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WM WASTE MANAGEMENT

PHASE 14 SOLID WASTE PERMIT APPLICATION

VOLUME IV OF VI

Landfill Engineering Report

Crossroads Landfill

Norridgewock, Maine

Prepared for

Waste Management Disposal Services of Maine, Inc.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF APPENDICES

1. INTRODUCTION

1.1 Purpose and Organization

This Landfill Engineering Report was prepared for the proposed Phase 14 landfill waste disposal unit at the Crossroads Landfill (Crossroads) by Geosyntec Consultants (Geosyntec) for Waste Management Disposal Services of Maine, Inc. (WMDSM). This report was prepared by Mr. Nicholas J. Yafrate, Mr. Youngmin Cho, and Mr. Scott M. Luettich, P.E. (Maine PE # 7452), all of Geosyntec.

This report was prepared to satisfy the engineering requirements established by the Maine Department of Environmental Protection (MEDEP) for landfill design, specifically, Chapter 401.2 of the Maine Solid Waste Management Regulations (Maine SWMR), effective 2 November 1998 (revisions effective 12 April 2015). This document represents Volume IV of the Phase 14 Solid Waste Permit Application package, which, in its entirety is organized as follows:

- Volume I Application Form and General Information Requirements
- Volume II Natural Resources Protection Act (NRPA) Application
- Volume III Geologic and Hydrogeologic Assessment Report
- Volume IV Landfill Engineering Report
- Volume V Site Operations Manual
- Volume VI Draft Construction Bid Documents

1.2 Applicable Regulations

Volume IV of this permit application package is focused on demonstrating compliance of the Phase 14 landfill design with the standards set forth in Maine SWMR Chapter 401.2.D, E F, and H. (The requirements of Chapter 401.2.G, Contaminant Transport Analysis, are addressed in the *Geologic and Hydrogeologic Assessment Report* (Volume III) of this permit application.) Table IV-1 lists the specific location in the solid waste permit package where each regulatory requirement / standard is addressed.

1.3 Report Organization

This report is organized to provide a detailed description and present analyses that demonstrate the technical validity of the engineering design of the proposed Phase 14 landfill. The remainder of this report is organized as follows:

- Section 2 describes the major design component features of Phase 14, including the site layout, development sequence, liner and leachate management systems, stormwater management system, landfill gas management system, and final cover; references to the Phase 14 Solid Waste Permit Drawings, including the plan and profile drawings, are made throughout Section 2;

- Section 3 presents the criteria and results of engineering design calculations for the Phase 14 landfill, including slope stability and settlement analyses, liner system performance, leachate management, and landfill gas management;

- Section 4 presents the criteria and results of engineering design calculations for surface water (stormwater) management;

- Section 5 summarizes the results of the contaminant transport analyses presented in the Geologic and Hydrogeologic Assessment Report (Volume III); and

- Section 6 summarizes how the Permit Drawings presented in Appendix IV(a) of this report meet the requirements set forth in the Maine SWMR Chapter 401.2.H.

- A list of references followed by tables and several appendices with supporting documentation and calculations are provided at the end of the report.

2. OVERVIEW AND MAJOR COMPONENTS OF PHASE 14

2.1 Site Layout and Development Sequence

Phase 14 will be constructed at the locations shown on Sheets 1 and 2 of the Permit Drawings presented in Appendix IV(a). Access to Phase 14 will be provided by the current main entrance from US Route 2, upgrades to an existing road past the Tire Processing Facility, and a new portion of road as shown on Sheet 14 of the Permit Drawings. Earthwork for Phase 14 will involve excavating surficial soil stockpiles and the in-situ eolian sand stratum from the landfill footprint (see Sheet 4) and constructing a perimeter berm to establish a lined landfill footprint area of 48.6 acres. As shown on Sheet 5, Phase 14 will be divided into five cells (Phases 14A, 14B, 14C, 14D, and 14E).

The liner and leachate collection system (LCS) for each cell will be placed directly atop in-situ clay or compacted clay subgrade that is placed (backfilled) where over-excavation of the eolian sand stratum is required. The base liner and LCS will slope downward from northeast to southwest, with the LCS sump for each cell located along the southwest perimeter portion of the base grades (Sheet 6). LCS pipes positioned through each cell will facilitate flow of leachate to the sumps (Sheet 7). The leachate will be pumped from each LCS sump through a buried double-containment forcemain pipe to the existing South-Central Pump Station, where it will be pumped with leachate from the other existing landfill units at Crossroads to the on-site leachate storage tanks (Sheet 23).

The perimeter berm surrounding the Phase 14 landfill will consists of a mechanically stabilized earth (MSE) berm in which reinforcing will be used to allow a steeper exterior slope than would be possible with unreinforced soil. The average height of the MSE berm will be 27.5 ft, and the total length will be approximately 6000 ft. Details of the MSE berm are shown on Sheets 20, 21, and 22. A 24-ft wide road will be constructed atop the perimeter berm, and an MSE ramp will be constructed to provide access for the waste hauling trucks and operational vehicles up onto the perimeter berm (Sheets 14 and 21).

Stormwater from future covered (temporary and final) areas of the landfill and from the perimeter access road and ramp will be conveyed via drainage ditches and stormwater pipes around the landfill perimeter to one of four stormwater management basins (Sheet 15). Two of the basins will be newly developed and the other two will be upgrades to existing basins.

Initial cell construction of the proposed Phase 14 landfill will include Phases 14A and 14B. Phase 14A is the smallest landfill cell and will provide limited capacity. As such, Phase 14 A and 14B will be constructed concurrently. The remaining cells will be constructed incrementally, with waste placement beginning in the initial cells constructed (Phase 14A/14B). As shown on Sheets 8 through 12, construction and filling of the subsequent cells will proceed as the disposal capacity is needed. The final cover system will be installed incrementally as final grades are achieved in portions of the landfill (conceptually shown on Sheets 10 through 13).

Additional information about the components of Phase 14 are provided below, and details of the engineering design analyses for each component are provide in Sections 3 and 4 of this report.

2.2 Liner System

The grading plan of the liner subgrade for Phase 14 is shown on Sheet 5 of the Permit Drawings. The liner subgrade will require excavation throughout much of the footprint (shown on Sheets 4 and 5) and construction of a mechanically stabilize earth (MSE) berm around the landfill perimeter. The liner system on the base of all five cells (Phases 14A through 14E) will be sloped down from high points at the northeast ends of the cells such that leachate within each cell will drain in a southwesterly direction to LCS sumps located along the southwest perimeter portion of the base grades of each cell (Sheet 7). The liner system on the interior sideslope of the Phase 14 perimeter berm will be graded at 3H:1V.

The Phase 14 liner system will be configured as follows (from top to bottom):

- 24-in. thick drainage sand leachate collection system (LCS) layer;
- geocomposite drainage layer consisting of nonwoven geotextiles bonded to both sides of a high-density polyethylene (HDPE) geonet (i.e., a double-sided geocomposite);
- 60-mil thick textured HDPE geomembrane;
- Geosynthetic clay liner (GCL); and
- 12-in. thick compacted clay layer.

In some localized areas, additional in-situ silty sand will be removed (over-excavated) prior to placement of the liner system on the base of the landfill. In these areas (see Sheet 4), the silty sand will be replaced with compacted silty clay material to achieve the required subgrade elevations.

2.3 Leachate Collection System

The Phase 14 leachate collection system (LCS) consists of perforated leachate collection pipes, solid leachate conveyance header pipes, leachate collection sumps, a 24-in. thick drainage sand layer, and a double-sided geocomposite located directly atop the geomembrane. As shown on Sheet 7 of the Permit Drawings, the liner/LCS will convey leachate toward the LCS sumps located along the southwest perimeter portion of the base grades for each cell. To prevent more than 12 inches of leachate head from building up in the LCS, leachate flowing through the leachate collection layers will be intercepted by perforated leachate collection pipes embedded in crushed stone wrapped in a geotextile. Leachate in the perforated pipes will flow via gravity to a perforated leachate conveyance header pipe located along the central LCS corridor in each cell and then directly to the associated LCS sump.

The double-sided geocomposite and other liner-system components will extend under each LCS sump, which will be approximately 3 ft deeper than the surrounding base grades. Two 24-in. diameter riser pipes will be embedded in crushed stone within each LCS sump. One of the riser pipes (shown on the Permit Drawings as Primary Riser No. 1) will serve as the primary collection access conduit for insertion of the pump into the LCS sump; the other riser (shown on the Permit Drawings as Primary Riser No. 2) will provide auxiliary leachate removal capacity. The stone in the sump will be completely wrapped with geotextile to preclude infiltration of the drainage sand or waste particles into the sump. The riser pipes will be perforated within the sump area but will be solid as they progress out of the sump and up the sideslope to the leachate vault. A typical detail of the LCS sump for the Phase 14 cells is shown on Sheet 24 of the Permit Drawings.

Further descriptions of the Phase 14 pumps, vaults and piping system are provided in the following section of this report.

2.4 Leachate Transmission System

Leachate collected in the Phase 14 LCS sumps will be transmitted to the existing South Central Leachate Pump Station as follows:

- submersible pumps will pump leachate from each LCS sump through a 3-inch diameter HDPE pipes within the riser pipes up the lined sideslopes to the leachate vault (see details on Sheet 24 of the Permit Drawings);
- leachate from each pump vault will be conveyed into a double-containment forcemain pipe buried in the upper part of the MSE berm running under the inside edge of the perimeter road (Sheet 7 of the Permit Drawings); and
- the double-containment forcemain will continue under the landfill perimeter road down the MSE Ramp and then under the edge of the access road from Phase 14 to the existing South Central Pump Station, then to the on-site leachate storage tanks (Sheet 23 of the Permit Drawings).

A detail of the new forcemain connection into the South Central Pump Station is shown on Sheet 24 of the Permit Drawings. Leachate will be transmitted to the existing onsite storage tanks (located as shown on Sheet 23 of the Permit Drawings) which have a total storage capacity of approximately 1.039 million gallons. Tanker trucks will continue to be used to transport the leachate to two nearby wastewater treatment facilities (SAPPI Paper in Hinkley or Anson-Madison Sanitary District in Madison) in accordance with the current contracts with these entities. Further detailed discussion about leachate treatment/disposal are presented in Sections 3.5 and 3.6 of this report.

2.5 Landfill Gas Management System

Phase 14 will include an active landfill gas collection and control system (GCCS) that is installed incrementally as waste is placed. The GCCS will consist of vertical gas extraction wells connected to a landfill gas main header pipe that runs from Phase 14 to the existing on-site landfill gas-to-energy (LFGTE) plant. The landfill gas main will also be tied-in to the existing flare station between Phase 11 and 12 to provide supplemental capacity to the LFGTE plant, if necessary. Details of incremental gas well installation and related GCCS components are provided on the drawings titled *Phase 14 Landfill Gas System Permit Application*, attached to the GCCS design report, prepared by SCS Engineers (included as Appendix IV(g) to this Volume IV report).

2.6 Final Cover System

As previously described in Section 2.1 of this report, construction and filling of Phases 14A through 14E will proceed as the disposal capacity is needed, and the final cover system will be installed incrementally as final grades are achieved in portions of the landfill (conceptually depicted on Sheets 10 through 12 of the Permit Drawings located in Appendix IV(a) of this report). As shown on Sheets 12 and 13, the final cover system will be installed on 3H:1V landfill sideslopes and on the topdeck area which will be sloped outward at a minimum of 5%.

Pursuant to SWMR Chapter 401.5.H, WMDSM is submitting a proposed alternative design for the Phase 14 final cover system. The alternative final cover will include all components prescribed by SWMR Chapter 401.5.G.(2)(a) with the exception of the 12-inch compacted barrier soil layer. This request is consistent with the alternative final cover approved by MEDEP for the Phase 8 landfill at Crossroads under license amendment S-010735-WD-XH-A, dated 23 July 2012.

The alternative Phase 14 final cover cross section will be comprised of the following components (from top to bottom):

- 6-in. thick vegetated topsoil layer;
- 12-in. thick protective soil layer;
- double-sided geocomposite drainage layer;
- 40-mil thick HDPE textured geomembrane;
- an internally reinforced GCL; and
- 6-in. thick intermediate cover / gas vent layer

A cross-sectional detail of the final cover system is shown on Sheet 30 of the Permit Drawings. And as shown on Sheet 30, the edge of the final cover geomembrane will be welded to the crest of the geomembrane liner around the landfill perimeter.

It is noted that, as part of this alternative design submittal, WMDSM intends to perform controlled and systematic leachate recirculation in Phase 14 to degrade and biologically stabilize the waste more rapidly than would be accomplished with conventional landfilling practices. Similar to the recirculation method accepted by MEDEP for the Phase 8 landfill, leachate recirculation in Phase 14 will be accomplished by spraying leachate on the areas where waste is being placed. The type of distribution technique and the quantity of leachate recirculated will be determined based on location-specific factors such as performance of the landfill gas collection and control system (LFGCCS), waste density, waste type, landfill stability, and final cap construction schedule. The proposed Leachate Recirculation Plan, presented in Appendix IV(i) of this report, includes the leachate recirculation procedures, quantities, monitoring procedures, and reporting procedures to be implemented in Phase 14.

In accordance with SWMR Chapter 401.5.H, the remainder of this section presents discussion and documentation to clearly and convincingly demonstrate technical equivalency of the alternative final cover system. Frequent citations are made herein to the documents titled *Alternative Final Cover System Engineering Report for Phase 14* and the *Phase 14 Leachate Recirculation Plan*, both of which are presented in Appendix IV(i) of this report.

As required in Chapter 401.5.H (1), the benefits of the proposed alternative final cover system are presented below.

- Enhanced and accelerated degradation of the waste. As an integral aspect to obtaining approval for the alternative final cover system and as described in Section 2.3 of the Alternative Final Cover System Engineering Report, WMDSM intends to perform leachate recirculation in Phase 14. This will degrade and biologically stabilize the waste more rapidly than accomplished with conventional landfilling practices. This will be a considerable benefit in that the waste will pose reduced environmental risk after closure of the landfill.
- Less leachate requiring off-site treatment. As addressed in the Leachate Recirculation Plan, moisture in the waste is necessary for the degradation process to occur. As such, much of the recirculated leachate will be utilized in the generation of landfill gas rather than being transported off site for treatment. This will be a further collateral benefit of the alternative cover system.
- Accelerated and more efficient generation of landfill gas for power generation at the on-site LFGTE facility. As described in Section 3.4 of the Alternative Final Cover System Engineering Report, leachate recirculation will increase the rate of landfill gas production. This will allow the on-site LFGTE facility to produce energy more rapidly and efficiently than if leachate were not recirculated, and will result in less landfill gas generation during the post-closure period.
- Increased disposal capacity and conservation of earthen resources. As described in Section 3.8 of the Alternative Final Cover System Engineering Report, the alternative final cover system will produce 78,000 cubic yards of additional disposal capacity in Phase 14. Considering the documented effectiveness of a geomembrane/GCL composite barrier layer, this landfill capacity volume would be more beneficial in servicing the State of Maine for waste disposal purposes rather than being occupied by a layer of soil. Eliminating the soil layer also preserves approximately 78,800 cubic yards of soil and the need to transport it to the site.
- Constructability. As described in Section 3.6 of the Alternative Final Cover System Engineering Report, the Phase 14 alternative final cover system will be considerably easier to construct than the SWMR-prescribed cover system, and will pose less environmental risk for sediment transport due to potential erosion during final closure construction.
- Cost Savings. As described in Section 3.6 of the Alternative Final Cover System Engineering Report, the Phase 14 alternative final cover system will cost approximately $1.8 million less than the SWMR-prescribed cover system.

As required in Chapter 401.5.H (2), the risks and drawbacks of the proposed alternative final cover system are presented below.

- Puncture of the barrier components. As addressed in Section 3.1 of the Alternative Final Cover System Engineering Report, the risk of puncture of the barrier components of the alternative cover system will be mitigated through the experienced and diligent limitations established for operating designated construction equipment and vehicles on the landfill cover system. The ability to detect breaches in the final cover, either visually during routine inspections and/or by reviewing flow quantities in the LCS, coupled with the ease of repairing cover systems further mitigate environmental risks associated with potential puncture of the final cover system.
- Settlement of the cover system. As addressed in Section 3.2 of the Alternative Final Cover System Engineering Report, the risk associated with settlement (actually differential settlement) is minor because even for an extreme set of assumptions, the calculated tensile stress in the geomembrane or GCL components of the alternative cover system remain considerably lower than the tensile strength and strain compatibility of these materials.
- Leakage Rate and Time of Travel. As addressed in Section 4.2 of the Alternative Final Cover System Engineering Report, the risk associated with leakage from the landfill is no different for the alternative final cover system than for the SWMR-prescribed cover system. This is due in large part to the efficiency of the waste-containment (liner and leachate collection) system in removing leachate from the waste, and the very low-permeability clay that underlies the Phase 14 site which produces a time of travel that significantly exceeds the time-of-travel required by the Maine SWMR.

As required in Chapter 401.5.H (3), similar applications of the proposed final cover system are discussed below.

- As discussed in Section 2.2 of the Alternative Final Cover System Engineering Report, Geosyntec's review of solid-waste regulations in many other states has revealed that closure of lined landfills has been allowed using geomembrane only or geomembrane/GCL composite barriers similar to the proposed alternative final cover system for Phase 14. We are aware of more than two dozen landfill units that have been closed with a geomembrane/GCL final cover barrier system that did not include a compacted soil barrier layer. An especially relevant example of this includes the Waste Management owned and operated landfill facility known as Turnkey Recycling and Environmental Enterprises (T.R.E.E.) in the neighboring state of New Hampshire. T.R.E.E has been successful in closing large landfill disposal units using only a geomembrane for the barrier layer. WMDSM's proposed Phase 14 alternative final cover system using a composite geomembrane/GCL barrier layer is actually more robust than the cover system used at T.R.E.E.

As required in Chapter 401.5.H (4), the performance of the alternative final cover system will be equal or superior to the SWMR-prescribed cover system based on the following considerations:

- Enhanced and accelerated degradation of the waste from leachate recirculation. The outcome of the alternative cover system will be superior to the SWMR-prescribed cover because of reduced environmental risk after closure of the landfill.
- Less leachate requiring off-site treatment. The use of recirculated leachate to degrade the waste rather than transporting the leachate to an off-site treatment/disposal facility is an additional environmental and safety benefit resulting from application of the alternative final cover system.
- Accelerated and more efficient generation of landfill gas for power generation at the on-site LFGTE facility. As described above and in Section 3.4 of the Alternative Final Cover System Engineering Report, recirculated leachate will increase the rate of landfill gas production and will therefore allow the on-site LFGTE facility to produce energy more rapidly and efficiently.
- Leakage Rate and Time of Travel. As addressed above and in Section 4.2 of the Alternative Final Cover System Engineering Report, the risk associated with leakage from the landfill from the alternative final cover system is equivalent to the SWMR-prescribed cover system.

As required in Chapter 401.5.H (5), the feasibility of constructing the alternative final cover system, including the ability to provide an adequate level of quality assurance and quality control is discussed below.

- As addressed above and in Section 3.6 of the Alternative Final Cover System Engineering Report, construction of the Phase 14 alternative cover system offers a significant advantage because construction complexities related to installation of the compacted soil layer (e.g., compacted silt clay) will be eliminated. The alternative configuration allows for a more streamlined approach to constructing the cover system. When coupled with the reduced potential for erosion and sediment problems (discussed in Section 3.5.1 of the Alternative Final Cover System Engineering Report), the constructability and the reduced requirements for Construction Quality Assurance (CQA) demonstrates that the alternative cover system is superior to that of the SWMR-prescribed cover system.

As required in Chapter 401.5.H (6), the performance of the alternative cover system through landfill closure and post-closure periods is discussed below.

- Enhanced and accelerated degradation of the waste from leachate recirculation. As discussed above, the outcome of the alternative cover system will be superior to the SWMR-prescribed cover because of reduced environmental risk after closure of the landfill.
- Accelerated and more efficient generation of landfill gas for power generation at the on-site LFGTE facility. As discussed above and described in Section 3.4 of the Alternative Final Cover System Engineering Report, leachate recirculation will increase the rate of landfill gas production. This will result in less landfill gas generation during the post-closure period.

2.7 Stormwater Management

Stormwater will be managed during the active and post-closure stages of Phase 14 using four stormwater management basins. These basins also provide erosion and sediment control functions and are hereafter referred to as erosion control structure (ECS) basins. Sheet 15 of the Permit Drawings shows the location of the ECS basins and how stormwater will be conveyed off the landfill final cover to the ECS basins. Specifically, overland runoff (aka, sheet flow) from the landfill final cover system will be collected in grass-lined benches on the final cover slopes. The cover system benches will convey these flows to rip-rap lined downchutes installed at designated locations down the landfill slopes (see Sheet 15). As shown in the details on Sheets 31 through 35, the downchutes will discharge into perimeter drainage channels (surface ditches) around the landfill perimeter or directly into catch basins. The perimeter ditches will convey the stormwater to catch basins that drain into welded polyethylene (PE) pipe or reinforced concrete pipe culverts buried in the Phase 14 perimeter berm. The locations of the perimeter ditches and culverts are shown on Sheet 15 of the Permit Drawings. The buried pipes will convey the stormwater via gravity flow to one of three ECS basins (i.e., ECS-22A, ECS-32, and ECS-33). Stormwater falling on the MSE access ramp will be collected in a curb and gutter on the ramp and conveyed into catch basins that drain to ECS-23. Suspended sediment in the stormwater will be removed by the filtering/settling systems in the ECS basins (see ECS details on Sheet 35). The stormwater will also be detained in the ECS basins before being discharged at a controlled outflow rate that is lower than the pre-development flowrate and will therefore preclude flooding of adjacent wetland or other downstream areas. Details of the ECS features for removing sediment and detaining flow are shown on Sheet 35 of the Permit Drawings.

Additional information regarding the stormwater management system for Phase 14 is presented in Section 4 and Appendix IV(f) of this report. Additional information and procedures focused on erosion and sediment control are provided in Section 11 of Volume I of this permit application package.

3. LANDFILL DESIGN

3.1 Introduction

In accordance with Chapter 401.2.F of the Maine SWMR, this section discusses the site-specific factors evaluated in the Phase 14 design, design narratives, and design analyses in the form of calculations provided in appendices attached to this document. The following information is provided in accordance with Chapter 401.2.F(1 through 13):

- Slope Stability Assessment;
- Settlement Assessment;
- Stability and Settlement Monitoring Plan;
- Water Balance;
- Leachate Management;
- Landfill Gas Management;
- Landfill Cell Development Plan;
- Phased Landfill Final Cover System;
- Waste Storage, Staging, and Burn Areas Design;
- Waste Characterization and Design Compatibility;
- Surface Water Control Plans;
- Test Pad Submission; and
- Special Construction Requirements.

These topics are addressed in the remainder of this section.

3.2 Slope Stability Assessment

Detailed analyses of the static and seismic stability of Phase 14 were performed for this permit application in accordance with Chapter 401.2.F(1) of the Maine SWMR. The analyses were based on the geotechnical conditions of the site described in the *Geotechnical Site Assessment Report* which is presented as Appendix IV(b) to this engineering report, and groundwater conditions described in Golder's Hydrogeologic Assessment Report (Volume III of this permit application). The stability analyses were performed at seven sections around the landfill perimeter (Sections I through VII) and at an eighth section (Section VIII) across the MSE ramp. The analyses modeled critical conditions that will occur during construction, namely the condition when the existing ground has been excavated to the proposed liner subgrade elevations and the MSE perimeter berm has been constructed adjacent to this excavation, as well as other conditions where live loads from construction equipment could affect the interim stability. The analyses were also performed to model the final post-closure configuration of the landfill to ensure stability failure does not occur when the foundation soils are subjected to the maximum loading conditions.

In accordance with the Maine SWMR, the analyses were performed to address the global stability of potential failure planes that pass through the foundation soils, the waste mass, and/or the final cover and liner system components. The specific static stability analyses include static and seismic evaluations of conditions during construction and after waste has been placed to the final configuration in the landfill. As demonstrated in the computations/analyses presented in Appendix IV(c) of this engineering report. the Phase 14 design meets or exceeds the minimum required factor of safety (FS) set forth in Chapter 401.2.F(1) of the Maine SWMR, as summarized below.

Static Loading Conditions

- The calculated FS values at all eight stability sections are greater than or equal to 1.5 against static slope stability failure for permanent post-closure conditions.

- The calculated FS values are greater than or equal to 1.3 against static slope stability failure for interim (construction) conditions. The FS values were initially calculated considering no consolidation or strengthening of the clay foundation during construction. This is a conservative assumption which rendered acceptably high FS values at six of the eight stability sections. At Sections III and VII, however, the analyses included partial consolidation of the clay foundation which may be necessary to achieve FS $\geq$ 1.3 for initial stability of the MSE berm during construction. Alternatively, additional testing of clay samples from these areas may be performed before construction to further assess whether foundational strength gain will be needed. If additional strength gain is deemed necessary, the MSE berm in the vicinity of Sections III and VII will be constructed to partial height and then allowed to sit (on the order of 6 to 9 months) while the clay foundation strengthens before finishing the berm to its full height. This staged-construction procedure was successfully used to construct portions of the MSE berm for Phase 8. Pre-loading the localized areas of Sections III and VII may also be accomplished before construction with stockpiled materials to minimize the need for staged construction of the berm.

Seismic Loading Conditions

- The seismic stability calculations, also included in Appendix IV(c), demonstrate that the Phase 14 design meets or exceeds the minimum required FS $\geq$ 1.1 for interim construction periods when subject to the 475-year seismic event (earthquake) (i.e. 90% probability of not being exceeded in 50 years), and FS $\geq$ 1.0 for the post-closure period when subject to the 2500-year earthquake (i.e. 90% probability of not being exceeded in 250 years).

In addition to the global analyses described above, calculations were performed to evaluate the FS against punching shear of the MSE berm in locations where the layer of stiff brown clay is underlain by soft gray clay. And veneer stability calculations were performed to evaluate the FS against veneer sliding of the liner components when placed on the inner slopes of the MSE berm, of the final cover system components when placed on the waste sideslopes of the Phase 14 landfill.

3.3 Settlement Assessment

Analyses were made of the potential total and differential settlements of the Phase 14 liner and leachate collection system in accordance with Maine SWMR Chapter 401.2.F(2). The analyses were performed along the alignments of the LCS collection corridor in each cell (Phases 14A through 14E). The subsurface stratigraphy and groundwater elevations below the landfill used in the analyses were modeled using the Phase 14 subsurface stratigraphy and potentiometric groundwater elevations developed by Golder Associates as presented in the *Geologic and Hydrogeologic Assessment Report* (Volume III of the Permit Application). The properties of the subsurface strata for each alignment were based on the geotechnical conditions of the site described in the *Geotechnical Site Assessment Report* presented as Appendix IV(b) to this report. The loading conditions were obtained from the final waste configuration shown on Sheet 13 of the Permit Drawings.

The settlement analyses are presented in Appendix IV(d) of this report. As shown, the design of the Phase 14 meets the requirements of Chapter 401.2.F(2) of the Maine SWMR, specifically: (i) the calculated settlement will not induce unacceptable levels of tensile strain in the liner system; and (ii) the calculated differential settlement of the base of the landfill will not result in unacceptable flattening of the LCS that would disrupt or reduce flow in the leachate collection system to unacceptable levels in the post-settlement condition.

3.4 Stability and Settlement Monitoring Plan

The proposed stability and settlement monitoring plan is provided in Appendix IV(h) to this report. As shown, the plan establishes prescriptive procedures for monitoring during periods of activity in Phase 14 which are defined as waste placement, leachate recirculation, and construction activity within the influence zones of the instruments. The plan also provides quantitative thresholds for interpreting the data and describes specific response actions such as obtaining additional readings, or altering waste-placement activities if/when required. This plan will be incorporated into the Site Operations Manual and forwarded to the MEDEP prior to waste disposal in the Phase 14 landfill.

3.5 Water Balance

3.5.1 Introduction

Pursuant to Chapter 401.2.F(4) of the Maine SWMR, this section provides an assessment of the water balance for Phase 14 relative to the performance of the leachate collection system (LCS) during operations and post-closure periods. In this section, leachate generation rates for Phase 14, and the design of the LCS components, as well as the predicted liner system performance are discussed.

The objectives of the liner and LCS are to contain, collect, and remove leachate while protecting groundwater quality beneath the site. These objectives will be accomplished as follows:

- leachate generation will be minimized by preventing clean stormwater from entering exposed areas of the waste and the LCS; this will be accomplished by: (i) covering waste with daily or interim cover; (ii) covering disposal areas reaching interim waste grades with Interim Geomembrane Cover (temporary tarps) and routing clean runoff from these areas to the surface water management system; and (iii) preventing run-on to the active disposal areas through the use of run-on control features (e.g., ditches, intercell berms, temporary rainflap berms);

- leachate will be collected and conveyed through the LCS and leachate collection pipes to maintain less than 12 inches of sustained leachate head on the liner;

- leachate will be removed from each landfill cell using pumps and forcemain piping, which will convey the leachate to the existing South Central Pump Station, and then to the on-site Leachate Storage Tank Facility; and

- leachate will be stored in the on-site leachate storage tanks and transported by tanker trucks for treatment at permitted off-site wastewater treatment facilities.

3.5.2 Leachate Generation Rates

The volume of leachate that will be generated by Phase 14 was estimated using the United States Environmental Protection Agency (USEPA) Hydrologic Evaluation of Landfill Performance (HELP) Model (Version 3.07). HELP is a quasi-two-dimensional hydrologic model of water movement across, into, through, and out of landfills. The model uses solution techniques that account for surface storage, snowmelt, runoff, infiltration, vegetative growth, evapotranspiration, soil moisture storage, lateral subsurface drainage, unsaturated vertical drainage, and leakage through soil, geomembrane, or composite liners. The HELP model uses climatologic, soil, and landfill design data to predict the peak daily and average monthly runoff, percolation, evaporation, and lateral water drainage.

Analyses were performed for four representative waste placement conditions that will occur during the life of Phase 14: (i) an initial 10-ft thick waste lift with daily cover, (ii) 40-ft thick waste with daily cover, (iii) 40-ft thick waste with a long-term temporary tarp cover (geomembrane), and (iv) 186-ft thick waste with the final cover[1] installed. For each of these conditions, the HELP model was used to calculate a per-acre flow rate of leachate into the LCS. Detailed analyses of the leachate generation rate for the various conditions of the Phase 14 are presented in Appendix IV(e)(i) of this report. The calculated leachate generation rates were then used in the analyses to assess the performance of the liner and leachate collection system, presented in the following sections.

[1] The HELP model was run using the alternative final cover system described in Section 2.6 of this report.

3.5.3 Leachate Collection System Performance

The following engineering performance standards were used to assess the performance of the Phase 14 LCS: (i) performance of the geocomposite drainage layer and resulting head of leachate on the liner; (ii) leachate collection pipe flow capacity; (iii) leachate collection pipe structural integrity; and (iv) clogging potential of the leachate collection materials.

3.5.3.1 Head of Leachate on Liner System

Maine SWMR Chapter 401.2.D(4)(a)(i) requires that the maximum head of leachate on the primary liner not exceed 12 inches or the thickness of the drainage media, whichever is less. For Phase 14, the combined thickness of the geocomposite drainage layer and LCS sand layer will be slightly more than 24 inches; therefore the 12-inch head criterion was used. The maximum anticipated head of leachate on the liner system was calculated for the four configurations described above, namely: (i) an initial 10-ft thick waste lift with daily cover, (ii) 40-ft thick waste with daily cover, (iii) 40-ft thick waste with a long-term temporary tarp cover (geomembrane) and (iv) 186-ft thick waste with the final cover installed. The results of the calculations are presented in Appendix IV(e)(i) of this report. The calculated maximum head of leachate on the liner of 11 inches was found to occur for the condition of daily cover over a 10-ft thick layer of waste.

The analysis also incorporated the effects of reduced transmissivity of the geocomposite drainage layer with increased waste load and possible chemical and biological clogging, which is further discussed in Section 3.5.3.4 of this report. However, since thicker waste will attenuate and/or moderate the rate at which precipitation produces leachate generation, the worst case for head on the geomembrane is appropriately represented in the calculation for an initial 10-ft thick waste lift with daily cover.

3.5.3.2 Flow Capacity of Leachate Collection Pipes

Pursuant to Maine SWMR Chapter 401.2.D(4)(a)(i), an evaluation of the flow capacity of the leachate collection pipes was performed. The parameters used in the analysis include: (i) the required flow rate of leachate in the pipes; (ii) the post-settlement slopes of leachate collection pipes; and (iii) the diameter of the leachate collection pipes. As shown in Appendix IV(e)(ii) of this report, the leachate collection pipes have more than adequate capacity to transmit the expected peak flow rate in the LCS.

3.5.3.3 Structural Integrity of Pipes

Pursuant to Maine SWMR Chapter 401.2.D(4)(a)(iii), calculations were performed to ensure the leachate collection system pipes will withstand the anticipated loads and stresses from the overlying waste, waste cover materials, and operations equipment. As shown in Appendix IV(e)(iii) of this report, the calculations include an analysis of leachate collection pipe ring deflection under expected loading conditions caused by the overlying waste, waste cover materials, and operations equipment. The standard dimension ratio (SDR) of the HDPE leachate collection pipes was selected to provide the required structural integrity (and therefore to continue transmitting leachate) under the expected loading conditions.

3.5.3.4 Clogging Potential of Leachate Collection System

The clogging potential of the LCS was evaluated pursuant to Maine SWMR Chapter 401.2.D(4)(a)(vi). Clogging is defined as the physical build-up of material in a pipe, drainage layer, or filter layer to the extent that leachate flow is significantly restricted. Clogging of LCS components may be caused by physical, chemical, and biological mechanisms. Koerner and Koerner [2007] recommends factors for flow rate reduction due to soil (physical) clogging and blinding, chemical clogging, and biological clogging along with creep and intrusion reduction by overburden stress. As presented in Appendices IV(e)(i) and (ii) of this report, the design of the components of the LCS considered the potential mechanisms of clogging listed above. As shown, the calculated reductions in flow in the LCS components will not render the performance of the leachate collection system lower than what is required to collect and remove leachate from Phase 14. It is noted too, that the Phase 14 LCS design includes LCS cleanouts that will be similar to other previously permitted cells at Crossroads and which have been successfully used to back-flush and maintain/clean the LCS when necessary.

3.5.4 Leachate Transmission System

As previously described in Section 2.4 of this report, leachate collected in the Phase 14 LCS sumps will be transmitted in a dual-containment HDPE forcemain pipe from the leachate vaults to the existing South Central Pump Station. The leachate vaults will be equipped with a leachate leak detection and alarm system and a venting system to prevent landfill gas accumulation in the vaults. Manholes will be installed along the alignment of the leachate forcemain at the locations shown on Sheet 23 of the Permit Drawings. Piping in the manholes will be equipped with fittings to provide access for pipeline cleaning and inspection. Air/vacuum release will be installed approximately every 1,000 ft of the forcemain. Cleanouts for the HDPE pipe, where required, will be provided at approximately 500-foot intervals. The cleanouts will extend to the ground surface into a secondary concrete containment sump. These sumps will provide spill containment during cleaning operations and eliminate the need for worker confined space restrictions as would be required in conventional manholes below grade. A cast iron manhole cover and frame set in a concrete apron will provide access.

Consistent with the LCS sumps in the other existing cells at Crossroads, the leachate pumps, 3-inch discharge pipes, and other equipment will be installed inside the riser pipes extending from the sumps up the lined sideslopes to the pump vaults. An approximate 60-gallon per minute (gpm) submersible pump will be inserted in the primary collection riser (shown as Primary Riser No. 1 on the Permit Drawings), with an approximate 200-gpm pump available to be inserted in the auxiliary riser (shown as Primary Riser No. 2 on the Permit Drawings) in case of rain events that could generate large (but typically short-duration) quantities of leachate. The sideslope riser pipes will terminate inside the leachate vault with sealed bulkheads, as shown on Sheets 25 through 28 of the Permit Drawings. The bulkheads have been designed to allow extraction of the pumps for maintenance purposes. The on/off cycling of the pumps will be controlled by leachate levels in each sump, which will be measured by transducers in the sumps connected to switches in the pump-control panel. The transducers will be housed in separate, 8-inch diameter sideslope riser pipes running from the leachate vaults down to the LCS sumps.

As shown on Sheet 28 of the Permit Drawings, flow will be measured using meter readouts mounted on the exterior wall of the leachate vaults. Sampling ports in the vault will provide access to obtain leachate samples. Check values will prevent backflow. Regulating and shutoff valves may be installed where needed to facilitate maintenance and adjust flow rate. A vacuum/air relief valve for the pumping inside the vault will release air under pressure during filling of the piping. The valve blow-off-line from the vacuum/air relief valve will connect into the bulkhead of the sideslope risers. The design includes a 3-inch diameter truck loadout pipe with a shut-off valve and quick-connect fittings to allow for leachate to be pumped directly into a transport truck in the event that the leachate forcemain, pump station, or leachate storage tanks are non-operational (e.g., during periods of routine maintenance). All connections for the truck loadout are located inside the leachate vault to provide an extra level of containment for the manual connection and transfer activities.

The Phase 14 leachate/riser vault design provides for worker accessibility to valves and meters inside the vault, and general worker occupancy without confined space entry restrictions. As shown on Sheet 28 of the Permit Drawings, access to the leachate vaults will be through a set of double-steel insulated doors. Gas monitoring equipment (%oxygen / explosivity (% Low Explosive Limit (LEL)) / hydrogen sulfide) will monitor the ambient atmosphere within the vaults. The monitors will be connected to the control panel to activate ventilation equipment at preset trigger levels. If the fan is not successful in ventilating the leachate vault and the ambient air concentrations do not drop below preset levels, electric power to specific building equipment will be automatically disconnected and a warning light/alarm will be activated. A sideslope riser vent has been provided to vent gases to the atmosphere which may collect inside the sideslope riser pipes, thereby limiting the potential for landfill gas to collect in the vaults.

As shown on Sheets 25 and 28 of the Permit Drawings, the pump control panel and electrical boxes will be located on the outside wall of each vault. An emergency power (generator) receptacle is provided for connection to a portable backup generator in the event of an extended power outage. Ground Fault Circuit Interrupter (GFCI) receptacles are included outside the vault on the two end walls for connecting outside equipment such as truck block heaters or maintenance equipment if/when needed. Area lighting, controlled by photoelectric switches with manual overrides, are included at the outside entrance and on each end wall of the leachate vaults.

The concrete foundation of each leachate vault consists of a conventional cast-in-place 8-inch-wide concrete frost wall and a 16-inch-wide keyed footing (Sheet 25). A reinforced concrete floor slab is included inside the leachate vaults. The foundation and floor slab will provide containment, should a leachate spill occur inside the vaults. The concrete floor is sloped to drain to an HDPE collection sump, which is to be fitted with a liquid level detector. A liquid sensor, connected into the control panel, is included in the HDPE collection sump to activate a warning light/alarm and to electrically disrupt landfill sump pump equipment if liquid is detected in the vault sump.

Leachate will be conveyed from the Phase 14 leachate vault through a buried double-containment HDPE transfer pipe. The transfer piping will consist of 8-inch carrier pipe inside a 14-inch containment pipe, installed at a minimum slope of 0.005 ft./ft. Although a smaller diameter carrier pipe is adequate for flow capacity, an 8-inch carrier pipe will be used to facilitate ease of cleaning and potential camera examination after installation. Any breach in the 8-inch carrier pipe, if it were to occur, will flow from the carrier pipe into the outer 14-inch diameter containment pipe then to the nearest downslope leak-detection manhole, which will be located at an interval of approximately every 1000-ft along the forcemain pipe.

3.5.5 Leachate Storage System

Historic leachate generation rates of the existing landfill cells at Crossroads range from approximately 50,000 to peak rates of 100,000 gallons per day. Since the operational size of Phase 14 will be similar to the current operation in Phase 8, the anticipated leachate generation rate of Phase 14 (when averaged over the long-term) will be conservatively no more than 50,000 to 100,000 gallons per day, depending on the open active area, waste thickness, installation of impermeable temporary tarp, and diversion of clean stormwater from the active landfill area. As explained in Section 3.6.5, the existing leachate tanks' storage capacity of approximately 1.039 million gallons will provide sufficient temporary storage of leachate prior to transportation to the nearby treatment facilities in Hinkley and Madison. As such, WMDSM will continue to utilize the existing leachate storage tanks for Phase 14. The location of the existing leachate storage tanks is shown on Sheet 23 of the Permit Drawings, and further information regarding leachate treatment/disposal at the facilities in Hinkley and Madison is presented in Section 3.6.5 of this report.

3.6 Leachate Management

In accordance with Chapter 401.2.F(5) of the Maine SWMR, this section discusses the leachate management system for the site.

3.6.1 Description of Leachate Management Method

Pursuant to Chapter 401.2.F(5)(a) of the Maine SWMR, descriptions of the Phase 14 leachate collection, transmission, and transfer system are provided in Sections 2.3 and 2.4 of this report. Since Phase 14 won't require changes to the on-site leachate storage tanks or existing treatment agreements for the site, leachate will continue to be managed in accordance with the methods and procedures outlined and described in Section III of the Site Operations Manual (i.e., Leachate Management Plan).

3.6.2 Design for Leachate Conveyance and Storage System

Pursuant to Chapter 401.2.F(5)(b) of the Maine SWMR, specific design calculations for the leachate conveyance system (i.e., sump and pump sizing and head losses in transmission (conveyance) system) are provided in Appendices IV(e) of this report. As demonstrated in these calculations, the Phase 14 leachate transmission system has been designed to manage and transmit the calculated flows. The leachate transmission system was described in Section 3.5.4 and the storage system was described in Section 3.5.5 of this report.

3.6.3 Leachate Recirculation

Chapter 401.2.F(5)(c) of the Maine SWMR requires that applicants present a design for an on-site recirculation facility, if applicable. As discussed in Section 24 of Volume I of this permit application package, WMDSM intends to recirculate leachate to enhance degradation of the waste in Phase 14. The recirculation approaches and methodologies will be consistent with those approved by MEDEP for the Phase 8 landfill[2].

3.6.4 Leachate Pretreatment

Chapter 401.2.F(5)(d) of the Maine SWMR requires that applicants present an evaluation of expected leachate quality over the active life of the landfill to determine the need for pretreatment. Since the Phase 14 operations and waste types will be consistent with the current Phase 8 operations at the site, the quality of leachate from Phase 14 is expected to be consistent with that of the existing leachate. The current leachate disposal agreement with local wastewater treatment facilities (i.e., SAPPI in Hinkley, Maine and the Anson-Madison Sanitary District in Madison, Maine) do not require pretreatment of the leachate from the site. Copies of these contracts are provided in APPENDIX 13A of Volume I of this solid waste permit application package. As such, no pretreatment of leachate is intended for Phase 14.

3.6.5 Leachate Management Plan

Pursuant to Chapter 401.2.F(5)(e) of the Maine SWMR, drawings of the leachate conveyance and storage system are provided on Sheet 23 of the Permit Drawings. Leachate from Phase 14 will be stored in the existing leachate storage tanks at the site, from which it will be transferred by tanker trucks to local wastewater treatment facilities. WMDSM has existing leachate disposal contracts to treat up to 408,000 gallons per day, consisting of their agreements with SAPPI in Hinkley, Maine for up to 376,000 gallons per day, and with the Anson-Madison Sanitary District in Madison, Maine for up to 32,000 gallons per day. Copies of these contracts are provided in APPENDIX 13A of Volume I of this solid waste permit application package. As previously described in Section 3.5.5 of this report, the maximum calculated quantity of leachate from the Crossroads facility once Phase 14 is operational will be less than 300,000 gallons per day (gpd) which is a conservative estimate of 100,000 gpd from the existing landfill Phases 1 through 12 (for a limited time prior to Phase8 being closed) plus a conservative estimate of 200,000 gpd from Phase 14. This maximum combined quantity is less than the existing agreements for the disposal of up to 408,000 gallons per day. The truck loadout station adjacent to the tanks allows for filling one 8000-gallon truck every 20 minutes. WMDSM's contracted trucking company (HO Bouchard) is capable of running multiple trucks 24 hours/day, 7 days/week. Therefore, up to 576,000 gpd could be loaded in tanker trucks and transported to the treatment facilities. With that said and as stated above, the allowable combined volume of leachate accepted at SAPPI and Anson-Madison Sanitary District is 408,000 gpd. WMDSM's operational protocol is to maintain the leachate storage tanks at levels whereby approximately 60% of maximum capacity is available

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[2] MEDEP License Amendment #S-010735-WD-XH-A dated July 2012 and Condition Compliance #S-010735-WD-XP-C dated September 2014.

(i.e., 60% of 1.039 million gallons = 623,400 gallons). As such, the current tanks will provide more than 2 days of peak excess storage capacity in the unlikely event of interrupted or reduced tanker truck service.

The leachate conveyance and storage systems are equipped with a secondary containment system and early detection and response of leakage, including the sumps in the leachate vault and the leak-detection/cleanout manholes associated with the leachate conveyance forcemain. In addition, the leachate vaults will be equipped with an emergency shut-off system of the leachate management system (including pumps) should leachate leakage occur in the leachate vault. Should a leak occur within the pump vaults, leachate from the sumps will be securely pumped using onsite equipment and disposed of at the active secure landfill.

The maintenance, inspections, and monitoring of the leachate management system at the site are presented in Section III of the Site Operations Manual (i.e., Leachate Management Plan).

3.7 Landfill Gas Management

As previously described in Section 2, an active GCCS will be installed incrementally as waste is placed in Phase 14. SCS Engineers (SCS) has designed many aspects of the site-wide GCCS at Crossroads for many years. For Phase 14, SCS has performed modeling of the waste type and tonnage and has developed a preliminary design for the vertical GCCS wells that will be installed incrementally as waste is placed in Phase 14, and for a landfill gas main header pipe that will run from Phase 14 to the existing on-site landfill gas-to-energy (LFGTE) plant. Details are provided in the GCCS design report, prepared by SCS Engineers (included as Appendix IV(g) to this Volume IV report) and on the drawings titled Phase 14 Landfill Gas System Solid Waste Permit Application attached to SCS's report. Specific aspect and components of the GCCS design are summarized below.

Based on the projected waste quantities and characteristics for Phase 14, SCS has calculated the gas recovery using the Landfill Gas Emission Model (LandGEM). The vertical gas-extraction well spacing has been established based on the gas recovery estimates. The estimated 100-ft radius of influence will result in 68 vertical gas-extraction wells in Phase 14. The wells will be incrementally installed as waste is placed in Phase 14. Other supplemental features include connecting the leachate cleanout pipes and surface collectors, which may be installed if needed directly beneath the final cover system, to the vacuum header pipe. The header pipe will be installed as a loop header around the Phase 14 perimeter and will be sloped at ≥5% to allow condensate to drain into the wells or cleanouts and then into the LCS.

SCS anticipates that the initial vacuum requirements for Phase 14 can be provided by the existing blowers, and that the level of vacuum will be assessed periodically as waste is placed with provisions to size and install a supplemental blower if necessary. The landfill gas main from Phase 14 will also be tied-in to the existing flare near Phase 11 to provide supplemental capacity to the LFGTE plant, if necessary.

Based on the design of the GCCS, and because the Phase 14 final cover geomembrane will be continuously welded to the geomembrane liner, SCS concludes that migration of landfill gas from Phase 14 is not expected. As part of the operations requirements for Phase 14, WMDSM will incorporate Phase 14 landfill gas specifics into the approved Gas Migration Monitoring Plan (Volume II, Section VI of the Site Operations Manual) prior to commencement of waste placement.

3.8 Landfill Cell Development Plan

As required by Chapter 401.2.F(7) of the Maine SWMR, a cell development plan for the phased operations of the Phase 8 Secure Landfill is required and provided yearly with the site's Annual Report. Specifically, the phased operations plan must address the sequence of waste and cover placement at the site, manage stormwater run-on and run-off, manage leachate, protect the liner system, and maintain stability. The Phase 14 sequential stages of site development (cell construction), waste placement, and final cover construction are shown on Sheets 8 through 12 of the Permit Drawings. The incremental and cumulative disposal capacities provided by each sequence of cell construction and filling are also shown on each of these sheets. Phase 14 landfill cell development plans will be provided within the Annual Report to the MEDEP once waste disposal activities commence.

3.9 Phased Landfill Final Cover System

According to Chapter 401.2.F(8) of the Maine SWMR, WMDSM plans to install the final cover system in staged increments during the operational life of the Phase 14. The areas over which this is envisioned are illustrated on Sheets 10 through 12 of the Permit Drawings. WMDSM will submit a final closure application with construction drawings and other documents for approval by the MEDEP prior to performing closure construction of any portion of the Phase 14 landfill.

3.10 Waste Storage, Staging, and Burn Areas

According to Chapter 401.2.F(9) of the Maine SWMR, a waste storage, staging, and burn area operating plan must be submitted if these operations are proposed outside of the solid waste boundary. WMDSM does not anticipate having any waste storage, staging, and/or burn areas outside of the solid waste boundary for Phase 14. Therefore, the requirements of Chapter 401.2.F(8) do not apply to this permit application.

3.11 Waste Characterization and Design Compatibility

As indicated in Chapter 401.2.F(10) of the Maine SWMR, a waste characterization and design compatibility assessment must be provided in the solid waste permit application. The wastes that are proposed for disposal in the Phase 14 landfill are the same as the currently approved waste streams for the Crossroads Landfill. This approved waste stream is identified in Section I, Part B of the Site Operations Manual (i.e., Waste Characterization / Acceptance). The containment system materials for Phase 14 (e.g., liner and LCS components) are the same as has been used for several of the previous phases at Crossroads. Therefore, further analyses of physical characteristics, chemical characterization, compatibility with other wastes, and compatibility with engineered systems are not formally included in this permit application.

3.12 Surface Water Control Plans

In accordance with Chapter 401.2.F(11) of the Maine SWMR, an erosion and sediment control plan meeting the requirements of Chapter 400.4.J, and a stormwater management plan meeting the standards and submission requirements of Chapter 400.4.M of the Maine SWMR are provided in this solid waste permit application. The erosion and sediment control plan is provided in Section 11 of Volume I of this permit application, and the Stormwater Management Plan was briefly described in Section 2.7, with details presented subsequently in Section 4 of this report.

3.13 Test Pad Submission

In accordance with Chapter 401.2.F(12) of the Maine SWMR, a test pad program may be implemented by WMDSM to demonstrate that a proposed barrier soil and construction methods will result in a barrier soil that meets the requirements of the Maine SWMR. If WMDSM decides to implement a test pad program (as has been done for previous landfill units at Crossroads and most recently conducted for the Phase 8C″ PM landfill cell construction (Geosyntec 2019)), then a detailed work plan will be submitted to MEDEP with the construction documents for the applicable Phase 14 cell(s).

3.14 Special Construction Requirements

Chapter 401.2.F(13) of the Maine SWMR requires that information on all measures to be taken to minimize the disturbance of soil material within five feet of the bedrock surface be submitted at facilities where groundwater monitoring in bedrock is anticipated or being conducted. As indicated on the Permit Drawings and as described in Volume III of this permit application, the liner system will be vertically no closer than 5 ft from the bedrock surface. Therefore, special construction requirements relative to bedrock do not apply to Phase 14.

Although not specifically prescribed by Chapter 401.2.F(13) of the Maine SWMR, groundwater conditions in some portions of Phase 14 will likely need to be addressed during construction. As previously described in Section 2.1 of this report and as shown on Sheet 4 of the Permit Drawings, earthwork for Phase 14 will involve excavating the in-situ eolian sand stratum from the landfill footprint. In some areas, mostly in Phases 14A, 14B and 14C, the potentiometric groundwater levels in the clay are higher than the required excavation grades. Because the clay has very low hydraulic conductivity, this may not cause a significant influx of groundwater into the excavation. Nonetheless, the contractor will be required to control the groundwater locally near the excavation, with specific requirements to maintain the lower potentiometric head until after the liner is constructed and some waste has been initially placed within the landfill cells. Since groundwater levels fluctuate seasonally, additional groundwater level measurements will be obtained during the time leading up to construction to assess the need for groundwater control during construction, such that the specific requirements can be incorporated into the construction documents for the applicable cells.

4. STORMWATER MANAGEMENT

4.1 Existing Site Hydrology

The Crossroads facility is located within the north-central portion of the Mill Stream watershed. Mill Stream, a tributary to the Kennebec River, flows through WMDSM's property, crosses under U.S. Route 2 via twin 51-inch-diameter reinforced concrete pipe (RCP) culverts, and then flows to the Kennebec River. The total drainage area of the Mill Stream watershed at the Route 2 culverts is approximately 3.03 square miles. The landfill site contributes about 0.67 square miles (i.e., 22 percent) of the total drainage area at the Route 2 crossing. Runoff from the Crossroads facility is diffuse, with numerous outlet points, which discharge stormwater runoff and stream flow to various unnamed tributaries of Mill Stream (GZA, 1996[3]). The Mill Stream is not identified as a *waterbody most at risk from new development* as defined in 06-096 CMR 502.

Existing conditions with respect to Phase 14 stormwater management were established by examining: "Topographic Survey", Boynton and Pickett, September 2018; and "Groundwater Contours" by Golder Associates based on field data gathered on 2 May 2018, as well as field observations, discussions with WMDSM personnel, and existing design documentation and calculations from previously permitted disposal units at the Crossroads facility.

4.2 Design Criteria

Design criteria were established for development of the permanent post-closure stormwater management system based on requirements of Maine Site Location of Development Law Guidelines for Solid Waste Management (06-096 CMR, Chapter 400). Calculations demonstrating compliance with the design approach are discussed below and documented in the Stormwater Management Calculation Package presented in Appendix IV(f) of this report. Please refer to Section 4.6 of this report for a conclusion of how the proposed Phase 14 stormwater management system will meet the MEDEP design criteria outlined below:

- Per 06-096 CMR, Chapter 400, Part 4.H.(1)a, a solid waste facility may not discharge any water pollutants, directly or indirectly, that affect the state classification of a surface water body, as specified in 38 M.R.S.A. §464.

- Per 06-096 CMR, Chapter 400, Part 4.J(1), the solid waste facility must be located on soils suitable for the nature of the undertaking and the facility must not cause unreasonable sedimentation or erosion of soil.

[3] "Volume VII, Stormwater Management Report, Crossroads Landfill, Phases 9, 11 & 12 Expansion, Norridgewock, Maine", GZA GeoEnvironmental, Inc. May 1996.

- Per 06-096 CMR, Chapter 400, Part 4.M(1)(a), except for an agronomic utilization site, a solid waste facility may not be located in a 100-year flood plain or restrict the flow of a 100 year flood.

- Per 06-096 CMR, Chapter 400, Part 4.M(1)(b), a solid waste facility must include a stormwater management system that controls run-on and run-off, and infiltrates, details, or retains water falling on the facility site during a storm of an intensity up to and including a 25-year, 24-hour storm, such that the rate of flow of stormwater from the facility after construction does not exceed the rate of outflow of stormwater from the facility site prior to construction.

4.3 Post-Closure Stormwater Management

The components of the Phase 14 stormwater management system are depicted on Sheets 15, and 31 through 36 of the Permit Drawings. The proposed stormwater management system includes:

- a landfill perimeter berm which prevents stormwater run-on to the waste disposal area and limits stormwater runoff to the landfill closure system;

- a series of vegetated-lined cover system benches; rip-rap lined downchutes; geosynthetic lined, vegetated, and/or riprap perimeter swales/ditches; concrete catch basins and buried storm drain pipes/culverts that collect stormwater runoff from covered landfill surfaces and conveys these flows to designated ECS basins;

- construction of two new ECS Basins (ECS-32 and ECS-33) adjacent to the southwest and north edges of Phase 14, respectively; and

- upgrades of two existing ECS Basins (ECS-22A and ECS-23) located south of Phase 14.

4.4 Analyses and Design Methodology

The general methodology and analytical assumptions used to model the Phase 14 stormwater management system are summarized below. Detailed input data and calculations are presented in Appendix IV(f), Stormwater Management Calculations package.

The post-closure stormwater hydrology was simulated based on the post-closure design plans. This scenario assumes final cover system construction is complete and slopes are stabilized with the specified vegetation. The post-closure design methodology included:

- The post-closure landfill surface was divided into four sub-catchment areas. Each sub-area drains to a single ECS Basin. Sub-area 33 was further subdivided into sub-areas 33A and 33B which drain to the same ECS Basin (ECS-33). A plan depicting the drainage sub-areas is provided on Sheet 15 of the Permit Drawings. Phase 14 post-closure grades (also shown on Sheet 15) were used to delineate the post-closure sub-watershed areas.

- For each design scenario, the rainfall/runoff response from the drainage sub-areas was modeled using Storm Water Management Model (SWMM) (Version 5.1) computer program (U.S. Environmental Protection Agency, 2018[4]). Input parameters to these models included sub-area watershed characteristics (sub-area size, runoff potential [expressed as a Curve Number (CN)], flow path length, slope, and surface type). The runoff simulations were executed using a 24-hour, Type II rainfall distribution pattern. The rainfall/runoff simulations were run for the 25-year, 24-hour (4.9 inches) and 100-year, 24-hour (6.7 inches) design storms.

- The Phase 14 stormwater management system conveyance components (i.e., slope drainage benches and downchutes, catch basins, swales, and pipes) were sized to convey the 25-year, 24-hour design storm event from the applicable contributing drainage area(s). The Bentley Systems FlowMaster Hydraulic Calculator [Bently, 2019][5] was used to size conveyance channels and conduits.

- Elevation-storage relationships were developed for the existing and proposed ECS basins based on detailed site topography and proposed design grades. As a conservative measure, any infiltration from the drainage sand bedding material into the subsurface soils was neglected in developing basin storage characteristics. Elevation-discharge relationships for existing and proposed outlet structures were modeled in SWMM. ECS basins include a primary outlet structure and an emergency spillway. The primary outlet structure includes a low-level orifice and a primary horizontal orifice. The gated low-level orifice is designed to drain the ECS basin volume in a 72-hour period. These provisions will increase the quiescent settling of particulate matter and provide the ability to throttle basin discharges, thereby enhancing WMDSM's ability to control stormwater flow from the site. The outlet pipe from the riser structure is gated for additional operational flexibility. Each basin is also equipped with a rip-rap-lined emergency spillway sized to pass a 25-year, 24-hour design storm assuming the primary outlet riser structure is inoperative (e.g., clogged) and the starting water surface elevation in the basin is at the invert of the emergency spillway.

4.5 Stormwater Management System

The results of the design analysis of the Phase 14 stormwater management system layout are shown on Sheet 15 of the Permit Drawings. Details associated with the structural stormwater measures are included on Sheets 31 through 36. In summary, the stormwater management system will collect and direct runoff to ECS basins which will provide mechanisms for the settlement/removal of sediment suspended and associated pollutants in the runoff water as well as accommodate the discharge rates of runoff generated from the landfill post-closure area. Landfill perimeter grades are significantly elevated above surrounding undisturbed areas to prevent run-on of stormwater to

[4] USEPA, Storm Water Management Model Version 5.1, USEPA [2018]
[5] Bentley Systems FlowMaster Hydraulic Calculator, Bentley [2019]

the waste disposal area. Detailed output data and calculation results are presented in Appendix IV(f), Stormwater Management Calculations Package.

4.6 Conclusions

The stormwater management system for Phase 14 has been designed to meet the SWMR design criteria as follows:

- Per Chapter 400, Part 4.H.(1)a, a solid waste facility may not discharge any water pollutants, directly or indirectly, that affect the state classification of a surface water body, as specified in 38 M.R.S.A. §464. The proposed stormwater management system has been designed to prevent discharge of pollutants that may affect the state classification of Mill Stream.

- Per Chapter 400, Part 4.J(1), the solid waste facility must be located on soils suitable for the nature of the undertaking and the facility must not cause unreasonable sedimentation or erosion of soil. The proposed stormwater management system including temporary erosion and sediment control best management practices have been designed in accordance with the Maine Erosion and Sediment Control Handbook for Construction: Best Management Practices," prepared by the Cumberland County Soil & Water Conservation District and Maine Department of Environmental Protection (March 1991).

- Per Chapter 400, Part 4.M(1)(a), except for an agronomic utilization site, a solid waste facility may not be located in a 100 year flood plain or restrict the flow of a 100 year flood. The proposed Phase 14 landfill is not located within the 100 year flood plain per the Federal Emergency Management Agency National Flood Insurance Program Flood Insurance Rate Map for the Town of Norridgewock, Maine shown on Map Number 2301780016C, dated May 6, 1996.

- Per Chapter 400, Part 4.M(1)(b), a solid waste facility must include a stormwater management system that controls run-on and run-off, and infiltrates, detains, or retains water falling on the facility site during a storm of an intensity up to and including a 25-year, 24-hour storm, such that the rate of flow of stormwater from the facility after construction does not exceed the rate of outflow of stormwater from the facility site prior to the construction. The calculated post-closure flowrates to the Mill Stream Watershed do not exceed estimated pre-development flowrates associated with the 25-year, 24-hour design storm event as prescribed in 06-096 CMR Chapter 500 Stormwater Management Rules Appendix H, Type II 24-hour duration rainfall distribution for Somerset S (Solon Area).

The calculations documented in the Stormwater Management Calculation Package presented in Appendix IV(f) of this report demonstrate the stormwater management system meets or exceeds the design criteria set forth in the Maine Site Location of Development Law Guidelines for Solid Waste Management (06-096 CMR, Chapter 400).

5. CONTAMINANT TRANSPORT ANALYSIS

In accordance with the Maine SWMR Chapter 401.2.G, an analysis was performed to assess the potential of an unreasonable threat to sensitive receptors of releases of contaminants to groundwater beyond the engineered systems. The details of the analysis are provided in Section 6.0, Time of Travel Analysis of the *Geologic and Hydrogeologic Assessment Report*, located within Volume III of this Application. The analysis demonstrates that the requirements for minimum allowable time-of-travel to identified sensitive receptors set forth in the SWMRs are met or exceeded by the Phase 14 landfill design.

6. PLAN AND PROFILE DRAWINGS

The requirements set forth in the Maine SWMR Chapter 401.2.H are addressed on the Permit Drawings (presented in Appendix IV(a) of this report) as described below.

(1) Plan View Drawings

(a) All utilities and structures on the site; a description of these utilities must also be included;

All utilities and structures associated with the Phase 14 site are presented on Sheet 2.

(b) All surface water management structures including ditches, culverts, diversion structures, detention basins, and sedimentation basins;

All surface water management structures for Phase 14 are presented on Sheet 15.

(c) Borrow pits, if applicable;

Borrow soil will be largely obtained from off-site sources. Some material for MSE berm construction may be obtained from excavating the future cells of Phase 14, however, the exact locations of these areas will be evaluated as construction of the cells approaches with details provided in the construction document submittals to MEDEP.

(d) Any areas for stumps/brush, white goods, tires, or hot loads;

Areas for disposing stumps/brush, white goods, or tires will be designated by WMDSM as presented within the Site Operations Manual (Section IIA Secure Landfill and IIC Airport Road Transfer Station) prior to waste disposal within Phase 14. Similarly, a hot load area will be identified and also presented within a future submission of the Site Operations Manual.

(e) Any gas monitoring probes and gas vents outside the solid waste boundary, if applicable;

Gas monitoring probes or gas vents outside the solid waste boundary of Phase 14 will be evaluated and incorporated within the Site Operations Manual (Section VIA Gas Migration and Monitoring Plan) prior to acceptance of waste in Phase 14.

(f) Fencing and gates;

The Phase 14 waste disposal area and associated infrastructure will all be located within interior portions of the Crossroads facility property boundaries. As such, WMDSM is not planning to install additional fencing or gates specific to Phase 14.

(g) Leachate management structures;

Leachate management structures are presented on Sheets 7 and 23.

(h) Any waste storage or staging areas;

Any waste storage or staging would occur within the Container Storage Area (Section IIA of the Site Operations Manual). This section will be reviewed and modified as necessary prior to acceptance of waste in Phase 14.

(i) Temporary and permanent soil stockpile areas; and

Temporary and permanent soil stockpile areas are shown on Sheet 2. Additional stockpile areas will be designated on the construction documents submitted to MEDEP prior to construction of each cell.

(j) Baseline for cross-section drawings of the site.

Baselines for the cross-section drawings are presented on Sheets 16, 17, and 18.

(2) Profile View Drawings

(a) Cross-sections of the area within the solid waste boundary taken at 100-foot intervals from a baseline, to the same horizontal scale as the plan view in Chapter 401.2.C(1) of the Maine SWMR.

In accordance with SWMR Chapter 401.2.H(a) and (b), several plan sheets of the Phase 14 landfill development are provided as Sheets 2 through 15, and 23 of the Permit Drawings. Profile drawings showing the cross-sectional geometry of the liner system and final waste grades are provided on Sheets 16, 17, and 18 of the Permit Drawings. Based on discussions with MEDEP personnel during the 15 August 2019 pre-submission meeting, presenting profiles every 100 ft would result in an unreasonable and unnecessary number of profiles (over 50 profiles requiring at least 25 additional sheets in the set of permit drawings). As agreed by MEDEP and in accordance with the provisions of Chapter 401.2.H(2)(c), the frequency of cross-sections in paragraphs (2)(a) and (2)(b) has been reduced to profile sections (Sheets 16, 17, and 18) that correspond to the alignment of the central LCS corridor of each cell (Phases 14A through 14E) and a longitudinal section that captures the profile section of all four phases of the landfill. The required landfill capacity information and filling sequence detailed in the cell development plans for the landfill has also been provided (Sheets 8 through 12).

(b) Longitudinal cross-sections of the area within the solid waste boundary, taken at 100-foot intervals from a baseline, to the same horizontal scale as the plan view in Chapter 401.2.C(1) of the Maine SWMR.

See discussion above regarding the Phase 14 cross sections.

(c) Typical cross-sections of the road and water drainage features.

Cross sections of the access roads and stormwater management features are presented on Sheets 20, 21, and 33 of the Permit Drawings.

REFERENCES

Giroud, J.P. and Bonaparte, R., "Leakage Through Liners Constructed with Geomembranes; Part I: Geomembrane Liners", Geotextiles and Geomembranes, Vol 8, No. 1, 1989, pp. 27-67.

Giroud, J.P., Khatami, A. And Badu-Tweneboan, K., "Evaluation of the Rate of Leakage Through Composite Liners", Geotextiles and Geomembranes, Vol. 8, No. 4, 1989, pp. 337-340.

Koerner, R.M. and Koerner, G.R. "Reduction Factors Used in Geosynthetic Design, GSI White Paper #4, Rev. 1," March 2007.

Ladd, C.C., and Foote, R., "New Design Procedure for Stability of Soft Clays," Journal of Geotechnical Engineering, July, 1974 pp. 763-786.

Robert G. Gerber, Inc., "Crossroads Landfill Phases 9, 11 and 12 Expansion Report", May 1996.

Robert G. Gerber, Inc., "Phase 1-6 and Phase 10 Sideslope Modification, Geotechnical Evaluation of Special Waste Landfill, Crossroads Landfill, Norridgewock, Maine", August 1997.

State of Maine, Department of Environmental Protection, Bureau of Remediation and Waste Management, "Solid Waste Management Regulations, Chapters 400-403, 405, 409, and 418", effective 2 November 1998, revised 6 September 1999.

Weston Geophysical Corporation, "Seismic Hazard Assessment for the Norridgewock, ME Landfill Expansion", prepared for Robert G. Gerber, Inc., 1991.

Weston Geophysical Corporation, "Supplemental Probabilistic Seismic Hazard Computations for the Crossroads Landfill Project", prepared for Robert G. Gerber, Inc., 1993.

Table IV-1: Checklist of SWMR Chapter 401 Requirements

Phase 14 Permit Application

Crossroads Landfill, Norridgewock, Maine

SWMR Ch.401 Section	Regulatory Requirement	Location Where Addressed in Permit Package
1.	**General Licensing Requirements**	
1.D(4)	Notify airport and the Federal Aviation Administration (FAA)	Vol. I Sect. 7
2.	**Application Requirements**	
2.A.	General Information	
2.A(1)	Site and Surroundings Map	Vol. I Sect. 1
2.A(2)	Aerial Photographs	Vol. I Sect. 1
2.B.	Site-Specific Investigation	
2.B(1)	Geological Investigations	Vol. III Sect. 2, 3, & 4
2.B(2)	Ground and Surface Water Investigation	Vol. III Sect. 2, 3, & 5
2.B(3)	Geotechnical Investigation	Vol. IV Sect. 3.2, App. IV(b)
2.C.	Site Assessment Report	
2.C(1)	Maps, Drawings, and Sections: (a) topographic base map; (b) surficial geologic map; (c) geologic cross-sections; (d) isopach map of surficial deposits; (e) bedrock contour map; (f) two phreatic surface contour maps (seasonal high and low water conditions); (g) vertical flow nets; (h) detailed drawings	Vol. III
2.C(2)	Time of Travel Calculations	Vol. III Sect. 6
2.C(3)	Geotechnical Results	Vol. IV Sect. 3.2, App. IV(b)
2.D.	Design Standards for Landfills	
2.D(1)	Liner System Requirements	Vol. IV Sect. 2.2
2.D(2)	Improvement Allowance System	Not Applicable
2.D(3)	Base Preparation below Liner Systems	Vol IV Sect. 2.1, 2.2
2.D(4)	Leachate Conveyance System and Storage Structure Standards	
2.D(4)(a)	Leachate Conveyance System	Vol. IV Sect. 2.3, 2.4, & 3.5
2.D(4)(b)	Leachate Storage Systems Standards	Vol. IV Sect. 3.5.5
2.D(5)	Seismic Impact	Vol. IV Sect. 3.2
2.D(6)	Phased Operations	Vol. IV Sect. 3.8 & 3.9, App. IV(a)
2.E.	Alternative Design Process	Vol IV Sect. 2.6, App. IV(i)
2.F.	Engineering Landfill	
2.F(1)	Stability Assessment	Vol. IV Sect. 3.2
2.F(2)	Settlement Assessment	Vol. IV Sect. 3.3
2.F(3)	Stability and Settlement Monitoring Plan	Vol. IV Sect. 3.4
2.F(4)	Water Balance Submission	Vol. IV Sect. 3.5
2.F(5)	Leachate Management Submission	Vol. IV Sect. 3.6
2.F(6)	Gas Management Submission	Vol. IV Sect. 3.7
2.F(7)	Cell Development Plan	Vol. IV Sect. 3.8
2.F(8)	Phased Final Cover System Proposal	Vol. IV Sect. 3.9
2.F(9)	Waste Storage, Staging, and Burn Areas Design Submission	Vol. IV Sect. 3.10
2.F(10)	Waste Characterization and Design Compatibility Submission	Vol. IV Sect. 3.11
2.F(11)	Surface Water Control Plans	Vol. IV Sect. 3.12 & Sect. 4
2.F(12)	Test Pads Submission	Vol. IV Sect. 3.13
2.F(13)	Special Construction Requirements	Vol. IV Sect. 3.14
2.G.	Contaminant Transport Analysis	Vol. III Sect. 6 and Vol. IV Sect. 5
2.H.	Plan View and Profile View Drawings	Vol. IV App. IV(a)
2.I.	Quality Assurance Plan	Vol. VI
2.J.	Construction Contract Bid Documents	Vol. VI
2.K.	Water Quality Report and Proposed Monitoring Program	Vol. III Sect. 7
2.L.	Operations Manual	Vol. V

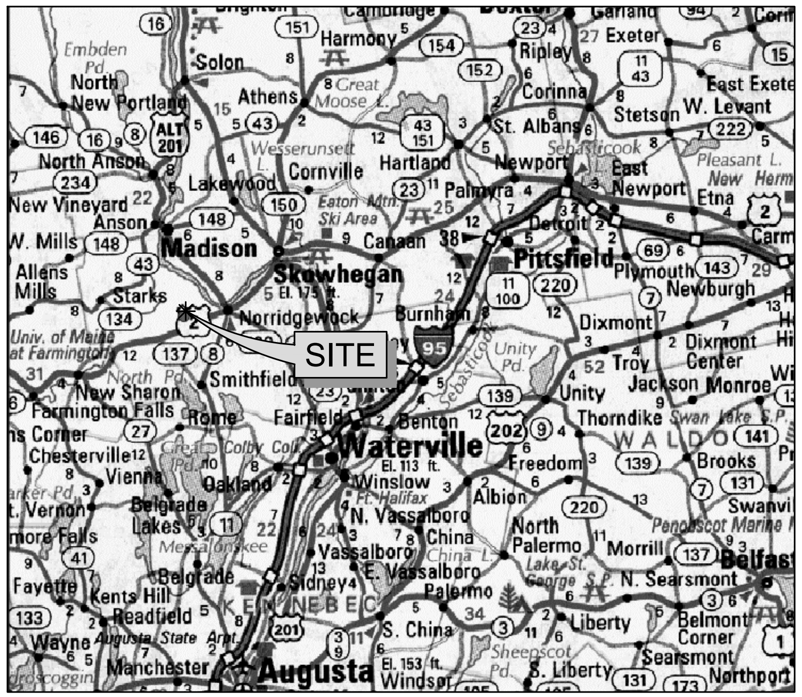
APPENDICES

APPENDIX IV(a)
Permit Drawings

PHASE 14 PERMIT APPLICATION
PERMIT LEVEL ENGINEERING DRAWINGS
CROSSROADS LANDFILL

NORRIDGEWOCK, MAINE

OCTOBER 2019

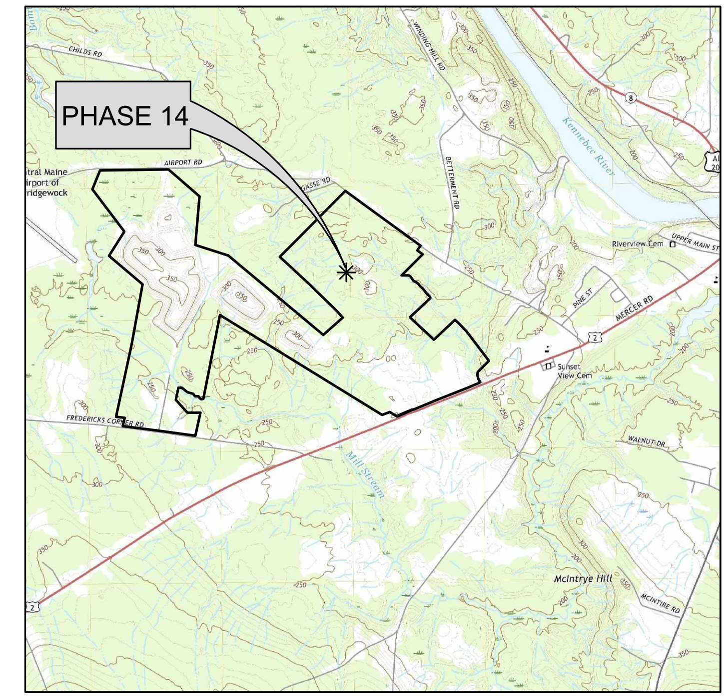


VICINITY MAP

0 5
SCALE IN MILES

LIST OF DRAWINGS

DRAWING NUMBER	DRAWING TITLE
1	TITLE SHEET
2	SITE PLAN
3	EXISTING CONDITIONS PLAN
4	EXCAVATION GRADING PLAN
5	BASE GRADING PLAN
6	GEOMEMBRANE GRADING PLAN
7	LEACHATE COLLECTION PLAN
8	FILL SEQUENCE PLAN FOR PHASE 14A
9	FILL SEQUENCE PLAN FOR PHASE 14A & B
10	FILL SEQUENCE PLAN FOR PHASES 14A, B, & C
11	FILL SEQUENCE PLAN FOR PHASES 14A, B, C, & D
12	FILL SEQUENCE PLAN FOR PHASES 14A, B, C, D & E
13	TOP OF FINAL COVER GRADING PLAN
14	LANDFILL ACCESS ROAD AND MSE RAMP PLAN
15	SURFACE WATER MANAGEMENT PLAN
16	PROFILES I
17	PROFILES II
18	PROFILES III
19	LINER SYSTEM DETAILS
20	MSE BERM DETAILS I
21	MSE BERM DETAILS II
22	MSE BERM DETAILS III
23	LEACHATE TRANSMISSION PLAN
24	LEACHATE TRANSMISSION SYSTEM DETAILS
25	LEACHATE VAULT - STRUCTURAL DETAILS I
26	LEACHATE VAULT - STRUCTURAL DETAILS II
27	LEACHATE VAULT PIPING DETAILS
28	LEACHATE VAULT MECHANICAL -ELECTRICAL DETAILS
29	MISCELLANEOUS DETAILS
30	FINAL COVER SYSTEM DETAILS
31	SURFACE WATER MANAGEMENT DETAILS I
32	SURFACE WATER MANAGEMENT DETAILS II
33	SURFACE WATER MANAGEMENT DETAILS III
34	SURFACE WATER MANAGEMENT DETAILS IV
35	ECS BASIN PLAN
36	ECS BASIN DETAILS
37	ACCESS ROAD STREAM CROSSING DETAILS
38	EROSION AND SEDIMENTATION CONTROL STANDARD DETAILS



LOCATION MAP

0 6,000
SCALE IN FEET

DETAIL NUMBER
SHEET ON WHICH ABOVE DETAIL IS PRESENTED
DETAIL NUMBER
SHEET ON WHICH ABOVE DETAIL WAS FIRST REFERENCED
DETAIL
TITLE OF DETAIL
SCALE: 1"=2'

EXAMPLE: DETAIL NUMBER 4 PRESENTED ON SHEET NO. 6 WAS REFERENCED FOR THE FIRST TIME ON SHEET NO.3.

ABOVE SYSTEM ALSO APPLIES TO SECTION IDENTIFICATIONS.

DETAIL IDENTIFICATION LEGEND

GEOSYNTHETIC LEGEND

- GEOCOMPOSITE DRAINAGE LAYER
- GEOMEMBRANE
- GEOSYNTHETIC CLAY LINER
- GEOTEXTILE SEPARATION, FILTER, OR CUSHION LAYER

NOTE:

1. DETAILS ARE NOT SHOWN TO SCALE. GEOSYNTHETICS ARE SHOWN AT AN EXAGGERATED SCALE FOR CLARITY. MATERIAL TOLERANCES SHALL BE WITHIN THE LIMITS GIVEN IN THE SPECIFICATIONS.

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SCALE IS BASED ON 22" X 34" NON-REDUCED SHEET SIZE (BORDER = 21" X 32")

REV	DATE	DESCRIPTION	DRN	APP

SCOTT M. LUETTICH No. 7452 — STATE OF MAINE LICENSED PROFESSIONAL ENGINEER

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SIGNATURE

24 OCTOBER 2019
DATE

DESIGN BY: NJY
DRAWN BY: JT / RK
CHECKED BY: NJY
REVIEWED BY: SML
APPROVED BY: SML

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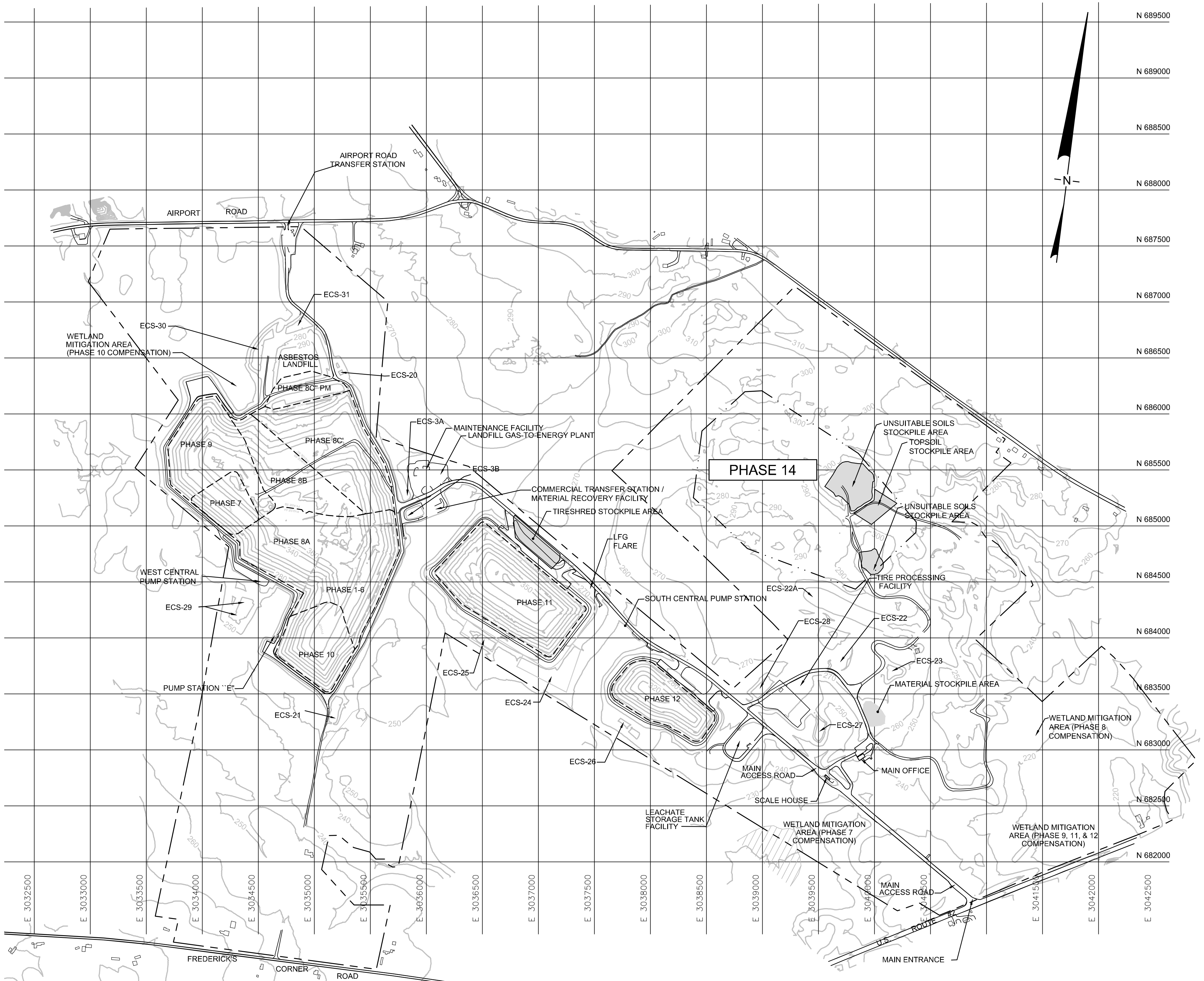
TITLE: TITLE SHEET
PROJECT: PHASE 14 PERMIT APPLICATION
SITE: CROSSROADS LANDFILL NORRIDGEWOCK, MAINE

DATE: OCTOBER 2019
PROJECT NO.: BE0232C
DRAWING NO.: 1 OF 38

PERMIT DRAWINGS



LEGEND

- GROUND SURFACE ELEVATION CONTOUR
- EXISTING BUILDINGS
- EXISTING WASTE MANAGEMENT FACILITY
- STOCKPILE AREAS
- PHASE 14 DESIGN LIMIT OF WASTE
- ACCESS ROAD

NOTES:

1. EXISTING GROUND SURFACE AND FEATURES OBTAINED FROM TOPOGRAPHIC SURVEYS, DATED NOV 2017, AND SEPT 2018, PROVIDED BY BOYNTON & PICKETT.
2. HORIZONTAL DATUM IS NORTH AMERICAN DATUM OF 1983 (NAD 83) MAINE WEST STATE PLAN. VERTICAL DATUM IS NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88). PROPERTY BOUNDARY SURVEYED IN UTM SCALED TO NAD 83.

0 500' 1000'
SCALE IN FEET

(3in) (2in) (1in)
(1in) (2in) (3in) (4in)
SCALE IS BASED ON 22" X 34" NON-REDUCED SHEET SIZE (BORDER = 21" X 32")

REV	DATE	DESCRIPTION	DRN	APP

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DATE: 24 OCTOBER 2019

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CHECKED BY: NJY
REVIEWED BY: SML
APPROVED BY: SML

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TITLE: SITE PLAN
PROJECT: PHASE 14 PERMIT APPLICATION
SITE: CROSSROADS LANDFILL NORRIDGEWOCK, MAINE

DATE: OCTOBER 2019
PROJECT NO.: BE0232C
DRAWING NO.: 2 OF 38

PERMIT DRAWINGS

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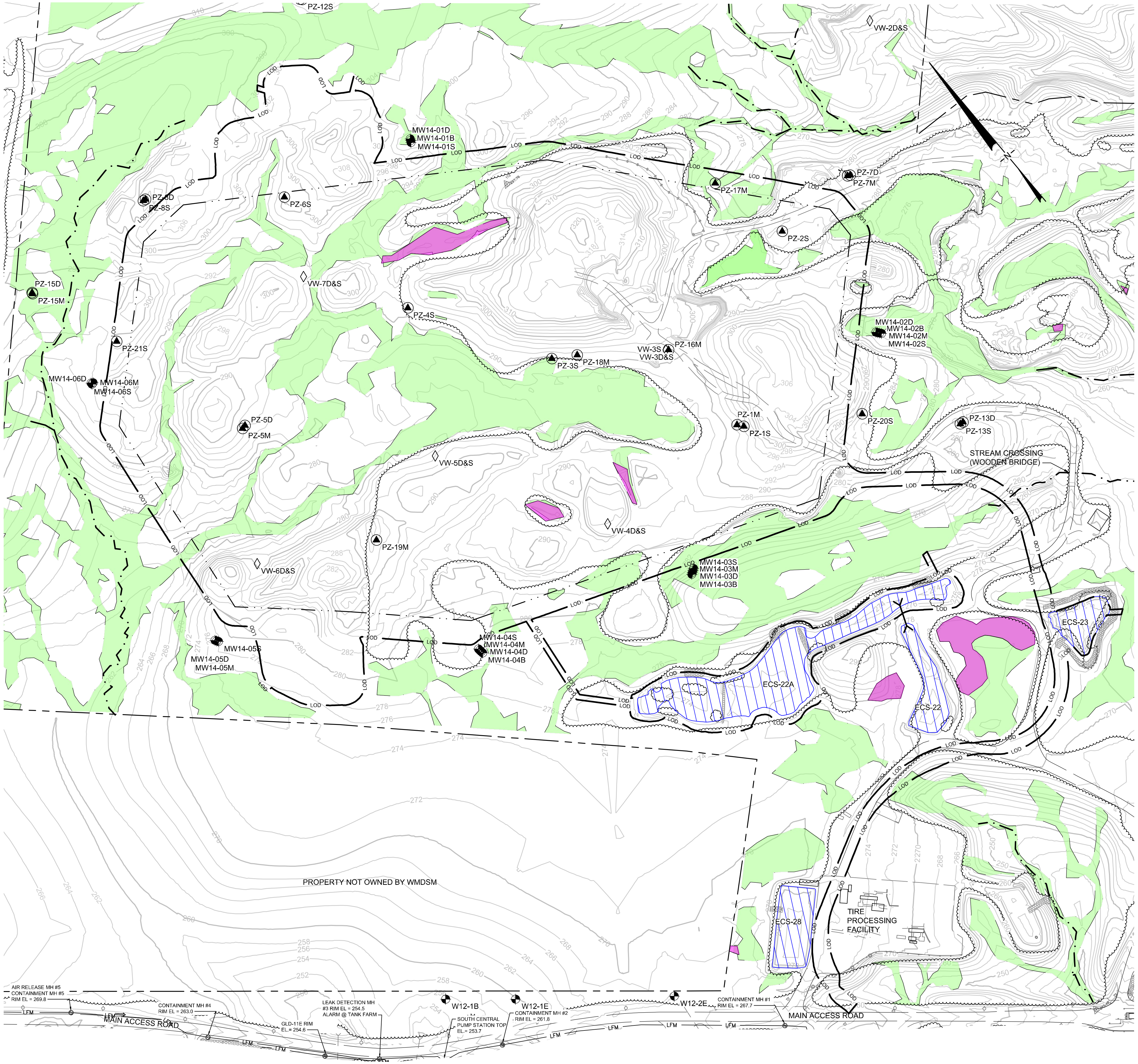

LEGEND

310	MAJOR (10 FT) GROUND SURFACE ELEVATION CONTOUR
316	MINOR (2 FT) GROUND SURFACE ELEVATION CONTOUR
	EXISTING WASTE MANAGEMENT FACILITY
	PHASE 14 DESIGN LIMIT OF WASTE
	ECS BASIN
	WETLANDS (NOTE 3)
	STREAM (NOTE 3)
	VERNAL POOL (NOTE 3)
	STORMWATER CULVERT
	TREELINE
	BUILDING/STRUCTURE
	ACCESS ROAD
	OVERHEAD ELECTRIC
	MONITORING WELL
	PIEZOMETER
	VIBRATING WIRE PIEZOMETER
LFM	EXISTING LEACHATE FORCE MAIN
	EXISTING LEACHATE MANHOLE
LOD	LIMIT OF DISTURBANCE

NOTES:

1. EXISTING GROUND SURFACE AND FEATURES OBTAINED FROM TOPOGRAPHIC SURVEYS, DATED NOV 2017, AND SEPT 2018, PROVIDED BY BOYNTON & PICKETT.
2. HORIZONTAL DATUM IS NORTH AMERICAN DATUM OF 1983 (NAD 83) MAINE WEST STATE PLAN. VERTICAL DATUM IS NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88). PROPERTY BOUNDARY SURVEYED IN UTM SCALED TO NAD 83.
3. STREAM, WETLAND, AND VERNAL POOL DELINEATIONS PROVIDED BY NORMANDEAU ENVIRONMENTAL CONSULTANTS ON 19 MAY 2019 AND 14 JUNE 2019.

0 150' 300'
SCALE IN FEET

(1in) (2in) (3in) (4in)
SCALE IS BASED ON 22" X 34" NON-REDUCED SHEET SIZE (BORDER = 21" X 32")

PERMIT DRAWINGS

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STATE OF MAINE
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TITLE: EXISTING CONDITIONS PLAN
PROJECT: PHASE 14 PERMIT APPLICATION
SITE: CROSSROADS LANDFILL
NORRIDGEWOCK, MAINE

DATE: OCTOBER 2019
PROJECT NO.: BE0232C
DRAWING NO.: 3 OF 38

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LEGEND

310	MAJOR (10 FT) GROUND SURFACE ELEVATION CONTOUR
316	MINOR (2 FT) GROUND SURFACE ELEVATION CONTOUR
340	PROPOSED EXCAVATION ELEVATION CONTOUR (NOTE 3)
	EXISTING WASTE MANAGEMENT FACILITY
	PHASE 14 DESIGN LIMIT OF WASTE
	SUB CELL BOUNDARY
	OVER EXCAVATION FOR SAND REMOVAL (NOTE 3)

NOTES:

1. EXISTING GROUND SURFACE AND FEATURES OBTAINED FROM TOPOGRAPHIC SURVEYS, DATED NOV 2017, AND SEPT 2018, PROVIDED BY BOYNTON & PICKETT.
2. HORIZONTAL DATUM IS NORTH AMERICAN DATUM OF 1983 (NAD 83) MAINE WEST STATE PLAN. VERTICAL DATUM IS NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88). PROPERTY BOUNDARY SURVEYED IN UTM SCALED TO NAD 83.
3. EXCAVATION GRADES IN SHADED AREAS REPRESENT BOTTOM OF IN-SITU SAND TO BE OVER EXCAVATED AND REPLACED WITH COMPACTED CLAY TO ACHIEVE THE BOTTOM OF LINER GRADES SHOWN ON DRAWING 5. GRADES IN UNSHADED AREAS CORRESPOND TO THE BOTTOM OF LINER GRADES SHOWN ON DRAWING 5.
4. GROUNDWATER ELEVATIONS MEASURED DURING THE PHASE 14 PERMITTING ACTIVITIES INDICATE AREAS WHERE THE POTENTIOMETRIC SURFACE MAY BE HIGHER THAN THE EXCAVATION GRADES SHOWN ON THIS DRAWING AND LINER SYSTEM GRADES SHOWN ON DRAWING 6. GROUNDWATER LEVELS WILL BE RE-EVALUATED DURING DEVELOPMENT OF THE CONSTRUCTION DOCUMENTS TO ESTABLISH THE POSSIBLE NEED FOR DEWATERING DURING CONSTRUCTION, AND PROMPT LOADING OF THE LINER WITH LCS SAND AND SELECT-LIFT WASTE TO OFFSET BUOYANCY (UPLIFT) FORCES.

0 100' 200'
SCALE IN FEET

SCALE IS BASED ON 22" X 34" NON-REDUCED SHEET SIZE (BORDER = 21" X 32")

(1in) (2in) (3in) (4in)

PERMIT DRAWINGS

REV | DATE | DESCRIPTION | DRN | APP

STATE OF MAINE
SCOTT M. LUETTICH
No. 7482
LICENSED PROFESSIONAL ENGINEER

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SIGNATURE
24 OCTOBER 2019
DATE

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TITLE: EXCAVATION GRADING PLAN

PROJECT: PHASE 14 PERMIT APPLICATION

SITE: CROSSROADS LANDFILL NORRIDGEWOCK, MAINE

DATE: OCTOBER 2019

PROJECT NO.: BE0232C

DRAWING NO.: 4 OF 38

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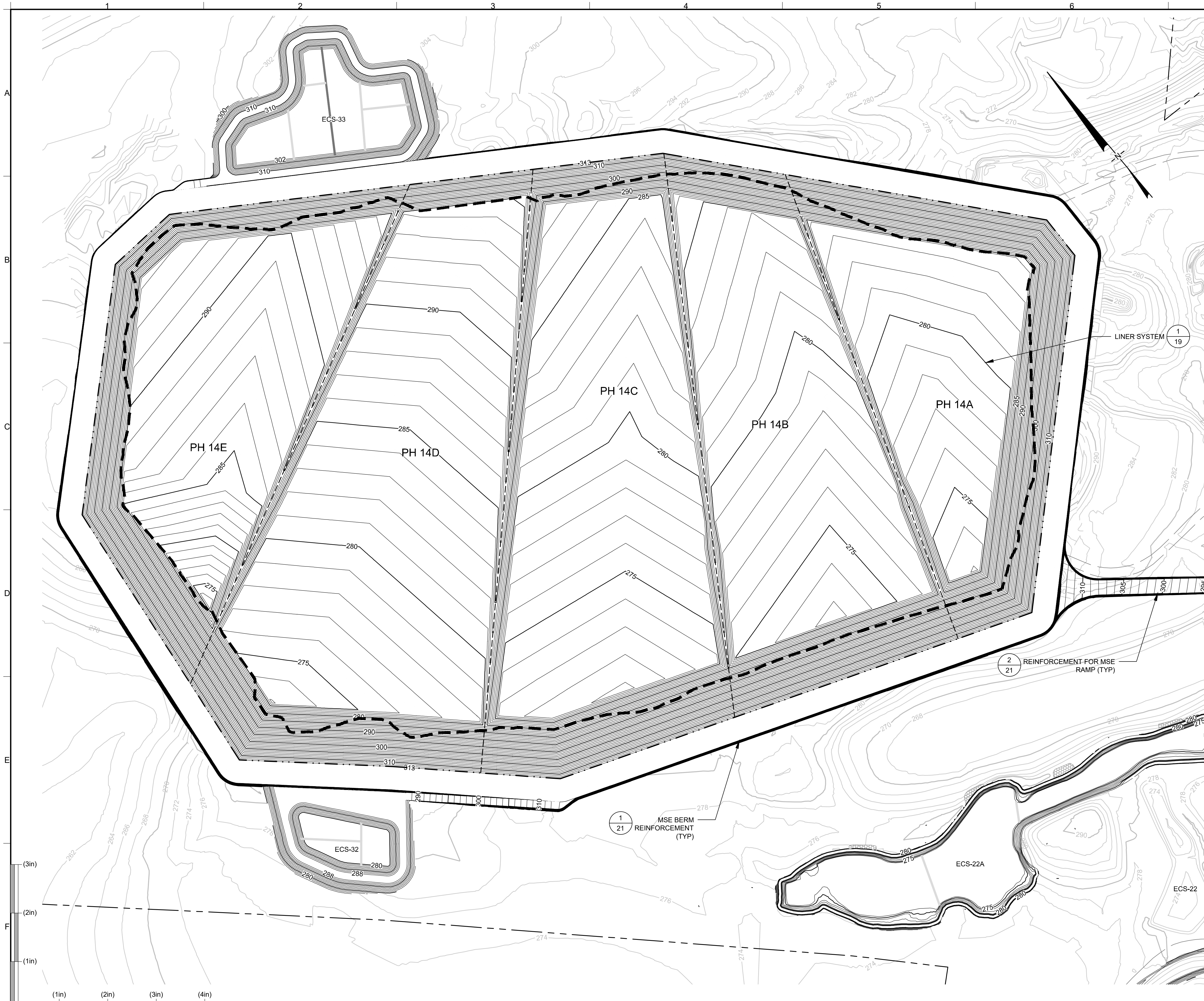

LEGEND

310	MAJOR (10 FT) GROUND SURFACE ELEVATION CONTOUR
316	MINOR (2 FT) GROUND SURFACE ELEVATION CONTOUR
340	PROPOSED EXCAVATION AND BASE GRADE ELEVATION CONTOUR
	EXISTING WASTE MANAGEMENT FACILITY
	PHASE 14 DESIGN LIMIT OF WASTE
	SUB CELL BOUNDARY
	LIMIT OF EXCAVATION

NOTES:

1. EXISTING GROUND SURFACE AND FEATURES OBTAINED FROM TOPOGRAPHIC SURVEYS, DATED NOV 2017, AND SEPT 2018, PROVIDED BY BOYNTON & PICKETT.
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0 100' 200'
SCALE IN FEET

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REV | DATE | DESCRIPTION | DRN | APP

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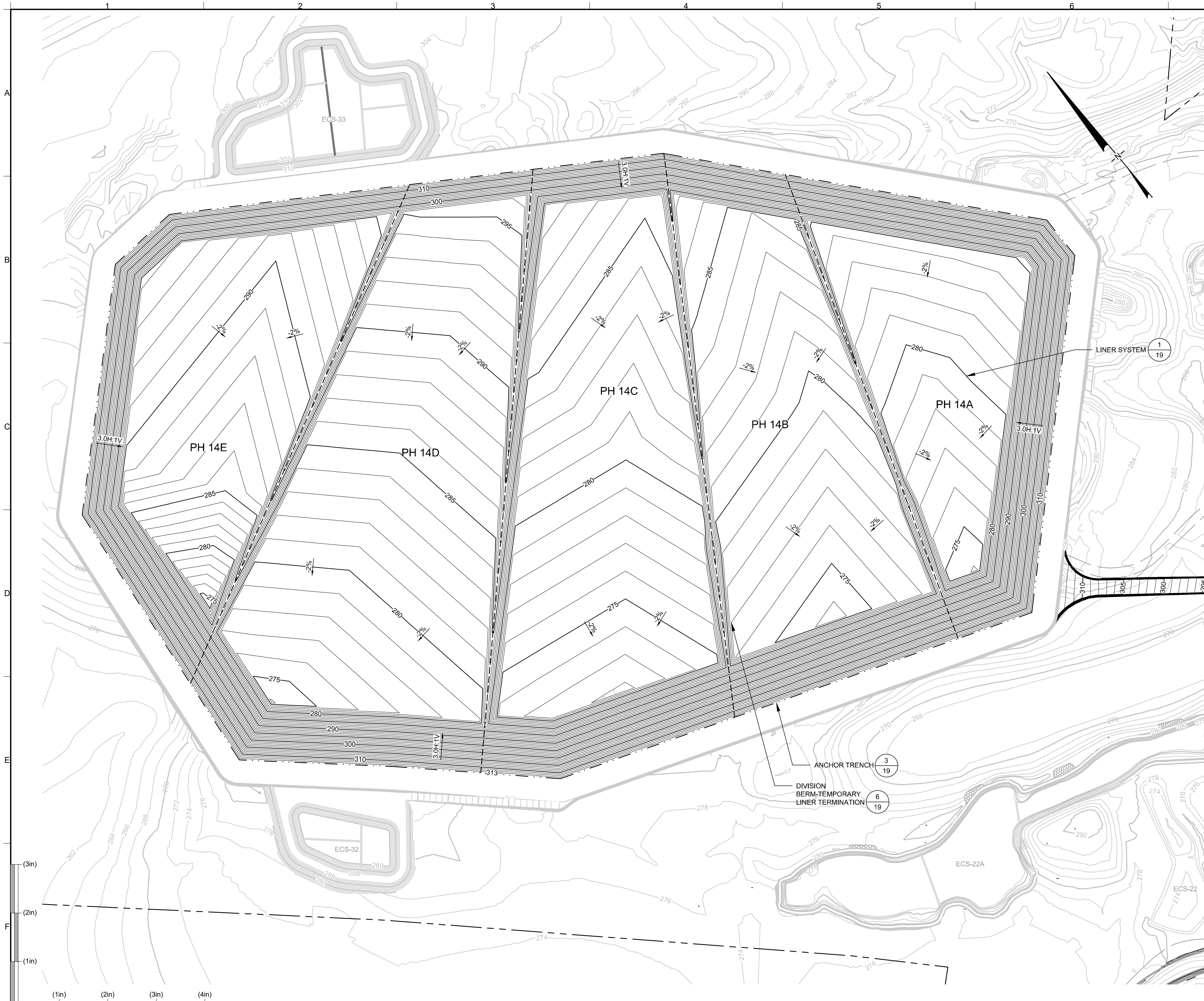
Geosyntec consultants
289 GREAT ROAD, SUITE 202
ACTON, MASSACHUSETTS 01720 USA
PHONE: 978.263.9588

TITLE: BASE GRADING PLAN
PROJECT: PHASE 14 PERMIT APPLICATION
SITE: CROSSROADS LANDFILL NORRIDGEWOCK, MAINE

DATE: OCTOBER 2019
PROJECT NO.: BE0232C
DRAWING NO.: 5 OF 38

PERMIT DRAWINGS



LEGEND

310	MAJOR (10 FT) GROUND SURFACE ELEVATION CONTOUR
316	MINOR (2 FT) GROUND SURFACE ELEVATION CONTOUR
340	PROPOSED GEOMEMBRANE GRADE ELEVATION CONTOUR
— — —	EXISTING WASTE MANAGEMENT FACILITY
— · · —	PHASE 14 DESIGN LIMIT OF WASTE
- - - -	SUB CELL BOUNDARY

NOTES:

1. EXISTING GROUND SURFACE AND FEATURES OBTAINED FROM TOPOGRAPHIC SURVEYS, DATED NOV 2017, AND SEPT 2018, PROVIDED BY BOYNTON & PICKETT.
2. HORIZONTAL DATUM IS NORTH AMERICAN DATUM OF 1983 (NAD 83) MAINE WEST STATE PLAN. VERTICAL DATUM IS NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88). PROPERTY BOUNDARY SURVEYED IN UTM SCALED TO NAD 83.
3. GROUNDWATER ELEVATIONS MEASURED DURING THE PHASE 14 PERMITTING ACTIVITIES INDICATE AREAS WHERE THE POTENTIOMETRIC SURFACE MAY BE HIGHER THAN THE EXCAVATION GRADES SHOWN ON DRAWING 4 AND LINER SYSTEM GRADES SHOWN ON THIS DRAWING. GROUNDWATER LEVELS WILL BE RE-EVALUATED DURING DEVELOPMENT OF THE CONSTRUCTION DOCUMENTS TO ESTABLISH THE POSSIBLE NEED FOR DEWATERING DURING CONSTRUCTION, AND PROMPT LOADING OF THE LINER WITH LCS SAND AND SELECT-LIFT WASTE TO OFFSET BUOYANCY (UPLIFT) FORCES

0 100' 200'
SCALE IN FEET

SCALE IS BASED ON 22" X 34" NON-REDUCED SHEET SIZE (BORDER = 21" X 32")

PERMIT DRAWINGS

REV	DATE	DESCRIPTION	DRN	APP

STATE OF MAINE — SCOTT M. LUETTICH No. 7482 — LICENSED PROFESSIONAL ENGINEER

THIS DRAWING MAY NOT BE ISSUED FOR PROJECT TENDER OR CONSTRUCTION UNLESS SEALED.

SIGNATURE — 24 OCTOBER 2019 DATE

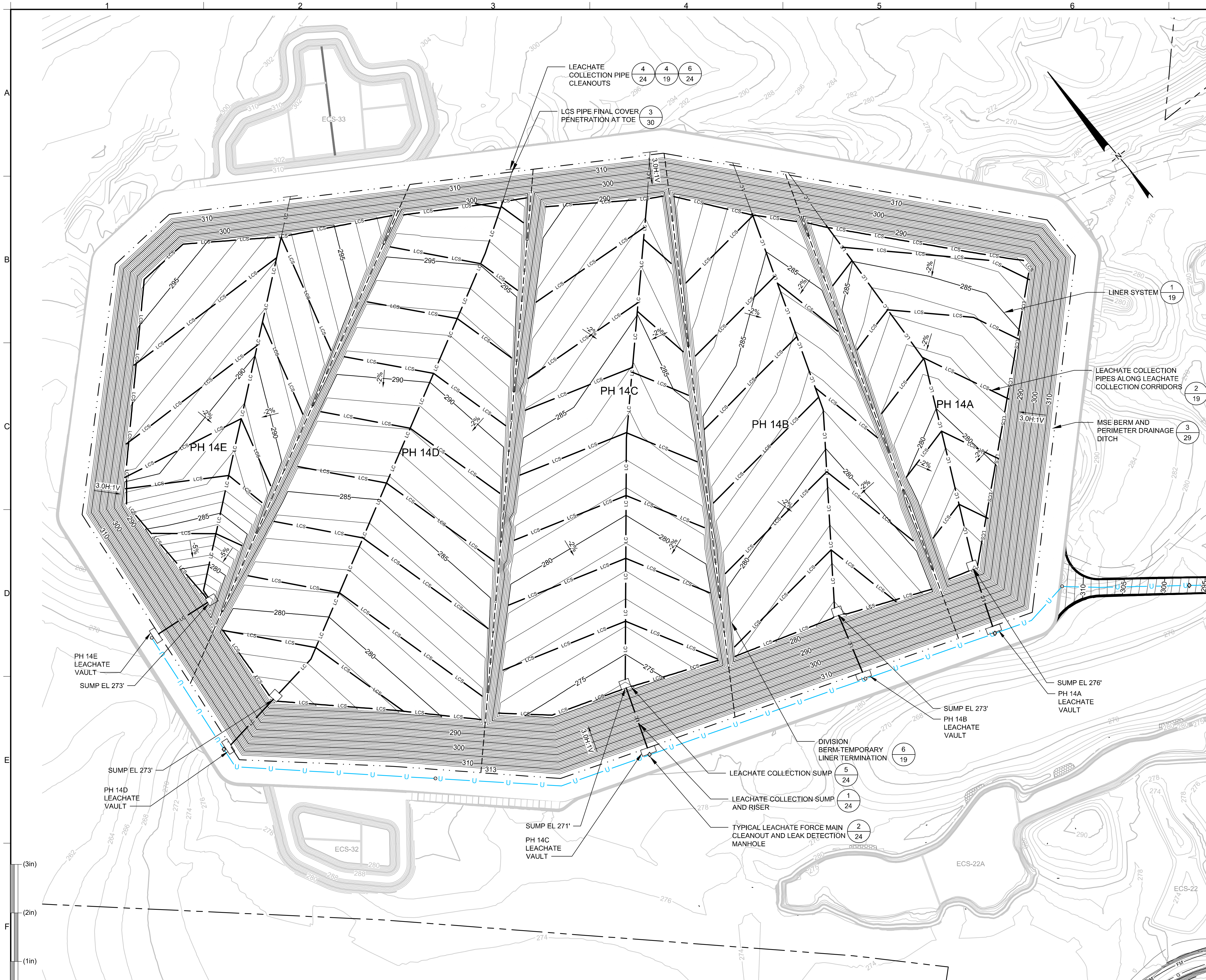
DESIGN BY: NJY
DRAWN BY: JT / RK
CHECKED BY: NJY
REVIEWED BY: SML
APPROVED BY: SML

WASTE MANAGEMENT DISPOSAL SERVICES OF MAINE, INC.
357 MERCER ROAD
NORRIDGEWOCK, MAINE 04957
TELEPHONE: (207) 634-2714

Geosyntec consultants
289 GREAT ROAD, SUITE 202
ACTON, MASSACHUSETTS 01720 USA
PHONE: 978.263.9588

TITLE: GEOMEMBRANE GRADING PLAN
PROJECT: PHASE 14 PERMIT APPLICATION
SITE: CROSSROADS LANDFILL NORRIDGEWOCK, MAINE

DATE: OCTOBER 2019
PROJECT NO.: BE0232C
DRAWING NO.: 6 OF 38



LEGEND

310	MAJOR (10 FT) GROUND SURFACE ELEVATION CONTOUR
316	MINOR (2 FT) GROUND SURFACE ELEVATION CONTOUR
340	PROPOSED LEACHATE COLLECTION GRADE ELEVATION CONTOUR (TOP OF DRAINAGE SAND)
	EXISTING WASTE MANAGEMENT FACILITY
	PHASE 14 DESIGN LIMIT OF WASTE
	SUB CELL BOUNDARY
LC	SUMP WITH LEACHATE COLLECTION PIPE
	LEACHATE VAULT
U	UTILITY CORRIDOR (NOTE 3)
LCS	LEACHATE COLLECTION PIPE LATERAL
	LEACHATE FORCE MAIN CLEANOUT MANHOLE
	LEACHATE FORCE MAIN CLEANOUT AND LEAK DETECTION MANHOLE
	LEACHATE COLLECTION SYSTEM CLEANOUT

NOTES:

1. EXISTING GROUND SURFACE AND FEATURES OBTAINED FROM TOPOGRAPHIC SURVEYS, DATED NOV 2017, AND SEPT 2018, PROVIDED BY BOYNTON & PICKETT.
2. HORIZONTAL DATUM IS NORTH AMERICAN DATUM OF 1983 (NAD 83) MAINE WEST STATE PLAN. VERTICAL DATUM IS NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88). PROPERTY BOUNDARY SURVEYED IN UTM SCALED TO NAD 83.
3. UTILITY CORRIDOR FOR UNDERGROUND LEACHATE FORCE MAIN, GAS TRANSMISSION PIPE AND THREE-PHASE POWER CONDUIT.
4. REFER TO DRAWINGS 24 THROUGH 28 FOR LEACHATE VAULT AND TRANSMISSION SYSTEM DETAILS.

0 100' 200'
SCALE IN FEET

SCALE IS BASED ON 22" X 34" NON-REDUCED SHEET SIZE (BORDER = 21" X 32")

PERMIT DRAWINGS

REV	DATE	DESCRIPTION	DRN	APP

STATE OF MAINE — SCOTT M. LUETTICH No. 7462 — LICENSED PROFESSIONAL ENGINEER

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SIGNATURE
24 OCTOBER 2019
DATE

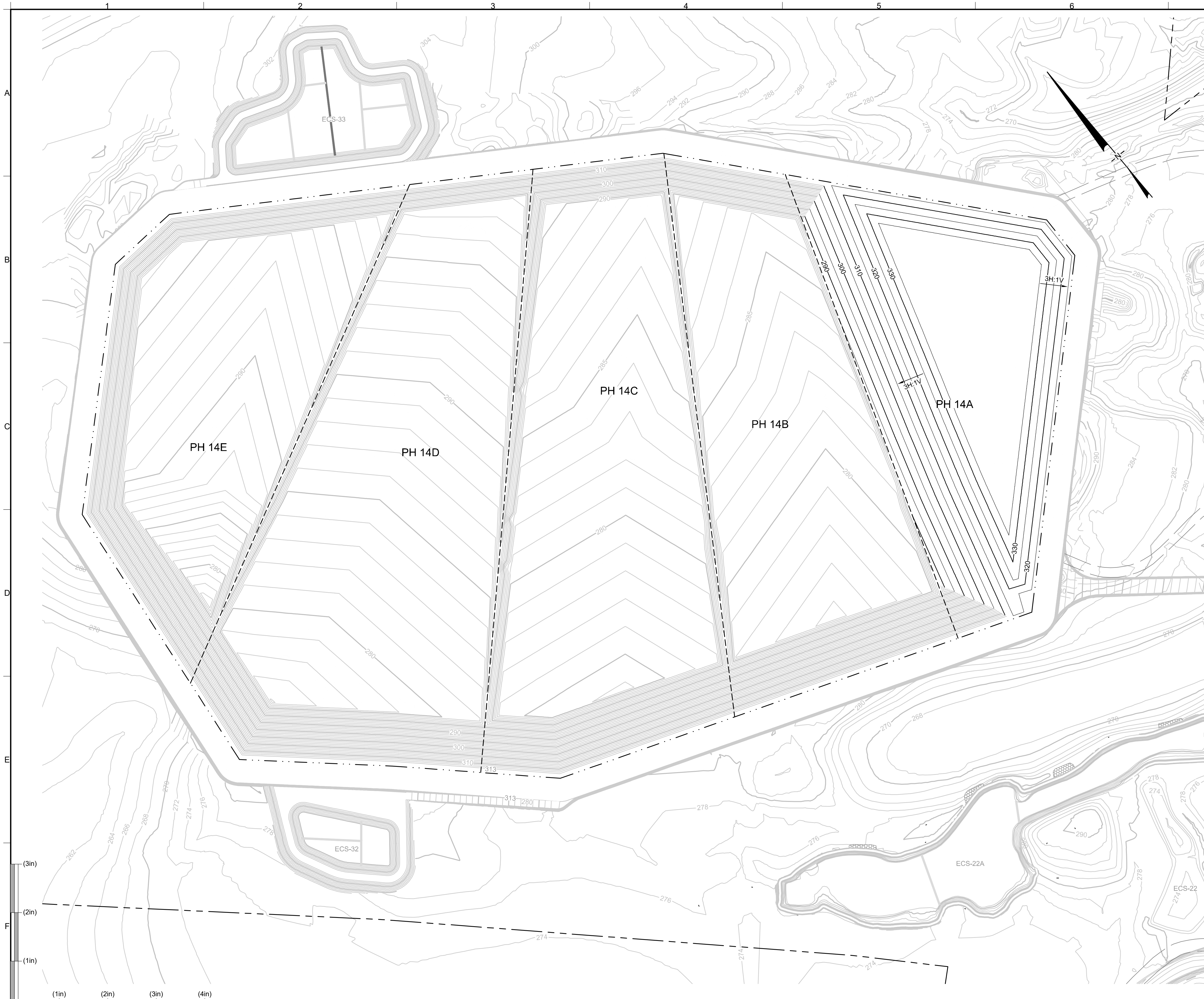
DESIGN BY: NJY
DRAWN BY: JT / RK
CHECKED BY: NJY
REVIEWED BY: SML
APPROVED BY: SML

WM WASTE MANAGEMENT
WASTE MANAGEMENT DISPOSAL SERVICES OF MAINE, INC.
357 MERCER ROAD
NORRIDGEWOCK, MAINE 04957
TELEPHONE: (207) 634-2714

Geosyntec consultants
289 GREAT ROAD, SUITE 202
ACTON, MASSACHUSETTS 01720 USA
PHONE: 978.263.9588

TITLE: LEACHATE COLLECTION PLAN
PROJECT: PHASE 14 PERMIT APPLICATION
SITE: CROSSROADS LANDFILL NORRIDGEWOCK, MAINE

DATE: OCTOBER 2019
PROJECT NO.: BE0232C
DRAWING NO.: 7 OF 38



LEGEND

- 310 — MAJOR (10 FT) GROUND SURFACE ELEVATION CONTOUR
- 316 — MINOR (2 FT) GROUND SURFACE ELEVATION CONTOUR
- 340 — PROPOSED INTERIM WASTE GRADE ELEVATION CONTOUR
- EXISTING WASTE MANAGEMENT FACILITY
- PHASE 14 DESIGN LIMIT OF WASTE
- SUB CELL BOUNDARY

NOTES:

1. EXISTING GROUND SURFACE AND FEATURES OBTAINED FROM TOPOGRAPHIC SURVEYS, DATED NOV 2017, AND SEPT 2018, PROVIDED BY BOYNTON & PICKETT.
2. HORIZONTAL DATUM IS NORTH AMERICAN DATUM OF 1983 (NAD 83) MAINE WEST STATE PLAN. VERTICAL DATUM IS NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88). PROPERTY BOUNDARY SURVEYED IN UTM SCALED TO NAD 83.
3. LOCATIONS OF TEMPORARY INTERNAL ACCESS ROADS WILL BE DEVELOPED BY WMDSM PERSONNEL IN CONSULTATION WITH LANDFILL DESIGNER AS WASTE PLACEMENT PROGRESSES.
4. FUTURE CELLS OF PHASE 14 ARE SHOWN FOR CLARITY, AND WILL NOT NECESSARILY BE CONSTRUCTED WHEN INTERIM FILLING IS OCCURRING AS SHOWN.
5. APPROXIMATE DISPOSAL CAPACITY GAINED BY CONSTRUCTING PHASE 14A: 376,000 Cu. Yd.

0 100' 200'
SCALE IN FEET

(1in) (2in) (3in) (4in)
SCALE IS BASED ON 22" X 34" NON-REDUCED SHEET SIZE (BORDER = 21" X 32")

PERMIT DRAWINGS

REV	DATE	DESCRIPTION	DRN	APP

STATE OF MAINE — SCOTT M. LUETTICH — No. 7492 — LICENSED PROFESSIONAL ENGINEER

THIS DRAWING MAY NOT BE ISSUED FOR PROJECT TENDER OR CONSTRUCTION UNLESS SEALED.

SIGNATURE
24 OCTOBER 2019
DATE

DESIGN BY: NJY
DRAWN BY: JT / RK
CHECKED BY: NJY
REVIEWED BY: SML
APPROVED BY: SML

WM WASTE MANAGEMENT
WASTE MANAGEMENT DISPOSAL SERVICES OF MAINE, INC.
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TELEPHONE: (207) 634-2714

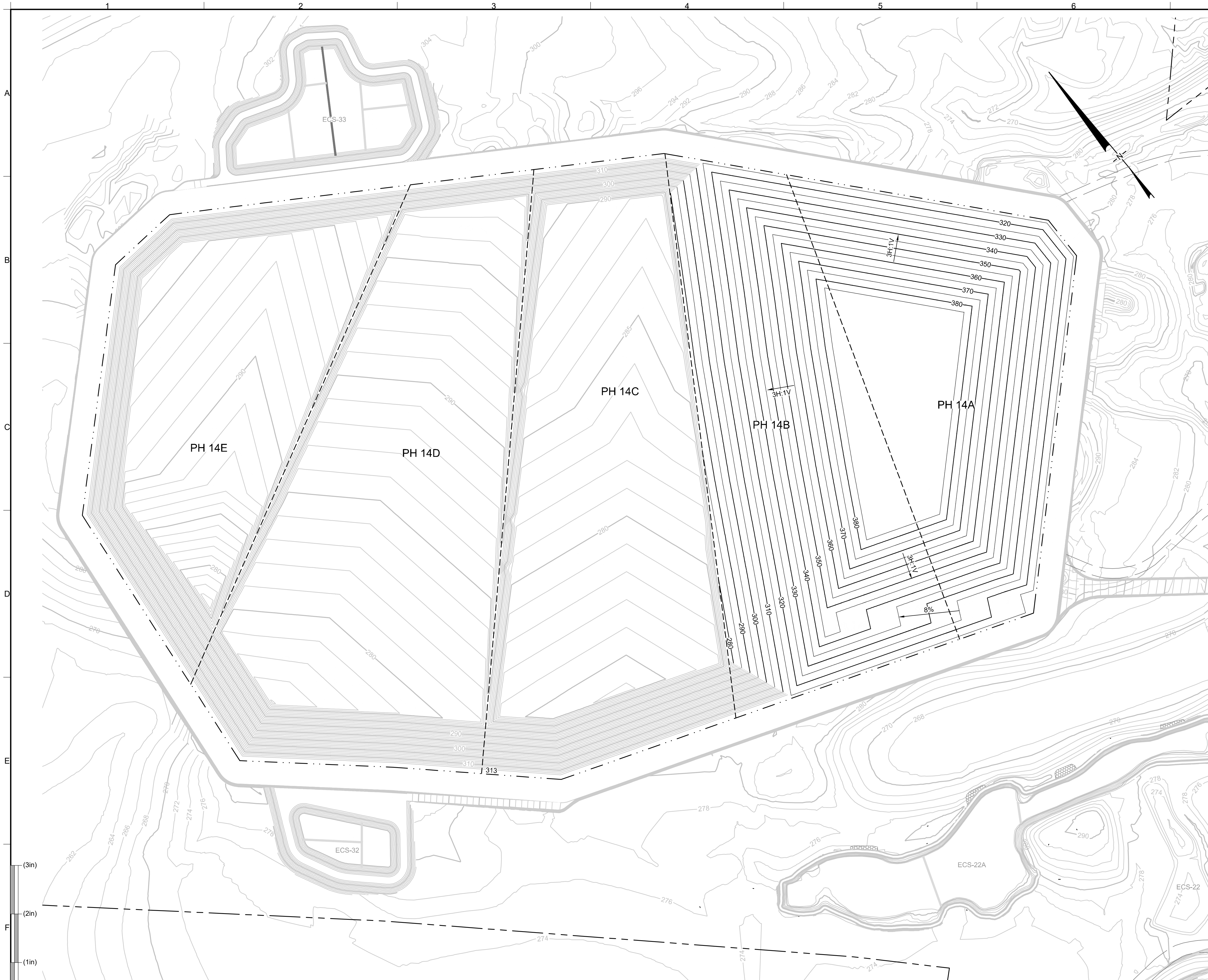
Geosyntec consultants
289 GREAT ROAD, SUITE 202
ACTON, MASSACHUSETTS 01720 USA
PHONE: 978.263.9588

TITLE: FILL SEQUENCE PLAN FOR PHASE 14A

PROJECT: PHASE 14 PERMIT APPLICATION

SITE: CROSSROADS LANDFILL NORRIDGEWOCK, MAINE

DATE: OCTOBER 2019
PROJECT NO.: BE0232C
DRAWING NO.: 8 OF 38



LEGEND

310	MAJOR (10 FT) GROUND SURFACE ELEVATION CONTOUR
316	MINOR (2 FT) GROUND SURFACE ELEVATION CONTOUR
340	PROPOSED INTERIM WASTE GRADE ELEVATION CONTOUR
	EXISTING WASTE MANAGEMENT FACILITY
	PHASE 14 DESIGN LIMIT OF WASTE
	SUB CELL BOUNDARY

NOTES:

1. EXISTING GROUND SURFACE AND FEATURES OBTAINED FROM TOPOGRAPHIC SURVEYS, DATED NOV 2017, AND SEPT 2018, PROVIDED BY BOYNTON & PICKETT.
2. HORIZONTAL DATUM IS NORTH AMERICAN DATUM OF 1983 (NAD 83) MAINE WEST STATE PLAN. VERTICAL DATUM IS NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88). PROPERTY BOUNDARY SURVEYED IN UTM SCALED TO NAD 83.
3. LOCATIONS OF TEMPORARY INTERNAL ACCESS ROADS WILL BE DEVELOPED BY WMDSM PERSONNEL IN CONSULTATION WITH LANDFILL DESIGNER AS WASTE PLACEMENT PROGRESSES.
4. FUTURE CELLS OF PHASE 14 ARE SHOWN FOR CLARITY, AND WILL NOT NECESSARILY BE CONSTRUCTED WHEN INTERIM FILLING IS OCCURRING AS SHOWN.
5. APPROXIMATE DISPOSAL CAPACITY GAINED BY CONSTRUCTING PHASE 14B: 1,116,500 Cu. Yd., CUMULATIVE DISPOSAL CAPACITY 1,492,500 Cu. Yd.

0 100' 200'
SCALE IN FEET

SCALE IS BASED ON 22" X 34" NON-REDUCED SHEET SIZE (BORDER = 21" X 32")

PERMIT DRAWINGS

REV	DATE	DESCRIPTION	DRN	APP

STATE OF MAINE SCOTT M. LUETTICH No. 7482 LICENSED PROFESSIONAL ENGINEER

THIS DRAWING MAY NOT BE ISSUED FOR PROJECT TENDER OR CONSTRUCTION UNLESS SEALED.

SIGNATURE

24 OCTOBER 2019
DATE

DESIGN BY: NJY
DRAWN BY: JT / RK
CHECKED BY: NJY
REVIEWED BY: SML
APPROVED BY: SML

WASTE MANAGEMENT DISPOSAL SERVICES OF MAINE, INC.
357 MERCER ROAD
NORRIDGEWOCK, MAINE 04957
TELEPHONE: (207) 634-2714

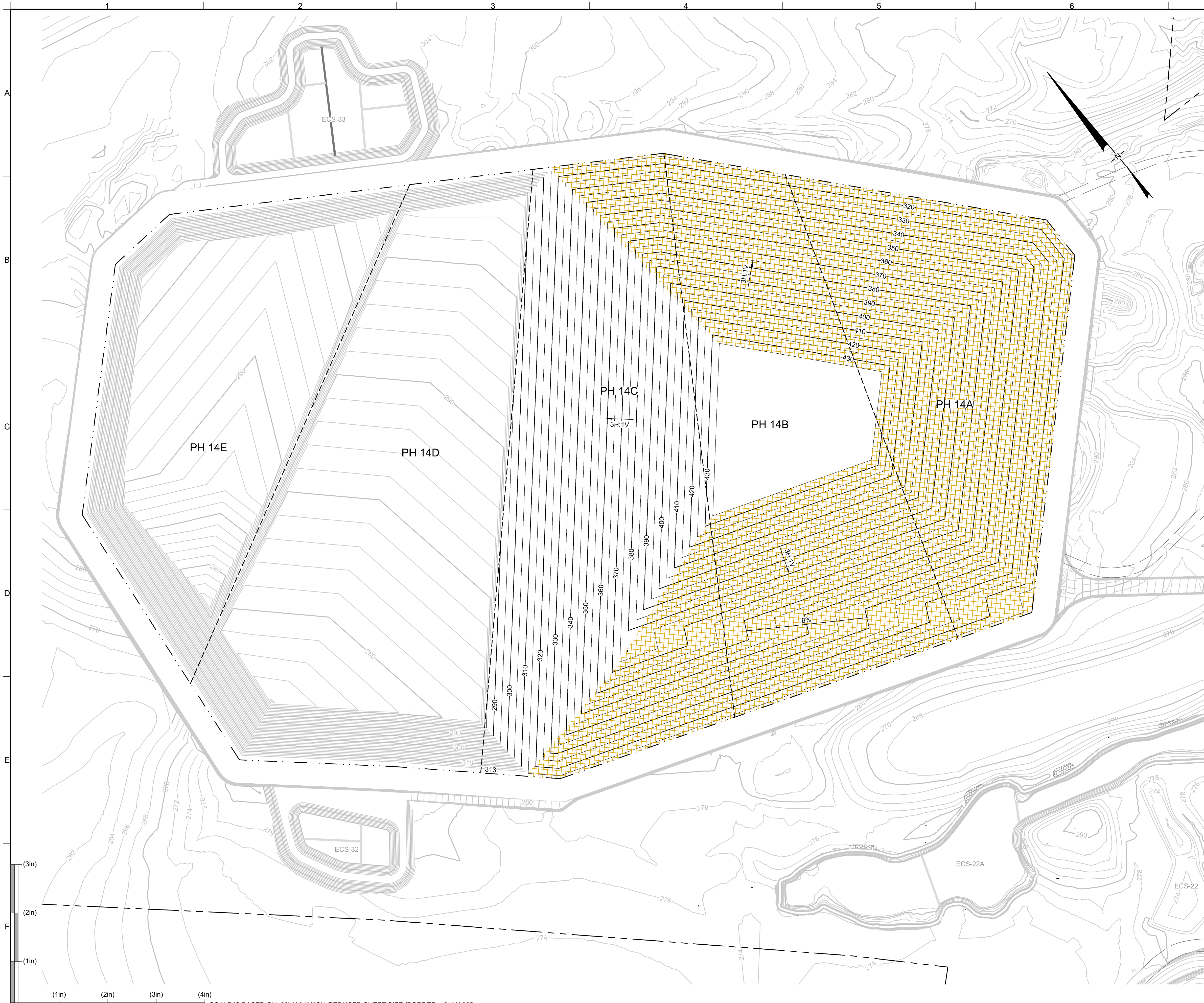
Geosyntec consultants
289 GREAT ROAD, SUITE 202
ACTON, MASSACHUSETTS 01720 USA
PHONE: 978.263.9588

TITLE: FILL SEQUENCE PLAN FOR PHASE 14A & B

PROJECT: PHASE 14 PERMIT APPLICATION

SITE: CROSSROADS LANDFILL NORRIDGEWOCK, MAINE

DATE: OCTOBER 2019
PROJECT NO.: BE0232C
DRAWING NO.: 9 OF 38



LEGEND

310	MAJOR (10 FT) GROUND SURFACE ELEVATION CONTOUR
316	MINOR (2 FT) GROUND SURFACE ELEVATION CONTOUR
340	PROPOSED INTERIM WASTE GRADE ELEVATION CONTOUR
	EXISTING WASTE MANAGEMENT FACILITY
	PHASE 14 DESIGN LIMIT OF WASTE
	SUB CELL BOUNDARY
	LIMIT OF FINAL CLOSURE AND/OR INTERIM GEOMEMBRANE COVER

NOTES:

1. EXISTING GROUND SURFACE AND FEATURES OBTAINED FROM TOPOGRAPHIC SURVEYS, DATED NOV 2017, AND SEPT 2018, PROVIDED BY BOYNTON & PICKETT.
2. HORIZONTAL DATUM IS NORTH AMERICAN DATUM OF 1983 (NAD 83) MAINE WEST STATE PLAN. VERTICAL DATUM IS NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88). PROPERTY BOUNDARY SURVEYED IN UTM SCALED TO NAD 83.
3. LOCATIONS OF TEMPORARY INTERNAL ACCESS ROADS WILL BE DEVELOPED BY WMDSM PERSONNEL IN CONSULTATION WITH LANDFILL DESIGNER AS WASTE PLACEMENT PROGRESSES.
4. FUTURE CELLS OF PHASE 14 ARE SHOWN FOR CLARITY, AND WILL NOT NECESSARILY BE CONSTRUCTED WHEN INTERIM FILLING IS OCCURRING AS SHOWN.
5. APPROXIMATE DISPOSAL CAPACITY GAINED BY CONSTRUCTING PHASE 14C: 1,965,000 Cu. Yd., CUMULATIVE DISPOSAL CAPACITY 3,457,500 Cu. Yd.

0 100' 200'
SCALE IN FEET

SCALE IS BASED ON 22" X 34" NON-REDUCED SHEET SIZE (BORDER = 21" X 32")

PERMIT DRAWINGS

REV	DATE	DESCRIPTION	DRN	APP

STATE OF MAINE
SCOTT M. LUETTICH
No. 7462
LICENSED PROFESSIONAL ENGINEER

THIS DRAWING MAY NOT BE ISSUED FOR PROJECT TENDER OR CONSTRUCTION UNLESS SEALED.

SIGNATURE
24 OCTOBER 2019
DATE

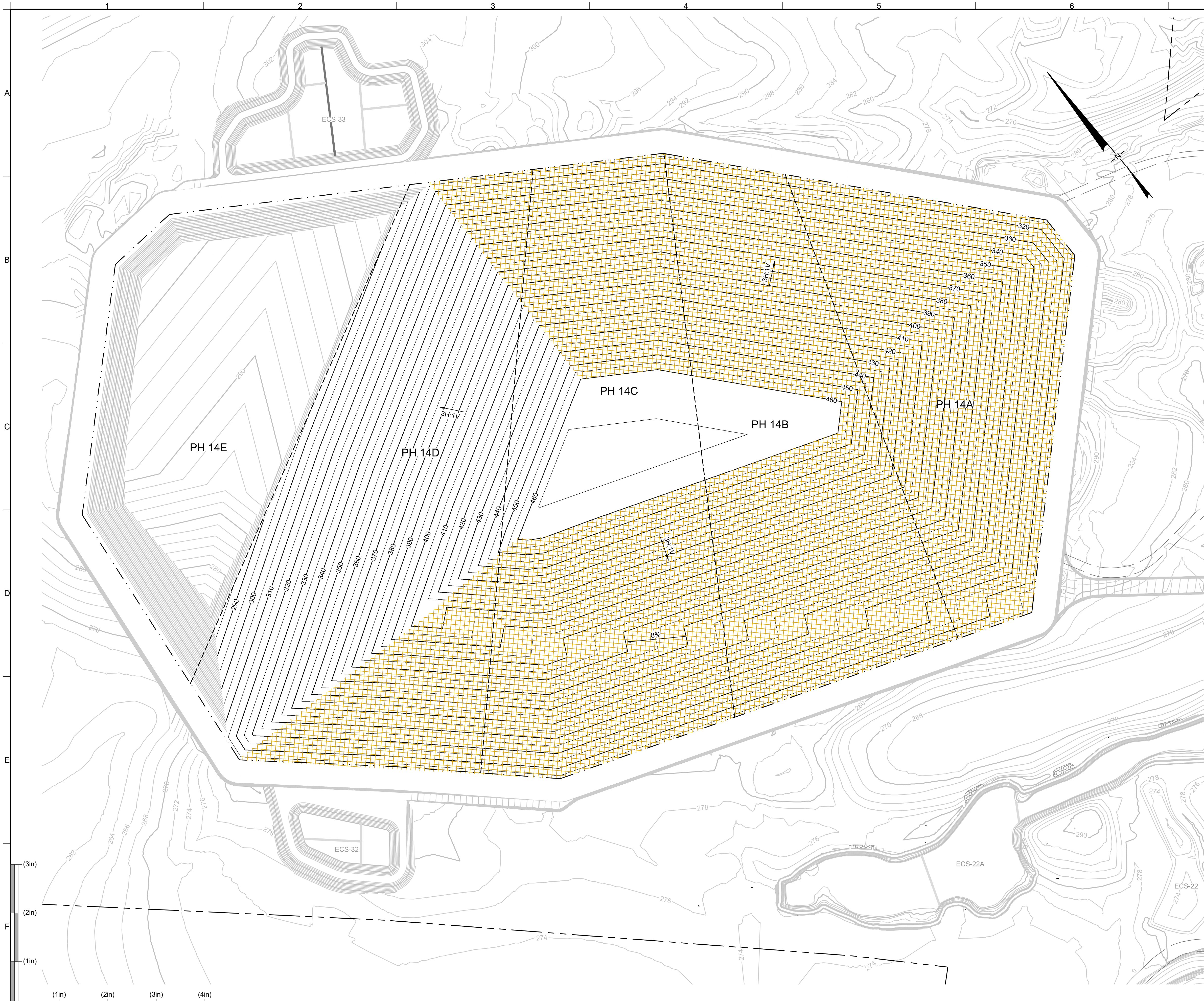
DESIGN BY: NJY
DRAWN BY: JT / RK
CHECKED BY: NJY
REVIEWED BY: SML
APPROVED BY: SML

WM WASTE MANAGEMENT
WASTE MANAGEMENT DISPOSAL SERVICES OF MAINE, INC.
357 MERCER ROAD
NORRIDGEWOCK, MAINE 04957
TELEPHONE: (207) 634-2714

Geosyntec consultants
289 GREAT ROAD, SUITE 202
ACTON, MASSACHUSETTS 01720 USA
PHONE: 978.263.9588

TITLE: FILL SEQUENCE PLAN FOR PHASES 14A, B, & C
PROJECT: PHASE 14 PERMIT APPLICATION
SITE: CROSSROADS LANDFILL NORRIDGEWOCK, MAINE

DATE: OCTOBER 2019
PROJECT NO.: BE0232C
DRAWING NO.: 10 OF 38



LEGEND

- 310 — MAJOR (10 FT) GROUND SURFACE ELEVATION CONTOUR
- 316 — MINOR (2 FT) GROUND SURFACE ELEVATION CONTOUR
- 340 — PROPOSED INTERIM WASTE GRADE ELEVATION CONTOUR
- EXISTING WASTE MANAGEMENT FACILITY
- PHASE 14 DESIGN LIMIT OF WASTE
- SUB CELL BOUNDARY
- LIMIT OF FINAL CLOSURE AND/OR INTERIM GEOMEMBRANE COVER

NOTES:

1. EXISTING GROUND SURFACE AND FEATURES OBTAINED FROM TOPOGRAPHIC SURVEYS, DATED NOV 2017, AND SEPT 2018, PROVIDED BY BOYNTON & PICKETT.
2. HORIZONTAL DATUM IS NORTH AMERICAN DATUM OF 1983 (NAD 83) MAINE WEST STATE PLAN. VERTICAL DATUM IS NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88). PROPERTY BOUNDARY SURVEYED IN UTM SCALED TO NAD 83.
3. LOCATIONS OF TEMPORARY INTERNAL ACCESS ROADS WILL BE DEVELOPED BY WMDSM PERSONNEL IN CONSULTATION WITH LANDFILL DESIGNER AS WASTE PLACEMENT PROGRESSES.
4. FUTURE CELLS OF PHASE 14 ARE SHOWN FOR CLARITY, AND WILL NOT NECESSARILY BE CONSTRUCTED WHEN INTERIM FILLING IS OCCURRING AS SHOWN.
5. APPROXIMATE DISPOSAL CAPACITY GAINED BY CONSTRUCTING PHASE 14D: 2,374,000 Cu. Yd., CUMULATIVE DISPOSAL CAPACITY 5,831,500 Cu. Yd.

0 100' 200'
SCALE IN FEET

SCALE IS BASED ON 22" X 34" NON-REDUCED SHEET SIZE (BORDER = 21" X 32")

REV	DATE	DESCRIPTION	DRN	APP

STATE OF MAINE
SCOTT M. LUETTICH
No. 7462
LICENSED PROFESSIONAL ENGINEER

THIS DRAWING MAY NOT BE ISSUED FOR PROJECT TENDER OR CONSTRUCTION UNLESS SEALED.

SIGNATURE
24 OCTOBER 2019
DATE

DESIGN BY: NJY
DRAWN BY: JT / RK
CHECKED BY: NJY
REVIEWED BY: SML
APPROVED BY: SML

WASTE MANAGEMENT
WASTE MANAGEMENT DISPOSAL SERVICES OF MAINE, INC.
357 MERCER ROAD
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Geosyntec consultants
289 GREAT ROAD, SUITE 202
ACTON, MASSACHUSETTS 01720 USA
PHONE: 978.263.9588

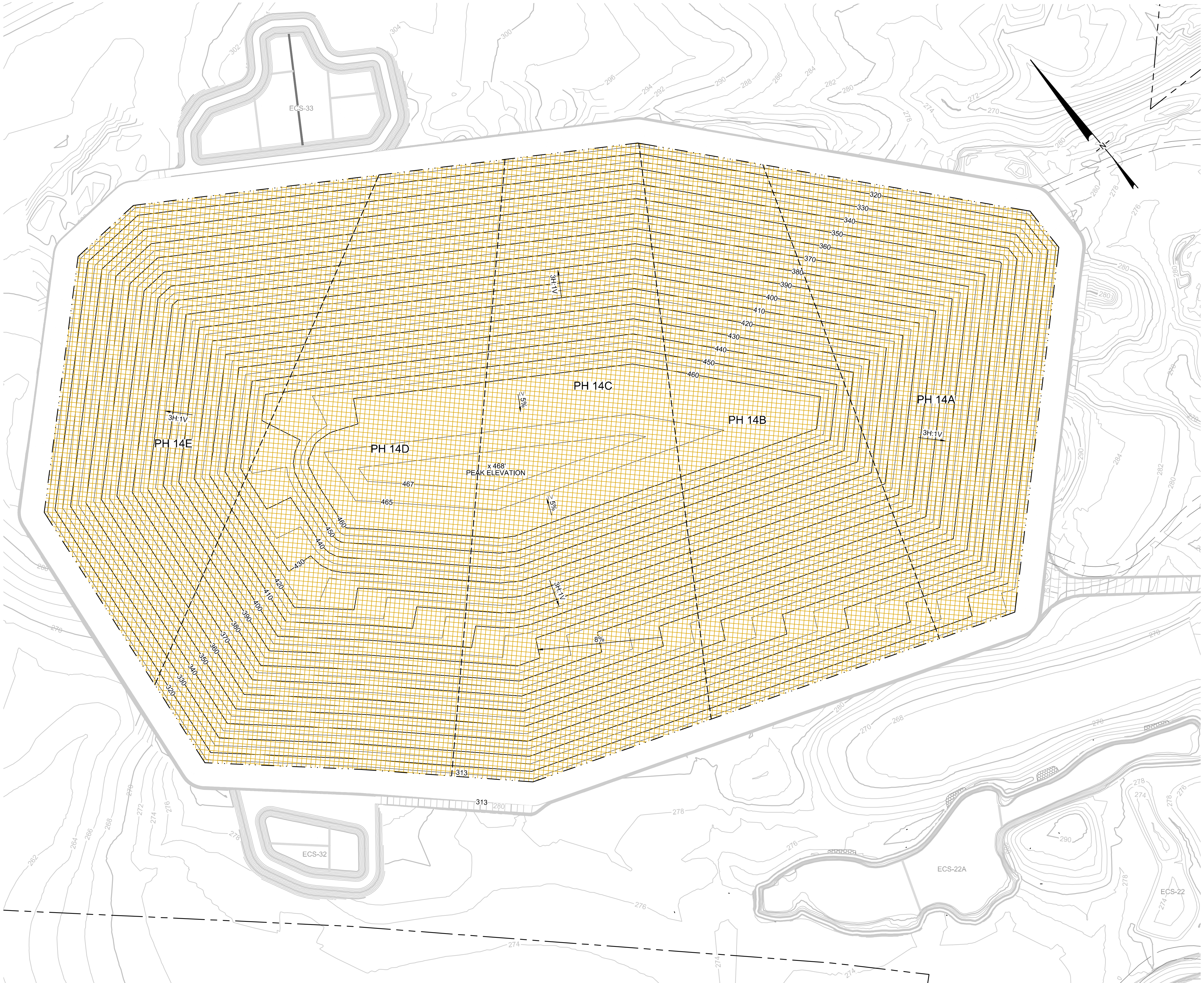
TITLE: FILL SEQUENCE PLAN FOR PHASES 14A, B, C, & D

PROJECT: PHASE 14 PERMIT APPLICATION

SITE: CROSSROADS LANDFILL NORRIDGEWOCK, MAINE

DATE: OCTOBER 2019
PROJECT NO.: BE0232C
DRAWING NO.: 11 OF 38

PERMIT DRAWINGS



LEGEND

- 310 — MAJOR (10 FT) GROUND SURFACE ELEVATION CONTOUR
- 316 — MINOR (2 FT) GROUND SURFACE ELEVATION CONTOUR
- 340 — PROPOSED INTERIM WASTE GRADE ELEVATION CONTOUR
- EXISTING WASTE MANAGEMENT FACILITY
- PHASE 14 DESIGN LIMIT OF WASTE
- SUB CELL BOUNDARY
- LIMIT OF FINAL CLOSURE

NOTES:

1. EXISTING GROUND SURFACE AND FEATURES OBTAINED FROM TOPOGRAPHIC SURVEYS, DATED NOV 2017, AND SEPT 2018, PROVIDED BY BOYNTON & PICKETT.
2. HORIZONTAL DATUM IS NORTH AMERICAN DATUM OF 1983 (NAD 83) MAINE WEST STATE PLAN. VERTICAL DATUM IS NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88). PROPERTY BOUNDARY SURVEYED IN UTM SCALED TO NAD 83.
3. LOCATIONS OF TEMPORARY INTERNAL ACCESS ROADS WILL BE DEVELOPED BY WMDSM PERSONNEL IN CONSULTATION WITH LANDFILL DESIGNER AS WASTE PLACEMENT PROGRESSES.
4. APPROXIMATE DISPOSAL CAPACITY GAINED BY CONSTRUCTING PHASE 14E: 1,925,500 Cu. Yd., CUMULATIVE DISPOSAL CAPACITY 7,757,000 Cu. Yd.

0 100' 200'
SCALE IN FEET

(3in) (2in) (1in)
(1in) (2in) (3in) (4in)
SCALE IS BASED ON 22" X 34" NON-REDUCED SHEET SIZE (BORDER = 21" X 32")

PERMIT DRAWINGS

REV	DATE	DESCRIPTION	DRN	APP

STATE OF MAINE
SCOTT M. LUETTICH
No. 7452
LICENSED
PROFESSIONAL ENGINEER

THIS DRAWING MAY NOT BE ISSUED FOR PROJECT TENDER OR CONSTRUCTION, UNLESS SEALED.

SIGNATURE
24 OCTOBER 2019
DATE

DESIGN BY: NJY
DRAWN BY: JT / RK
CHECKED BY: NJY
REVIEWED BY: SML
APPROVED BY: SML

WASTE MANAGEMENT
WASTE MANAGEMENT DISPOSAL SERVICES OF MAINE, INC.
357 MERCER ROAD
NORRIDGEWOCK, MAINE 04957
TELEPHONE: (207) 634-2714

Geosyntec consultants
289 GREAT ROAD, SUITE 202
ACTON, MASSACHUSETTS 01720 USA
PHONE: 978.263.9588

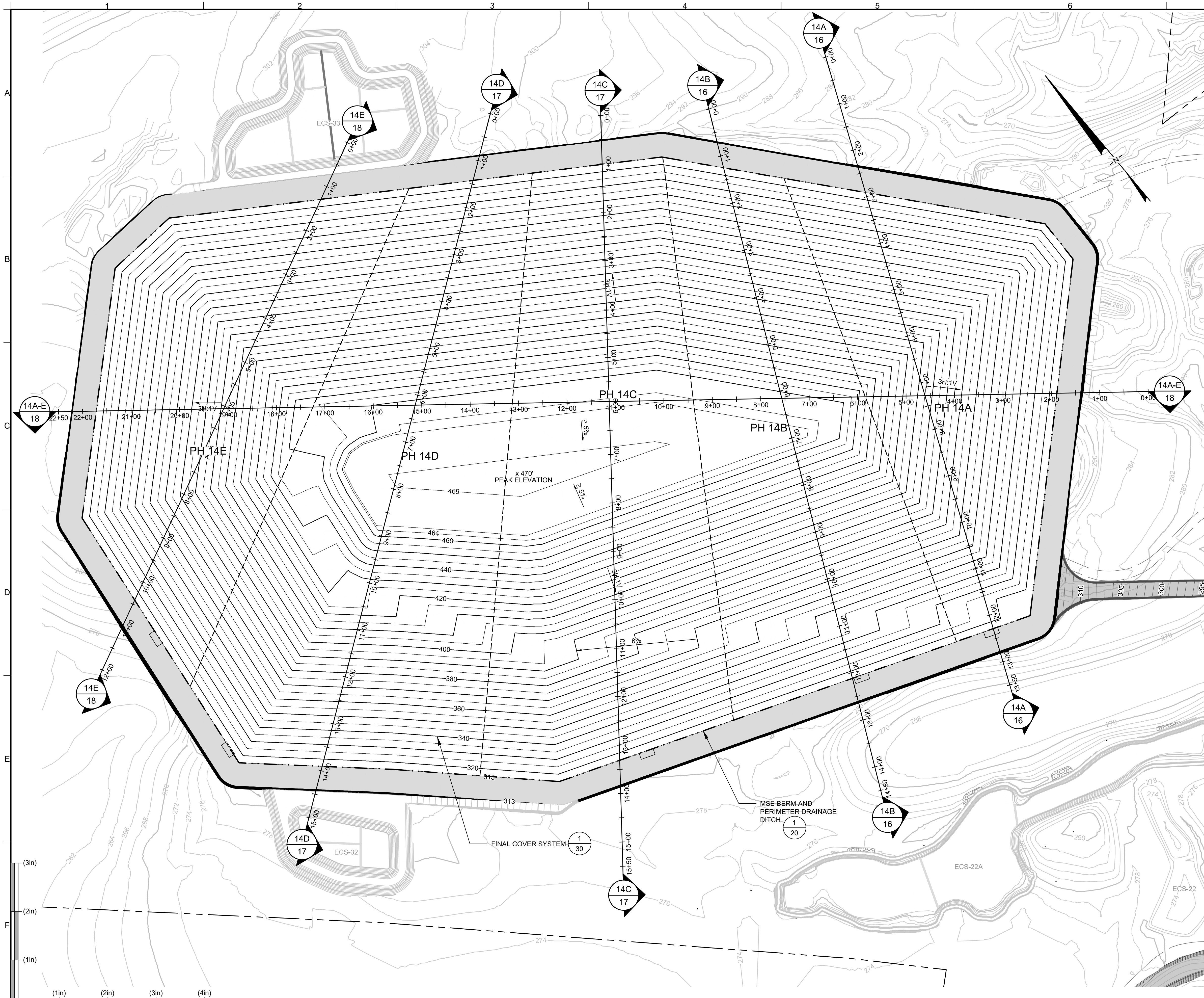
TITLE: FILL SEQUENCE PLAN FOR PHASES 14A, B, C, D & E

PROJECT: PHASE 14 PERMIT APPLICATION

SITE: CROSSROADS LANDFILL
NORRIDGEWOCK, MAINE

DATE: OCTOBER 2019
PROJECT NO.: BE0232C
DRAWING NO.: 12 OF 38

T:\PROJECTS_CADD\C\CROSSROADS LANDFILL\PHASE 14 EXPANSION\PERMIT\DRAWINGS\BE0232 D012 (FILL SEQ 14ABCDE).DWG Last Edited by: jfrayler on 10/10/19



LEGEND

- 310 — MAJOR (10 FT) GROUND SURFACE ELEVATION CONTOUR
- 316 — MINOR (2 FT) GROUND SURFACE ELEVATION CONTOUR
- 340 — PROPOSED TOP OF FINAL COVER GRADE ELEVATION CONTOUR
- EXISTING WASTE MANAGEMENT FACILITY
- PHASE 14 DESIGN LIMIT OF WASTE
- SUB CELL BOUNDARY
- 14A / 16 — PROFILE LOCATION (NOTE 3)
- PAVED LANDFILL ACCESS ROAD
- LEACHATE VAULTS

NOTES:

1. EXISTING GROUND SURFACE AND FEATURES OBTAINED FROM TOPOGRAPHIC SURVEYS, DATED NOV 2017, AND SEPT 2018, PROVIDED BY BOYNTON & PICKETT.
2. HORIZONTAL DATUM IS NORTH AMERICAN DATUM OF 1983 (NAD 83) MAINE WEST STATE PLAN. VERTICAL DATUM IS NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88). PROPERTY BOUNDARY SURVEYED IN UTM SCALED TO NAD 83.
3. PROFILES PRESENTED ON DRAWINGS 16 THROUGH DRAWING 18.

SCALE IS BASED ON 22" X 34" NON-REDUCED SHEET SIZE (BORDER = 21" X 32")

PERMIT DRAWINGS

REV	DATE	DESCRIPTION	DRN	APP

STATE OF MAINE — SCOTT M. LUETTICH — No. 7482 — LICENSED — PROFESSIONAL ENGINEER

THIS DRAWING MAY NOT BE ISSUED FOR PROJECT TENDER OR CONSTRUCTION, UNLESS SEALED.

SIGNATURE — 24 OCTOBER 2019 — DATE

DESIGN BY: NJY
DRAWN BY: JT / RK
CHECKED BY: NJY
REVIEWED BY: SML
APPROVED BY: SML

WASTE MANAGEMENT DISPOSAL SERVICES OF MAINE, INC.
357 MERCER ROAD
NORRIDGEWOCK, MAINE 04957
TELEPHONE: (207) 634-2714

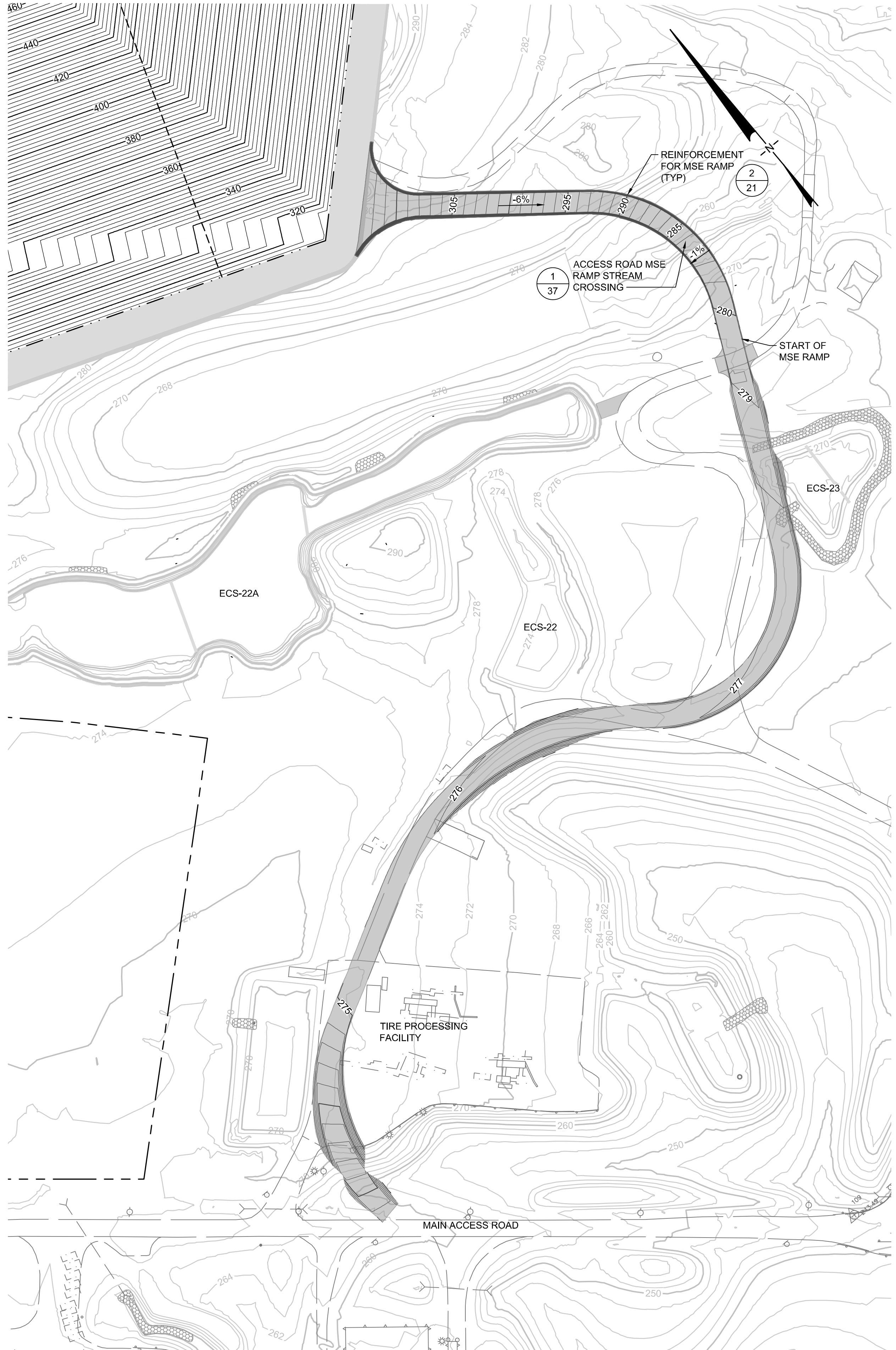
Geosyntec consultants
289 GREAT ROAD, SUITE 202
ACTON, MASSACHUSETTS 01720 USA
PHONE: 978.263.9588

TITLE: TOP OF FINAL COVER GRADING PLAN

PROJECT: PHASE 14 PERMIT APPLICATION

SITE: CROSSROADS LANDFILL
NORRIDGEWOCK, MAINE

DATE: OCTOBER 2019
PROJECT NO.: BE0232C
DRAWING NO.: 13 OF 38



LEGEND

310	MAJOR (10 FT) GROUND SURFACE ELEVATION CONTOUR
316	MINOR (2 FT) GROUND SURFACE ELEVATION CONTOUR
340	PROPOSED TOP OF FINAL COVER GRADE ELEVATION CONTOUR
— — —	EXISTING WASTE MANAGEMENT FACILITY
- - - -	SUB CELL BOUNDARY
(shaded)	PAVED LANDFILL ACCESS ROAD

NOTES:

1. EXISTING GROUND SURFACE AND FEATURES OBTAINED FROM TOPOGRAPHIC SURVEYS, DATED NOV 2017, AND SEPT 2018, PROVIDED BY BOYNTON & PICKETT.
2. HORIZONTAL DATUM IS NORTH AMERICAN DATUM OF 1983 (NAD 83) MAINE WEST STATE PLAN. VERTICAL DATUM IS NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88). PROPERTY BOUNDARY SURVEYED IN UTM SCALED TO NAD 83.
3. AN ON THE GROUND SURVEY SHALL BE PERFORMED ALONG THE ACCESS ROAD ALIGNMENT PRIOR TO DEVELOPMENT OF CONSTRUCTION LEVEL DRAWINGS.

0 100' 200'
SCALE IN FEET

SCALE IS BASED ON 22" X 34" NON-REDUCED SHEET SIZE (BORDER = 21" X 32")

PERMIT DRAWINGS

REV | DATE | DESCRIPTION | DRN | APP

STATE OF MAINE — SCOTT M. LUETTICH No. 7482 — LICENSED PROFESSIONAL ENGINEER

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SIGNATURE
24 OCTOBER 2019
DATE

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DRAWN BY: JT / RK
CHECKED BY: NJY
REVIEWED BY: SML
APPROVED BY: SML

WASTE MANAGEMENT DISPOSAL SERVICES OF MAINE, INC.
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NORRIDGEWOCK, MAINE 04957
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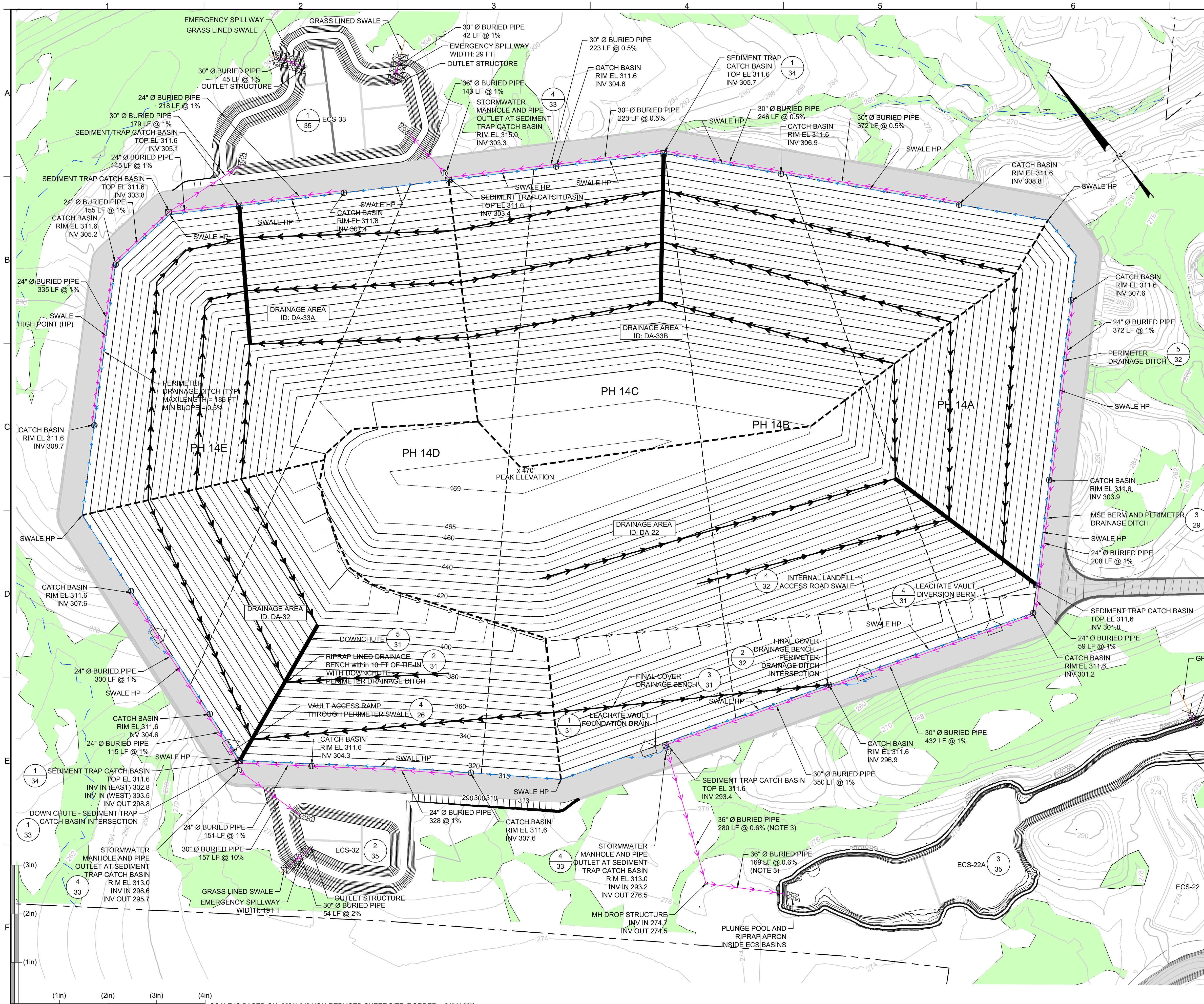
Geosyntec consultants
289 GREAT ROAD, SUITE 202
ACTON, MASSACHUSETTS 01720 USA
PHONE: 978.263.9588

TITLE: LANDFILL ACCESS ROAD AND MSE RAMP PLAN
PROJECT: PHASE 14 PERMIT APPLICATION
SITE: CROSSROADS LANDFILL NORRIDGEWOCK, MAINE

DATE: OCTOBER 2019
PROJECT NO.: BE0232C
DRAWING NO.: 14 OF 38

T:\PROJECTS_CADD\C\CROSSROADS LANDFILL\PHASE 14 EXPANSION\PERMIT\DRAWINGS\BE0232 D014 (LF ACCESS RD).DWG Last Edited by: jhtaylor on 10/10/19



LEGEND

- 310 — MAJOR (10 FT) GROUND SURFACE ELEVATION CONTOUR
- 316 — MINOR (2 FT) GROUND SURFACE ELEVATION CONTOUR
- 340 — PROPOSED TOP OF FINAL COVER GRADE ELEVATION CONTOUR
- EXISTING WASTE MANAGEMENT FACILITY
- DRAINAGE BENCH
- DOWNCHUTE
- STORMWATER CATCHMENT AREA
- STORMWATER PIPE
- PERIMETER DRAINAGE DITCH
- GRASS LINED SWALE
- LEACHATE VAULT DIVERSION BERM
- RIP RAP SPLASH PAD, EMERGENCY SPILL WAY, OR STILLING BASIN
- WETLANDS
- STORMWATER CATCH BASIN
- SEDIMENT TRAP CATCH BASIN
- STORMWATER MANHOLE
- INTERNAL LANDFILL ACCESS ROAD SWALE

NOTES:

1. EXISTING GROUND SURFACE AND FEATURES OBTAINED FROM TOPOGRAPHIC SURVEYS, DATED NOV 2017, AND SEPT 2018, PROVIDED BY BOYNTON & PICKETT.
2. HORIZONTAL DATUM IS NORTH AMERICAN DATUM OF 1983 (NAD 83) MAINE WEST STATE PLAN. VERTICAL DATUM IS NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88). PROPERTY BOUNDARY SURVEYED IN UTM SCALED TO NAD 83.
3. COMMON BORROW WILL BE MOUNDED OVER PIPE TO ECS-22A TO ENSURE MINIMUM 2 FT OF COVER.
4. REFER TO DRAWING 35 FOR ECS BASIN RELATED DETAILS.

