.06280
.06290
.06300
.06310
.06320
.06330
.06340
TIME IN MINUTES
0.1
1
10
100
1,000
BOWSER-MORNER
Testing Laboratories, Inc.


CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: FLY ASH PIT
LOCATION NO.: 8A
SAMPLE NO.: 2C
DEPTH: 20.0' - 22.0'
LOAD 16 Tons
DIAL READING IN INCHES
.06620
.06640
.06660
.06680
.06700
.06720
.06740
.06760
TIME IN MINUTES
0.1
1
10
100
1,000
BOWSER-MORNER
Testing Laboratories, Inc.

CONSOLIDATION TEST

Project: EXISTING DIKE, ASH PIT NO. 3, Stuart Station

Material: Fill of Brown Clay, Some Silt, Some Sand

Boring No: 5B
Sample No: 2C
Depth: 21.5' - 23.5'

Tested by: JLH, JAC
Date: 12-18-74

Specific Gravity: 2.76

Moisture Content, Before: 20.9%
After: 20.2%
Natural: 20.9%

Degree of Saturation, Start of Test: 88%
End of Test: 100%

Applied Load (tons/ft.^{2})	Final Dial Reading (in.)	Dial Change (in.)	2H from Dial Change (in.)	Void Ratio	Fitting Time (sec.) t_{90}	Fitting Time (sec.) t_{50}	Coef. of Consolidation (in.^{2}/sec.) $.848\ H^2/t_{90}$	Coef. of Consolidation (in.^{2}/sec.) $.197\ H^2/t_{50}$
0	0.08302							
.25	0.08380	0.00078	0.99922	0.6563				
.5	0.08509	0.00207	0.99793	0.6541				
1	0.08899	0.00597	0.99403	0.6477				
2	0.09572	0.01270	0.98730	0.6365				
1	0.09476	0.01174	0.98826	0.63811				
1/2	0.09230	0.00928	0.99072	0.6422				
1/4	0.09025	0.00723	0.99277	0.64558				
1/2	0.09090	0.00788	0.99212	0.6445				

CONSOLIDATION TEST

Project: EXISTING DIKE, ASH PIT NO. 3, Stuart Station

Material: Fill of Brown Clay, Some Silt, Some Sand

Boring No: 5B
Sample No: 2C
Depth: 21.5' - 23.5'

Tested by: JLH, JAC
Date: 12-18-74

Specific Gravity: 2.76

Moisture Content, Before: 20.9%
After: 20.2%
Natural: 20.9%

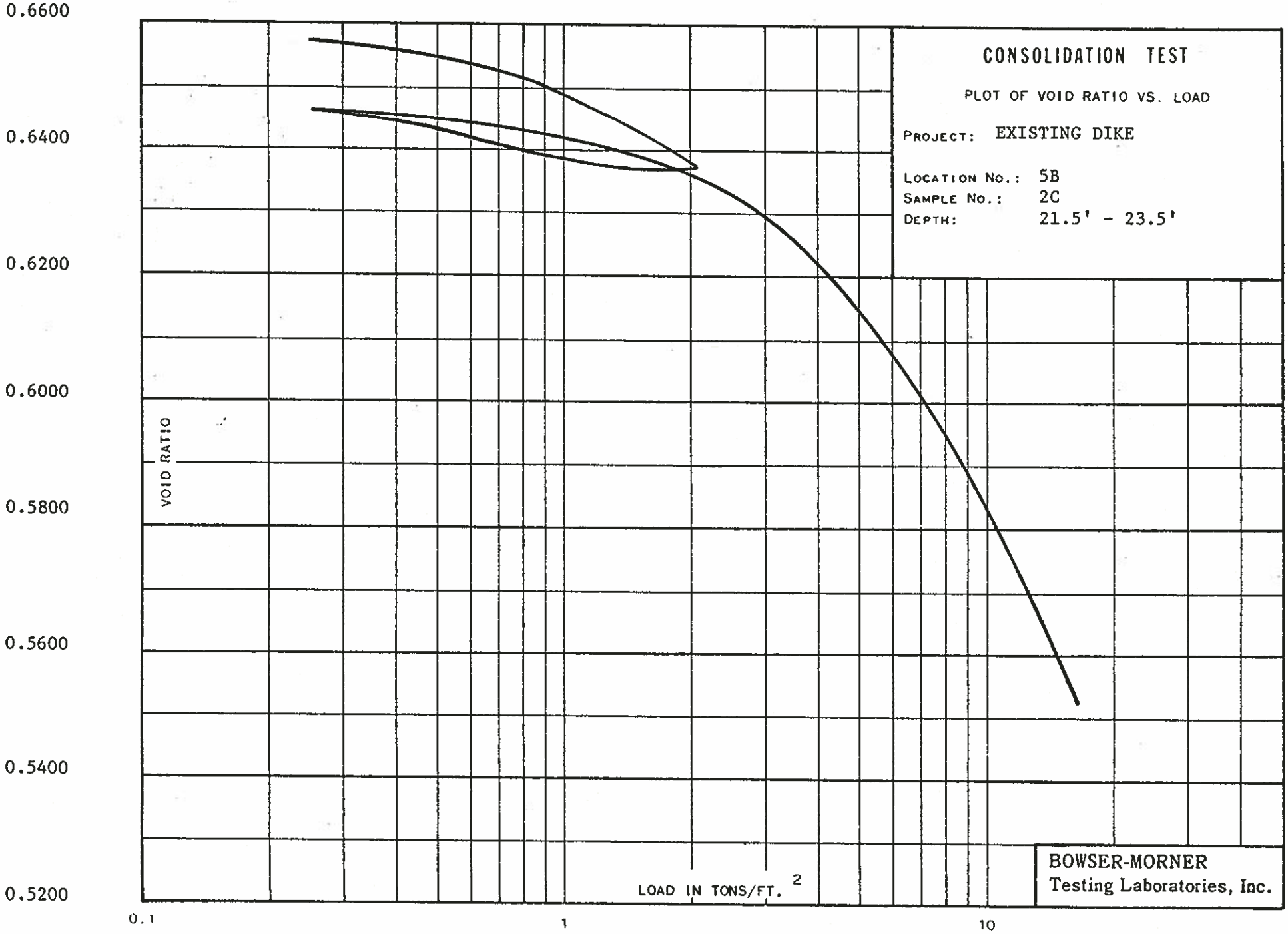
Degree of Saturation, Start of Test: 88%
End of Test: 100%

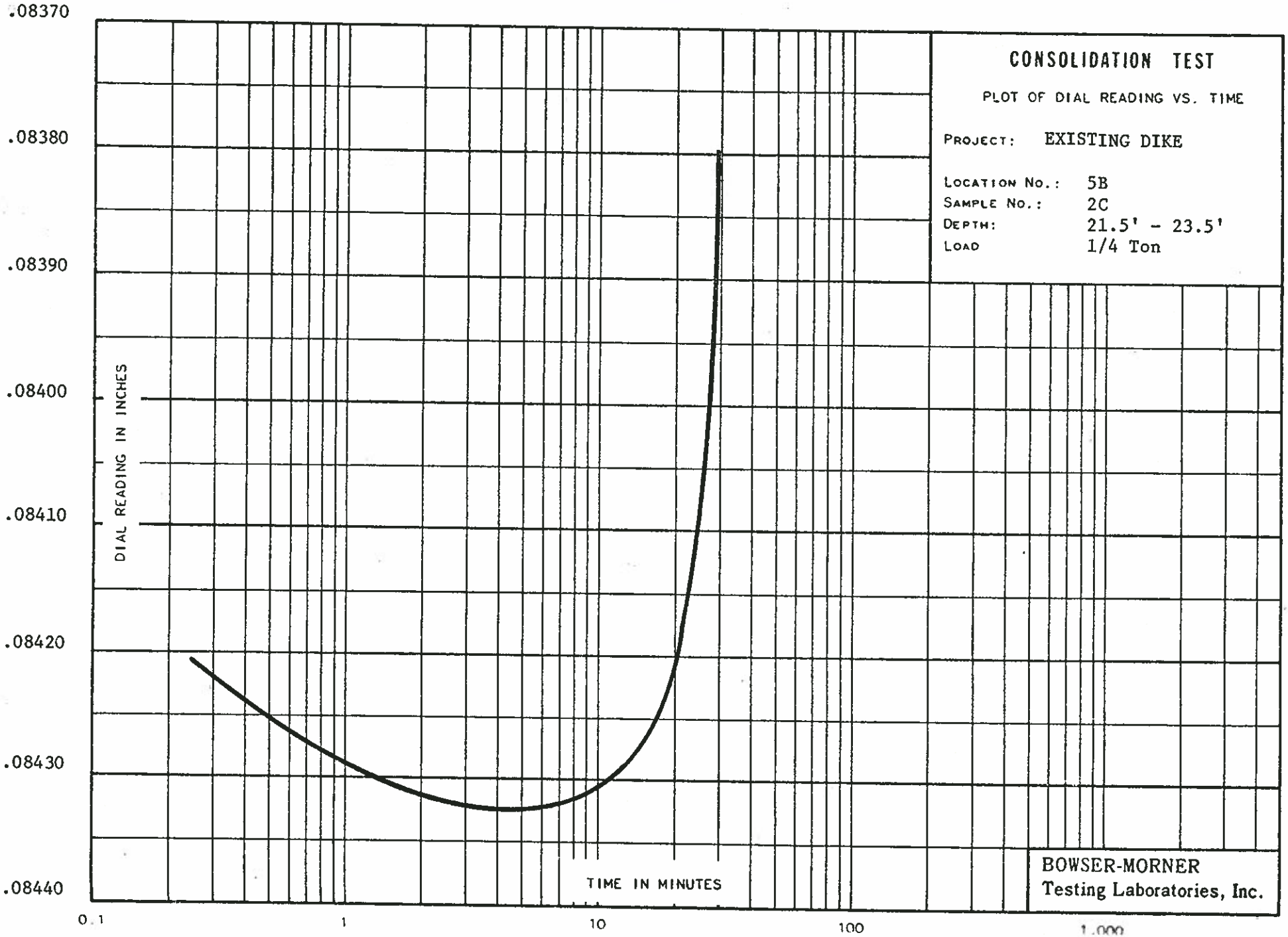
Applied Load (tons/ft.^{2})	Final Dial Reading (in.)	Dial Change (in.)	2H from Dial Change (in.)	Void Ratio	Fitting Time (sec.) t_{90}	Fitting Time (sec.) t_{50}	Coef. of Consolidation (in.^{2}/sec.) $.848\ H^2/t_{90}$	Coef. of Consolidation (in.^{2}/sec.) $.197\ H^2/t_{50}$
		0.00939						
1	0.09241		0.99061	0.6420				
		0.01302						
2	0.09604		0.98698	0.6360				
		0.02179						
4	0.10481		0.97821	0.6215				
		0.03763						
8	0.12065		0.96237	0.5952				
		0.06268						
16	0.14570		0.93732	0.5537				

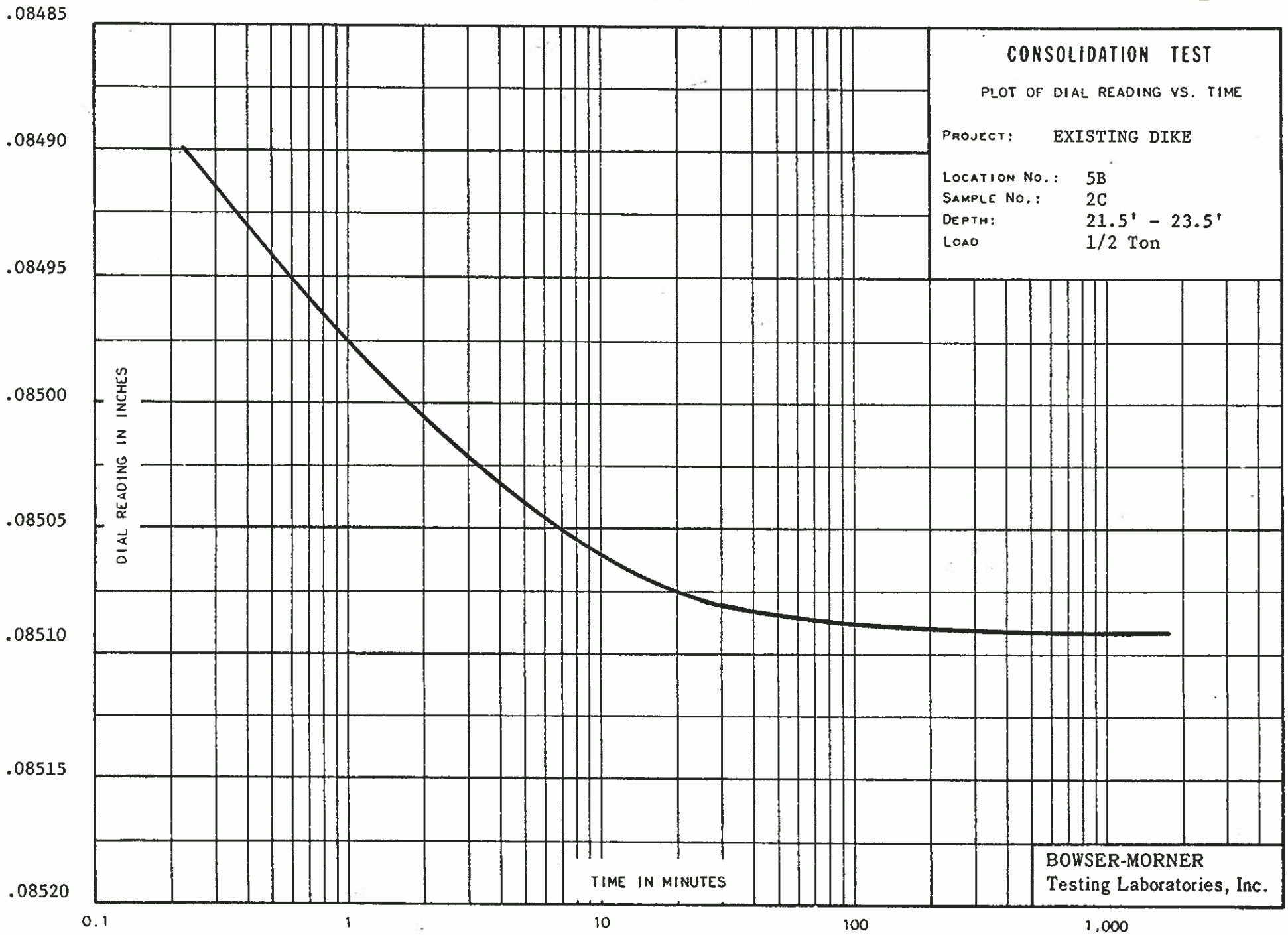
2A44

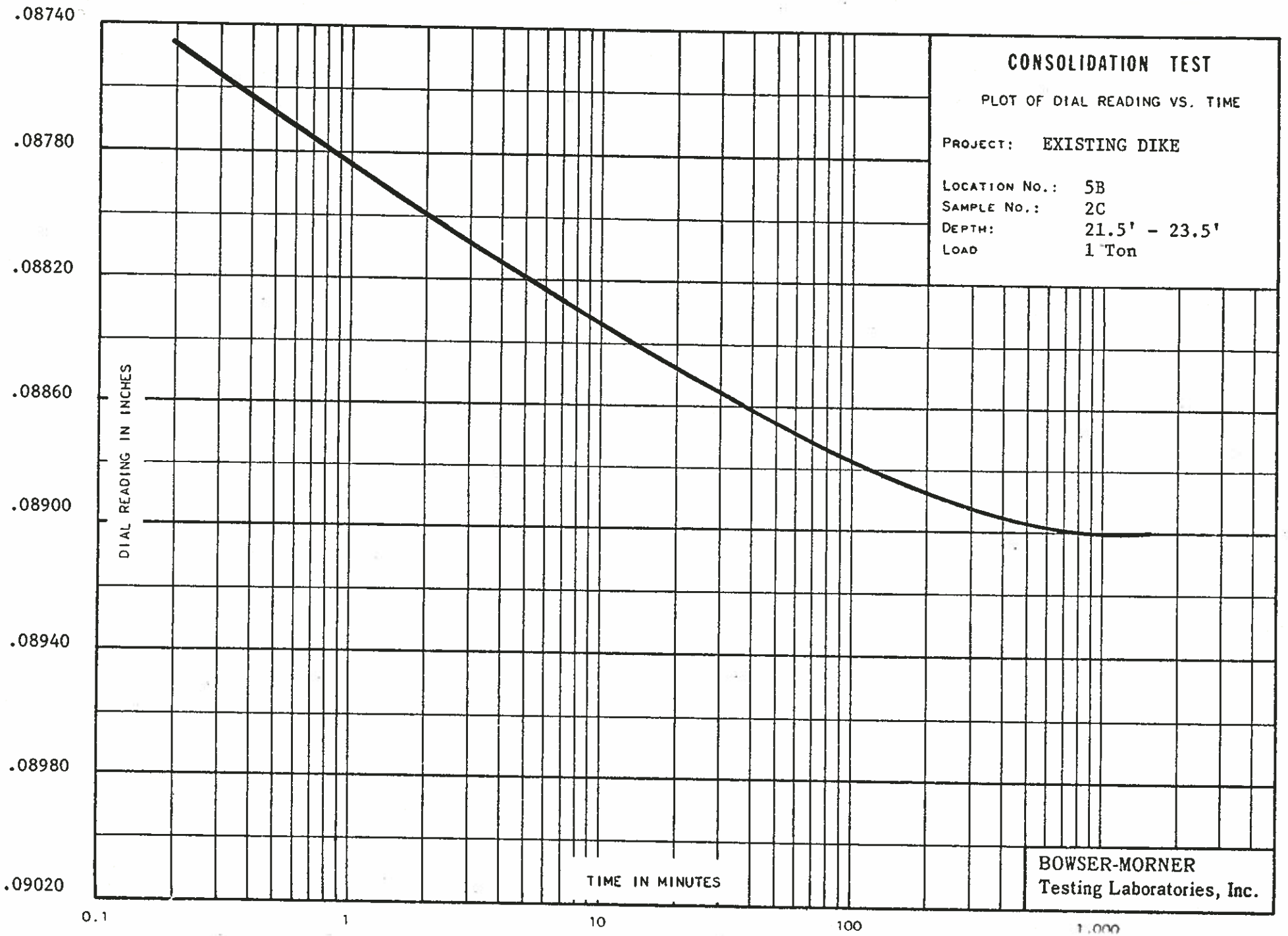
BOWSER-MORNER
Testing Laboratories, Inc.

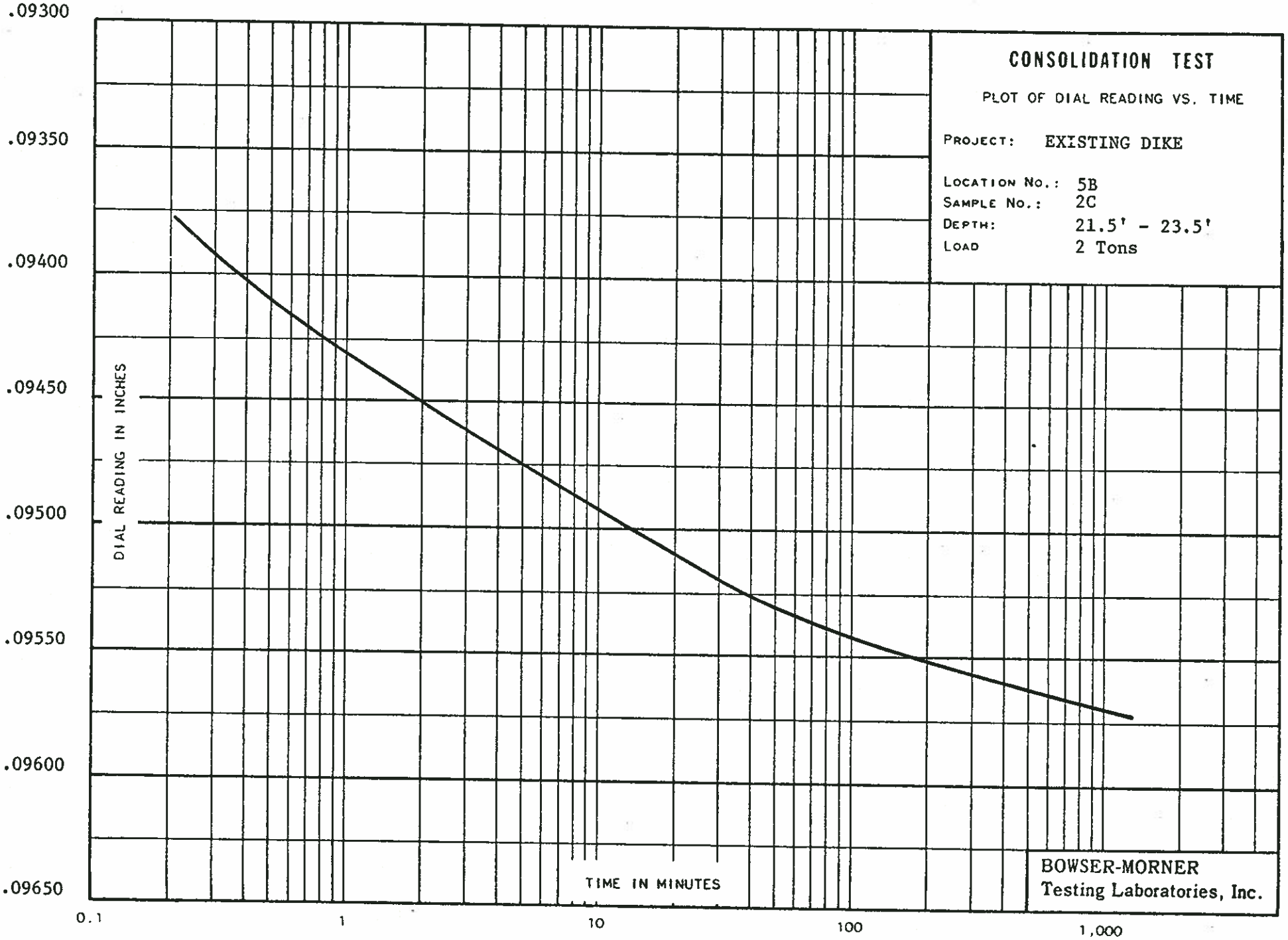
FORM 2A86

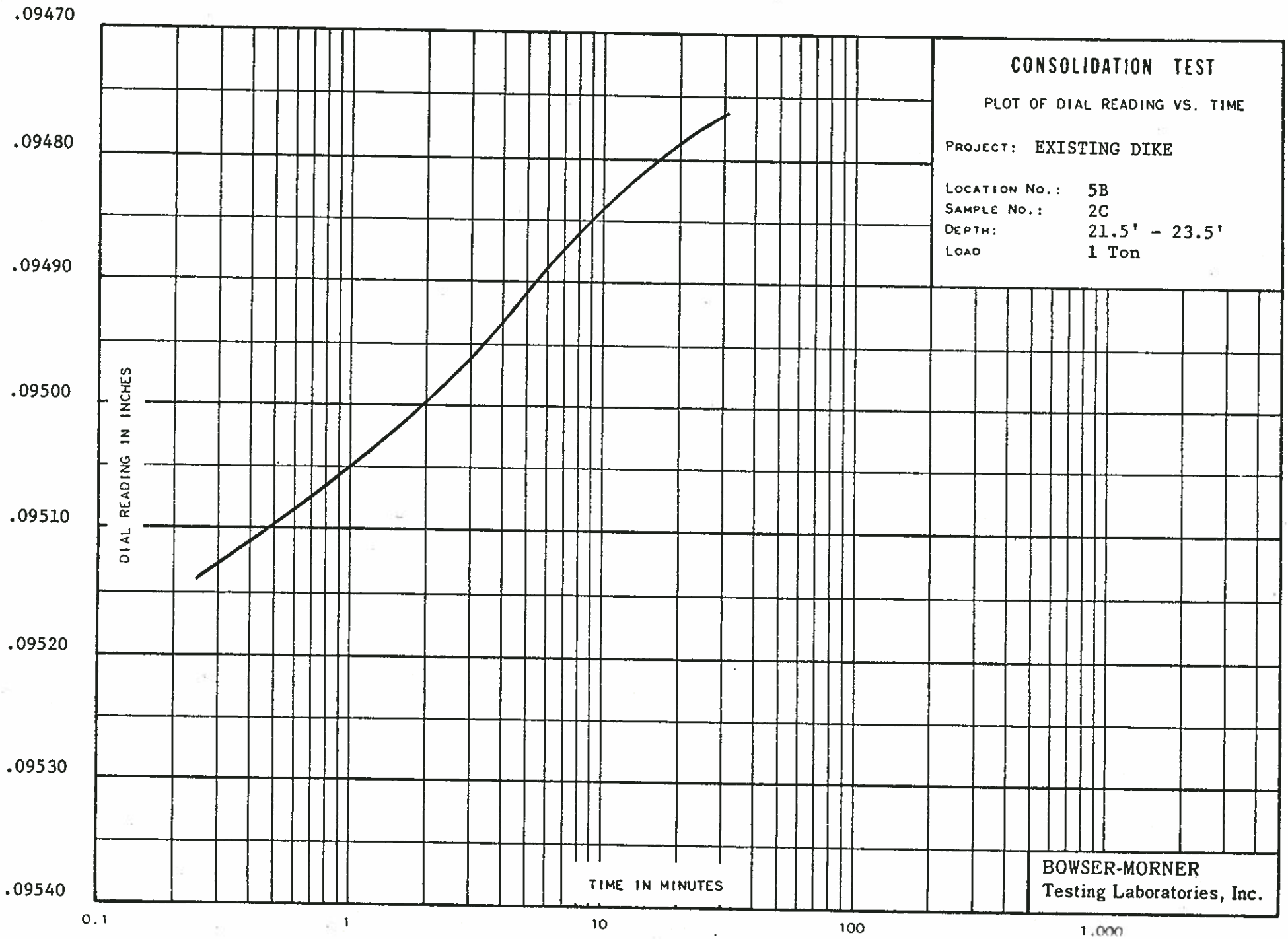

CONSOLIDATION TEST
PLOT OF VOID RATIO VS. LOAD
PROJECT: EXISTING DIKE
LOCATION NO.: 5B
SAMPLE NO.: 2C
DEPTH: 21.5' - 23.5'
VOID RATIO
0.6600
0.6400
0.6200
0.6000
0.5800
0.5600
0.5400
0.5200
LOAD IN TONS/FT.2
0.1
1
10
BOWSER-MORNER
Testing Laboratories, Inc.

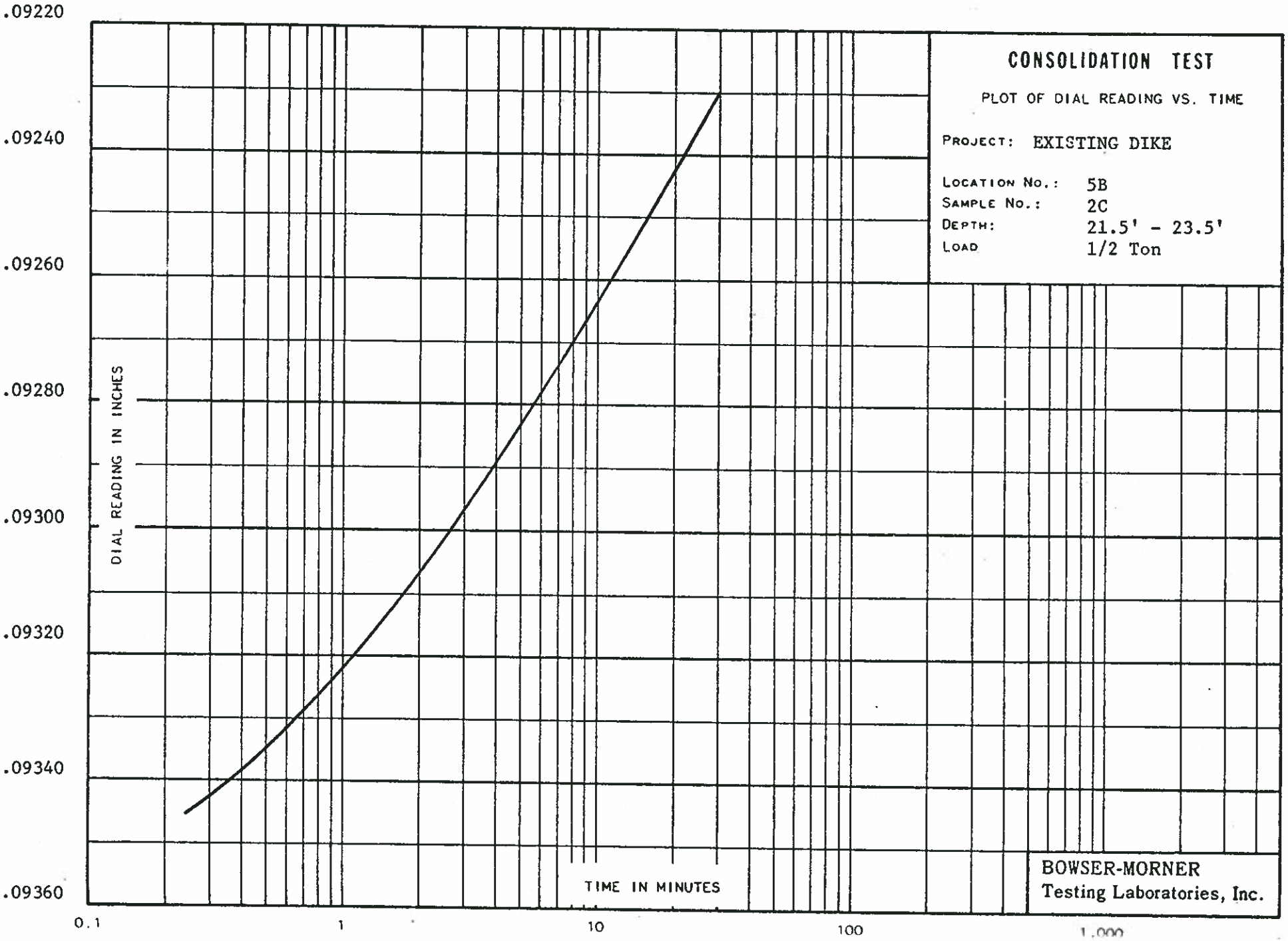

CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: EXISTING DIKE
LOCATION NO.: 5B
SAMPLE NO.: 2C
DEPTH: 21.5' - 23.5'
LOAD 1/4 Ton
DIAL READING IN INCHES
.08370
.08380
.08390
.08400
.08410
.08420
.08430
.08440
TIME IN MINUTES
0.1
1
10
100
1,000
BOWSER-MORNER
Testing Laboratories, Inc.

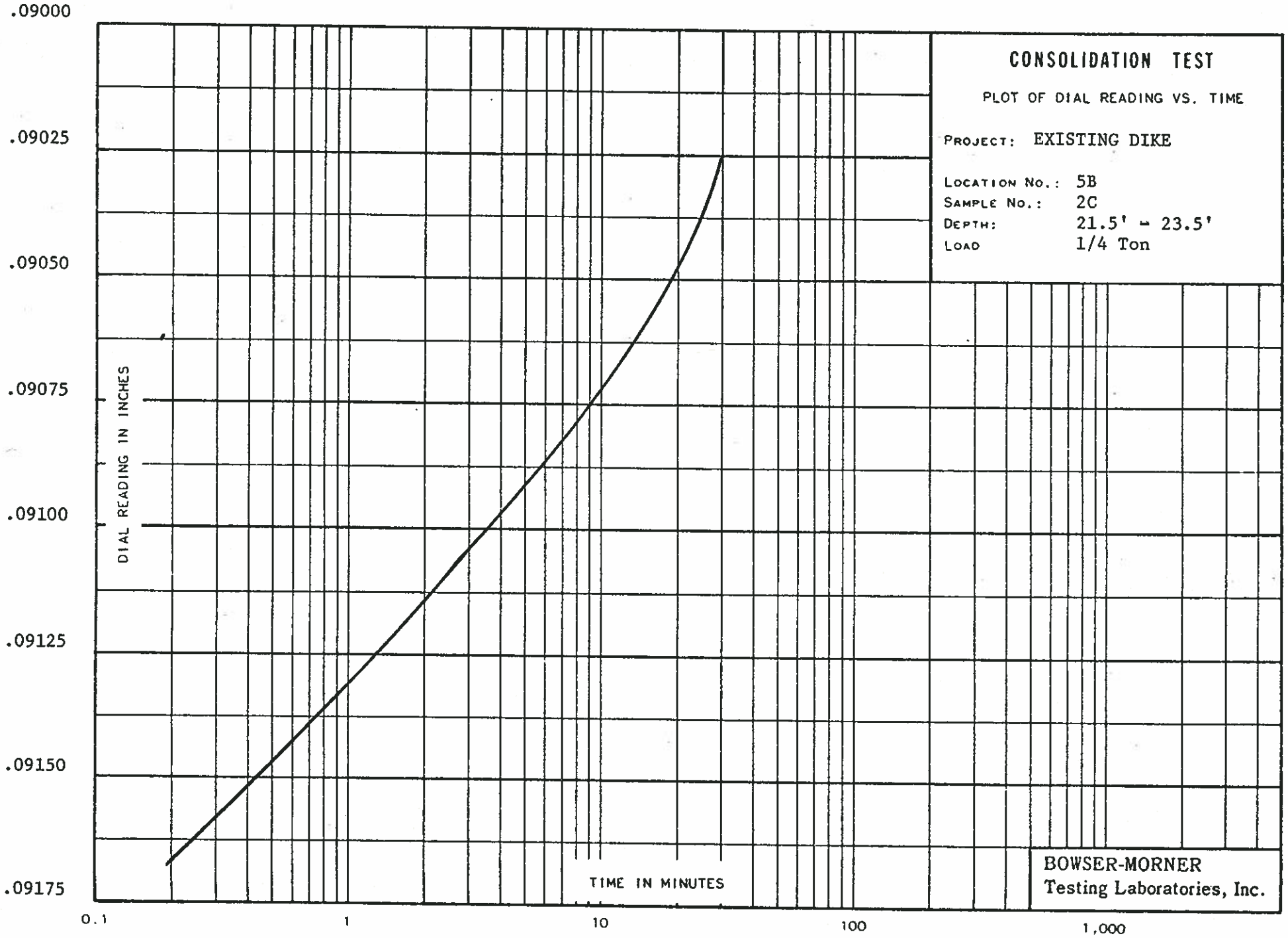

CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: EXISTING DIKE
LOCATION NO.: 5B
SAMPLE NO.: 2C
DEPTH: 21.5' - 23.5'
LOAD 1/2 Ton
DIAL READING IN INCHES
.08485
.08490
.08495
.08500
.08505
.08510
.08515
.08520
TIME IN MINUTES
0.1
1
10
100
1,000
BOWSER-MORNER
Testing Laboratories, Inc.


CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: EXISTING DIKE
LOCATION NO.: 5B
SAMPLE NO.: 2C
DEPTH: 21.5' - 23.5'
LOAD 1 Ton
DIAL READING IN INCHES
.08740
.08780
.08820
.08860
.08900
.08940
.08980
.09020
TIME IN MINUTES
0.1
1
10
100
1,000
BOWSER-MORNER
Testing Laboratories, Inc.


CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: EXISTING DIKE
LOCATION NO.: 5B
SAMPLE NO.: 2C
DEPTH: 21.5' - 23.5'
LOAD 2 Tons
DIAL READING IN INCHES
.09300
.09350
.09400
.09450
.09500
.09550
.09600
.09650
TIME IN MINUTES
0.1
1
10
100
1,000
BOWSER-MORNER
Testing Laboratories, Inc.


CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: EXISTING DIKE
LOCATION NO.: 5B
SAMPLE NO.: 2C
DEPTH: 21.5' - 23.5'
LOAD 1 Ton
DIAL READING IN INCHES
.09470
.09480
.09490
.09500
.09510
.09520
.09530
.09540
TIME IN MINUTES
0.1
1
10
100
1,000
BOWSER-MORNER
Testing Laboratories, Inc.


CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: EXISTING DIKE
LOCATION NO.: 5B
SAMPLE NO.: 2C
DEPTH: 21.5' - 23.5'
LOAD 1/2 Ton
DIAL READING IN INCHES
.09220
.09240
.09260
.09280
.09300
.09320
.09340
.09360
TIME IN MINUTES
0.1
1
10
100
1,000
BOWSER-MORNER
Testing Laboratories, Inc.


CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: EXISTING DIKE
LOCATION NO.: 5B
SAMPLE NO.: 2C
DEPTH: 21.5' - 23.5'
LOAD 1/4 Ton
DIAL READING IN INCHES
.09000
.09025
.09050
.09075
.09100
.09125
.09150
.09175
TIME IN MINUTES
0.1
1
10
100
1,000
BOWSER-MORNER
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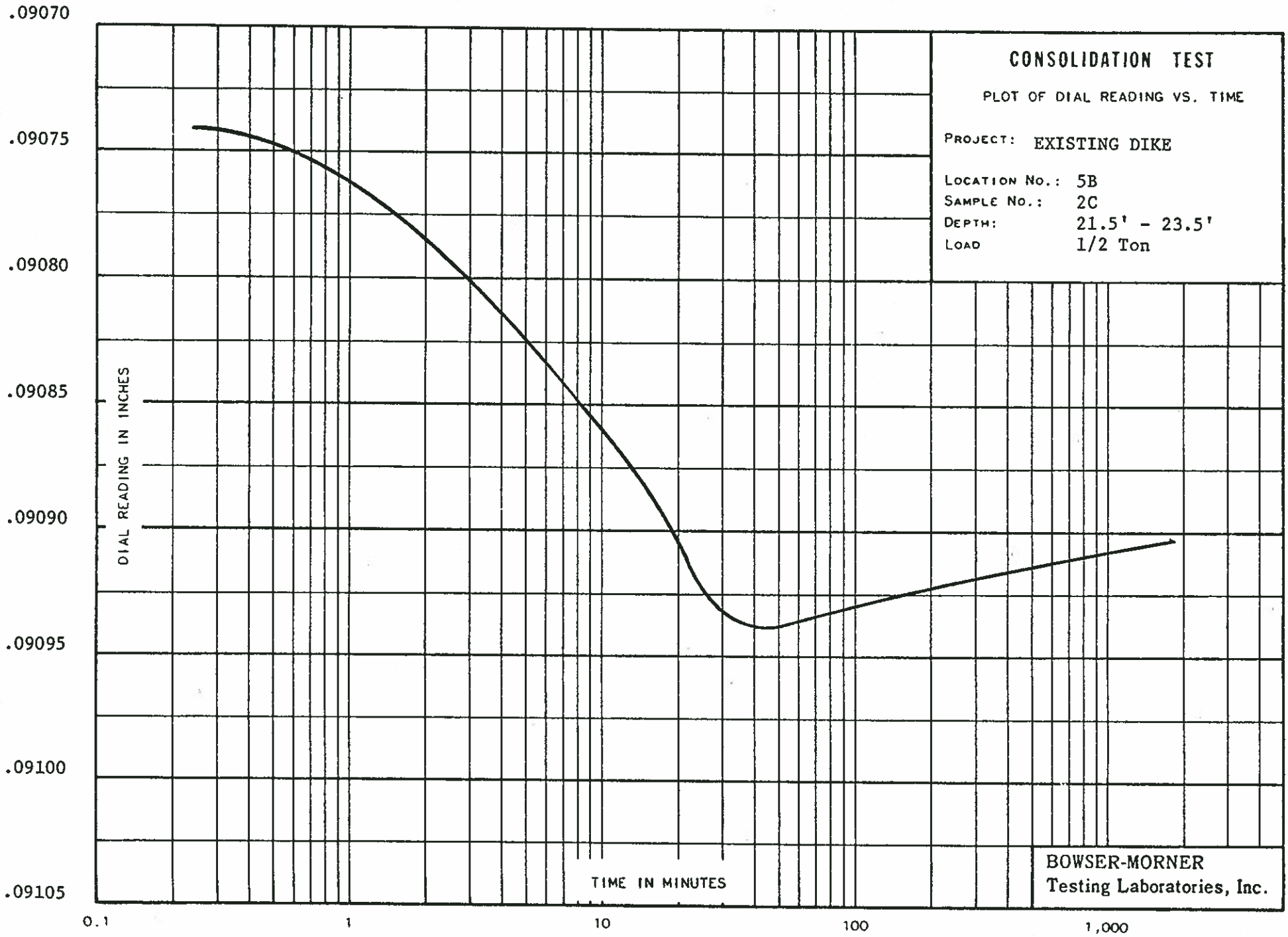
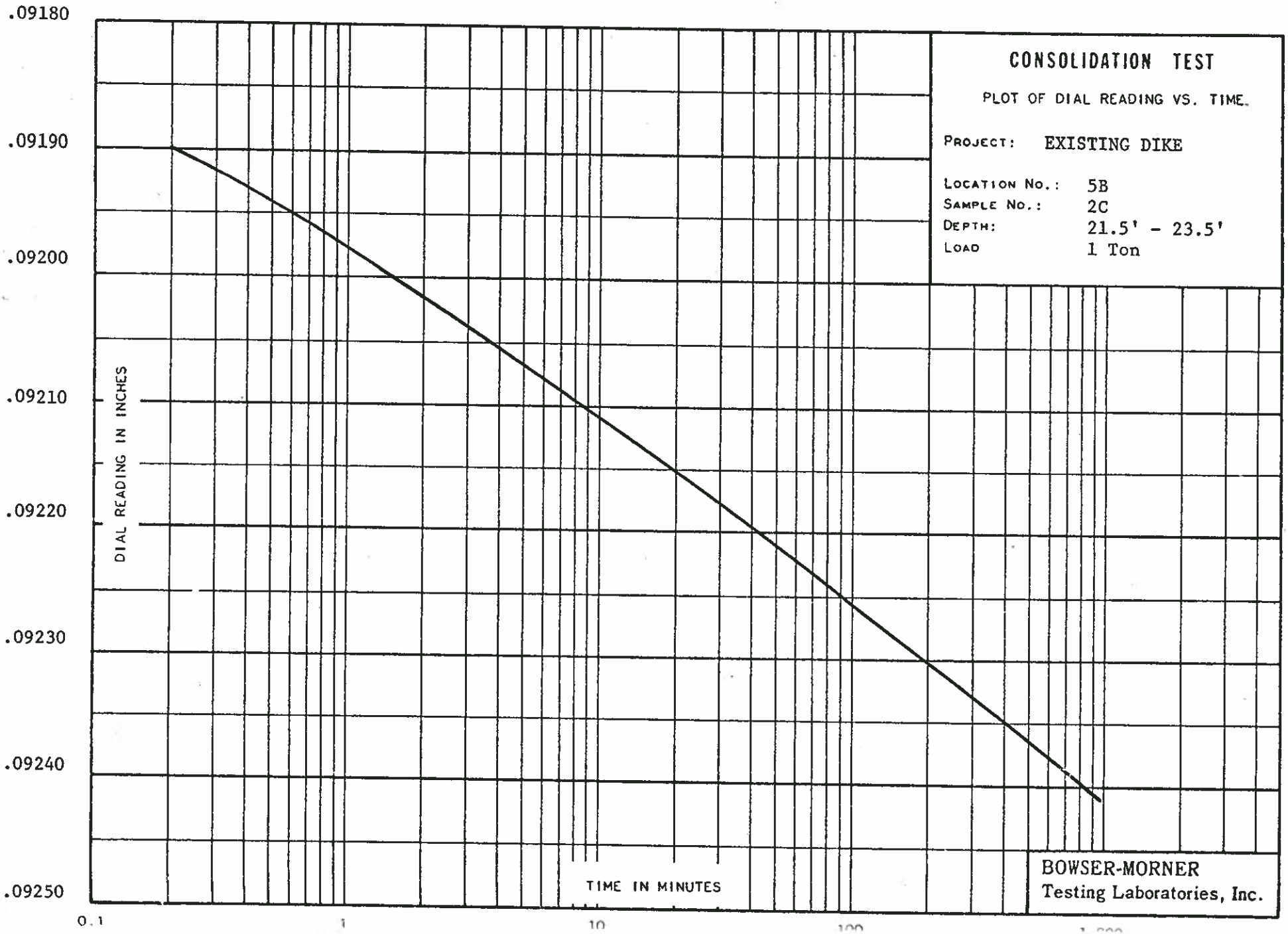
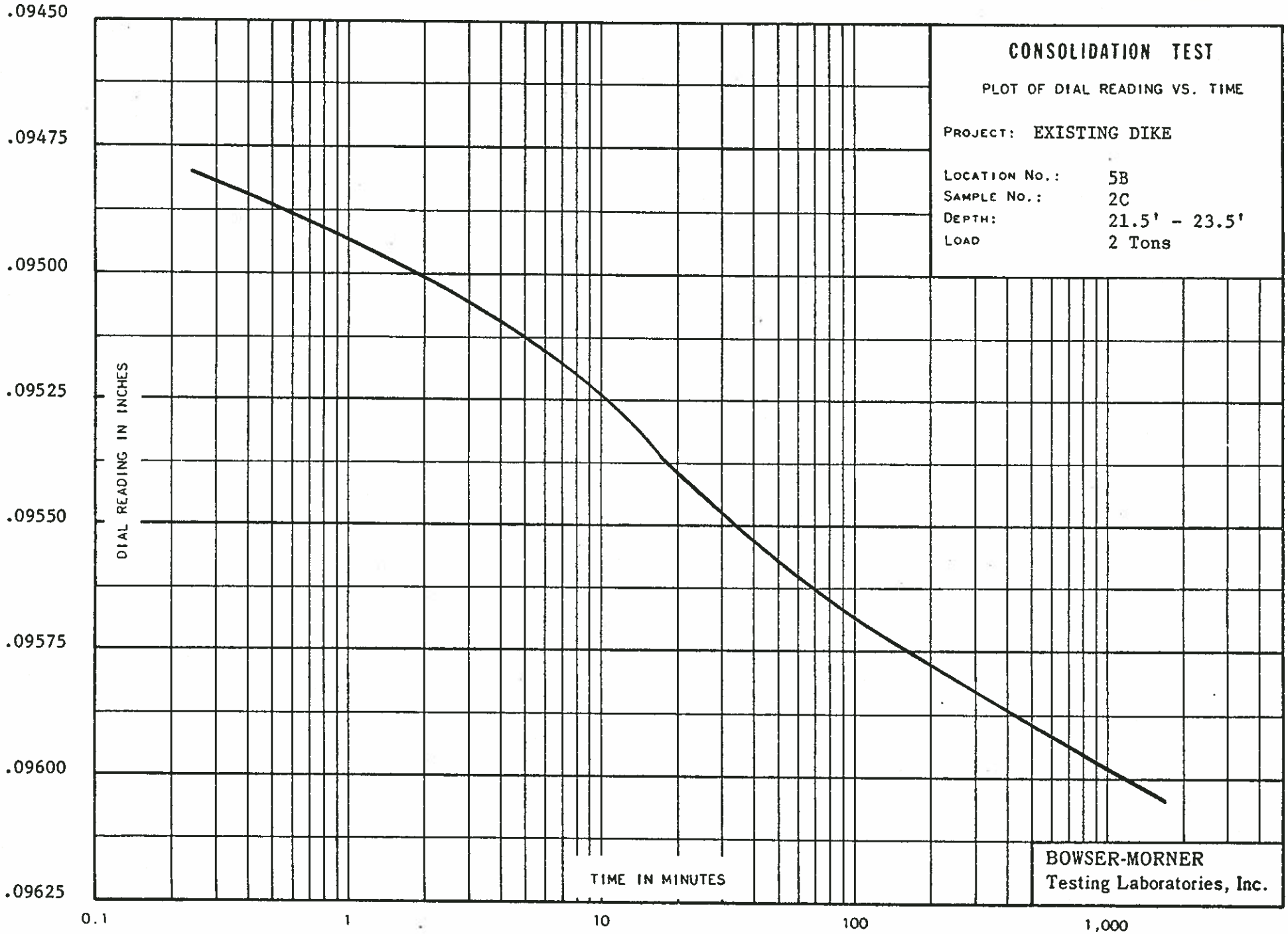
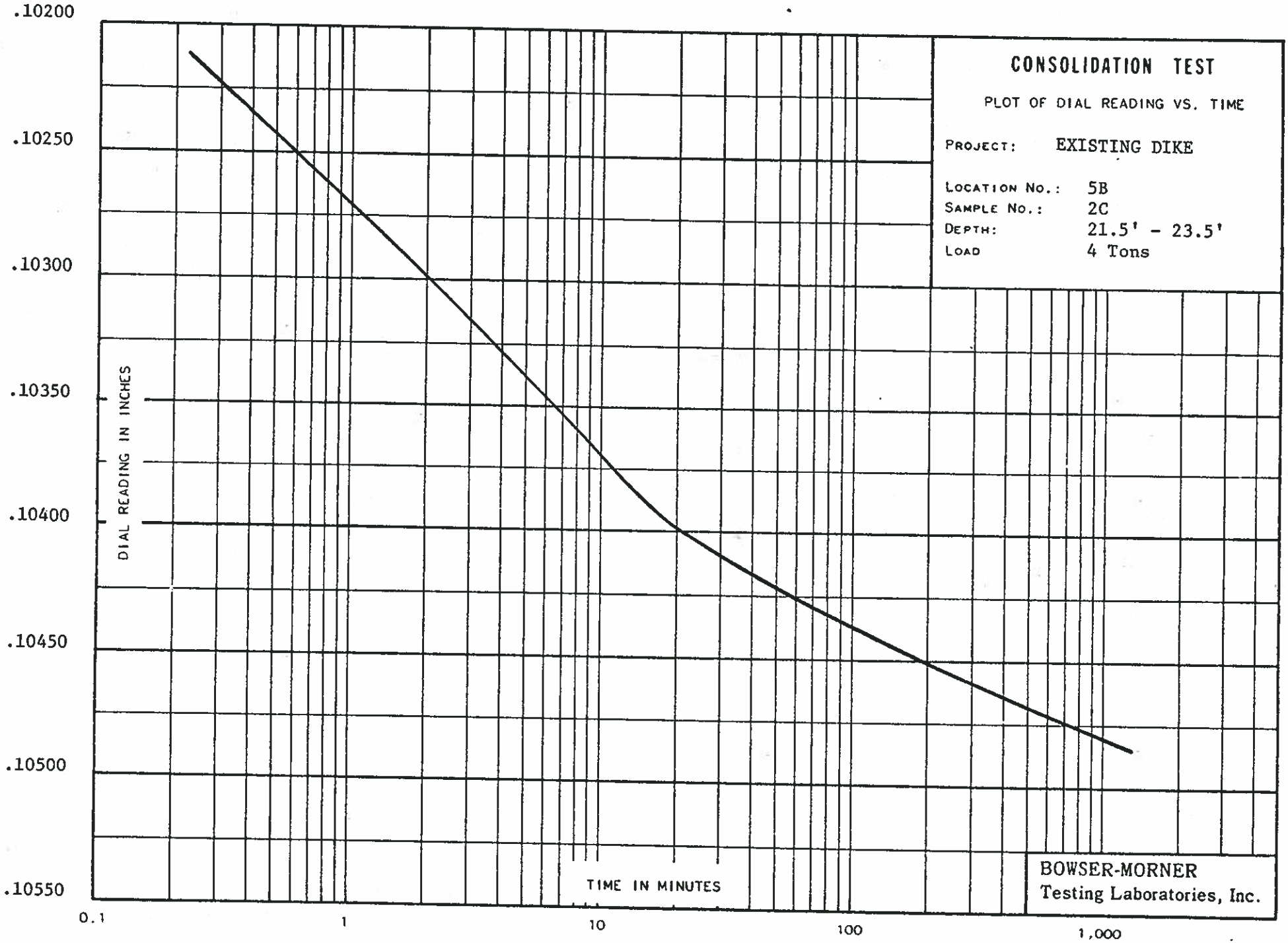
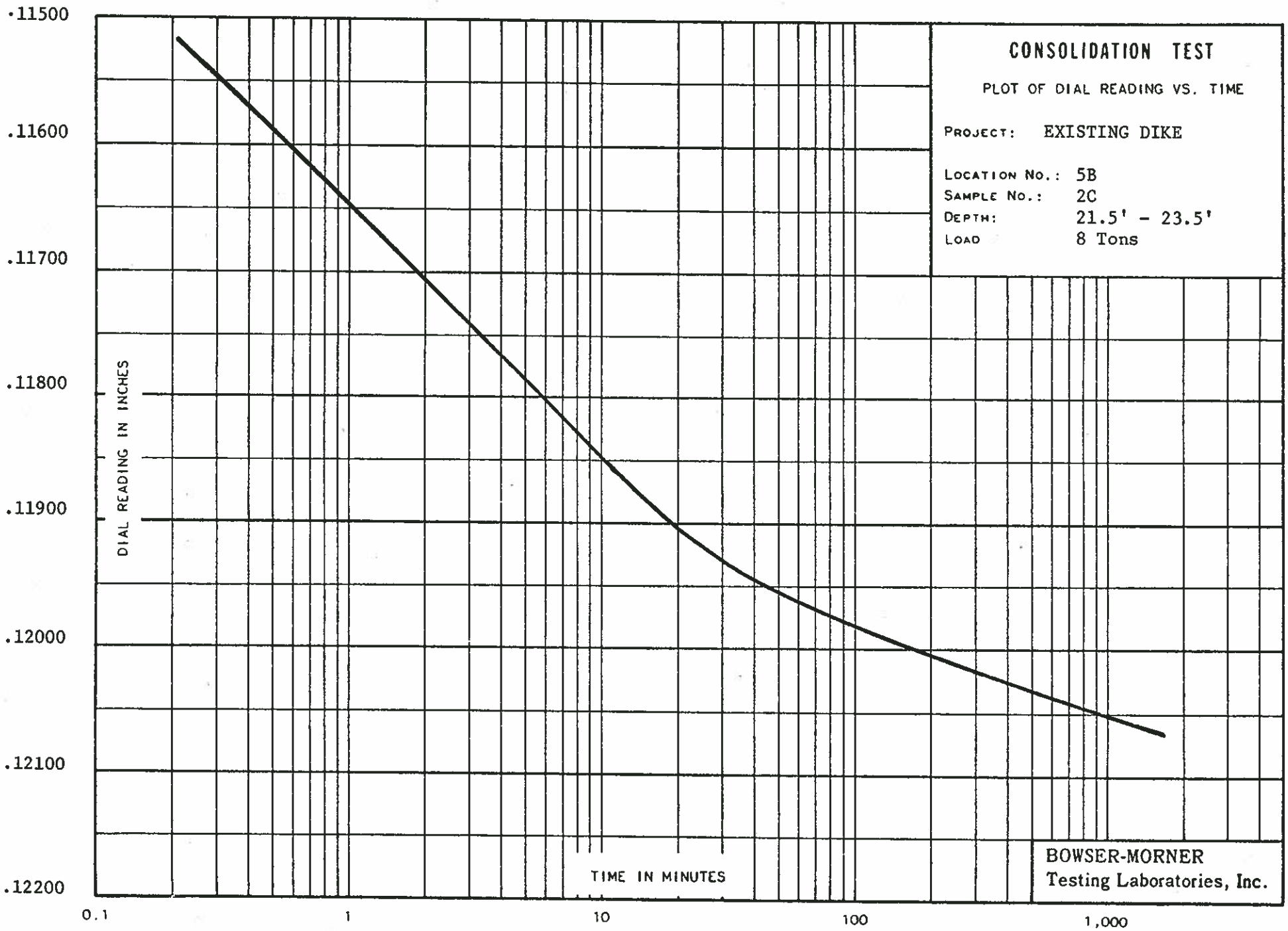
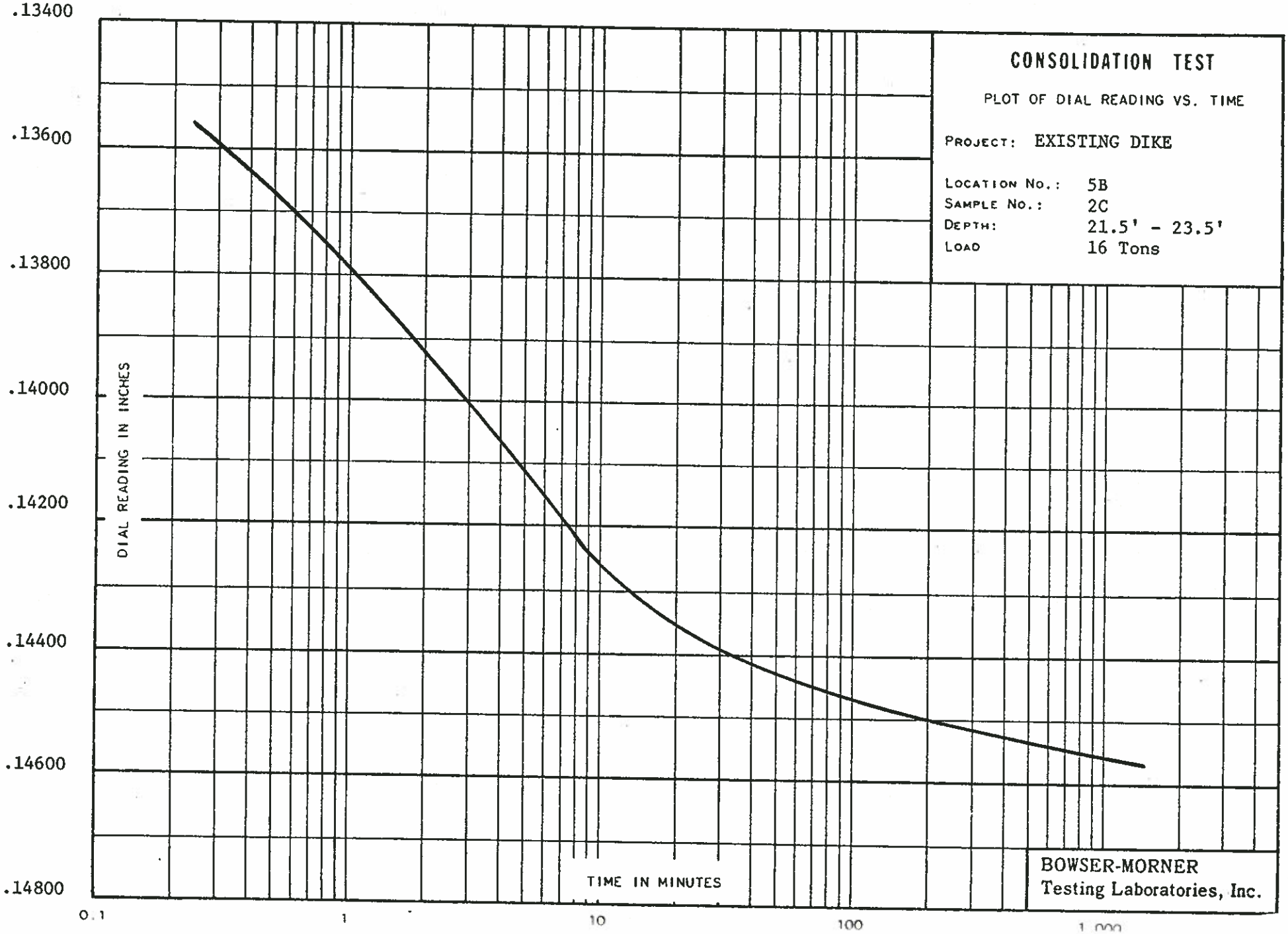

CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: EXISTING DIKE
LOCATION NO.: 5B
SAMPLE NO.: 2C
DEPTH: 21.5' - 23.5'
LOAD 1/2 Ton
DIAL READING IN INCHES
.09070
.09075
.09080
.09085
.09090
.09095
.09100
.09105
TIME IN MINUTES
0.1
1
10
100
1,000
BOWSER-MORNER
Testing Laboratories, Inc.


CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME.
PROJECT: EXISTING DIKE
LOCATION No.: 5B
SAMPLE No.: 2C
DEPTH: 21.5' - 23.5'
LOAD 1 Ton
DIAL READING IN INCHES
.09180
.09190
.09200
.09210
.09220
.09230
.09240
.09250
TIME IN MINUTES
0.1
1
10
100
BOWSER-MORNER
Testing Laboratories, Inc.


CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: EXISTING DIKE
LOCATION No.: 5B
SAMPLE No.: 2C
DEPTH: 21.5' - 23.5'
LOAD 2 Tons
DIAL READING IN INCHES
.09450
.09475
.09500
.09525
.09550
.09575
.09600
.09625
TIME IN MINUTES
0.1
1
10
100
1,000
BOWSER-MORNER
Testing Laboratories, Inc.


CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: EXISTING DIKE
LOCATION NO.: 5B
SAMPLE NO.: 2C
DEPTH: 21.5' - 23.5'
LOAD 4 Tons
DIAL READING IN INCHES
.10200
.10250
.10300
.10350
.10400
.10450
.10500
.10550
TIME IN MINUTES
0.1
1
10
100
1,000
BOWSER-MORNER
Testing Laboratories, Inc.


CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: EXISTING DIKE
LOCATION NO.: 5B
SAMPLE NO.: 2C
DEPTH: 21.5' - 23.5'
LOAD 8 Tons
DIAL READING IN INCHES
.11500
.11600
.11700
.11800
.11900
.12000
.12100
.12200
TIME IN MINUTES
0.1
1
10
100
1,000
BOWSER-MORNER
Testing Laboratories, Inc.


CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: EXISTING DIKE
LOCATION No.: 5B
SAMPLE No.: 2C
DEPTH: 21.5' - 23.5'
LOAD 16 Tons
DIAL READING IN INCHES
.13400
.13600
.13800
.14000
.14200
.14400
.14600
.14800
TIME IN MINUTES
0.1
1
10
100
1,000
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Testing Laboratories, Inc.

CONSOLIDATION TEST

Project: ORIGINAL GROUND AREA, ASH PIT NO. 3, Stuart Station

Material: Brown Clay, Some Silt, Some Sand

Boring No: 7D
Sample No: 1C
Depth: 3.5' - 5.5'

Tested by: JLH, JAC
Date: 12-18-74

Specific Gravity: 2.70

Moisture Content, Before: 23.4%
After: 22.3%
Natural: 23.4%

Degree of Saturation, Start of Test: 86%
End of Test: 100%

Applied Load (tons/ft.^{2})	Final Dial Reading (in.)	Dial Change (in.)	2H from Dial Change (in.)	Void Ratio	Fitting Time (sec.) t_{90}	Fitting Time (sec.) t_{50}	Coef. of Consolidation (in.^{2}/sec.) $.848\ H^2/t_{90}$	Coef. of Consolidation (in.^{2}/sec.) $.197\ H^2/t_{50}$
0	0.02362							
		0.00404						
.25	0.02766		0.99596	0.7246				
		0.00656						
.5	0.03018		0.99344	0.7202				
		0.01122						
1	0.03484		0.98878	0.7121				
		0.01768						
2	0.04130		0.98232	0.7009				
		0.02755						
4	0.05117		0.97245	0.6838				
		0.04787						
8	0.07149		0.95213	0.6487				
		0.08174						
16	0.10536		0.91826	0.5900				
		0.07924						
8	0.10286		0.92076	0.5944				

2A44

CONSOLIDATION TEST

Project: ORIGINAL GROUND AREA, ASH PIT NO. 3, Stuart Station

Material: Brown Clay, Some Silt, Some Sand

Boring No: 7D
Sample No: 1C
Depth: 3.5' - 5.5'

Tested by: JLH, JAC
Date: 12-18-74

Specific Gravity: 2.70

Moisture Content, Before: 23.4%
After: 22.3%
Natural: 23.4%

Degree of Saturation, Start of Test: 86%
End of Test: 100%

Applied Load (tons/ft.^{2})	Final Dial Reading (in.)	Dial Change (in.)	2H from Dial Change (in.)	Void Ratio	Fitting Time (sec.) t_{90}	Fitting Time (sec.) t_{50}	Coef. of Consolidation (in.^{2}/sec.) $.848\ H^2/t_{90}$	Coef. of Consolidation (in.^{2}/sec.) $.197\ H^2/t_{50}$
4	0.09889	0.07527	0.92473	0.6012				
2	0.09404	0.07042	0.99958	0.6096				
1	0.08862	0.06500	0.93500	0.6190				
1/2	0.08318	0.05956	0.94044	0.6284				
1/4	0.07790	0.05428	0.94572	0.6376				
1/2	0.07850	0.05488	0.94512	0.6365				
1	0.08050	0.05688	0.94312	0.6331				
2	0.08445	0.06083	0.93917	0.6262				
4	0.09033	0.06671	0.93329	0.6160				

CONSOLIDATION TEST

Project: ORIGINAL GROUND AREA, ASH PIT NO. 3, Stuart Station

Material: Brown Clay, some Silt, Some Sand

Boring No: 7D
Sample No: 1C
Depth: 3.5' - 5.5'

Tested by: JLH, JAC
Date: 12-18-74

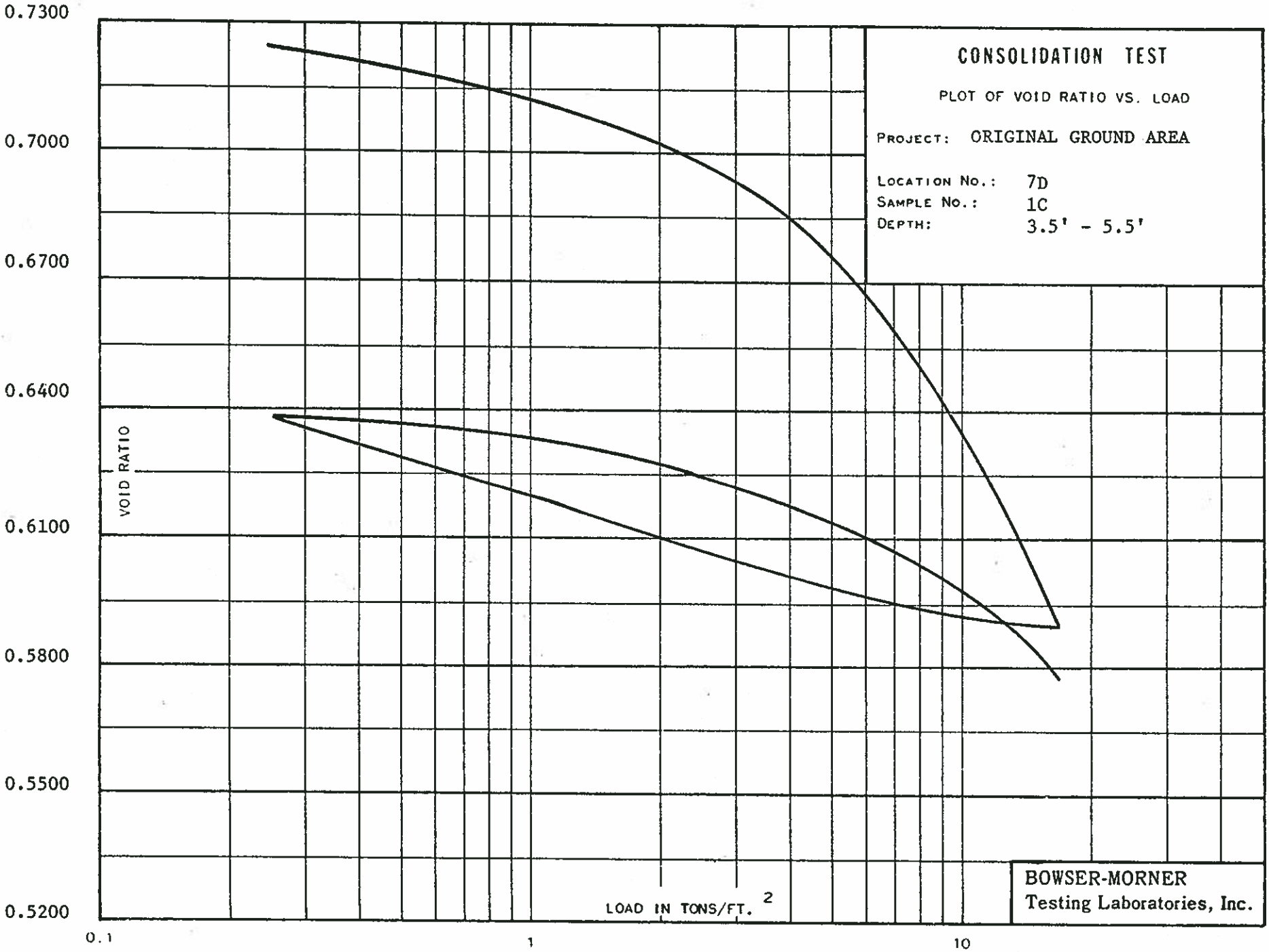
Specific Gravity: 2.70

Moisture Content, Before: 23.4%
After: 22.3%
Natural: 23.4%

Degree of Saturation, Start of Test: 86%
End of Test: 100%

Applied Load (tons/ft.^{2})	Final Dial Reading (in.)	Dial Change (in.)	2H from Dial Change (in.)	Void Ratio	Fitting Time (sec.) t_{90}	Fitting Time (sec.) t_{50}	Coef. of Consolidation (in.^{2}/sec.) $.848\ H^2/t_{90}$	Coef. of Consolidation (in.^{2}/sec.) $.197\ H^2/t_{50}$
		0.07442						
8	0.09804		0.92558	0.6027				
		0.08907						
16	0.11269		0.91093	0.5773				

FORM 2A86


CONSOLIDATION TEST
PLOT OF VOID RATIO VS. LOAD
PROJECT: ORIGINAL GROUND AREA
LOCATION NO.: 7D
SAMPLE NO.: 1C
DEPTH: 3.5' - 5.5'
VOID RATIO
0.7300
0.7000
0.6700
0.6400
0.6100
0.5800
0.5500
0.5200
LOAD IN TONS/FT.2
0.1
1
10
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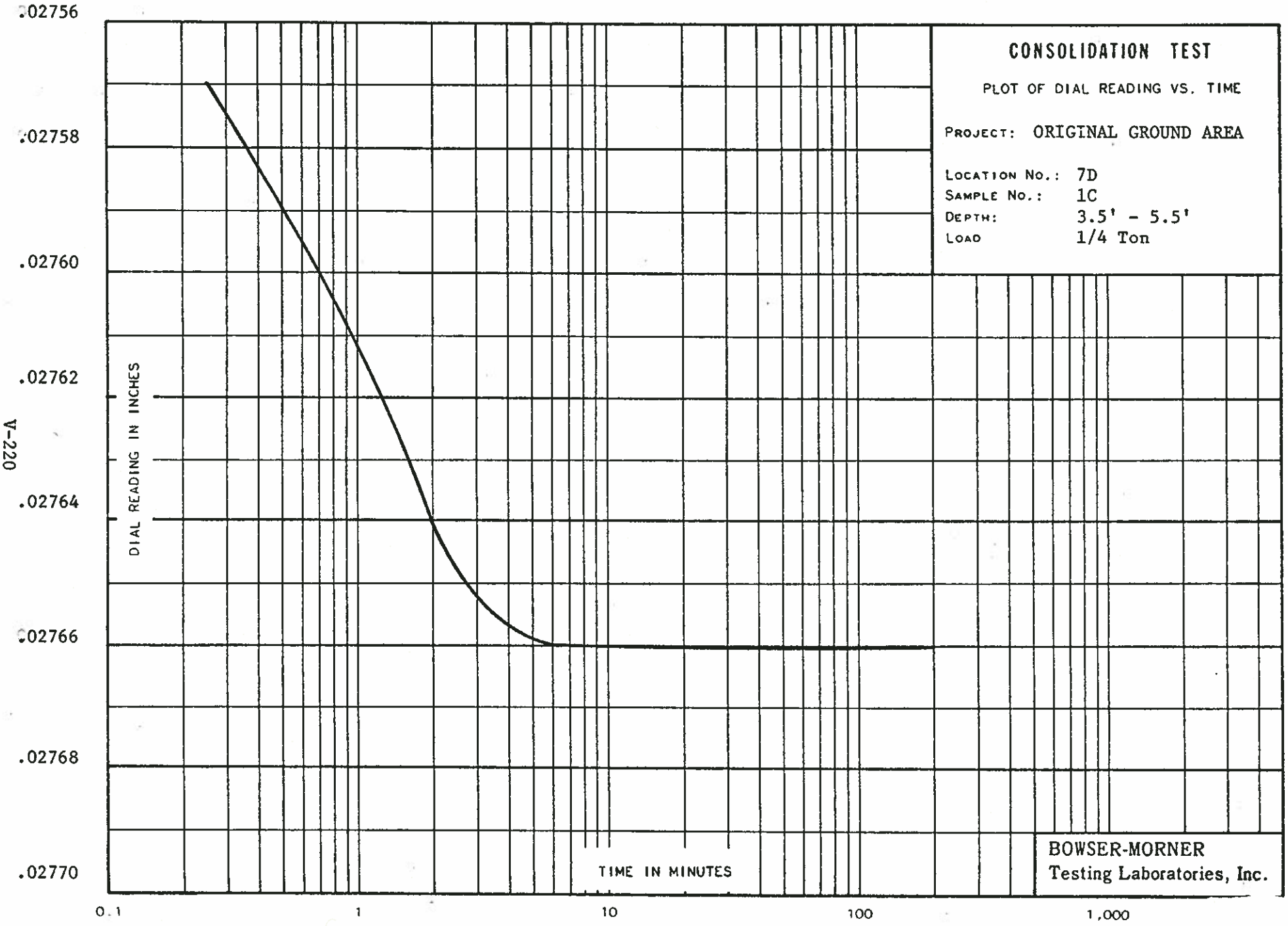
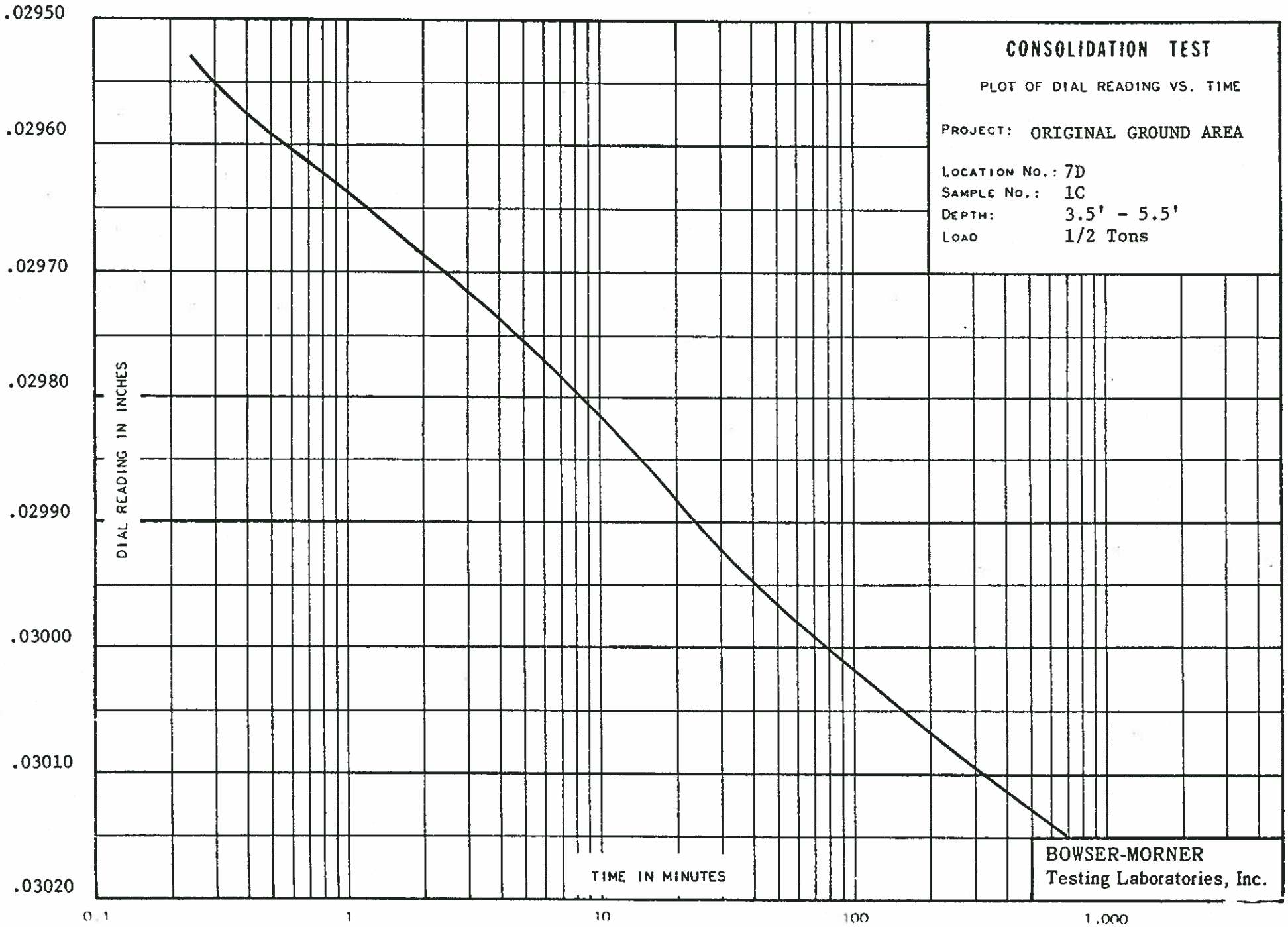
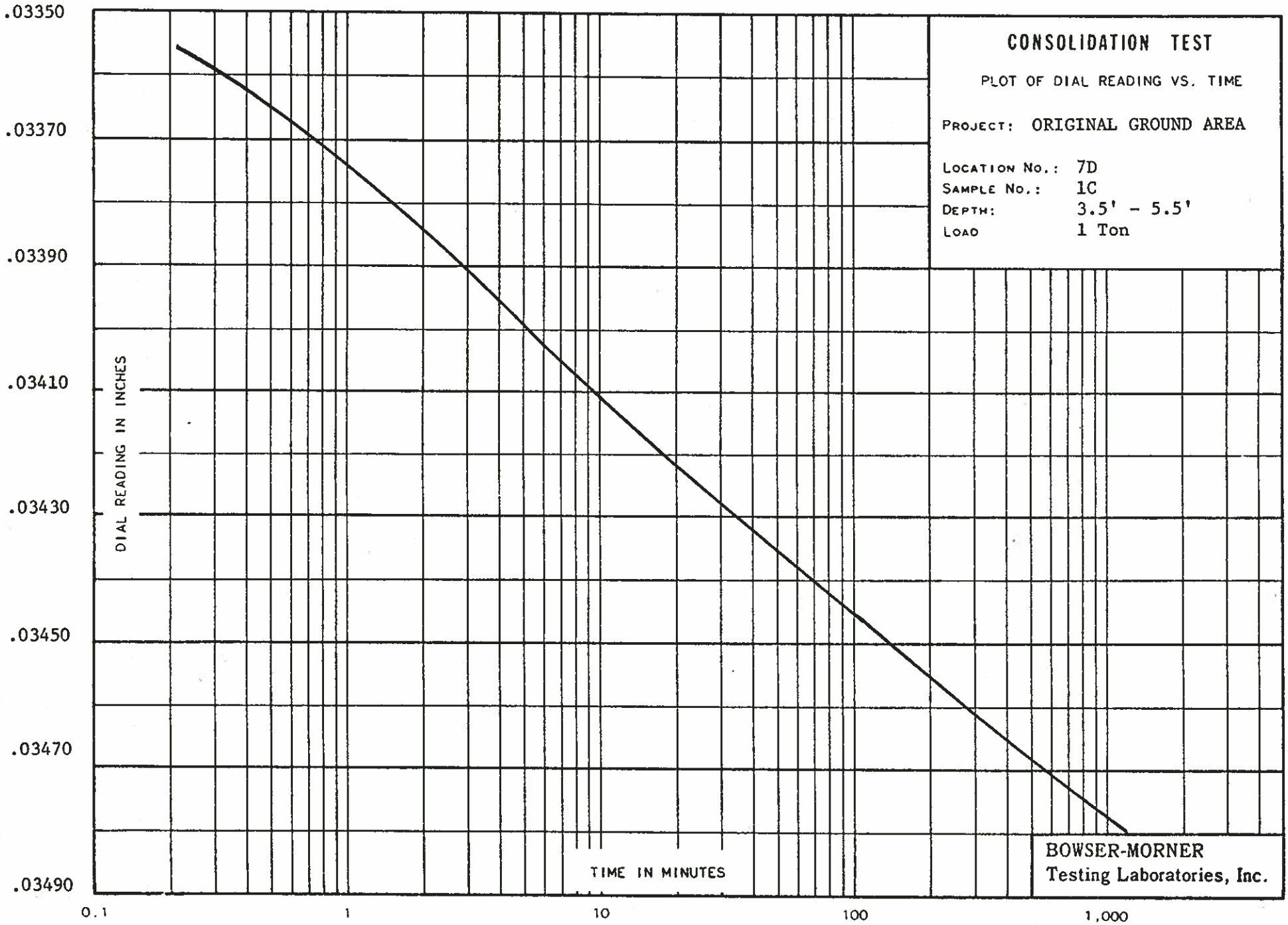
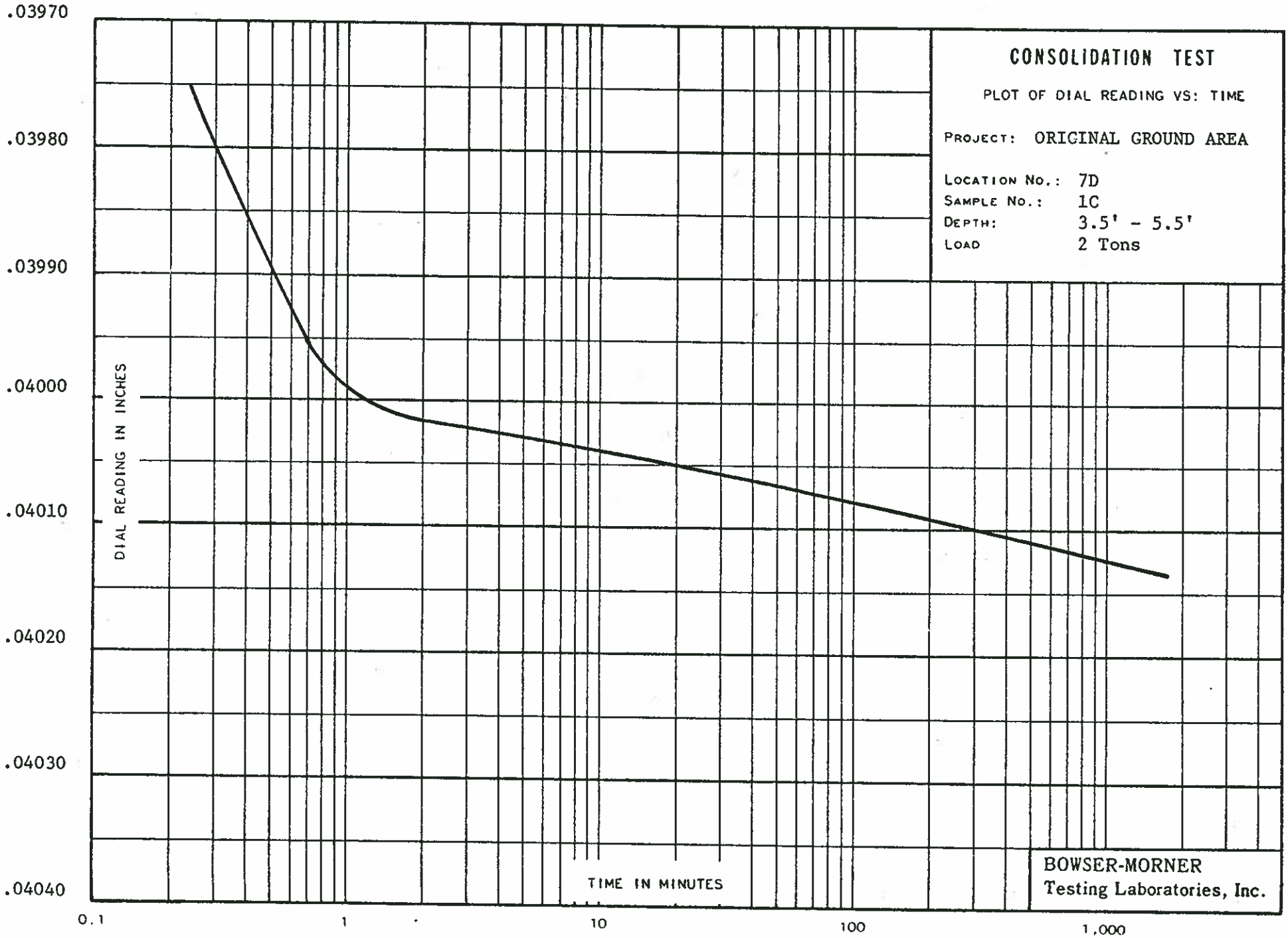
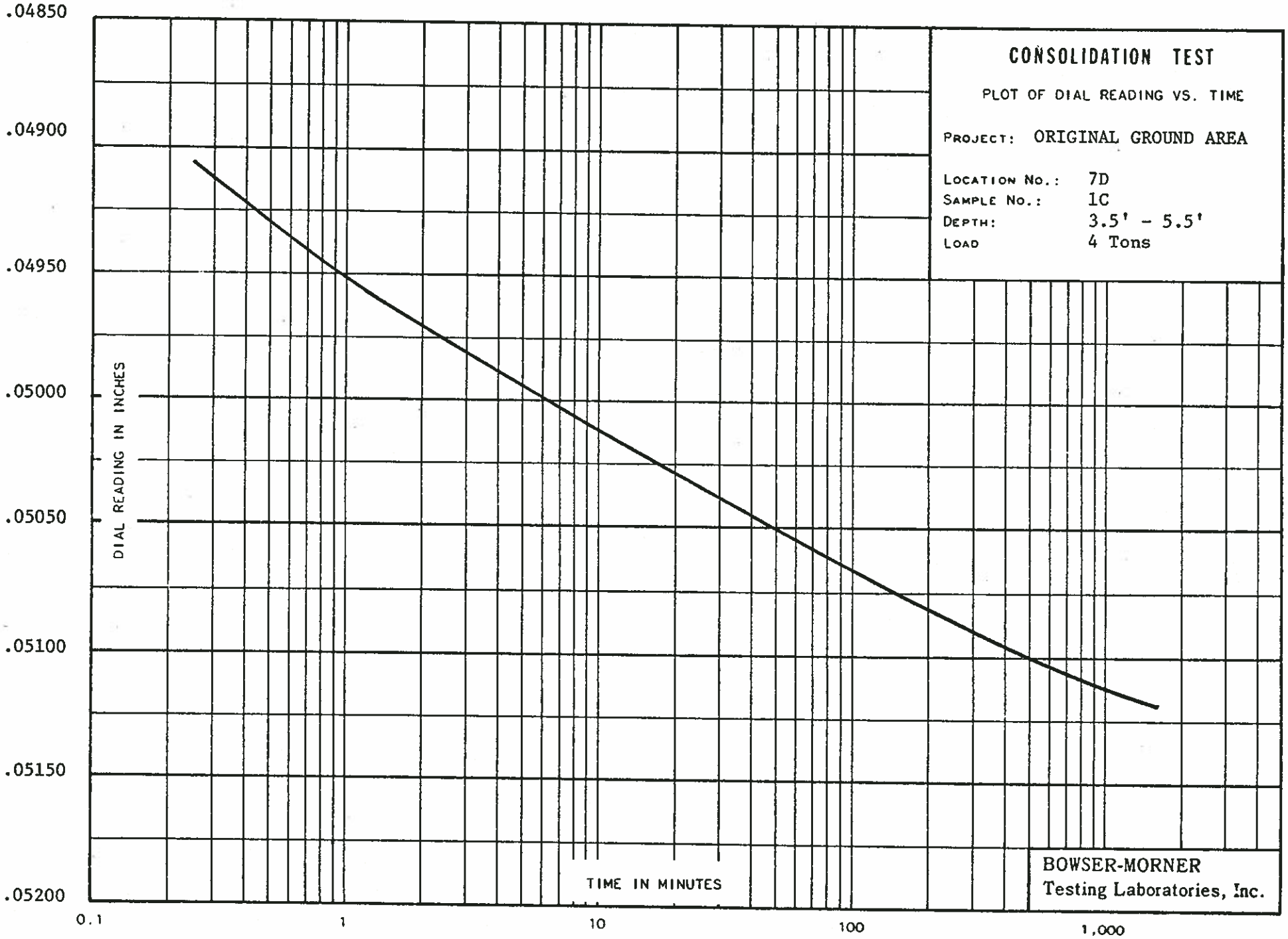
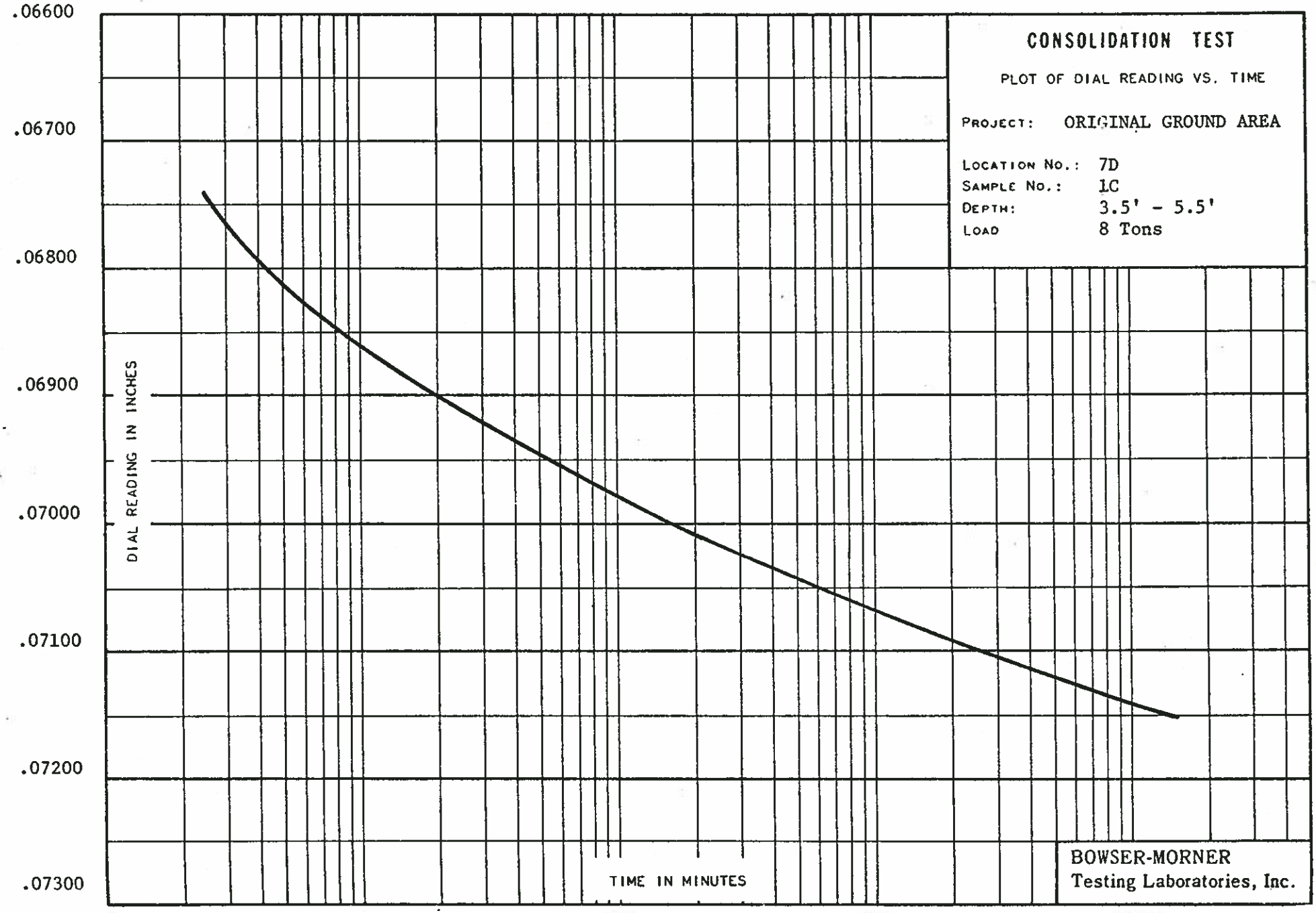

CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: ORIGINAL GROUND AREA
LOCATION NO.: 7D
SAMPLE NO.: 1C
DEPTH: 3.5' - 5.5'
LOAD 1/4 Ton
DIAL READING IN INCHES
.02756
.02758
.02760
.02762
.02764
.02766
.02768
.02770
TIME IN MINUTES
0.1
1
10
100
1,000
BOWSER-MORNER
Testing Laboratories, Inc.

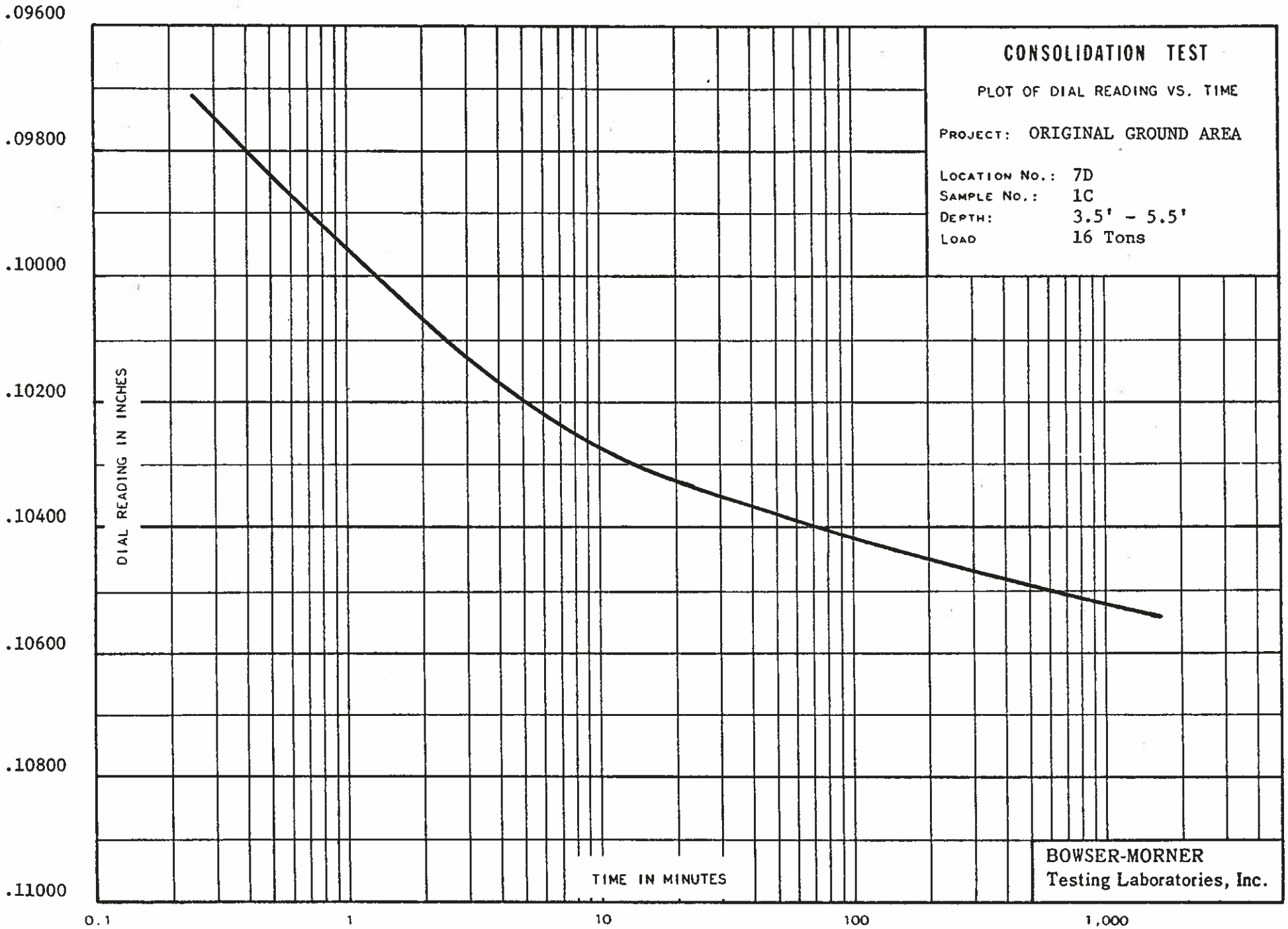

CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: ORIGINAL GROUND AREA
LOCATION NO.: 7D
SAMPLE NO.: 1C
DEPTH: 3.5' - 5.5'
LOAD 1/2 Tons
DIAL READING IN INCHES
.02950
.02960
.02970
.02980
.02990
.03000
.03010
.03020
TIME IN MINUTES
0.1
1
10
100
1,000
BOWSER-MORNER
Testing Laboratories, Inc.

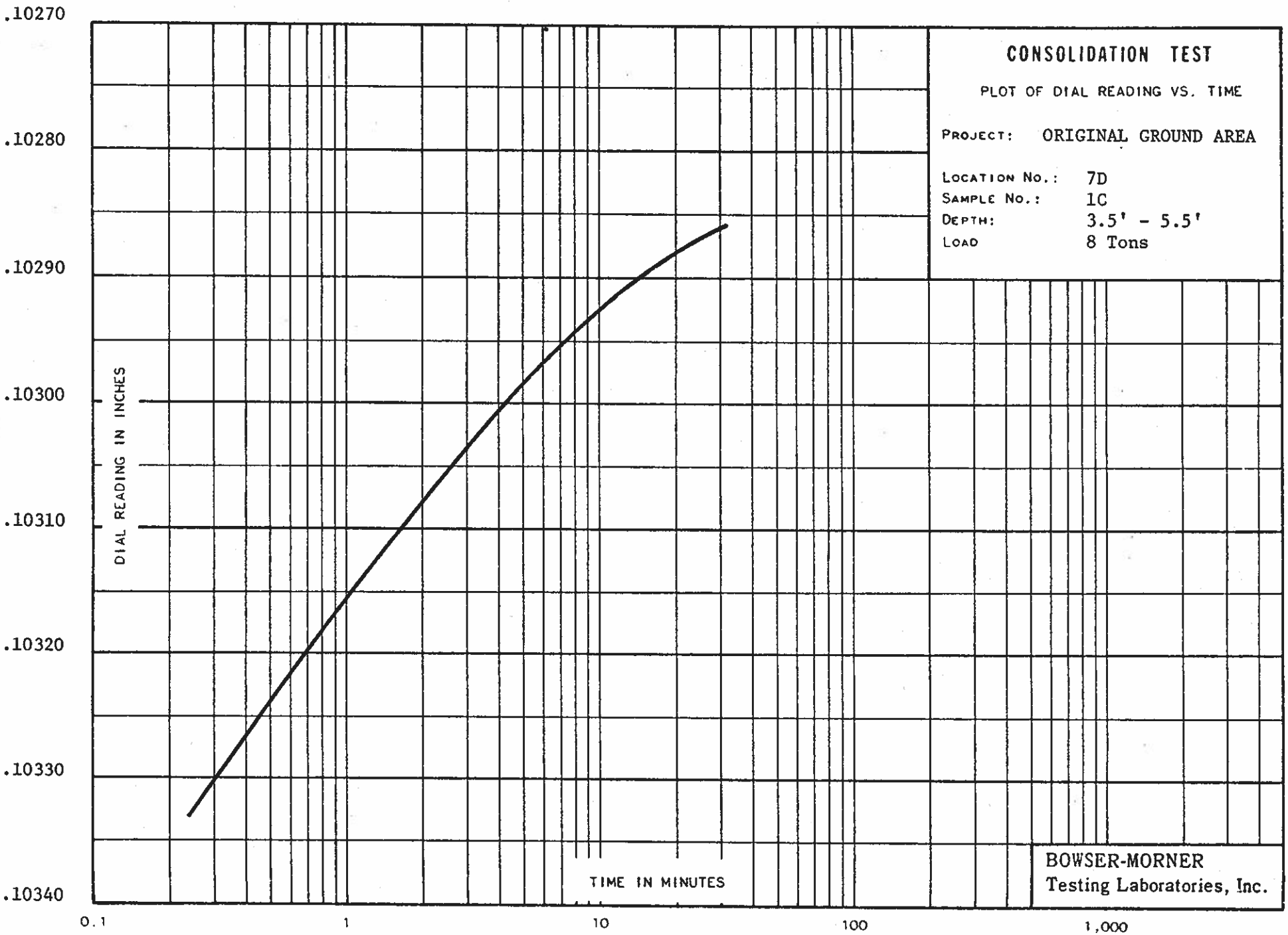

CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: ORIGINAL GROUND AREA
LOCATION NO.: 7D
SAMPLE NO.: 1C
DEPTH: 3.5' - 5.5'
LOAD 1 Ton
DIAL READING IN INCHES
.03350
.03370
.03390
.03410
.03430
.03450
.03470
.03490
TIME IN MINUTES
0.1
1
10
100
1,000
BOWSER-MORNER
Testing Laboratories, Inc.

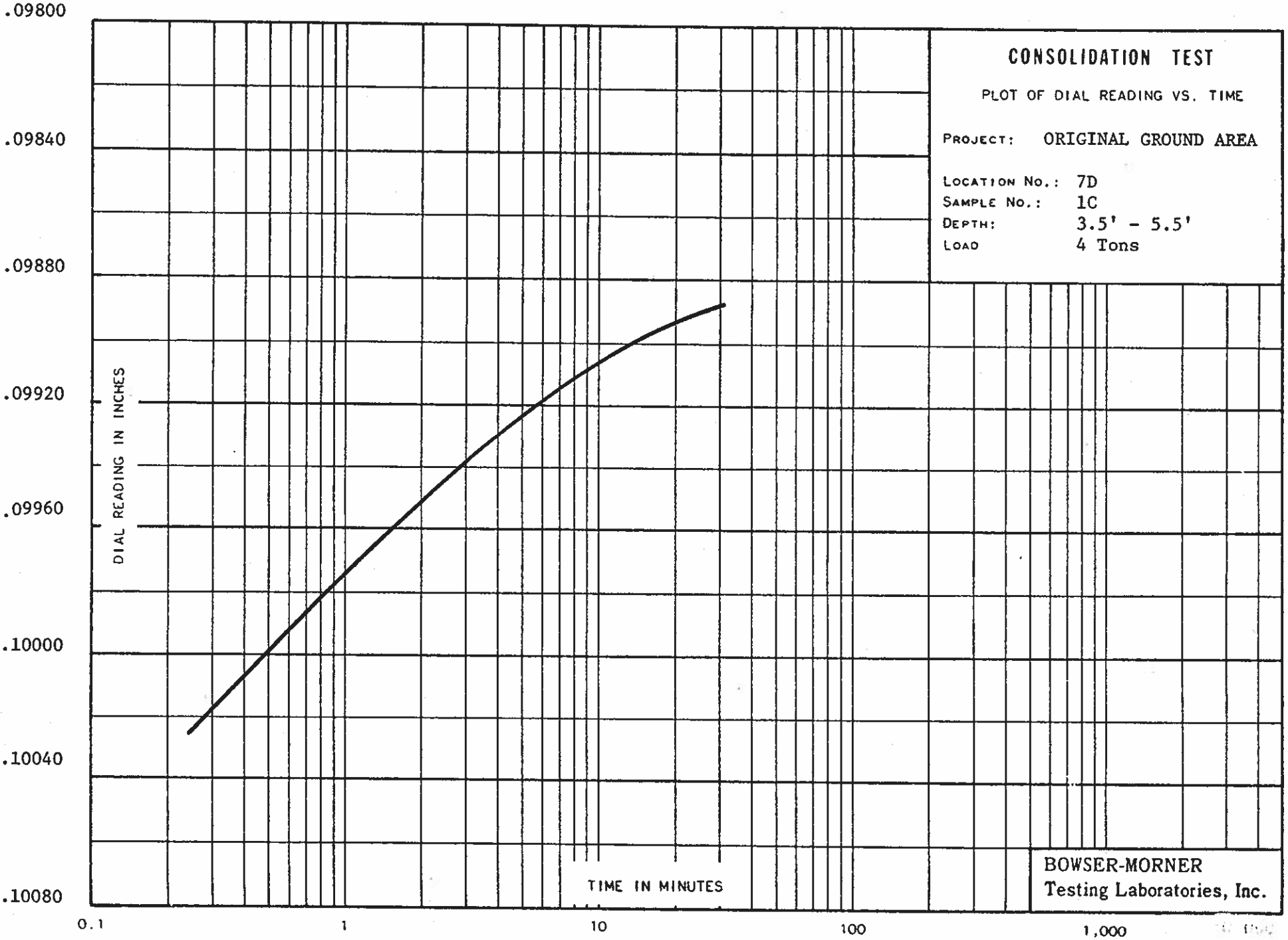

CONSOLIDATION TEST
PLOT OF DIAL READING VS: TIME
PROJECT: ORIGINAL GROUND AREA
LOCATION NO.: 7D
SAMPLE NO.: 1C
DEPTH: 3.5' - 5.5'
LOAD 2 Tons
DIAL READING IN INCHES
.03970
.03980
.03990
.04000
.04010
.04020
.04030
.04040
TIME IN MINUTES
0.1
1
10
100
1,000
BOWSER-MORNER
Testing Laboratories, Inc.

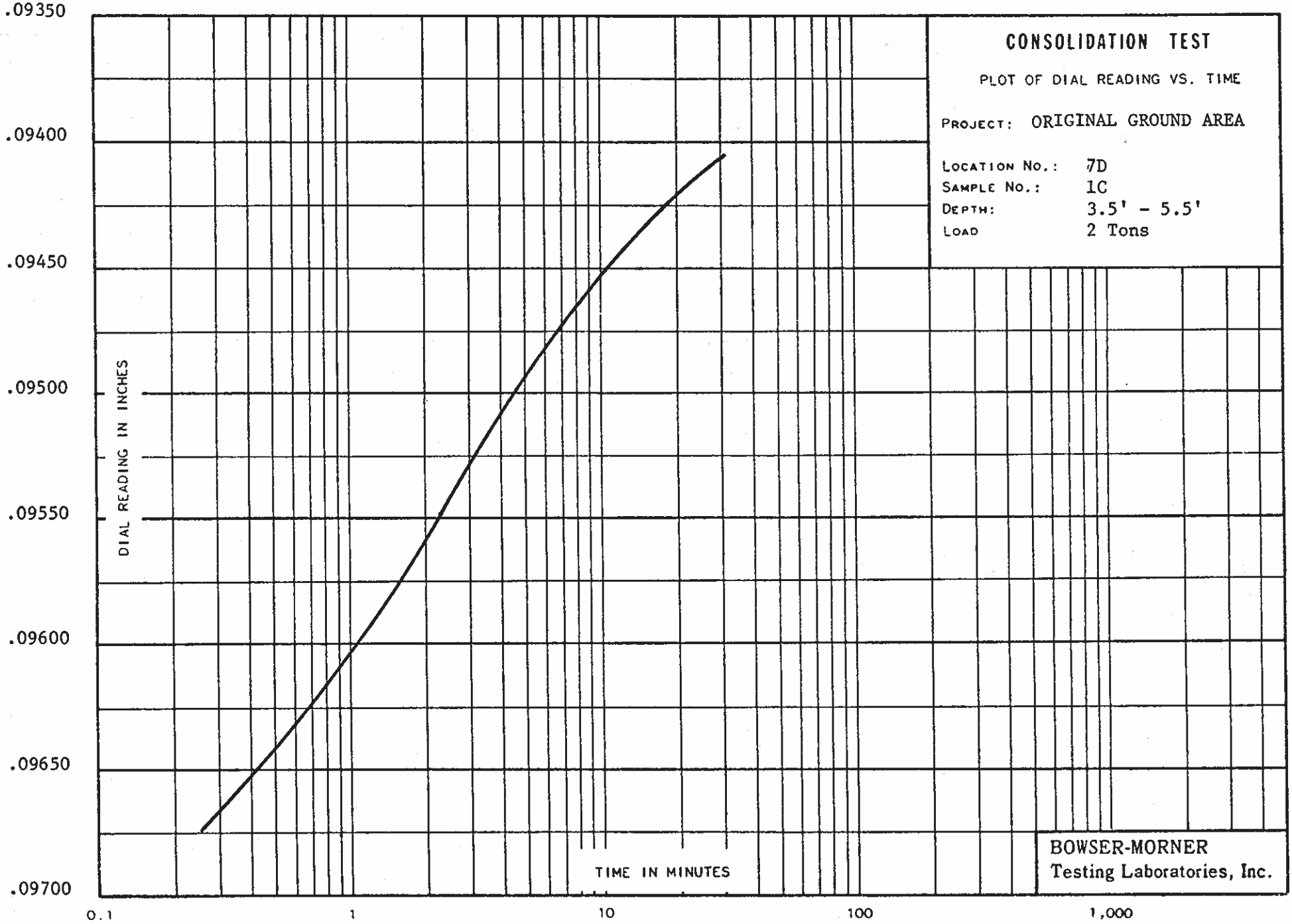

CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: ORIGINAL GROUND AREA
LOCATION NO.: 7D
SAMPLE NO.: 1C
DEPTH: 3.5' - 5.5'
LOAD 4 Tons
DIAL READING IN INCHES
.04850
.04900
.04950
.05000
.05050
.05100
.05150
.05200
TIME IN MINUTES
0.1
1
10
100
1,000
BOWSER-MORNER
Testing Laboratories, Inc.

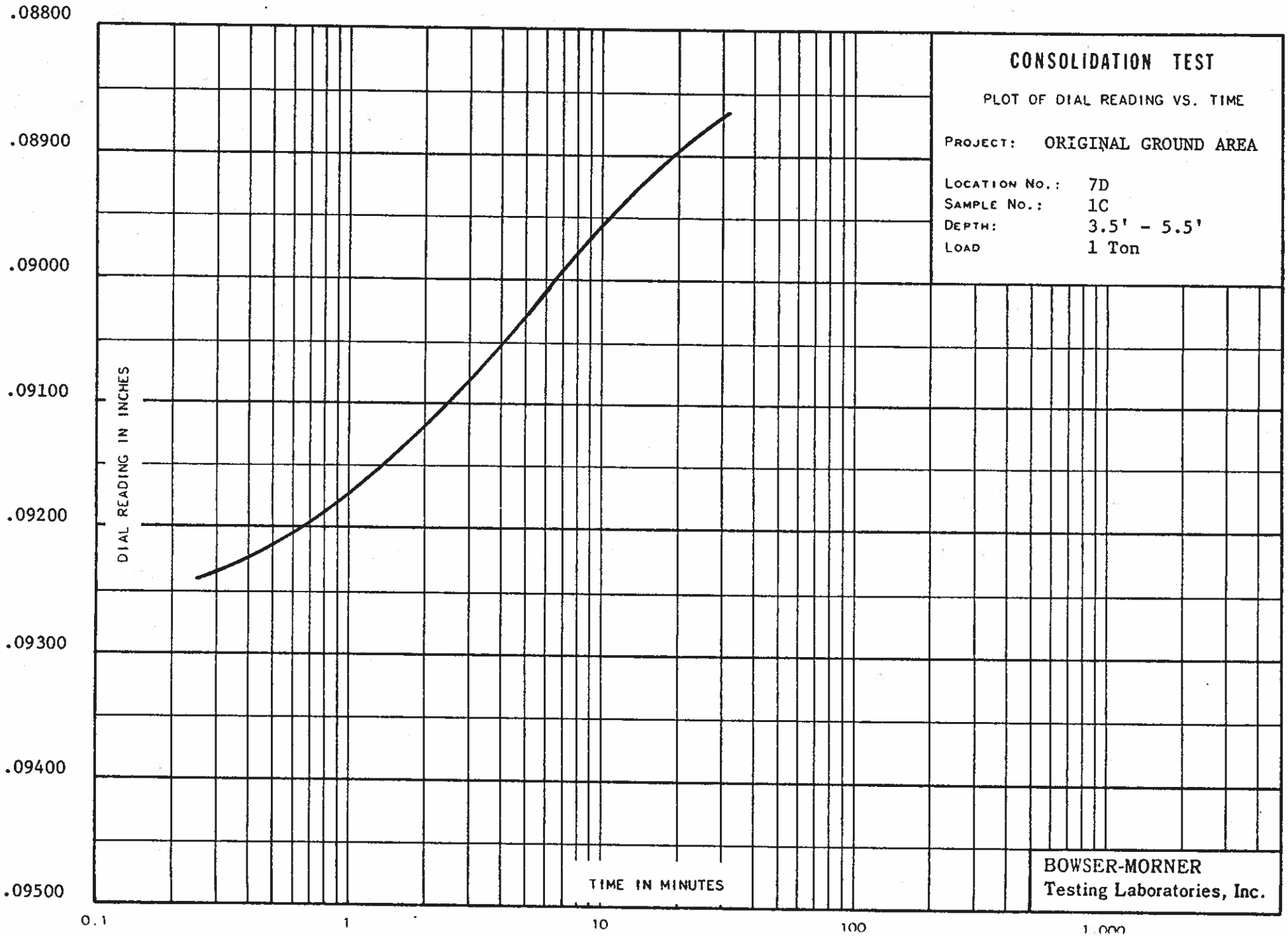

CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: ORIGINAL GROUND AREA
LOCATION NO.: 7D
SAMPLE NO.: 1C
DEPTH: 3.5' - 5.5'
LOAD 8 Tons
.06600
.06700
.06800
.06900
.07000
.07100
.07200
.07300
DIAL READING IN INCHES
TIME IN MINUTES
BOWSER-MORNER
Testing Laboratories, Inc.

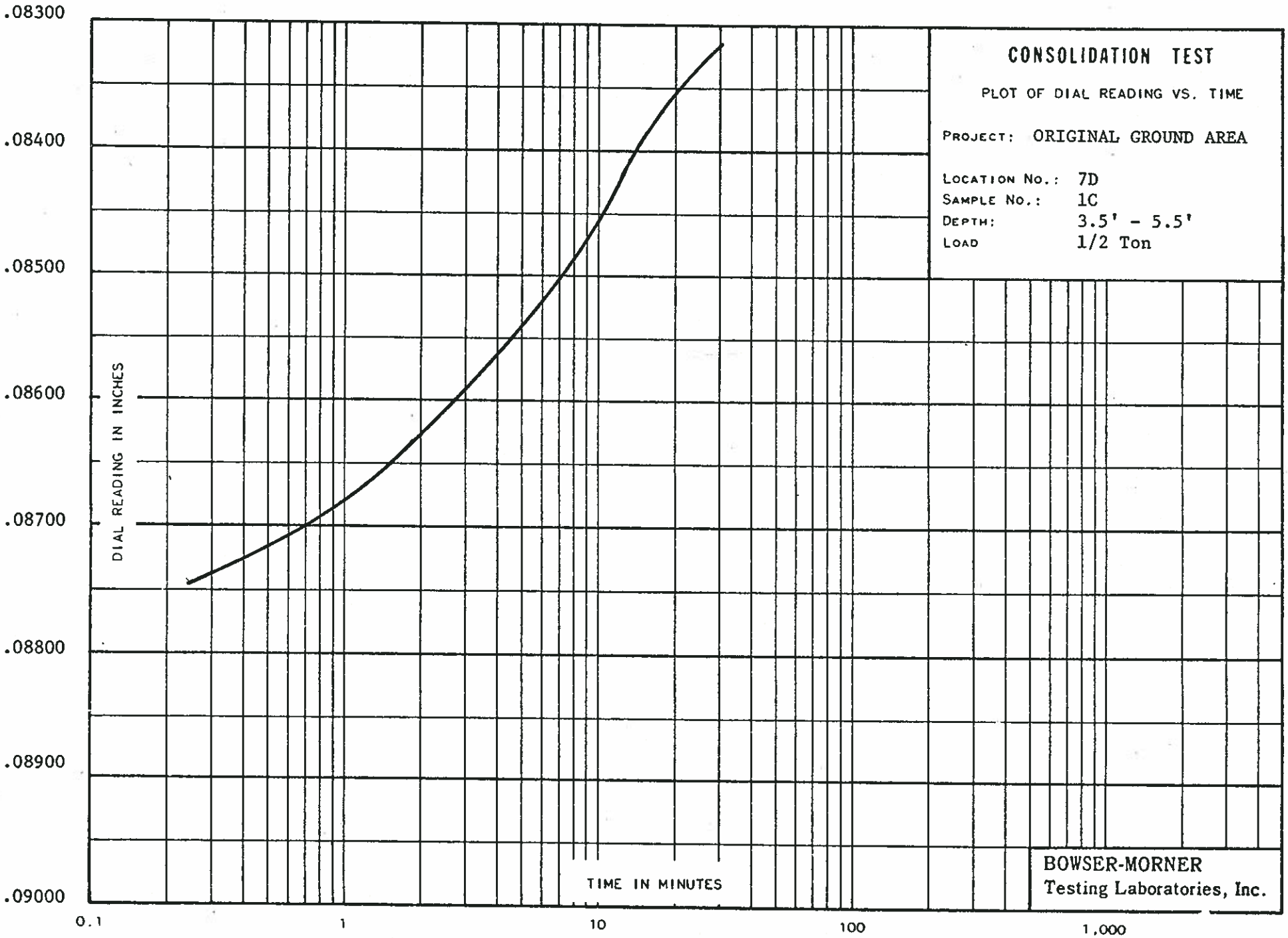

CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: ORIGINAL GROUND AREA
LOCATION NO.: 7D
SAMPLE NO.: 1C
DEPTH: 3.5' - 5.5'
LOAD 16 Tons
DIAL READING IN INCHES
.09600
.09800
.10000
.10200
.10400
.10600
.10800
.11000
TIME IN MINUTES
0.1
1
10
100
1,000
BOWSER-MORNER
Testing Laboratories, Inc.