0 100' 200'
SCALE IN FEET

STATE OF MAINE — SCOTT M. LUETTICH No. 7462 — LICENSED PROFESSIONAL ENGINEER

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SIGNATURE / 24 OCTOBER 2019 DATE

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DRAWN BY: JT / RK
CHECKED BY: NJY
REVIEWED BY: SML
APPROVED BY: SML

WASTE MANAGEMENT DISPOSAL SERVICES OF MAINE, INC.
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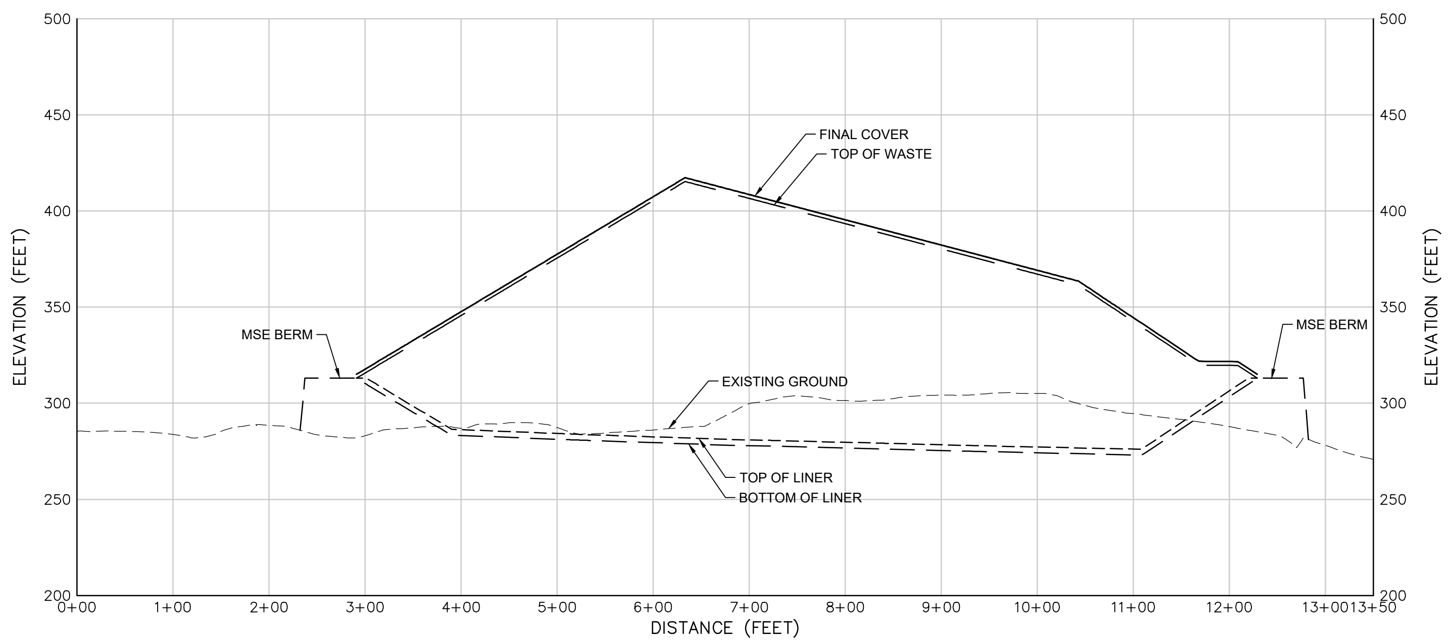
Geosyntec consultants
289 GREAT ROAD, SUITE 202
ACTON, MASSACHUSETTS 01720 USA
PHONE: 978.263.9588

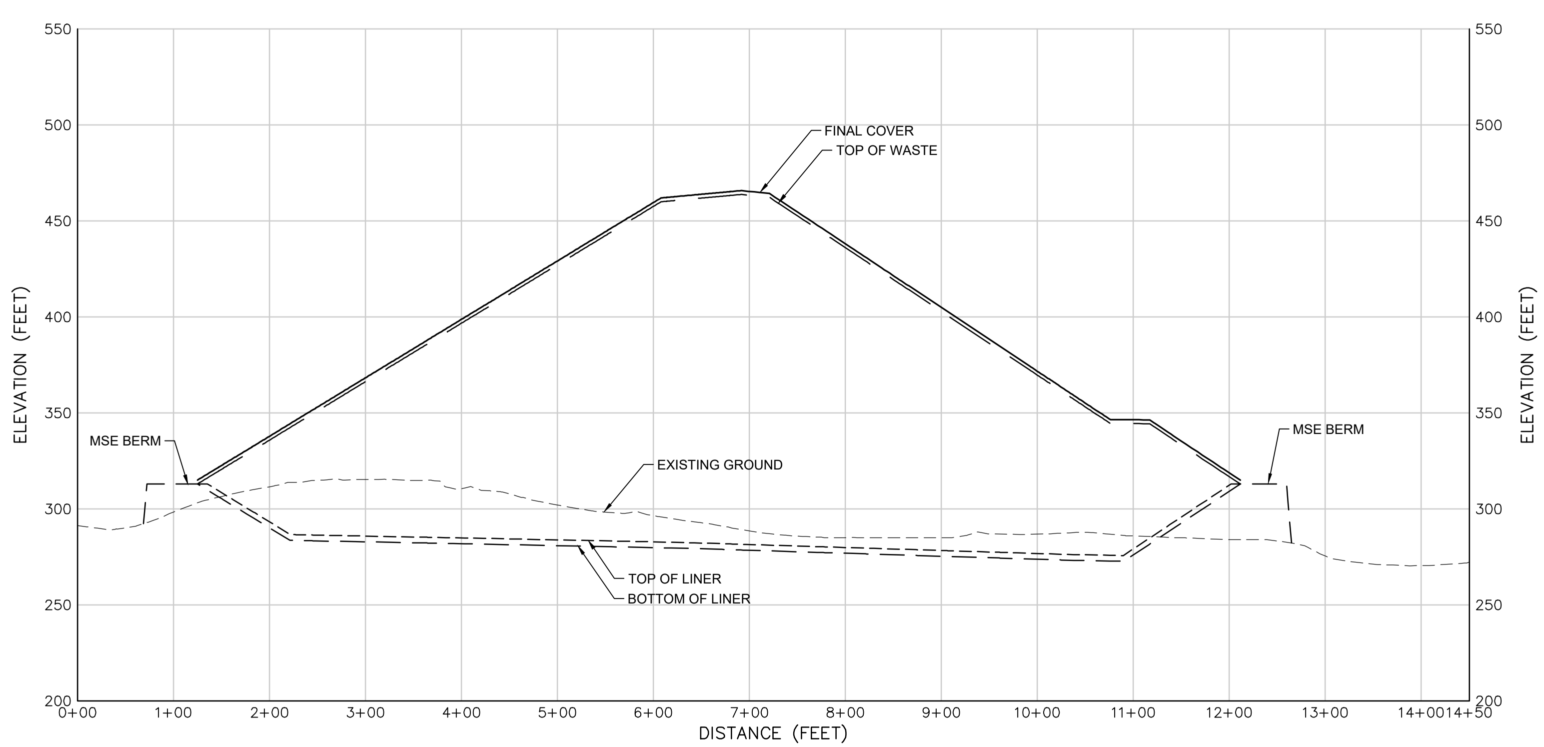
TITLE: SURFACE WATER MANAGEMENT PLAN
PROJECT: PHASE 14 PERMIT APPLICATION
SITE: CROSSROADS LANDFILL NORRIDGEWOCK, MAINE

DATE: OCTOBER 2019
PROJECT NO.: BE0232C
DRAWING NO.: 15 OF 38

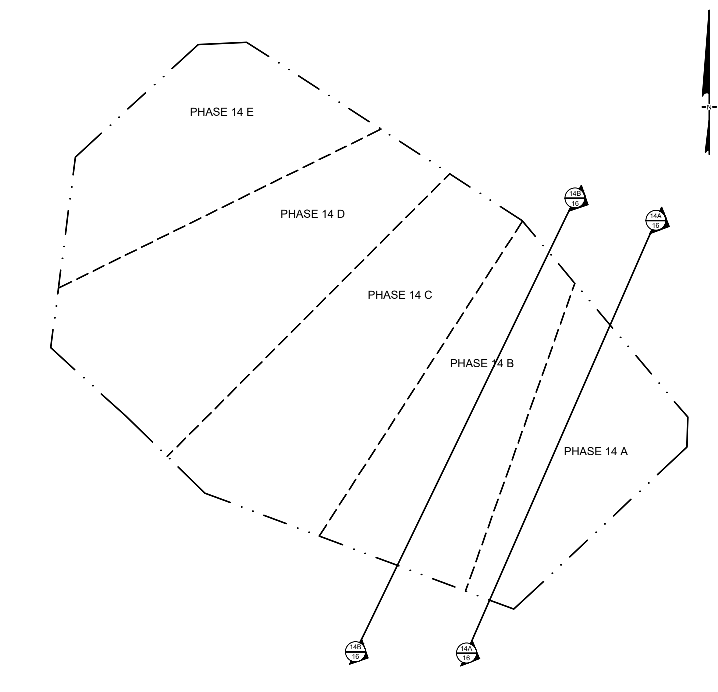
PERMIT DRAWINGS



PROFILE 14A



PROFILE 14B



PROFILE LOCATION KEY MAP

SCALE IS BASED ON 22" X 34" NON-REDUCED SHEET SIZE (BORDER = 21" X 32")

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CHECKED BY:	NJY
REVIEWED BY:	SML
APPROVED BY:	SML

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TITLE: PROFILES I

PROJECT: PHASE 14 PERMIT APPLICATION

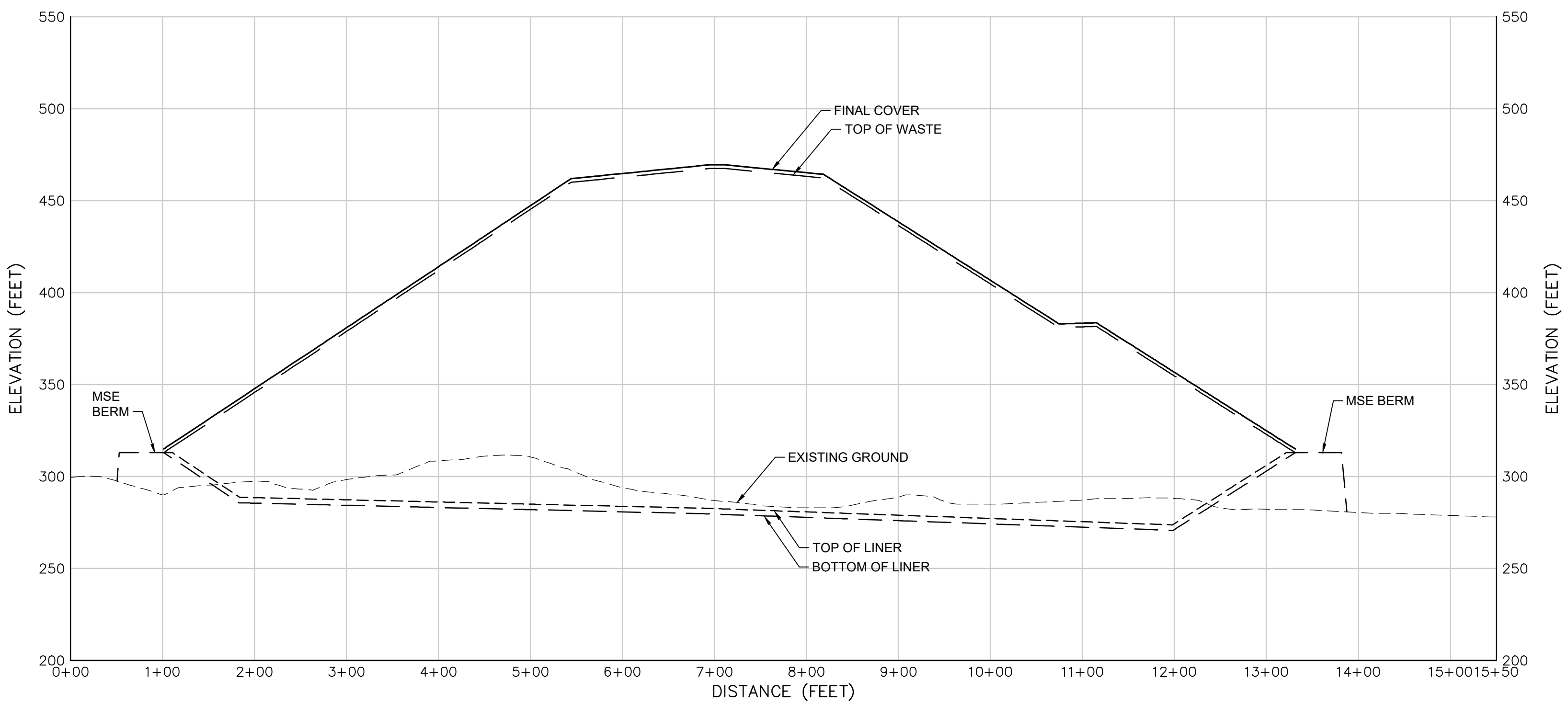
SITE: CROSSROADS LANDFILL NORRIDGEWOCK, MAINE

DATE: OCTOBER 2019

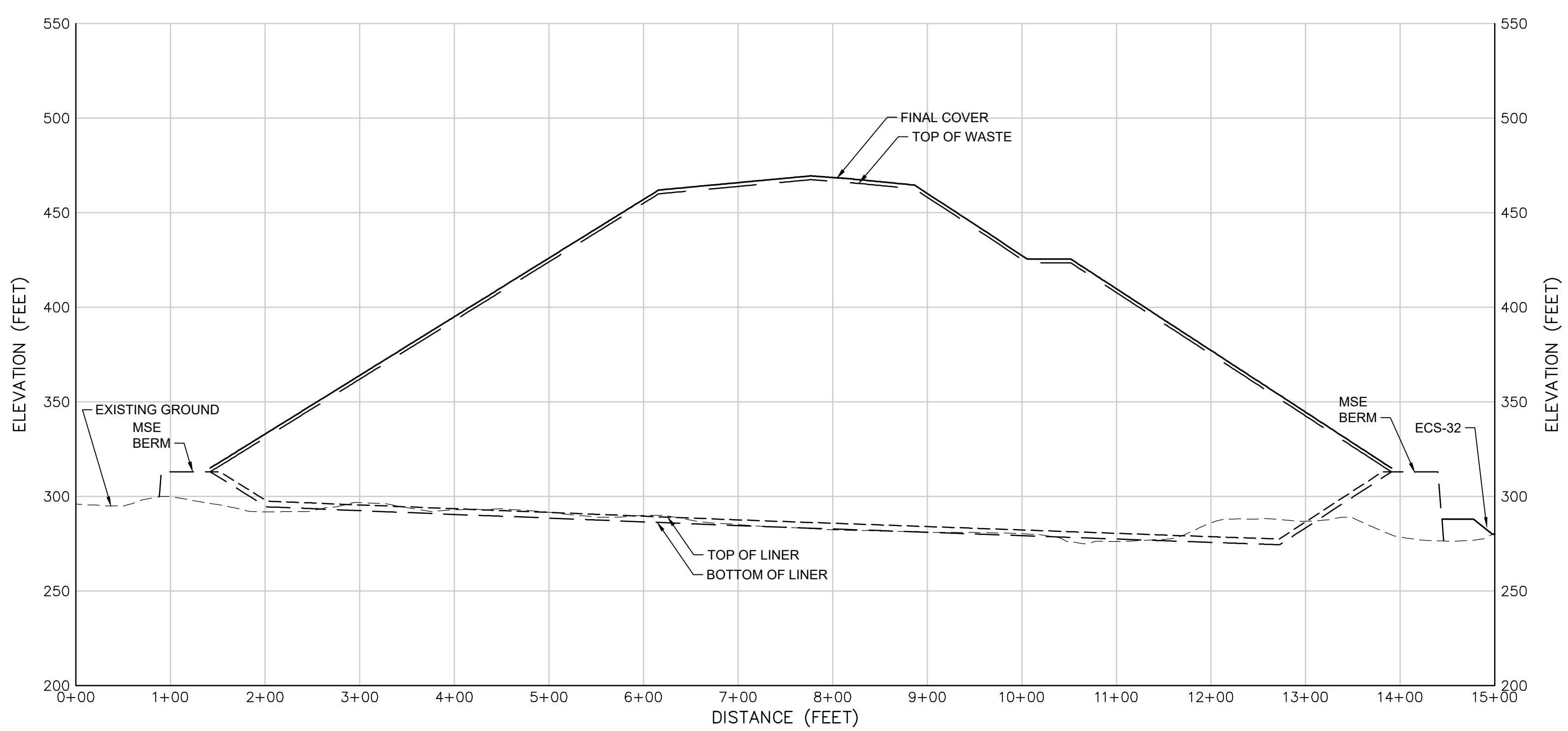
PROJECT NO.: BE0232C

DRAWING NO.: 16 OF 38

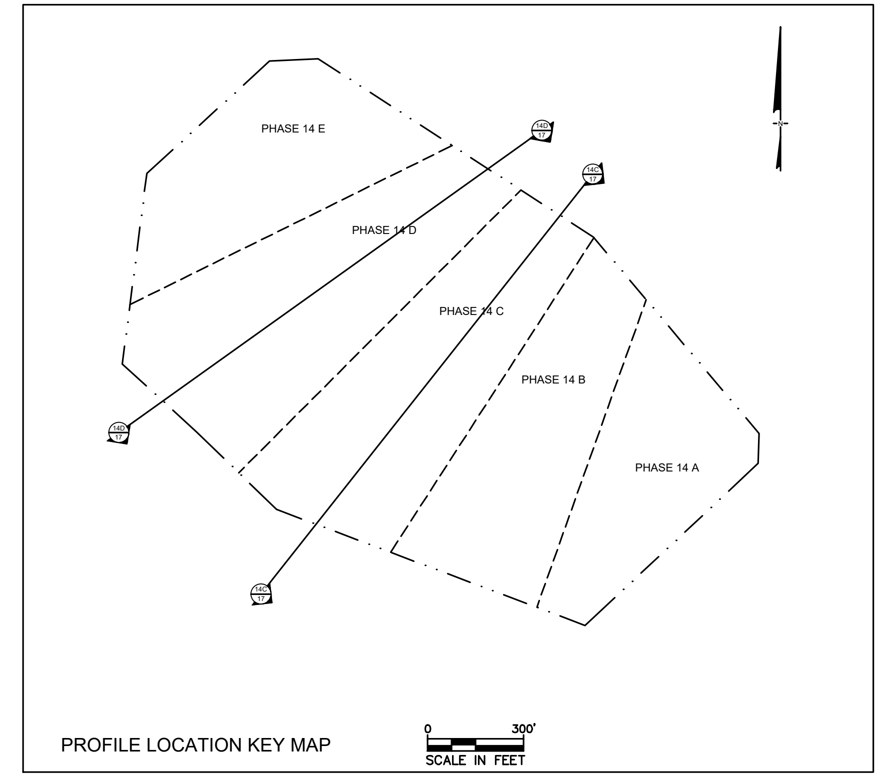
PERMIT DRAWINGS



PROFILE 14C



PROFILE 14D



PROFILE LOCATION KEY MAP

SCALE IS BASED ON 22" X 34" NON-REDUCED SHEET SIZE (BORDER = 21" X 32")

PERMIT DRAWINGS

REV	DATE	DESCRIPTION	DRN	APP

STATE OF MAINE
SCOTT M. LUETTICH
No. 7482
LICENSED PROFESSIONAL ENGINEER

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SIGNATURE
24 OCTOBER 2019
DATE

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DRAWN BY: JT / RK
CHECKED BY: NJY
REVIEWED BY: SML
APPROVED BY: SML

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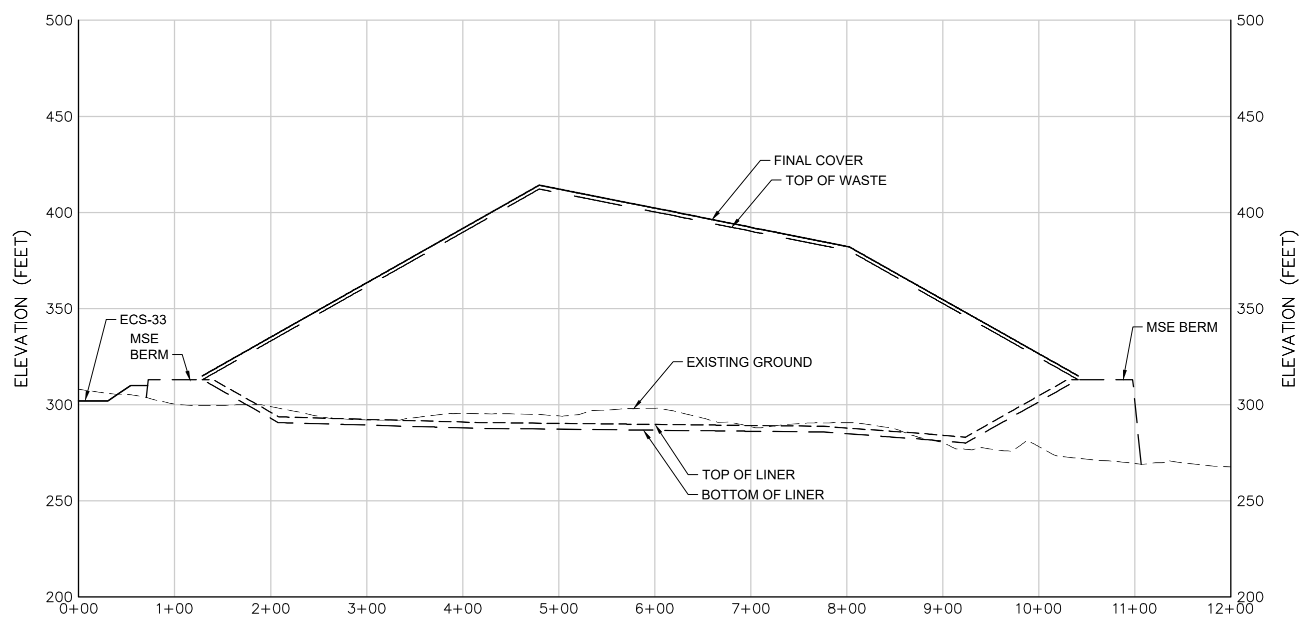
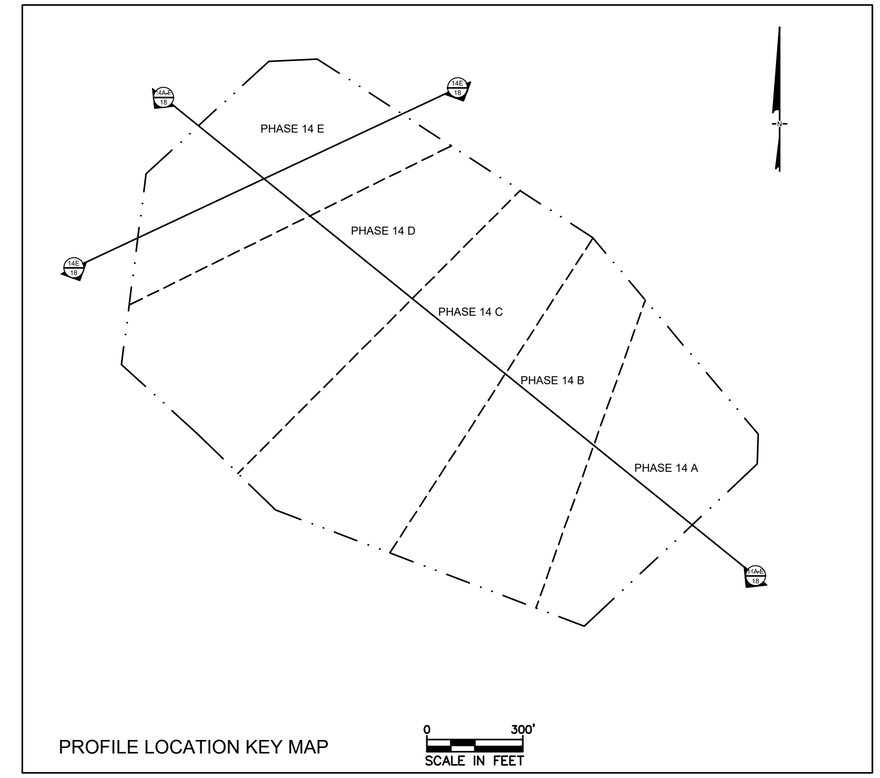
TITLE: PROFILES II
PROJECT: PHASE 14 PERMIT APPLICATION
SITE: CROSSROADS LANDFILL NORRIDGEWOCK, MAINE

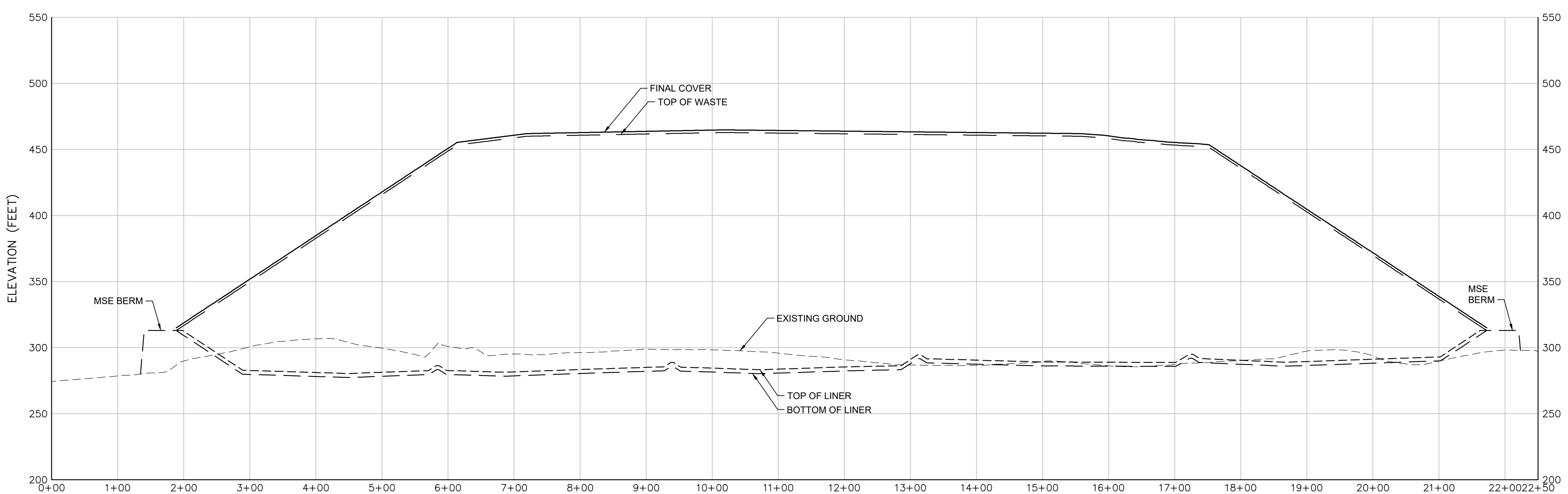
DATE: OCTOBER 2019
PROJECT NO.: BE0232C
DRAWING NO.: 17 OF 38



PROFILE 14E



PROFILE LOCATION KEY MAP



PROFILE 14A–E

SCALE IS BASED ON 22" X 34" NON-REDUCED SHEET SIZE (BORDER = 21" X 32")

PERMIT DRAWINGS

REV | DATE | DESCRIPTION | DRN | APP

STATE OF MAINE — SCOTT M. LUETTICH No. 7482 — LICENSED PROFESSIONAL ENGINEER

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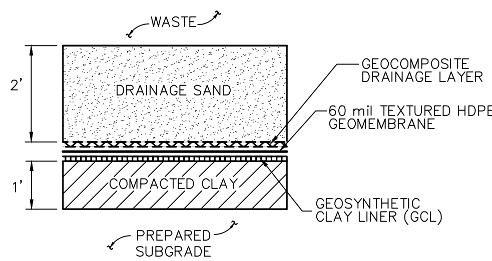
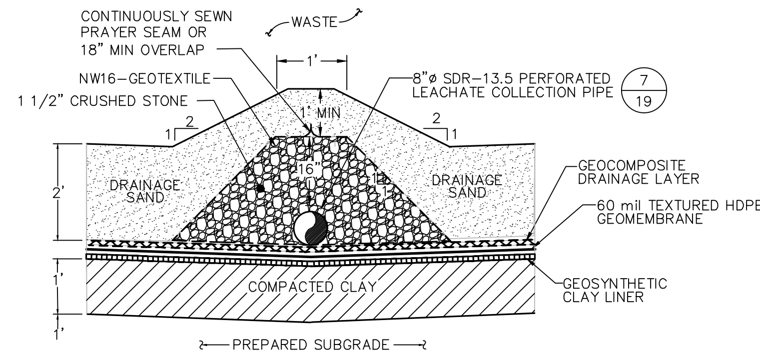
TITLE: PROFILES III
PROJECT: PHASE 14 PERMIT APPLICATION
SITE: CROSSROADS LANDFILL NORRIDGEWOCK, MAINE

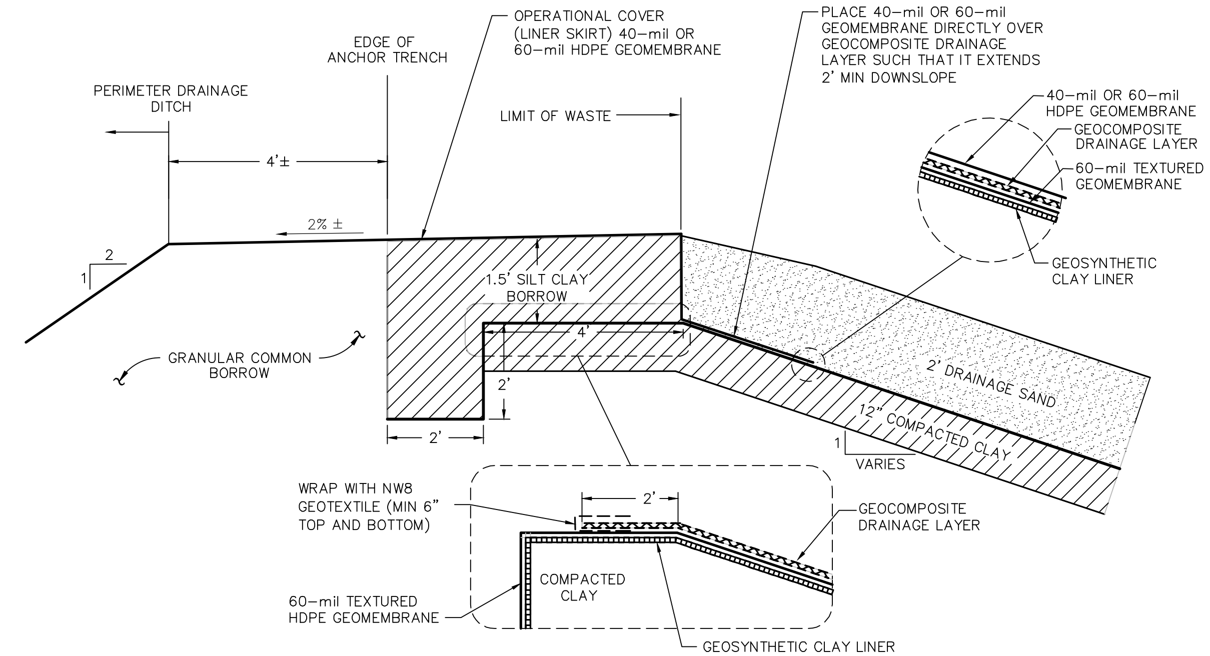
DATE: OCTOBER 2019
PROJECT NO.: BE0232C
DRAWING NO.: 18 OF 38



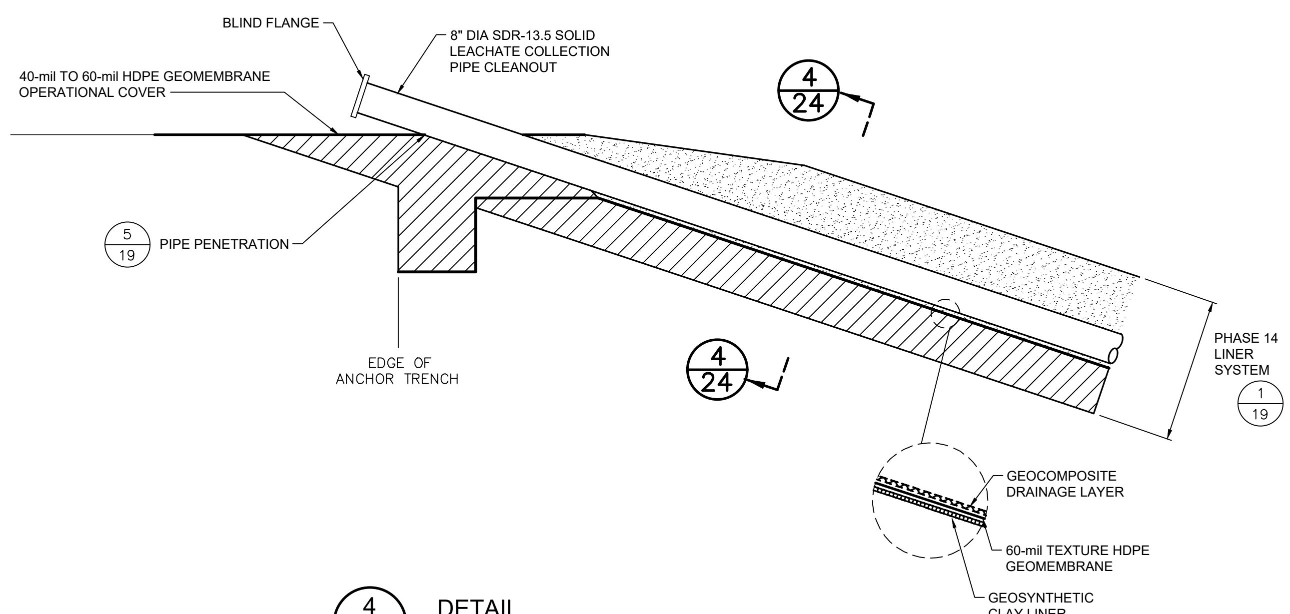
1/5 DETAIL
LINER SYSTEM
N.T.S.



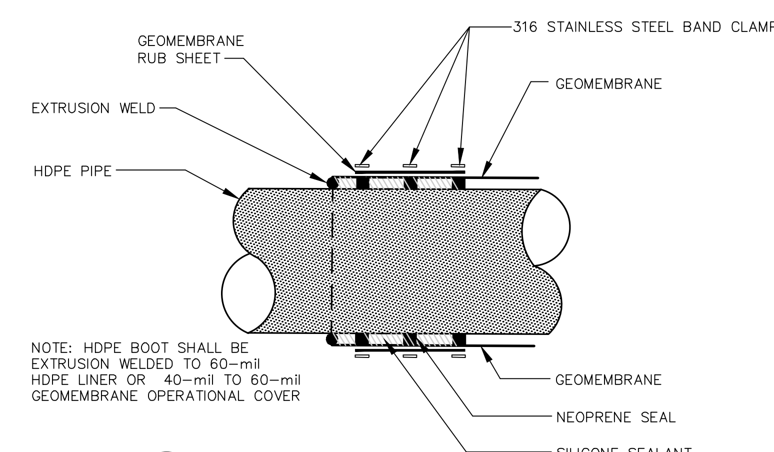
2/7 DETAIL
LEACHATE COLLECTION PIPES ALONG LEACHATE COLLECTION CORRIDORS
N.T.S.



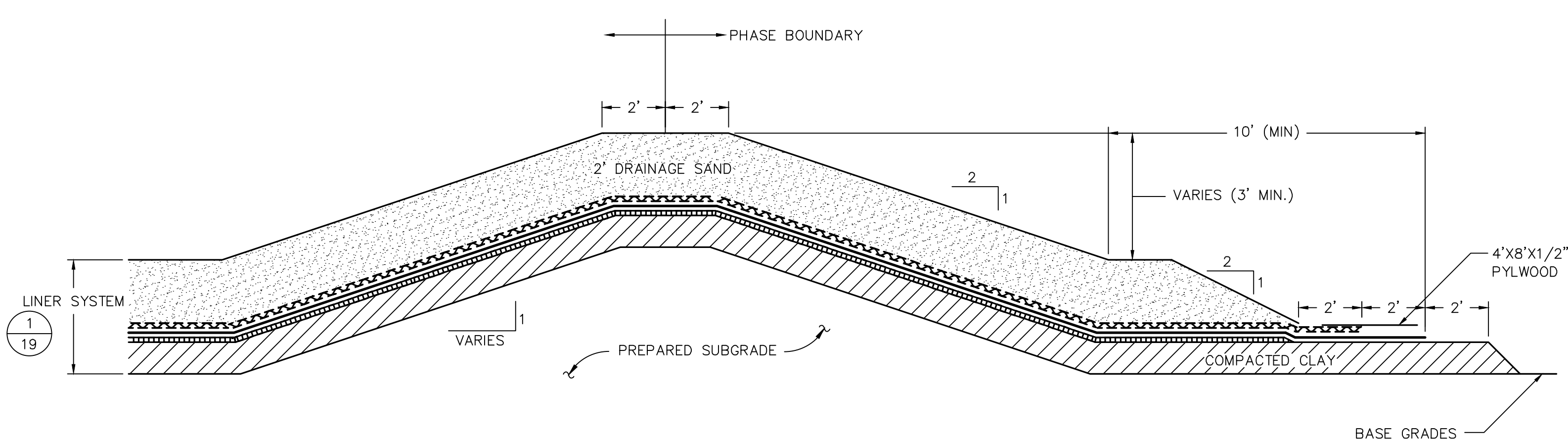
3/6 DETAIL
ANCHOR TRENCH
N.T.S.



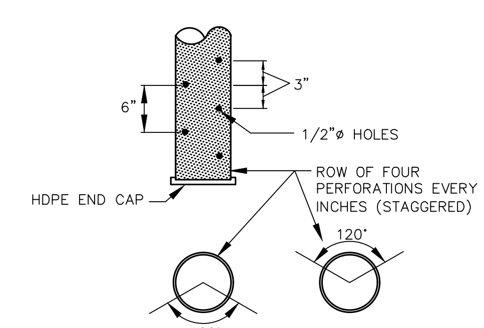
4/7 DETAIL
LEACHATE COLLECTION PIPE AND CLEANOUTS
N.T.S.



5/19 DETAIL
HDPE PIPE CONNECTION TO HDPE BOOT
N.T.S.



6/6 DETAIL
DIVISION BERM-TEMPORARY LINER TERMINATION
N.T.S.



7/19 DETAIL
LEACHATE COLLECTION AND SUMP PIPE PERFORATIONS
N.T.S.

SCALE IS BASED ON 22" X 34" NON-REDUCED SHEET SIZE (BORDER = 21" X 32")

PERMIT DRAWINGS

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STATE OF MAINE — SCOTT M. LUETTICH — No. 7482 — LICENSED PROFESSIONAL ENGINEER

SIGNATURE — 24 OCTOBER 2019 DATE

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REVIEWED BY: SML
APPROVED BY: SML

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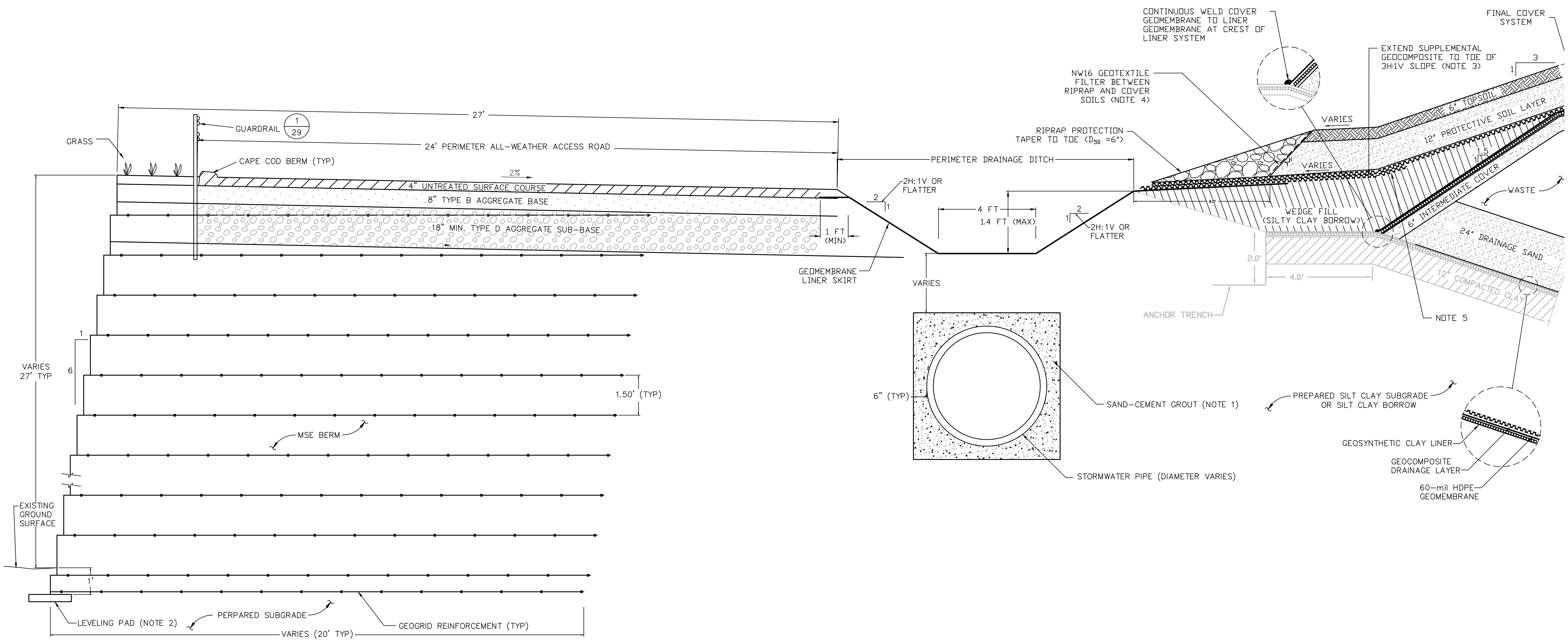
TITLE: LINER SYSTEM DETAILS
PROJECT: PHASE 14 PERMIT APPLICATION
SITE: CROSSROADS LANDFILL NORRIDGEWOCK, MAINE
DATE: OCTOBER 2019
PROJECT NO.: BE0232C
DRAWING NO.: 19 OF 38



1/13 DETAIL
MSE BERM AND PERIMETER DRAINAGE DITCH
N.T.S.

NOTES:

1. SAND-CEMENT GROUT USED FOR PIPES WITH MECHANICAL CONNECTIONS. HDPE BUTT-FUSED PIPE DOES NOT REQUIRE SAND-CEMENT GROUT.
2. LEVELING PAD MAY BE INSTALLED BY CONTRACTOR TO ASSIST IN INITIAL BERM ALIGNMENT. PAD SHALL CONSIST OF COMPACTED STRUCTURAL FILL OR POURED CONCRETE.
3. CONTRACTOR SHALL GRADE SO GEOCOMPOSITE DRAINS FREELY INTO PERIMETER SWALE.
4. DOUBLE LAYER OF 8 OZ/SYD GEOXTEXTILE MAY BE USED IN LIEU OF SINGLE LAYER OF 16 OZ/SYD (NW16) GEOTEXTILE.
5. WRAP GEOTEXTILE FLAPS UNDER SUPPLEMENTAL GEOCOMPOSITE.

SCALE IS BASED ON 22" X 34" NON-REDUCED SHEET SIZE (BORDER = 21" X 32")

PERMIT DRAWINGS

REV | DATE | DESCRIPTION | DRN | APP

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STATE OF MAINE — SCOTT M. LUETTICH No. 7482 — LICENSED PROFESSIONAL ENGINEER

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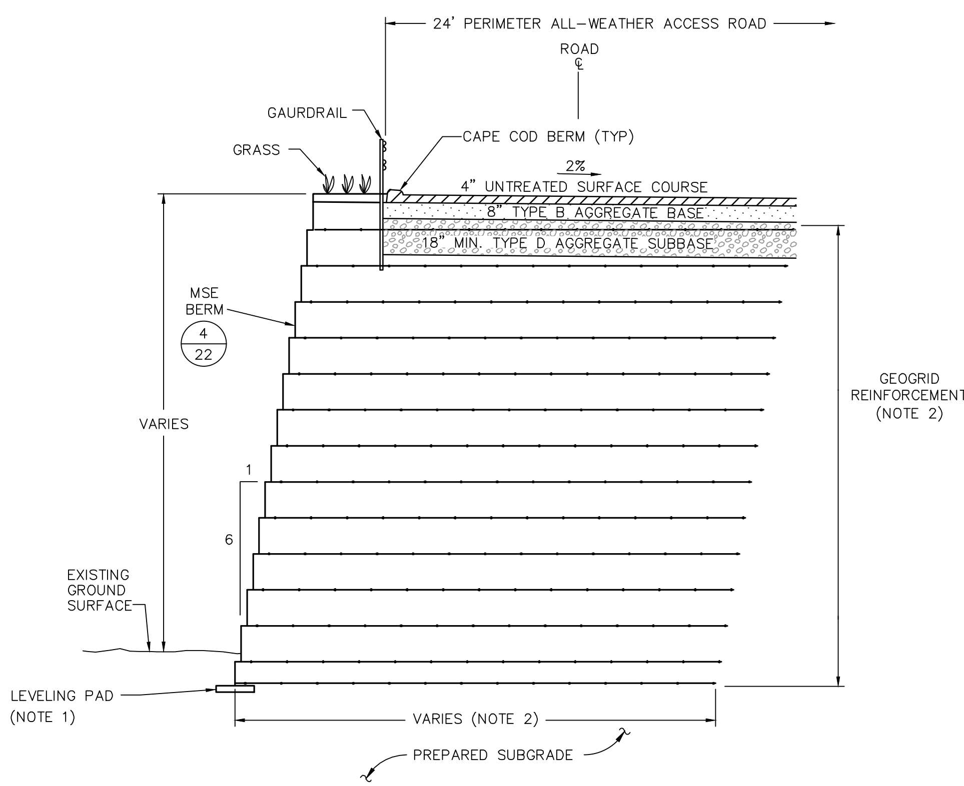
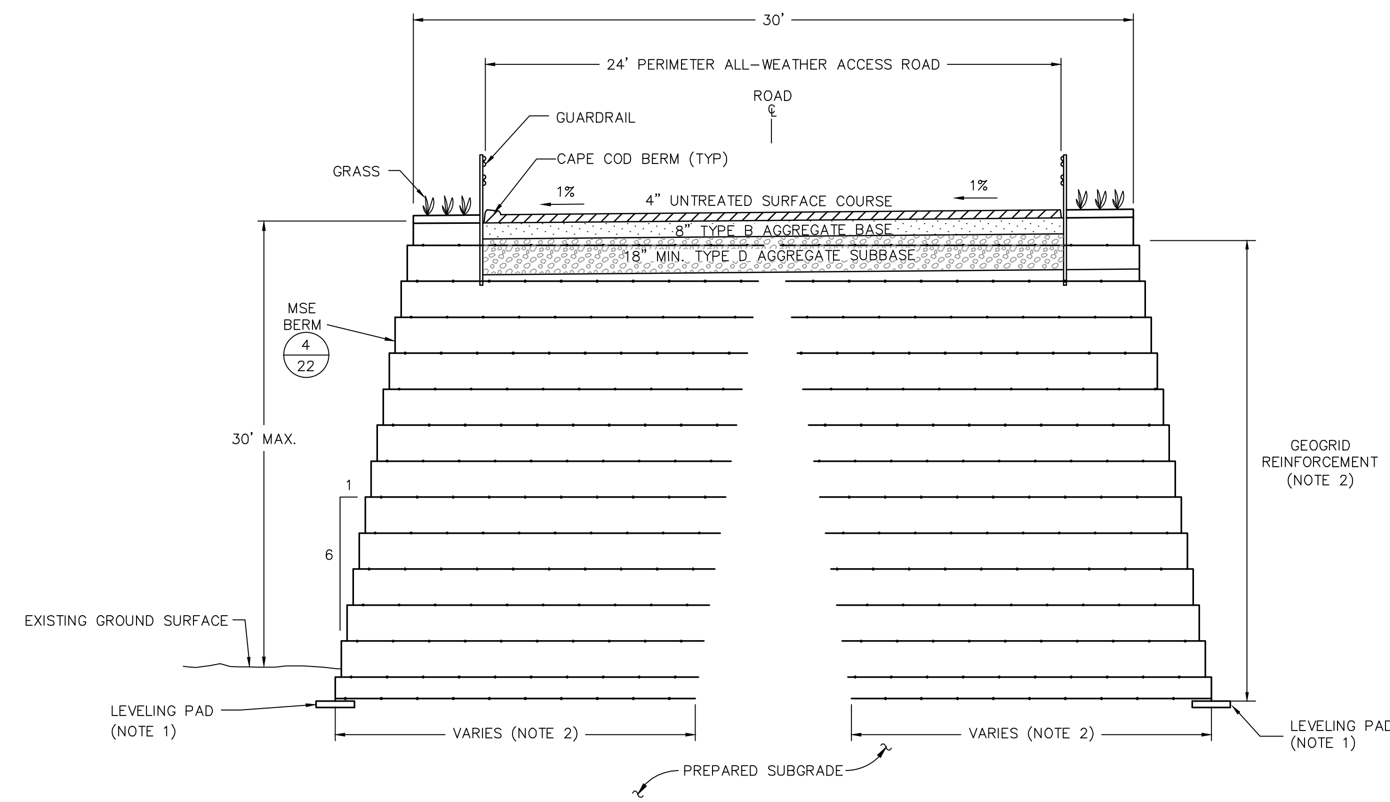
TITLE: MSE BERM DETAILS I
PROJECT: PHASE 14 PERMIT APPLICATION
SITE: CROSSROADS LANDFILL NORRIDGEWOCK, MAINE
DATE: OCTOBER 2019
PROJECT NO.: BE0232C
DRAWING NO.: 20 OF 38



1
5
DETAIL
MSE BERM REINFORCEMENT (TYP)
N.T.S.



2
5
DETAIL
REINFORCEMENT FOR MSE RAMP (TYP)
N.T.S.

NOTE:
1. LEVELING PAD MAY BE INSTALLED BY CONTRACTOR TO ASSIST IN INITIAL BERM ALIGNMENT. PAD SHALL CONSIST OF COMPACTED STRUCTURAL FILL OR POURED CONCRETE.
2. GEOGRID STRENGTH AND LENGTH TO BE DETERMINED DURING PREPARATION OF CONSTRUCTION DOCUMENTS BASED ON SLOPE STABILITY AND PUNCHING SHEAR CALCULATIONS TO ACHIEVE THE REQUIRED FACTOR OF SAFETY.

SCALE IS BASED ON 22" X 34" NON-REDUCED SHEET SIZE (BORDER = 21" X 32")

PERMIT DRAWINGS

REV	DATE	DESCRIPTION	DRN	APP

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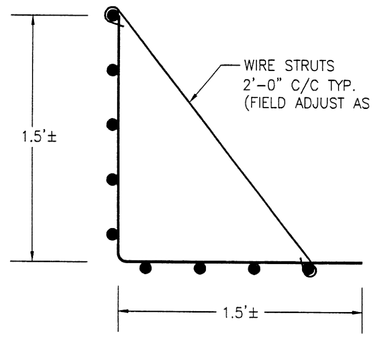
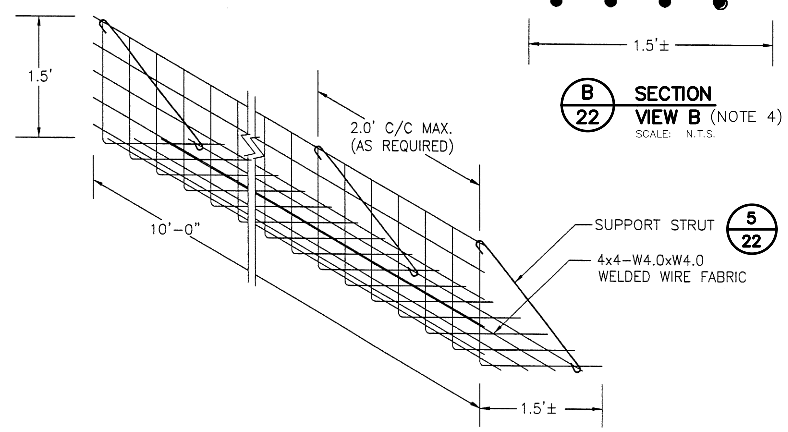
TITLE: MSE BERM DETAILS II
PROJECT: PHASE 14 PERMIT APPLICATION
SITE: CROSSROADS LANDFILL NORRIDGEWOCK, MAINE

DATE: OCTOBER 2019
PROJECT NO.: BE0232C
DRAWING NO.: 21 OF 38

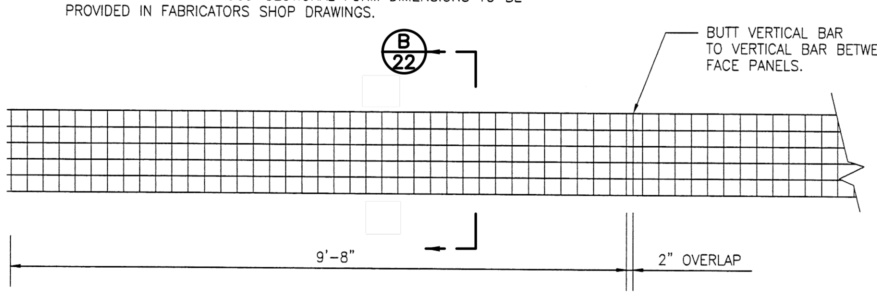


B / 22 **SECTION VIEW B** (NOTE 4)
SCALE: N.T.S.

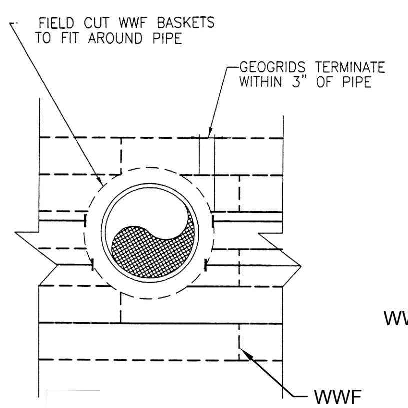


NOTES:

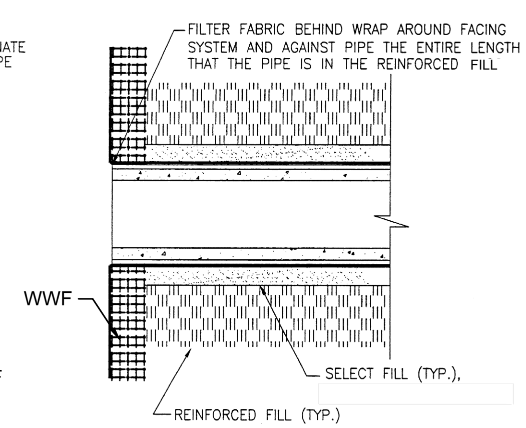
1. FACING TO CONSIST OF PREFABRICATED WWF 4x4-W4.0xW4.0 FORMS.
2. ALL FORMS AND STRUTS WILL BE FABRICATED WITH BLACK WIRE.
3. OVERALL LENGTH OF WIRE FORMS IS 10'-0". EFFECTIVE CONSTRUCTED WIDTH IS 9'-8" WITH 2" OVER LAPPING AT ENDS.
4. STRUT LENGTH AND CROSS-SECTIONAL FORM DIMENSIONS TO BE PROVIDED IN FABRICATORS SHOP DRAWINGS.



1 / 22 DETAIL
WELDED WIRE FORM (WWF)
N.T.S.

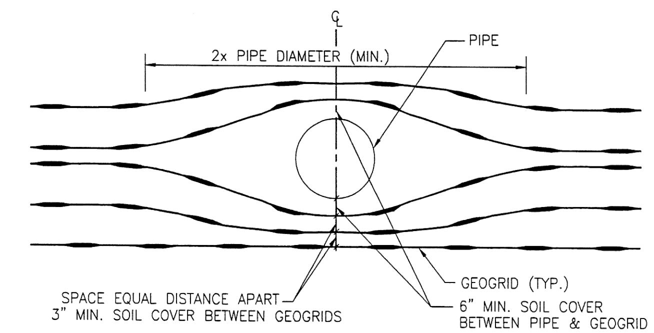


ELEVATION VIEW

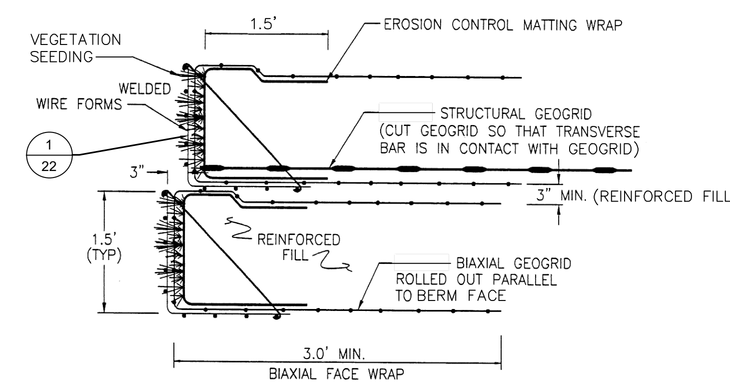


PLAN VIEW

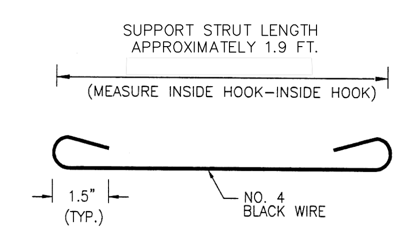
3 / - DETAIL
PIPE PENETRATION AT WELDED WIRE FACING SYSTEM
N.T.S.



2 / - DETAIL
PIPE PLACEMENT ON GEOGRID
N.T.S.



4 / 21 DETAIL
MSE BERM FACE
N.T.S.



5 / 22 DETAIL
SUPPORT STRUT
N.T.S.

(3in) (2in) (1in)
(1in) (2in) (3in) (4in)
SCALE IS BASED ON 22" X 34" NON-REDUCED SHEET SIZE (BORDER = 21" X 32")

PERMIT DRAWINGS

REV	DATE	DESCRIPTION	DRN	APP

STATE OF MAINE
SCOTT M. LUETTICH
No. 7482
LICENSED PROFESSIONAL ENGINEER

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24 OCTOBER 2019
DATE

DESIGN BY: NJY
DRAWN BY: JT / RK
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REVIEWED BY: SML
APPROVED BY: SML

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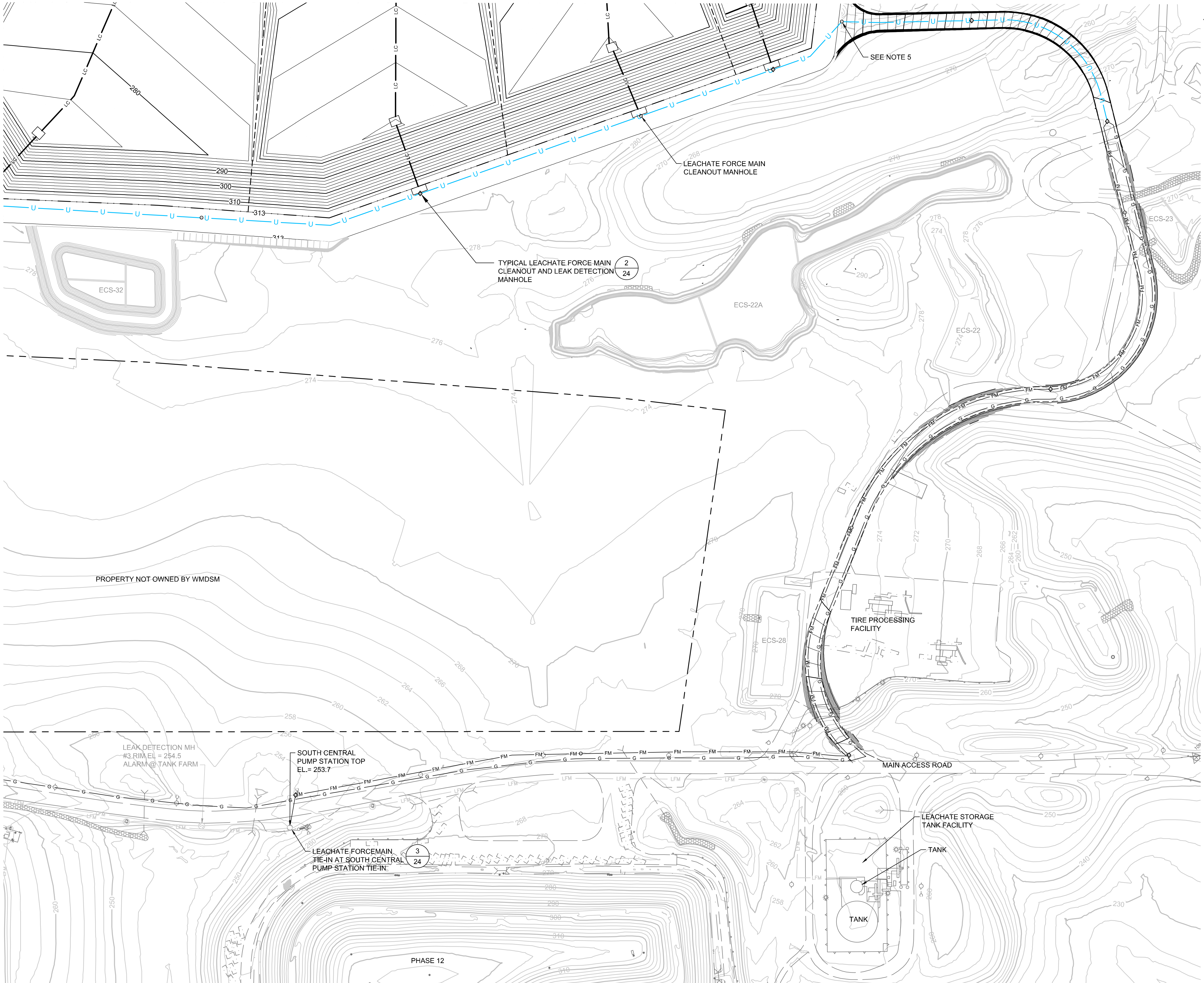
PHONE: 978.263.9588

TITLE: MSE BERM DETAILS III

PROJECT: PHASE 14 PERMIT APPLICATION

SITE: CROSSROADS LANDFILL
NORRIDGEWOCK, MAINE

DATE: OCTOBER 2019
PROJECT NO.: BE0232C
DRAWING NO.: 22 OF 38



LEGEND

310	MAJOR (10 FT) GROUND SURFACE ELEVATION CONTOUR
316	MINOR (2 FT) GROUND SURFACE ELEVATION CONTOUR
300	PROPOSED LEACHATE ELEVATION CONTOUR
	EXISTING WASTE MANAGEMENT FACILITY
	PHASE 14 DESIGN LIMIT OF WASTE
	BUILDING/STRUCTURE
	ACCESS ROAD
	OVERHEAD ELECTRIC
LFM	EXISTING LEACHATE FORCE MAIN
	EXISTING LEACHATE MANHOLE
U	UTILITY CORRIDOR
G	LANDFILL GAS MAIN
FM	LEACHATE FORCE MAIN (NOTE 6 & 7)
	LEACHATE FORCE MAIN CLEANOUT MANHOLE
	LEACHATE FORCE MAIN CLEANOUT AND LEAK DETECTION MANHOLE
LC	SUMP WITH LEACHATE COLLECTION PIPE
	LEACHATE VAULT

NOTES:

1. EXISTING GROUND SURFACE AND FEATURES OBTAINED FROM TOPOGRAPHIC SURVEYS, DATED NOV 2017, AND SEPT 2018, PROVIDED BY BOYNTON & PICKETT.
2. HORIZONTAL DATUM IS NORTH AMERICAN DATUM OF 1983 (NAD 83) MAINE WEST STATE PLAN. VERTICAL DATUM IS NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88). PROPERTY BOUNDARY SURVEYED IN UTM SCALED TO NAD 83.
3. UTILITY CORRIDOR FOR UNDERGROUND LEACHATE FORCE MAIN, LANDFILL GAS TRANSMISSION PIPE, THREE-PHASE POWER CABLE CONDUIT, AND LEACHATE MANAGEMENT COMMUNICATION CABLE CONDUIT.
4. LEACHATE FORCE MAIN AND LANDFILL GAS TRANSMISSION PIPE SHOWN IN SEPARATE TRENCHES IN ACCESS ROAD TO LANDFILL. LOCATION OF PIPES WILL BE EVALUATED FOR THE CONSTRUCTION DOCUMENTS.
5. MANHOLE AT TOP OF MSE RAMP TO INCLUDE VACUUM RELIEF VALVE.
6. LEACHATE FORCE MAIN SHALL BE DUAL CONTAINMENT PIPE WITH INNER 8-INCH DIAMETER CARRIER PIPE AND OUTER 14-INCH DIAMETER CONTAINMENT PIPE.
7. LEACHATE FORCE MAIN PIPE SHALL HAVE A MINIMUM 0.5% SLOPE.

0 100' 200'
SCALE IN FEET

SCALE IS BASED ON 22" X 34" NON-REDUCED SHEET SIZE (BORDER = 21" X 32")

PERMIT DRAWINGS

REV | DATE | DESCRIPTION | DRN | APP

STATE OF MAINE
SCOTT M. LUETTICH
No. 7482
LICENSED
PROFESSIONAL ENGINEER

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SIGNATURE
24 OCTOBER 2019
DATE

DESIGN BY: NJY
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APPROVED BY: SML

WASTE MANAGEMENT
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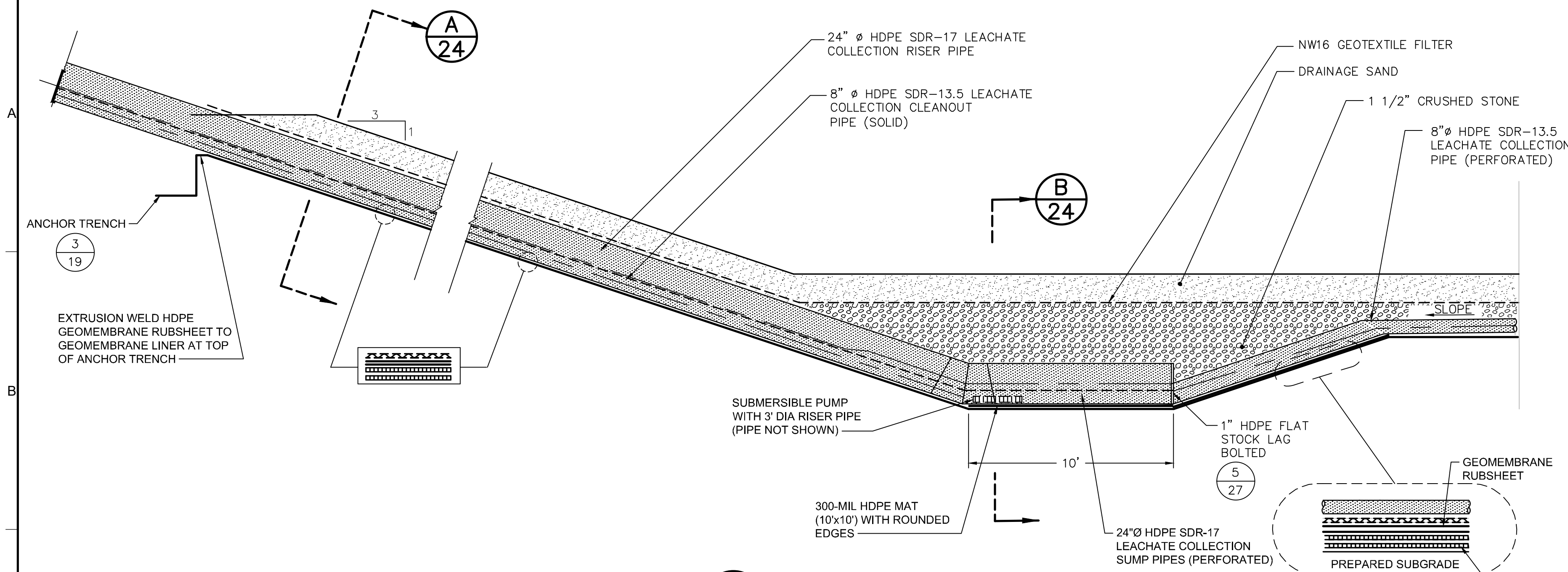
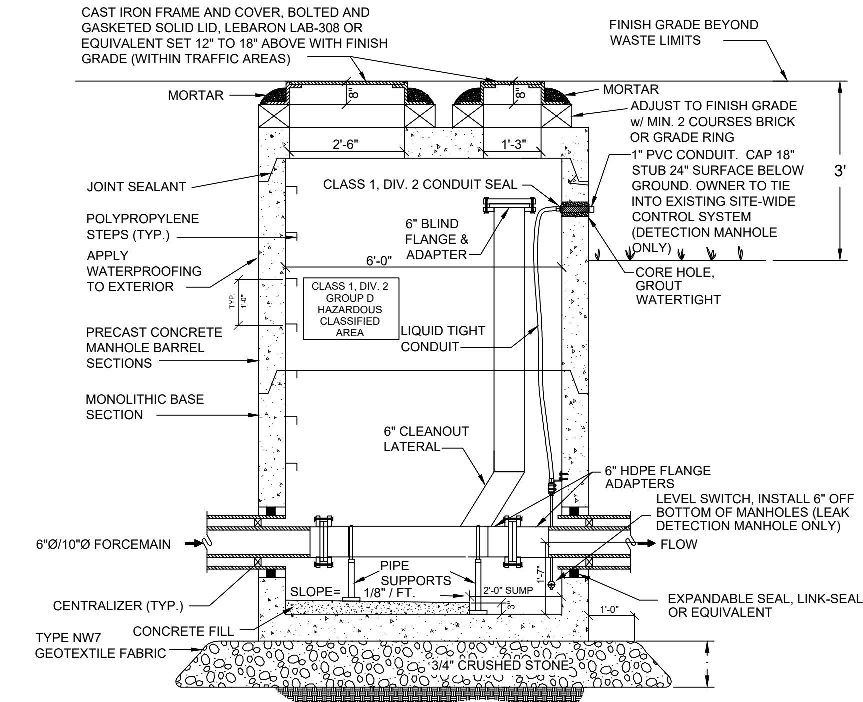
TITLE: LEACHATE TRANSMISSION PLAN
PROJECT: PHASE 14 PERMIT APPLICATION
SITE: CROSSROADS LANDFILL NORRIDGEWOCK, MAINE

DATE: OCTOBER 2019
PROJECT NO.: BE0232C
DRAWING NO.: 23 OF 38

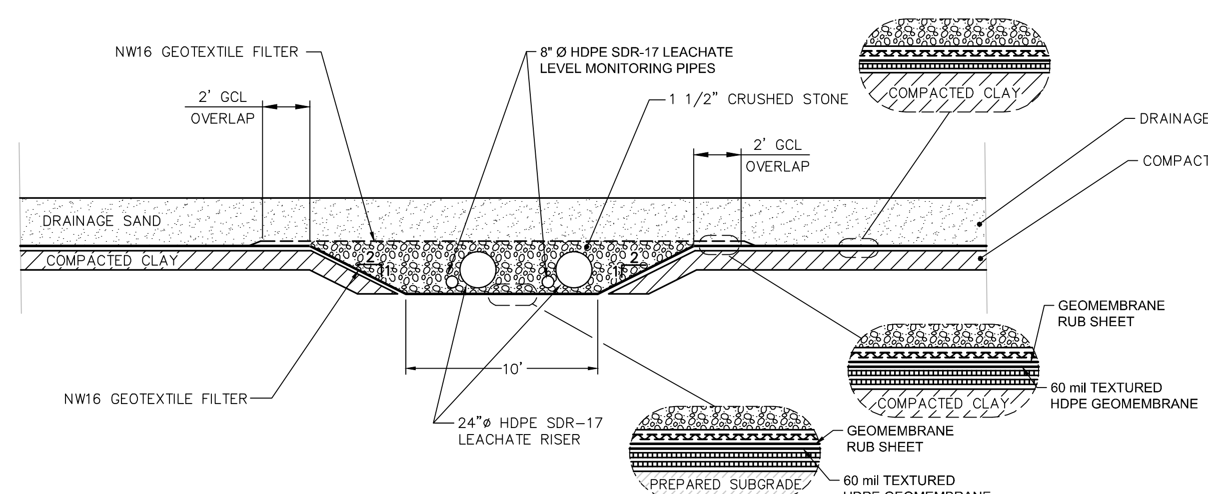
T:\PROJECTS_CADD\CROSSROADS LANDFILL\PHASE 14 EXPANSION\PERMIT\DRAWINGS\BE0232 D23 (LEACH TRANS).DWG Last Edited by: jfrayler on 10/23/19



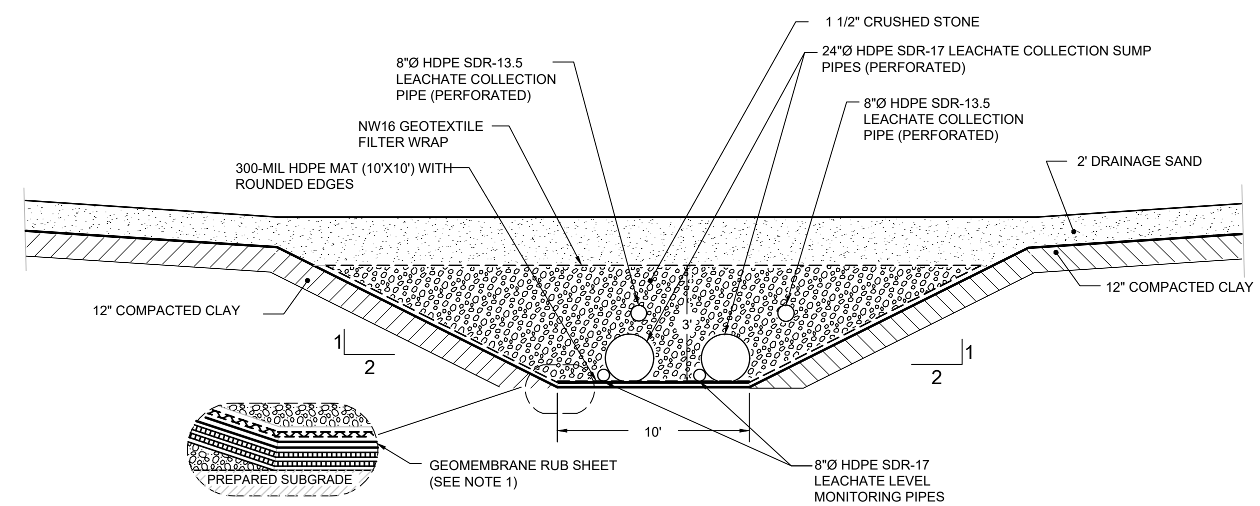
1 / 7 DETAIL
LEACHATE COLLECTION SUMP AND RISER
N.T.S.



2 / 23 DETAIL
TYPICAL LEACHATE FORCE MAIN CLEANOUT AND LEAK DETECTION MANHOLE
N.T.S.

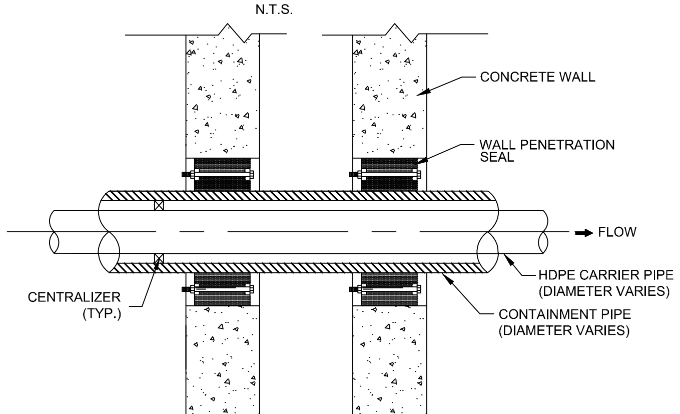


A / 24 DETAIL
LEACHATE COLLECTION RISERS (ON SIDESLOPE)
N.T.S.

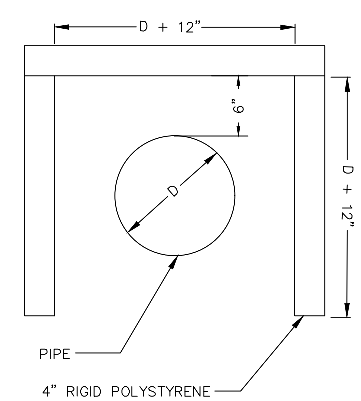


NOTE:
1. AN EXTRA GEOMEMBRANE (RUB SHEET) SHALL BE INSTALLED DIRECTLY OVER THE GEOMEMBRANE LINER THROUGHOUT THE SUMP AND EXTEND 3 FT UP THE SIDES OF THE SUMP.

B / 24 DETAIL
LEACHATE COLLECTION SUMP
N.T.S.

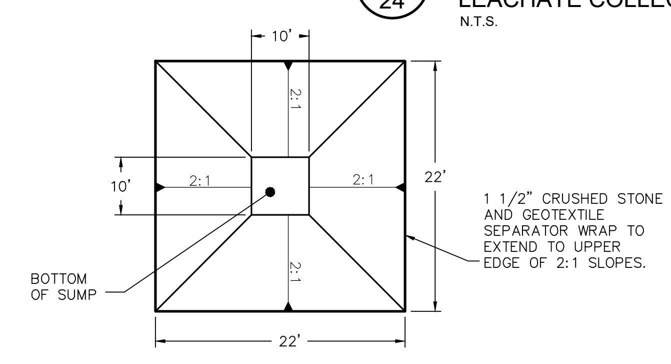


3 / 23 DETAIL
LEACHATE FORCEMAIN TIE-IN AT SOUTH CENTRAL PUMP STATION TIE-IN
N.T.S.

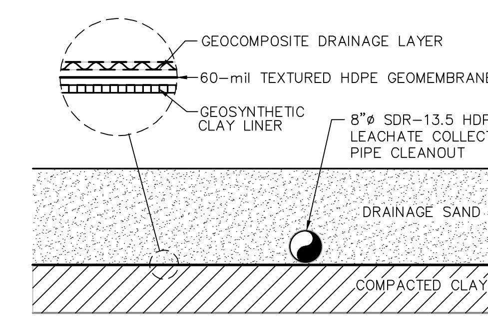


NOTE: INSULATION PROVIDED FOR ALL PIPE WITH LESS THAN 5 FEET BURIAL DEPTH

4 / 7 DETAIL
LEACHATE FORCE MAIN PIPE INSULATION
N.T.S.



5 / 7 DETAIL
LEACHATE COLLECTION SUMP
N.T.S.



6 / 7 DETAIL
LEACHATE COLLECTION PIPE CLEANOUTS
N.T.S.

SCALE IS BASED ON 22" X 34" NON-REDUCED SHEET SIZE (BORDER = 21" X 32")

PERMIT DRAWINGS

T:\PROJECTS_CADD\C\CROSSROADS LANDFILL\PHASE 14 EXPANSION\PERMIT\DRAWINGS\BE0232 0024 (LEACH TRANS SYS DET).DWG Last Edited by: jtaylor on 10/23/19

REV	DATE	DESCRIPTION	DRN	APP

STATE OF MAINE — SCOTT M. LUETTICH No. 7452 — LICENSED PROFESSIONAL ENGINEER

THIS DRAWING MAY NOT BE ISSUED FOR PROJECT TENDER OR CONSTRUCTION UNLESS SEALED.
SIGNATURE — 24 OCTOBER 2019 DATE

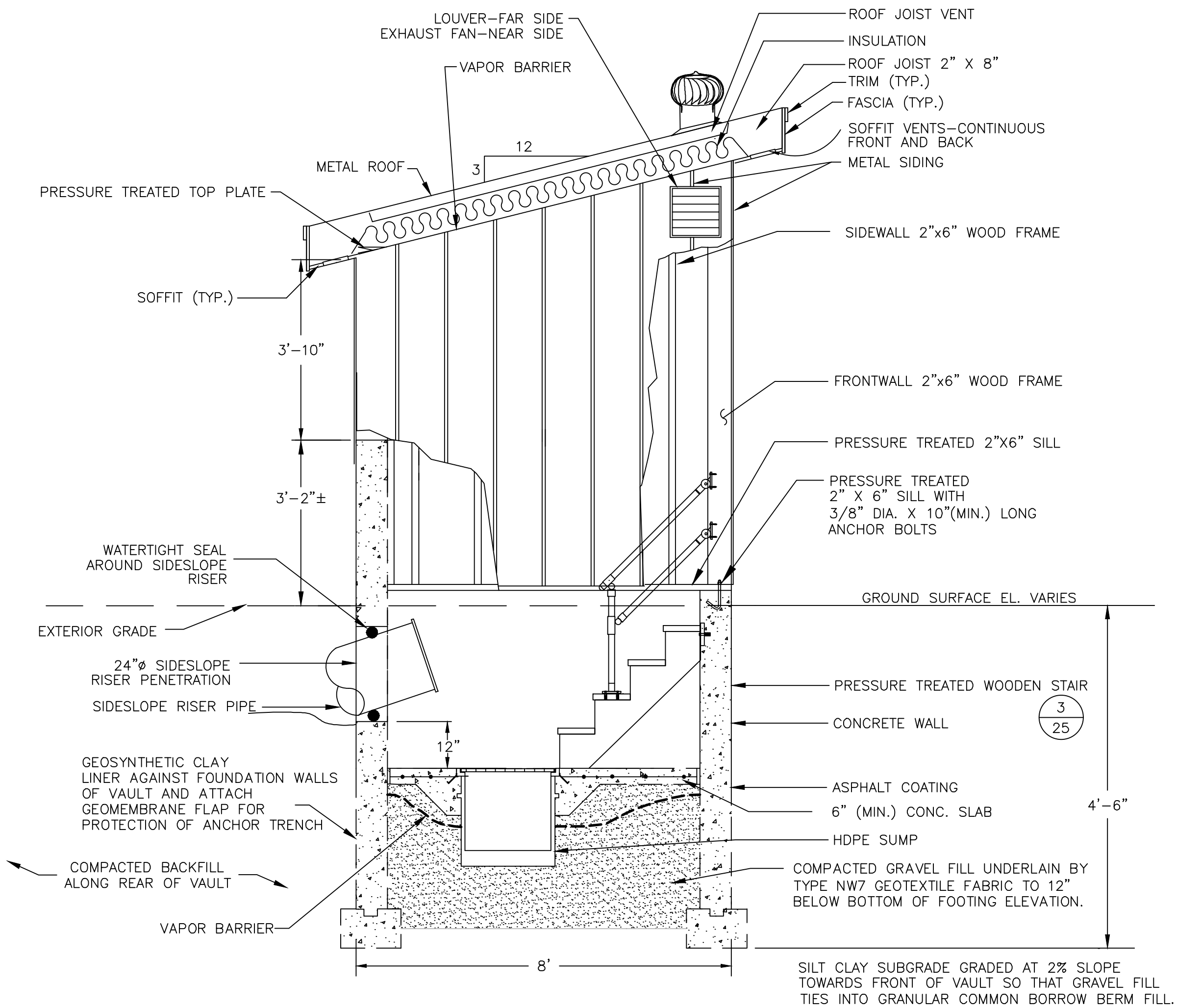
DESIGN BY: NJY
DRAWN BY: JT / RK
CHECKED BY: NJY
REVIEWED BY: SML
APPROVED BY: SML

WASTE MANAGEMENT DISPOSAL SERVICES OF MAINE, INC.
357 MERCER ROAD
NORRIDGEWOCK, MAINE 04957
TELEPHONE: (207) 634-2714

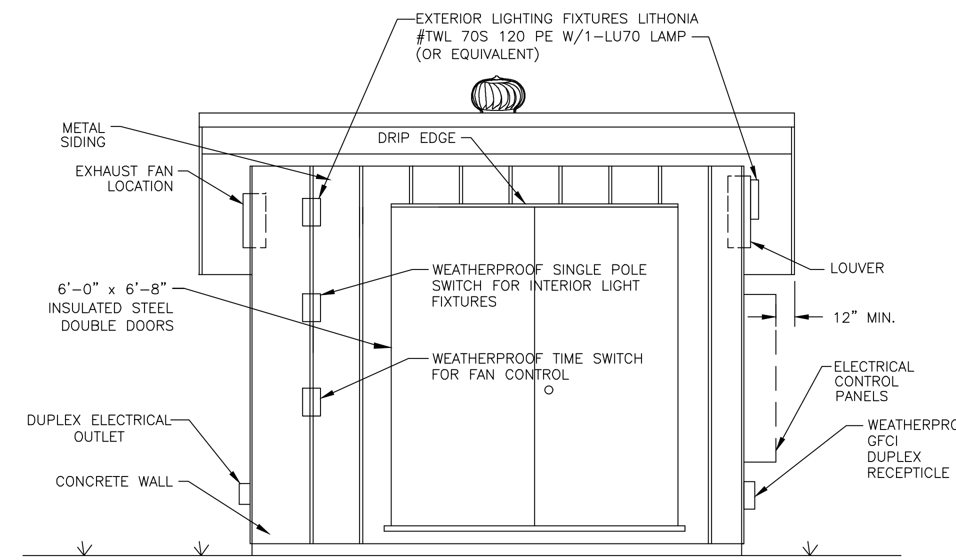
Geosyntec consultants
289 GREAT ROAD, SUITE 202
ACTON, MASSACHUSETTS 01720 USA
PHONE: 978.263.9588

TITLE: LEACHATE TRANSMISSION SYSTEM DETAILS
PROJECT: PHASE 14 PERMIT APPLICATION
SITE: CROSSROADS LANDFILL NORRIDGEWOCK, MAINE

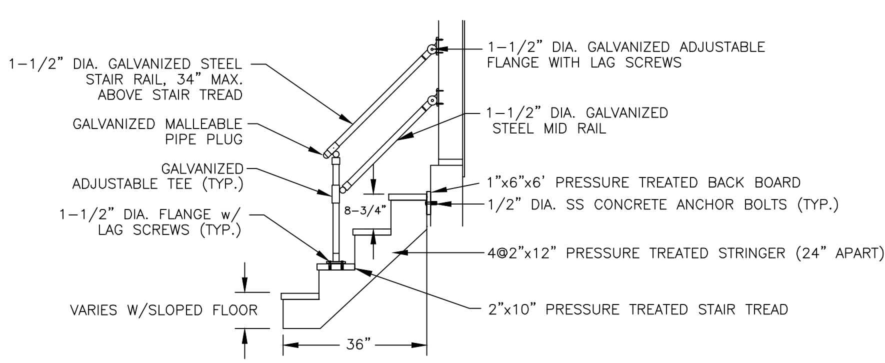
DATE: OCTOBER 2019
PROJECT NO.: BE0232C
DRAWING NO.: 24 OF 38



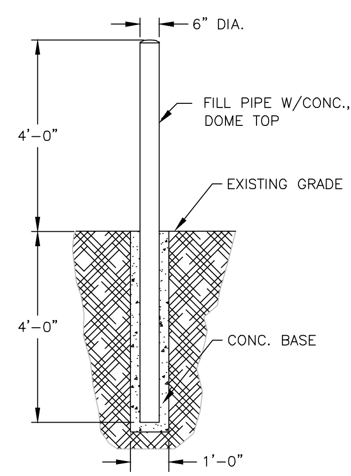
1/7 DETAIL
LEACHATE VAULT SECTION - SIDE VIEW
SCALE: NTS
XREF: BE0232 XD 200



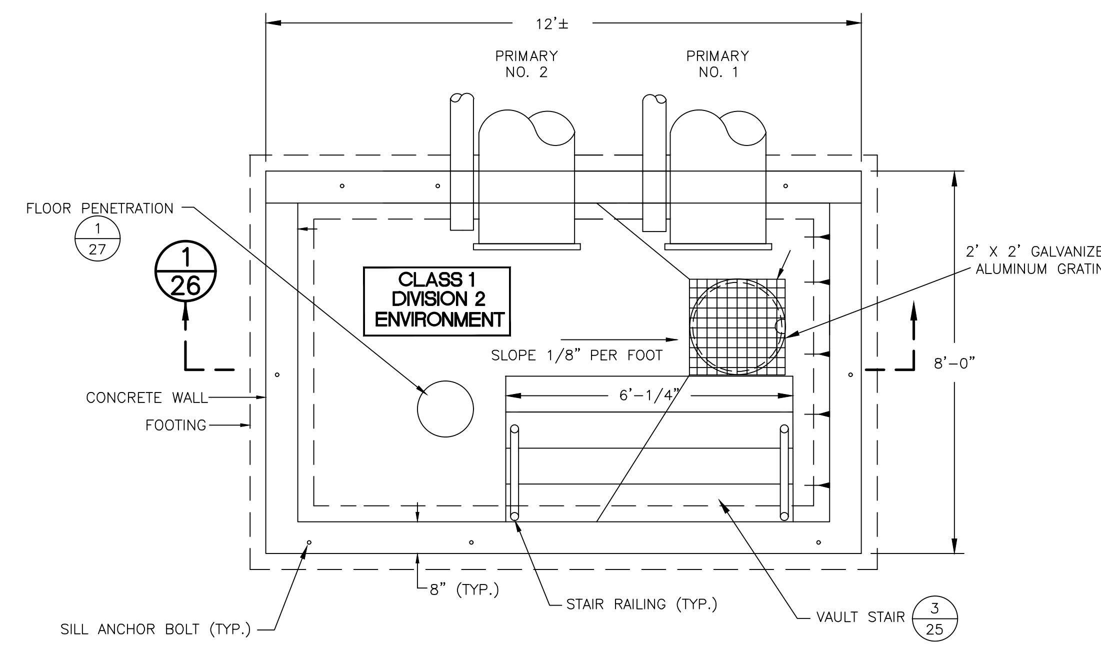
2/7 DETAIL
LEACHATE VAULT ELEVATION - FRONT VIEW
SCALE: NTS
XREF: BE0232 XD 200A



3/25 DETAIL
LEACHATE VAULT STAIR
SCALE: NTS
XREF: BE0232 XD 200B



4/- DETAIL
BOLLARD POST
SCALE: NTS
XREF: BE0232 XD 200D



5/7 DETAIL
LEACHATE VAULT FLOOR PLAN
SCALE: NTS
XREF: BE0232 XD 200C

SCALE IS BASED ON 22" X 34" NON-REDUCED SHEET SIZE (BORDER = 21" X 32")

PERMIT DRAWINGS

REV	DATE	DESCRIPTION	DRN	APP

STATE OF MAINE – SCOTT M. LUETTICH – No. 7492 – LICENSED PROFESSIONAL ENGINEER

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SIGNATURE

24 OCTOBER 2019
DATE

DESIGN BY: NJY
DRAWN BY: JT / RK
CHECKED BY: NJY
REVIEWED BY: SML
APPROVED BY: SML

WM WASTE MANAGEMENT
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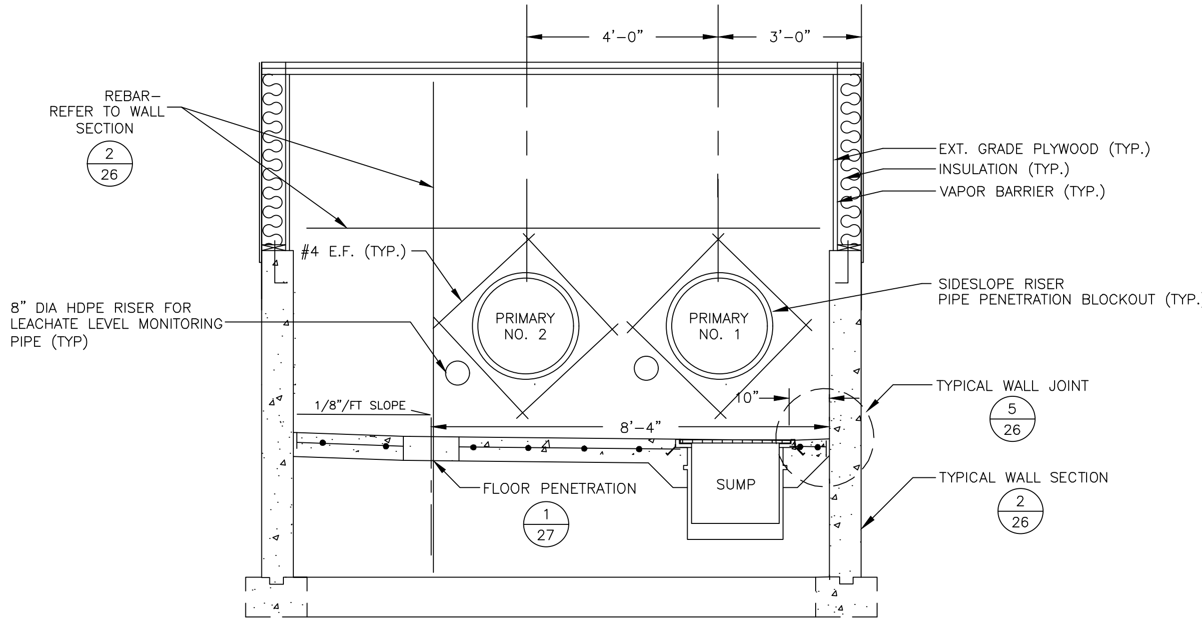
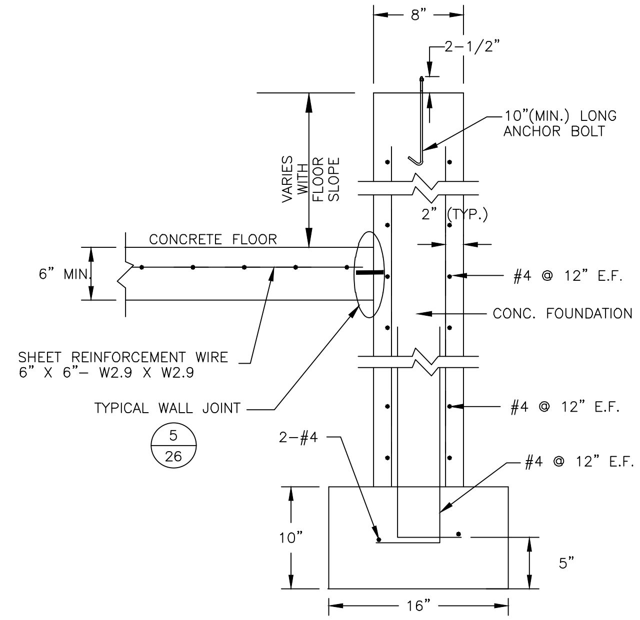
TITLE: LEACHATE VAULT - STRUCTURAL DETAILS I
PROJECT: PHASE 14 PERMIT APPLICATION
SITE: CROSSROADS LANDFILL NORRIDGEWOCK, MAINE

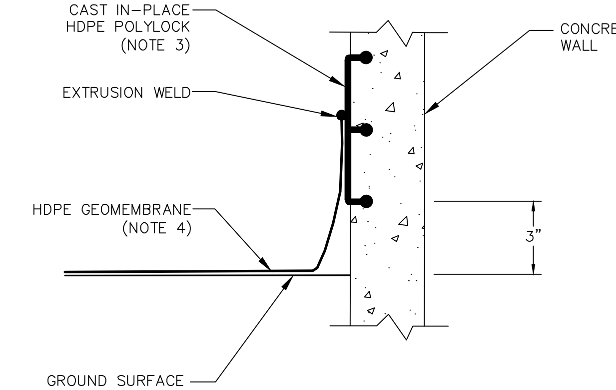
DATE: OCTOBER 2019
PROJECT NO.: BE0232C
DRAWING NO.: 25 OF 38



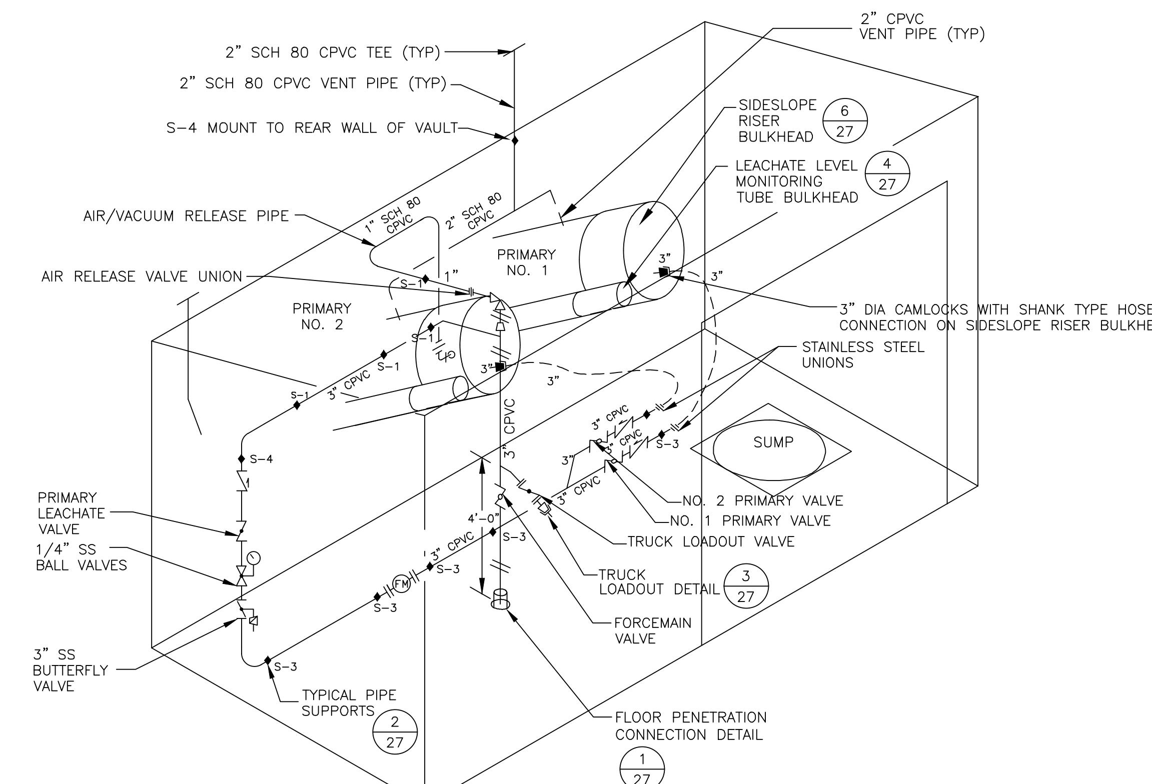
DETAIL 1/7
LEACHATE VAULT
SCALE: NTS
XREF: BE0232 XD202



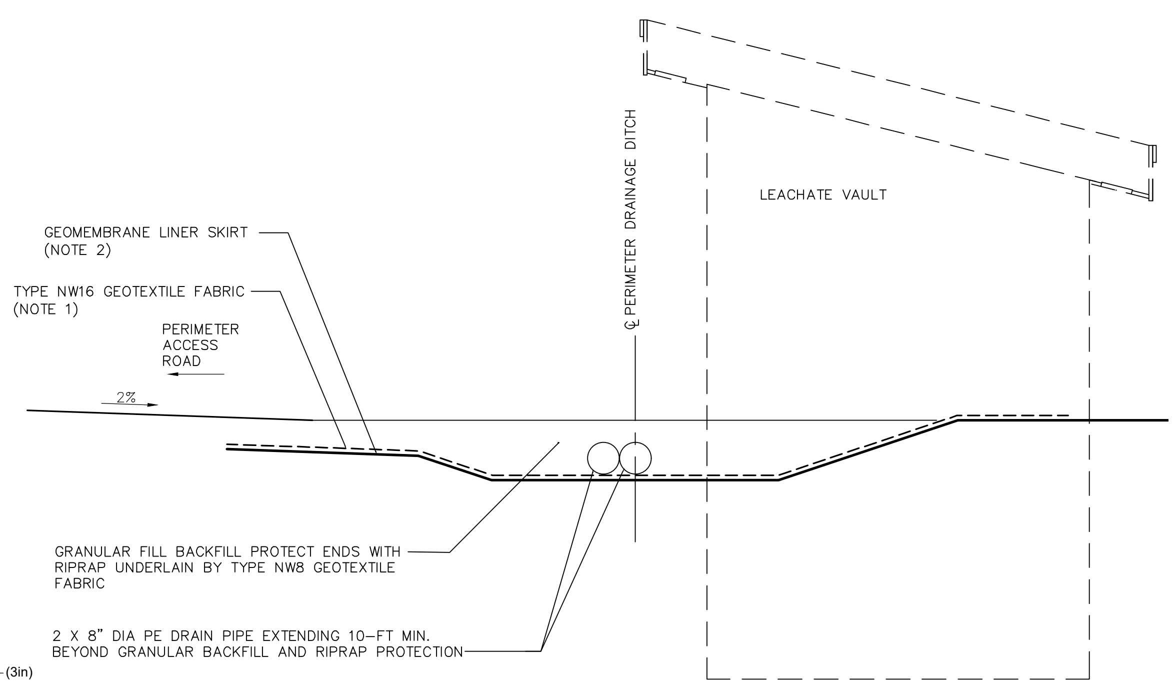
DETAIL 2/26
TYPICAL WALL SECTION
SCALE: NTS
XREF: BE0232 XD202A



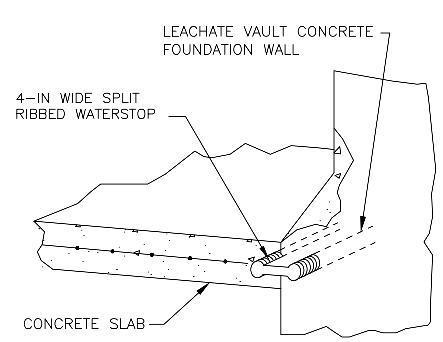
DETAIL 3/7
CONNECTION OF LINER SKIRT TO LEACHATE VAULT
SCALE: NTS
XREF: BE0232 XD202B



DETAIL 6/7
LEACHATE VAULT PIPING ISOMETRIC
SCALE: NTS
XREF: BE0232 XD213



DETAIL 4/15
VAULT ACCESS RAMP THROUGH PERIMETER SWALE
SCALE: NTS
XREF: BE0232 XD202C



DETAIL 5/26
TYPICAL WALL JOINT
SCALE: NTS
XREF: BE0232 XD202D

NOTES:

1. EXTEND WIDTH OF RAMP 4 FT BEYOND EITHER SIDE OF VAULT.
2. WHERE A CULVERT AND GRANULAR FILL IS TO BE PLACED IN THE PERIMETER DRAINAGE SWALE TO PROVIDE ACCESS TO THE LEACHATE VAULTS, THE LINER SKIRT SHALL BE OVERLAIN BY TYPE NW16 GEOTEXTILE FABRIC AS DEPICTED.
3. THE LINER SKIRT SHALL BE ATTACHED TO THE LEACHATE VAULT STRUCTURES BY WELDING TO AN HDPE CAST IN–PLACE BAR IN THE VAULT FOUNDATION. THE LINER SKIRT SHALL EXTEND UP THE LEACHATE VAULT STRUCTURES TO ABOUT 10 INCHES ABOVE FINISHED GRADE AROUND THE REAR AND SIDES OF THE STRUCTURE, AND SHALL BE TERMINATED IMMEDIATELY BELOW THE THRESHOLD ON THE FRONT OF THE STRUCTURES.
4. BOOTS SHALL BE PROVIDED AROUND ALL PENETRATIONS OF THE LINER SKIRT.

SCALE IS BASED ON 22" X 34" NON-REDUCED SHEET SIZE (BORDER = 21" X 32")

PERMIT DRAWINGS

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SIGNATURE: 24 OCTOBER 2019 (DATE)

DESIGN BY: NJY | DRAWN BY: JT / RK | CHECKED BY: NJY | REVIEWED BY: SML | APPROVED BY: SML

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Geosyntec consultants
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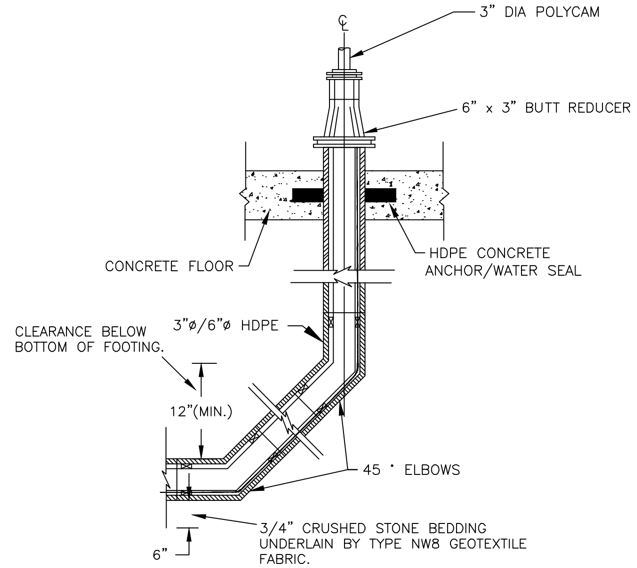
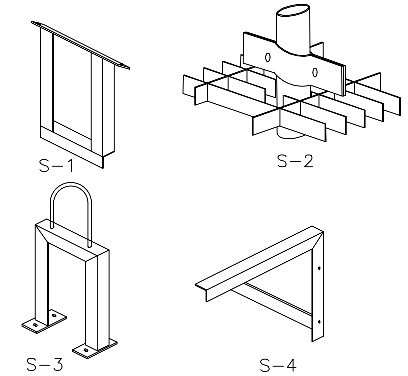
TITLE: LEACHATE VAULT - STRUCTURAL DETAILS II
PROJECT: PHASE 14 PERMIT APPLICATION
SITE: CROSSROADS LANDFILL NORRIDGEWOCK, MAINE

DATE: OCTOBER 2019
PROJECT NO.: BE0232C
DRAWING NO.: 26 OF 38

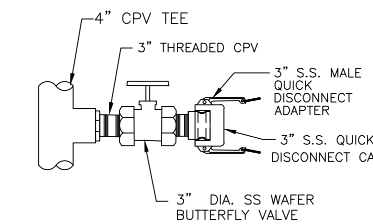


1/25 DETAIL
FLOOR PENETRATION CONNECTION
N.T.S.

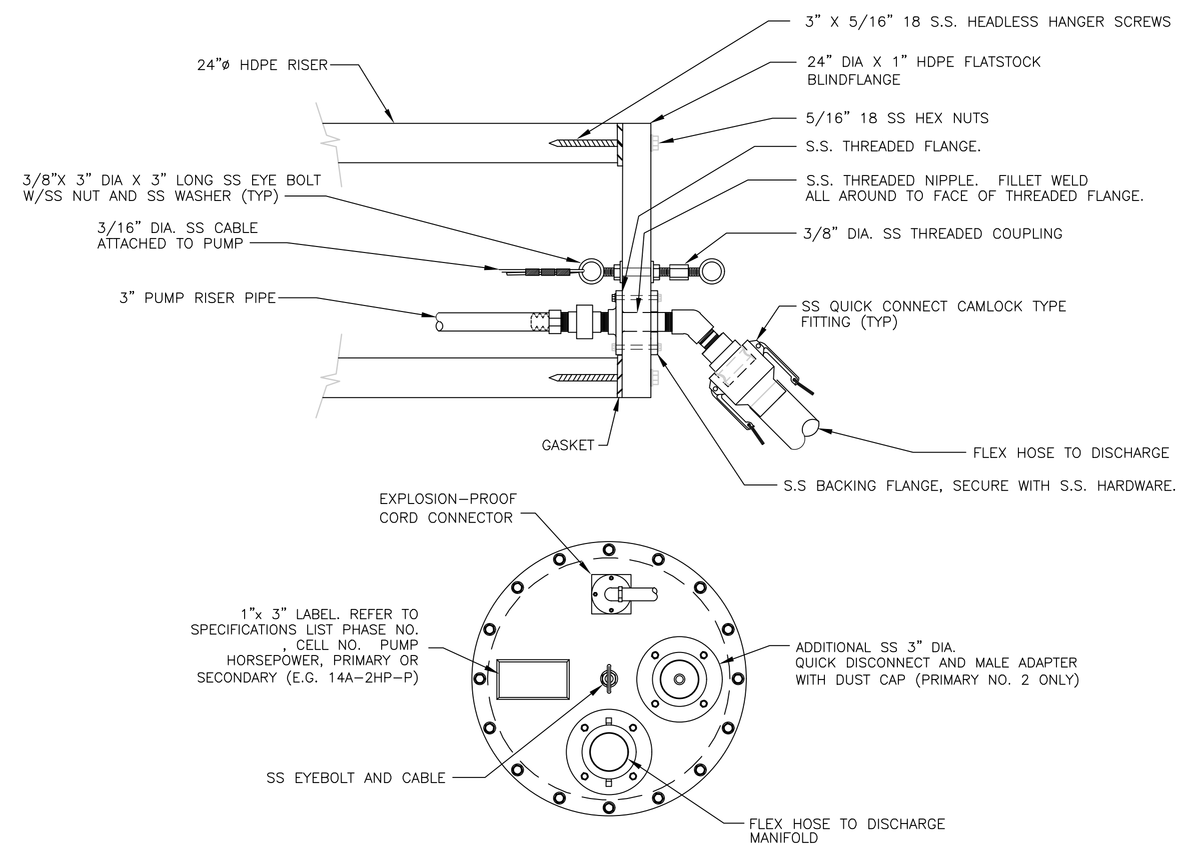


NOTE:
1) PIPE SUPPORTS CONSTRUCTED USING 2" X 1/8" S.S. ANGLE, AND 2" X 1/4" S.S. FLATSTOCK. SUPPORTS SHOWN ARE INTENDED TO ILLUSTRATE GENERAL DESIGN. DESIGN AND LOCATIONS MODIFIED AS REQUIRED TO MEET SPECIFIC REQUIREMENTS AND CONFORM TO SPECIFICATIONS.

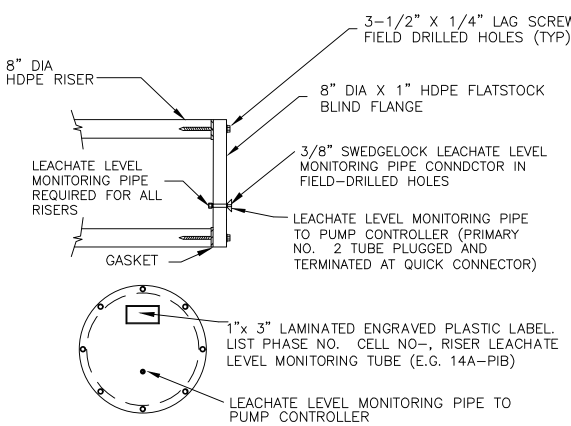
2/26 DETAIL
TYPICAL PIPE SUPPORTS
N.T.S.



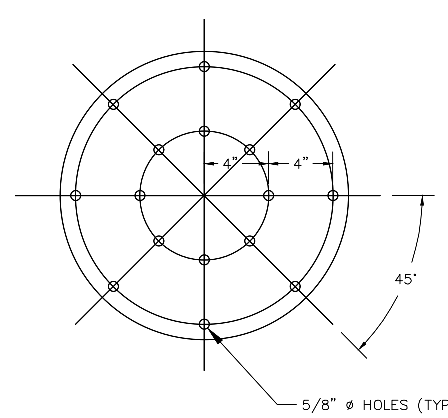
3/26 DETAIL
TRUCK LOADOUT
N.T.S.



6/26 DETAIL
SIDESLOPE RISER BULKHEAD
N.T.S.



4/26 DETAIL
LEACHATE LEVEL MONITORING TUBE BULKHEAD
N.T.S.



5/24 DETAIL
1 in HDPE FLAT STOCK FOR 24 in DIA. HDPE LEACHATE SUMP PIPES
N.T.S.

(3in) (2in) (1in)
(1in) (2in) (3in) (4in)
SCALE IS BASED ON 22" X 34" NON-REDUCED SHEET SIZE (BORDER = 21" X 32")

PERMIT DRAWINGS

REV	DATE	DESCRIPTION	DRN	APP

STATE OF MAINE * SCOTT M. LUETTICH No. 7482 LICENSED PROFESSIONAL ENGINEER

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SIGNATURE
24 OCTOBER 2019
DATE

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CHECKED BY: NJY
REVIEWED BY: SML
APPROVED BY: SML

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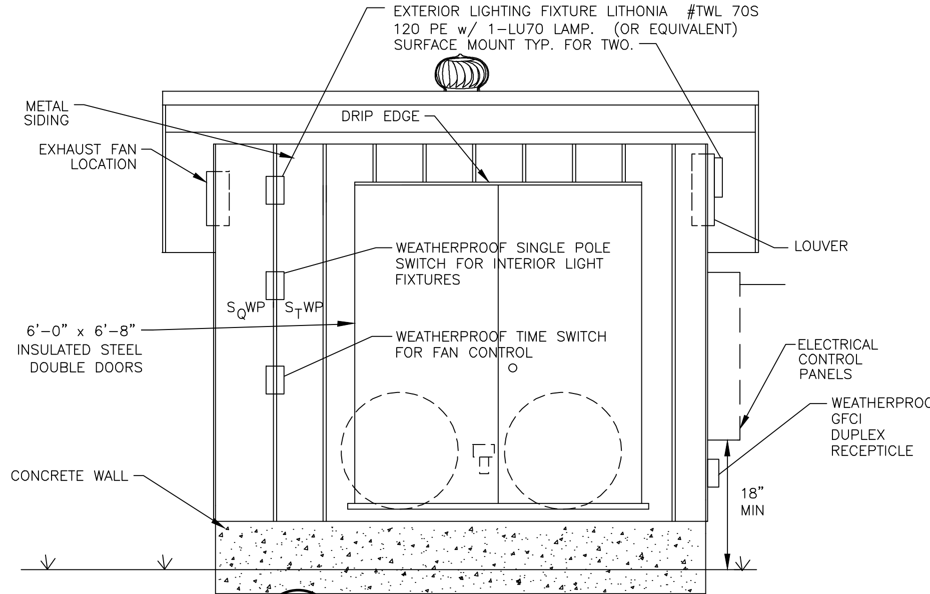
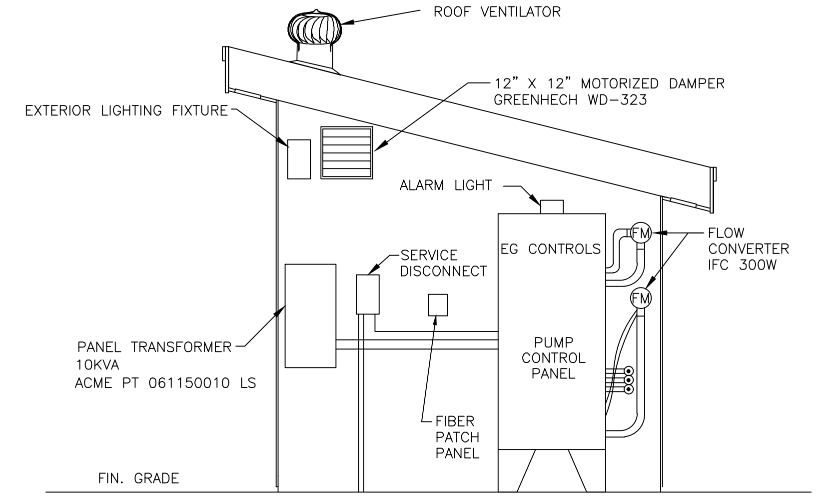
TITLE: LEACHATE VAULT PIPING DETAILS
PROJECT: PHASE 14 PERMIT APPLICATION
SITE: CROSSROADS LANDFILL NORRIDGEWOCK, MAINE

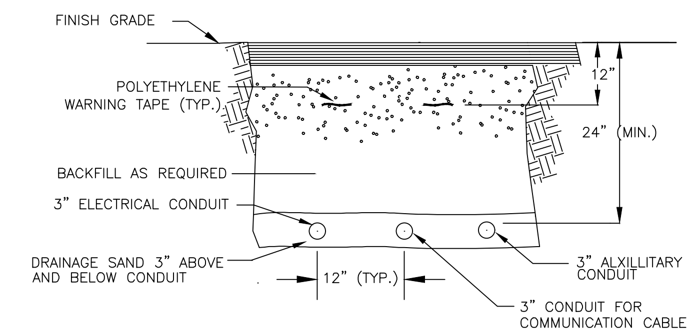
DATE: OCTOBER 2019
PROJECT NO.: BE0232C
DRAWING NO.: 27 OF 38



1/7 DETAIL
LEACHATE VAULT ELEVATION FRONT VIEW
N.T.S.

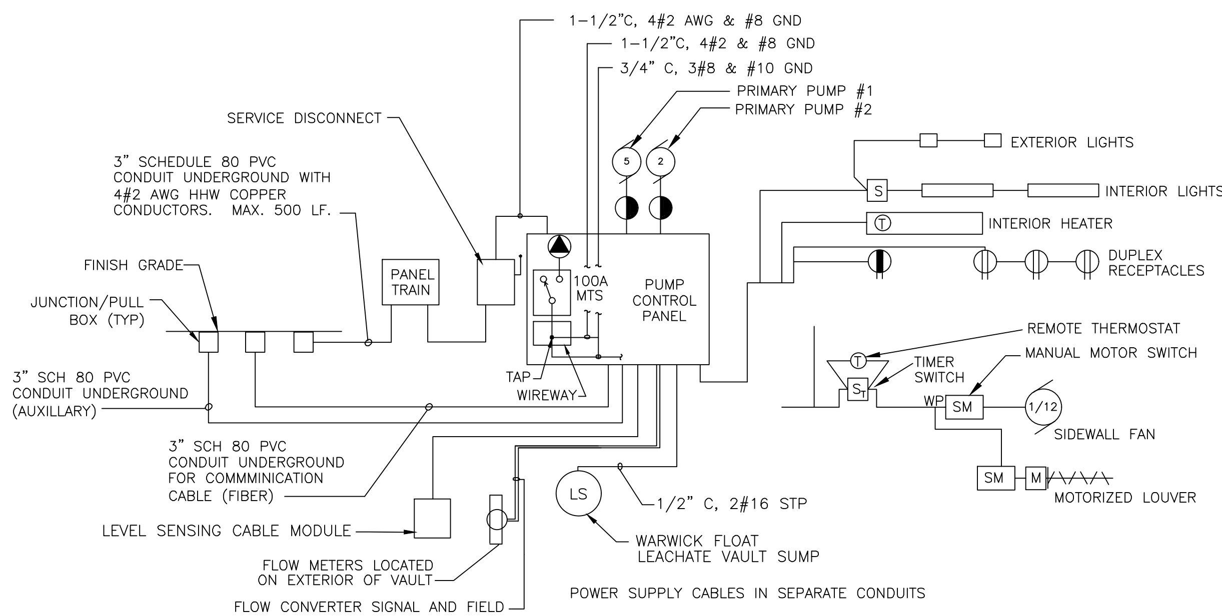


2/7 DETAIL
LEACHATE VAULT ELEVATION
N.T.S.

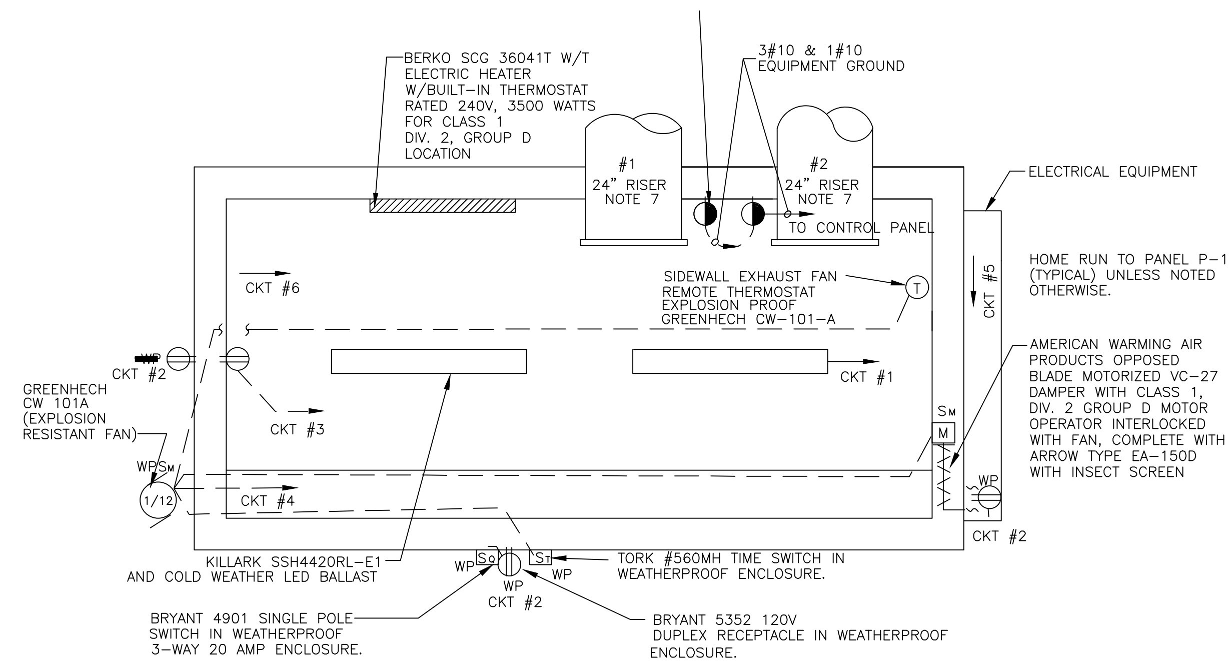


NOTE: PROVIDE MINIMUM 1 CONDUIT FOR USE AS A SPARE AT ALL ROAD CROSSING LOCATIONS IN FRONT OF ALL LEACHATE VAULTS.

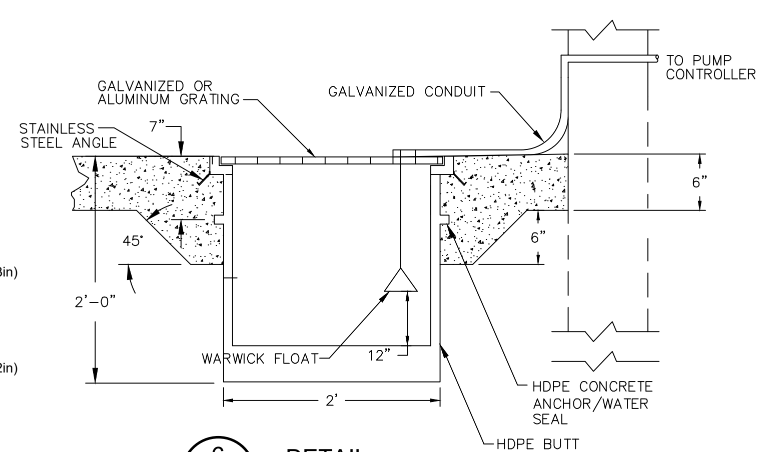
3/7 DETAIL
SECTION - UNDERGROUND CONDUIT
N.T.S.



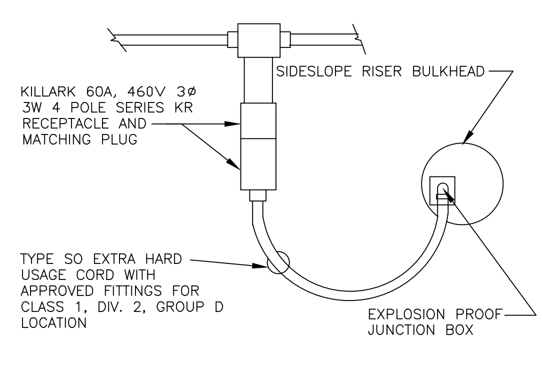
4/7 DETAIL
PUMP VAULT ELECTRICAL SCHEMATIC
N.T.S.



5/7 DETAIL
LEACHATE VAULT BUILDING ELECTRICAL PLAN VIEW
N.T.S.



6/7 DETAIL
VAULT SUMP LEVEL SWITCH
N.T.S.



7/7 DETAIL
BULKHEAD ELECTRICAL CONNECTION
N.T.S.

LEGEND

- FLOW METERS
- CKT #4 — HOMERUN TO PANELBOARD. 2#12 AWG AND #12 GND UNLESS OTHERWISE NOTED. NUMERALS INDICATE CIRCUIT NUMBER.
- MOTORIZED DAMPER
- WP — DENOTES WEATHERPROOF ENCLOSURE
- 1/12 — MOTOR NUMERAL DENOTES HORESPOWER. MOTOR SHALL BE FURNISHED AND INSTALLED BY CONTRACTOR.
- DISCONNECT SWITCH-HEAVY DUTY TYPE-RATED 600V. 30 DENOTES 30 AMP SWITCH, 20 DENOTES FUSE RATING AMPS, 3P DENOTES 3 POLE SWITCH. ENCLOSURE SHALL BE NEMA 4X.
- PANELBOARD "P-1" DENOTES PANEL DESIGNATION. SEE PANELBOARD DESCRIPTION ON PLAN.
- MANUAL TRANSFER SWITCH, SQUARE D CLASS 3140, NEMA 4X
- S — SINGLE POLE TOGGLE SWITCH 20A, 120V.
- POWER RECEPTACLE 60A, 480V FOR HAZARDOUS LOCATION.
- DUPLEX RECEPTACLE 20A 120V, GFCI INDICATES GROUND FAULT CIRCUIT INTERRUPTER.
- DUPLEX RECEPTACLE 20A, 120V FOR HAZARDOUS LOCATION.
- GENERATOR RECEPTACLE, CROUSE-HINDS AR642 M3 60 AMP 3W, 4P
- SM — MANUAL MOTOR SWITCH WITHOUT THERMAL OVERLOAD DEVICE FURNISHED AND INSTALLED BY THE ELECTRICAL CONTRACTOR MOUNT ADJACENT TO MOTOR.
- NOTE: 4-FT. LONG — FLUORESCENT LIGHTING FIXTURE. LOWER CASE LETTER DENOTES SWITCH CONTROL OF FIXTURE.
- ELECTRIC BASEBOARD HEATER
- T — REMOTE THERMOSTAT FOR CONTROL SWITCH.

NOTE:

1. REFER TO SECTION 16900 FOR PUMP CONTROLLER SPECIFICATIONS, INCLUDING ALARM AND CONTROL LOGIC.
2. ALL CONDUIT SHALL BE FIBERGLASS.
3. ALL CONDUIT LEAVING THE VAULT (CLASS 1 DIVISION 2 AREA) SHALL BE PROVIDED WITH A CONDUIT SEAL IN ACCORDANCE WITH NECK ART 501-5(b). THERE SHALL BE NO UNION, COUPLING, BOX OR FITTING IN THE CONDUIT BETWEEN THE SEALING FITTING THE POINT AT WHICH THE CONDUIT LEAVES THE DIVISION 2 LOCATION.
4. ACME PANEL CAT. NO. PT-BA-3150015L, 10 OVA, 208Y/120V SECONDARY WITH 12 20A-1P BREAKERS. CAT #3 TO BE GFCI TYPE.
5. FLOW METER, LEVEL SWITCH AND LEAK DETECTION WIRING IS INTRINSICALLY SAFE AND SHALL BE INSTALLED IN ACCORDANCE WITH NECK ART 504.
6. LEACHATE VAULT WILL HAVE TWO LEACHATE RISER PIPES.
7. RISERS #1 AND #2 ARE FOR LEACHATE COLLECTION AND AUXILIARY LEACHATE COLLECTION SUMP PIPES RESPECTIVELY.
8. ELECTRICAL DESIGN PROVIDED BY ECONO ELECTRIC FOR PHASE 8 AND ADAPTED FOR PHASE 14.

(1in) (2in) (3in) (4in)
SCALE IS BASED ON 22" X 34" NON-REDUCED SHEET SIZE (BORDER = 21" X 32")

PERMIT DRAWINGS

REV | DATE | DESCRIPTION | DRN | APP

THIS DRAWING MAY NOT BE ISSUED FOR PROJECT TENDER OR CONSTRUCTION UNLESS SEALED.
SIGNATURE 24 OCTOBER 2019 DATE

DESIGN BY: NJY
DRAWN BY: JT / RK
CHECKED BY: NJY
REVIEWED BY: SML
APPROVED BY: SML

WASTE MANAGEMENT
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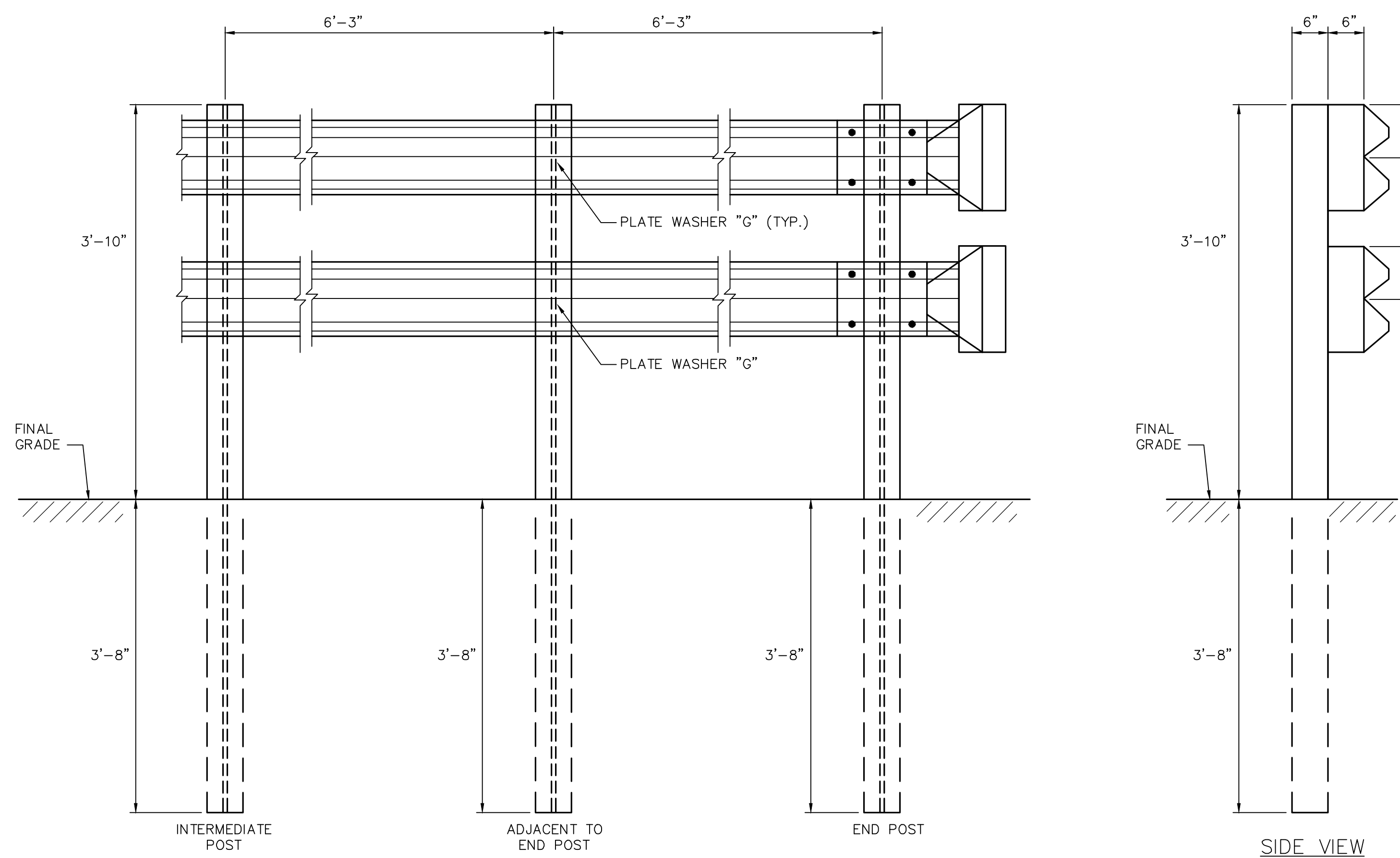
TITLE: LEACHATE VAULT MECHANICAL -ELECTRICAL DETAILS
PROJECT: PHASE 14 PERMIT APPLICATION
SITE: CROSSROADS LANDFILL NORRIDGEWOCK, MAINE
DATE: OCTOBER 2019
PROJECT NO.: BE0232C
DRAWING NO.: 28 OF 38

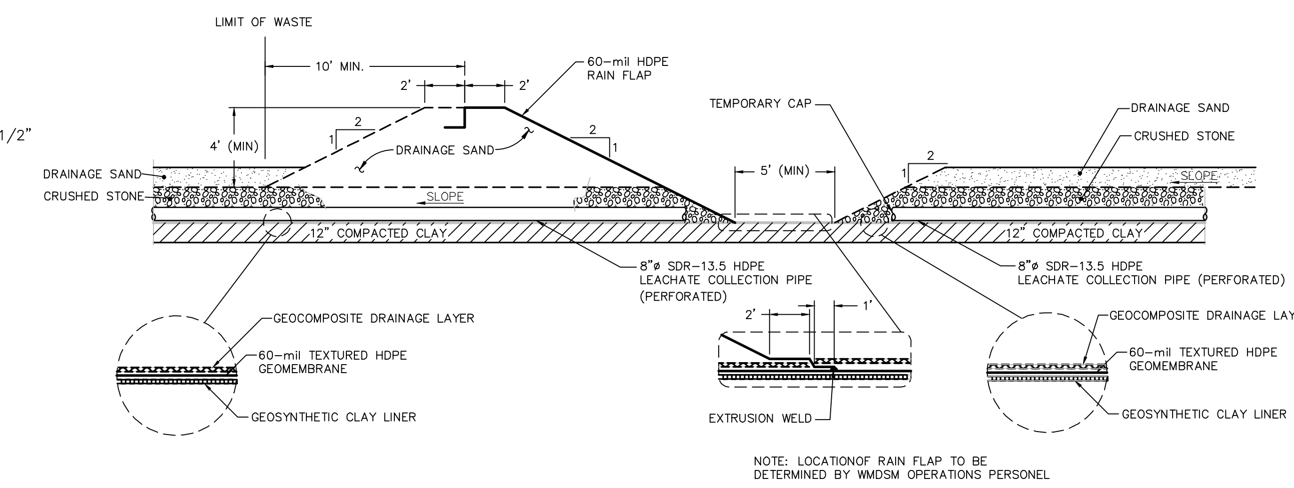


NOTES:

1. ALL POST SPACING SHALL BE 6'–3" UNLESS OTHERWISE DIRECTED BY THE ENGINEER.
2. GUARDRAIL SHALL BE MDOT SPECIFICATION TYPE "b" POSTS AND SHALL CONFORM TO MDOT SPECIFICATION SECTION 710.07(b).
3. ALL HOLES IN BEAM SHALL BE SHOP–PUNCHED BEFORE GALVANIZING.

1 / 20 DETAIL GUARDRAIL

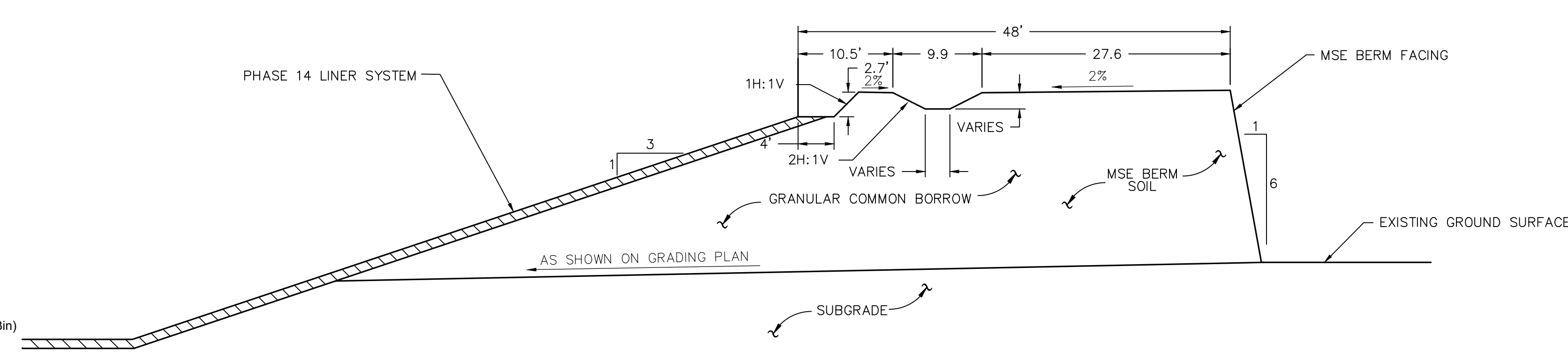
N.T.S.



NOTE: LOCATIONOF RAIN FLAP TO BE DETERMINED BY WMDSM OPERATIONS PERSONEL

2 / - DETAIL TEMPORARY RAIN FLAP

N.T.S.



3 / 7 DETAIL MSE BERM AND PERIMETER DRAINAGE DITCH

N.T.S.

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PERMIT DRAWINGS

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STATE OF MAINE – SCOTT M. LUETTICH – No. 7482 – LICENSED PROFESSIONAL ENGINEER

SIGNATURE: 24 OCTOBER 2019 DATE

DESIGN BY: NJY
DRAWN BY: JT / RK
CHECKED BY: NJY
REVIEWED BY: SML
APPROVED BY: SML

WM WASTE MANAGEMENT – WASTE MANAGEMENT DISPOSAL SERVICES OF MAINE, INC. 357 MERCER ROAD NORRIDGEWOCK, MAINE 04957 TELEPHONE: (207) 634-2714

Geosyntec consultants – 289 GREAT ROAD, SUITE 202 ACTON, MASSACHUSETTS 01720 USA PHONE: 978.263.9588

TITLE: MISCELLANEOUS DETAILS

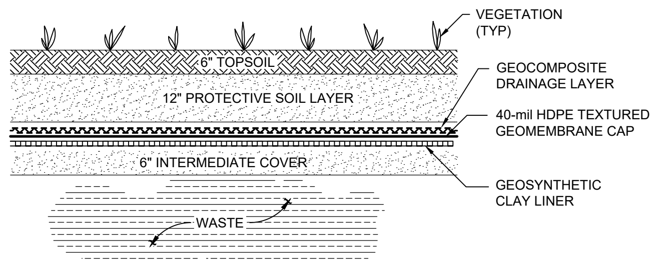
PROJECT: PHASE 14 PERMIT APPLICATION

SITE: CROSSROADS LANDFILL NORRIDGEWOCK, MAINE

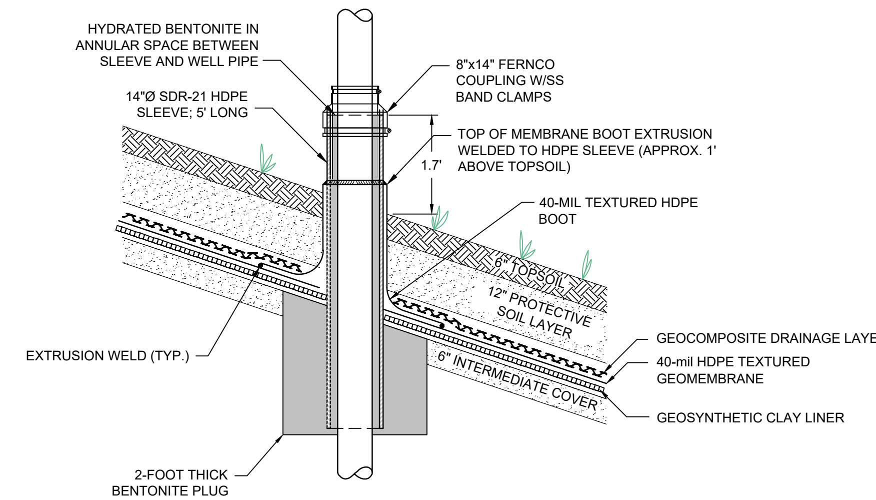
DATE: OCTOBER 2019

PROJECT NO.: BE0232C

DRAWING NO.: 29 OF 38

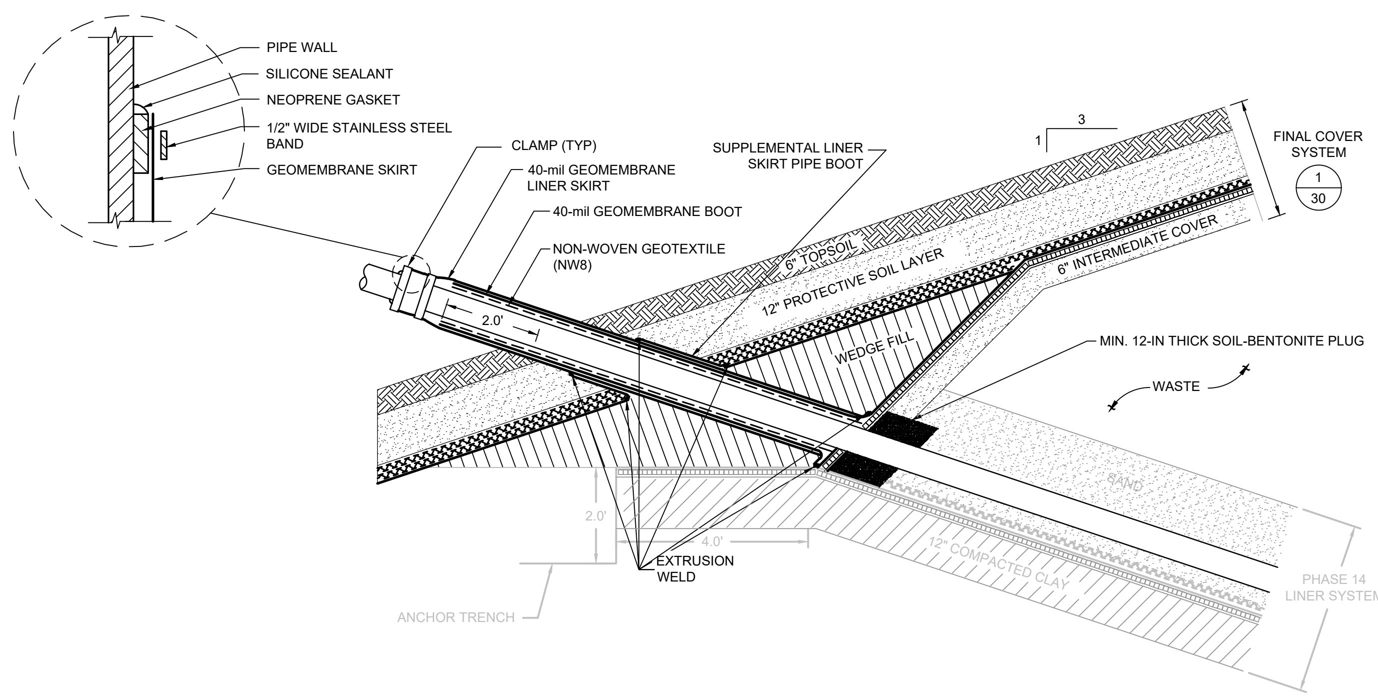


1
13
DETAIL
FINAL COVER SYSTEM
N.T.S.



NOTE:
1. COUPLINGS TO BE INSTALLED AT SAME TIME AS BENTONITE IS PLACED IN ANNULAR SPACE.

2
-
DETAIL - LANDFILL GAS WELL
PIPE FINAL COVER SYSTEM PENETRATION
N.T.S.



3
7
DETAIL
LCS PIPE FINAL COVER PENETRATION AT TOE
N.T.S.

SCALE IS BASED ON 22" X 34" NON-REDUCED SHEET SIZE (BORDER = 21" X 32")

PERMIT DRAWINGS

REV	DATE	DESCRIPTION	DRN	APP

STATE OF MAINE
SCOTT M. LUETTICH
No. 7482
LICENSED
PROFESSIONAL ENGINEER

THIS DRAWING MAY NOT BE ISSUED FOR PROJECT TENDER OR CONSTRUCTION UNLESS SEALED.
SIGNATURE
24 OCTOBER 2019
DATE

DESIGN BY: NJY
DRAWN BY: JT / RK
CHECKED BY: NJY
REVIEWED BY: SML
APPROVED BY: SML

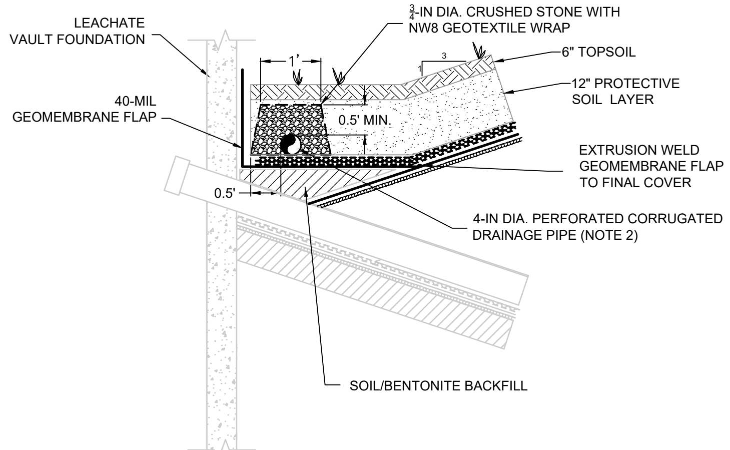
WM WASTE MANAGEMENT
WASTE MANAGEMENT DISPOSAL SERVICES OF MAINE, INC.
357 MERCER ROAD
NORRIDGEWOCK, MAINE 04957
TELEPHONE: (207) 634-2714

Geosyntec consultants
289 GREAT ROAD, SUITE 202
ACTON, MASSACHUSETTS 01720 USA
PHONE: 978.263.9588

TITLE: FINAL COVER SYSTEM DETAILS
PROJECT: PHASE 14 PERMIT APPLICATION
SITE: CROSSROADS LANDFILL
NORRIDGEWOCK, MAINE

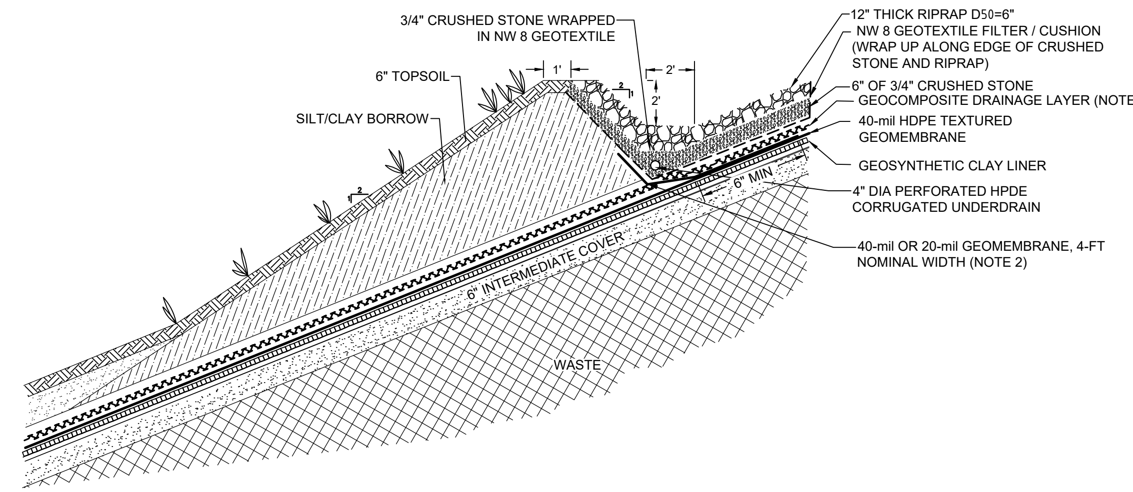
DATE: OCTOBER 2019
PROJECT NO.: BE0232C
DRAWING NO.: 30 OF 38

T:\PROJECTS_CADD\C\CROSSROADS LANDFILL\PHASE 14 EXPANSION\PERMIT\DRAWINGS\BE0232 D030 (FINAL CVR SYS DET).DWG Last Edited by: Rkoshavan on 10/1/19



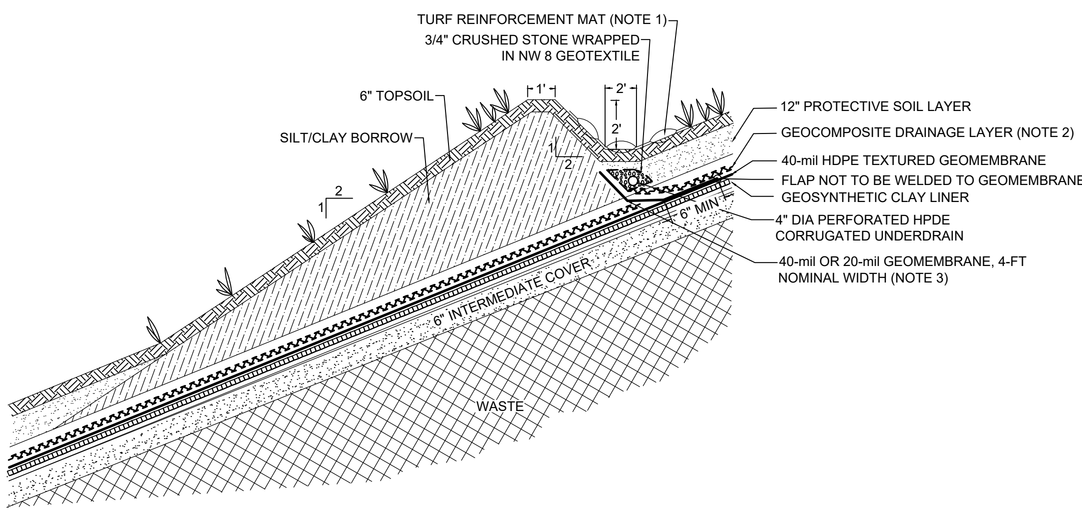
NOTES:
1. LEACHATE VAULT DRAIN TO BE INSTALLED ALONG EXTERIOR BACK WALL AND WRAPPED AROUND SIDE WALLS OF LEACHATE VAULT.
2. AT FRONT ENDS OF DRAIN (NEAR FRONT CORNERS OF THE LEACHATE VAULT) THE 4-IN DIA. PERFORATED PIPE TO BE TRANSITIONED TO SOLID PIPE AND EXTENDED LATERALLY TO DAYLIGHT IN THE PERIMETER DRAINAGE DITCH.
3. CONTRACTOR TO GRADE SOIL BEHIND LEACHATE VAULTS TO SHED WATER AROUND BACK OF VAULTS AND TOWARDS THE PERIMETER DRAINAGE DITCH.

1 / 15 DETAIL
LEACHATE VAULT FOUNDATION DRAIN
N.T.S.



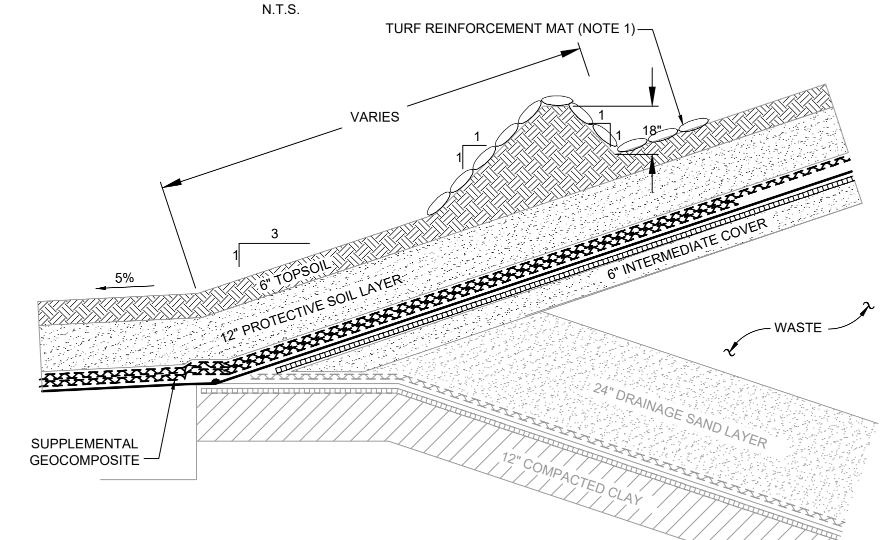
NOTES:
1. DAYLIGHT GEOCOMPOSITE INTO CRUSHED STONE.
3. SHINGLE GEOMEMBRANE UPSLOPE UNDER GEOCOMPOSITE SO THAT THERE IS INTIMATE CONTACT WITH THE GEOMEMBRANE COMPONENT OF THE CLOSURE.

2 / 15 DETAIL
RIPRAP LINED DRAINAGE BENCH within 10 FT OF TIE-IN WITH DOWNCHUTE - PERIMETER DRAINAGE DITCH
N.T.S.



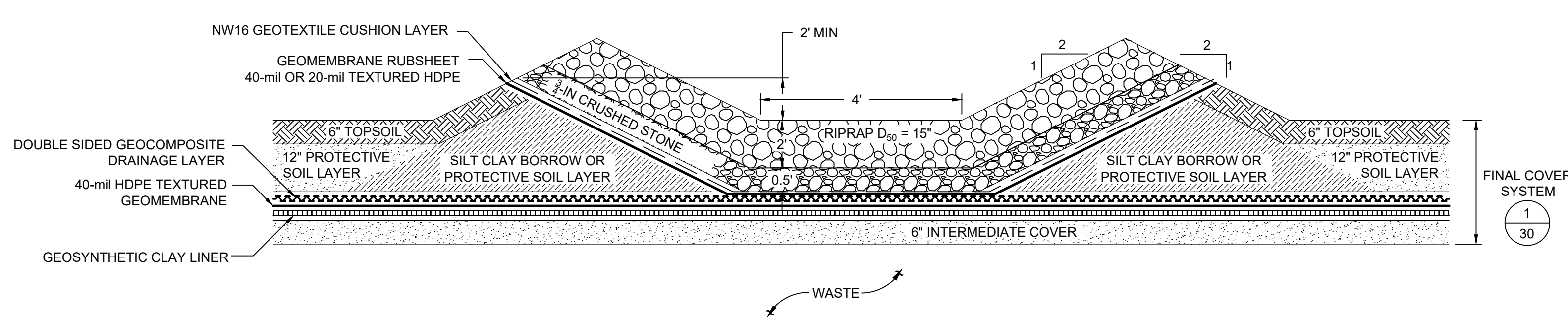
NOTES:
1. TURF REINFORCEMENT MAT (TRM) SHALL BE CURLEX ENFORCER OR APPROVED EQUAL, AND SHALL BE INSTALLED A MINIMUM OF 2-FT HIGH ALONG THE DRAINAGE BENCH AND PER THE MANUFACTURER'S RECOMMENDED INSTALLATION PROCEDURES.
2. DAYLIGHT GEOCOMPOSITE INTO CRUSHED STONE.
3. SHINGLE GEOMEMBRANE UPSLOPE UNDER GEOCOMPOSITE SO THAT THERE IS INTIMATE CONTACT WITH THE GEOMEMBRANE COMPONENT OF THE CLOSURE.

3 / 15 DETAIL
FINAL COVER DRAINAGE BENCH
N.T.S.



NOTE:
1. TURF REINFORCEMENT MAT (TRM) SHALL BE CURLEX ENFORCER OR APPROVED EQUAL, AND SHALL BE INSTALLED A MINIMUM OF 2-FT HIGH ALONG THE DRAINAGE BENCH PER THE MANUFACTURER'S RECOMMENDED INSTALLATION PROCEDURES.

4 / 15 DETAIL
LEACHATE VAULT DIVERSION BERM
N.T.S.



5 / 15 DETAIL
DOWNCHUTE
N.T.S.

SCALE IS BASED ON 22" X 34" NON-REDUCED SHEET SIZE (BORDER = 21" X 32")

PERMIT DRAWINGS

REV | DATE | DESCRIPTION | DRN | APP

STATE OF MAINE — SCOTT M. LUETTICH No. 7482 — LICENSED PROFESSIONAL ENGINEER

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SIGNATURE
24 OCTOBER 2019 DATE

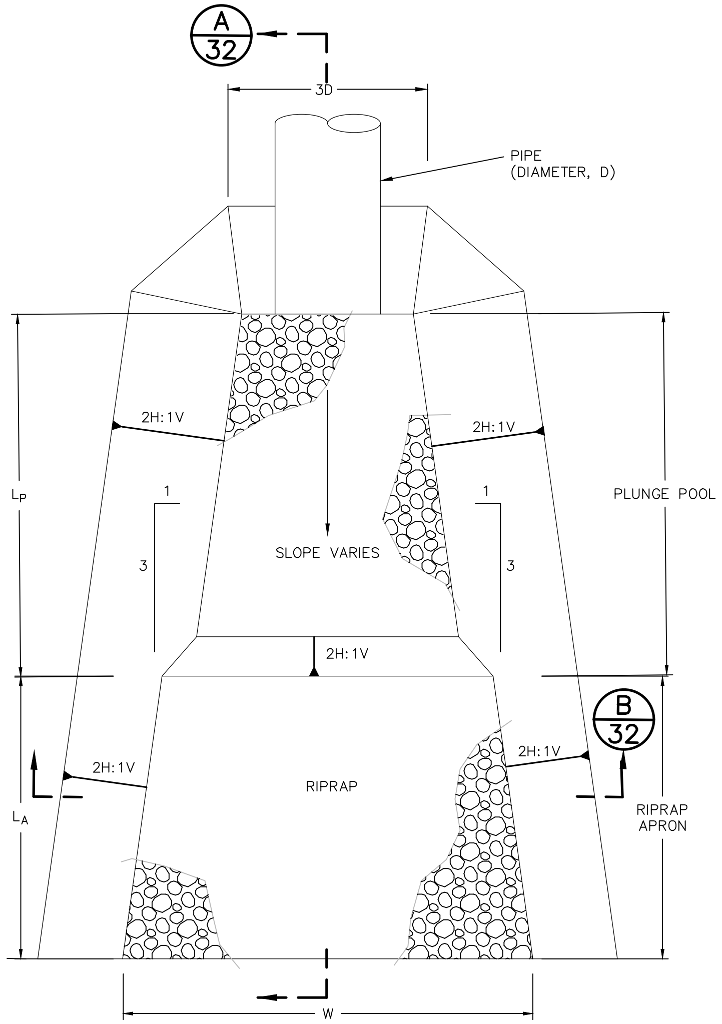
DESIGN BY: NJY
DRAWN BY: JT / RK
CHECKED BY: NJY
REVIEWED BY: SML
APPROVED BY: SML

WASTE MANAGEMENT DISPOSAL SERVICES OF MAINE, INC.
357 MERCER ROAD
NORRIDGEWOCK, MAINE 04957
TELEPHONE: (207) 634-2714

Geosyntec consultants
289 GREAT ROAD, SUITE 202
ACTON, MASSACHUSETTS 01720 USA
PHONE: 978.263.9588

TITLE: SURFACE WATER MANAGEMENT DETAILS I
PROJECT: PHASE 14 PERMIT APPLICATION
SITE: CROSSROADS LANDFILL NORRIDGEWOCK, MAINE

DATE: OCTOBER 2019
PROJECT NO.: BE0232C
DRAWING NO.: 31 OF 38

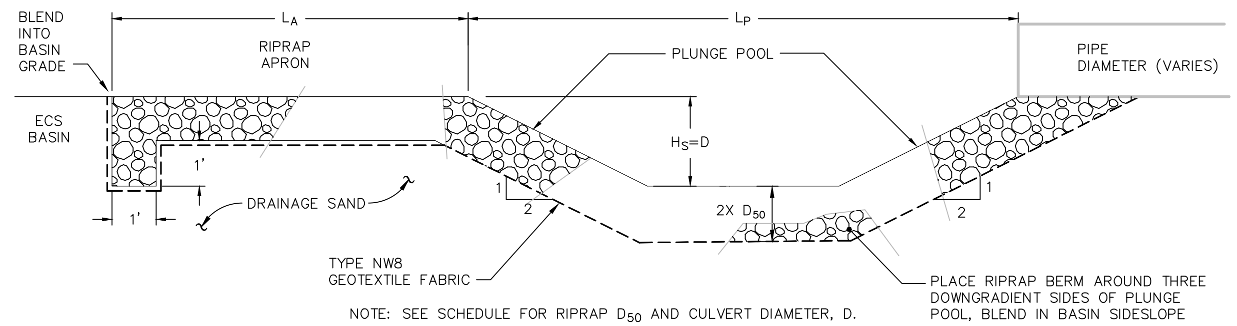


NOTES:

1. SEE SCHEDULE FOR DIMENSIONS AND RIPRAP D_{50}.

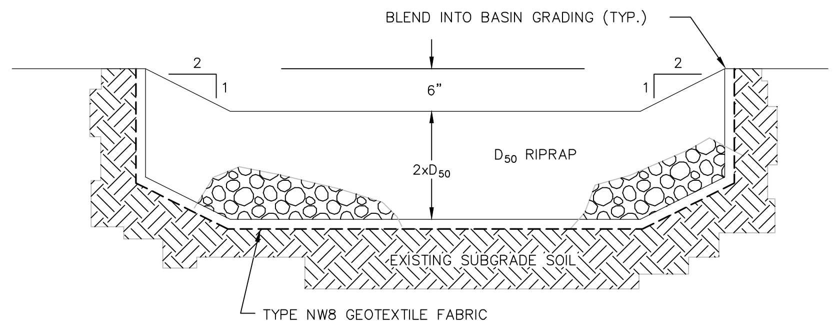
PLUNGE POOL AND RIPRAP APRON SCHEDULE					
BASIN ID	PIPE DIA, D (FT)	LENGTH POOL, L_P (FT)	LENGTH APRON, L_A(FT)	APRON WIDTH, W (FT)	RIPRAP D50 (INCHES)
22A	2.5	6	22	24	15
32	2.5	6	22	24	15
33A	2.5	6	22	24	15
33B	2.5	6	22	24	15
23	1	6	12	13	15

1 / 35 DETAIL
PLUNGE POOL AND RIPRAP APRON INSIDE ECS BASINS
N.T.S.



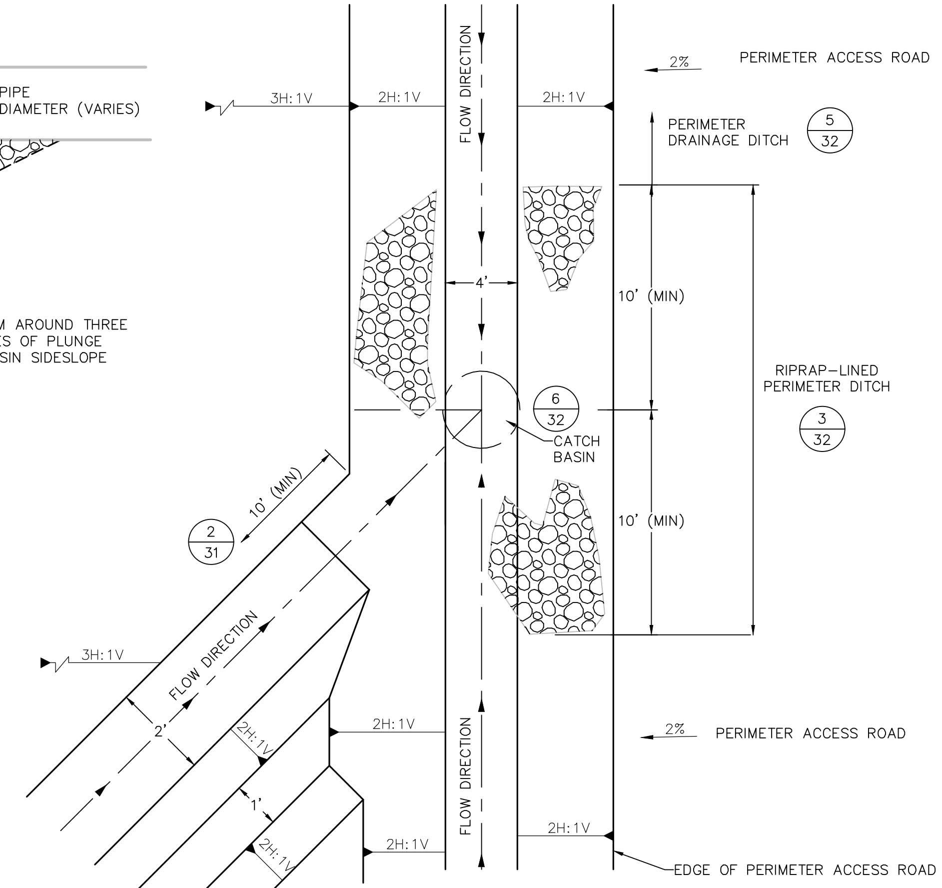
NOTE: SEE SCHEDULE FOR RIPRAP D_{50} AND CULVERT DIAMETER, D.

A / 32 SECTION
PLUNGE POOL AND RIPRAP APRON INSIDE ECS BASINS
N.T.S

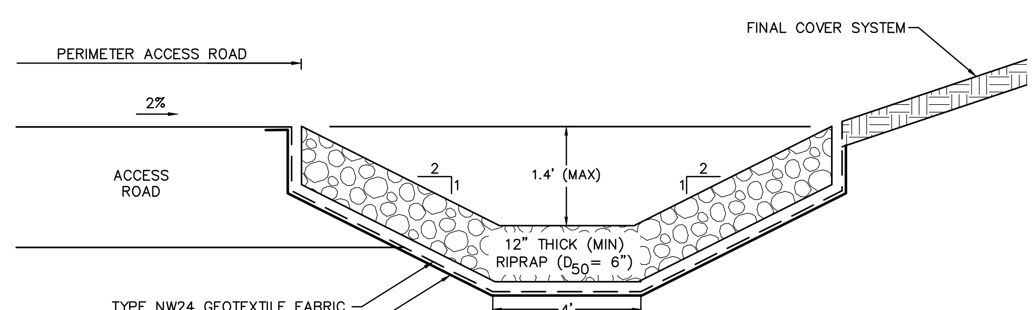


NOTE: SEE SCHEDULE FOR RIPRAP D_{50} AND CULVERT DIAMETER, D.

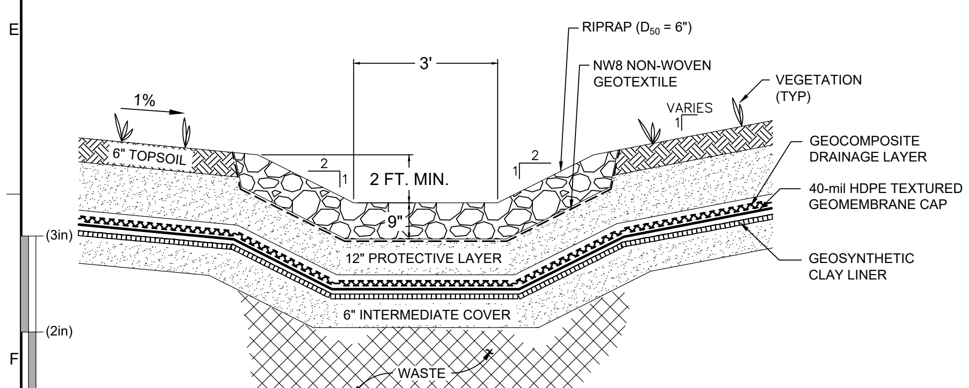
B / 32 SECTION
RIPRAP APRON INSIDE ECS BASINS
N.T.S.



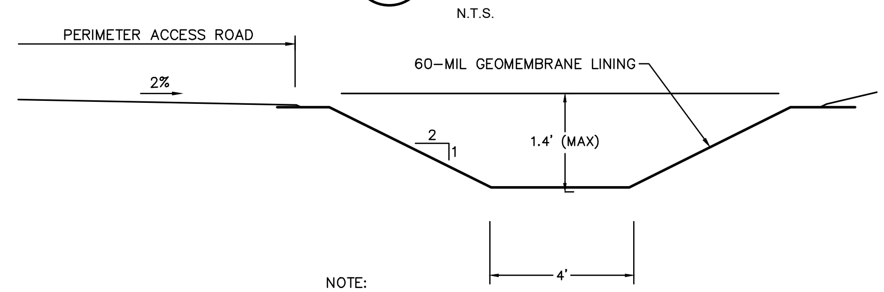
2 / 15 DETAIL
FINAL COVER DRAINAGE BENCH - PERIMETER DRAINAGE DITCH INTERSECTION
N.T.S.



3 / 32 DETAIL
RIPRAP-LINED (PERIMETER) DITCH
N.T.S.



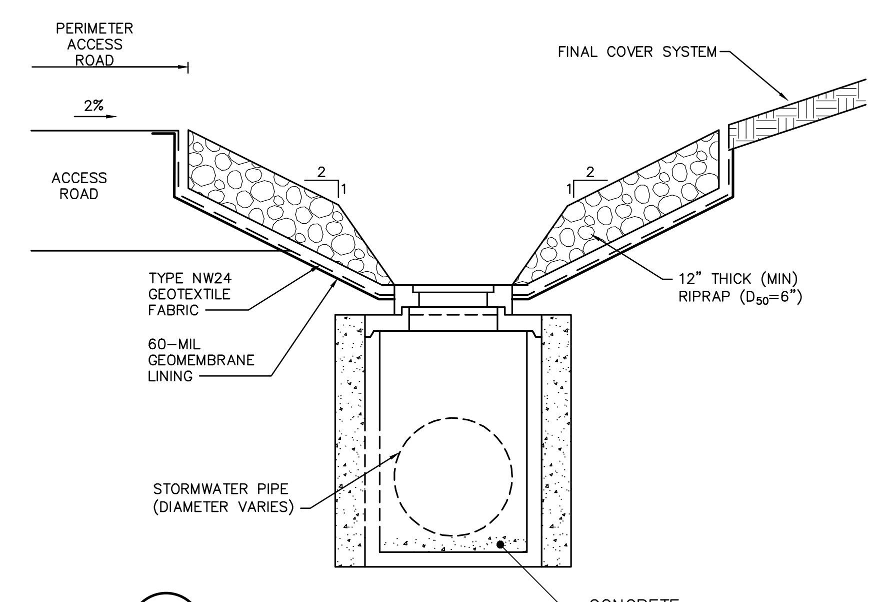
4 / 15 DETAIL
INTERNAL LANDFILL ACCESS ROAD SWALE
N.T.S.



NOTE:

1.SWALE WIDTH AND DEPTH VARY AS NEEDED TO ACHIEVE REQUIRED SLOPE.

5 / 15 DETAIL
PERIMETER DRAINAGE DITCH
N.T.S.



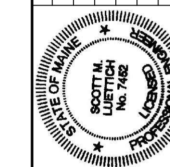
6 / 15 DETAIL
RIPRAP-LINED (PERIMETER) DITCH with CATCH BASIN
N.T.S.

(1in) (2in) (3in) (4in) SCALE IS BASED ON 22" X 34" NON-REDUCED SHEET SIZE (BORDER = 21" X 32")

T:\PROJECTS_CADD\C\CROSSROADS LANDFILL\PHASE 14 EXPANSION\PERMIT\DRAWINGS\BE0232 D031-33 (SURF WATER MNGMT DET).DWG Last Edited by: jtaylor on 10/23/19

PERMIT DRAWINGS

REV	DATE	DESCRIPTION	DRN	APP



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24 OCTOBER 2019
DATE

DESIGN BY: NJY
DRAWN BY: JT / RK
CHECKED BY: NJY
REVIEWED BY: SML
APPROVED BY: SML

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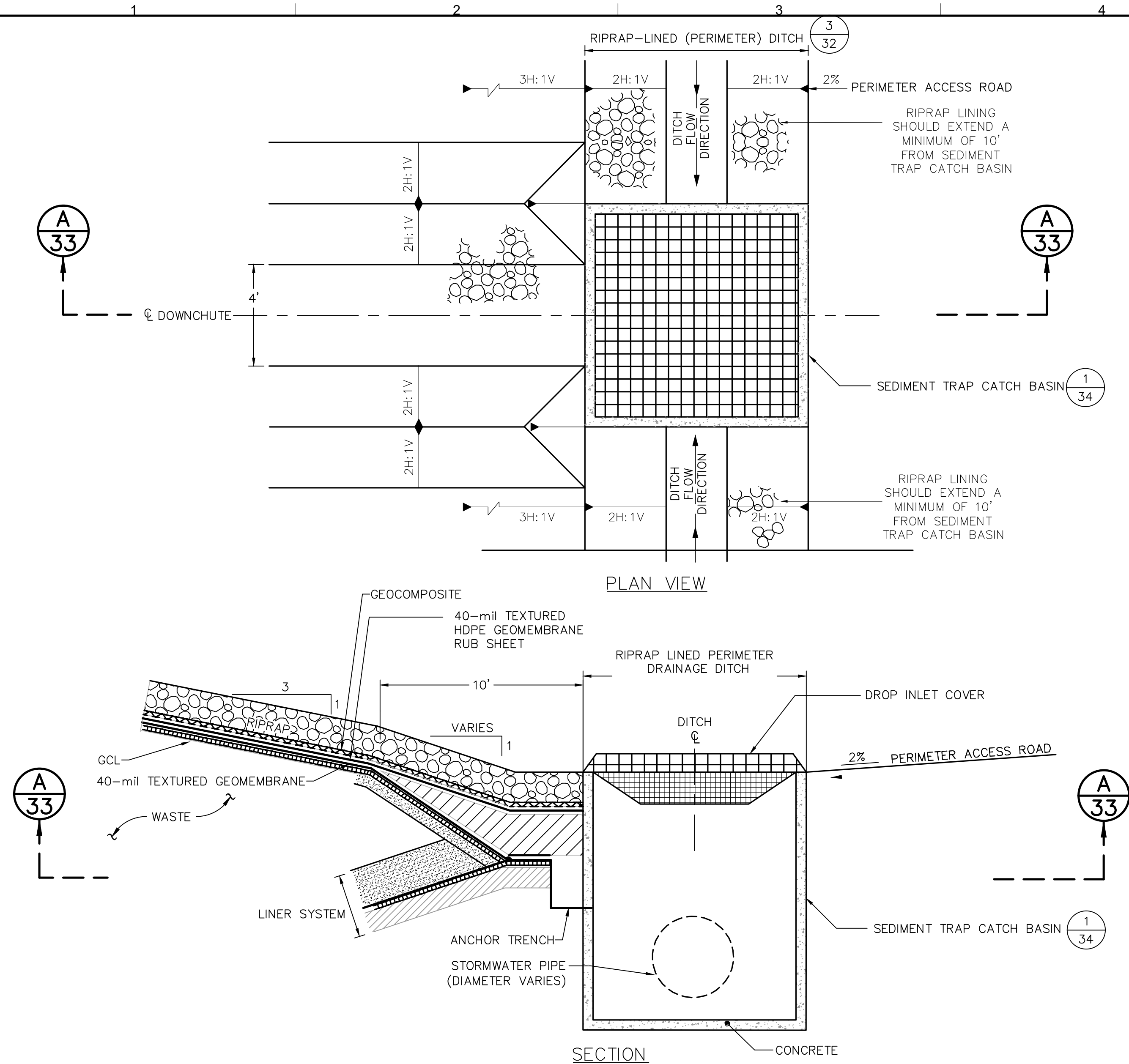
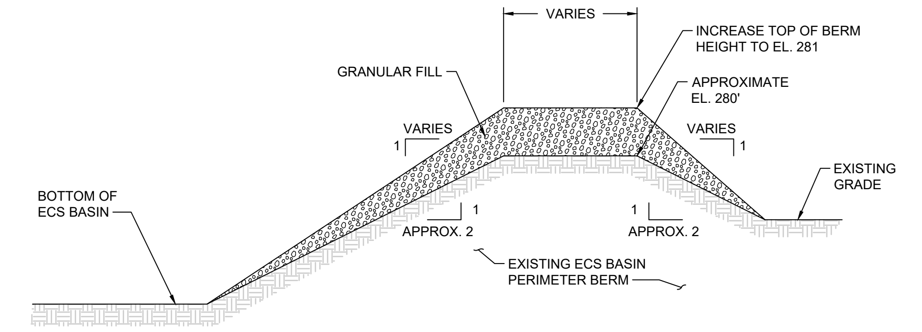
TITLE: SURFACE WATER MANAGEMENT DETAILS II
PROJECT: PHASE 14 PERMIT APPLICATION
SITE: CROSSROADS LANDFILL NORRIDGEWOCK, MAINE

DATE: OCTOBER 2019
PROJECT NO.: BE0232C
DRAWING NO.: 32 OF 38

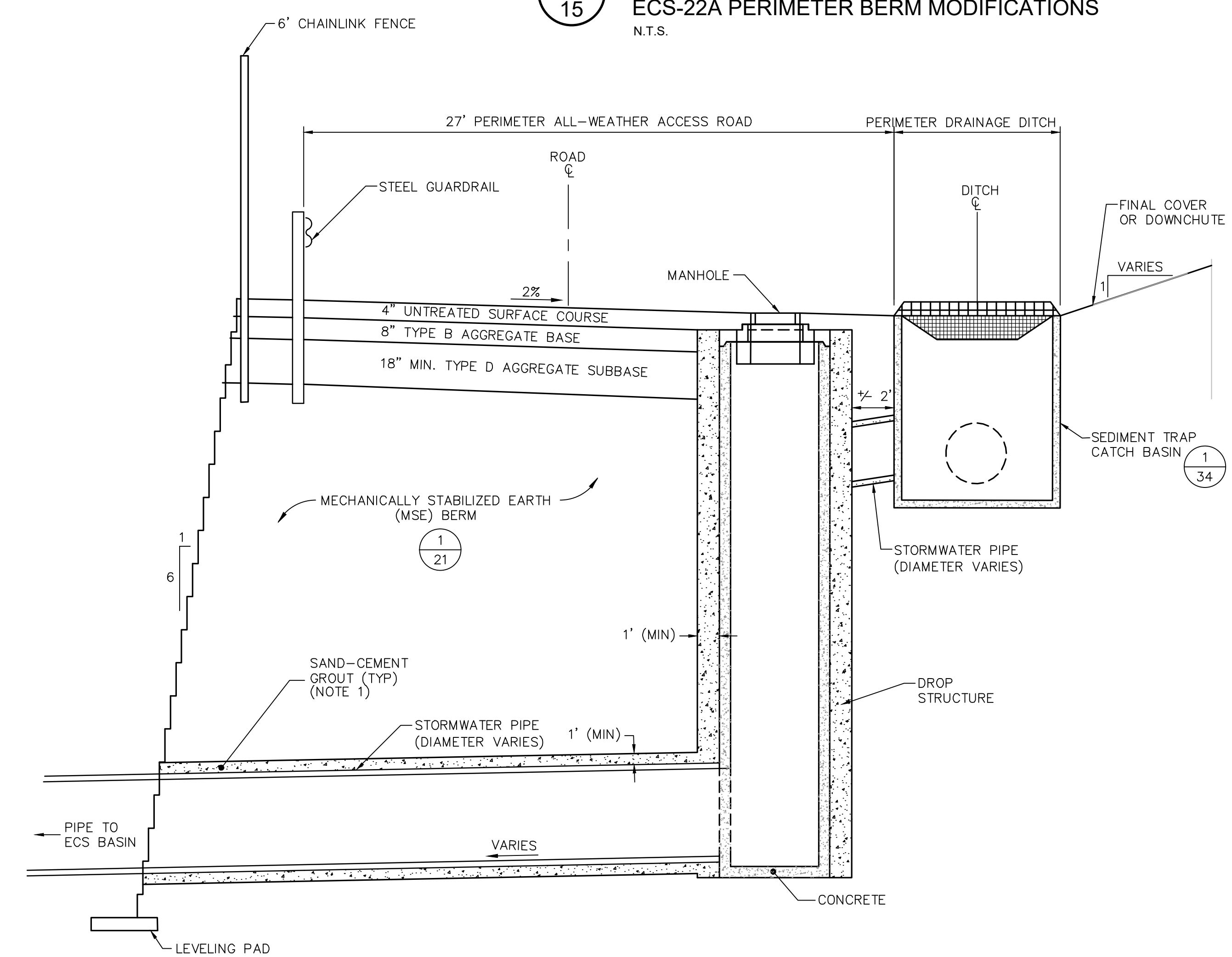


1/15 DETAIL
DOWN CHUTE - SEDIMENT TRAP CATCH BASIN INTERSECTION
N.T.S.



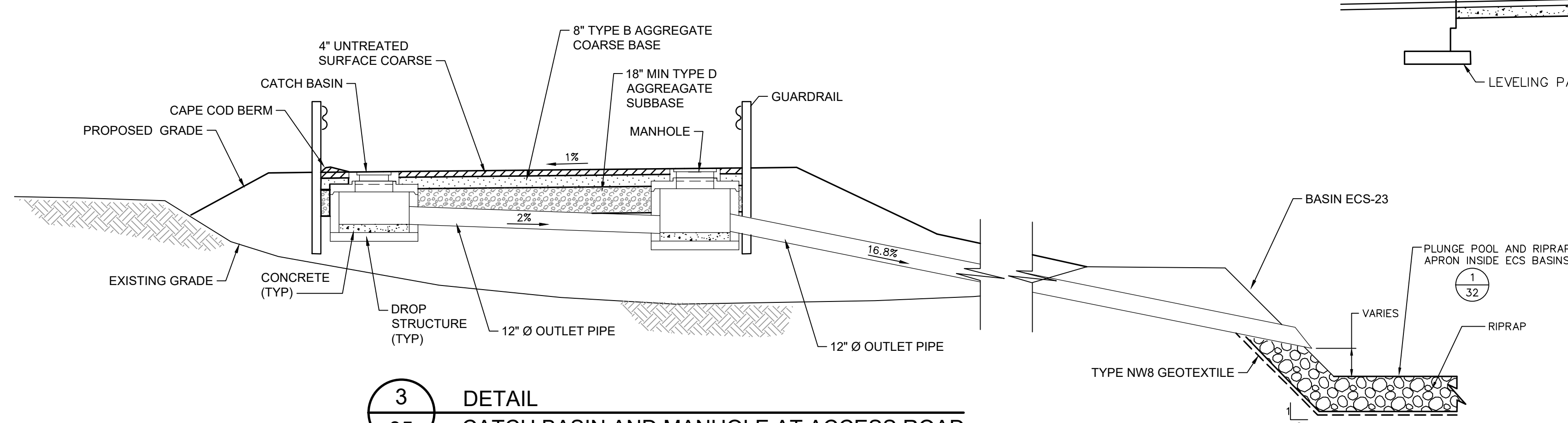
NOTE:
1. 1-½" STONE SHALL BE USED TO INCREASES ECS BASIN HEIGHT AT FILTER OUTLET LOCATIONS.
2. VEGETATION ON EXISTING ECS BASIN PERIMETER BERM WILL BE REMOVED PRIOR TO PLACEMENT OF GRANULAR FILL.

2/15 DETAIL
ECS-22A PERIMETER BERM MODIFICATIONS
N.T.S.



NOTES:
1. SAND-CEMENT GROUT USED FOR PIPES WITH MECHANICAL CONNECTIONS. HDPE BUTT-FUSED PIPE DOES NOT REQUIRE SAND-CEMENT GROUT.

4/15 DETAIL
STORMWATER MANHOLE AND PIPE OUTLET AT SEDIMENT TRAP CATCH BASIN
N.T.S.



3/35 DETAIL
CATCH BASIN AND MANHOLE AT ACCESS ROAD
N.T.S.

SCALE IS BASED ON 22" X 34" NON-REDUCED SHEET SIZE (BORDER = 21" X 32")

PERMIT DRAWINGS

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SIGNATURE
24 OCTOBER 2019 DATE

DESIGN BY: NJY
DRAWN BY: JT / RK
CHECKED BY: NJY
REVIEWED BY: SML
APPROVED BY: SML

WASTE MANAGEMENT DISPOSAL SERVICES OF MAINE, INC.
357 MERCER ROAD
NORRIDGEWOCK, MAINE 04957
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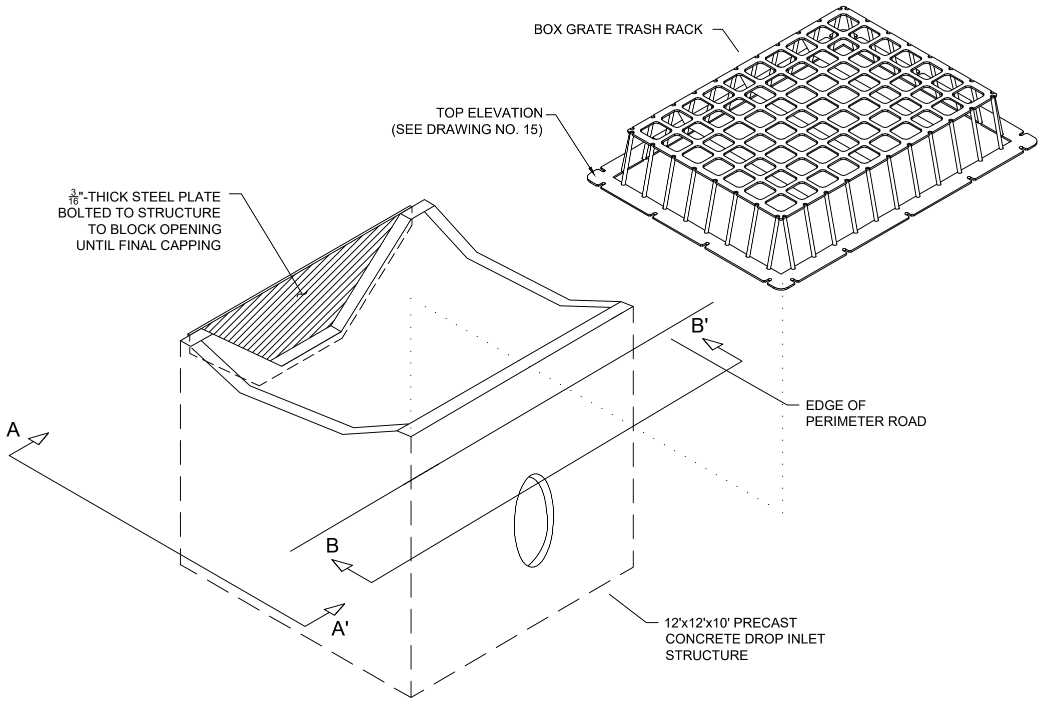
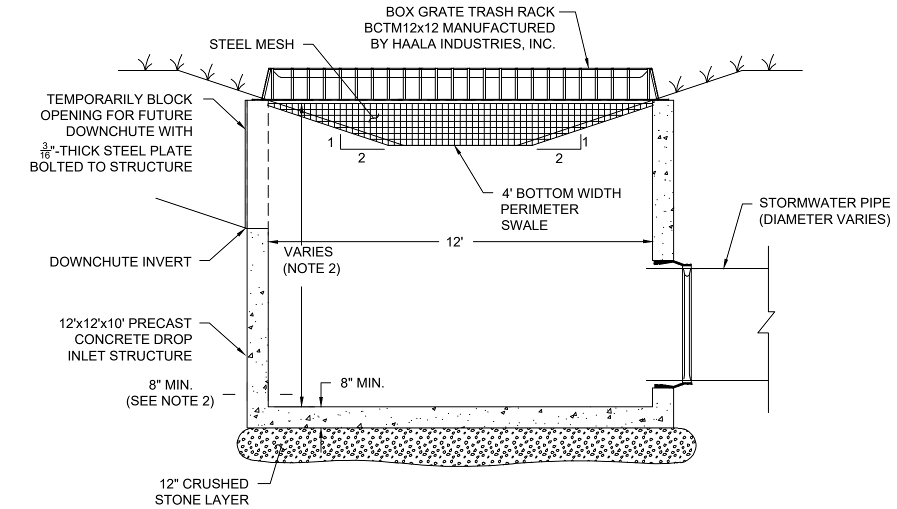
289 GREAT ROAD, SUITE 202
ACTON, MASSACHUSETTS 01720 USA
PHONE: 978.263.9588

TITLE: SURFACE WATER MANAGEMENT DETAILS III
PROJECT: PHASE 14 PERMIT APPLICATION
SITE: CROSSROADS LANDFILL NORRIDGEWOCK, MAINE

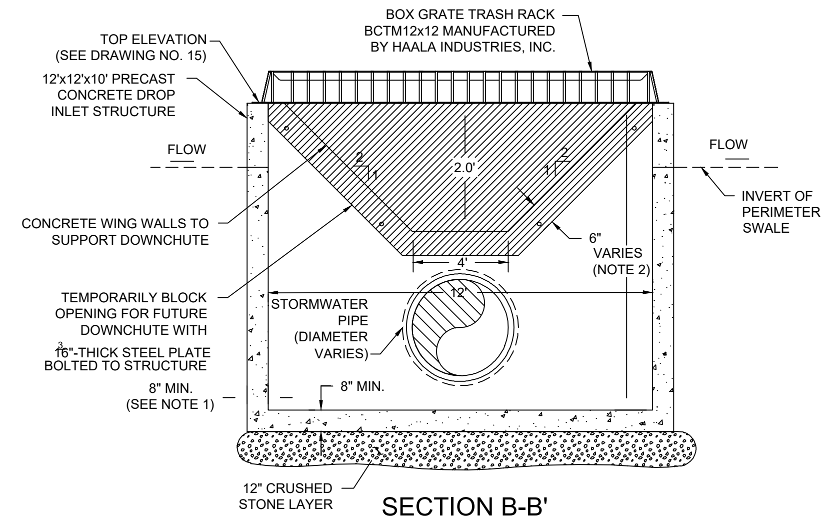
DATE: OCTOBER 2019
PROJECT NO.: BE0232C
DRAWING NO.: 33 OF 38



ISOMETRIC VIEW



SECTION A-A
ELEVATION VIEW'



SECTION B-B'
ELEVATION VIEW

NOTE:

1. WALL THICKNESSES SHOWN ARE FOR REFERENCE ONLY. ACTUAL WALL THICKNESSES SHALL BE DETERMINED BY THE PRECAST CONCRETE MANUFACTURER AT TIME OF CONSTRUCTION.
2. REFER TO DRAWING 15 FOR ELEVATIONS.
3. DETAIL ADAPTED FROM "TLR-III PHASE 13 CELL CONSTRUCTION RECORD DRAWINGS" PREPARED BY SANBORN HEAD ASSOCIATES FOR WASTE MANAGMENT, INC.

1 / 15 DETAIL
SEDIMENT TRAP CATCH BASIN
N.T.S.

(1in) (2in) (3in) (4in) SCALE IS BASED ON 22" X 34" NON-REDUCED SHEET SIZE (BORDER = 21" X 32")

PERMIT DRAWINGS

REV	DATE	DESCRIPTION	DRN	APP

STATE OF MAINE — SCOTT M. LUETTICH No. 7482 — LICENSED PROFESSIONAL ENGINEER

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SIGNATURE
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REVIEWED BY: SML
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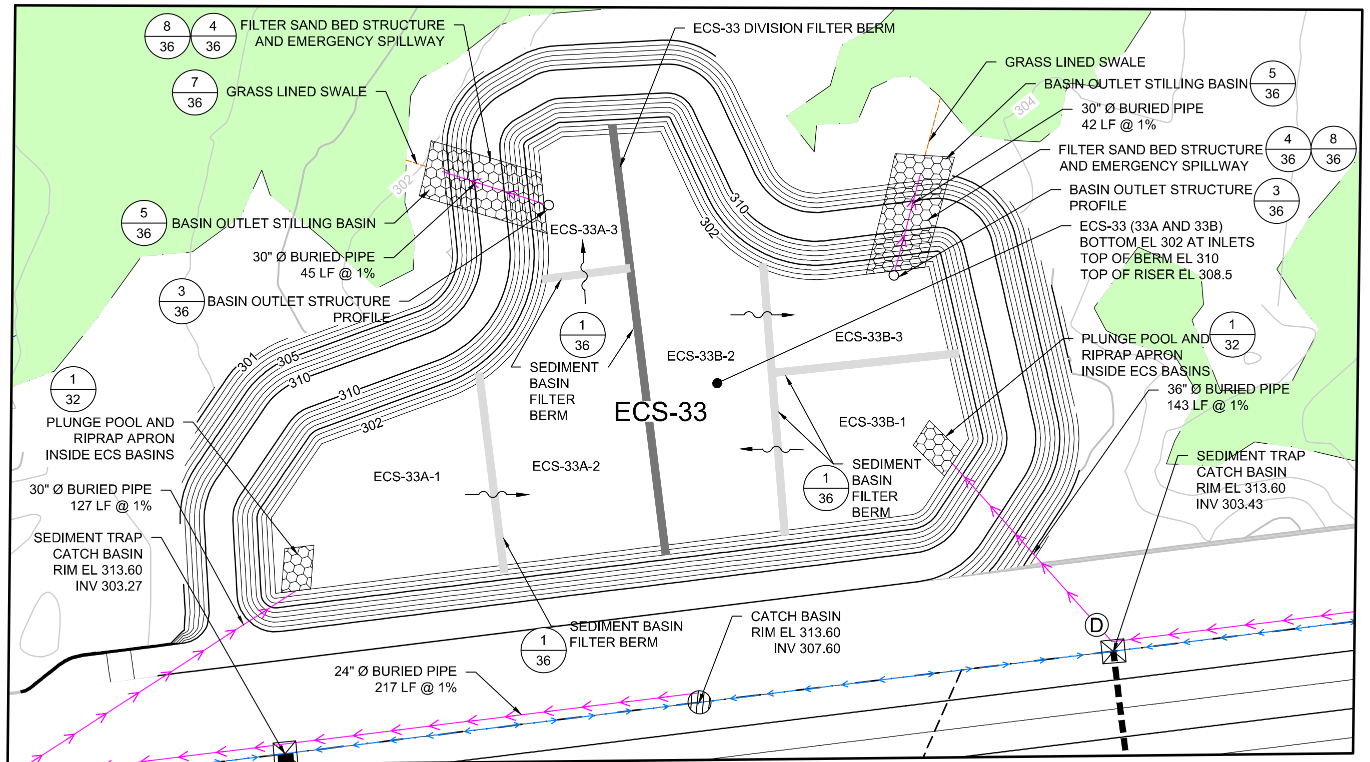
WM WASTE MANAGEMENT
WASTE MANAGEMENT DISPOSAL SERVICES OF MAINE, INC.
357 MERCER ROAD
NORRIDGEWOCK, MAINE 04957
TELEPHONE: (207) 634-2714

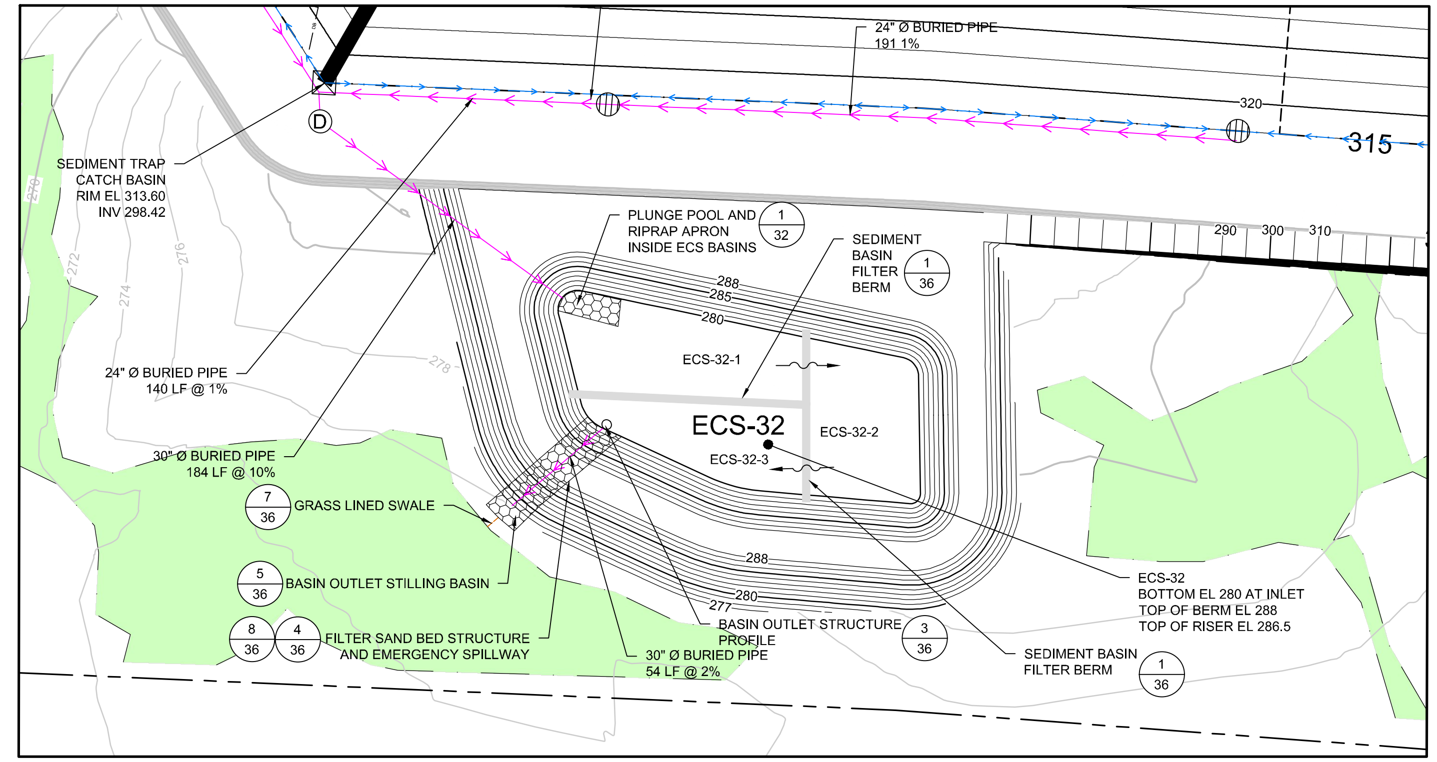
Geosyntec consultants
289 GREAT ROAD, SUITE 202
ACTON, MASSACHUSETTS 01720 USA
PHONE: 978.263.9588

TITLE: SURFACE WATER MANAGEMENT DETAILS IV
PROJECT: PHASE 14 PERMIT APPLICATION
SITE: CROSSROADS LANDFILL NORRIDGEWOCK, MAINE

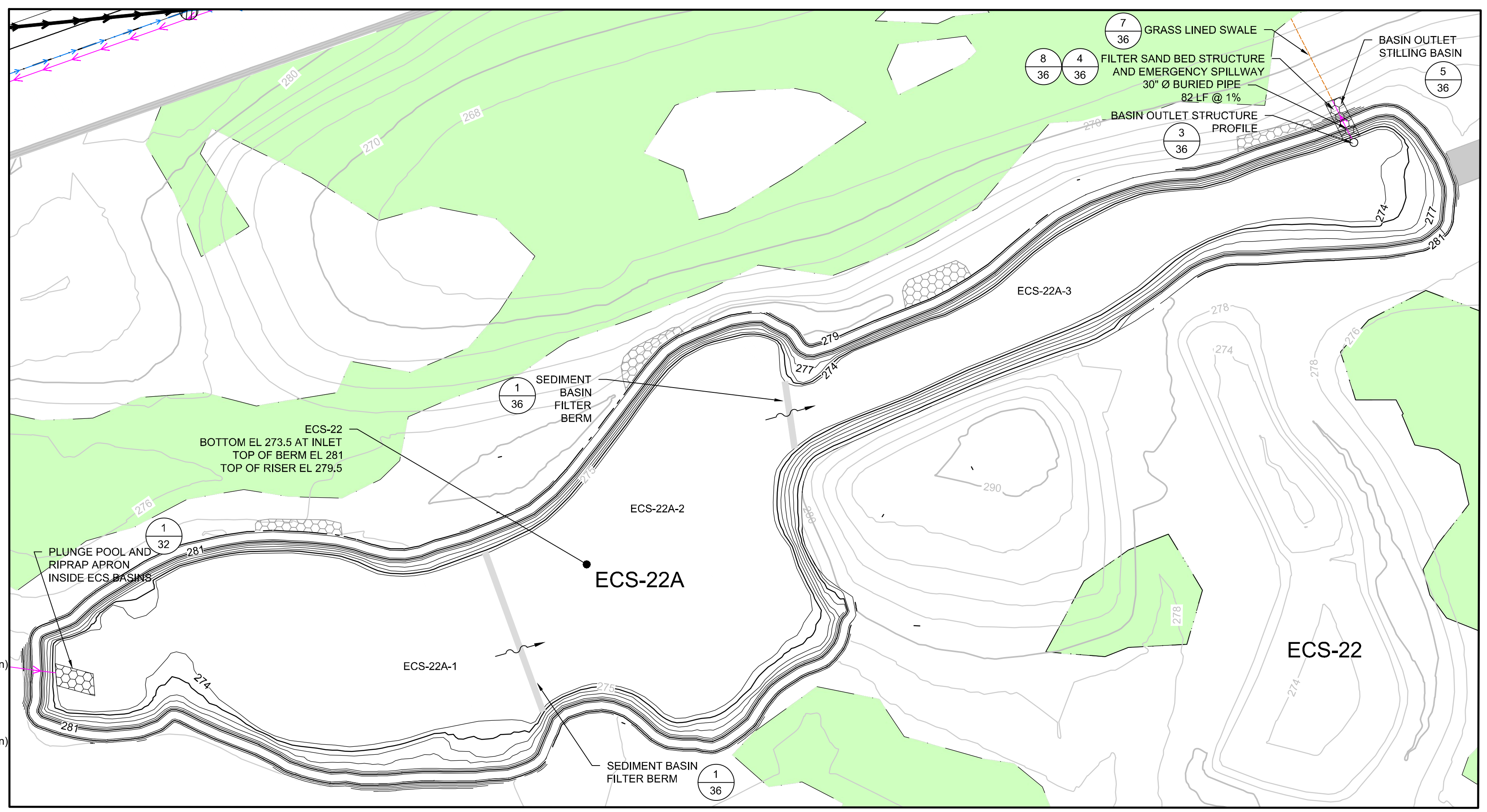
DATE: OCTOBER 2019
PROJECT NO.: BE0232C
DRAWING NO.: 34 OF 38



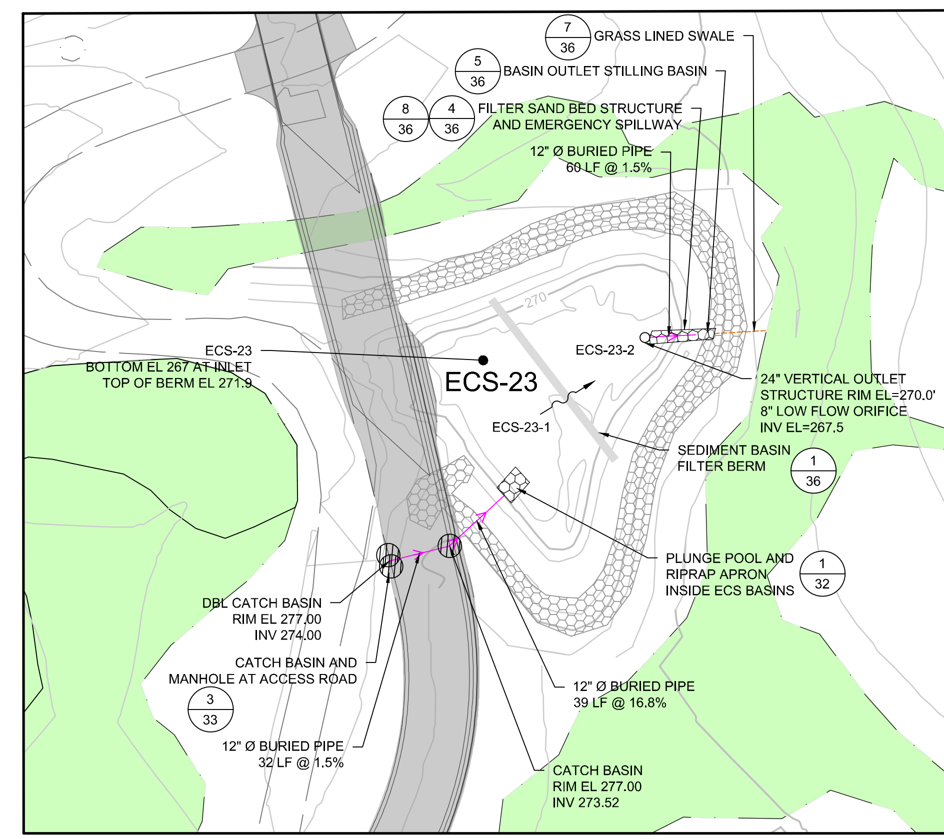
1/15 PLAN ECS BASIN 33



2/15 PLAN ECS BASIN 32



3/15 PLAN ECS BASIN 22A



4/15 PLAN ECS BASIN 23

NOTE:

1. REFER TO LEGEND ON DRAWING SHEET 15

0 50' 100' SCALE IN FEET

SCALE IS BASED ON 22" X 34" NON-REDUCED SHEET SIZE (BORDER = 21" X 32")

PERMIT DRAWINGS

STATE OF MAINE SCOTT M. LUETTICH No. 7492 LICENSED PROFESSIONAL ENGINEER

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SIGNATURE 24 OCTOBER 2019 DATE

DESIGN BY: NJY
DRAWN BY: JT / RK
CHECKED BY: NJY
REVIEWED BY: SML
APPROVED BY: SML

WASTE MANAGEMENT DISPOSAL SERVICES OF MAINE, INC. 357 MERCER ROAD NORRIDGEWOCK, MAINE 04957 TELEPHONE: (207) 634-2714

Geosyntec consultants 289 GREAT ROAD, SUITE 202 ACTON, MASSACHUSETTS 01720 USA PHONE: 978.263.9588

TITLE: ECS BASIN PLAN

PROJECT: PHASE 14 PERMIT APPLICATION

SITE: CROSSROADS LANDFILL NORRIDGEWOCK, MAINE

DATE: OCTOBER 2019
PROJECT NO.: BE0232C
DRAWING NO.: 35 OF 38

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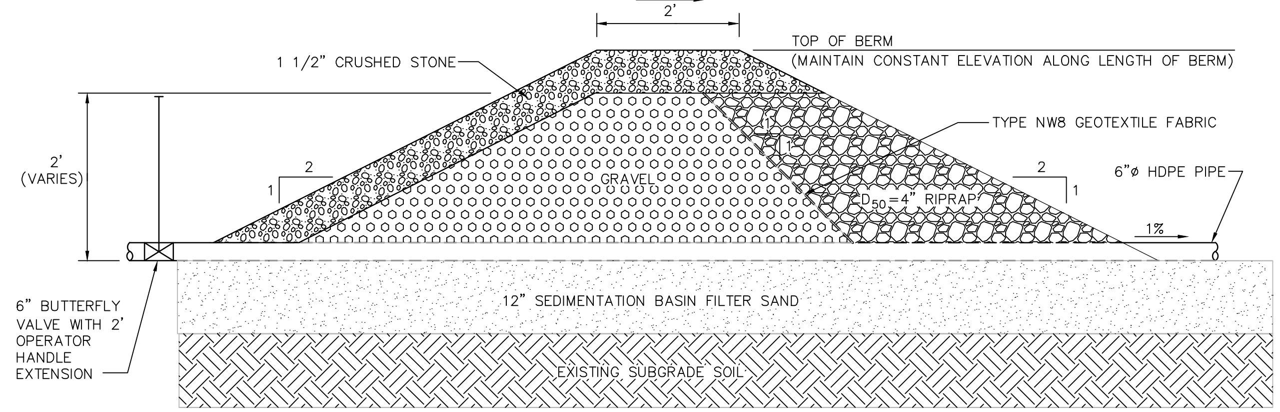
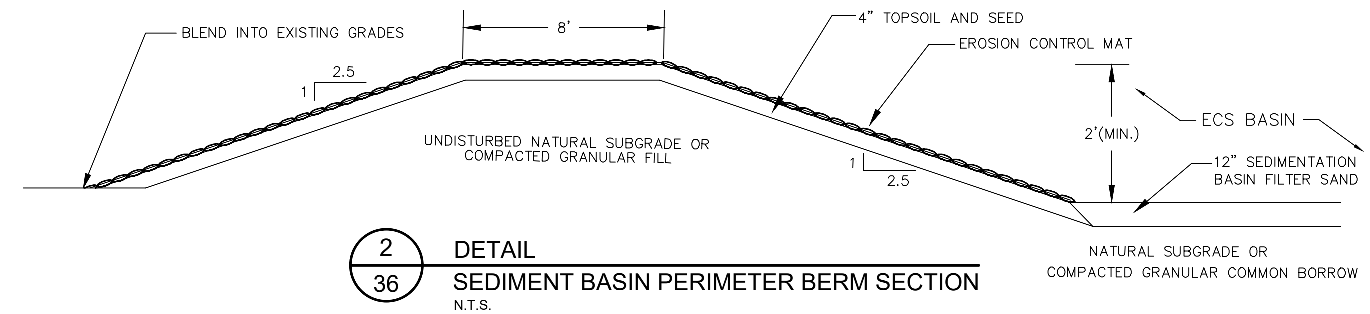
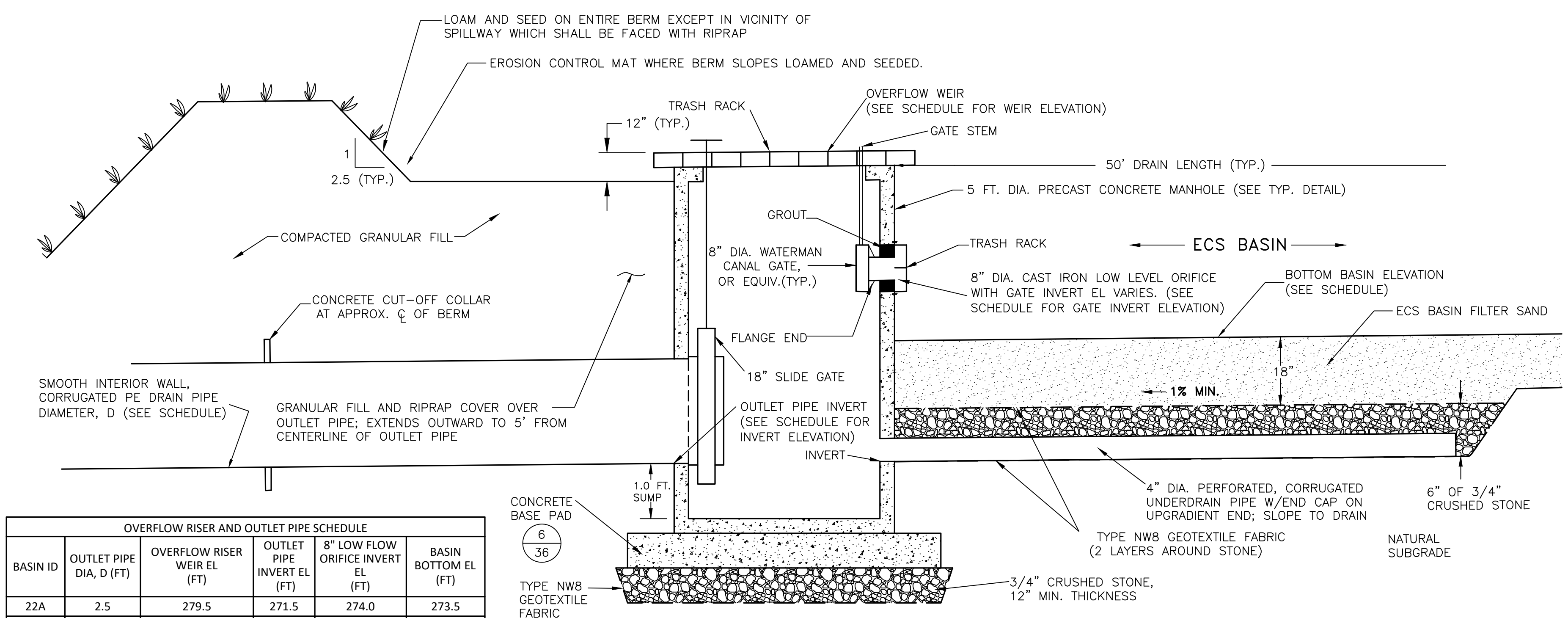


1/35 DETAIL
SEDIMENT BASIN FILTER BERM
N.T.S.



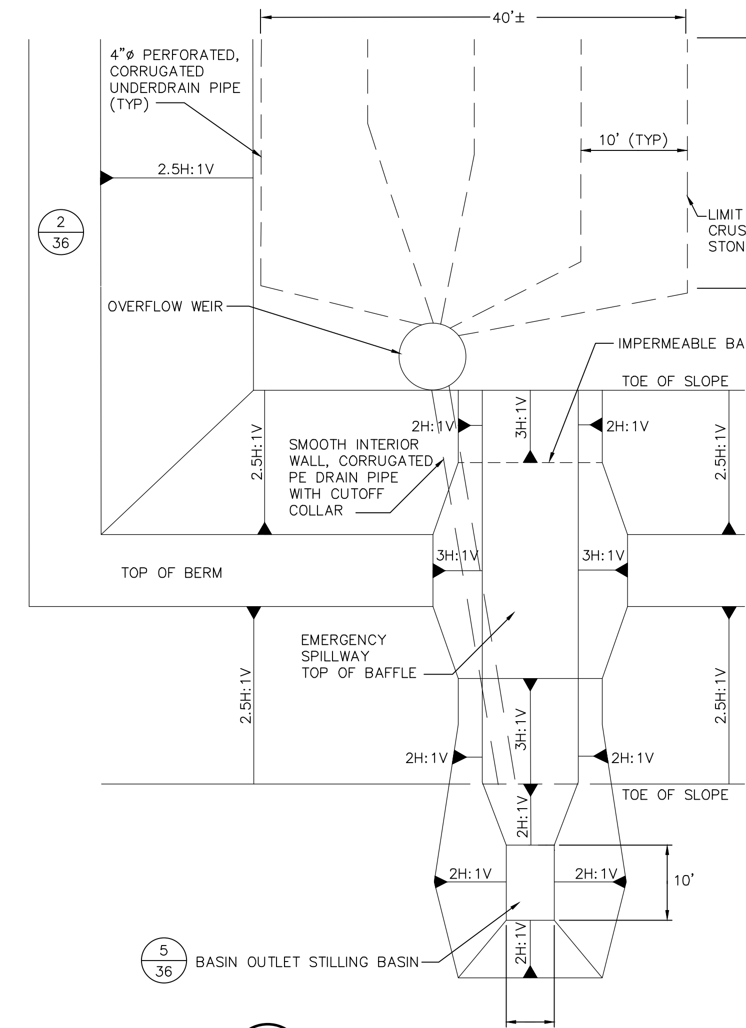
2/36 DETAIL
SEDIMENT BASIN PERIMETER BERM SECTION
N.T.S.



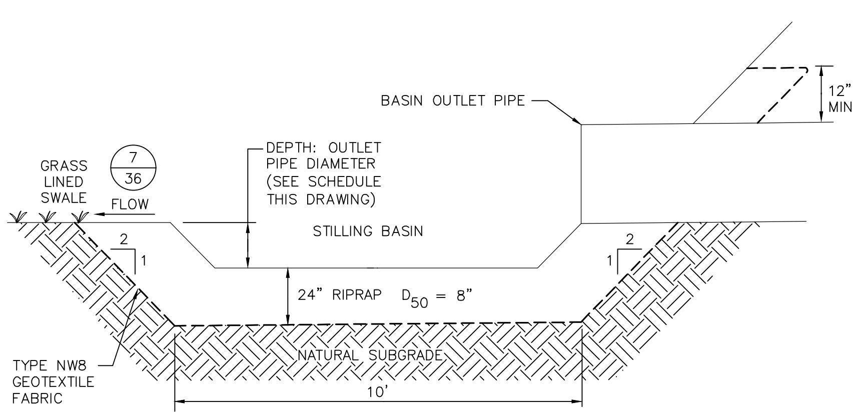
OVERFLOW RISER AND OUTLET PIPE SCHEDULE

BASIN ID	OUTLET PIPE DIA, D (FT)	OVERFLOW RISER WEIR EL (FT)	OUTLET PIPE INVERT EL (FT)	8" LOW FLOW ORIFICE INVERT EL (FT)	BASIN BOTTOM EL (FT)
22A	2.5	279.5	271.5	274.0	273.5
32	2.5	286.5	278.0	280.5	280.0
33A	2.5	308.5	300.0	302.5	302.0
33B	2.5	308.5	300.0	302.5	302.0

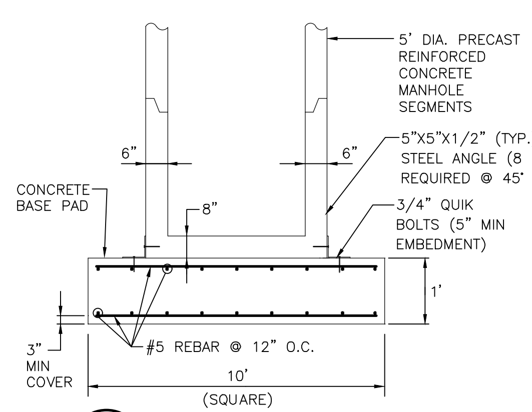
3/35 DETAIL
BASIN OUTLET STRUCTURE PROFILE
N.T.S.



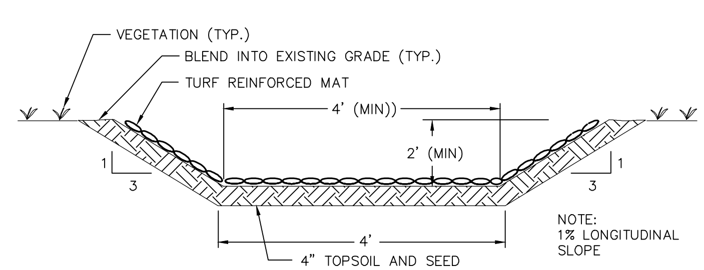
4/35 DETAIL
FILTER SAND BED STRUCTURE AND EMERGENCY SPILLWAY
N.T.S.



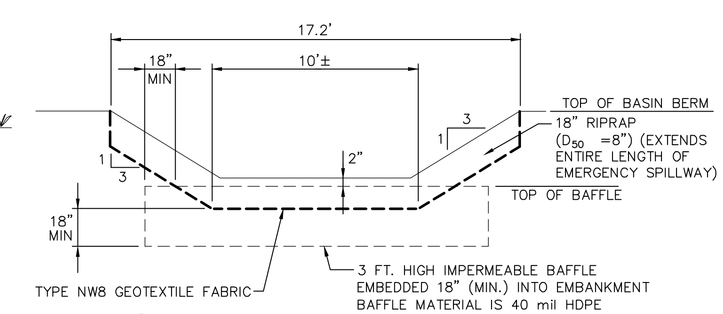
5/35 DETAIL
BASIN OUTLET STILLING BASIN
N.T.S.



6/36 DETAIL
RCP BASIN OUTLET STRUCTURE BASE PAD
N.T.S.



7/35 DETAIL
GRASS LINED SWALE
N.T.S.

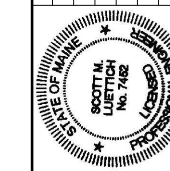


8/35 DETAIL
CROSS-SECTION EMERGENCY SPILLWAY
N.T.S.

SCALE IS BASED ON 22" X 34" NON-REDUCED SHEET SIZE (BORDER = 21" X 32")

PERMIT DRAWINGS

REV	DATE	DESCRIPTION	DRN	APP



THIS DRAWING MAY NOT BE ISSUED FOR PROJECT TENDER OR CONSTRUCTION UNLESS SEALED.
SIGNATURE
24 OCTOBER 2019
DATE

DESIGN BY: NJY
DRAWN BY: JT / RK
CHECKED BY: NJY
REVIEWED BY: SML
APPROVED BY: SML

WASTE MANAGEMENT DISPOSAL SERVICES OF MAINE, INC.
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TELEPHONE: (207) 634-2714

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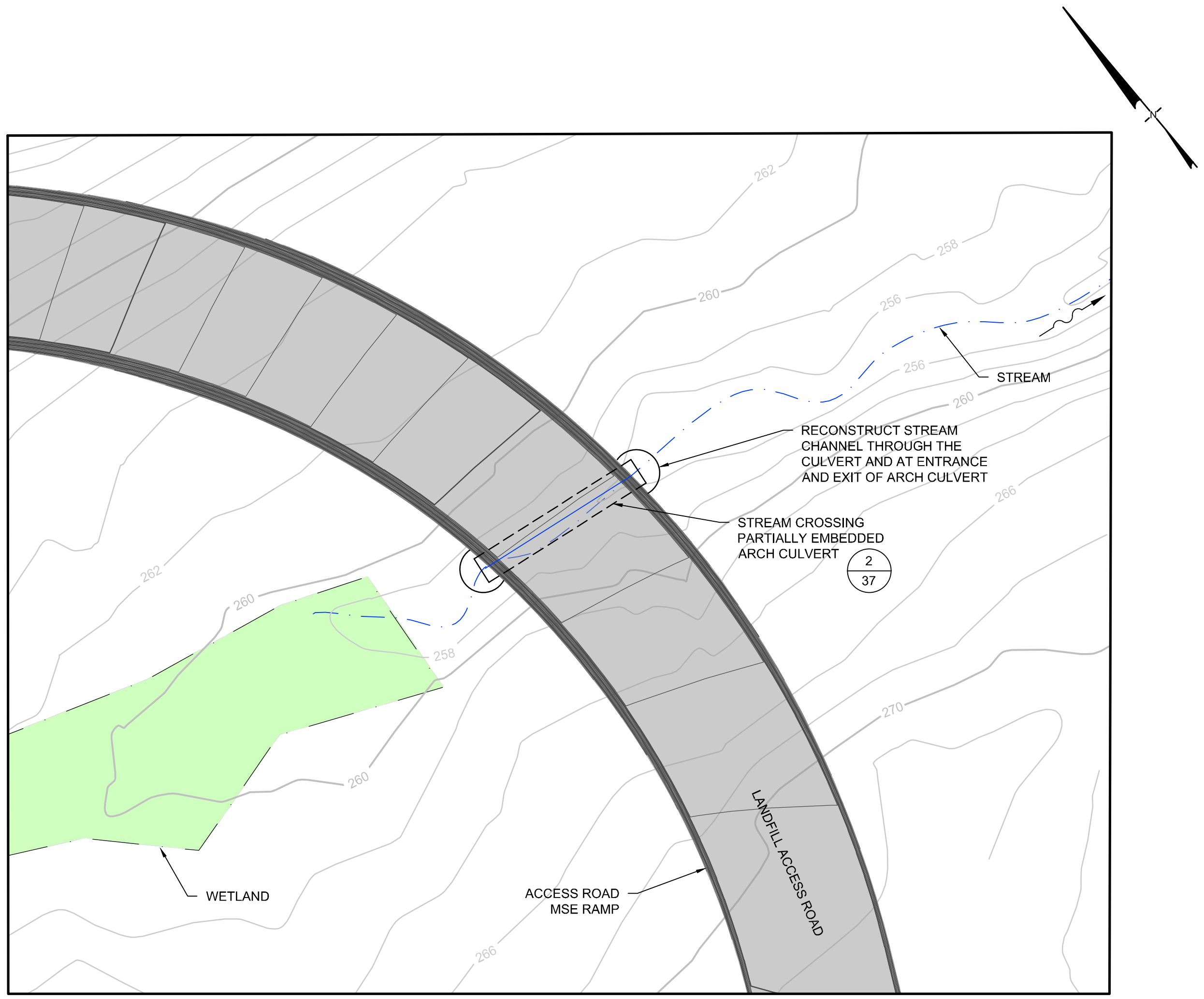
TITLE: ECS BASIN DETAILS
PROJECT: PHASE 14 PERMIT APPLICATION
SITE: CROSSROADS LANDFILL NORRIDGEWOCK, MAINE

DATE: OCTOBER 2019
PROJECT NO.: BE0232C
DRAWING NO.: 36 OF 38

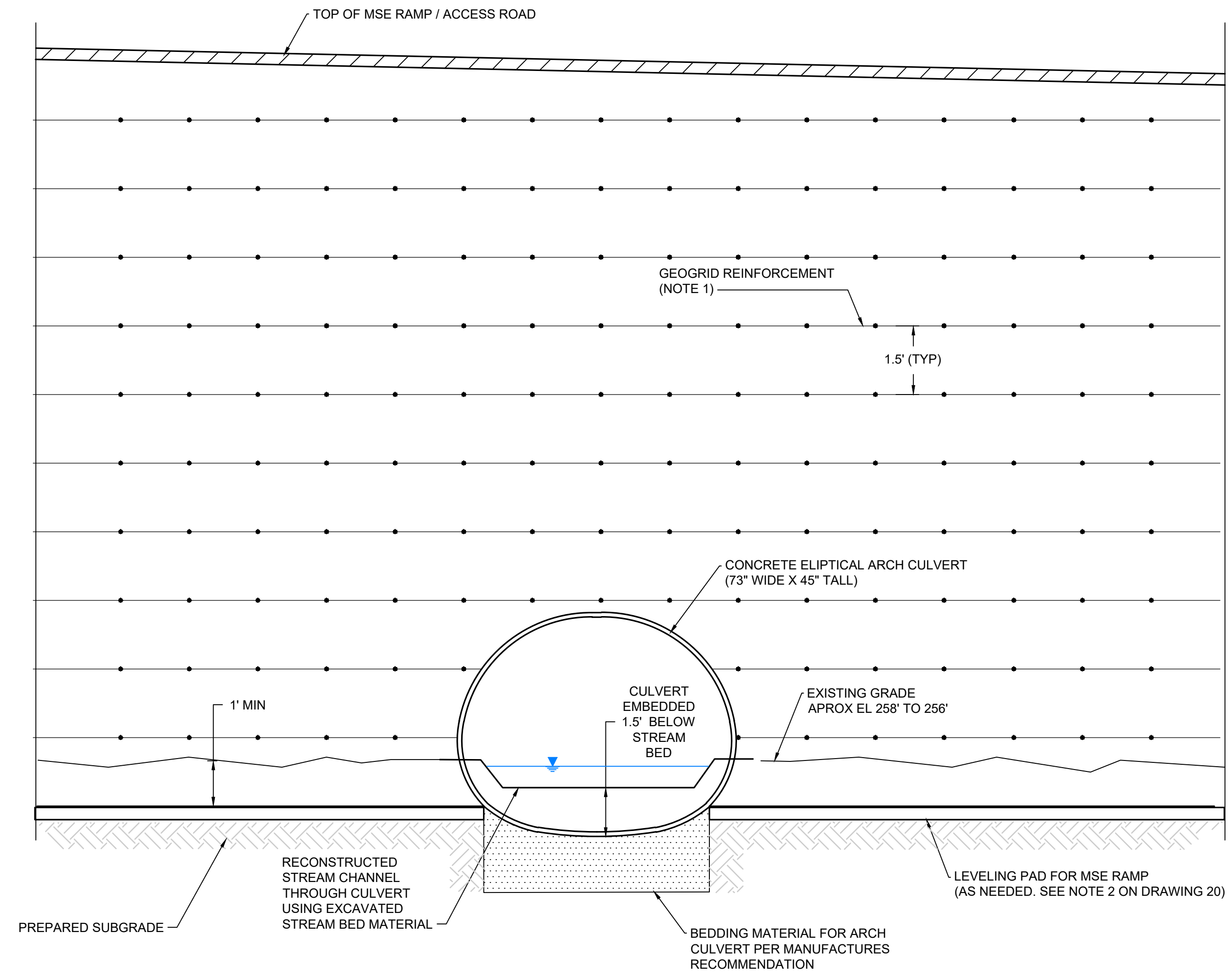


NOTE:

1. REFER TO LEGEND ON DRAWING SHEET 3.

0 20' 40'
SCALE IN FEET

1/14 PLAN
ACCESS ROAD MSE RAMP STREAM CROSSING



NOTE:
1. DETAIL OF REINFORCEMENT AROUND/OVER ARCH CULVERT TO BE SUBMITTED WITH SHOP DRAWINGS PRIOR TO CONSTRUCTION.

2/15 DETAIL
STREAM CROSSING PARTIALLY EMBEDDED ARCH CULVERT
NTS

SCALE IS BASED ON 22" X 34" NON-REDUCED SHEET SIZE (BORDER = 21" X 32")

PERMIT DRAWINGS

REV	DATE	DESCRIPTION	DRN	APP

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SIGNATURE 24 OCTOBER 2019 DATE

STATE OF MAINE SCOTT M. LUETTICH No. 7482 LICENSED PROFESSIONAL ENGINEER

DESIGN BY: NJY
DRAWN BY: JT / RK
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REVIEWED BY: SML
APPROVED BY: SML

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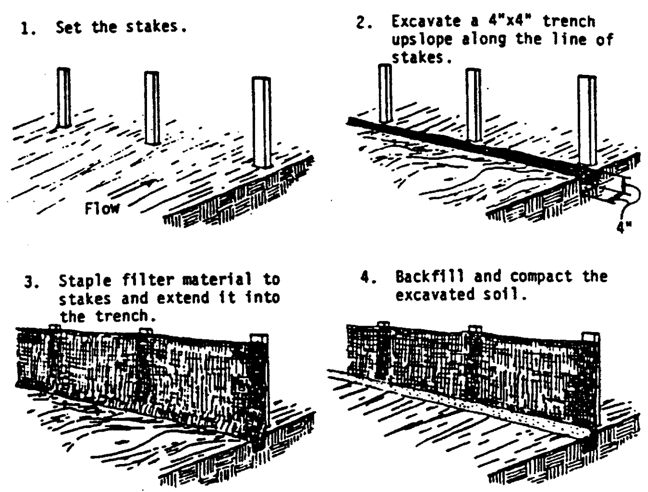
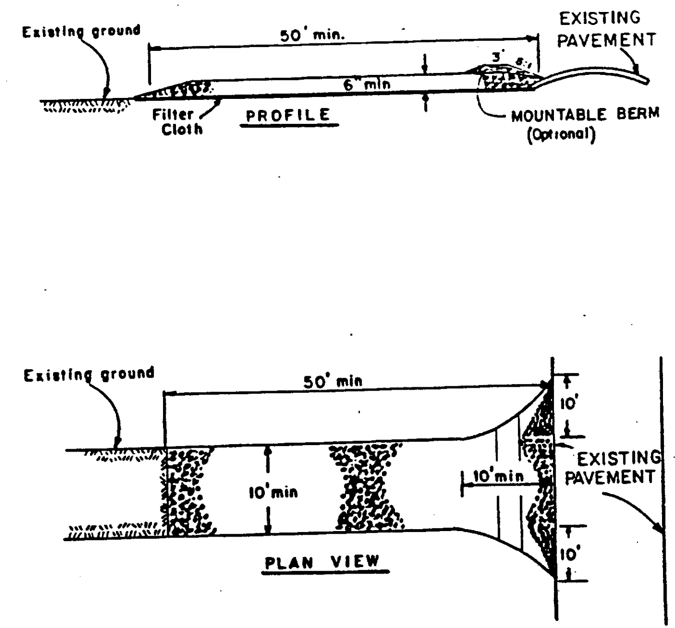
TITLE: ACCESS ROAD STREAM CROSSING DETAILS
PROJECT: PHASE 14 PERMIT APPLICATION
SITE: CROSSROADS LANDFILL NORRIDGEWOCK, MAINE

DATE: OCTOBER 2019
PROJECT NO.: BE0232C
DRAWING NO.: 37 OF 38



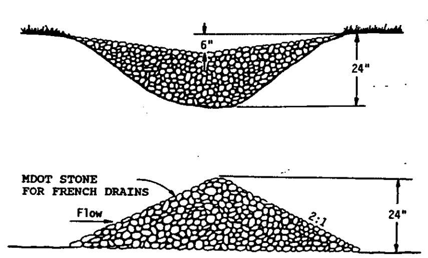
1 DETAIL
– SILT FENCE



2 DETAIL
– STABILIZATION CONSTRUCTION ENTRANCE

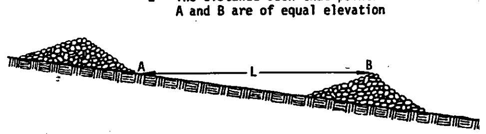
NOTES:

1. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO INSTALL AND MAINTAIN, THROUGHOUT THE LIFE OF THE PROJECT, ALL EROSION AND SEDIMENT CONTROL MEASURES AS NECESSARY SO THAT NO SEDIMENTATION AND/OR EROSION OCCURS DOWNGRADIENT OF THE WORK AREA.
2. TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES SHALL BE IN ACCORDANCE WITH THESE PLANS, THE PROJECT SPECIFICATIONS, AND THE PROJECT EROSION AND SEDIMENT CONTROL PLAN.
3. THE SMALLEST PRACTICAL LAND AREA SHALL BE EXPOSED AT ANY ONE TIME.
4. WHEREVER POSSIBLE, DISTURBED AREAS SHALL BE SLOPED BY THE CONTRACTOR TO DRAIN INTO THE WORK AREA. TEMPORARY DITCHES SHALL DIRECT RUNOFF FROM SUCH AREAS TO TEMPORARY SUMPS, THAT SHALL BE LOCATED WITHIN THE WORK AREA AT LOCATIONS SELECTED BY THE CONTRACTOR. RUNOFF COLLECTED IN THE SUMPS SHALL BE PUMPED BY THE CONTRACTOR TO THE UPGRADIENT BAY OF A SEDIMENTATION (ECS) BASIN, INTO TANKER TRUCKS FOR DISPOSAL IN THE SITE INFILTRATION BASINS, OR AS DIRECTED BY SITE PERSONNEL.
5. AT A MINIMUM, SILT FENCE EROSION CONTROL STRUCTURES SHALL BE INSTALLED BY THE CONTRACTOR ALONG THE DOWNGRADIENT LIMITS OF WORK, INSTALLED AS SHOWN ON THIS SHEET, AND IN ACCORDANCE WITH THE PROJECT SPECIFICATIONS AND STATE OF MAINE BMP'S.
6. ADDITIONAL TEMPORARY SILT FENCE SHALL BE INSTALLED BY THE CONTRACTOR AS WORK PROGRESSES TO LIMIT UNPROTECTED/UNCHECKED RUNOFF LENGTHS TO LIMIT SEDIMENTATION CAUSED BY EROSION OF BERM EMBANKMENTS UNDER CONSTRUCTION AS PART OF THE WORK.
7. SILT FENCE SHALL BE REGULARLY INSPECTED BY THE CONTRACTOR AND CQA PERSONNEL DURING THE LIFE OF THE PROJECT AND AFTER EACH STORM EVENT. ALL DAMAGED SILT FENCE SHALL BE REPAIRED AND SEDIMENT DEPOSITS SHALL BE REMOVED BY THE CONTRACTOR ON A REGULAR BASIS.
8. SEDIMENTATION (ECS) BASINS SHALL BE CLEANED BY THE CONTRACTOR AS NEEDED THROUGHOUT THE LIFE OF THE PROJECT, WITH THE ACCUMULATED SEDIMENT REMOVED TO A DESIGNATED LOCATION, SO AS TO PREVENT SILTATION OF NATURAL WATERWAYS DURING CONSTRUCTION.
9. THE CONTRACTOR SHALL REVEGETATE DISTURBED AREAS AS RAPIDLY AS POSSIBLE. ALL AREAS SHALL BE PERMANENTLY STABILIZED BY THE CONTRACTOR WITHIN 15 DAYS OF FINAL GRADING OR WITHIN 15 DAYS AFTER COMPLETING THE ROUGH GRADING OPERATIONS. AREAS WITHIN 100 FEET OF ANY WETLAND BOUNDARY SHALL BE TEMPORARILY OR PERMANENTLY STABILIZED BY THE CONTRACTOR WITHIN 7 DAYS OF FINAL GRADING.
10. BALED HAY AND MULCH SHALL BE MOWINGS OF ACCEPTABLE HERBACEOUS GROWTH, FREE FROM NOXIOUS WEEDS OR WOODY STEMS, AND SHALL BE DRY. IF HAYBALE BARRIERS ARE CONSTRUCTED, HAY SHALL BE CHINKED BETWEEN ADJACENT BALES.
11. THE CONTRACTOR SHALL INSTALL AND MAINTAIN ADDITIONAL TEMPORARY EROSION AND SEDIMENT CONTROL STRUCTURES AS CONSTRUCTION PROGRESSES, AS NECESSARY AND IN ACCORDANCE WITH STATE OF MAINE BMP'S, THROUGHOUT THE LIFE OF THE PROJECT. SUCH MEASURES SHALL INCLUDE, BUT NOT BE LIMITED TO TEMPORARY SEEDING AND MULCHING, THE CONSTRUCTION OF TEMPORARY STONE CHECK DAMS IN TEMPORARY AND/OR PERMANENT DRAINAGE SWALES PRIOR TO THE ESTABLISHMENT OF THE PERMANENT LINING, AND THE USE OF HAYBALE BARRIERS TO REDUCE EROSION AND SEDIMENTATION OF SLOPES.
12. ALL DISTURBED AREAS SHALL HAVE A MINIMUM OF 4 INCHES OF TOPSOIL PLACED BEFORE BEING SEEDED AND MULCHED, UNLESS AN ALTERNATIVE SURFACE TREATMENT IS SPECIFIED.
13. AFTER ALL DISTURBED AREAS HAVE BEEN STABILIZED, AND WITH THE APPROVAL OF THE OWNER, THE TEMPORARY EROSION CONTROL STRUCTURES SHALL BE REMOVED AND ACCUMULATED SEDIMENT SHALL BE DISPOSED OF IN A LOCATION DESIGNATED BY THE OWNER. ANY DISTURBED SOIL RESULTING FROM THIS WORK SHALL BE SEEDED AND MULCHED BY THE CONTRACTOR AS REMOVAL WORK PROGRESSES.

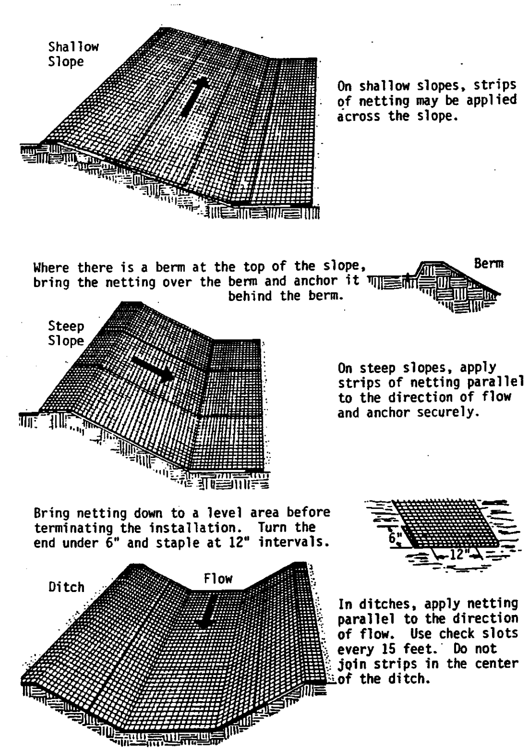


SLOPE (ft./ft)	LENGTH (ft./ft.)
0.020	100
0.030	66
0.040	50
0.050	40
0.080	25
0.100	20
0.120	17
0.150	13

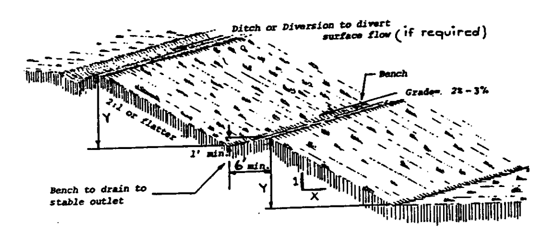
L = The distance such that points A and B are of equal elevation



3 DETAIL
– ROCK CHECK DAM



4 DETAIL
– EROSION MAT INSTALLATION



SLOPE DETAIL (WITH BENCH)

X	Y (MAX.)
2	20
3	30
4	40

5 DETAIL
– TEMPORARY BENCHES

SCALE IS BASED ON 22" X 34" NON-REDUCED SHEET SIZE (BORDER = 21" X 32")

PERMIT DRAWINGS

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SIGNATURE

24 OCTOBER 2019
DATE

STATE OF MAINE – SCOTT M. LUETTICH – No. 7492 – LICENSED – PROFESSIONAL ENGINEER

DESIGN BY: NJY
DRAWN BY: JT / RK
CHECKED BY: NJY
REVIEWED BY: SML
APPROVED BY: SML

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TITLE: EROSION AND SEDIMENTATION CONTROL STANDARD DETAILS

PROJECT: PHASE 14 PERMIT APPLICATION

SITE: CROSSROADS LANDFILL NORRIDGEWOCK, MAINE

DATE: OCTOBER 2019

PROJECT NO.: BE0232C

DRAWING NO.: 38 OF 38

REV	DATE	DESCRIPTION	DRN	APP

APPENDIX IV(b)
Geotechnical Site Assessment Report

PHASE 14 PERMIT APPLICATION

VOLUME IV OF VI

Appendix IV(b) - Geotechnical Site Assessment Report

Crossroads Landfill

Norridgewock, Maine

Prepared for

Waste Management Disposal Services of Maine, Inc.

357 Mercer Road
Norridgewock, Maine

Prepared by

Geosyntec Consultants, Inc.
289 Great Road, Suite 202
Acton, Massachusetts, 01720

Project BE0232

October 2019

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

ACRONYMS AND ABBREVIATIONS

ASTM	American Society for Testing and Materials
B&P	Boynton & Pickett, LLC
cm/s	centimeters per second
CL	low plasticity clay
CPT, CPTu	Cone Penetrometer Test
CRS	Constant Rate of Strain Test
CU	Consolidated Undrained
DSS	Direct Simple Shear Test
f_s	sleeve friction
GB	Geotechnical Boring
GTX	GeoTesting Express
LI	Liquid Index
LL	Liquid Limit
MEDEP	Maine Department of Environmental Protection
ML	low plasticity silt
NC	Normally Consolidated
NEBC	New England Boring Contractors
OC	Overconsolidated
OCR	Overconsolidation Ratio
pcf	pounds per cubic foot
PI	Plasticity Index
PPD	Pore Pressure Dissipation
psf	pounds per square foot
PVC	polyvinyl chloride
PZ	Standpipe Piezometer
q_c	uncorrected tip resistance
SCPT, SCPTu	Seismic Cone Penetration Test
SHP	Stress History Parameters
SHANSEP	Stress History and Normalized Soil Engineering Properties
SM	silty sand

SP	poorly graded sand
SPT	Standard Penetration Test
SWMR	Solid Waste Management Regulations
u	dynamic pore pressure
VWP	Vibrating Wire Piezometer
WMDSM	Waste Management Disposal Services of Maine, Inc.

1. INTRODUCTION

1.1 Terms of Reference

This Geotechnical Site Assessment Report was prepared for the proposed Phase 14 waste disposal unit at the Crossroads Landfill (Crossroads) by Geosyntec Consultants (Geosyntec) for Waste Management Disposal Services of Maine, Inc. (WMDSM). This report was prepared by Mr. Andrew Rohrman, Mr. Nicholas J. Yafrate (Maine PE #16092), and Mr. Scott M. Luettich (Maine PE # 7452), all of Geosyntec.

This report was prepared to satisfy the engineering requirements established by the Maine Department of Environmental Protection (MEDEP) for geotechnical site assessment, specifically Chapter 401.2.C of the Maine Solid Waste Management Regulations (Maine SWMR), effective 2 November 1998 (revisions effective 12 April 2015).

1.2 Report Organization

This report is organized to provide a detailed description of the geotechnical site characterization, the results of which are used in development the landfill design. The remainder of this report is organized as follows:

- Section 2 describes the existing site, including geologic setting, subsurface stratigraphy, and groundwater conditions.
- Section 3 summarizes the geotechnical field investigation, including cone penetrometer testing, geotechnical borings, and standpipe piezometer installation.
- Section 4 presents the result of laboratory testing of the clay foundational soils.
- Section 5 presents interpretation of the results of laboratory tests performed on the clay foundational soils, including SHANSEP parameters, consolidation pressures, coefficient of consolidation, and density. This section also includes the selection of design parameters of other site soils based on the results of field tests.

2. SITE CHARACTERIZATION

2.1 Geologic Setting

The regional and site geology has been investigated and characterized by Golder Associates (Golder). A detailed description of the regional and site geology, as prepared by Golder, is presented in Volume III of the Phase 14 permit application.

2.2 Phase 14 Site Stratigraphy

The subsurface stratigraphy of Phase 14 was characterized based on the results of cone penetrometer tests (CPT) performed in 2018 and geotechnical borings performed in 2019. Those field investigations are described in Section 3 of this report. Descriptions, depths, and thicknesses of the strata presented in this section are based on the results of those field investigations.

The subsurface in Phase 14 generally consists of the following strata, from the ground surface down:

- Topsoil – Approximately one foot or less of topsoil exists over most the Phase 14 area.
- Sand – The sand layer consists of Sand or Silty Sand and varies in thickness from zero to approximately 22 ft with an average of approximately 6 ft.
- Brown Clay (also referred to as Stiff Clay) – The Brown Clay layer consists of a stiff brown clay of the Presumpscot formation that varies in thickness from zero to approximately 12 ft with an average thickness of approximately 7 ft.
- Gray Clay (also referred to as Soft Clay) – The Gray Clay layer consists of a soft gray clay of the Presumpscot formation that varies in thickness from zero to approximately 20 ft with an average thickness of 5.5 ft.
- Glacial Till (Till) – The Till layer consists of glacially deposited sand, silt, and medium to fine gravel. The thickness varies from approximately 0.5 ft to 13 feet and has an average thickness of approximately 6 ft.
- Bedrock – The bedrock layer is encountered at depths ranging from approximately 14 ft to approximately 43 ft below ground surface. On average, bedrock is encountered at a depth of approximately 28 ft from the ground surface.

The approximate elevations of these strata, as identified at individual CPT and geotechnical borings locations, are presented in Tables 1 and 2, respectively.

In addition to the strata described above, there are areas of Phase 14 in which soil removed from Phase 8 during construction has been stockpiled. This material was not included in the scope of the Phase 14 investigations and has not been addressed further in this report because it will be removed prior to Phase 14 construction.

2.3 Groundwater Conditions

Groundwater conditions at Phase 14 are characterized by potentiometric surfaces measured in the sand layer, clay layers, till layer, and in bedrock.

A detailed description of the field and analytical methods used to characterize the groundwater conditions and descriptions of the potentiometric surfaces, as prepared by Golder, are presented in Volume III of the Phase 14 permit application.

3. FIELD INVESTIGATION

3.1 Cone Penetrometer Program

Geosyntec coordinated ConeTec Inc. (ConeTec) to advance a series of piezometric cone penetrometer tests (CPT or CPTu) and seismic piezometric cone penetrometer tests (SCPT or SCPTu) and install vibrating wire piezometers in Phase 14. WMDSM's surveyor, Boynton & Pickett, LLC (B&P), field-located and marked the proposed CPT locations prior to ConeTec and Geosyntec mobilizing to site on 20 August 2018. Investigation locations are presented in Figure 1.

ConeTec prepared a report on the CPT portion of the field investigation at Phase 14; the report is included as Appendix A.

3.1.1 Cone Penetrometer Testing

ConeTec advanced a total of 45 CPTs at a constant rate of 2 centimeters per second (cm/s) using a track-mounted rig and a penetrometer with a cross-sectional tip area of 15 cm^2. ConeTec used their data acquisition system to collect measurements every 2.5 cm that included depth, uncorrected tip resistance (q_c), sleeve friction (f_s), and dynamic pore pressure (u). During advancement of the piezocones, ConeTec stopped advancing the penetrometer at certain depths to perform Pore Pressure Dissipation (PPD) tests in which the static pore pressure is measured versus time. ConeTec conducted a series of 83 PPD tests, and the results were used to interpret the phreatic surface (by Golder) and consolidation characteristics of the soil.

ConeTec conducted shear wave velocity tests at four locations (SCPT18-02, SCPT18-07, SCPT18-32, and SCPT18-41) at 1-meter intervals. ConeTec used an impact hammer to horizontally strike a beam held in place by a normal load to create shear waves and an up-hole integrated digital oscilloscope to measure and record the data.

The as-built locations (Northings, Eastings, and elevations) of the CPTs are presented in Table 1.

3.1.2 Vibrating Wire Piezometer Installation

During the CPT program, ConeTec installed 14 Geokon vibrating wire piezometers (VWP) at seven locations. Two VWPs were installed in each borehole at depths ranging from approximately 2 ft to 39 ft. The lower VWP was installed in the Brown Clay or Gray Clay, and the upper piezometer was installed in the Sand layer.

Geosyntec monitored the installation of the VWPs from 27 August 2018 through 29 August 2019. The installation depths of the VWPs are provided with the CPT installation data in Table 1.

3.2 Geotechnical Boring Program

Geosyntec coordinated New England Boring Contractors (NEBC) to advance a series of geotechnical borings and install standpipe piezometers in the Phase 14 area, perform field tests, and collect samples for laboratory testing. Geosyntec logged the soil stratigraphy as boreholes were advanced, recorded the number of hammer blows per six-inch interval during standard penetration tests (SPT), monitored sample collection and piezometer installation, and documented that drilling and backfilling was performed in accordance with relevant ASTM standards.

Geosyntec and NEBC mobilized to the site on 25 February 2019 and demobilized on 28 March 2019. WMDSM's surveyor, Boynton & Pickett, LLC (B&P), field-located and marked the proposed boring locations prior to NEBC and Geosyntec mobilizing to site, and performed as-built surveys for any borings that were adjusted from the originally proposed locations. Investigation locations are presented in Figure 1.

Boring logs for these geotechnical borings are presented in Appendix B.

3.2.1 Standard Penetration Testing and Sample Collection

NEBC advanced the borings using the drive casing and rotary wash method. NEBC advanced a four-inch diameter steel casing using a 400-pound automatic hammer and removed soil cuttings from the borehole using a roller cone drill bit and wash water. NEBC performed SPTs and collected disturbed samples using two-inch diameter split spoons advanced by a 140-pound automatic hammer from a height of 30-inches.

Geosyntec collected and recorded water level measurements in each borehole after drilling was complete and after a borehole had been left open overnight, when practical.

At locations identified by Geosyntec, NEBC collected Shelby (i.e., thin-walled) tube samples from the clay layers. NEBC collected samples from within the Brown Clay using the hydraulic power of the drill rig and standard Shelby tube sampler and from within the Gray Clay using weighted drilling mud (i.e., a mixture of Baroid 41 weighting agent manufactured by Halliburton, Super Gel-X bentonite powder manufactured by Cetco, and water) and a piston sampler. NEBC backfilled completed boreholes with bentonite chips (i.e., Bentonite Plug manufactured by PDS) and staked the locations for B&P to record the as-built location.

After collecting and logging soil samples, Geosyntec returned the samples to their office in Acton, Massachusetts for storage until the samples were transmitted to the geotechnical laboratory for testing.

The as-built locations of the geotechnical boings are presented in Table 2.

3.2.2 Standpipe Piezometer Installation

NEBC installed standpipe piezometers at six locations in Phase 14. Each piezometer is constructed with a two-inch diameter polyvinyl chloride (PVC) pipe. A screened length (0.010-inch wide slots) and a sand pack (0s and 1s sand manufactured by Holliston Sand) were installed in the annular space between the riser pipe and borehole wall within the clay layer. The annular space above the screen interval is was backfilled with bentonite chips (i.e., Bentonite Plug manufactured by PDS). NEBC installed steel standpipes with locking covers over the PVC risers[1].

Details of the piezometer installations are provided on the corresponding boring logs in Appendix B. The identifications, as-built locations, and installation details of the piezometers are presented in Table 3.

[1] Note that the steel standpipe at PZ-16M was not installed by NEBC because of frozen ground conditions and Geosyntec installed it when the ground thawed.

4. LABORATORY TESTING

Geosyntec transported select split-spoon and Shelby tube samples to GeoTesting Express of Acton, Massachusetts (GTX) for geotechnical laboratory testing. As directed by Geosyntec, GTX performed a series of tests on the samples to characterize the index and engineering properties of the soil.

4.1 Classification Testing

GTX performed particle size analysis and Atterberg Limit tests in June and July 2019 on select Shelby tube clay samples. GTX performed particle size analysis tests in accordance with ASTM D6913 and ASTM D7928 and Atterberg Limits tests according to ASTM D4318. The soils were classified by GTX in accordance with ASTM D2487. The results of the classification tests are provided in Appendix C.

4.2 Hydraulic Conductivity

GTX performed hydraulic conductivity tests during the last week of June 2019 on select Shelby tube clay samples in general accordance with ASTM D5084 using a flexible wall permeameter. The results of the hydraulic conductivity tests are provided in Appendix C.

4.3 Consolidation Tests

GTX performed constant rate of strain (CRS) consolidation tests on select Shelby tube samples from mid-May to mid-September 2019 in accordance with ASTM D4829. The laboratory data sheets for the consolidation tests are provided in Appendix C.

4.4 Strength Tests

GTX performed Direct Simple Shear (DSS) and Consolidated Undrained (CU) triaxial tests on select Shelby tube samples from mid-July to mid-September 2019. Laboratory shear strength reports are included in Appendix C. Further details and specific test procedures for the clay strength tests are described below.

SHANSEP Testing

Geosyntec selected two soil samples for DSS testing in accordance with the Stress History and Normalized Soil Engineering Properties (SHANSEP) procedure (Ladd and Foot, 1974). Specimens from samples GB-15 (7-9) and GB-21 (23-25) were tested at a range of OCRs to evaluate the shear strength parameters for Brown and Gray Clay, respectively.

Specimens from samples GB-15 (7-9) and GB-21 (23-25) were tested in accordance with the SHANSEP procedure to develop relationship between the in-situ effective stress and undrained shear strength for use in the design of Phase 14. Specimens from each sample were tested using the following procedure:

- *Normally Consolidated (NC) Shear Testing.* Three DSS tests were performed at an OCR of 1 at a range of consolidation stresses that were 1.5, 2.5, and 4.5 times the effective preconsolidation stress evaluated from CRS consolidation testing for that sample.

- *Undrained Strength Ratio.* The undrained strength ratio (i.e., the ratio of the measured undrained shear strength to the vertical effective stress at the initiation of shearing) of each of the three tests was evaluated to determine if the results can be normalized (i.e., the undrained strength ratios are consistent among the three tests). The undrained strength ratios were considered consistent, so testing proceeded to the next stage.

- *Overconsolidated (OC) Shear Testing.* Three additional DSS tests were performed at OCRs of 2, 4, and 6. For this stage, the as-tested OCR is established by first consolidating the specimen to the consolidation pressure of the second NC test (i.e. 2.5 times the measured preconsolidation stress, thereby establishing a new preconsolidation pressure), then reducing the vertical stress to desired OCR.

- *Undrained Strength Ratio.* The undrained strength ratios resulting from the NC and OC shear tests are plotted against the tested OCR and fitted with a power function to evaluate the stress history parameters (SHPs) S and m.

Non-SHANSEP Testing

Geosyntec selected eight soil samples for additional DSS testing tested at an OCR representative of the expected post-closure vertical stresses to provide independent confirmation of the results of SHANSEP testing.

Geosyntec selected two soil samples for CU triaxial testing. Specimens from samples GB-03 (3-5) and GB-04 (19-21) were tested at NC conditions at consolidations stresses representative of the expected post-closure vertical stresses for comparison to the results of DSS testing.

5. DATA INTERPRETATION

5.1 Presumpscot Clay

This section presents the results of laboratory tests performed on the Brown and Gray Clays and summarizes Geosyntec's interpretation of the results relative to the Phase 14 design.

5.1.1 Soil Classification

Classification of the Brown Clay and Gray Clay was performed using particle size analysis and Atterberg Limits test results. The Brown Clay and Gray Clay samples tested had Liquid Limits between 26 and 35 and Plasticity Indices between 10 and 15. As such the samples are classified as lean or low plasticity clays (CL).

Results of the particle size and Atterberg Limits testing are presented in Table 4.

5.1.2 Hydraulic Conductivity

Flexible wall permeameter tests were performed to measure the hydraulic conductivity of select Brown Clay and Gray Clay samples. Two tests were performed on each clay. The Brown Clay had measured average permeabilities of 2.9×10^{-7} cm/s and 7.7×10^{-8} cm/s and the Gray Clay had measured average permeabilities of 1.2×10^{-7} cm/s and 8.4×10^{-8} cm/s.

5.1.3 Consolidation Parameters

Geosyntec reviewed the results of consolidation tests performed on 22 specimens extracted from the Shelby tubes samples. Geosyntec used the results of the consolidation tests to estimate the preconsolidation stress using the Casagrande construction method, the compression ratio (i.e., the relationship between effective vertical stress and vertical strain in the virgin compression portion of the consolidation curve), and the recompression ratio (i.e., the relationship between effective vertical stress and vertical strain in the recompression portion of the consolidation curve) of each specimen.

Geosyntec found the Brown Clay to have consistent consolidation characteristics, with preconsolidation stresses estimated to be between 11,500 pounds per square foot (psf) and 21,000 psf with an average of approximately 17,000 psf. Geosyntec estimated the compression ratio of the Brown Clay to be between 0.10 and 0.14 and the recompression ratio to be between 0.008 and 0.018.

The consolidation characteristics of the Gray Clay were found to be more variable than Brown Clay, with estimated preconsolidation stresses between 3,050 psf and 20,500 psf, with an average of approximately 8,500 psf, though most of the preconsolidation stresses estimated were below 9,000 psf, with only three tests (CRC-22, CRC-3, and CRC-11) indicating higher values. Geosyntec estimated the compression ratio of the Gray Clay to be between 0.10 and 0.19 and the recompression ratio to be between 0.004 and 0.017.

The water content and void ratio of the clays, measured as part of the consolidation tests prior to loading, were used to calculate the density of the specimens. The Brown Clay specimens had wet densities ranging from approximately 99 pcf to 125 pcf and the Gray Clay specimens had wet densities raging from approximately 118 pcf to 124 pcf. The consolidation specimen properties are summarized in Table 5.

5.1.4 Shear Strength

As described in Section 4, GTX performed DSS and CU triaxial tests on select Shelby tube samples. This section describes Geosyntec's interpretation of those shear strength test results.

5.1.4.1 SHANSEP

Geosyntec selected sample GB-15 (7-9) to represent Brown Clay and GB-21 (23-25) to represent Gray Clay in evaluating the shear strength relationships using the SHANSEP procedure. Geosyntec reviewed the results of the twelve DSS tests performed on the two samples to evaluate the shear strength. Interpretation of the results is presented below.

Consolidation and Confining Stresses

The laboratory consolidation and confining stresses were selected in accordance with the procedure described in Section 4. The consolidation and confining stresses were selected as follows for the NC and OC shearing stages.

- For the NC stage, samples were sheared at an OCR of 1 (i.e., consolidation and vertical effective confining stresses are equal) at stresses equal to approximately 1.5, 2.5, and 4 times the measured effective preconsolidation stress (from CRS testing).

  The Brown Clay NC shear tests were performed at 16,500 psf, 27,500 psf, and 44,000 psf. The Gray Clay NC shear tests were performed at 11,250 psf, 18,750 psf, and 30,000 psf.

- For the OC stage, samples were sheared at OCRs of 2, 4, and 6.

  The Brown Clay OC shear test specimens were consolidated to 27,500 psf and sheared at 4,585 psf, 6,875 psf, and 13,750 psf. The Gray Clay OC shear tests were performed at 3,125 psf, 4,700 psf, and 9,375 psf.

Geosyntec reviewed the results of these tests to calculate the undrained strength ratio and select the Stress History Parameters, as described below.

Undrained Strength Ratios

The undrained strength ratio is calculated as the measured undrained shear strength divided by the vertical effective stress at the time of shearing. The undrained strength ratios calculated for the NC stage range from 0.20 to 0.25 for the Brown Clay and 0.18 to 0.21 for the Gray Clay, as summarized in Table 6.

Stress History Parameters
Geosyntec plotted the calculated undrained strength ratios versus the as-tested OCRs and fitted a power function to develop the relevant stress history parameters (SHPs).

Based on the results of the DSS tests, Geosyntec selected the stress history parameter S to be 0.22 and 0.19 for the Brown and Gray Clays, respectively, and the stress history parameter m to be 0.76 for the Brown Clay and 0.66 for the Gray Clay.

The relationships between OCR and undrained strength ratio for the Brown and Gray Clays are presented as Figure 2.

5.1.4.2 Non-SHANSEP Strength Tests

Geosyntec reviewed the results of eight DSS tests and two triaxial shear test that were performed to provide independent confirmation of the SHANSEP evaluation.

These shear strength tests were performed on Brown and Gray Clay samples at a range of consolidation and confining stresses to represent conditions following the construction and closure of Phase 14.

The results of the tests, specifically the undrained strength ratios relative to the as-tested OCR, are consistent with the results of the SHANSEP shear tests. DSS tests yielded undrained strength ratios between 0.31 and 0.87 at OCRs between 2 and 6. Triaxial compression shear strength tests on two normally consolidated specimens yielded undrained strength ratios of 0.27 and 0.54, which are expectedly higher than those yielded by the DSS tests at the same OCR. The results of the Non-SHANSEP strength tests are summarized in Table 7

5.2 Other Soils

The Presumpscot Formation (i.e., Brown and Gray Clays) is the major geological unit found at the Phase 14 site. Below the clay is a deposit of Glacial Till, which overlays the bedrock. Above the clay is a Sand layer, which contains aeolian sands and silty sands. The following sections describe the classifications and design properties of these other soils.

5.2.1 Soil Classifications

The soil classifications of the Sand and Till layers were based on observations of split spoon samples collected during the geotechnical boring investigation.

The upper Sand layer consists of primarily poorly graded sand (SP) and silty sand (SM). In some cases, a relatively thin layer of low plasticity silt (ML) was found near the ground surface.

The Glacial Till is typically classified as a low plasticity silt (ML) or in some cases a silty sand (SM). Regardless of classification, the till is usually described as containing coarse to fine sand, silt, and medium to fine gravel.

5.2.2 Shear Strength

The shear strengths of the Sand and Till materials were not measured directly with laboratory tests, but correlations to the SPT N-values were used to estimate the internal friction angle. Within the Sand layer, N-values typically ranged from 8 to 38. After adjustments (for overburden stress, hammer type, sampler type, hole diameter, etc.) the estimated friction angles are between 33° and 45° which are typical of fine to coarse sands. A friction angle of 36° was selected for use in design.

The Till layer had N-values that typically ranged from 10 to 83. After adjustments (for overburden stress, hammer type, sampler type, hole diameter, etc.) the estimated friction angles are between 34° and 61°. A friction angle of 50° was selected for use in design.

6. REFERENCES

Ladd, C.C. and Foott (1974). "New Design Procedure for Stability of Soft Clays". *Journal of Geotechnical Engineering Division*, July 1974.

TABLES

Table 1 - Stratigraphic Layer Interpretation from CPT Tests
Crossroads - Phase 14

Location	Northing (ft)	Easting (ft)	Ground Surface Elev (ft)	Top of Sand Elev (ft)	Top of Brown Clay (Elev) (ft)	Top of Gray Clay Elev (ft)	Top of Till Elev (ft)	Vibrating Wire Peizometer Installation Depth (ft)	
CPT01	686156.5	3038544.1	281.6	280.1	279.3	-	276.8	-	-
CPT02	686044.4	3038601.2	298.8	297.8	287.3	-	281.8	-	-
CPT03	685862.3	3038765.7	294.6	292.7	286.2	-	277.7	-	-
CPT04	685670.5	3038965.6	284.9	-	283.9	278.9	276.9	-	-
CPT05	685836.5	3039124.4	292.8	291.3	286.8	-	284.3	6.0	11.0
CPT06	686119.4	3039487.5	304.8	304.3	295.8	-	293.3	-	-
CPT07	685999.1	3039398.3	308.2	307.2	293.7	-	292.2	-	-
CPT08	685717.1	3039272.8	294.2	293.8	287.5	-	280.3	-	-
CPT09	685717.9	3039629.7	293.0	291.0	288.0	282.0	277.5	-	-
CPT10	685558.3	3039438.9	304.0	289.5	287.5	-	279.5	-	-
CPT11	685541.4	3039982.7	298.6	288.6	286.6	276.3	274.8	-	-
CPT12	685400.6	3039861.0	315.4	289.4	286.0	-	278.5	-	-
CPT12b	685437.8	3039873.1	314.9	287.9	283.9	-	274.9	-	-
CPT13	685289.0	3039730.3	307.1	286.6	283.1	274.6	271.0	-	-
CPT14	685100.6	3039624.2	289.7	286.6	281.7	275.7	271.7	-	-
CPT15	685002.6	3040047.8	286.5	286.0	277.7	269.5	262.5	-	-
CPT16	684996.6	3040403.7	280.9	280.4	276.4	266.4	262.9	-	-
CPT17	684603.9	3039780.8	295.1	295.0	273.1	263.6	259.1	-	-
CPT18	684760.0	3039331.5	294.4	280.9	273.9	264.9	258.2	18.0	39.0
CPT19	684750.5	3038914.7	276.5	-	-	262.6	253.6	-	-
CPT20	684875.8	3039150.1	288.8	281.3	273.8	265.3	253.7	-	-
CPT21	685215.6	3039084.2	286.1	286.0	280.1	271.6	264.9	6.0	23.3
CPT22	685031.2	3038858.3	284.2	278.2	274.2	269.4	252.2	-	-
CPT23	684910.4	3038478.5	277.0	276.2	270.5	263.0	251.5	-	-
CPT24	685304.5	3038508.8	280.2	278.7	273.4	266.7	261.9	6.0	20.0
CPT25	685474.3	3038244.1	260.2	-	260.2	255.2	251.2	-	-
CPT26	684305.9	3039827.8	270.3	269.8	268.8	261.3	242.3	-	-
CPT27	685366.4	3040797.5	276.9	276.4	274.9	272.4	269.4	2.0	9.8
CPT28	685580.8	3041108.8	289.8	288.8	279.3	272.8	253.3	10.0	36.6
CPT29	685500.4	3039067.3	284.2	283.7	283.2	-	278.2	-	-
CPT29b	685500.4	3039067.3	284.2	283.4	282.9	-	277.7	-	-
CPT30	685492.3	3038612.5	273.4	273.2	272.4	-	267.9	-	-
CPT30b	685492.3	3038612.5	273.4	273.2	271.6	-	265.9	-	-
CPT31	685483.3	3038363.8	267.3	266.8	265.5	261.3	259.0	-	-
CPT32	684983.5	3038599.8	288.2	286.7	270.2	259.2	253.7	-	-
CPT33	685144.7	3038811.1	294.7	278.2	275.5	268.7	256.5	-	-
CPT34	685182.8	3039575.8	292.5	286.5	282.5	276.5	273.0	-	-
CPT35	685072.1	3039366.0	284.8	284.0	278.3	271.8	265.8	-	-
CPT36	684874.5	3039432.8	287.1	286.6	276.1	265.6	259.8	-	-
CPT37	684572.2	3039323.5	281.4	280.9	271.9	261.4	257.4	-	-
CPT38	684452.8	3039267.9	281.2	280.7	272.2	264.4	263.0	-	-
CPT39	684541.8	3040317.2	274.0	273.5	272.0	265.0	249.0	-	-
CPT40	684682.4	3040159.0	289.6	281.6	276.1	265.1	258.6	-	-
CPT41	684855.6	3039972.3	308.4	283.1	277.9	269.9	265.4	-	-
CPT42	685035.4	3040220.3	286.3	281.1	277.3	271.3	265.3	-	-
CPT43	685027.7	3039768.9	292.2	292.0	280.2	270.0	268.2	12.0	25.5
CPT44	685189.5	3040006.8	290.7	287.5	282.7	275.7	269.7		
CPT45	685306.6	3040179.5	280.5	280.2	279.2	273.5	266.2		
CPT46	685385.1	3040288.2	280.5	279.5	277.9	271.0	263.3		

Notes:

(1) "-" indicates the layer was not encountered, or no vibrating wire piezometer was installed.

(2) Horizontal Datum: Maine State Coordinates, West Zone, NAD 83. Vertical Datum: NAVD 1988.

(3) Top of Grey Clay in CPT tests was identified as penetration resistance approx. ≤ 100 kPa (15.6 tsf) with a corresponding increase in pore pressure.

Table 2 - Stratigraphic Layers from Geotechnical Borings
Crossroads - Phase 14

Location	Northing (ft)	Easting (ft)	Ground Surface Elev (ft)	Top of Sand Elev (ft)	Top of Brown Clay (Elev) (ft)	Top of Gray Clay Elev (ft)	Top of Till Elev (ft)	Top of Bedrock Elev (ft)
GB-01	686030.3	3038601.9	298.4	298.4	286.4	-	278.6	270.1
GB-02	685714.2	3039269.6	295.0	295.0	288.5	288.0	281.0	280.6
GB-03	685510.9	3039072.2	285.0	-	284.5	-	278.5	267.2
GB-04	685210.8	3039100.5	287.2	284.8	280.7	271.2	265.2	255.5
GB-05	685141.2	3038807.0	294.2	287.3	276.2	266.2	257.4	254.2
GB-06	684980.7	3038607.0	288.1	288.1	271.3	264.1	255.7	253.3
GB-07	685137.4	3039242.1	286.9	286.3	278.9	272.9	267.1	254.1
GB-08	684873.2	3039143.8	289.0	281.0	274.7	267.0	253.7	250.8
GB-09	684683.2	3039038.4	279.7	279.7	271.7	-	262.9	257.1
GB-10	684553.3	3039011.9	291.4	291.4	286.5	-	273.9	261.4
GB-11	685176.6	3039570.1	294.8	290.3	286.3	280.8	276.8	274.8
GB-12	685023.2	3039774.8	291.7	291.7	276.7	272.7	267.2	265.7
GB-13	685193.1	3040012.1	290.4	290.4	282.4	274.4	269.4	266.6
GB-14	685296.3	3040174.0	280.0	280.0	-	279.7	268.2	265.6
GB-15	685379.4	3040280.3	280.3	280.3	278.3	272.3	265.7	263.8
GB-16	684685.1	3040168.8	289.2	282.7	276.4	267.2	257.6	246.0
GB-17	684549.2	3040314.1	273.8	273.8	271.3	265.8	249.8	249.2
GB-18	685036.9	3040210.1	286.0	286.0	278.8	270.0	265.0	259.3
GB-19	684294.4	3039831.7	270.3	270.3	268.3	262.3	244.5	234.1
GB-21	684885.9	3039433.4	286.8	286.8	277.8	270.8	260.8	255.2
PZ-1MR	684739.0	3039786.8	292.6	292.6	276.5	270.6	-	-
PZ-5M	685620.5	3038720.6	286.1	286.1	282.8	276.1	274.1	-

Notes:

(1) "-" indicates the layer was not encountered.
(2) Horizontal Datum: Maine State Coordinates, West Zone, NAD 83. Vertical Datum: NAVD 1988.
(3) GB is geotechnical boring, and PZ is standpipe piezometer.
(4) Top of Grey Clay in geotechnical borings was identified base on visual observations and approx. N ≤8.

Table 3 - Standpipe Piezometers
Crossroads - Phase 14

Piezometer ID	Borehole ID	Northing (ft)	Easting (ft)	Ground Surface Elev (ft)	Top of Slot Elev (ft)	Slot Length (ft)
PZ-1M	PZ-1M	684739.0	3039786.8	292.6	291.6	5
PZ-5M	PZ-5M	685620.5	3038720.6	286.1	279.1	5
PZ-16	GB-12	685023.2	3039774.8	291.7	275.7	5
PZ-17	GB-14	685296.3	3040174.0	280.0	275.0	5
PZ-18	GB-11	685176.6	3039570.1	294.8	280.8	3
PZ-19	GB-05	684294.4	3039831.7	270.3	245.3	10

Table 4 - Grain Size Distribution and Atterberg Limits Test Results
Crossroads - Phase 14

Boring (-)	Depth (ft)	Clay Layer (-)	D_{85} (mm)	D_{60} (mm)	D_{50} (mm)	D_{30} (mm)	Natural Moisture Content (%)	Liquid Limit (-)	Plastic Limit (-)	Plasticity Index (-)	Liquidity Index (-)	USCS Classification
GB-03	3-5	Brown	0.0207	0.0072	0.0051	0.0022	26	30	19	11	0.7	CL
GB-04	11-13	Brown	0.0152	0.0053	0.0037	0.0015	24	35	20	15	0.3	CL
GB-04	19-21	Gray	0.0168	0.0067	0.0046	0.0015	33	33	18	15	1	CL
GB-05	31-33	Gray	0.0152	0.0065	0.0044	0.0017	32	28	18	10	1.4	CL
GB-06	21-23	Brown	0.0472	0.0206	0.0111	0.0022	25	34	20	14	0.3	CL
GB-06	29-31	Gray	0.0401	0.0144	0.0092	0.0024	30	31	20	11	0.9	CL
GB-07	17-19	Gray	0.0227	0.0081	0.0060	0.0020	29	28	17	11	1.1	CL
GB-08	27-29	Gray	0.0235	0.0090	0.0062	0.0024	30	27	17	10	1.3	CL
GB-11	17-19	Gray	0.0177	0.0049	0.0033	N/A	35	31	17	14	1.3	CL
GB-13	17-19	Gray	0.0152	0.0051	0.0036	N/A	32	31	20	11	1.1	CL
GB-14	9-11	Gray	0.0131	0.0051	0.0034	N/A	35	31	19	12	1.4	CL
GB-15	11-13	Gray	0.0194	0.0078	0.0054	0.0020	30	29	17	12	1.1	CL
GB-15	7-9	Brown	0.0151	0.0066	0.0043	0.0015	29	30	20	10	0.9	CL
GB-16	17-19	Brown	0.0157	0.0061	0.0038	0.0016	28	33	19	14	0.7	CL
GB-16	27-29	Gray	0.0237	0.0084	0.0052	0.0016	31	32	19	13	0.9	CL
GB-17	15-17	Gray	0.0111	0.0045	0.0033	N/A	33	34	19	15	0.9	CL
GB-17B	5-7	Brown	0.0125	0.0056	0.0041	0.0016	26	30	18	12	0.7	CL
GB-19	17-19	Gray	0.0142	0.0054	0.0040	0.0016	32	31	20	11	1.1	CL
GB-21	23-25	Gray	0.0215	0.0089	0.0061	0.0021	28	26	16	10	1.2	CL

Table 5 - Constant Rate of Strain Test Results
Crossroads - Phase 14

Boring ID	Sample ID	Test No.	Clay Type	Before Test					After Test					Estimated Preconsolidation Stress, σ'$_p$
				Water content, w	Void Ratio, e	Saturation, S	Dry Unit Weight	Wet Density	Water content, w	Void Ratio, e	Saturation, S	Dry Unit Weight	Wet Density	
(-)	(ft)	(-)	(-)	(%)	(-)	(%)	(psf)		(%)	(-)	(%)	(pcf)	(pcf)	(psf)
GB-01	19-20.8	CRC-21	Brown	30.08	0.87	95.57	92.21	119.37	24.02	0.66	100	103.61	128.20	16500
GB-02	9-11	CRC-22	Gray	28.51	0.79	99.14	95.85	123.20	23.55	0.65	100	104.19	128.49	20500
GB-03	3-5	CRC-1	Brown	28.46	0.77	99.44	94.96	124.54	24.68	0.66	100	101.02	128.89	21000
GB-04	19-21	CRC-2	Gray	33.98	0.95	98.24	87.93	117.90	23.23	0.64	100	104.68	128.94	7000
GB-05	31-33	CRC-14	Gray	30.57	0.84	99.83	93.27	121.77	21.25	0.58	100	108.45	131.69	6500
GB-05	31-33	CRC-17	Gray	29.64	0.83	97.84	93.75	121.56	20.97	0.58	100	109.01	131.38	5100
GB-06	21-23	CRC-18	Brown	26.31	0.75	95.46	97.42	123.86	23.08	0.63	100	104.76	129.57	21000
GB-06	29-31	CRC-24	Gray	30.05	0.83	99.47	93.82	121.95	23.56	0.65	100	104.24	128.50	7150
GB-07	17-19	CRC-12	Gray	32.49	0.9	99.66	90.63	119.66	20.2	0.56	100	110.53	132.22	4800
GB-08	27-29	CRC-4	Gray	31.28	0.86	99.93	92.14	121.12	21.14	0.58	100	108.40	131.57	8500
GB-11	17-19	CRC-15A	Gray	30.79	0.85	99.7	92.93	121.32	20.13	0.55	100	110.63	133.00	4750
GB-12	17-19	CRC-23	Brown	29.67	0.82	98.42	93.42	122.26	23.46	0.64	100	103.80	129.18	12250
GB-13	17-19	CRC-11	Gray	30.71	0.85	99.19	92.46	121.24	23.54	0.64	100	103.88	129.27	18500
GB-14	9-11	CRC-10	Gray	28.65	0.79	99.68	95.70	123.33	20.91	0.57	100	108.75	132.15	3050
GB-15	7-9	CRC-8	Gray	28.06	0.78	98.33	96.02	123.46	21.38	0.59	100	107.89	131.00	14500
GB-15	11-13	CRC-3	Gray	30.72	0.86	98.78	92.77	120.60	19.66	0.54	100	111.78	133.34	11500
GB-16	17-19	CRC-19A	Brown	29.34	0.82	99.1	95.00	121.95	24.35	0.67	100	103.26	127.78	5800
GB-16	27-29	CRC-20	Gray	30.18	0.83	99.76	93.64	122.07	21.58	0.59	100	107.63	131.21	21000
GB-17	15-17	CRC-7	Gray	33.49	0.92	99.43	88.72	119.31	25.95	0.71	100	99.69	126.39	4600
GB-17B	5-7	CRC-6B	Brown	29.05	0.81	99.38	95.29	122.35	24.64	0.68	100	102.46	127.31	19500
GB-17B	5-7	CRC-16	Brown	27.81	0.76	99.55	96.16	124.61	24.05	0.65	100	102.29	129.01	15500
GB-18	17-19	CRC-13	Gray	27.77	0.77	99.43	97.43	123.87	20.88	0.58	100	109.47	131.28	8500
GB-19	17-19	CRC-5A	Gray	31.29	0.86	99.63	91.92	121.13	23.94	0.66	100	103.28	128.12	7250
GB-21	23-25	CRC-9	Gray	29.73	0.83	98.07	93.56	121.65	18.98	0.52	100	112.72	134.32	7250

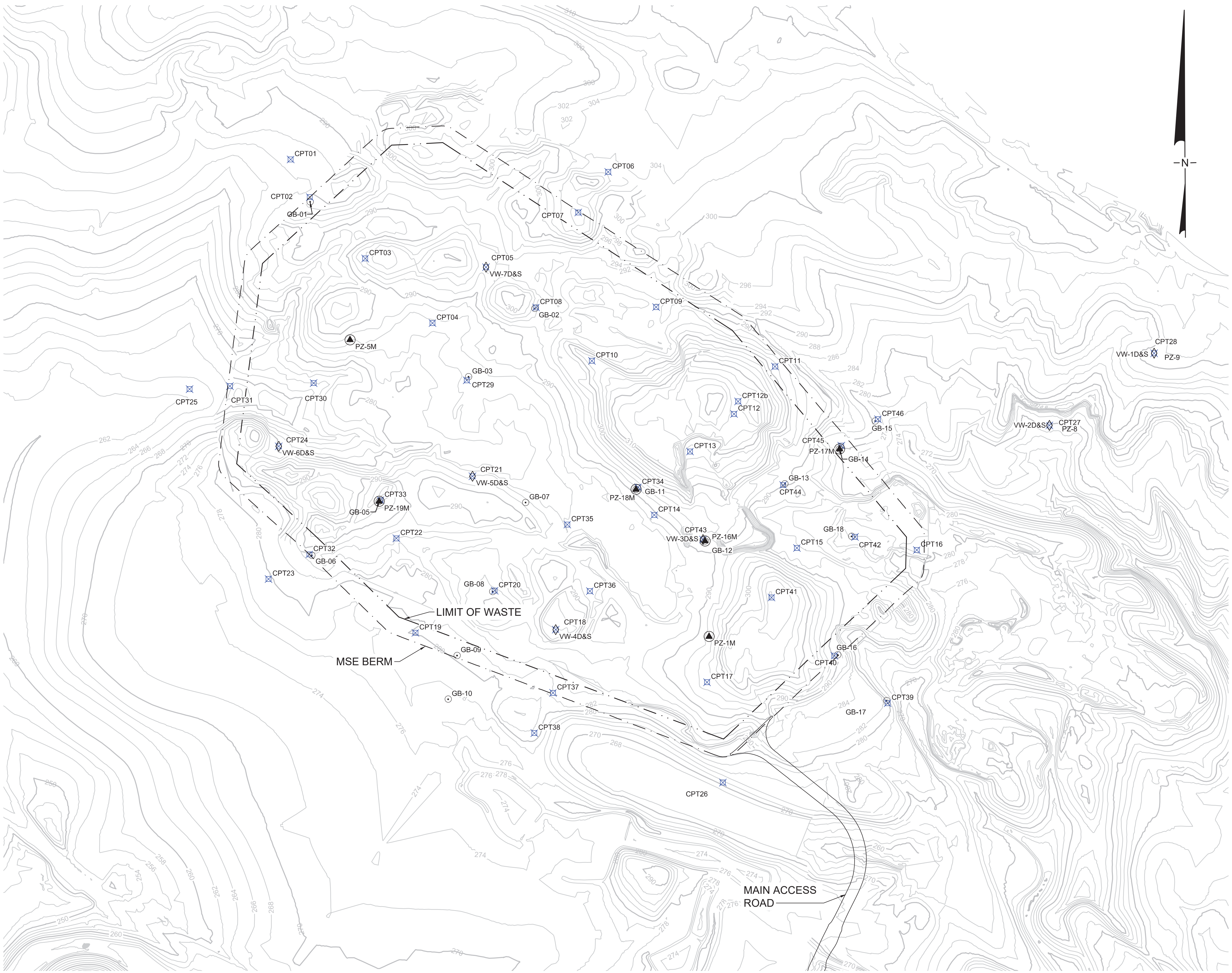
Table 6 - Direct Simple Shear used for SHANSEP
Crossroads - Phase 14

Boring (-)	Sample (ft)	Clay Type (-)	Consolidation Stress (psf)	Vertical Stress at Shear (psf)	Tested OCR (-)	Shear Strength (psf)	Undrained Strength Ratio (-)
GB-15	7-9	Brown	16500	16500	1	4079	0.25
GB-15	7-9	Brown	27500	27500	1	6205	0.23
GB-15	7-9	Brown	44000	44000	1	8740	0.20
GB-15	7-9	Brown	27500	13750	2	4767	0.35
GB-15	7-9	Brown	27500	6875	4	4303	0.63
GB-15	7-9	Brown	27500	4585	6	4009	0.87
GB-15	11-13	Gray	13750	3440	4	1789	0.52
GB-21	23-25	Gray	11250	11250	1	2221	0.20
GB-21	23-25	Gray	18750	18750	1	3381	0.18
GB-21	23-25	Gray	30000	30000	1	6174	0.21
GB-21	23-25	Gray	18750	9375	2	3276	0.35
GB-21	23-25	Gray	18750	4700	4	2236	0.48
GB-21	23-25	Gray	18750	3125	6	2016	0.65

Table 7 - Non-SHANSEP Direct Simple Shear and Triaxial Test Results
Crossroads - Phase 14

Boring (-)	Sample (ft)	Clay Type (-)	Consolidation Stress (psf)	Vertical Stress at Shear (psf)	Tested OCR (-)	Shear Strength (psf)	Undrained Strength Ratio (-)
Direct Simple Shear							
GB-03	3-5	Brown	26250	6560	4	5719	0.87
GB-04	19-21	Gray	8750	4375	2	1352	0.31
GB-07	17-19	Gray	5125	1280	4	853	0.67
GB-08	27-29	Gray	10625	1770	6	1268	0.72
GB-14	9-11	Gray	2625	1310	2	660	0.50
GB-17	15-17	Gray	4000	2000	2	770	0.39
GB-18	17-19	Gray	18750	3125	6	2539	0.81
Consolidated Undrained Triaxial							
GB-03	3-5	brown clay	15000	15000	1	8128	0.54
GB-04	19-21	Gray Clay	15000	15000	1	4116	0.27

FIGURES



LEGEND

- GROUND SURFACE ELEVATION CONTOUR (NOTE 1)
- LIMIT OF WASTE
- OUTER CREST OF MSE BERM
- CPT TEST LOCATION (NOTE 3)
- GEOTECHNICAL BORING LOCATION (NOTE 4)
- PIEZOMETER
- VIBRATING WIRE PIEZOMETER

NOTES:

1. EXISTING GROUND SURFACE AND FEATURES OBTAINED FROM TOPOGRAPHIC SURVEYS, DATED NOV 2017, AND SEPT 2018, PROVIDED BY BOYNTON & PICKETT.
2. HORIZONTAL DATUM IS NORTH AMERICAN DATUM OF 1983 (NAD 83) MAINE WEST STATE PLAN. VERTICAL DATUM IS NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88). PROPERTY BOUNDARY SURVEYED IN UTM SCALED TO NAD 83.
3. CPT PERFORMED IN AUGUST AND SEPTEMBER 2018 BY GEOSYNTEC. LOCATIONS FROM SURVEY POINT FILE PREPARED BY BOYNTON & PICKETT RECEIVED 4 SEPT 2018.
4. GEOTECHNICAL BORINGS PERFORMED BY GEOSYNTEC IN FEBRUARY AND MARCH 2019. LOCATIONS FROM SURVEY POINT FILE PREPARED BY BOYNTON & PICKET RECEIVE DATED 17 APRIL 2019.

0 150' 300'
SCALE IN FEET

GEOTECHNICAL SITE INVESTIGATION PLAN
PHASE 14

WASTE MANAGEMENT DISPOSAL SERVICES OF MAINE, INC.
CROSSROADS LANDFILL
NORRIDGEWOCK, MAINE

Geosyntec consultants

FIGURE 1

PROJECT NO: BE0232 | OCTOBER 2019

T:\PROJECTS_CADD\C\CROSSROADS LANDFILL\PHASE 14 EXPANSION\PERMIT\FIGURES\2019.10.08 SITE INVESTIG FIG\BE0232 2019.10.08 SITE INVESTIG FIG

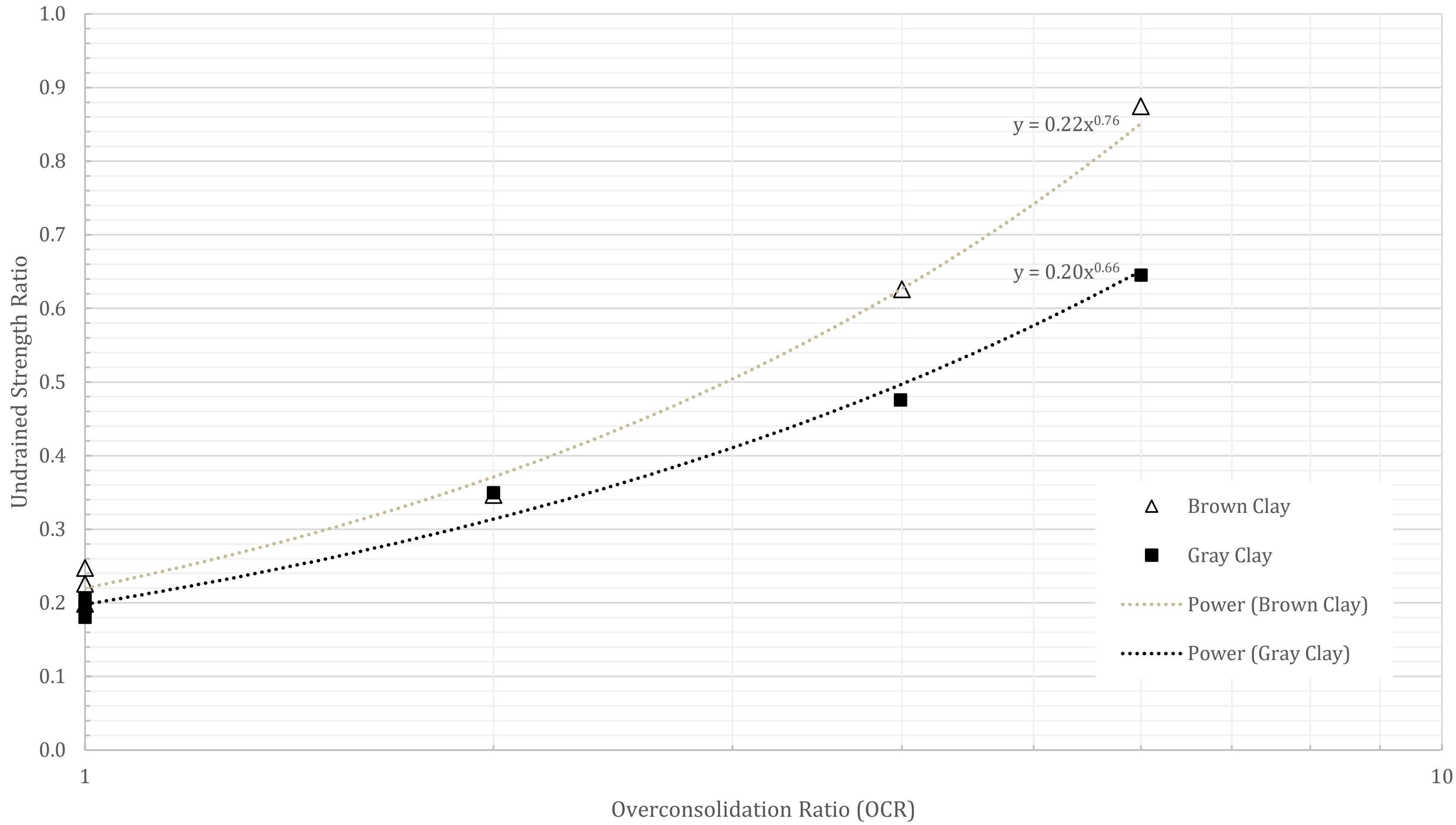


Figure 2. Relationship between undrained strength ratio and OCR to evaluate stress history parameters.

APPENDIX A

CPT Report

PRESENTATION OF SITE INVESTIGATION RESULTS

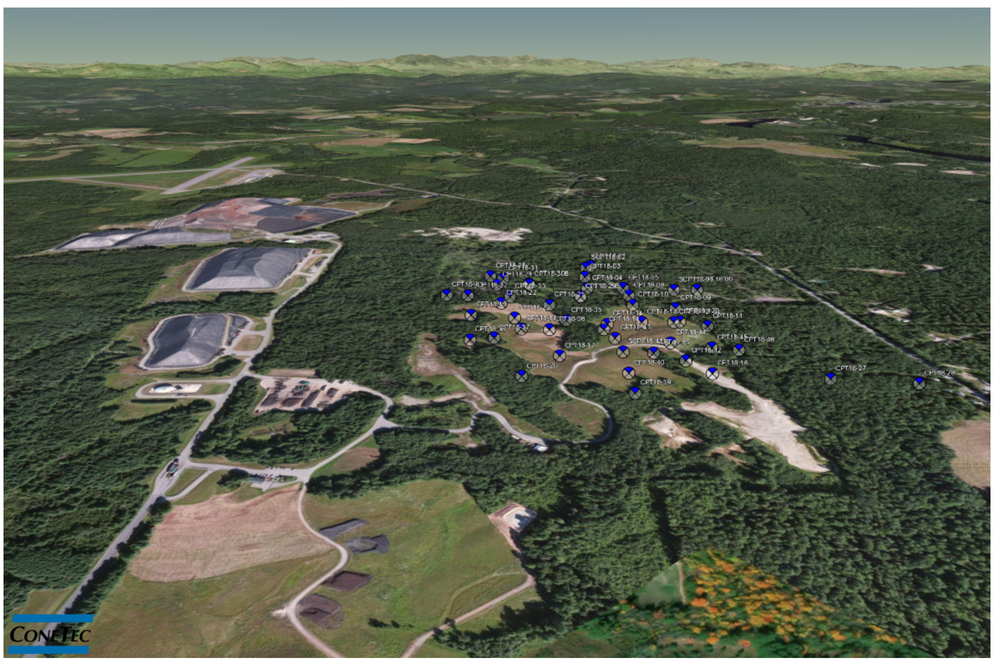
Crossroads Landfill, Phase 14
Norridgewock, Maine

Prepared for:

Geosyntec Consultants

ConeTec Job No: 18-53098

Project Start Date: 20-Aug-2018
Project End Date: 29-Aug-2018
Report Date: 7-Sep-2018



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CONETEC

Introduction

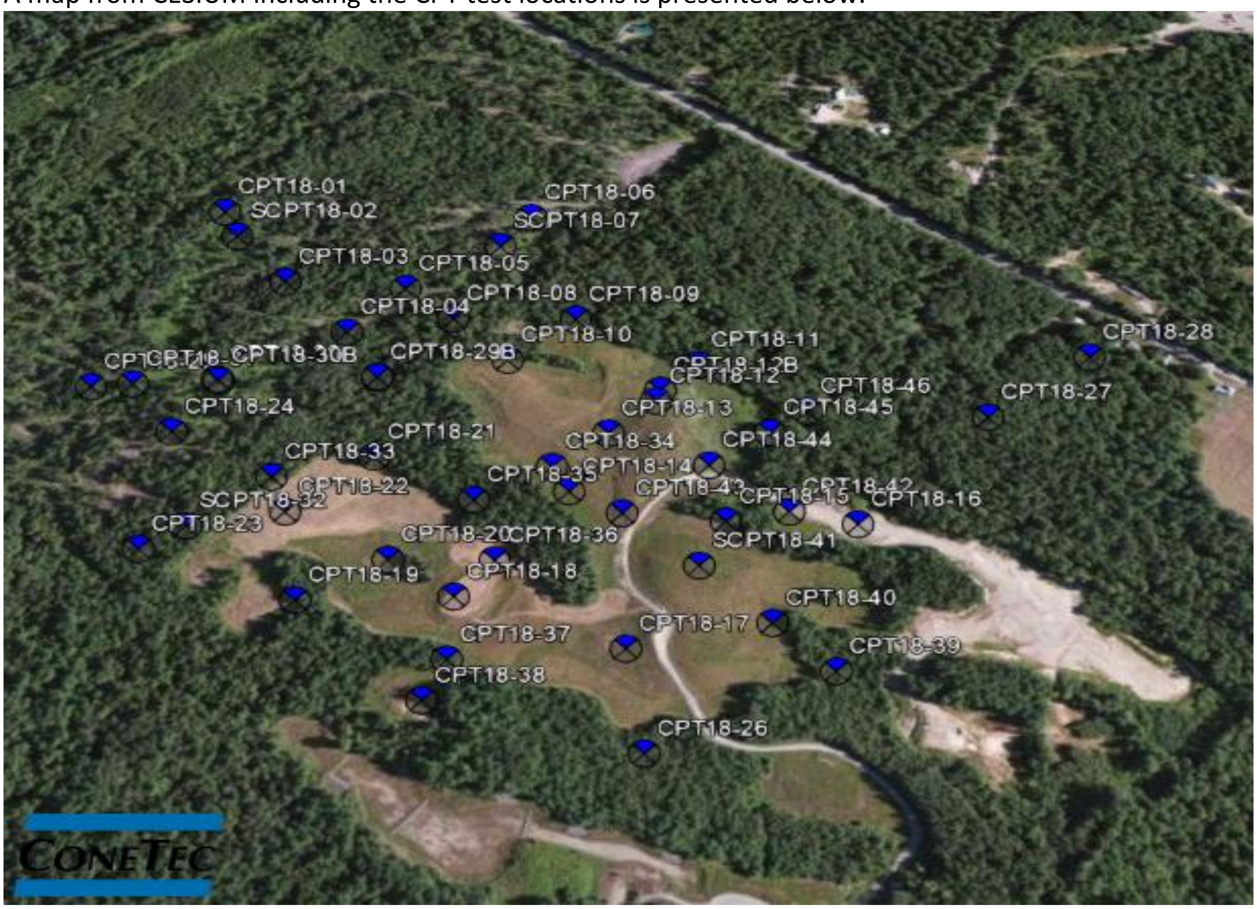
The enclosed report presents the results of a piezocone penetration testing (CPTu or CPT) and seismic piezocone penetration testing (SCPTu or SCPT) and GEOKON vibrating wire piezometer (VWP) installation program carried out at the Crossroads Landfill, Phase 14 site located in Norridgewock, Maine. The site investigation program was conducted by ConeTec Inc. (ConeTec), under contract to Geosyntec Consultants (Geosyntec) of Acton, Massachusetts.

A total of 45 cone penetration tests and 4 seismic cone penetration tests were completed at 46 locations (there were a few shallow refusals that were offset and reattempted to be pushed to depth). A total of 14 vibrating wire piezometers were installed at 7 locations. The CPT and SCPT program was performed to evaluate the subsurface soil conditions. CPT and SCPT sounding locations and VWP locations were selected and numbered under supervision of Geosyntec personnel (Mr. Morteza Mirshekari).

Project Information

Project	
Client	Geosyntec Consultants
Project	Crossroads Landfill, Norridgewock, ME
ConeTec project number	18-53098

A map from CESIUM including the CPT test locations is presented below.



Rig Description	Deployment System	Test Type
CPT Track Rig	20 ton track mounted (twin cylinders)	CPT and SCPT

Coordinates		
Test Type	Collection Method	EPSG Number
CPT and SCPT	Client provided	32619 (NAD83 / Maine West State Plane)

Cone Penetration Test (CPT)	
Depth reference	Ground surface at the time of the investigation.
Tip and sleeve data offset	0.1 meter. This has been accounted for in the CPT data files.
Pore pressure dissipation (PPD) tests	Eighty-three pore pressure dissipation tests were completed to determine the phreatic surface and consolidation characteristics.
Additional Comments	Shear wave velocity tests were conducted at one meter depth intervals at four locations. Vibrating wire piezometers were installed at seven locations, at two different depths at each location.

Cone Description	Cone Number	Cross Sectional Area (cm^2)	Sleeve Area (cm^2)	Tip Capacity (bar)	Sleeve Capacity (bar)	Pore Pressure Capacity (psi)
388:T1500F15U500	388	15	225	1500	15	500
452:T1500F15U500	452	15	225	1500	15	500

Limitations

This report has been prepared for the exclusive use of Geosyntec Consultants (Client) for the project titled "Crossroads Landfill, Norridgewock, ME". The report's contents may not be relied upon by any other party without the express written permission of ConeTec. ConeTec has provided site investigation services, prepared the factual data reporting, and provided geotechnical parameter calculations consistent with current best practices. No other warranty, expressed or implied, is made.

The information presented in the report document and the accompanying data set pertain to the specific project, site conditions and objectives described to ConeTec by the Client. In order to properly understand the factual data, assumptions and calculations, reference must be made to the documents provided and their accompanying data sets, in their entirety.

The cone penetration tests (CPTu) are conducted using an integrated electronic piezocone penetrometer and data acquisition system manufactured by Adara Systems Ltd. of Richmond, British Columbia, Canada.

ConeTec's piezocone penetrometers are compression type designs in which the tip and friction sleeve load cells are independent and have separate load capacities. The piezocones use strain gauged load cells for tip and sleeve friction and a strain gauged diaphragm type transducer for recording pore pressure. The piezocones also have a platinum resistive temperature device (RTD) for monitoring the temperature of the sensors, an accelerometer type dual axis inclinometer and a geophone sensor for recording seismic signals. All signals are amplified down hole within the cone body and the analog signals are sent to the surface through a shielded cable.

ConeTec penetrometers are manufactured with various tip, friction and pore pressure capacities in both 10 cm^2 and 15 cm^2 tip base area configurations in order to maximize signal resolution for various soil conditions. The 15 cm^2 penetrometers do not require friction reducers as they have a diameter larger than the deployment rods. The 10 cm^2 piezocones use a friction reducer consisting of a rod adapter extension behind the main cone body with an enlarged cross sectional area (typically 44 mm diameter over a length of 32 mm with tapered leading and trailing edges) located at a distance of 585 mm above the cone tip.

The penetrometers are designed with equal end area friction sleeves, a net end area ratio of 0.8 and cone tips with a 60 degree apex angle.

All ConeTec piezocones can record pore pressure at various locations. Unless otherwise noted, the pore pressure filter is located directly behind the cone tip in the "u_2" position (ASTM Type 2). The filter is 6 mm thick, made of porous plastic (polyethylene) having an average pore size of 125 microns (90-160 microns). The function of the filter is to allow rapid movements of extremely small volumes of water needed to activate the pressure transducer while preventing soil ingress or blockage.

The piezocone penetrometers are manufactured with dimensions, tolerances and sensor characteristics that are in general accordance with the current ASTM D5778 standard. ConeTec's calibration criteria also meet or exceed those of the current ASTM D5778 standard. An illustration of the piezocone penetrometer is presented in Figure CPTu.

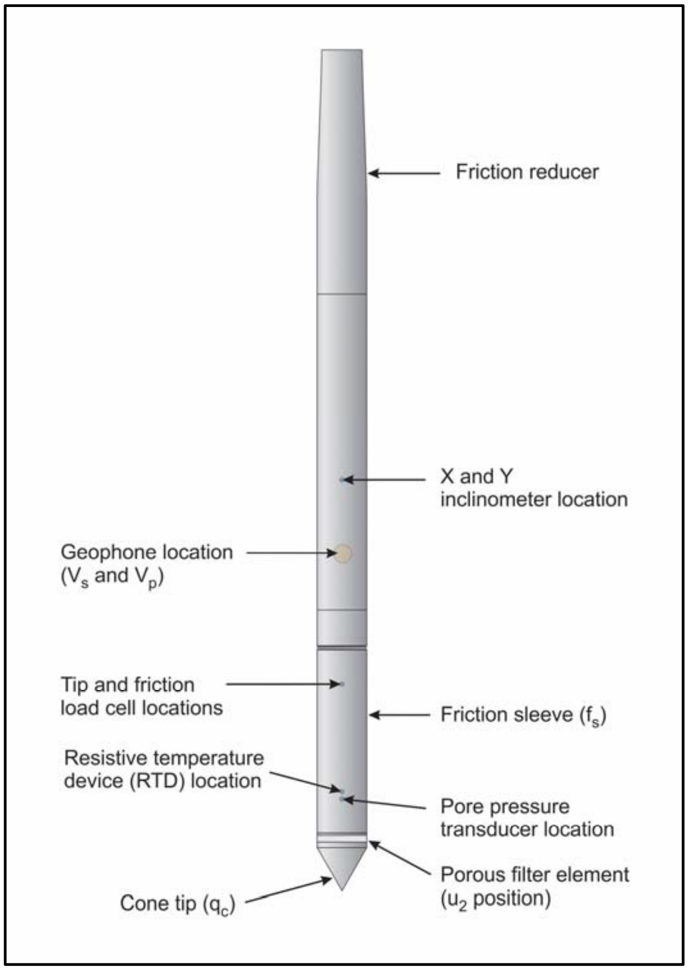


Figure CPTu. Piezocone Penetrometer (15 cm^2)

The ConeTec data acquisition systems consist of a Windows based computer and a signal conditioner and power supply interface box with a 16 bit (or greater) analog to digital (A/D) converter. The data is recorded at fixed depth increments using a depth wheel attached to the push cylinders or by using a spring loaded rubber depth wheel that is held against the cone rods. The typical recording intervals are either 2.5 cm or 5.0 cm depending on project requirements; custom recording intervals are possible. The system displays the CPTu data in real time and records the following parameters to a storage media during penetration:

- Depth
- Uncorrected tip resistance (q_c)
- Sleeve friction (f_s)
- Dynamic pore pressure (u)
- Additional sensors such as resistivity, passive gamma, ultra violet induced fluorescence, if applicable

All testing is performed in accordance to ConeTec's CPT operating procedures which are in general accordance with the current ASTM D5778 standard.

Prior to the start of a CPTu sounding a suitable cone is selected, the cone and data acquisition system are powered on, the pore pressure system is saturated with either glycerin or silicone oil and the baseline readings are recorded with the cone hanging freely in a vertical position.

The CPTu is conducted at a steady rate of 2 cm/s, within acceptable tolerances. Typically one meter length rods with an outer diameter of 1.5 inches are added to advance the cone to the sounding termination depth. After cone retraction final baselines are recorded.

Additional information pertaining to ConeTec's cone penetration testing procedures:

- Each filter is saturated in silicone oil or glycerin under vacuum pressure prior to use
- Recorded baselines are checked with an independent multi-meter
- Baseline readings are compared to previous readings
- Soundings are terminated at the client's target depth or at a depth where an obstruction is encountered, excessive rod flex occurs, excessive inclination occurs, equipment damage is likely to take place, or a dangerous working environment arises
- Differences between initial and final baselines are calculated to ensure zero load offsets have not occurred and to ensure compliance with ASTM standards

The interpretation of piezocone data for this report is based on the corrected tip resistance (q_t), sleeve friction (f_s) and pore water pressure (u). The interpretation of soil type is based on the correlations developed by Robertson (1990) and Robertson (2009). It should be noted that it is not always possible to accurately identify a soil type based on these parameters. In these situations, experience, judgment and an assessment of other parameters may be used to infer soil behavior type.

The recorded tip resistance (q_c) is the total force acting on the piezocone tip divided by its base area. The tip resistance is corrected for pore pressure effects and termed corrected tip resistance (q_t) according to the following expression presented in Robertson et al, 1986:

$$q_t = q_c + (1-a) \bullet u_2$$

where: q_t is the corrected tip resistance
q_c is the recorded tip resistance
u_2 is the recorded dynamic pore pressure behind the tip (u_2 position)
a is the Net Area Ratio for the piezocone (0.8 for ConeTec probes)

The sleeve friction (f_s) is the frictional force on the sleeve divided by its surface area. As all ConeTec piezocones have equal end area friction sleeves, pore pressure corrections to the sleeve data are not required.

The dynamic pore pressure (u) is a measure of the pore pressures generated during cone penetration. To record equilibrium pore pressure, the penetration must be stopped to allow the dynamic pore pressures to stabilize. The rate at which this occurs is predominantly a function of the permeability of the soil and the diameter of the cone.

The friction ratio (Rf) is a calculated parameter. It is defined as the ratio of sleeve friction to the tip resistance expressed as a percentage. Generally, saturated cohesive soils have low tip resistance, high friction ratios and generate large excess pore water pressures. Cohesionless soils have higher tip resistances, lower friction ratios and do not generate significant excess pore water pressure.

A summary of the CPTu soundings along with test details and individual plots are provided in the appendices. A set of interpretation files were generated for each sounding based on published correlations and are provided in Excel format in the data release folder. Information regarding the interpretation methods used is included in an appendix.

For additional information on CPTu interpretations, refer to Robertson et al. (1986), Lunne et al. (1997), Robertson (2009), Mayne (2013, 2014) and Mayne and Peuchen (2012).

References

ASTM D5778-12, 2012, "Standard Test Method for Performing Electronic Friction Cone and Piezocone Penetration Testing of Soils", ASTM, West Conshohocken, US.

Lunne, T., Robertson, P.K. and Powell, J. J. M., 1997, “Cone Penetration Testing in Geotechnical Practice”, Blackie Academic and Professional.

Mayne, P.W., 2013, “Evaluating yield stress of soils from laboratory consolidation and in-situ cone penetration tests”, Sound Geotechnical Research to Practice (Holtz Volume) GSP 230, ASCE, Reston/VA: 406-420.

Mayne, P.W. and Peuchen, J., 2012, “Unit weight trends with cone resistance in soft to firm clays”, Geotechnical and Geophysical Site Characterization *4,* Vol. 1 (Proc. ISC-4, Pernambuco), CRC Press, London: 903-910.

Mayne, P.W., 2014, “Interpretation of geotechnical parameters from seismic piezocone tests”, CPT’14 Keynote Address, Las Vegas, NV, May 2014.

Robertson, P.K., Campanella, R.G., Gillespie, D. and Greig, J., 1986, “Use of Piezometer Cone Data”, Proceedings of InSitu 86, ASCE Specialty Conference, Blacksburg, Virginia.

Robertson, P.K., 1990, “Soil Classification Using the Cone Penetration Test”, Canadian Geotechnical Journal, Volume 27: 151-158.

Robertson, P.K., 2009, “Interpretation of cone penetration tests – a unified approach”, Canadian Geotechnical Journal, Volume 46: 1337-1355.

Shear wave velocity testing is performed in conjunction with the piezocone penetration test (SCPTu) in order to collect interval velocities. For some projects seismic compression wave (Vp) velocity is also determined.

ConeTec's piezocone penetrometers are manufactured with a horizontally active geophone (28 hertz) that is rigidly mounted in the body of the cone penetrometer, 0.2 meters behind the cone tip.

Shear waves are typically generated by using an impact hammer horizontally striking a beam that is held in place by a normal load. In some instances an auger source or an imbedded impulsive source maybe used for both shear waves and compression waves. The hammer and beam act as a contact trigger that triggers the recording of the seismic wave traces. For impulsive devices an accelerometer trigger may be used. The traces are recorded using an up-hole integrated digital oscilloscope which is part of the SCPTu data acquisition system. An illustration of the shear wave testing configuration is presented in Figure SCPTu-1.

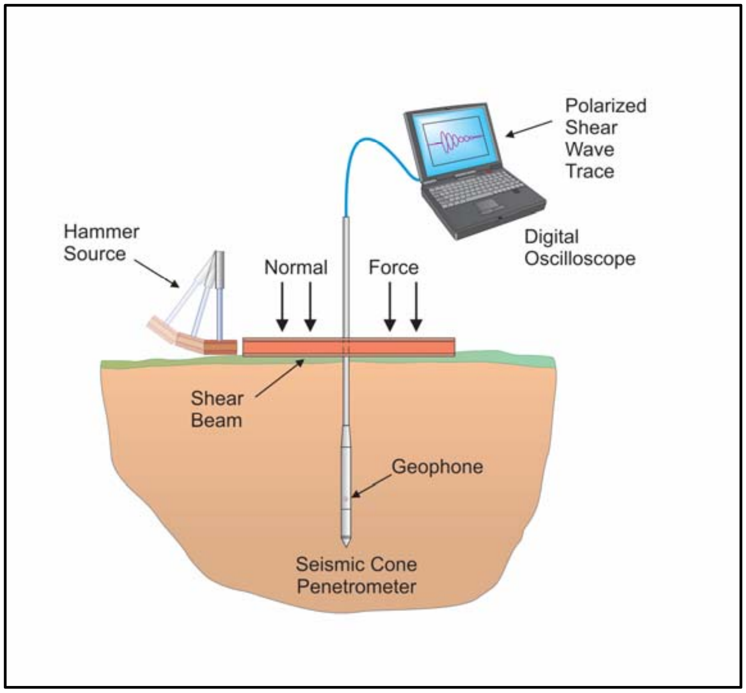


Figure SCPTu-1. Illustration of the SCPTu system

All testing is performed in accordance to ConeTec's SCPTu operating procedures.

Prior to the start of a SCPTu sounding, the procedures described in the Cone Penetration Test section are followed. In addition, the active axis of the geophone is aligned parallel to the beam (or source) and the horizontal offset between the cone and the source is measured and recorded.

Prior to recording seismic waves at each test depth, cone penetration is stopped and the rods are decoupled from the rig to avoid transmission of rig energy down the rods. Multiple wave traces are recorded for quality control purposes. After reviewing wave traces for consistency the cone is pushed to the next test depth (typically one meter intervals or as requested by the client). Figure SCPTu-2 presents an illustration of a SCPTu test.

For additional information on seismic cone penetration testing refer to Robertson et.al. (1986).

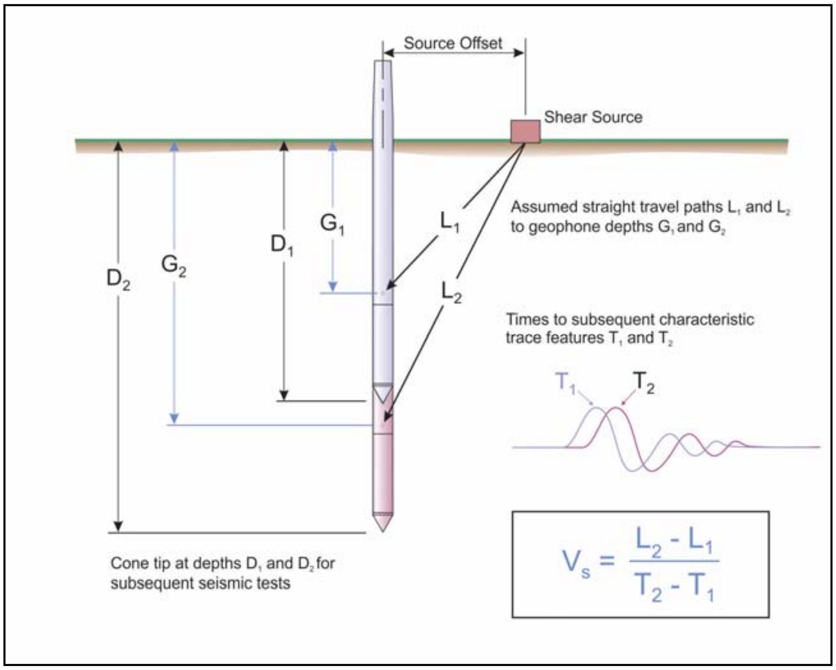


Figure SCPTu-2. Illustration of a seismic cone penetration test

Calculation of the interval velocities are performed by visually picking a common feature (e.g. the first characteristic peak, trough, or crossover) on all of the recorded wave sets and taking the difference in ray path divided by the time difference between subsequent features. Ray path is defined as the straight line distance from the seismic source to the geophone, accounting for beam offset, source depth and geophone offset from the cone tip.

The average shear wave velocity to a depth of 100 feet (30 meters) ($\bar{v}_s$) has been calculated and provided for all applicable soundings using the following equation presented in ASCE, 2010.

$$\bar{v}_s = \frac{\sum_{i=1}^{n} d_i}{\sum_{i=1}^{n} \frac{d_i}{v_{si}}}$$

where: $\bar{v}_s$ = average shear wave velocity ft/s (m/s)
d_i = the thickness of any layer between 0 and 100 ft (30 m)
v_{si} = the shear wave velocity in ft/s (m/s)
$\sum_{i=1}^{n} d_i$ = 100 ft (30 m)

Average shear wave velocity, $\bar{v}_s$ is also referenced to V_{s100} or V_{s30}.

The layer travel times refers to the travel times propagating in the vertical direction, not the measured travel times from an offset source.

Tabular results and SCPTu plots are presented in the relevant appendix.

References

American Society of Civil Engineers (ASCE), 2010, “Minimum Design Loads for Buildings and Other Structures”, Standard ASCE/SEI 7-10, American Society of Civil Engineers, ISBN 978-0-7844-1085-1, Reston, Virginia.

Robertson, P.K., Campanella, R.G., Gillespie D and Rice, A., 1986, “Seismic CPT to Measure In-Situ Shear Wave Velocity”, Journal of Geotechnical Engineering ASCE, Vol. 112, No. 8: 791-803.

The cone penetration test is halted at specific depths to carry out pore pressure dissipation (PPD) tests, shown in Figure PPD-1. For each dissipation test the cone and rods are decoupled from the rig and the data acquisition system measures and records the variation of the pore pressure (u) with time (t).

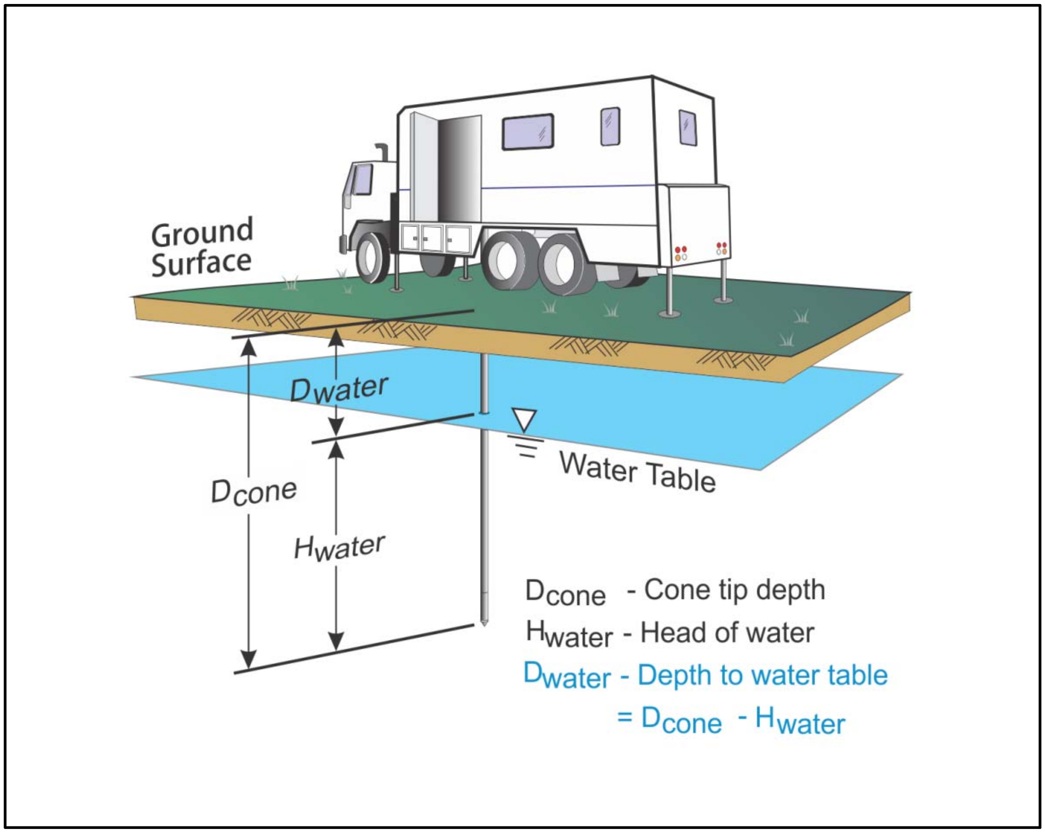


Figure PPD-1. Pore pressure dissipation test setup

Pore pressure dissipation data can be interpreted to provide estimates of ground water conditions, permeability, consolidation characteristics and soil behavior.

The typical shapes of dissipation curves shown in Figure PPD-2 are very useful in assessing soil type, drainage, in situ pore pressure and soil properties. A flat curve that stabilizes quickly is typical of a freely draining sand. Undrained soils such as clays will typically show positive excess pore pressure and have long dissipation times. Dilative soils will often exhibit dynamic pore pressures below equilibrium that then rise over time. Overconsolidated fine-grained soils will often exhibit an initial dilatory response where there is an initial rise in pore pressure before reaching a peak and dissipating.

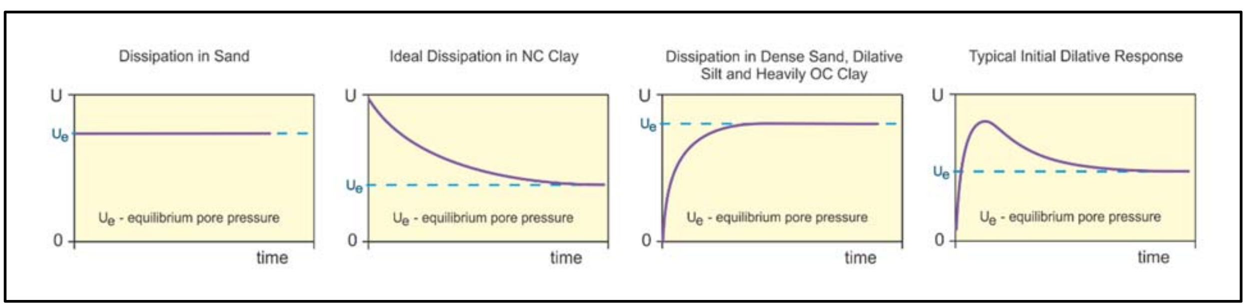


Figure PPD-2. Pore pressure dissipation curve examples

In order to interpret the equilibrium pore pressure (u_{eq}) and the apparent phreatic surface, the pore pressure should be monitored until such time as there is no variation in pore pressure with time as shown for each curve of Figure PPD-2.

In fine grained deposits the point at which 100% of the excess pore pressure has dissipated is known as t_{100}. In some cases this can take an excessive amount of time and it may be impractical to take the dissipation to t_{100}. A theoretical analysis of pore pressure dissipations by Teh and Houlsby (1991) showed that a single curve relating degree of dissipation versus theoretical time factor (T*) may be used to calculate the coefficient of consolidation (c_h) at various degrees of dissipation resulting in the expression for c_h shown below.

$$c_h = \frac{T^* \cdot a^2 \cdot \sqrt{I_r}}{t}$$

Where:

T* is the dimensionless time factor (Table Time Factor)
a is the radius of the cone
I_r is the rigidity index
t is the time at the degree of consolidation

Table Time Factor. T* versus degree of dissipation (Teh and Houlsby, 1991)

Degree of Dissipation (%)	20	30	40	50	60	70	80
T* (u_2)	0.038	0.078	0.142	0.245	0.439	0.804	1.60

The coefficient of consolidation is typically analyzed using the time (t_{50}) corresponding to a degree of dissipation of 50% (u_{50}). In order to determine t_{50}, dissipation tests must be taken to a pressure less than u_{50}. The u_{50} value is half way between the initial maximum pore pressure and the equilibrium pore pressure value, known as u_{100}. To estimate u_{50}, both the initial maximum pore pressure and u_{100} must be known or estimated. Other degrees of dissipations may be considered, particularly for extremely long dissipations.

At any specific degree of dissipation the equilibrium pore pressure (u at t_{100}) must be estimated at the depth of interest. The equilibrium value may be determined from one or more sources such as measuring the value directly (u_{100}), estimating it from other dissipations in the same profile, estimating the phreatic surface and assuming hydrostatic conditions, from nearby soundings, from client provided information, from site observations and/or past experience, or from other site instrumentation.

For calculations of c_h (Teh and Houlsby, 1991), t_{50} values are estimated from the corresponding pore pressure dissipation curve and a rigidity index (I_r) is assumed. For curves having an initial dilatory response in which an initial rise in pore pressure occurs before reaching a peak, the relative time from the peak value is used in determining t_{50}. In cases where the time to peak is excessive, t_{50} values are not calculated.

Due to possible inherent uncertainties in estimating I_r, the equilibrium pore pressure and the effect of an initial dilatory response on calculating t_{50}, other methods should be applied to confirm the results for c_h.

Additional published methods for estimating the coefficient of consolidation from a piezocone test are described in Burns and Mayne (1998, 2002), Jones and Van Zyl (1981), Robertson et al. (1992) and Sully et al. (1999).

A summary of the pore pressure dissipation tests and dissipation plots are presented in the relevant appendix.

References

Burns, S.E. and Mayne, P.W., 1998, “Monotonic and dilatory pore pressure decay during piezocone tests”, Canadian Geotechnical Journal 26 (4): 1063-1073.

Burns, S.E. and Mayne, P.W., 2002, “Analytical cavity expansion-critical state model cone dissipation in fine-grained soils”, Soils & Foundations, Vol. 42(2): 131-137.

Jones, G.A. and Van Zyl, D.J.A., 1981, “The piezometer probe: a useful investigation tool”, Proceedings, 10th International Conference on Soil Mechanics and Foundation Engineering, Vol. 3, Stockholm: 489-495.

Robertson, P.K., Sully, J.P., Woeller, D.J., Lunne, T., Powell, J.J.M. and Gillespie, D.G., 1992, “Estimating coefficient of consolidation from piezocone tests”, Canadian Geotechnical Journal, 29(4): 551-557.

Sully, J.P., Robertson, P.K., Campanella, R.G. and Woeller, D.J., 1999, “An approach to evaluation of field CPTU dissipation data in overconsolidated fine-grained soils”, Canadian Geotechnical Journal, 36(2): 369-381.

Teh, C.I., and Houlsby, G.T., 1991, “An analytical study of the cone penetration test in clay”, Geotechnique, 41(1): 17-34.