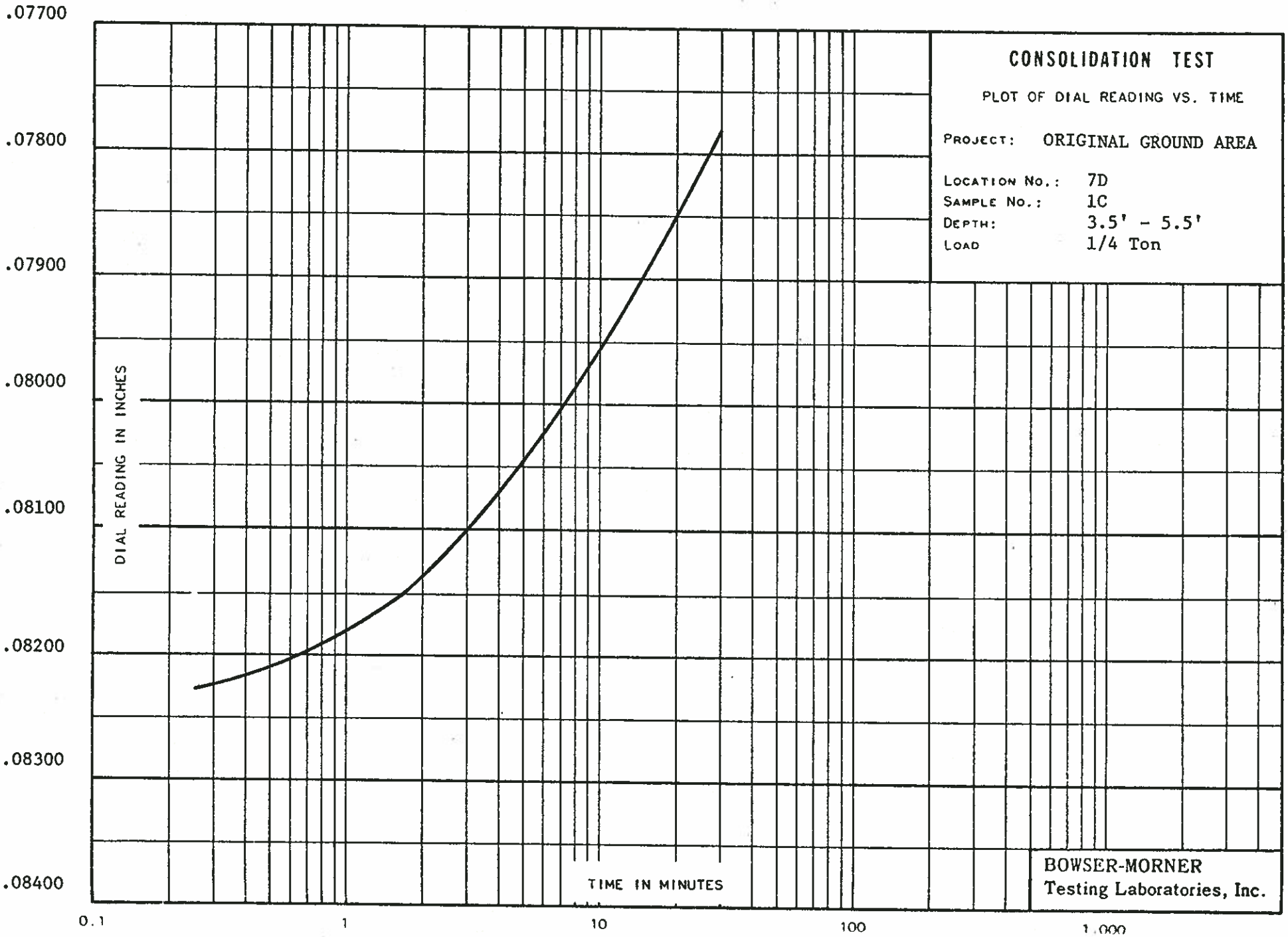

CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: ORIGINAL GROUND AREA
LOCATION NO.: 7D
SAMPLE NO.: 1C
DEPTH: 3.5' - 5.5'
LOAD 8 Tons
DIAL READING IN INCHES
.10270
.10280
.10290
.10300
.10310
.10320
.10330
.10340
TIME IN MINUTES
0.1
1
10
100
1,000
BOWSER-MORNER
Testing Laboratories, Inc.

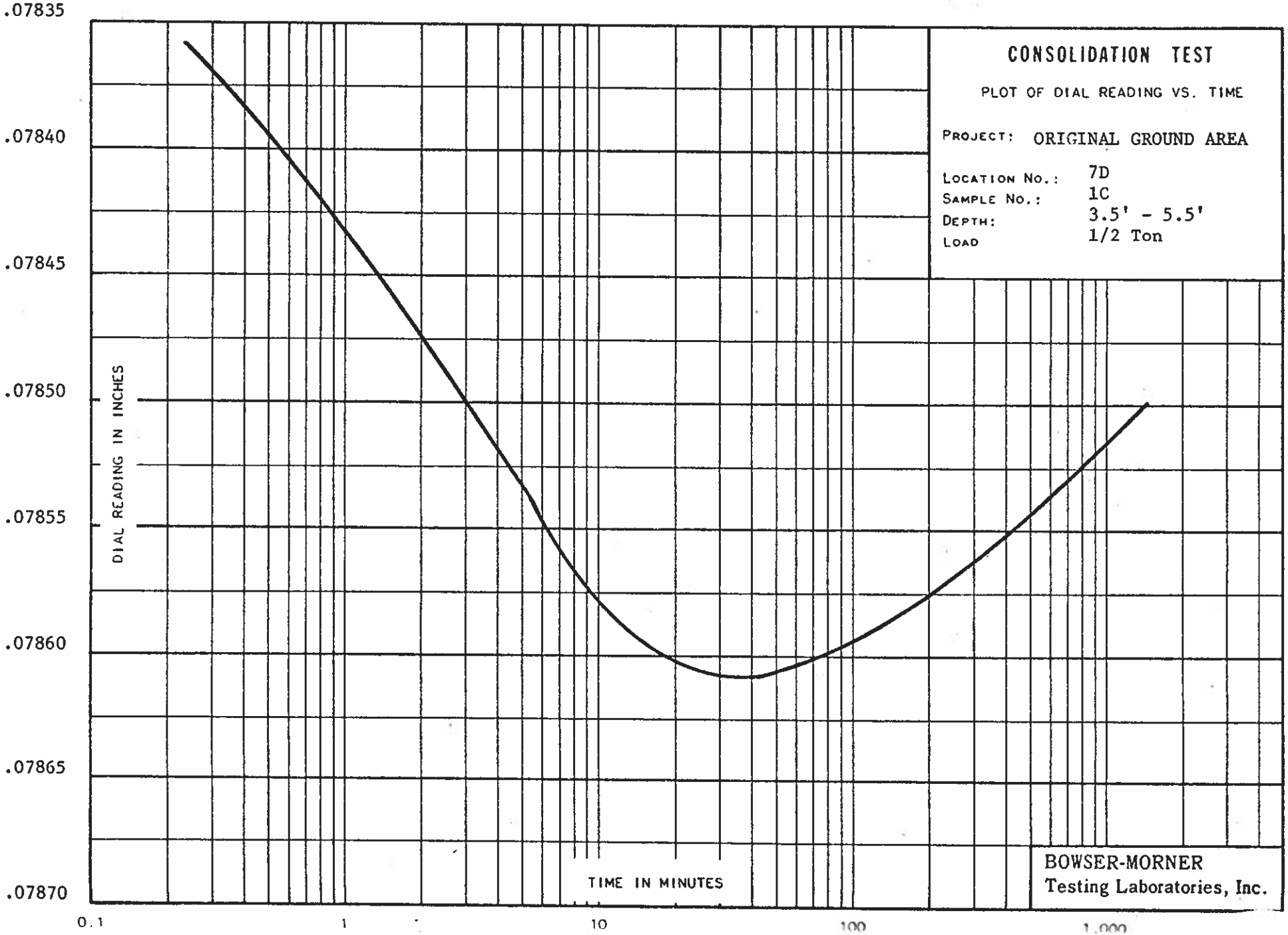

CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: ORIGINAL GROUND AREA
LOCATION NO.: 7D
SAMPLE NO.: 1C
DEPTH: 3.5' - 5.5'
LOAD 4 Tons
DIAL READING IN INCHES
.09800
.09840
.09880
.09920
.09960
.10000
.10040
.10080
TIME IN MINUTES
0.1
1
10
100
1,000
BOWSER-MORNER
Testing Laboratories, Inc.

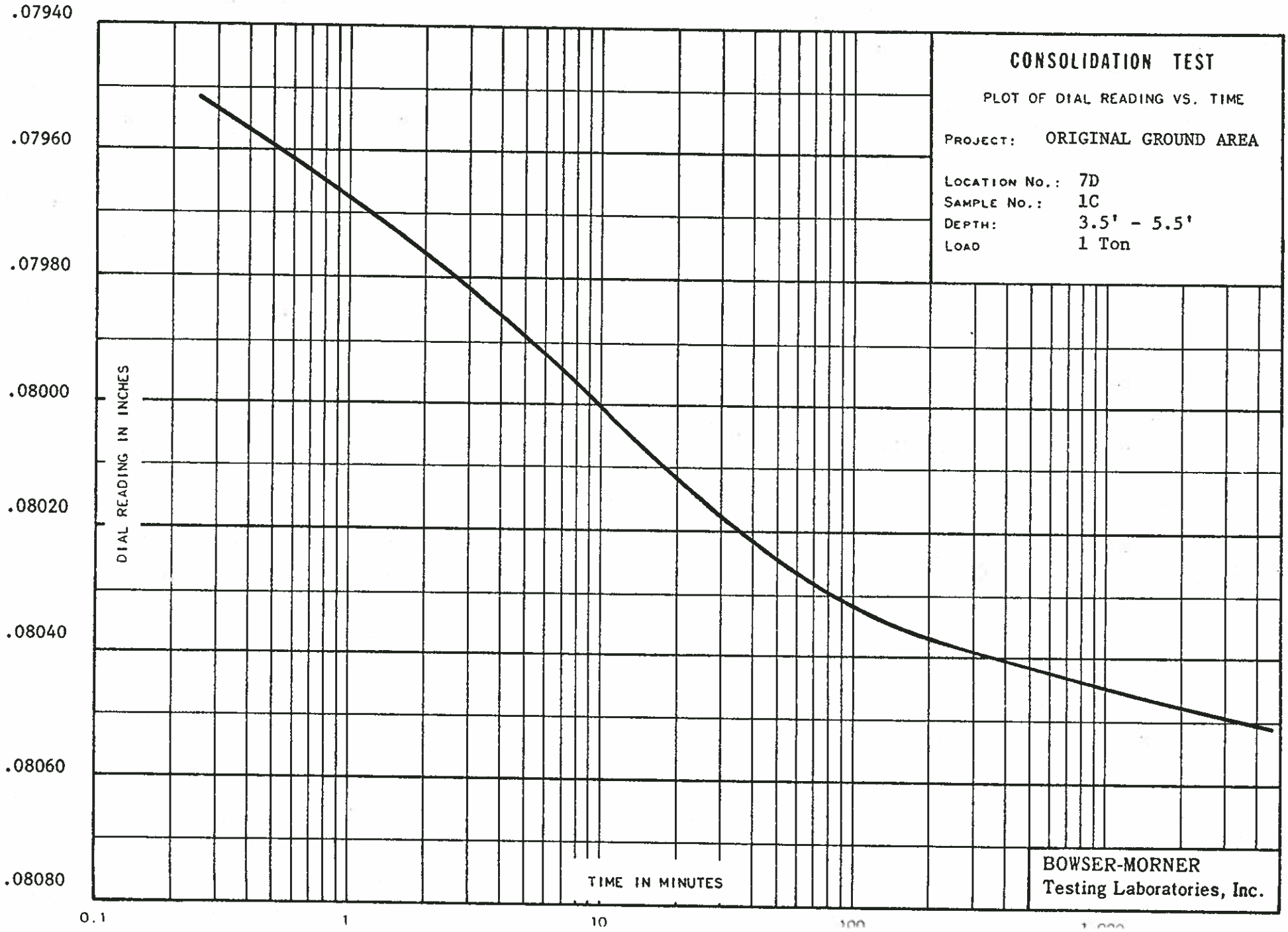

CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: ORIGINAL GROUND AREA
LOCATION NO.: 7D
SAMPLE NO.: 1C
DEPTH: 3.5' - 5.5'
LOAD 2 Tons
DIAL READING IN INCHES
.09350
.09400
.09450
.09500
.09550
.09600
.09650
.09700
TIME IN MINUTES
0.1
1
10
100
1,000
BOWSER-MORNER
Testing Laboratories, Inc.

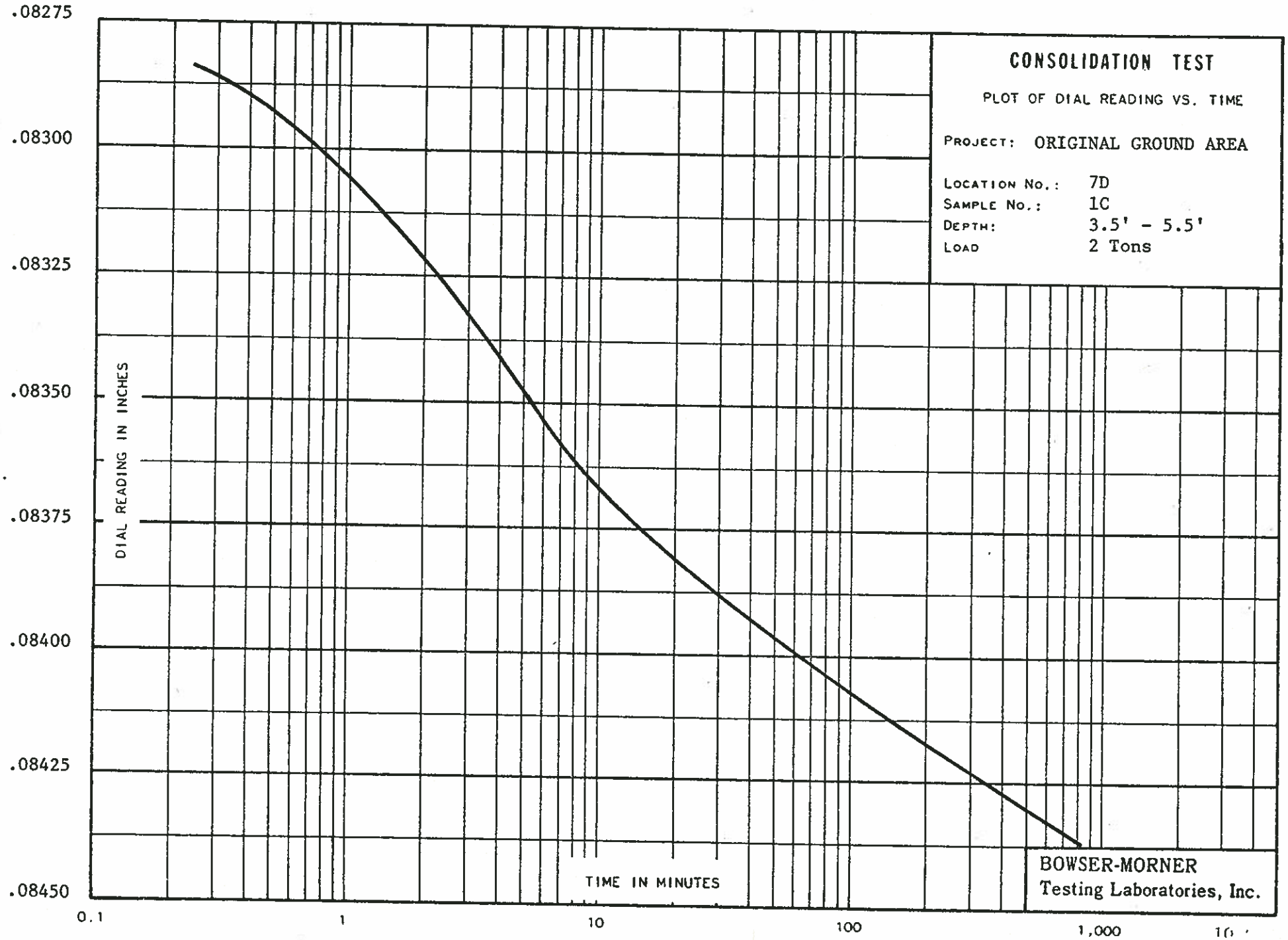

CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: ORIGINAL GROUND AREA
LOCATION NO.: 7D
SAMPLE NO.: 1C
DEPTH: 3.5' - 5.5'
LOAD 1 Ton
DIAL READING IN INCHES
.08800
.08900
.09000
.09100
.09200
.09300
.09400
.09500
TIME IN MINUTES
0.1
1
10
100
1,000
BOWSER-MORNER
Testing Laboratories, Inc.

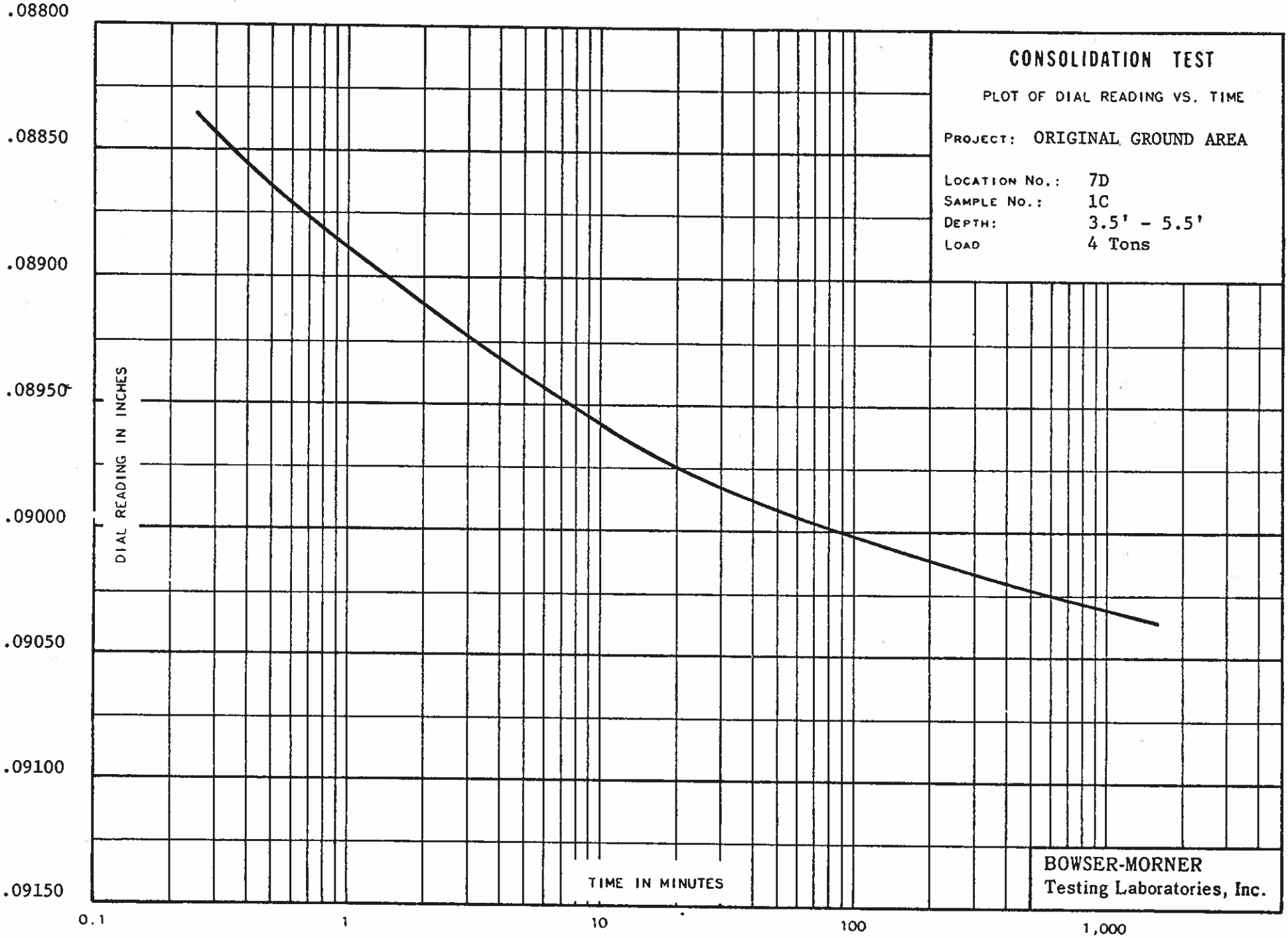

CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: ORIGINAL GROUND AREA
LOCATION NO.: 7D
SAMPLE NO.: 1C
DEPTH: 3.5' - 5.5'
LOAD 1/2 Ton
DIAL READING IN INCHES
.08300
.08400
.08500
.08600
.08700
.08800
.08900
.09000
TIME IN MINUTES
0.1
1
10
100
1,000
BOWSER-MORNER
Testing Laboratories, Inc.

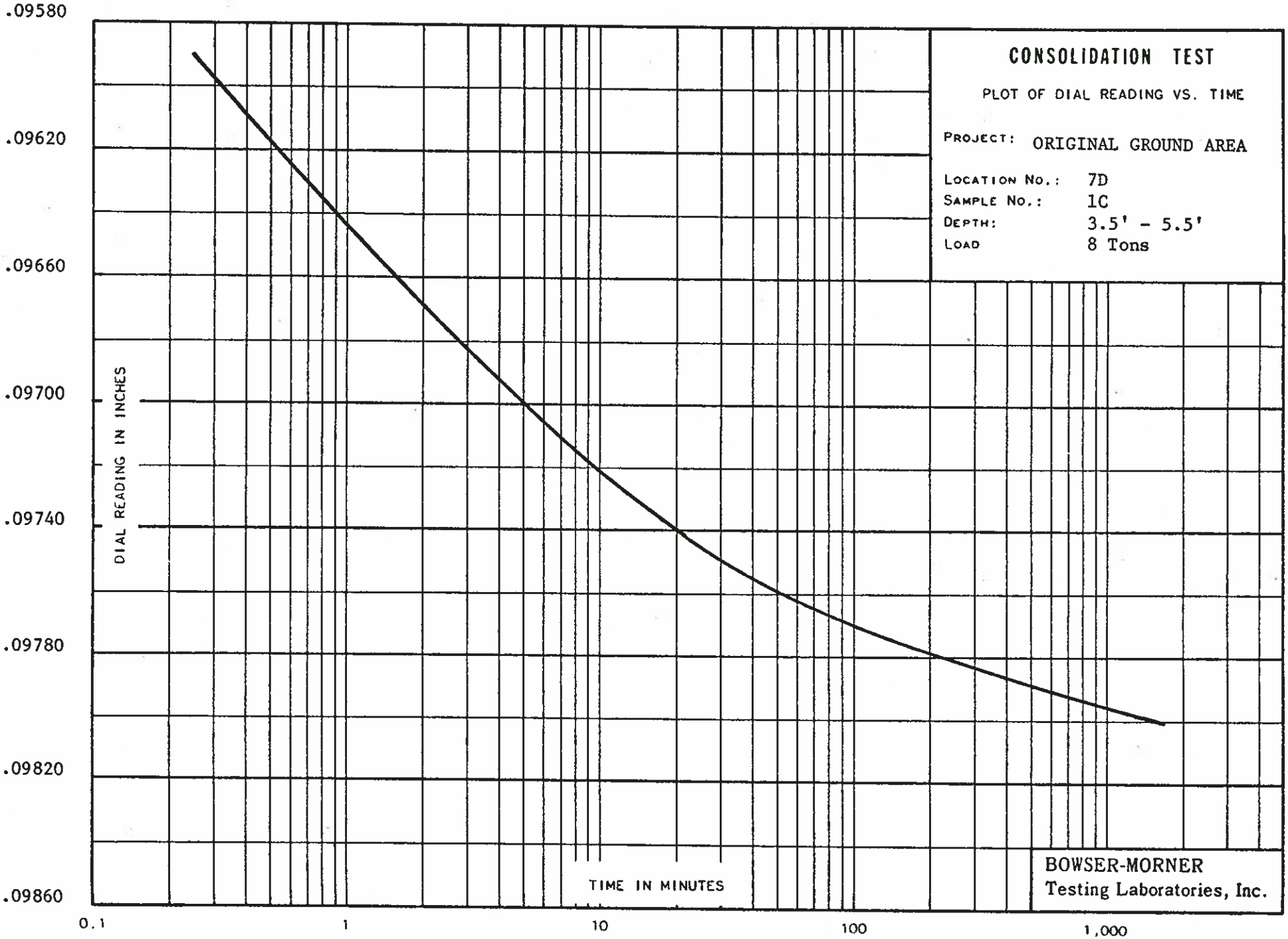

CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: ORIGINAL GROUND AREA
LOCATION NO.: 7D
SAMPLE NO.: 1C
DEPTH: 3.5' - 5.5'
LOAD 1/4 Ton
DIAL READING IN INCHES
.07700
.07800
.07900
.08000
.08100
.08200
.08300
.08400
TIME IN MINUTES
0.1
1
10
100
1,000
BOWSER-MORNER
Testing Laboratories, Inc.


CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: ORIGINAL GROUND AREA
LOCATION NO.: 7D
SAMPLE NO.: 1C
DEPTH: 3.5' - 5.5'
LOAD 1/2 Ton
DIAL READING IN INCHES
.07835
.07840
.07845
.07850
.07855
.07860
.07865
.07870
TIME IN MINUTES
0.1
1
10
100
1,000
BOWSER-MORNER
Testing Laboratories, Inc.

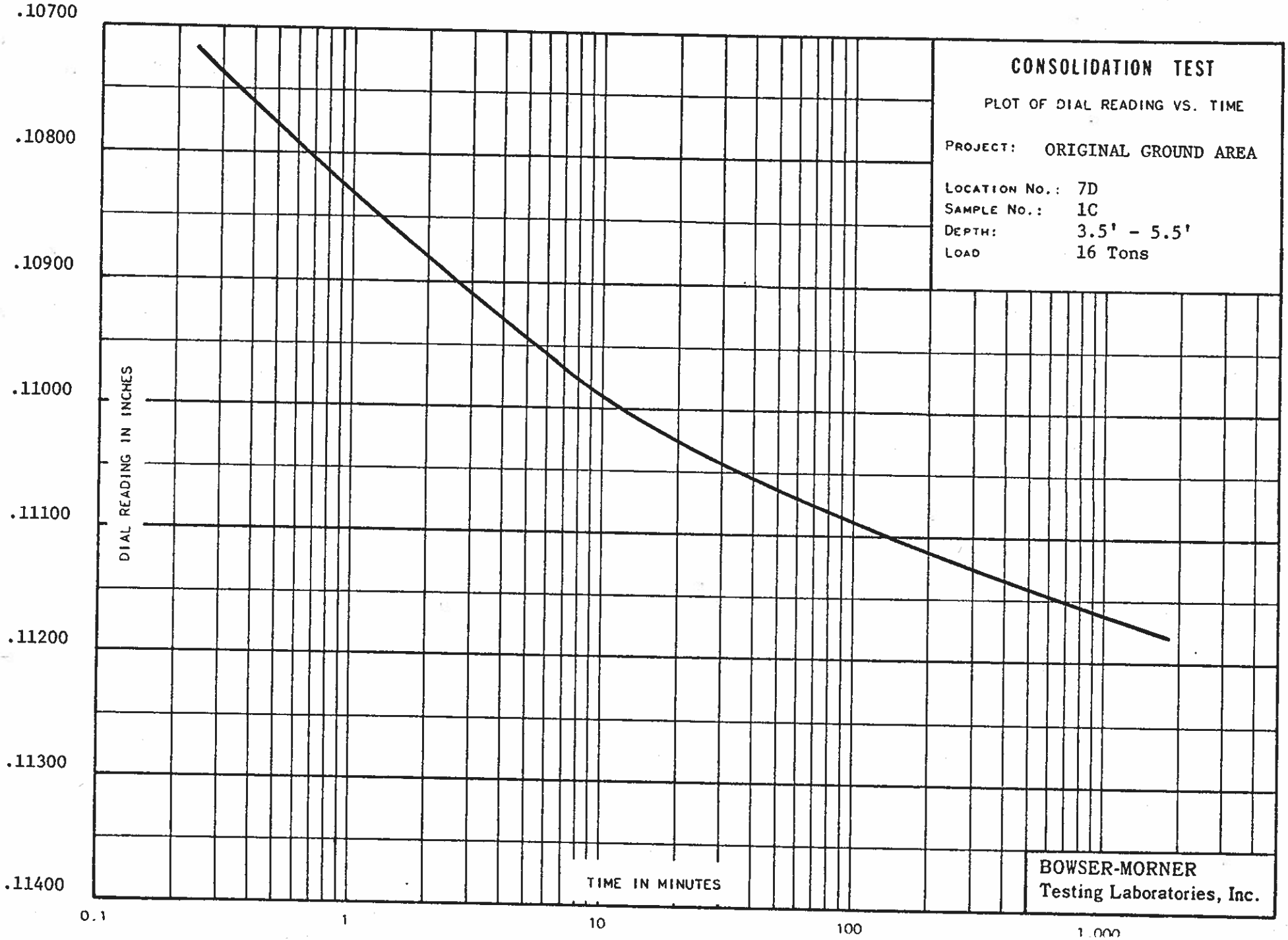

CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: ORIGINAL GROUND AREA
LOCATION NO.: 7D
SAMPLE NO.: 1C
DEPTH: 3.5' - 5.5'
LOAD 1 Ton
DIAL READING IN INCHES
.07940
.07960
.07980
.08000
.08020
.08040
.08060
.08080
TIME IN MINUTES
0.1
1
10
100
1,000
BOWSER-MORNER
Testing Laboratories, Inc.


CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: ORIGINAL GROUND AREA
LOCATION NO.: 7D
SAMPLE NO.: 1C
DEPTH: 3.5' - 5.5'
LOAD 2 Tons
DIAL READING IN INCHES
.08275
.08300
.08325
.08350
.08375
.08400
.08425
.08450
TIME IN MINUTES
0.1
1
10
100
1,000
BOWSER-MORNER
Testing Laboratories, Inc.


CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: ORIGINAL GROUND AREA
LOCATION NO.: 7D
SAMPLE NO.: 1C
DEPTH: 3.5' - 5.5'
LOAD 4 Tons
DIAL READING IN INCHES
.08800
.08850
.08900
.08950
.09000
.09050
.09100
.09150
TIME IN MINUTES
0.1
1
10
100
1,000
BOWSER-MORNER
Testing Laboratories, Inc.


CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: ORIGINAL GROUND AREA
LOCATION NO.: 7D
SAMPLE NO.: 1C
DEPTH: 3.5' - 5.5'
LOAD 8 Tons
DIAL READING IN INCHES
.09580
.09620
.09660
.09700
.09740
.09780
.09820
.09860
TIME IN MINUTES
0.1
1
10
100
1,000
BOWSER-MORNER
Testing Laboratories, Inc.

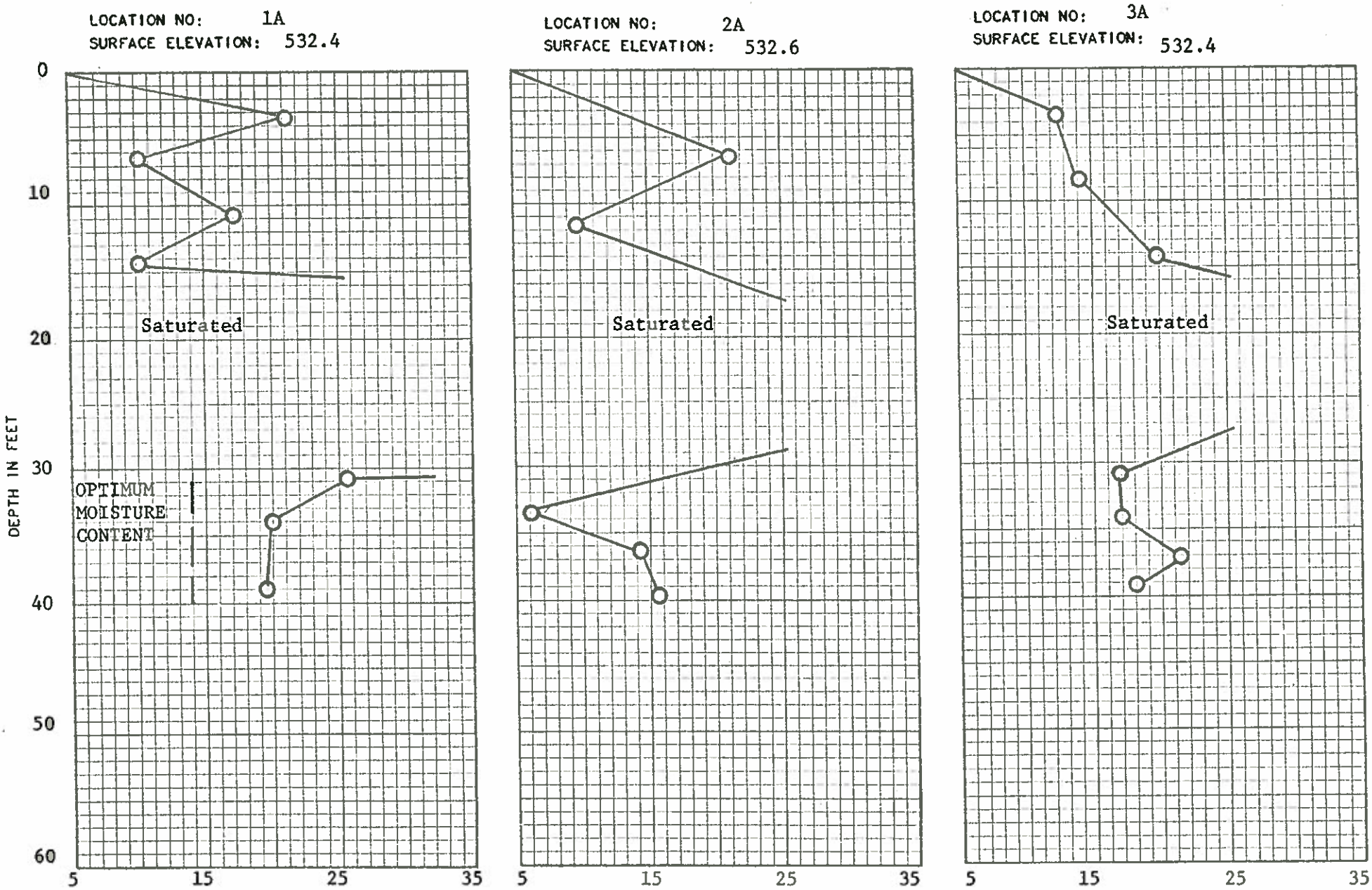
FORM 2A88


CONSOLIDATION TEST
PLOT OF DIAL READING VS. TIME
PROJECT: ORIGINAL GROUND AREA
LOCATION NO.: 7D
SAMPLE NO.: 1C
DEPTH: 3.5' - 5.5'
LOAD 16 Tons
DIAL READING IN INCHES
.10700
.10800
.10900
.11000
.11100
.11200
.11300
.11400
TIME IN MINUTES
0.1
1
10
100
1,000
BOWSER-MORNER
Testing Laboratories, Inc.

FORM 2A85

PLOT OF MOISTURE CONTENT VS. DEPTH

PROJECT: FLY ASH PIT, ASH PIT NO. 3, Stuart Station



BOWSER-MORNER
Testing Laboratories, Inc.

FORM 2A85

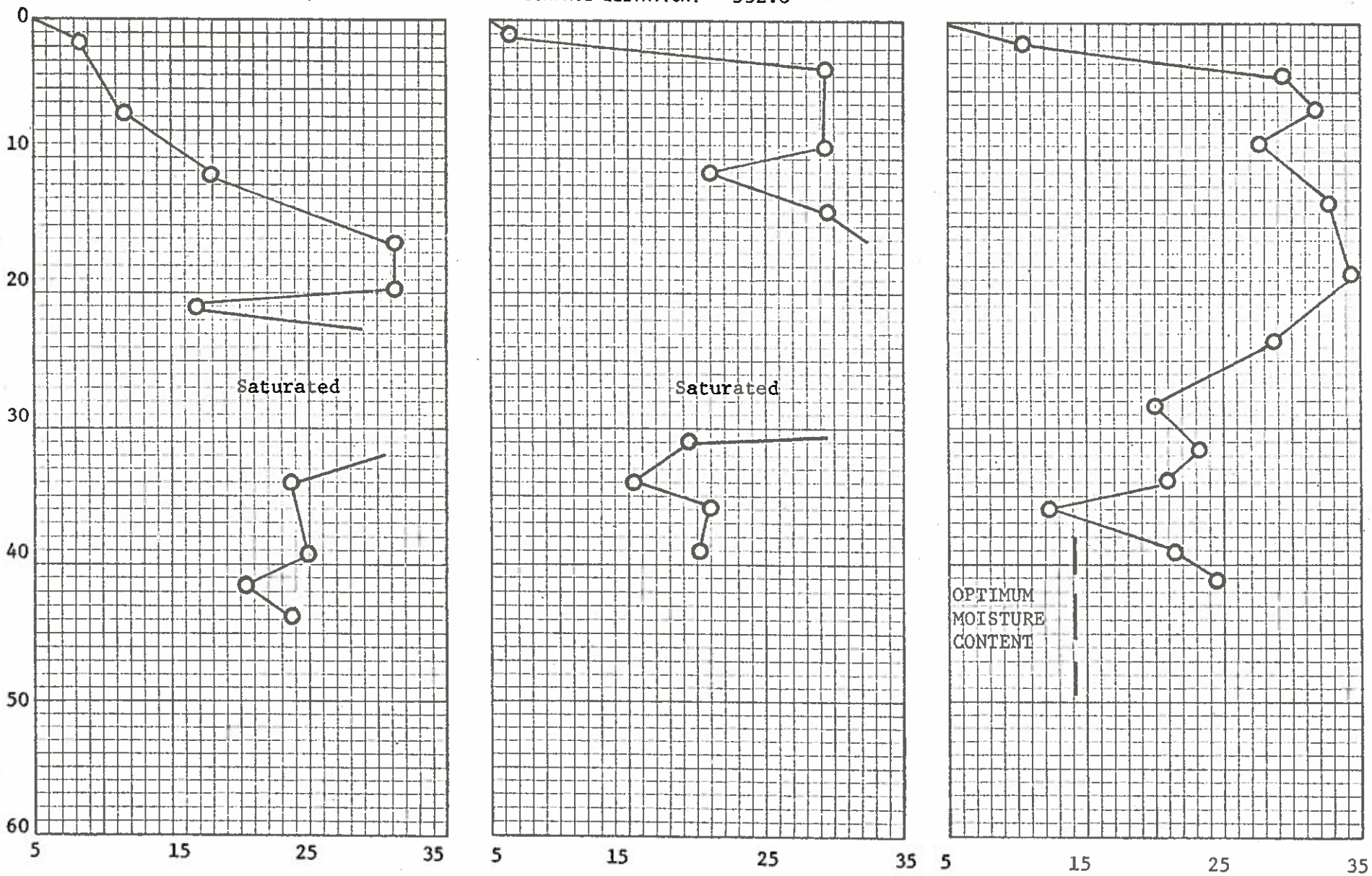
PLOT OF MOISTURE CONTENT VS. DEPTH

PROJECT: FLY ASH PIT, ASH PIT NO. 3, Stuart Station

LOCATION NO: 4A
SURFACE ELEVATION: 532.9

LOCATION NO: 5A
SURFACE ELEVATION: 532.8

LOCATION NO: 6A
SURFACE ELEVATION: 534.3



BOWSER-MORNER
Testing Laboratories, Inc.