The appendices listed below are included in the report:

- Cone Penetration Test Summary and Standard Cone Penetration Test Plots
- Advanced Cone Penetration Test Plots
- Seismic Cone Penetration Test Plots
- Seismic Cone Penetration Test Time Domain Traces
- Seismic Cone Penetration Test Tabular Results
- Pore Pressure Dissipation Summary and Pore Pressure Dissipation Plots
- GEOKON Vibrating Wire Piezometer Field Notes

Cone Penetration Test Summary and

Standard Cone Penetration Test Plots

Job No: 18-53098
Client: Geosyntec Consultants
Project: Crossroads Landfill
Start Date: 20-Aug-2018
End Date: 29-Aug-2018

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)	Easting (m)	Refer to Notation Number
CPT18-01	18-53098_CP01	8/25/2018	452:T1500F15U500	2.1	6.97		686156	3038544	282	
SCPT18-02	18-53098_SP02	8/25/2018	452:T1500F15U500	5.0	18.04	4	686044	3038601	299	3
CPT18-03	18-53098_CP03	8/25/2018	452:T1500F15U500	15.1	20.10		685862	3038766	295	
CPT18-04	18-53098_CP04	8/25/2018	452:T1500F15U500	8.8	9.43		685670	3038966	285	
CPT18-05	18-53098_CP05	8/25/2018	452:T1500F15U500	4.0	10.34		685836	3039124	293	
CPT18-06	18-53098_CP06	8/25/2018	452:T1500F15U500	8.5	14.85		686119	3039488	305	
SCPT18-07	18-53098_SP07	8/24/2018	452:T1500F15U500	14.9	18.45	4	685999	3039398	308	
CPT18-08	18-53098_CP08	8/26/2018	452:T1500F15U500	8.8	14.60		685717	3039273	294	
CPT18-09	18-53098_CP09	8/22/2018	452:T1500F15U500	7.9	18.70		685718	3039630	293	
CPT18-10	18-53098_CP10	8/24/2018	452:T1500F15U500	19.4	25.26		685558	3039439	304	
CPT18-11	18-53098_CP11	8/22/2018	452:T1500F15U500	15.2	24.28		685541	3039983	299	
CPT18-12	18-53098_CP12	8/21/2018	388:T1500F15U500	31.6	37.48		685401	3039861	315	
CPT18-12B	18-53098_CP12B	8/21/2018	452:T1500F15U500	33.0	40.52		685438	3039873	315	3
CPT18-13	18-53098_CP13	8/22/2018	452:T1500F15U500	29.6	37.81		685289	3039730	307	
CPT18-14	18-53098_CP14	8/22/2018	452:T1500F15U500	12.5	20.67		685101	3039624	290	
CPT18-15	18-53098_CP15	8/21/2018	388:T1500F15U500	14.0	25.75		685003	3040048	287	
CPT18-16	18-53098_CP16	8/21/2018	388:T1500F15U500	13.0	18.62		684997	3040404	281	
CPT18-17	18-53098_CP17	8/20/2018	388:T1500F15U500	31.3	44.87		684604	3039781	295	
CPT18-18	18-53098_CP18	8/22/2018	452:T1500F15U500	21.0	38.14		684760	3039332	294	3
CPT18-19	18-53098_CP19	8/24/2018	452:T1500F15U500	8.3	26.66		684751	3038915	277	
CPT18-20	18-53098_CP20	8/23/2018	452:T1500F15U500	18.0	35.68		684876	3039150	289	3
CPT18-21	18-53098_CP21	8/23/2018	452:T1500F15U500	7.5	21.74		685216	3039084	286	
CPT18-22	18-53098_CP22	8/24/2018	452:T1500F15U500	15.0	32.15		685031	3038858	284	3
CPT18-23	18-53098_CP23	8/24/2018	452:T1500F15U500	20.2	26.74		684910	3038478	277	
CPT18-24	18-53098_CP24	8/26/2018	452:T1500F15U500	16.8	19.93		685305	3038509	280	
CPT18-25	18-53098_CP25	8/25/2018	452:T1500F15U500	2.6	13.37		685474	3038244	260	
CPT18-26	18-53098_CP26	8/20/2018	388:T1500F15U500	10.1	28.63		684306	3039828	270	
CPT18-27	18-53098_CP27	8/28/2018	452:T1500F15U500	5.5	10.09		685366	3040797	277	
CPT18-28	18-53098_CP28	8/28/2018	452:T1500F15U500	9.4	36.91		685581	3041109	290	

CONETEC

Job No: 18-53098
Client: Geosyntec Consultants
Project: Crossroads Landfill
Start Date: 20-Aug-2018
End Date: 29-Aug-2018

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)	Easting (m)	Refer to Notation Number
CPT18-29	18-53098_CP29	8/26/2018	452:T1500F15U500	3.2	8.12		685505	3039069	284	
CPT18-29B	18-53098_CP29B	8/26/2018	452:T1500F15U500	3.6	7.46		685500	3039067	284	
CPT18-30	18-53098_CP30	8/25/2018	452:T1500F15U500	1.4	7.87		685499	3038606	273	
CPT18-30B	18-53098_CP30B	8/25/2018	452:T1500F15U500	2.2	9.10		685492	3038612	273	
CPT18-31	18-53098_CP31	8/25/2018	452:T1500F15U500	6.6	9.60		685483	3038364	267	
SCPT18-32	18-53098_SP32	8/24/2018	452:T1500F15U500	28.6	35.43	9	684984	3038600	288	
CPT18-33	18-53098_CP33	8/24/2018	452:T1500F15U500	22.0	39.12		685145	3038811	295	3
CPT18-34	18-53098_CP34	8/22/2018	452:T1500F15U500	16.0	20.59		685183	3039576	293	3
CPT18-35	18-53098_CP35	8/24/2018	452:T1500F15U500	7.9	26.66		685072	3039366	285	
CPT18-36	18-53098_CP36	8/22/2018	452:T1500F15U500	11.1	27.72		684874	3039433	287	
CPT18-37	18-53098_CP37	8/23/2018	452:T1500F15U500	14.3	24.36		684572	3039323	281	
CPT18-38	18-53098_CP38	8/22/2018	452:T1500F15U500	13.0	21.41		684453	3039268	281	3
CPT18-39	18-53098_CP39	8/20/2018	388:T1500F15U500	13.0	25.51		684542	3040317	274	3
CPT18-40	18-53098_CP40	8/20/2018	388:T1500F15U500	26.0	31.41		684682	3040159	290	3
SCPT18-41	18-53098_SP41	8/21/2018	388:T1500F15U500	27.0	43.47	13	684856	3039972	308	3
CPT18-42	18-53098_CP42	8/21/2018	388:T1500F15U500	18.3	21.90		685035	3040220	286	
CPT18-43	18-53098_CP43	8/22/2018	452:T1500F15U500	10.0	24.44		685028	3039769	292	3
CPT18-44	18-53098_CP44	8/21/2018	388:T1500F15U500	10.0	21.00		685190	3040007	291	3
CPT18-45	18-53098_CP45	8/21/2018	388:T1500F15U500	5.2	15.17		685307	3040180	281	
CPT18-46	18-53098_CP46	8/21/2018	388:T1500F15U500	5.7	18.37		685385	3040288	281	
Totals	49 soundings				1135.49	30				

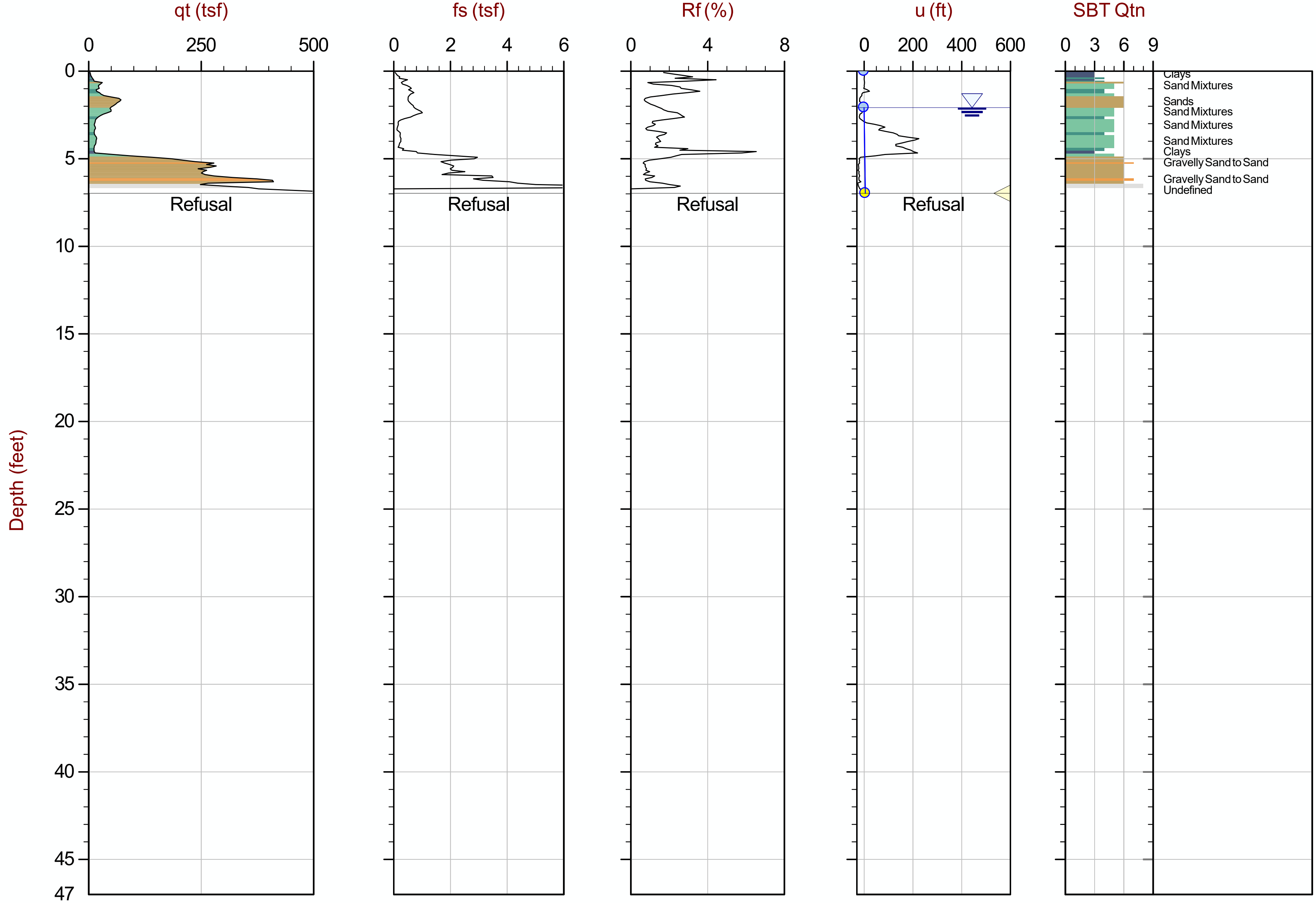
1. Assumed phreatic surface depths were determined from the pore pressure data unless otherwise noted. Hydrostatic data were used for calculated parameters.
2. Coordinates are NAD83 / Maine State Plane West (1983) and were provided by the Geosyntec.
3. Assumed phreatic surface estimated from an adjacent CPT's pore pressure dissipation test.
4. No phreatic surface detected

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-25 11:16
Site: Crossroads Landfill

Sounding: CPT18-01
Cone: 452:T1500F15U500



Max Depth: 2.125 m / 6.97 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP01.COR

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 686156ft E: 3038544ft Elev: 281.6

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

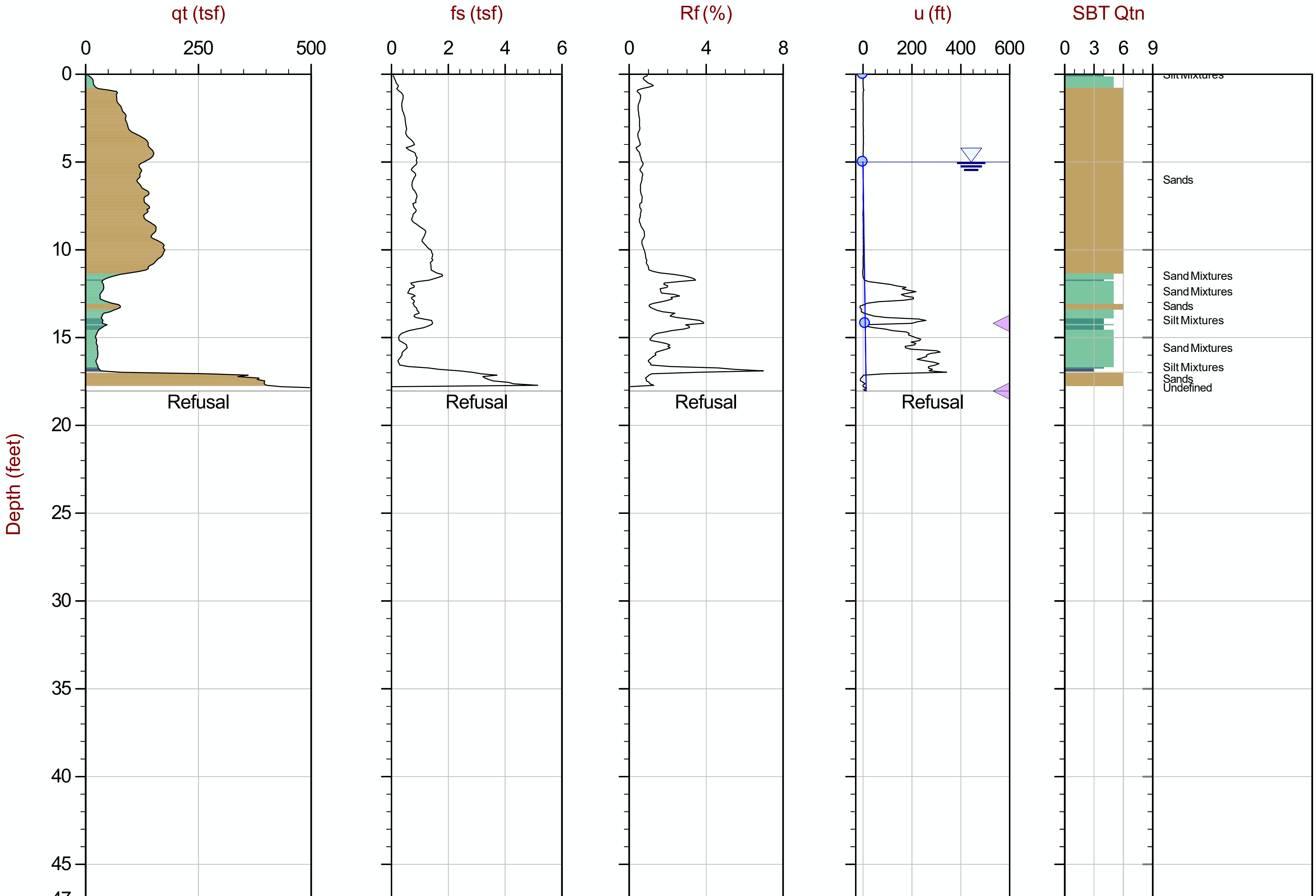
The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-25 11:46
Site: Crossroads Landfill

Sounding: SCPT18-02
Cone: 452:T1500F15U500



Max Depth: 5.500 m / 18.04 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_SP02.COR

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 686044ft E: 3038601ft Elev: 298.8

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

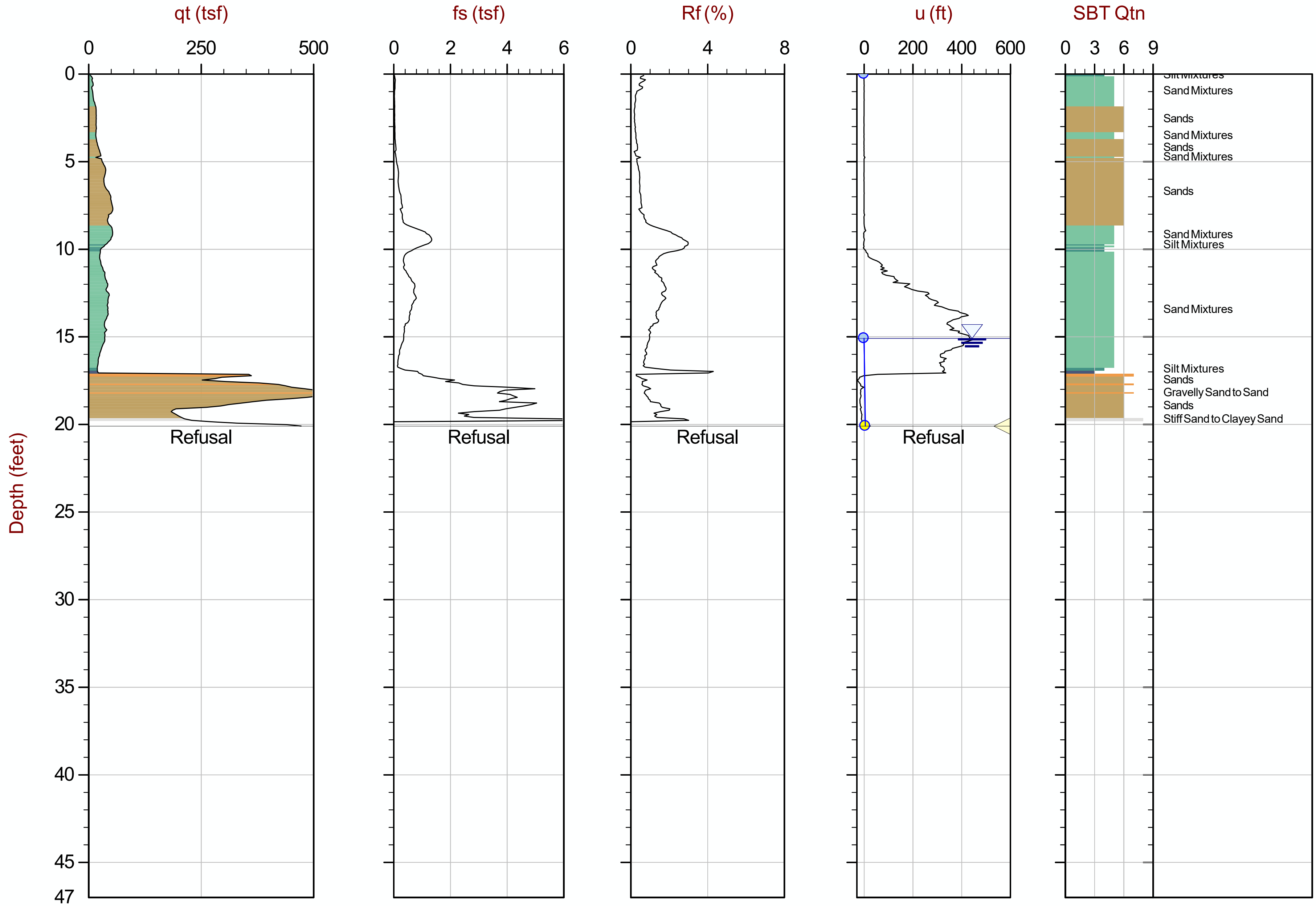
The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

ConeTec

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-25 13:08
Site: Crossroads Landfill

Sounding: CPT18-03
Cone: 452:T1500F15U500



Max Depth: 6.125 m / 20.09 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP03.COR

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 685862ft E: 3038766ft Elev: 294.6

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

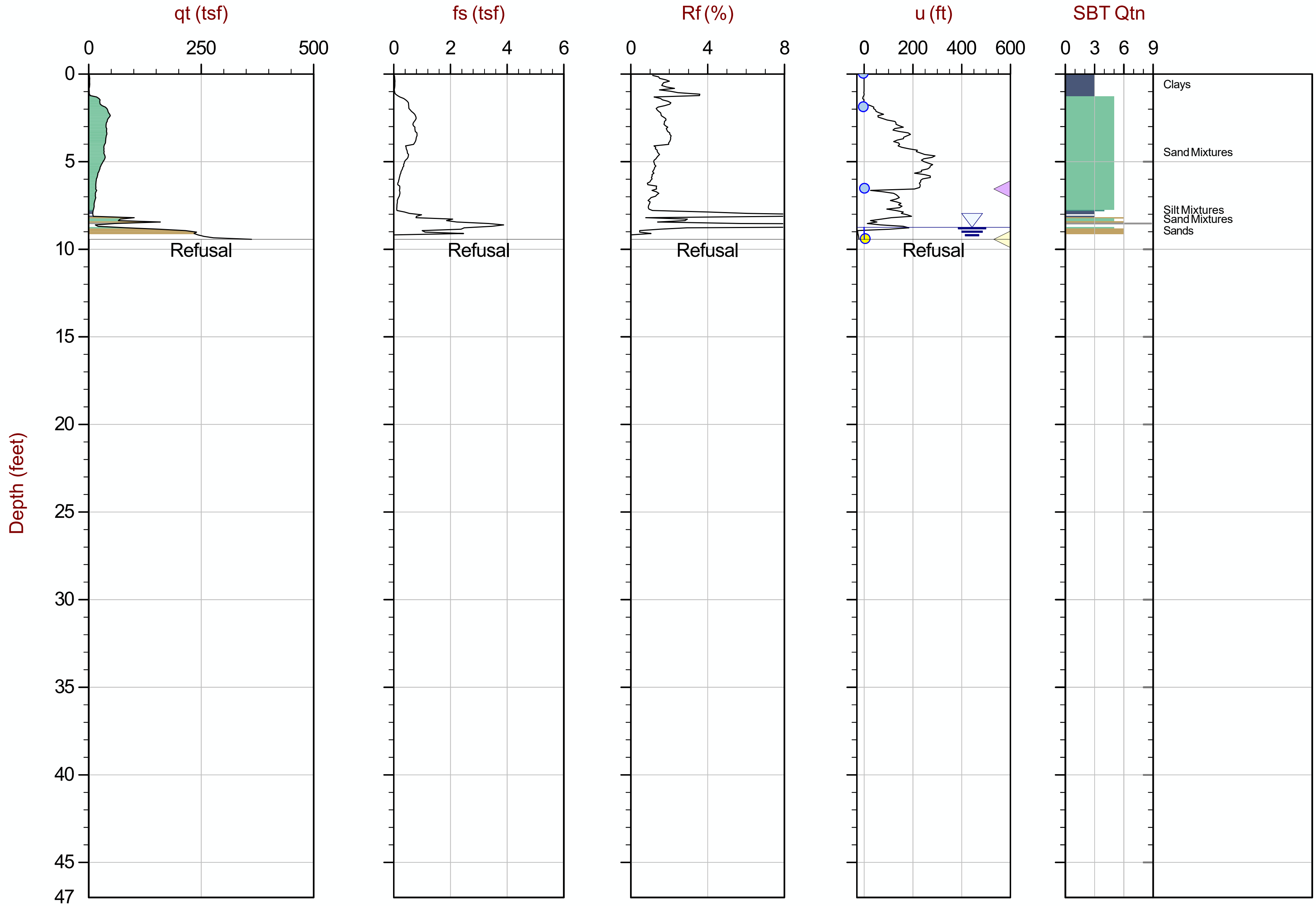
The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-25 10:24
Site: Crossroads Landfill

Sounding: CPT18-04
Cone: 452:T1500F15U500



Max Depth: 2.875 m / 9.43 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP04.COR

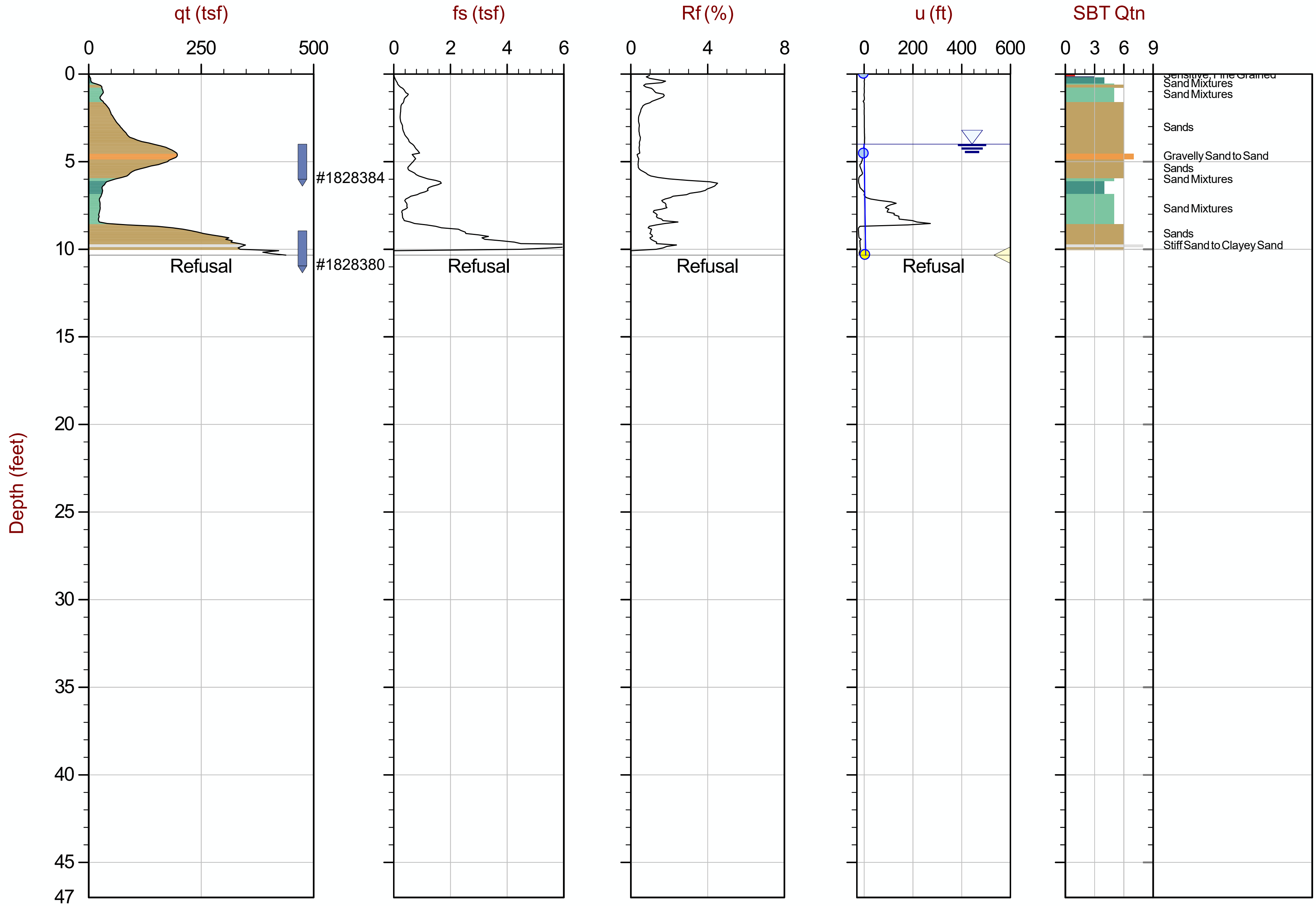
SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 685670ft E: 3038966ft Elev: 284.9

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

The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-25 09:44
Site: Crossroads Landfill
Sounding: CPT18-05
Cone: 452:T1500F15U500



Max Depth: 3.150 m / 10.33 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP05.COR

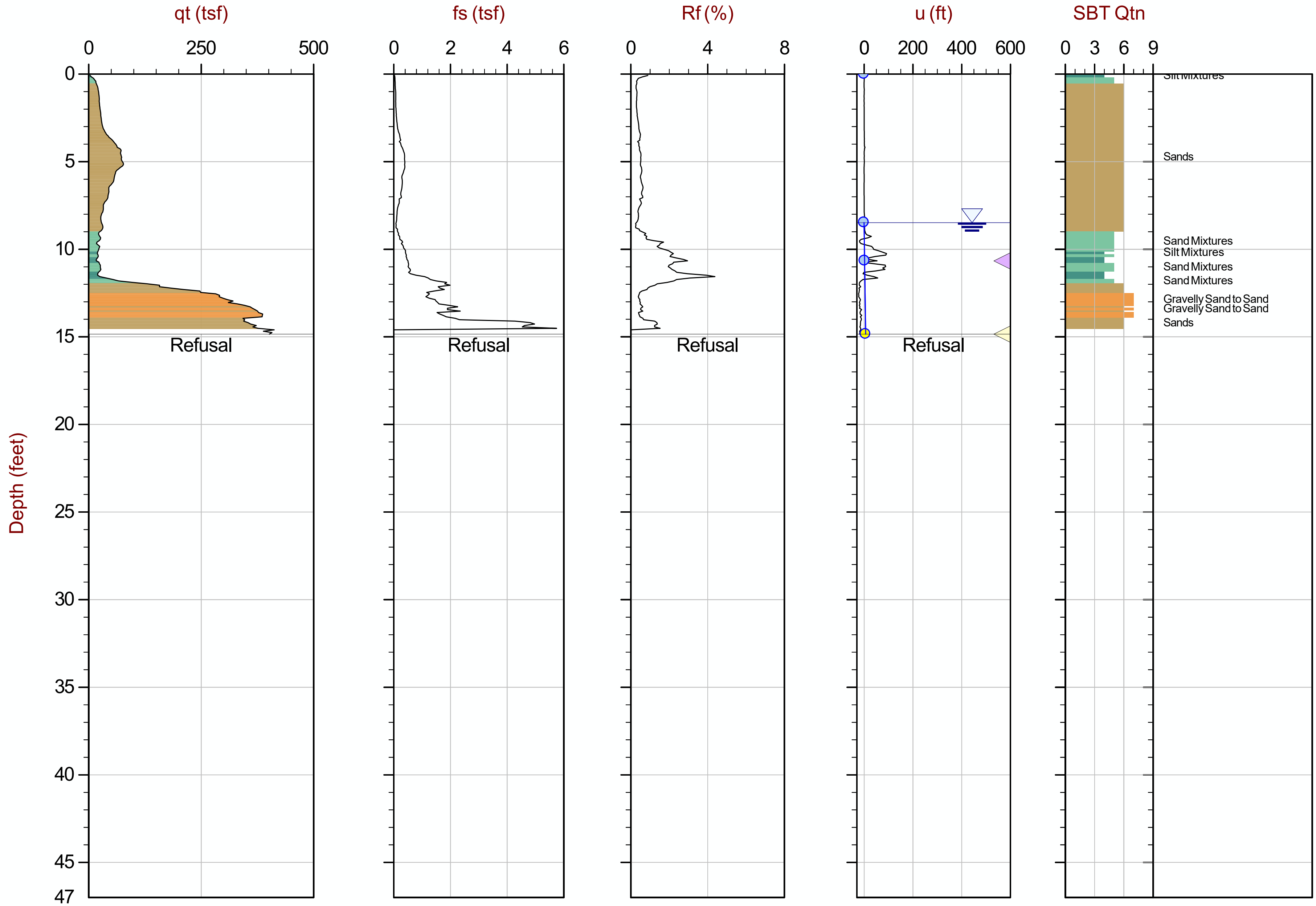
SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 685836ft E: 3039124ft Elev: 292.8

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

The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-25 08:54
Site: Crossroads Landfill
Sounding: CPT18-06
Cone: 452:T1500F15U500



Max Depth: 4.525 m / 14.85 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP06.COR

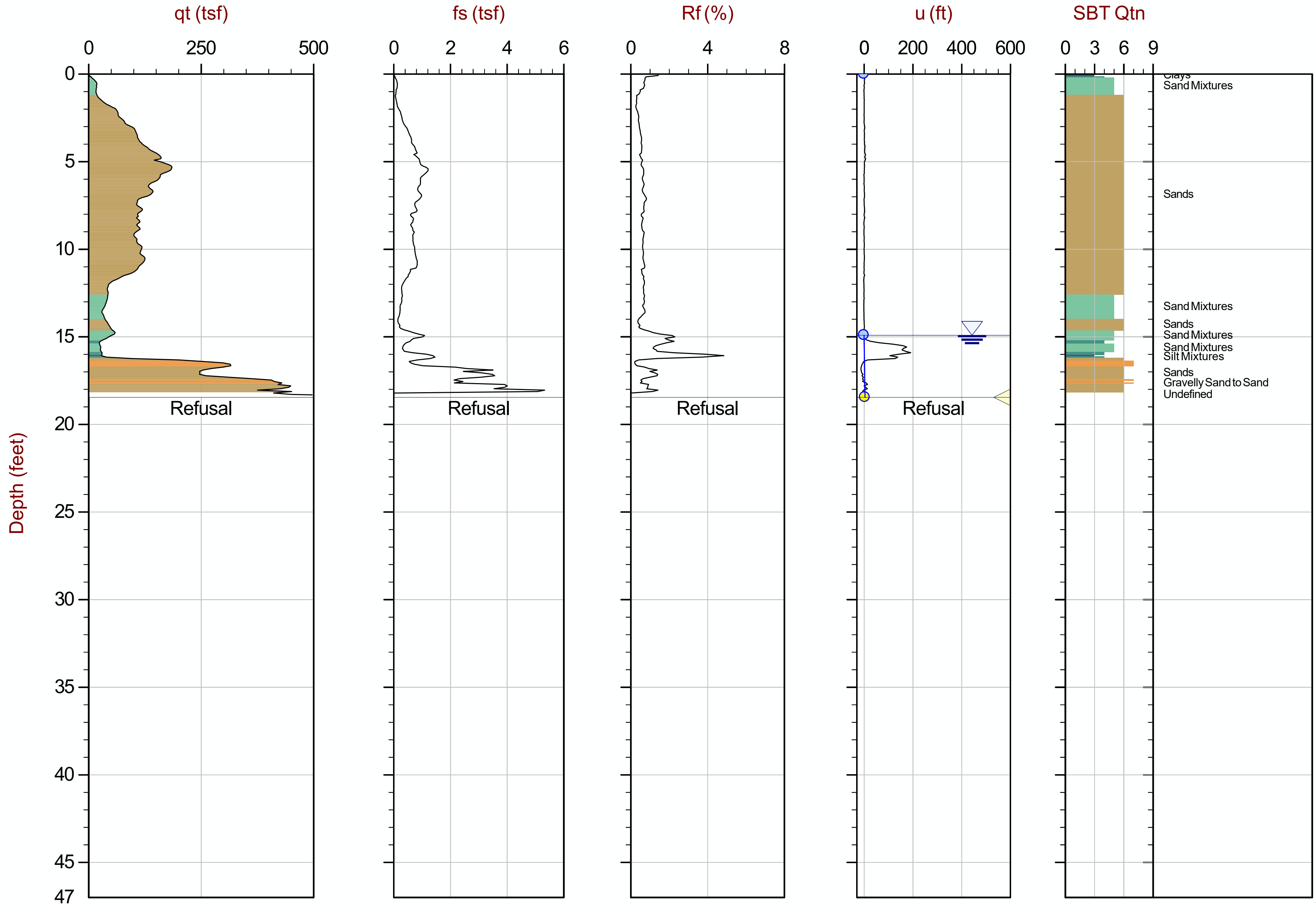
SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 686119ft E: 3039488ft Elev: 304.8

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

The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-24 16:27
Site: Crossroads Landfill
Sounding: SCPT18-07
Cone: 452:T1500F15U500



Max Depth: 5.625 m / 18.45 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_SP07.COR

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 685999ft E: 3039398ft Elev: 308.2

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

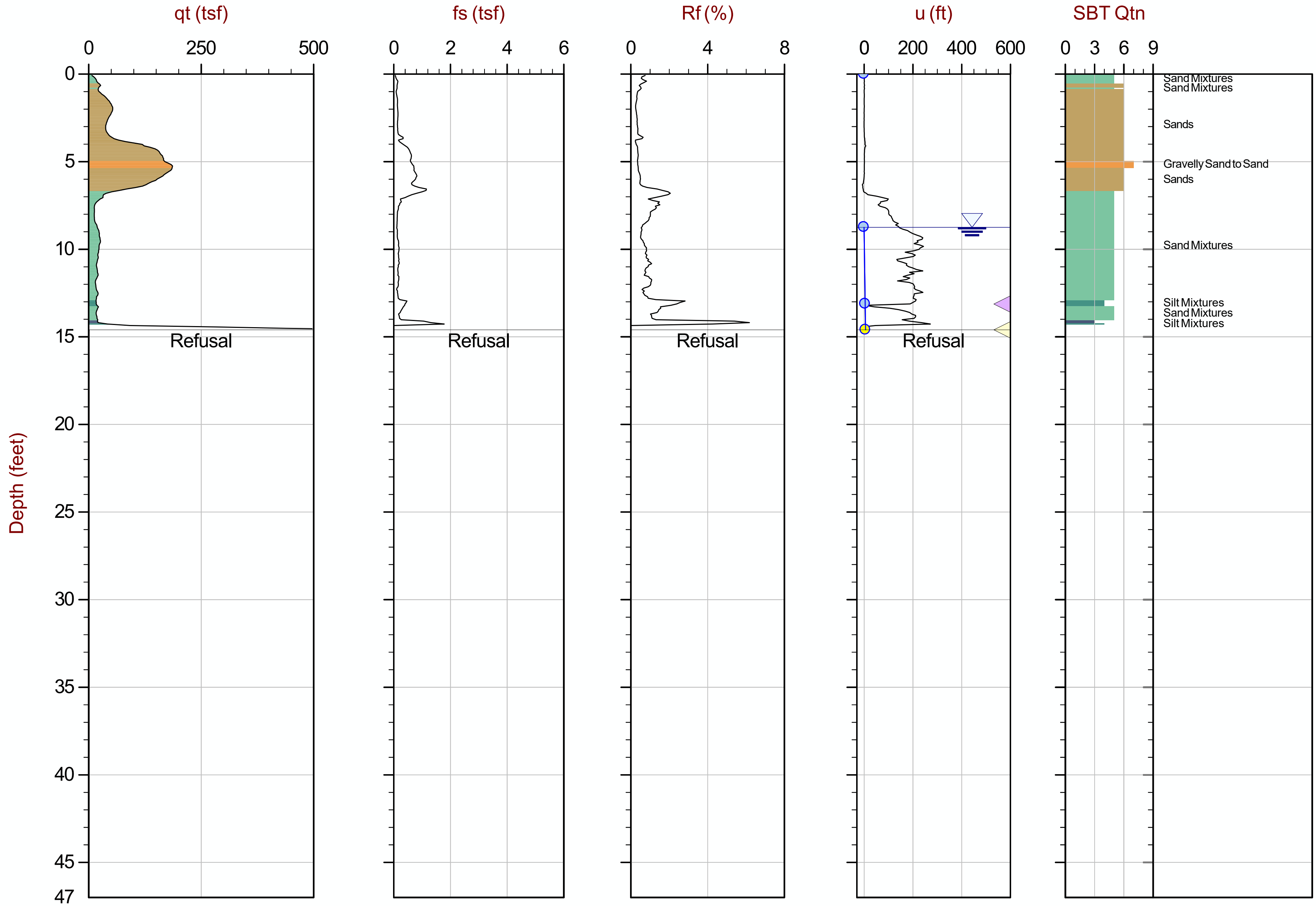
The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-26 16:39
Site: Crossroads Landfill

Sounding: CPT18-08
Cone: 452:T1500F15U500



Max Depth: 4.450 m / 14.60 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP08.COR

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 685717ft E: 3039273ft Elev: 294.2

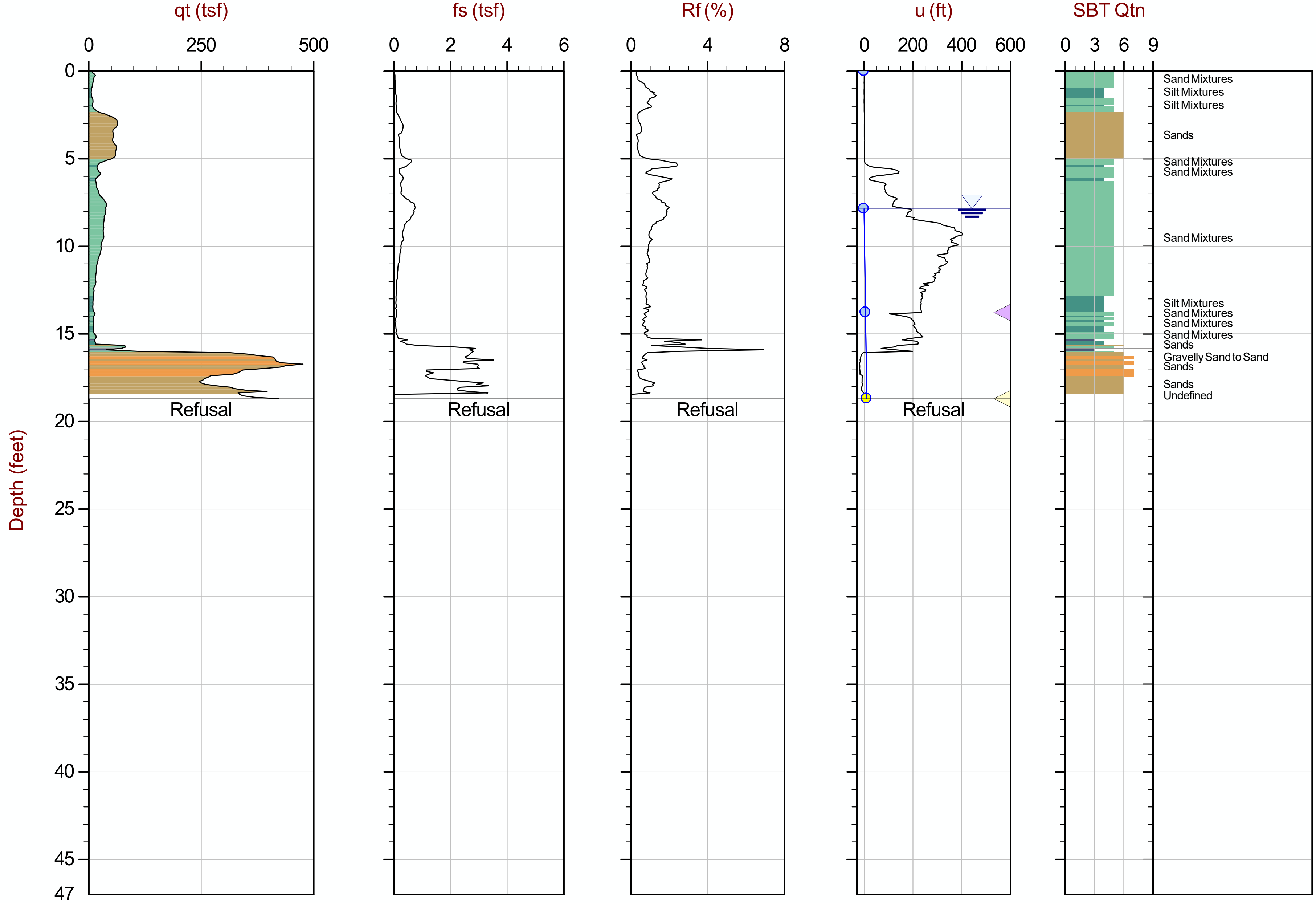
Hydrostatic Line   Ueq   Assumed Ueq   PPD, Ueq achieved   PPD, Ueq not achieved

The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-22 09:14
Site: Crossroads Landfill

Sounding: CPT18-09
Cone: 452:T1500F15U500



Max Depth: 5.700 m / 18.70 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP09.COR

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 685718ft E: 3039630ft Elev: 293.0

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

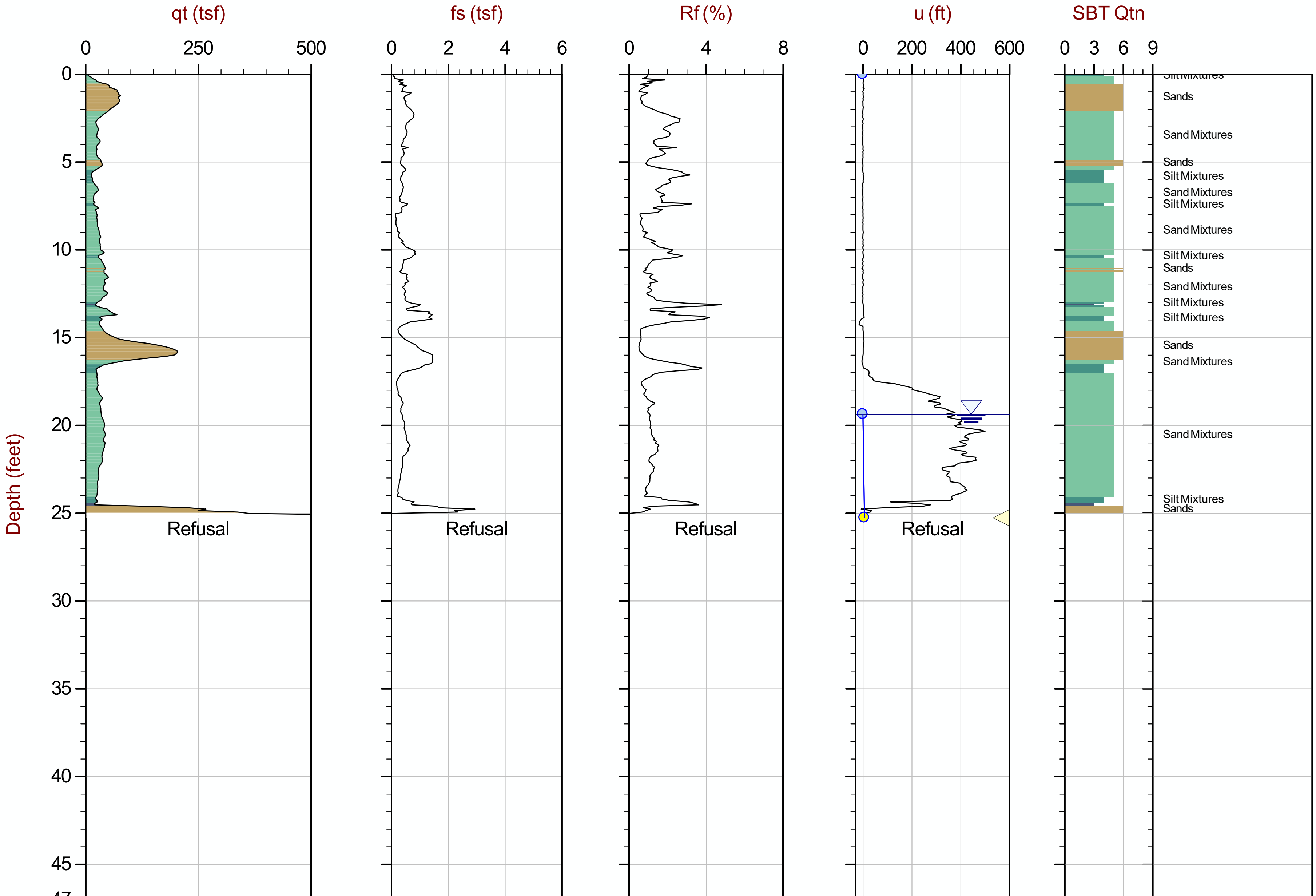
The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-24 15:22
Site: Crossroads Landfill

Sounding: CPT18-10
Cone: 452:T1500F15U500



Max Depth: 7.700 m / 25.26 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP10.COR

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 685558ft E: 3039439ft Elev: 304.0

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

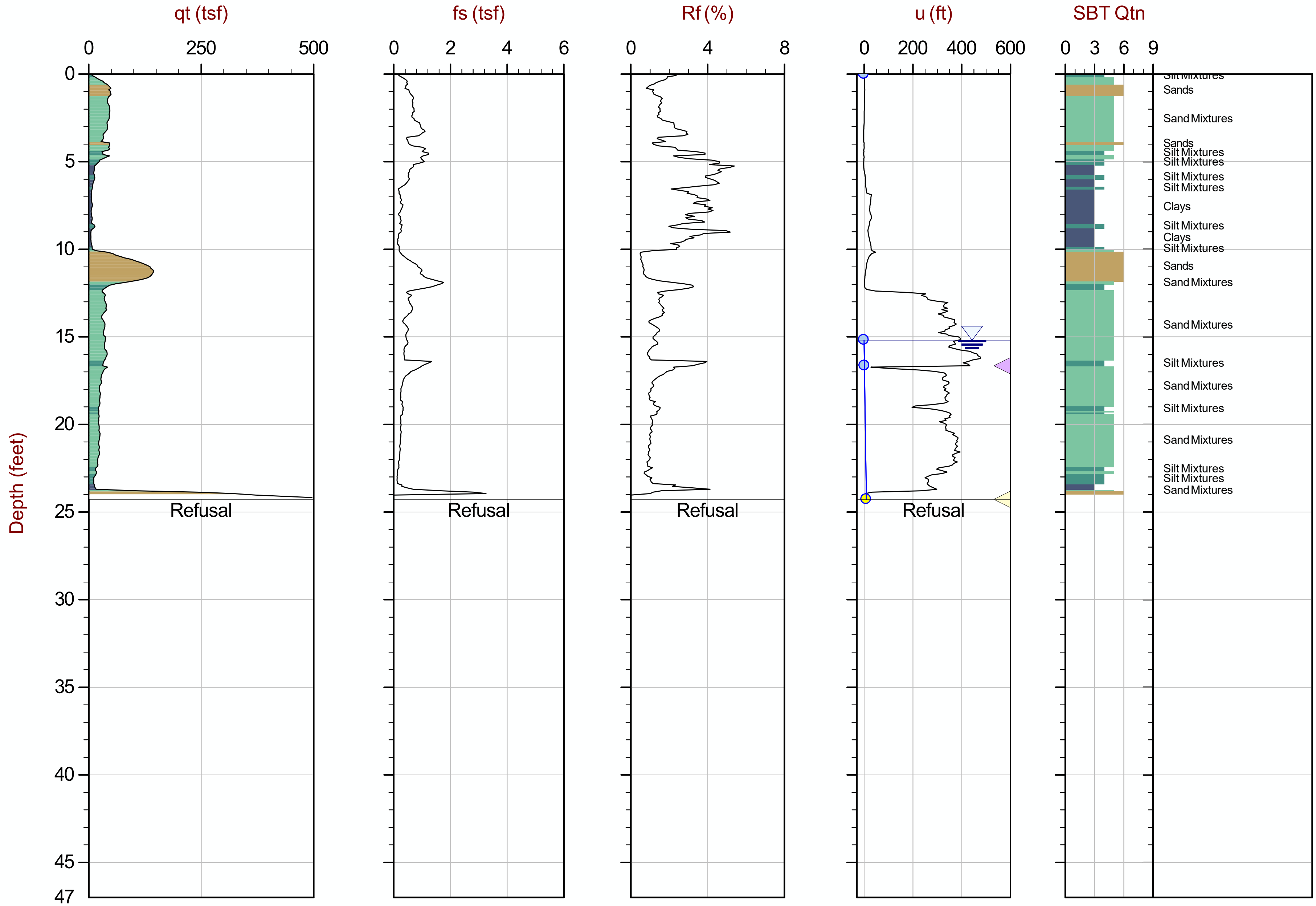
The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-22 08:16
Site: Crossroads Landfill

Sounding: CPT18-11
Cone: 452:T1500F15U500



Max Depth: 7.400 m / 24.28 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP11.COR

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 685541ft E: 3039983ft Elev: 298.6

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

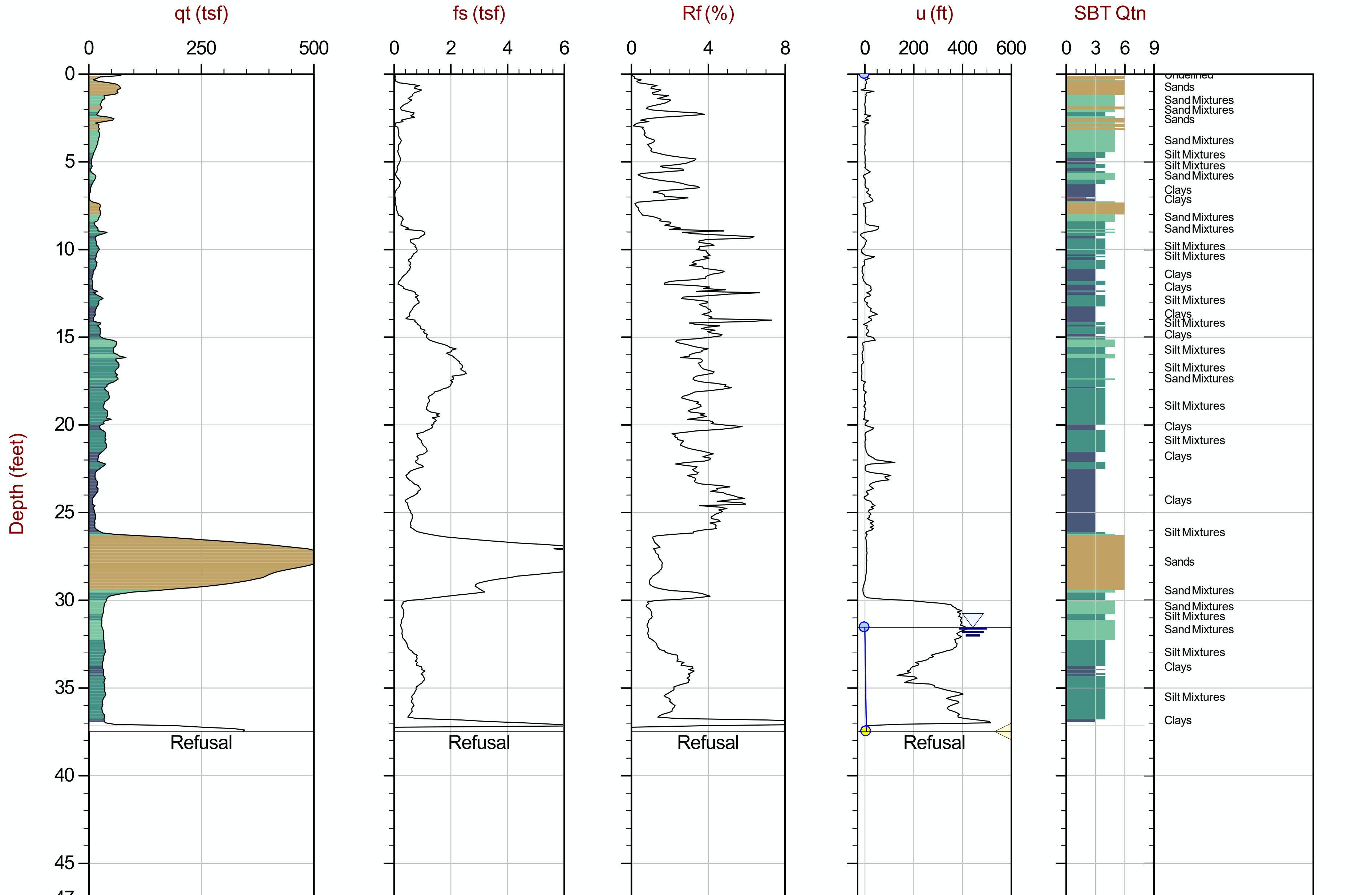
The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-21 15:41
Site: Crossroads Landfill

Sounding: CPT18-12
Cone: 388:T1500F15U500



Max Depth: 11.425 m / 37.48 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP12.COR

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 685401ft E: 3039861ft Elev: 315.4

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

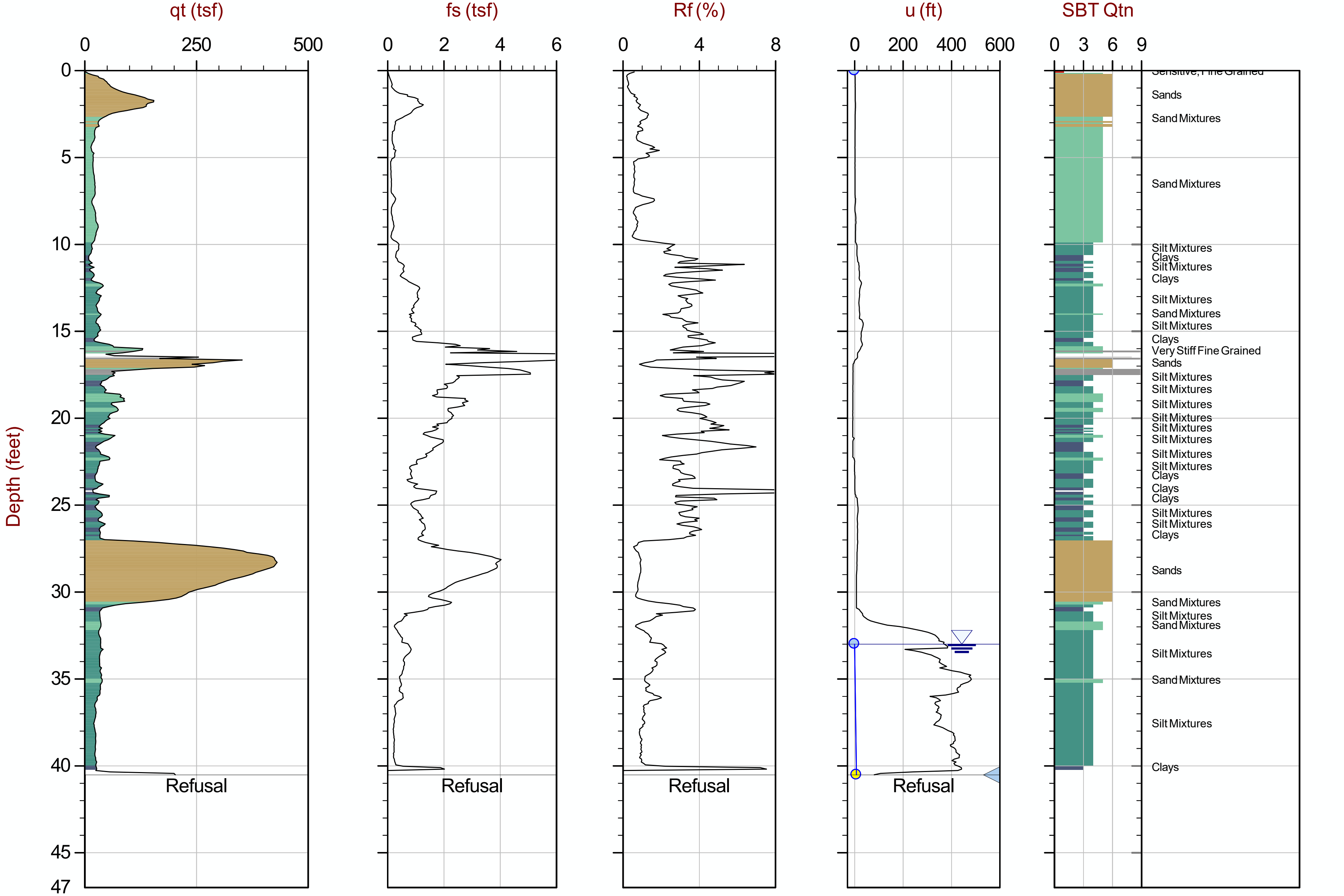
The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-21 18:03
Site: Crossroads Landfill

Sounding: CPT18-12B
Cone: 452:T1500F15U500



Max Depth: 12.350 m / 40.52 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP12B.COR

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 685438ft E: 3039873ft Elev: 314.9

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

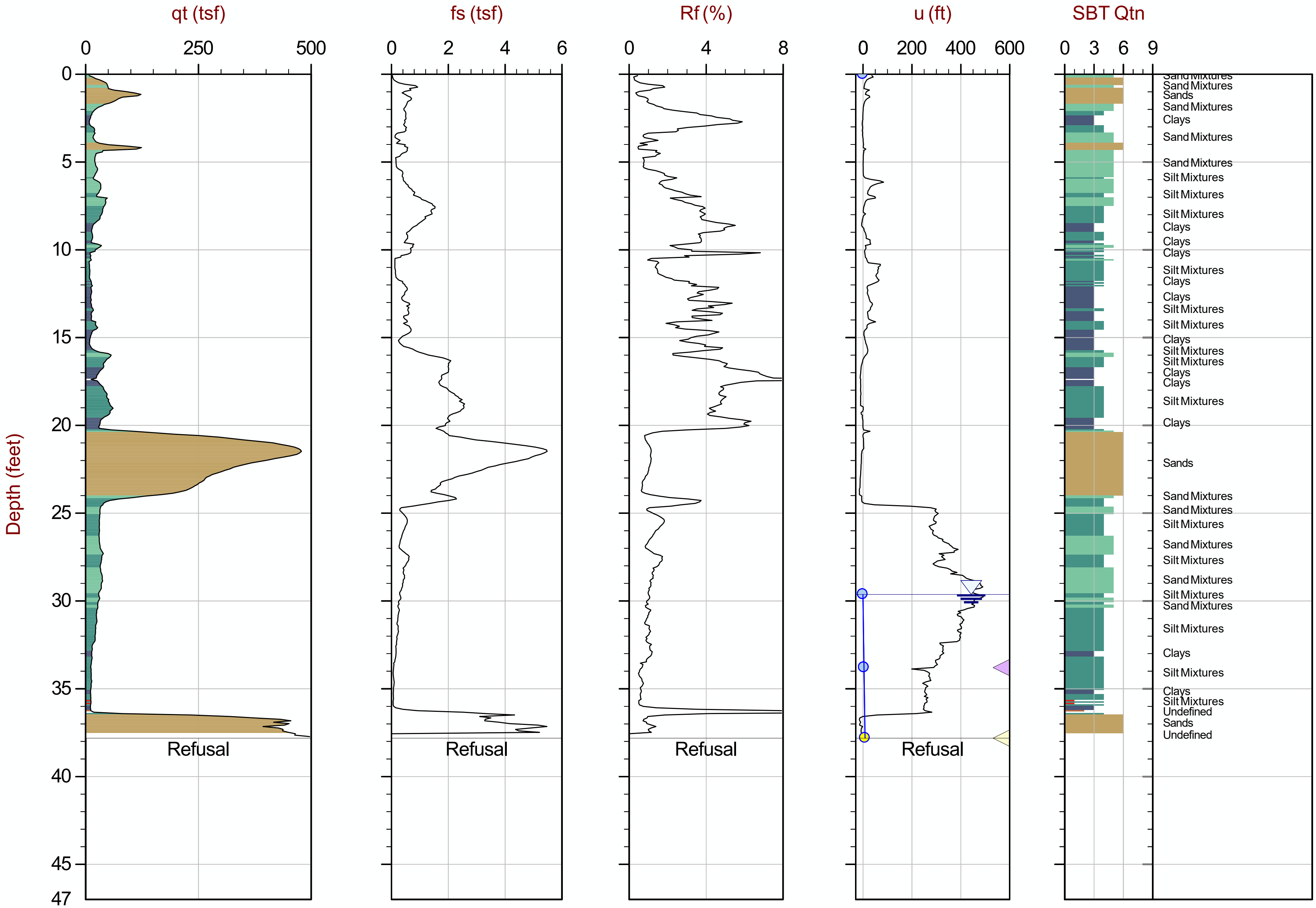
The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-22 10:28
Site: Crossroads Landfill

Sounding: CPT18-13
Cone: 452:T1500F15U500



Max Depth: 11.525 m / 37.81 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP13.COR

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 685289ft E: 3039730ft Elev: 307.1

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

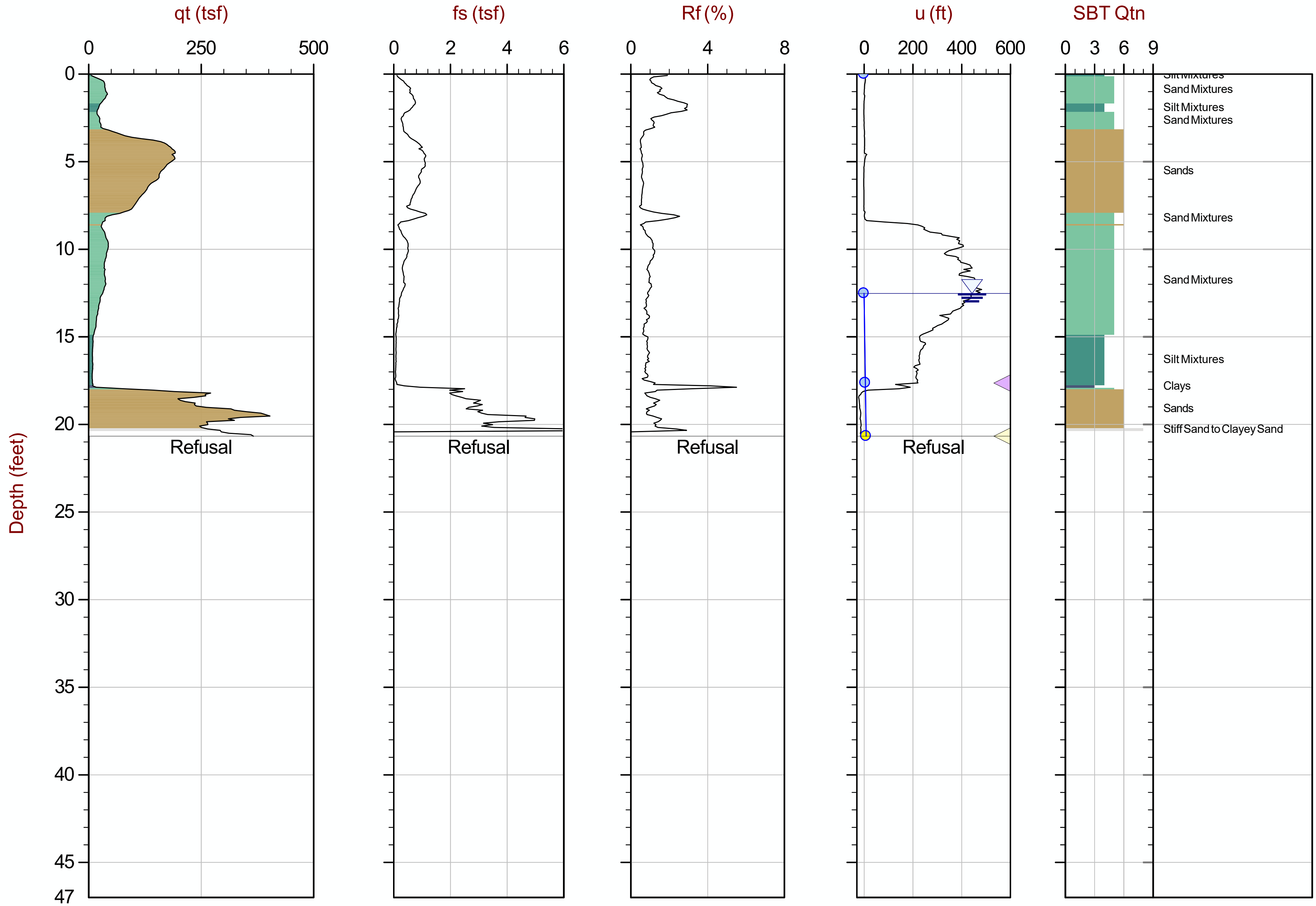
The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-22 12:38
Site: Crossroads Landfill

Sounding: CPT18-14
Cone: 452:T1500F15U500



Max Depth: 6.300 m / 20.67 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP14.COR

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 685101ft E: 3039624ft Elev: 289.7

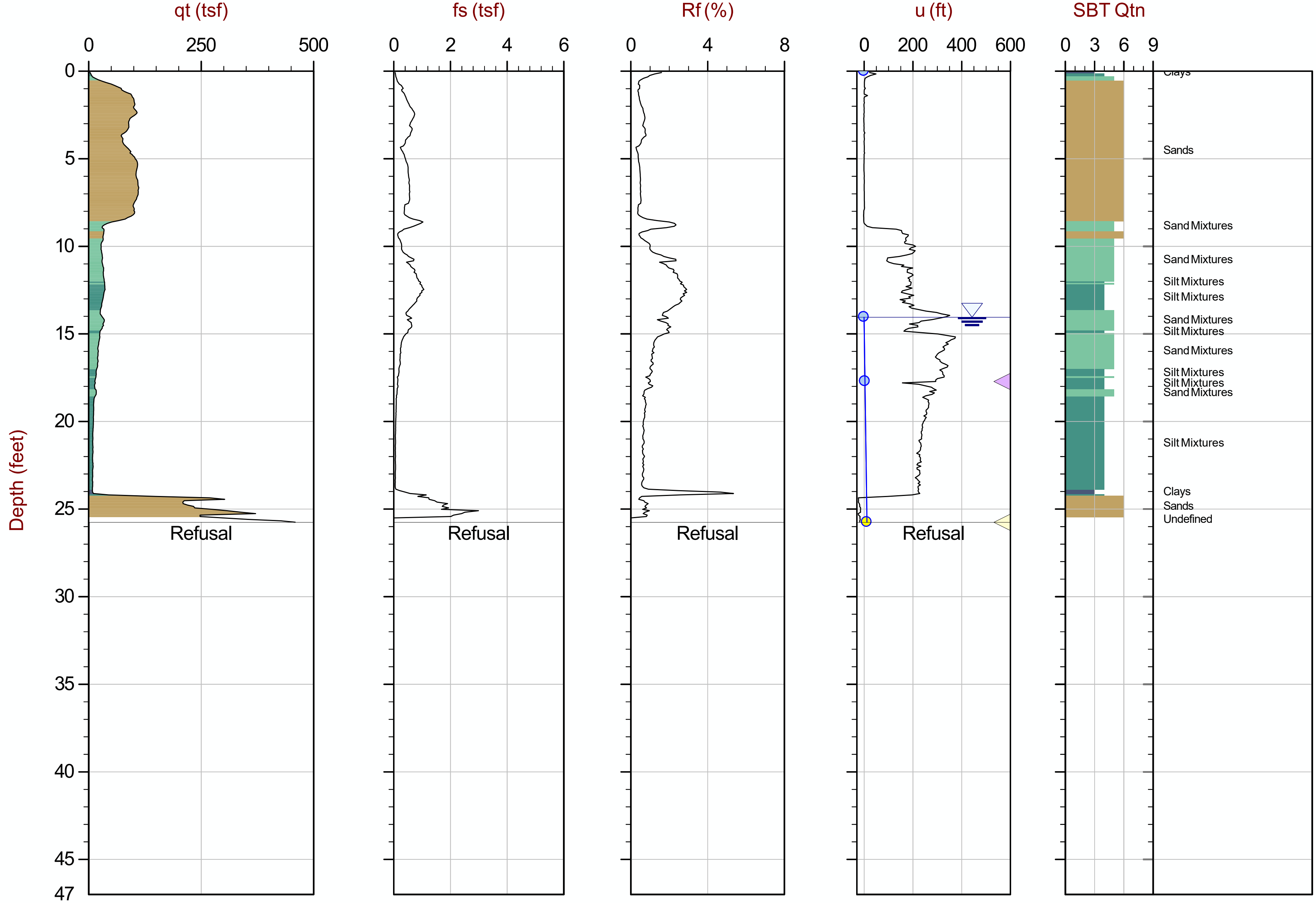
Hydrostatic Line — Ueq — Assumed Ueq — PPD, Ueq achieved — PPD, Ueq not achieved

The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-21 09:51
Site: Crossroads Landfill
Sounding: CPT18-15
Cone: 388:T1500F15U500



Max Depth: 7.850 m / 25.75 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP15.COR

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 685003ft E: 3040048ft Elev: 286.5

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

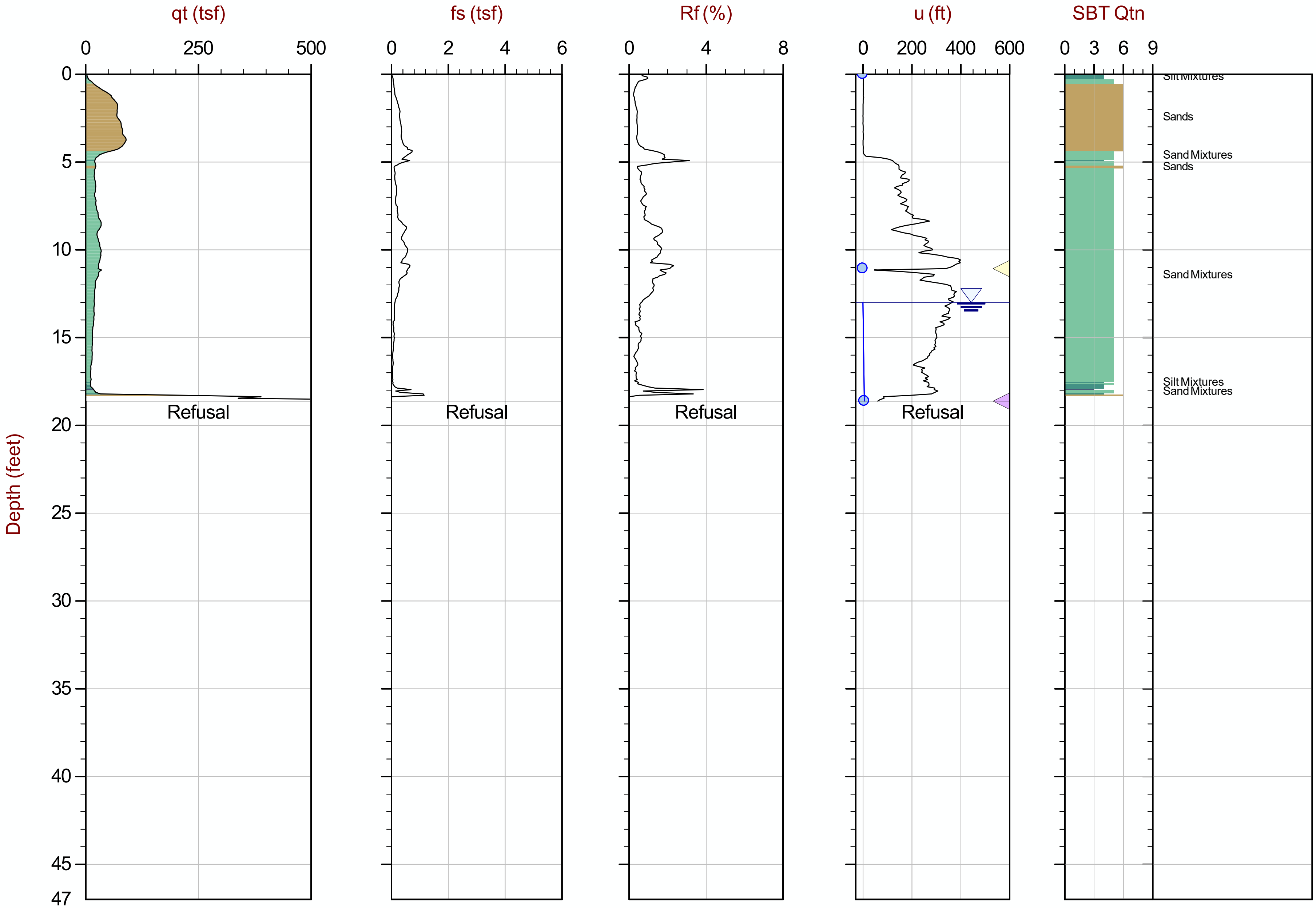
The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-21 14:48
Site: Crossroads Landfill

Sounding: CPT18-16
Cone: 388:T1500F15U500



Max Depth: 5.675 m / 18.62 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP16.COR

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 684997ft E: 3040404ft Elev: 280.9

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

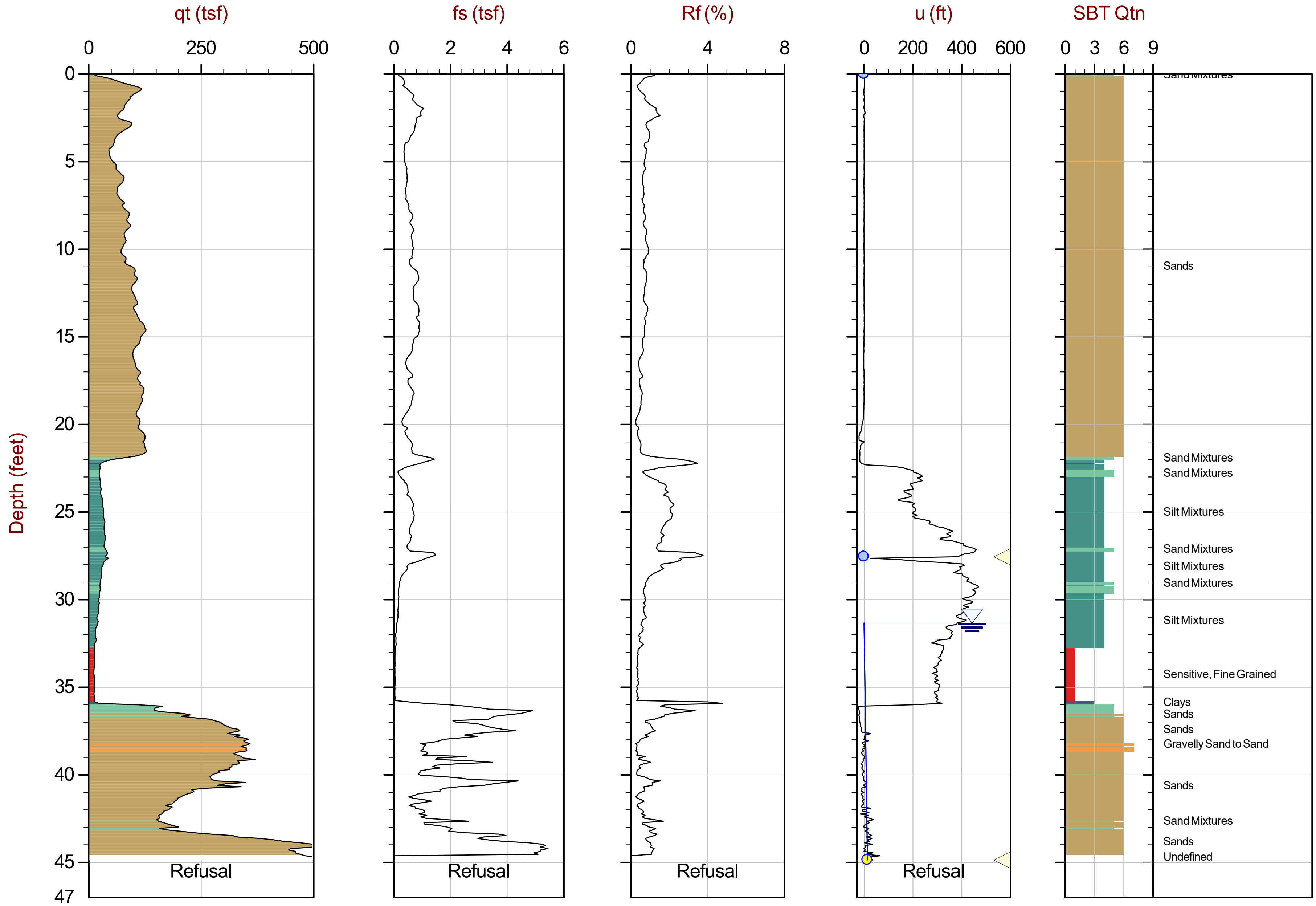
The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-20 11:31
Site: Crossroads Landfill

Sounding: CPT18-17
Cone: 388:T1500F15U500



Max Depth: 13.675 m / 44.86 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP17.COR

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 684604ft E: 3039781ft Elev: 295.1

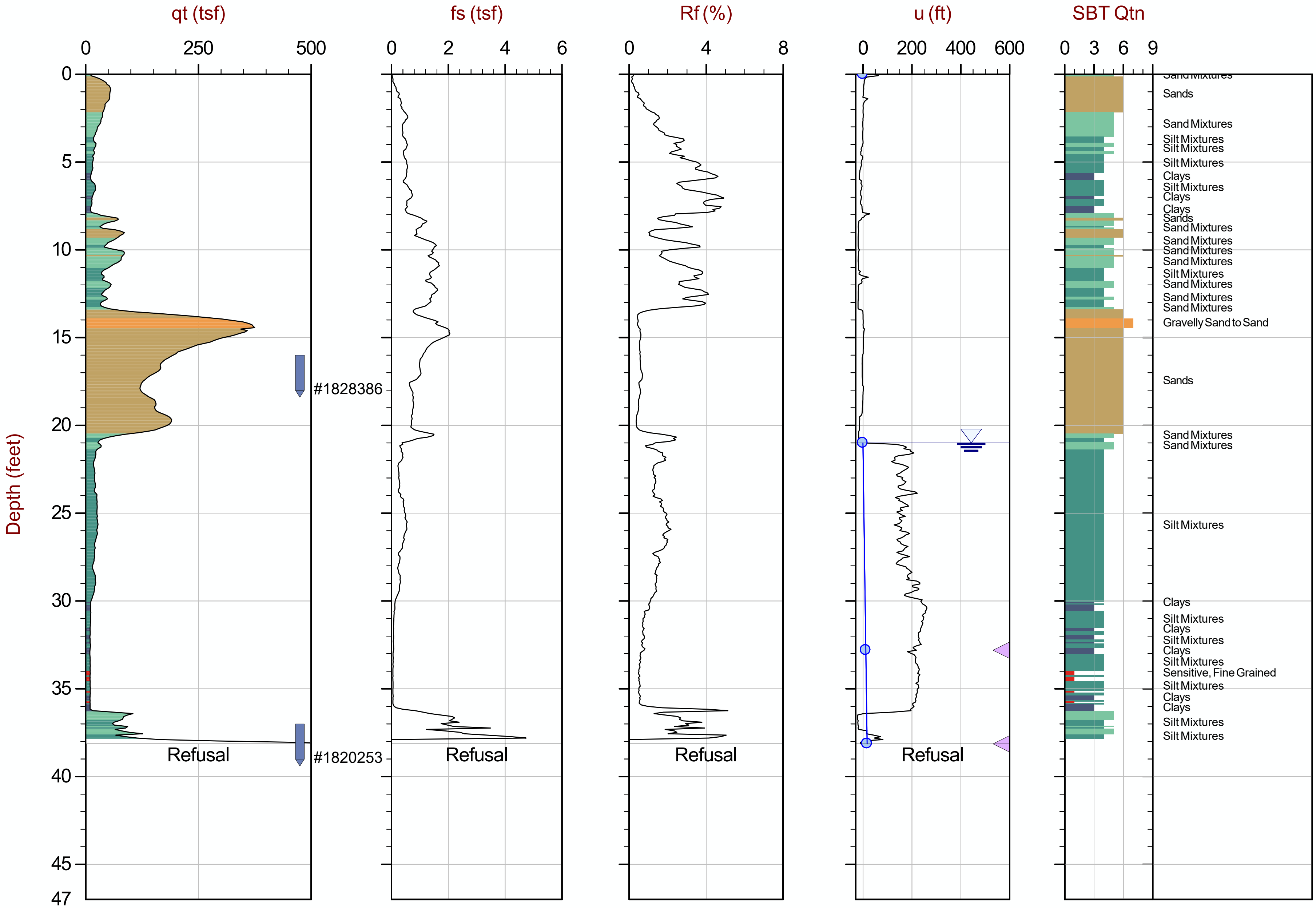
Hydrostatic Line   Ueq   Assumed Ueq   PPD, Ueq achieved   PPD, Ueq not achieved

The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

ConeTec

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-22 15:39
Site: Crossroads Landfill
Sounding: CPT18-18
Cone: 452:T1500F15U500



Max Depth: 11.625 m / 38.14 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP18.COR

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 684760ft E: 3039332ft Elev: 294.4

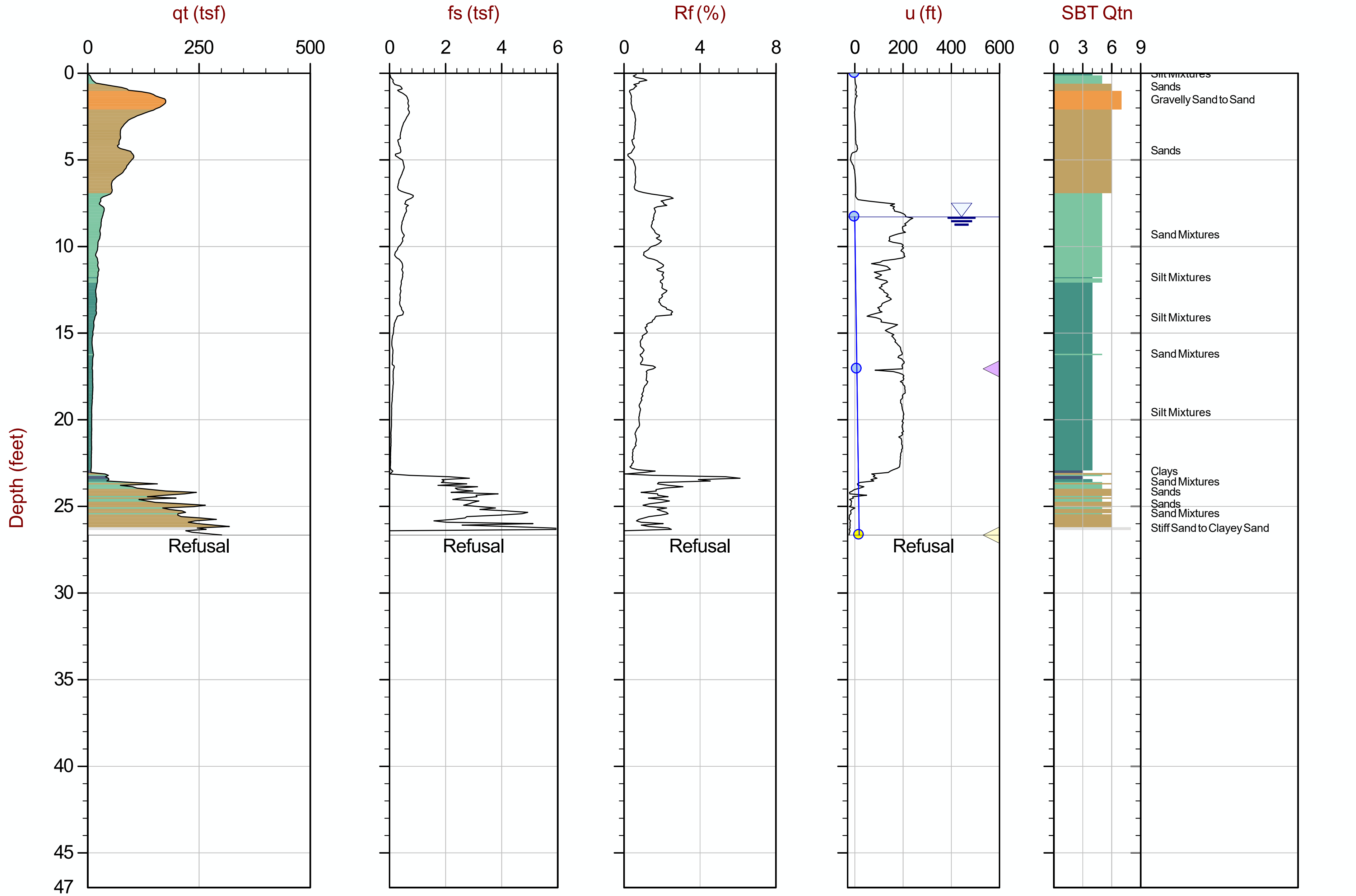
Hydrostatic Line · Ueq · Assumed Ueq · PPD, Ueq achieved · PPD, Ueq not achieved

The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-24 08:17
Site: Crossroads Landfill
Sounding: CPT18-19
Cone: 452:T1500F15U500



Max Depth: 8.125 m / 26.66 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP19.COR

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 684751ft E: 3038915ft Elev: 276.5

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

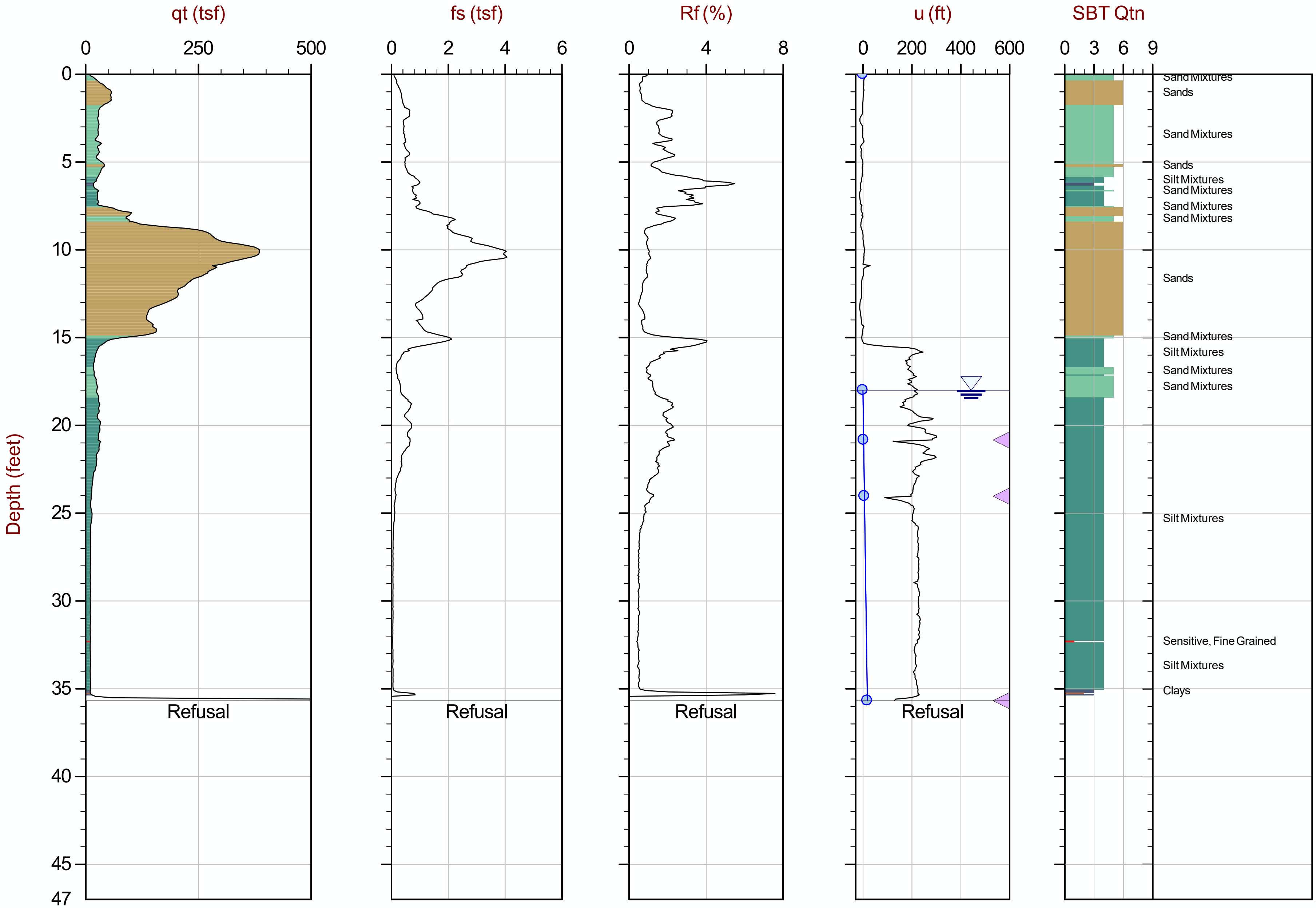
The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

ConeTec

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-23 15:39
Site: Crossroads Landfill

Sounding: CPT18-20
Cone: 452:T1500F15U500



Max Depth: 10.875 m / 35.68 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP20.COR

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 684876ft E: 3039150ft Elev: 288.8

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

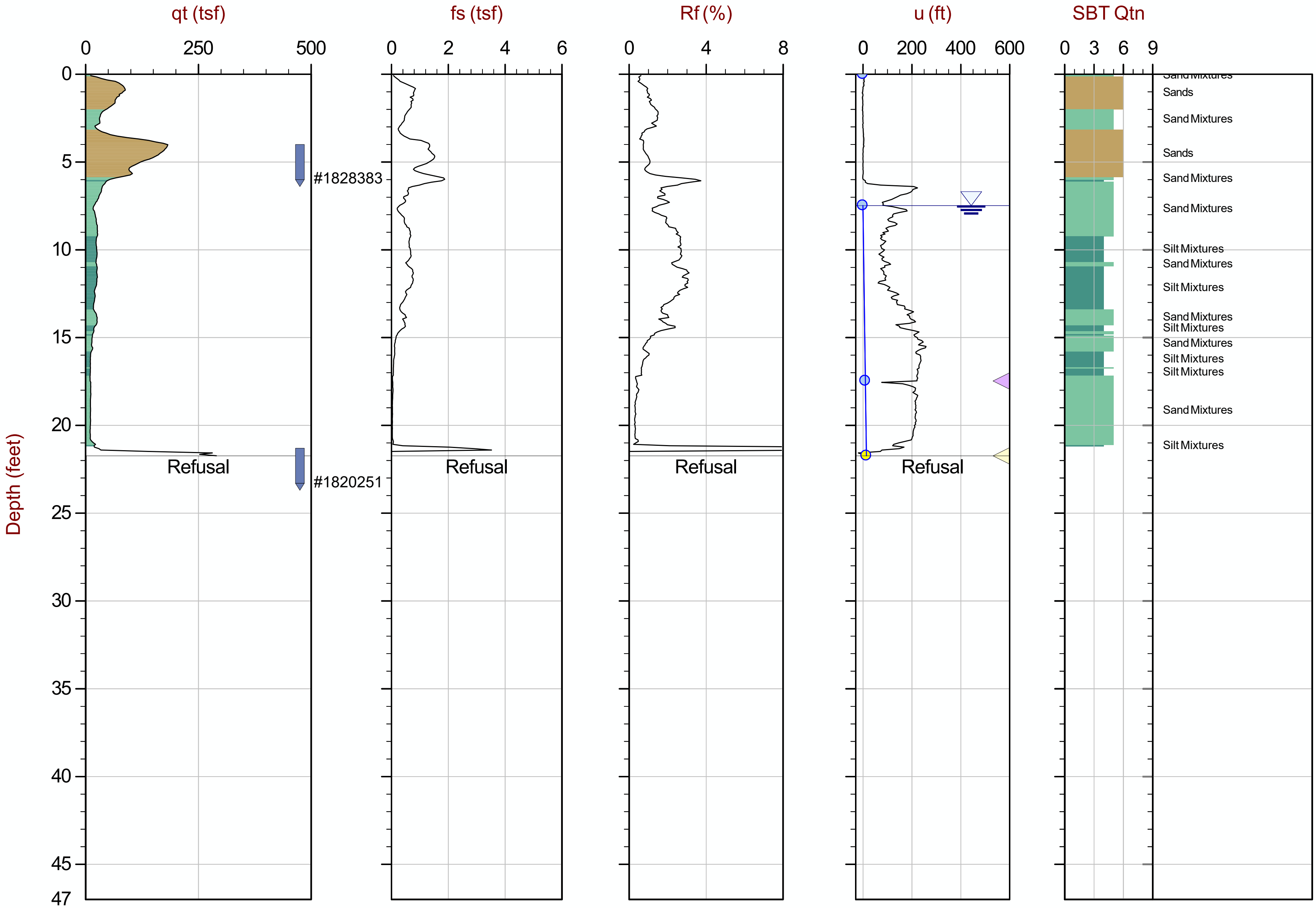
The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-23 17:22
Site: Crossroads Landfill

Sounding: CPT18-21
Cone: 452:T1500F15U500



Max Depth: 6.625 m / 21.74 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP21.COR

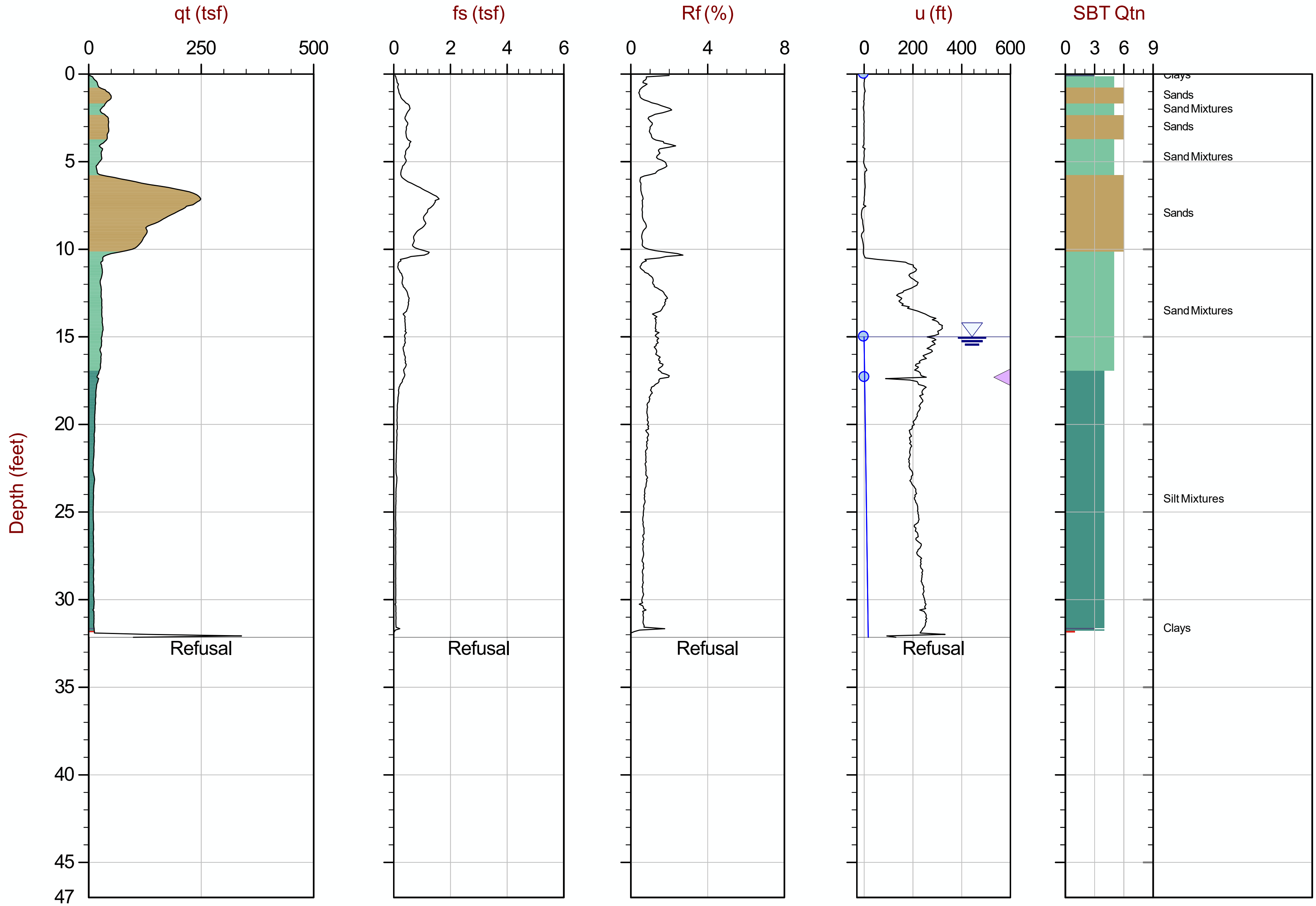
SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 685216ft E: 3039084ft Elev: 286.1

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

The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-24 13:42
Site: Crossroads Landfill
Sounding: CPT18-22
Cone: 452:T1500F15U500



Max Depth: 9.800 m / 32.15 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP22.COR

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 685031ft E: 3038858ft Elev: 284.2

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

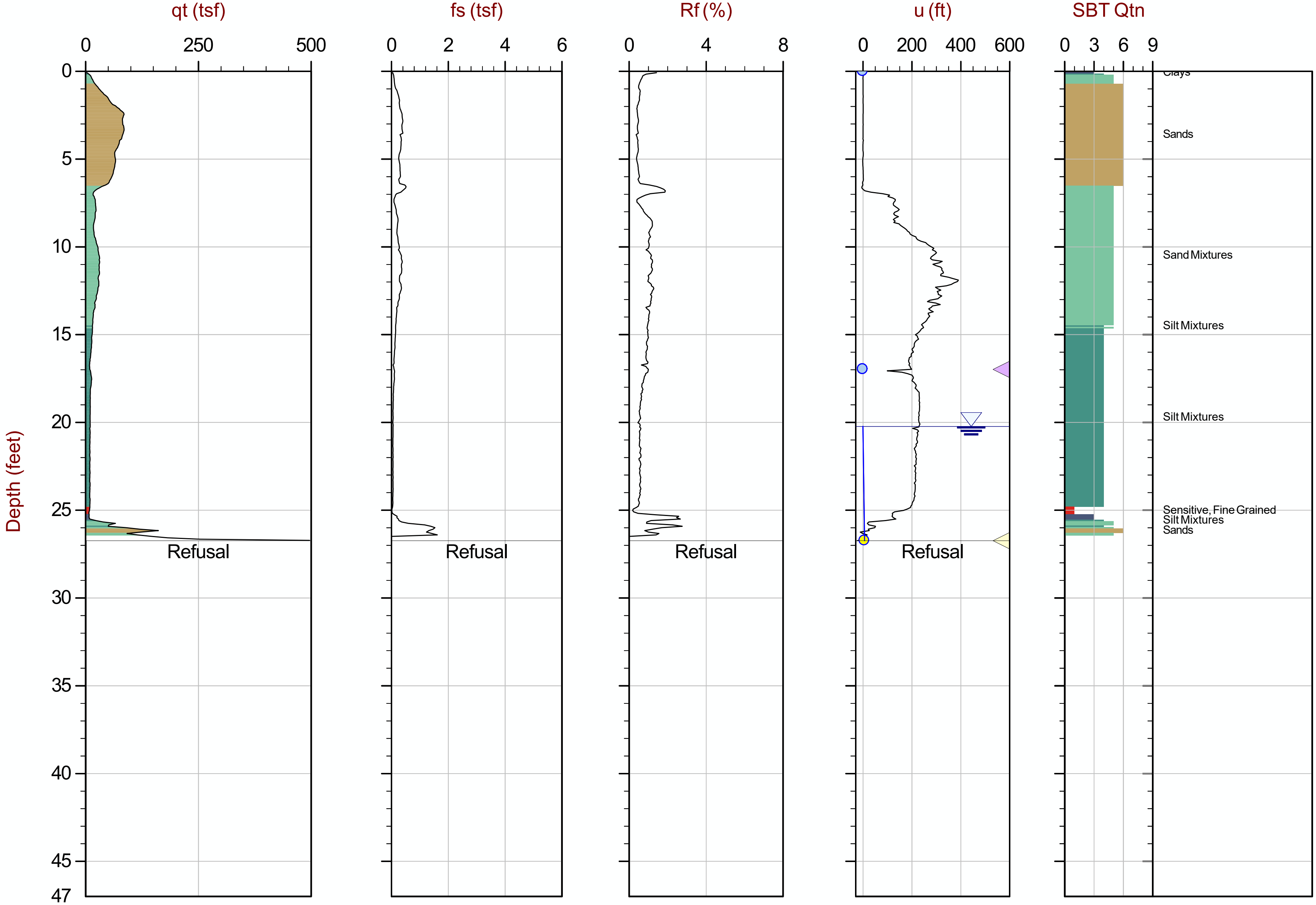
The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-24 11:16
Site: Crossroads Landfill

Sounding: CPT18-23
Cone: 452:T1500F15U500



Max Depth: 8.150 m / 26.74 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP23.COR

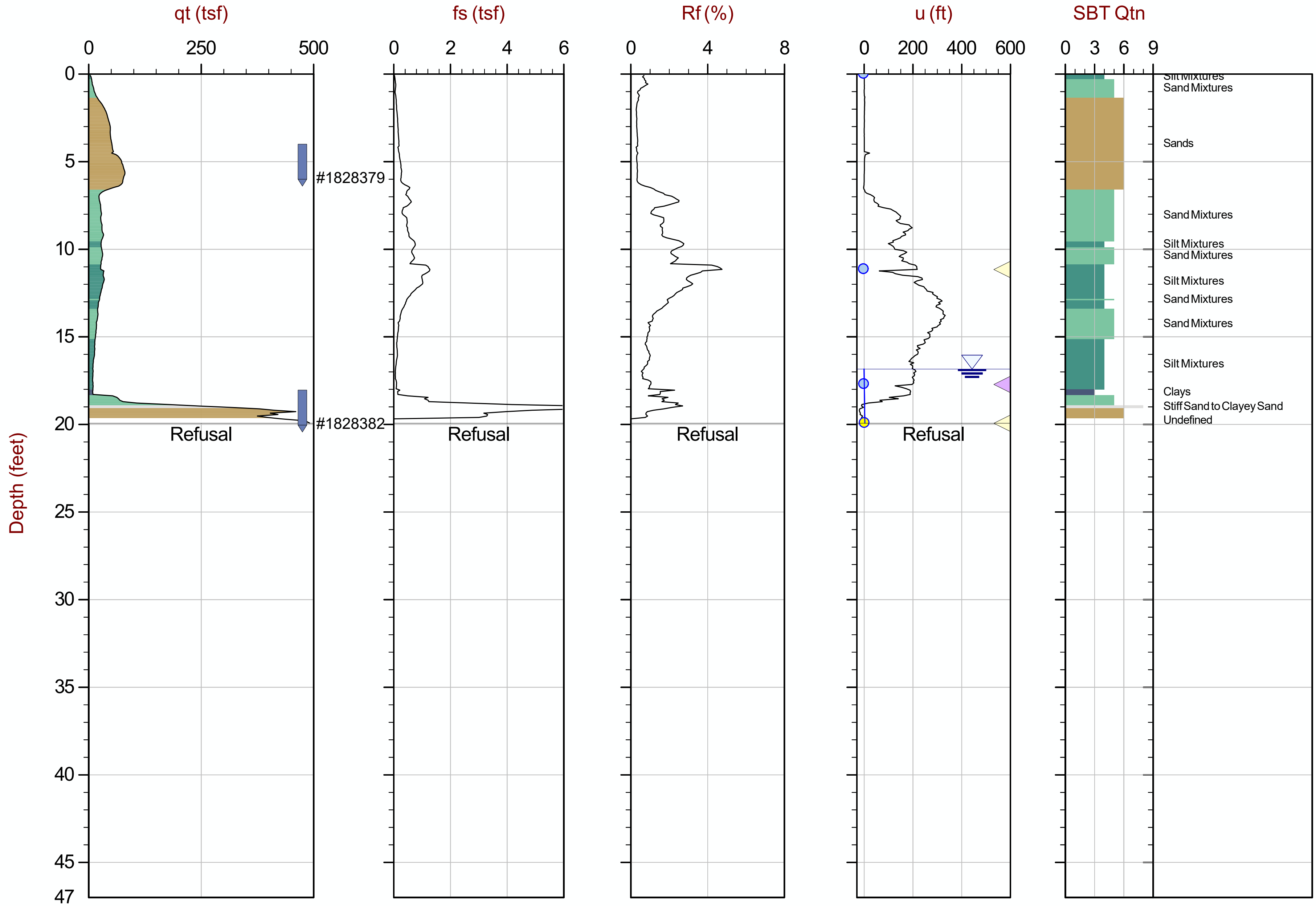
SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 684910ft E: 3038478ft Elev: 277.0

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

The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-26 10:52
Site: Crossroads Landfill
Sounding: CPT18-24
Cone: 452:T1500F15U500



Max Depth: 6.075 m / 19.93 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP24.COR

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 685305ft E: 3038509ft Elev: 280.2

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

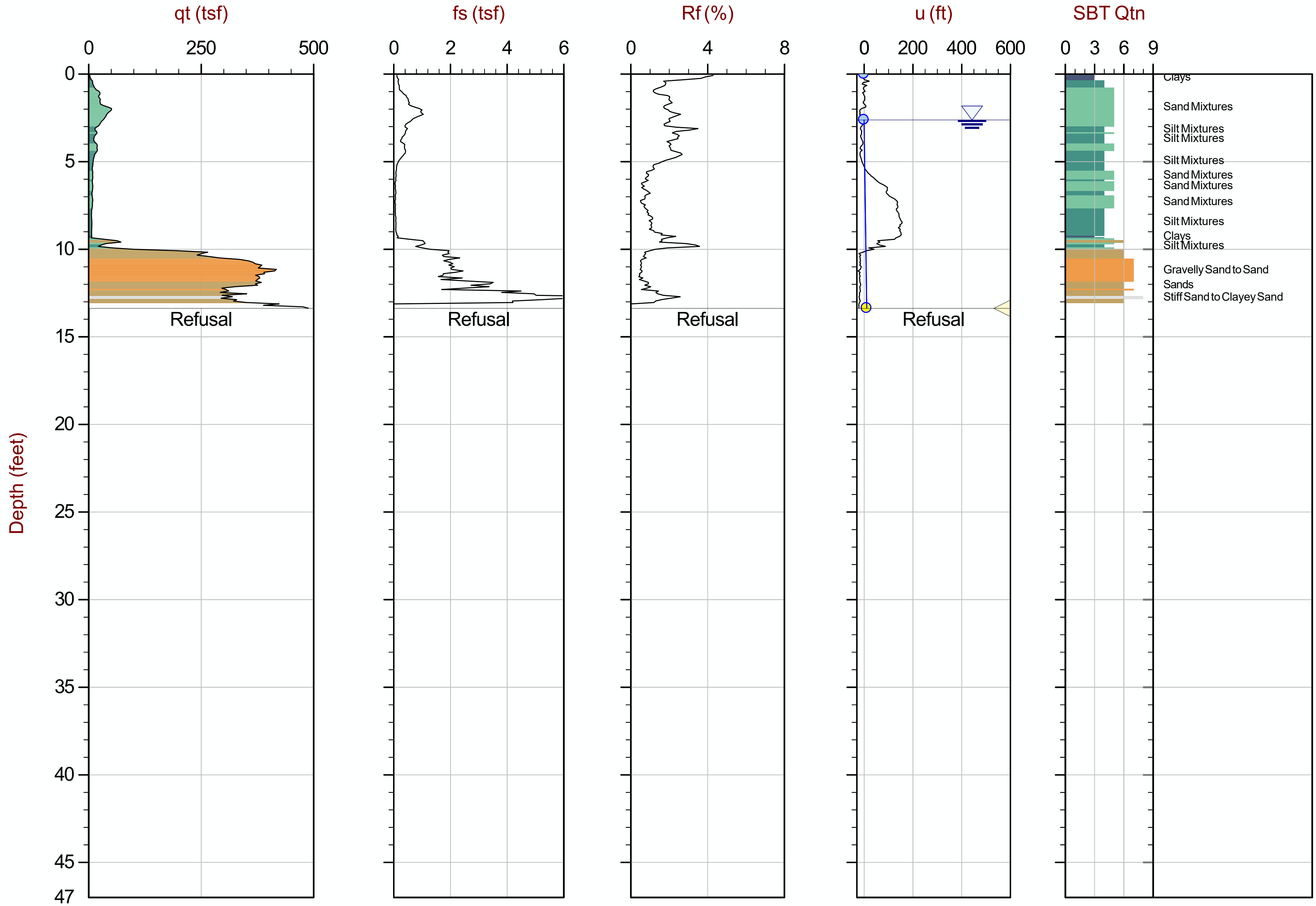
The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-25 16:48
Site: Crossroads Landfill

Sounding: CPT18-25
Cone: 452:T1500F15U500



Max Depth: 4.075 m / 13.37 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP25.COR

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 685474ft E: 3038244ft Elev: 260.2

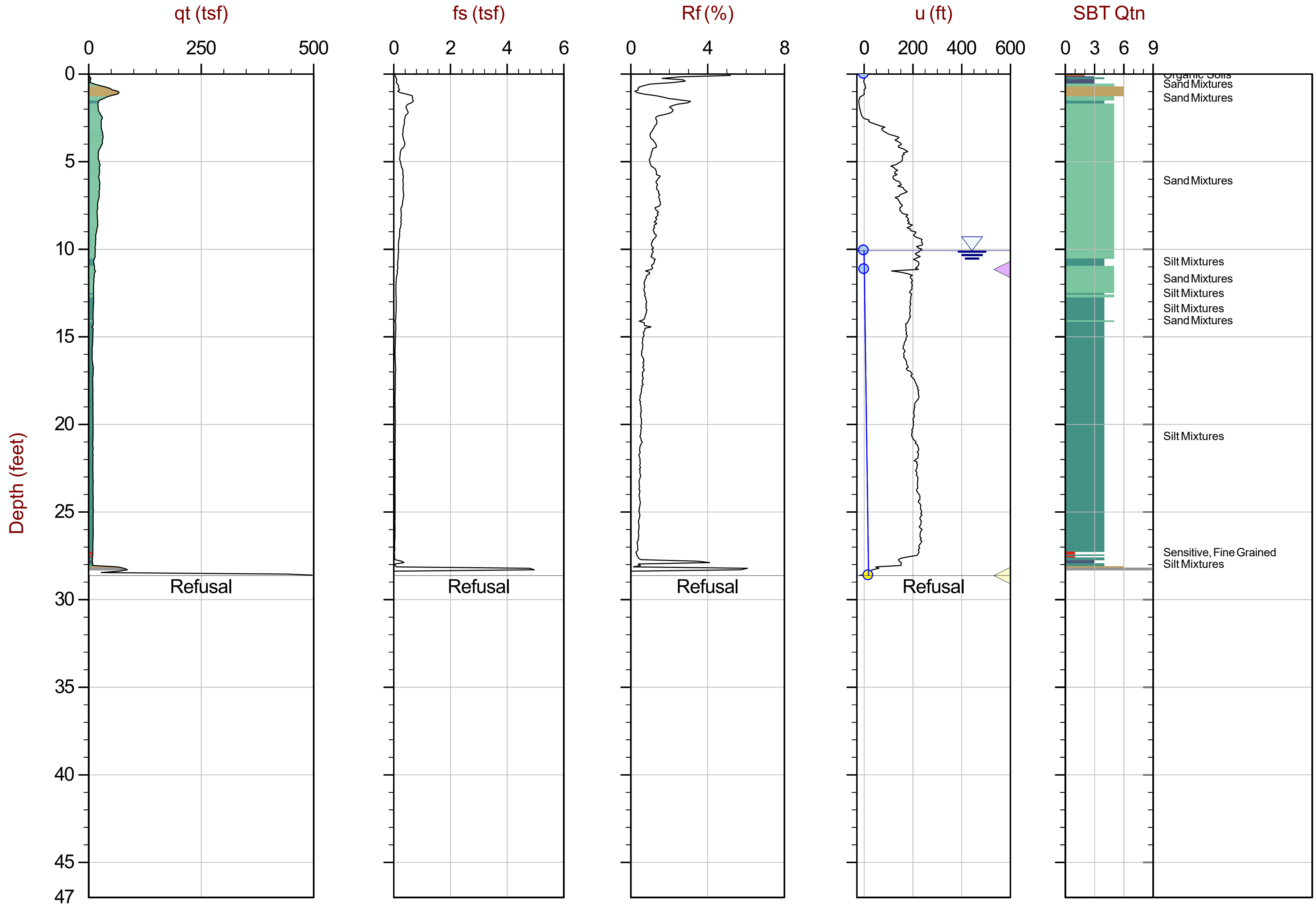
Hydrostatic Line   Ueq   Assumed Ueq   PPD, Ueq achieved   PPD, Ueq not achieved

The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-20 12:50
Site: Crossroads Landfill

Sounding: CPT18-26
Cone: 388:T1500F15U500



Max Depth: 8.725 m / 28.62 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP26.COR

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 684306ft E: 3039828ft Elev: 270.3

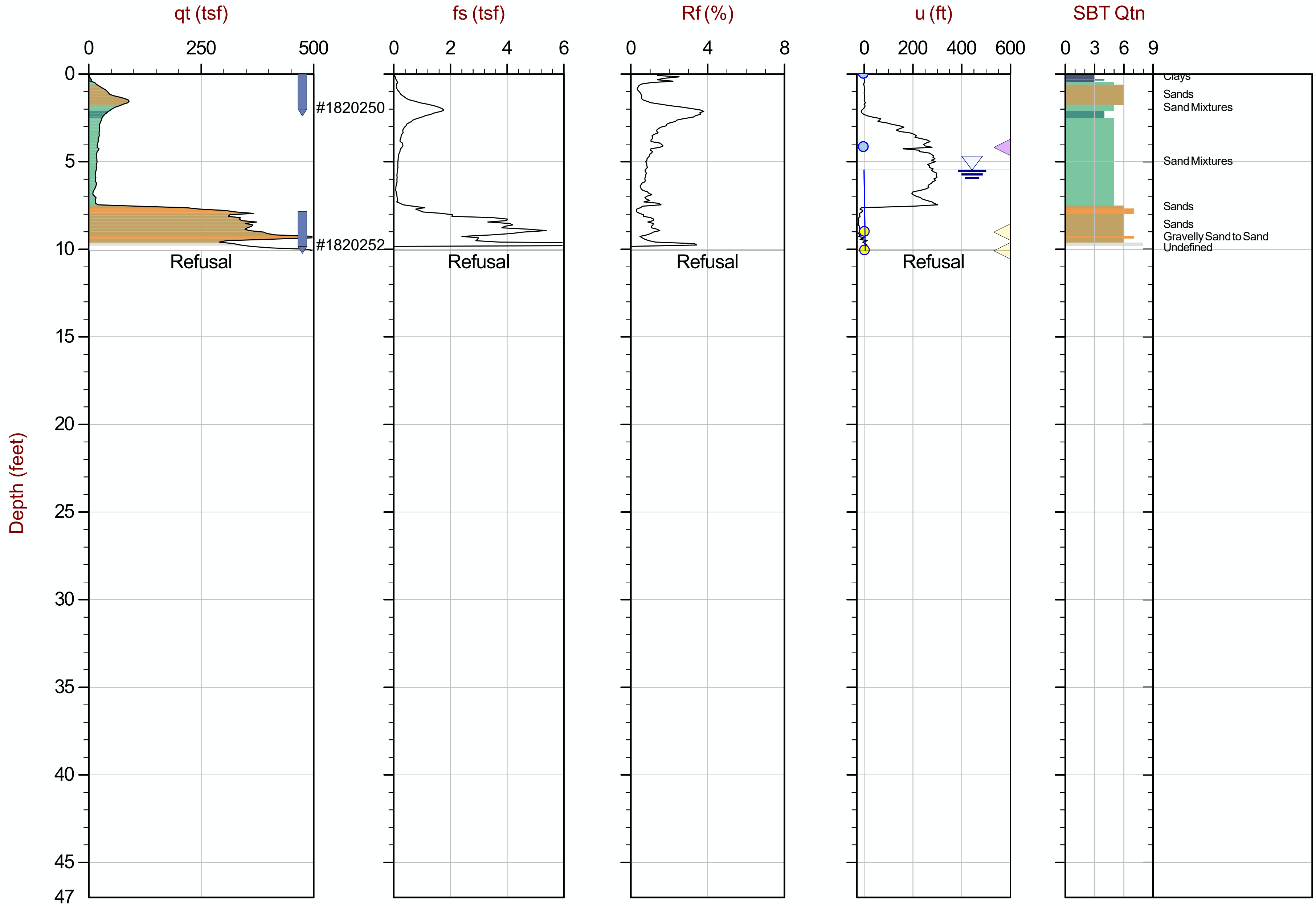
Hydrostatic Line, Ueq, Assumed Ueq, PPD, Ueq achieved, PPD, Ueq not achieved

The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-28 17:42
Site: Crossroads Landfill

Sounding: CPT18-27
Cone: 452:T1500F15U500



Max Depth: 3.075 m / 10.09 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP27.COR

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 685366ft E: 3040797ft Elev: 276.9

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

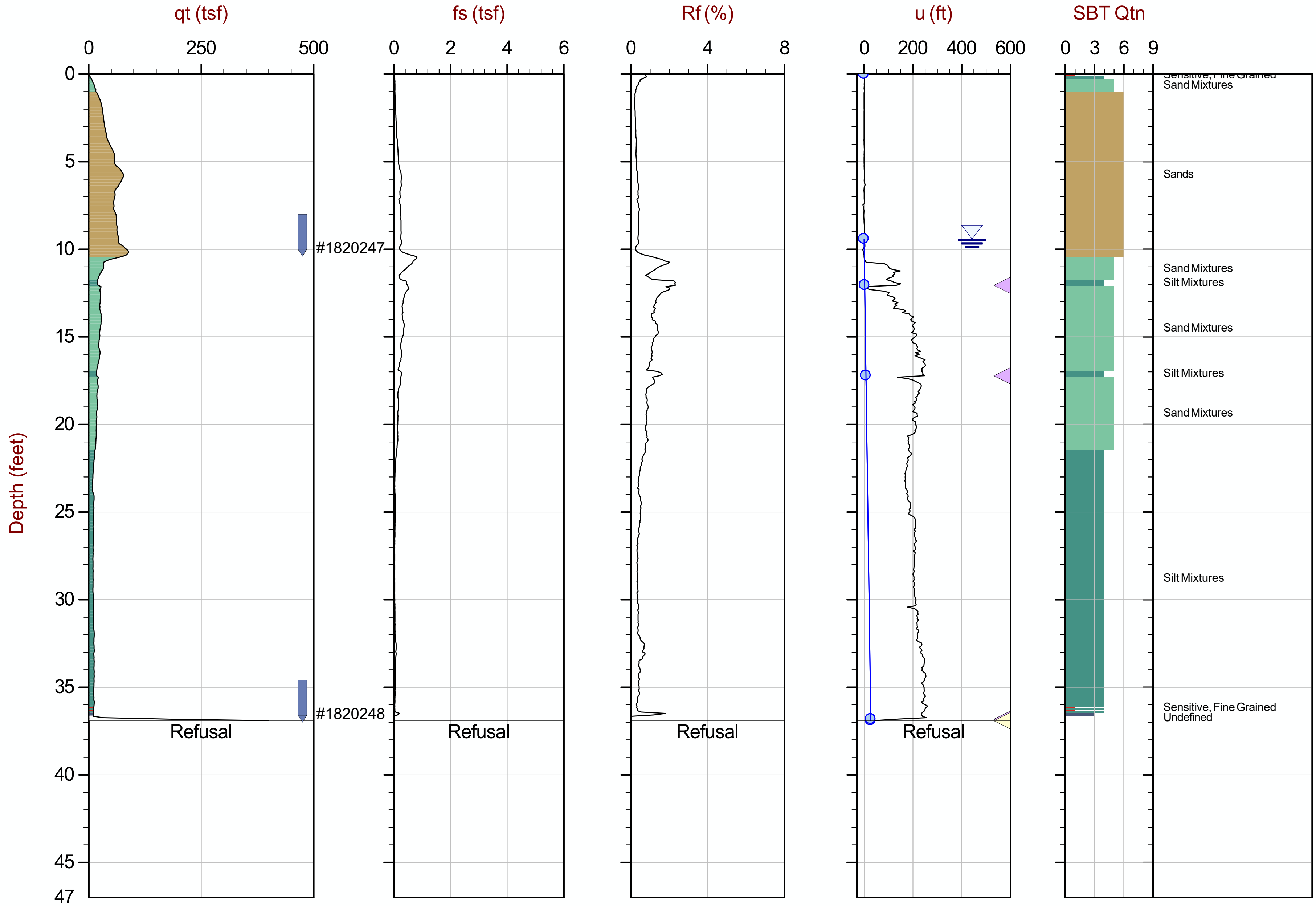
The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

ConeTec

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-28 15:22
Site: Crossroads Landfill

Sounding: CPT18-28
Cone: 452:T1500F15U500



Max Depth: 11.250 m / 36.91 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP28.COR

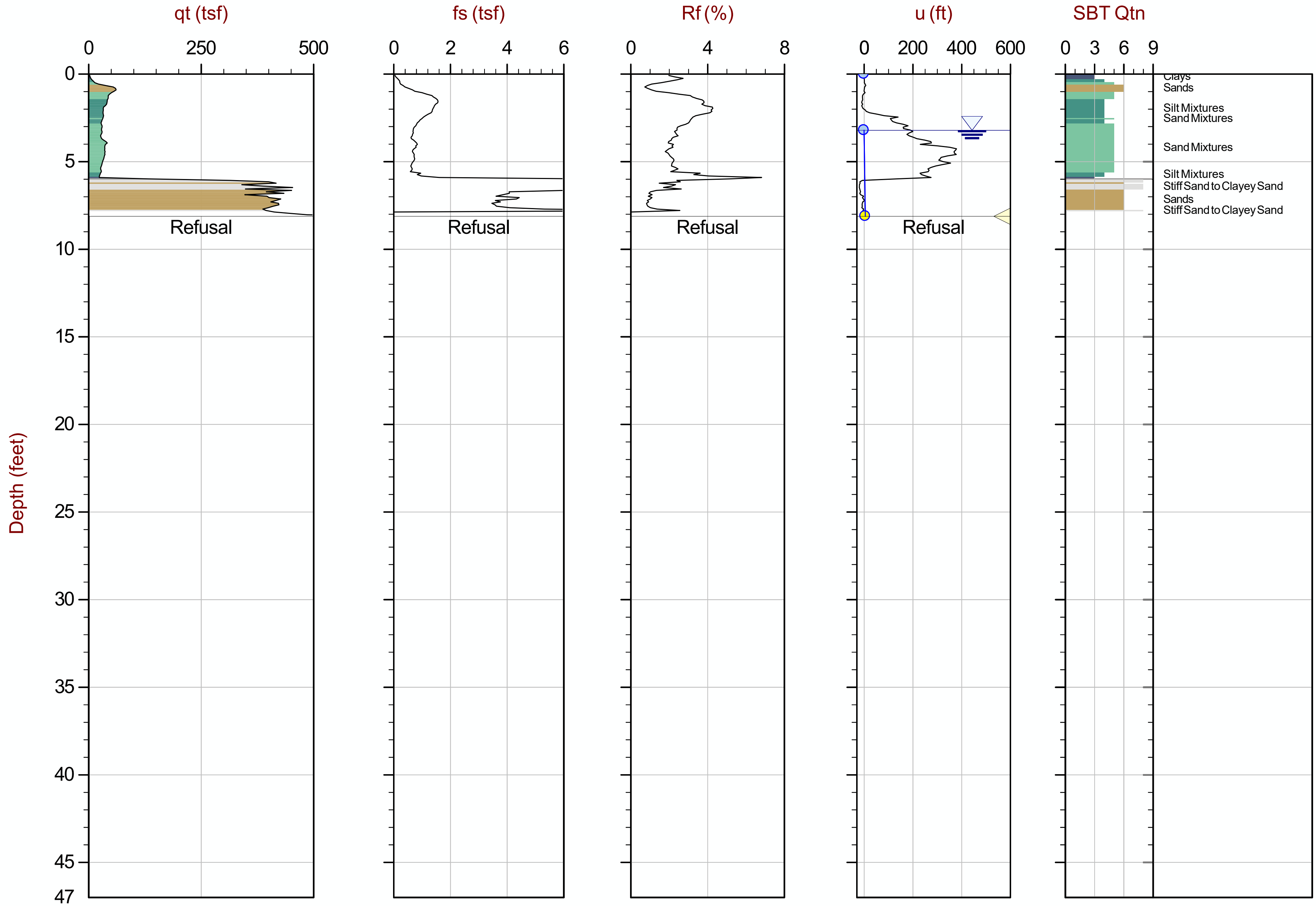
SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 685581ft E: 3041109ft Elev: 289.8

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

The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-26 15:29
Site: Crossroads Landfill
Sounding: CPT18-29
Cone: 452:T1500F15U500



Max Depth: 2.475 m / 8.12 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP29.COR

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 685505ft E: 3039069ft Elev: 284.2

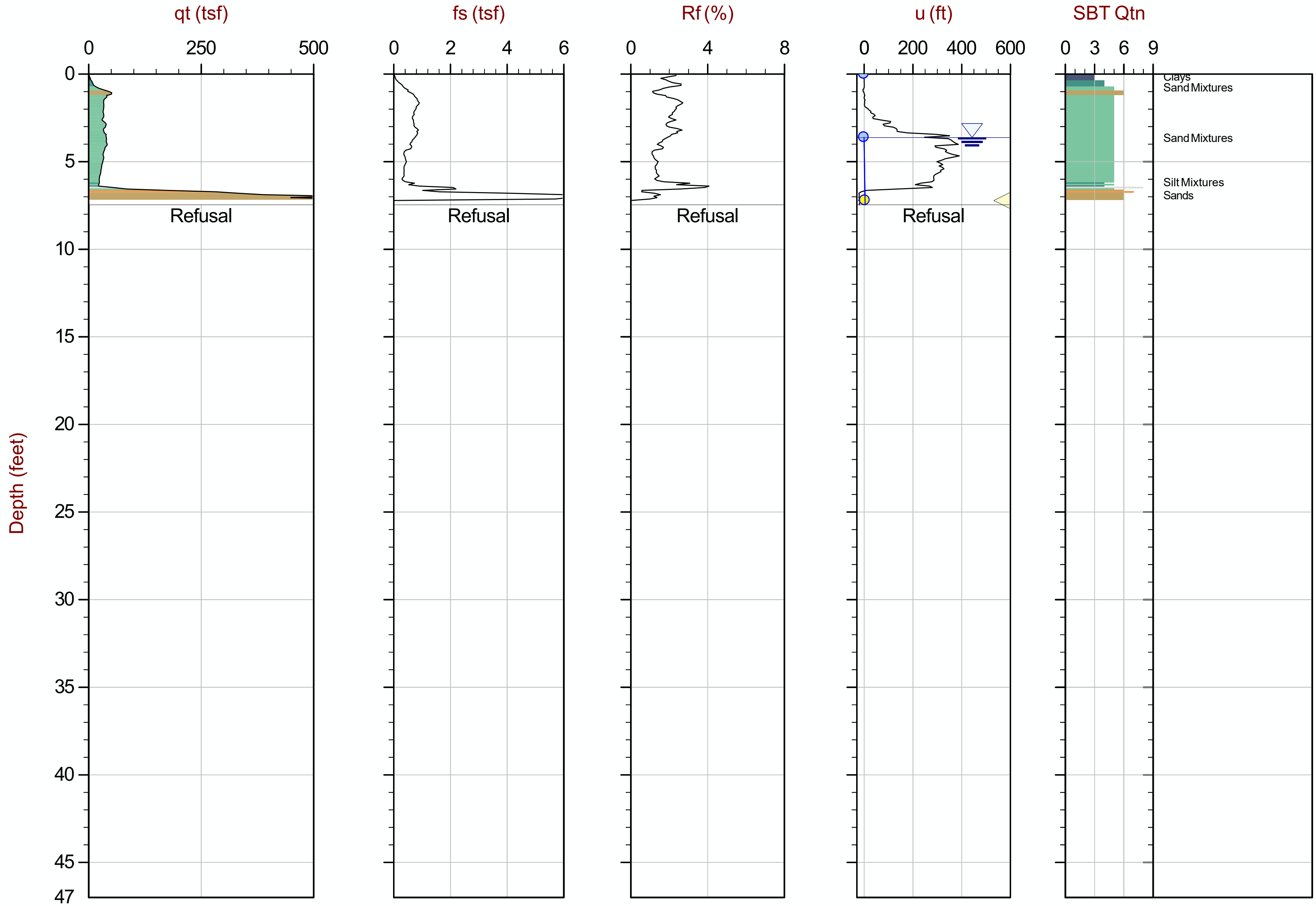
Hydrostatic Line | Ueq | Assumed Ueq | PPD, Ueq achieved | PPD, Ueq not achieved

The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

ConeTec

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-26 15:57
Site: Crossroads Landfill
Sounding: CPT18-29B
Cone: 452:T1500F15U500



Max Depth: 2.275 m / 7.46 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP29B.COR

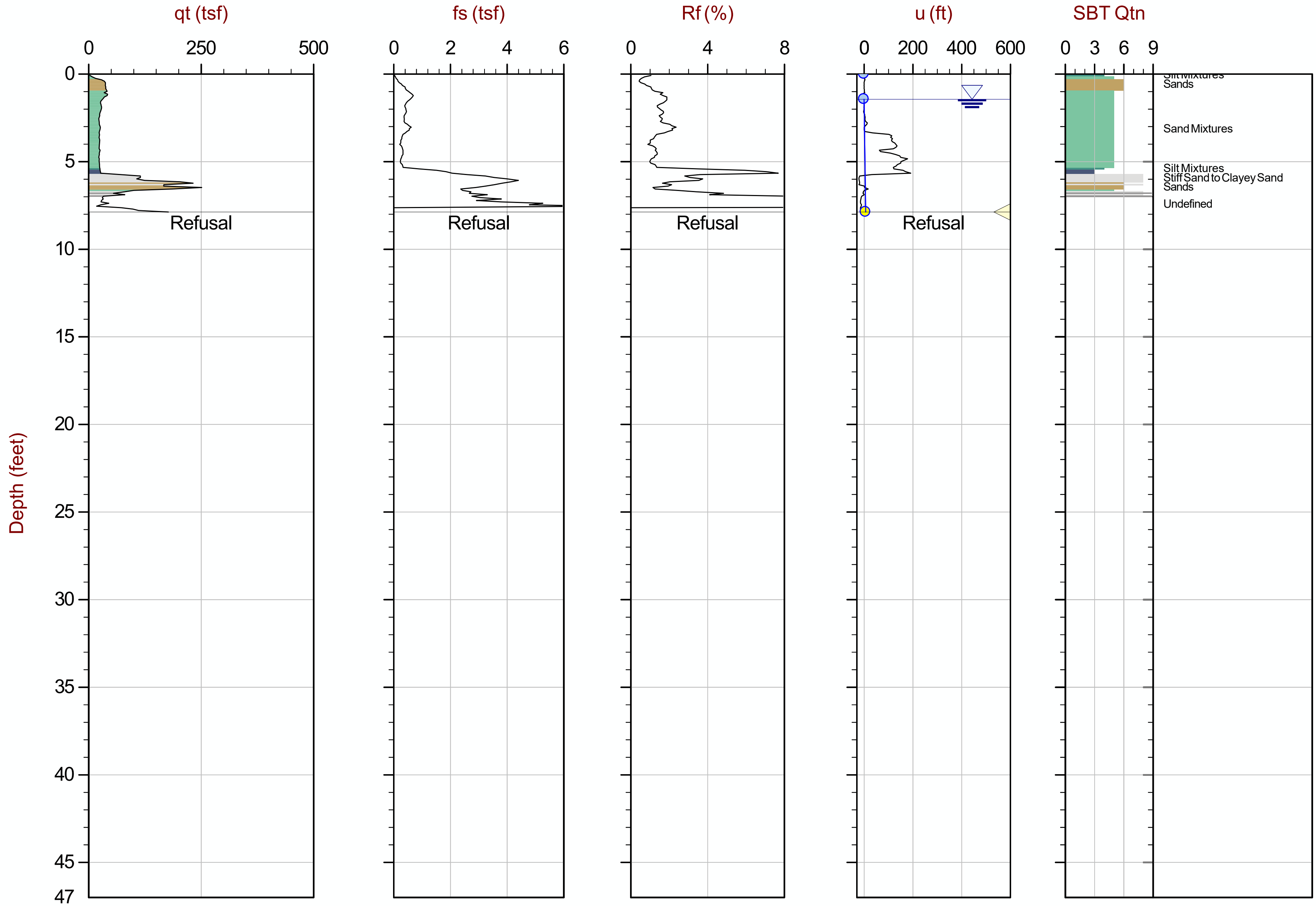
SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 685500ft E: 3039067ft Elev: 284.2

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

The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-25 14:10
Site: Crossroads Landfill
Sounding: CPT18-30
Cone: 452:T1500F15U500



Max Depth: 2.400 m / 7.87 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP30.COR

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 685499ft E: 3038606ft Elev: 273.4

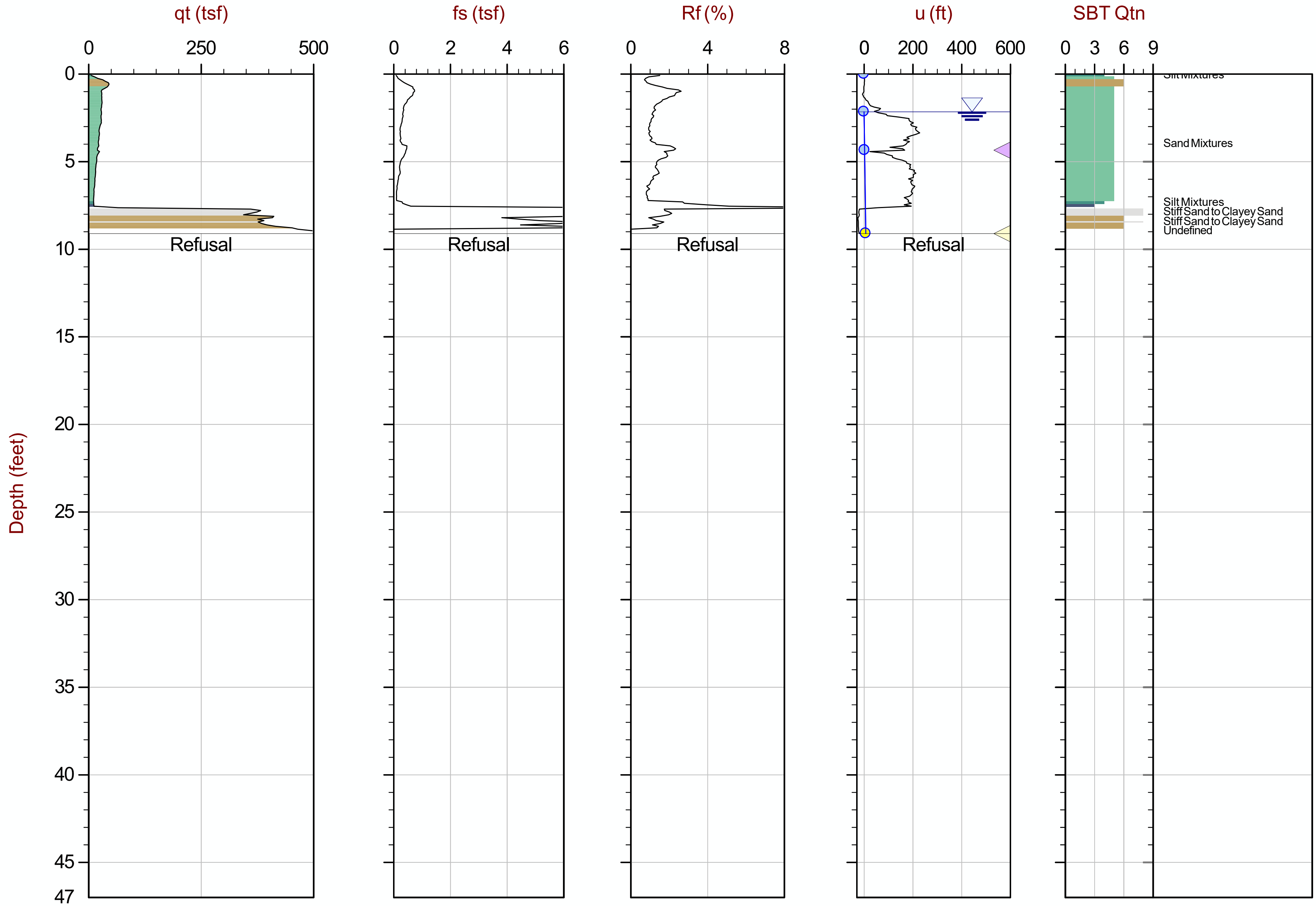
Hydrostatic Line   Ueq   Assumed Ueq   PPD, Ueq achieved   PPD, Ueq not achieved

The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-25 14:40
Site: Crossroads Landfill
Sounding: CPT18-30B
Cone: 452:T1500F15U500



Max Depth: 2.775 m / 9.10 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP30B.COR

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 685492ft E: 3038612ft Elev: 273.4

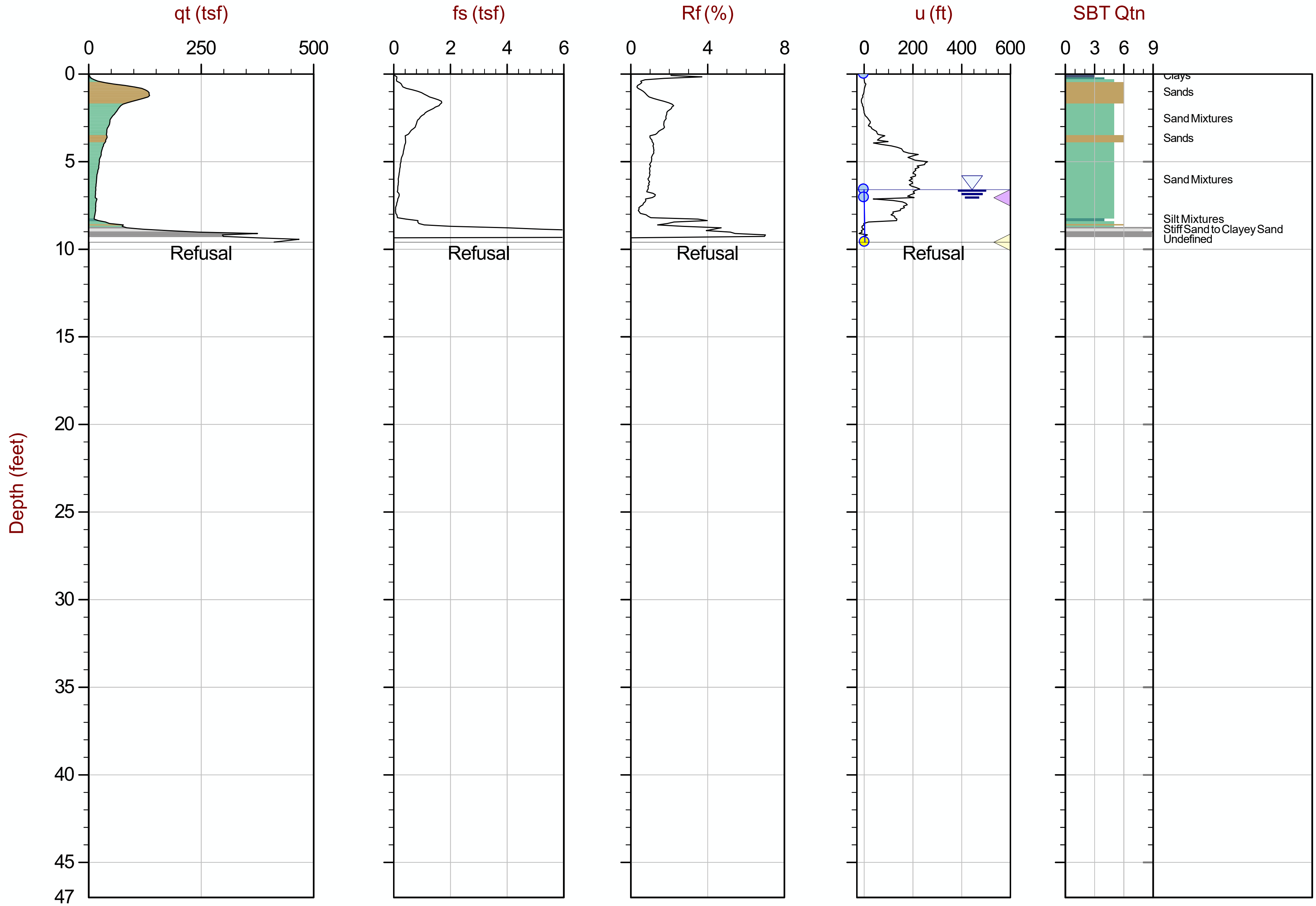
Hydrostatic Line   Ueq   Assumed Ueq   PPD, Ueq achieved   PPD, Ueq not achieved

The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-25 16:02
Site: Crossroads Landfill
Sounding: CPT18-31
Cone: 452:T1500F15U500



Max Depth: 2.925 m / 9.60 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP31.COR

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 685483ft E: 3038364ft Elev: 267.3

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

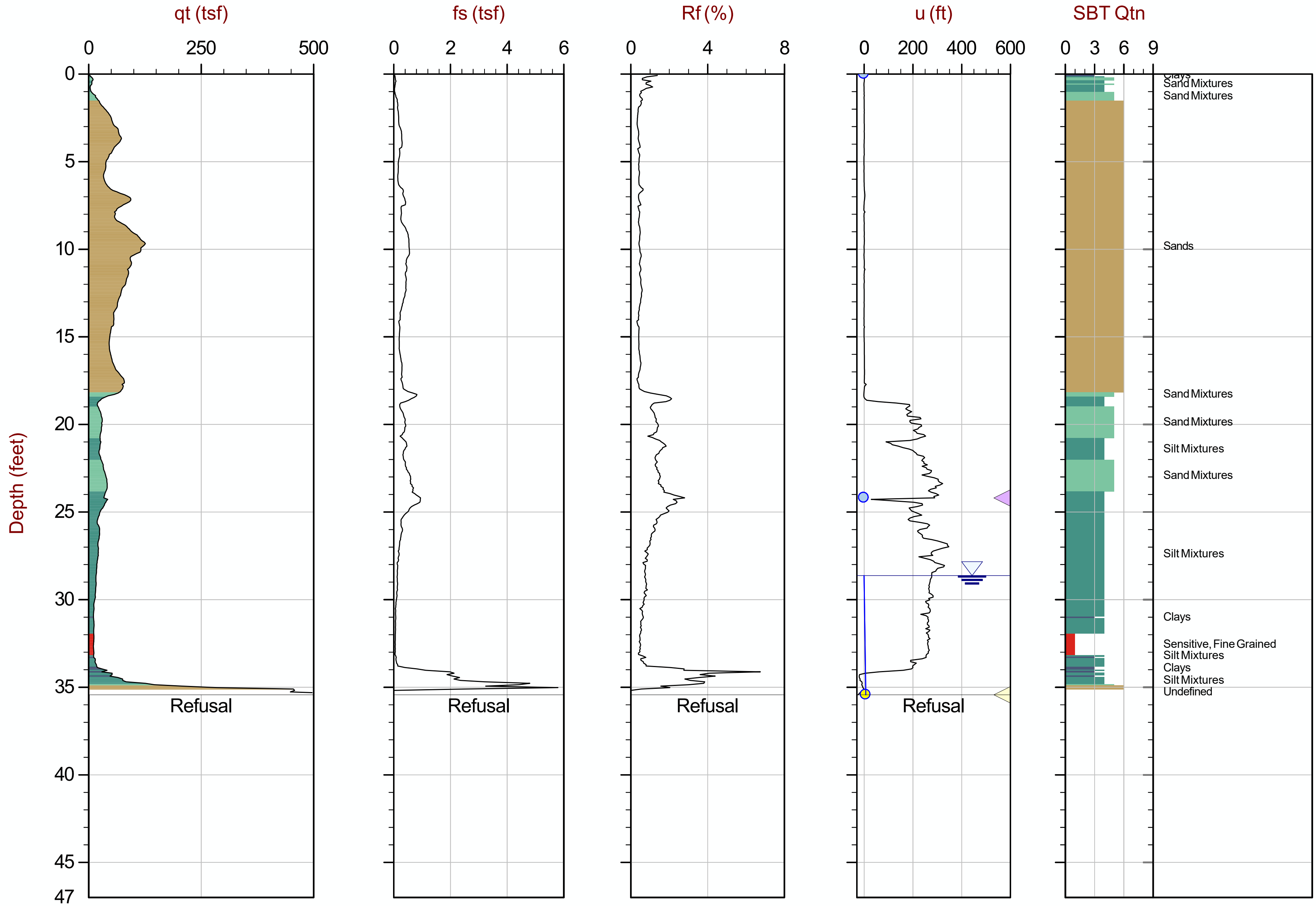
The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-24 10:01
Site: Crossroads Landfill

Sounding: SCPT18-32
Cone: 452:T1500F15U500



Max Depth: 10.800 m / 35.43 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_SP32.COR

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 684984ft E: 3038600ft Elev: 288.2

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

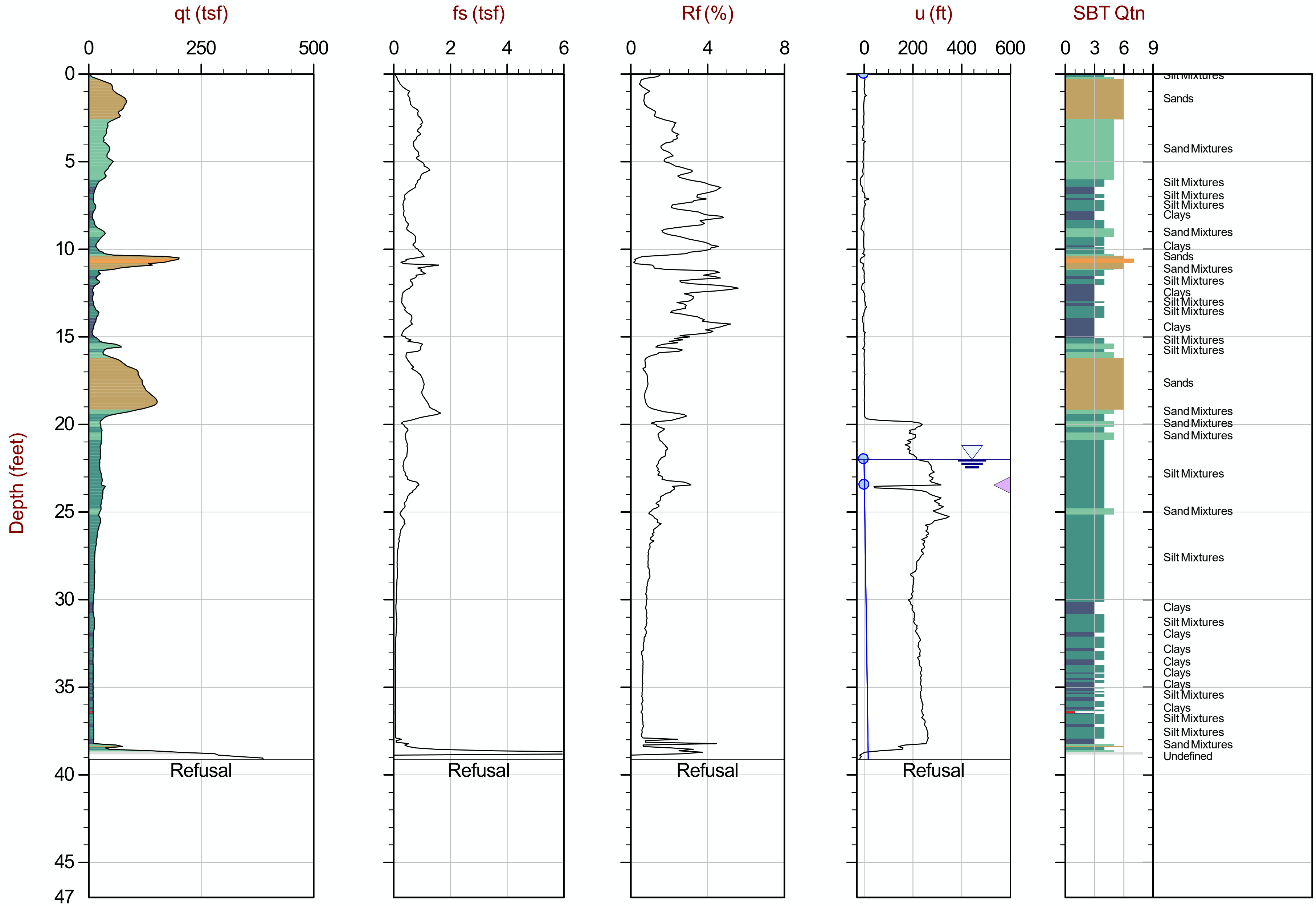
The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

ConeTec

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-24 12:30
Site: Crossroads Landfill

Sounding: CPT18-33
Cone: 452:T1500F15U500



Max Depth: 11.925 m / 39.12 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP33.COR

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 685145ft E: 3038811ft Elev: 294.7

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

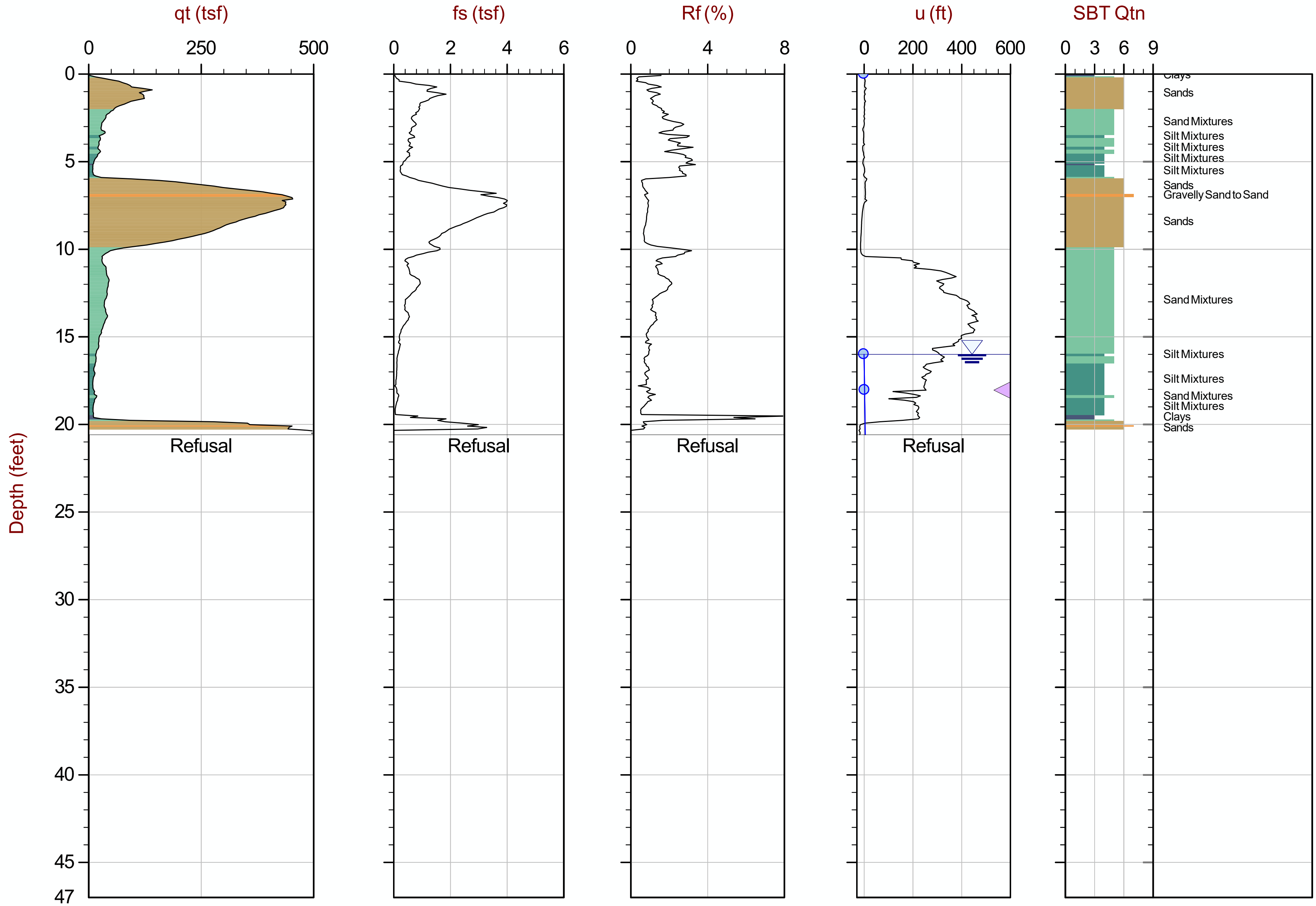
The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-22 13:51
Site: Crossroads Landfill

Sounding: CPT18-34
Cone: 452:T1500F15U500



Max Depth: 6.275 m / 20.59 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP34.COR

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 685183ft E: 3039576ft Elev: 292.5

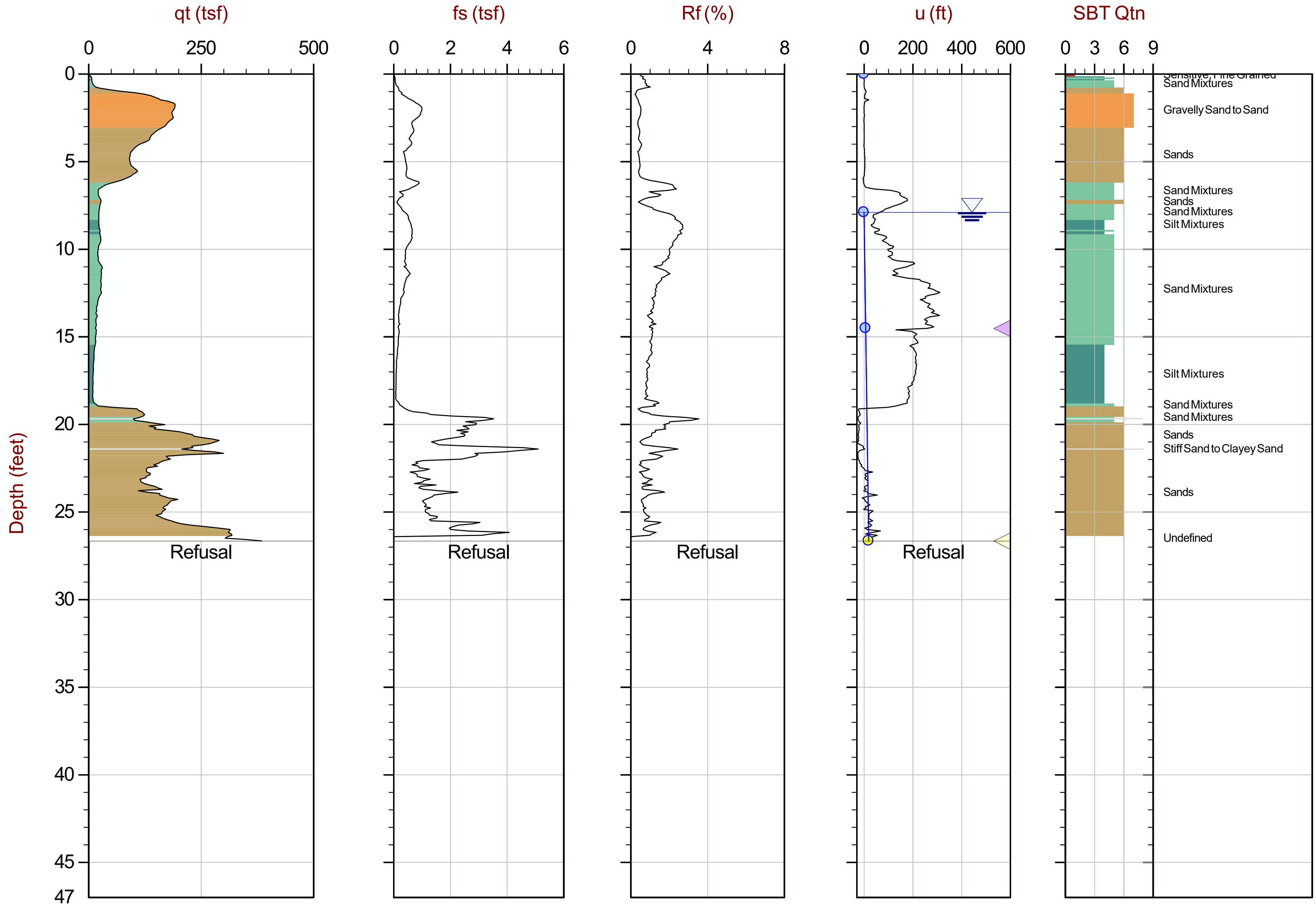
Hydrostatic Line   Ueq   Assumed Ueq   PPD, Ueq achieved   PPD, Ueq not achieved

The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-24 14:30
Site: Crossroads Landfill

Sounding: CPT18-35
Cone: 452:T1500F15U500



Max Depth: 8.125 m / 26.66 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP35.COR

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 685072ft E: 3039366ft Elev: 284.8

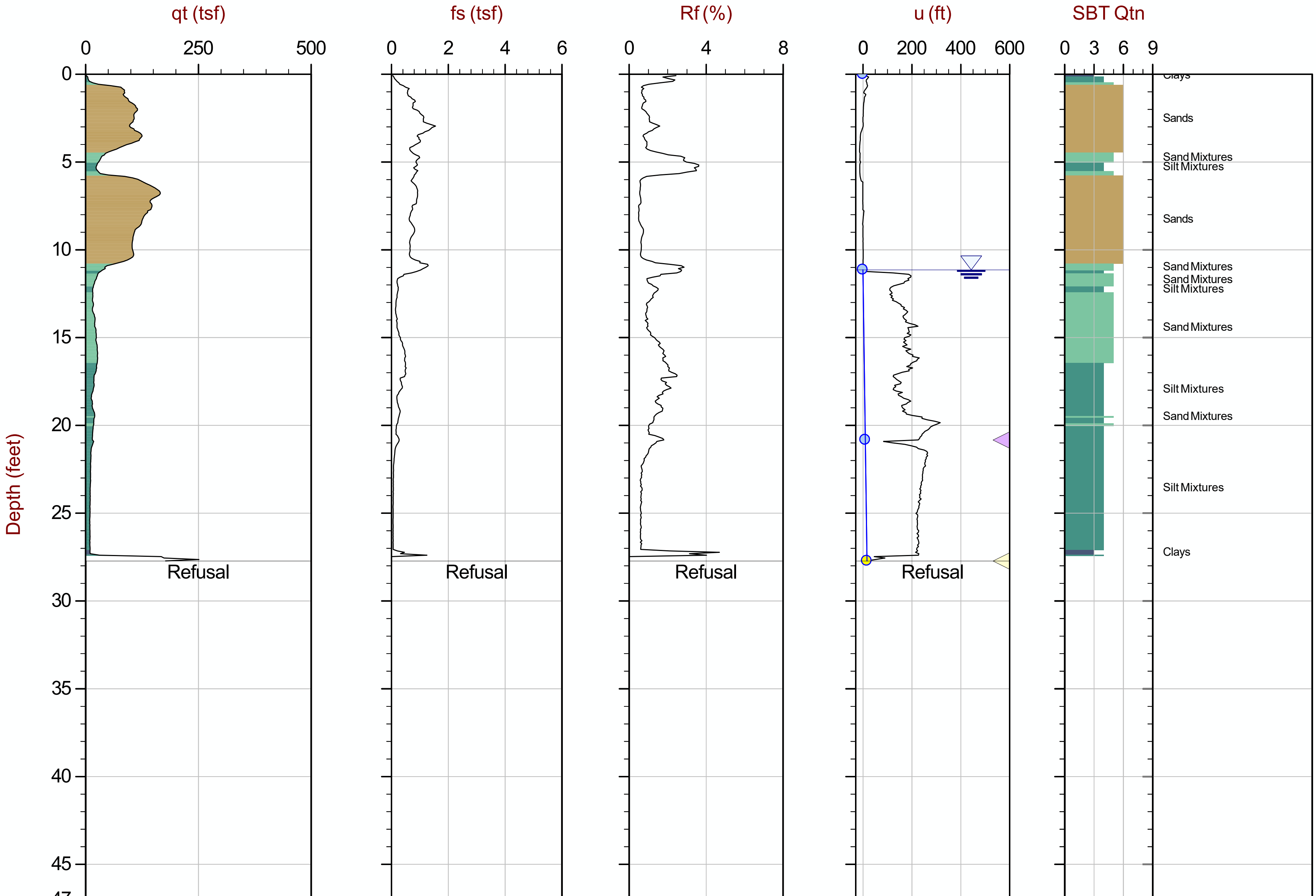
Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-22 14:46
Site: Crossroads Landfill

Sounding: CPT18-36
Cone: 452:T1500F15U500



Max Depth: 8.450 m / 27.72 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP36.COR

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 684874ft E: 3039433ft Elev: 287.1

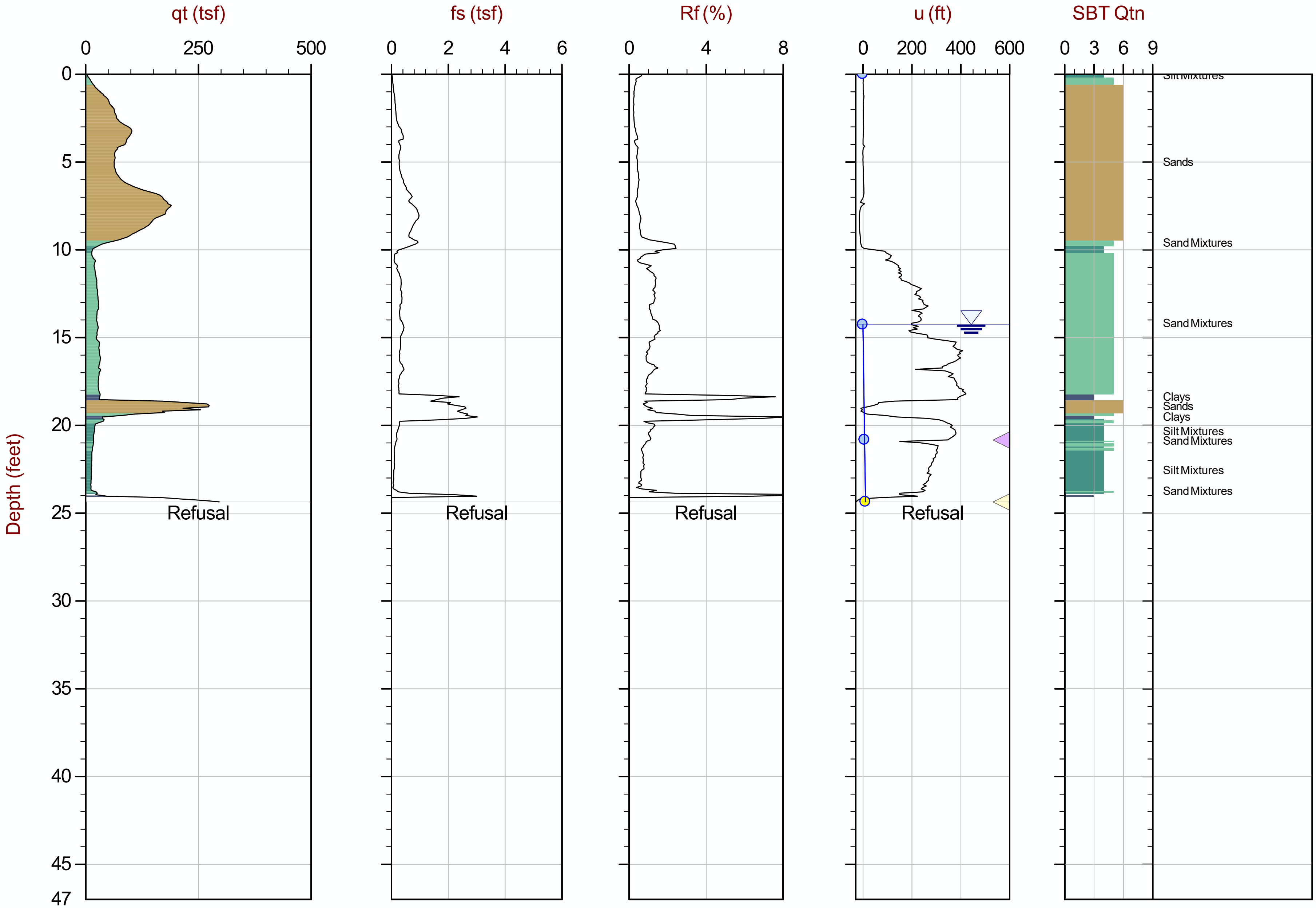
Hydrostatic Line · Ueq · Assumed Ueq · PPD, Ueq achieved · PPD, Ueq not achieved

The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-23 14:21
Site: Crossroads Landfill
Sounding: CPT18-37
Cone: 452:T1500F15U500



Max Depth: 7.425 m / 24.36 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP37.COR

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 684572ft E: 3039323ft Elev: 281.4

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

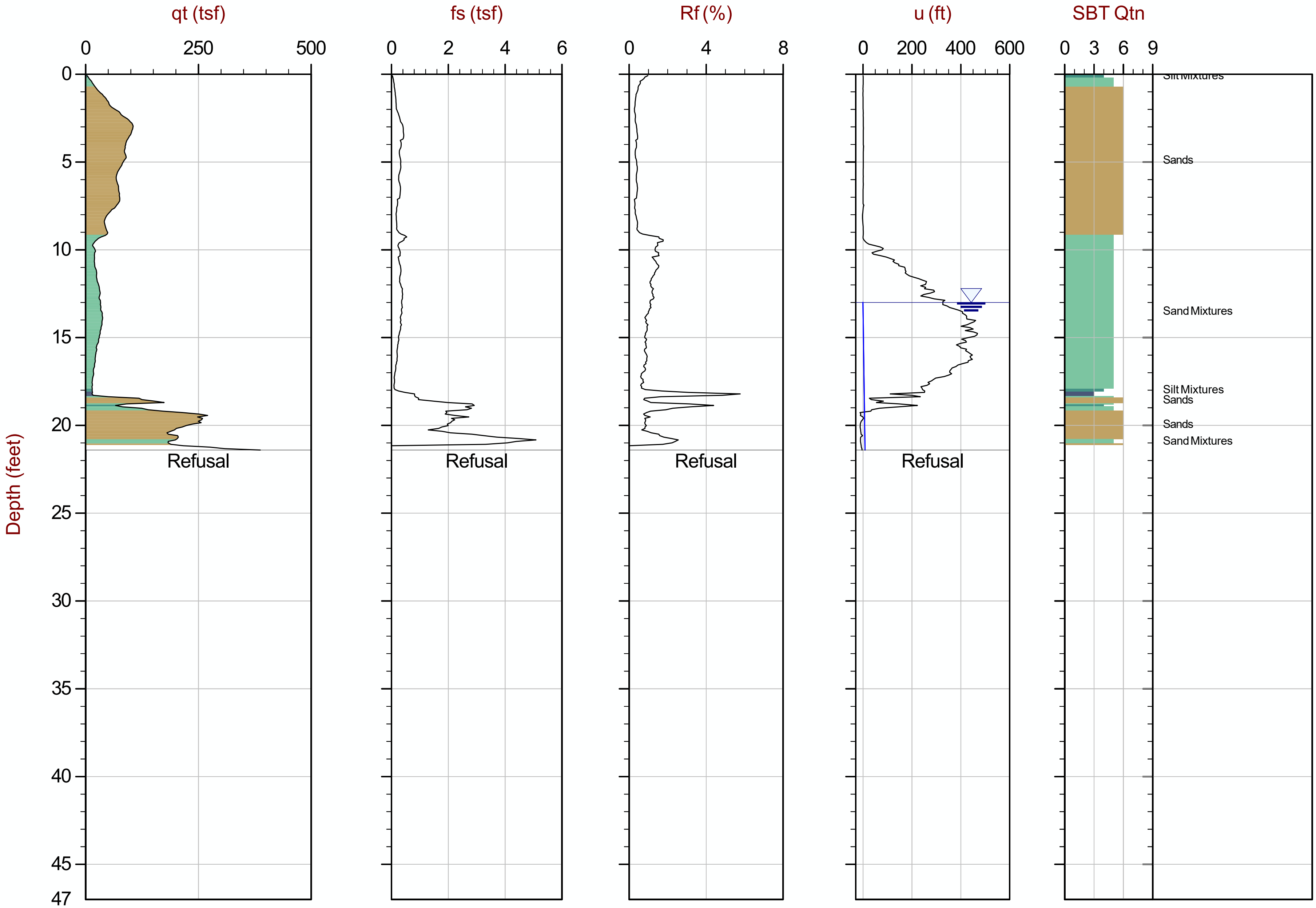
The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

ConeTec

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-22 16:53
Site: Crossroads Landfill

Sounding: CPT18-38
Cone: 452:T1500F15U500



Max Depth: 6.525 m / 21.41 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP38.COR

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 684453ft E: 3039268ft Elev: 281.2

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

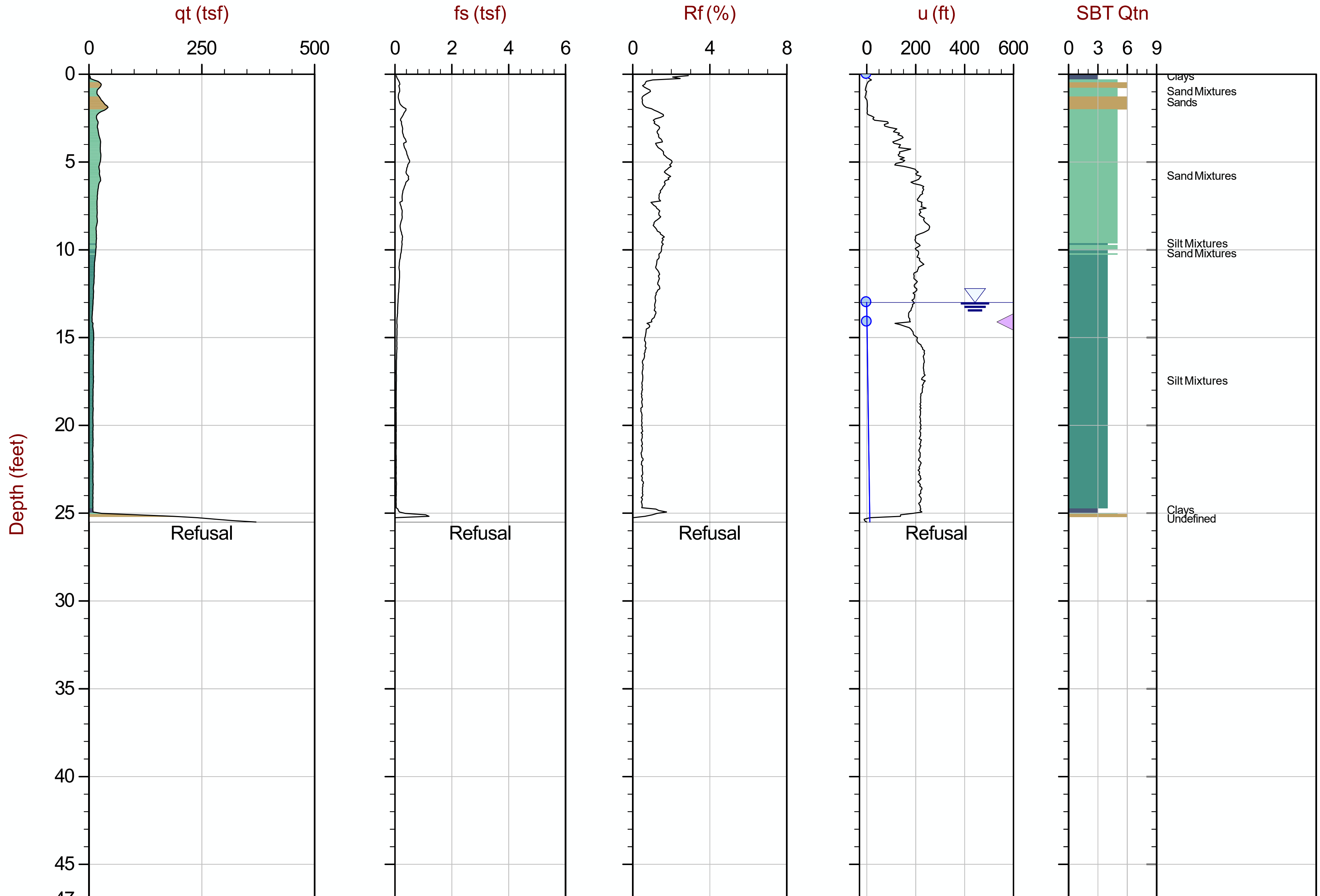
The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-20 16:11
Site: Crossroads Landfill

Sounding: CPT18-39
Cone: 388:T1500F15U500



Max Depth: 7.775 m / 25.51 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP39.COR

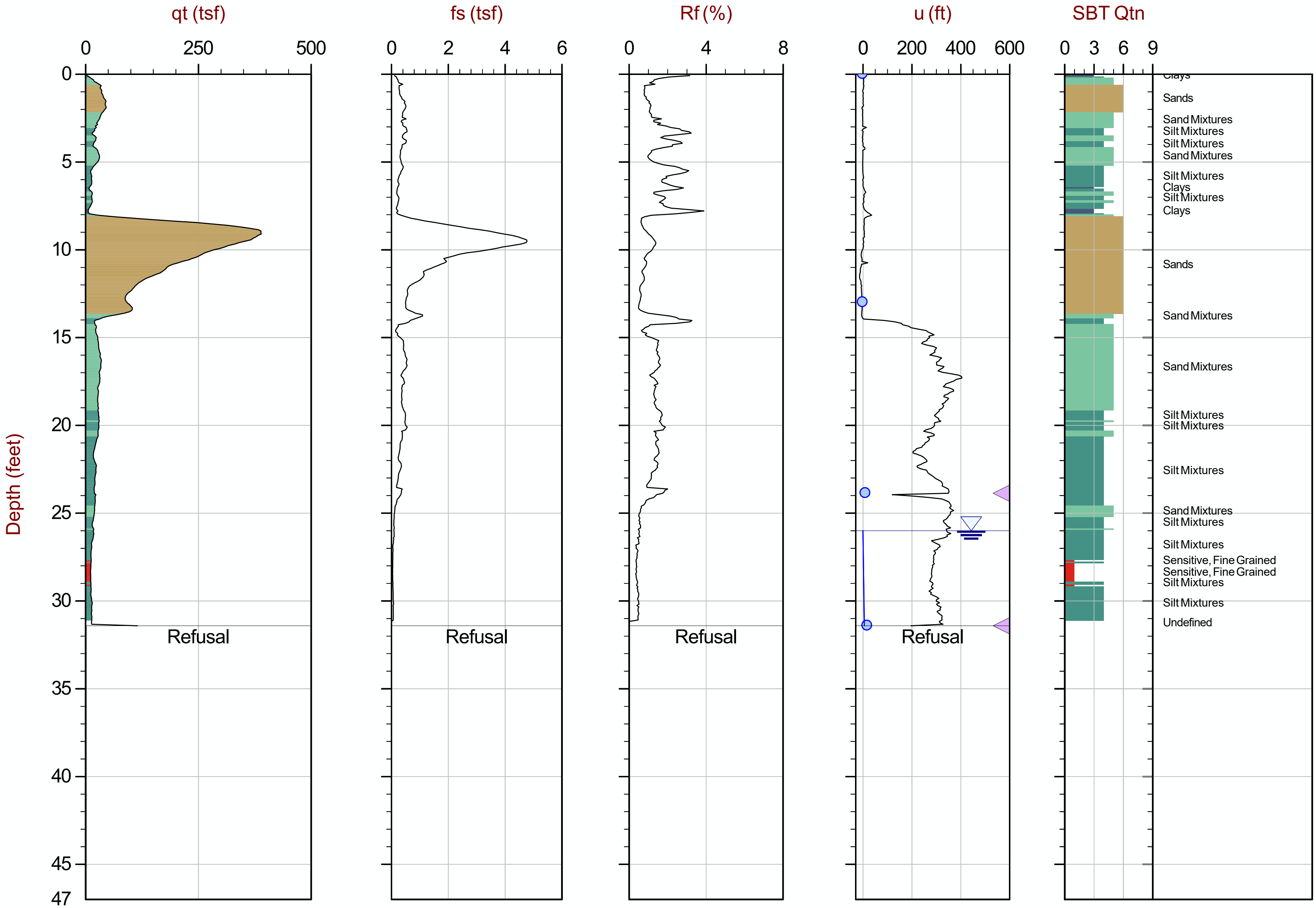
SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 684542ft E: 3040317ft Elev: 274.0

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

The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-20 14:54
Site: Crossroads Landfill
Sounding: CPT18-40
Cone: 388:T1500F15U500



Max Depth: 9.575 m / 31.41 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP40.COR

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 684682ft E: 3040159ft Elev: 289.6

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

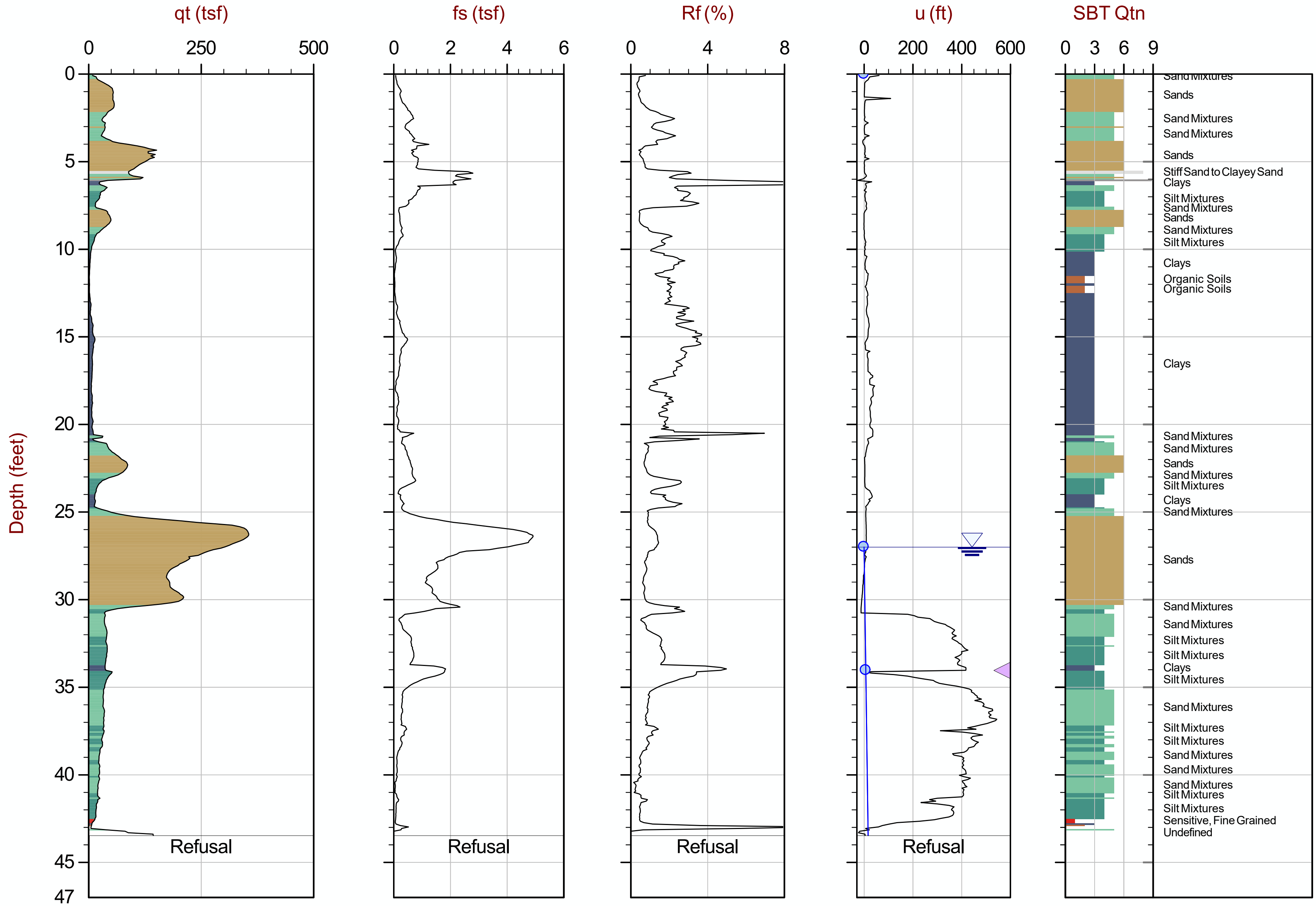
The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-21 08:24
Site: Crossroads Landfill

Sounding: SCPT18-41
Cone: 388:T1500F15U500



Max Depth: 13.250 m / 43.47 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_SP41.COR

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 684856ft E: 3039972ft Elev: 308.4

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

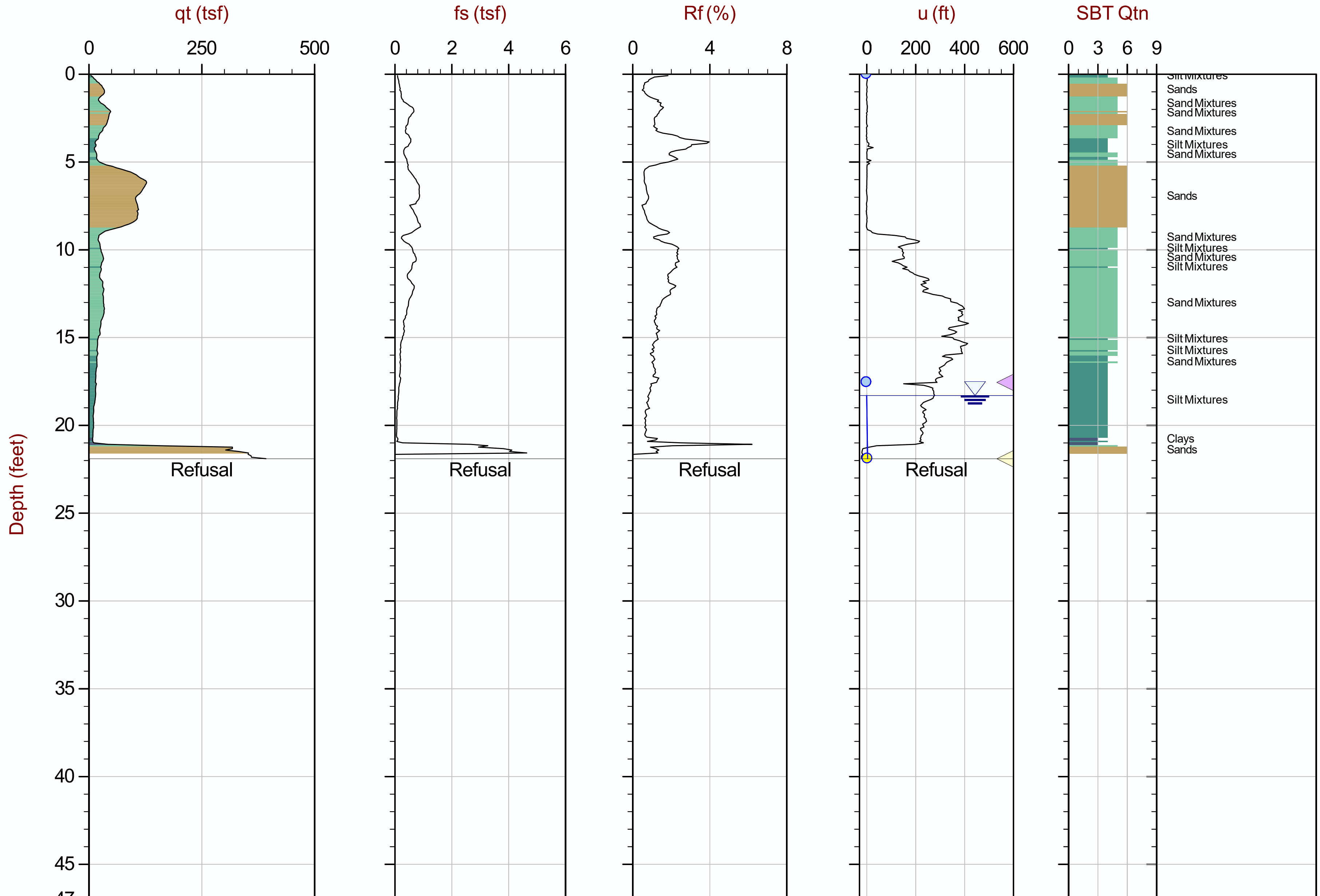
The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-21 13:52
Site: Crossroads Landfill

Sounding: CPT18-42
Cone: 388:T1500F15U500



Max Depth: 6.675 m / 21.90 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP42.COR

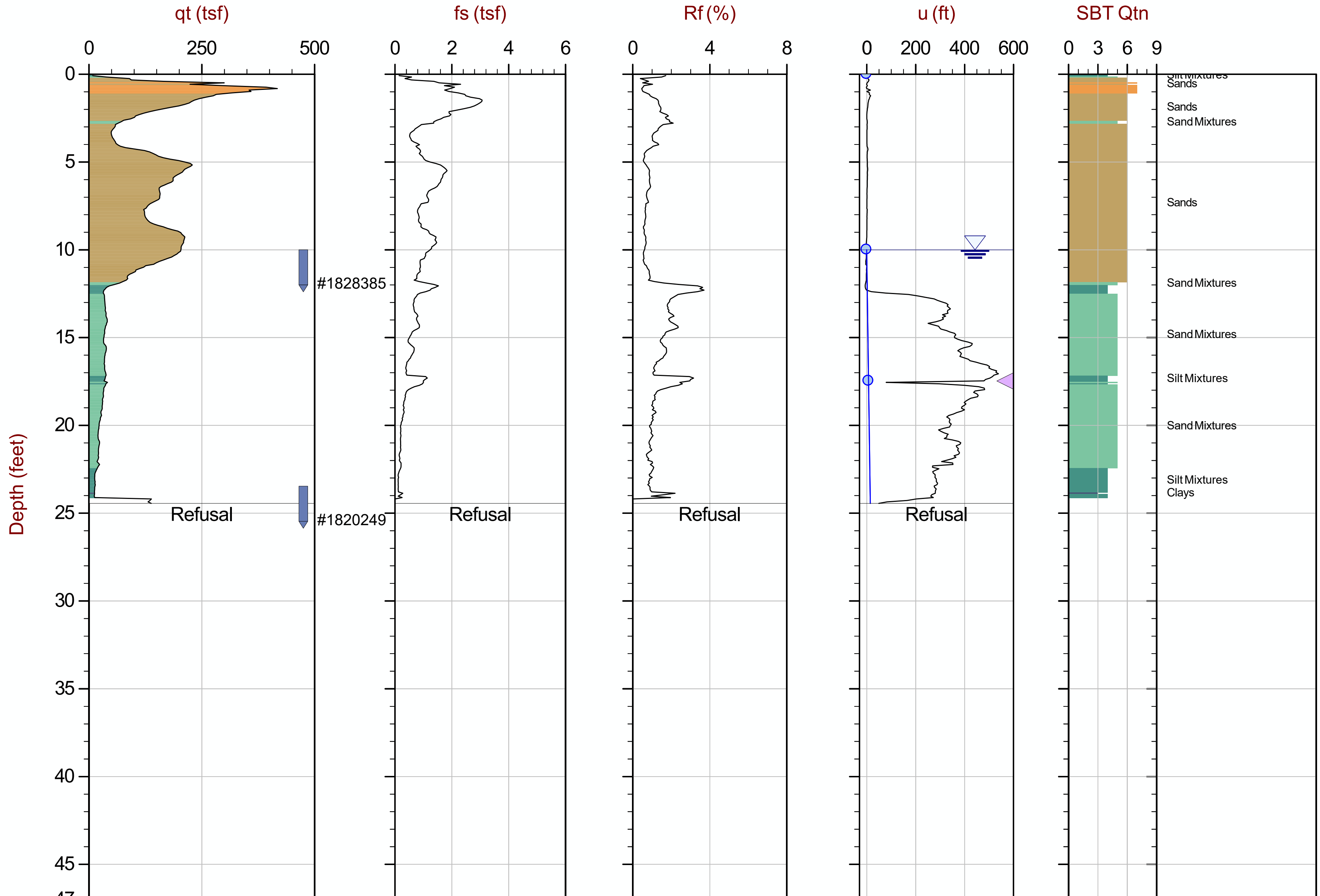
SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 685035ft E: 3040220ft Elev: 286.3

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

The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-22 11:48
Site: Crossroads Landfill
Sounding: CPT18-43
Cone: 452:T1500F15U500



Max Depth: 7.450 m / 24.44 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP43.COR

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 685028ft E: 3039769ft Elev: 292.2

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

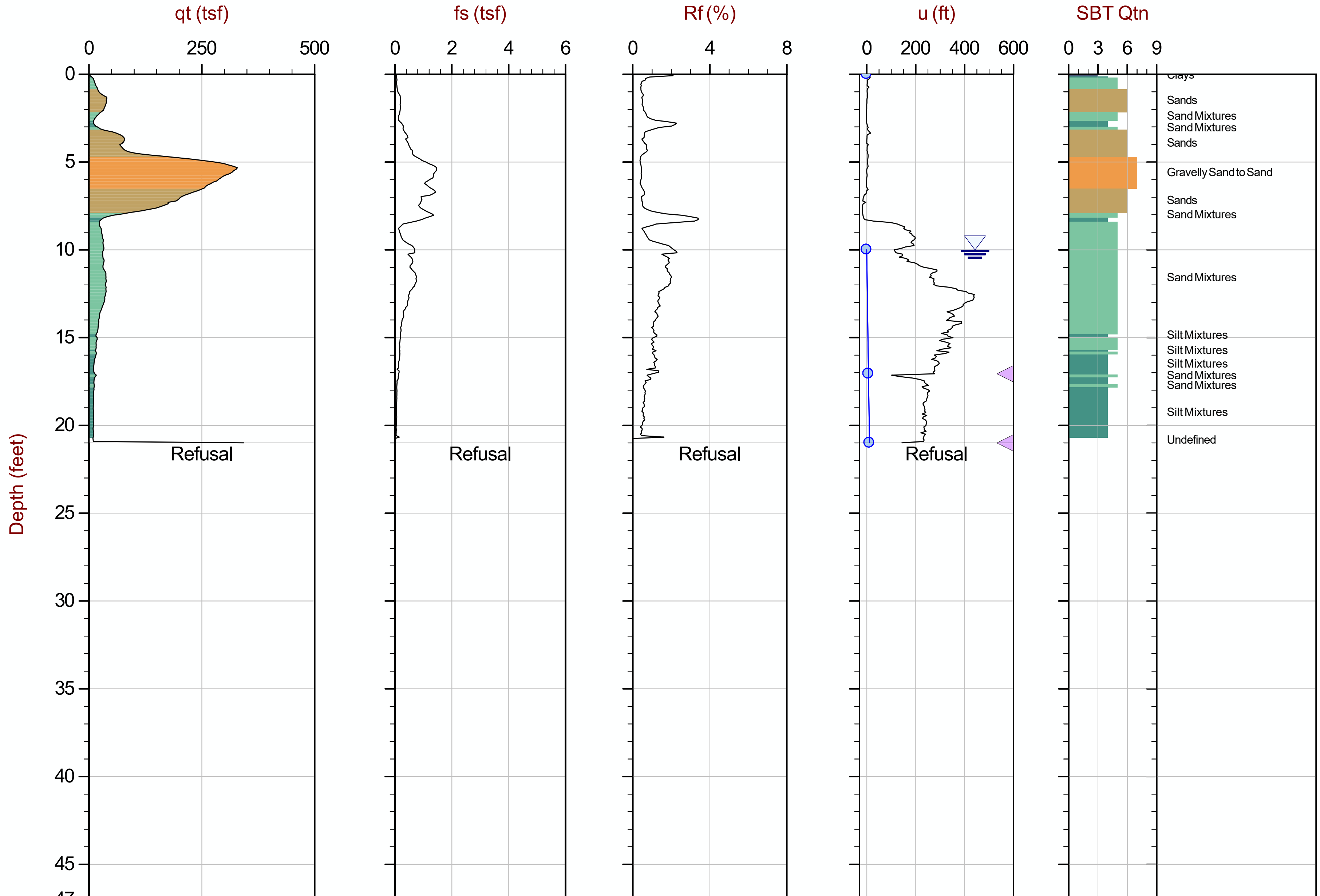
The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-21 10:55
Site: Crossroads Landfill

Sounding: CPT18-44
Cone: 388:T1500F15U500



Max Depth: 6.400 m / 21.00 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP44.COR

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 685190ft E: 3040007ft Elev: 290.7

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

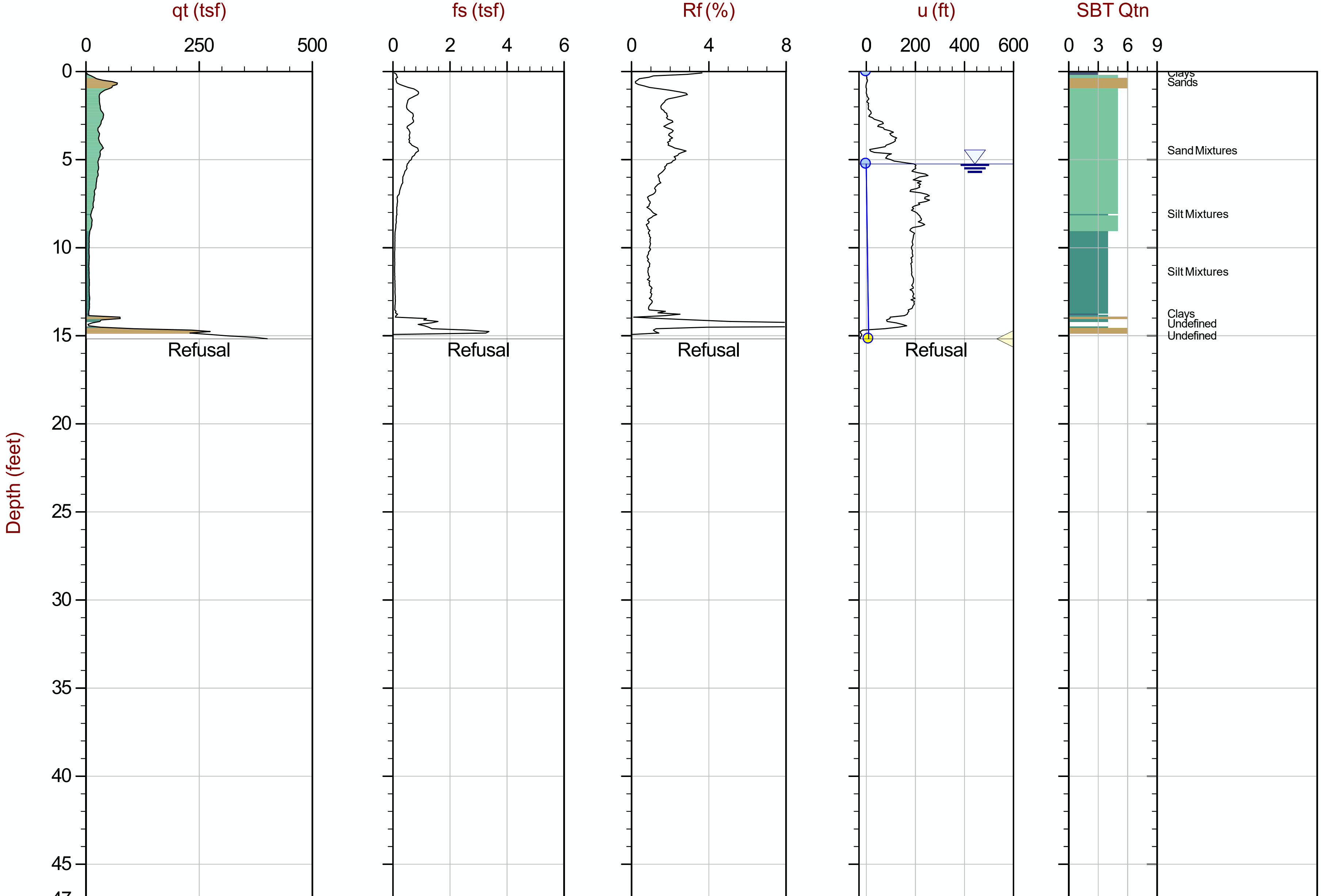
The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-21 12:08
Site: Crossroads Landfill

Sounding: CPT18-45
Cone: 388:T1500F15U500



Max Depth: 4.625 m / 15.17 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP45.COR

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 685307ft E: 3040180ft Elev: 280.5

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

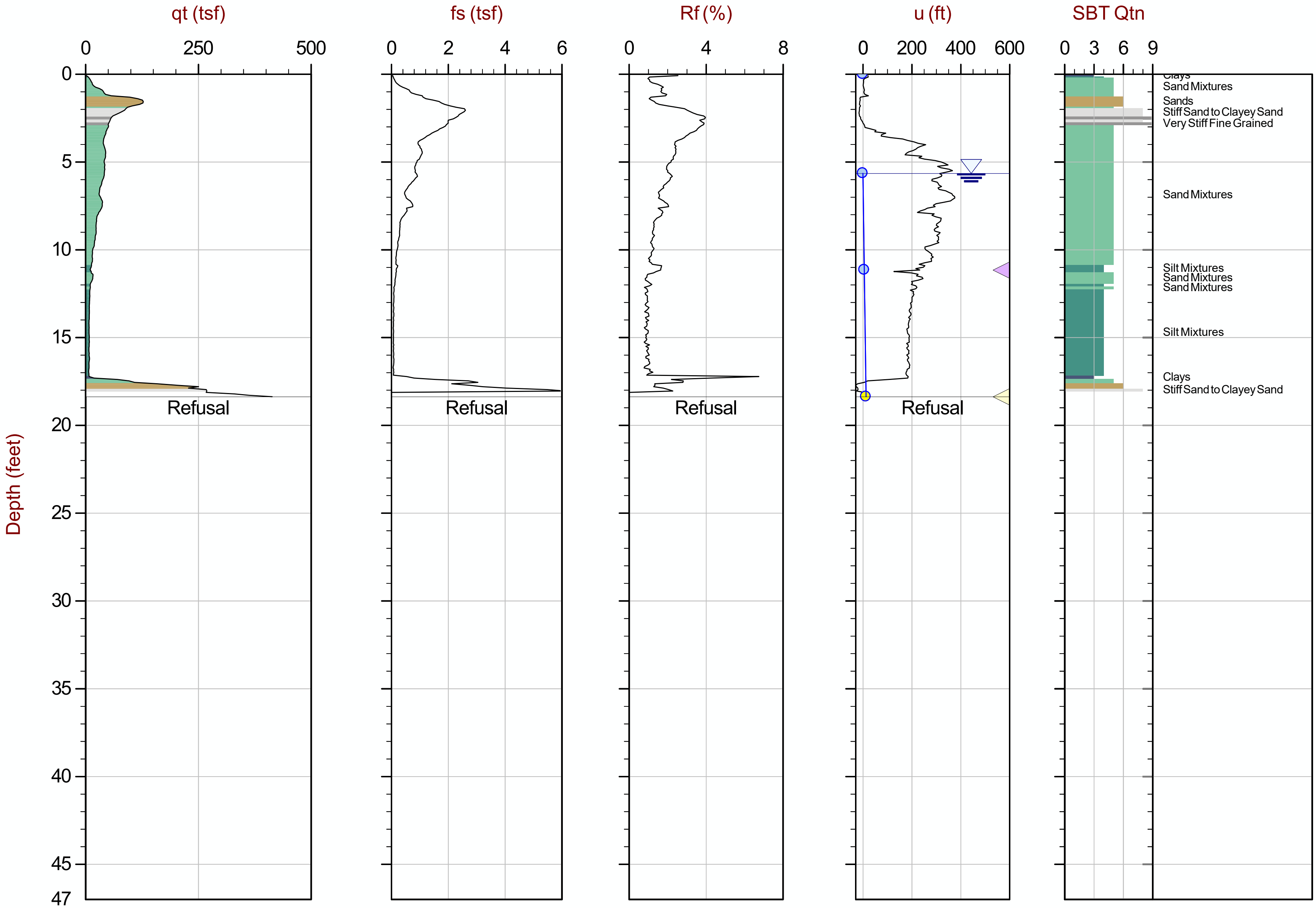
The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-21 12:45
Site: Crossroads Landfill

Sounding: CPT18-46
Cone: 388:T1500F15U500



Max Depth: 5.600 m / 18.37 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP46.COR

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 685385ft E: 3040288ft Elev: 280.5

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

The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

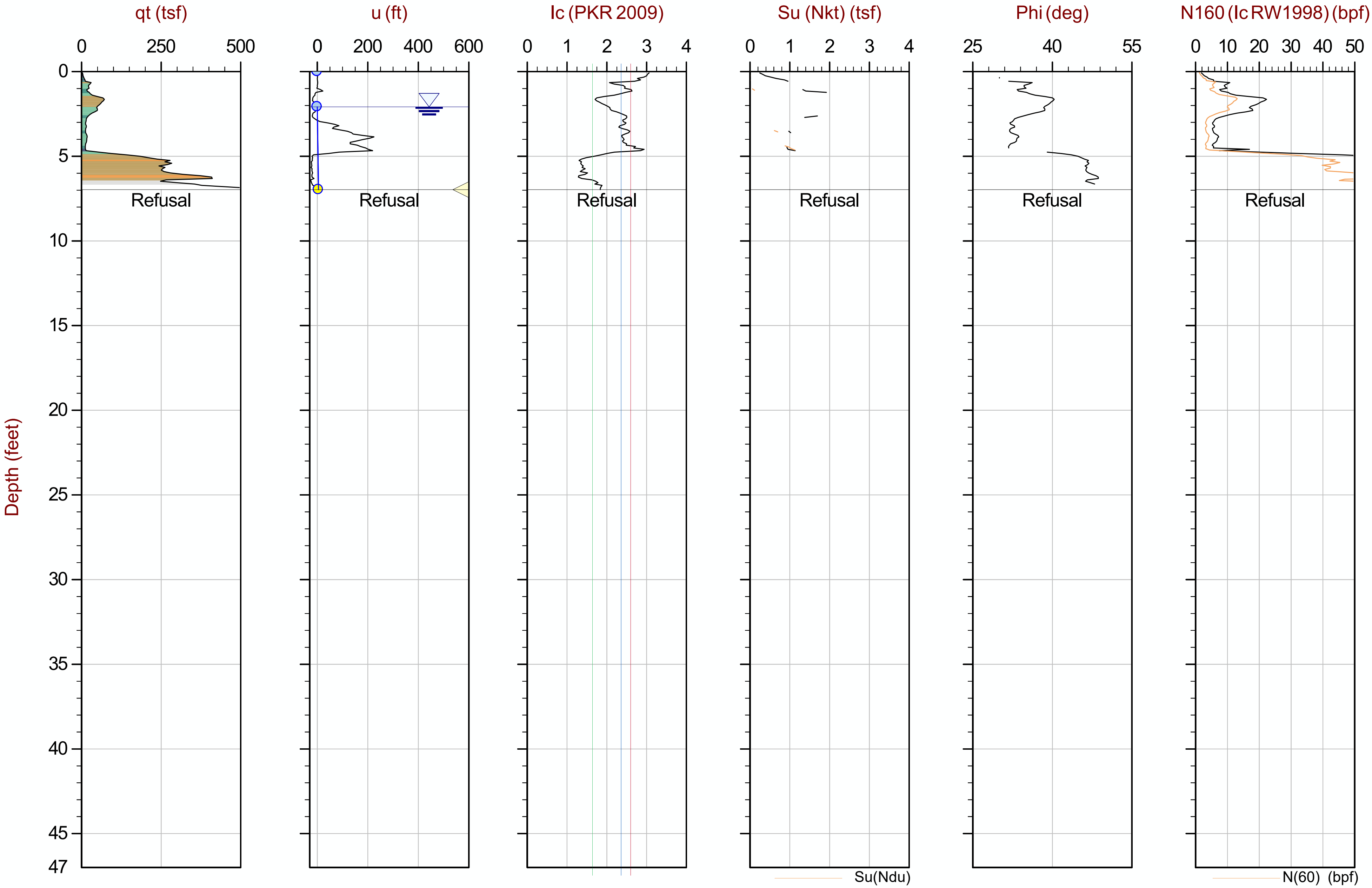
Advanced Cone Penetration Test Plots

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-25 11:16
Site: Crossroads Landfill

Sounding: CPT18-01
Cone: 452:T1500F15U500



Max Depth: 2.125 m / 6.97 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP01.COR
Su Nkt/Ndu: 12.5 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 686156ft E: 3038544ft Elev: 281.6

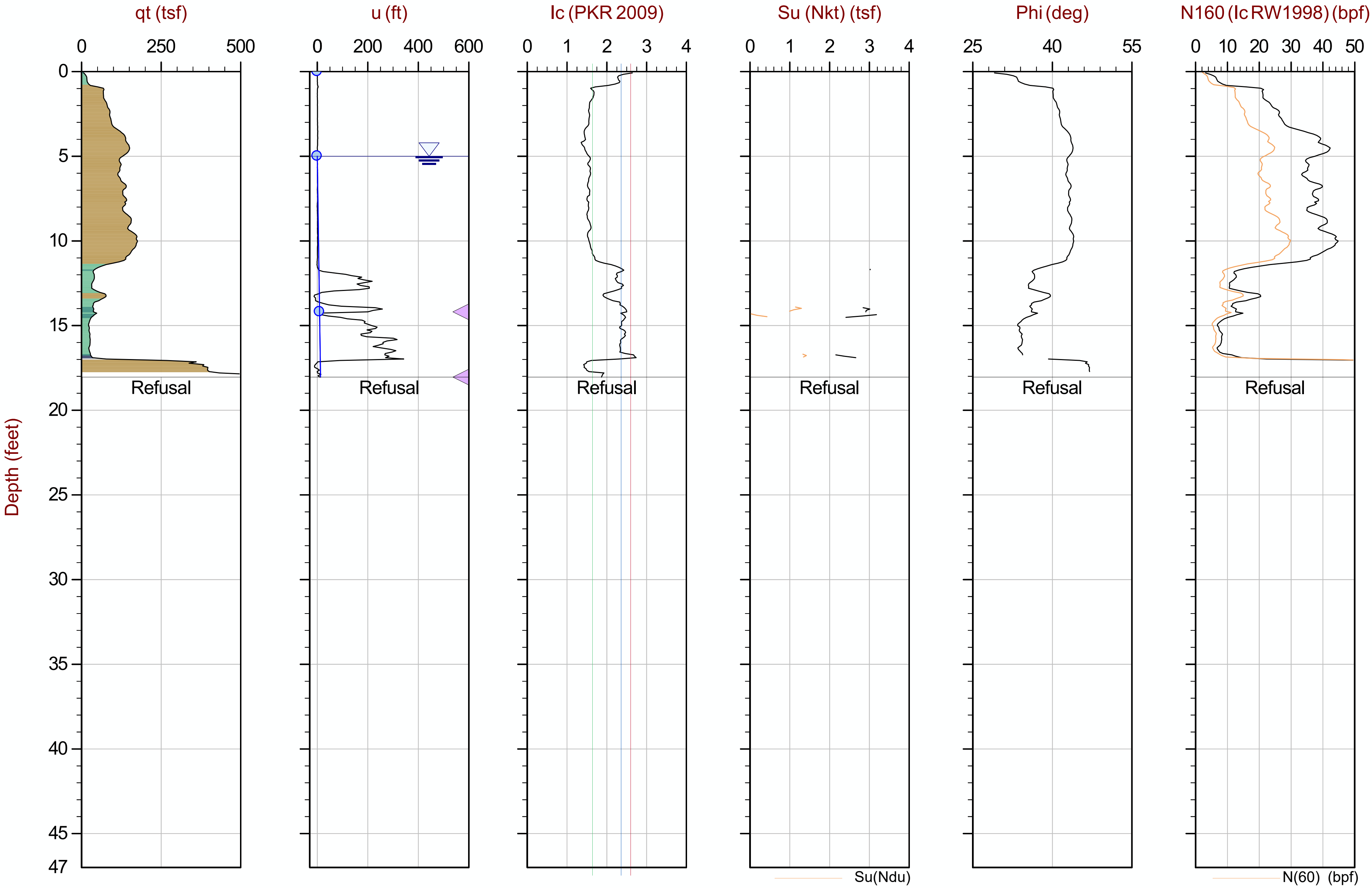
Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-25 11:46
Site: Crossroads Landfill
Sounding: SCPT18-02
Cone: 452:T1500F15U500



Max Depth: 5.500 m / 18.04 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_SP02.COR
Su Nkt/Ndu: 12.5 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 686044ft E: 3038601ft Elev: 298.8

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

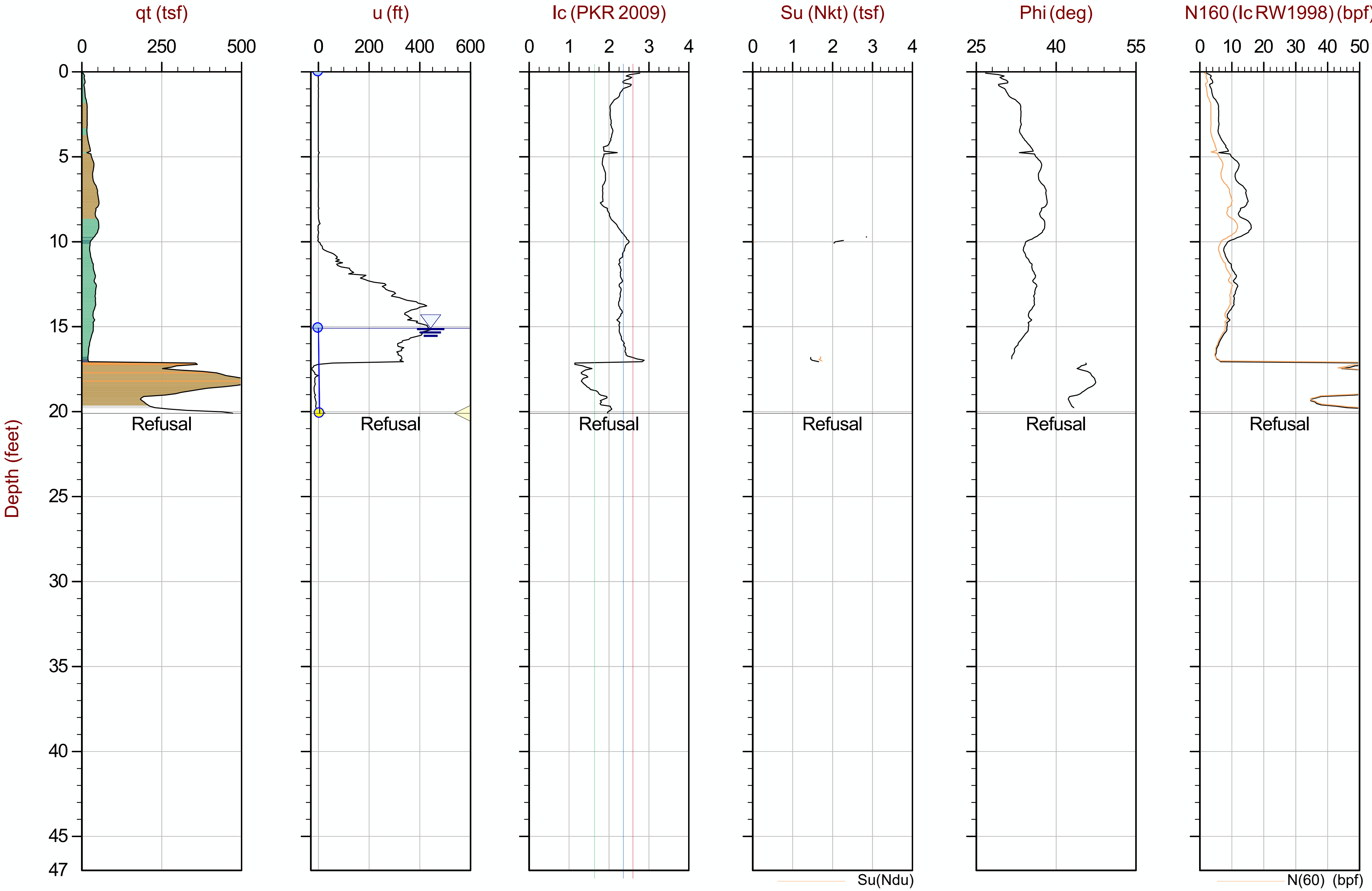
The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-25 13:08
Site: Crossroads Landfill

Sounding: CPT18-03
Cone: 452:T1500F15U500



Max Depth: 6.125 m / 20.09 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP03.COR
Su Nkt/Ndu: 12.5 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 685862ft E: 3038766ft Elev: 294.6

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

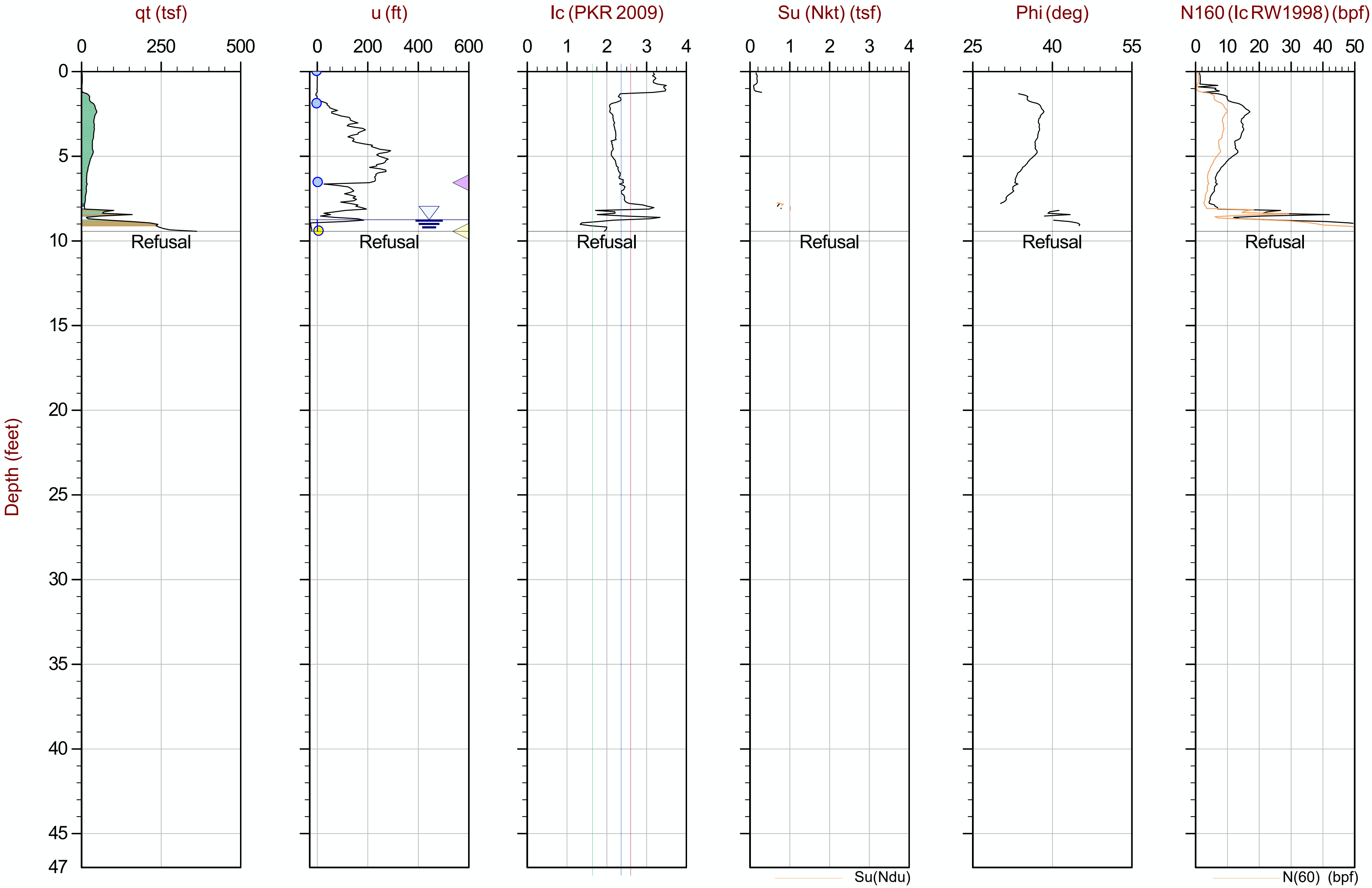
The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-25 10:24
Site: Crossroads Landfill

Sounding: CPT18-04
Cone: 452:T1500F15U500



Max Depth: 2.875 m / 9.43 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP04.COR
Su Nkt/Ndu: 12.5 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 685670ft E: 3038966ft Elev: 284.9

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

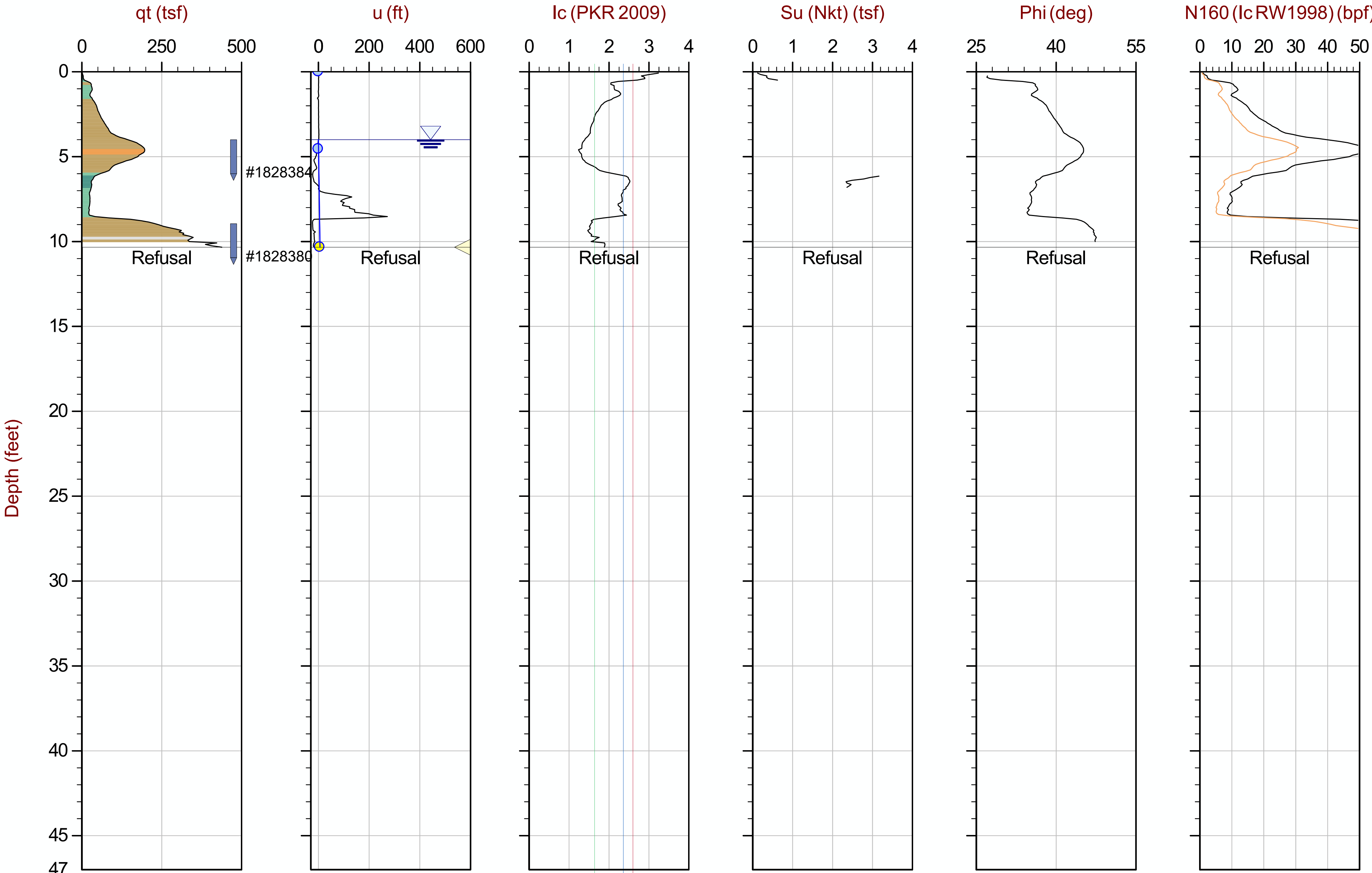
The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-25 09:44
Site: Crossroads Landfill

Sounding: CPT18-05
Cone: 452:T1500F15U500



Max Depth: 3.150 m / 10.33 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP05.COR
Su Nkt/Ndu: 12.5 / 6.0

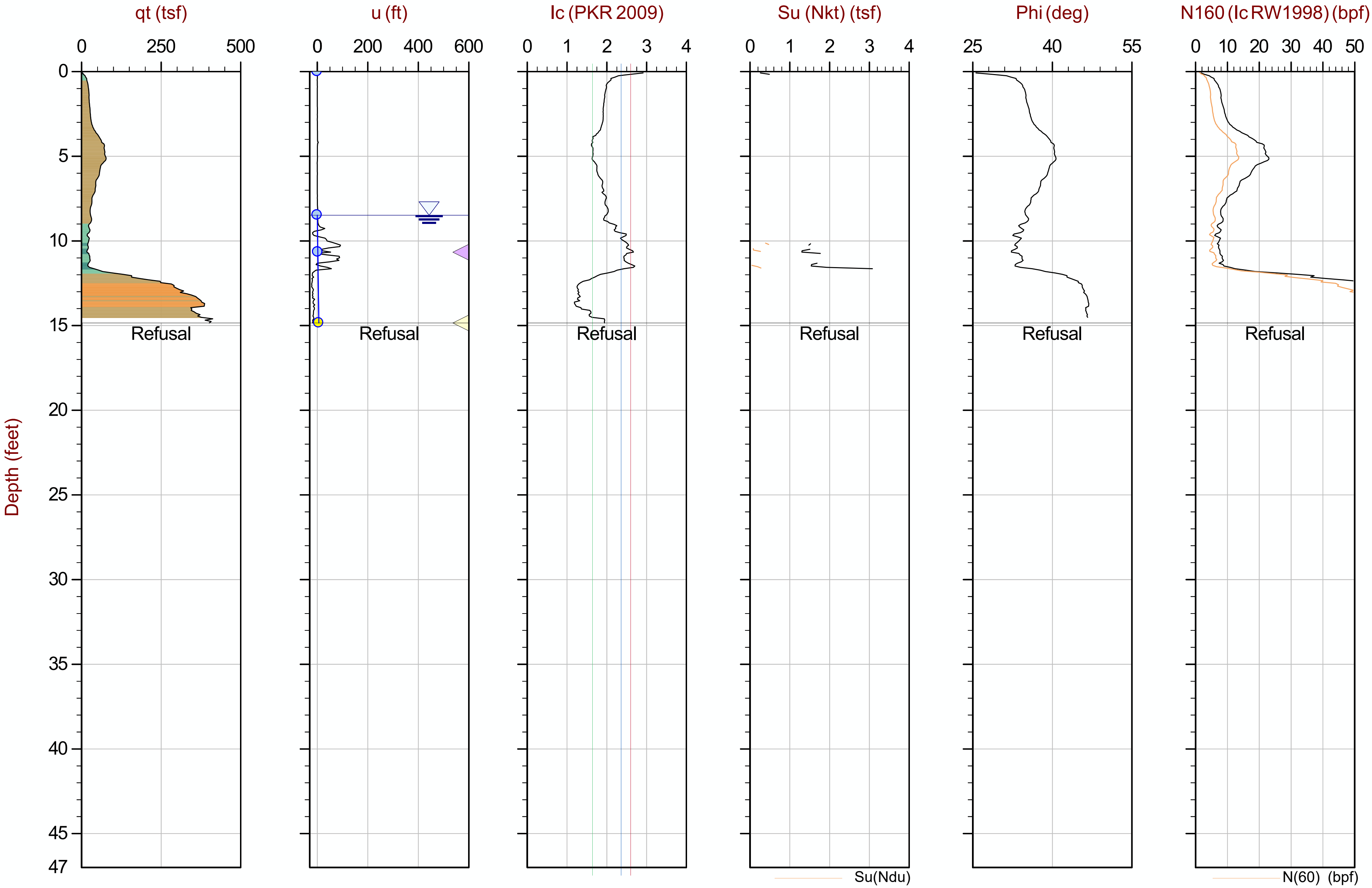
SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 685836ft E: 3039124ft Elev: 292.8

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

The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-25 08:54
Site: Crossroads Landfill
Sounding: CPT18-06
Cone: 452:T1500F15U500



Max Depth: 4.525 m / 14.85 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP06.COR
Su Nkt/Ndu: 12.5 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 686119ft E: 3039488ft Elev: 304.8

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

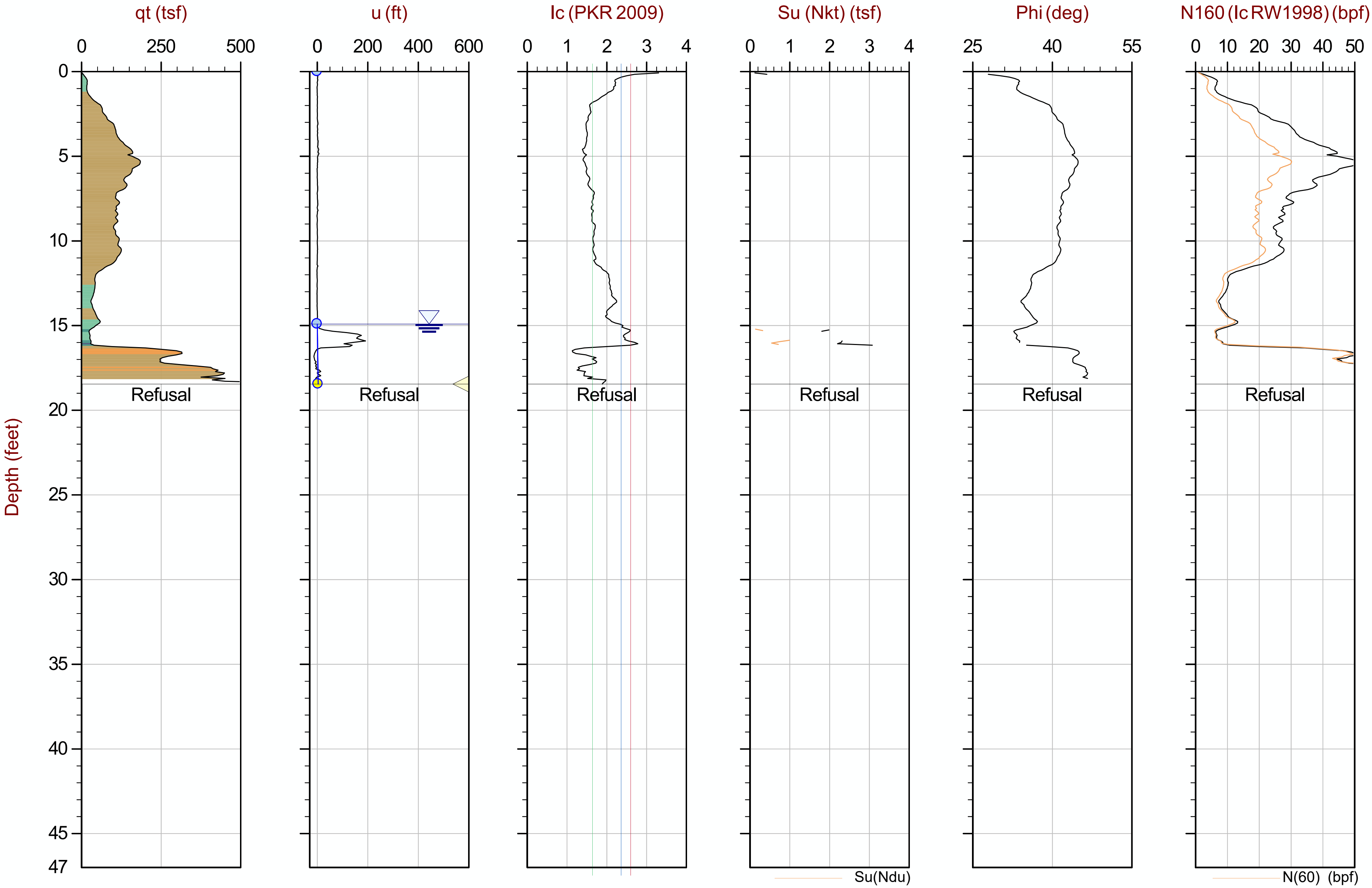
The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-24 16:27
Site: Crossroads Landfill

Sounding: SCPT18-07
Cone: 452:T1500F15U500



Max Depth: 5.625 m / 18.45 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_SP07.COR
Su Nkt/Ndu: 12.5 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 685999ft E: 3039398ft Elev: 308.2

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

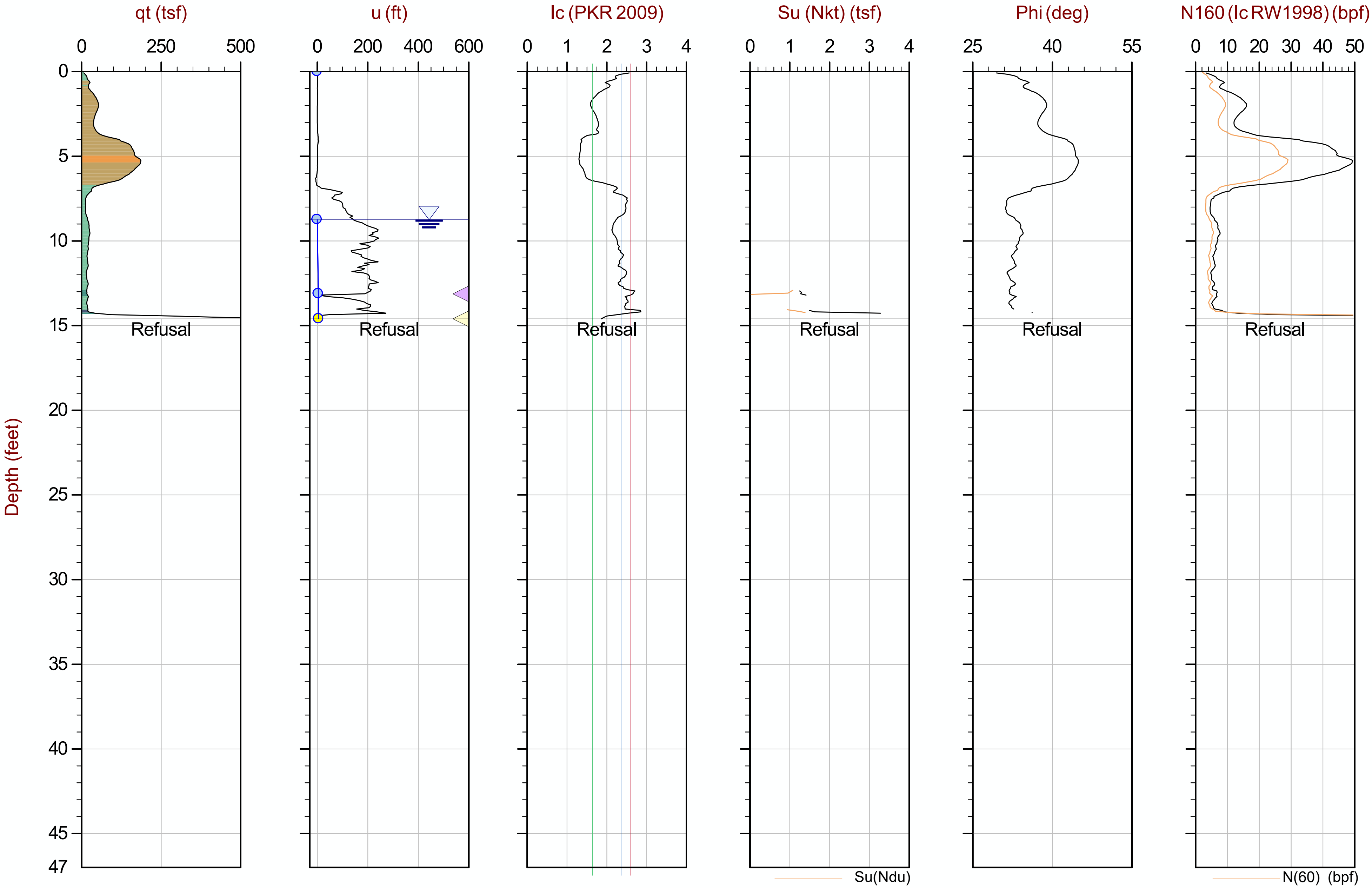
The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

ConeTec

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-26 16:39
Site: Crossroads Landfill

Sounding: CPT18-08
Cone: 452:T1500F15U500



Max Depth: 4.450 m / 14.60 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP08.COR
Su Nkt/Ndu: 12.5 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 685717ft E: 3039273ft Elev: 294.2

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

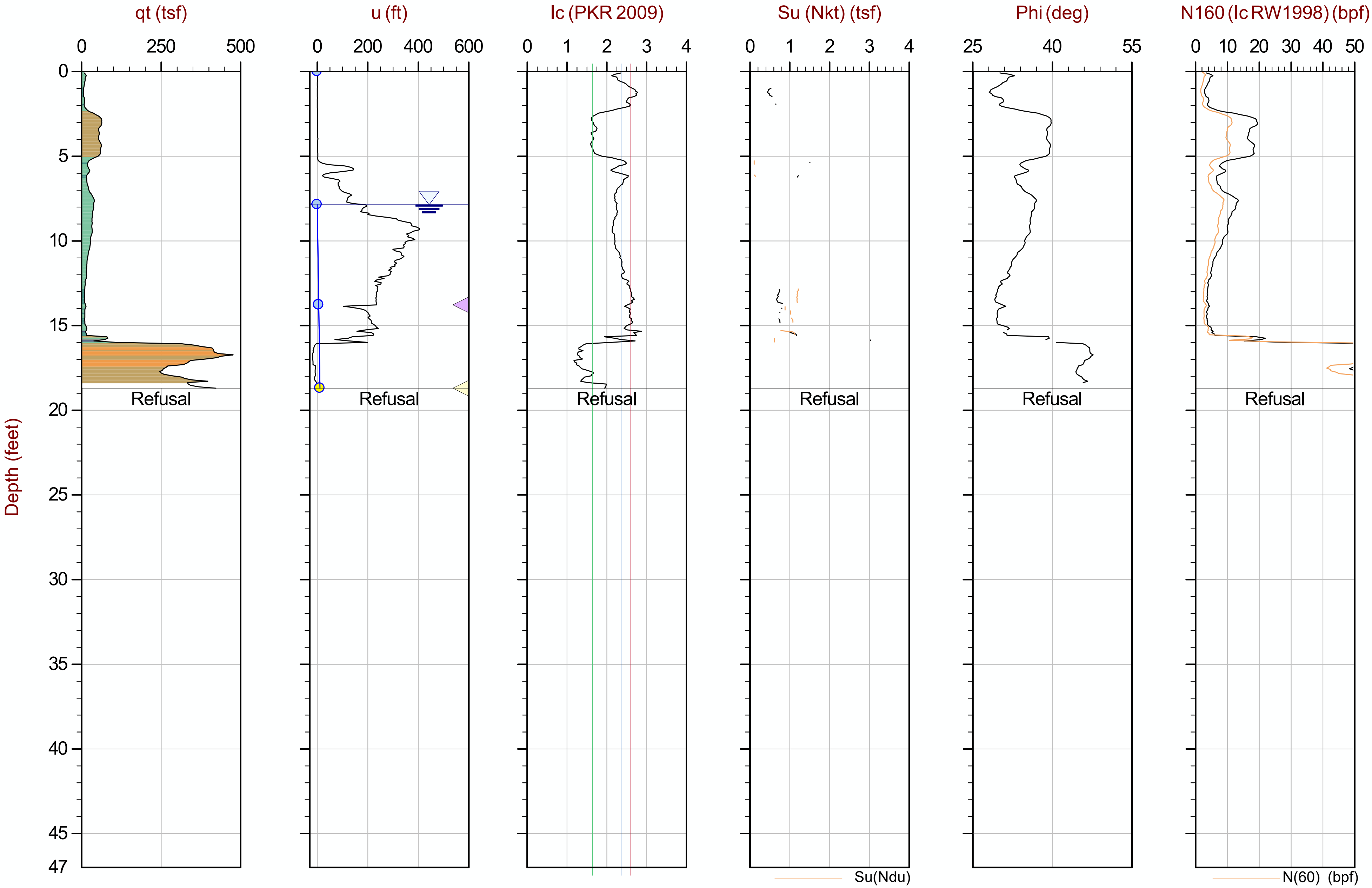
The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-22 09:14
Site: Crossroads Landfill

Sounding: CPT18-09
Cone: 452:T1500F15U500



Max Depth: 5.700 m / 18.70 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP09.COR
Su Nkt/Ndu: 12.5 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 685718ft E: 3039630ft Elev: 293.0

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

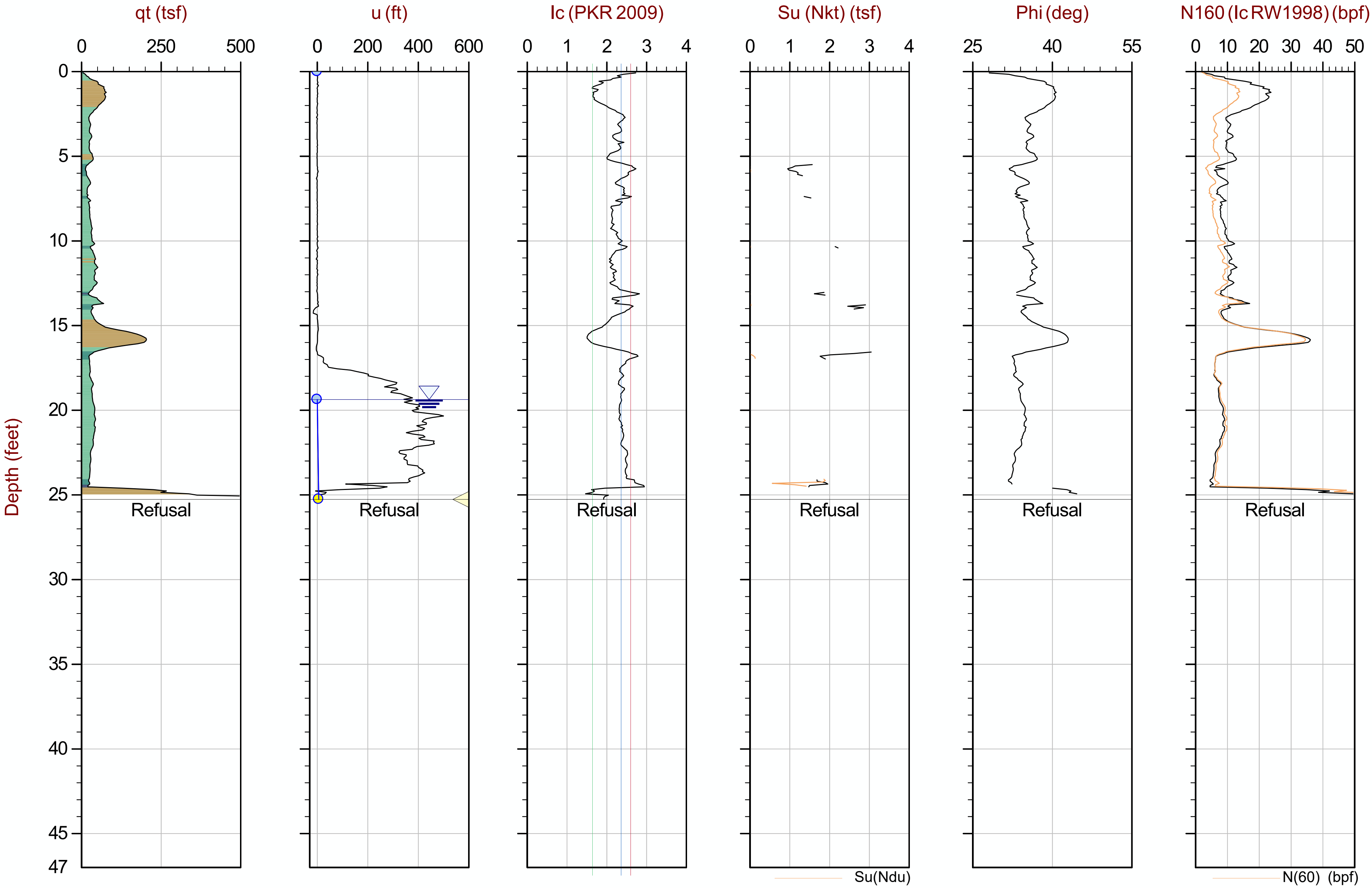
The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-24 15:22
Site: Crossroads Landfill

Sounding: CPT18-10
Cone: 452:T1500F15U500



Max Depth: 7.700 m / 25.26 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP10.COR
Su Nkt/Ndu: 12.5 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 685558ft E: 3039439ft Elev: 304.0

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

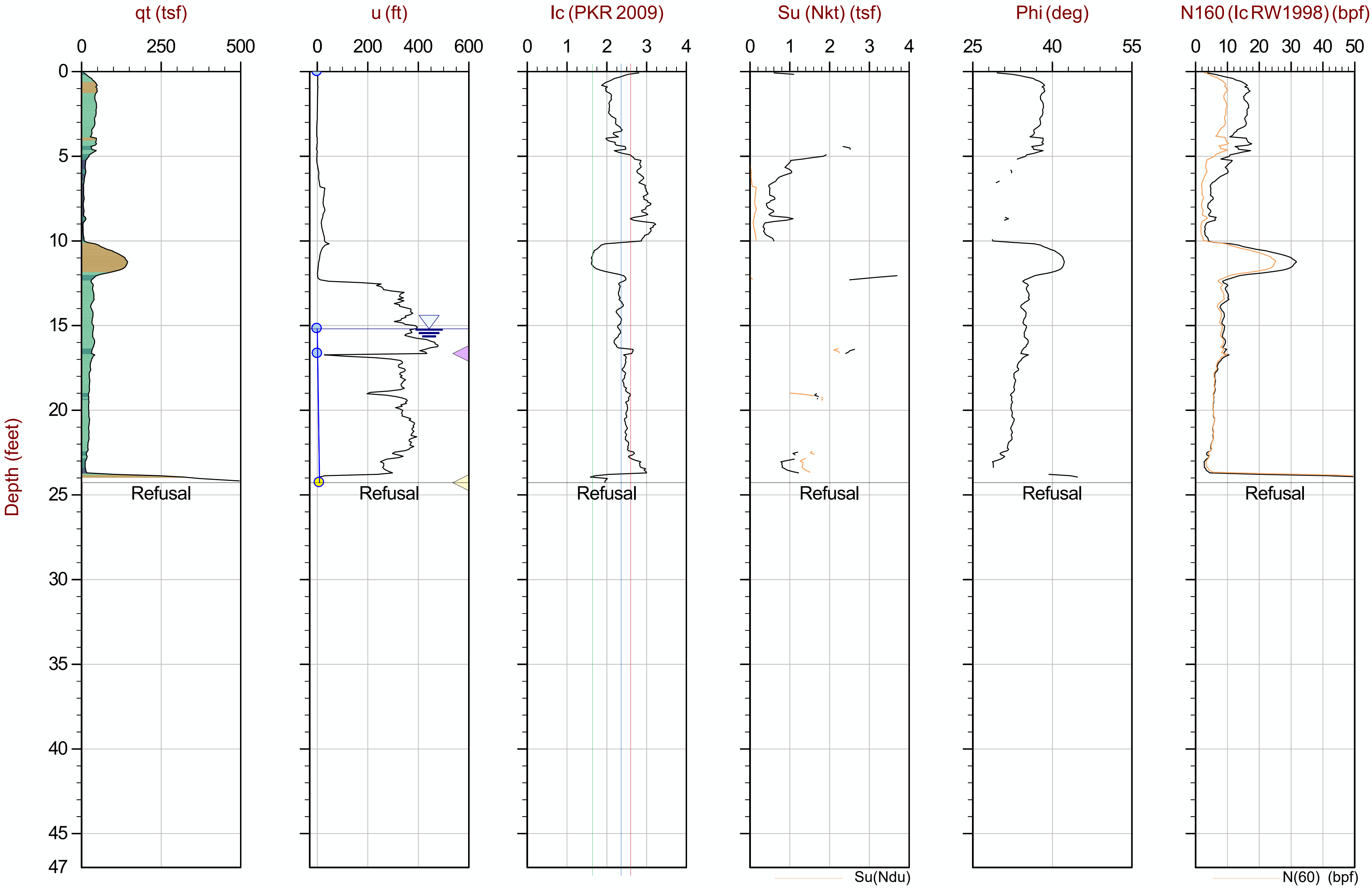
The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-22 08:16
Site: Crossroads Landfill

Sounding: CPT18-11
Cone: 452:T1500F15U500



Max Depth: 7.400 m / 24.28 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP11.COR
Su Nkt/Ndu: 12.5 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 685541ft E: 3039983ft Elev: 298.6

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

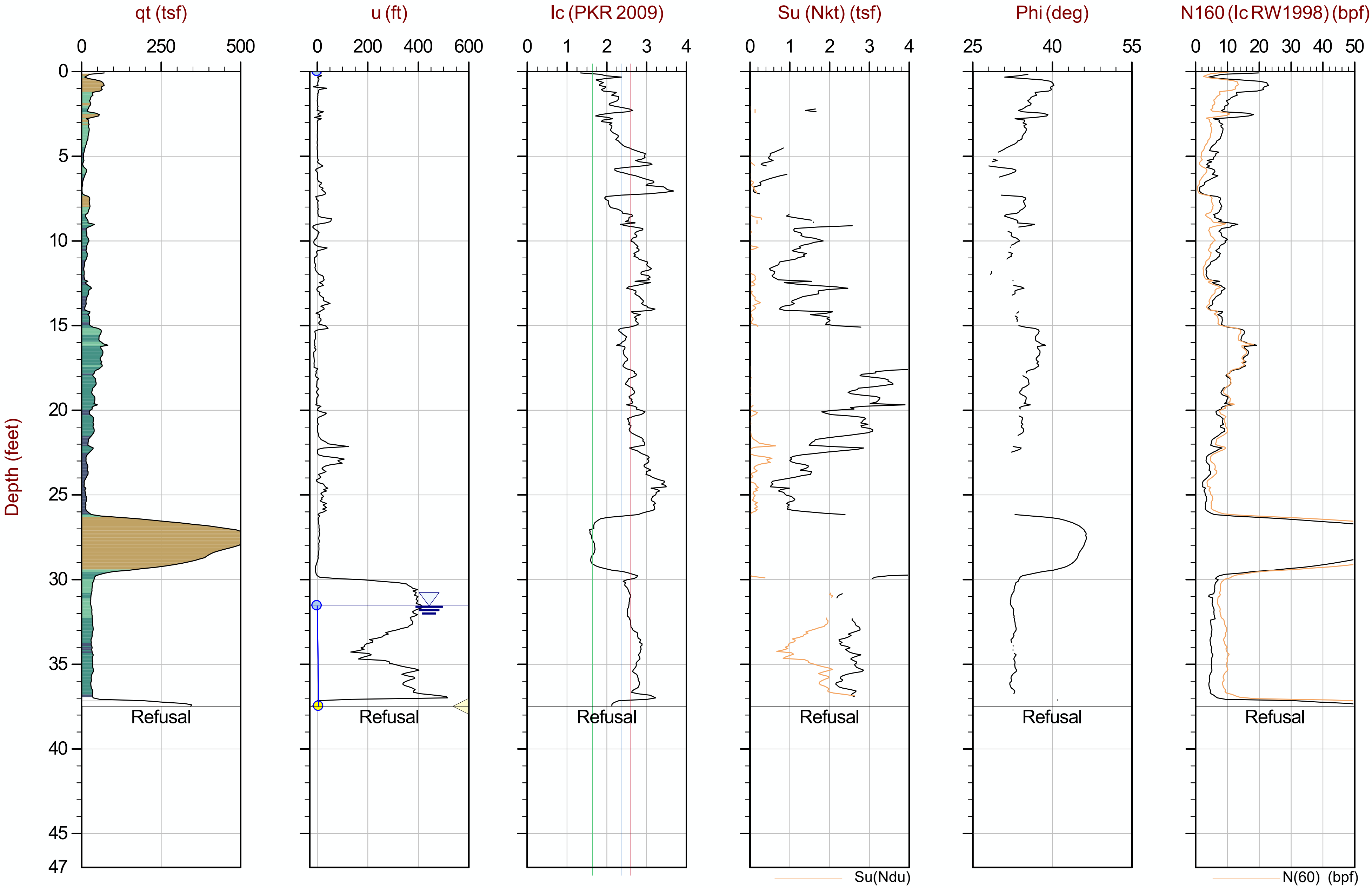
The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

ConeTec

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-21 15:41
Site: Crossroads Landfill

Sounding: CPT18-12
Cone: 388:T1500F15U500



Max Depth: 11.425 m / 37.48 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP12.COR
Su Nkt/Ndu: 12.5 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 685401ft E: 3039861ft Elev: 315.4

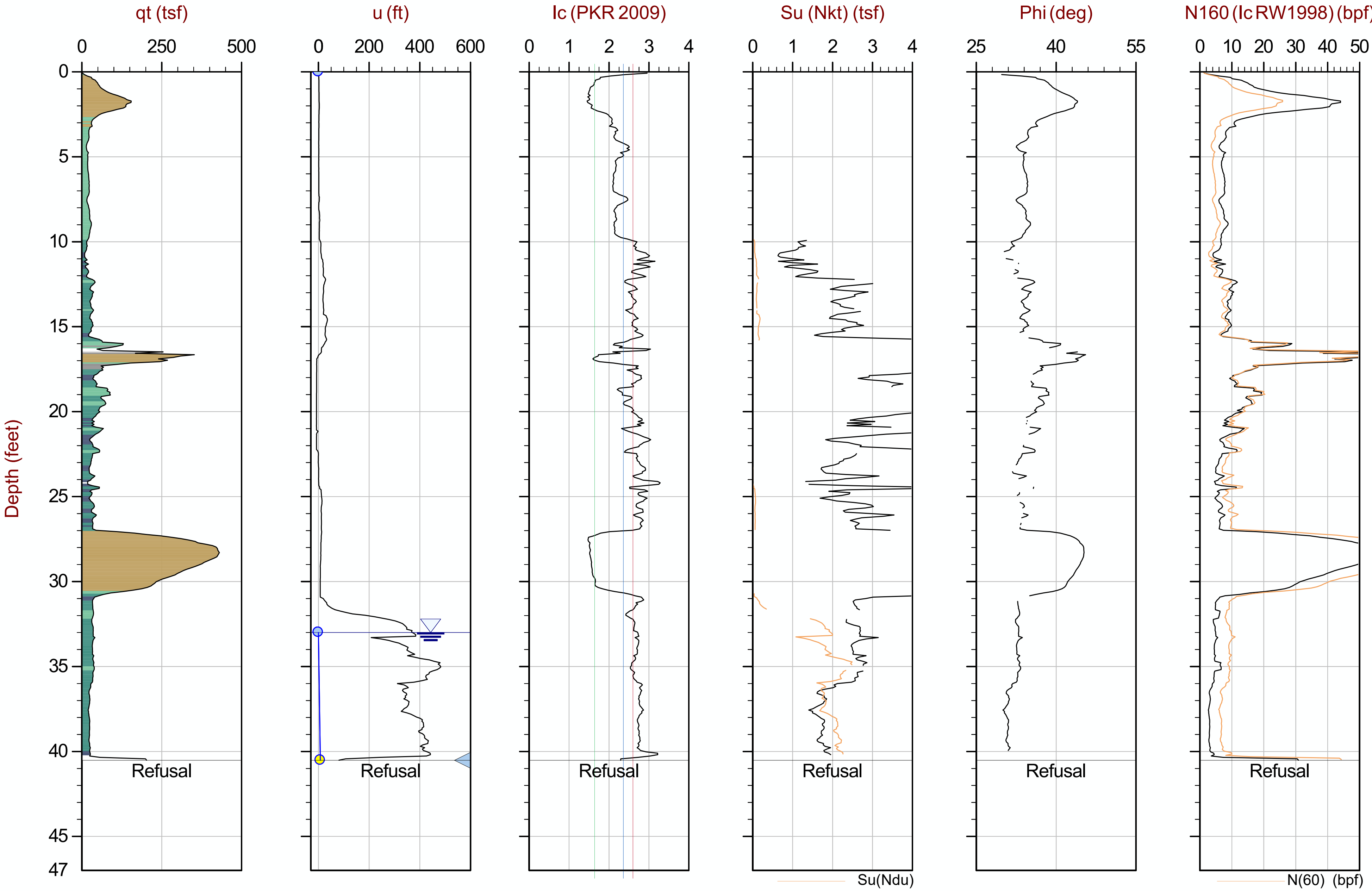
Hydrostatic Line   Ueq   Assumed Ueq   PPD, Ueq achieved   PPD, Ueq not achieved

The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

ConeTec

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-21 18:03
Site: Crossroads Landfill
Sounding: CPT18-12B
Cone: 452:T1500F15U500



Max Depth: 12.350 m / 40.52 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point
File: 18-53098_CP12B.COR
Su Nkt/Ndu: 12.5 / 6.0
SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 685438ft E: 3039873ft Elev: 314.9

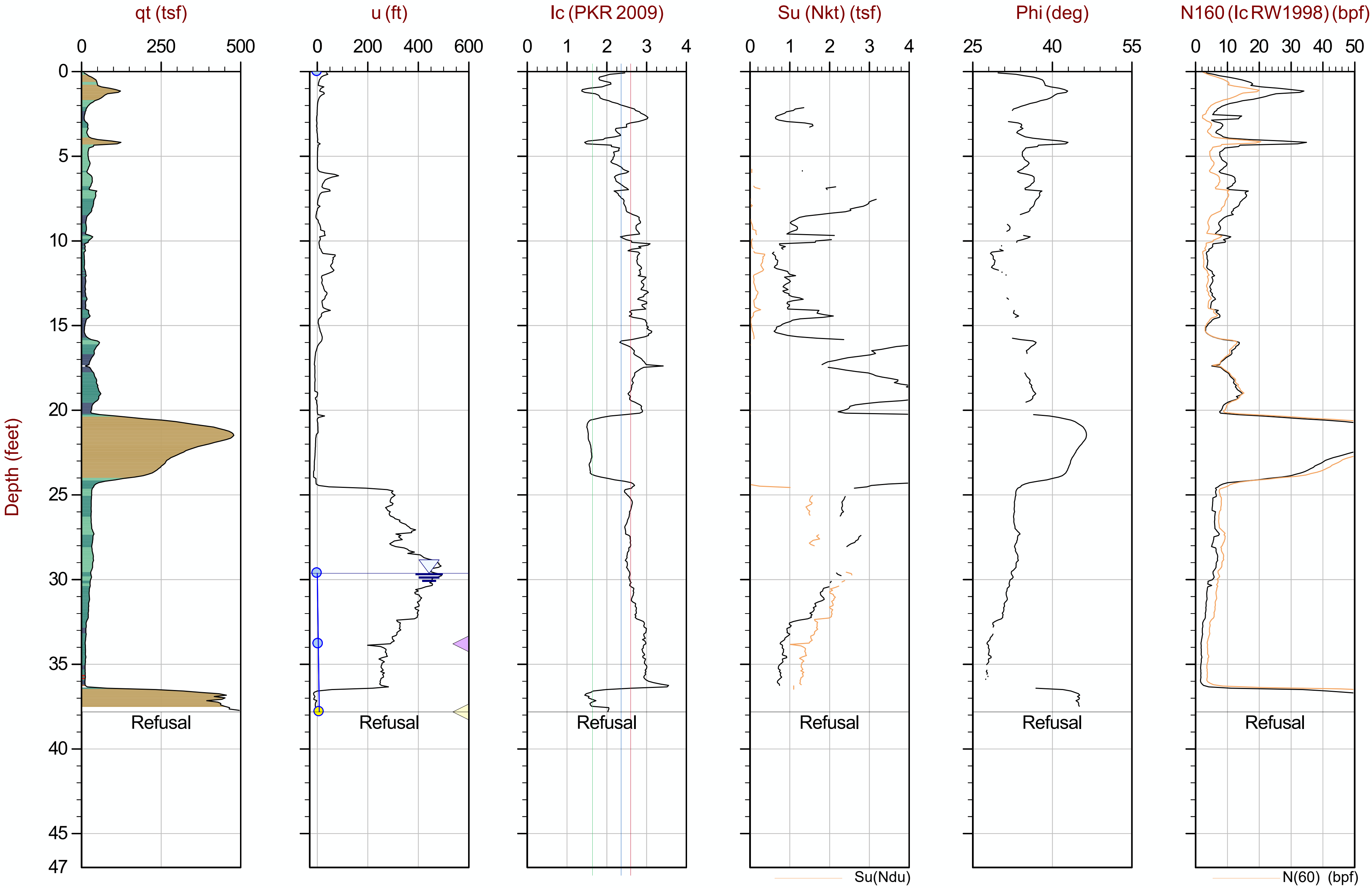
Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

CONETEC | **Geosyntec Consultants**

Job No: 18-53098
Date: 2018-08-22 10:28
Site: Crossroads Landfill

Sounding: CPT18-13
Cone: 452:T1500F15U500



Max Depth: 11.525 m / 37.81 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP13.COR
Su Nkt/Ndu: 12.5 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 685289ft E: 3039730ft Elev: 307.1

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

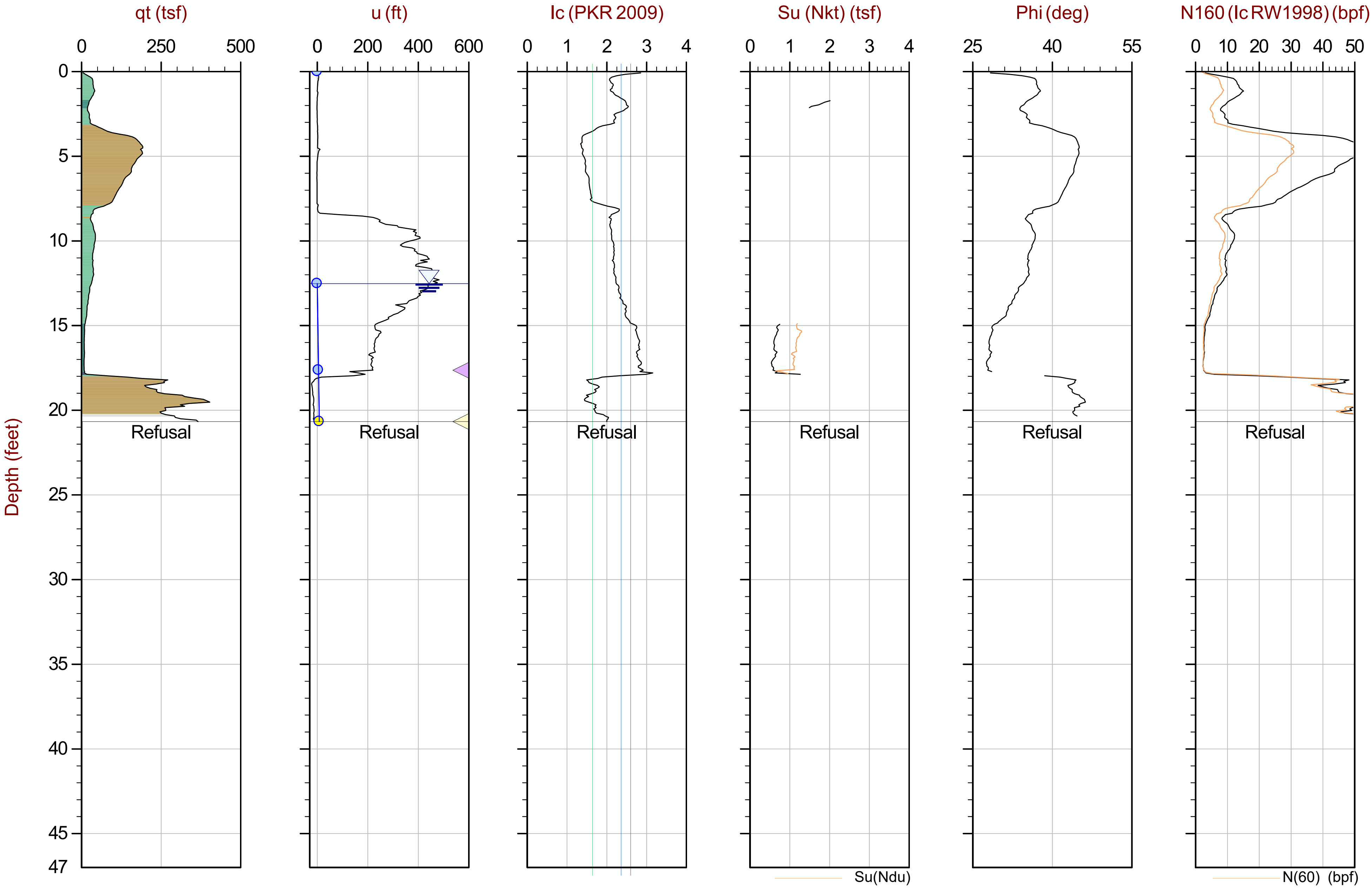
The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-22 12:38
Site: Crossroads Landfill

Sounding: CPT18-14
Cone: 452:T1500F15U500



Max Depth: 6.300 m / 20.67 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP14.COR
Su Nkt/Ndu: 12.5 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 685101ft E: 3039624ft Elev: 289.7

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

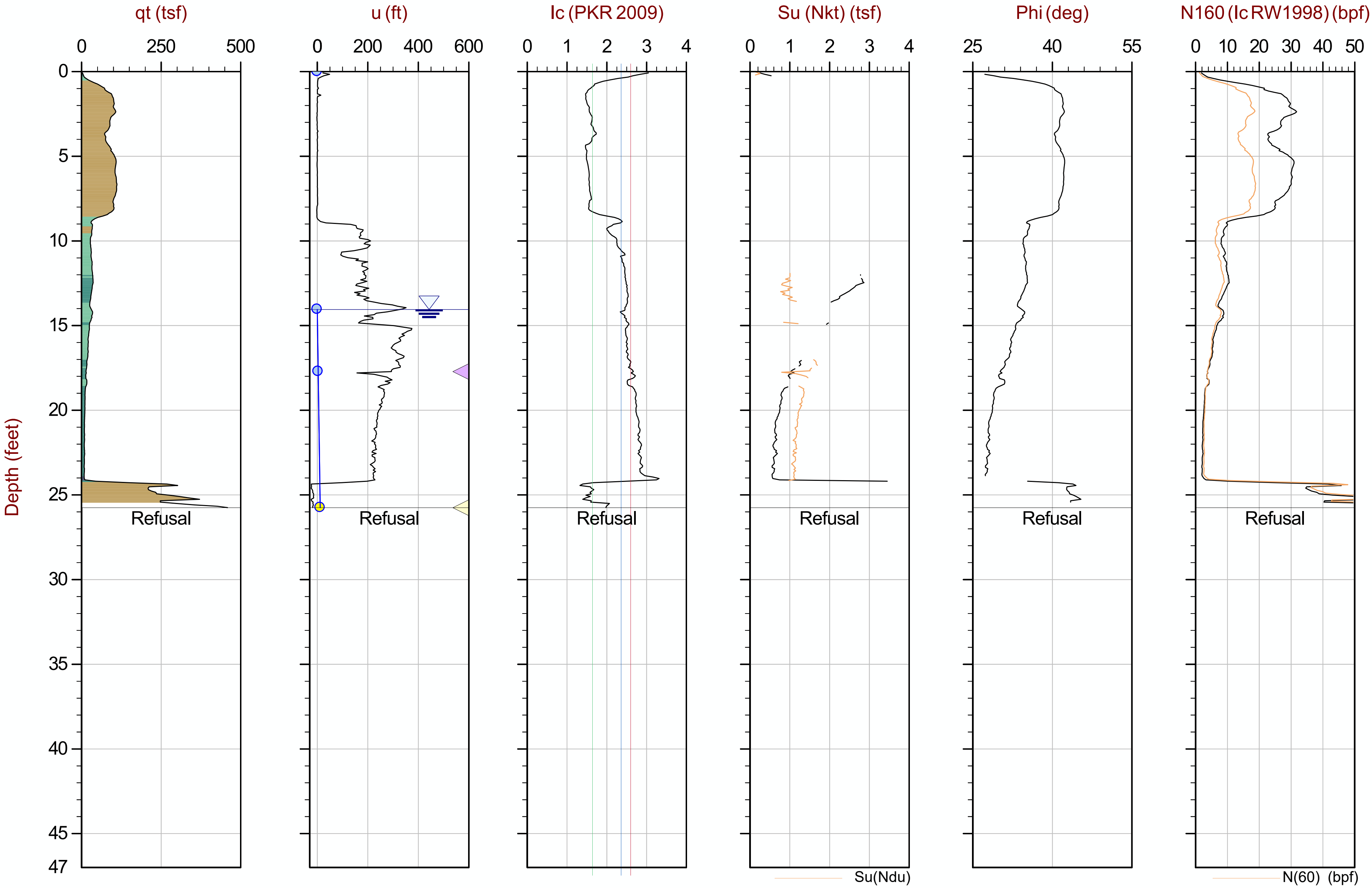
The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

ConeTec

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-21 09:51
Site: Crossroads Landfill

Sounding: CPT18-15
Cone: 388:T1500F15U500



Max Depth: 7.850 m / 25.75 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP15.COR
Su Nkt/Ndu: 12.5 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 685003ft E: 3040048ft Elev: 286.5

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

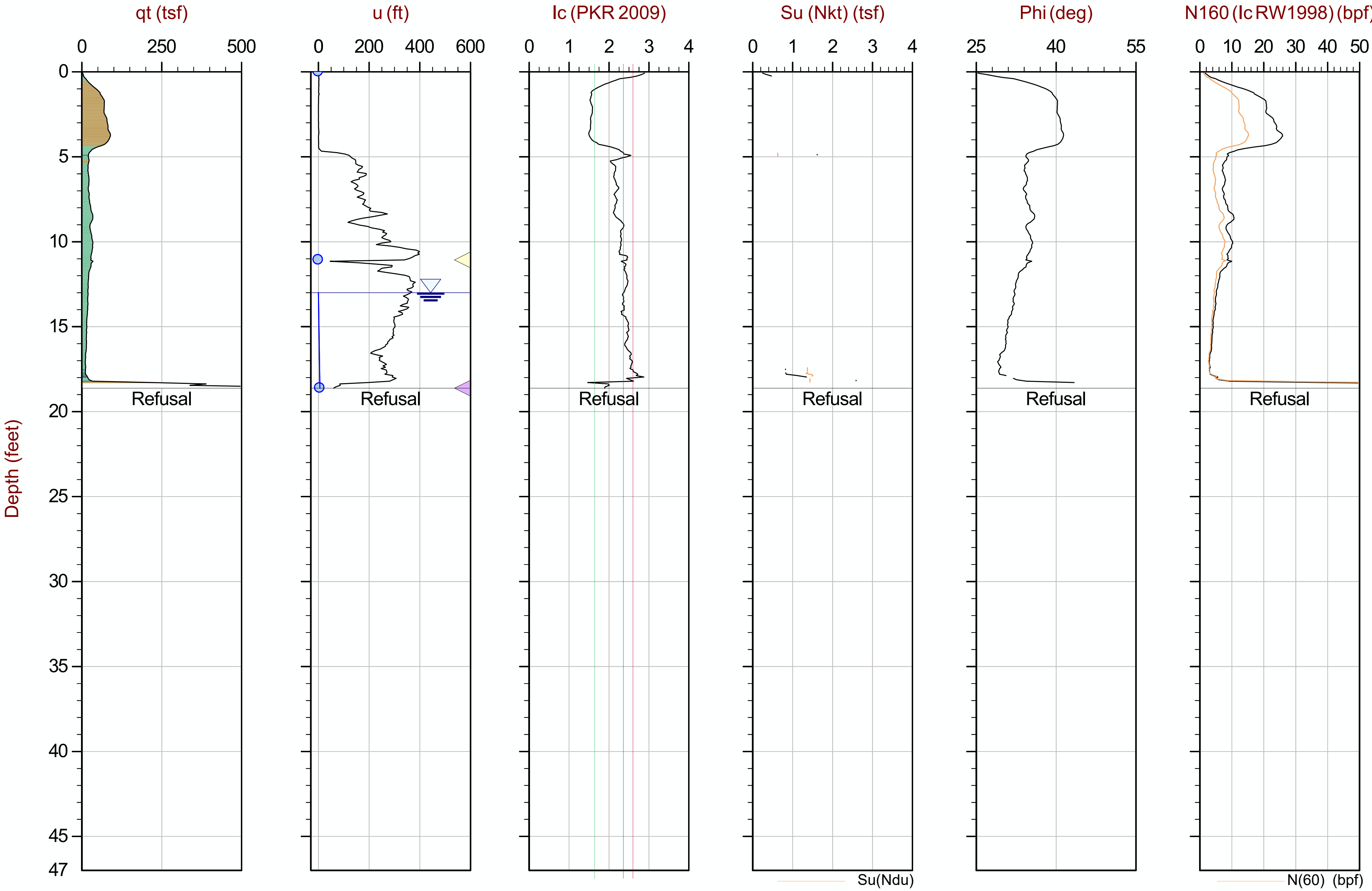
The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-21 14:48
Site: Crossroads Landfill

Sounding: CPT18-16
Cone: 388:T1500F15U500



Max Depth: 5.675 m / 18.62 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP16.COR
Su Nkt/Ndu: 12.5 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 684997ft E: 3040404ft Elev: 280.9

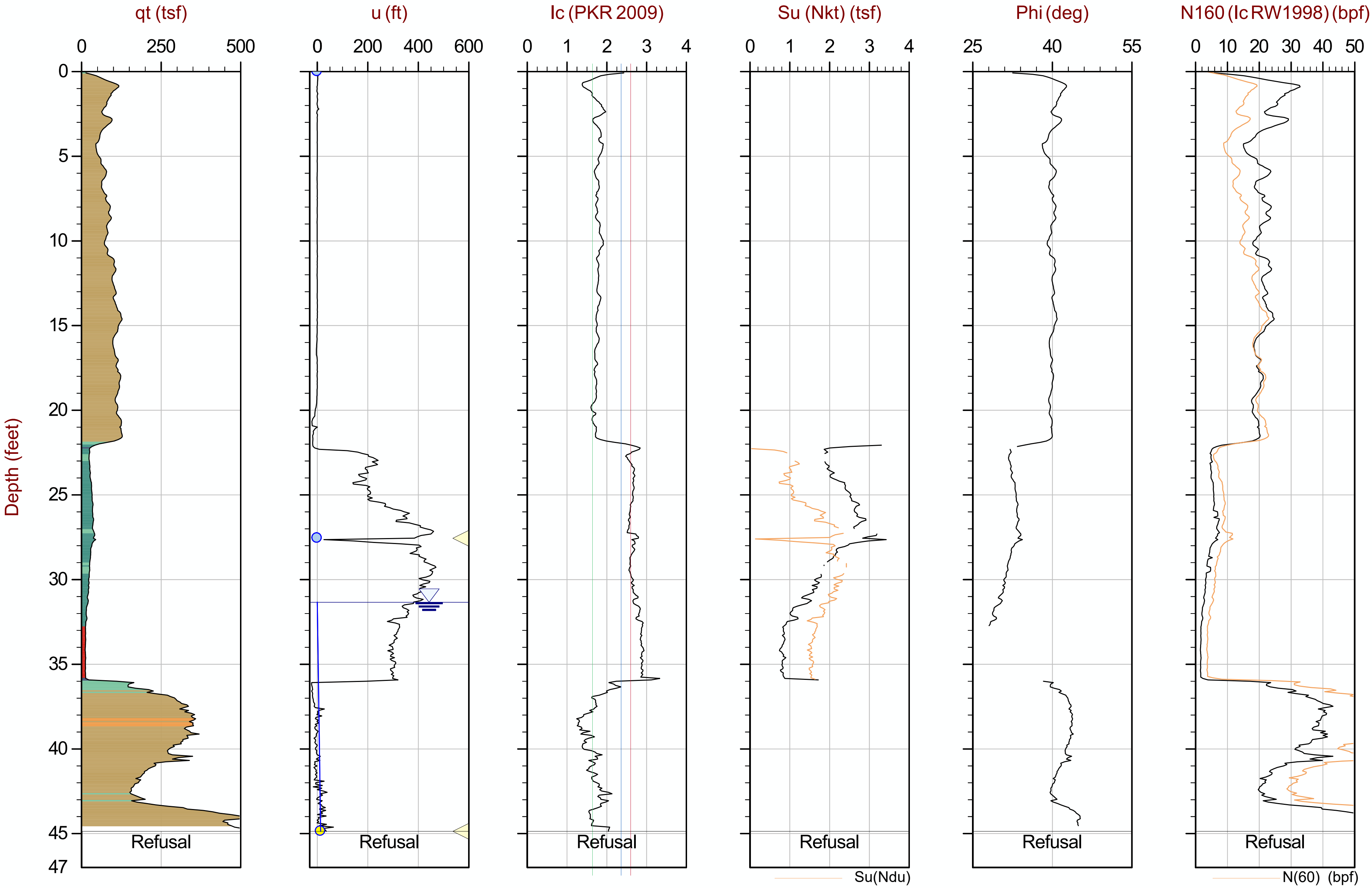
Hydrostatic Line   Ueq   Assumed Ueq   PPD, Ueq achieved   PPD, Ueq not achieved

The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-20 11:31
Site: Crossroads Landfill
Sounding: CPT18-17
Cone: 388:T1500F15U500



Max Depth: 13.675 m / 44.86 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP17.COR
Su Nkt/Ndu: 12.5 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 684604ft E: 3039781ft Elev: 295.1

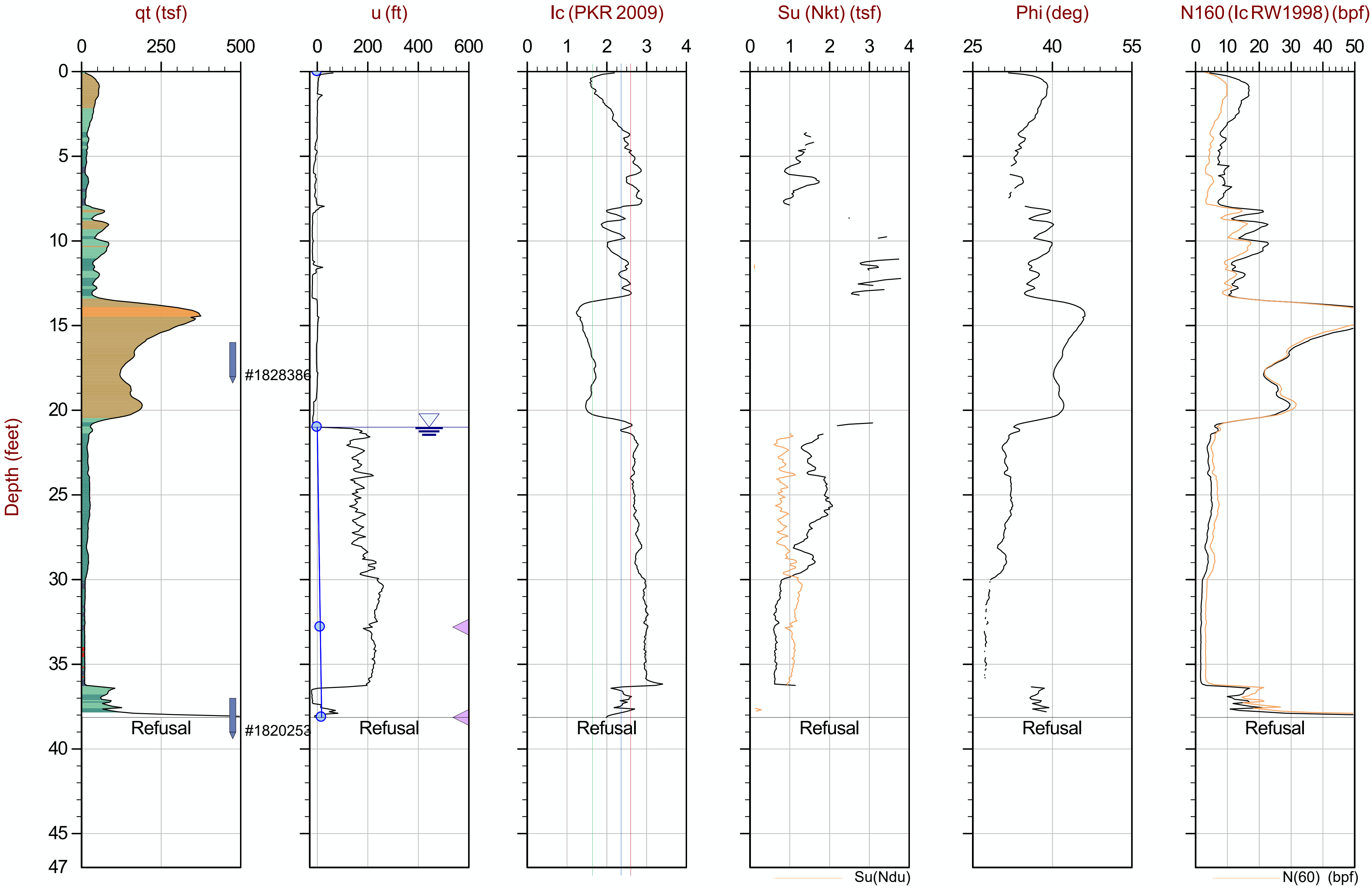
Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-22 15:39
Site: Crossroads Landfill

Sounding: CPT18-18
Cone: 452:T1500F15U500



Max Depth: 11.625 m / 38.14 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP18.COR
Su Nkt/Ndu: 12.5 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 684760ft E: 3039332ft Elev: 294.4

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

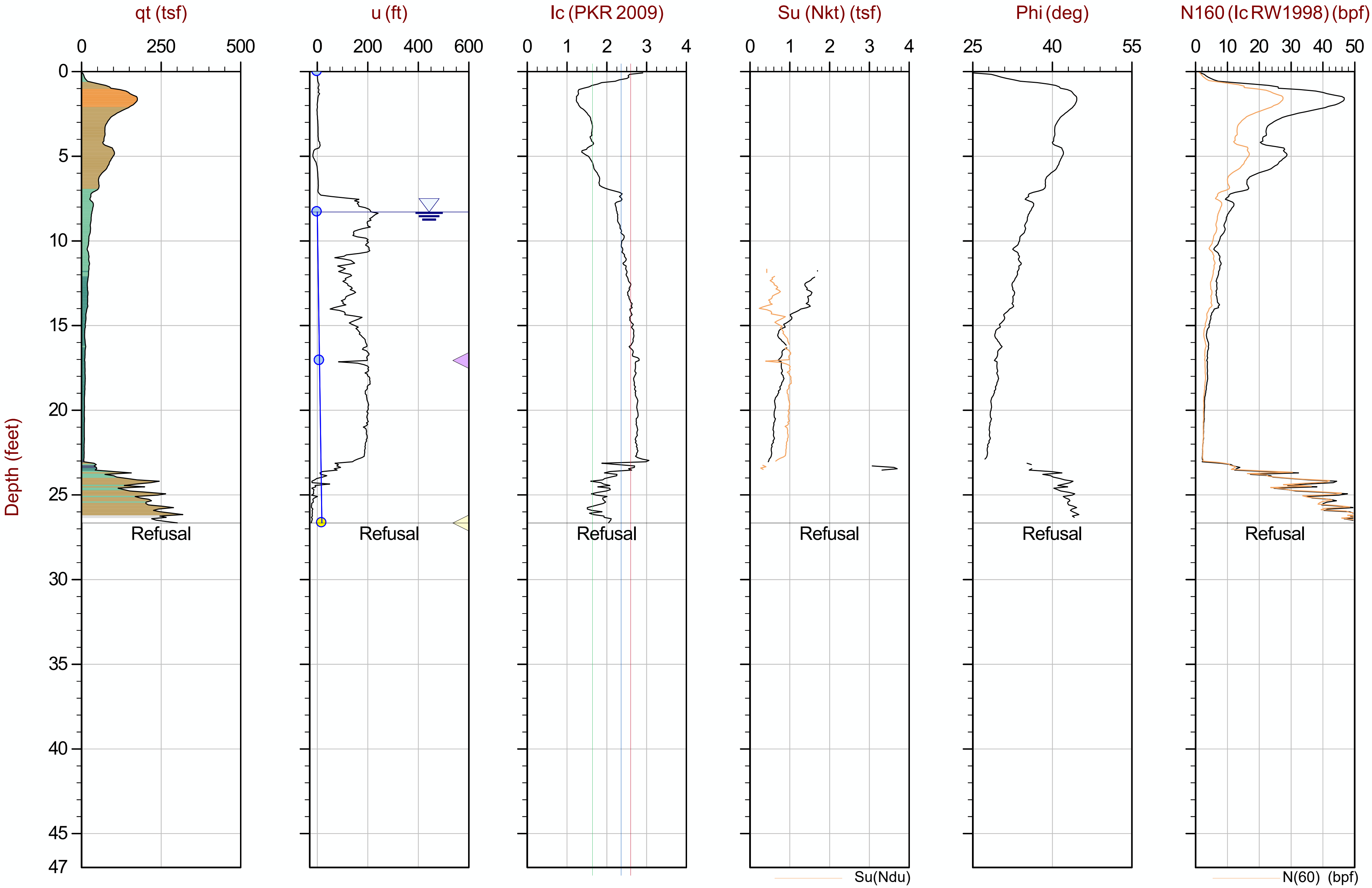
The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-24 08:17
Site: Crossroads Landfill

Sounding: CPT18-19
Cone: 452:T1500F15U500



Max Depth: 8.125 m / 26.66 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP19.COR
Su Nkt/Ndu: 12.5 / 6.0

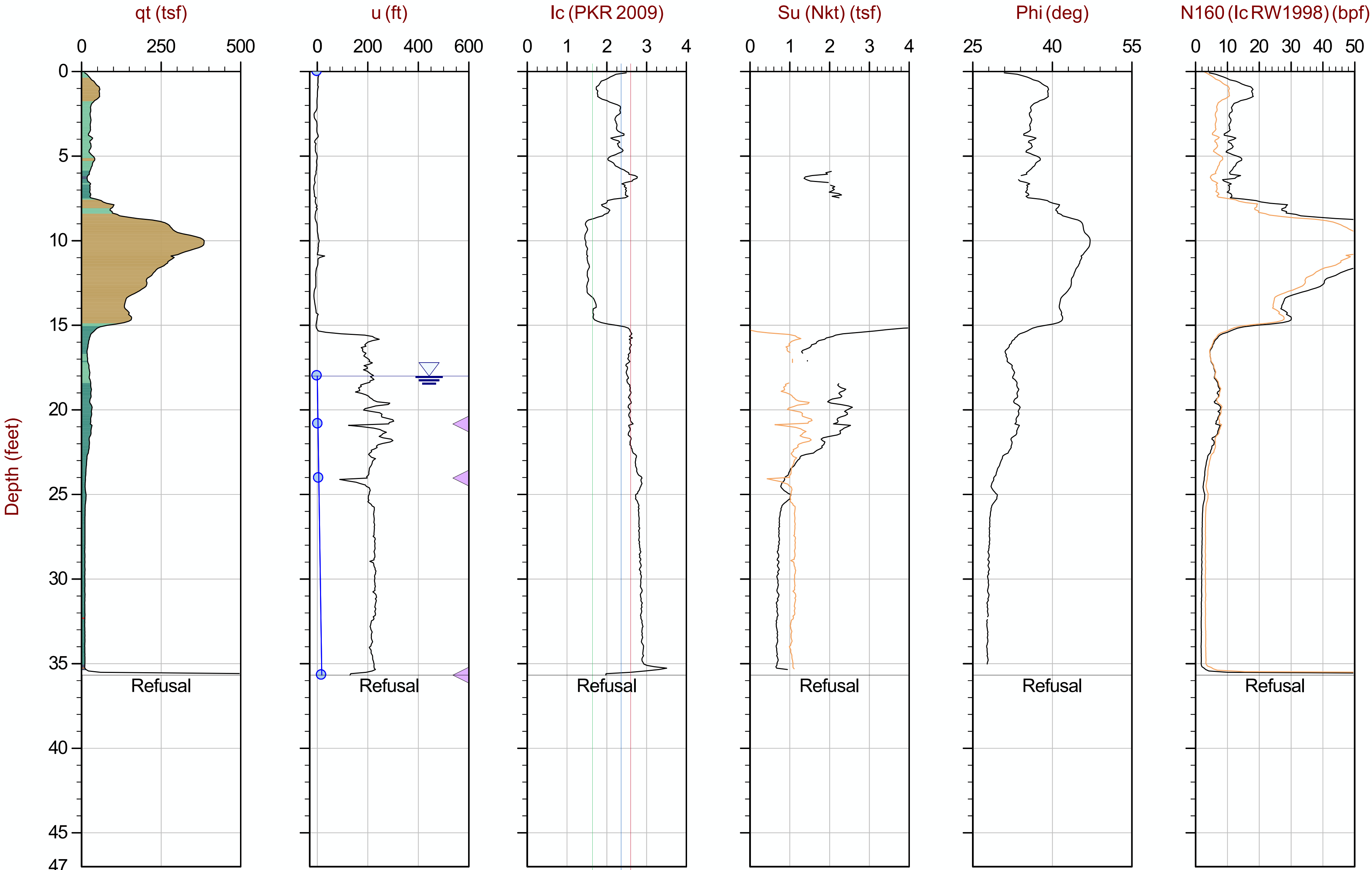
SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 684751ft E: 3038915ft Elev: 276.5

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

The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

Job No: 18-53098
Date: 2018-08-23 15:39
Site: Crossroads Landfill
Sounding: CPT18-20
Cone: 452:T1500F15U500

Geosyntec Consultants



Max Depth: 10.875 m / 35.68 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP20.COR
Su Nkt/Ndu: 12.5 / 6.0

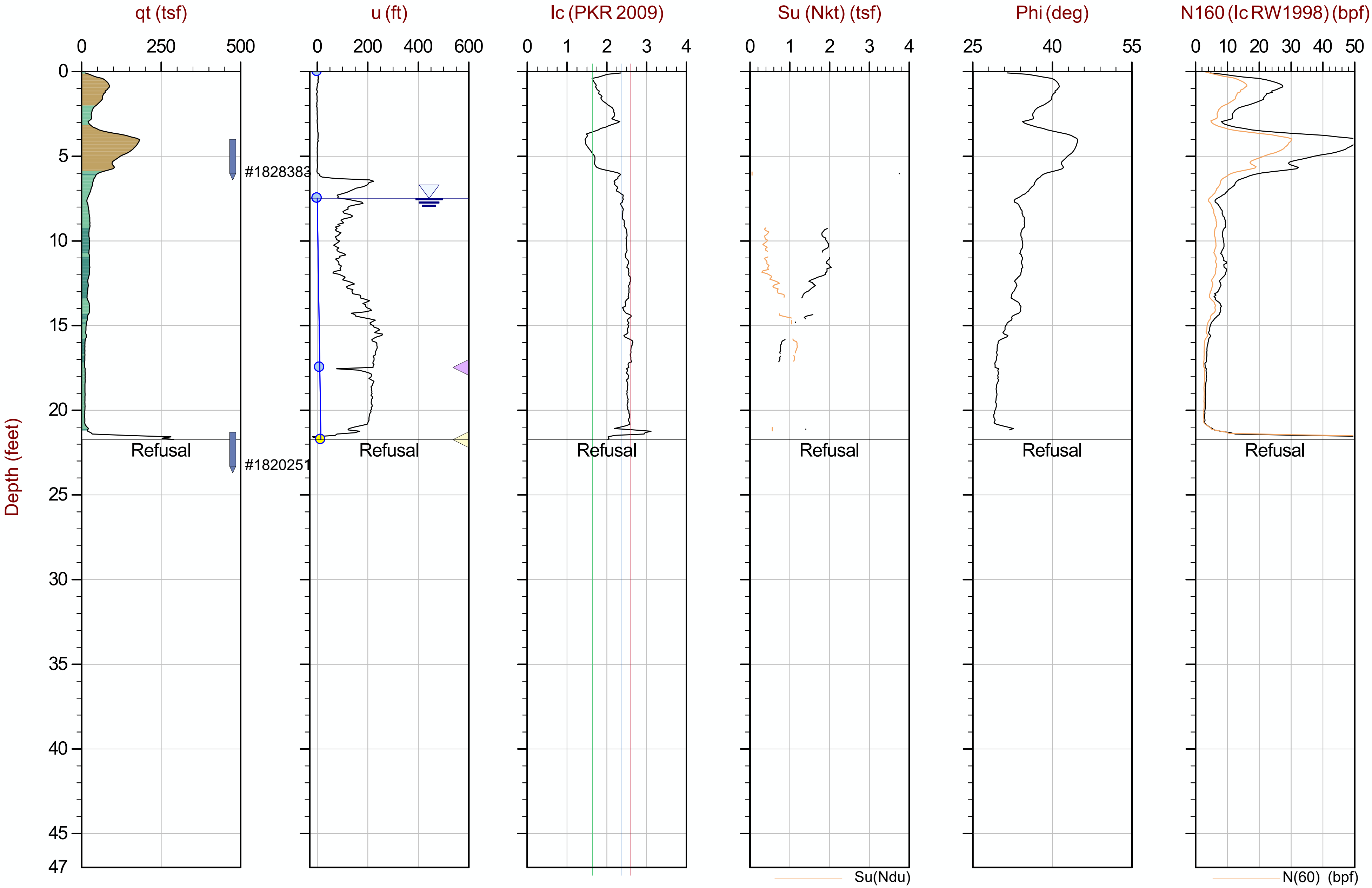
SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 684876ft E: 3039150ft Elev: 288.8

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

The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

Job No: 18-53098
Date: 2018-08-23 17:22
Site: Crossroads Landfill
Sounding: CPT18-21
Cone: 452:T1500F15U500

Geosyntec Consultants



Max Depth: 6.625 m / 21.74 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP21.COR
Su Nkt/Ndu: 12.5 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 685216ft E: 3039084ft Elev: 286.1

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

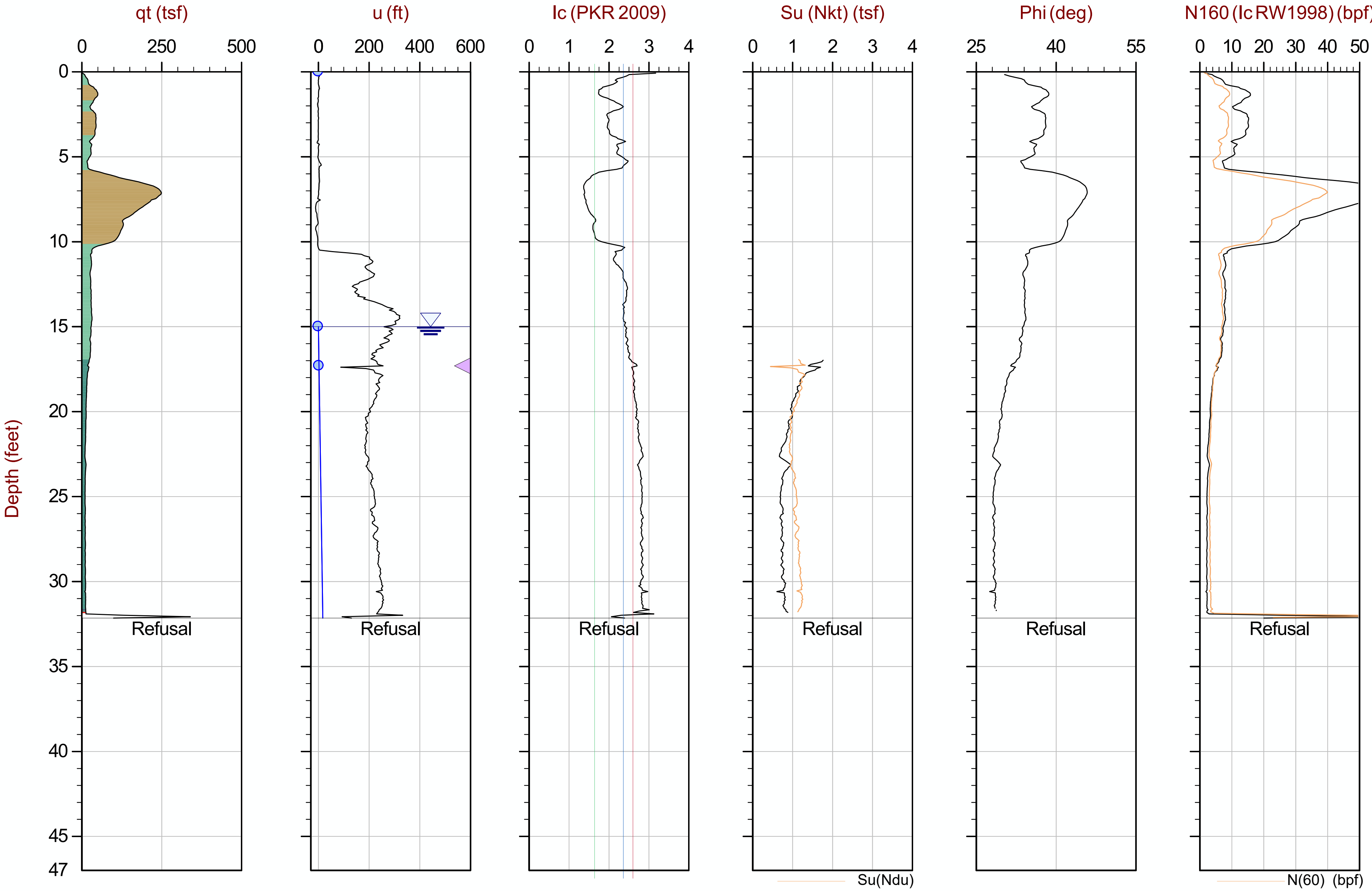
The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-24 13:42
Site: Crossroads Landfill

Sounding: CPT18-22
Cone: 452:T1500F15U500



Max Depth: 9.800 m / 32.15 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP22.COR
Su Nkt/Ndu: 12.5 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 685031ft E: 3038858ft Elev: 284.2

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

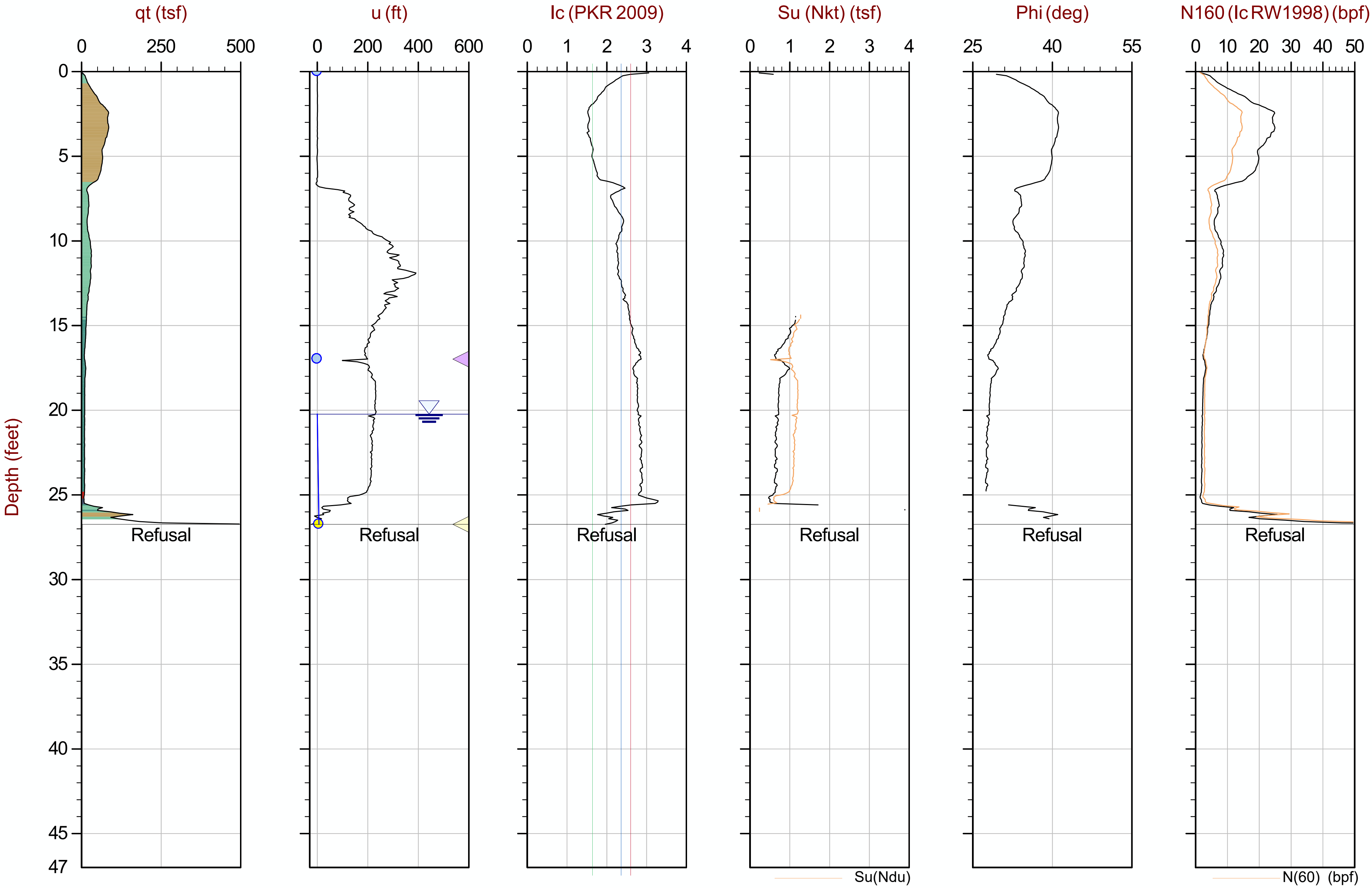
The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

ConeTec

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-24 11:16
Site: Crossroads Landfill

Sounding: CPT18-23
Cone: 452:T1500F15U500



Max Depth: 8.150 m / 26.74 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP23.COR
Su Nkt/Ndu: 12.5 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 684910ft E: 3038478ft Elev: 277.0

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

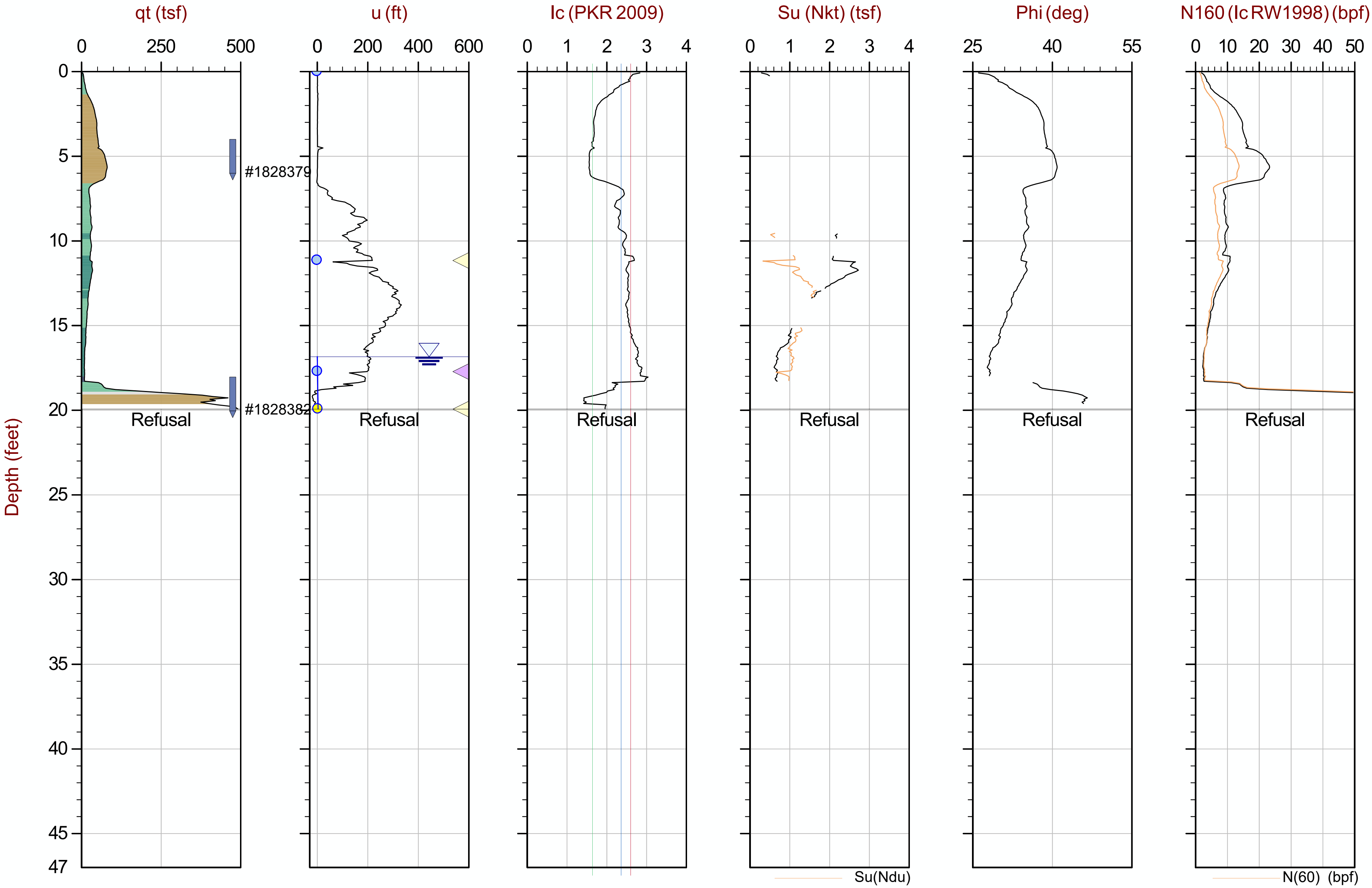
The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-26 10:52
Site: Crossroads Landfill

Sounding: CPT18-24
Cone: 452:T1500F15U500



Max Depth: 6.075 m / 19.93 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP24.COR
Su Nkt/Ndu: 12.5 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 685305ft E: 3038509ft Elev: 280.2

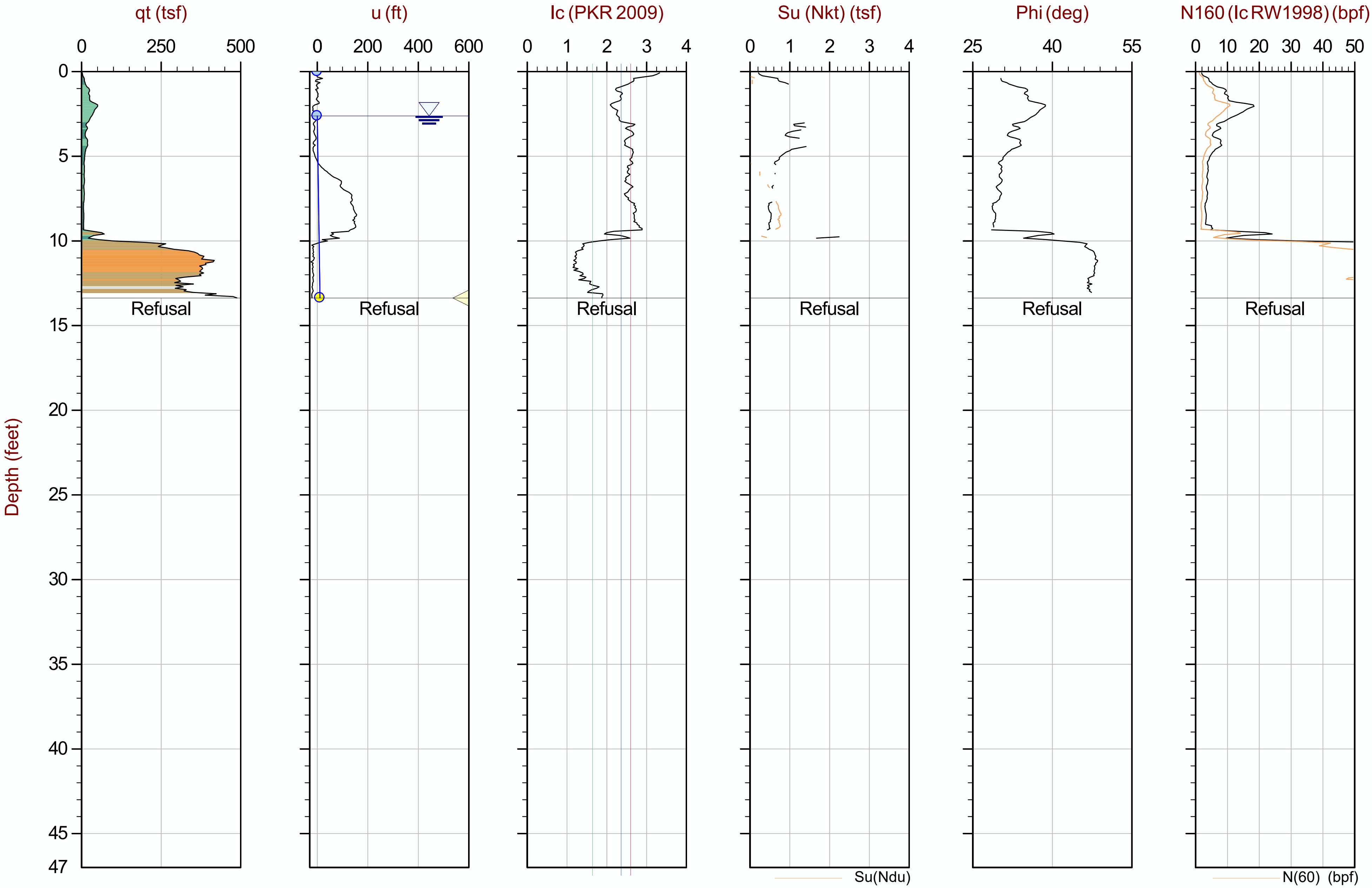
Hydrostatic Line   Ueq   Assumed Ueq   PPD, Ueq achieved   PPD, Ueq not achieved

The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-25 16:48
Site: Crossroads Landfill

Sounding: CPT18-25
Cone: 452:T1500F15U500



Max Depth: 4.075 m / 13.37 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP25.COR
Su Nkt/Ndu: 12.5 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 685474ft E: 3038244ft Elev: 260.2

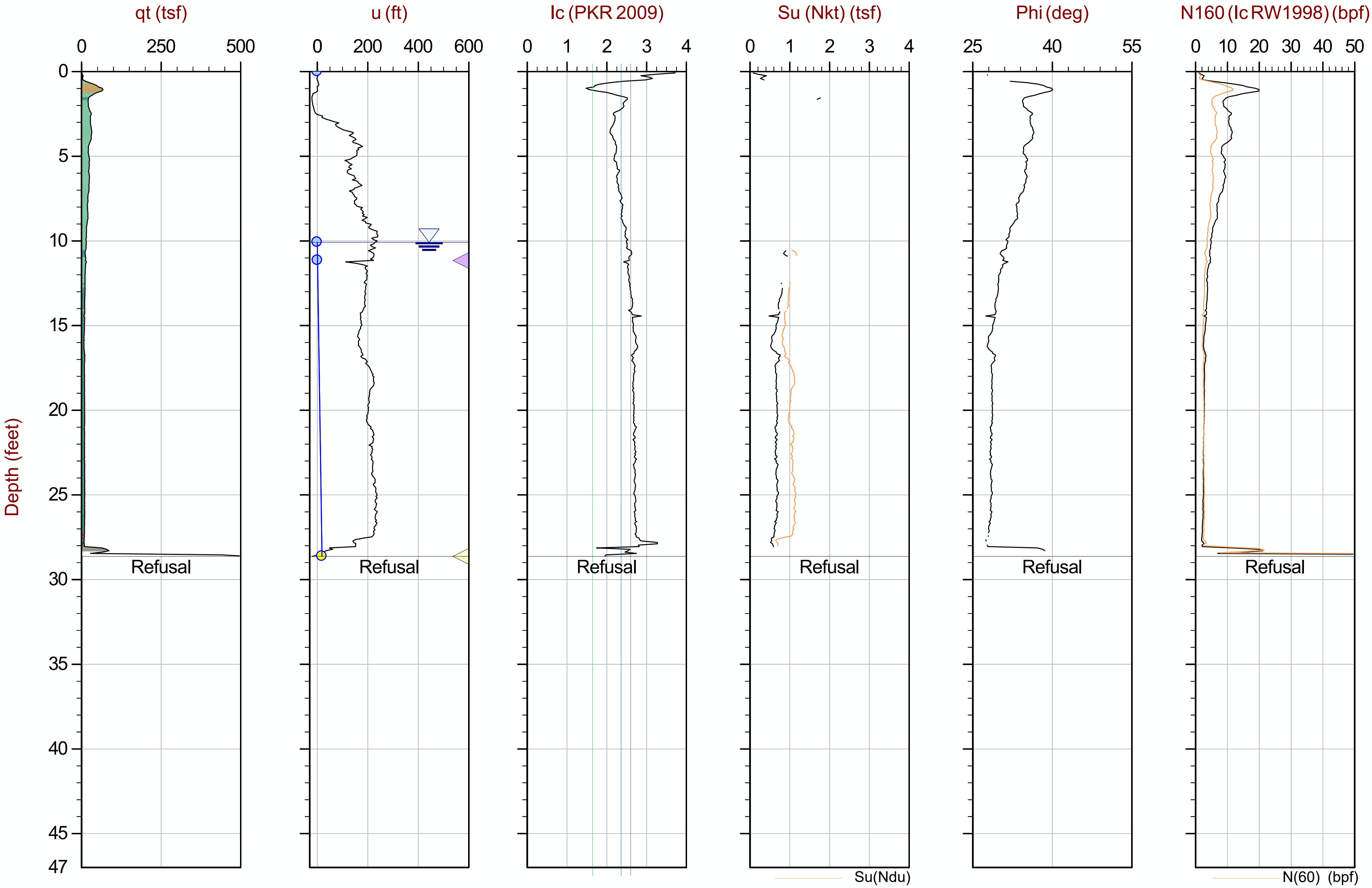
Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-20 12:50
Site: Crossroads Landfill
Sounding: CPT18-26
Cone: 388:T1500F15U500



Max Depth: 8.725 m / 28.62 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP26.COR
Su Nkt/Ndu: 12.5 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 684306ft E: 3039828ft Elev: 270.3

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

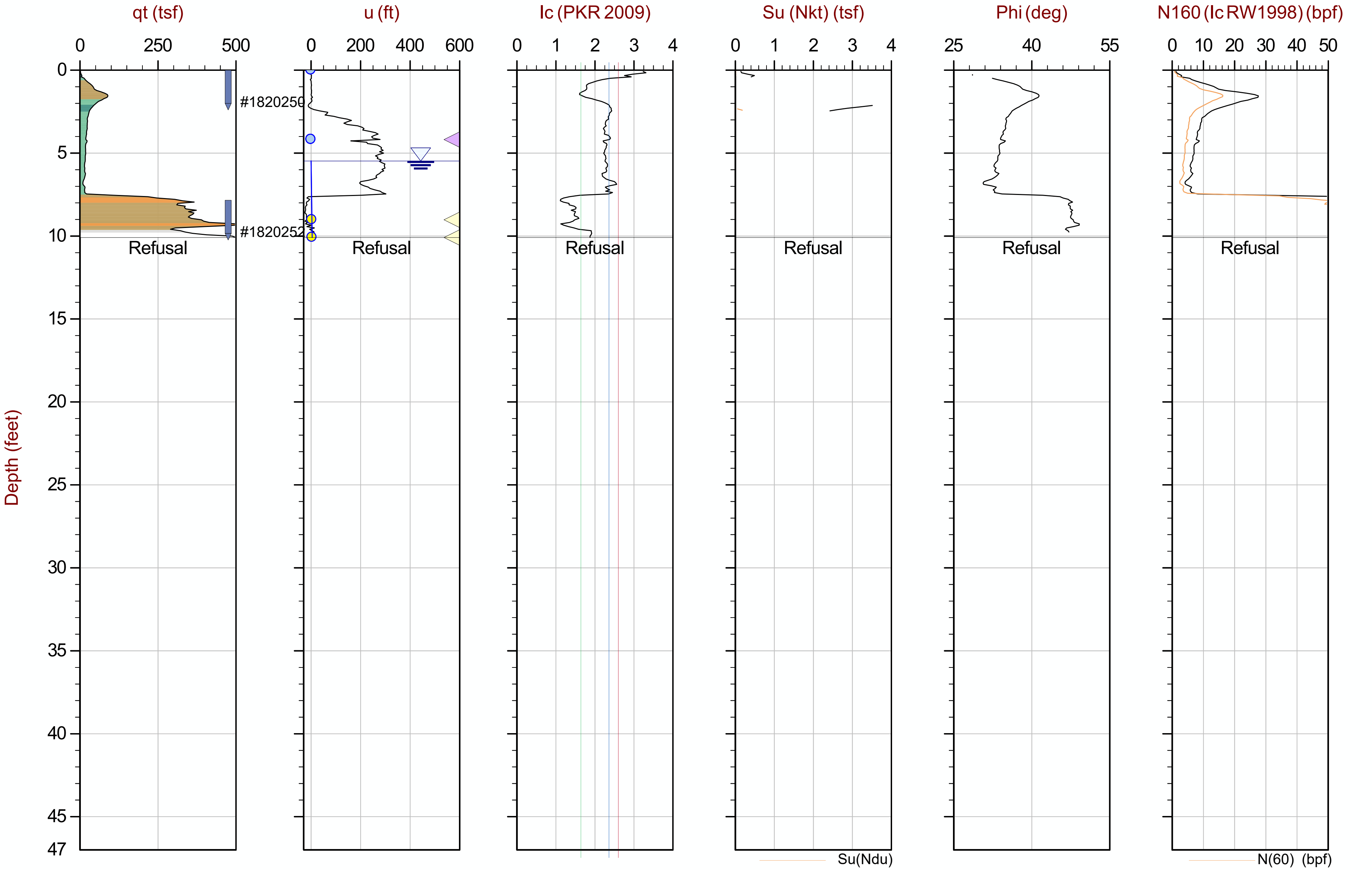
The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-28 17:42
Site: Crossroads Landfill

Sounding: CPT18-27
Cone: 452:T1500F15U500



Max Depth: 3.075 m / 10.09 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP27.COR
Su Nkt/Ndu: 12.5 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 685366ft E: 3040797ft Elev: 276.9

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

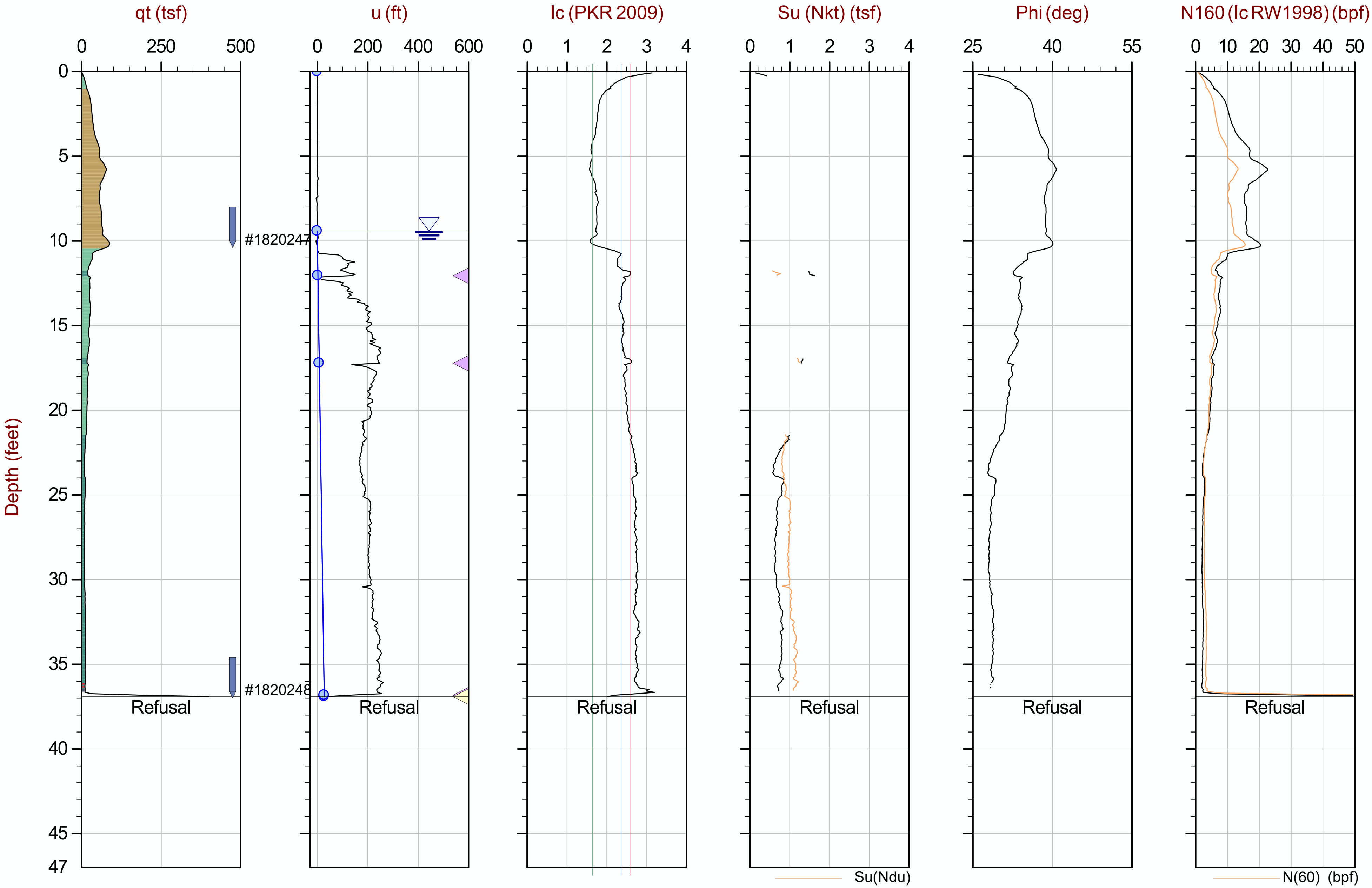
The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-28 15:22
Site: Crossroads Landfill

Sounding: CPT18-28
Cone: 452:T1500F15U500



Max Depth: 11.250 m / 36.91 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP28.COR
Su Nkt/Ndu: 12.5 / 6.0

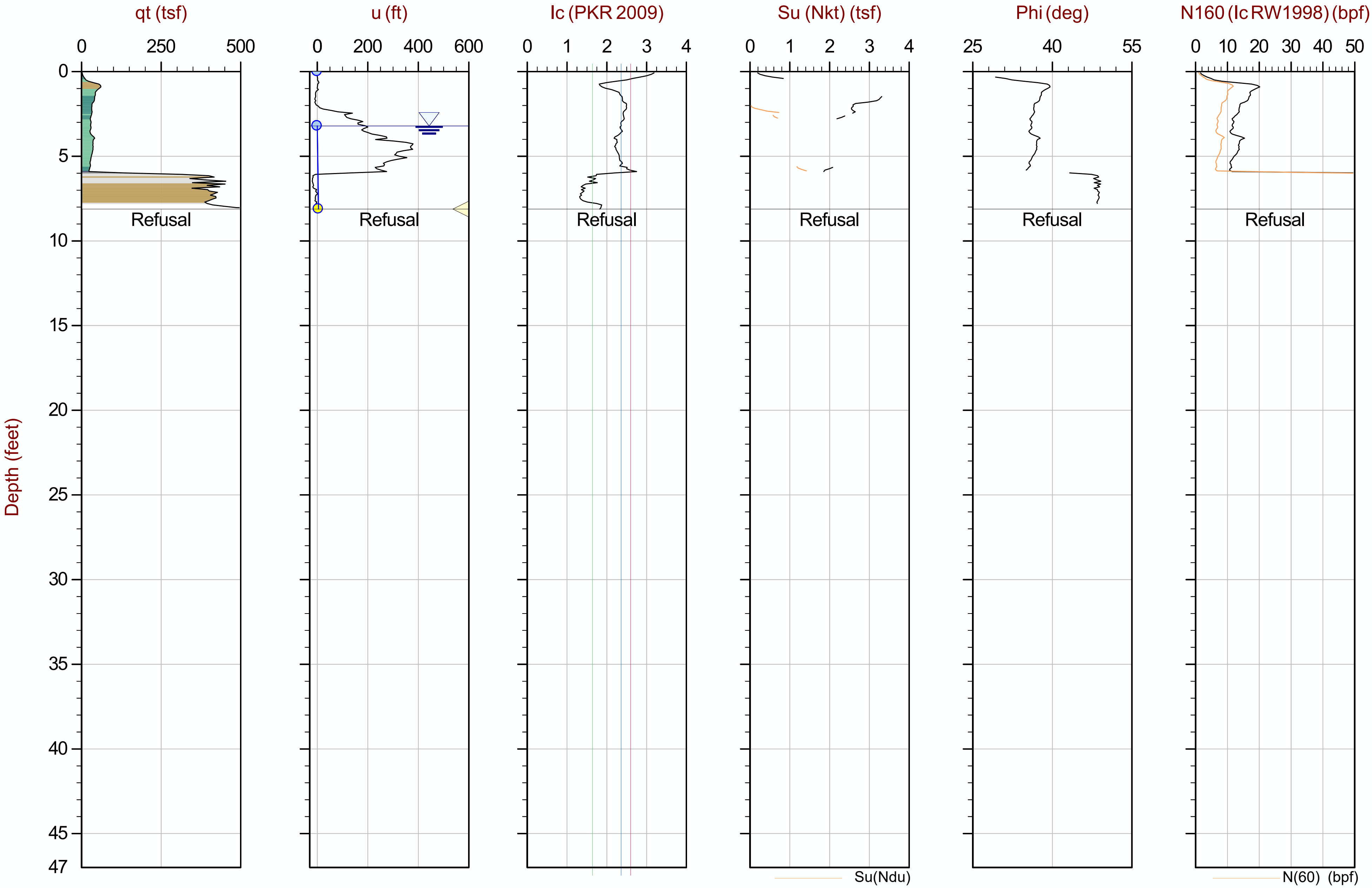
SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 685581ft E: 3041109ft Elev: 289.8

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

The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-26 15:29
Site: Crossroads Landfill
Sounding: CPT18-29
Cone: 452:T1500F15U500



Max Depth: 2.475 m / 8.12 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP29.COR
Su Nkt/Ndu: 12.5 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 685505ft E: 3039069ft Elev: 284.2

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

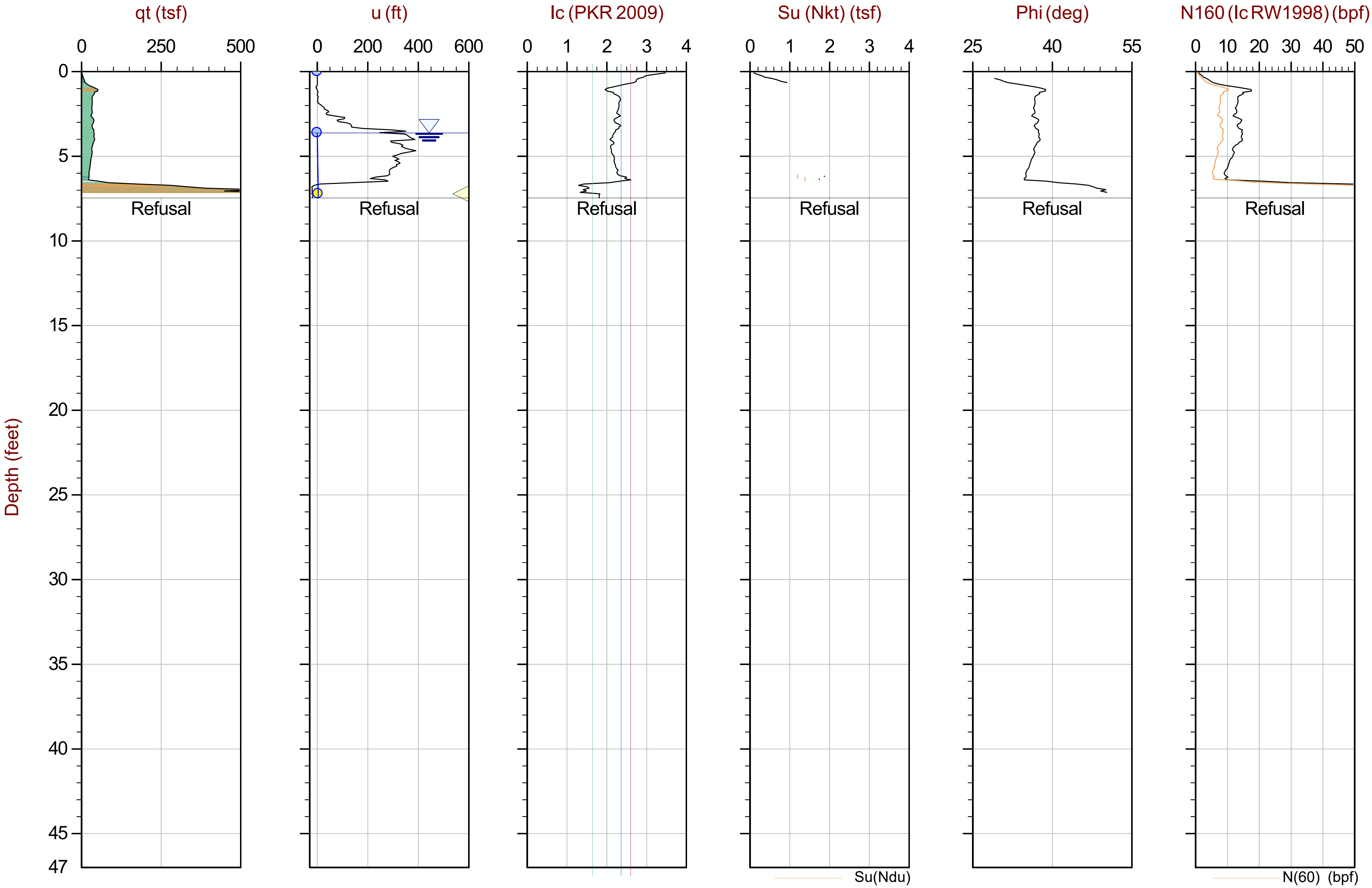
The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-26 15:57
Site: Crossroads Landfill

Sounding: CPT18-29B
Cone: 452:T1500F15U500



Max Depth: 2.275 m / 7.46 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP29B.COR
Su Nkt/Ndu: 12.5 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 685500ft E: 3039067ft Elev: 284.2

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

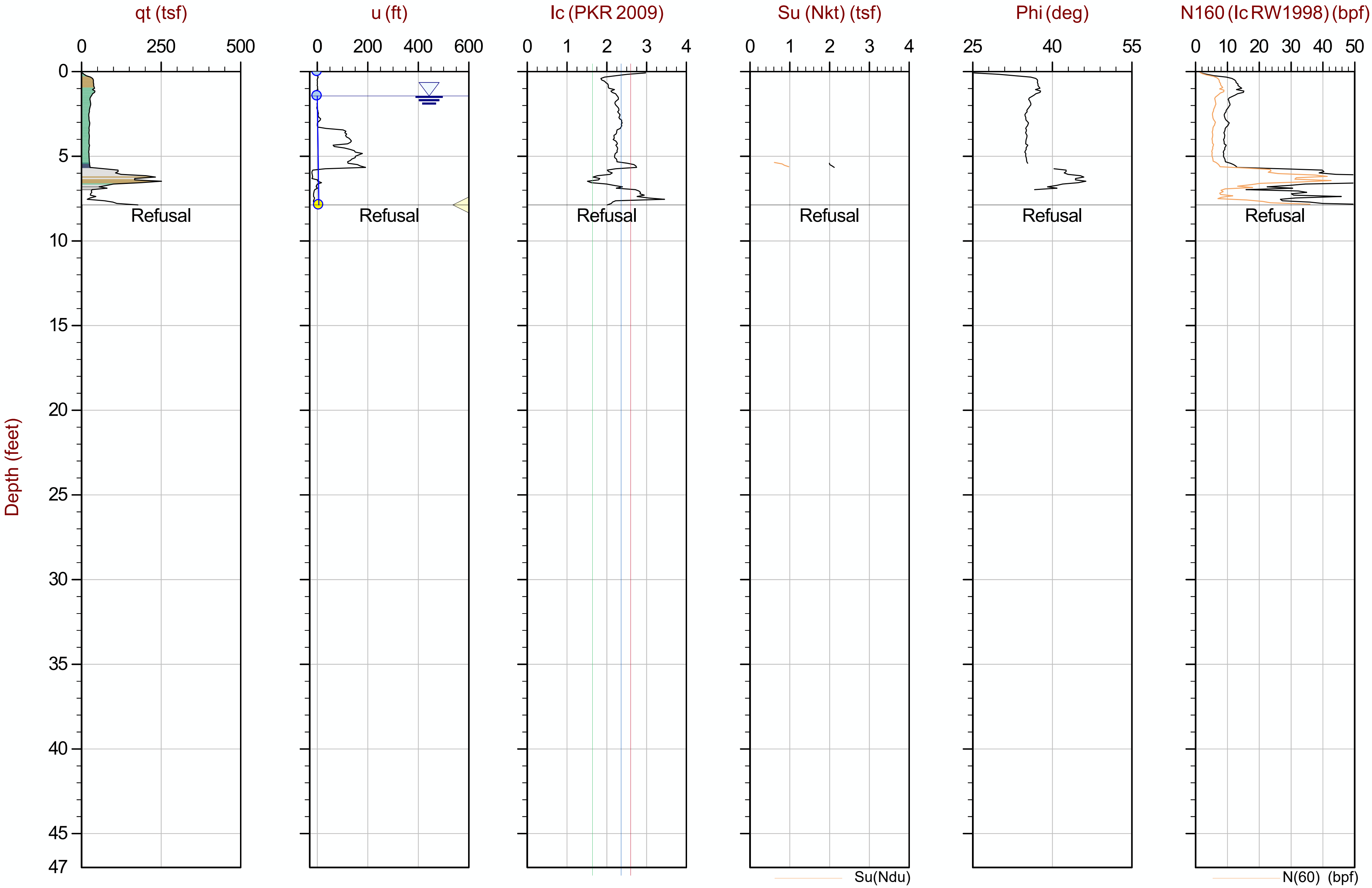
The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-25 14:10
Site: Crossroads Landfill

Sounding: CPT18-30
Cone: 452:T1500F15U500



Max Depth: 2.400 m / 7.87 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP30.COR
Su Nkt/Ndu: 12.5 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 685499ft E: 3038606ft Elev: 273.4

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

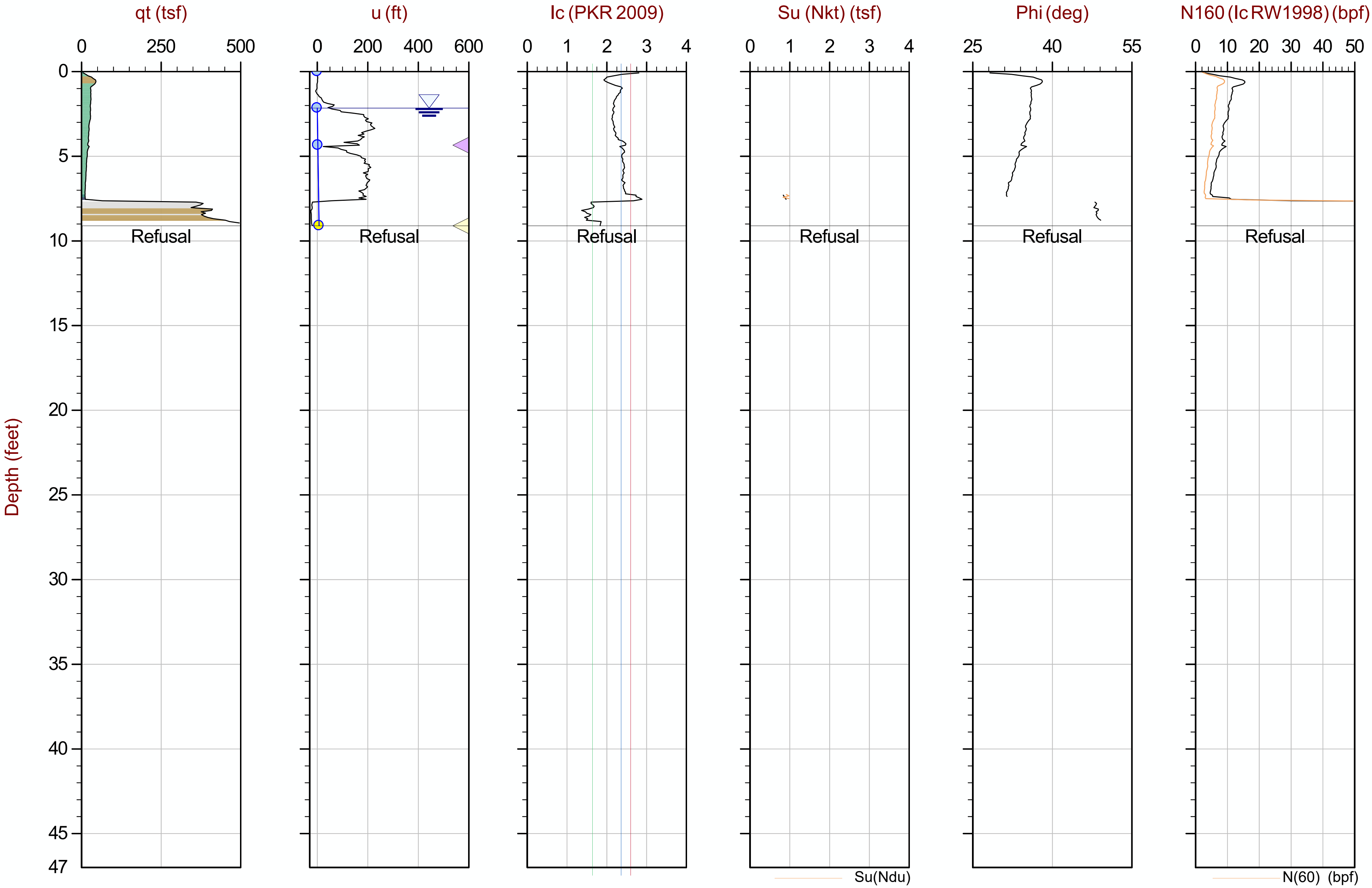
The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-25 14:40
Site: Crossroads Landfill

Sounding: CPT18-30B
Cone: 452:T1500F15U500



Max Depth: 2.775 m / 9.10 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP30B.COR
Su Nkt/Ndu: 12.5 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 685492ft E: 3038612ft Elev: 273.4