V-240

FORM 2185

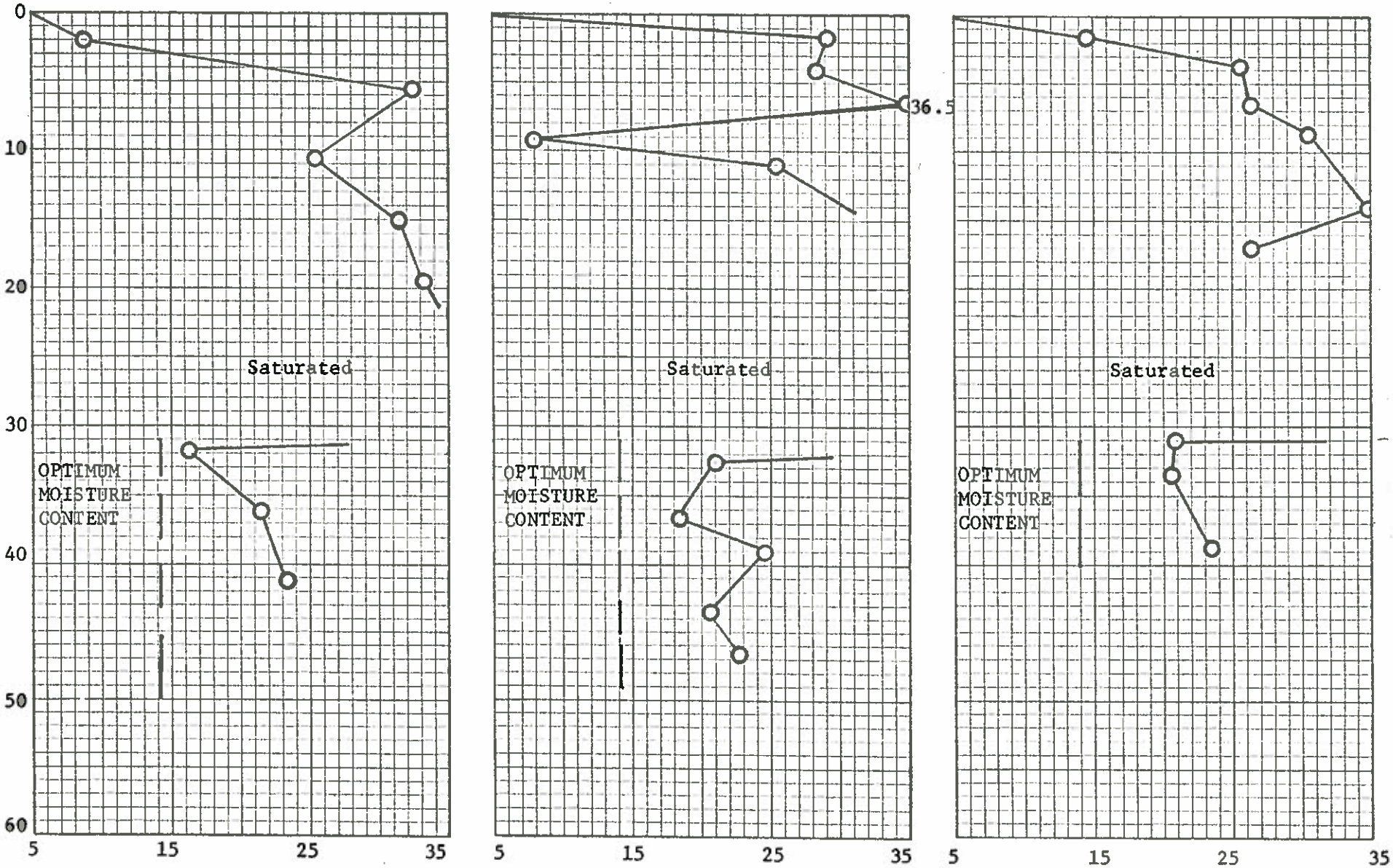
PLOT OF MOISTURE CONTENT VS. DEPTH

PROJECT: FLY ASH PIT, ASH PIT NO. 3, Stuart Station

LOCATION NO: 7A
SURFACE ELEVATION: 533.2

LOCATION NO: 8A
SURFACE ELEVATION: 531.2

LOCATION NO: 9A
SURFACE ELEVATION: 531.7



BOWSER-MORNER

FORM 2135

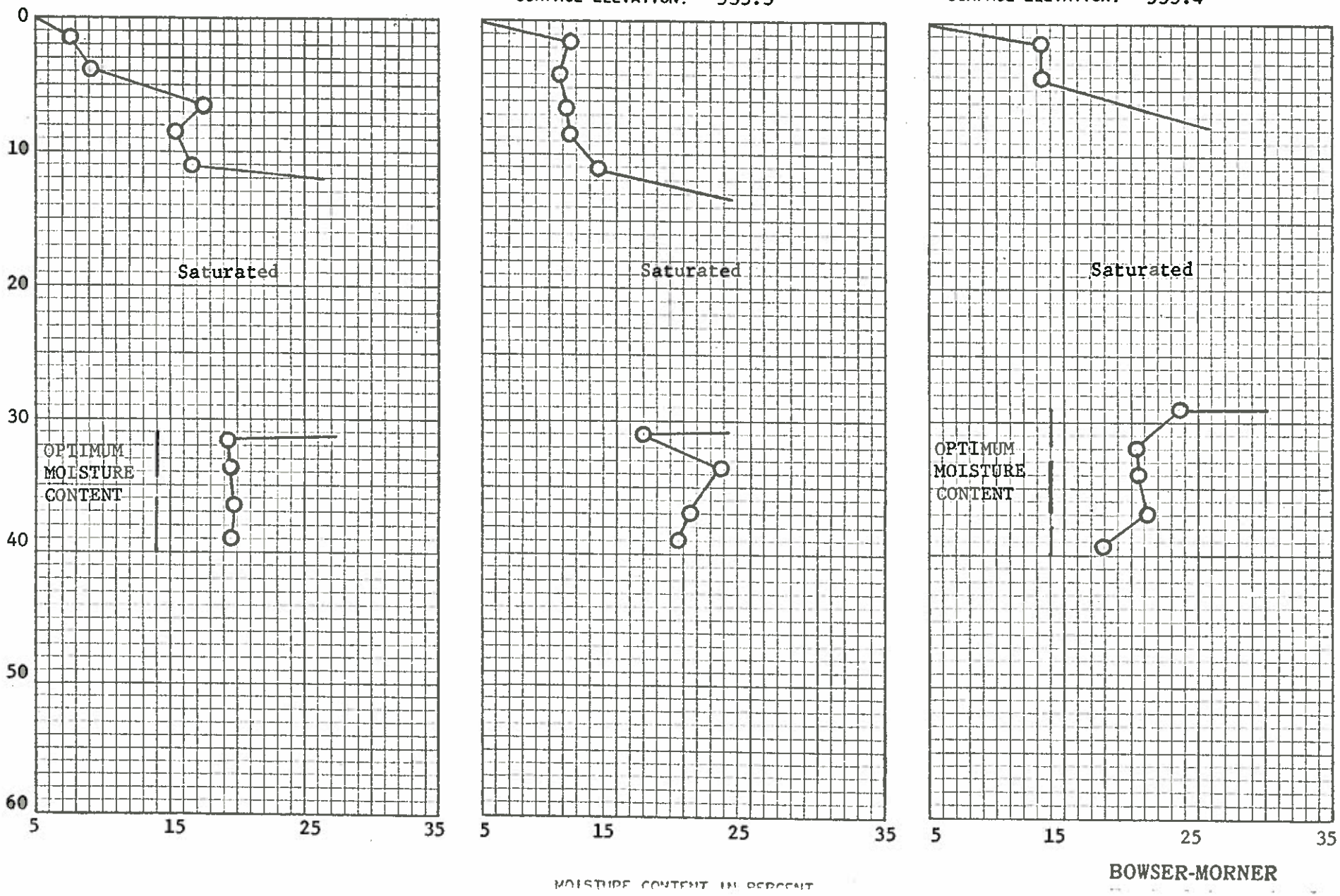
PLOT OF MOISTURE CONTENT VS. DEPTH

PROJECT: FLY ASH PIT, ASH PIT NO. 3, Stuart Station

LOCATION NO: 10A
SURFACE ELEVATION: 533.2

LOCATION NO: 11A
SURFACE ELEVATION: 533.3

LOCATION NO: 12A
SURFACE ELEVATION: 533.4



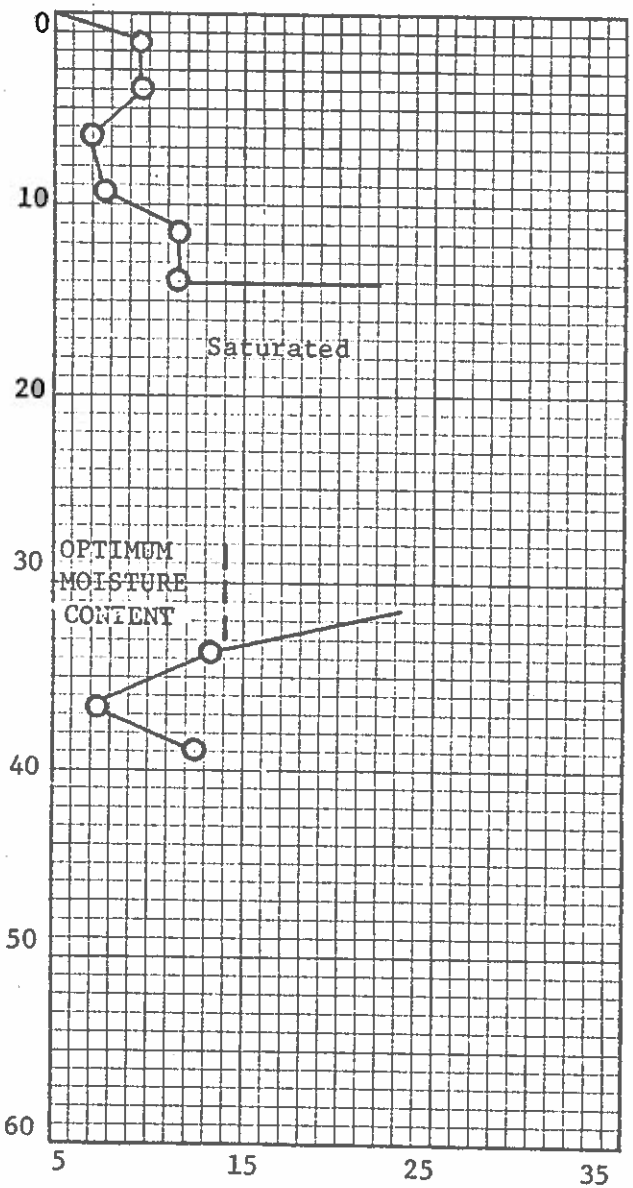
BOWSER-MORNER

FORM 2A85

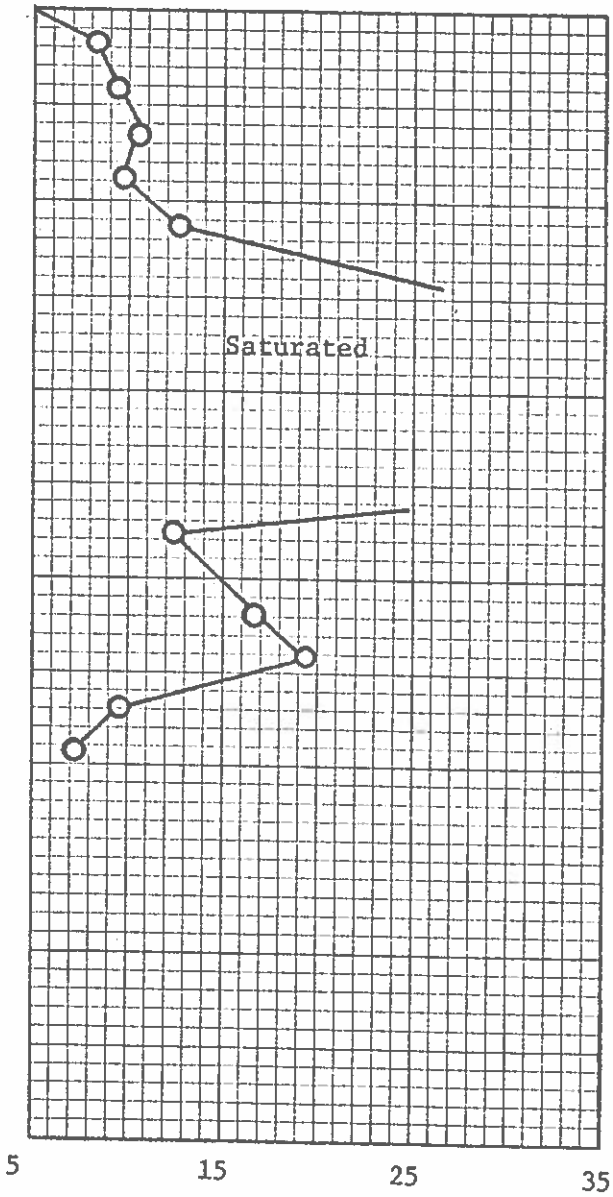
PLOT OF MOISTURE CONTENT VS. DEPTH

PROJECT: FLY ASH PIT, ASH PIT NO. 3, Stuart Station

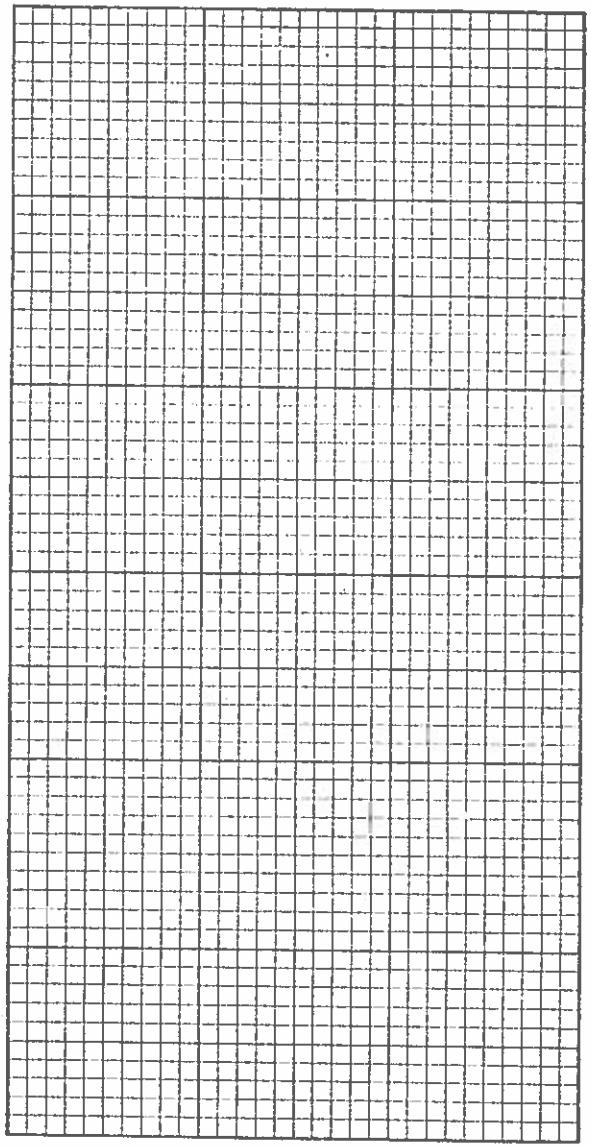
LOCATION NO: 13A
SURFACE ELEVATION: 534.1



LOCATION NO: 14A
SURFACE ELEVATION: 533.7



LOCATION NO:
SURFACE ELEVATION:



DEPTH IN FEET

MOISTURE CONTENT IN PERCENT

BOWSER-MORNER

FORM 2A85

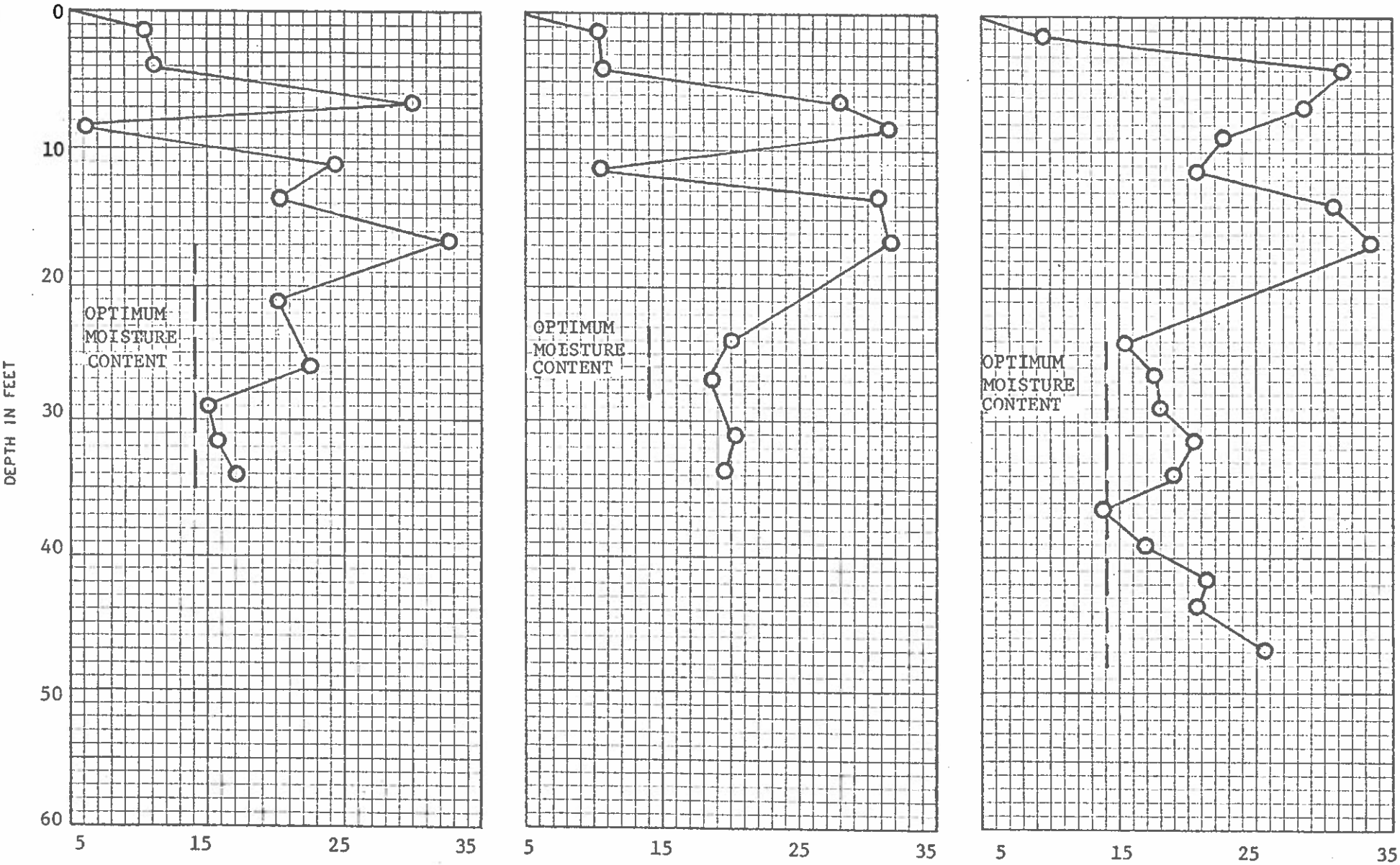
PLOT OF MOISTURE CONTENT VS. DEPTH

PROJECT: EXISTING DIKE, ASH PIT NO. 3, Stuart Station

LOCATION NO: 1B
SURFACE ELEVATION: 537.5

LOCATION NO: 2B
SURFACE ELEVATION: 532.4

LOCATION NO: 3B
SURFACE ELEVATION: 532.6



BOWSER-MORNER
Testing Laboratories, Inc.

FORM 2A85

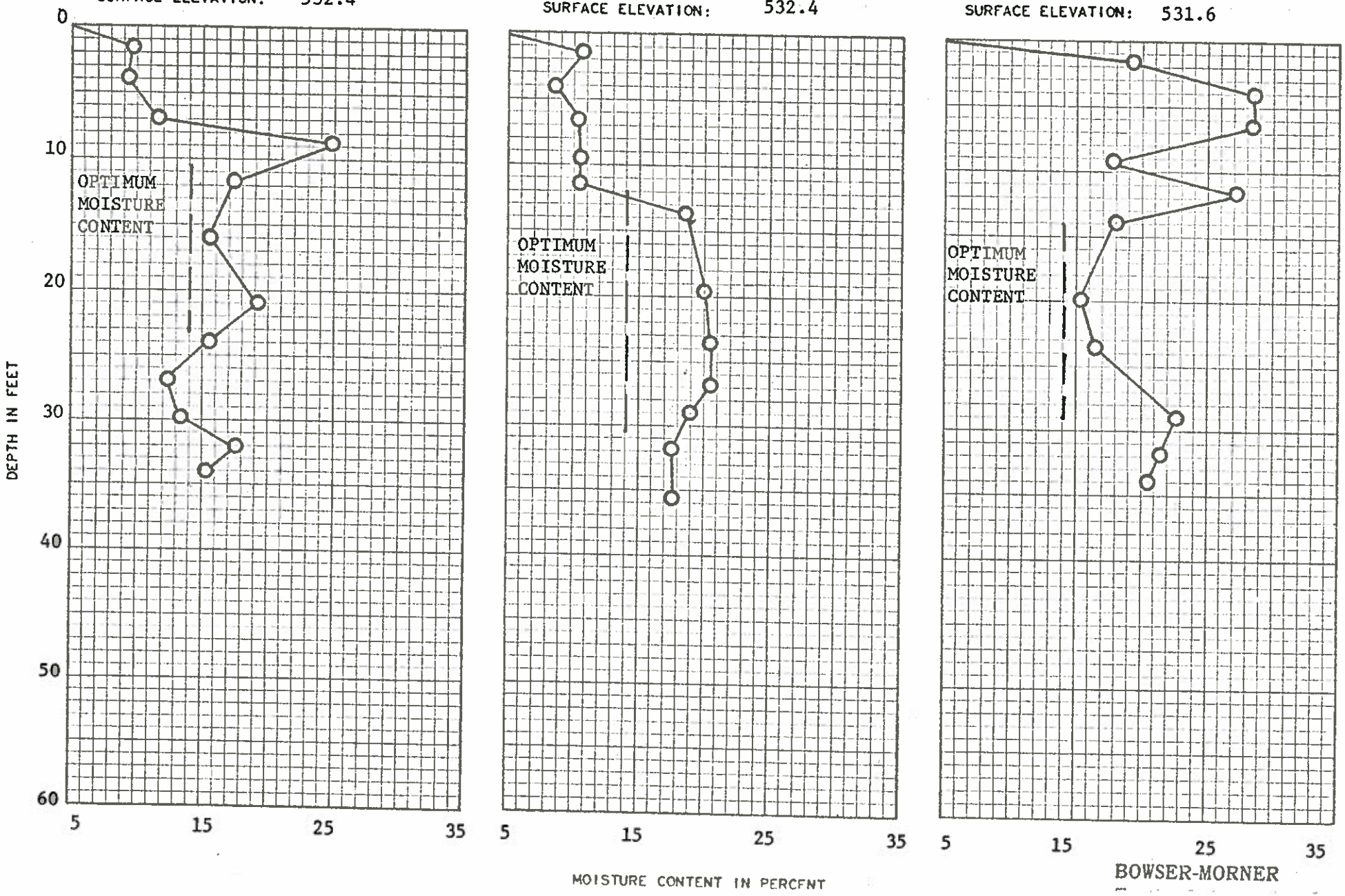
PLOT OF MOISTURE CONTENT VS. DEPTH

PROJECT: EXISTING DIKE, ASH PIT NO. 3, Stuart Station

LOCATION NO: 4B
SURFACE ELEVATION: 532.4

LOCATION NO: 5B
SURFACE ELEVATION: 532.4

LOCATION NO: 6B
SURFACE ELEVATION: 531.6



BOWSER-MORNER

FORM 2A85

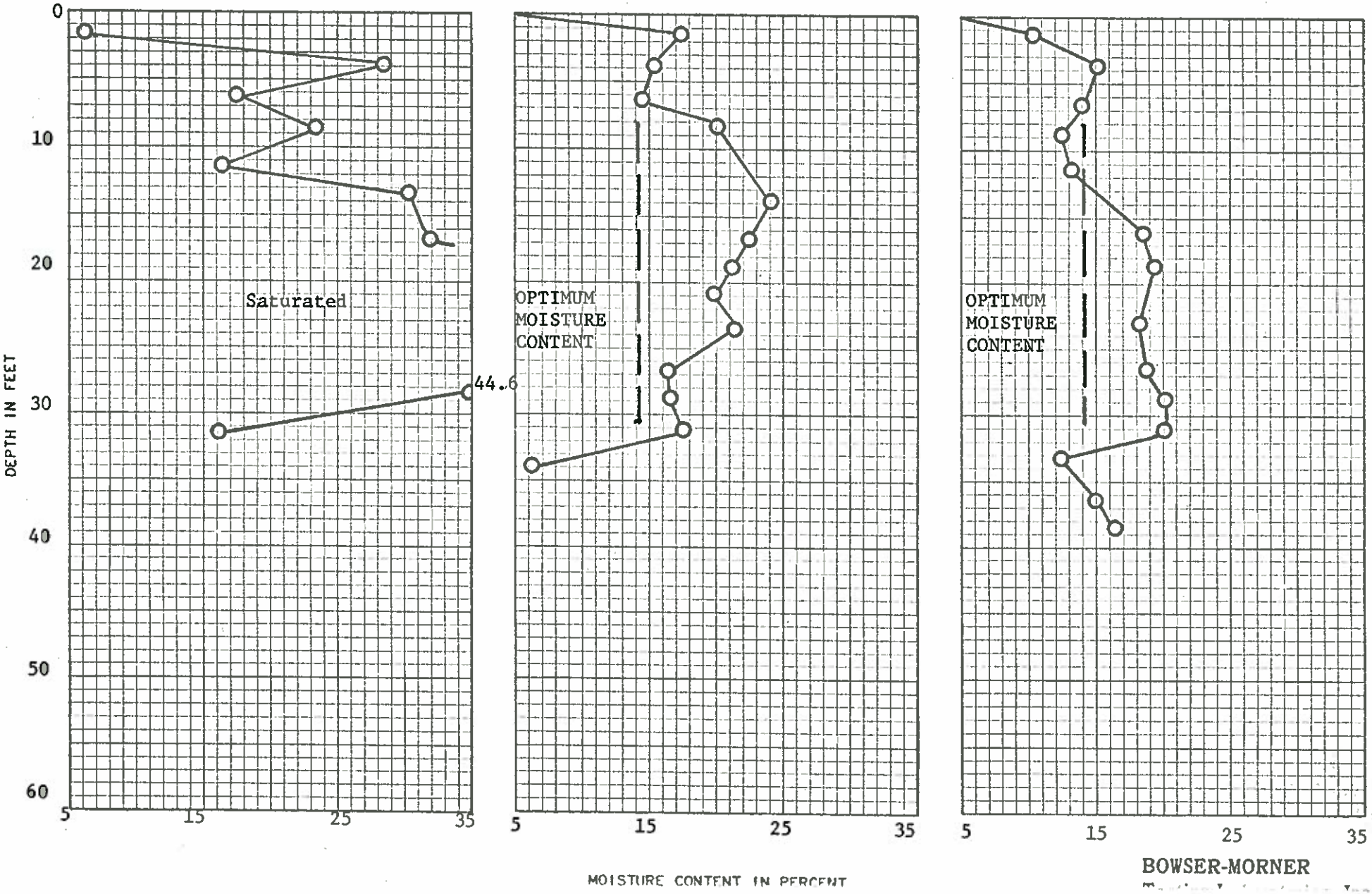
PLOT OF MOISTURE CONTENT VS. DEPTH

PROJECT: COAL STORAGE FILL, ASH PIT NO. 3, Stuart Station

LOCATION NO: 1C
SURFACE ELEVATION: 533.2

LOCATION NO: 2C
SURFACE ELEVATION: 533.0

LOCATION NO: 3C
SURFACE ELEVATION: 543.5



BOWSER-MORNER

Form 2A85

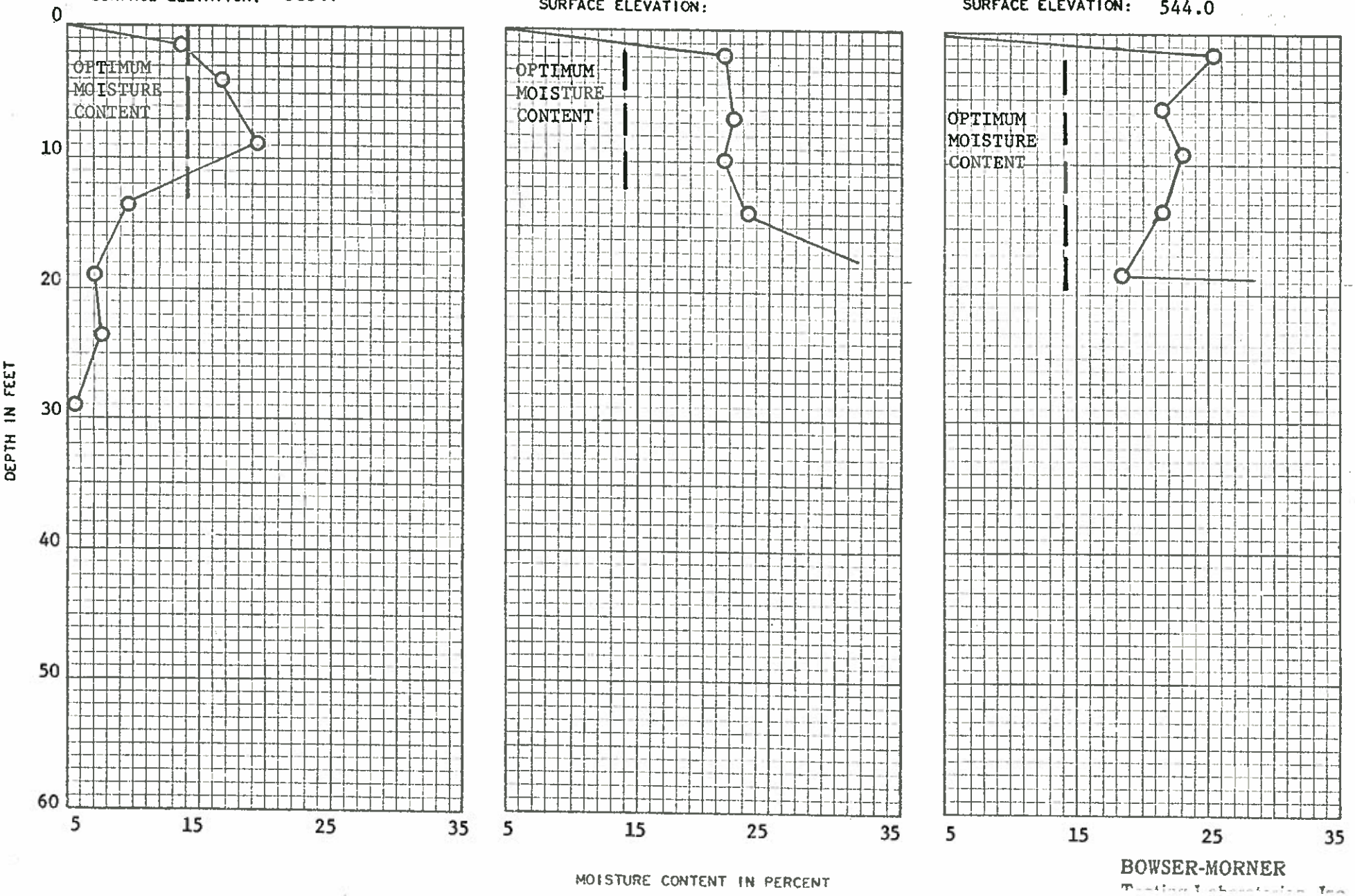
PLOT OF MOISTURE CONTENT VS. DEPTH

PROJECT: ORIGINAL GROUND AREA, ASH PIT NO. 3, Stuart Station

LOCATION NO: 1D
SURFACE ELEVATION: 535.7

LOCATION NO: 2D
SURFACE ELEVATION:

LOCATION NO: 3D
SURFACE ELEVATION: 544.0



BOWSER-MORNER

FORM [illegible]5

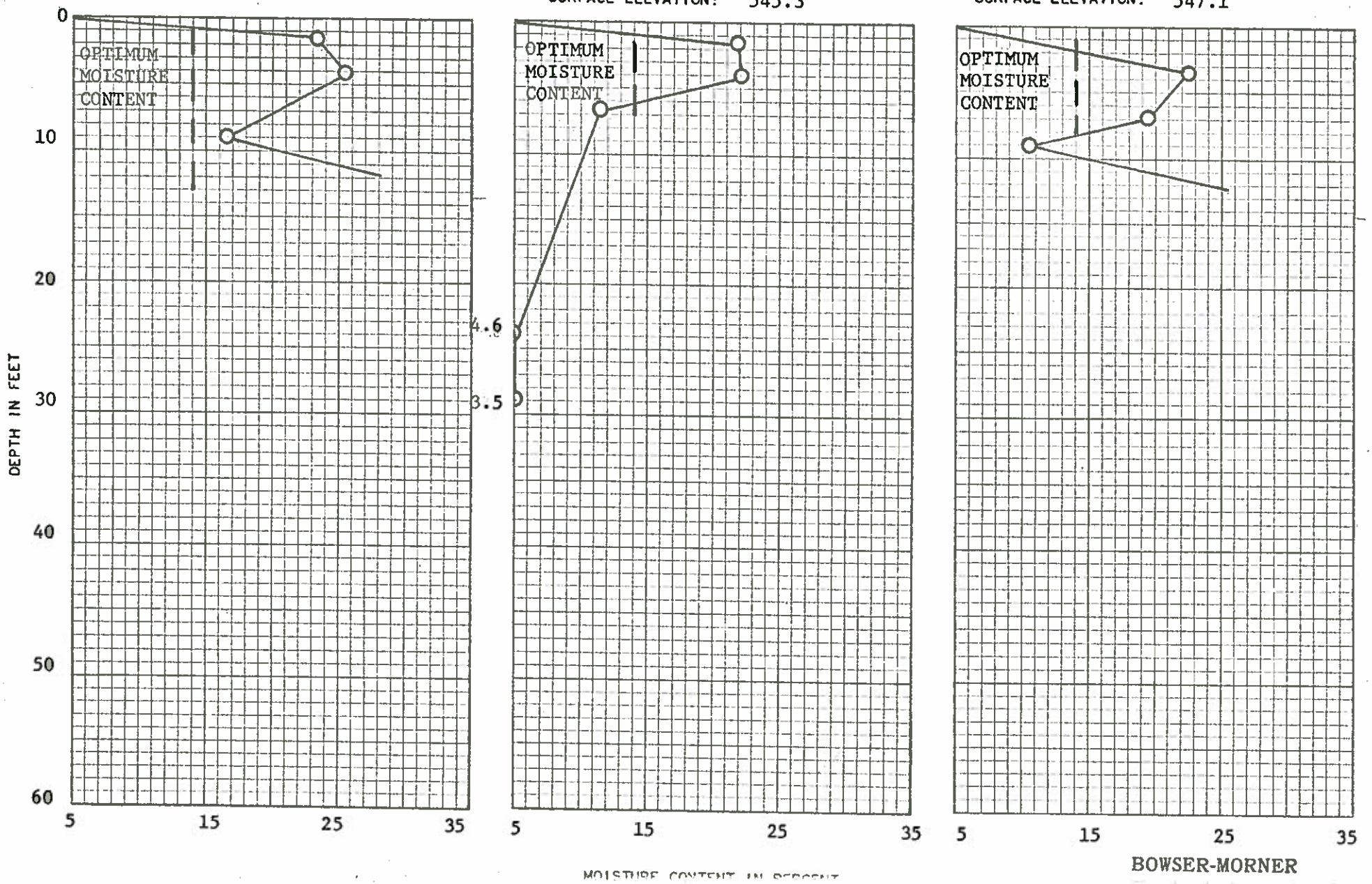
PLOT OF MOISTURE CONTENT VS. DEPTH

PROJECT: ORIGINAL GROUND AREA, ASH PIT NO. 3, Stuart Station

LOCATION NO: 4D
SURFACE ELEVATION: 544.9

LOCATION NO: 5D
SURFACE ELEVATION: 545.3

LOCATION NO: 6D
SURFACE ELEVATION: 547.1



BOWSER-MORNER

FORM 2A85

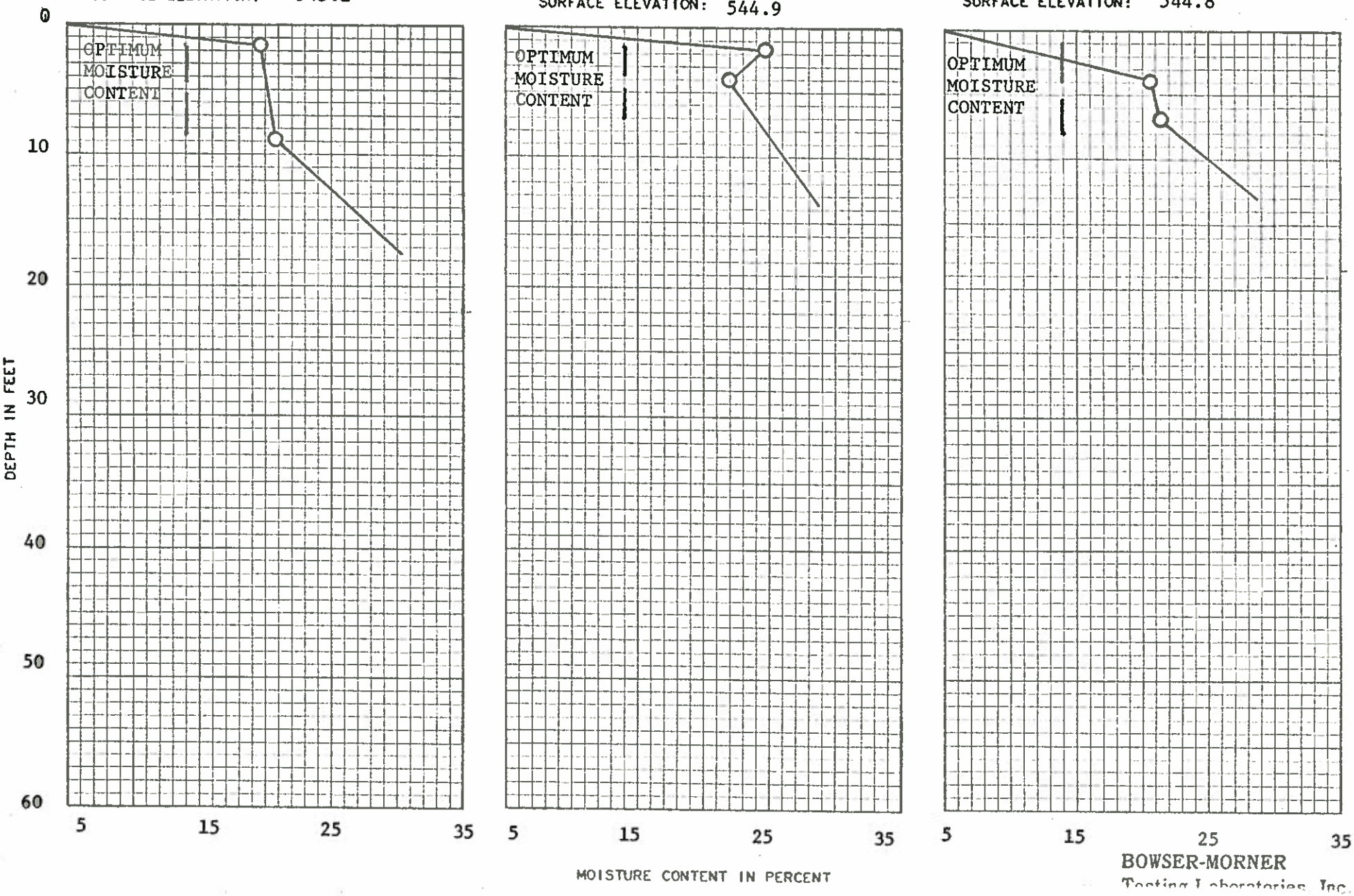
PLOT OF MOISTURE CONTENT VS. DEPTH

PROJECT: ORIGINAL GROUND AREA, ASH PIT NO. 3, Stuart Station

LOCATION NO: 7D
SURFACE ELEVATION: 545.2

LOCATION NO: 8D
SURFACE ELEVATION: 544.9

LOCATION NO: 9D
SURFACE ELEVATION: 544.8



BOWSER-MORNER
Testing Laboratories, Inc.