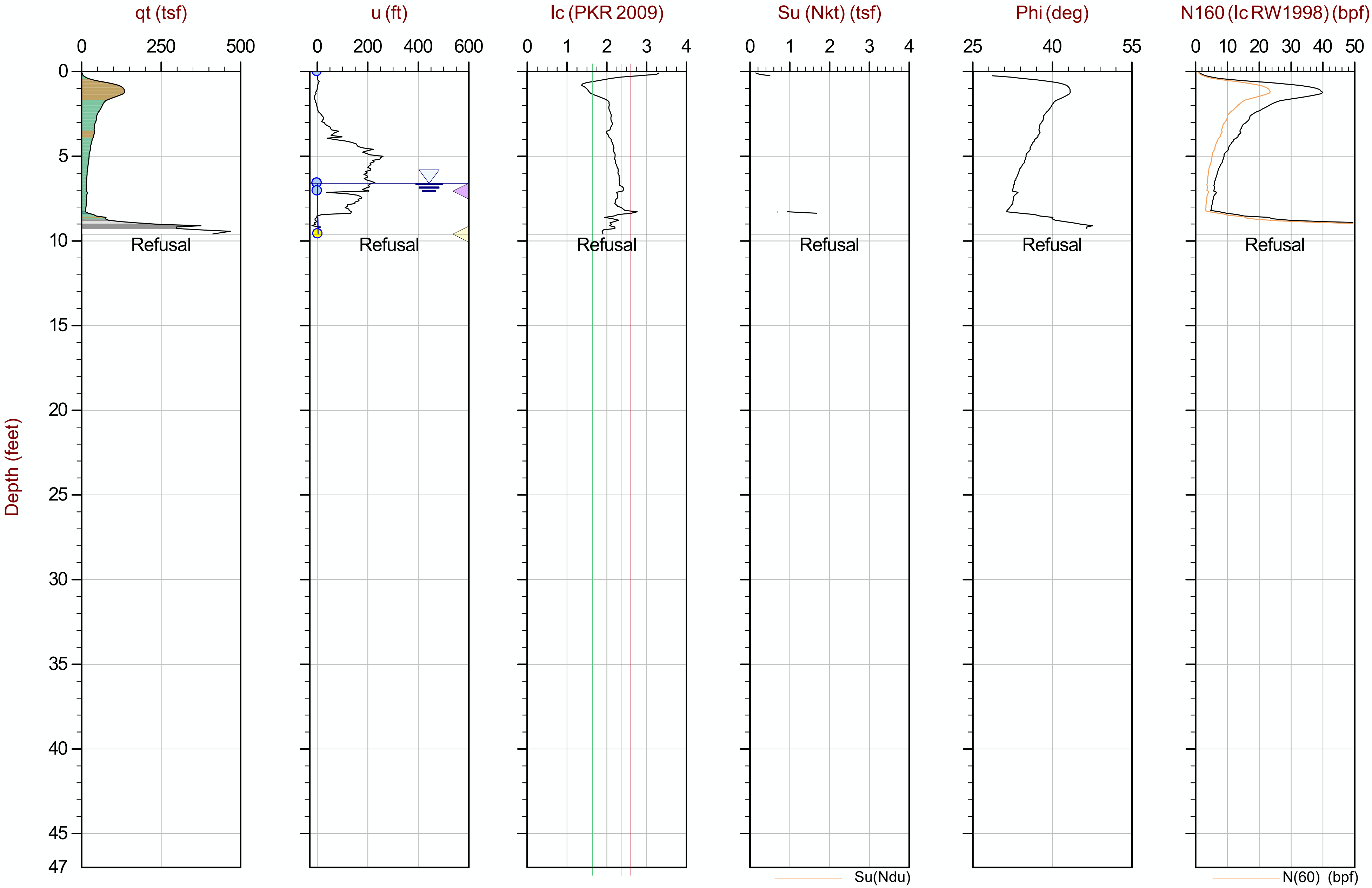
Hydrostatic Line   Ueq   Assumed Ueq   PPD, Ueq achieved   PPD, Ueq not achieved

The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

ConeTec

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-25 16:02
Site: Crossroads Landfill
Sounding: CPT18-31
Cone: 452:T1500F15U500



Max Depth: 2.925 m / 9.60 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP31.COR
Su Nkt/Ndu: 12.5 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 685483ft E: 3038364ft Elev: 267.3

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

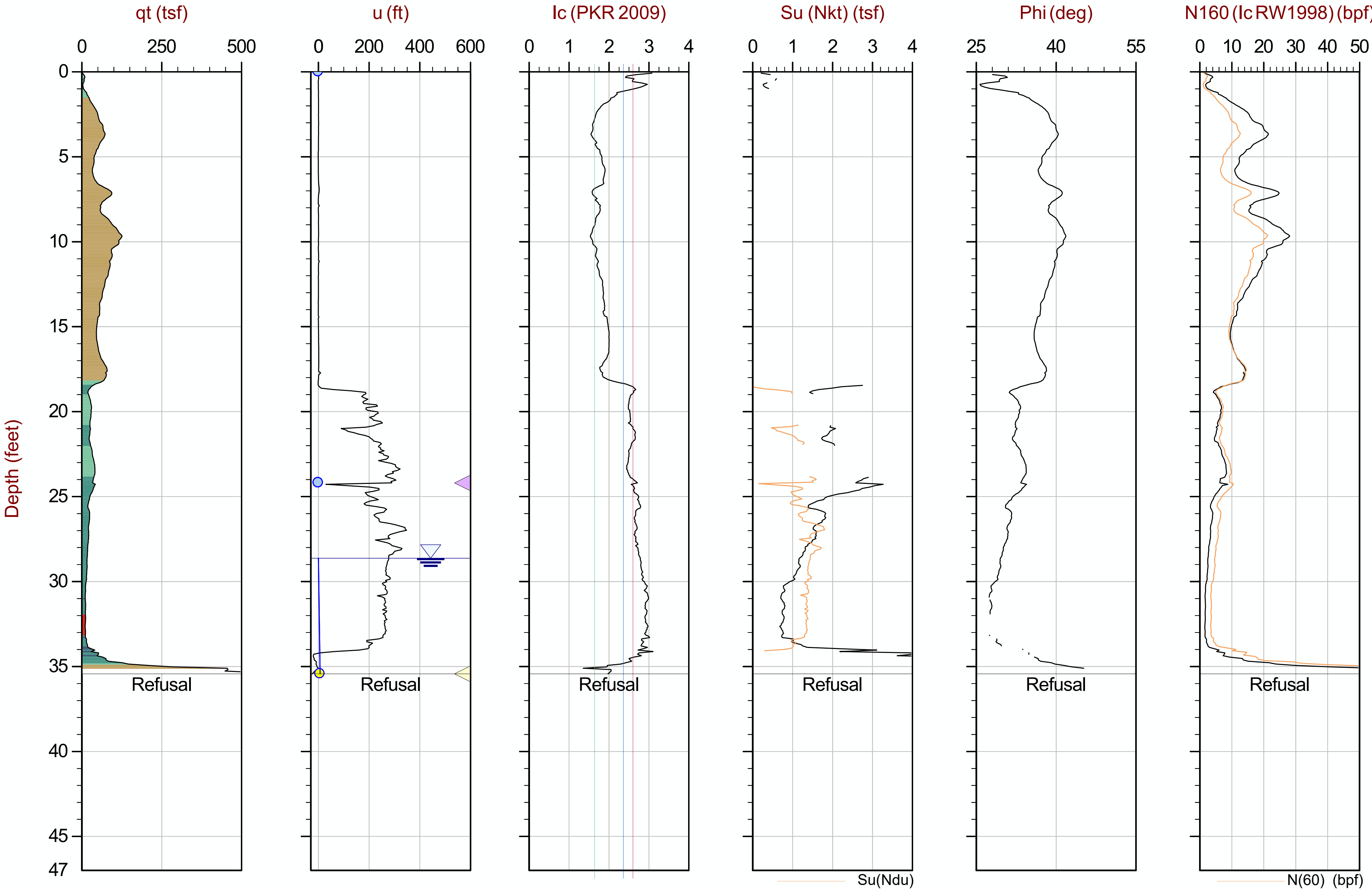
The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-24 10:01
Site: Crossroads Landfill

Sounding: SCPT18-32
Cone: 452:T1500F15U500



Max Depth: 10.800 m / 35.43 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_SP32.COR
Su Nkt/Ndu: 12.5 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 684984ft E: 3038600ft Elev: 288.2

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

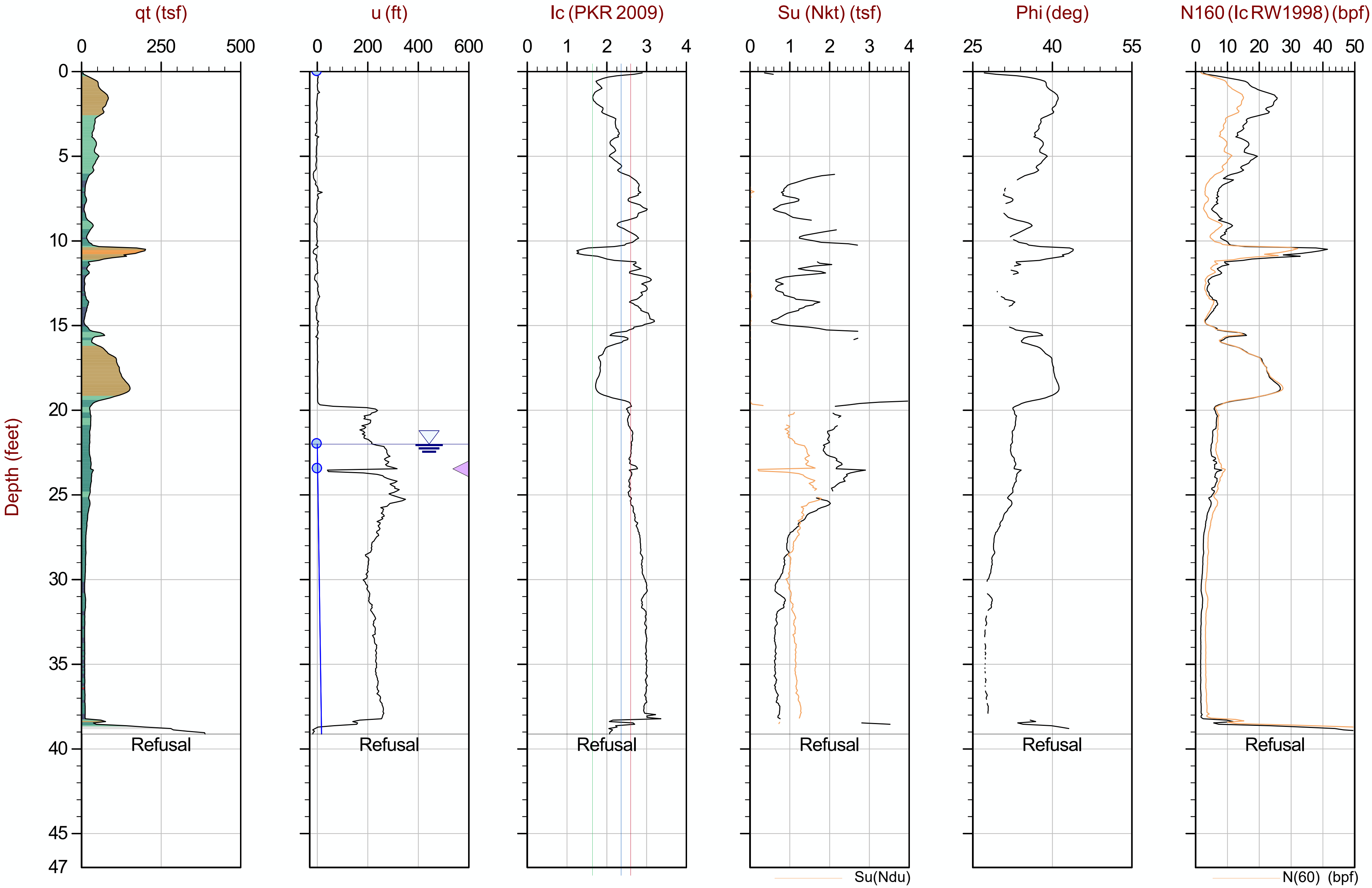
The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-24 12:30
Site: Crossroads Landfill

Sounding: CPT18-33
Cone: 452:T1500F15U500



Max Depth: 11.925 m / 39.12 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP33.COR
Su Nkt/Ndu: 12.5 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 685145ft E: 3038811ft Elev: 294.7

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

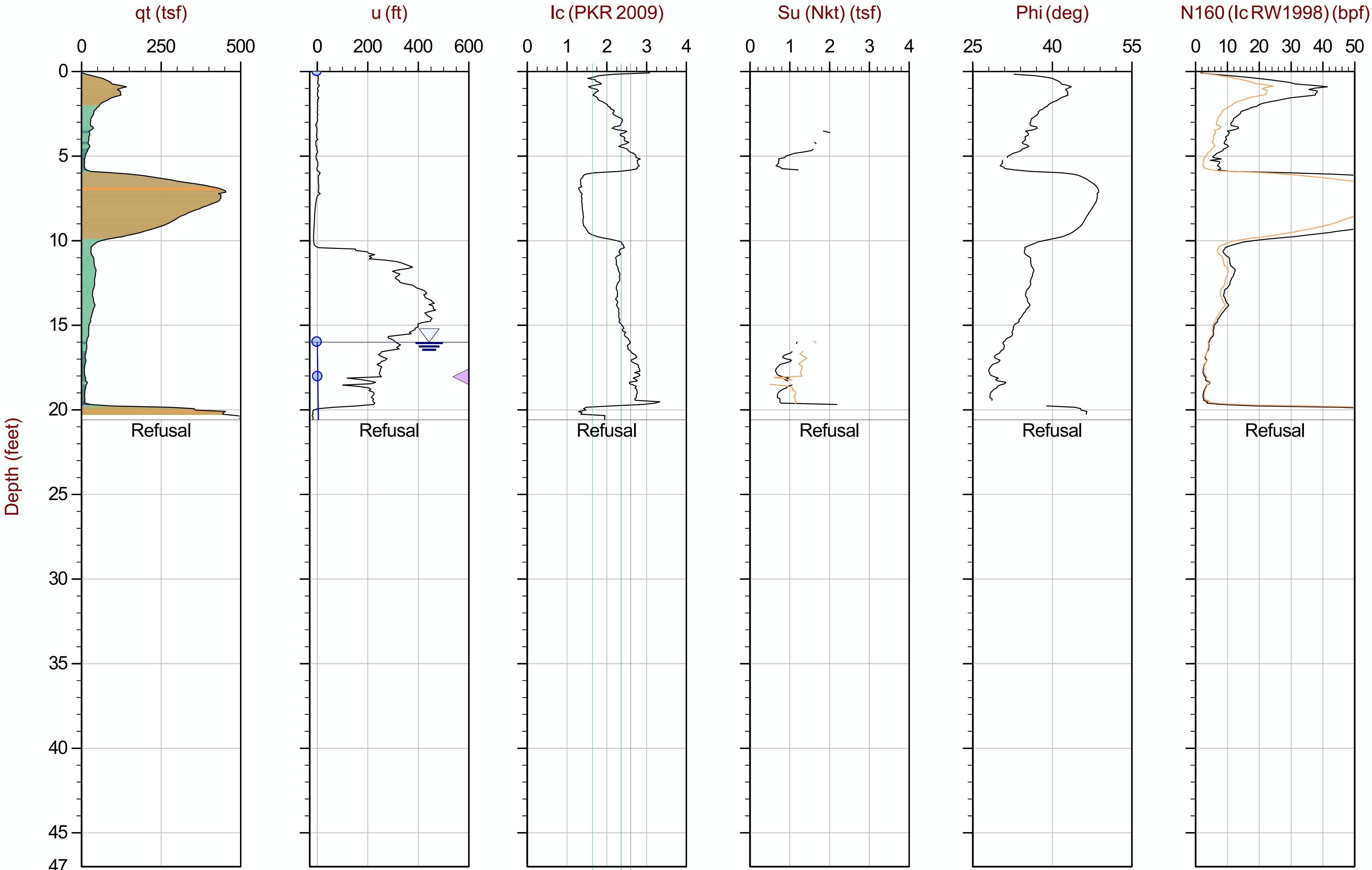
The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

ConeTec

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-22 13:51
Site: Crossroads Landfill

Sounding: CPT18-34
Cone: 452:T1500F15U500



Max Depth: 6.275 m / 20.59 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

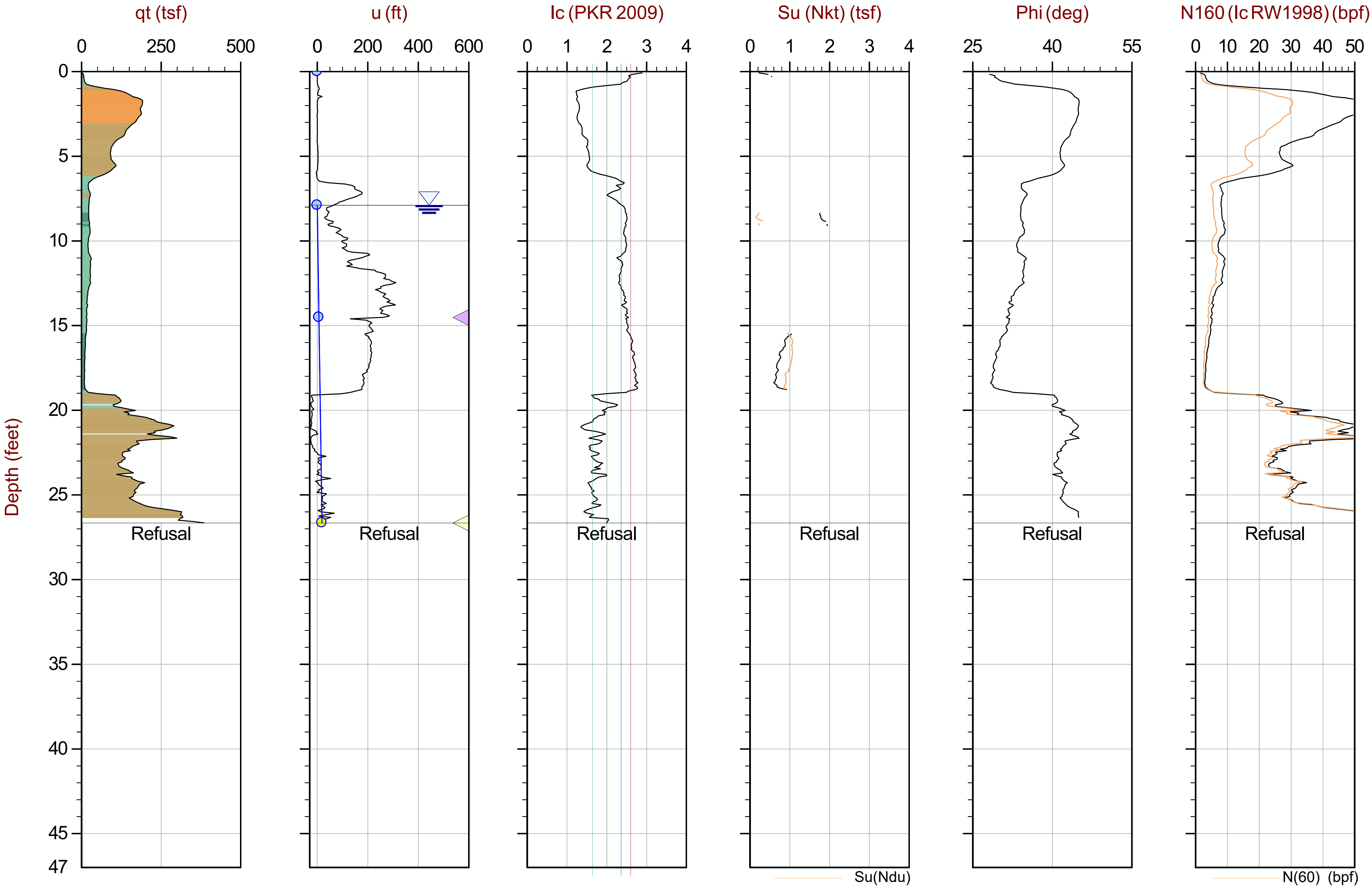
File: 18-53098_CP34.COR
Su Nkt/Ndu: 12.5 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 685183ft E: 3039576ft Elev: 292.5

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

The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

Geosyntec Consultants	Job No: 18-53098 Date: 2018-08-24 14:30 Site: Crossroads Landfill	Sounding: CPT18-35 Cone: 452:T1500F15U500



Max Depth: 8.125 m / 26.66 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP35.COR
Su Nkt/Ndu: 12.5 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 685072ft E: 3039366ft Elev: 284.8

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

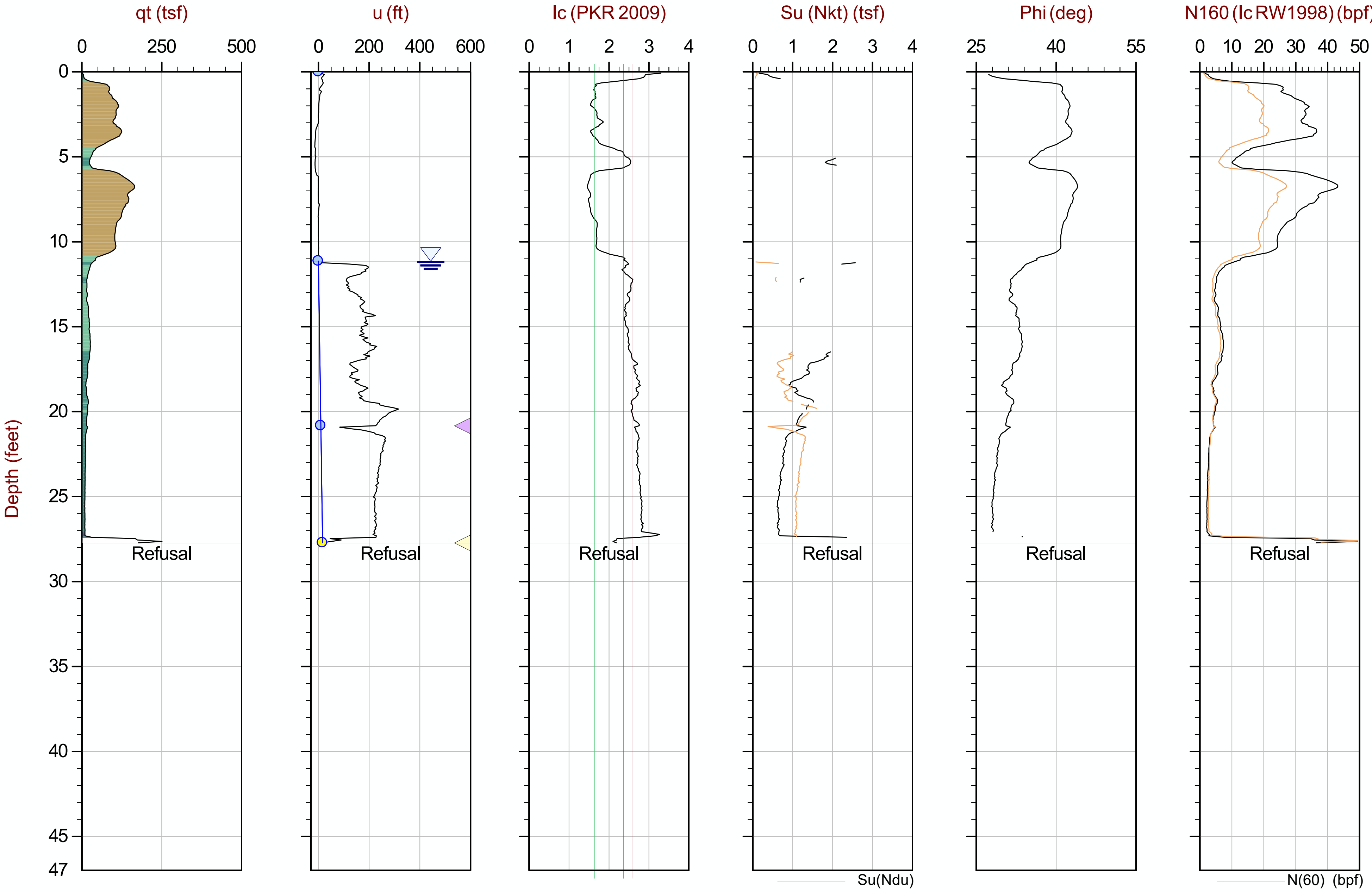
The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-22 14:46
Site: Crossroads Landfill

Sounding: CPT18-36
Cone: 452:T1500F15U500



Max Depth: 8.450 m / 27.72 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP36.COR
Su Nkt/Ndu: 12.5 / 6.0

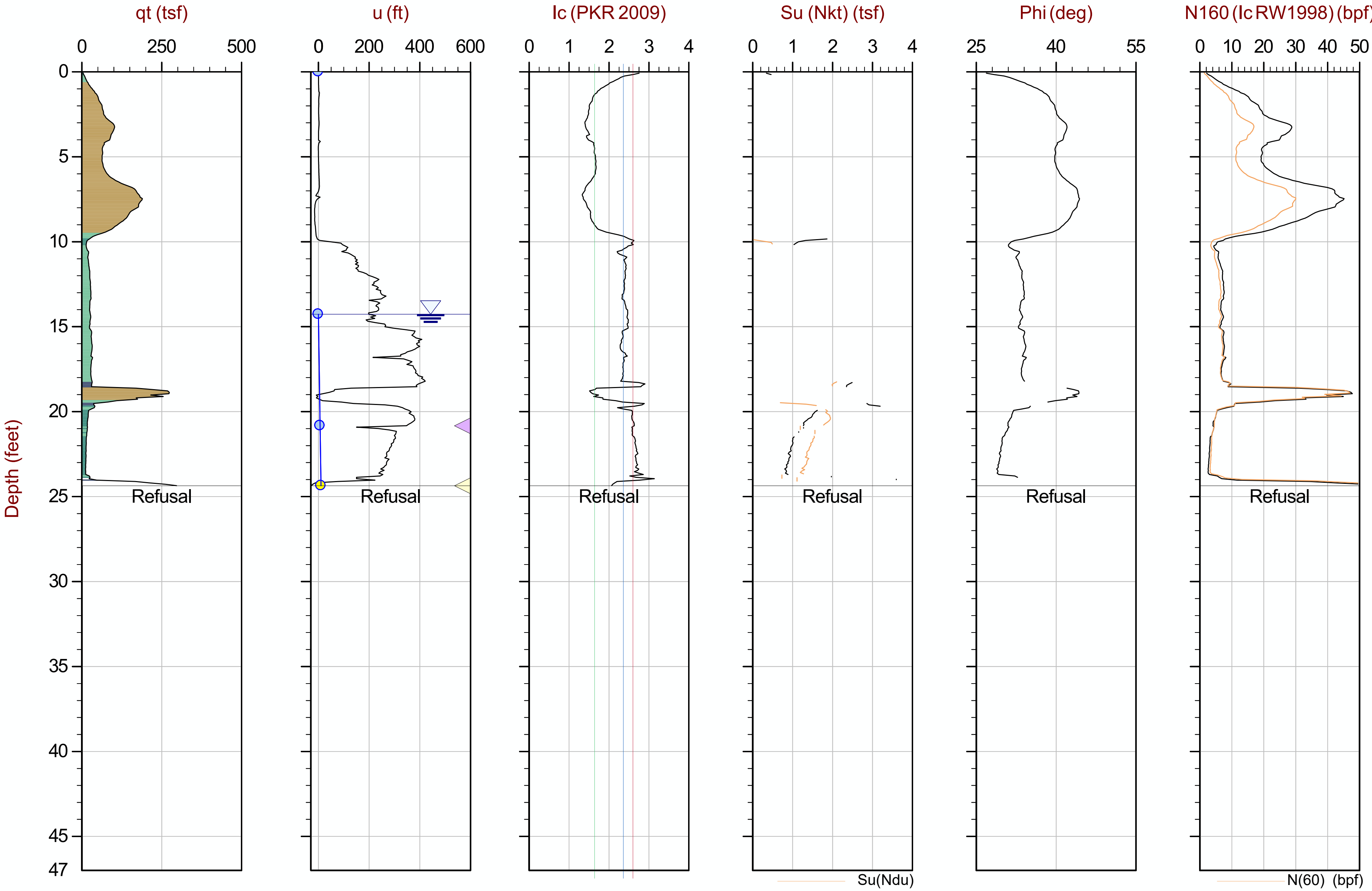
SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 684874ft E: 3039433ft Elev: 287.1

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

The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-23 14:21
Site: Crossroads Landfill
Sounding: CPT18-37
Cone: 452:T1500F15U500



Max Depth: 7.425 m / 24.36 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP37.COR
Su Nkt/Ndu: 12.5 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 684572ft E: 3039323ft Elev: 281.4

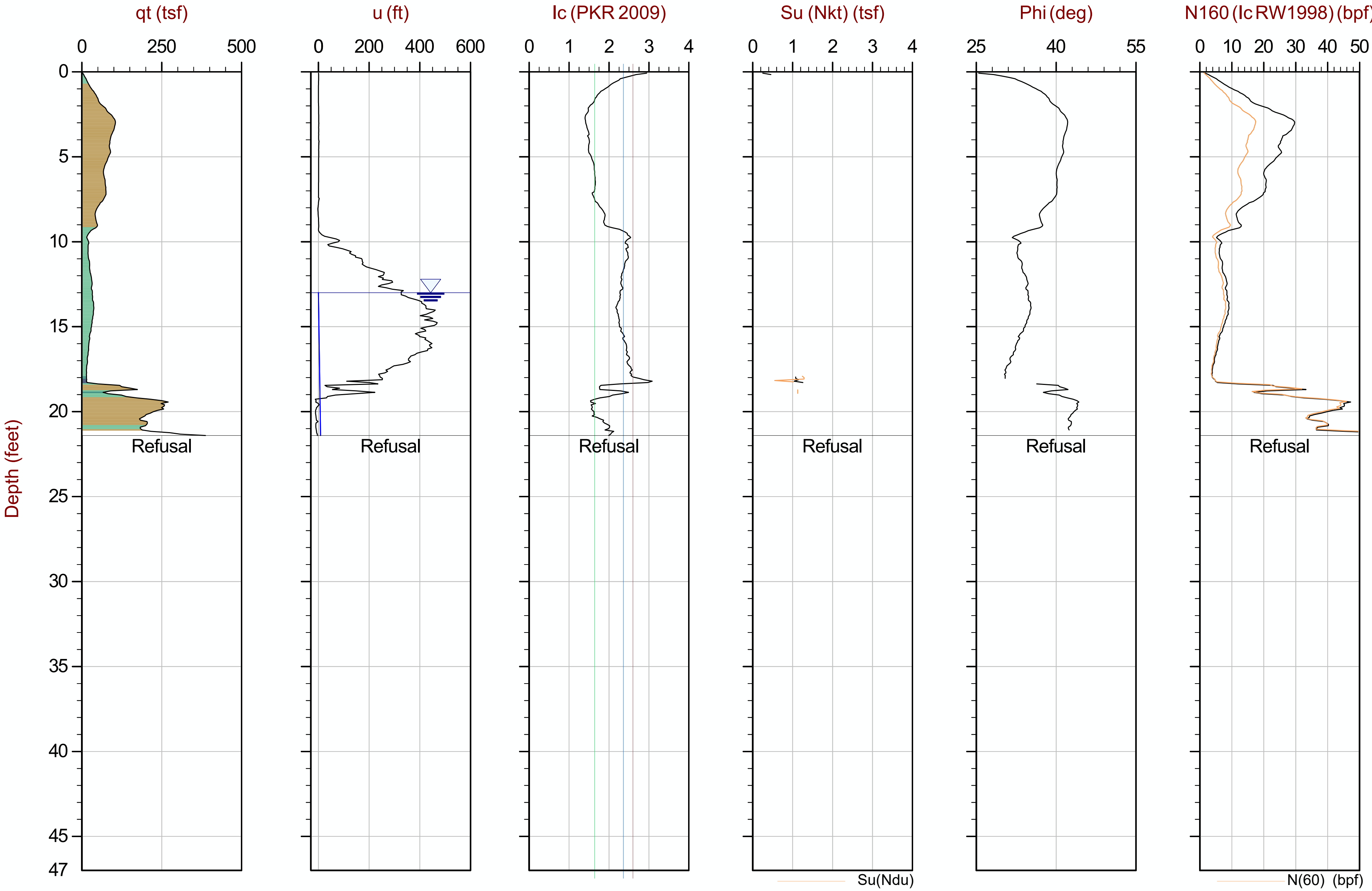
Hydrostatic Line   Ueq   Assumed Ueq   PPD, Ueq achieved   PPD, Ueq not achieved

The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-22 16:53
Site: Crossroads Landfill
Sounding: CPT18-38
Cone: 452:T1500F15U500



Max Depth: 6.525 m / 21.41 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP38.COR
Su Nkt/Ndu: 12.5 / 6.0

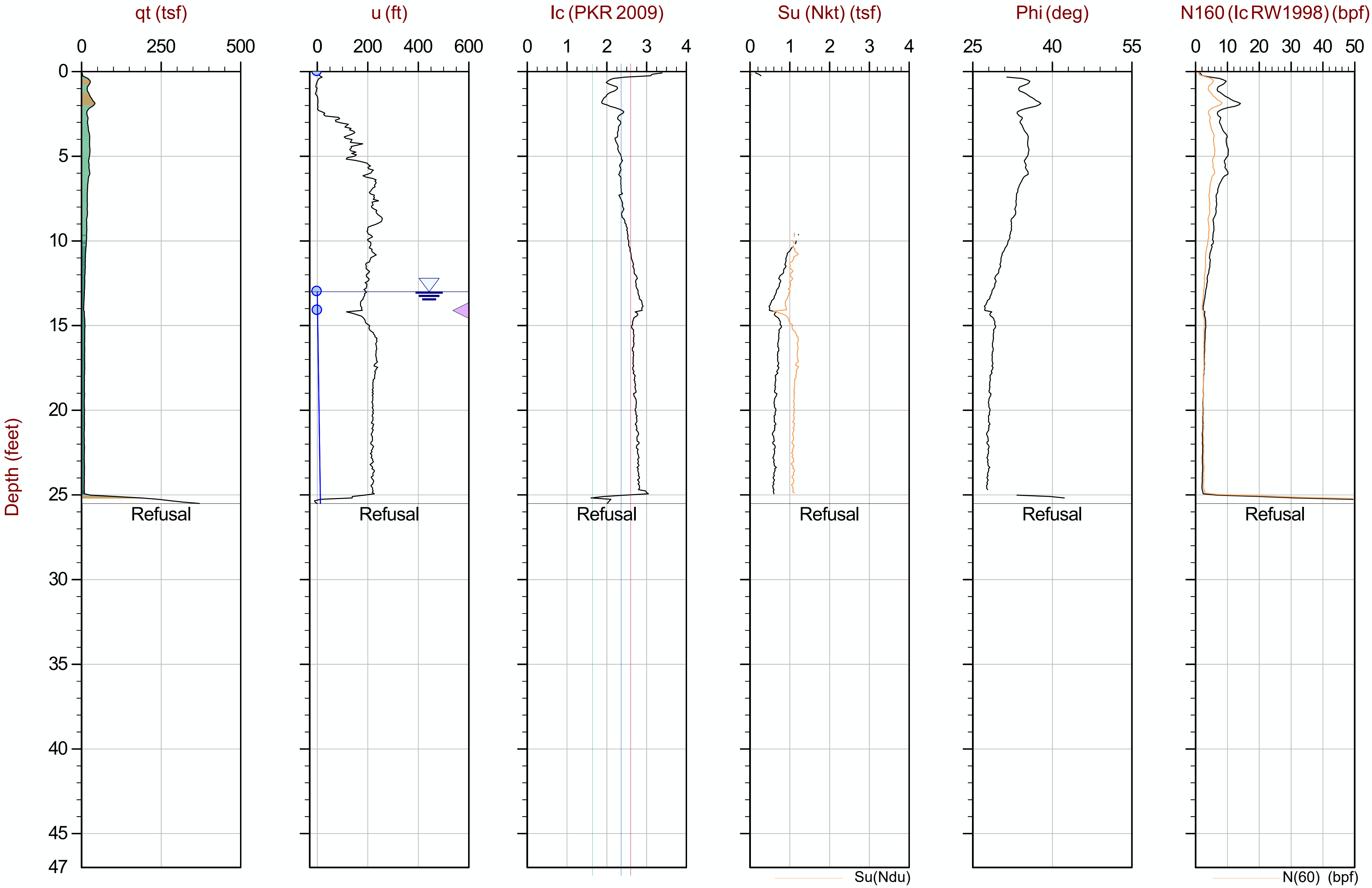
SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 684453ft E: 3039268ft Elev: 281.2

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

The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-20 16:11
Site: Crossroads Landfill
Sounding: CPT18-39
Cone: 388:T1500F15U500



Max Depth: 7.775 m / 25.51 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP39.COR
Su Nkt/Ndu: 12.5 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 684542ft E: 3040317ft Elev: 274.0

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

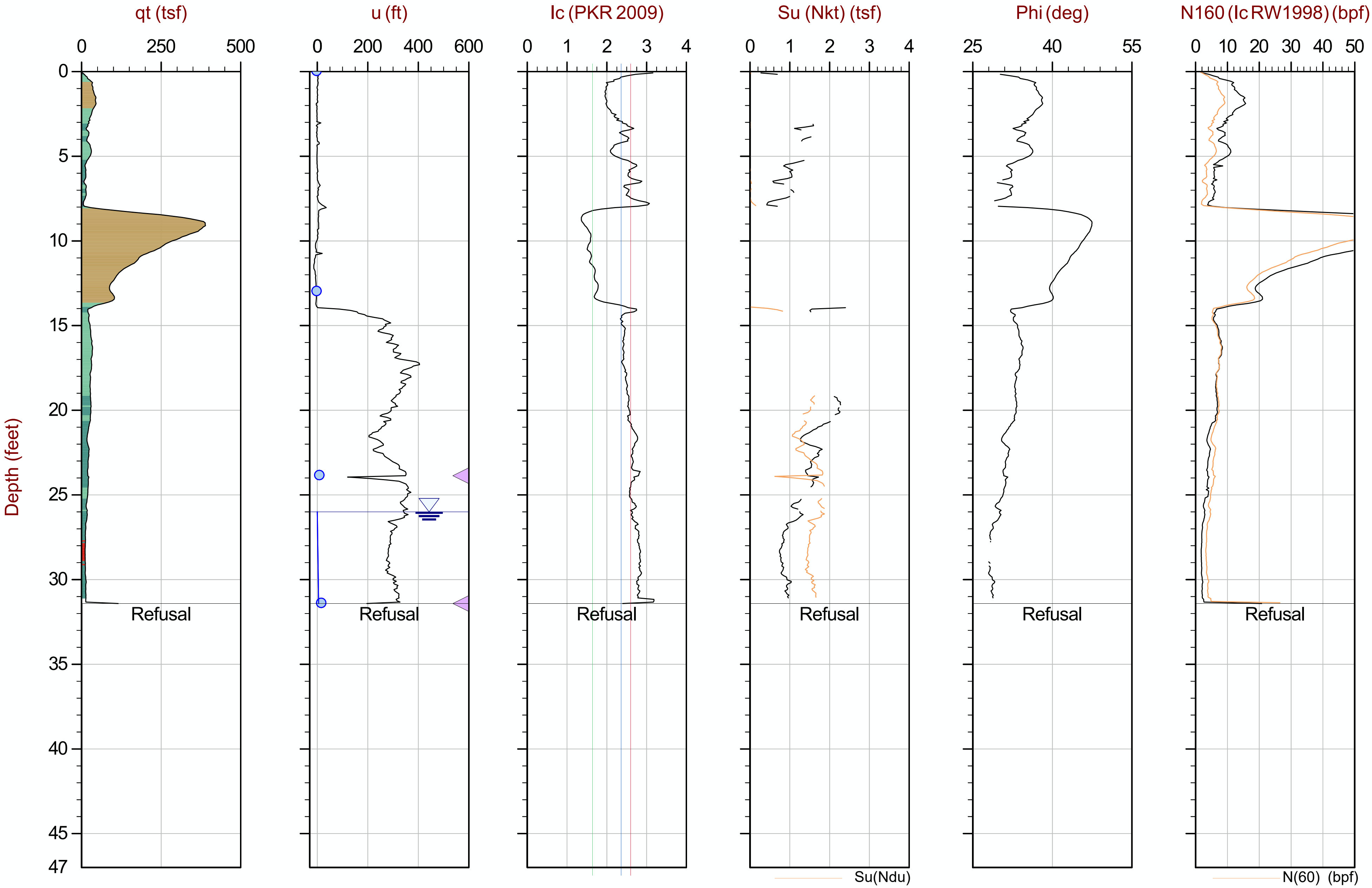
The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-20 14:54
Site: Crossroads Landfill

Sounding: CPT18-40
Cone: 388:T1500F15U500



Max Depth: 9.575 m / 31.41 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP40.COR
Su Nkt/Ndu: 12.5 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 684682ft E: 3040159ft Elev: 289.6

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

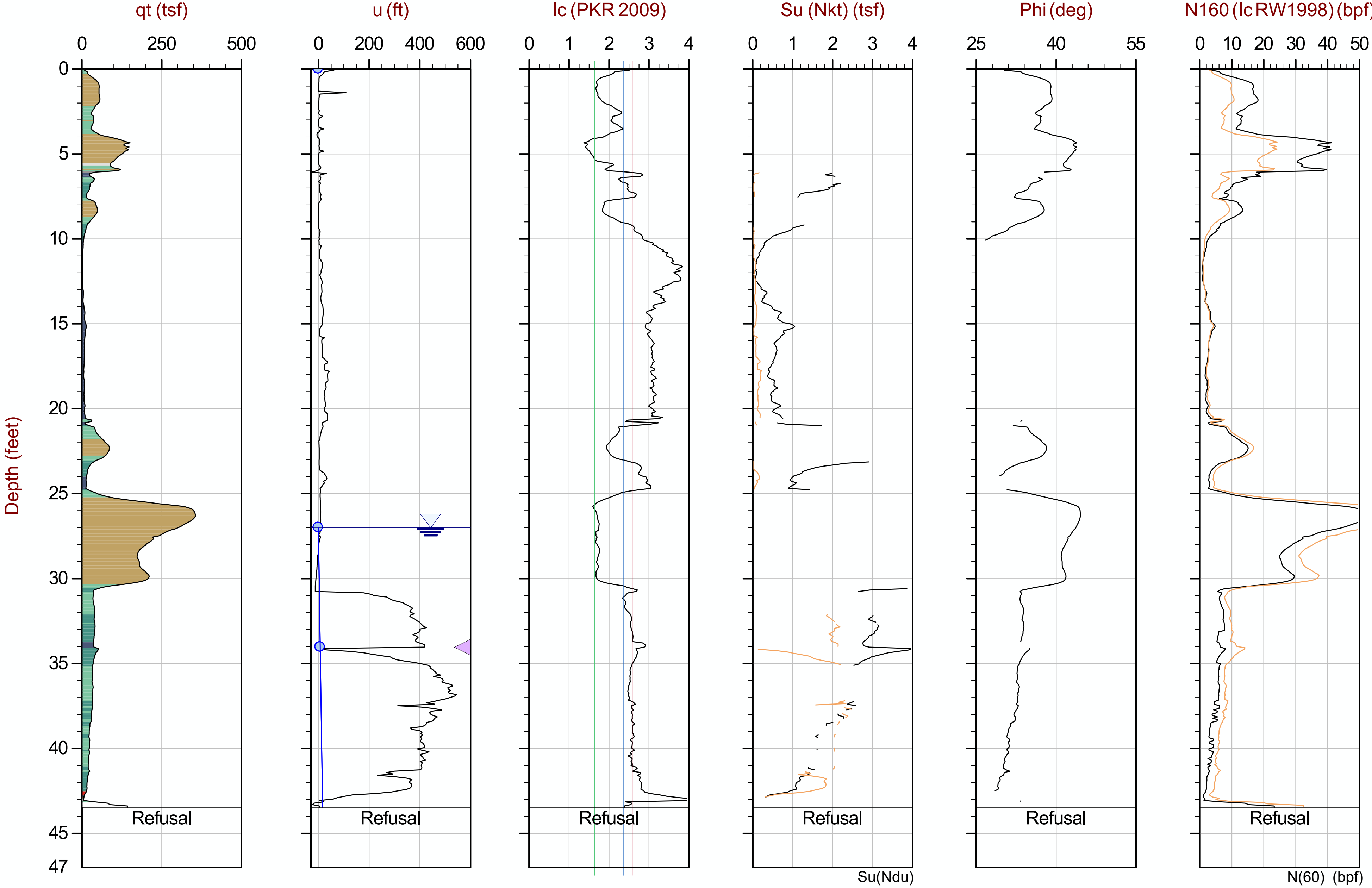
The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-21 08:24
Site: Crossroads Landfill

Sounding: SCPT18-41
Cone: 388:T1500F15U500



Max Depth: 13.250 m / 43.47 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_SP41.COR
Su Nkt/Ndu: 12.5 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 684856ft E: 3039972ft Elev: 308.4

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

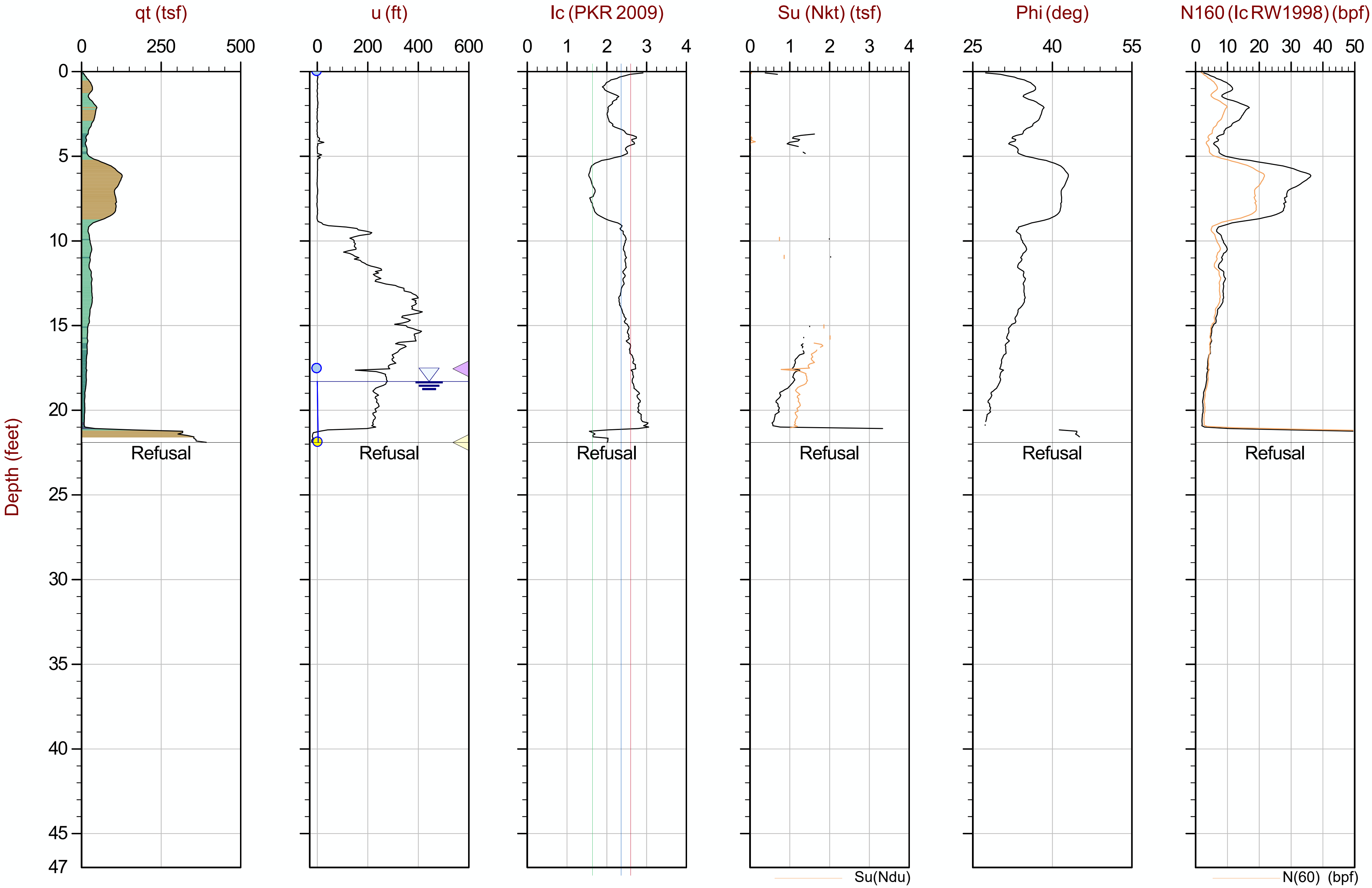
The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

ConeTec

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-21 13:52
Site: Crossroads Landfill

Sounding: CPT18-42
Cone: 388:T1500F15U500



Max Depth: 6.675 m / 21.90 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP42.COR
Su Nkt/Ndu: 12.5 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 685035ft E: 3040220ft Elev: 286.3

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

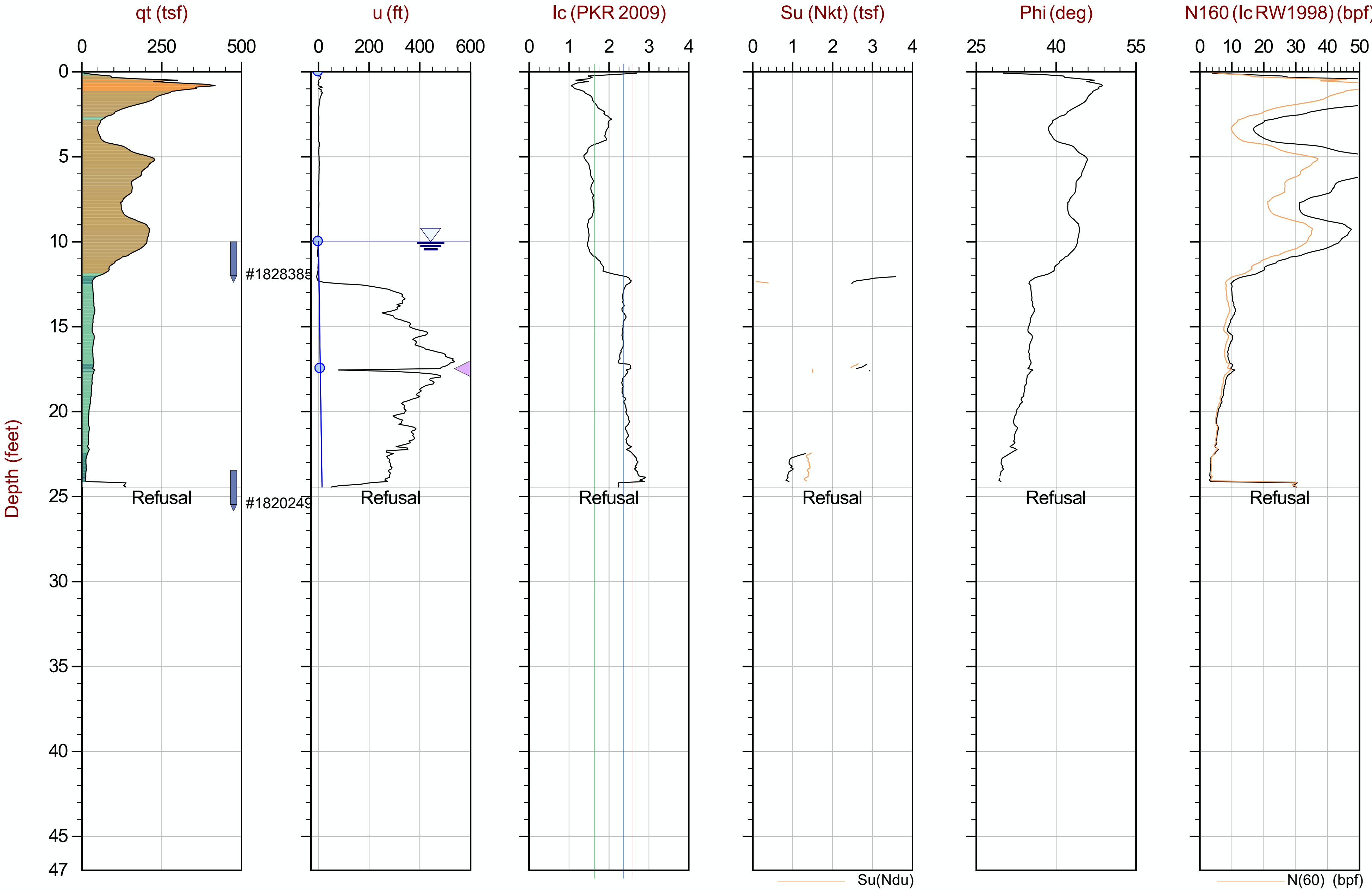
The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-22 11:48
Site: Crossroads Landfill

Sounding: CPT18-43
Cone: 452:T1500F15U500



Max Depth: 7.450 m / 24.44 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP43.COR
Su Nkt/Ndu: 12.5 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 685028ft E: 3039769ft Elev: 292.2

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

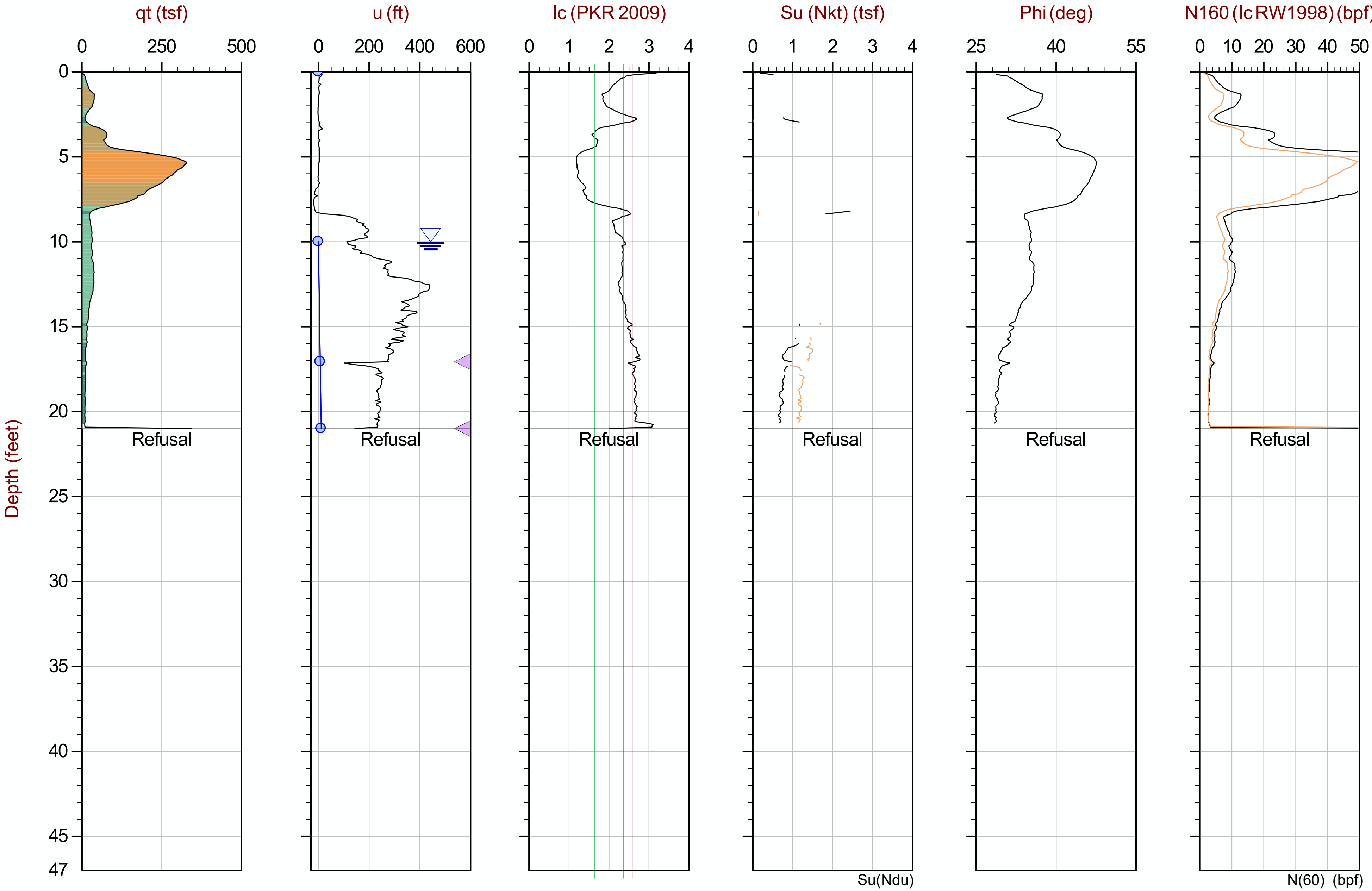
The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

ConeTec

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-21 10:55
Site: Crossroads Landfill

Sounding: CPT18-44
Cone: 388:T1500F15U500



Max Depth: 6.400 m / 21.00 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP44.COR
Su Nkt/Ndu: 12.5 / 6.0

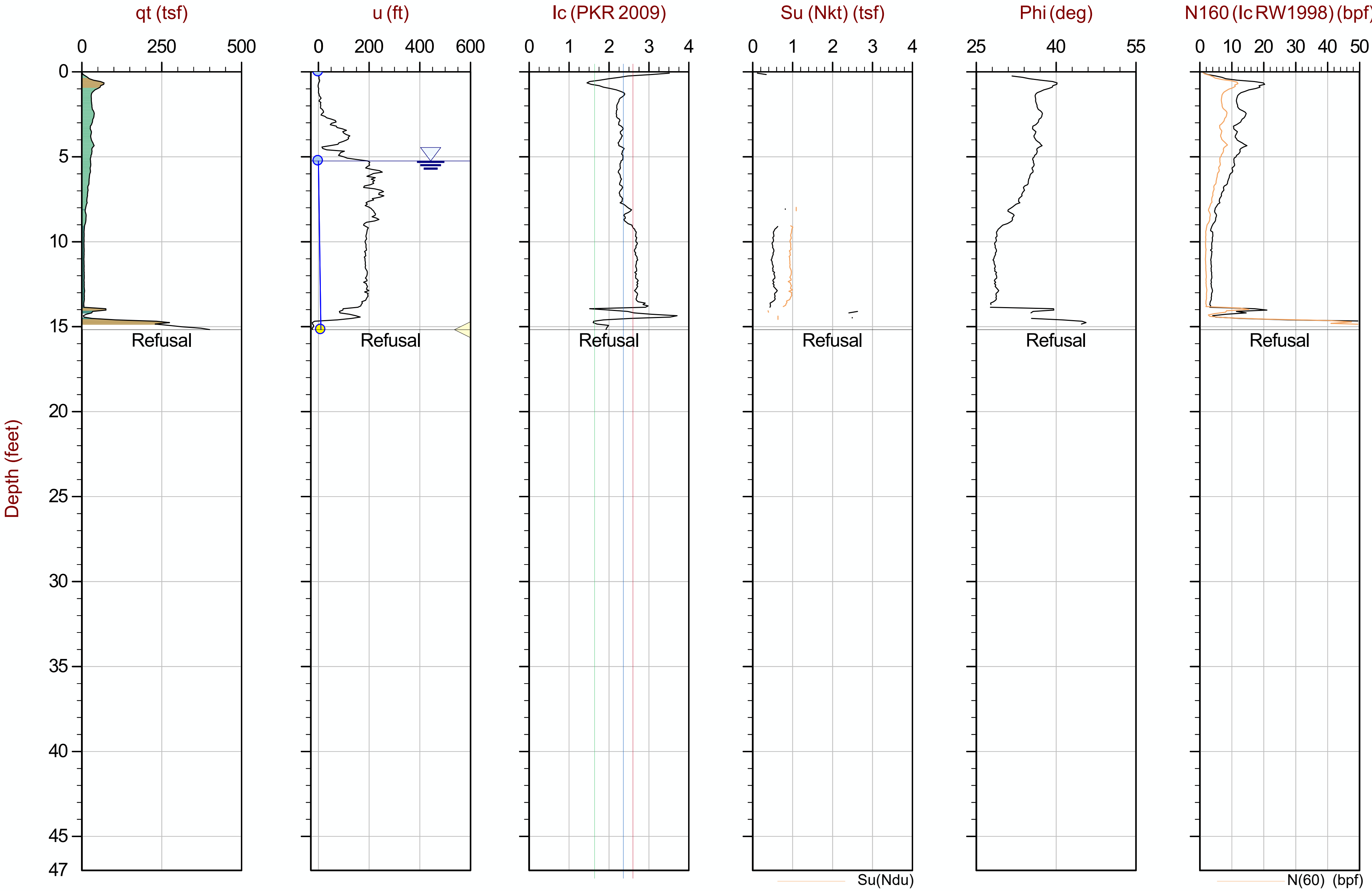
SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 685190ft E: 3040007ft Elev: 290.7

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

The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-21 12:08
Site: Crossroads Landfill
Sounding: CPT18-45
Cone: 388:T1500F15U500



Max Depth: 4.625 m / 15.17 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP45.COR
Su Nkt/Ndu: 12.5 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 685307ft E: 3040180ft Elev: 280.5

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

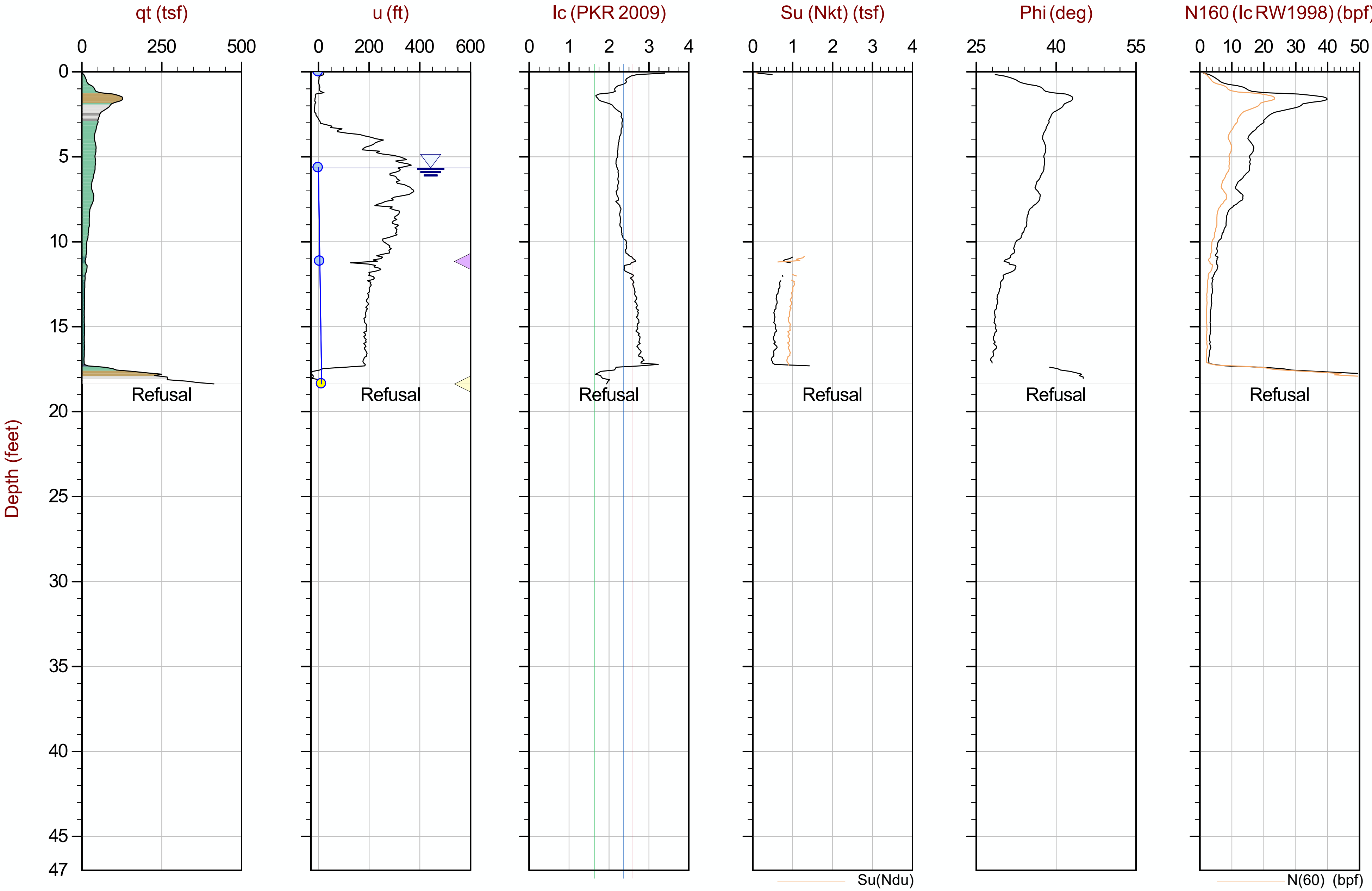
The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-21 12:45
Site: Crossroads Landfill

Sounding: CPT18-46
Cone: 388:T1500F15U500



Max Depth: 5.600 m / 18.37 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_CP46.COR
Su Nkt/Ndu: 12.5 / 6.0

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 685385ft E: 3040288ft Elev: 280.5

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

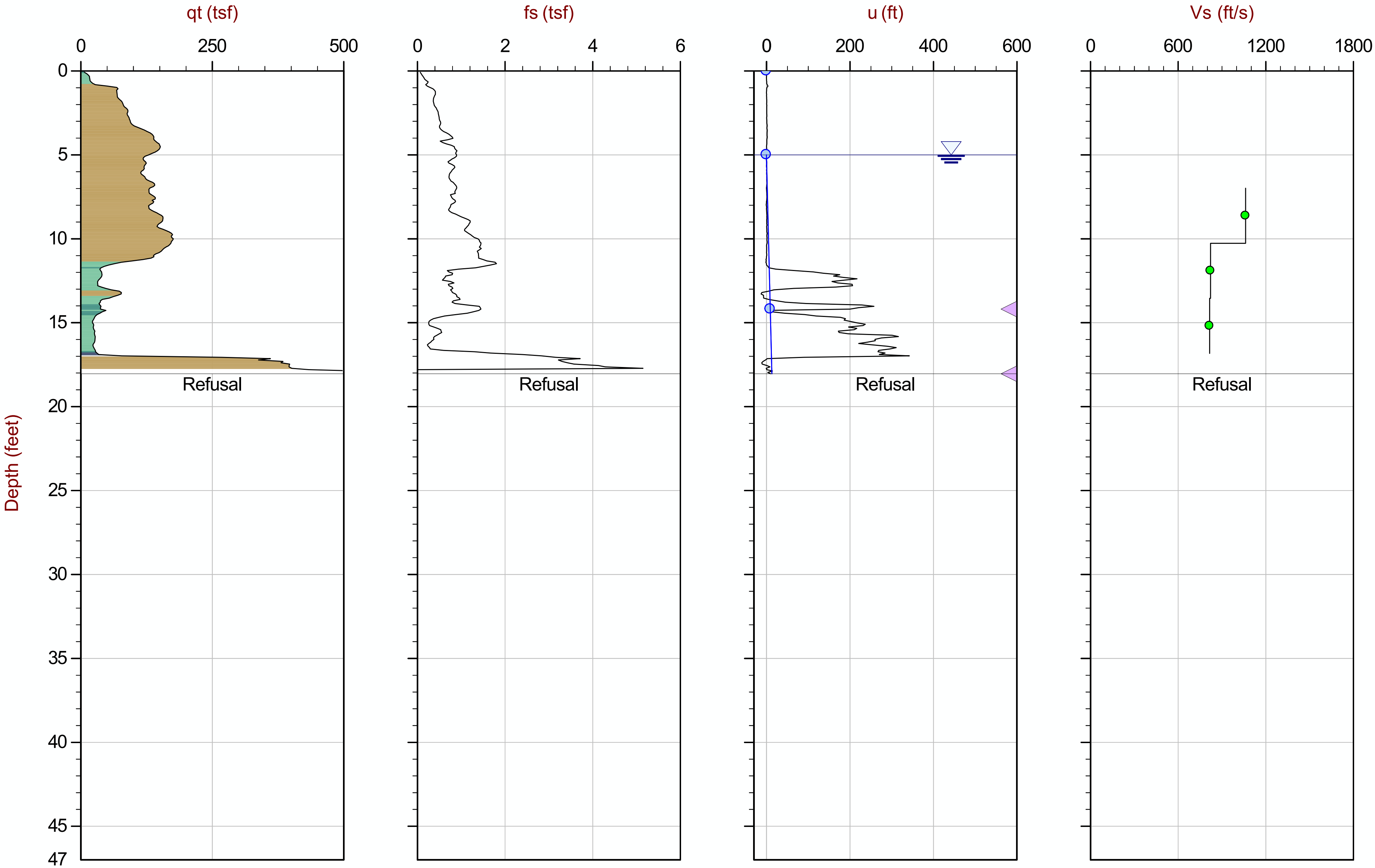
The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

Seismic Cone Penetration Test Plots

ConeTec

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-25 11:46
Site: Crossroads Landfill
Sounding: SCPT18-02
Cone: 452:T1500F15U500



Max Depth: 5.500 m / 18.04 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_SP02.COR

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 686044ft E: 3038601ft Elev: 298.8

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

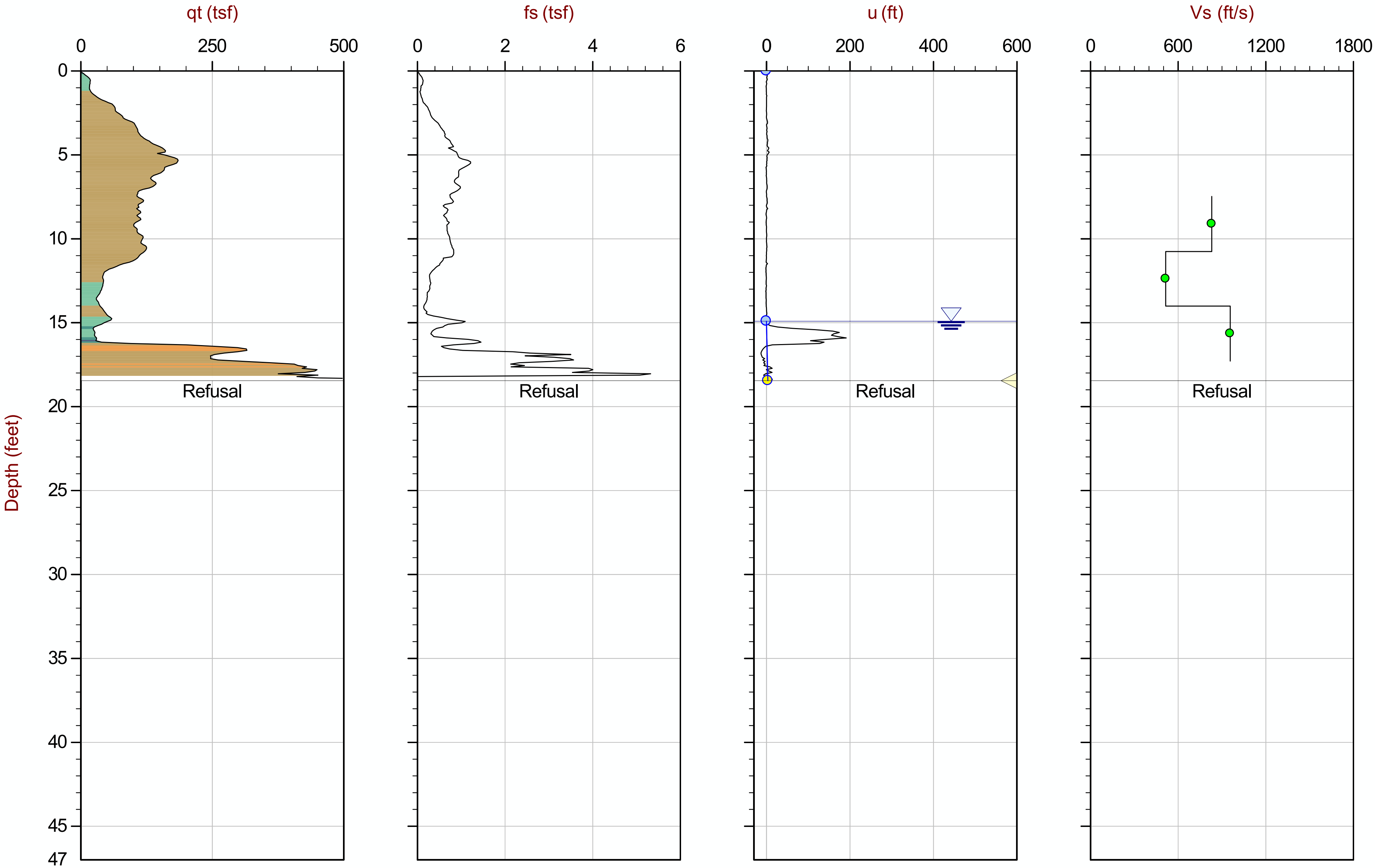
The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-24 16:27
Site: Crossroads Landfill

Sounding: SCPT18-07
Cone: 452:T1500F15U500



Max Depth: 5.625 m / 18.45 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

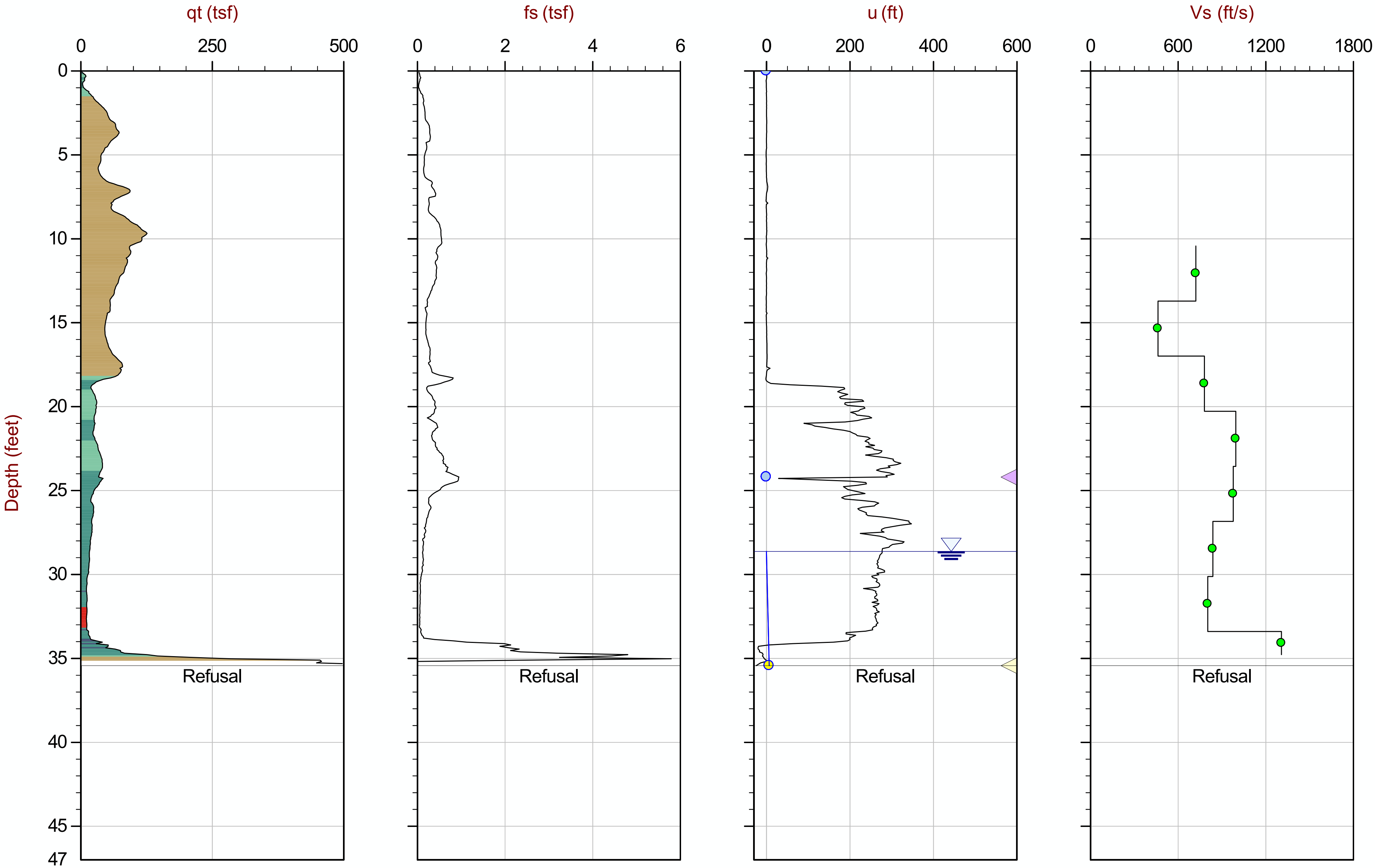
File: 18-53098_SP07.COR

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 685999ft E: 3039398ft Elev: 308.2

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

The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

Geosyntec Consultants	Job No: 18-53098 Date: 2018-08-24 10:01 Site: Crossroads Landfill	Sounding: SCPT18-32 Cone: 452:T1500F15U500



Max Depth: 10.800 m / 35.43 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_SP32.COR

SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 684984ft E: 3038600ft Elev: 288.2

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

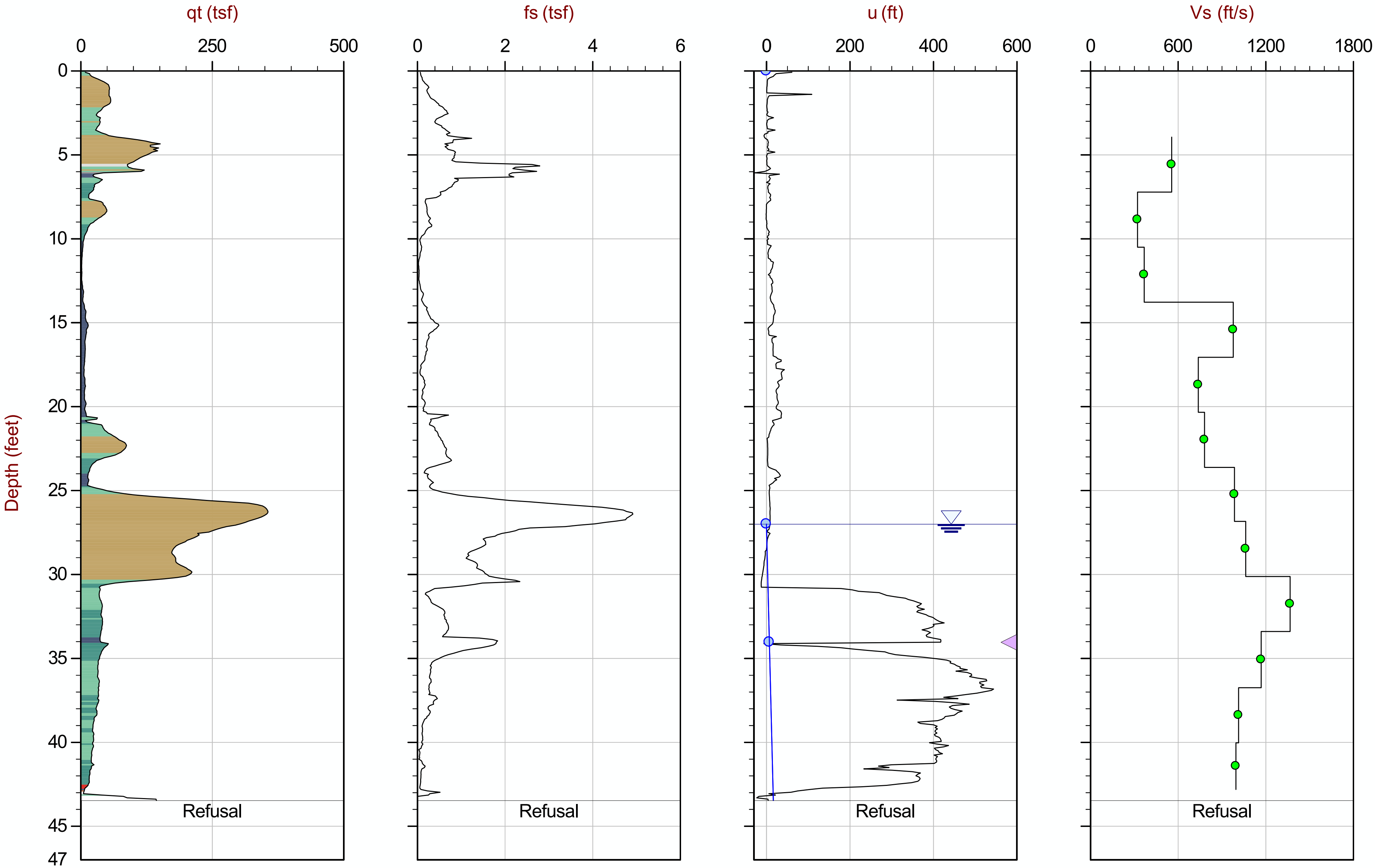
The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 2018-08-21 08:24
Site: Crossroads Landfill

Sounding: SCPT18-41
Cone: 388:T1500F15U500



Max Depth: 13.250 m / 43.47 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 18-53098_SP41.COR

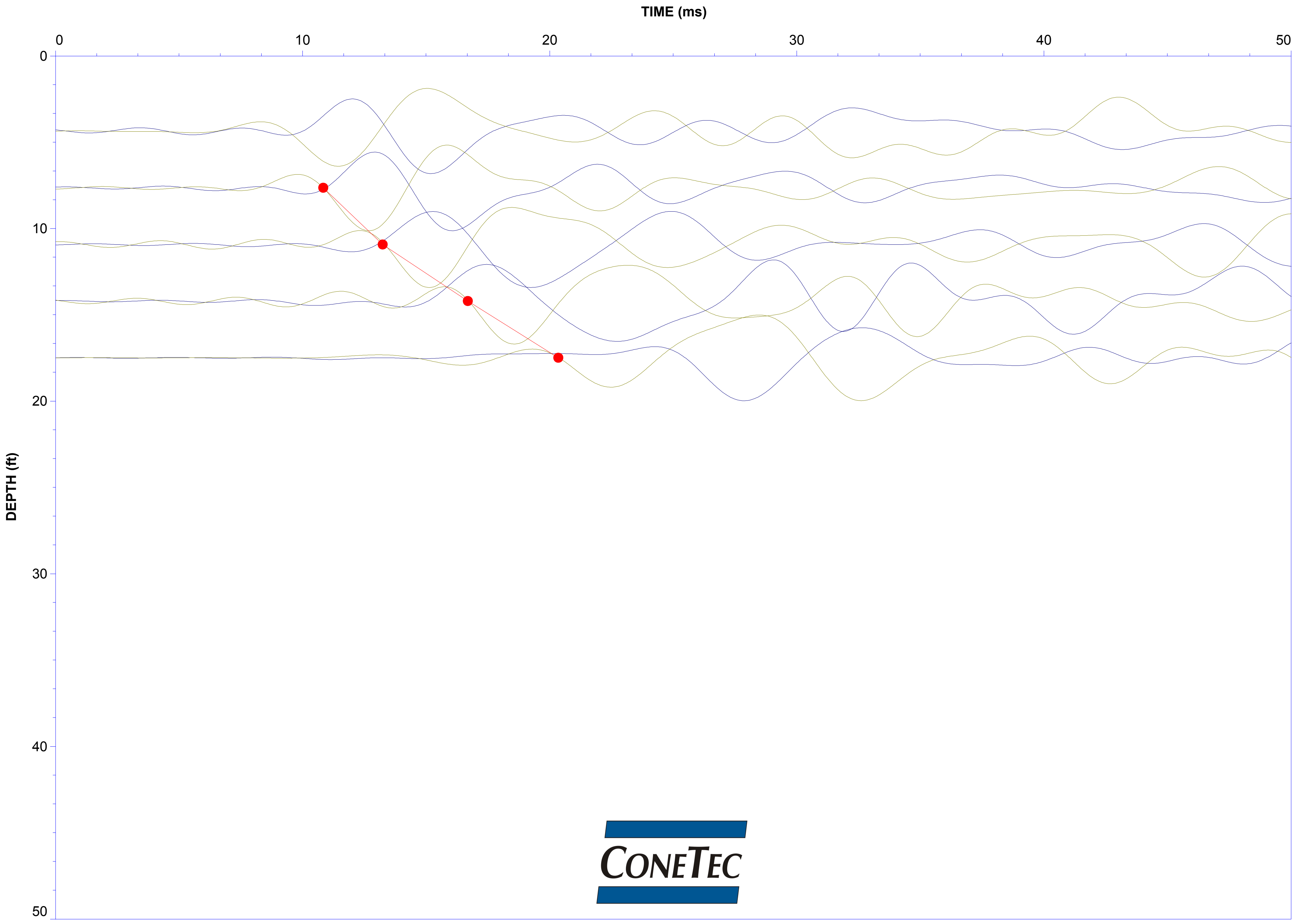
SBT: Robertson, 2009 and 2010
Coords: Maine SP West N: 684856ft E: 3039972ft Elev: 308.4

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

The reported coordinates were acquired from Geosyntec Consultants in NAD83/Maine West state plane(1983) format.

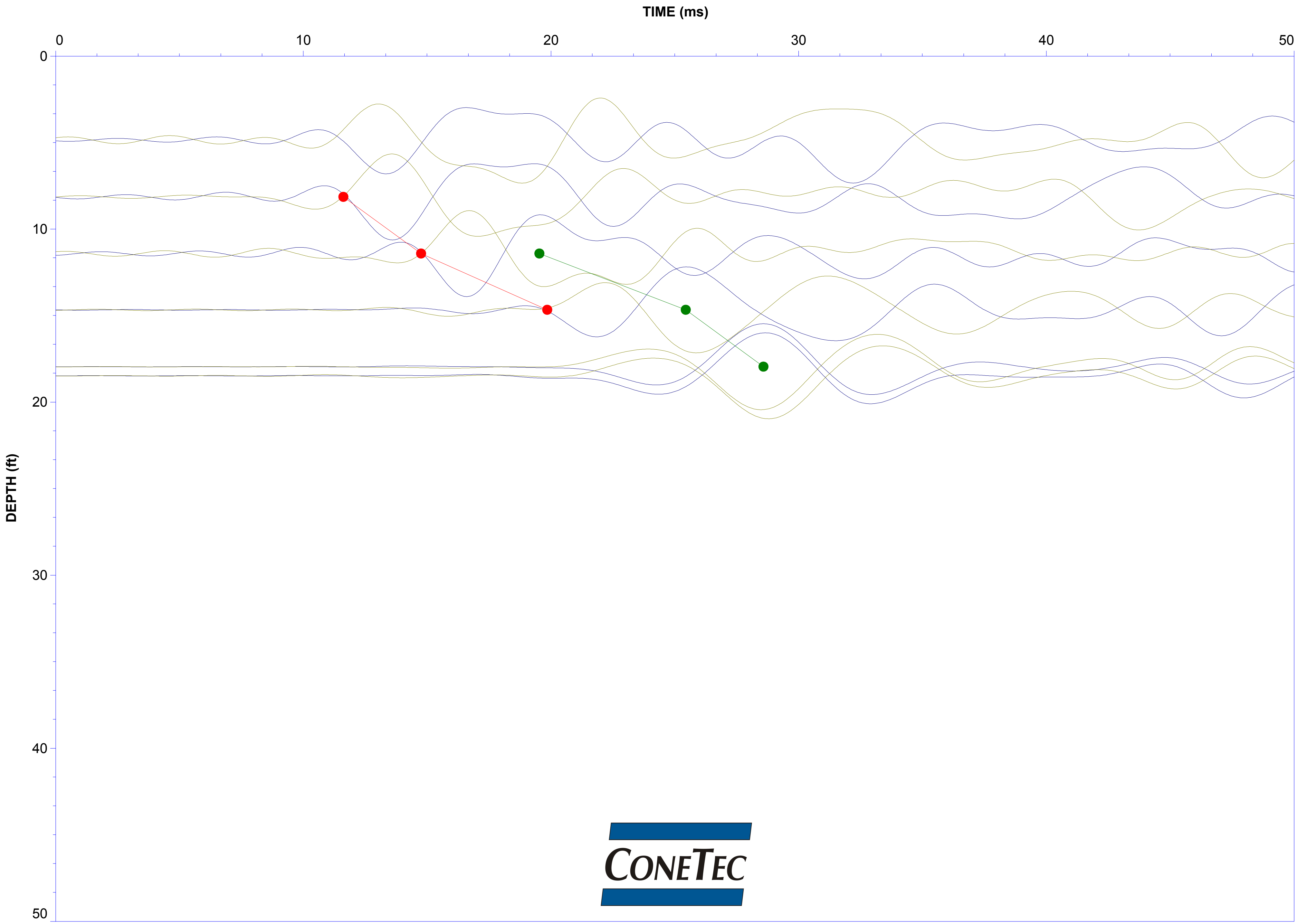
Seismic Cone Penetration Wave Traces

Job No: 18-53098 Client: Geosyntec Consultants Project Title: Crossroads Landfill Hole: SCPT18-02 Filter: 0-250hz Date: 8/25/2018

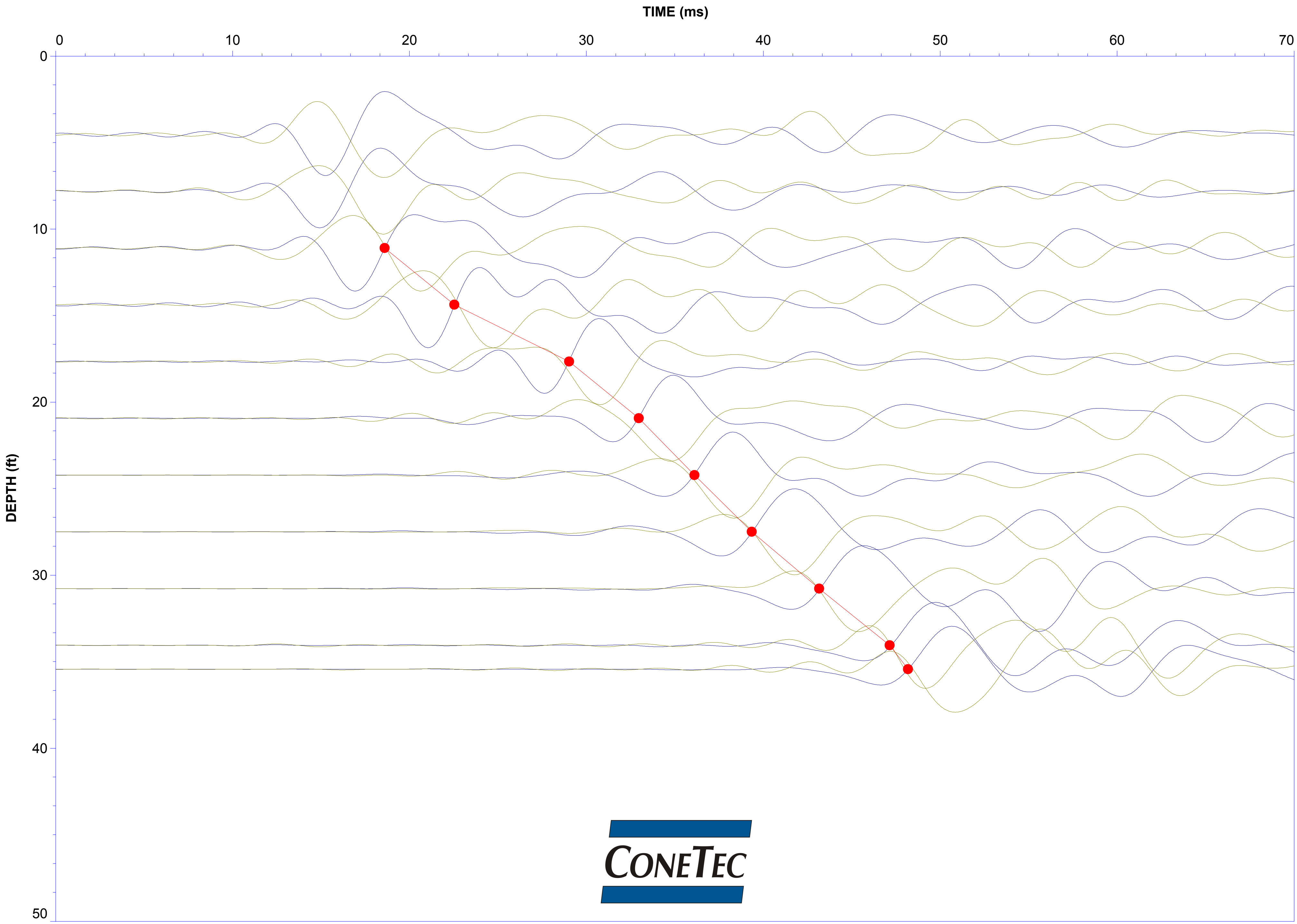


ConeTec

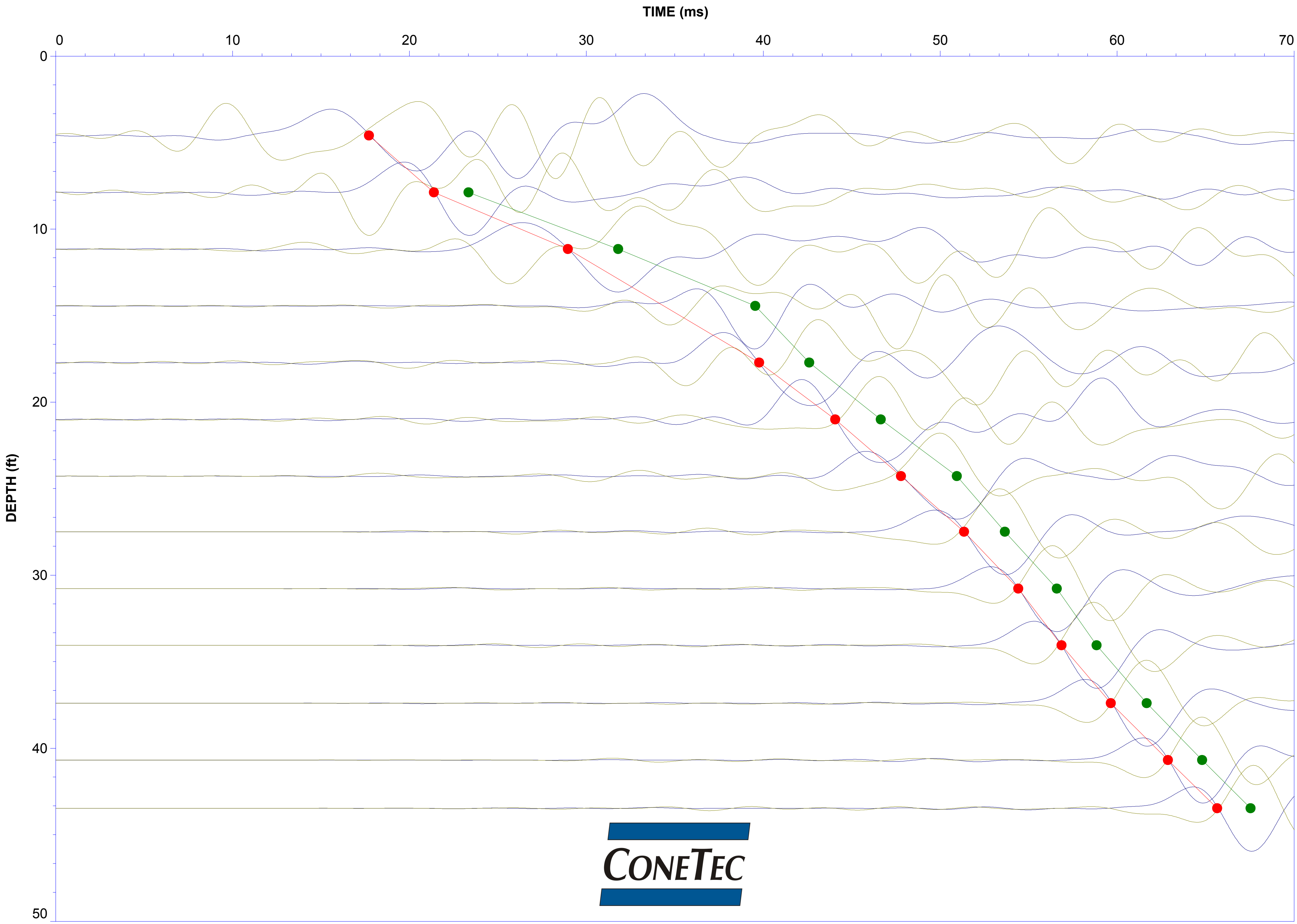
Job No: 18-53098 | Client: Geosyntec Consultants | Project Title: Crossroads Landfill | Hole: SCPT18-07 | Filter: 0-250hz | Date: 8/24/2018



Job No: 18-53098	Client: Geosyntec Consultants	Project Title: Crossroads Landfill	Hole: SCPT18-32	Filter: 0-250hz	Date: 8/24/2018



Job No: 18-53098 | Client: Geosyntec Consultants | Project Title: Crossroads Landfill | Hole: SCPT18-41 | Filter: 0-250hz | Date: 8/21/2018



Seismic Cone Penetration Test Tabular Results (Vs)

ConeTec

Job No: 18-53098
Client: Geosyntec Consultants
Project: Crossroads Landfill
Sounding ID: SCPT18-02
Date: 25-Aug-2018

Seismic Source: Beam
Source Offset (ft): 6.89
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)
7.64	6.99	9.81			
10.92	10.27	12.37	2.55	2.40	1062
14.21	13.55	15.20	2.83	3.45	822
17.49	16.83	18.19	2.99	3.66	816

Job No:	18-53098
Client:	Geosyntec Consultants
Project:	Crossroads Landfill
Sounding ID:	SCPT18-07
Date:	24-Aug-2018

Seismic Source:	Beam
Source Offset (ft):	6.89
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)
8.14	7.48	10.17			
11.42	10.76	12.78	2.61	3.14	830
14.67	14.01	15.61	2.83	5.50	515
17.95	17.29	18.61	3.00	3.14	957

Job No: 18-53098
Client: Geosyntec Consultants
Project: Crossroads Landfill
Sounding ID: SCPT18-32
Date: 24-Aug-2018

Seismic Source: Beam
Source Offset (ft): 6.89
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)
11.09	10.43	12.50			
14.37	13.71	15.35	2.84	3.94	721
17.65	16.99	18.34	2.99	6.48	462
20.93	20.28	21.41	3.08	3.94	780
24.21	23.56	24.54	3.13	3.15	995
27.49	26.84	27.71	3.16	3.24	977
30.77	30.12	30.90	3.19	3.80	838
34.06	33.40	34.10	3.21	3.99	803
35.43	34.78	35.45	1.35	1.03	1307

Job No: 18-53098
Client: Geosyntec Consultants
Project: Crossroads Landfill
Sounding ID: SCPT18-41
Date: 21-Aug-2018

Seismic Source: Beam
Source Offset (ft): 6.89
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)
4.59	3.94	7.93			
7.87	7.22	9.98	2.04	3.68	556
11.15	10.50	12.56	2.58	8.02	322
14.44	13.78	15.41	2.85	7.74	368
17.72	17.06	18.40	2.99	3.06	977
21.00	20.34	21.48	3.08	4.17	738
24.28	23.62	24.61	3.13	4.01	781
27.49	26.84	27.71	3.10	3.14	986
30.77	30.12	30.90	3.19	3.00	1063
34.06	33.40	34.10	3.21	2.34	1367
37.40	36.75	37.39	3.28	2.81	1169
40.68	40.03	40.61	3.23	3.18	1014
43.47	42.81	43.37	2.75	2.76	996

Pore Pressure Dissipation Summary and

Pore Pressure Dissipation Plots

ConeTec

CONETEC

Job No: 18-53098
Client: Geosyntec Consultants
Project: Crossroads Landfill
Start Date: 20-Aug-2018
End Date: 29-Aug-2018

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)
CPT18-01	18-53098_CP01.PPD	15	300	6.97	4.89	2.08				
SCPT18-02	18-53098_SP02.PPD	15	500	14.19	9.19		5.00	171.7	100	4.09
SCPT18-02	18-53098_SP02.PPD	15	180	18.04						
CPT18-03	18-53098_CP03.PPD	15	400	20.09	5.00	15.09				
CPT18-04	18-53098_CP04.PPD	15	720	6.56	4.66		1.91	518.21	100	1.35
CPT18-04	18-53098_CP04.PPD	15	240	9.43	7.53	1.91				
CPT18-05	18-53098_CP05.PPD	15	300	10.33	5.78	4.55				
CPT18-06	18-53098_CP06.PPD	15	200	10.66	2.18		8.48	63.444	100	11.06
CPT18-06	18-53098_CP06.PPD	15	200	14.85	6.36	8.48				
SCPT18-07	18-53098_SP07.PPD	15	500	18.45	3.55	14.91				
CPT18-08	18-53098_CP08.PPD	15	1140	13.12	4.38		8.74	99.868	100	7.03
CPT18-08	18-53098_CP08.PPD	15	200	14.60	5.85	8.75				
CPT18-09	18-53098_CP09.PPD	15	820	13.78	5.92		7.86	669.05	100	1.05
CPT18-09	18-53098_CP09.PPD	15	370	18.70	10.84	7.86				
CPT18-10	18-53098_CP10.PPD	15	280	25.26	5.89	19.37		11.38	100	61.68
CPT18-11	18-53098_CP11.PPD	15	380	16.65	1.46		15.19	54.483	100	12.88
CPT18-11	18-53098_CP11.PPD	15	280	24.28	9.09	15.19				
CPT18-12	18-53098_CP12.PPD	15	200	37.48	5.93	31.55				
CPT18-12B	18-53098_CP12B.PPD	15	500	40.52	7.52		33.00			
CPT18-13	18-53098_CP13.PPD	15	770	33.79	4.16		29.63	666.59	100	1.05
CPT18-13	18-53098_CP13.PPD	15	675	37.81	8.18	29.63				
CPT18-14	18-53098_CP14.PPD	15	900	17.63	5.11		12.52	413.05	100	1.70

Job No: 18-53098
Client: Geosyntec Consultants
Project: Crossroads Landfill
Start Date: 20-Aug-2018
End Date: 29-Aug-2018

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)
CPT18-14	18-53098_CP14.PPD	15	300	20.67	8.15	12.52				
CPT18-15	18-53098_CP15.PPD	15	600	17.72	3.67		14.05	469.34	100	1.50
CPT18-15	18-53098_CP15.PPD	15	320	25.75	11.71	14.05				
CPT18-16	18-53098_CP16.PPD	15	500	11.07	0.00	11.07		266.14	100	2.64
CPT18-16	18-53098_CP16.PPD	15	205	18.62	5.62		13.00	28.964	100	24.23
CPT18-17	18-53098_CP17.PPD	15	600	27.56	0.00	27.56		193.94	100	3.62
CPT18-17	18-53098_CP17.PPD	15	370	44.86	13.53	31.34				
CPT18-18	18-53098_CP18.PPD	15	1220	32.81	11.81		21.00	940.63	100	0.75
CPT18-18	18-53098_CP18.PPD	15	300	38.14	17.14		21.00	65.986	100	10.64
CPT18-19	18-53098_CP19.PPD	15	1800	17.06	8.77		8.29	1552.4	100	0.45
CPT18-19	18-53098_CP19.PPD	15	240	26.66	18.36	8.29				
CPT18-20	18-53098_CP20.PPD	15	420	20.83	2.83		18.00	358	100	1.96
CPT18-20	18-53098_CP20.PPD	15	2250	24.03	6.03		18.00	2047.8	100	0.34
CPT18-20	18-53098_CP20.PPD	15	120	35.68	17.68		18.00	92.659	100	7.57
CPT18-21	18-53098_CP21.PPD	15	845	17.47	9.99		7.48	694.74	100	1.01
CPT18-21	18-53098_CP21.PPD	15	240	21.74	14.26	7.48		37.315	100	18.81
CPT18-22	18-53098_CP22.PPD	15	500	17.31	2.31		15.00	477.7	100	1.47
CPT18-23	18-53098_CP23.PPD	15	1800	16.98	0.00		16.98			
CPT18-23	18-53098_CP23.PPD	15	160	26.74	6.51	20.23				
CPT18-24	18-53098_CP24.PPD	15	240	11.15	0.00	11.15		170.89	100	4.11
CPT18-24	18-53098_CP24.PPD	15	1020	17.72	0.88		16.84	983.82	100	0.71
CPT18-24	18-53098_CP24.PPD	15	240	19.93	3.09	16.84				

	Job No:	18-53098
	Client:	Geosyntec Consultants
	Project:	Crossroads Landfill
	Start Date:	20-Aug-2018
	End Date:	29-Aug-2018

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)
CPT18-25	18-53098_CP25.PPD	15	180	13.37	10.74	2.62				
CPT18-26	18-53098_CP26.PPD	15	600	11.15	1.08		10.08	443.09	100	1.58
CPT18-26	18-53098_CP26.PPD	15	200	28.62	18.55	10.08				
CPT18-27	18-53098_CP27.PPD	15	400	4.18	0.00		4.18	312.74	100	2.24
CPT18-27	18-53098_CP27.PPD	15	500	9.02	3.55	5.48				
CPT18-27	18-53098_CP27.PPD	15	420	10.09	4.40	5.69				
CPT18-28	18-53098_CP28.PPD	15	1195	12.06	2.64		9.42	144.88	100	4.84
CPT18-28	18-53098_CP28.PPD	15	500	17.22	7.81		9.42	328.61	100	2.14
CPT18-28	18-53098_CP28.PPD	15	375	36.83	27.41		9.42	27.46	100	25.56
CPT18-28	18-53098_CP28.PPD	15	700	36.91	27.49	9.42				
CPT18-29	18-53098_CP29.PPD	15	300	8.12	4.91	3.21				
CPT18-29B	18-53098_CP29B.PPD	15	160	7.22	3.60	3.62				
CPT18-30	18-53098_CP30.PPD	15	200	7.87	6.43	1.44				
CPT18-30B	18-53098_CP30B.PPD	15	910	4.35	2.19		2.16	303	100	2.32
CPT18-30B	18-53098_CP30B.PPD	15	1740	9.10	6.95	2.16				
CPT18-31	18-53098_CP31.PPD	15	900	7.05	0.46		6.59	445.27	100	1.58
CPT18-31	18-53098_CP31.PPD	15	240	9.60	3.00	6.60				
SCPT18-32	18-53098_SP32.PPD	15	480	24.20	0.00		24.20	296.79	100	2.36
SCPT18-32	18-53098_SP32.PPD	15	340	35.43	6.80	28.63				
CPT18-33	18-53098_CP33.PPD	15	320	23.46	1.46		22.00	167.88	100	4.18
CPT18-34	18-53098_CP34.PPD	15	640	18.04	2.04		16.00	467.23	100	1.50
CPT18-35	18-53098_CP35.PPD	15	450	14.52	6.62		7.89	390.74	100	1.80

Job No: 18-53098
Client: Geosyntec Consultants
Project: Crossroads Landfill
Start Date: 20-Aug-2018
End Date: 29-Aug-2018

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)
CPT18-35	18-53098_CP35.PPD	15	250	26.66	18.76	7.89				
CPT18-36	18-53098_CP36.PPD	15	940	20.83	9.69		11.14	794.09	100	0.88
CPT18-36	18-53098_CP36.PPD	15	200	27.72	16.58	11.14		60.646	100	11.57
CPT18-37	18-53098_CP37.PPD	15	900	20.83	6.56		14.27	688.25	100	1.02
CPT18-37	18-53098_CP37.PPD	15	330	24.36	10.09	14.27				
CPT18-39	18-53098_CP39.PPD	15	2500	14.11	1.11		13.00	1835.1	100	0.38
CPT18-40	18-53098_CP40.PPD	15	660	23.87	10.87		13.00	242.46	100	2.89
CPT18-40	18-53098_CP40.PPD	15	600	31.41	18.42		13.00	193.02	100	3.64
SCPT18-41	18-53098_SP41.PPD	15	620	34.04	7.04		27.00			
CPT18-42	18-53098_CP42.PPD	15	780	17.55	0.00		17.55	708.91	100	0.99
CPT18-42	18-53098_CP42.PPD	15	200	21.90	3.60	18.30				
CPT18-43	18-53098_CP43.PPD	15	240	17.47	7.47		10.00	60.685	100	11.57
CPT18-44	18-53098_CP44.PPD	15	900	17.06	7.06		10.00	725.78	100	0.97
CPT18-44	18-53098_CP44.PPD	15	705	21.00	11.00		10.00	604.31	100	1.16
CPT18-45	18-53098_CP45.PPD	15	320	15.17	9.93	5.25				
CPT18-46	18-53098_CP46.PPD	15	1080	11.15	5.51		5.65	541.52	100	1.30
CPT18-46	18-53098_CP46.PPD	15	120	18.37	12.73	5.65				
Totals	83 dissipations		790.7 min							

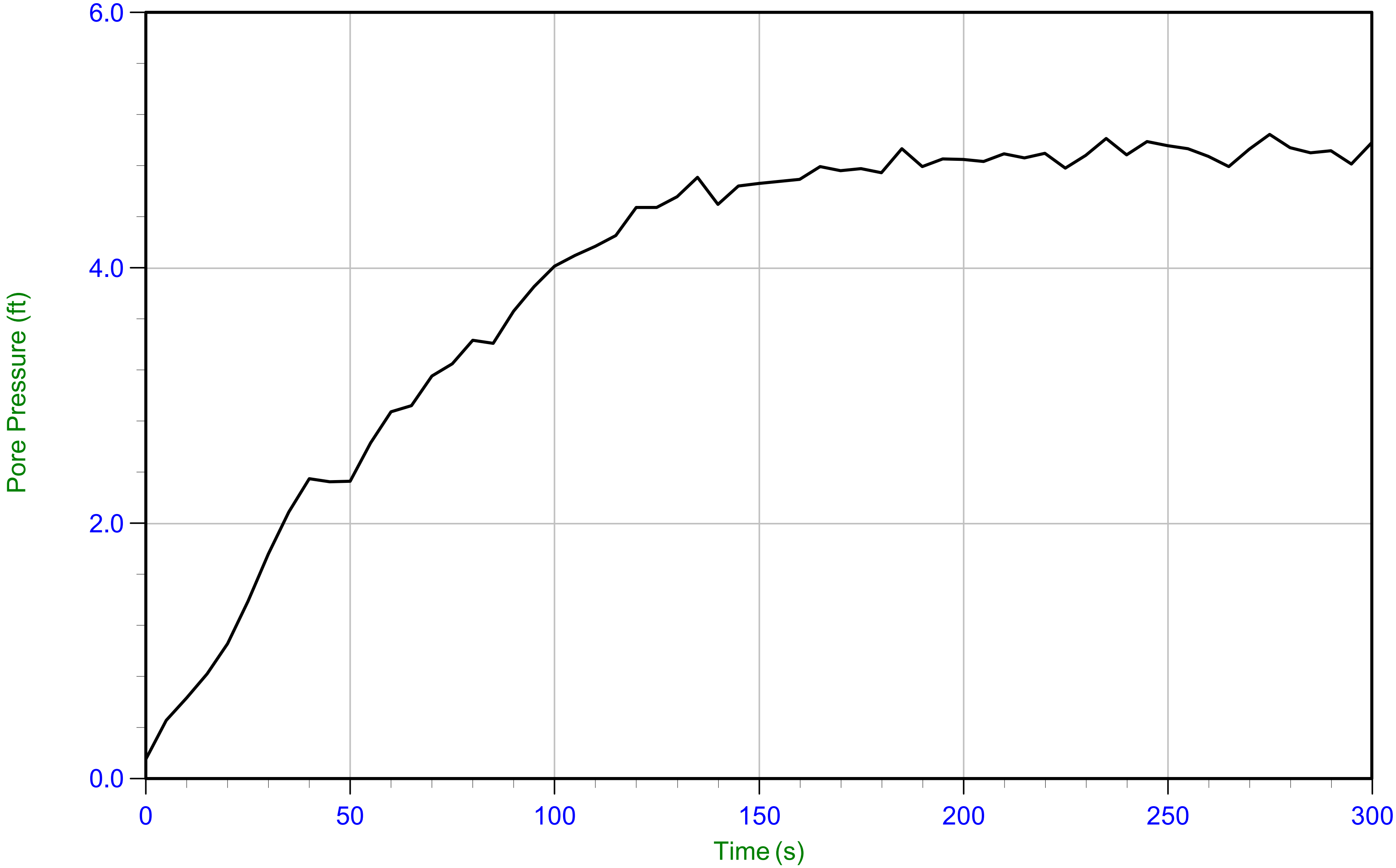
a. Time is relative to where umax occurred
b. Houlsby and Teh, 1991

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 25-Aug-2018 11:16:04
Site: Crossroads Landfill

Sounding: CPT18-01
Cone: AD452 Area=15 cm²



Trace Summary:

Filename: 18-53098_CP01.PPD
Depth: 2.125 m / 6.972 ft
Duration: 300.0 s

U Min: 0.2 ft
U Max: 5.0 ft

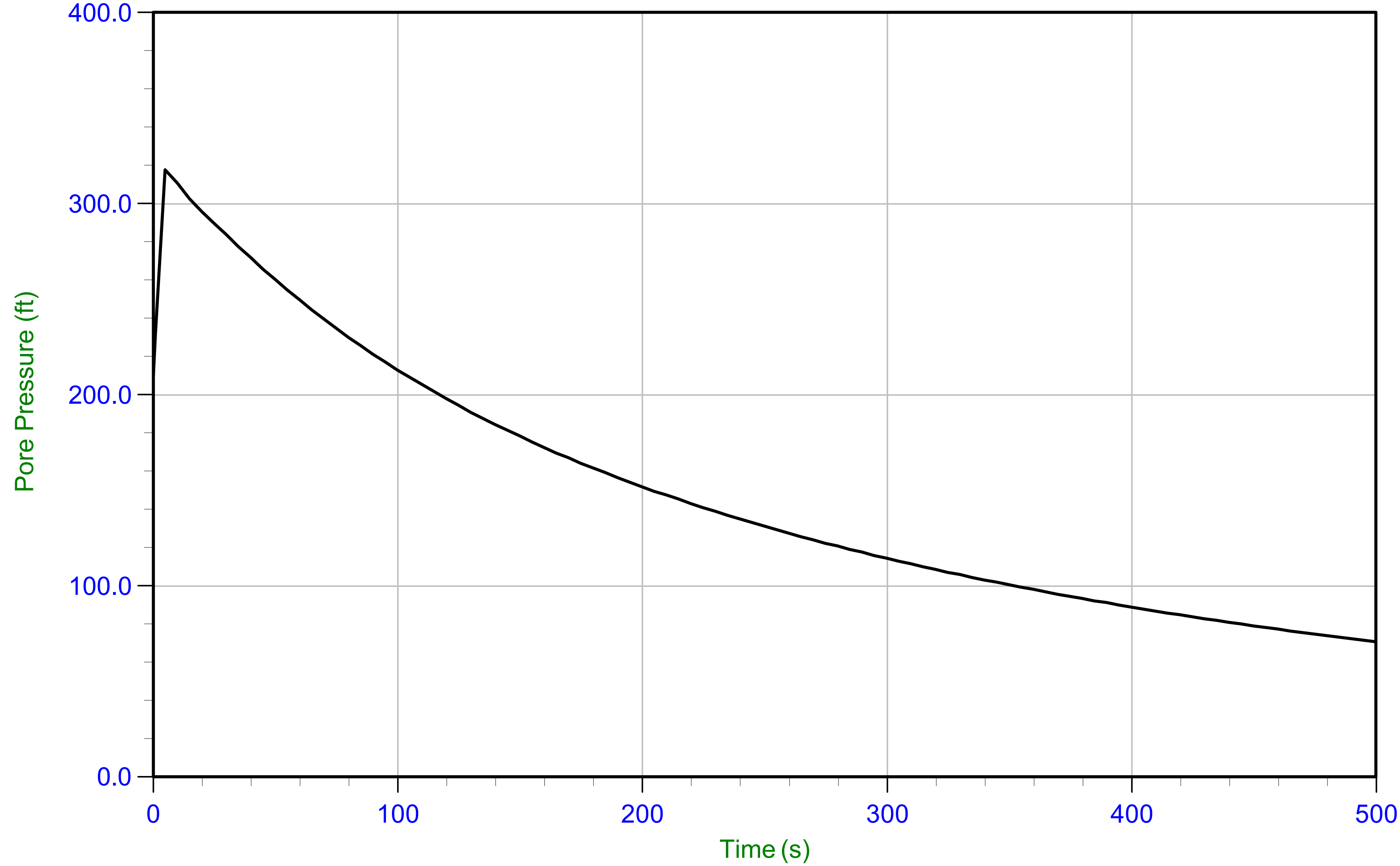
WT: 0.635 m / 2.083 ft
Ueq: 4.9 ft

ConeTec

Geosyntec Consultants

Job No: 18-53098
Date: 25-Aug-2018 11:46:11
Site: Crossroads Landfill

Sounding: SCPT18-02
Cone: AD452 Area=15 cm²



Trace Summary:

Filename: 18-53098_SP02.PPD
Depth: 4.325 m / 14.189 ft
Duration: 500.0 s

U Min: 70.8 ft
U Max: 317.7 ft

WT: 1.524 m / 5.000 ft
Ueq: 9.2 ft
U(50): 163.45 ft

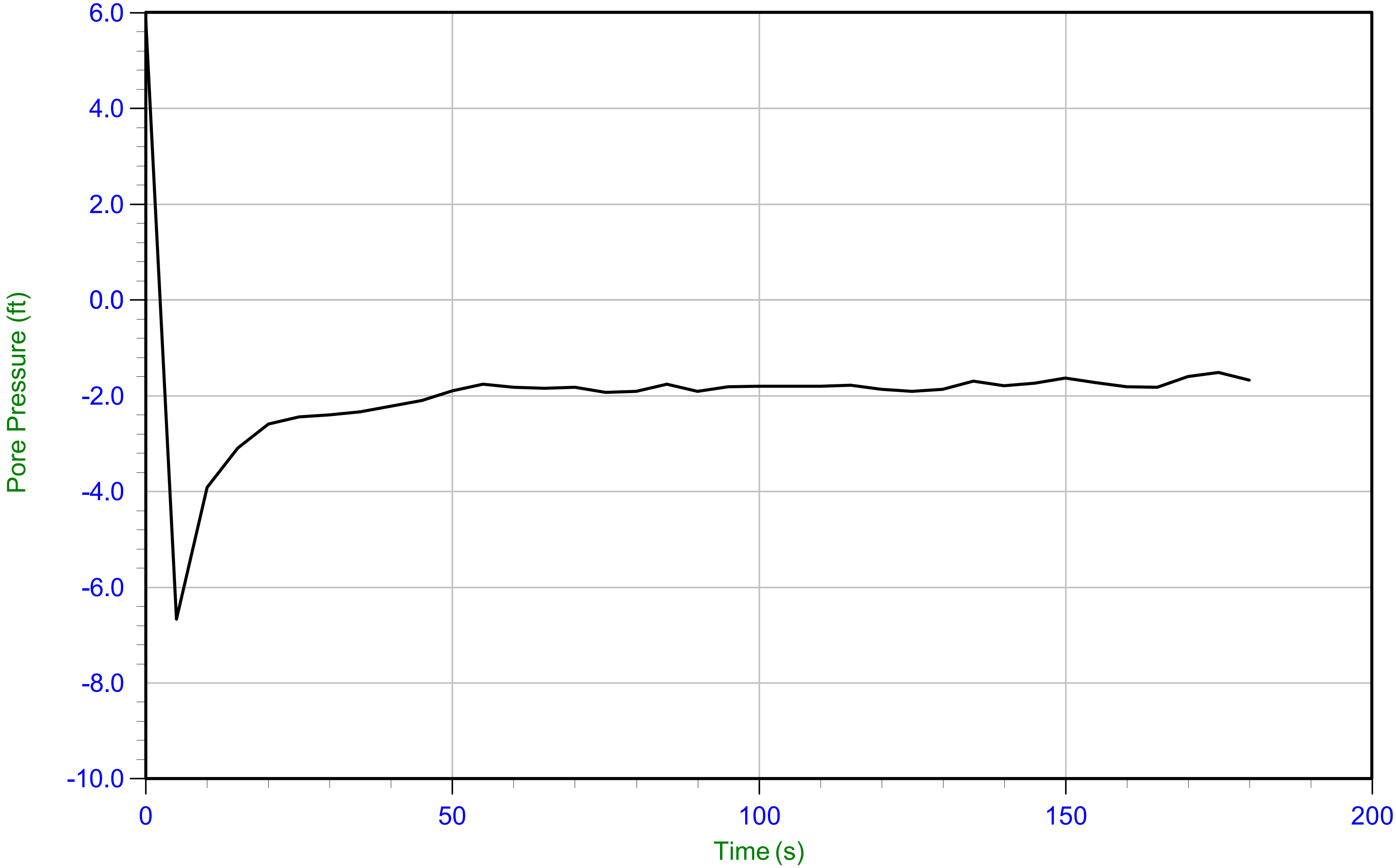
T(50): 171.7 s
Ir: 100
Ch: 4.1 cm²/min

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 25-Aug-2018 11:46:11
Site: Crossroads Landfill

Sounding: SCPT18-02
Cone: AD452 Area=15 cm²



Trace Summary:

Filename: 18-53098_SP02.PPD
Depth: 5.500 m / 18.044 ft
Duration: 180.0 s

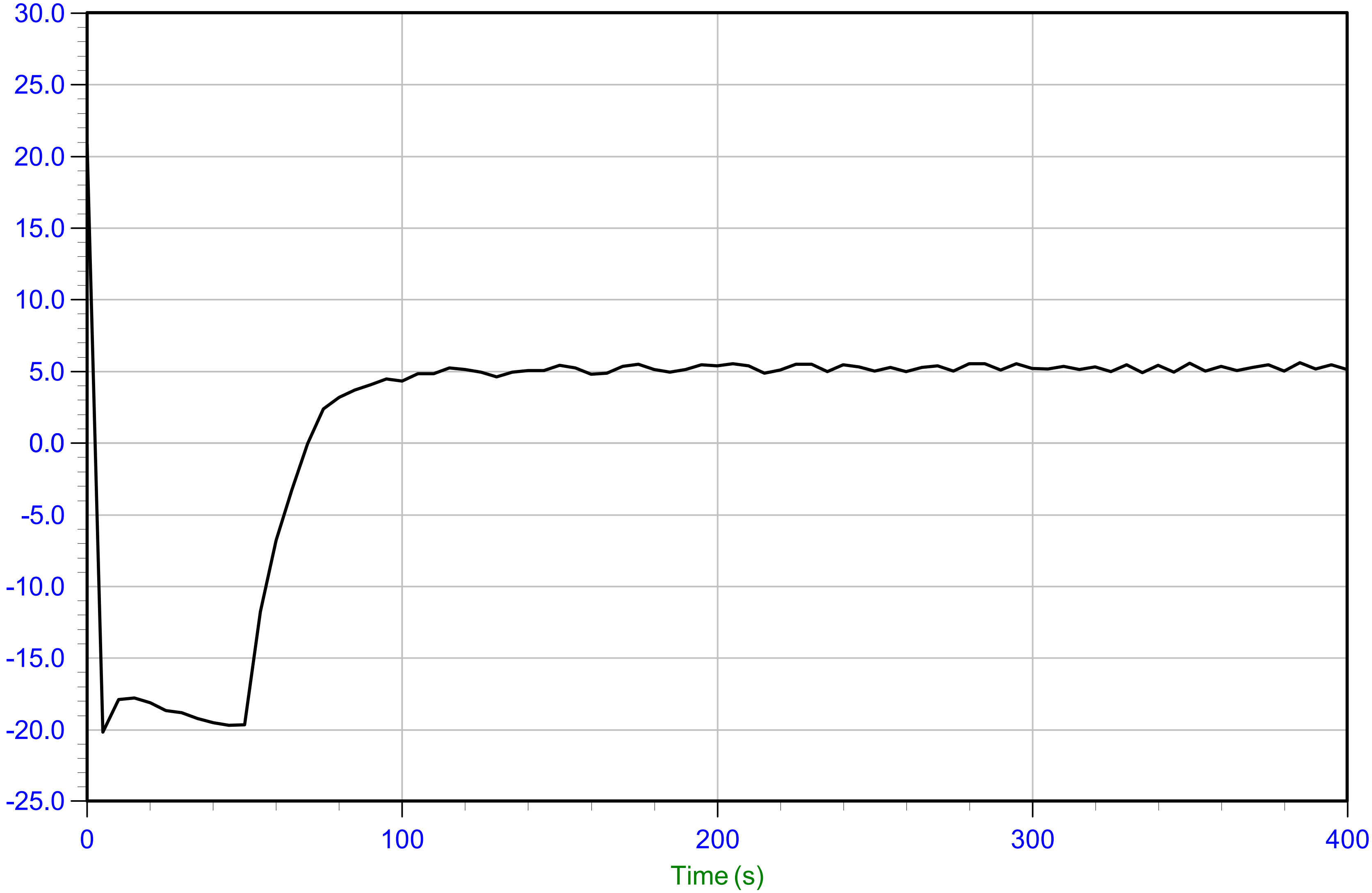
U Min: -6.7 ft
U Max: 5.8 ft

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 25-Aug-2018 13:08:16
Site: Crossroads Landfill

Sounding: CPT18-03
Cone: AD452 Area=15 cm²



Trace Summary:

Filename: 18-53098_CP03.PPD
Depth: 6.125 m / 20.095 ft
Duration: 400.0 s

U Min: -20.2 ft
U Max: 20.9 ft

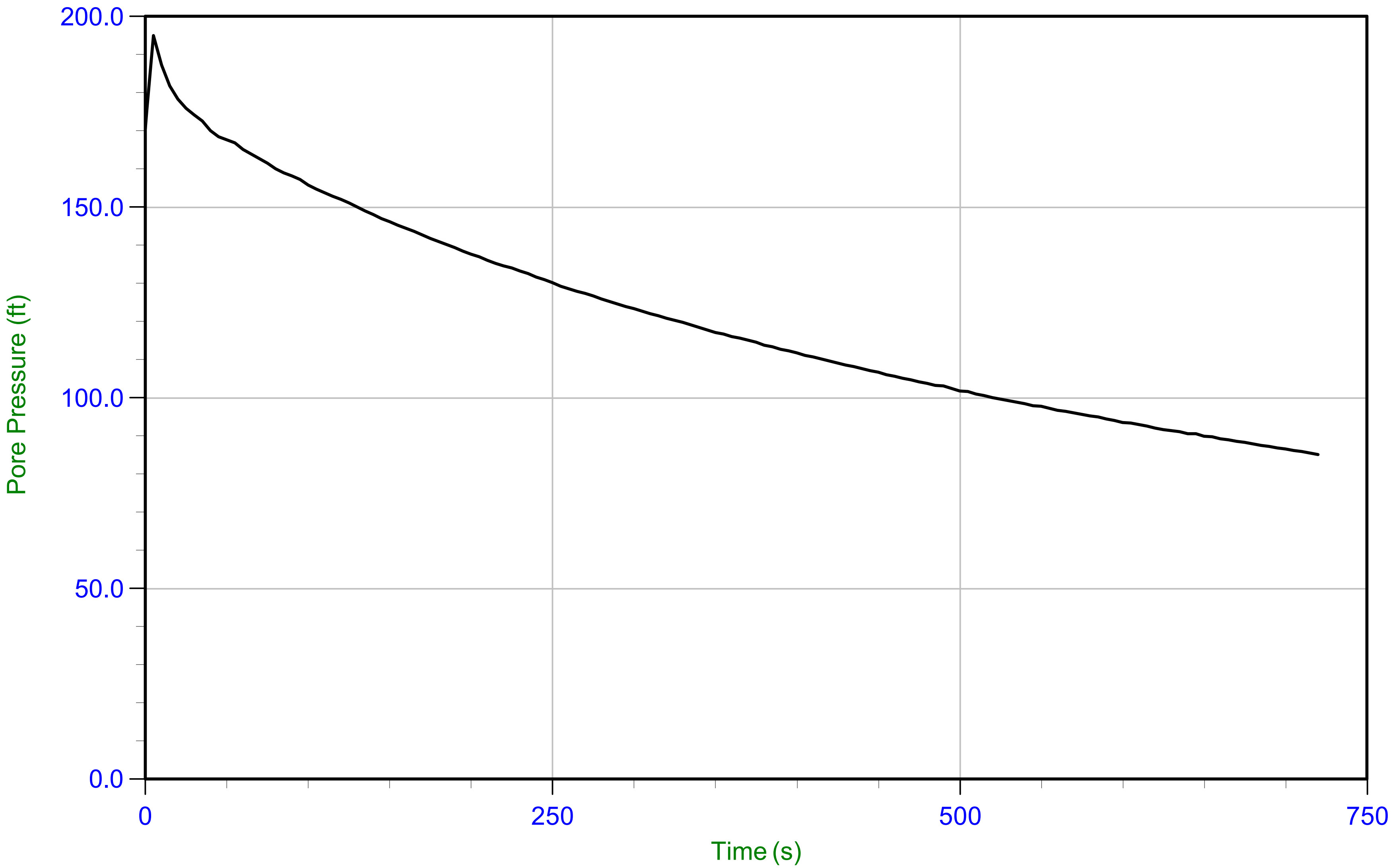
WT: 4.601 m / 15.095 ft
Ueq: 5.0 ft

ConeTec

Geosyntec Consultants

Job No: 18-53098
Date: 25-Aug-2018 10:24:43
Site: Crossroads Landfill

Sounding: CPT18-04
Cone: AD452 Area=15 cm²



Trace Summary:

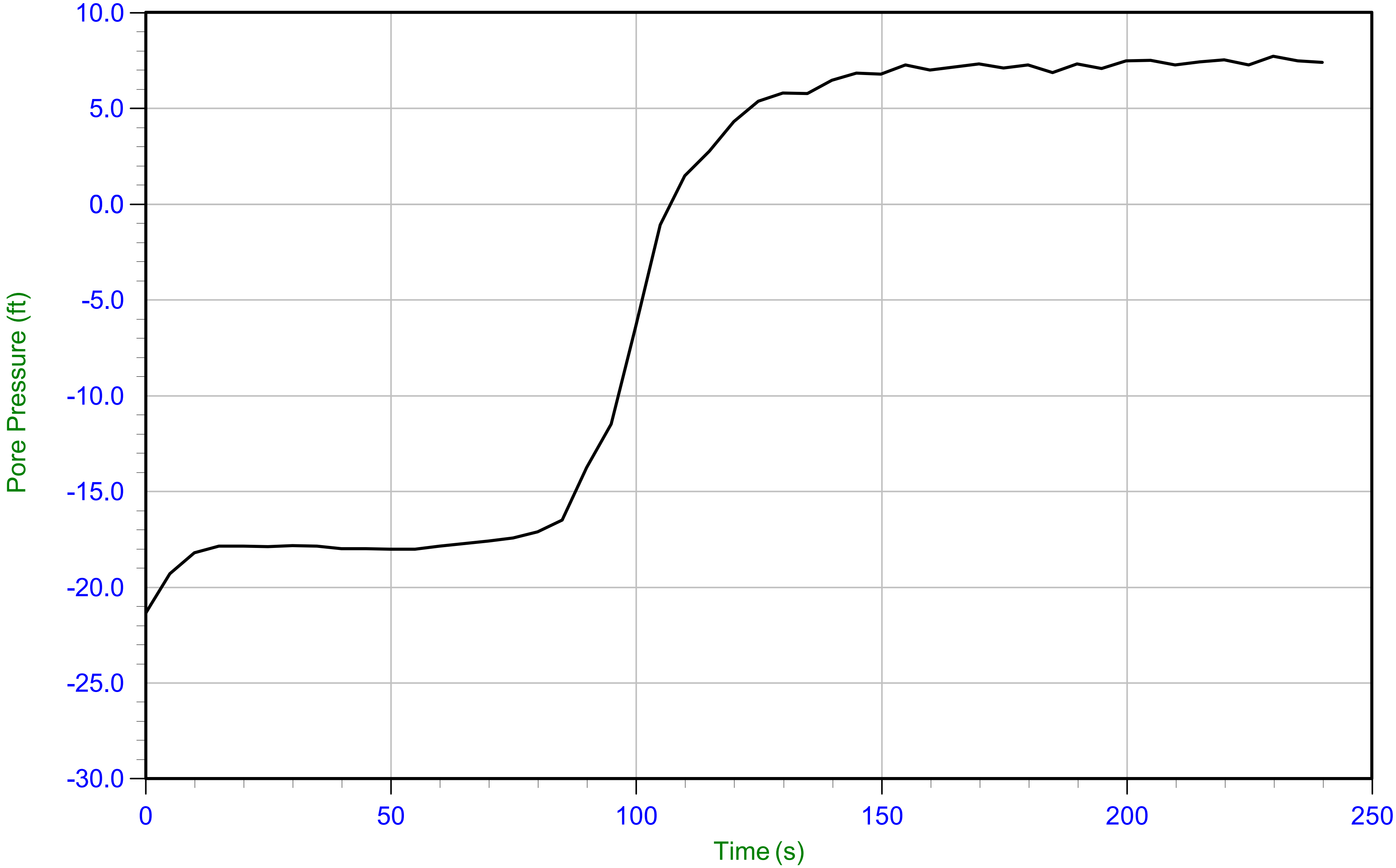
Filename: 18-53098_CP04.PPD
Depth: 2.000 m / 6.562 ft
Duration: 720.0 s

U Min: 85.1 ft
U Max: 195.0 ft

WT: 0.581 m / 1.906 ft
Ueq: 4.7 ft
U(50): 99.85 ft

T(50): 518.2 s
Ir: 100
Ch: 1.4 cm²/min

Geosyntec Consultants	Job No: 18-53098 Date: 25-Aug-2018 10:24:43 Site: Crossroads Landfill	Sounding: CPT18-04 Cone: AD452 Area=15 cm²



Trace Summary:

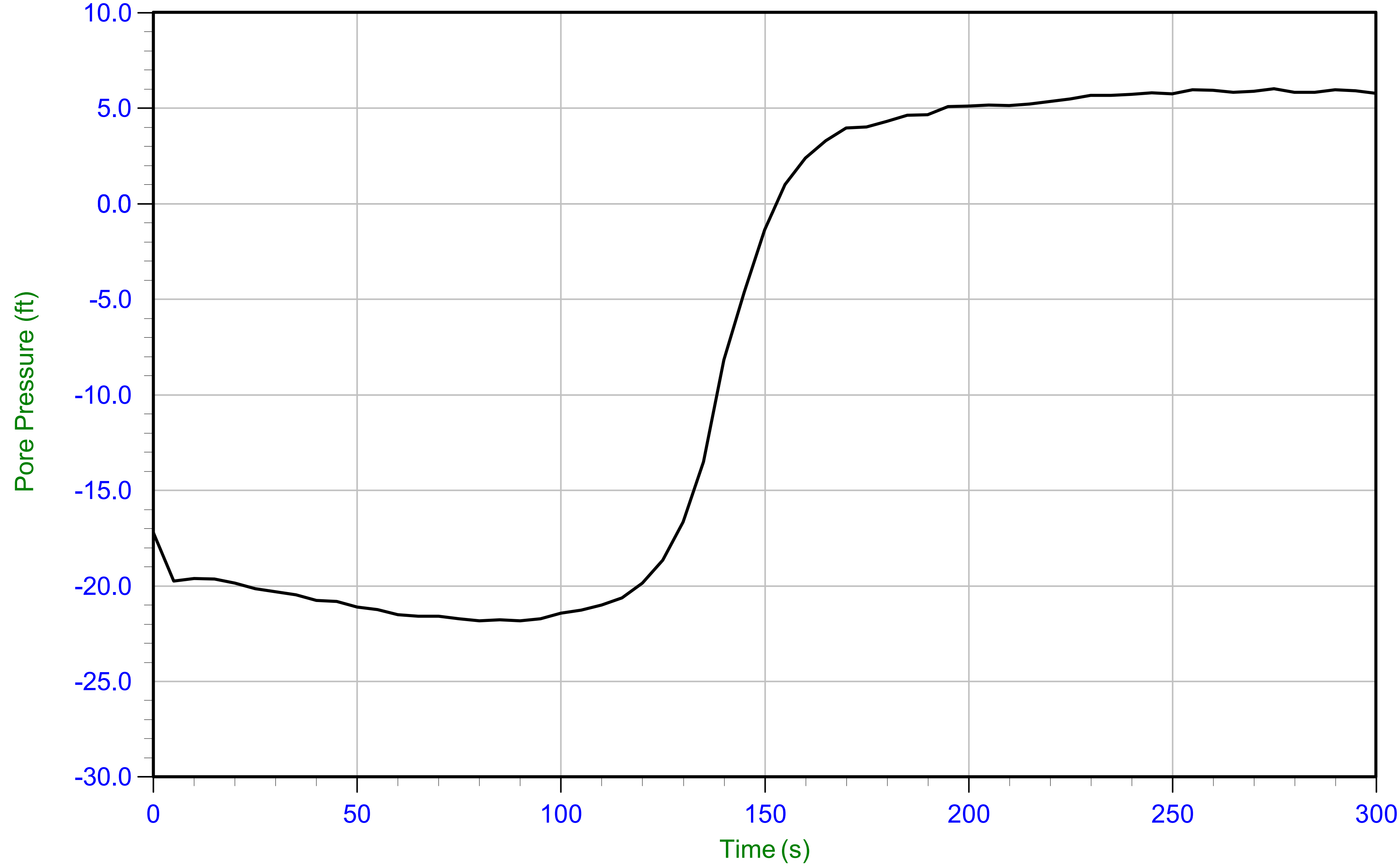
Filename: 18-53098_CP04.PPD	U Min: -21.3 ft	WT: 0.581 m / 1.906 ft
Depth: 2.875 m / 9.432 ft	U Max: 7.7 ft	Ueq: 7.5 ft
Duration: 240.0 s		

ConeTec

Geosyntec Consultants

Job No: 18-53098
Date: 25-Aug-2018 09:44:09
Site: Crossroads Landfill

Sounding: CPT18-05
Cone: AD452 Area=15 cm²



Trace Summary:

Filename: 18-53098_CP05.PPD
Depth: 3.150 m / 10.335 ft
Duration: 300.0 s

U Min: -21.8 ft
U Max: 6.0 ft

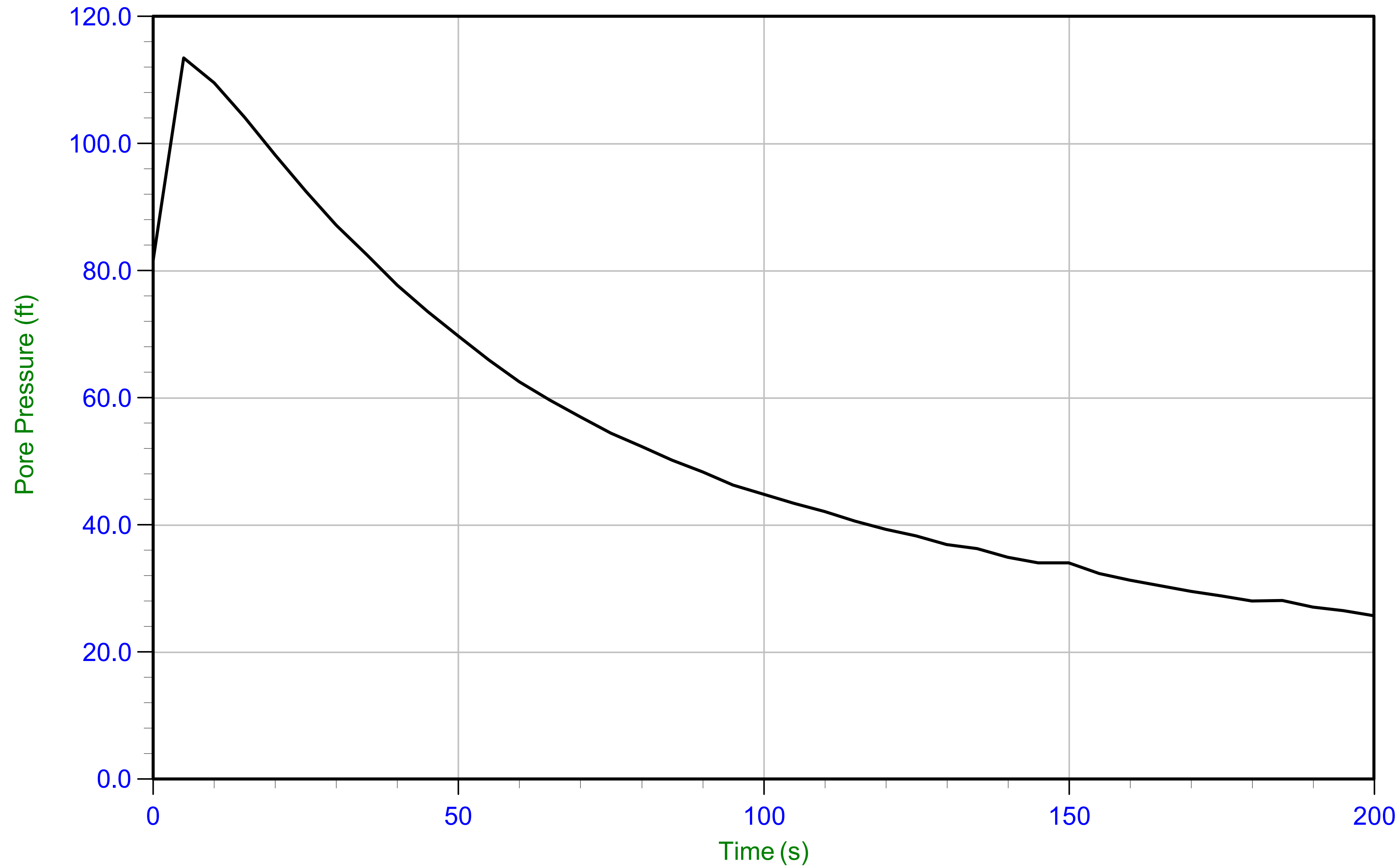
WT: 1.388 m / 4.554 ft
Ueq: 5.8 ft

ConeTec

Geosyntec Consultants

Job No: 18-53098
Date: 25-Aug-2018 08:54:40
Site: Crossroads Landfill

Sounding: CPT18-06
Cone: AD452 Area=15 cm²



Trace Summary:

Filename: 18-53098_CP06.PPD
Depth: 3.250 m / 10.663 ft
Duration: 200.0 s

U Min: 25.7 ft
U Max: 113.5 ft

WT: 2.585 m / 8.481 ft
Ueq: 2.2 ft
U(50): 57.83 ft

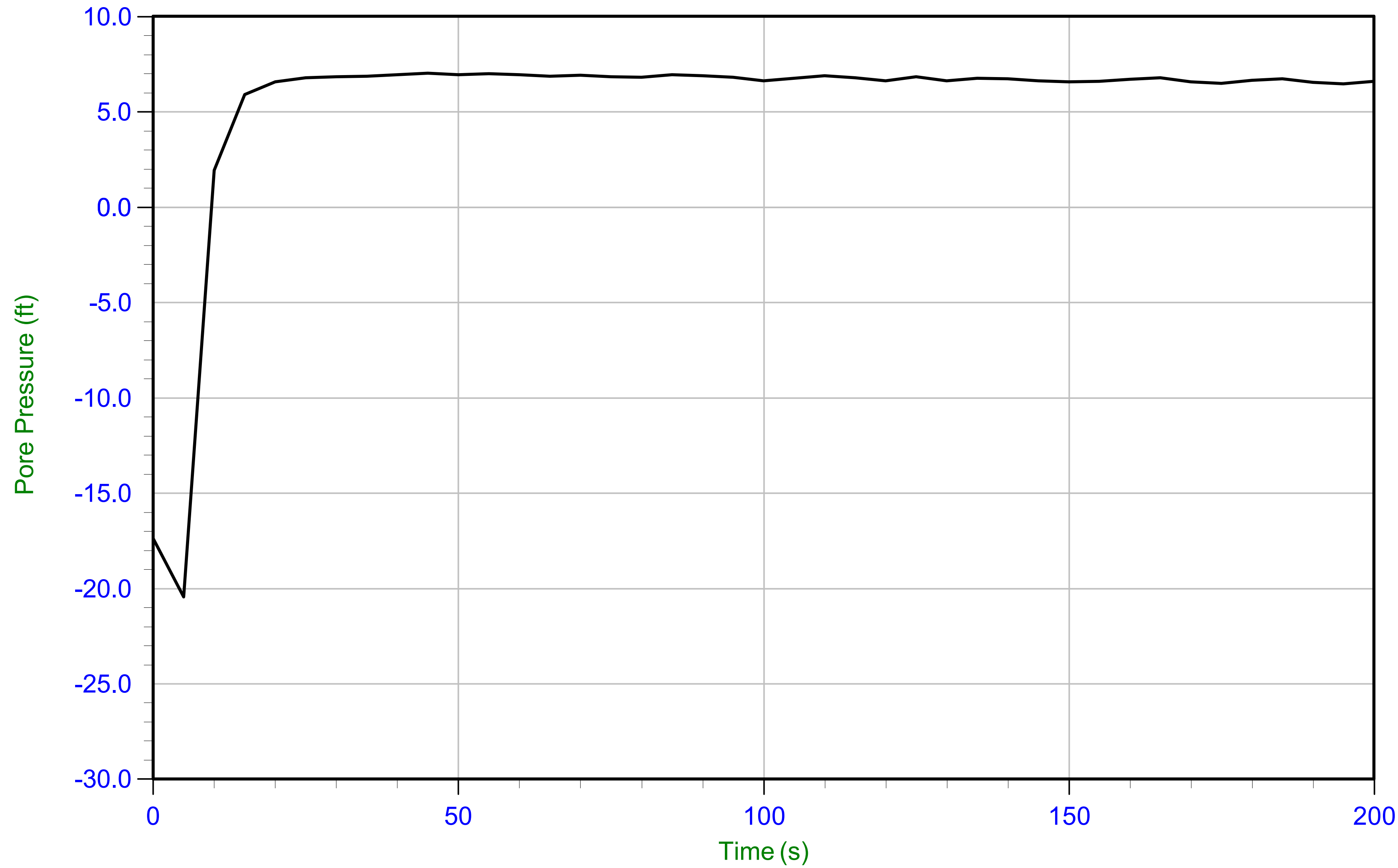
T(50): 63.4 s
Ir: 100
Ch: 11.1 cm²/min

ConeTec

Geosyntec Consultants

Job No: 18-53098
Date: 25-Aug-2018 08:54:40
Site: Crossroads Landfill

Sounding: CPT18-06
Cone: AD452 Area=15 cm²



Trace Summary:

Filename: 18-53098_CP06.PPD
Depth: 4.525 m / 14.846 ft
Duration: 200.0 s

U Min: -20.4 ft
U Max: 7.0 ft

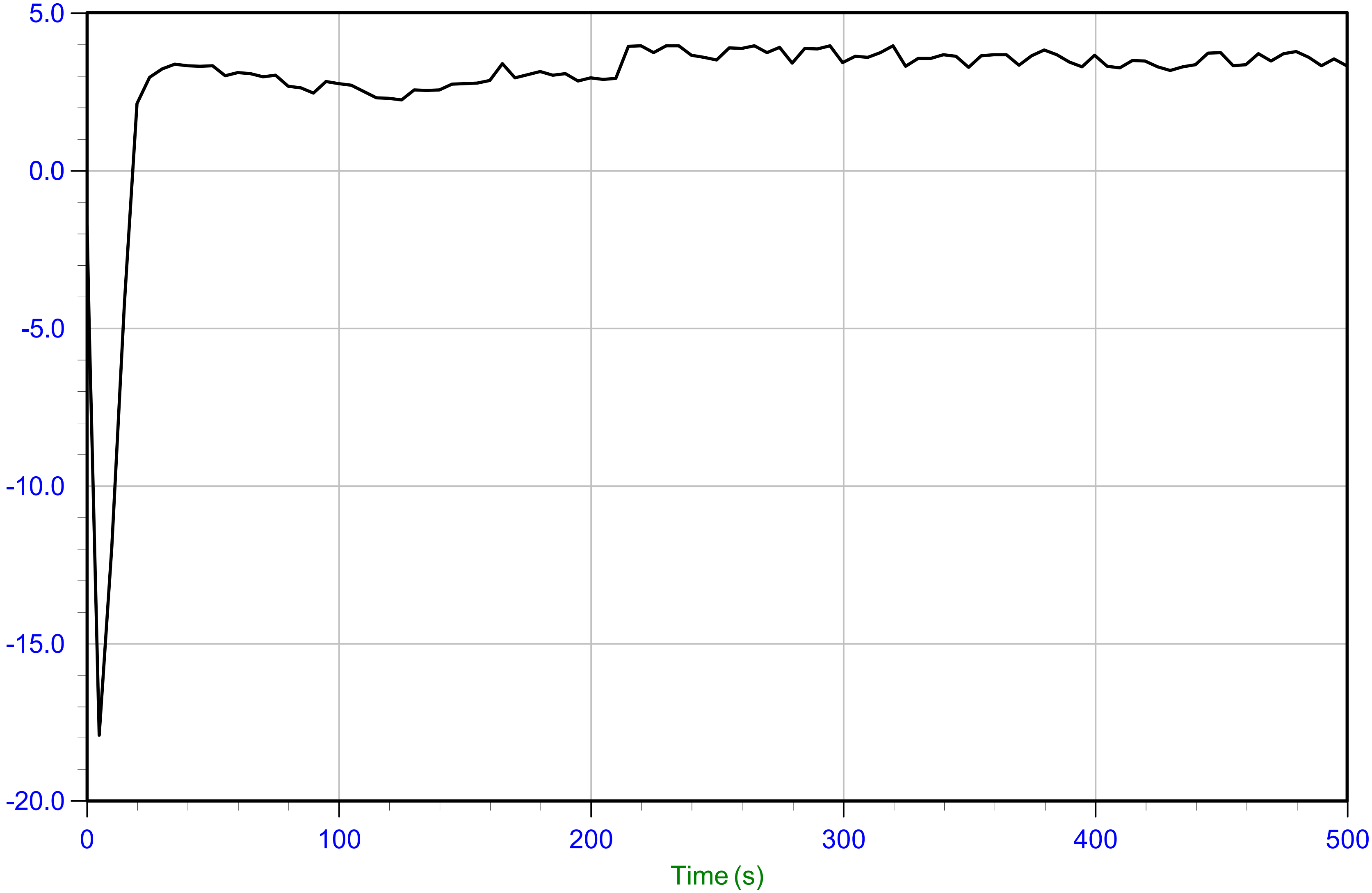
WT: 2.585 m / 8.481 ft
Ueq: 6.4 ft

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 24-Aug-2018 16:27:20
Site: Crossroads Landfill

Sounding: SCPT18-07
Cone: AD452 Area=15 cm²



Trace Summary:

Filename: 18-53098_SP07.PPD
Depth: 5.625 m / 18.454 ft
Duration: 500.0 s

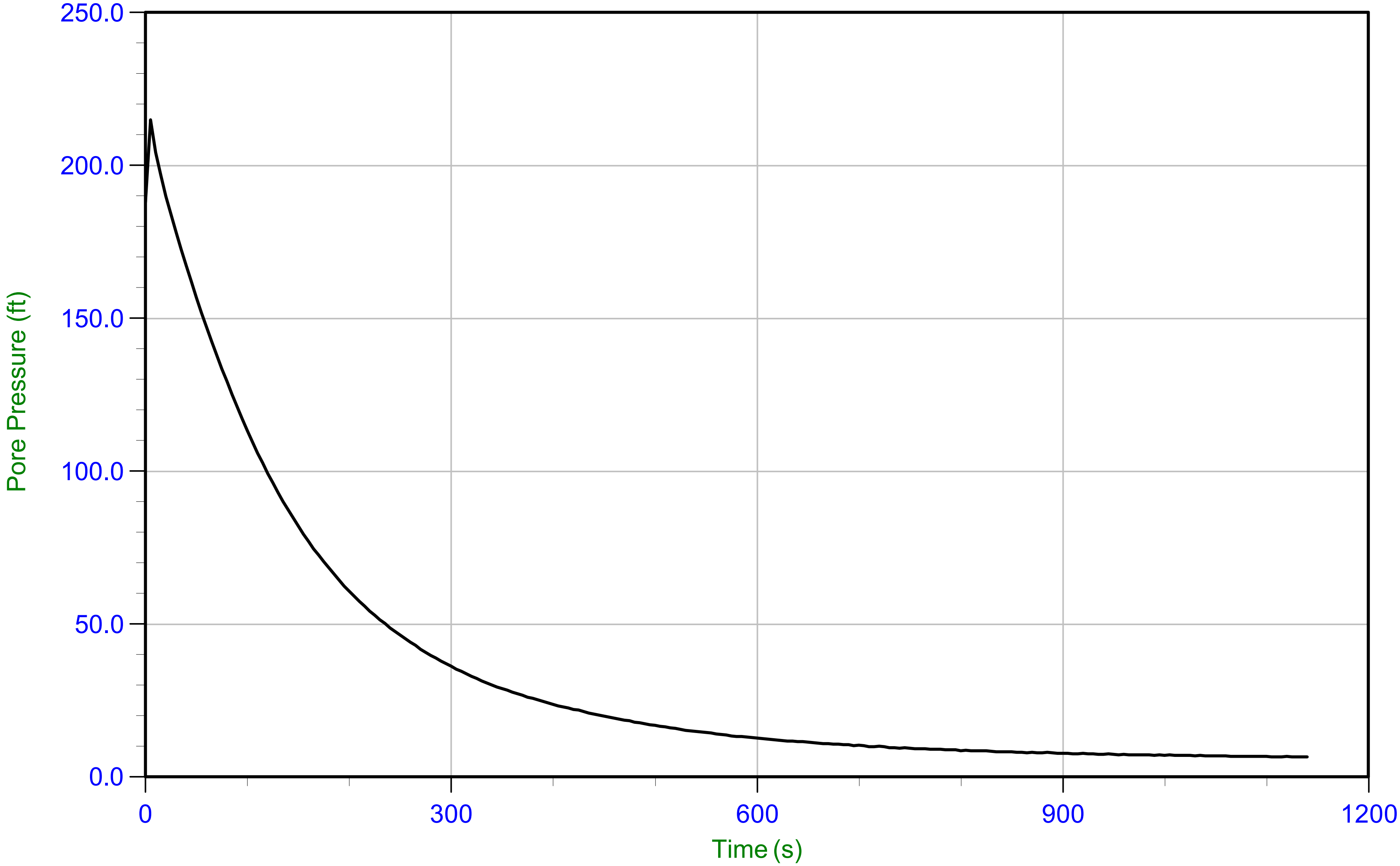
U Min: -17.9 ft
U Max: 4.0 ft

WT: 4.544 m / 14.908 ft
Ueq: 3.5 ft

Geosyntec Consultants

Job No: 18-53098
Date: 26-Aug-2018 16:39:52
Site: Crossroads Landfill

Sounding: CPT18-08
Cone: AD452 Area=15 cm²



Trace Summary:

Filename: 18-53098_CP08.PPD
Depth: 4.000 m / 13.123 ft
Duration: 1140.0 s

U Min: 6.5 ft
U Max: 214.9 ft

WT: 2.665 m / 8.743 ft
Ueq: 4.4 ft
U(50): 109.62 ft

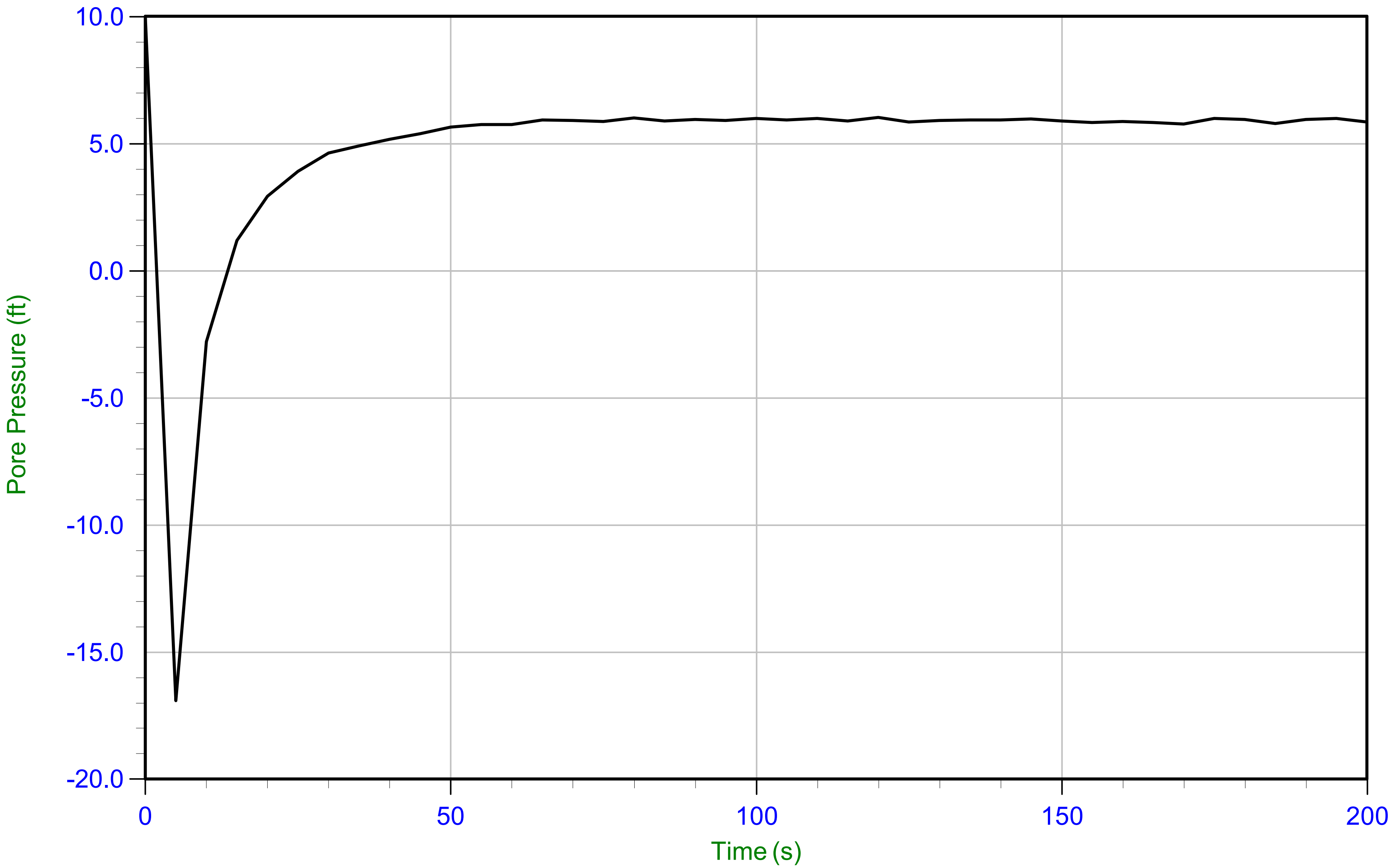
T(50): 99.9 s
Ir: 100
Ch: 7.0 cm²/min

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 26-Aug-2018 16:39:52
Site: Crossroads Landfill

Sounding: CPT18-08
Cone: AD452 Area=15 cm²



Trace Summary:

Filename: 18-53098_CP08.PPD
Depth: 4.450 m / 14.600 ft
Duration: 200.0 s

U Min: -16.9 ft
U Max: 10.0 ft

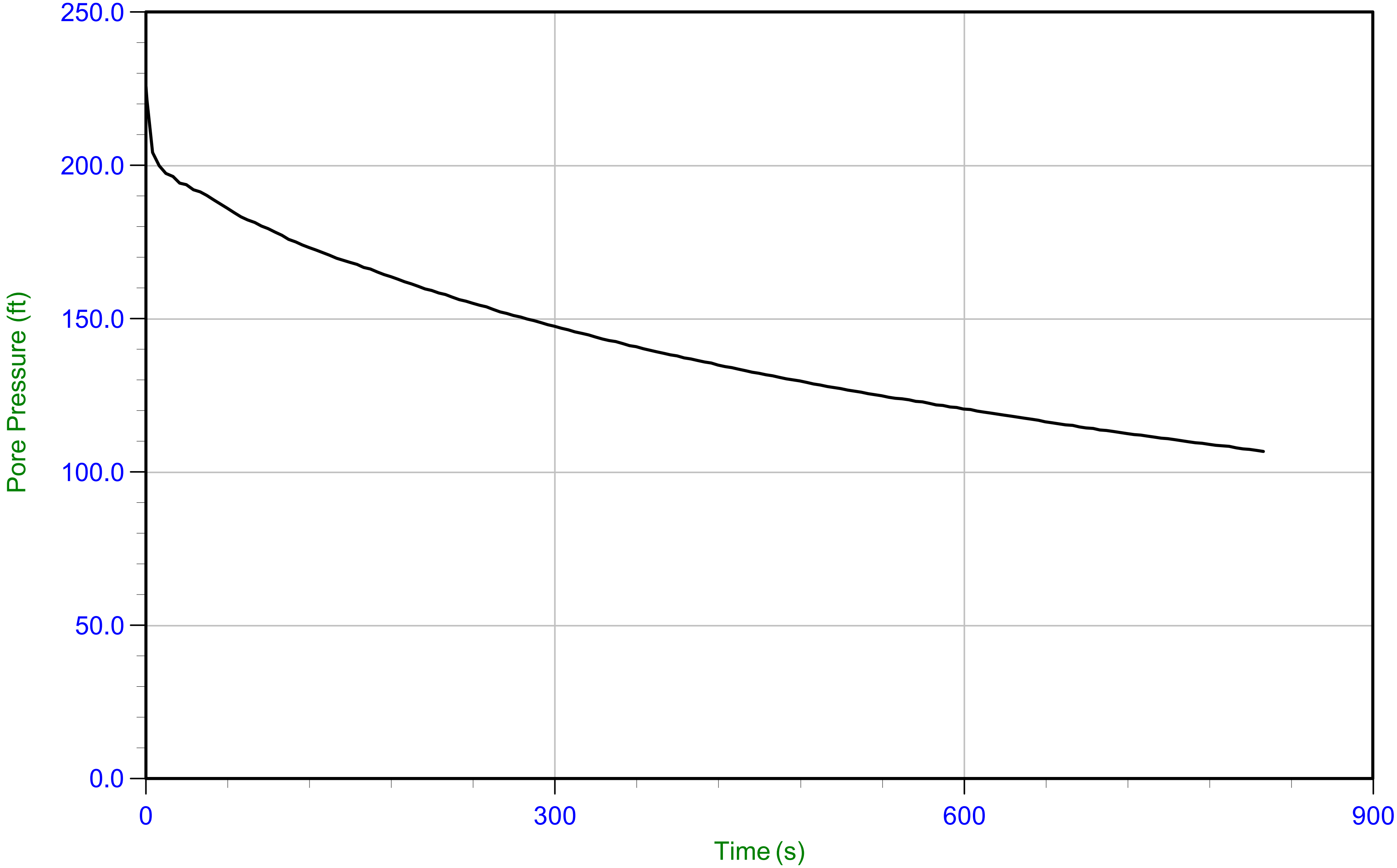
WT: 2.666 m / 8.747 ft
Ueq: 5.9 ft

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 22-Aug-2018 09:14:52
Site: Crossroads Landfill