FORM 2A85

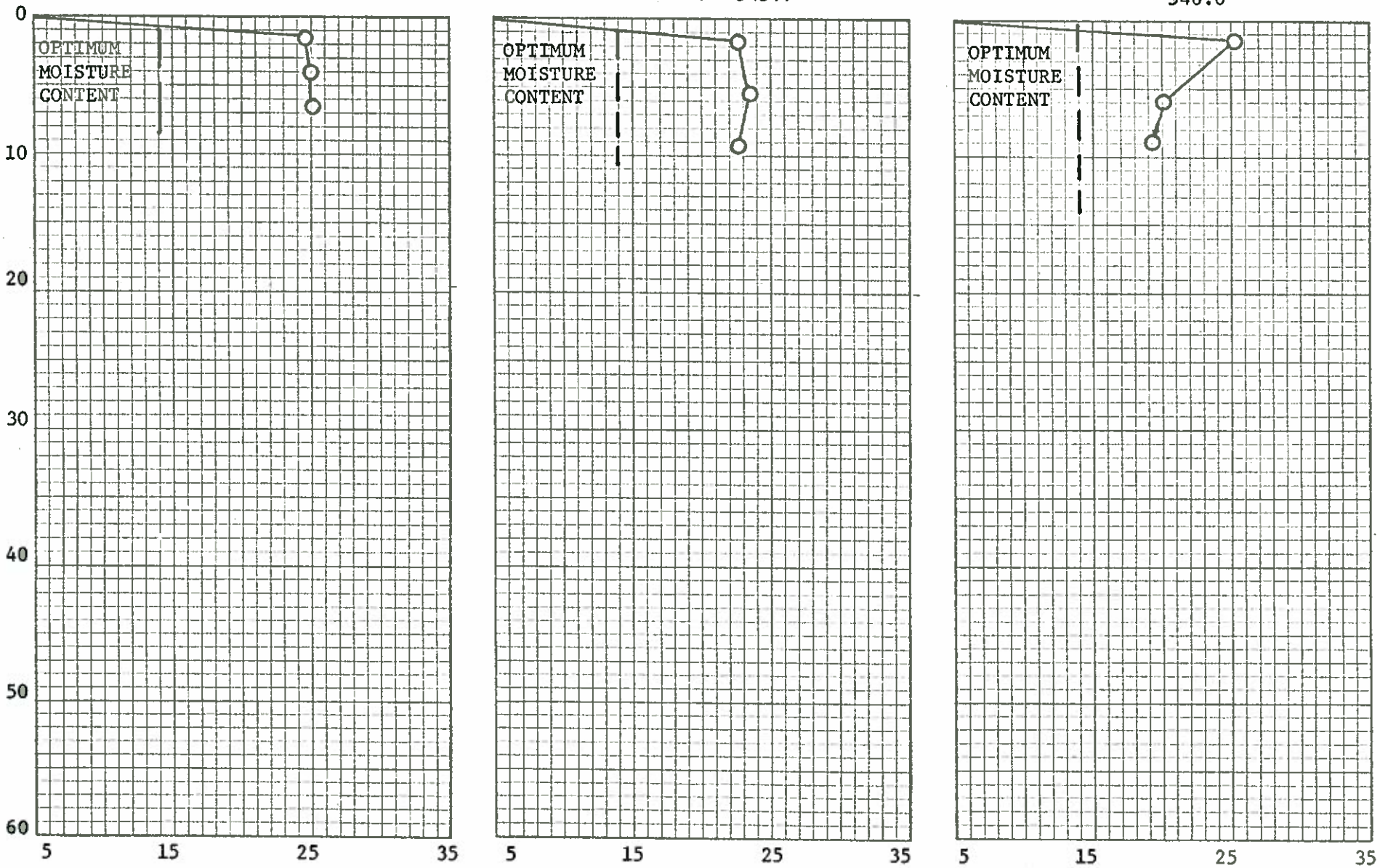
PLOT OF MOISTURE CONTENT VS. DEPTH

PROJECT: ORIGINAL GROUND AREA, ASH PIT NO. 3, Stuart Station

LOCATION NO: 10D
SURFACE ELEVATION: 544.6

LOCATION NO: 11D
SURFACE ELEVATION: 545.7

LOCATION NO: 12D
SURFACE ELEVATION: 546.0



BOWSER-MORNER
Testing Laboratories, Inc.

V-250

FORM 2485

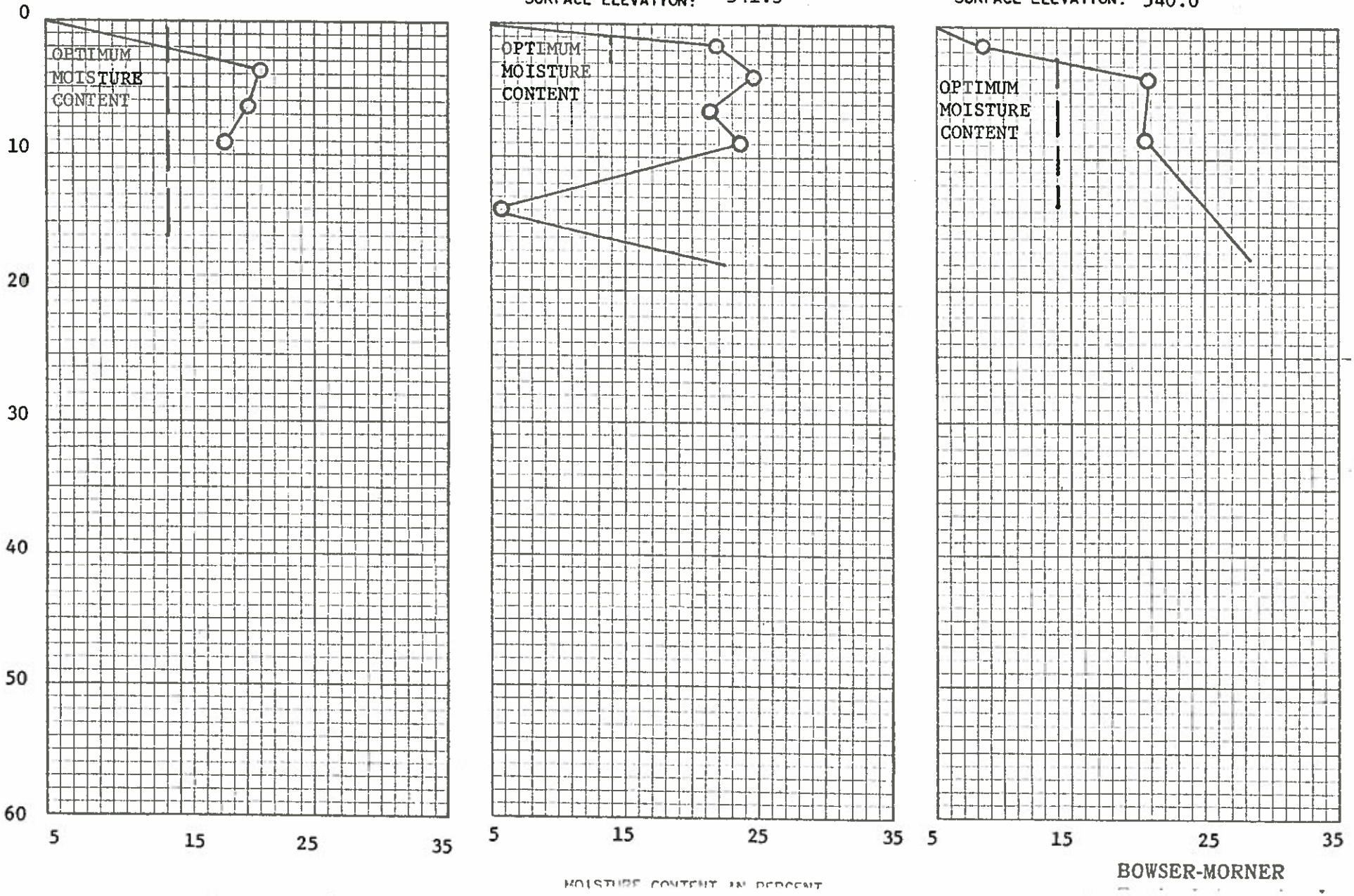
PLOT OF MOISTURE CONTENT VS. DEPTH

PROJECT: ORIGINAL GROUND AREA, ASH PIT NO. 3, Stuart Station

LOCATION NO: 13D
SURFACE ELEVATION: 541.6

LOCATION NO: 14D
SURFACE ELEVATION: 541.3

LOCATION NO: 15D
SURFACE ELEVATION: 540.0



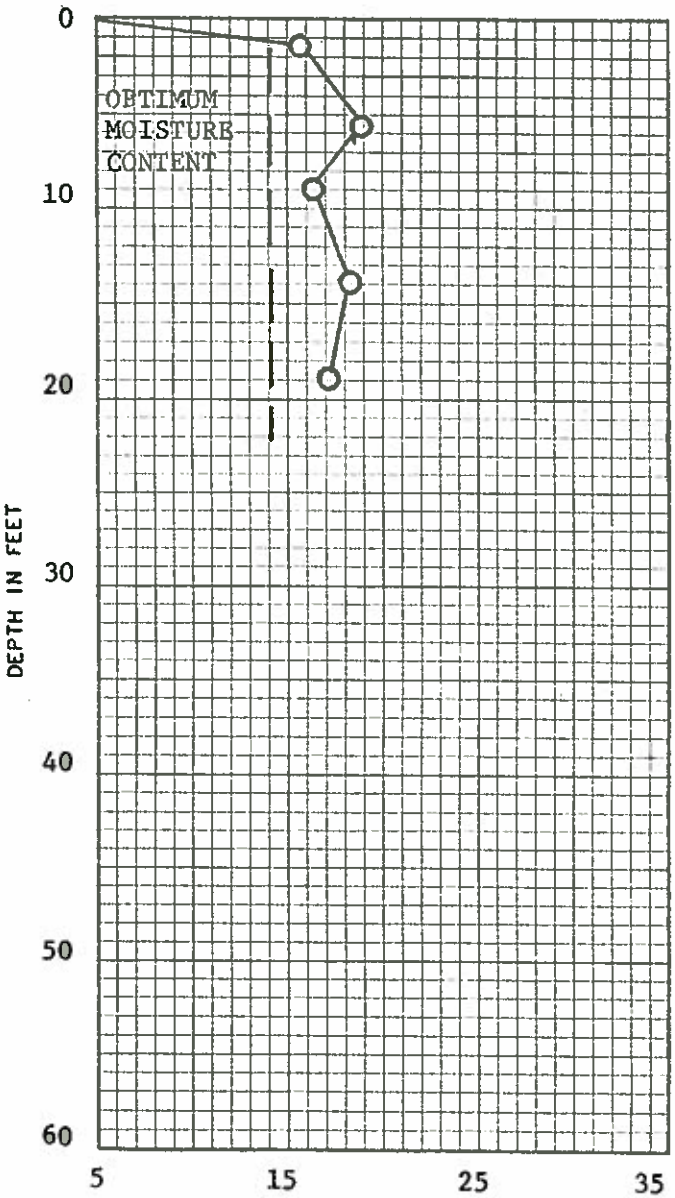
BOWSER-MORNER

FORM 2185

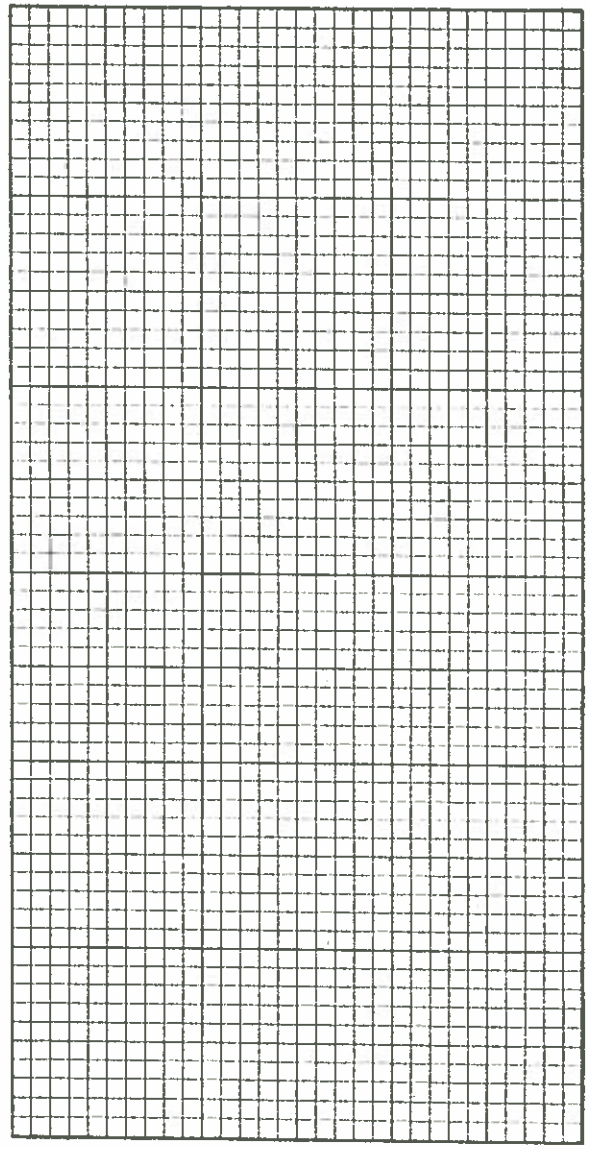
PLOT OF MOISTURE CONTENT VS. DEPTH

PROJECT: ORIGINAL GROUND AREA, ASH PIT NO. 3, Stuart Station

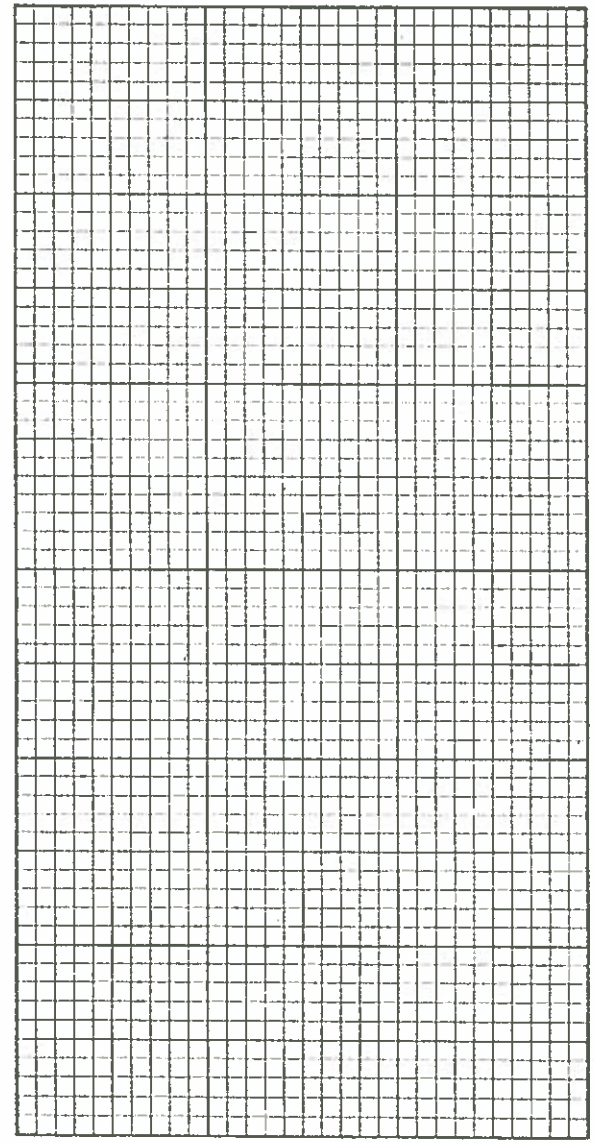
LOCATION NO: 16D
SURFACE ELEVATION:



LOCATION NO:
SURFACE ELEVATION:



LOCATION NO:
SURFACE ELEVATION:



MOISTURE CONTENT IN PERCENT

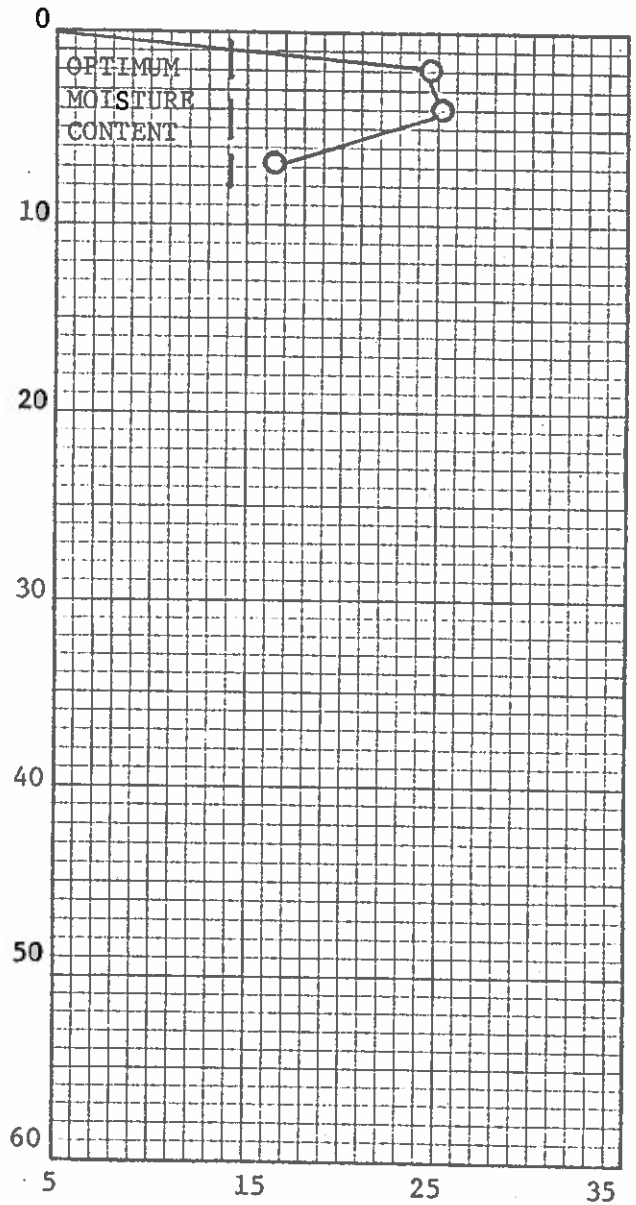
BOWSER-MORNER

FORM 2485

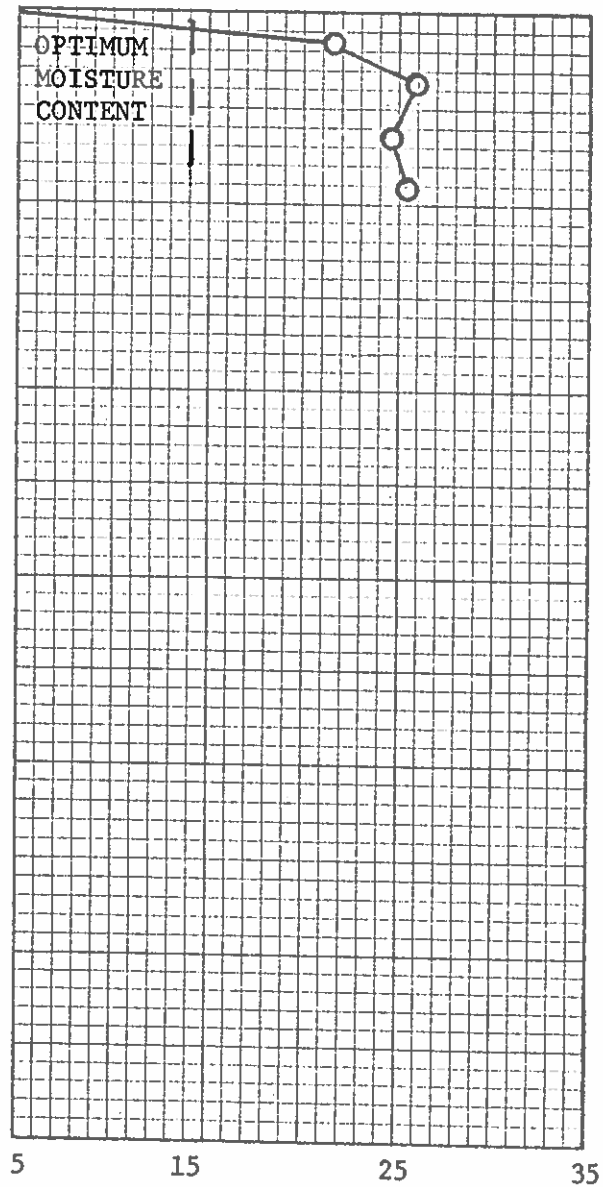
PLOT OF MOISTURE CONTENT VS. DEPTH

PROJECT: BORROW AREA, ASH PIT NO. 3, Stuart Station

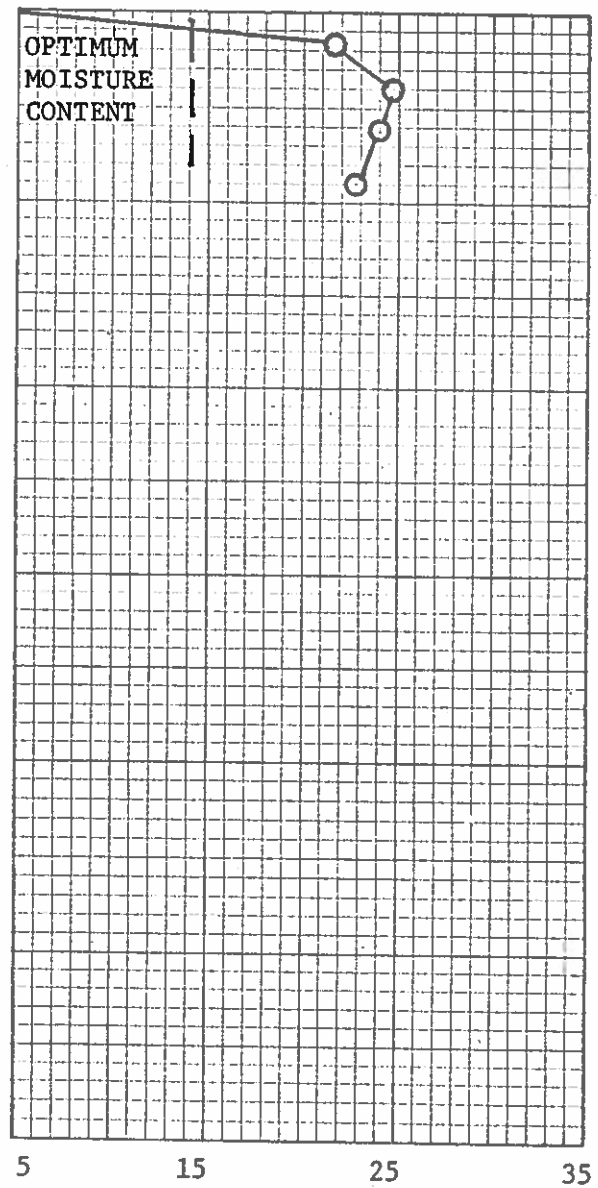
LOCATION NO: 1E
SURFACE ELEVATION: 544.5



LOCATION NO: 2E
SURFACE ELEVATION: 545.8



LOCATION NO: 3E
SURFACE ELEVATION: 543.9



DEPTH IN FEET

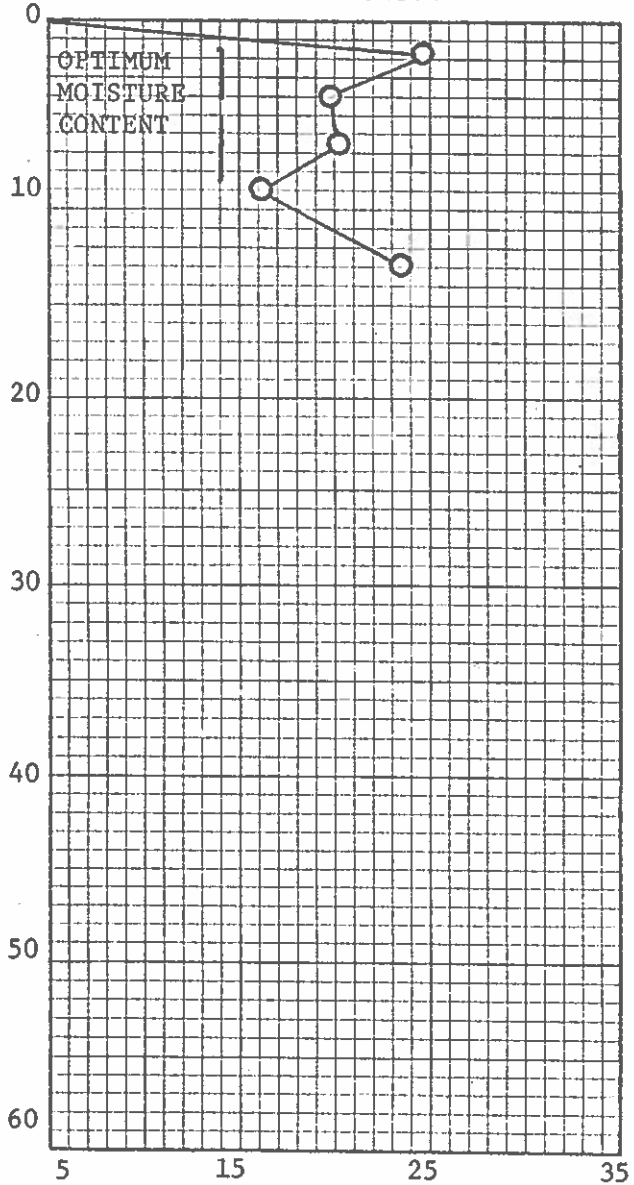
BOWSER-MORNER

FORM 2185

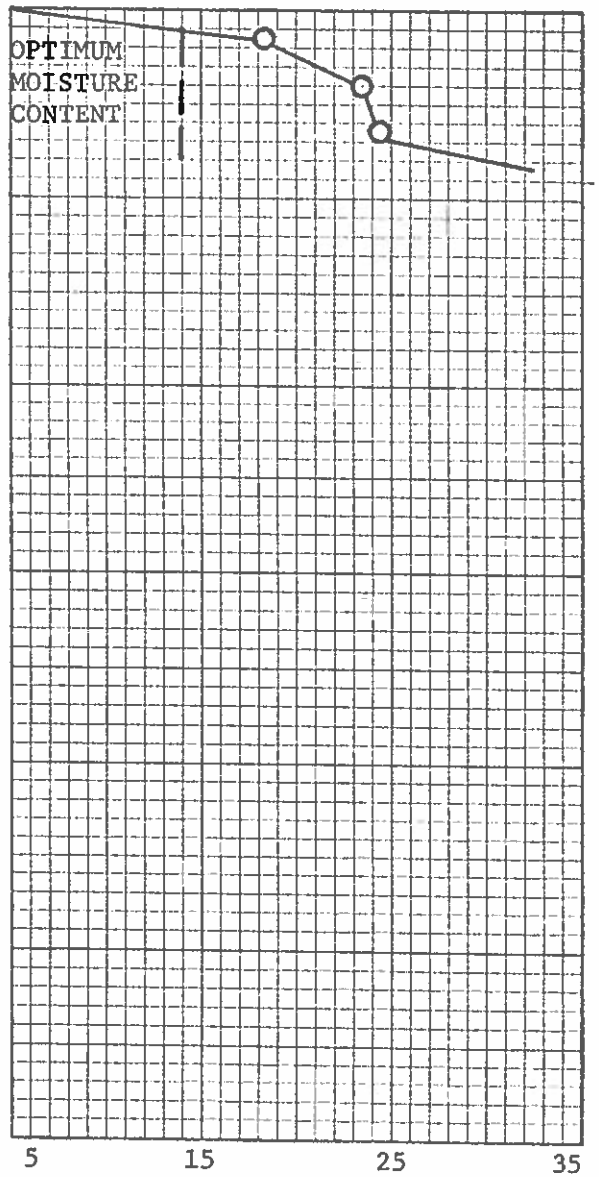
PLOT OF MOISTURE CONTENT VS. DEPTH

PROJECT: BORROW AREA, ASH PIT NO. 3, Stuart Station

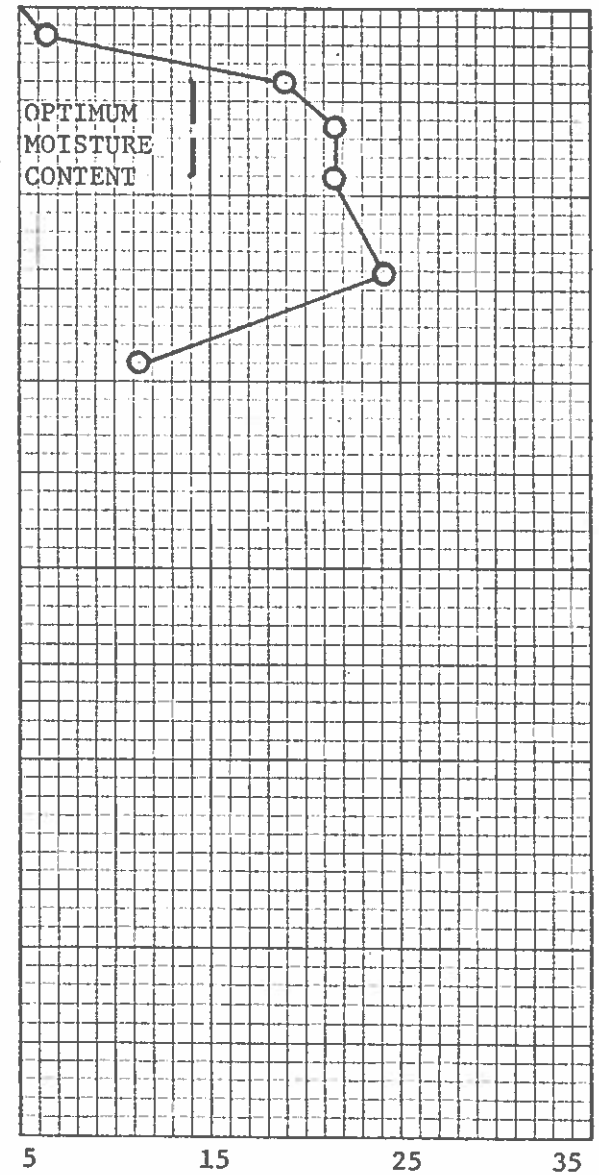
LOCATION NO: 4E
SURFACE ELEVATION: 543.4



LOCATION NO: 5E
SURFACE ELEVATION: 541.6



LOCATION NO: 6E
SURFACE ELEVATION: 541.4



DEPTH IN FEET

MOISTURE CONTENT IN PERCENT

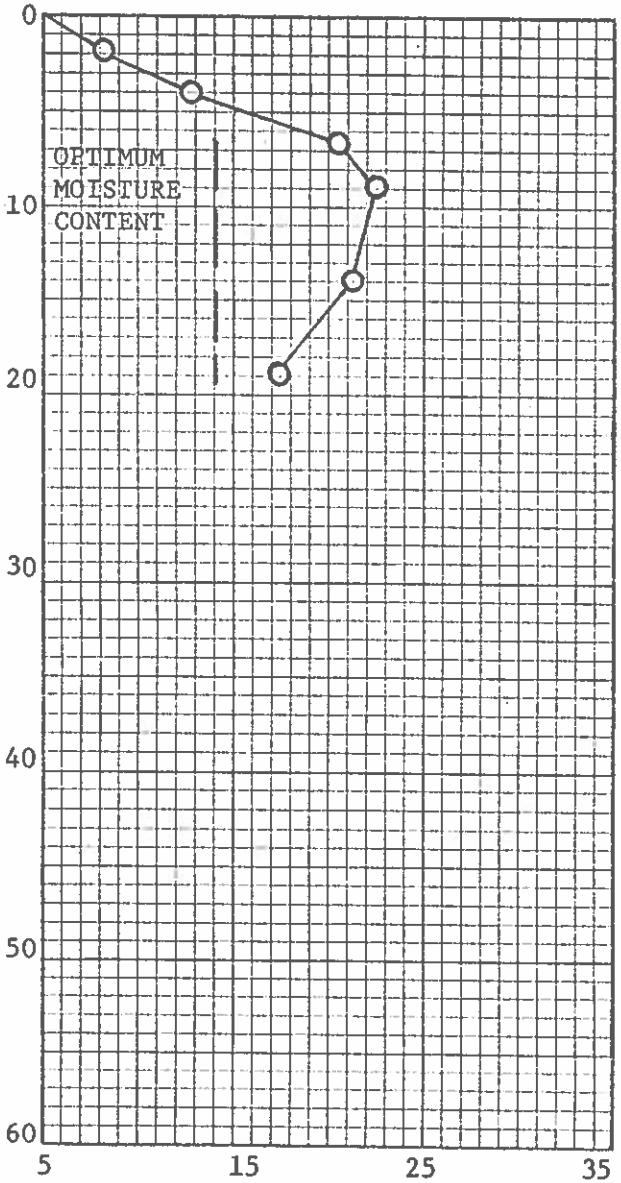
BOWSER-MORNER

FORM 2A85

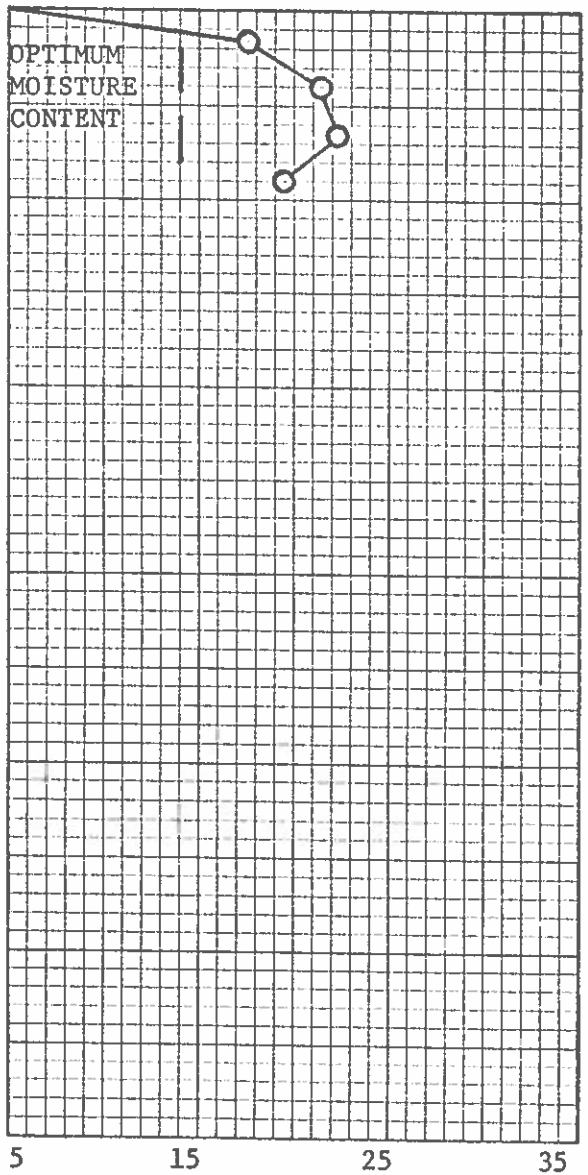
PLOT OF MOISTURE CONTENT VS. DEPTH

PROJECT: BORROW AREA, ASH PIT NO. 3, Stuart Station

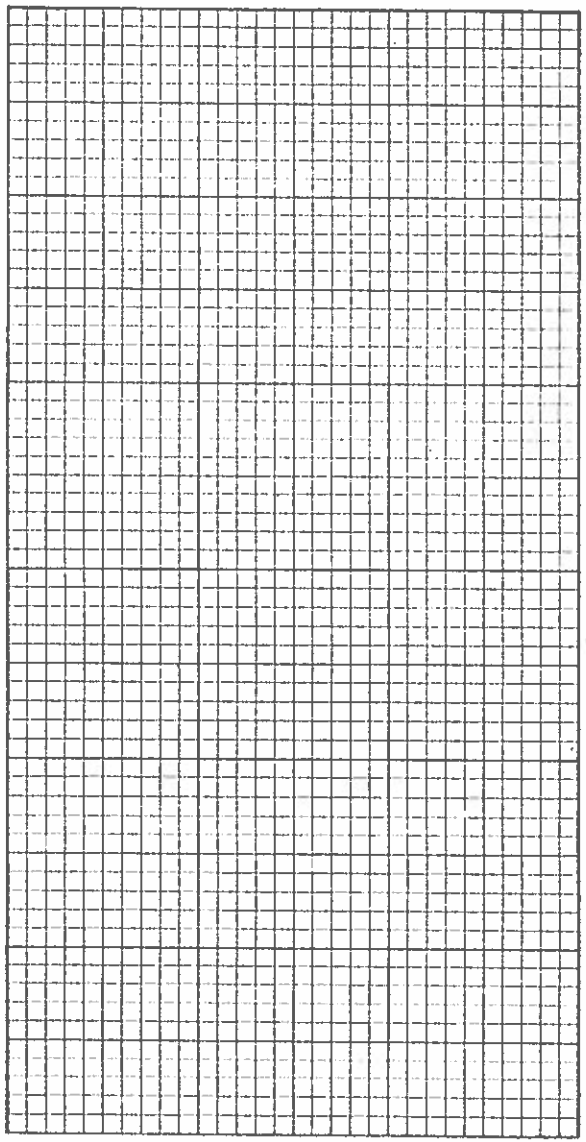
LOCATION NO: 7E
SURFACE ELEVATION: 545.4



LOCATION NO: 8E
SURFACE ELEVATION: 538.7



LOCATION NO:
SURFACE ELEVATION:



DEPTH IN FEET

MOISTURE CONTENT IN PERCENT

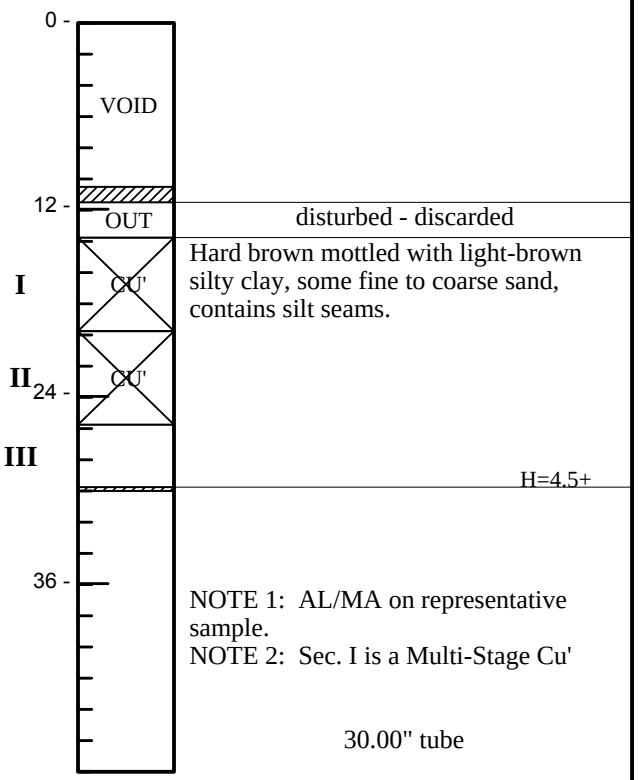
BOWSER-MORNER

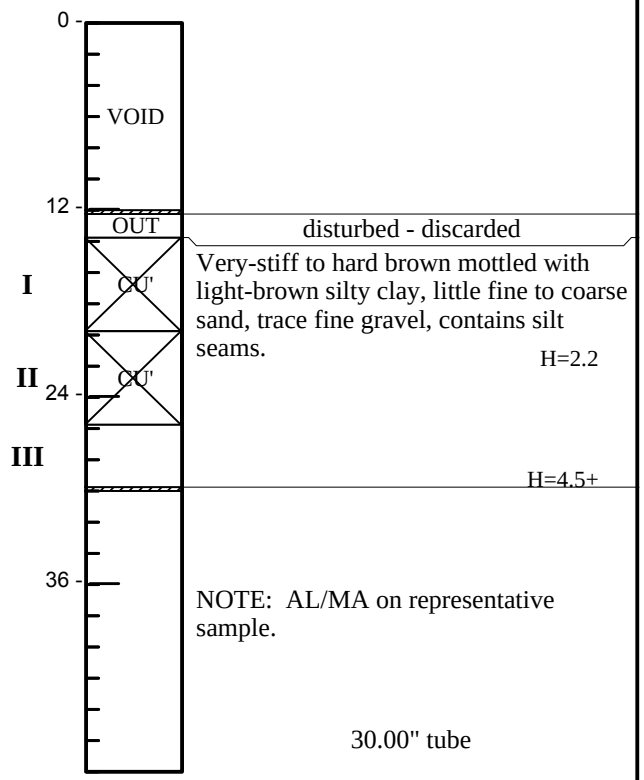
JOB NUMBER : **011-12608-000**
PROJECT : **PHASE 2 - STABILITY INVESTIGATION**
LOCATION : **DP&L STUART STATION - ABERDEEN, OHIO**

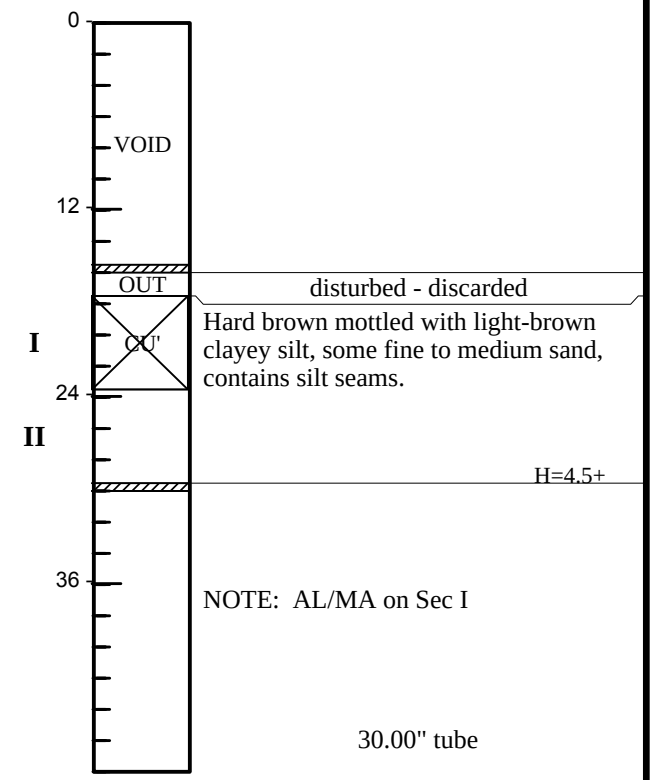
BBCM

LABORATORY LOG OF SHELBY TUBES

Boring : **B-3A-1**	Sample : **ST-14**	Boring : **B-3A-2**	Sample : **ST-4**	Boring : **B-3A-3**	Sample : **ST-6**
Depth : **33.5' to 35.0'**	Recovery : **16.00"**	Depth : **8.5' to 10.0'**	Recovery : **16.00"**	Depth : **13.5' to 14.7'**	Recovery : **12.00"**







LEGEND

- Consolidation, Incremental
- Swelling, Test
- Wax
- C R S - Consolidation, C R S
- P P - Permeability, Vertical / Horizontal
- Unconfined Compression Test
- Triaxial Compression Test

H - Hand Penetrometer (tsf)
Ds - Direct Shear
LOI - Loss on Ignition
AL - Atterberg Limits
MA - Sieve/Hydrometer
SG - Specific Gravity
SL - Shrinkage Limit
POR - Porosity
UDW - Unit Dry Weight
MC - Moisture Content
D_R - Relative Density
S - Sieve

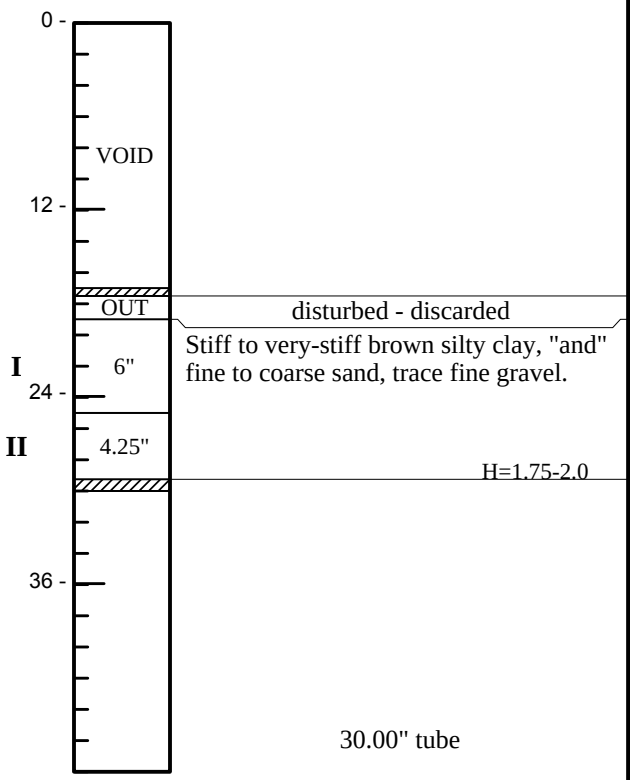
SHELBY TUBE LOG 112608000.GPJ BBCM.GDT 5/25/10

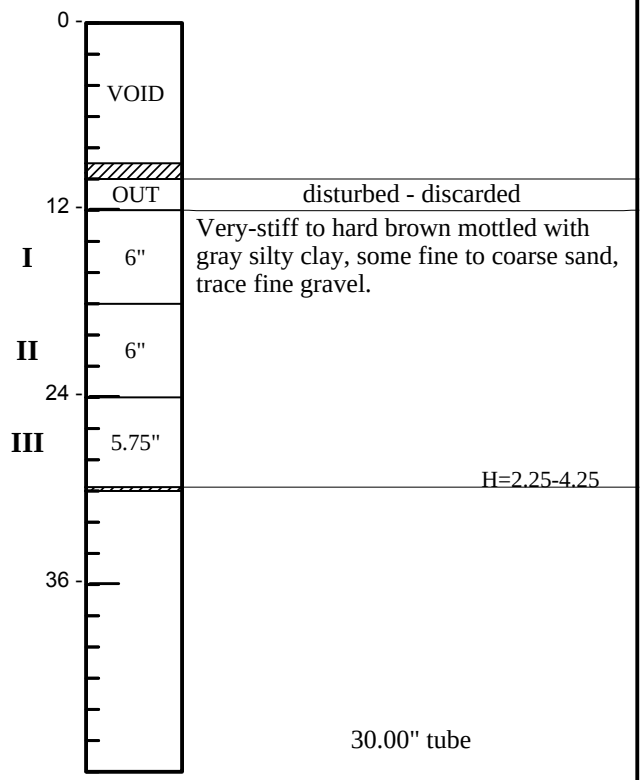
JOB NUMBER : **011-12608-000**
PROJECT : **PHASE 2 - STABILITY INVESTIGATION**
LOCATION : **DP&L STUART STATION - ABERDEEN, OHIO**

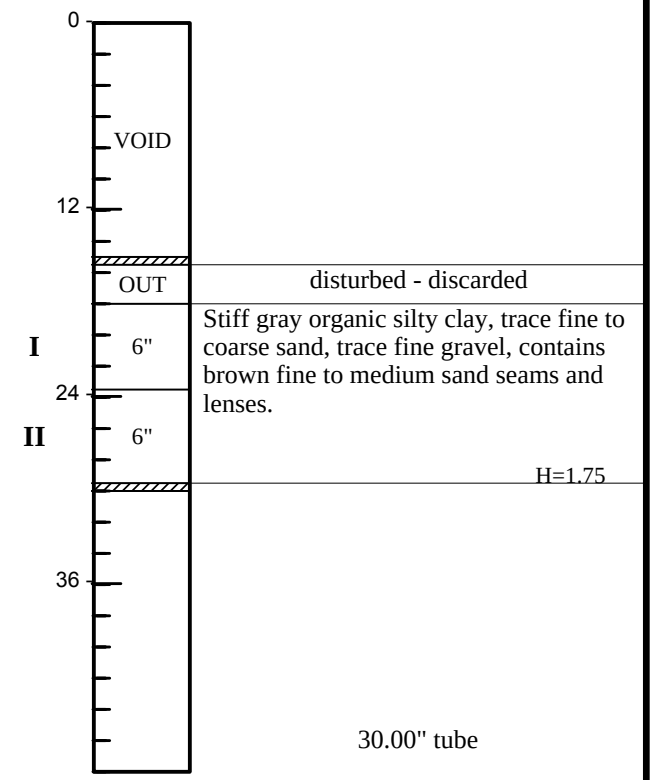
BBCM

LABORATORY LOG OF SHELBY TUBES

Boring : **B-6-2**	Sample : **ST-4**	Boring : **B-7-1**	Sample : **ST-4**	Boring : **B-7-2**	Sample : **ST-4**
Depth : **8.5' to 9.5'**	Recovery : **10.25"**	Depth : **8.5' to 10.2'**	Recovery : **17.75"**	Depth : **8.5' to 9.8'**	Recovery : **11.00"**







LEGEND

- Consolidation, Incremental
- Swelling, Test
- Wax
- C R S - Consolidation, C R S
- P P - Permeability, Vertical / Horizontal
- Unconfined Compression Test
- Triaxial Compression Test

H - Hand Penetrometer (tsf)
Ds - Direct Shear
LOI - Loss on Ignition
AL - Atterberg Limits
MA - Sieve/Hydrometer
SG - Specific Gravity
SL - Shrinkage Limit
POR - Porosity
UDW - Unit Dry Weight
MC - Moisture Content
D_R - Relative Density
S - Sieve

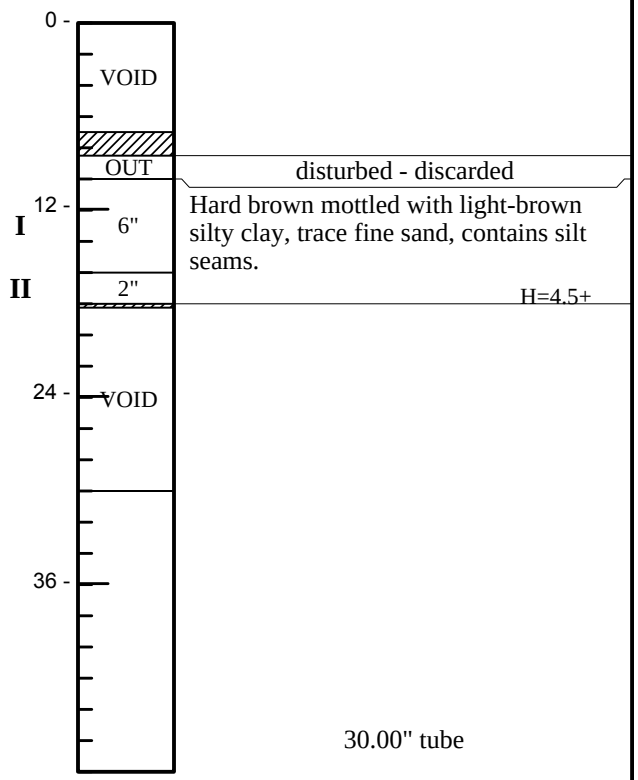
SHELBY TUBE LOG 112608000.GPJ BBCM.GDT 5/25/10

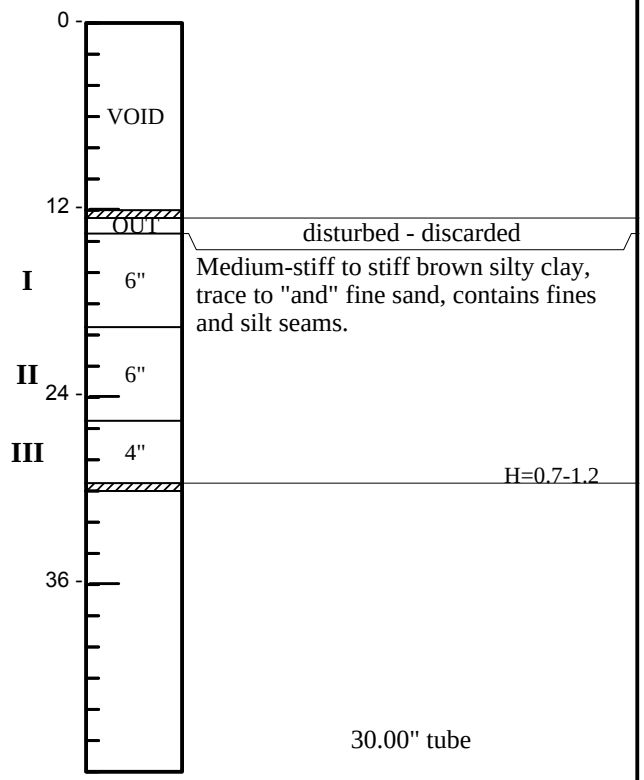
JOB NUMBER : **011-12608-000**
PROJECT : **PHASE 2 - STABILITY INVESTIGATION**
LOCATION : **DP&L STUART STATION - ABERDEEN, OHIO**

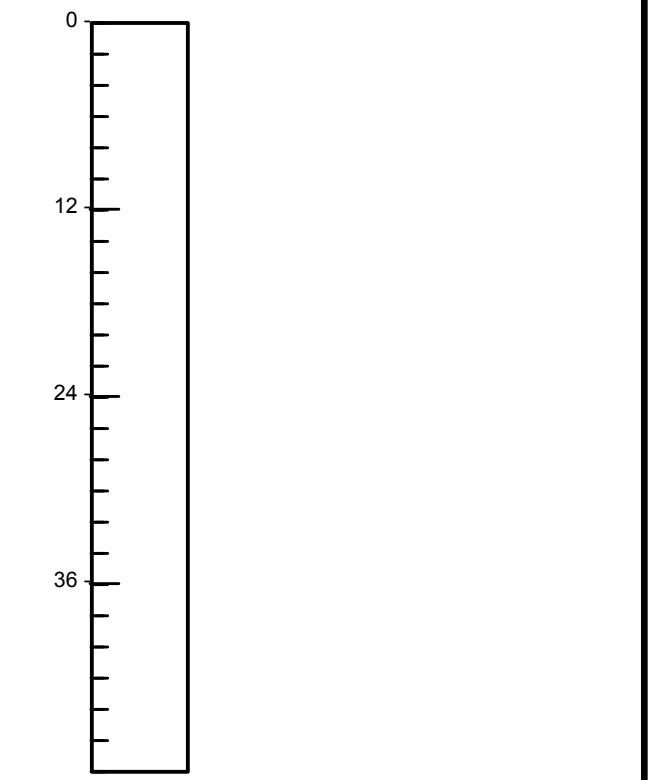
BBCM

LABORATORY LOG OF SHELBY TUBES

Boring : **B-7-3**	Sample : **ST-6**	Boring : **B-7-4**	Sample : **ST-4**	Boring :	Sample :
Depth : **13.5' to 14.1'**	Recovery : **8.00"**	Depth : **8.5' to 9.9'**	Recovery : **16.00"**	Depth :	Recovery :





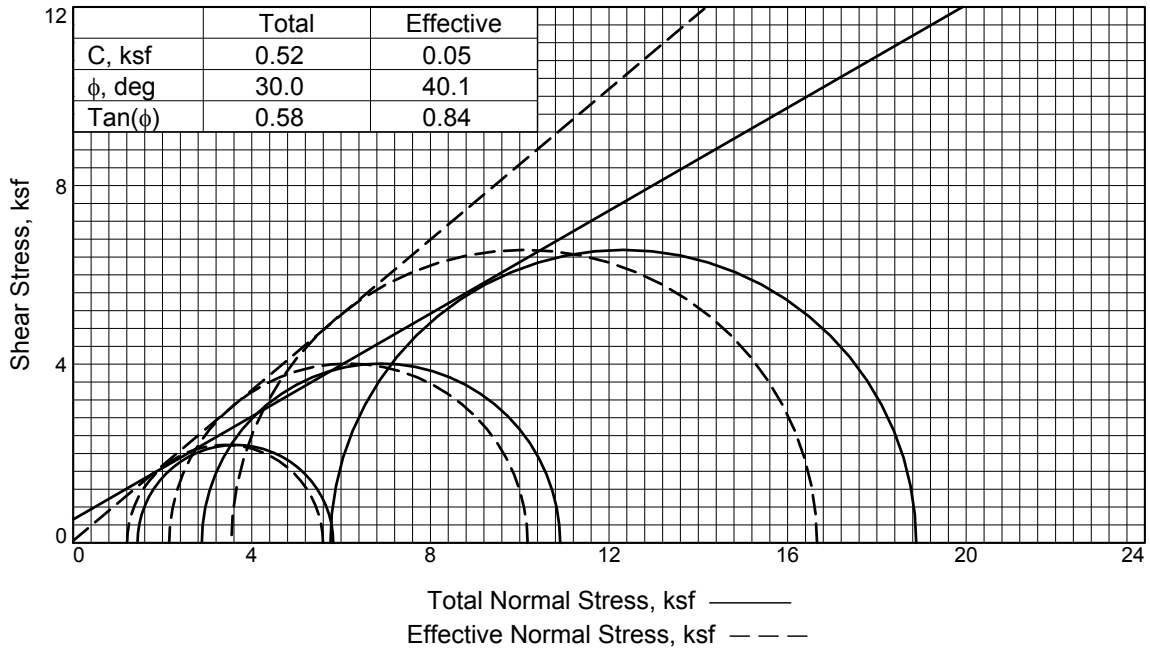


LEGEND

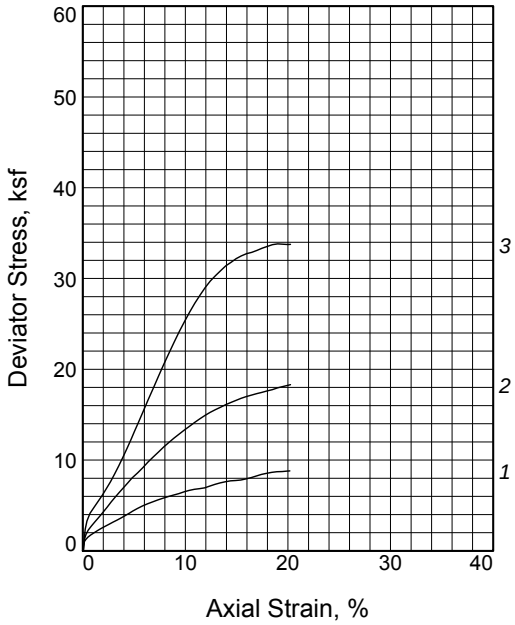
- Consolidation, Incremental
- Swelling, Test
- Wax
- C R S - Consolidation, C R S
- P P - Permeability, Vertical / Horizontal
- Unconfined Compression Test
- Triaxial Compression Test

H - Hand Penetrometer (tsf)
Ds - Direct Shear
LOI - Loss on Ignition
AL - Atterberg Limits
MA - Sieve/Hydrometer
SG - Specific Gravity
SL - Shrinkage Limit
POR - Porosity
UDW - Unit Dry Weight
MC - Moisture Content
D_R - Relative Density
S - Sieve

SHELBY TUBE LOG 112608000.GPJ BBCM.GDT 5/25/10



	Total	Effective
C, ksf	0.52	0.05
ϕ, deg	30.0	40.1
Tan(ϕ)	0.58	0.84



Sample No.		1	2	3
Initial	Water Content, %	16.3	15.5	13.2
	Dry Density, pcf	114.1	116.7	120.8
	Saturation, %	92.3	94.0	90.3
	Void Ratio	0.4775	0.4440	0.3948
	Diameter, in.	2.88	2.89	2.85
	Height, in.	5.60	5.60	5.60
At Test	Water Content, %	17.1	15.9	13.8
	Dry Density, pcf	115.6	118.9	123.3
	Saturation, %	101.1	102.7	101.5
	Void Ratio	0.4578	0.4181	0.3671
	Diameter, in.	2.87	2.87	2.83
	Height, in.	5.56	5.55	5.55
Strain rate, %/min.		0.0070	0.0070	0.0070
Back Pressure, psi		60.00	60.00	60.00
Cell Pressure, psi		70.00	80.00	100.00
Fail. Stress, ksf		4.4	8.0	13.1
Total Pore Pr., ksf		8.9	9.4	10.9
Ult. Stress, ksf		8.8	18.3	33.8
Total Pore Pr., ksf		6.3	3.8	-0.1
$\bar{\sigma}_1$ Failure, ksf		5.6	10.2	16.7
$\bar{\sigma}_3$ Failure, ksf		1.2	2.1	3.5

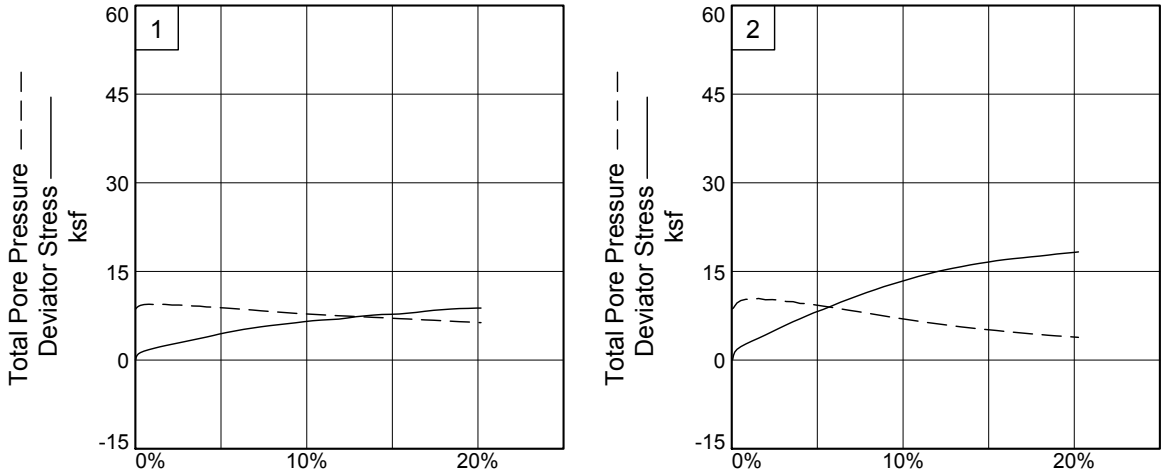
Type of Test:
CU with Pore Pressures
Sample Type: Shelby Tube
Description: Fill: Very-stiff to hard brown mottled with light-brown silty clay, little
LL= 29 **PL=** 18 **PI=** 11
Assumed Specific Gravity= 2.7
Remarks: B-3A-3, ST-6 I
Hard brown mottled with light-brown clayey silt, some fine to medium sand, contains silt seams.
Figure _____

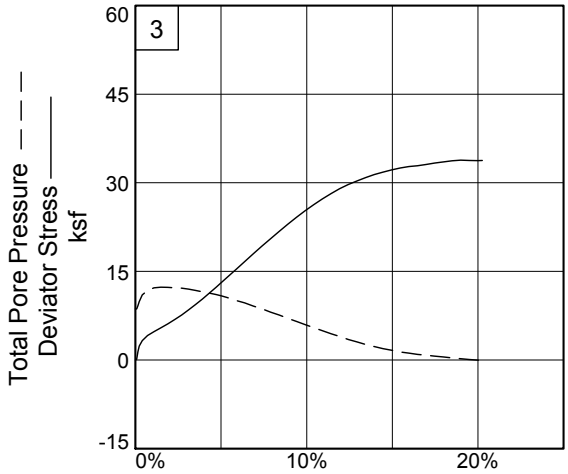
Client: Dayton Power & Light

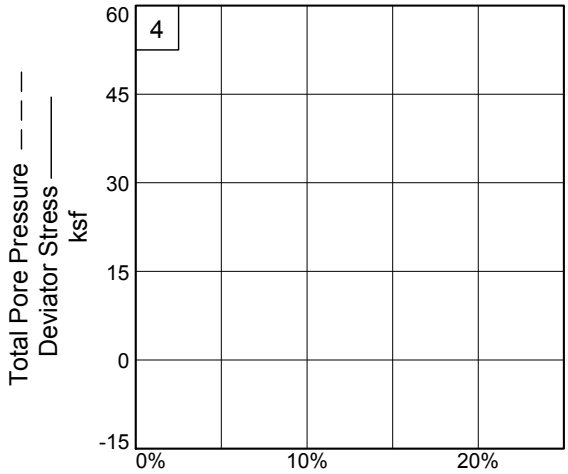
Project: PHASE 2 - STABILITY INVESTIGATION
DP&L STUART STATION - ABERDEEN, OHIO
Location: B-3A-2, B-3A-3
Sample Number: ST-4 I,II ST-6 I
Proj. No.: 011.12608.000 **Date Sampled:** 4/26/2010

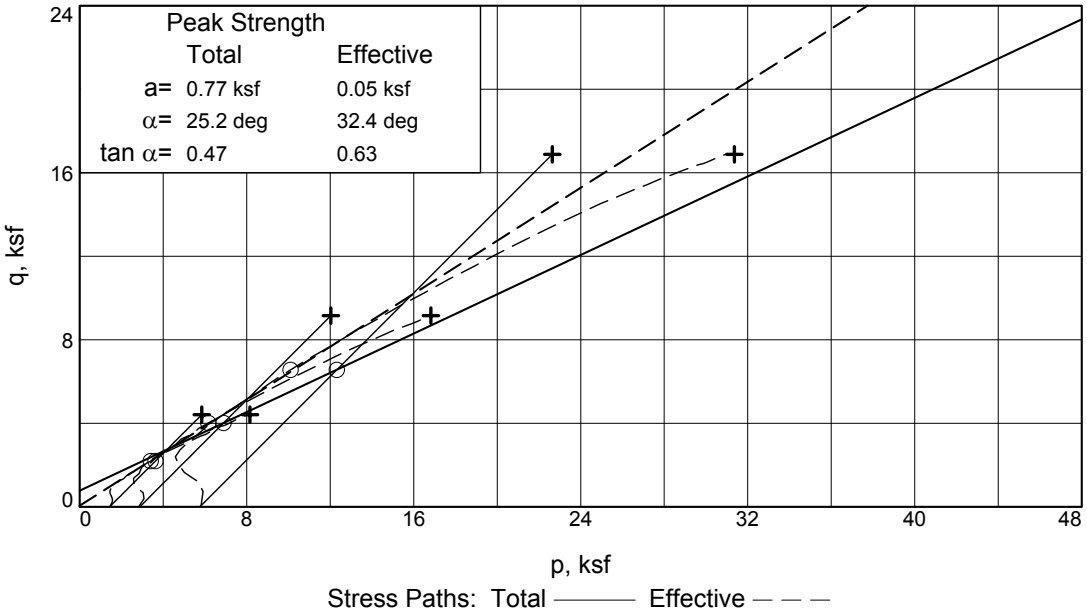
TRIAXIAL SHEAR TEST REPORT
BBC&M Engineering, Inc.
Dublin, Ohio

Tested By: PJM **Checked By:** JJ **PLATE 30**





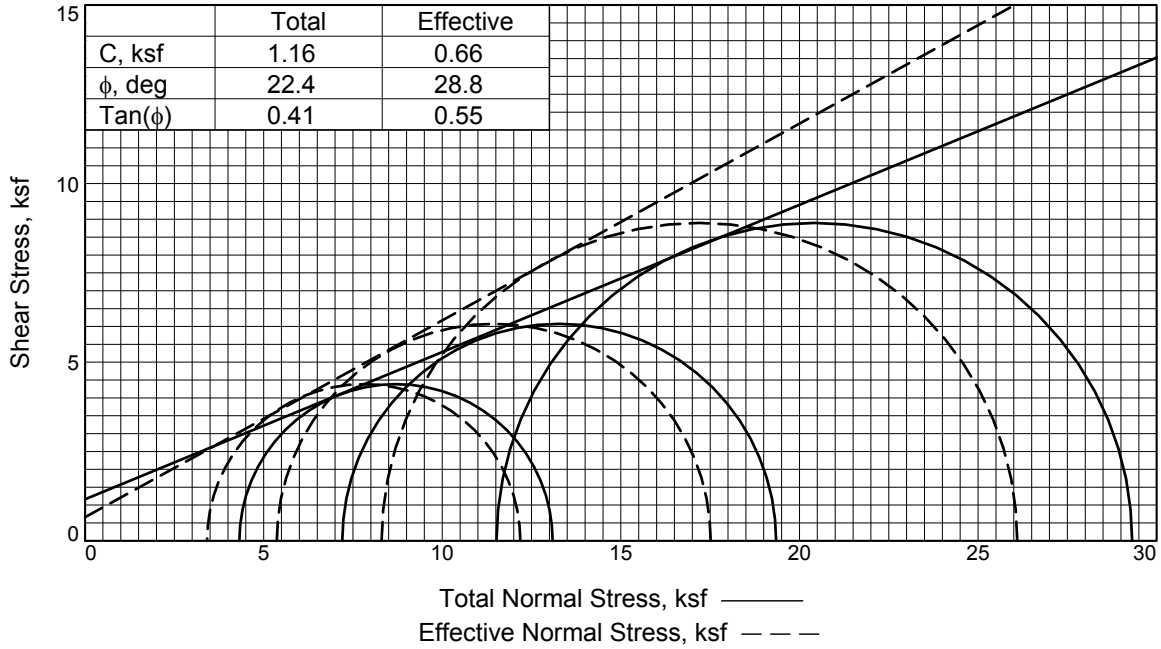




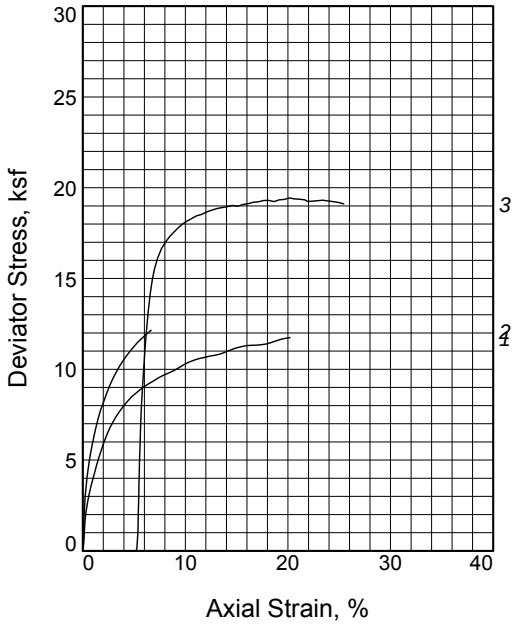
Client: Dayton Power & Light
Project: PHASE 2 - STABILITY INVESTIGATION
Location: B-3A-2, B-3A-3 **Depth:** 8.5' to 14.7' **Sample Number:** ST-4 I,II ST-6 I
Project No.: 011.12608.000 **Figure** _____

BBC&M Engineering, Inc.

Tested By: PJM **Checked By:** JJ



	Total	Effective
C, ksf	1.16	0.66
ϕ, deg	22.4	28.8
Tan(ϕ)	0.41	0.55



Sample No.		1	2	3
Initial	Water Content, %	18.6	18.6	18.6
	Dry Density, pcf	108.2	108.2	108.5
	Saturation, %	90.1	90.1	90.7
	Void Ratio	0.5579	0.5579	0.5542
	Diameter, in.	2.89	2.89	2.89
	Height, in.	5.59	5.59	5.59
At Test	Water Content, %	20.0	20.0	20.0
	Dry Density, pcf	110.0	109.5	110.2
	Saturation, %	101.3	100.2	102.0
	Void Ratio	0.5329	0.5389	0.5293
	Diameter, in.	2.88	2.89	2.88
	Height, in.	5.55	5.55	5.55
Strain rate, %/min.		0.0070	0.0060	0.0060
Back Pressure, psi		40.00	40.00	40.00
Cell Pressure, psi		70.00	90.00	120.00
Fail. Stress, ksf		8.8	12.1	17.8
Total Pore Pr., ksf		6.7	7.6	9.0
Ult. Stress, ksf		11.7	12.1	19.1
Total Pore Pr., ksf		4.4	7.6	6.8
$\bar{\sigma}_1$ Failure, ksf		12.2	17.5	26.1
$\bar{\sigma}_3$ Failure, ksf		3.4	5.4	8.3

Type of Test:
CU with Pore Pressures

Sample Type: Shelby Tube

Description: Hard brown mottled with light-brown silty clay, some fine to coarse sand,

LL= 33 **PL=** 19 **PI=** 14

Assumed Specific Gravity= 2.7

Remarks: Section II is a 2 point Multi Stage Cu'

Figure 1

Client: Dayton Power & Light

Project: PHASE 2 - STABILITY INVESTIGATION
DP&L STUART STATION - ABERDEEN, OHIO

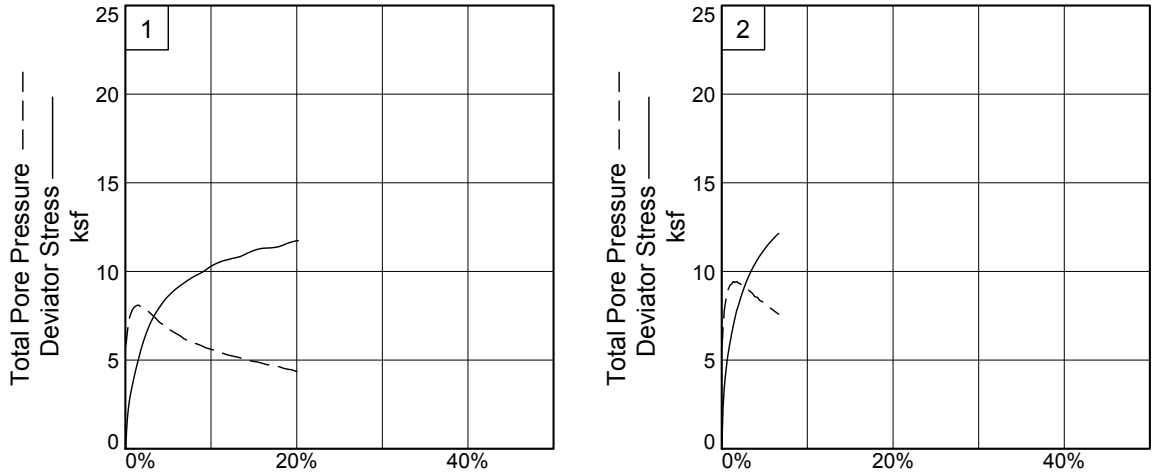
Location: B-3A-1

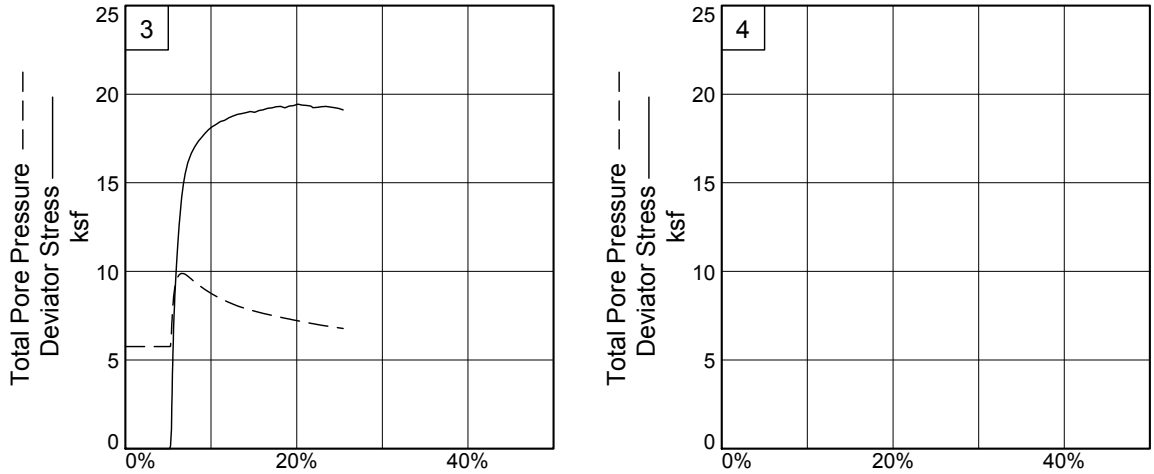
Sample Number: ST-14 I, II

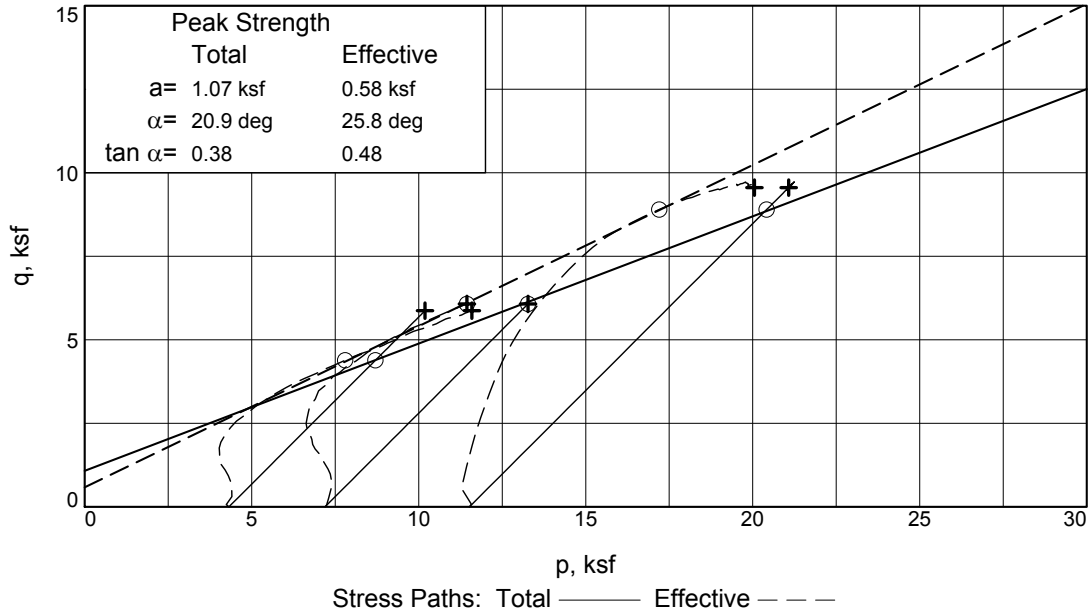
Proj. No.: 011.12608.000 **Date Sampled:** 5/5/2010

TRIAXIAL SHEAR TEST REPORT
BBC&M Engineering, Inc.
Dublin, Ohio

Tested By: PJM **Checked By:** JJ







Client: Dayton Power & Light
Project: PHASE 2 - STABILITY INVESTIGATION
Location: B-3A-1 **Depth:** 33.5' to 35.0' **Sample Number:** ST-14 I, II
Project No.: 011.12608.000 **Figure** 2

BBC&M Engineering, Inc.

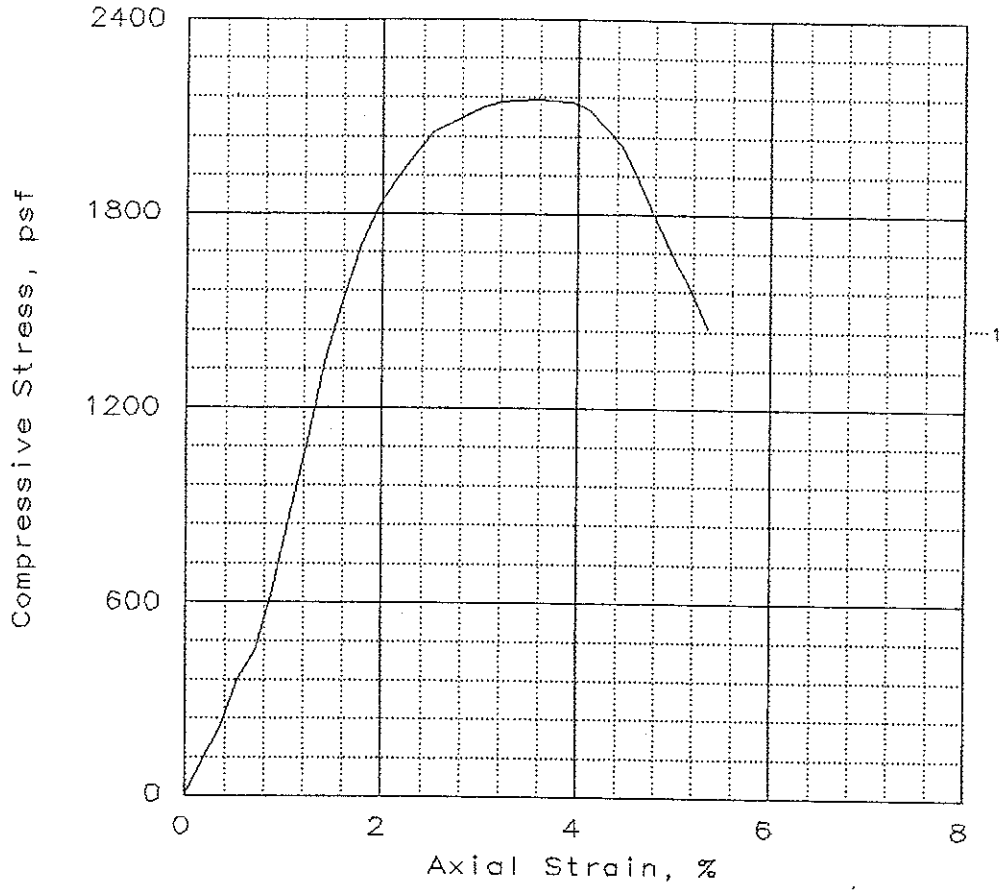
Tested By: PJM **Checked By:** JJ

APPENDIX F

RESULTS OF UNCONFINED COMPRESSION TESTING

(POND 10 PROJECT AREA)

UNCONFINED COMPRESSION TEST



SAMPLE NO.:	1			
Unconfined strength, psf	2155			
Undrained shear strength, psf	1077			
Failure strain, %	3.6			
Strain rate, in/min	0.0620			
Water content, %	20.5			
Wet density, pcf	130.4			
Dry density, pcf	108.2			
Saturation, %	96.8			
Void ratio	0.5804			
Specimen diameter, in	2.85			
Specimen height, in	5.60			
Height/diameter ratio	1.96			

Description: Brown Lean Clay CL

LL = 31	PL = 20	PI = 11	GS= 2.74	Type: Undisturbed

Project No.: 3808E06133.00

Date: 5/5/99

Remarks:

Shelby Tube sample

Client: Dayton Power and Light Co.
Aberdeen, Ohio

Project: Ashpond 10 and Landfill 11

Location: B10-5 @ 2-4 feet depth

Fig. No.: 06

UNCONFINED COMPRESSION TEST

WOODWARD-CLYDE CONSULTANTS

UNCONFINED COMPRESSION TEST

6-06-1999

Project and Sample Data

Date: 5/5/99
Client: Dayton Power and Light Co. Aberdeen, Ohio
Project: Ashpond 10 and Landfill 11
Sample location: B10-5 @ 2-4 feet depth
Sample description: Brown Lean Clay CL
Remarks: Shelby Tube sample

Fig no.: 06 2nd page Fig no. (if applicable):
Type of sample: Undisturbed
Specific gravity= 2.74 LL= 31 PL= 20 PI= 11

Specimen Parameters for Specimen No. 1

Specimen Parameter	Initial
Wt. moist soil and tare:	1225.800
Wt. dry soil and tare:	1017.300
Wt. of tare:	0.000
Weight, gms:	1225.8
Diameter, in:	2.854
Area, in²:	6.397
Height, in:	5.597
% Moisture:	20.5
Wet density, pcf:	130.4
[illegible] density, pcf:	108.2
[illegible]d ratio:	0.5804
% Saturation:	96.8

Test Readings Data for Specimen No. 1

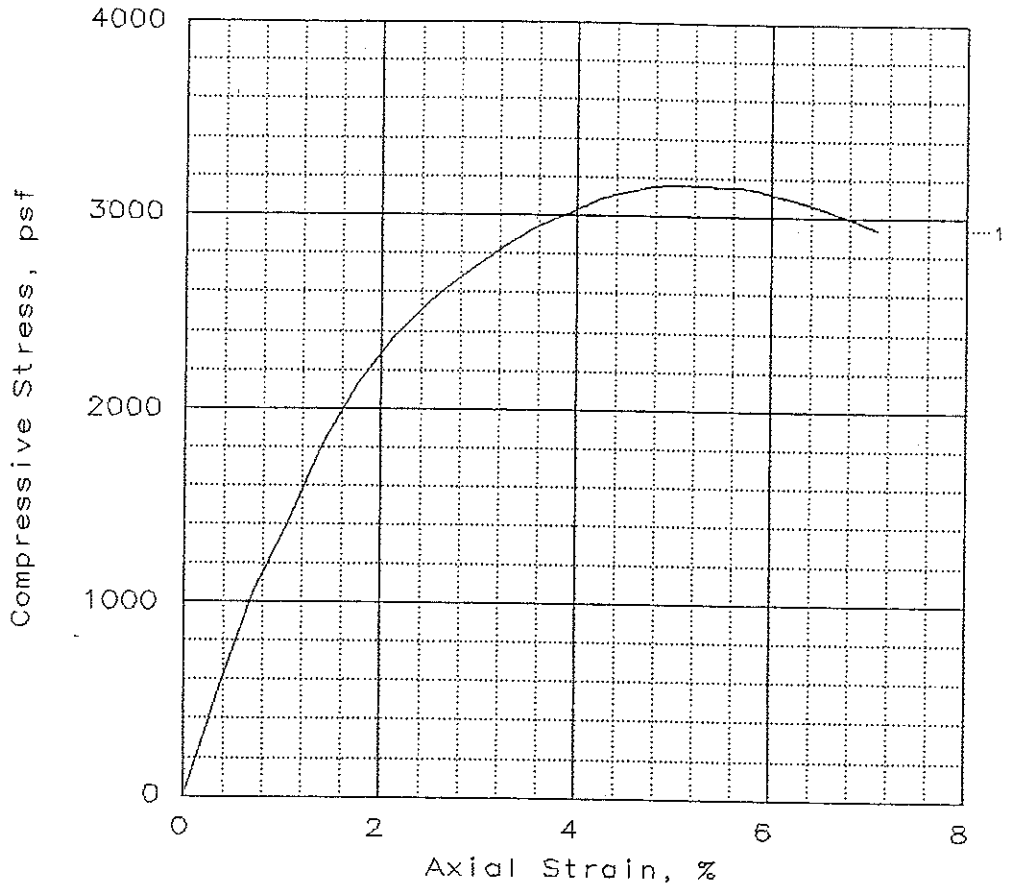
Deformation dial constant= 0.001 in per input unit
Primary load ring constant= 0.687 lbs per input unit
Secondary load ring constant= 0 lbs per input unit
Crossover reading for secondary load ring= 0 input units
Strain rate, in/min = 0.0620
Unconfined compressive strength = 2155 psf at reading no. 20
Unconfined ultimate strength = not selected

No.	Def. Dial Units	Def. in	Load Dial Units	Load lbs	Strain %	Deviator Stress psf
0	0.0	0.000	0.0	0.0	0.0	0
1	10.0	0.010	7.0	4.8	0.2	108
2	20.0	0.020	13.5	9.3	0.4	208
3	30.0	0.030	23.5	16.1	0.5	361
4	40.0	0.040	29.5	20.3	0.7	453
5	50.0	0.050	41.5	28.5	0.9	636
6	60.0	0.060	56.5	38.8	1.1	864
7	70.0	0.070	72.0	49.5	1.3	1099
[illegible]	80.0	0.080	88.0	60.5	1.4	1341
9	90.0	0.090	101.0	69.4	1.6	1537
10	100.0	0.100	112.0	76.9	1.8	1701
11	110.0	0.110	120.0	82.4	2.0	1819

Test Readings Data for Specimen No. 1

No.	Def. Dial Units	Def. in	Load Dial Units	Load lbs	Strain %	Deviator Stress psf
12	120.0	0.120	126.0	86.6	2.1	1907
13	130.0	0.130	131.0	90.0	2.3	1979
14	140.0	0.140	136.0	93.4	2.5	2051
15	150.0	0.150	138.0	94.8	2.7	2077
16	160.0	0.160	140.0	96.2	2.9	2103
17	170.0	0.170	142.0	97.6	3.0	2129
18	180.0	0.180	143.5	98.6	3.2	2148
19	190.0	0.190	144.0	98.9	3.4	2151
20	200.0	0.200	144.5	99.3	3.6	2155
21	210.0	0.210	144.5	99.3	3.8	2151
22	220.0	0.220	144.5	99.3	3.9	2147
23	230.0	0.230	143.5	98.6	4.1	2128
24	240.0	0.240	139.5	95.8	4.3	2065
25	250.0	0.250	136.0	93.4	4.5	2009
26	260.0	0.260	129.0	88.6	4.6	1902
27	270.0	0.270	121.0	83.1	4.8	1781
28	280.0	0.280	113.5	78.0	5.0	1667
29	290.0	0.290	107.0	73.5	5.2	1569
30	300.0	0.300	99.0	68.0	5.4	1449

UNCONFINED COMPRESSION TEST



SAMPLE NO.:	1			
Unconfined strength, psf	3161			
Undrained shear strength, psf	1581			
Failure strain, %	5.3			
Strain rate, in/min	0.0620			
Water content, %	21.4			
Wet density, pcf	129.4			
Dry density, pcf	106.6			
Saturation, %	97.0			
Void ratio	0.6049			
Specimen diameter, in	2.86			
Specimen height, in	5.64			
Height/diameter ratio	1.97			

Description: Brown Lean Clay CL

GS= 2.74 | Type: Undisturbed

Project No.: 3808E06133.00

Date: 5/5/99

Remarks:

Shelby Tube sample

Client: Dayton Power and Light Co.
Aberdeen, Ohio

Project: Ashpond 10 and Landfill 11

Location: B10-18 @ 2-4 ft depth

Fig. No.: 07

UNCONFINED COMPRESSION TEST

WOODWARD-CLYDE CONSULTANTS

UNCONFINED COMPRESSION TEST

Project and Sample Data

Date: 5/5/99
Client: Dayton Power and Light Co. Aberdeen, Ohio
Project: Ashpond 10 and Landfill 11
Sample location: B10-18 @ 2-4 ft depth
Sample description: Brown Lean Clay CL
Remarks: Shelby Tube sample

Fig no.: 07 2nd page Fig no. (if applicable):
Type of sample: Undisturbed
Specific gravity= 2.74 LL= PL= PI=

Specimen Parameters for Specimen No. 1

Specimen Parameter	Initial
Wt. moist soil and tare:	1233.800
Wt. dry soil and tare:	1016.290
Wt. of tare:	0.000
Weight, gms:	1233.8
Diameter, in:	2.865
Area, in²:	6.444
Height, in:	5.637
% Moisture:	21.4
Wet density, pcf:	129.4
D[illegible] density, pcf:	106.6
V[illegible]d ratio:	0.6049
% Saturation:	97.0

Test Readings Data for Specimen No. 1

Deformation dial constant= 0.001 in per input unit
Primary load ring constant= 0.687 lbs per input unit
Secondary load ring constant= 0 lbs per input unit
Crossover reading for secondary load ring= 0 input units
Strain rate, in/min = 0.0620
Unconfined compressive strength = 3161 psf at reading no. 18
Unconfined ultimate strength = not selected

No.	Def. Dial Units	Def. in	Load Dial Units	Load lbs	Strain %	Deviator Stress psf
0	0.0	0.000	0.0	0.0	0.0	0
1	20.0	0.020	36.0	24.7	0.4	551
2	40.0	0.040	68.0	46.7	0.7	1036
3	60.0	0.060	93.0	63.9	1.1	1412
4	80.0	0.080	120.0	82.4	1.4	1816
5	100.0	0.100	141.5	97.2	1.8	2134
6	120.0	0.120	158.0	108.5	2.1	2374
7	140.0	0.140	170.0	116.8	2.5	2545
[illegible]	150.0	0.150	175.5	120.6	2.7	2622
9	170.0	0.170	184.5	126.8	3.0	2747
10	180.0	0.180	189.5	130.2	3.2	2816
11	200.0	0.200	197.5	135.7	3.5	2924

Test Readings Data for Specimen No. 1

No.	Def. Dial Units	Def. in	Load Dial Units	Load lbs	Strain %	Deviator Stress psf
[illegible]	220.0	0.220	204.0	140.1	3.9	3009
13	240.0	0.240	210.0	144.3	4.3	3086
14	250.0	0.250	212.0	145.6	4.4	3110
15	270.0	0.270	215.5	148.0	4.8	3150
16	280.0	0.280	216.5	148.7	5.0	3158
17	290.0	0.290	217.0	149.1	5.1	3160
18	300.0	0.300	217.5	149.4	5.3	3161
19	310.0	0.310	217.5	149.4	5.5	3155
20	320.0	0.320	217.5	149.4	5.7	3149
21	330.0	0.330	217.0	149.1	5.9	3136
22	340.0	0.340	216.0	148.4	6.0	3116
23	350.0	0.350	215.0	147.7	6.2	3095
24	360.0	0.360	213.5	146.7	6.4	3068
25	370.0	0.370	212.0	145.6	6.6	3041
26	380.0	0.380	210.0	144.3	6.7	3006
27	390.0	0.390	208.0	142.9	6.9	2972
28	400.0	0.400	206.0	141.5	7.1	2938

APPENDIX G

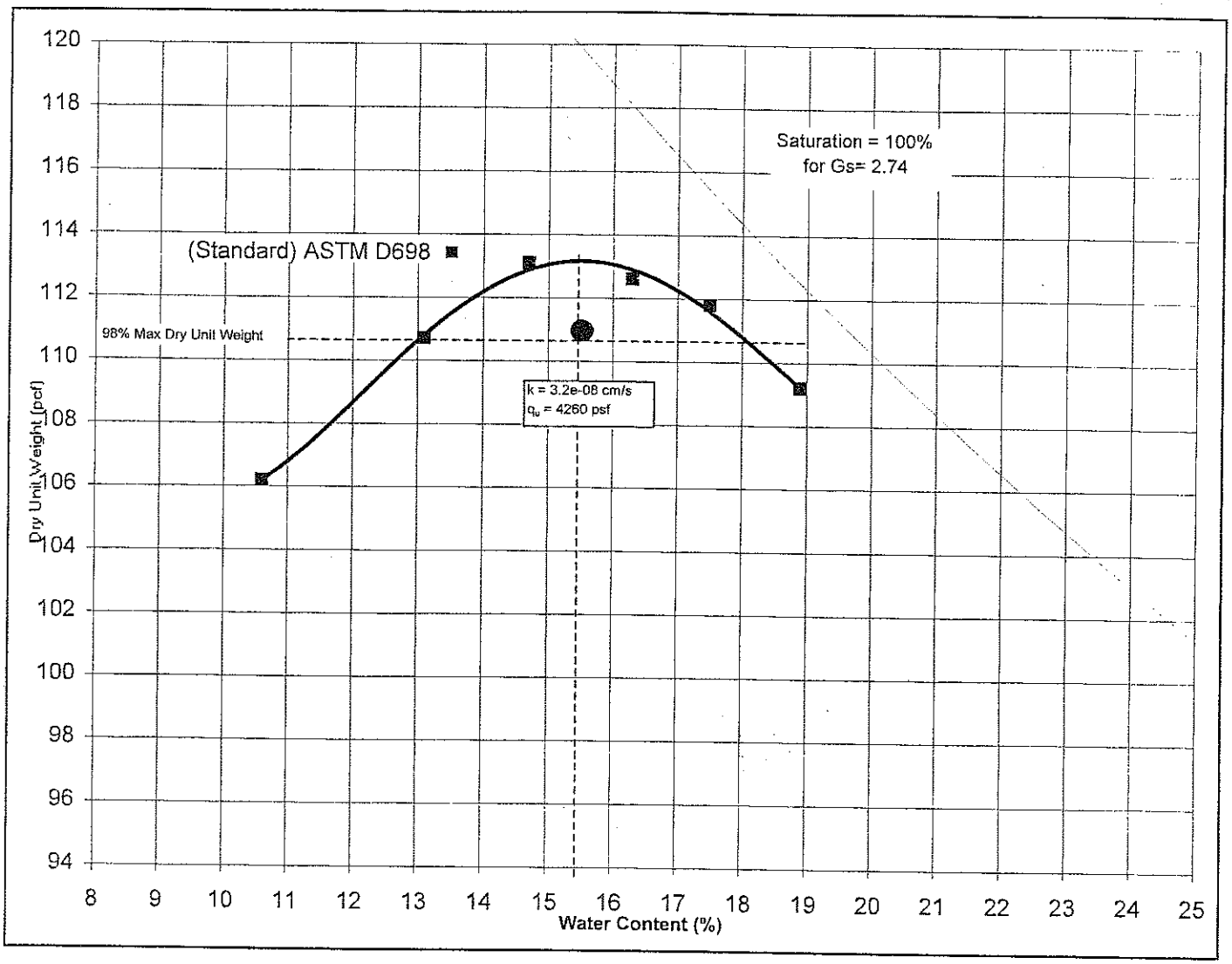
RESULTS OF COMPOSITE BORROW TESTING:

(INCLUDING STANDARD PROCTOR, REMOLDED PERMEABILITY, AND REMOLDED UNCONFINED COMPRESSION TESTING)

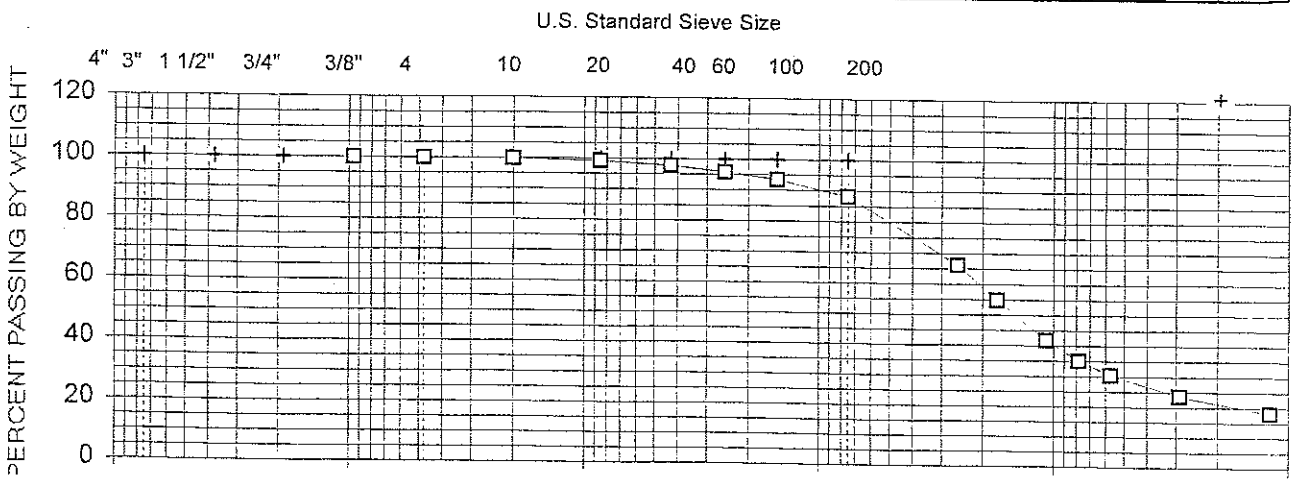
(POND 10 PROJECT AREA)

SUMMARY OF BORROW INVESTIGATION
"POND 10"

Project: Dayton Power and Light Co.					
Sample Location:	Pond 10 composite			Depth(ft):	0.5-8' variable
Material:	Brown Lean Clay. CL				
Method of Compaction:	ASTM D698-91-A (Standard); Dry Prep. Method, (manual rammer); Reprocessed material.				
Opt. Water Content (%)	15.5	Specific Gravity:	2.74 (boil method)	Liquid Limit	31
Max Dry Unit Wt (pcf)	113.2	Ave. As-received Water Content, %	24.3	Plastic Limit	18



COBBLES	%GRAVEL = 0.1		%SAND = 11.8			%SILT = 67.1	%CLAY = 21.0
	COARSE	FINE	COARSE	MEDIUM	FINE		



File: Pd10sum.xls Project No.: 3808E06133 Plotted by: TAG Reviewed by: PJK / TAG Date: 7/2/99 Fig. No. 2

URS Greiner Woodward Clyde

PERMEABILITY TEST
VARIABLE HEAD TEST WITH CONSTANT VOLUME U-TUBE
TEST METHOD: ASTM D 5084

Project Number: 3808E0613300 Project Name: Dayton Power and Light Co.
Sample Identification: Ashpond 10 composite; variable depth ~1-9 ft
Sample Classification: Brown Lean Clay (CL) with sand Test # 1

Apparatus Number: 2 Cell Number: P-11 Date: 4/28/99

Test Sample Data

Specimen Height (in):	4.009	Specimen Diameter (in):	2.878
	4.009		2.878
			2.878
Average Height (in):	4.009	Average Diameter (in):	2.878
L, Average Height (cm):	10.183		
		A_o, Sample Area(cm^2):	41.970
Initial Wet Sample wt (g):	875.7	A_c, Final Area(cm^2):	41.212
Specimen Height: Final (in):	3.985	Specific Gravity of Sample:	2.74

Water Content

	Initial		Final
Pan Number:		Pan Number:	
Pan weight:	0	Pan weight:	132.8
Wet Sample + Pan Weight:	875.7	Wet Sample + Pan Weight:	1033.6
Dry Sample + Pan Weight:	755.6	Dry Sample + Pan Weight:	888.4
Water Content, %:	15.9	Water Content, %:	19.2
% Over Optimum:	0.4		

	Initial	Final
Dry Density (pcf):	110.4	112.3
Wet Density (pcf):	128.0	133.9
Degree of Saturation (%):	79.4	100.9
% Compaction (Standard Proctor):	97.5	

Test Sample Run Data

Run	Date	Start Time	Elapsed Time (min)	Temp. °C		Gradient	Mercury Readings Right (h_{Ro})	Mercury Readings Left(h_{Lo})	Perm.@20°C (cm/sec)
1	4/27/99	1232	144	25	Initial	20.92	37.40	20.56	
					Final	17.28	35.47	21.56	3.1E-08
2	4/27/99	1517	124	25	Initial	20.95	37.42	20.55	
					Final	17.80	35.74	21.41	3.1E-08
3	4/27/99	1730	133	25	Initial	20.94	37.41	20.55	
					Final	17.66	35.67	21.45	3.1E-08
4	4/28/99	911	142	24	Initial	20.75	37.32	20.61	
					Final	17.07	35.35	21.61	3.4E-08
					AVERAGE PERMEABILITY @ 20°C=				3.2E-08

Maximum Cell Pressure: 90 psi
Confining Pressure: 5 psi
Maximum Back Pressure: 85 psi

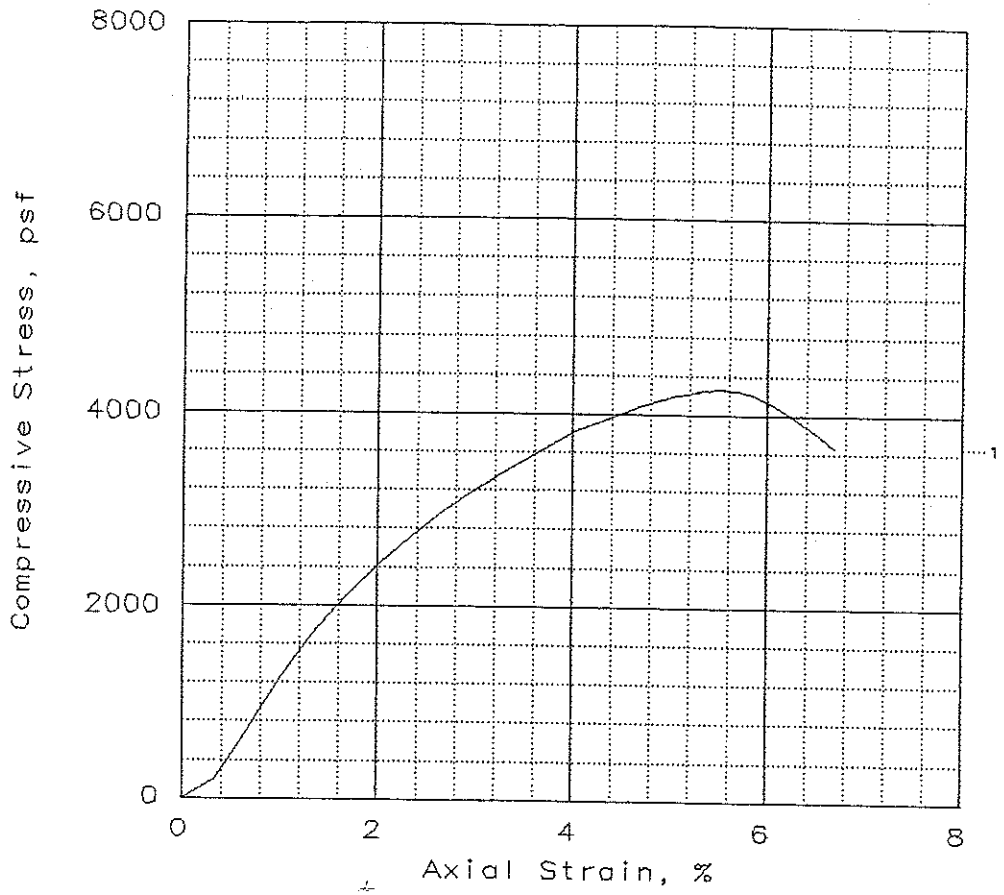
Permeant Liquid Utilized: City tap water (deaired)

B Coefficient: 1.0

Remarks: Standard proctor Maximum dry density / Optimum moisture content is 113.2 pcf / 15.5%.

Technician: TAG Checked By: TAG

UNCONFINED COMPRESSION TEST



SAMPLE NO.:	1			
Unconfined strength, psf	4260			
Undrained shear strength, psf	2130			
Failure strain, %	5.5			
Strain rate, in/min	0.0620			
Water content, %	15.1			
Wet density, pcf	128.8			
Dry density, pcf	111.9			
Saturation, %	78.3			
Void ratio	0.5281			
Specimen diameter, in	2.88			
Specimen height, in	5.97			
Height/diameter ratio	2.07			

Description: Brown Lean Clay CL ;Std Proc 113.2 pcf/ 15.5% mc

LL = 31	PL = 18	PI = 13	GS= 2.74	Type: Remolded

Project No.: 3808E06133.00

Date: 5/5/99

Remarks:
Test performed on reprocessed material @ 98.9% max dry dens / -0.4% of optimum moisture content.

Fig. No.: 05

Client: Dayton Power and Light Co.
Aberdeen, Ohio

Project: Ashpond 10

Location: Ashpond 10 composite sample taken @ variable depths.

UNCONFINED COMPRESSION TEST

WOODWARD-CLYDE CONSULTANTS

Project and Sample Data

Date: 5/5/99
Client: Dayton Power and Light Co. Aberdeen, Ohio
Project: Ashpond 10
Sample location: Ashpond 10 composite sample taken @ variable depths.
Sample description: Brown Lean Clay CL ;Std Proc 113.2 pcf/ 15.5% mc
Remarks: Test performed on reprocessed material @ 98.9%
max dry dens / -0.4% of optimum moisture content.
Fig no.: 05 2nd page Fig no. (if applicable):
Type of sample: Remolded
Specific gravity= 2.74 LL= 31 PL= 18 PI= 13

Specimen Parameters for Specimen No. 1

Specimen Parameter	Initial
Wt. moist soil and tare:	1313.500
Wt. dry soil and tare:	1141.280
Wt. of tare:	0.000
Weight, gms:	1313.5
Diameter, in:	2.878
Area, in²:	6.505
Height, in:	5.971
% Moisture:	15.1
Wet density, pcf:	128.8
[illegible] density, pcf:	111.9
[illegible]d ratio:	0.5281
% Saturation:	78.3

Test Readings Data for Specimen No. 1

Deformation dial constant= 0.001 in per input unit
Primary load ring constant= 0.687 lbs per input unit
Secondary load ring constant= 0 lbs per input unit
Crossover reading for secondary load ring= 0 input units
Strain rate, in/min = 0.0620
Unconfined compressive strength = 4260 psf at reading no. 19
Unconfined ultimate strength = not selected

No.	Def. Dial Units	Def. in	Load Dial Units	Load lbs	Strain %	Deviator Stress psf
0	0.0	0.000	0.0	0.0	0.0	0
1	20.0	0.020	13.0	8.9	0.3	197
2	40.0	0.040	46.0	31.6	0.7	695
3	60.0	0.060	82.0	56.3	1.0	1234
4	80.0	0.080	113.0	77.6	1.3	1695
5	100.0	0.100	140.0	96.2	1.7	2093
6	120.0	0.120	162.5	111.6	2.0	2422
7	140.0	0.140	183.0	125.7	2.3	2718
	160.0	0.160	201.0	138.1	2.7	2975
9	180.0	0.180	217.0	149.1	3.0	3200
10	200.0	0.200	232.5	159.7	3.3	3417
11	220.0	0.220	247.0	169.7	3.7	3618

Test Readings Data for Specimen No. 1

No.	Def. Dial Units	Def. in	Load Dial Units	Load lbs	Strain %	Deviator Stress psf
12	240.0	0.240	261.0	179.3	4.0	3810
13	260.0	0.260	271.5	186.5	4.4	3949
14	280.0	0.280	281.0	193.0	4.7	4073
15	290.0	0.290	285.5	196.1	4.9	4131
16	300.0	0.300	289.5	198.9	5.0	4181
17	310.0	0.310	292.5	200.9	5.2	4217
18	320.0	0.320	295.5	203.0	5.4	4253
19	330.0	0.330	296.5	203.7	5.5	4260
20	340.0	0.340	296.5	203.7	5.7	4252
21	350.0	0.350	294.0	202.0	5.9	4209
22	360.0	0.360	289.0	198.5	6.0	4130
23	370.0	0.370	282.5	194.1	6.2	4030
24	380.0	0.380	275.0	188.9	6.4	3916
25	390.0	0.390	267.0	183.4	6.5	3795
26	400.0	0.400	258.5	177.6	6.7	3668

Triaxial Shear Test Results
DP&L Bottom Ash

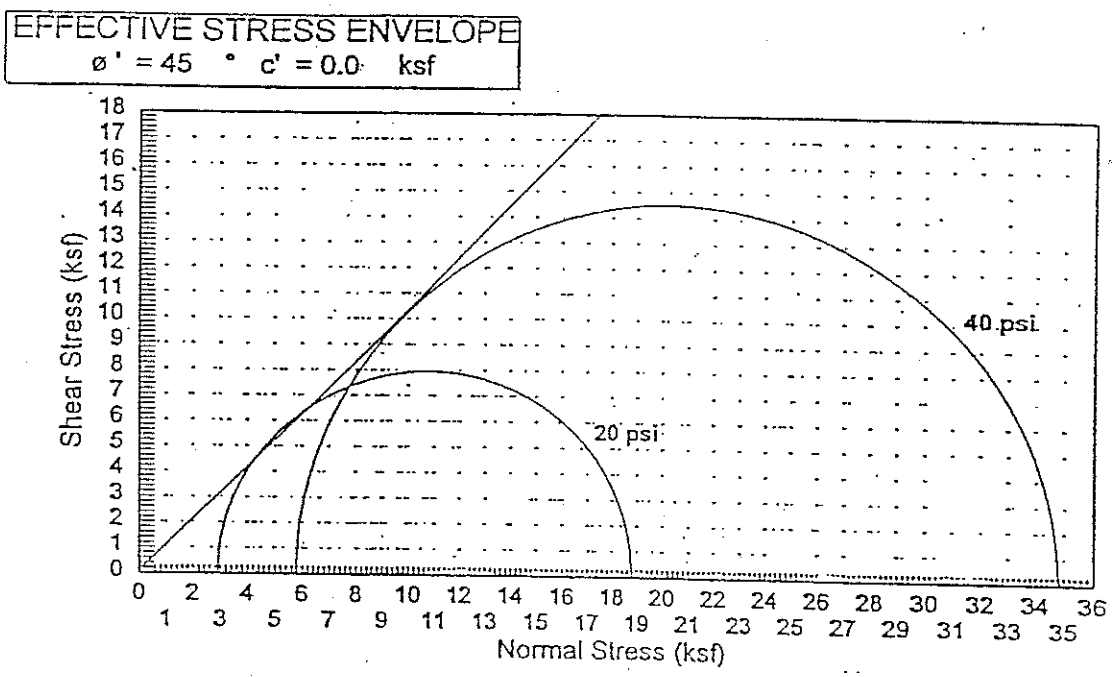


Figure 3