Sounding: CPT18-09
Cone: AD452 Area=15 cm²



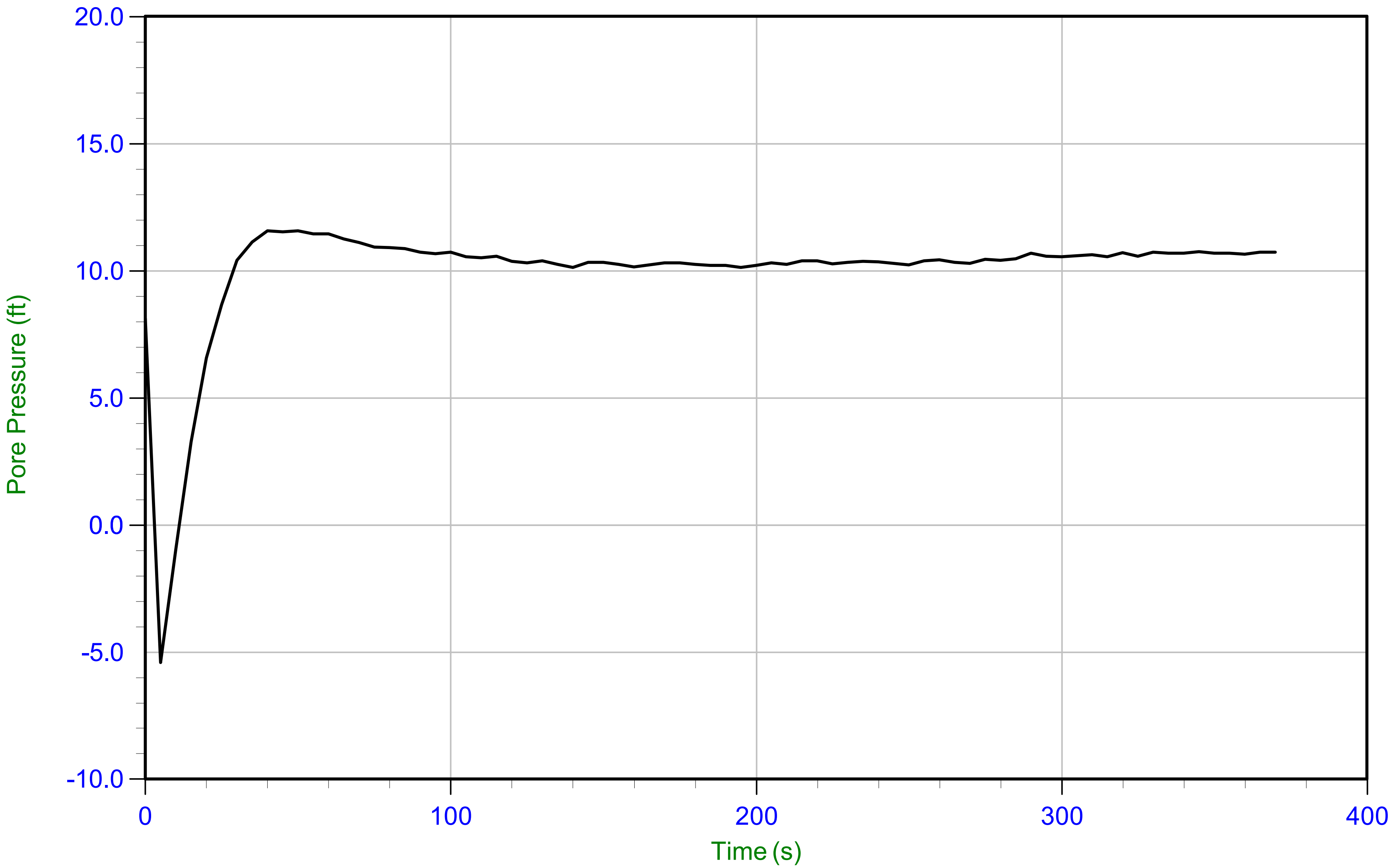
Trace Summary:	Filename: 18-53098_CP09.PPD	U Min: 106.8 ft	WT: 2.397 m / 7.864 ft	T(50): 669.0 s
	Depth: 4.200 m / 13.779 ft	U Max: 225.7 ft	Ueq: 5.9 ft	Ir: 100
	Duration: 820.0 s		U(50): 115.79 ft	Ch: 1.0 cm²/min

ConeTec

Geosyntec Consultants

Job No: 18-53098
Date: 22-Aug-2018 09:14:52
Site: Crossroads Landfill

Sounding: CPT18-09
Cone: AD452 Area=15 cm²



Trace Summary:

Filename: 18-53098_CP09.PPD
Depth: 5.700 m / 18.701 ft
Duration: 370.0 s

U Min: -5.4 ft
U Max: 11.6 ft

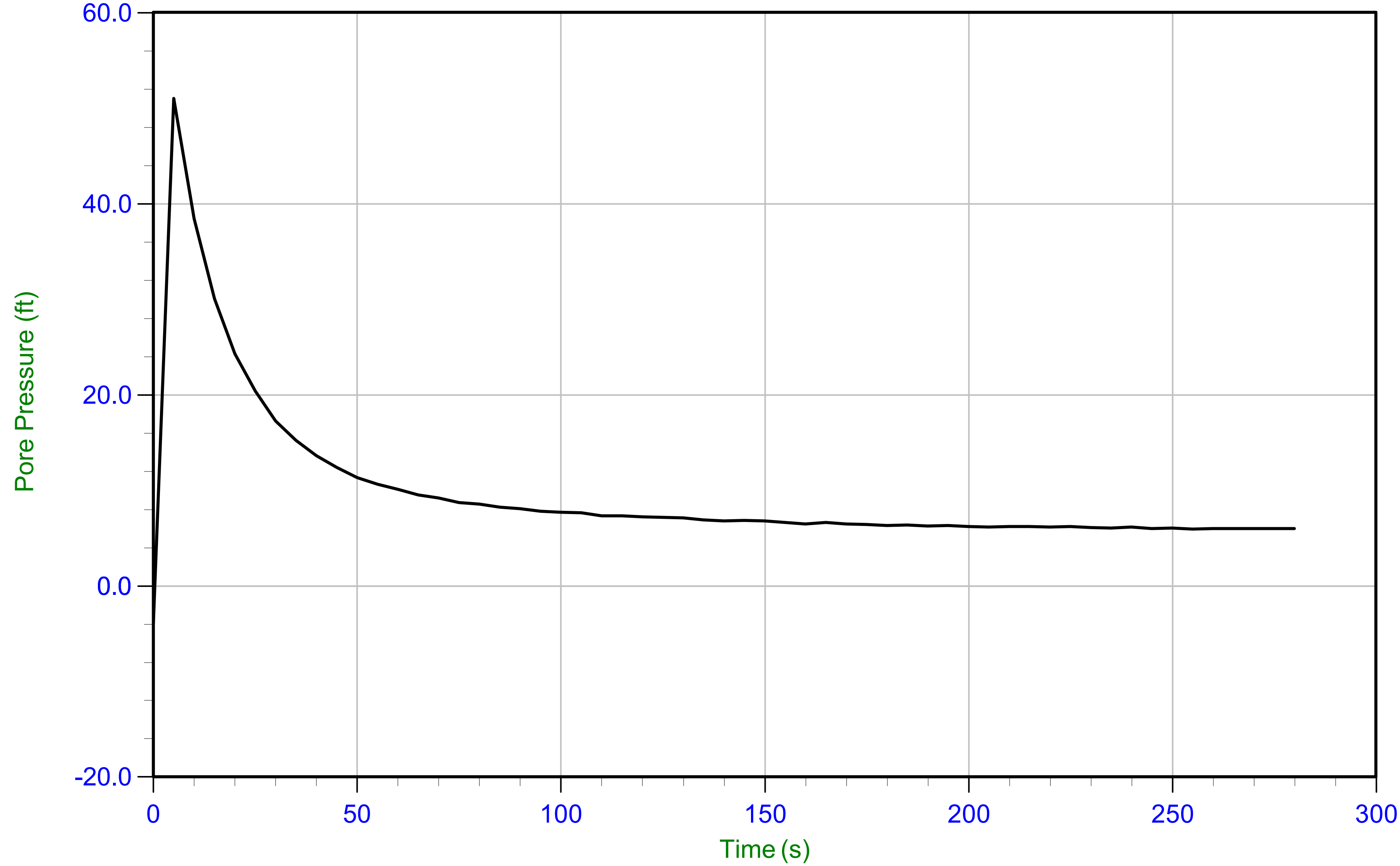
WT: 2.397 m / 7.864 ft
Ueq: 10.8 ft

ConeTec

Geosyntec Consultants

Job No: 18-53098
Date: 24-Aug-2018 15:22:10
Site: Crossroads Landfill

Sounding: CPT18-10
Cone: AD452 Area=15 cm²



Trace Summary:

Filename: 18-53098_CP10.PPD
Depth: 7.700 m / 25.262 ft
Duration: 280.0 s

U Min: -3.9 ft
U Max: 51.0 ft

WT: 5.904 m / 19.370 ft
Ueq: 5.9 ft
U(50): 28.46 ft

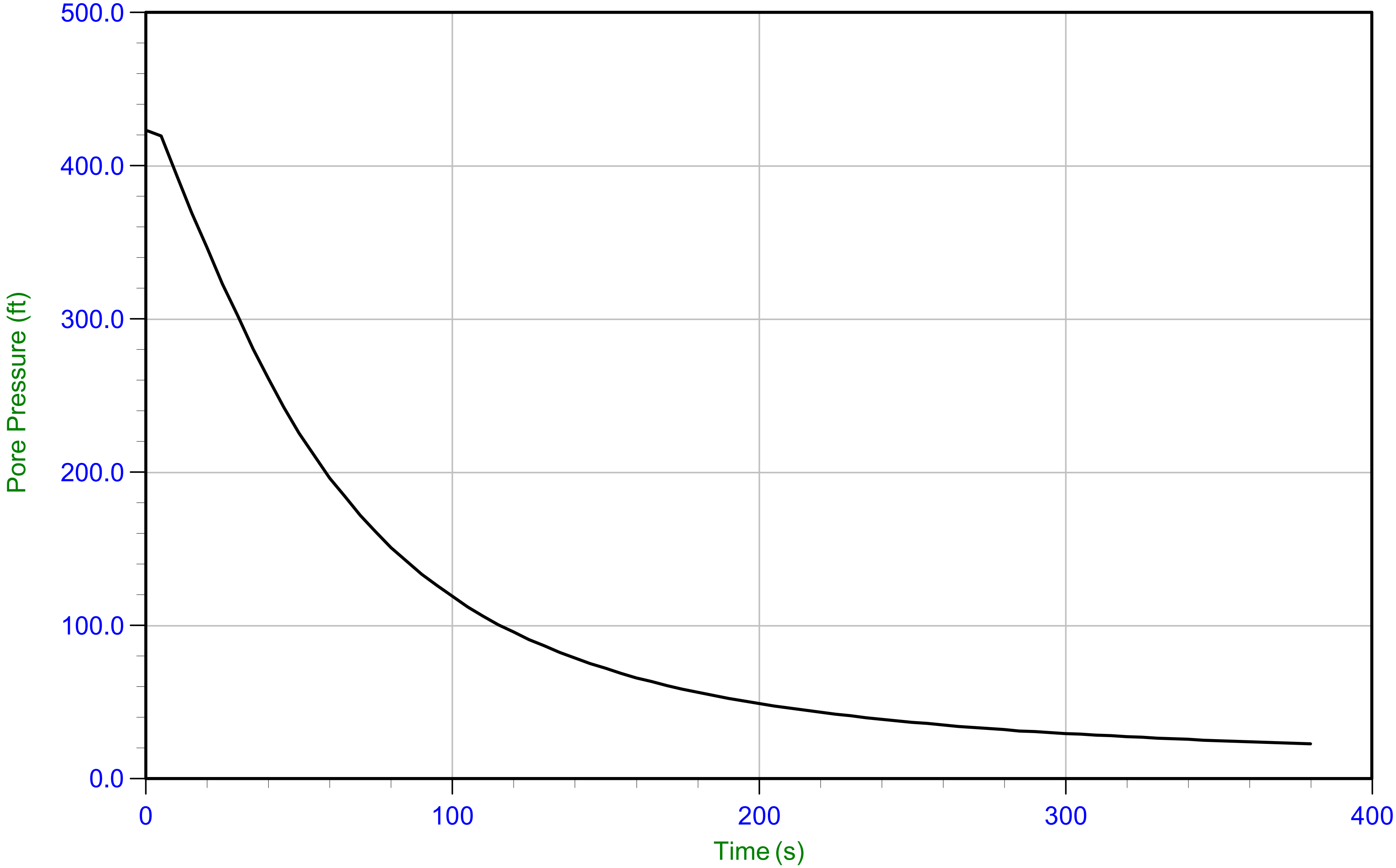
T(50): 11.4 s
Ir: 100
Ch: 61.7 cm²/min

ConeTec

Geosyntec Consultants

Job No: 18-53098
Date: 22-Aug-2018 08:16:40
Site: Crossroads Landfill

Sounding: CPT18-11
Cone: AD452 Area=15 cm²



Trace Summary:

Filename: 18-53098_CP11.PPD
Depth: 5.075 m / 16.650 ft
Duration: 380.0 s

U Min: 22.7 ft
U Max: 423.2 ft

WT: 4.629 m / 15.187 ft
Ueq: 1.5 ft
U(50): 212.33 ft

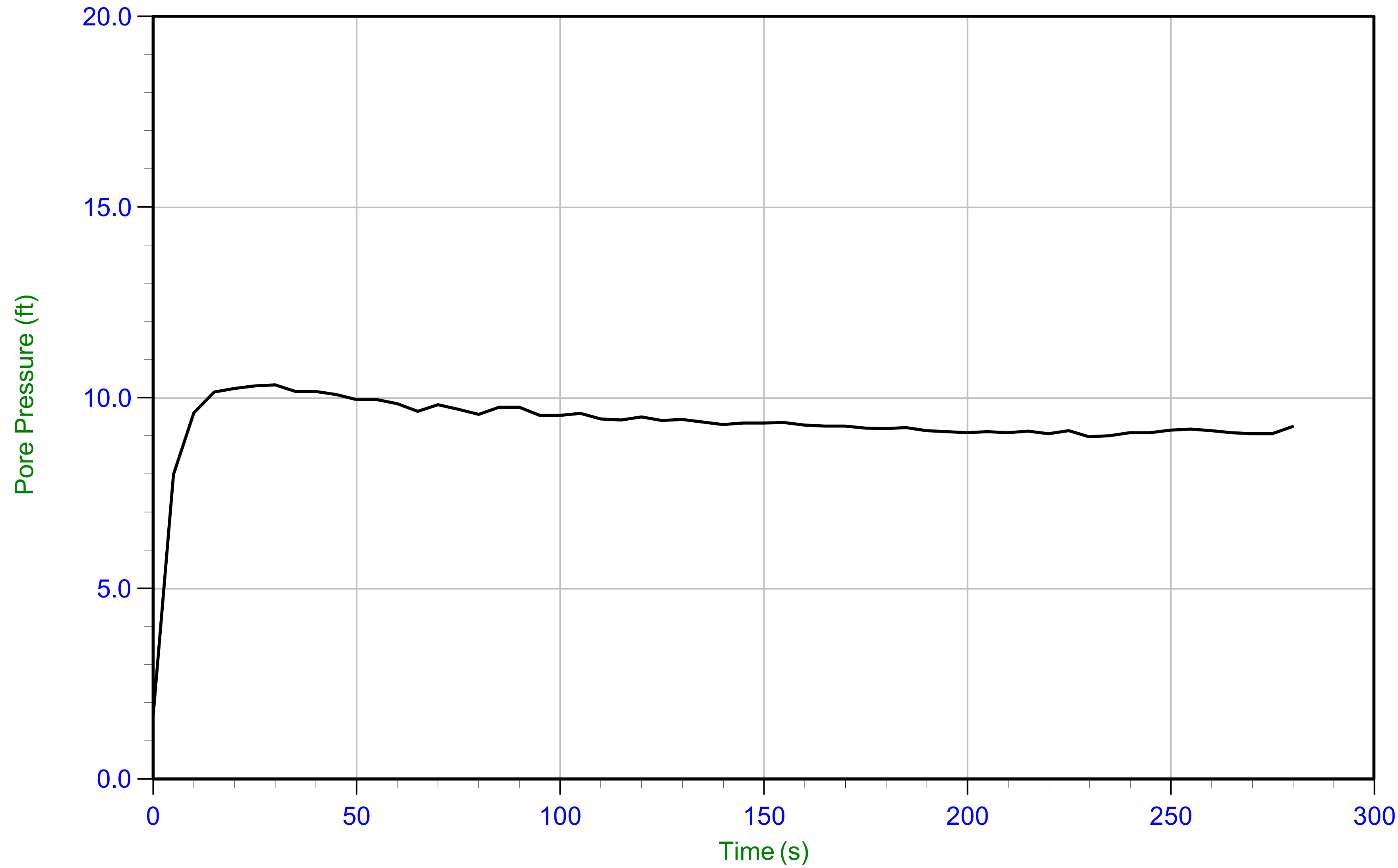
T(50): 54.5 s
Ir: 100
Ch: 12.9 cm²/min

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 22-Aug-2018 08:16:40
Site: Crossroads Landfill

Sounding: CPT18-11
Cone: AD452 Area=15 cm²



Trace Summary:

Filename: 18-53098_CP11.PPD
Depth: 7.400 m / 24.278 ft
Duration: 280.0 s

U Min: 1.7 ft
U Max: 10.3 ft

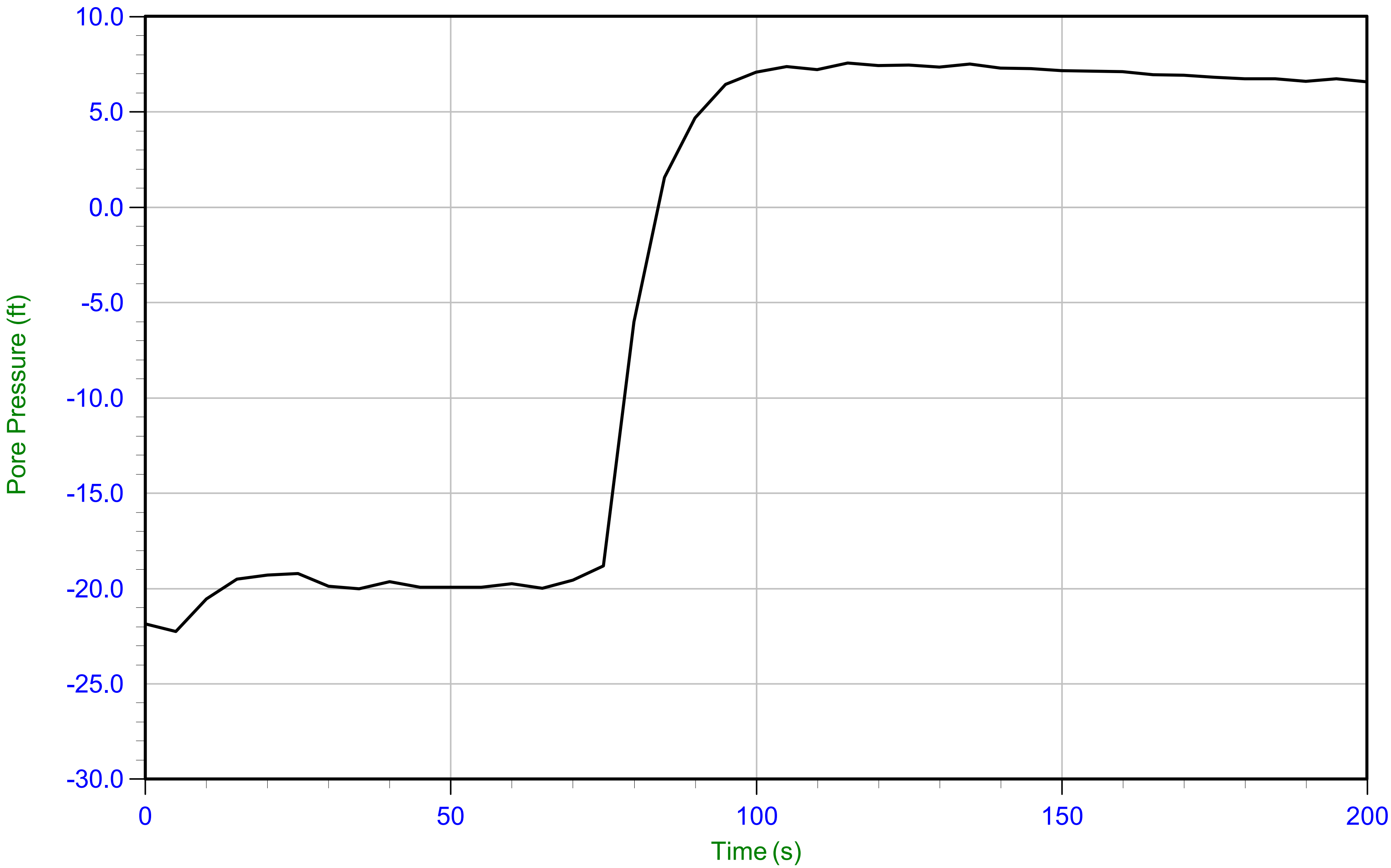
WT: 4.629 m / 15.187 ft
Ueq: 9.1 ft

ConeTec

Geosyntec Consultants

Job No: 18-53098
Date: 21-Aug-2018 15:41:22
Site: Crossroads Landfill

Sounding: CPT18-12
Cone: AD388 Area=15 cm²



Trace Summary:

Filename: 18-53098_CP12.PPD
Depth: 11.425 m / 37.483 ft
Duration: 200.0 s

U Min: -22.2 ft
U Max: 7.5 ft

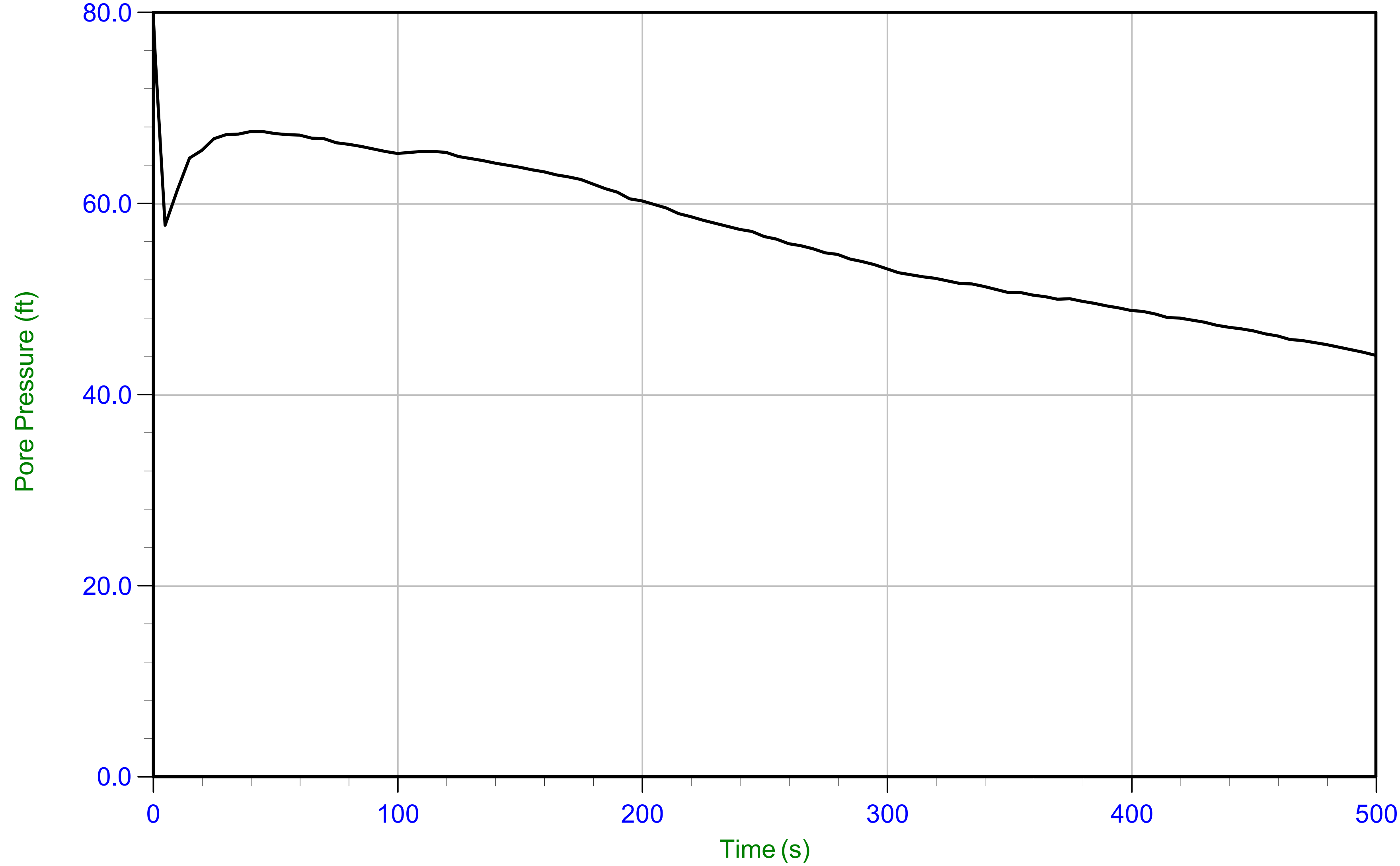
WT: 9.618 m / 31.555 ft
Ueq: 5.9 ft

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 21-Aug-2018 18:03:38
Site: Crossroads Landfill

Sounding: CPT18-12B
Cone: AD452 Area=15 cm²



Trace Summary:

Filename: 18-53098_CP12B.PPD
Depth: 12.350 m / 40.518 ft
Duration: 500.0 s

U Min: 44.1 ft
U Max: 79.5 ft

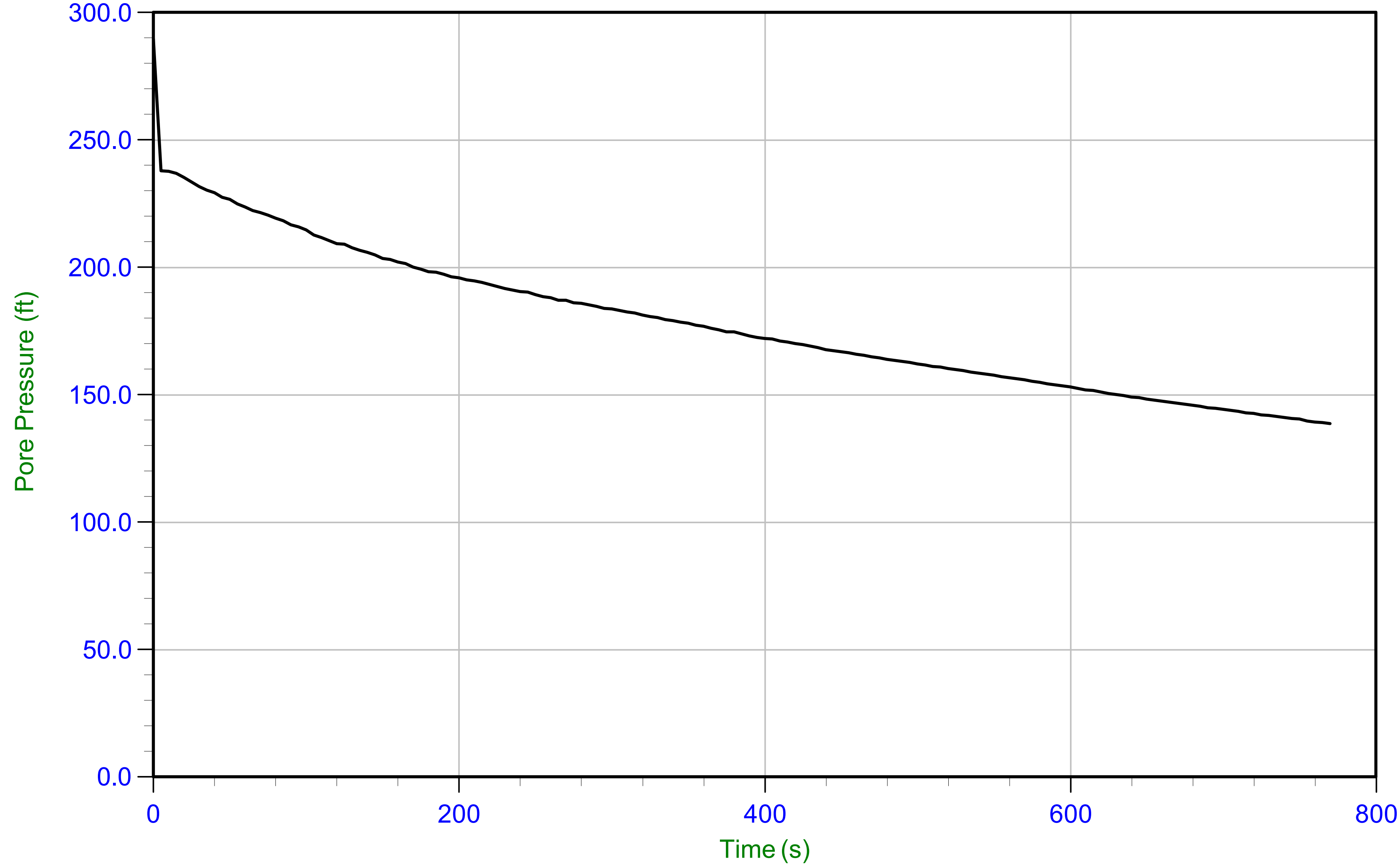
WT: 10.058 m / 32.998 ft
Ueq: 7.5 ft

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 22-Aug-2018 10:28:48
Site: Crossroads Landfill

Sounding: CPT18-13
Cone: AD452 Area=15 cm²



Trace Summary:

Filename: 18-53098_CP13.PPD
Depth: 10.300 m / 33.792 ft
Duration: 770.0 s

U Min: 138.7 ft
U Max: 289.7 ft

WT: 9.031 m / 29.629 ft
Ueq: 4.2 ft
U(50): 146.94 ft

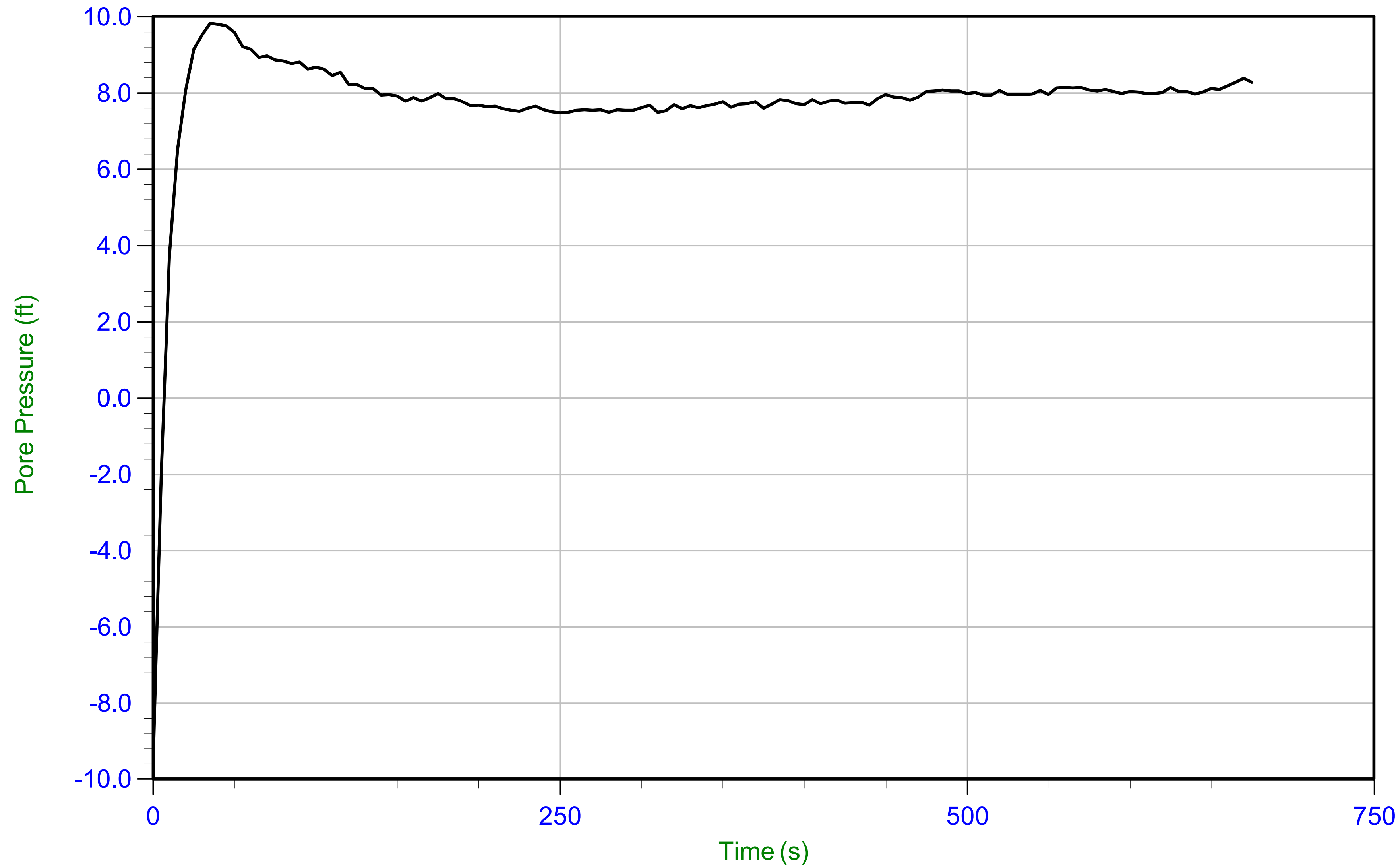
T(50): 666.6 s
Ir: 100
Ch: 1.1 cm²/min

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 22-Aug-2018 10:28:48
Site: Crossroads Landfill

Sounding: CPT18-13
Cone: AD452 Area=15 cm²



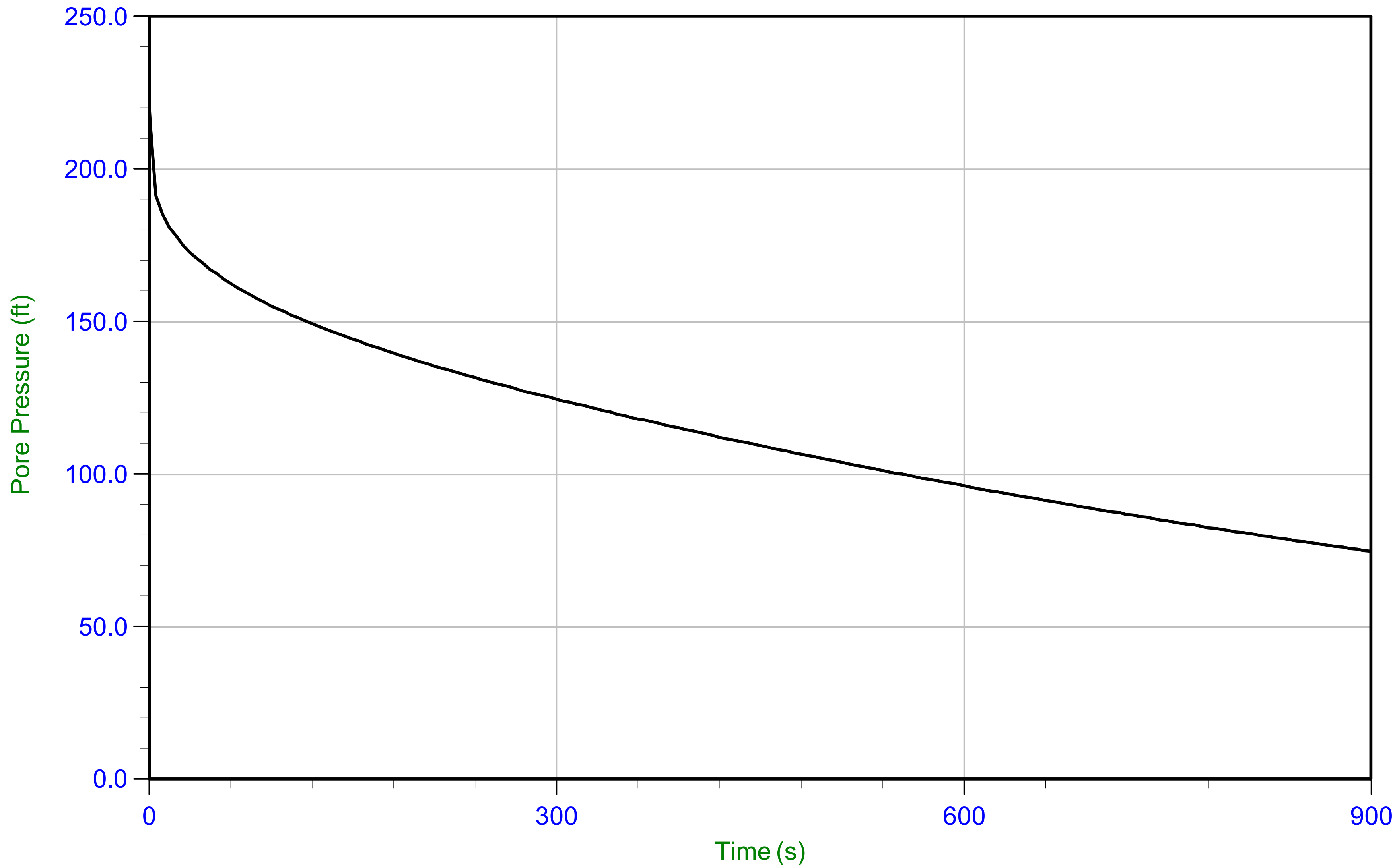
Trace Summary:

Filename: 18-53098_CP13.PPD
Depth: 11.525 m / 37.811 ft
Duration: 675.0 s

U Min: -9.6 ft
U Max: 9.8 ft

WT: 9.031 m / 29.629 ft
Ueq: 8.2 ft

Geosyntec Consultants	Job No: 18-53098 Date: 22-Aug-2018 12:38:30 Site: Crossroads Landfill	Sounding: CPT18-14 Cone: AD452 Area=15 cm²



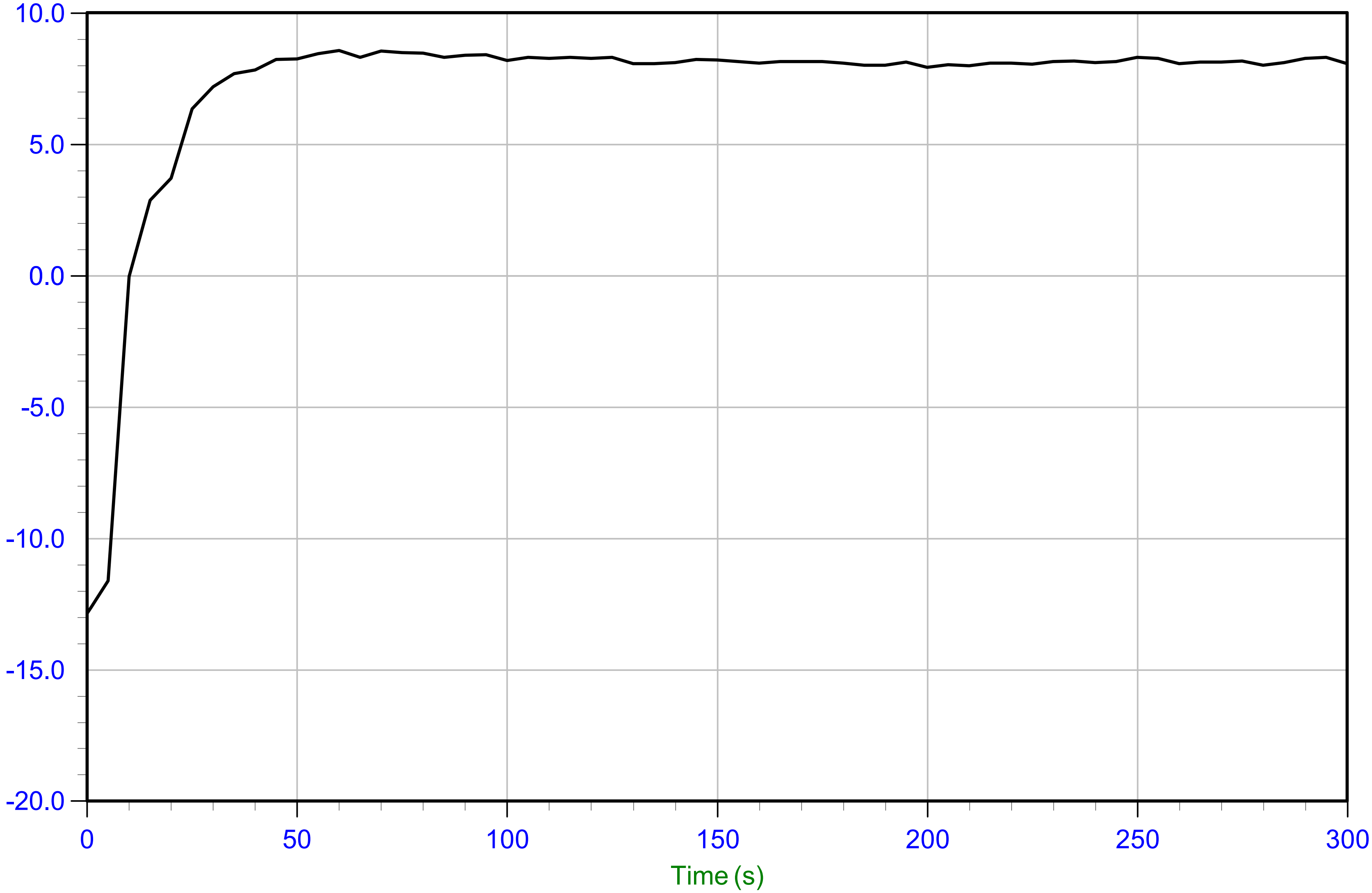
Trace Summary:	Filename: 18-53098_CP14.PPD	U Min: 74.8 ft	WT: 3.817 m / 12.523 ft	T(50): 413.1 s
	Depth: 5.375 m / 17.634 ft	U Max: 220.7 ft	Ueq: 5.1 ft	Ir: 100
	Duration: 900.0 s		U(50): 112.92 ft	Ch: 1.7 cm²/min

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 22-Aug-2018 12:38:30
Site: Crossroads Landfill

Sounding: CPT18-14
Cone: AD452 Area=15 cm²



Trace Summary:

Filename: 18-53098_CP14.PPD
Depth: 6.300 m / 20.669 ft
Duration: 300.0 s

U Min: -12.9 ft
U Max: 8.6 ft

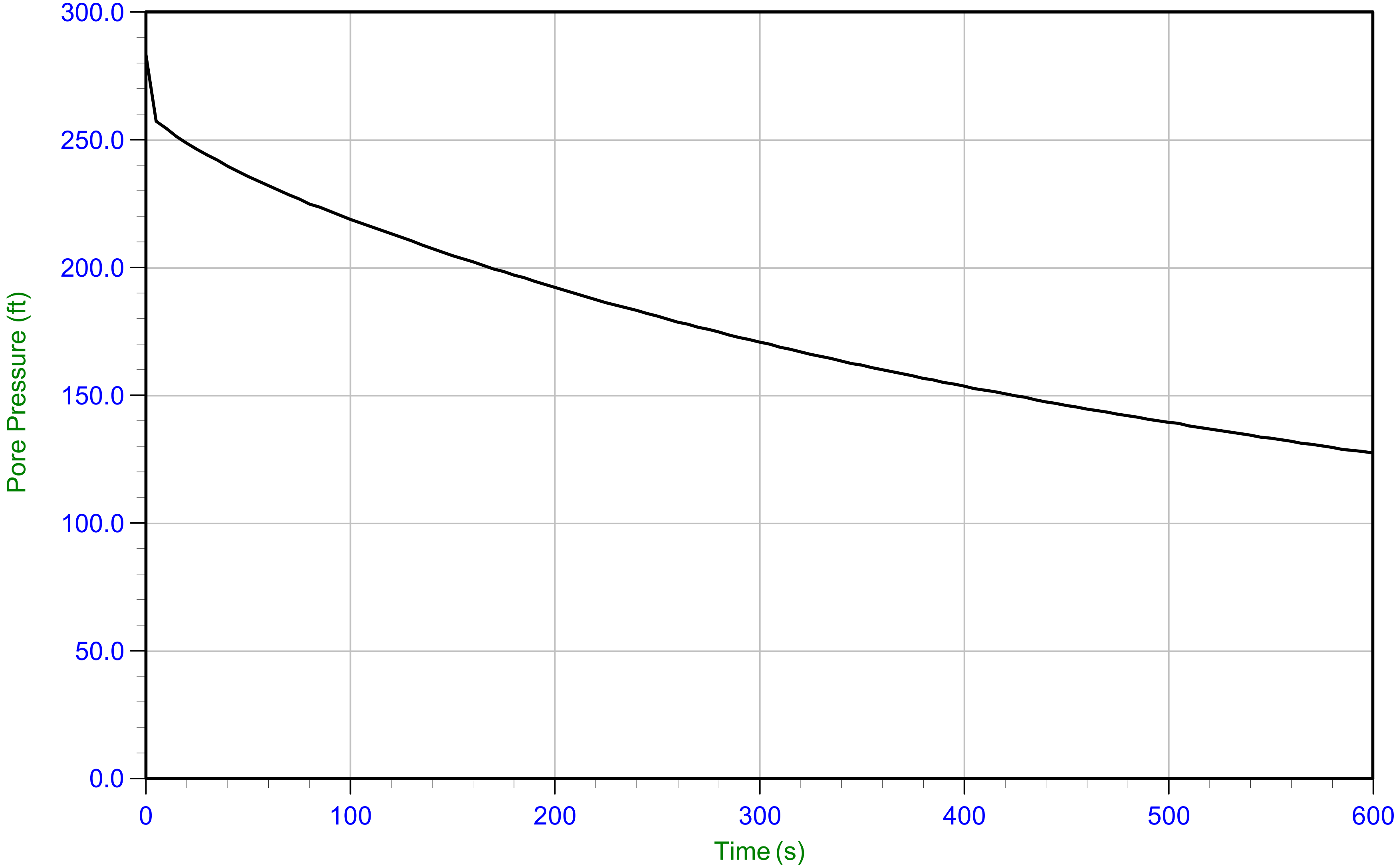
WT: 3.817 m / 12.523 ft
Ueq: 8.1 ft

ConeTec

Geosyntec Consultants

Job No: 18-53098
Date: 21-Aug-2018 09:51:49
Site: Crossroads Landfill

Sounding: CPT18-15
Cone: AD388 Area=15 cm²



Trace Summary:

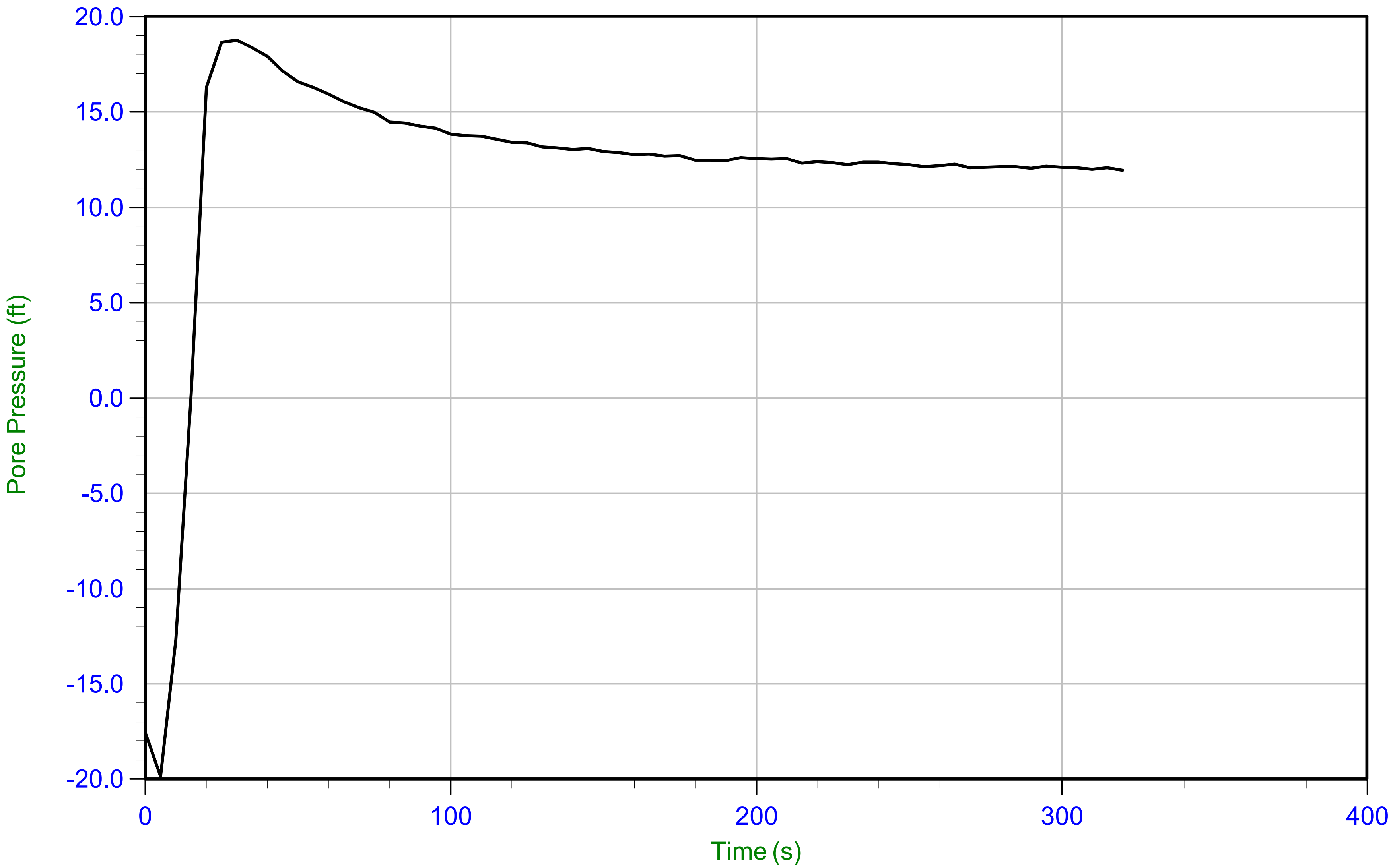
Filename: 18-53098_CP15.PPD	U Min: 127.5 ft	WT: 4.281 m / 14.045 ft	T(50): 469.3 s
Depth: 5.400 m / 17.716 ft	U Max: 283.3 ft	Ueq: 3.7 ft	Ir: 100
Duration: 600.0 s		U(50): 143.51 ft	Ch: 1.5 cm²/min

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 21-Aug-2018 09:51:49
Site: Crossroads Landfill

Sounding: CPT18-15
Cone: AD388 Area=15 cm²



Trace Summary:

Filename: 18-53098_CP15.PPD
Depth: 7.850 m / 25.754 ft
Duration: 320.0 s

U Min: -19.9 ft
U Max: 18.8 ft

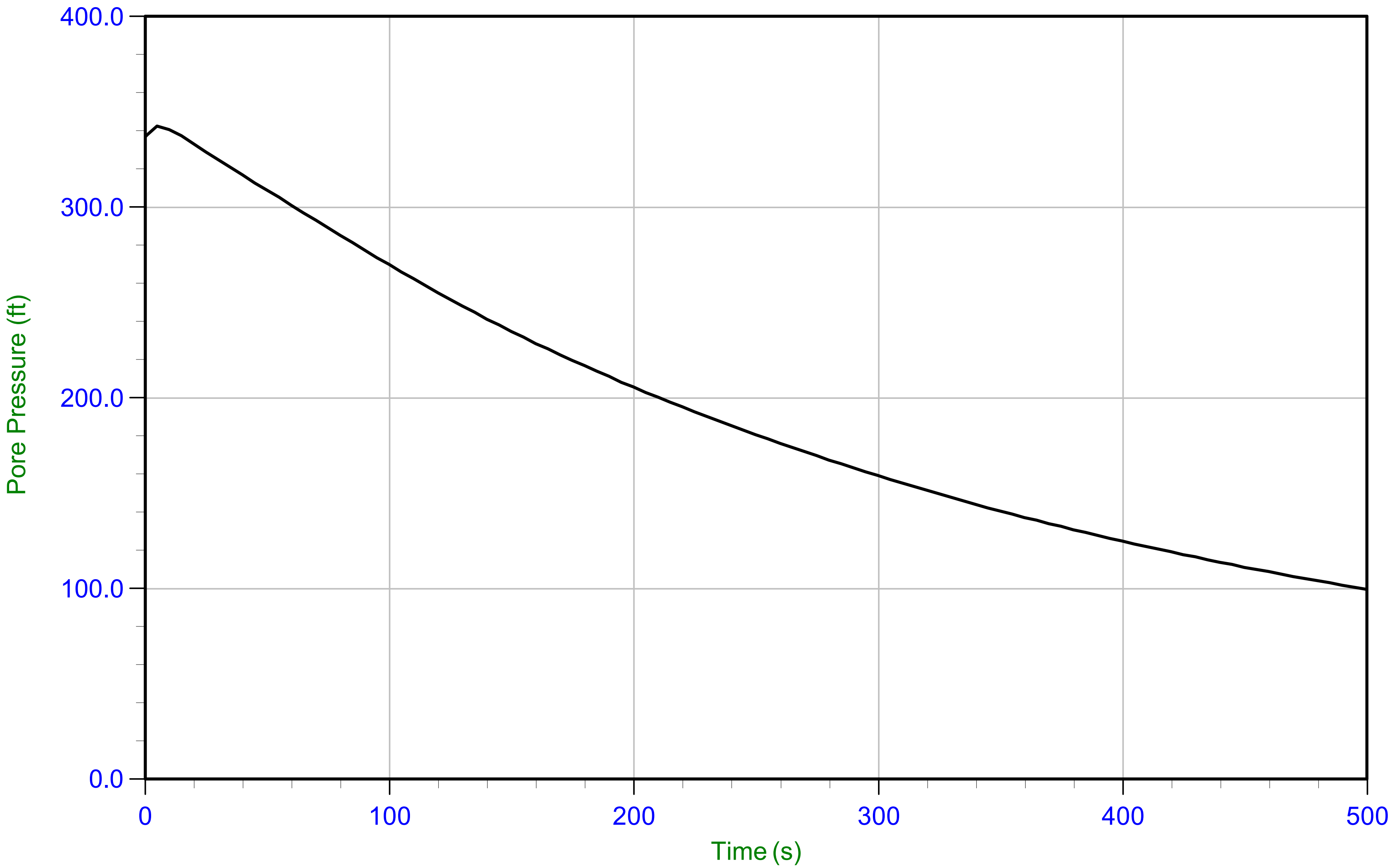
WT: 4.281 m / 14.045 ft
Ueq: 11.7 ft

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 21-Aug-2018 14:48:29
Site: Crossroads Landfill

Sounding: CPT18-16
Cone: AD388 Area=15 cm²



Trace Summary:

Filename: 18-53098_CP16.PPD
Depth: 3.375 m / 11.073 ft
Duration: 500.0 s

U Min: 99.6 ft
U Max: 342.7 ft

WT: 3.375 m / 11.073 ft
Ueq: 0.0 ft
U(50): 171.33 ft

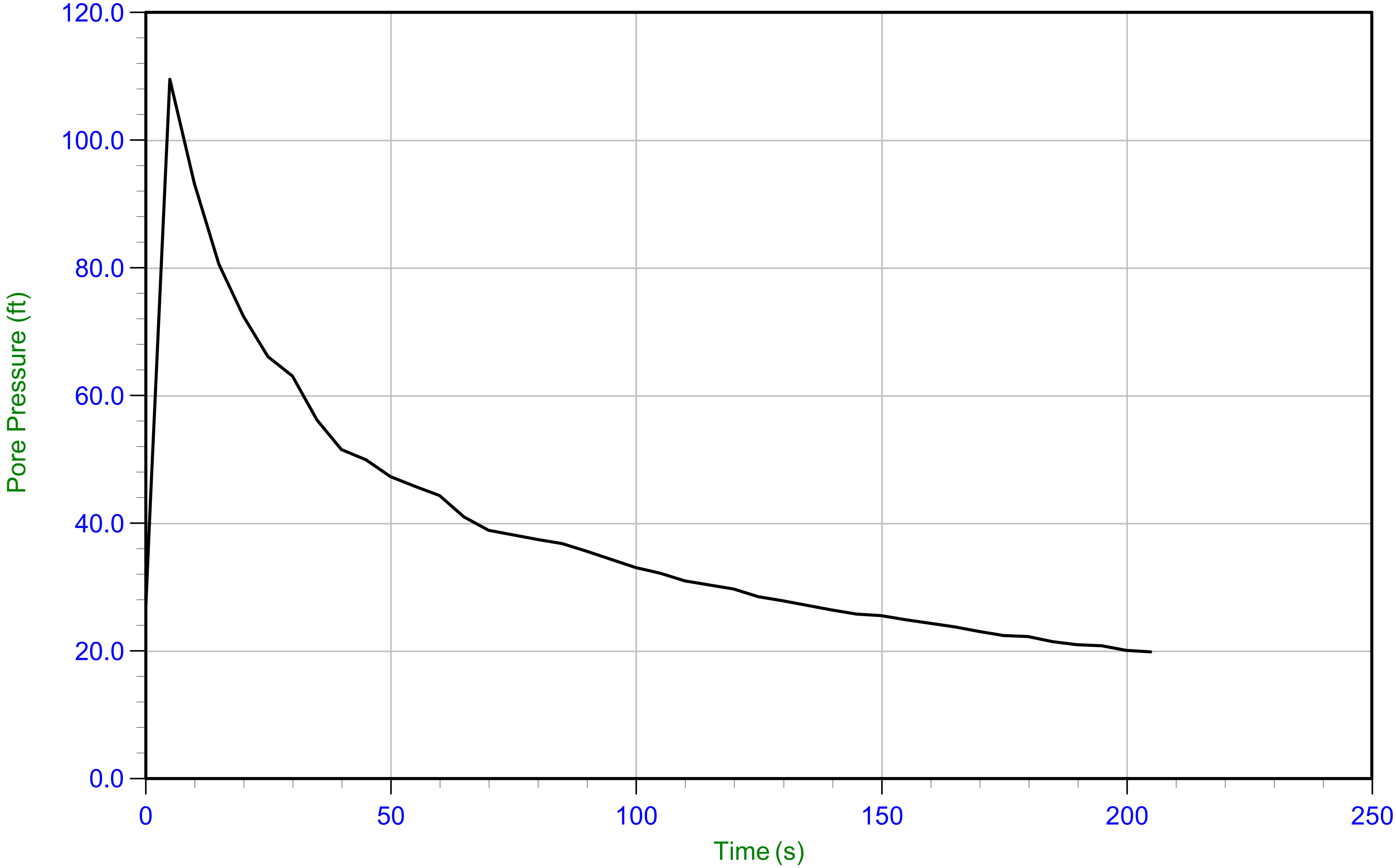
T(50): 266.1 s
Ir: 100
Ch: 2.6 cm²/min

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 21-Aug-2018 14:48:29
Site: Crossroads Landfill

Sounding: CPT18-16
Cone: AD388 Area=15 cm²



Trace Summary:

Filename: 18-53098_CP16.PPD
Depth: 5.675 m / 18.619 ft
Duration: 205.0 s

U Min: 19.9 ft
U Max: 109.6 ft

WT: 3.962 m / 12.999 ft
Ueq: 5.6 ft
U(50): 57.61 ft

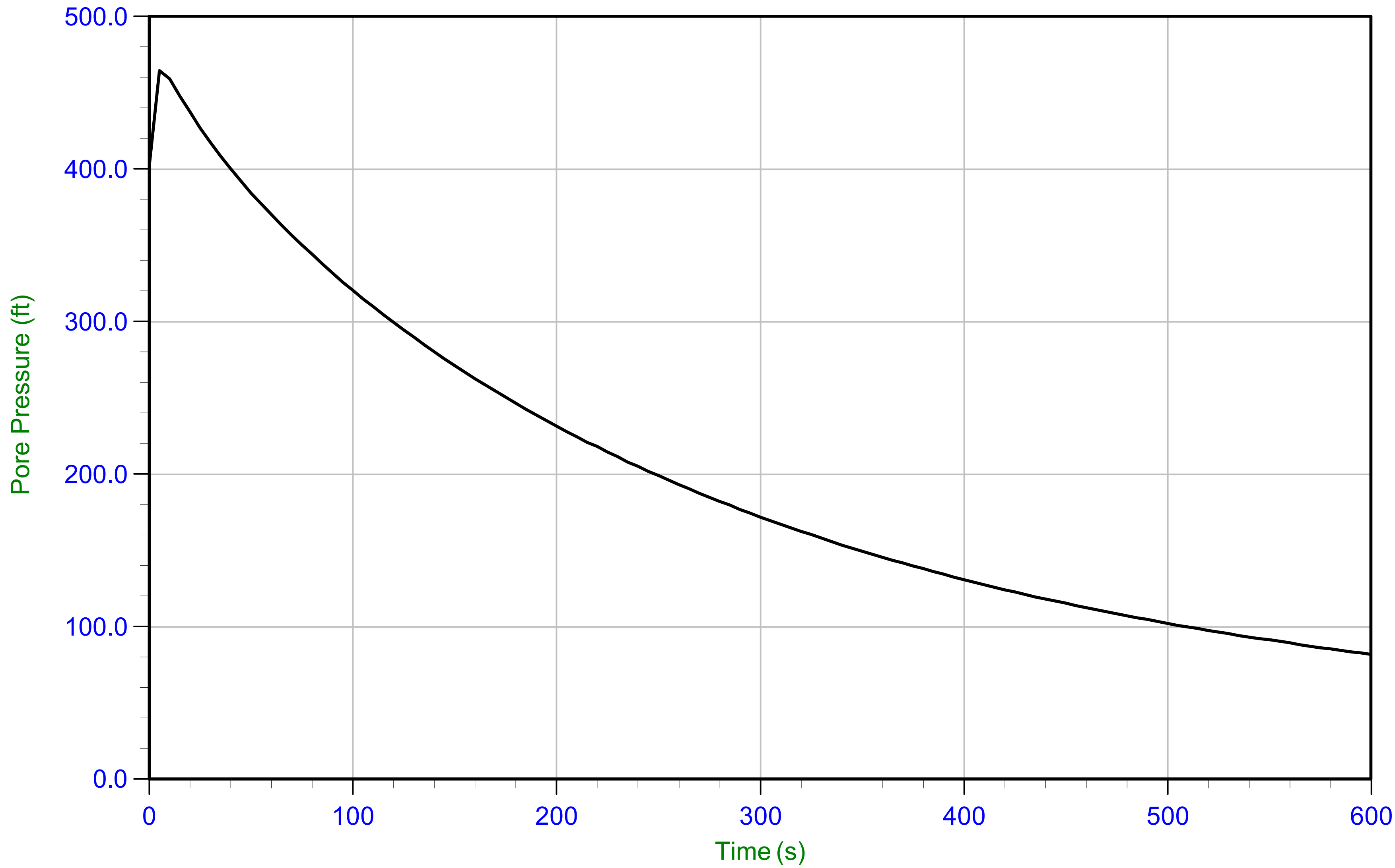
T(50): 29.0 s
Ir: 100
Ch: 24.2 cm²/min

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 20-Aug-2018 11:31:39
Site: Crossroads Landfill

Sounding: CPT18-17
Cone: AD388 Area=15 cm²



Trace Summary:

Filename: 18-53098_CP17.PPD
Depth: 8.400 m / 27.559 ft
Duration: 600.0 s

U Min: 81.9 ft
U Max: 464.6 ft

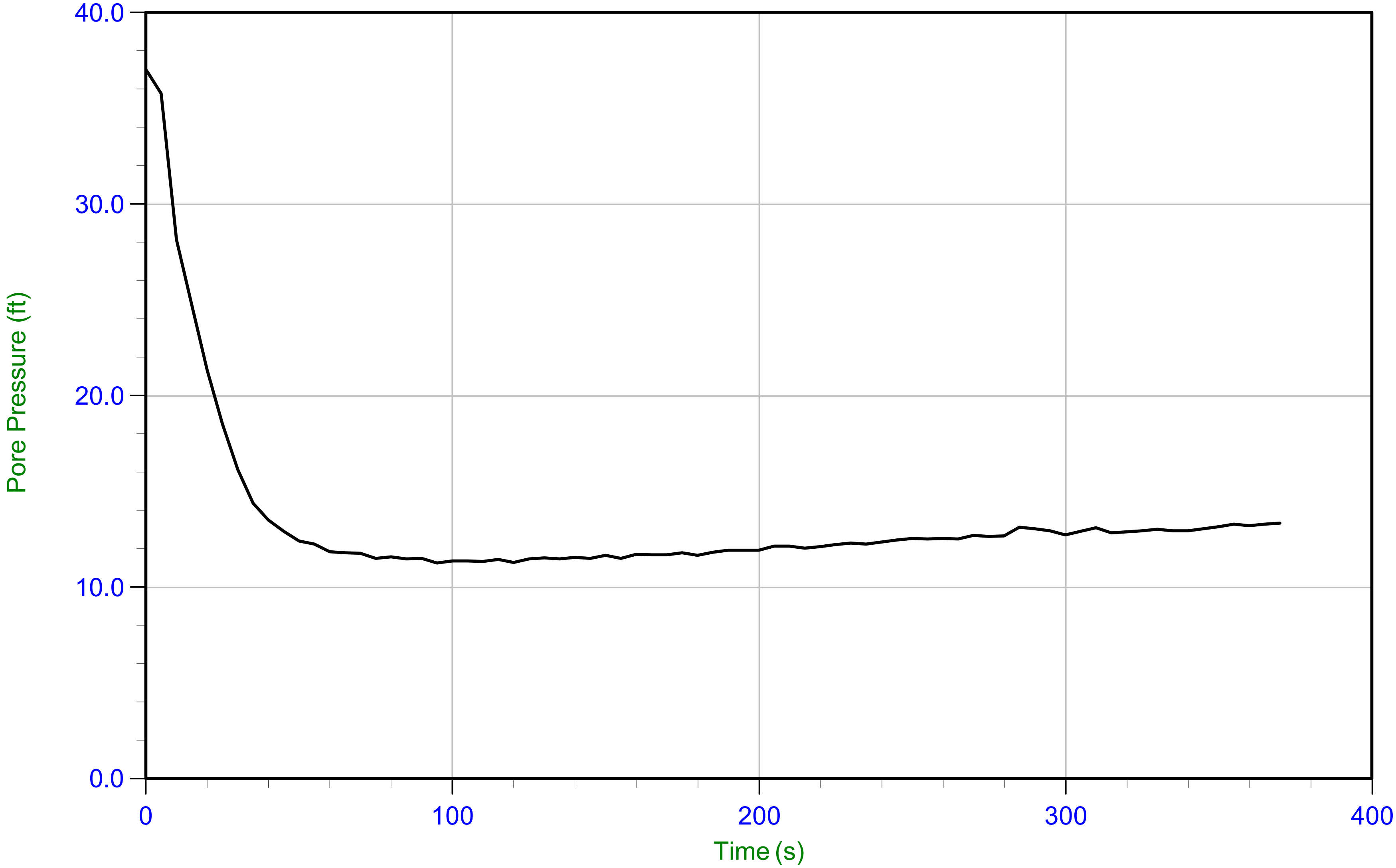
WT: 8.400 m / 27.559 ft
Ueq: 0.0 ft
U(50): 232.28 ft

T(50): 193.9 s
Ir: 100
Ch: 3.6 cm²/min

Geosyntec Consultants

Job No: 18-53098
Date: 20-Aug-2018 11:31:39
Site: Crossroads Landfill

Sounding: CPT18-17
Cone: AD388 Area=15 cm²



Trace Summary:

Filename: 18-53098_CP17.PPD
Depth: 13.675 m / 44.865 ft
Duration: 370.0 s

U Min: 11.3 ft
U Max: 37.0 ft

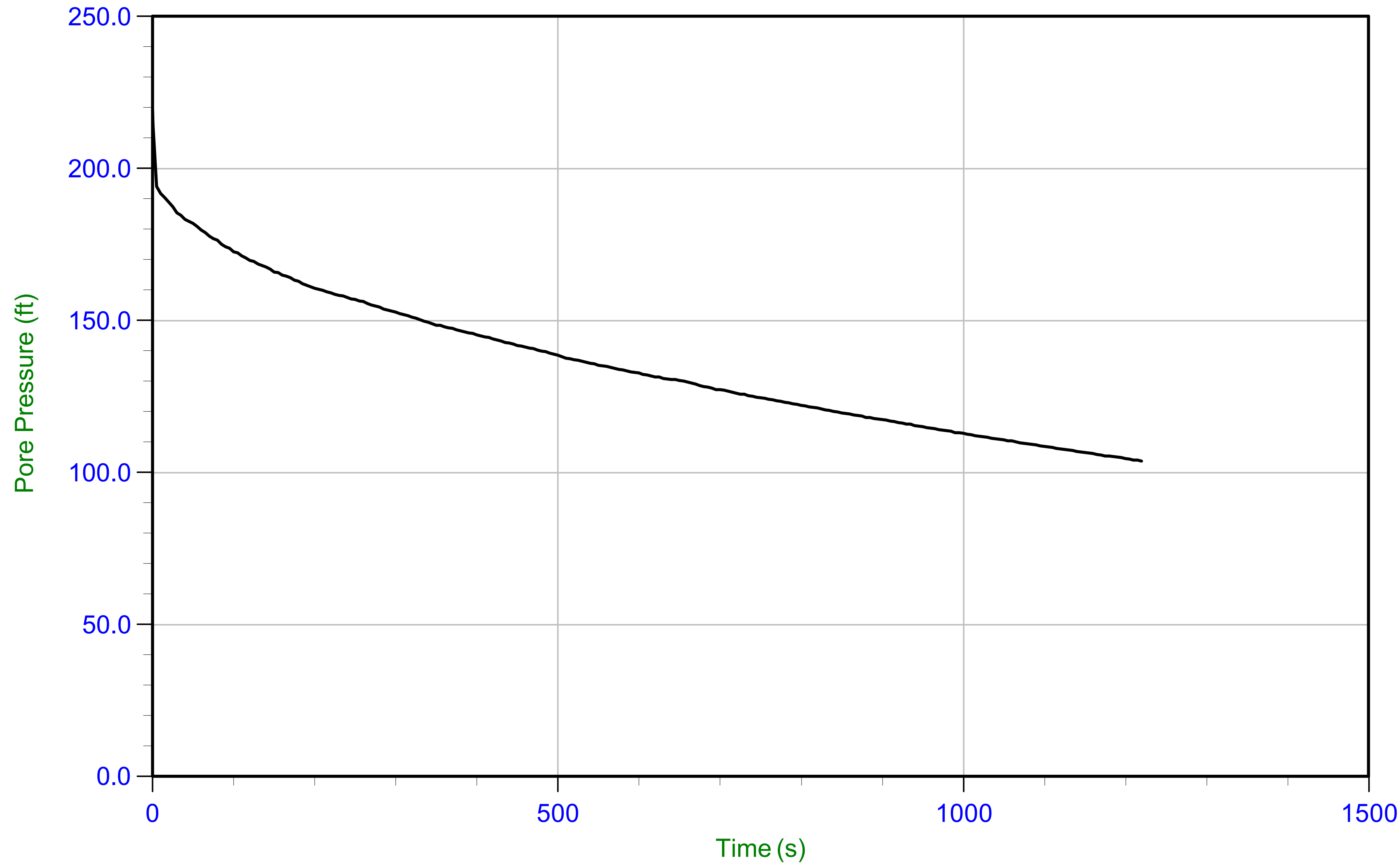
WT: 9.552 m / 31.338 ft
Ueq: 13.5 ft

ConeTec

Geosyntec Consultants

Job No: 18-53098
Date: 22-Aug-2018 15:39:49
Site: Crossroads Landfill

Sounding: CPT18-18
Cone: AD452 Area=15 cm²



Trace Summary:

Filename: 18-53098_CP18.PPD
Depth: 10.000 m / 32.808 ft
Duration: 1220.0 s

U Min: 103.8 ft
U Max: 219.1 ft

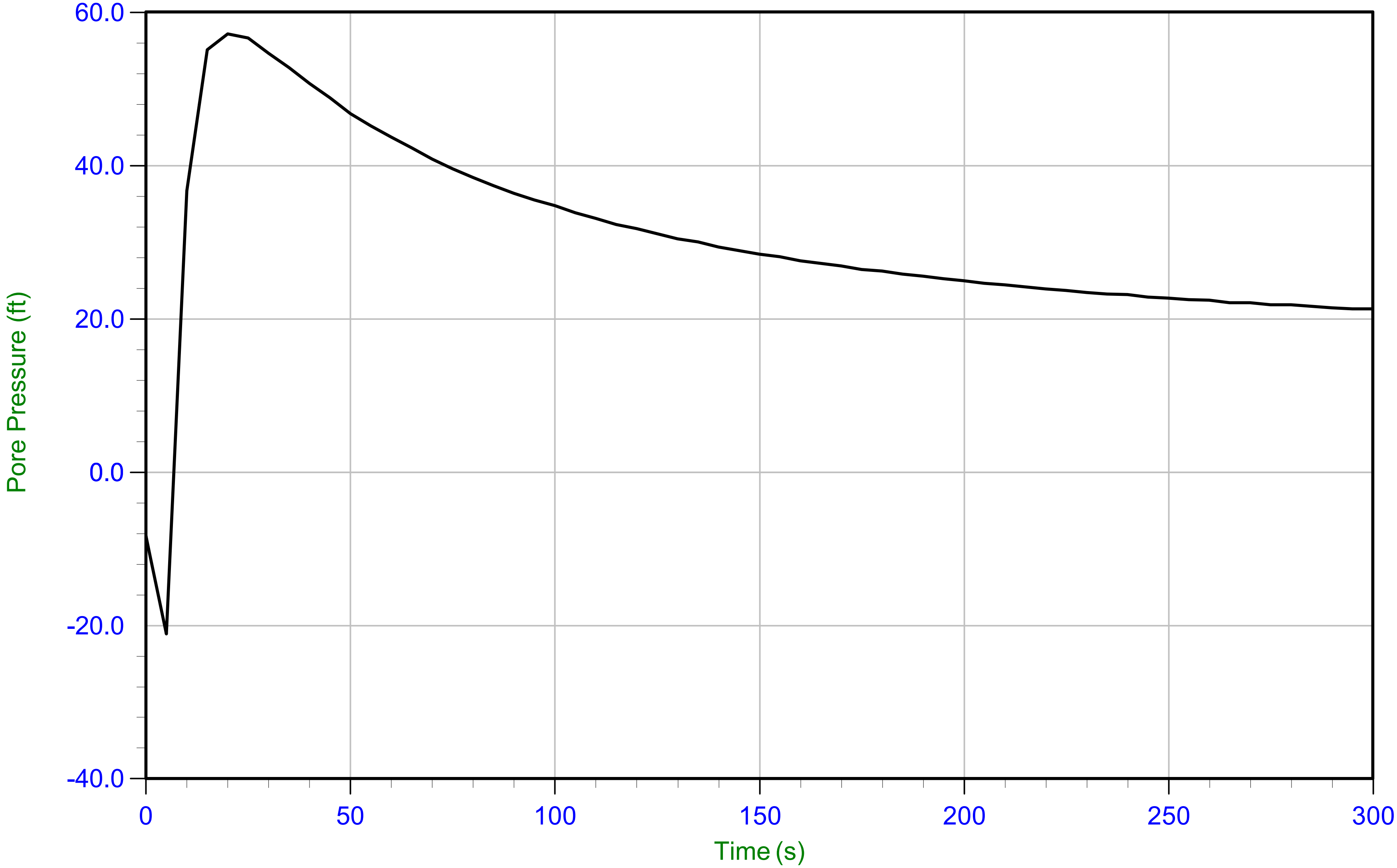
WT: 6.401 m / 21.000 ft
Ueq: 11.8 ft
U(50): 115.47 ft

T(50): 940.6 s
Ir: 100
Ch: 0.7 cm²/min

Geosyntec Consultants

Job No: 18-53098
Date: 22-Aug-2018 15:39:49
Site: Crossroads Landfill

Sounding: CPT18-18
Cone: AD452 Area=15 cm²



Trace Summary:

Filename: 18-53098_CP18.PPD
Depth: 11.625 m / 38.139 ft
Duration: 300.0 s

U Min: -21.1 ft
U Max: 57.2 ft

WT: 6.401 m / 21.000 ft
Ueq: 17.1 ft
U(50): 37.15 ft

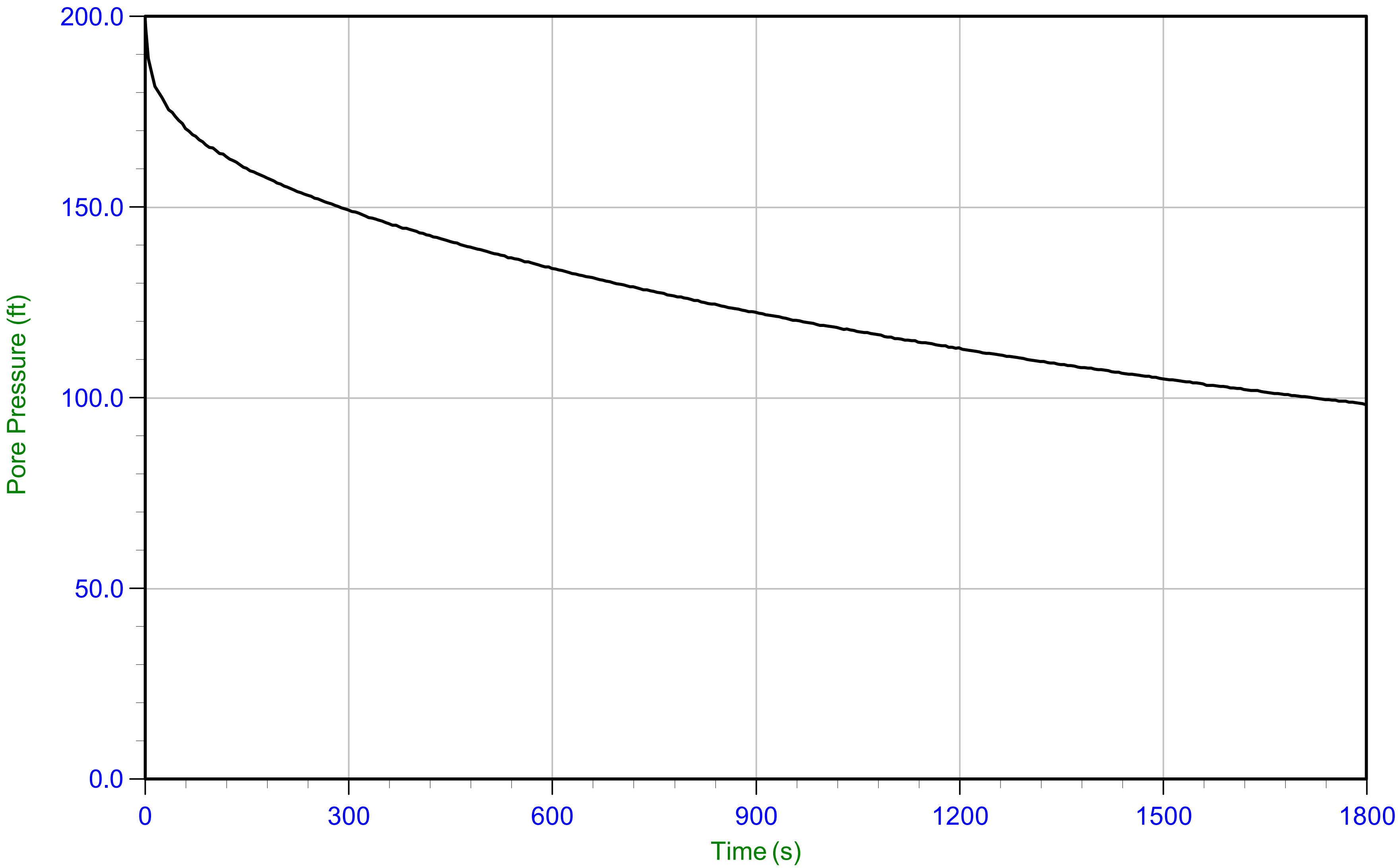
T(50): 66.0 s
Ir: 100
Ch: 10.6 cm²/min

ConeTec

Geosyntec Consultants

Job No: 18-53098
Date: 24-Aug-2018 08:17:27
Site: Crossroads Landfill

Sounding: CPT18-19
Cone: AD452 Area=15 cm²



Trace Summary:

Filename: 18-53098_CP19.PPD
Depth: 5.200 m / 17.060 ft
Duration: 1800.0 s

U Min: 98.2 ft
U Max: 198.9 ft

WT: 2.528 m / 8.294 ft
Ueq: 8.8 ft
U(50): 103.85 ft

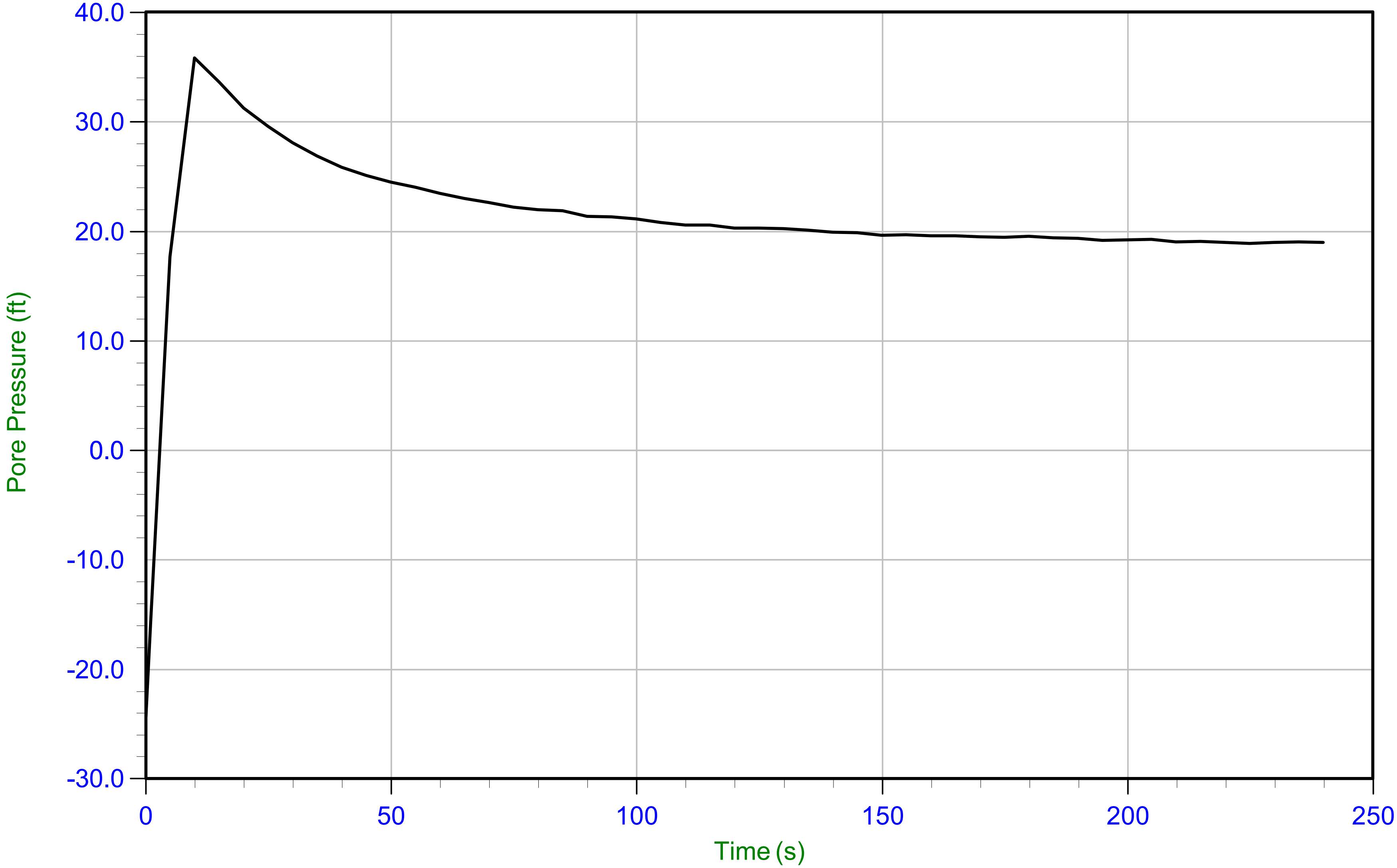
T(50): 1552.4 s
Ir: 100
Ch: 0.5 cm²/min

ConeTec

Geosyntec Consultants

Job No: 18-53098
Date: 24-Aug-2018 08:17:27
Site: Crossroads Landfill

Sounding: CPT18-19
Cone: AD452 Area=15 cm²



Trace Summary:

Filename: 18-53098_CP19.PPD
Depth: 8.125 m / 26.657 ft
Duration: 240.0 s

U Min: -24.3 ft
U Max: 35.8 ft

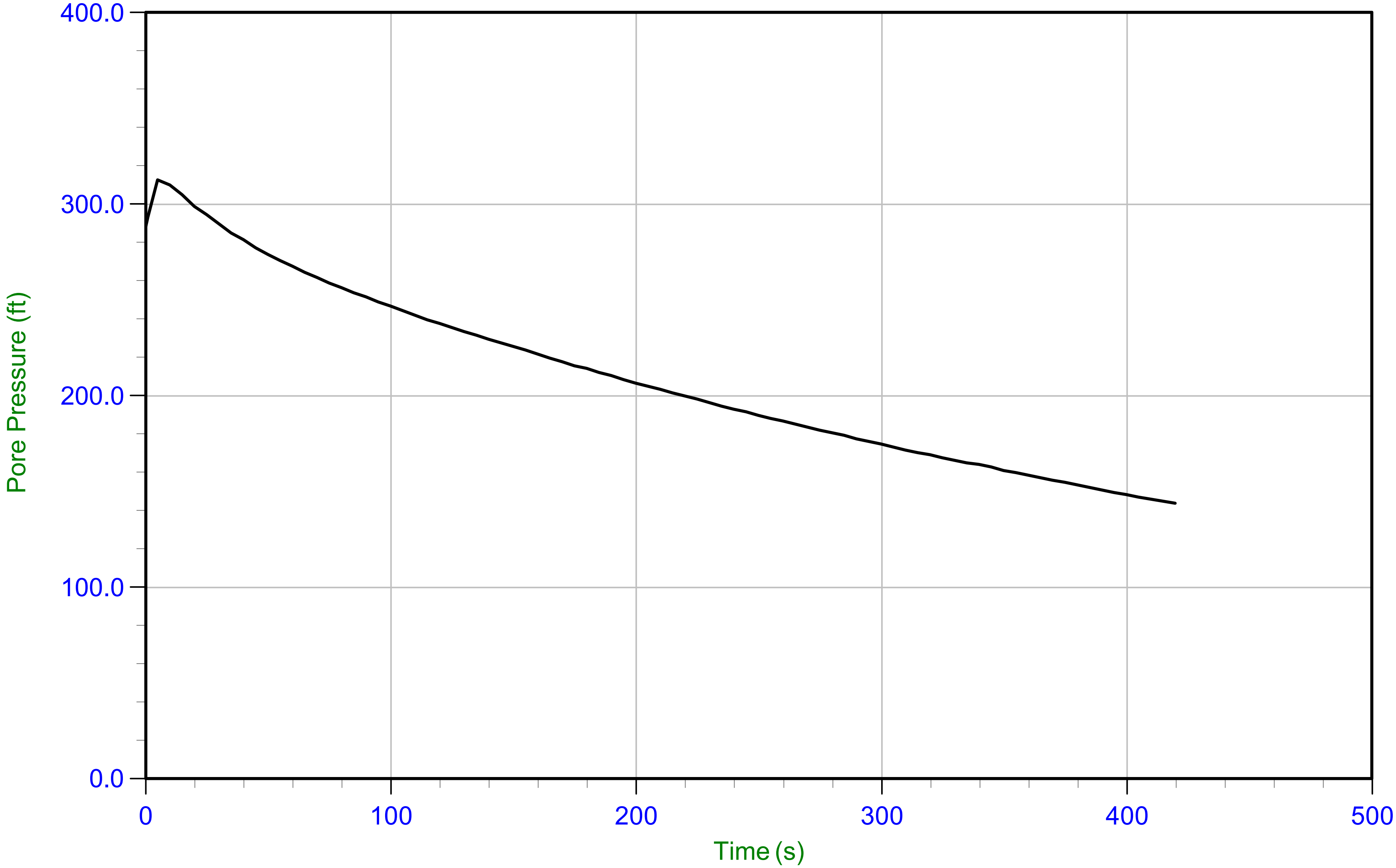
WT: 2.528 m / 8.294 ft
Ueq: 18.4 ft

ConeTec

Geosyntec Consultants

Job No: 18-53098
Date: 23-Aug-2018 15:39:51
Site: Crossroads Landfill

Sounding: CPT18-20
Cone: AD452 Area=15 cm²



Trace Summary:

Filename: 18-53098_CP20.PPD
Depth: 6.350 m / 20.833 ft
Duration: 420.0 s

U Min: 143.9 ft
U Max: 312.7 ft

WT: 5.486 m / 17.998 ft
Ueq: 2.8 ft
U(50): 157.79 ft

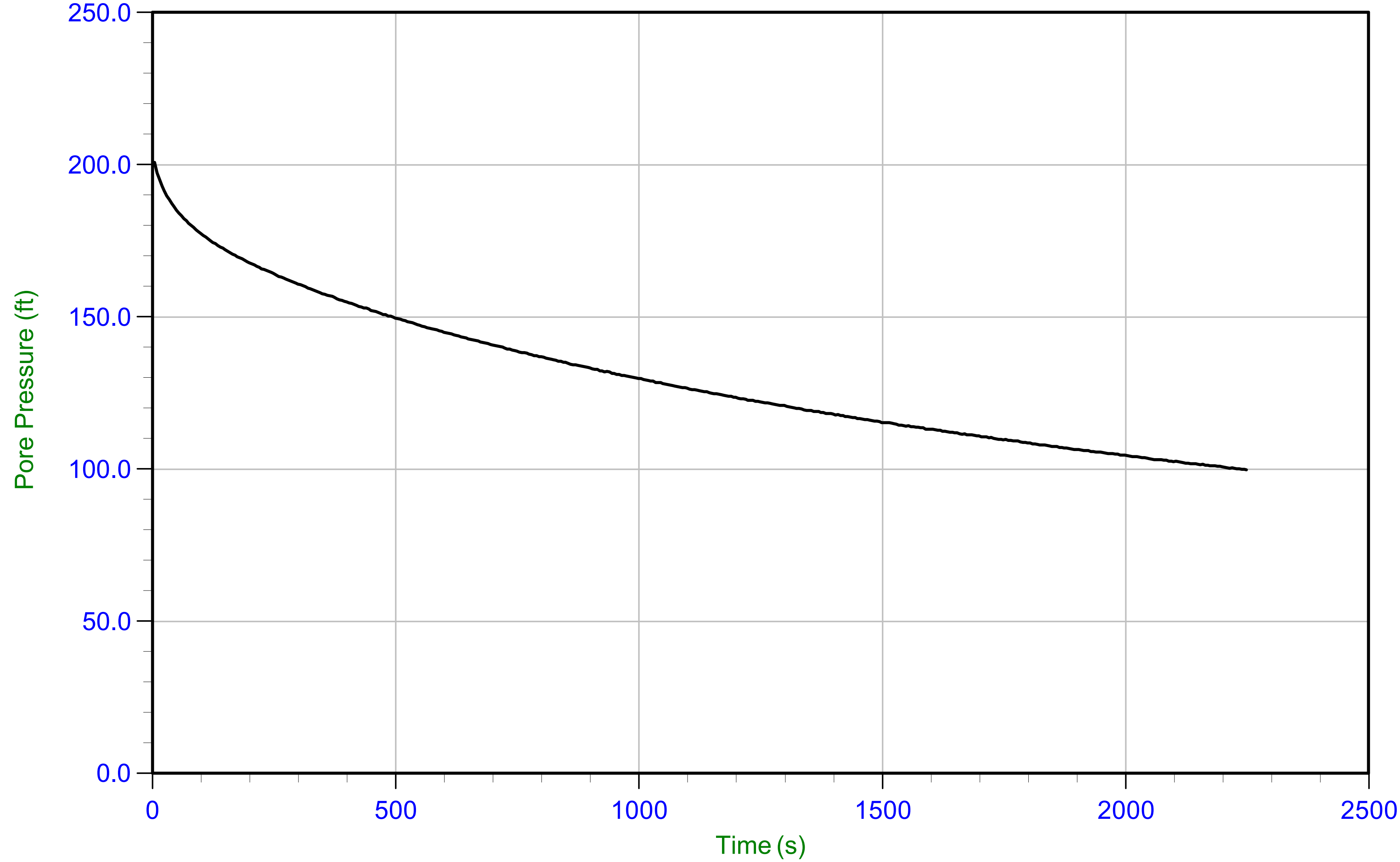
T(50): 358.0 s
Ir: 100
Ch: 2.0 cm²/min

ConeTec

Geosyntec Consultants

Job No: 18-53098
Date: 23-Aug-2018 15:39:51
Site: Crossroads Landfill

Sounding: CPT18-20
Cone: AD452 Area=15 cm²



Trace Summary:

Filename: 18-53098_CP20.PPD
Depth: 7.325 m / 24.032 ft
Duration: 2250.0 s

U Min: 99.8 ft
U Max: 200.7 ft

WT: 5.486 m / 17.998 ft
Ueq: 6.0 ft
U(50): 103.36 ft

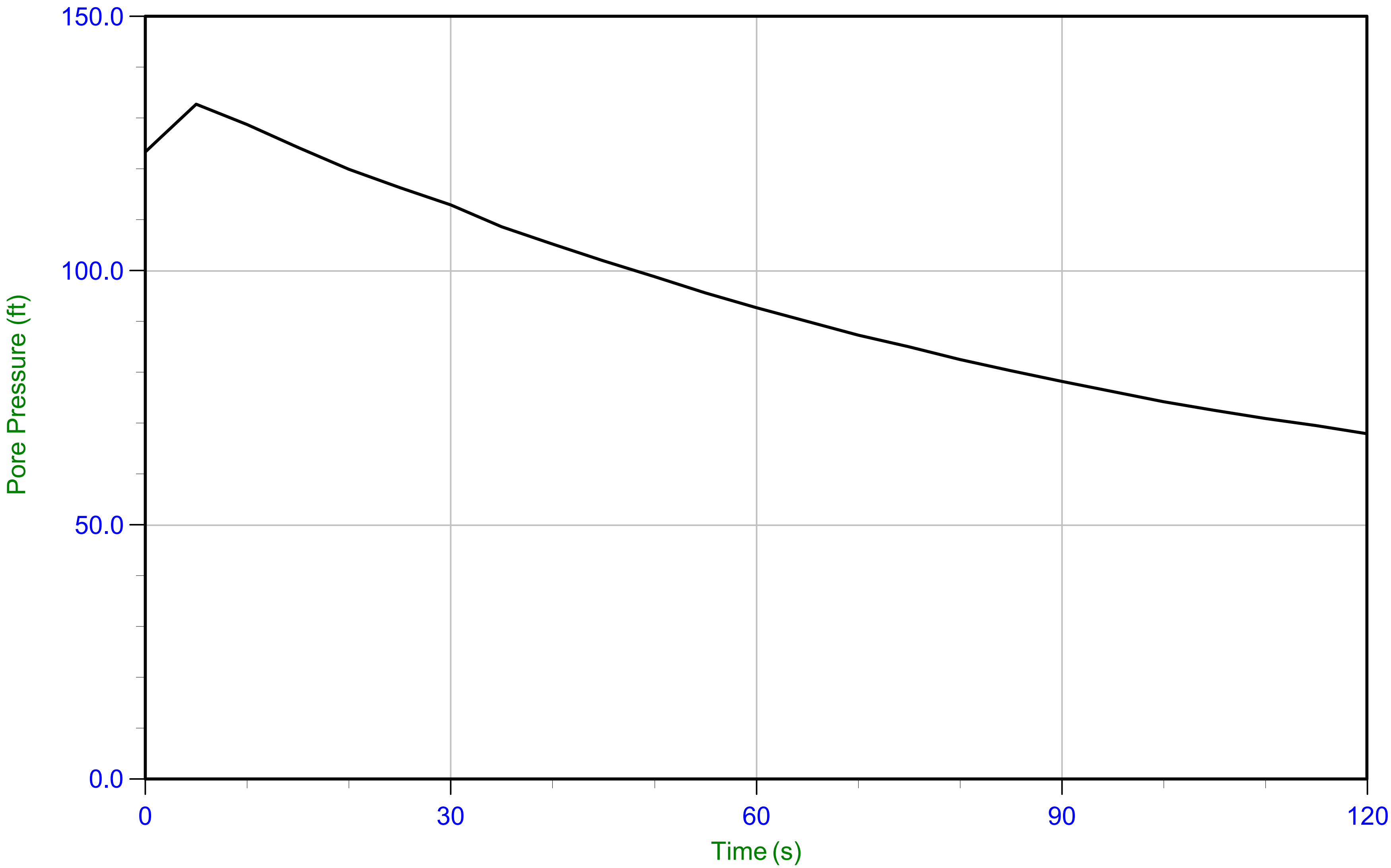
T(50): 2047.8 s
Ir: 100
Ch: 0.3 cm²/min

ConeTec

Geosyntec Consultants

Job No: 18-53098
Date: 23-Aug-2018 15:39:51
Site: Crossroads Landfill

Sounding: CPT18-20
Cone: AD452 Area=15 cm²



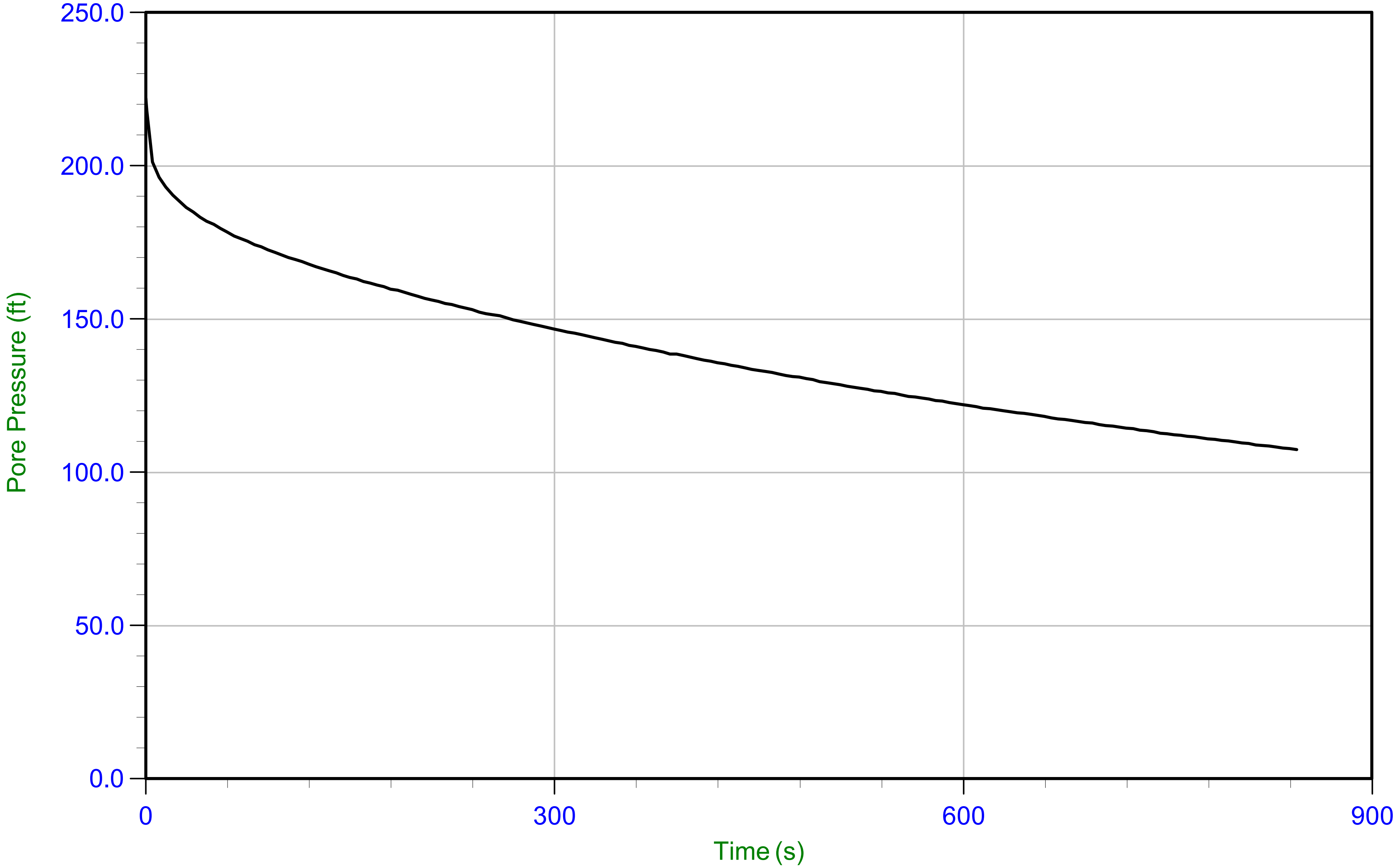
Trace Summary:	Filename: 18-53098_CP20.PPD	U Min: 67.9 ft	WT: 5.486 m / 17.998 ft	T(50): 92.7 s
	Depth: 10.875 m / 35.679 ft	U Max: 132.8 ft	Ueq: 17.7 ft	Ir: 100
	Duration: 120.0 s		U(50): 75.22 ft	Ch: 7.6 cm²/min

ConeTec

Geosyntec Consultants

Job No: 18-53098
Date: 23-Aug-2018 17:22:03
Site: Crossroads Landfill

Sounding: CPT18-21
Cone: AD452 Area=15 cm²



Trace Summary:

Filename: 18-53098_CP21.PPD
Depth: 5.325 m / 17.470 ft
Duration: 845.0 s

U Min: 107.4 ft
U Max: 222.1 ft

WT: 2.280 m / 7.480 ft
Ueq: 10.0 ft
U(50): 116.07 ft

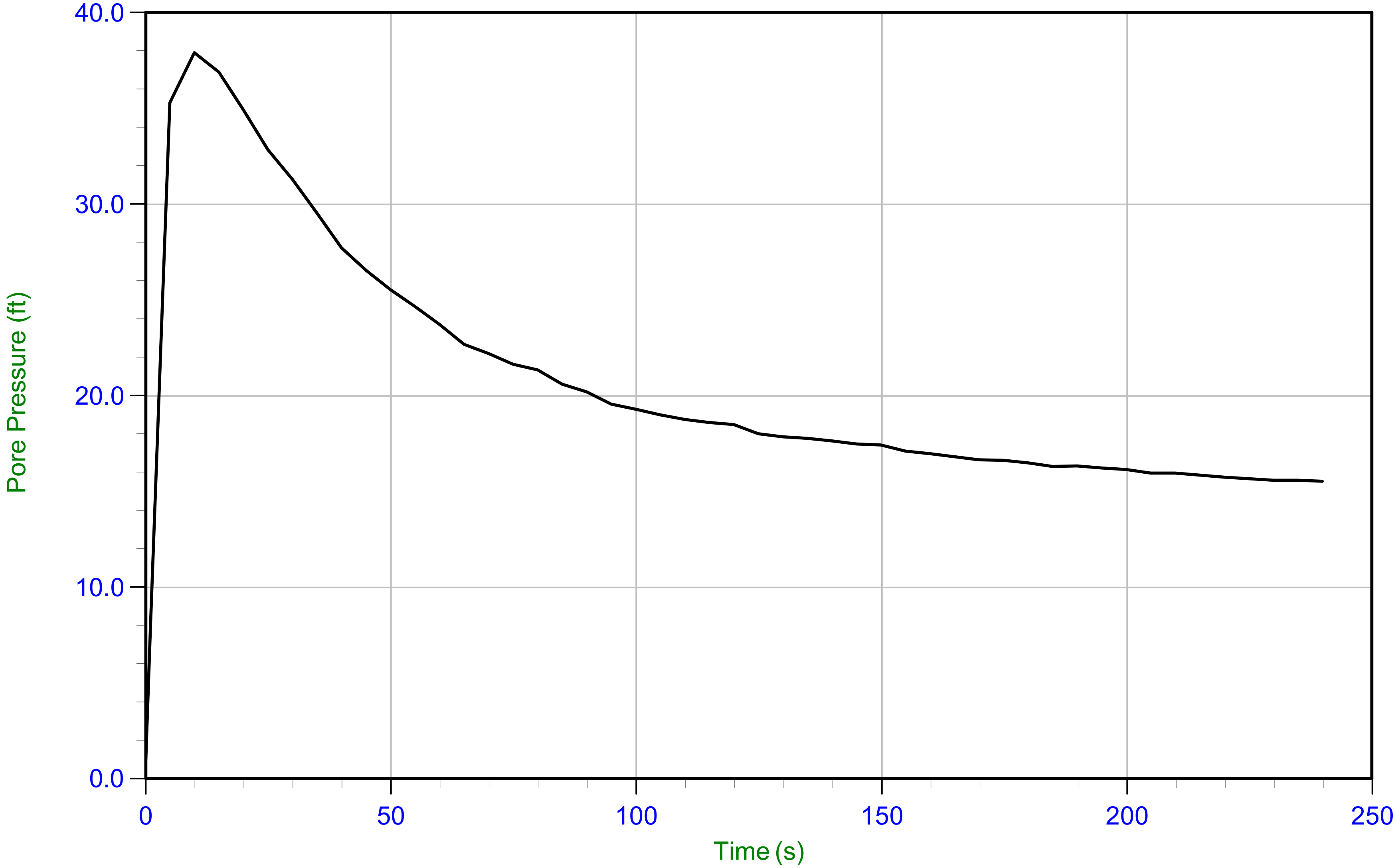
T(50): 694.7 s
Ir: 100
Ch: 1.0 cm²/min

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 23-Aug-2018 17:22:03
Site: Crossroads Landfill

Sounding: CPT18-21
Cone: AD452 Area=15 cm²



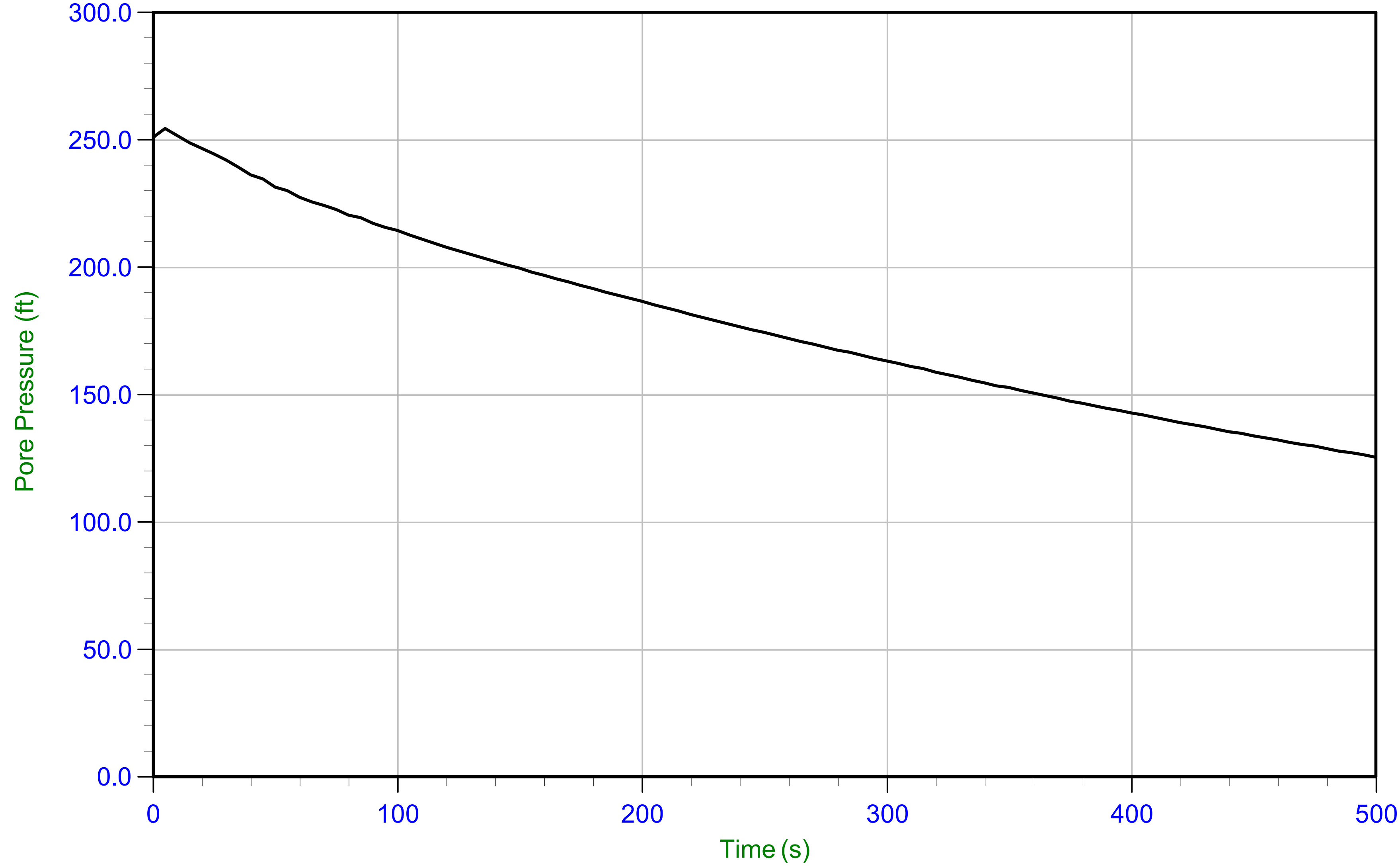
Trace Summary:	Filename: 18-53098_CP21.PPD	U Min: 1.0 ft	WT: 2.280 m / 7.480 ft	T(50): 37.3 s
	Depth: 6.625 m / 21.735 ft	U Max: 37.9 ft	Ueq: 14.3 ft	Ir: 100
	Duration: 240.0 s		U(50): 26.08 ft	Ch: 18.8 cm²/min

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 24-Aug-2018 13:42:14
Site: Crossroads Landfill

Sounding: CPT18-22
Cone: AD452 Area=15 cm²



Trace Summary:

Filename: 18-53098_CP22.PPD
Depth: 5.275 m / 17.306 ft
Duration: 500.0 s

U Min: 125.5 ft
U Max: 254.4 ft

WT: 4.572 m / 15.000 ft
Ueq: 2.3 ft
U(50): 128.36 ft

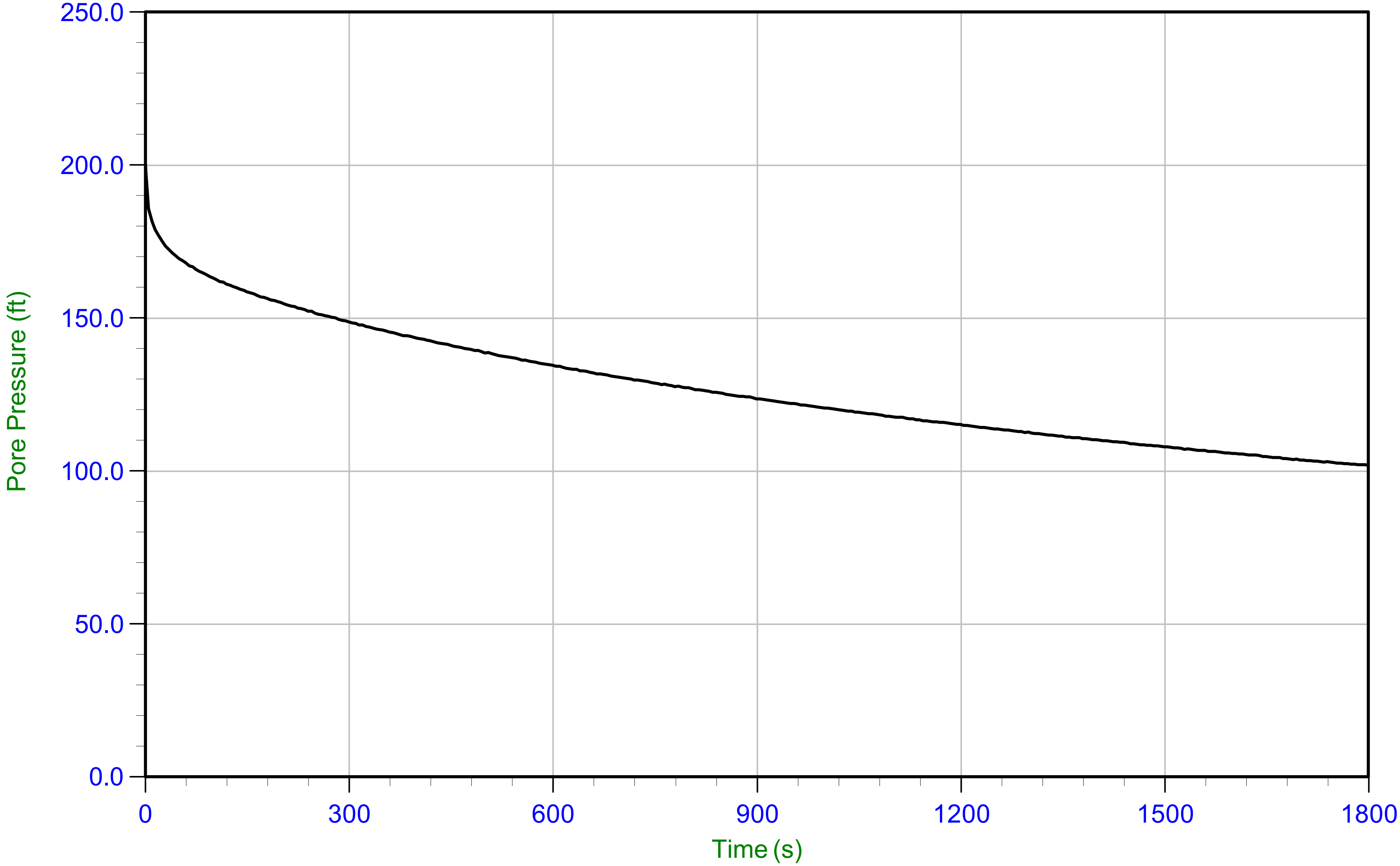
T(50): 477.7 s
Ir: 100
Ch: 1.5 cm²/min

ConeTec

Geosyntec Consultants

Job No: 18-53098
Date: 24-Aug-2018 11:16:20
Site: Crossroads Landfill

Sounding: CPT18-23
Cone: AD452 Area=15 cm²



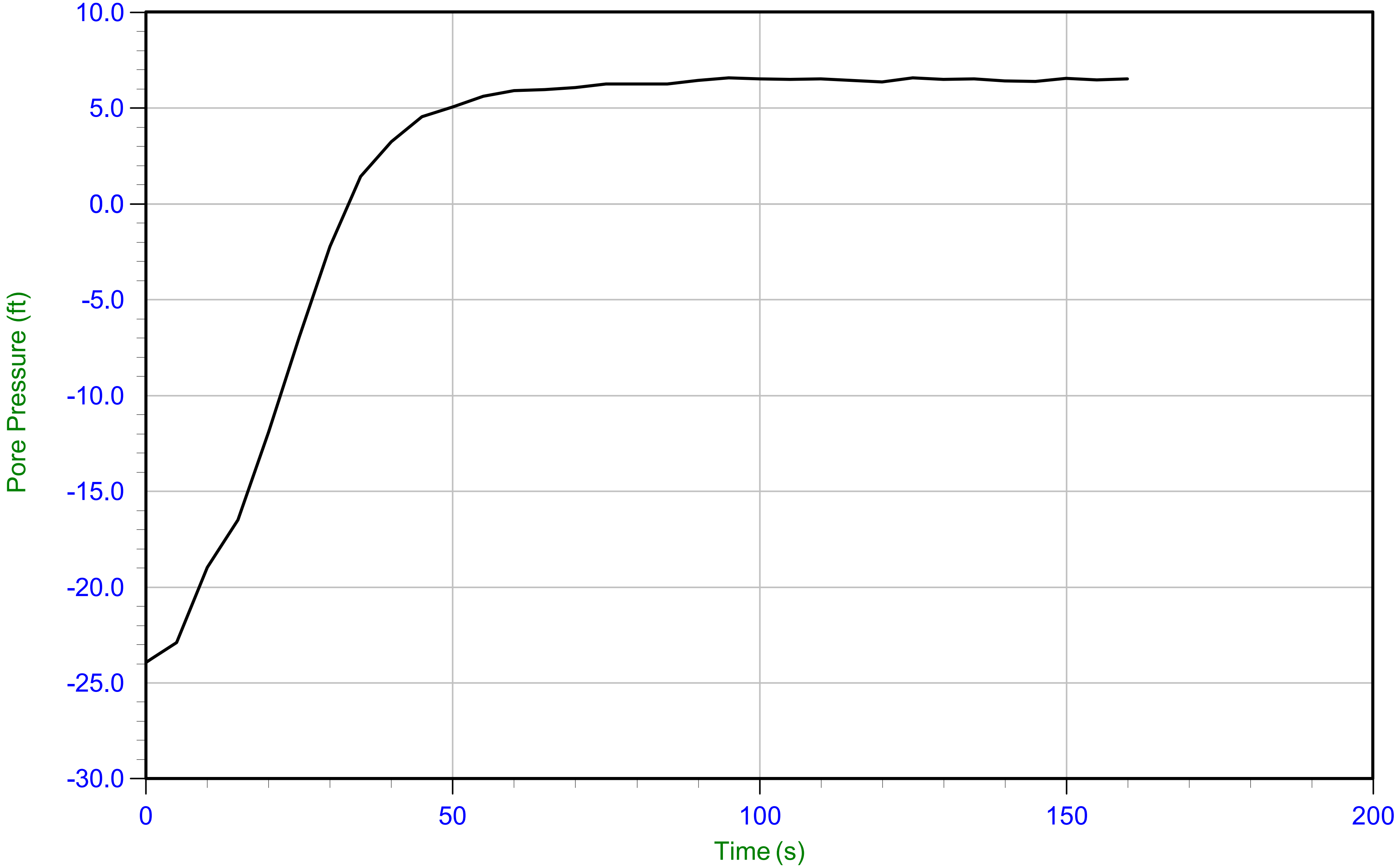
Trace Summary:

Filename: 18-53098_CP23.PPD
Depth: 5.175 m / 16.978 ft
Duration: 1800.0 s

U Min: 101.9 ft
U Max: 200.3 ft

WT: 5.175 m / 16.978 ft
Ueq: 0.0 ft

Geosyntec Consultants	Job No: 18-53098 Date: 24-Aug-2018 11:16:20 Site: Crossroads Landfill	Sounding: CPT18-23 Cone: AD452 Area=15 cm²

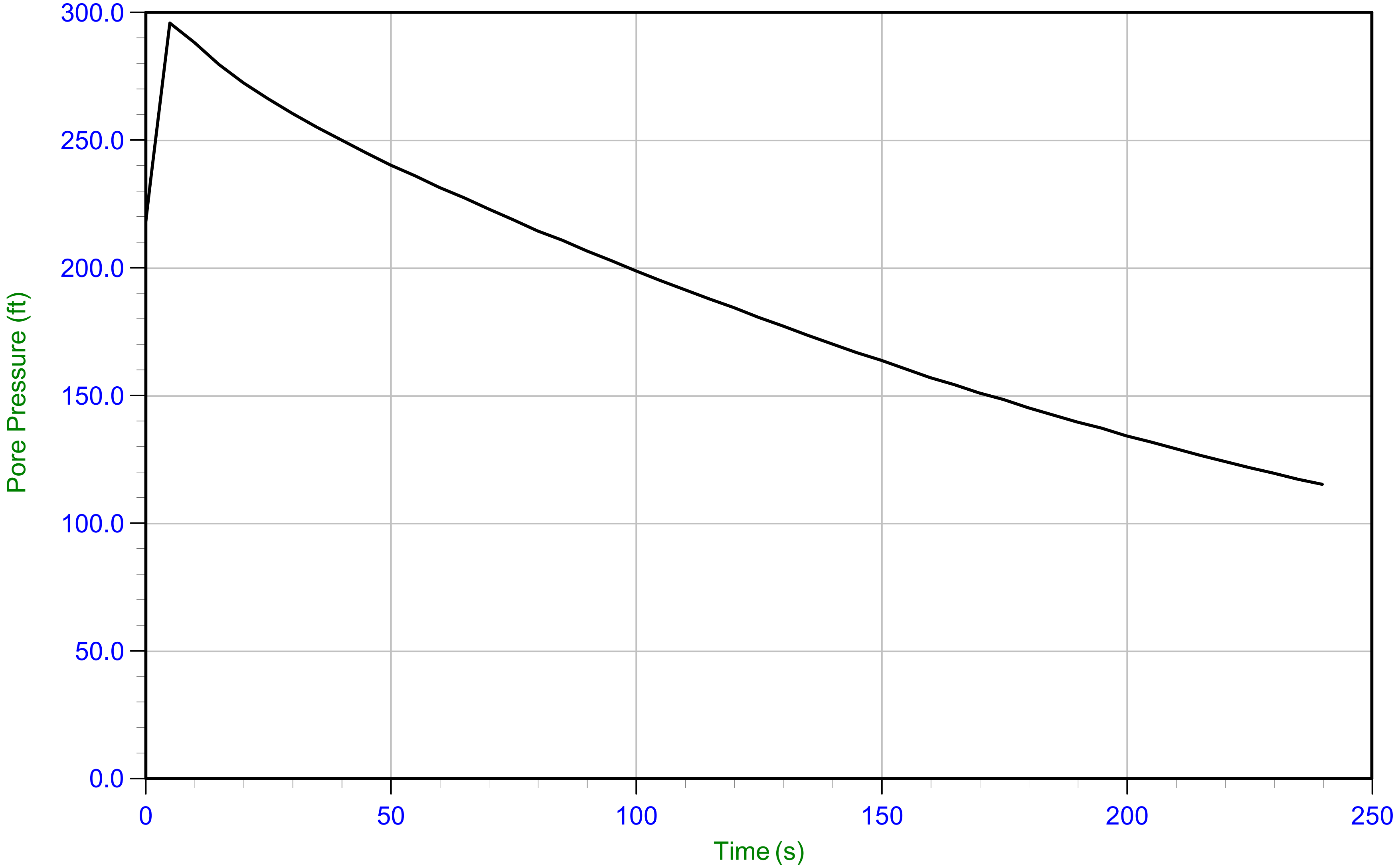


Trace Summary:	Filename: 18-53098_CP23.PPD	U Min: -23.9 ft	WT: 6.166 m / 20.229 ft
	Depth: 8.150 m / 26.739 ft	U Max: 6.6 ft	Ueq: 6.5 ft
	Duration: 160.0 s		

Geosyntec Consultants

Job No: 18-53098
Date: 26-Aug-2018 10:52:41
Site: Crossroads Landfill

Sounding: CPT18-24
Cone: AD452 Area=15 cm²



Trace Summary:

Filename: 18-53098_CP24.PPD
Depth: 3.400 m / 11.155 ft
Duration: 240.0 s

U Min: 115.3 ft
U Max: 295.8 ft

WT: 3.400 m / 11.155 ft
Ueq: 0.0 ft
U(50): 147.92 ft

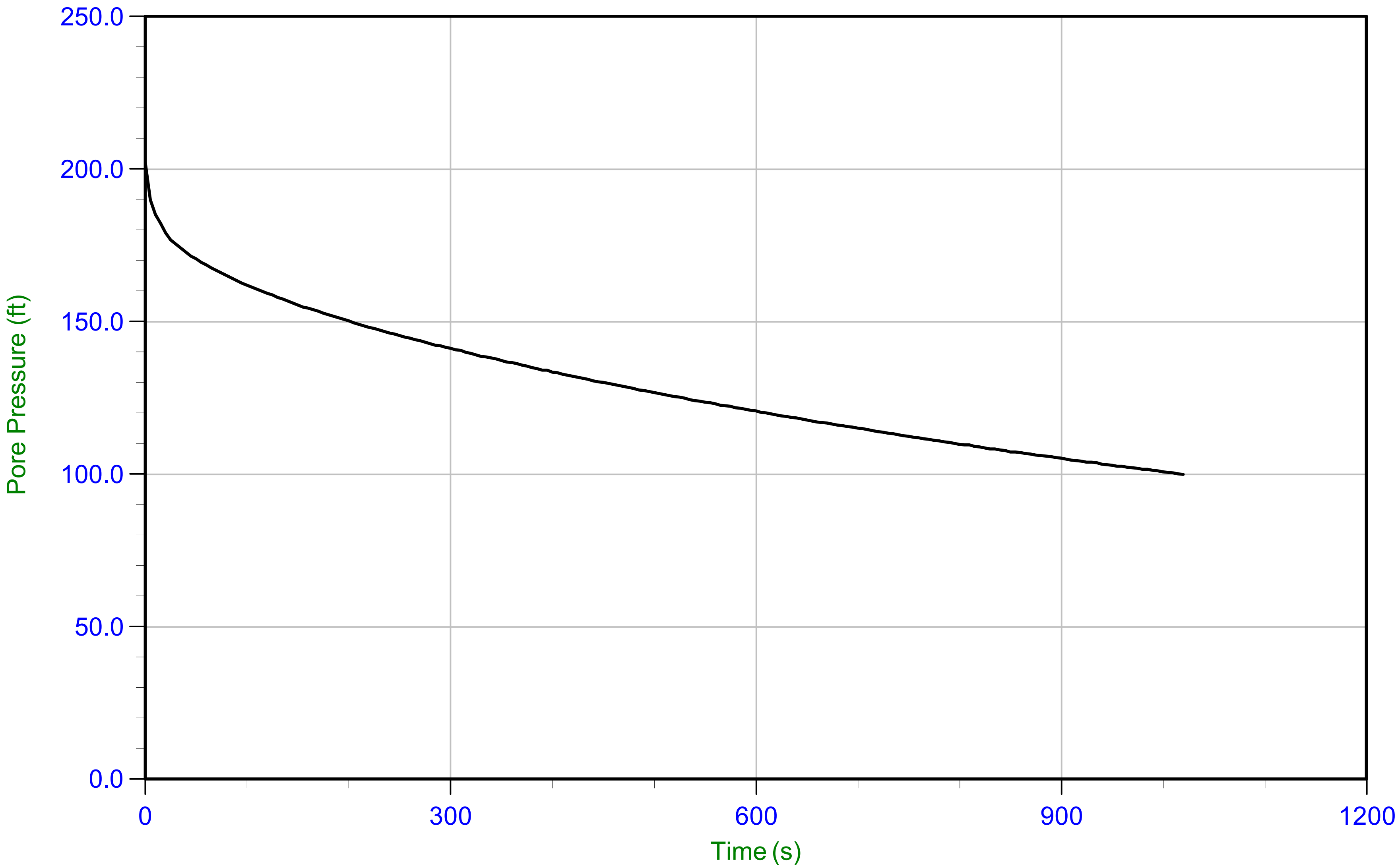
T(50): 170.9 s
Ir: 100
Ch: 4.1 cm²/min

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 26-Aug-2018 10:52:41
Site: Crossroads Landfill

Sounding: CPT18-24
Cone: AD452 Area=15 cm²



Trace Summary:

Filename: 18-53098_CP24.PPD
Depth: 5.400 m / 17.716 ft
Duration: 1020.0 s

U Min: 99.9 ft
U Max: 202.2 ft

WT: 5.133 m / 16.840 ft
Ueq: 0.9 ft
U(50): 101.54 ft

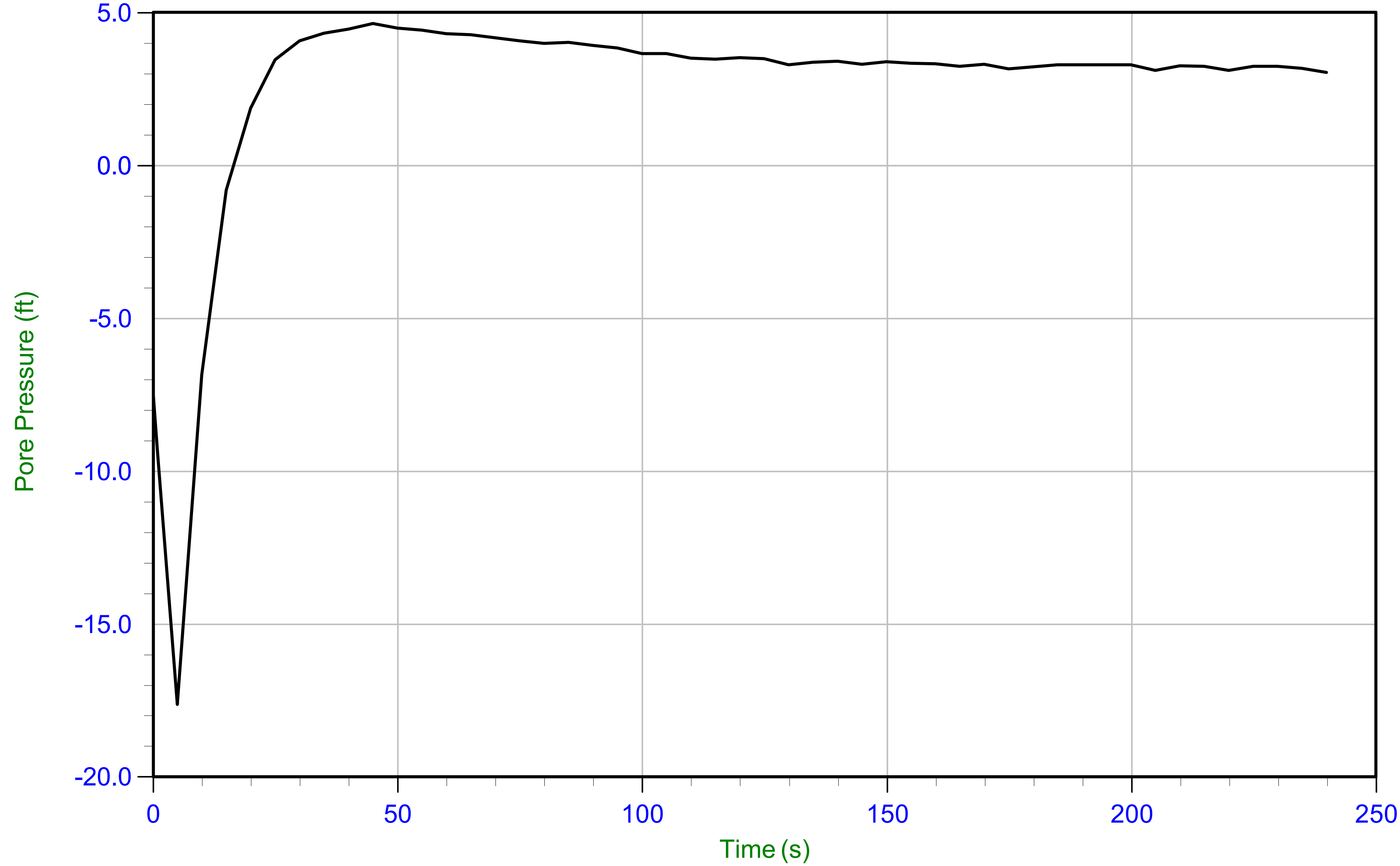
T(50): 983.8 s
Ir: 100
Ch: 0.7 cm²/min

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 26-Aug-2018 10:52:41
Site: Crossroads Landfill

Sounding: CPT18-24
Cone: AD452 Area=15 cm²



Trace Summary:

Filename: 18-53098_CP24.PPD
Depth: 6.075 m / 19.931 ft
Duration: 240.0 s

U Min: -17.6 ft
U Max: 4.6 ft

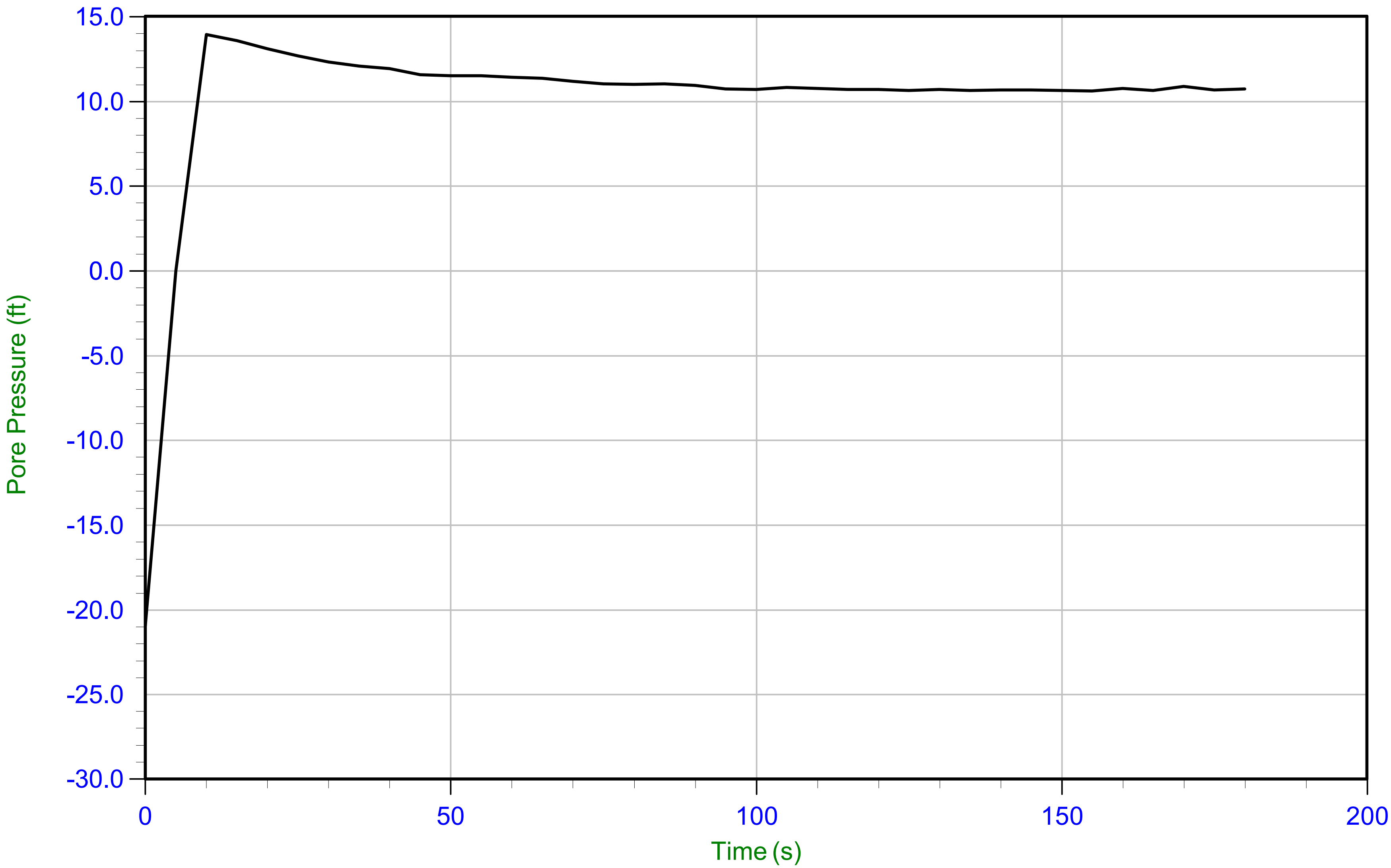
WT: 5.133 m / 16.840 ft
Ueq: 3.1 ft

ConeTec

Geosyntec Consultants

Job No: 18-53098
Date: 25-Aug-2018 16:48:43
Site: Crossroads Landfill

Sounding: CPT18-25
Cone: AD452 Area=15 cm²



Trace Summary:

Filename: 18-53098_CP25.PPD
Depth: 4.075 m / 13.369 ft
Duration: 180.0 s

U Min: -20.9 ft
U Max: 13.9 ft

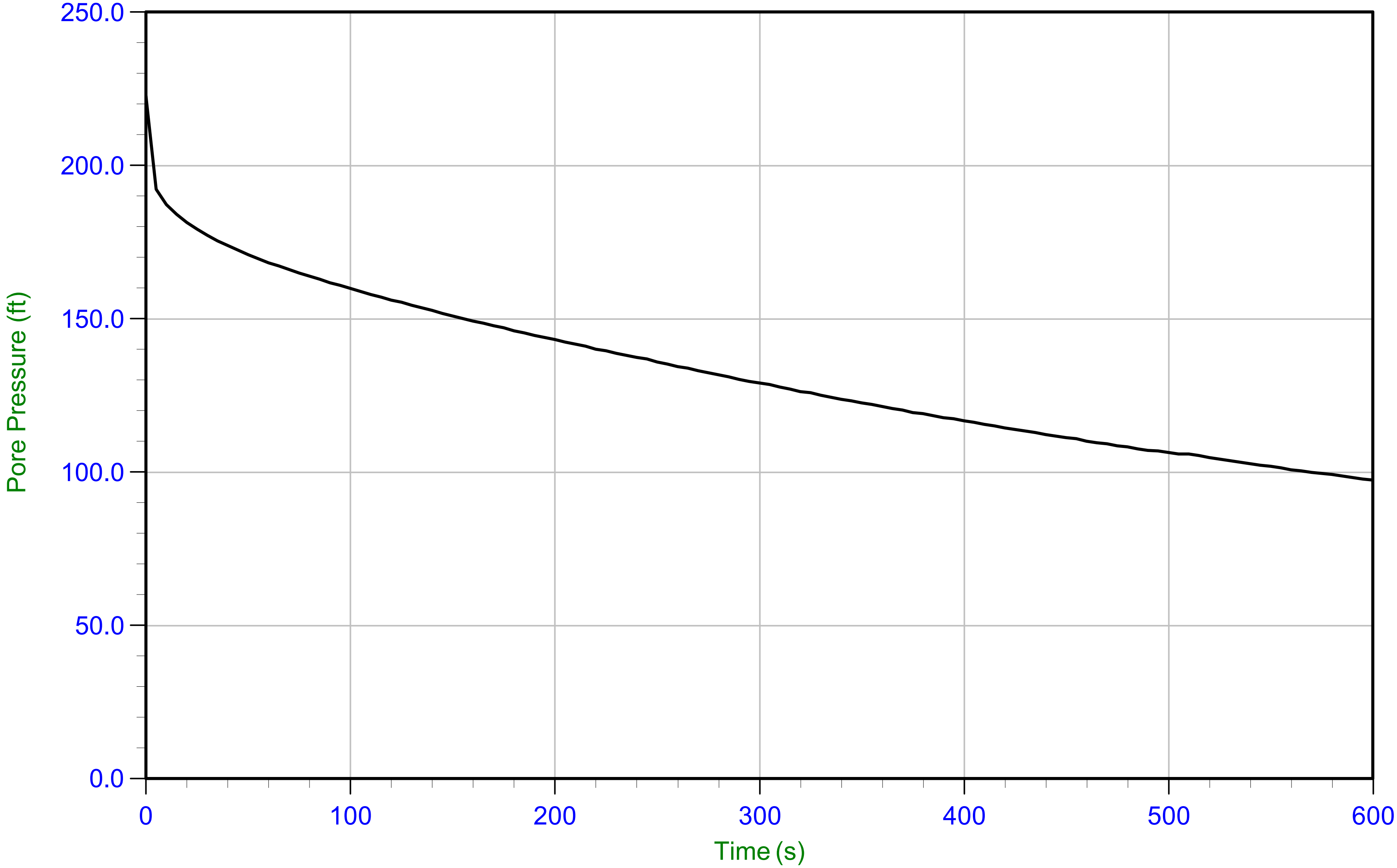
WT: 0.800 m / 2.625 ft
Ueq: 10.7 ft

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 20-Aug-2018 12:50:19
Site: Crossroads Landfill

Sounding: CPT18-26
Cone: AD388 Area=15 cm²



Trace Summary:

Filename: 18-53098_CP26.PPD
Depth: 3.400 m / 11.155 ft
Duration: 600.0 s

U Min: 97.4 ft
U Max: 222.8 ft

WT: 3.072 m / 10.079 ft
Ueq: 1.1 ft
U(50): 111.92 ft

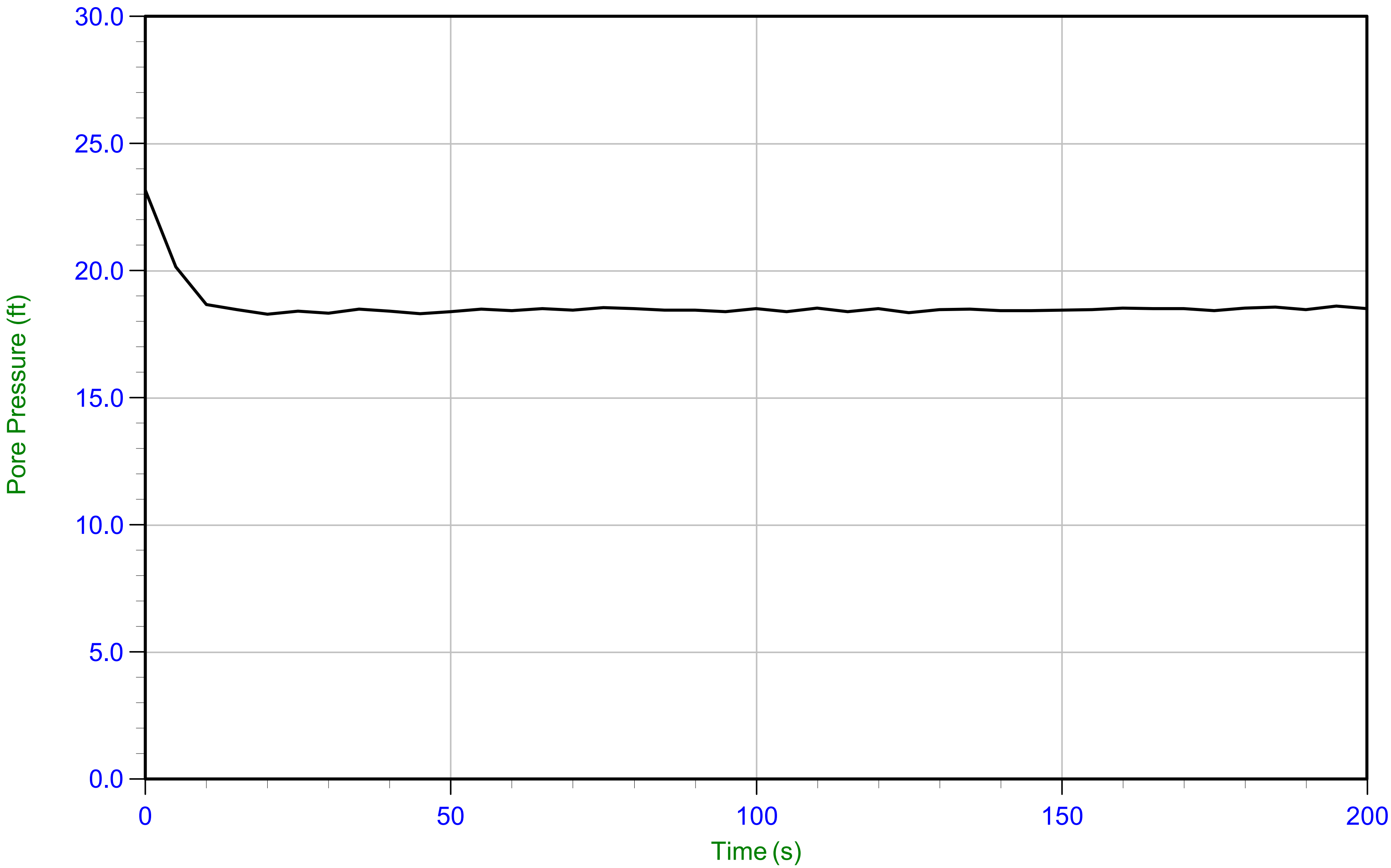
T(50): 443.1 s
Ir: 100
Ch: 1.6 cm²/min

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 20-Aug-2018 12:50:19
Site: Crossroads Landfill

Sounding: CPT18-26
Cone: AD388 Area=15 cm²



Trace Summary:

Filename: 18-53098_CP26.PPD
Depth: 8.725 m / 28.625 ft
Duration: 200.0 s

U Min: 18.3 ft
U Max: 23.2 ft

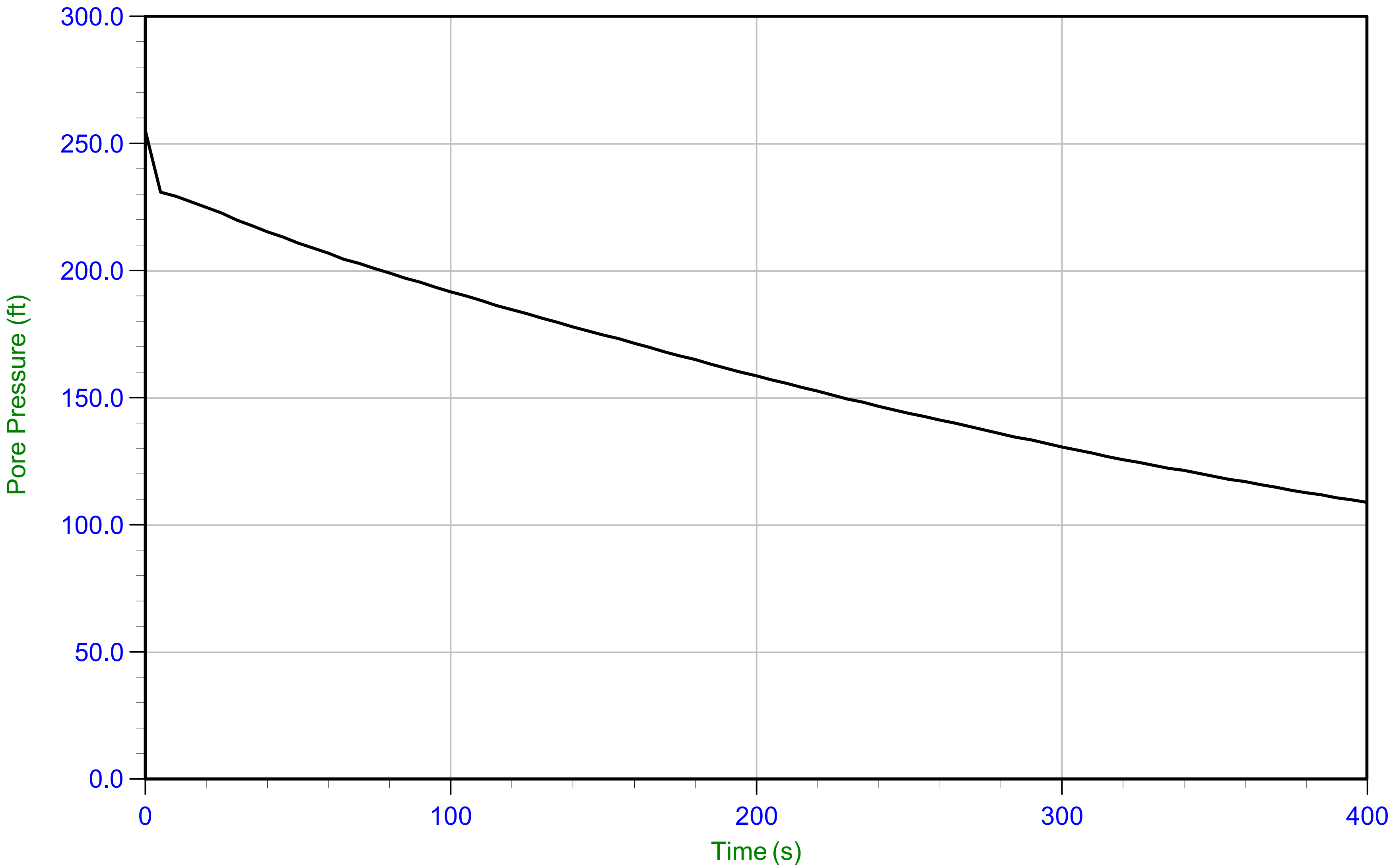
WT: 3.072 m / 10.079 ft
Ueq: 18.5 ft

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 28-Aug-2018 17:42:51
Site: Crossroads Landfill

Sounding: CPT18-27
Cone: AD452 Area=15 cm²



Trace Summary:

Filename: 18-53098_CP27.PPD
Depth: 1.275 m / 4.183 ft
Duration: 400.0 s

U Min: 108.9 ft
U Max: 255.2 ft

WT: 1.275 m / 4.183 ft
Ueq: 0.0 ft
U(50): 127.60 ft

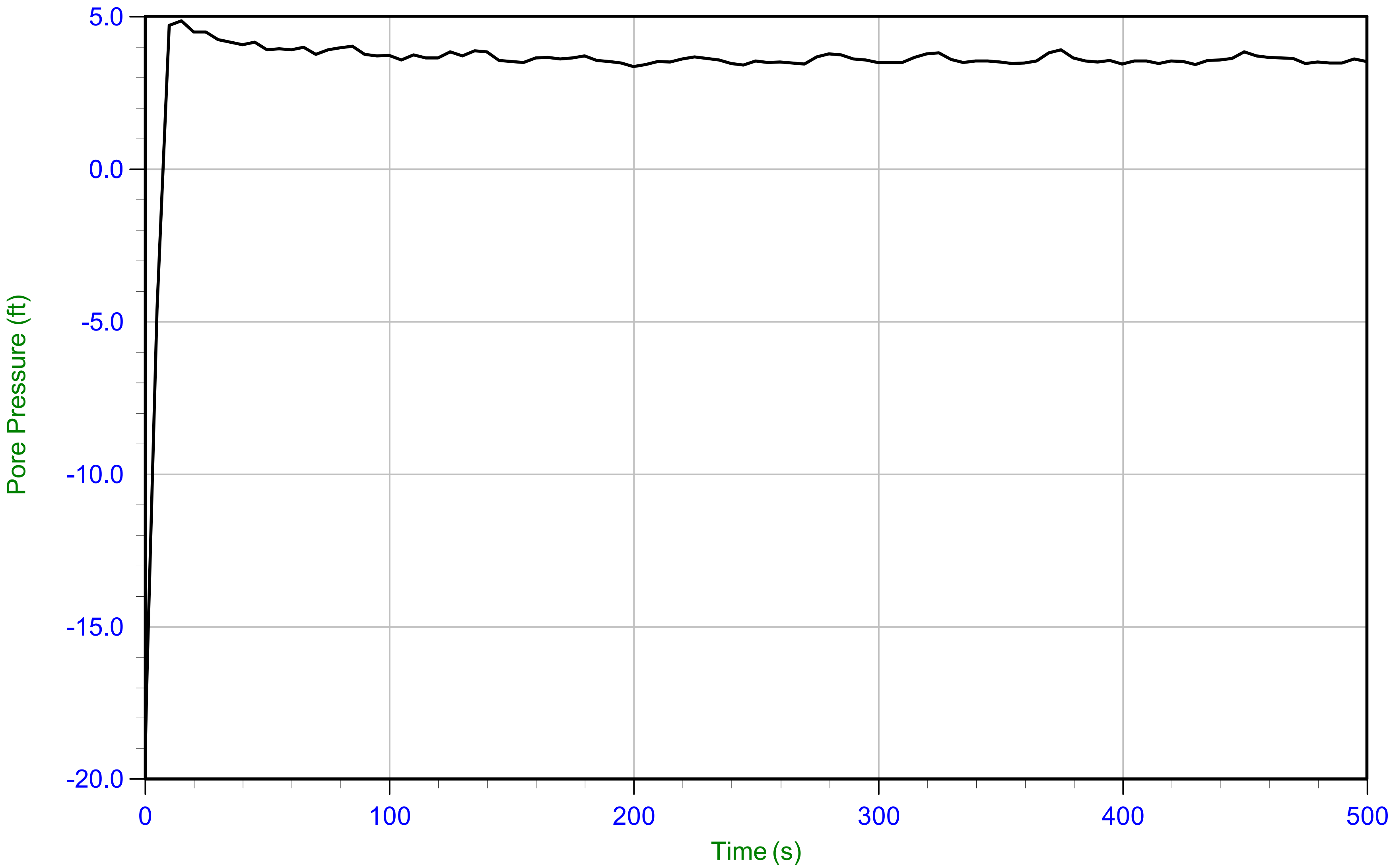
T(50): 312.7 s
Ir: 100
Ch: 2.2 cm²/min

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 28-Aug-2018 17:42:51
Site: Crossroads Landfill

Sounding: CPT18-27
Cone: AD452 Area=15 cm²



Trace Summary:

Filename: 18-53098_CP27.PPD
Depth: 2.750 m / 9.022 ft
Duration: 500.0 s

U Min: -19.0 ft
U Max: 4.9 ft

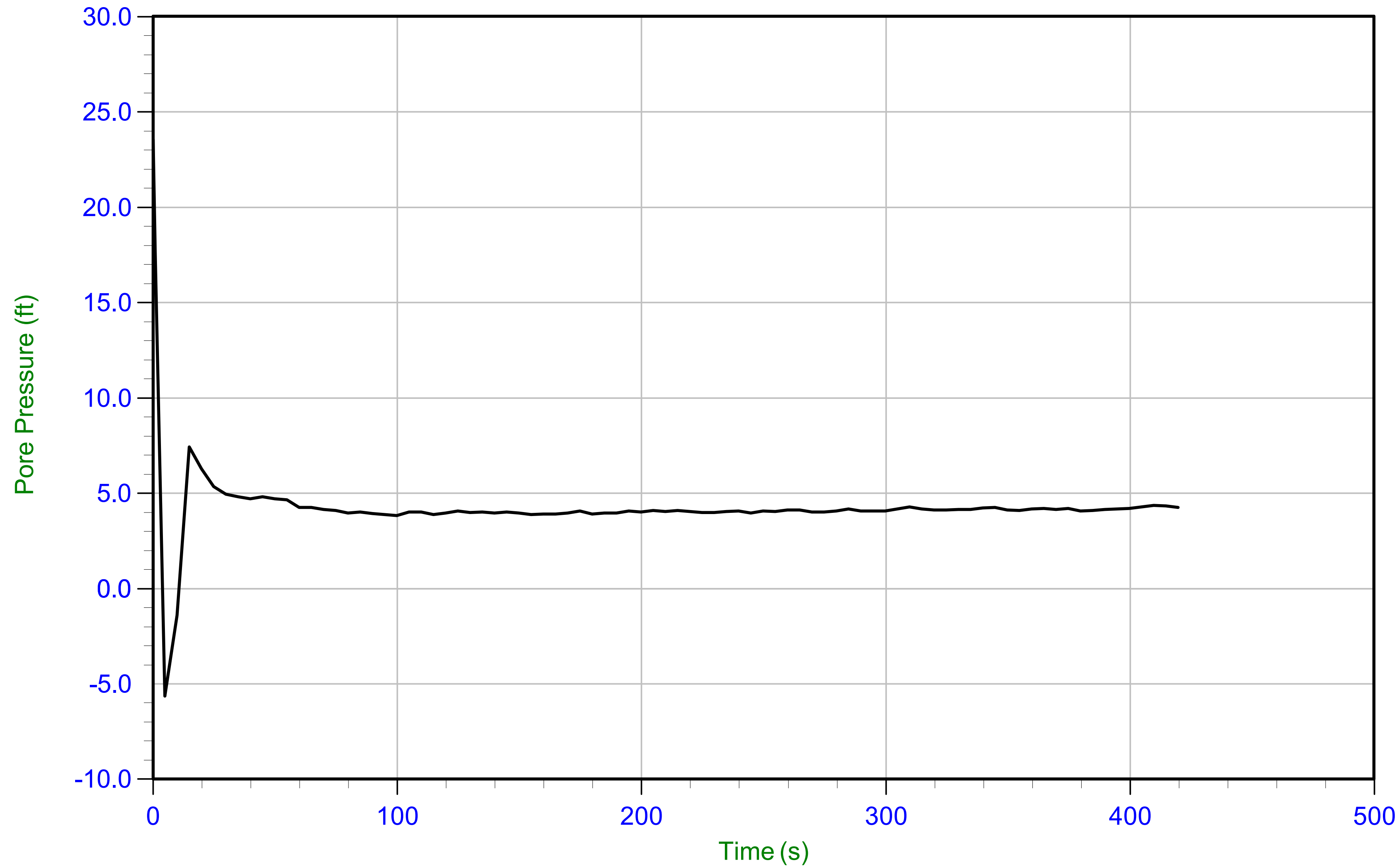
WT: 1.669 m / 5.476 ft
Ueq: 3.5 ft

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 28-Aug-2018 17:42:51
Site: Crossroads Landfill

Sounding: CPT18-27
Cone: AD452 Area=15 cm²



Trace Summary:

Filename: 18-53098_CP27.PPD
Depth: 3.075 m / 10.088 ft
Duration: 420.0 s

U Min: -5.7 ft
U Max: 23.6 ft

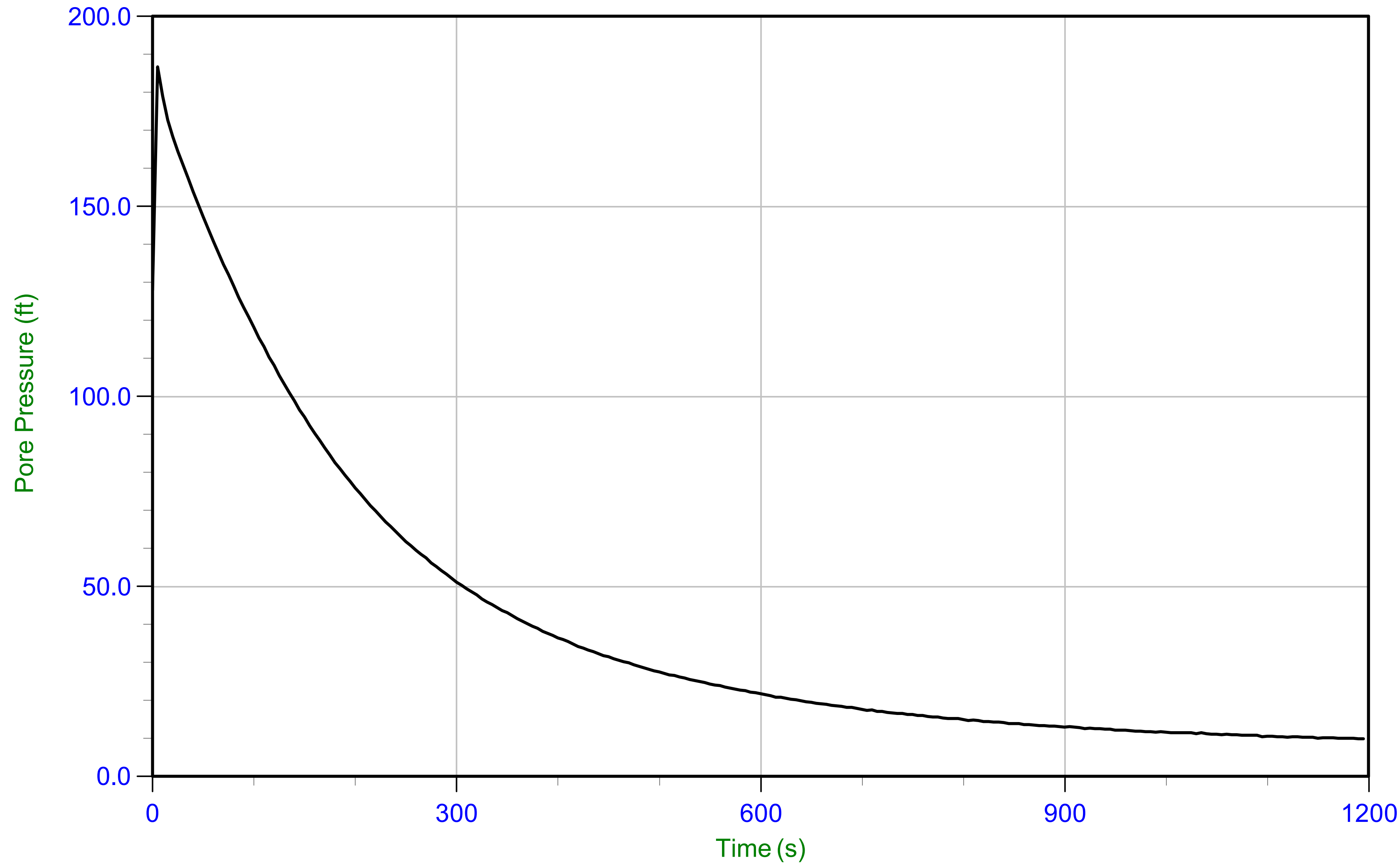
WT: 1.734 m / 5.689 ft
Ueq: 4.4 ft

ConeTec

Geosyntec Consultants

Job No: 18-53098
Date: 28-Aug-2018 15:22:48
Site: Crossroads Landfill

Sounding: CPT18-28
Cone: AD452 Area=15 cm²



Trace Summary:

Filename: 18-53098_CP28.PPD
Depth: 3.675 m / 12.057 ft
Duration: 1195.0 s

U Min: 9.9 ft
U Max: 186.7 ft

WT: 2.871 m / 9.419 ft
Ueq: 2.6 ft
U(50): 94.66 ft

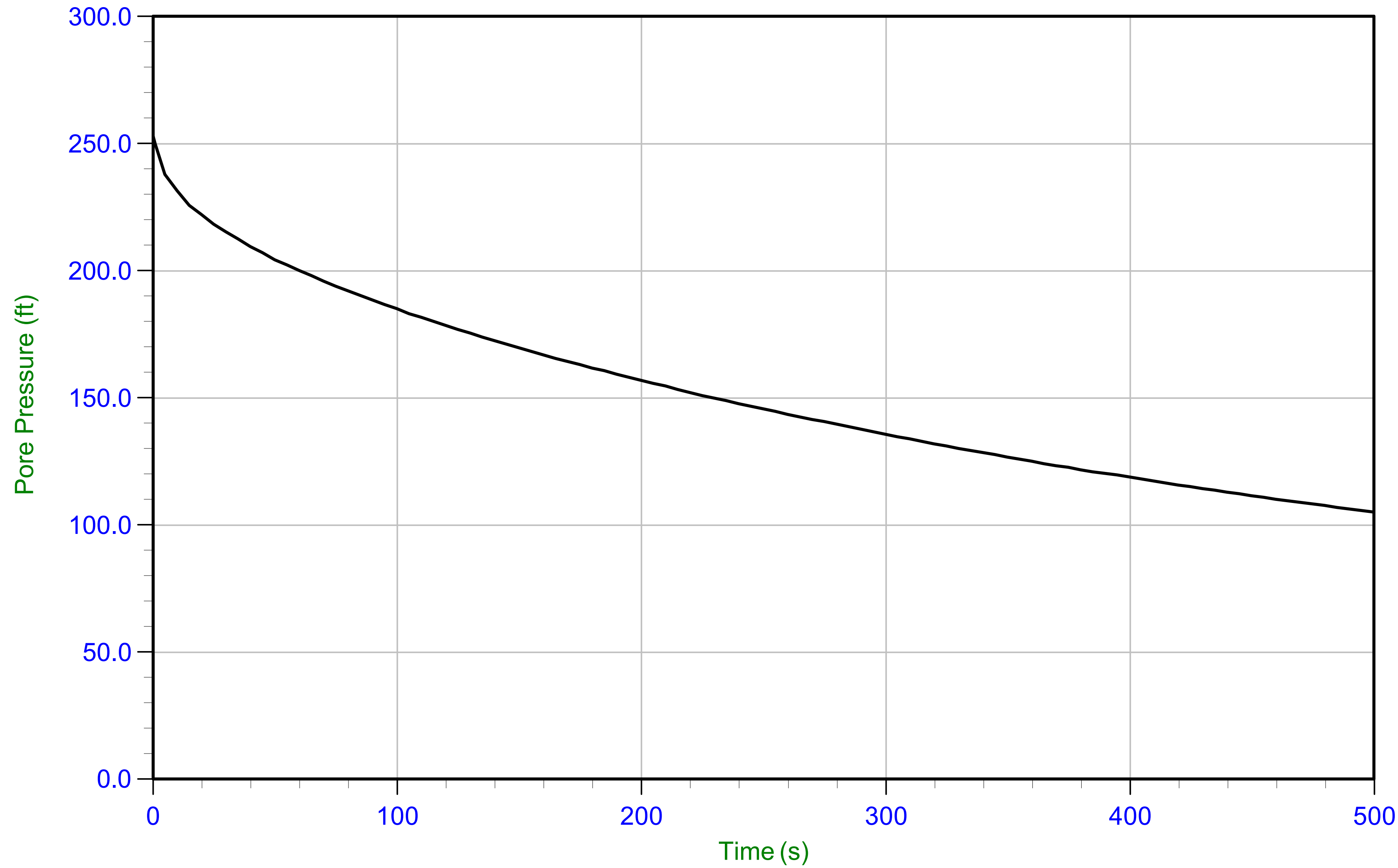
T(50): 144.9 s
Ir: 100
Ch: 4.8 cm²/min

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 28-Aug-2018 15:22:48
Site: Crossroads Landfill

Sounding: CPT18-28
Cone: AD452 Area=15 cm²



Trace Summary:

Filename: 18-53098_CP28.PPD
Depth: 5.250 m / 17.224 ft
Duration: 500.0 s

U Min: 105.0 ft
U Max: 253.0 ft

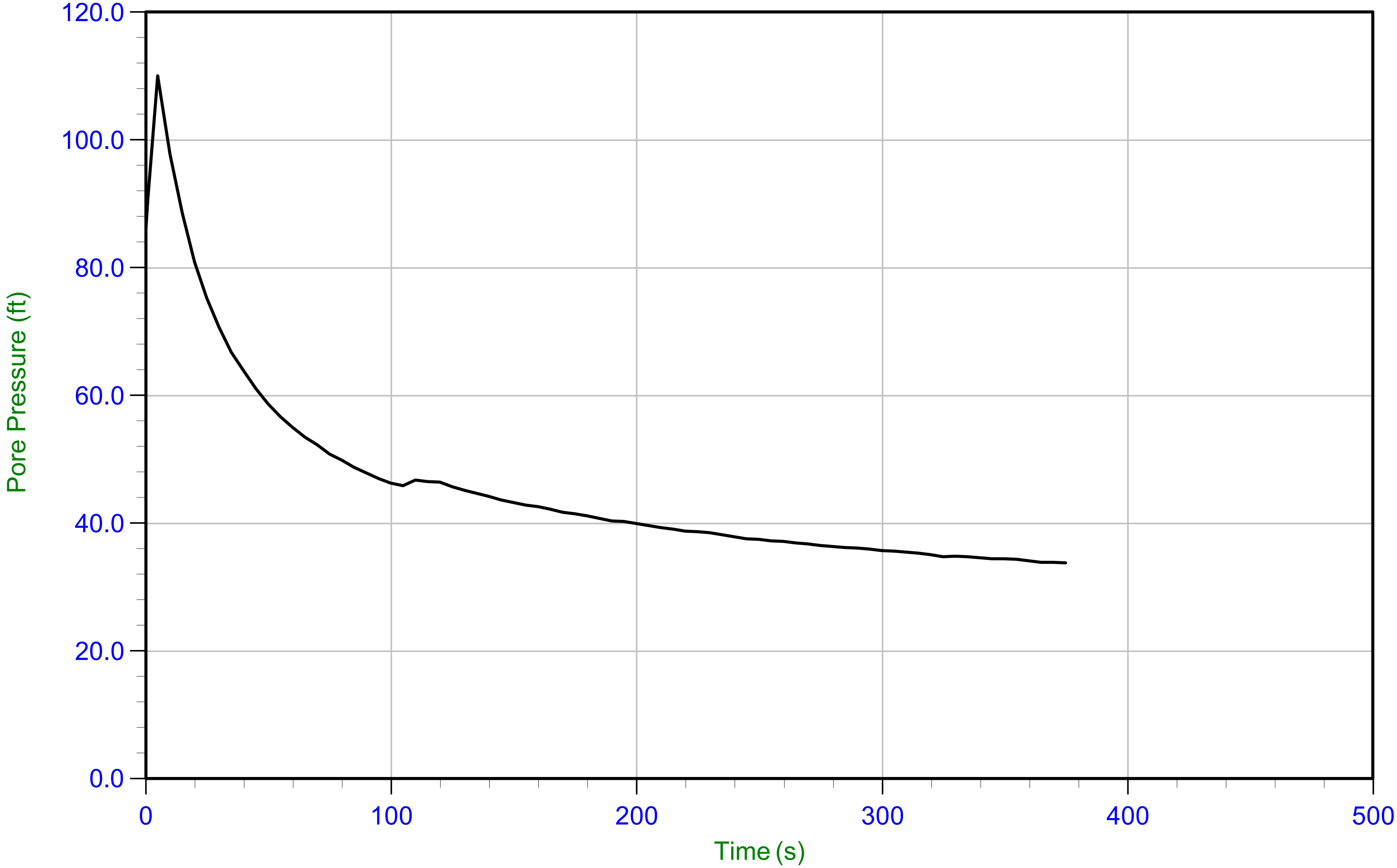
WT: 2.871 m / 9.419 ft
Ueq: 7.8 ft
U(50): 130.40 ft

T(50): 328.6 s
Ir: 100
Ch: 2.1 cm²/min

Geosyntec Consultants

Job No: 18-53098
Date: 28-Aug-2018 15:22:48
Site: Crossroads Landfill

Sounding: CPT18-28
Cone: AD452 Area=15 cm²



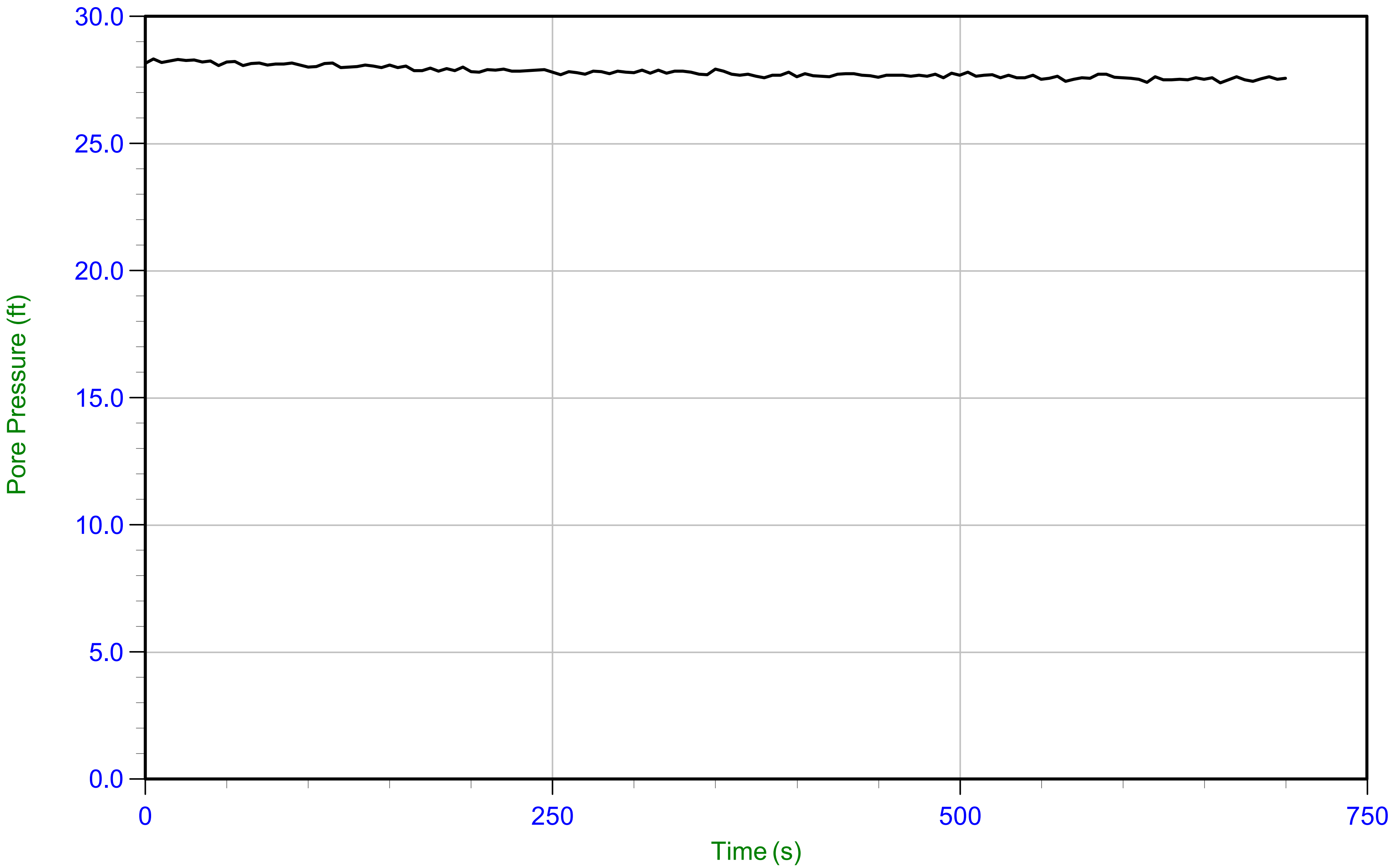
Trace Summary:	Filename: 18-53098_CP28.PPD	U Min: 33.8 ft	WT: 2.871 m / 9.419 ft	T(50): 27.5 s
	Depth: 11.225 m / 36.827 ft	U Max: 110.1 ft	Ueq: 27.4 ft	Ir: 100
	Duration: 375.0 s		U(50): 68.74 ft	Ch: 25.6 cm²/min

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 28-Aug-2018 15:22:48
Site: Crossroads Landfill

Sounding: CPT18-28
Cone: AD452 Area=15 cm²



Trace Summary:

Filename: 18-53098_CP28.PPD
Depth: 11.250 m / 36.909 ft
Duration: 700.0 s

U Min: 27.4 ft
U Max: 28.3 ft

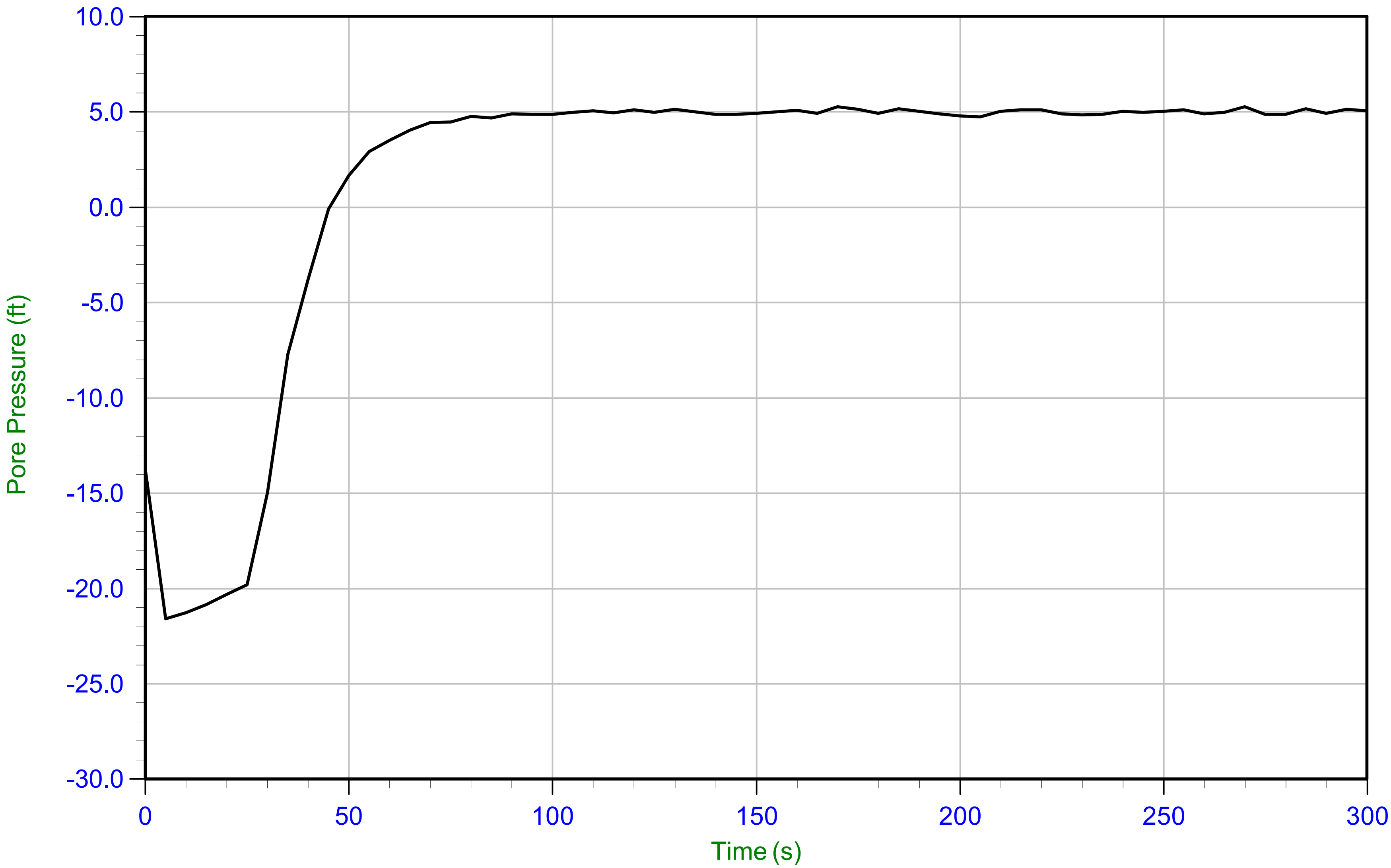
WT: 2.871 m / 9.419 ft
Ueq: 27.5 ft

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 26-Aug-2018 15:29:36
Site: Crossroads Landfill

Sounding: CPT18-29
Cone: AD452 Area=15 cm²



Trace Summary:

Filename: 18-53098_CP29.PPD
Depth: 2.475 m / 8.120 ft
Duration: 300.0 s

U Min: -21.6 ft
U Max: 5.3 ft

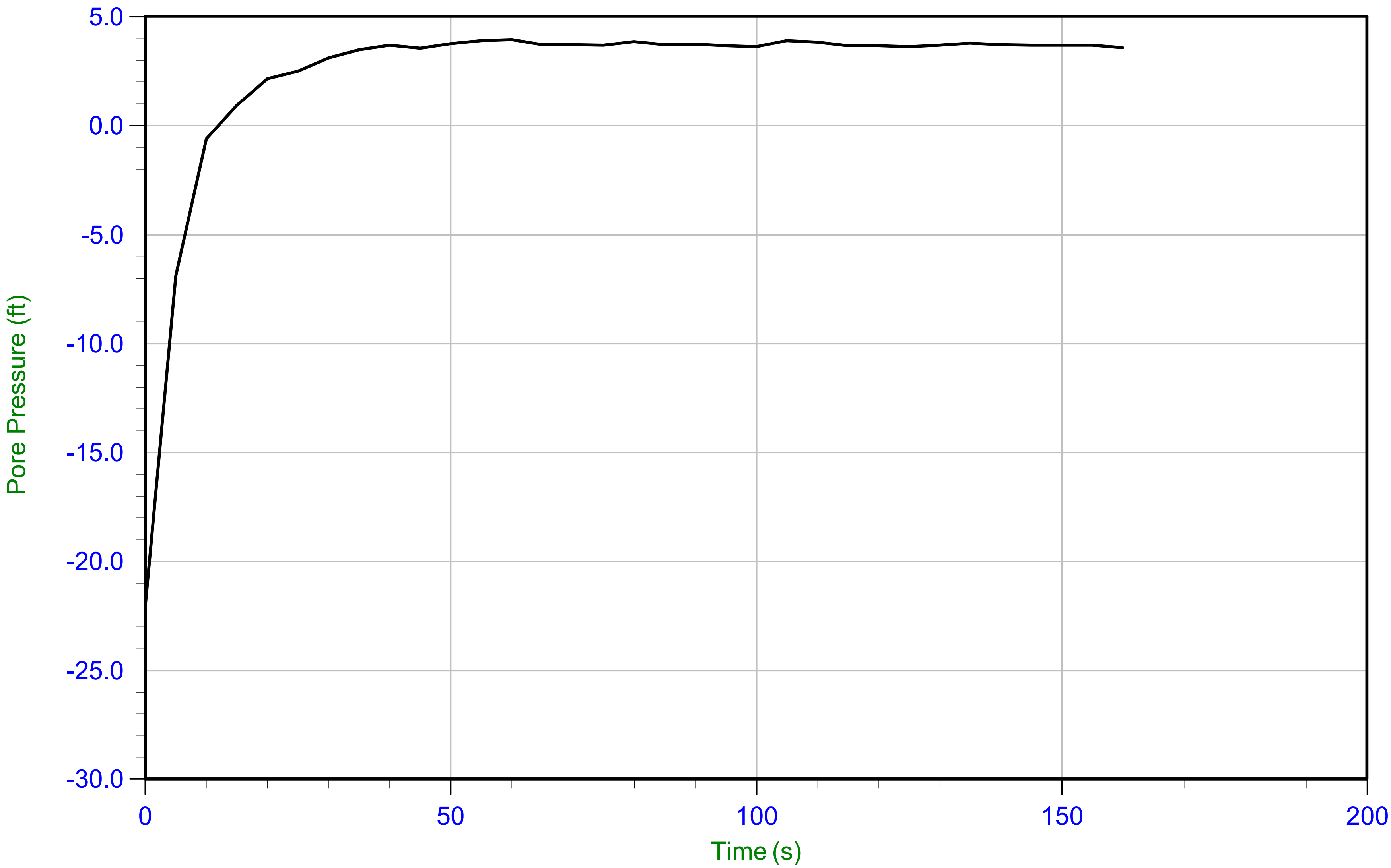
WT: 0.979 m / 3.212 ft
Ueq: 4.9 ft

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 26-Aug-2018 15:57:45
Site: Crossroads Landfill

Sounding: CPT18-29B
Cone: AD452 Area=15 cm²



Trace Summary:

Filename: 18-53098_CP29B.PPD
Depth: 2.200 m / 7.218 ft
Duration: 160.0 s

U Min: -22.0 ft
U Max: 3.9 ft

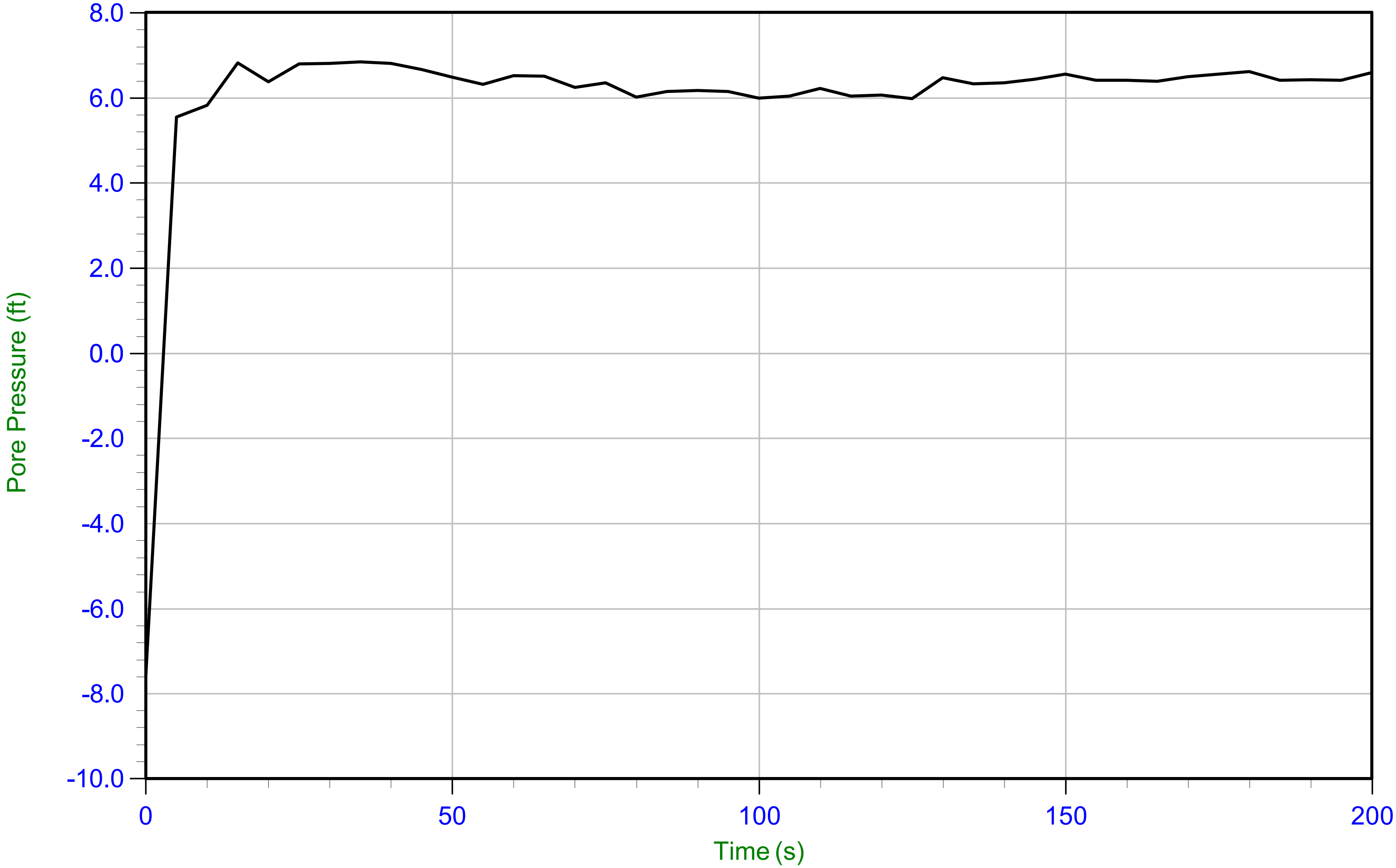
WT: 1.103 m / 3.619 ft
Ueq: 3.6 ft

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 25-Aug-2018 14:10:46
Site: Crossroads Landfill

Sounding: CPT18-30
Cone: AD452 Area=15 cm²



Trace Summary:

Filename: 18-53098_CP30.PPD
Depth: 2.400 m / 7.874 ft
Duration: 200.0 s

U Min: -7.6 ft
U Max: 6.8 ft

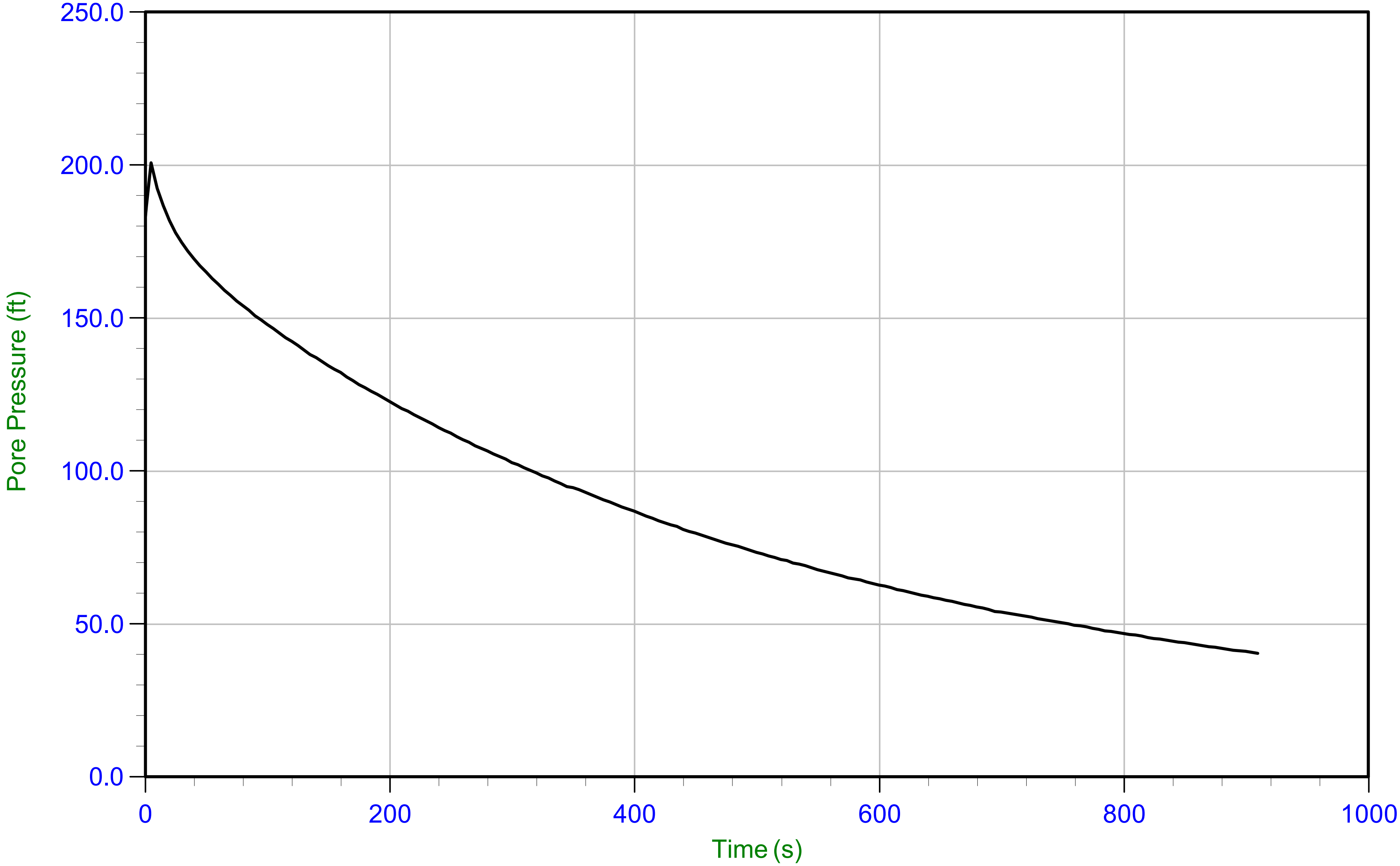
WT: 0.440 m / 1.444 ft
Ueq: 6.4 ft

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 25-Aug-2018 14:40:23
Site: Crossroads Landfill

Sounding: CPT18-30B
Cone: AD452 Area=15 cm²



Trace Summary:

Filename: 18-53098_CP30B.PPD
Depth: 1.325 m / 4.347 ft
Duration: 910.0 s

U Min: 40.4 ft
U Max: 200.7 ft

WT: 0.658 m / 2.159 ft
Ueq: 2.2 ft
U(50): 101.43 ft

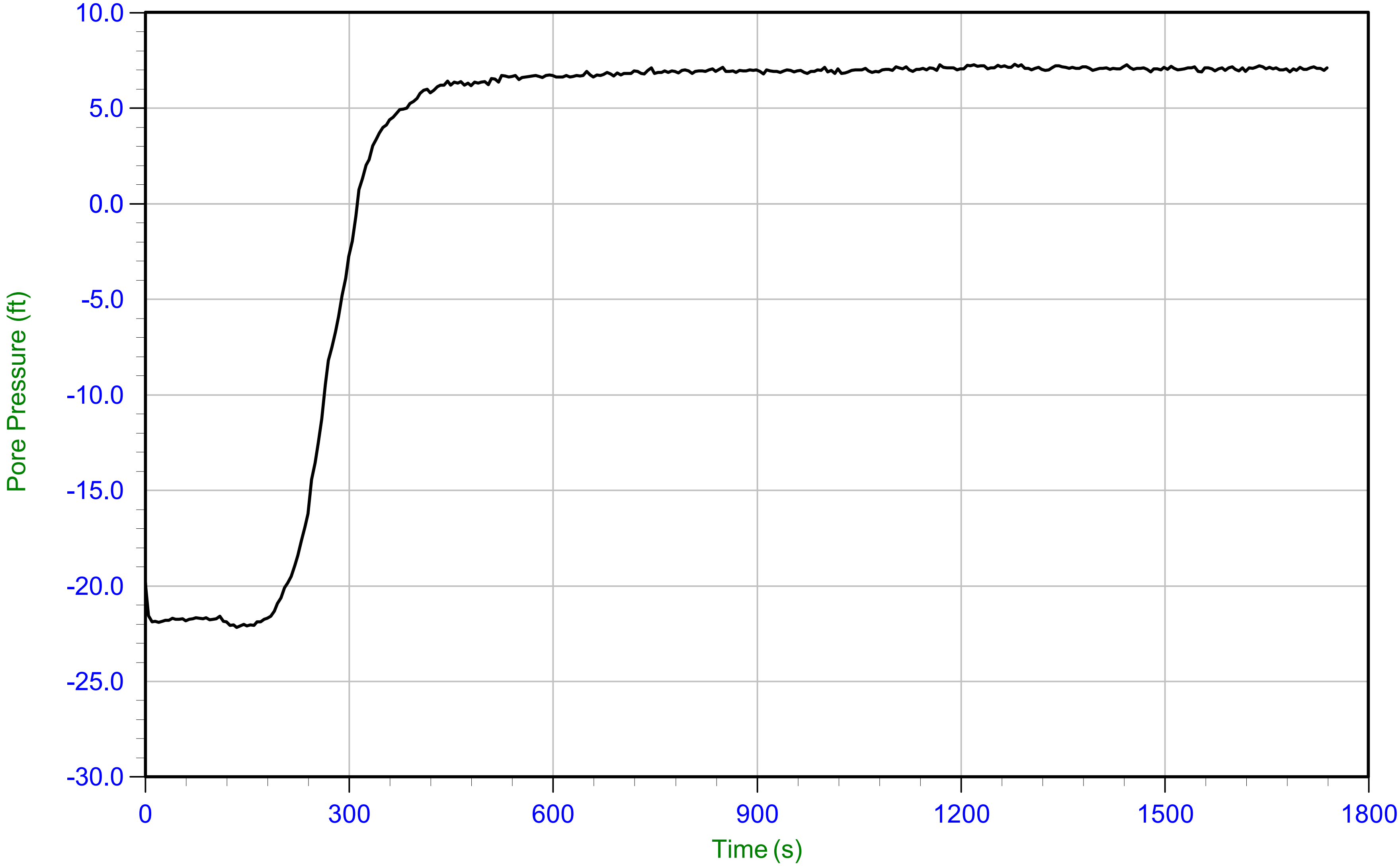
T(50): 303.0 s
Ir: 100
Ch: 2.3 cm²/min

ConeTec

Geosyntec Consultants

Job No: 18-53098
Date: 25-Aug-2018 14:40:23
Site: Crossroads Landfill

Sounding: CPT18-30B
Cone: AD452 Area=15 cm²



Trace Summary:

Filename: 18-53098_CP30B.PPD
Depth: 2.775 m / 9.104 ft
Duration: 1740.0 s

U Min: -22.2 ft
U Max: 7.3 ft

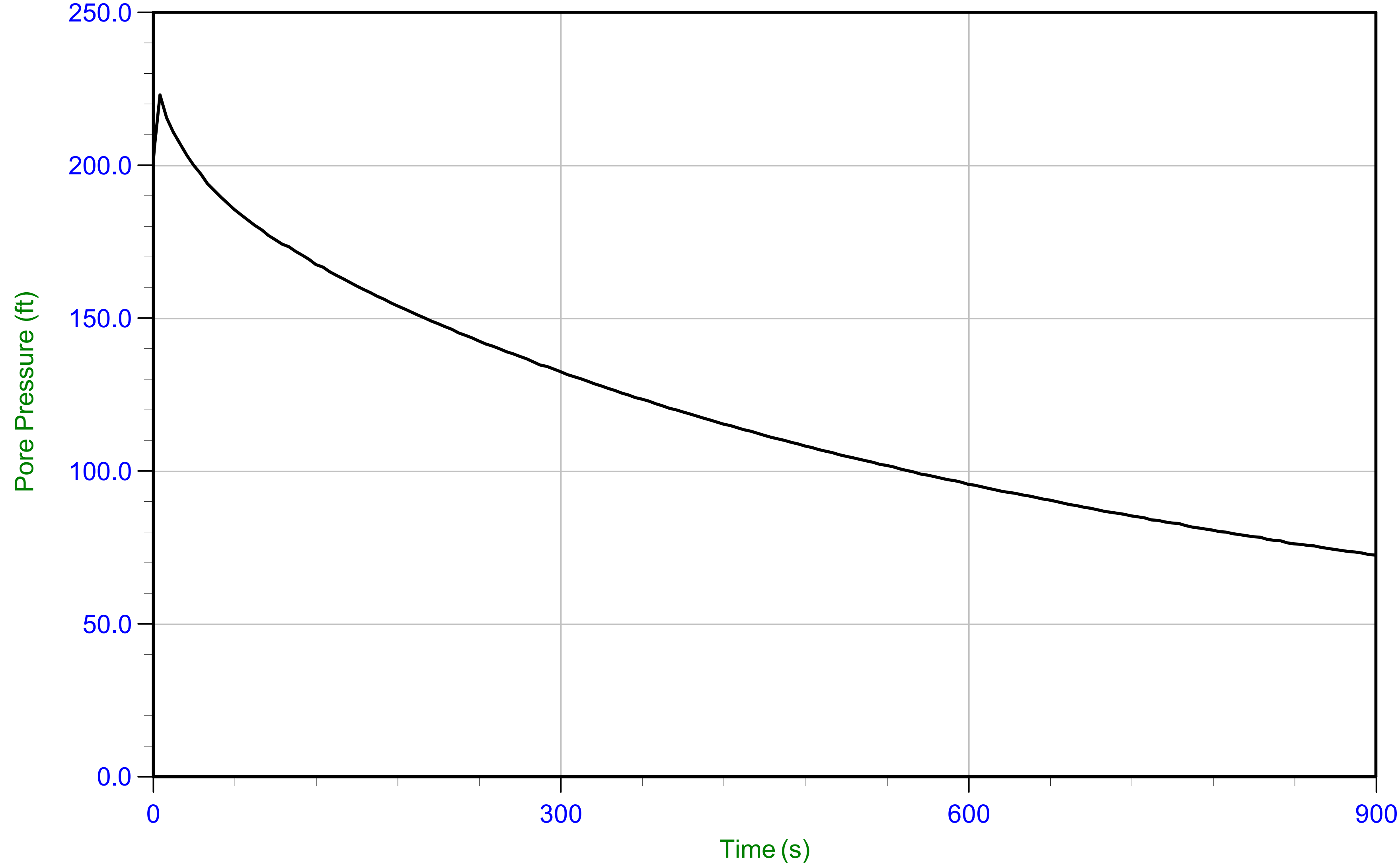
WT: 0.658 m / 2.159 ft
Ueq: 6.9 ft

ConeTec

Geosyntec Consultants

Job No: 18-53098
Date: 25-Aug-2018 16:02:54
Site: Crossroads Landfill

Sounding: CPT18-31
Cone: AD452 Area=15 cm²



Trace Summary:

Filename: 18-53098_CP31.PPD
Depth: 2.150 m / 7.054 ft
Duration: 900.0 s

U Min: 72.6 ft
U Max: 223.1 ft

WT: 2.010 m / 6.594 ft
Ueq: 0.5 ft
U(50): 111.79 ft

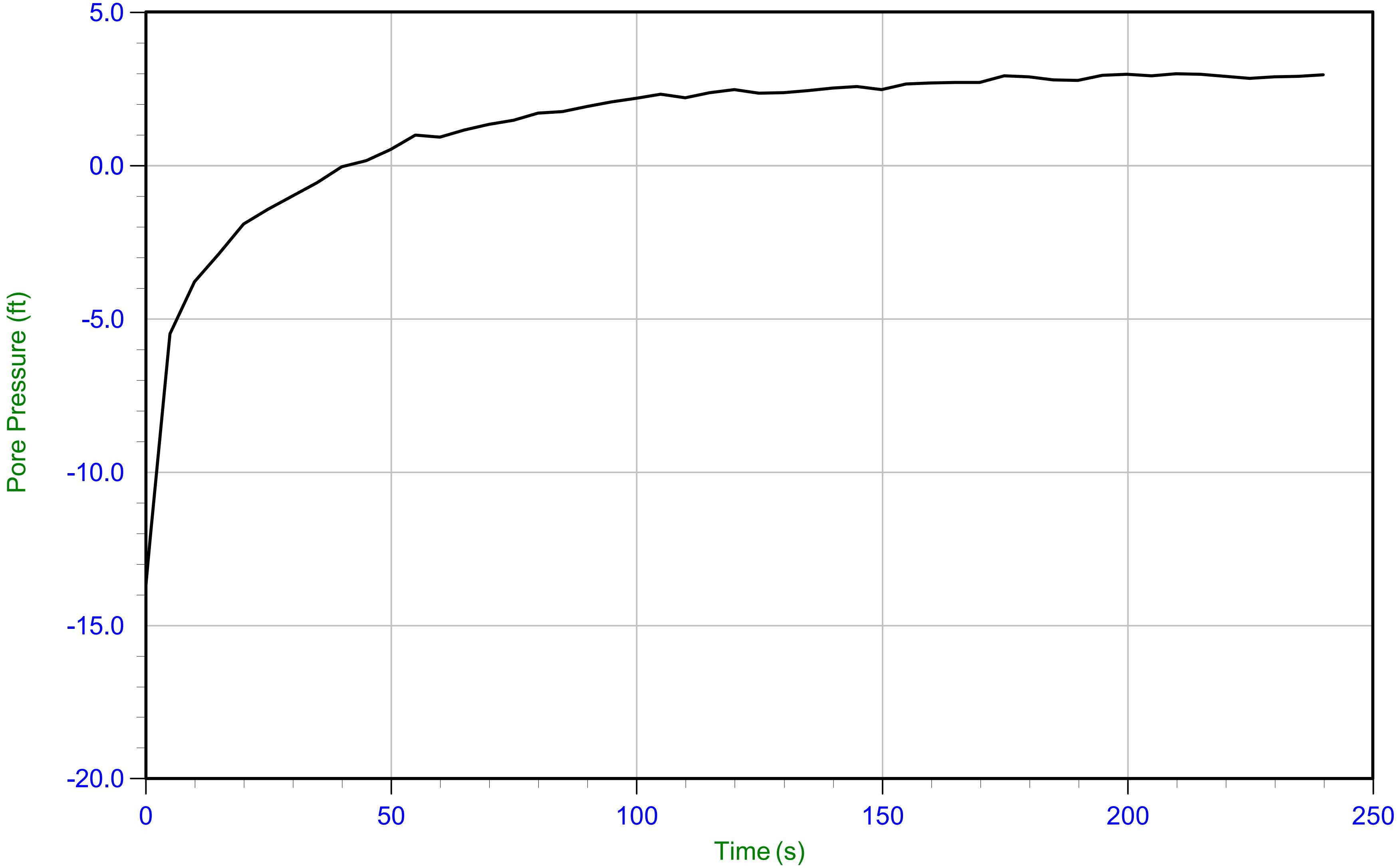
T(50): 445.3 s
Ir: 100
Ch: 1.6 cm²/min

ConeTec

Geosyntec Consultants

Job No: 18-53098
Date: 25-Aug-2018 16:02:54
Site: Crossroads Landfill

Sounding: CPT18-31
Cone: AD452 Area=15 cm²



Trace Summary:

Filename: 18-53098_CP31.PPD
Depth: 2.925 m / 9.596 ft
Duration: 240.0 s

U Min: -13.7 ft
U Max: 3.0 ft

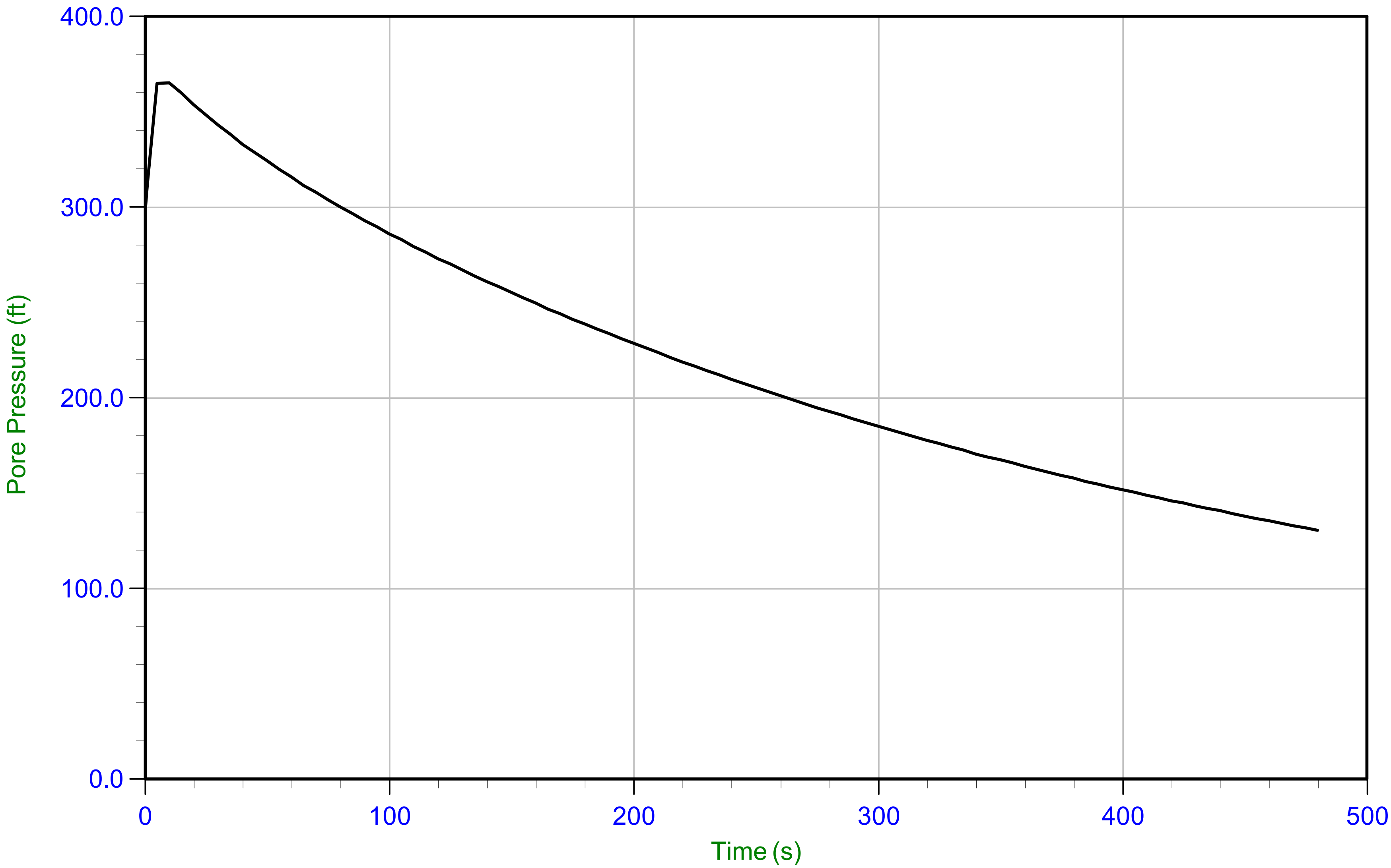
WT: 2.011 m / 6.598 ft
Ueq: 3.0 ft

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 24-Aug-2018 10:01:43
Site: Crossroads Landfill

Sounding: SCPT18-32
Cone: AD452 Area=15 cm²



Trace Summary:

Filename: 18-53098_SP32.PPD
Depth: 7.375 m / 24.196 ft
Duration: 480.0 s

U Min: 130.7 ft
U Max: 365.3 ft

WT: 7.375 m / 24.196 ft
Ueq: 0.0 ft
U(50): 182.64 ft

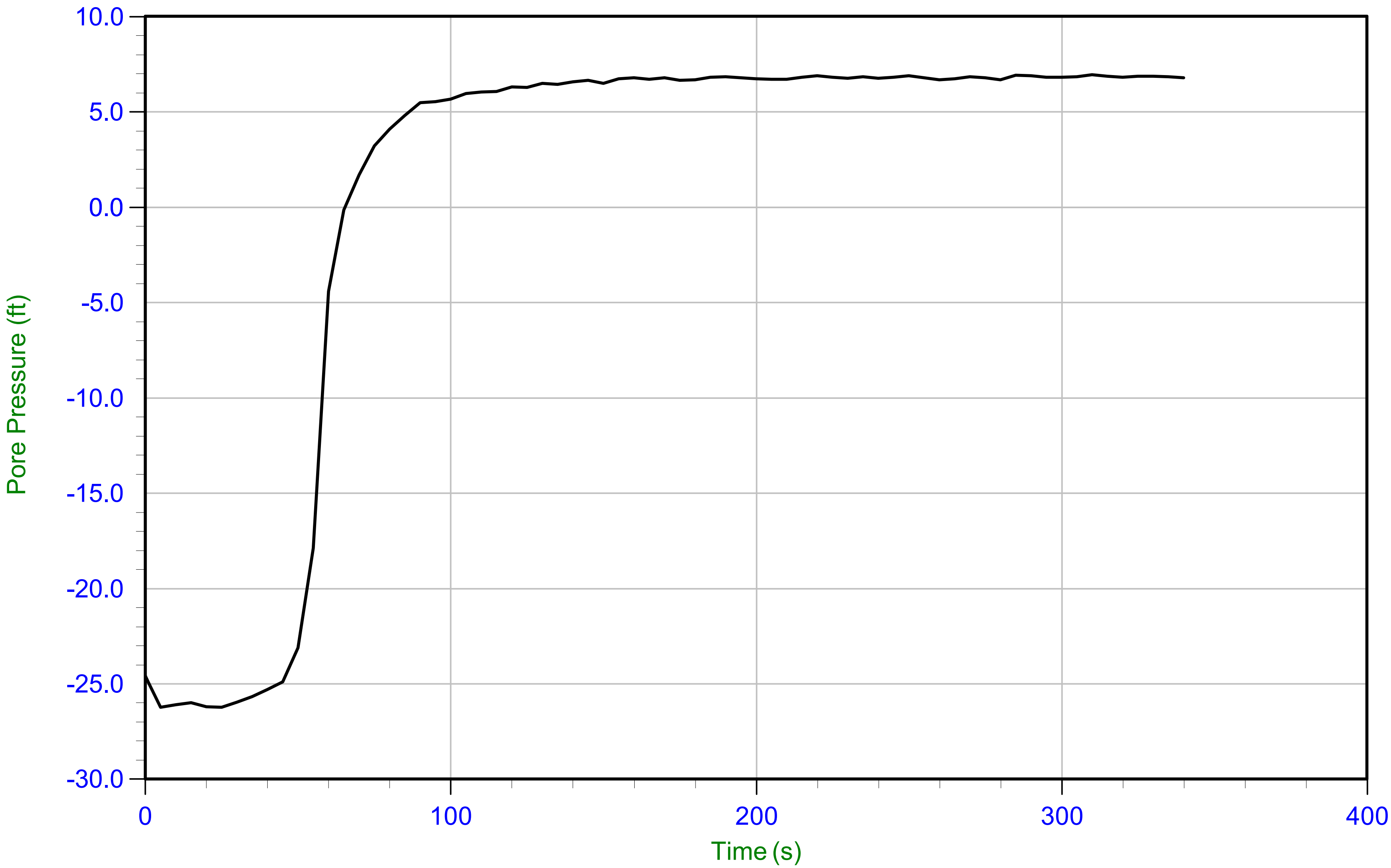
T(50): 296.8 s
Ir: 100
Ch: 2.4 cm²/min

ConeTec

Geosyntec Consultants

Job No: 18-53098
Date: 24-Aug-2018 10:01:43
Site: Crossroads Landfill

Sounding: SCPT18-32
Cone: AD452 Area=15 cm²



Trace Summary:

Filename: 18-53098_SP32.PPD
Depth: 10.800 m / 35.433 ft
Duration: 340.0 s

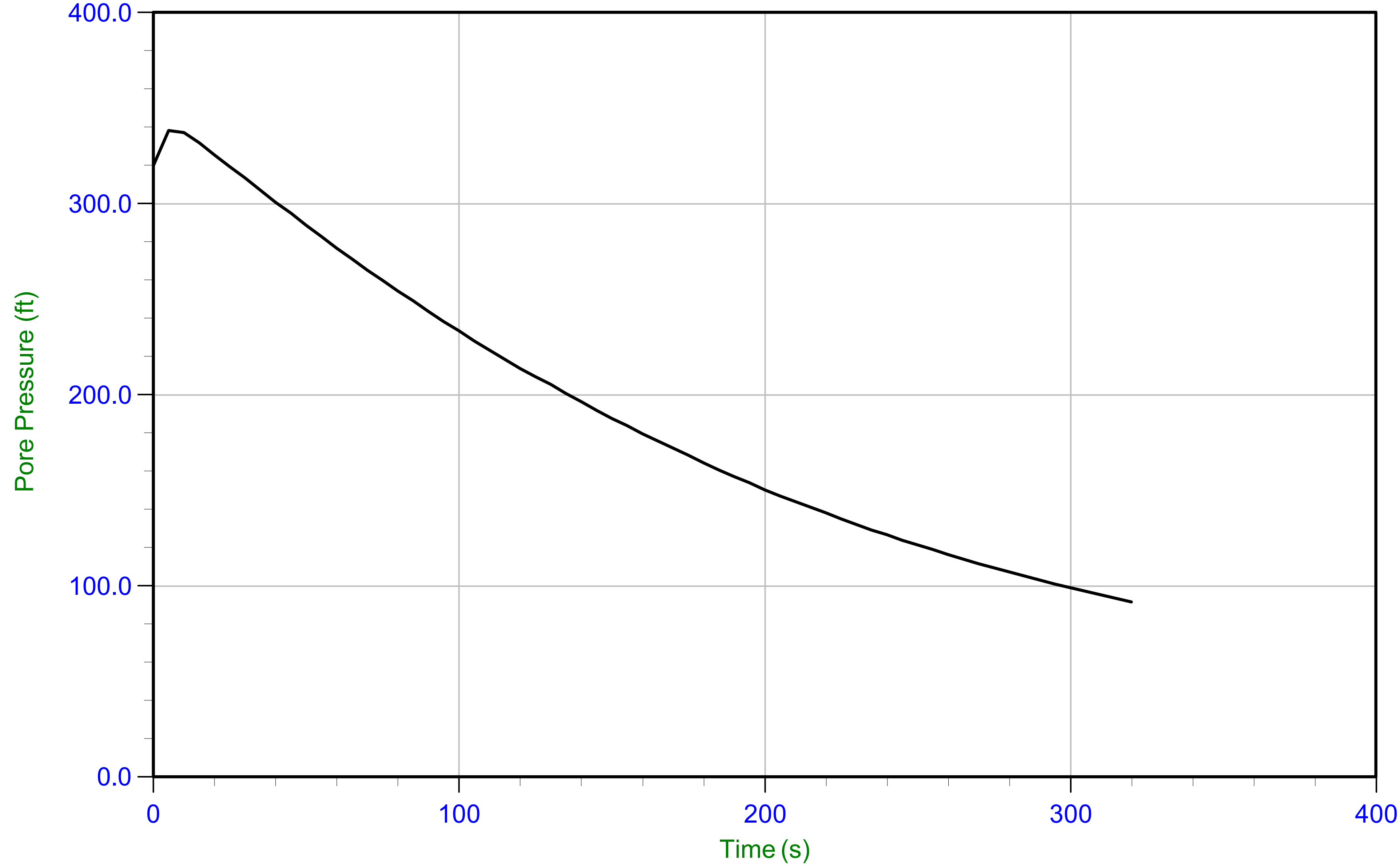
U Min: -26.2 ft
U Max: 6.9 ft

WT: 8.727 m / 28.632 ft
Ueq: 6.8 ft

Geosyntec Consultants

Job No: 18-53098
Date: 24-Aug-2018 12:30:53
Site: Crossroads Landfill

Sounding: CPT18-33
Cone: AD452 Area=15 cm²



Trace Summary:

Filename: 18-53098_CP33.PPD
Depth: 7.150 m / 23.458 ft
Duration: 320.0 s

U Min: 91.7 ft
U Max: 338.4 ft

WT: 6.706 m / 22.001 ft
Ueq: 1.5 ft
U(50): 169.93 ft

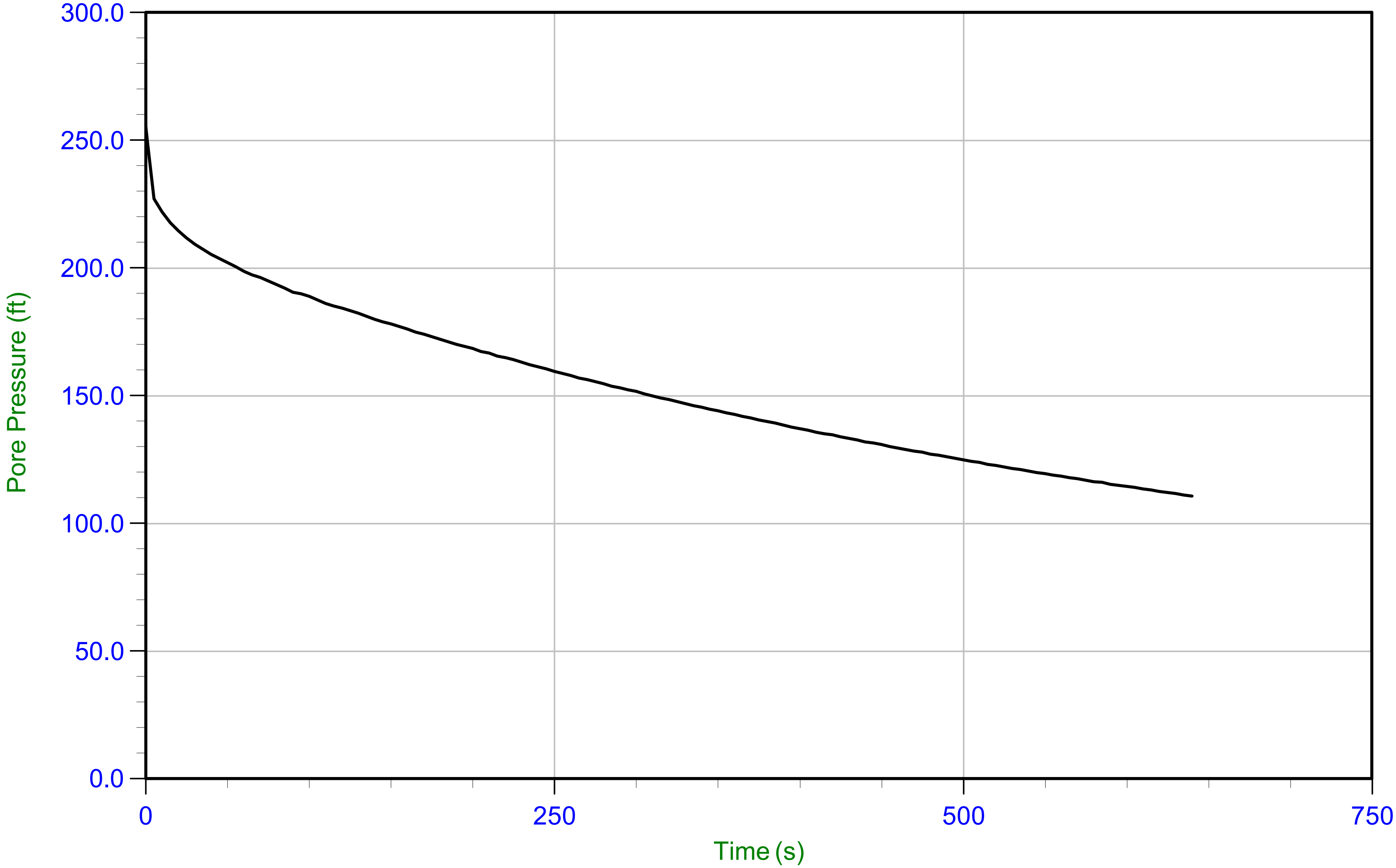
T(50): 167.9 s
Ir: 100
Ch: 4.2 cm²/min

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 22-Aug-2018 13:51:38
Site: Crossroads Landfill

Sounding: CPT18-34
Cone: AD452 Area=15 cm²



Trace Summary:

Filename: 18-53098_CP34.PPD
Depth: 5.500 m / 18.044 ft
Duration: 640.0 s

U Min: 110.8 ft
U Max: 255.3 ft

WT: 4.877 m / 16.000 ft
Ueq: 2.0 ft
U(50): 128.67 ft

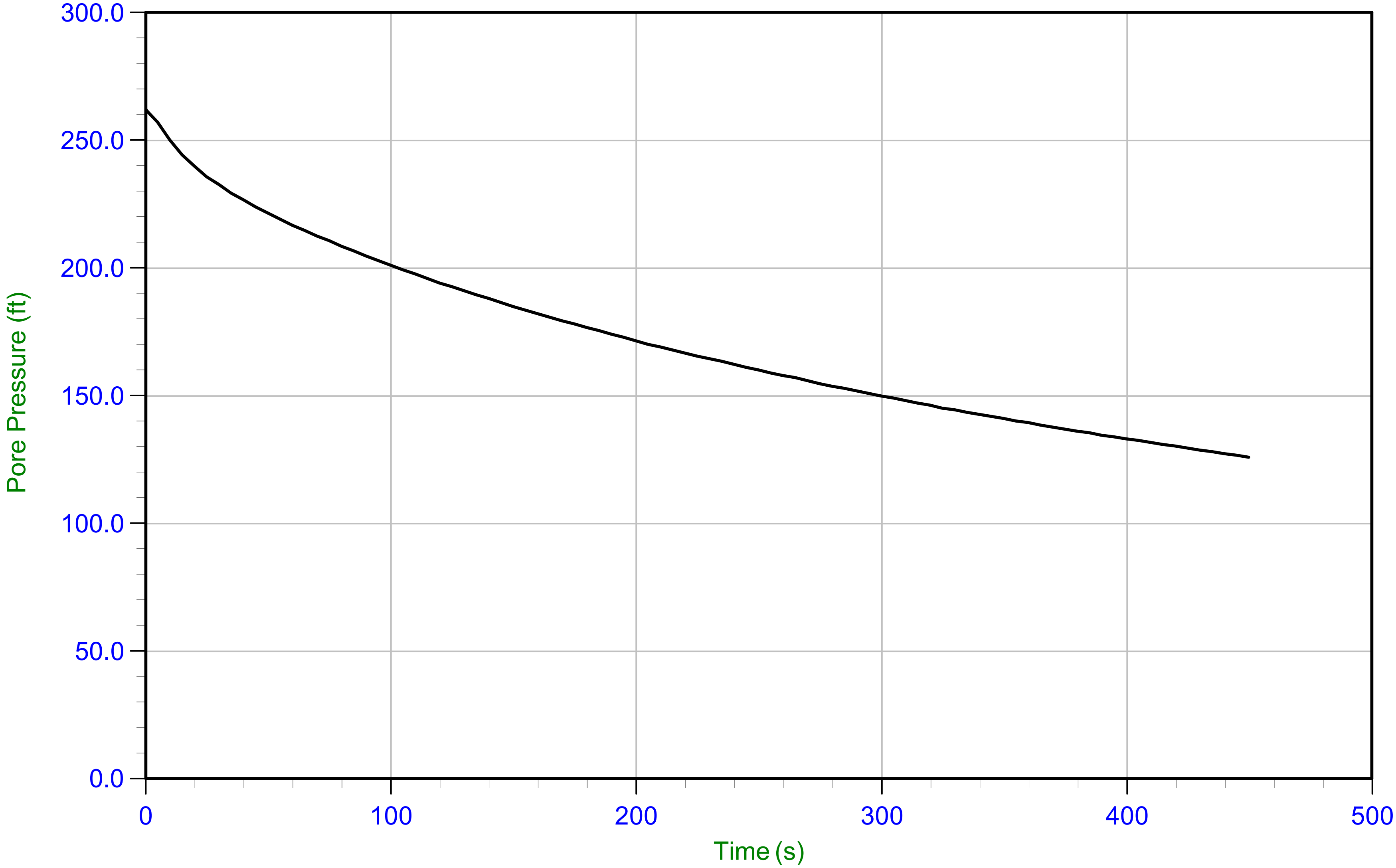
T(50): 467.2 s
Ir: 100
Ch: 1.5 cm²/min

ConeTec

Geosyntec Consultants

Job No: 18-53098
Date: 24-Aug-2018 14:30:29
Site: Crossroads Landfill

Sounding: CPT18-35
Cone: AD452 Area=15 cm²



Trace Summary:

Filename: 18-53098_CP35.PPD
Depth: 4.425 m / 14.518 ft
Duration: 450.0 s

U Min: 126.0 ft
U Max: 262.1 ft

WT: 2.406 m / 7.894 ft
Ueq: 6.6 ft
U(50): 134.39 ft

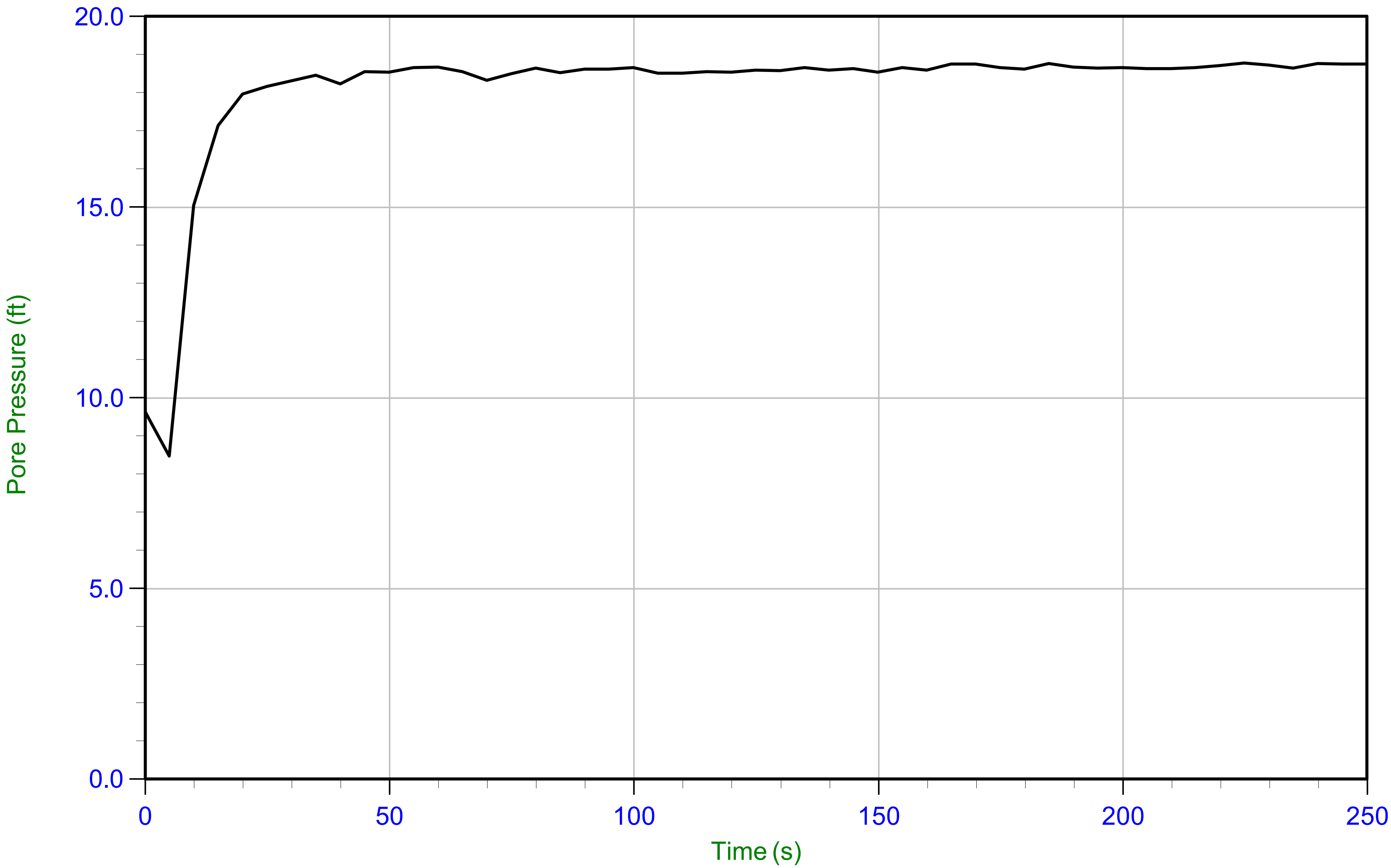
T(50): 390.7 s
Ir: 100
Ch: 1.8 cm²/min

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 24-Aug-2018 14:30:29
Site: Crossroads Landfill

Sounding: CPT18-35
Cone: AD452 Area=15 cm²



Trace Summary:

Filename: 18-53098_CP35.PPD
Depth: 8.125 m / 26.657 ft
Duration: 250.0 s

U Min: 8.5 ft
U Max: 18.8 ft

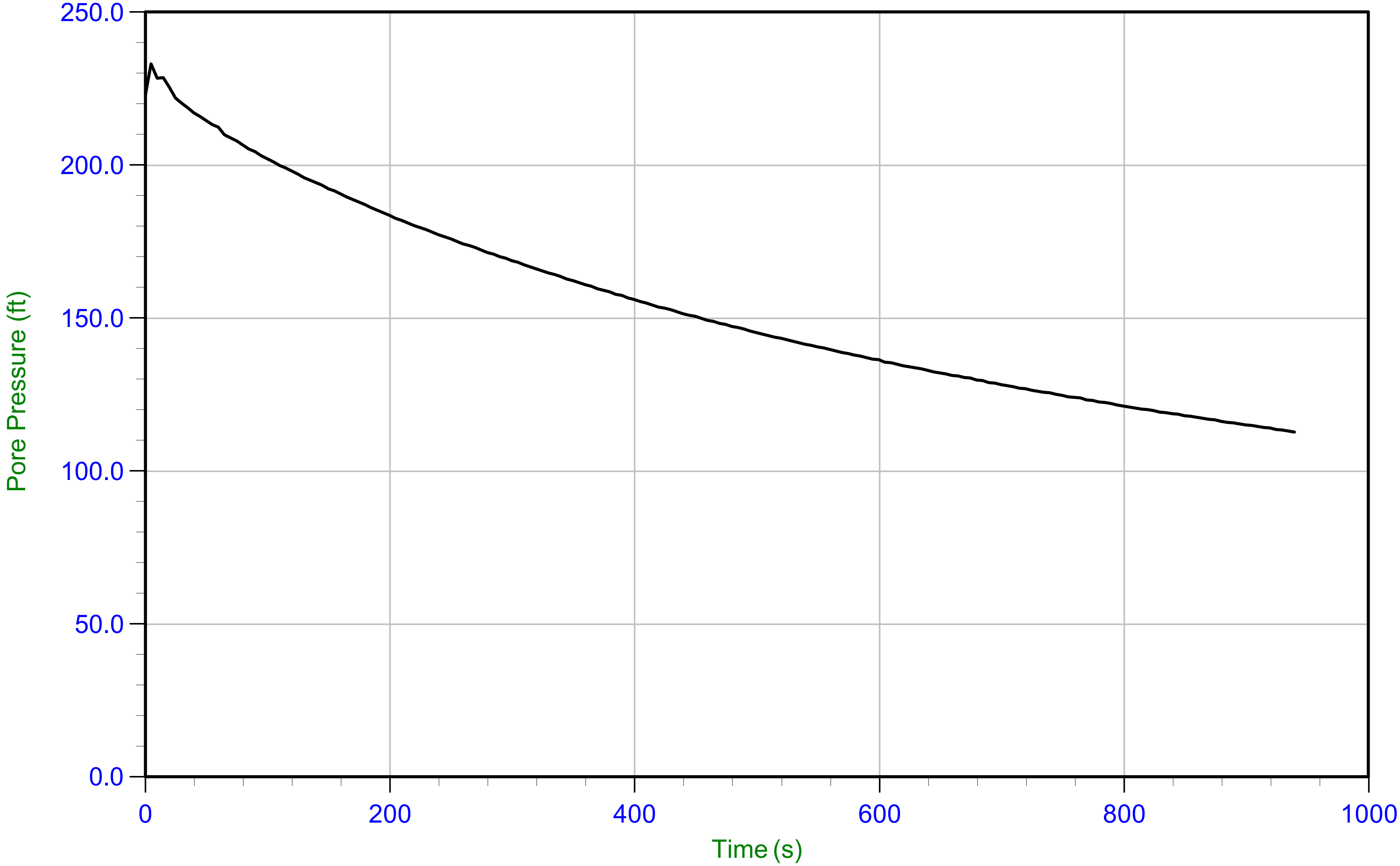
WT: 2.406 m / 7.894 ft
Ueq: 18.8 ft

ConeTec

Geosyntec Consultants

Job No: 18-53098
Date: 22-Aug-2018 14:46:19
Site: Crossroads Landfill

Sounding: CPT18-36
Cone: AD452 Area=15 cm²



Trace Summary:

Filename: 18-53098_CP36.PPD
Depth: 6.350 m / 20.833 ft
Duration: 940.0 s

U Min: 112.7 ft
U Max: 233.1 ft

WT: 3.396 m / 11.142 ft
Ueq: 9.7 ft
U(50): 121.38 ft

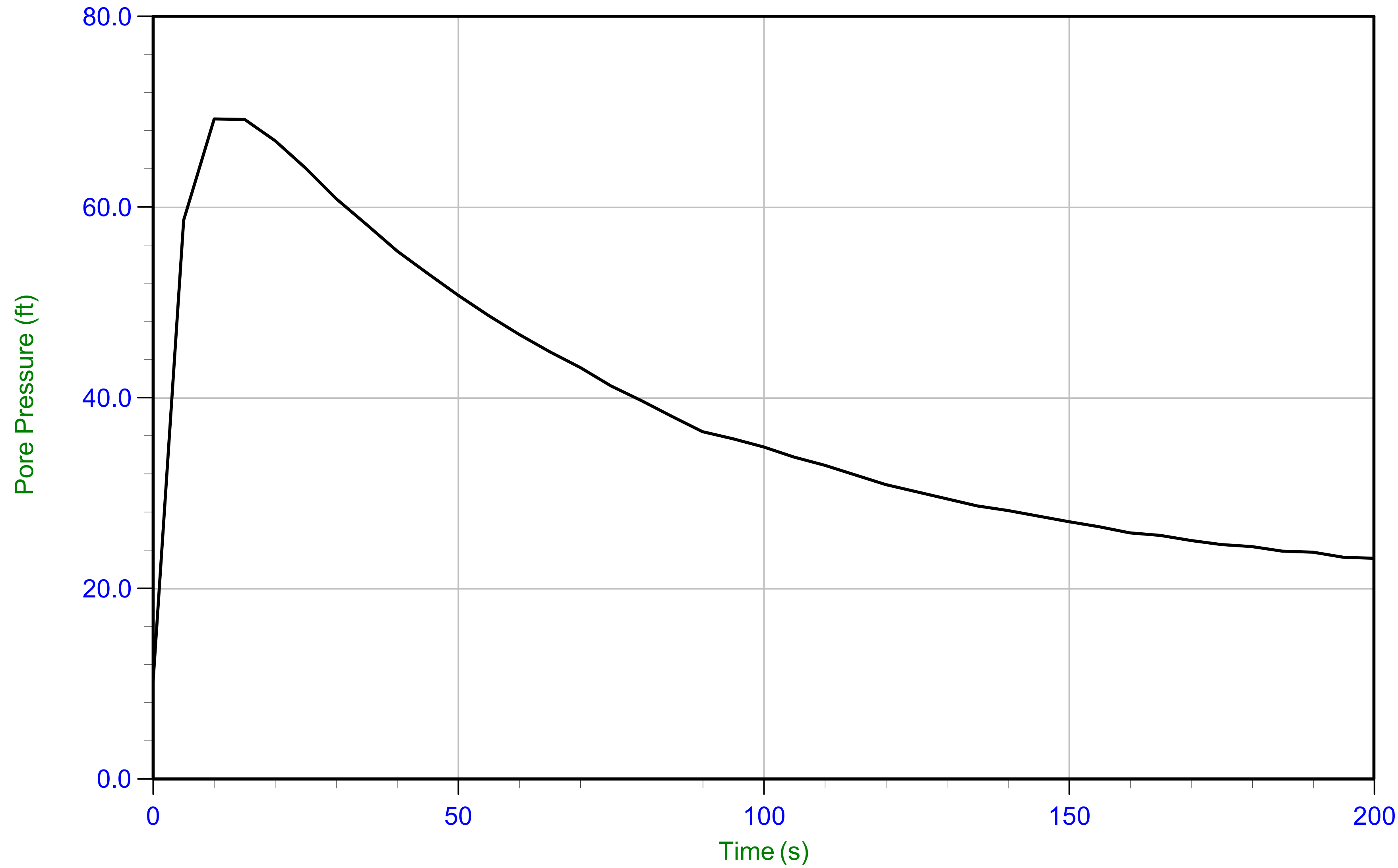
T(50): 794.1 s
Ir: 100
Ch: 0.9 cm²/min

ConeTec

Geosyntec Consultants

Job No: 18-53098
Date: 22-Aug-2018 14:46:19
Site: Crossroads Landfill

Sounding: CPT18-36
Cone: AD452 Area=15 cm²



Trace Summary:

Filename: 18-53098_CP36.PPD
Depth: 8.450 m / 27.723 ft
Duration: 200.0 s

U Min: 10.3 ft
U Max: 69.3 ft

WT: 3.396 m / 11.142 ft
Ueq: 16.6 ft
U(50): 42.92 ft

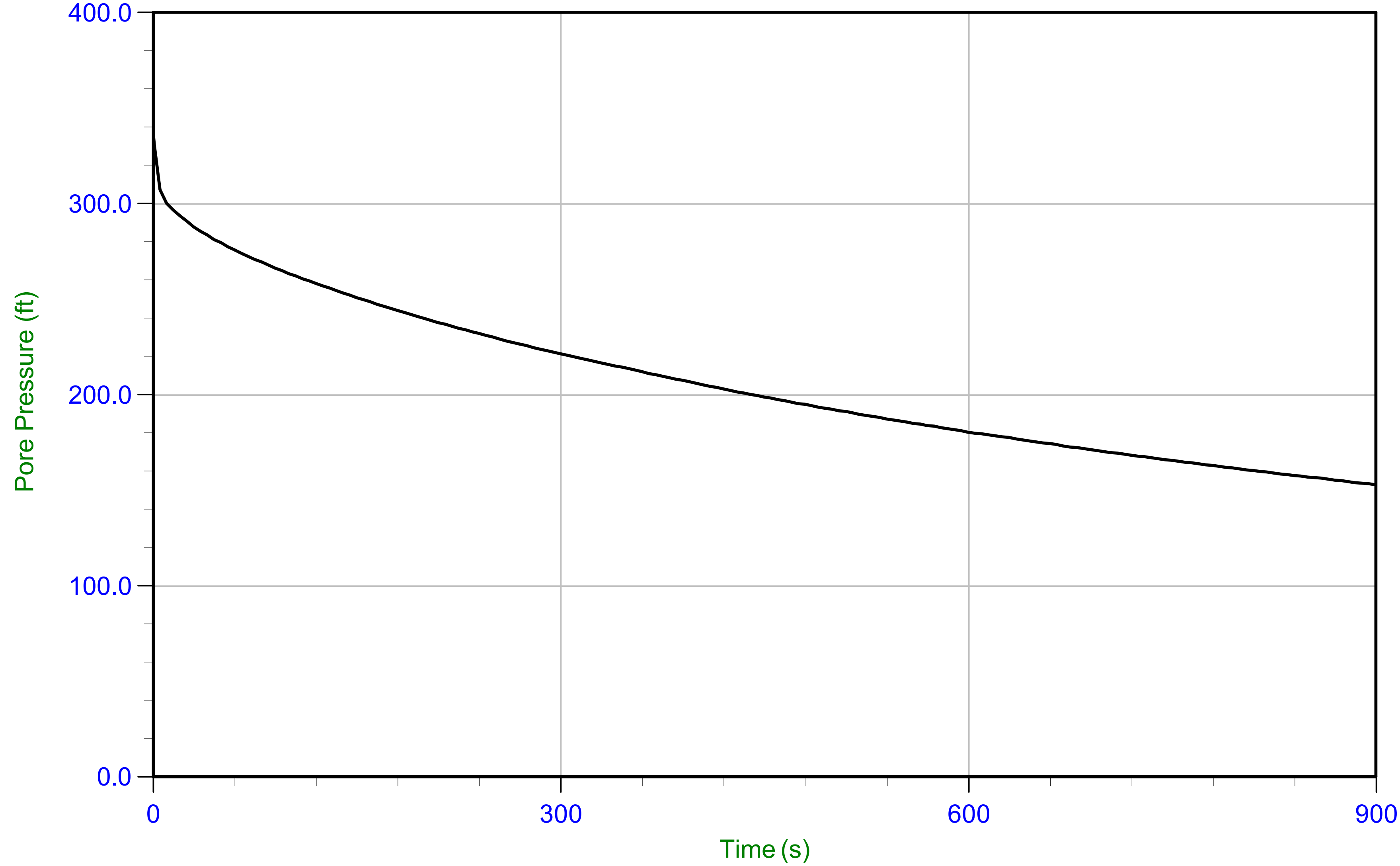
T(50): 60.6 s
Ir: 100
Ch: 11.6 cm²/min

ConeTec

Geosyntec Consultants

Job No: 18-53098
Date: 23-Aug-2018 14:21:10
Site: Crossroads Landfill

Sounding: CPT18-37
Cone: AD452 Area=15 cm²



Trace Summary:

Filename: 18-53098_CP37.PPD
Depth: 6.350 m / 20.833 ft
Duration: 900.0 s

U Min: 152.9 ft
U Max: 336.3 ft

WT: 4.349 m / 14.268 ft
Ueq: 6.6 ft
U(50): 171.45 ft

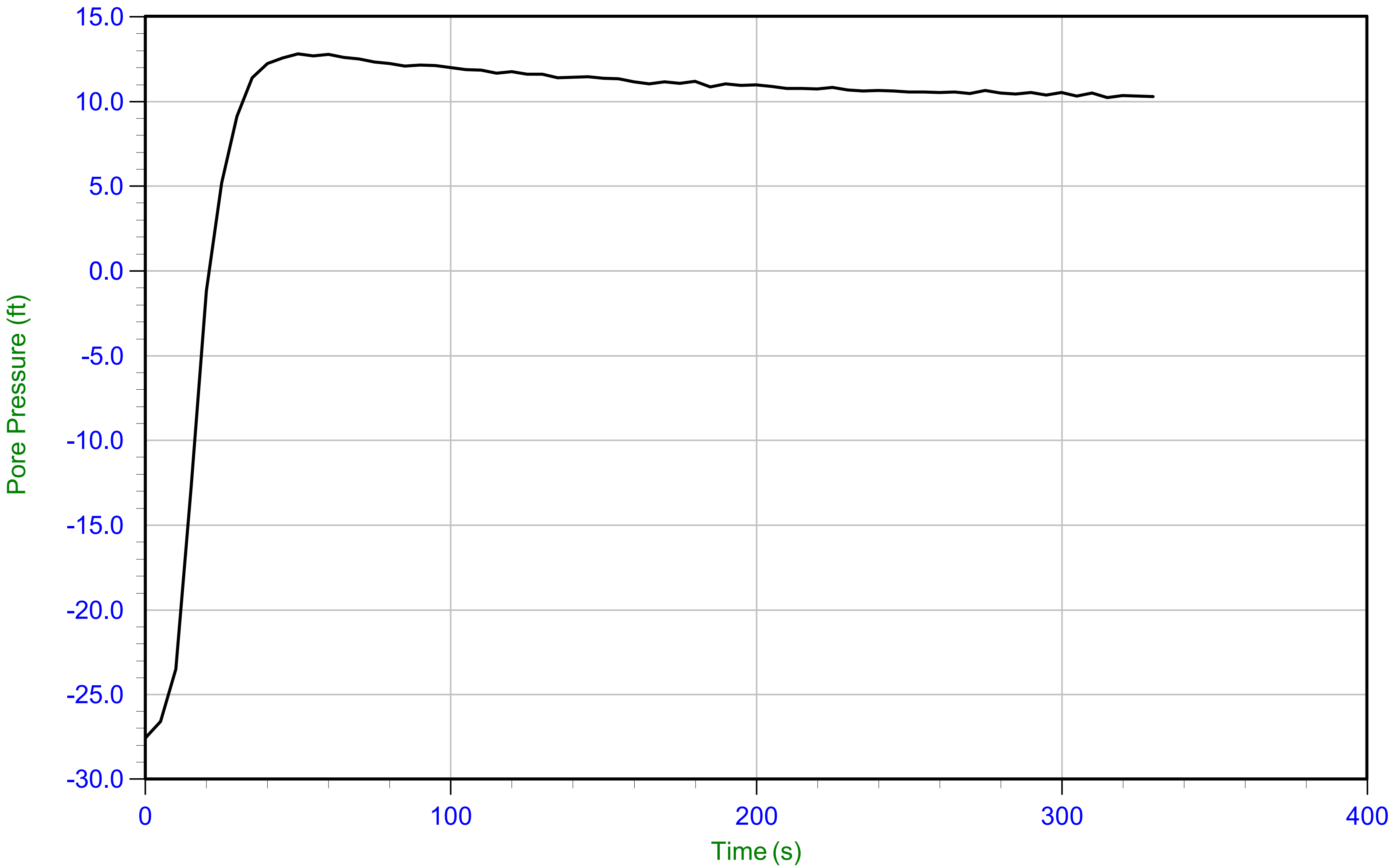
T(50): 688.2 s
Ir: 100
Ch: 1.0 cm²/min

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 23-Aug-2018 14:21:10
Site: Crossroads Landfill

Sounding: CPT18-37
Cone: AD452 Area=15 cm²



Trace Summary:

Filename: 18-53098_CP37.PPD
Depth: 7.425 m / 24.360 ft
Duration: 330.0 s

U Min: -27.6 ft
U Max: 12.8 ft

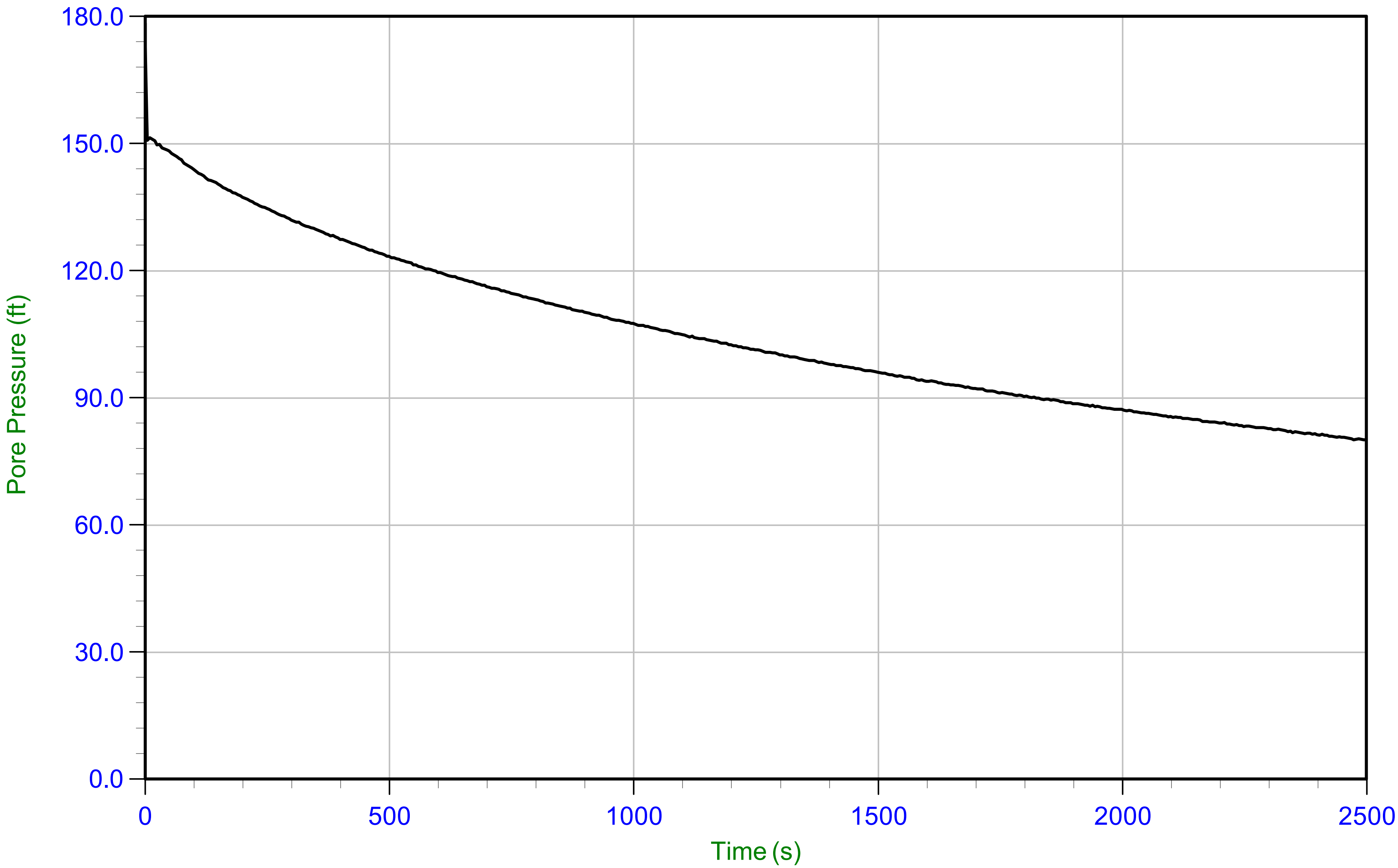
WT: 4.349 m / 14.268 ft
Ueq: 10.1 ft

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 20-Aug-2018 16:11:02
Site: Crossroads Landfill

Sounding: CPT18-39
Cone: AD388 Area=15 cm²



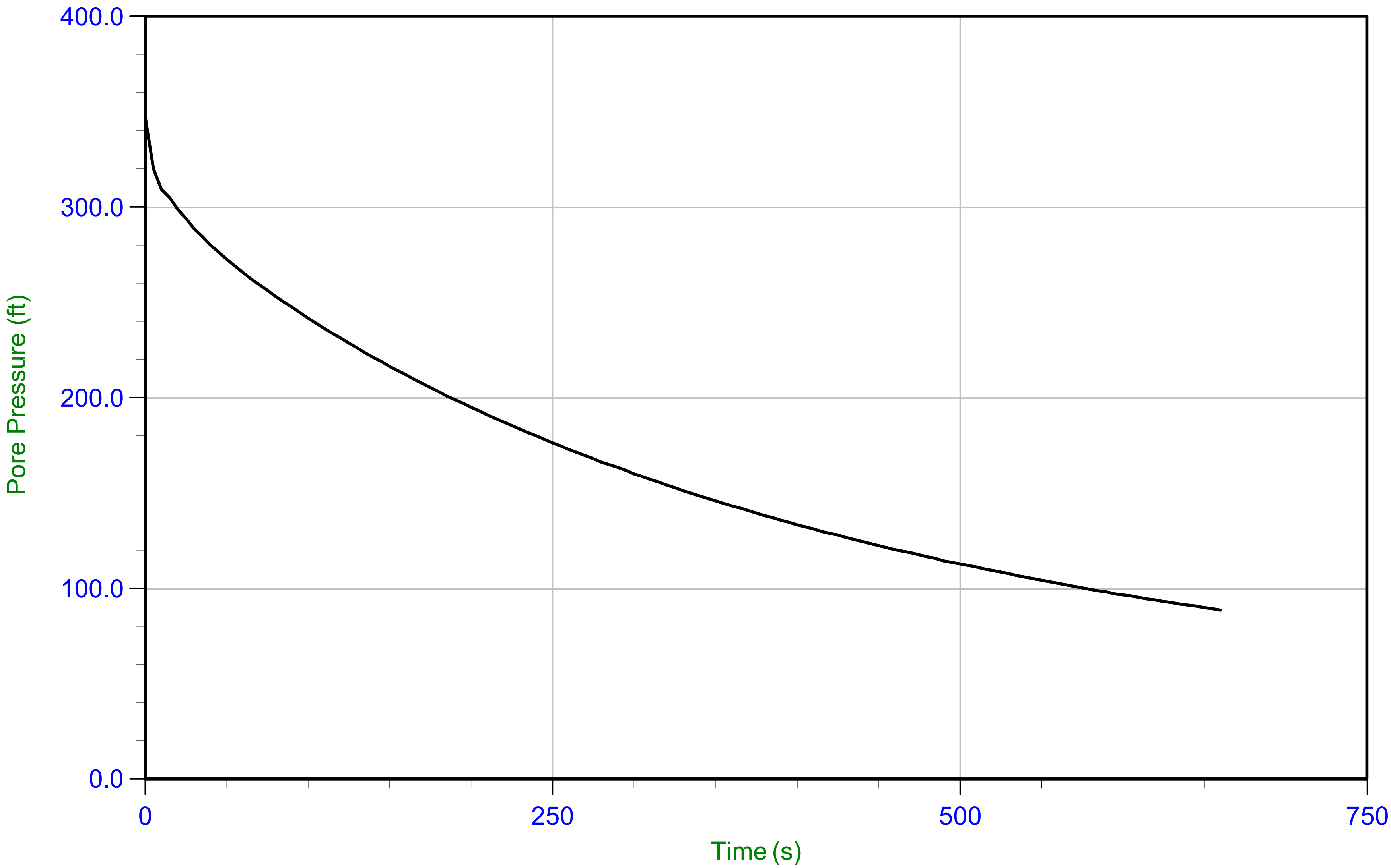
Trace Summary:

Filename: 18-53098_CP39.PPD
Depth: 4.300 m / 14.107 ft
Duration: 2500.0 s

U Min: 80.0 ft
U Max: 178.4 ft

WT: 3.962 m / 12.999 ft
Ueq: 1.1 ft
U(50): 89.74 ft

T(50): 1835.1 s
Ir: 100
Ch: 0.4 cm²/min



Trace Summary:

Filename: 18-53098_CP40.PPD
Depth: 7.275 m / 23.868 ft
Duration: 660.0 s

U Min: 88.7 ft
U Max: 347.4 ft

WT: 3.962 m / 12.999 ft
Ueq: 10.9 ft
U(50): 179.11 ft

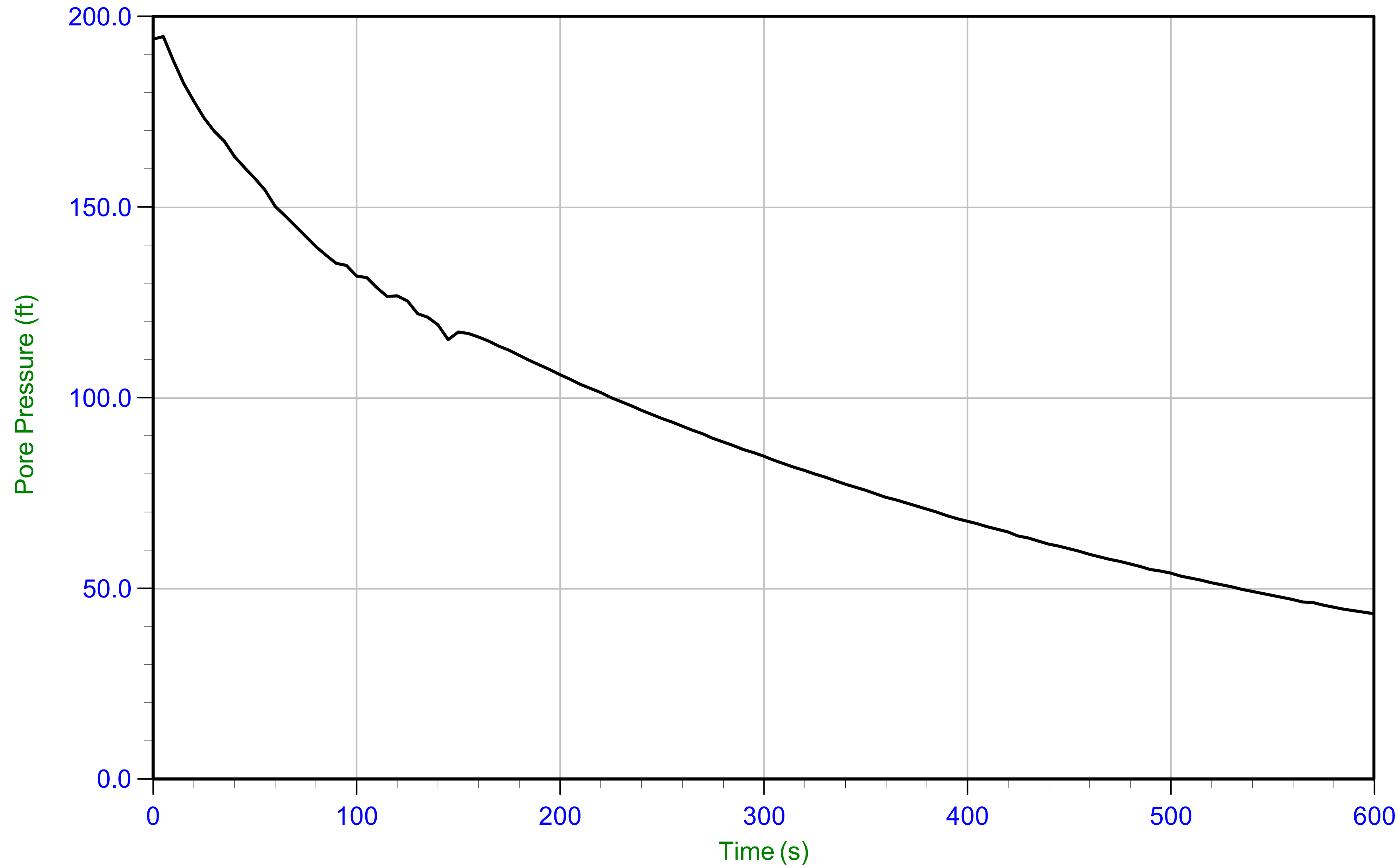
T(50): 242.5 s
Ir: 100
Ch: 2.9 cm²/min

ConeTec

Geosyntec Consultants

Job No: 18-53098
Date: 20-Aug-2018 14:54:43
Site: Crossroads Landfill

Sounding: CPT18-40
Cone: AD388 Area=15 cm²



Trace Summary:

Filename: 18-53098_CP40.PPD
Depth: 9.575 m / 31.414 ft
Duration: 600.0 s

U Min: 43.4 ft
U Max: 194.8 ft

WT: 3.962 m / 12.999 ft
Ueq: 18.4 ft
U(50): 106.59 ft

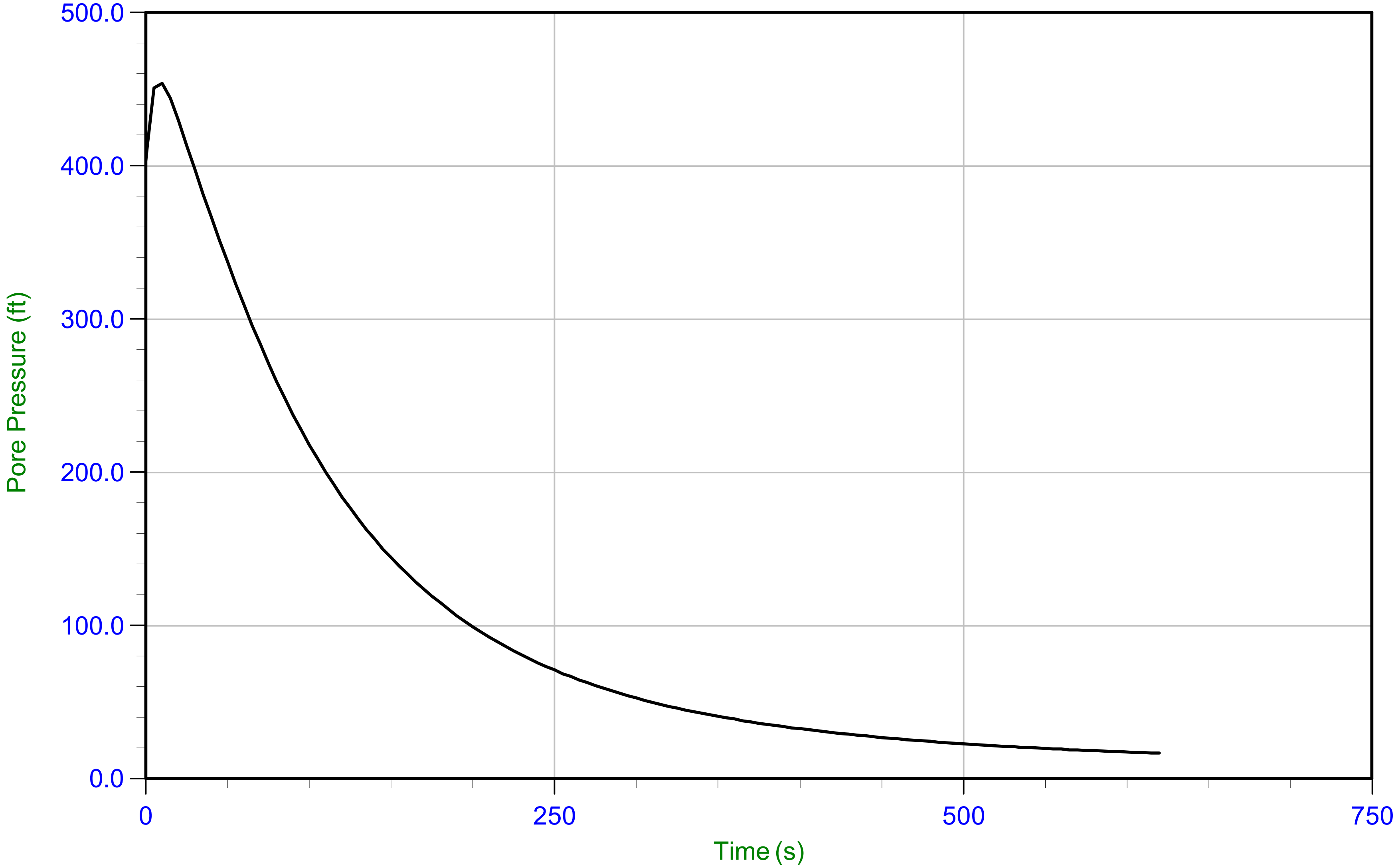
T(50): 193.0 s
Ir: 100
Ch: 3.6 cm²/min

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 21-Aug-2018 08:24:22
Site: Crossroads Landfill

Sounding: SCPT18-41
Cone: AD388 Area=15 cm²



Trace Summary:

Filename: 18-53098_SP41.PPD
Depth: 10.375 m / 34.038 ft
Duration: 620.0 s

U Min: 16.8 ft
U Max: 453.7 ft

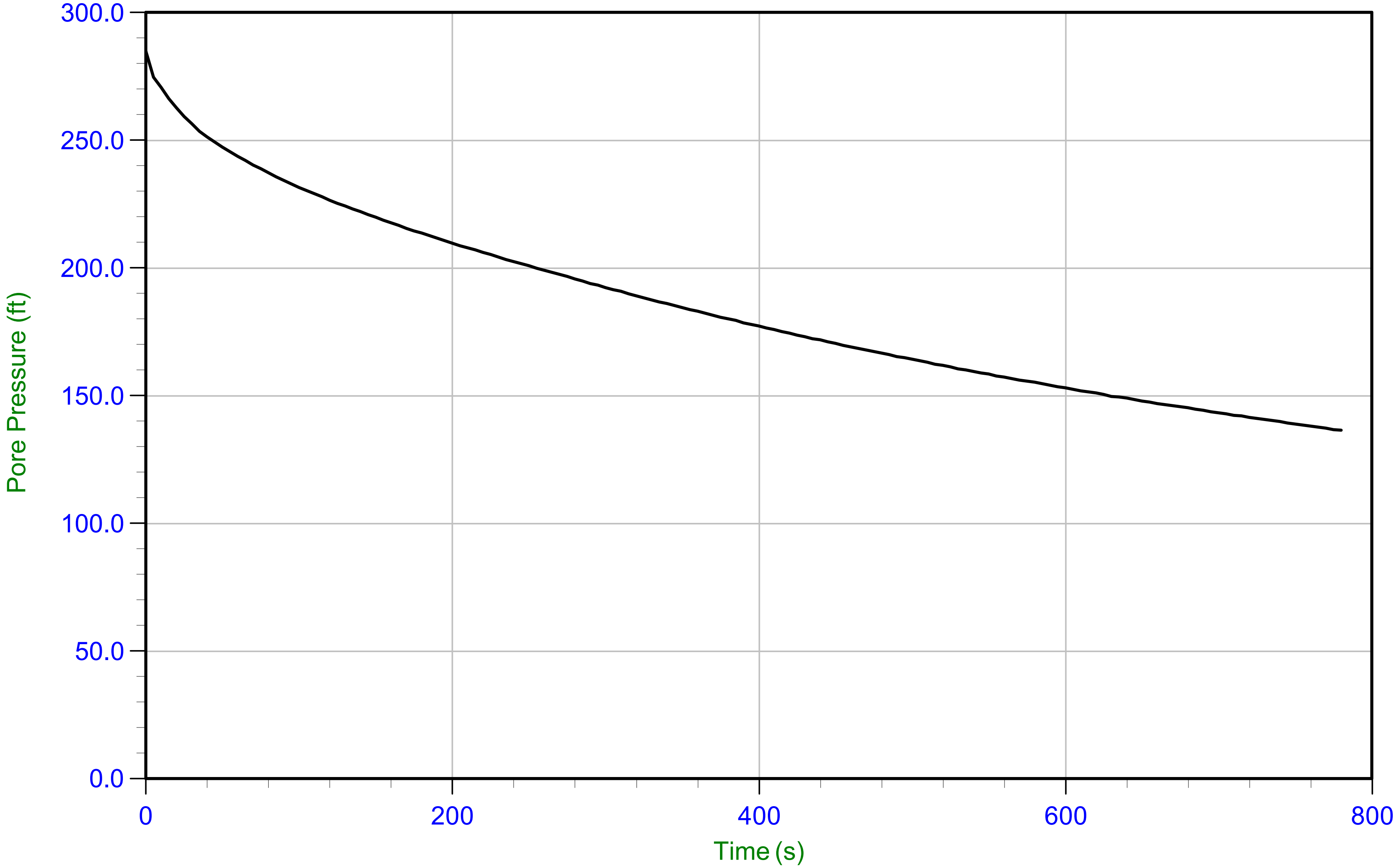
WT: 8.230 m / 27.001 ft
Ueq: 7.0 ft

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 21-Aug-2018 13:52:28
Site: Crossroads Landfill

Sounding: CPT18-42
Cone: AD388 Area=15 cm²



Trace Summary:

Filename: 18-53098_CP42.PPD
Depth: 5.350 m / 17.552 ft
Duration: 780.0 s

U Min: 136.5 ft
U Max: 284.8 ft

WT: 5.350 m / 17.552 ft
Ueq: 0.0 ft
U(50): 142.41 ft

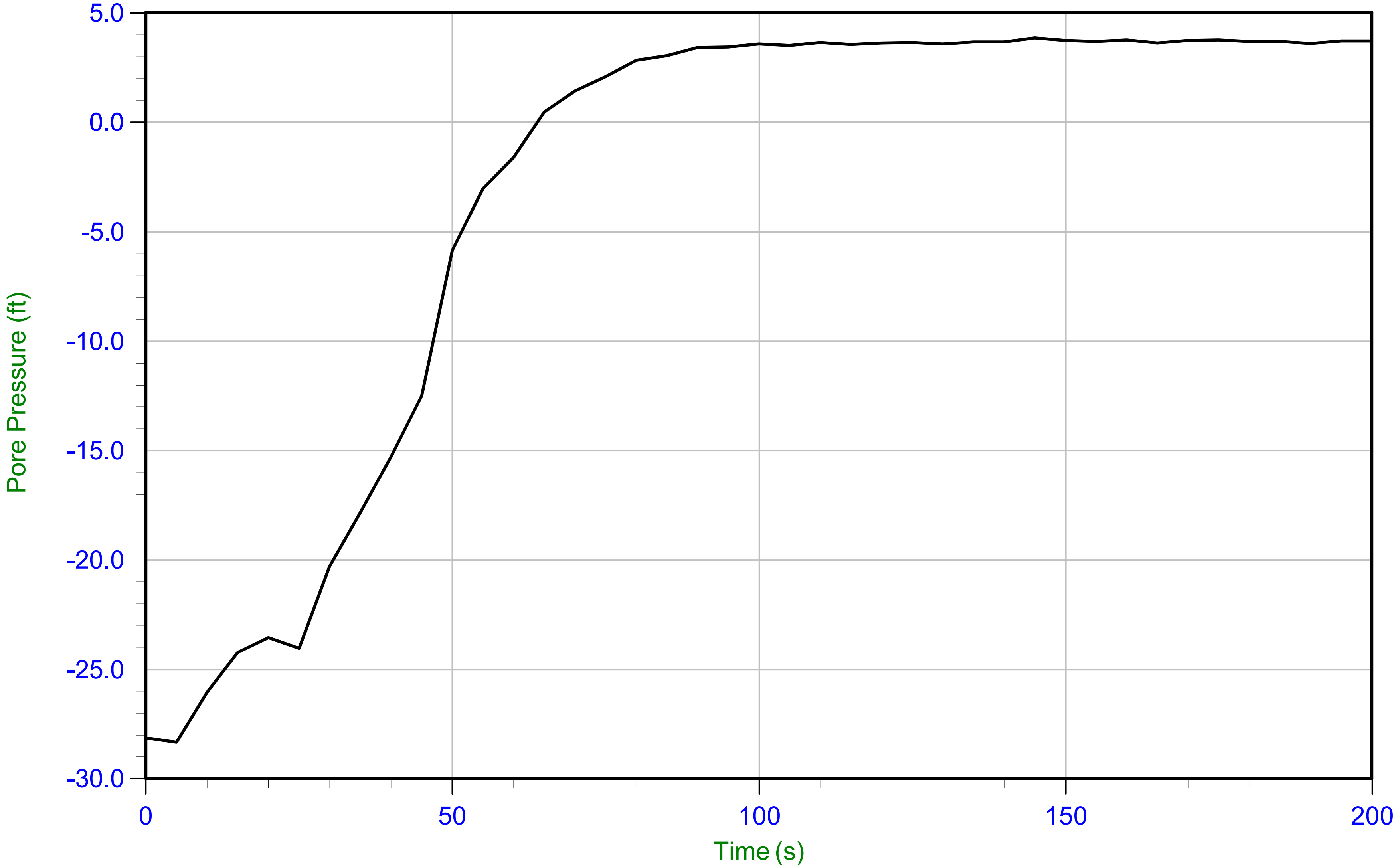
T(50): 708.9 s
Ir: 100
Ch: 1.0 cm²/min

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 21-Aug-2018 13:52:28
Site: Crossroads Landfill

Sounding: CPT18-42
Cone: AD388 Area=15 cm²



Trace Summary:

Filename: 18-53098_CP42.PPD
Depth: 6.675 m / 21.899 ft
Duration: 200.0 s

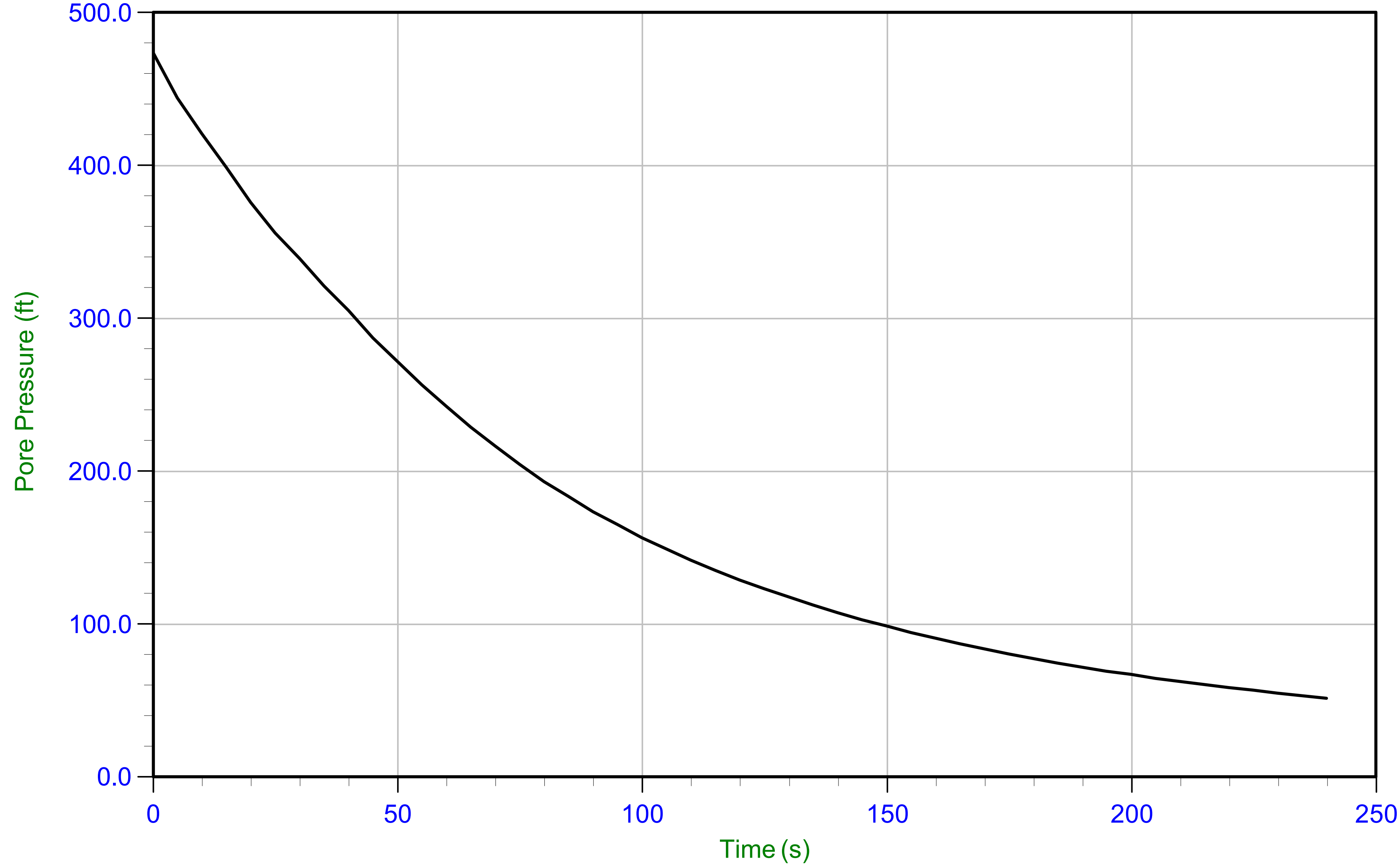
U Min: -28.3 ft
U Max: 3.8 ft

WT: 5.578 m / 18.300 ft
Ueq: 3.6 ft

Geosyntec Consultants

Job No: 18-53098
Date: 22-Aug-2018 11:48:05
Site: Crossroads Landfill

Sounding: CPT18-43
Cone: AD452 Area=15 cm²



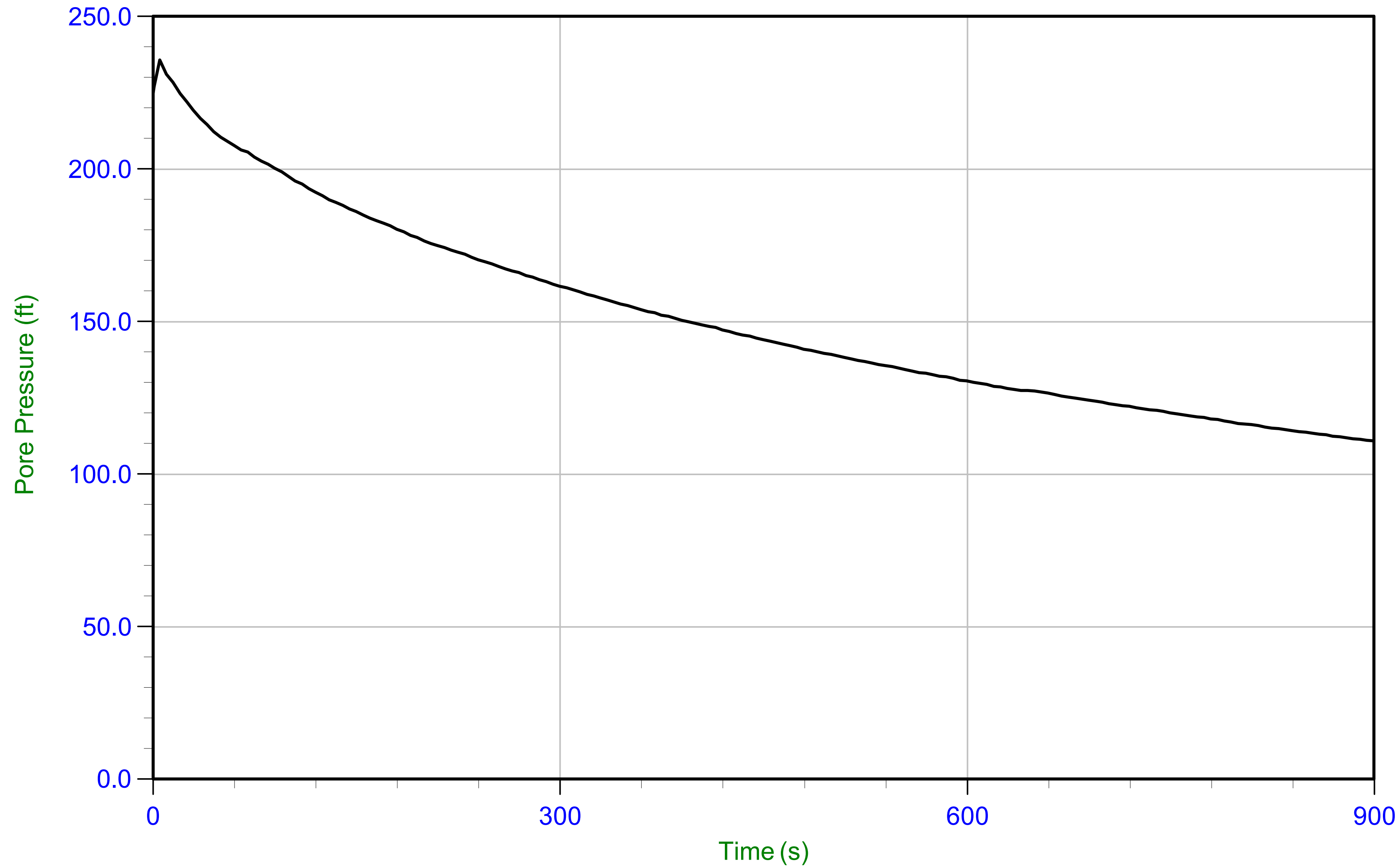
Trace Summary:	Filename: 18-53098_CP43.PPD	U Min: 51.7 ft	WT: 3.048 m / 10.000 ft	T(50): 60.7 s
	Depth: 5.325 m / 17.470 ft	U Max: 473.6 ft	Ueq: 7.5 ft	Ir: 100
	Duration: 240.0 s		U(50): 240.55 ft	Ch: 11.6 cm²/min

ConeTec

Geosyntec Consultants

Job No: 18-53098
Date: 21-Aug-2018 10:55:36
Site: Crossroads Landfill

Sounding: CPT18-44
Cone: AD388 Area=15 cm²



Trace Summary:

Filename: 18-53098_CP44.PPD
Depth: 5.200 m / 17.060 ft
Duration: 900.0 s

U Min: 110.9 ft
U Max: 235.8 ft

WT: 3.048 m / 10.000 ft
Ueq: 7.1 ft
U(50): 121.43 ft

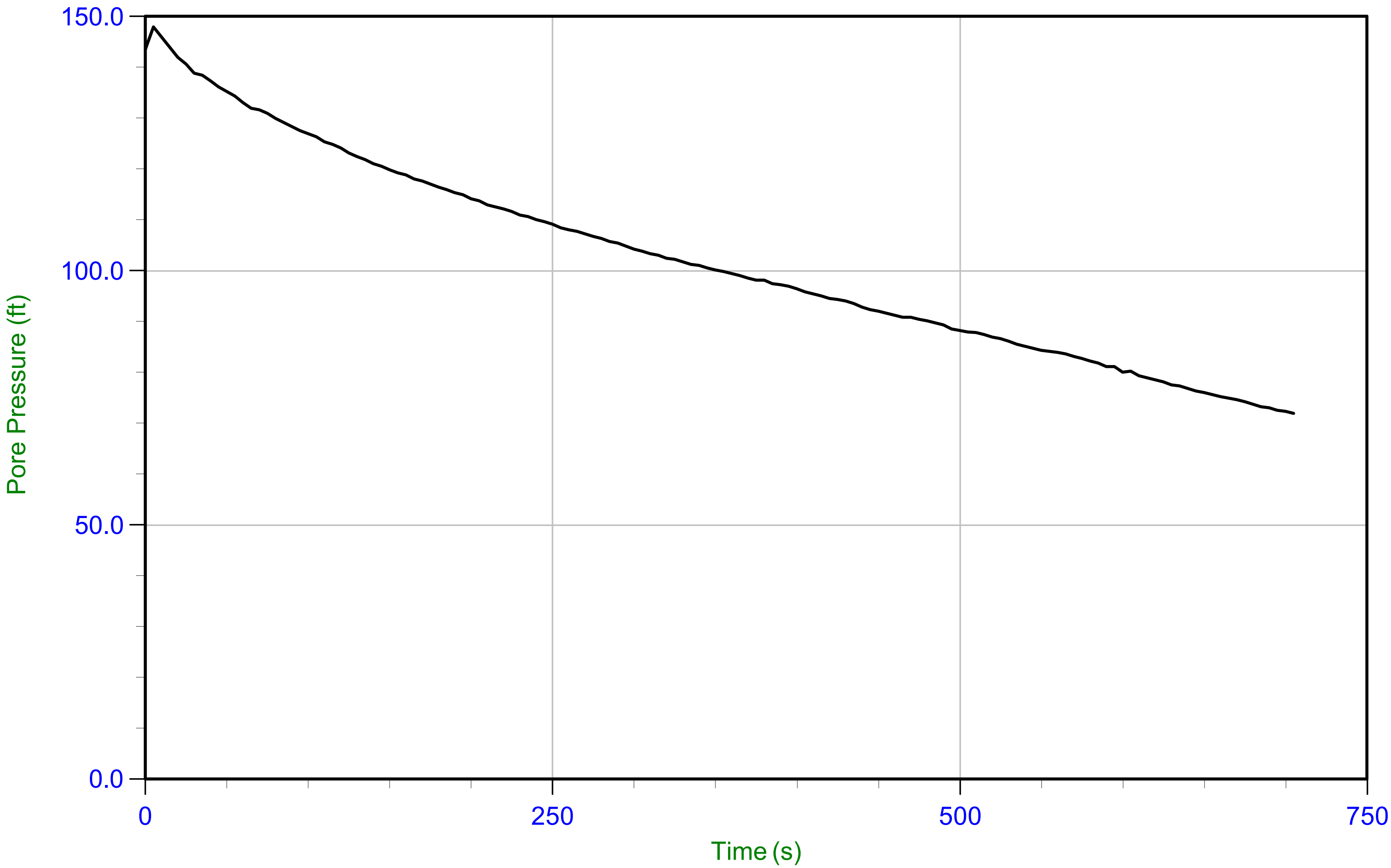
T(50): 725.8 s
Ir: 100
Ch: 1.0 cm²/min

ConeTec

Geosyntec Consultants

Job No: 18-53098
Date: 21-Aug-2018 10:55:36
Site: Crossroads Landfill

Sounding: CPT18-44
Cone: AD388 Area=15 cm²



Trace Summary:

Filename: 18-53098_CP44.PPD
Depth: 6.400 m / 20.997 ft
Duration: 705.0 s

U Min: 71.9 ft
U Max: 148.0 ft

WT: 3.048 m / 10.000 ft
Ueq: 11.0 ft
U(50): 79.49 ft

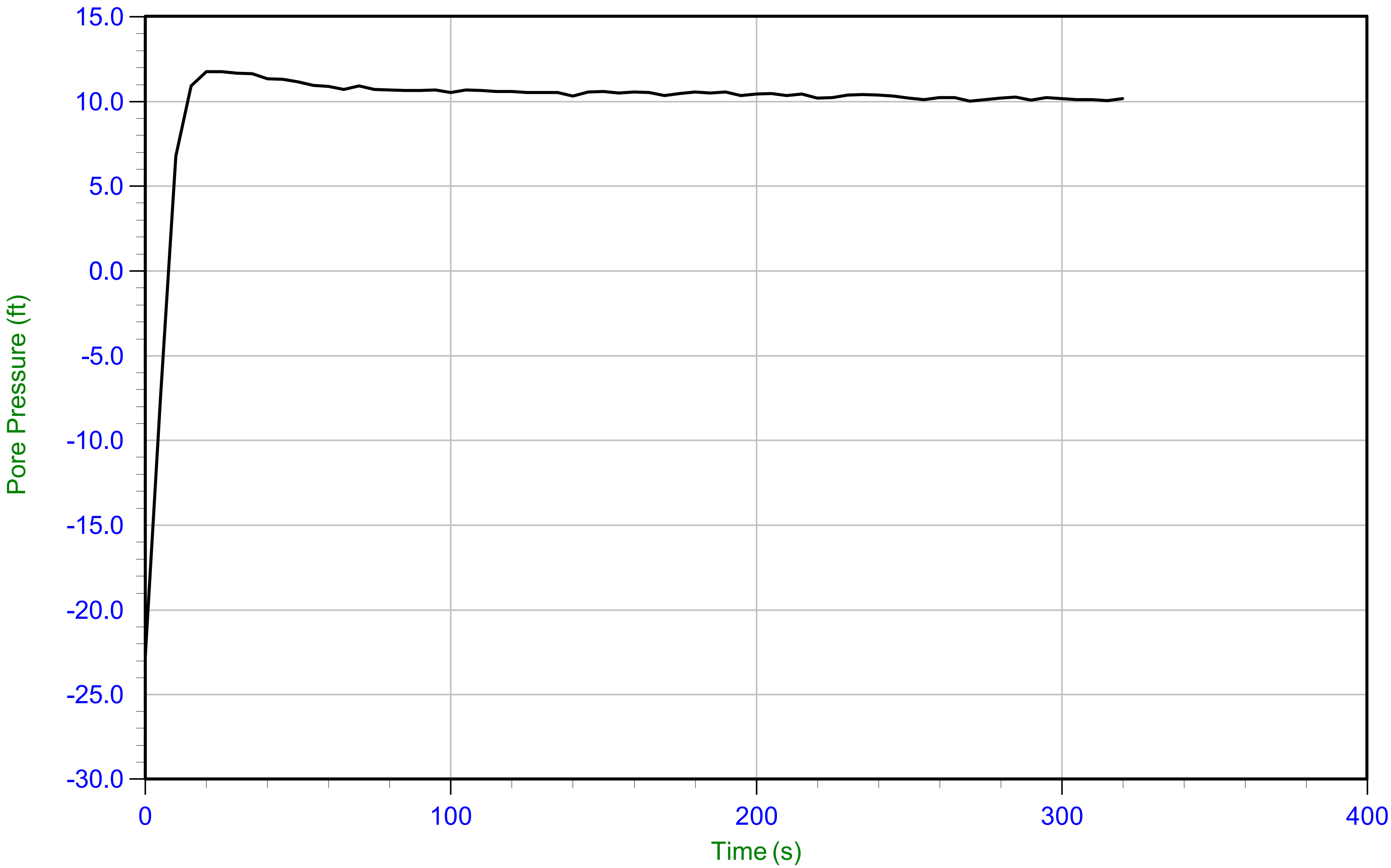
T(50): 604.3 s
Ir: 100
Ch: 1.2 cm²/min

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 21-Aug-2018 12:08:56
Site: Crossroads Landfill

Sounding: CPT18-45
Cone: AD388 Area=15 cm²



Trace Summary:

Filename: 18-53098_CP45.PPD
Depth: 4.625 m / 15.174 ft
Duration: 320.0 s

U Min: -22.7 ft
U Max: 11.7 ft

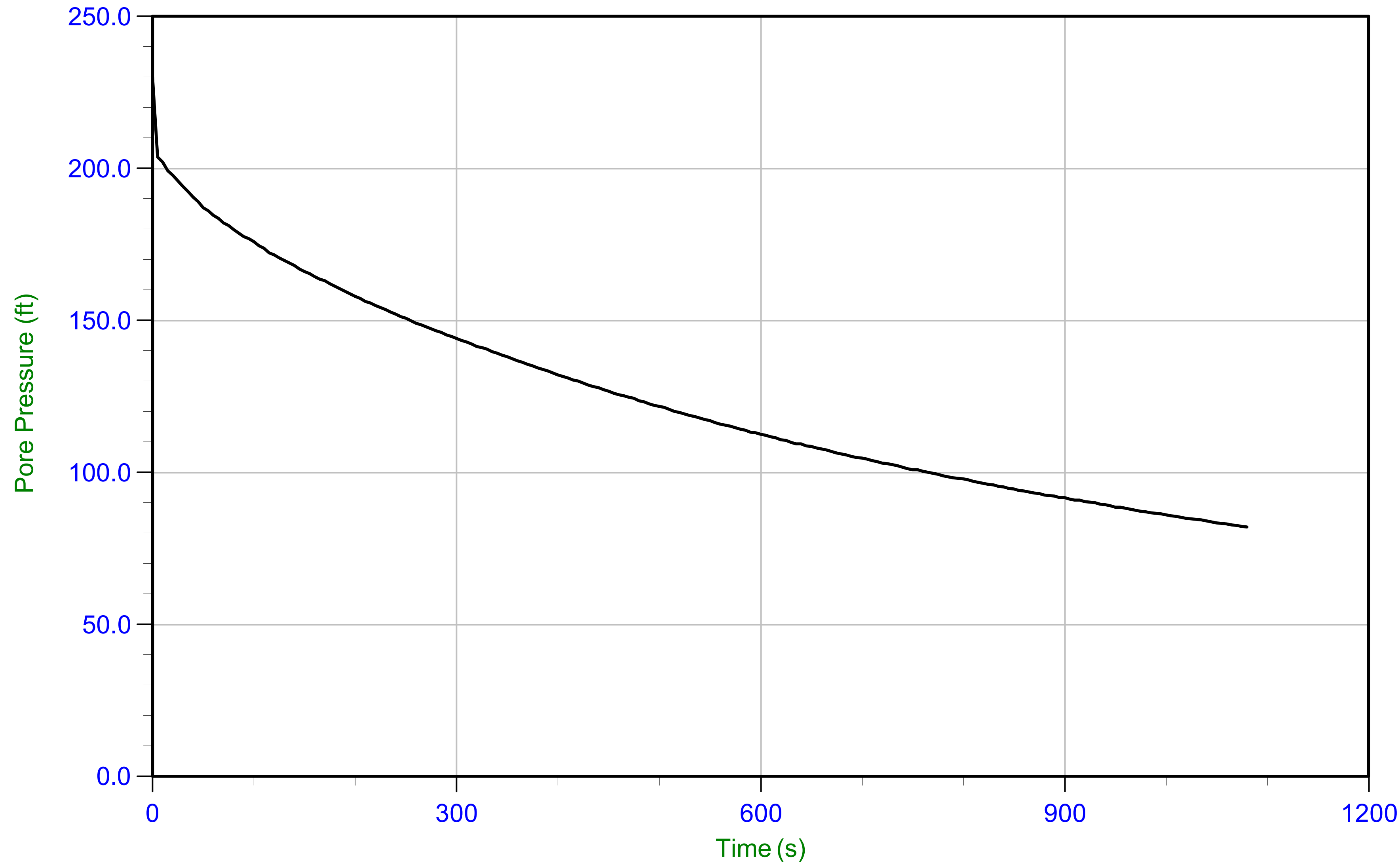
WT: 1.599 m / 5.246 ft
Ueq: 9.9 ft

CONETEC

Geosyntec Consultants

Job No: 18-53098
Date: 21-Aug-2018 12:45:02
Site: Crossroads Landfill

Sounding: CPT18-46
Cone: AD388 Area=15 cm²



Trace Summary:

Filename: 18-53098_CP46.PPD
Depth: 3.400 m / 11.155 ft
Duration: 1080.0 s

U Min: 82.1 ft
U Max: 230.1 ft

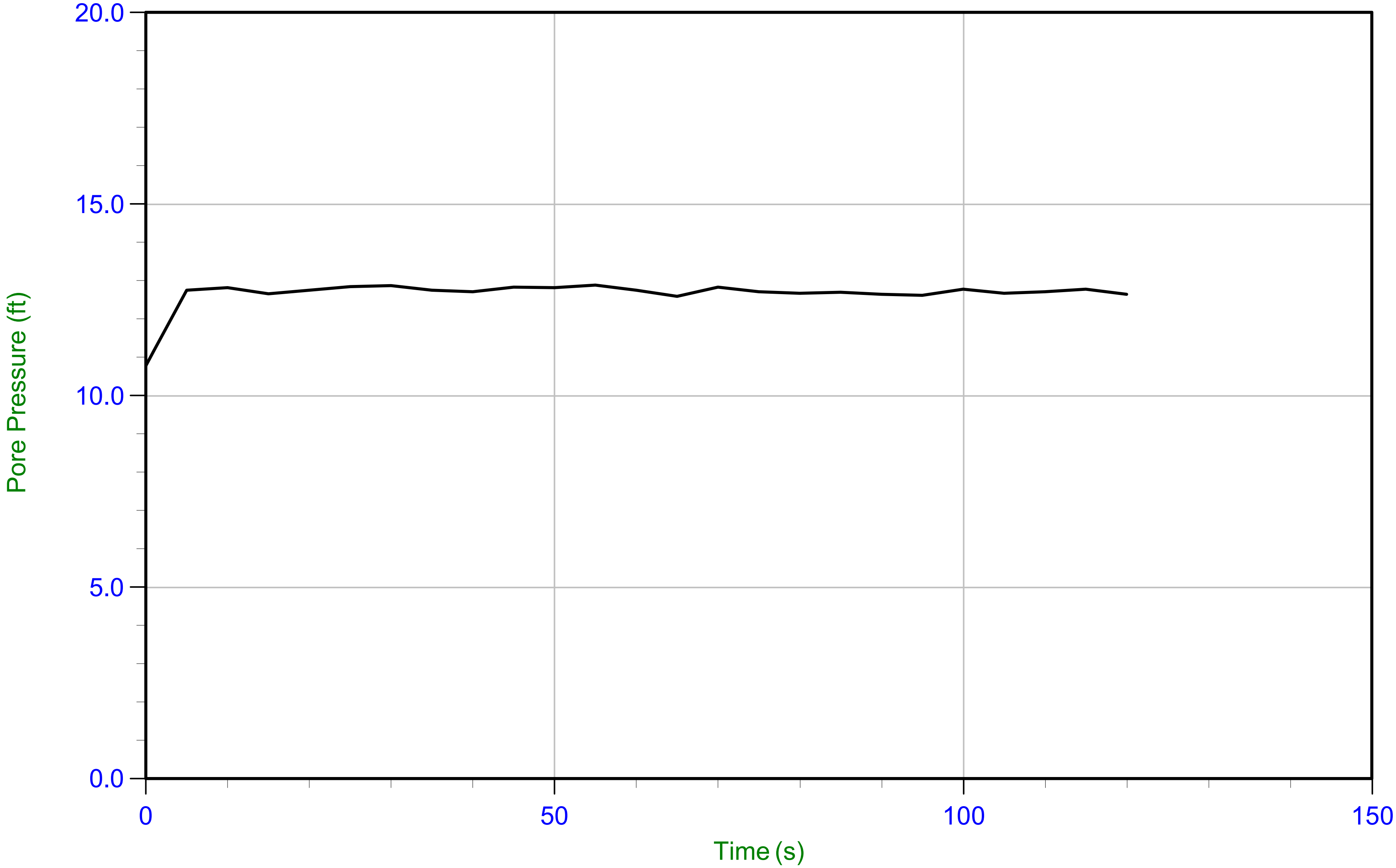
WT: 1.721 m / 5.646 ft
Ueq: 5.5 ft
U(50): 117.79 ft

T(50): 541.5 s
Ir: 100
Ch: 1.3 cm²/min

Geosyntec Consultants

Job No: 18-53098
Date: 21-Aug-2018 12:45:02
Site: Crossroads Landfill

Sounding: CPT18-46
Cone: AD388 Area=15 cm²



Trace Summary:

Filename: 18-53098_CP46.PPD
Depth: 5.600 m / 18.372 ft
Duration: 120.0 s

U Min: 10.8 ft
U Max: 12.9 ft

WT: 1.721 m / 5.646 ft
Ueq: 12.7 ft

GEOKON Vibrating Wire Piezometer Field Notes

ConeTec

CONETEC

Job No: 18-53098
Client: Geosyntec Consultants
Project: Crossroads Landfill, Norridgewock ME

GEOKON VIBRATING WIRE PIEZOMETER FIELD NOTES

Client Piezometer ID	Piezometer Serial No.[1]	Linear Gauge Factor[2] (kPa)	Thermal Factor[2] (kPa / deg C)	Cable Length (ft)	Adjacent CPT	CPT Northing[3] (ft)	CPT Easting[3] (ft)	CPT Elevation[3] (ft)	Target Installation Depth (ft)	Installation Depth[4] (ft)	Installation Date	Installation Time	Saturated Piezometer Surface Baseline (Hz)	Saturated Piezometer Surface Baseline[5] (Dg)	Saturated Thermistor Surface Baseline (°C)	Piezometer Reading after Deployment (Hz)	Piezometer Reading after Deployment[5] (Dg)	Thermistor Reading after Deployment (°C)
	1828386	-0.1003	0.005295	40	CPT18-18	684760.040	3039331.534	294.410	18.00	18.00	27-Aug-18	10:00 AM	2981.7	8890.5	22.8	2966.3	8798.9	18.4
	1820253	-0.1051	0.02004	50	CPT18-18	684760.040	3039331.534	294.410	Refusal	39.01	27-Aug-18	11:15 AM	2966.8	8801.9	23.2	2874.1	8260.5	10.2
	1820251	-0.1024	0.0171	50	CPT18-21	685215.611	3039084.187	286.142	Refusal	23.30	27-Aug-18	2:00 PM	2940.5	8646.5	23.8	2877.9	8282.3	10.0
	1828383	-0.09695	0.006399	40	CPT18-21	685215.611	3039084.187	286.142	6.00	6.00	27-Aug-18	3:00 PM	2975.1	8851.2	25.5	2975.0	8850.6	23.2
	1820249	-0.1075	0.02894	50	CPT18-43	685027.66	3039768.948	292.232	Refusal	25.46	27-Aug-18	4:00 PM	2962.0	8773.4	26.7	2818.9	7946.2	10.1
	1828385	-0.09958	0.02163	40	CPT18-43	685027.66	3039768.948	292.232	12.00	12.00	27-Aug-18	6:15 PM	2965.2	8792.4	27.0	2945.5	8676.0	20.6
	1828380	-0.1025	0.04208	40	CPT18-05	685836.483	3039124.351	292.789	Refusal	10.95	28-Aug-18	9:40 AM	2991.2	8947.3	22.2	2950.5	8705.6	missed
	1828384	-0.09512	0.08094	40	CPT18-05	685836.483	3039124.351	292.789	6.00	6.00	28-Aug-18	10:15 AM	2968.7	8813.2	22.2	2953.5	8723.3	missed
	1828382	-0.1015	0.04847	40	CPT18-24	685304.528	3038508.779	280.221	Refusal	20.04	28-Aug-18	11:30 AM	2969.1	8815.6	22.2	2942.1	8656.0	9.3
	1828379	-0.09162	0.02143	40	CPT18-24	685304.528	3038508.779	280.221	6.00	6.00	28-Aug-18	12:30 PM	2977.2	8863.7	22.8	2948.0	8690.5	missed
	1820252	-0.09629	0.06529	50	CPT18-27	685366.437	3040797.499	276.908	Refusal	9.84	29-Aug-18	9:10 AM	2990.4	8942.5	24	2964.8	8790.0	10.8
	1820250	-0.1017	0.01591	50	CPT18-27	685366.437	3040797.499	276.908	2.00	2.00	29-Aug-18	9:45 AM	2941.5	8652.4	23.1	2941.8	8654.2	21.7
	1820248	-0.1105	0.058	75	CPT18-28	685580.814	3041108.771	289.752	Refusal	36.60	29-Aug-18	10:55 AM	2974.5	8847.7	23.4	2818.0	7941.1	7.4
	1820247	-0.1096	0.04575	75	CPT18-28	685580.814	3041108.771	289.752	10.00	10.00	29-Aug-18	11:55 AM	2948.0	8690.7	23.8	2919.5	8523.5	12.8

Notes
1. vibrating wire piezometers model No. 4500DPCT-350 kPa
2. values taken from Geokon Calibration Reports and should be checked asgainst the reports for accuracy
3. coordinates and elevations were provided by Geosyntec in NAD 83 / Maine West State Plane
4. installation depth reported is to centre of piezometer filter, approx. 10 cm behind tip point.
5. Hertz (Hz) converted to Digits (Dg) using 1 $Dg = Hz^2/1000$

GEOKON 48 Spencer St. Lebanon, NH 03766 USA

Vibrating Wire Pressure Transducer Calibration Report

Model Number: 4500DPCT-350 kPa

Date of Calibration: June 26, 2018

This calibration has been verified/validated as of 08/10/2018

Serial Number: 1820247

Temperature: 23.30 °C

Calibration Instruction: CI-Pressure Transducer 7 kPa~3 MPa

Barometric Pressure: 1003.2 mbar

Cable Length: 75 feet

Technician: Kathy Rogers

Applied Pressure (kPa)	Gauge Reading 1st Cycle	Gauge Reading 2nd Cycle	Average Gauge Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	8690	8691	8691	-1.261	-0.36	0.051	0.01
70.0	8039	8040	8040	70.10	0.04	69.87	-0.03
140.0	7392	7393	7393	141.0	0.29	140.0	0.01
210.0	6754	6755	6755	211.0	0.29	210.0	0.01
279.9	6123	6124	6124	280.1	0.06	280.0	0.00
349.9	5499	5499	5499	348.6	-0.39	349.9	-0.02

(kPa) Linear Gauge Factor (G): -0.1096 (kPa/ digit)

Polynomial Gauge factors: A: 9.373E-07 B: -0.1229 C: ________

Thermal Factor (K): 0.04575 (kPa/ °C)

Calculate C by setting P=0 and R_1 = initial field zero reading into the polynomial equation

(psi) Linear Gauge Factor (G): -0.01590 (psi/ digit)

Polynomial Gauge Factors: A: 1.359E-07 B: -0.01783 C: ________

Thermal Factor (K): 0.006636 (psi/ °C)

Calculate C by setting P=0 and R_1 = initial field zero reading into the polynomial equation

Calculated Pressures:

Linear, $P = G(R_1 - R_0) + K(T_1 - T_0) - (S_1 - S_0)^*$

Polynomial, $P = AR_1^2 + BR_1 + C + K(T_1 - T_0) - (S_1 - S_0)^*$

*Barometric pressures expressed in kPa or psi. Barometric compensation is not required with vented transducers.

Factory Zero Reading: 8695 Temperature: 21.8 °C Barometer: 992.2 mbar

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

GEOKON 48 Spencer St. Lebanon, NH 03766 USA

Vibrating Wire Pressure Transducer Calibration Report

Model Number: 4500DPCT-350 kPa

Date of Calibration: June 26, 2018

This calibration has been verified/validated as of 08/10/2018

Serial Number: 1820248

Temperature: 23.30 °C

Calibration Instruction: CI-Pressure Transducer 7 kPa~3 MPa

Barometric Pressure: 1003.2 mbar

Cable Length: 75 feet

Technician: Kathy Rogers

Applied Pressure (kPa)	Gauge Reading 1st Cycle	Gauge Reading 2nd Cycle	Average Gauge Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	8847	8848	8848	-1.713	-0.49	-0.022	-0.01
70.0	8196	8196	8196	70.29	0.09	70.00	0.01
140.0	7553	7554	7554	141.3	0.37	140.1	0.01
210.0	6922	6922	6922	211.1	0.33	209.9	-0.02
279.9	6297	6297	6297	280.2	0.06	280.0	0.00
349.9	5681	5681	5681	348.3	-0.49	349.9	-0.01

(kPa) Linear Gauge Factor (G): -0.1105 (kPa/ digit)

Polynomial Gauge factors: A: 1.212E-06 B: -0.1281 C: ______

Thermal Factor (K): 0.05800 (kPa/ °C)

Calculate C by setting P=0 and R_1 = initial field zero reading into the polynomial equation

(psi) Linear Gauge Factor (G): -0.01603 (psi/ digit)

Polynomial Gauge Factors: A: 1.757E-07 B: -0.01858 C: ______

Thermal Factor (K): 0.008412 (psi/ °C)

Calculate C by setting P=0 and R_1 = initial field zero reading into the polynomial equation

Calculated Pressures:

Linear, $P = G(R_1 - R_0) + K(T_1 - T_0) - (S_1 - S_0)$*

Polynomial, $P = AR_1^2 + BR_1 + C + K(T_1 - T_0) - (S_1 - S_0)$*

*Barometric pressures expressed in kPa or psi. Barometric compensation is not required with vented transducers.

Factory Zero Reading: 8859 Temperature: 21.8 °C Barometer: 992.2 mbar

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

GEOKON 48 Spencer St. Lebanon, NH 03766 USA

Vibrating Wire Pressure Transducer Calibration Report

Model Number: 4500DPCT-350 kPa

Date of Calibration: June 26, 2018

This calibration has been verified/validated as of 08/10/2018

Serial Number: 1820249

Temperature: 23.30 °C

Calibration Instruction: CI-Pressure Transducer 7 kPa~3 MPa

Barometric Pressure: 1003.2 mbar

Cable Length: 50 feet

Technician: Kathy Rogers

Applied Pressure (kPa)	Gauge Reading 1st Cycle	Gauge Reading 2nd Cycle	Average Gauge Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	8783	8784	8784	-1.665	-0.48	0.035	0.01
70.0	8115	8115	8115	70.16	0.06	69.87	-0.03
140.0	7452	7453	7453	141.4	0.38	140.1	0.02
210.0	6802	6803	6803	211.2	0.35	210.0	0.01
279.9	6161	6161	6161	280.1	0.05	279.9	-0.01
349.9	5527	5527	5527	348.2	-0.49	349.9	-0.01

(kPa) Linear Gauge Factor (G): -0.1075 (kPa/ digit)

Polynomial Gauge factors: A: 1.154E-06 B: -0.1240 C: ______

Thermal Factor (K): 0.02894 (kPa/ °C)

Calculate C by setting P=0 and R_1 = initial field zero reading into the polynomial equation

(psi) Linear Gauge Factor (G): -0.01558 (psi/ digit)

Polynomial Gauge Factors: A: 1.674E-07 B: -0.01798 C: ______

Thermal Factor (K): 0.004198 (psi/ °C)

Calculate C by setting P=0 and R_1 = initial field zero reading into the polynomial equation

Calculated Pressures:

Linear, $P = G(R_1 - R_0) + K(T_1 - T_0) - (S_1 - S_0)$*

Polynomial, $P = AR_1^2 + BR_1 + C + K(T_1 - T_0) - (S_1 - S_0)$*

*Barometric pressures expressed in kPa or psi. Barometric compensation is not required with vented transducers.

Factory Zero Reading: 8790 Temperature: 21.8 °C Barometer: 992.2 mbar

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

GEOKON 48 Spencer St. Lebanon, NH 03766 USA

Vibrating Wire Pressure Transducer Calibration Report

Model Number: 4500DPCT-350 kPa

Date of Calibration: June 26, 2018

This calibration has been verified/validated as of 08/10/2018

Serial Number: 1820250

Temperature: 23.30 °C

Calibration Instruction: CI-Pressure Transducer 7 kPa~3 MPa

Barometric Pressure: 1003.2 mbar

Cable Length: 50 feet

Technician: Kathy Rogers

Applied Pressure (kPa)	Gauge Reading 1st Cycle	Gauge Reading 2nd Cycle	Average Gauge Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	8657	8658	8658	-1.271	-0.36	-0.001	0.00
70.0	7954	7954	7954	70.28	0.09	70.05	0.02
140.0	7261	7261	7261	140.8	0.21	139.8	-0.06
210.0	6570	6570	6570	211.0	0.31	210.1	0.04
279.9	5890	5891	5891	280.1	0.05	280.0	0.00
349.9	5217	5217	5217	348.6	-0.38	349.9	-0.02

(kPa) Linear Gauge Factor (G): -0.1017 (kPa/ digit)

Polynomial Gauge factors: A: 7.768E-07 B: -0.1125 C: ________

Thermal Factor (K): 0.01591 (kPa/ °C)

Calculate C by setting P=0 and R_1 = initial field zero reading into the polynomial equation

(psi) Linear Gauge Factor (G): -0.01475 (psi/ digit)

Polynomial Gauge Factors: A: 1.127E-07 B: -0.01631 C: ________

Thermal Factor (K): 0.002307 (psi/ °C)

Calculate C by setting P=0 and R_1 = initial field zero reading into the polynomial equation

Calculated Pressures:

Linear, $P = G(R_1 - R_0) + K(T_1 - T_0) - (S_1 - S_0)$*

Polynomial, $P = AR_1^2 + BR_1 + C + K(T_1 - T_0) - (S_1 - S_0)$*

*Barometric pressures expressed in kPa or psi. Barometric compensation is not required with vented transducers.

Factory Zero Reading: 8667 Temperature: 21.7 °C Barometer: 992.2 mbar

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

GEOKON 48 Spencer St. Lebanon, NH 03766 USA

Vibrating Wire Pressure Transducer Calibration Report

Model Number: 4500DPCT-350 kPa

Date of Calibration: June 26, 2018

This calibration has been verified/validated as of 08/10/2018

Serial Number: 1820251

Temperature: 23.30 °C

Calibration Instruction: CI-Pressure Transducer 7 kPa~3 MPa

Barometric Pressure: 1003.2 mbar

Cable Length: 50 feet

Technician: Kathy Rogers

Applied Pressure (kPa)	Gauge Reading 1st Cycle	Gauge Reading 2nd Cycle	Average Gauge Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	8647	8648	8648	-1.484	-0.42	-0.011	0.00
70.0	7945	7945	7945	70.42	0.13	70.07	0.03
140.0	7255	7255	7255	141.1	0.30	139.8	-0.06
210.0	6569	6569	6569	211.3	0.38	210.1	0.03
279.9	5895	5895	5895	280.3	0.09	280.0	0.01
349.9	5229	5229	5229	348.4	-0.44	349.9	-0.02

(kPa) Linear Gauge Factor (G): -0.1024 (kPa/ digit)

Polynomial Gauge factors: A: 9.582E-07 B: -0.1157 C: ________

Thermal Factor (K): 0.01710 (kPa/ °C)

Calculate C by setting P=0 and R_1 = initial field zero reading into the polynomial equation

(psi) Linear Gauge Factor (G): -0.01485 (psi/ digit)

Polynomial Gauge Factors: A: 1.39E-07 B: -0.01677 C: ________

Thermal Factor (K): 0.002480 (psi/ °C)

Calculate C by setting P=0 and R_1 = initial field zero reading into the polynomial equation

Calculated Pressures:

Linear, $P = G(R_1 - R_0) + K(T_1 - T_0) - (S_1 - S_0)^*$

Polynomial, $P = AR_1^2 + BR_1 + C + K(T_1 - T_0) - (S_1 - S_0)^*$

*Barometric pressures expressed in kPa or psi. Barometric compensation is not required with vented transducers.

Factory Zero Reading: 8657 Temperature: 22.1 °C Barometer: 992.2 mbar

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

GEOKON 48 Spencer St. Lebanon, NH 03766 USA

Vibrating Wire Pressure Transducer Calibration Report

Model Number: 4500DPCT-350 kPa

Date of Calibration: June 26, 2018

This calibration has been verified/validated as of 08/10/2018

Serial Number: 1820252

Temperature: 23.30 °C

Calibration Instruction: CI-Pressure Transducer 7 kPa~3 MPa

Barometric Pressure: 1003.2 mbar

Cable Length: 50 feet

Technician: Kathy Rogers

Applied Pressure (kPa)	Gauge Reading 1st Cycle	Gauge Reading 2nd Cycle	Average Gauge Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	8939	8940	8940	-1.011	-0.29	0.089	0.03
70.0	8202	8203	8203	69.96	0.00	69.79	-0.05
140.0	7466	7466	7466	140.9	0.25	140.1	0.02
210.0	6740	6741	6741	210.7	0.22	210.0	0.00
279.9	6019	6020	6020	280.2	0.06	280.0	0.02
349.9	5307	5307	5307	348.8	-0.34	349.9	-0.03

(kPa) Linear Gauge Factor (G): -0.09629 (kPa/ digit)

Polynomial Gauge factors: **A: 5.956E-07** **B: -0.1048** **C:**

Thermal Factor (K): 0.06529 (kPa/ °C)

Calculate C by setting P=0 and R_1 = initial field zero reading into the polynomial equation

(psi) Linear Gauge Factor (G): -0.01397 (psi/ digit)

Polynomial Gauge Factors: **A: 8.639E-08** **B: -0.01520** **C:**

Thermal Factor (K): 0.009469 (psi/ °C)

Calculate C by setting P=0 and R_1 = initial field zero reading into the polynomial equation

Calculated Pressures:

Linear, $P = G(R_1 - R_0) + K(T_1 - T_0) - (S_1 - S_0)$*

Polynomial, $P = AR_1^2 + BR_1 + C + K(T_1 - T_0) - (S_1 - S_0)$*

*Barometric pressures expressed in kPa or psi. Barometric compensation is not required with vented transducers.

Factory Zero Reading: 8948 **Temperature: 22.4 °C** **Barometer: 992.2 mbar**

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

GEOKON 48 Spencer St. Lebanon, NH 03766 USA

Vibrating Wire Pressure Transducer Calibration Report

Model Number: 4500DPCT-350 kPa

Date of Calibration: June 26, 2018

This calibration has been verified/validated as of 08/10/2018

Serial Number: 1820253

Temperature: 23.30 °C

Calibration Instruction: CI-Pressure Transducer 7 kPa~3 MPa

Barometric Pressure: 1003.2 mbar

Cable Length: 50 feet

Technician: Kathy Rogers

Applied Pressure (kPa)	Gauge Reading 1st Cycle	Gauge Reading 2nd Cycle	Average Gauge Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	8804	8805	8805	-1.419	-0.41	-0.010	0.00
70.0	8122	8123	8123	70.26	0.08	70.02	0.01
140.0	7450	7450	7450	140.9	0.27	139.9	-0.03
210.0	6783	6783	6783	211.0	0.31	210.0	0.03
279.9	6126	6126	6126	280.1	0.04	279.9	-0.01
349.9	5475	5475	5475	348.5	-0.41	349.9	-0.01

(kPa) Linear Gauge Factor (G): -0.1051 (kPa/ digit)

Polynomial Gauge factors: **A: 9.126E-07** **B: -0.1181** **C: ______**

Thermal Factor (K): 0.02004 (kPa/ °C)

Calculate C by setting P=0 and R_1 = initial field zero reading into the polynomial equation

(psi) Linear Gauge Factor (G): -0.01524 (psi/ digit)

Polynomial Gauge Factors: **A: 1.324E-07** **B: -0.01713** **C: ______**

Thermal Factor (K): 0.002907 (psi/ °C)

Calculate C by setting P=0 and R_1 = initial field zero reading into the polynomial equation

Calculated Pressures:

Linear, $P = G(R_1 - R_0) + K(T_1 - T_0) - (S_1 - S_0)^*$

Polynomial, $P = AR_1^2 + BR_1 + C + K(T_1 - T_0) - (S_1 - S_0)^*$

*Barometric pressures expressed in kPa or psi. Barometric compensation is not required with vented transducers.

Factory Zero Reading: 8813 **Temperature: 21.7 °C** **Barometer: 992.2 mbar**

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

GEOKON 48 Spencer St. Lebanon, NH 03766 USA

Vibrating Wire Pressure Transducer Calibration Report

Model Number: 4500DPCT-350 kPa

Date of Calibration: August 06, 2018

This calibration has been verified/validated as of 08/10/2018

Serial Number: 1828379

Temperature: 23.20 °C

Calibration Instruction: CI-Pressure Transducer 7 kPa~3 MPa

Barometric Pressure: 996.8 mbar

Cable Length: 40 feet

Technician: Kathy Rogers

Applied Pressure (kPa)	Gauge Reading 1st Cycle	Gauge Reading 2nd Cycle	Average Gauge Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	8868	8869	8869	-1.328	-0.38	0.072	0.02
70.0	8088	8089	8089	70.13	0.04	69.86	-0.03
140.0	7315	7315	7315	141.0	0.29	139.9	-0.02
209.9	6550	6550	6550	211.1	0.33	210.0	0.02
280.0	5795	5795	5795	280.3	0.08	280.0	0.01
350.1	5049	5049	5049	348.6	-0.41	350.0	-0.01

(kPa) Linear Gauge Factor (G): -0.09162 (kPa/ digit)

Polynomial Gauge factors: **A: 7.063E-07** **B: -0.1014** **C:** ______

Thermal Factor (K): 0.02143 (kPa/ °C)

Calculate C by setting P=0 and R_1 = initial field zero reading into the polynomial equation

(psi) Linear Gauge Factor (G): -0.01329 (psi/ digit)

Polynomial Gauge Factors: **A: 1.024E-07** **B: -0.01471** **C:** ______

Thermal Factor (K): 0.003108 (psi/ °C)

Calculate C by setting P=0 and R_1 = initial field zero reading into the polynomial equation

Calculated Pressures:

Linear, $P = G(R_1 - R_0) + K(T_1 - T_0) - (S_1 - S_0)^*$

Polynomial, $P = AR_1^2 + BR_1 + C + K(T_1 - T_0) - (S_1 - S_0)^*$

*Barometric pressures expressed in kPa or psi. Barometric compensation is not required with vented transducers.

Factory Zero Reading: 8870 **Temperature: 22.3 °C** **Barometer: 992.2 mbar**

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

GEOKON 48 Spencer St. Lebanon, NH 03766 USA

Vibrating Wire Pressure Transducer Calibration Report

Model Number: 4500DPCT-350 kPa

Date of Calibration: August 06, 2018

This calibration has been verified/validated as of 08/10/2018

Serial Number: 1828380

Temperature: 23.20 °C

Calibration Instruction: CI-Pressure Transducer 7 kPa~3 MPa

Barometric Pressure: 996.8 mbar

Cable Length: 40 feet

Technician: Kathy Rogers

Applied Pressure (kPa)	Gauge Reading 1st Cycle	Gauge Reading 2nd Cycle	Average Gauge Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	8945	8948	8947	-1.384	-0.39	0.126	0.04
70.0	8248	8249	8249	70.15	0.05	69.80	-0.05
140.0	7556	7557	7557	141.1	0.31	139.8	-0.05
209.9	6870	6871	6871	211.4	0.41	210.2	0.06
280.0	6197	6198	6198	280.4	0.10	280.1	0.02
350.1	5533	5533	5533	348.5	-0.46	350.0	-0.03

(kPa) Linear Gauge Factor (G): -0.1025 (kPa/ digit)

Polynomial Gauge factors: A: 9.834E-07 B: -0.1167 C: ________

Thermal Factor (K): 0.04028 (kPa/ °C)

Calculate C by setting P=0 and R_1 = initial field zero reading into the polynomial equation

(psi) Linear Gauge Factor (G): -0.01486 (psi/ digit)

Polynomial Gauge Factors: A: 1.426E-07 B: -0.01693 C: ________

Thermal Factor (K): 0.005842 (psi/ °C)

Calculate C by setting P=0 and R_1 = initial field zero reading into the polynomial equation

Calculated Pressures:

Linear, $P = G(R_1 - R_0) + K(T_1 - T_0) - (S_1 - S_0)^*$

Polynomial, $P = AR_1^2 + BR_1 + C + K(T_1 - T_0) - (S_1 - S_0)^*$

*Barometric pressures expressed in kPa or psi. Barometric compensation is not required with vented transducers.

Factory Zero Reading: 8954 Temperature: 22.2 °C Barometer: 992.2 mbar

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

GEOKON 48 Spencer St. Lebanon, NH 03766 USA

Vibrating Wire Pressure Transducer Calibration Report

Model Number: 4500DPCT-350 kPa

Date of Calibration: August 06, 2018

This calibration has been verified/validated as of 08/10/2018

Serial Number: 1828382

Temperature: 23.20 °C

Calibration Instruction: CI-Pressure Transducer 7 kPa~3 MPa

Barometric Pressure: 996.8 mbar

Cable Length: 40 feet

Technician: Kathy Rogers

Applied Pressure (kPa)	Gauge Reading 1st Cycle	Gauge Reading 2nd Cycle	Average Gauge Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	8816	8818	8817	-1.217	-0.35	0.089	0.03
70.0	8114	8115	8115	70.06	0.02	69.76	-0.06
140.0	7415	7413	7414	141.1	0.33	140.1	0.02
209.9	6724	6725	6725	211.1	0.32	210.0	0.02
280.0	6043	6044	6044	280.2	0.05	279.9	-0.02
350.1	5368	5367	5368	348.8	-0.37	350.1	0.00

(kPa) Linear Gauge Factor (G): -0.1015 (kPa/ digit)

Polynomial Gauge factors: A: 8.288E-07 B: -0.1132 C: ______

Thermal Factor (K): 0.04847 (kPa/ °C)

Calculate C by setting P=0 and R_1 = initial field zero reading into the polynomial equation

(psi) Linear Gauge Factor (G): -0.01471 (psi/ digit)

Polynomial Gauge Factors: A: 1.202E-07 B: -0.01642 C: ______

Thermal Factor (K): 0.007030 (psi/ °C)

Calculate C by setting P=0 and R_1 = initial field zero reading into the polynomial equation

Calculated Pressures:

Linear, $P = G(R_1 - R_0) + K(T_1 - T_0) - (S_1 - S_0)^*$

Polynomial, $P = AR_1^2 + BR_1 + C + K(T_1 - T_0) - (S_1 - S_0)^*$

*Barometric pressures expressed in kPa or psi. Barometric compensation is not required with vented transducers.

Factory Zero Reading: 8818 Temperature: 22.2 °C Barometer: 992.2 mbar

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

GEOKON 48 Spencer St. Lebanon, NH 03766 USA

Vibrating Wire Pressure Transducer Calibration Report

Model Number: 4500DPCT-350 kPa

Date of Calibration: August 06, 2018

This calibration has been verified/validated as of 08/10/2018

Serial Number: 1828383

Temperature: 23.20 °C

Calibration Instruction: CI-Pressure Transducer 7 kPa~3 MPa

Barometric Pressure: 996.8 mbar

Cable Length: 40 feet

Technician: Kathy Rogers

Applied Pressure (kPa)	Gauge Reading 1st Cycle	Gauge Reading 2nd Cycle	Average Gauge Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	8857	8858	8858	-1.309	-0.37	0.075	0.02
70.0	8120	8121	8121	70.14	0.05	69.83	-0.04
140.0	7388	7389	7389	141.1	0.32	140.0	0.00
209.9	6666	6667	6667	211.1	0.33	210.0	0.01
280.0	5953	5953	5953	280.3	0.08	280.0	0.01
350.1	5248	5248	5248	348.6	-0.40	350.0	-0.01

(kPa) Linear Gauge Factor (G): -0.09695 (kPa/ digit)

Polynomial Gauge factors: **A: 8.023E-07** **B: -0.1083** **C:** ______

Thermal Factor (K): 0.006399 (kPa/ °C)

Calculate C by setting P=0 and R_1 = initial field zero reading into the polynomial equation

(psi) Linear Gauge Factor (G): -0.01406 (psi/ digit)

Polynomial Gauge Factors: **A: 1.164E-07** **B: -0.01570** **C:** ______

Thermal Factor (K): 0.0009281 (psi/ °C)

Calculate C by setting P=0 and R_1 = initial field zero reading into the polynomial equation

Calculated Pressures:

Linear, $P = G(R_1 - R_0) + K(T_1 - T_0) - (S_1 - S_0)^*$

Polynomial, $P = AR_1^2 + BR_1 + C + K(T_1 - T_0) - (S_1 - S_0)^*$

*Barometric pressures expressed in kPa or psi. Barometric compensation is not required with vented transducers.

Factory Zero Reading: 8856 **Temperature: 22.2 °C** **Barometer: 992.2 mbar**

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

GEOKON 48 Spencer St. Lebanon, NH 03766 USA

Vibrating Wire Pressure Transducer Calibration Report

Model Number: 4500DPCT-350 kPa

Date of Calibration: August 06, 2018

This calibration has been verified/validated as of 08/10/2018

Serial Number: 1828384

Temperature: 23.20 °C

Calibration Instruction: CI-Pressure Transducer 7 kPa~3 MPa

Barometric Pressure: 996.8 mbar

Cable Length: 40 feet

Technician: Kathy Rogers

Applied Pressure (kPa)	Gauge Reading 1st Cycle	Gauge Reading 2nd Cycle	Average Gauge Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	8818	8819	8819	-0.809	-0.23	0.122	0.04
70.0	8074	8074	8074	70.01	0.01	69.85	-0.04
140.0	7334	7334	7334	140.4	0.12	139.7	-0.08
209.9	6593	6593	6593	210.9	0.27	210.2	0.07
280.0	5864	5864	5864	280.2	0.07	280.1	0.03
350.1	5141	5141	5141	349.0	-0.30	349.9	-0.03

(kPa) Linear Gauge Factor (G): -0.09512 (kPa/ digit)

Polynomial Gauge factors: **A: 4.995E-07** **B: -0.1021** **C:** ______

Thermal Factor (K): 0.08094 (kPa/ °C)

Calculate C by setting P=0 and R_1 = initial field zero reading into the polynomial equation

(psi) Linear Gauge Factor (G): -0.01380 (psi/ digit)

Polynomial Gauge Factors: **A: 7.244E-08** **B: -0.01481** **C:** ______

Thermal Factor (K): 0.01174 (psi/ °C)

Calculate C by setting P=0 and R_1 = initial field zero reading into the polynomial equation

Calculated Pressures:

Linear, $P = G(R_1 - R_0) + K(T_1 - T_0) - (S_1 - S_0)$*

Polynomial, $P = AR_1^2 + BR_1 + C + K(T_1 - T_0) - (S_1 - S_0)$*

*Barometric pressures expressed in kPa or psi. Barometric compensation is not required with vented transducers.

Factory Zero Reading: 8823 **Temperature: 22.2 °C** **Barometer: 992.2 mbar**

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

GEOKON 48 Spencer St. Lebanon, NH 03766 USA

Vibrating Wire Pressure Transducer Calibration Report

Model Number: 4500DPCT-350 kPa

Date of Calibration: August 06, 2018

This calibration has been verified/validated as of 08/10/2018

Serial Number: 1828385

Temperature: 23.20 °C

Calibration Instruction: CI-Pressure Transducer 7 kPa~3 MPa

Barometric Pressure: 996.8 mbar

Cable Length: 40 feet

Technician: Kathy Rogers

Applied Pressure (kPa)	Gauge Reading 1st Cycle	Gauge Reading 2nd Cycle	Average Gauge Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	8794	8796	8795	-1.195	-0.34	0.068	0.02
70.0	8078	8079	8079	70.16	0.05	69.94	-0.01
140.0	7370	7370	7370	140.7	0.21	139.8	-0.06
209.9	6665	6666	6666	210.9	0.26	210.0	0.00
280.0	5967	5967	5967	280.4	0.13	280.3	0.08
350.1	5282	5282	5282	348.6	-0.40	349.9	-0.04

(kPa) Linear Gauge Factor (G): -0.09958 (kPa/ digit)

Polynomial Gauge factors: A: 7.371E-07 B: -0.1100 C: ________

Thermal Factor (K): 0.02163 (kPa/ °C)

Calculate C by setting P=0 and R_1 = initial field zero reading into the polynomial equation

(psi) Linear Gauge Factor (G): -0.01444 (psi/ digit)

Polynomial Gauge Factors: A: 1.069E-07 B: -0.01595 C: ________

Thermal Factor (K): 0.003137 (psi/ °C)

Calculate C by setting P=0 and R_1 = initial field zero reading into the polynomial equation

Calculated Pressures:

Linear, $P = G(R_1 - R_0) + K(T_1 - T_0) - (S_1 - S_0)^*$

Polynomial, $P = AR_1^2 + BR_1 + C + K(T_1 - T_0) - (S_1 - S_0)^*$

*Barometric pressures expressed in kPa or psi. Barometric compensation is not required with vented transducers.

Factory Zero Reading: 8801 Temperature: 22.4 °C Barometer: 992.2 mbar

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

GEOKON 48 Spencer St. Lebanon, NH 03766 USA

Vibrating Wire Pressure Transducer Calibration Report

Model Number: 4500DPCT-350 kPa

Date of Calibration: August 06, 2018

This calibration has been verified/validated as of 08/10/2018

Serial Number: 1828386

Temperature: 23.20 °C

Calibration Instruction: CI-Pressure Transducer 7 kPa~3 MPa

Barometric Pressure: 996.8 mbar

Cable Length: 40 feet

Technician: Kathy Rogers

Applied Pressure (kPa)	Gauge Reading 1st Cycle	Gauge Reading 2nd Cycle	Average Gauge Reading	Calculated Pressure (Linear)	Error Linear (%FS)	Calculated Pressure (Polynomial)	Error Polynomial (%FS)
0.0	8899	8902	8901	-1.555	-0.44	0.126	0.04
70.0	8186	8186	8186	70.11	0.04	69.79	-0.05
140.0	7478	7478	7478	141.1	0.33	139.8	-0.04
209.9	6778	6778	6778	211.3	0.40	210.1	0.04
280.0	6090	6090	6090	280.4	0.11	280.1	0.04
350.1	5413	5413	5413	348.3	-0.51	349.9	-0.03

(kPa) Linear Gauge Factor (G): -0.1003 (kPa/ digit)

Polynomial Gauge factors: A: 1.011E-06 B: -0.1148 C: ______

Thermal Factor (K): 0.005295 (kPa/ °C)

Calculate C by setting P=0 and R_1 = initial field zero reading into the polynomial equation

(psi) Linear Gauge Factor (G): -0.01455 (psi/ digit)

Polynomial Gauge Factors: A: 1.466E-07 B: -0.01665 C: ______

Thermal Factor (K): 0.0007679 (psi/ °C)

Calculate C by setting P=0 and R_1 = initial field zero reading into the polynomial equation

Calculated Pressures:

Linear, $P = G(R_1 - R_0) + K(T_1 - T_0) - (S_1 - S_0)$*

Polynomial, $P = AR_1^2 + BR_1 + C + K(T_1 - T_0) - (S_1 - S_0)$*

*Barometric pressures expressed in kPa or psi. Barometric compensation is not required with vented transducers.

Factory Zero Reading: 8901 Temperature: 22.2 °C Barometer: 992.2 mbar

The above instrument was found to be in tolerance in all operating ranges.
The above named instrument has been calibrated by comparison with standards traceable to the NIST, in compliance with ANSI Z540-1.

APPENDIX B

Geotechnical Boring Logs

Geosyntec consultants

BOREHOLE LOG

GB-01

Client: WMDSM - Crossroads Landfill
Project Name: 2019 Phase 14 Geotechnical Investigation
Project Location: Norridgewock, Maine
Project Number: BE0232

Drilling Contractor: New England Boring Contractors
Surface Elevation (ft.): 298.43 (NAVD 88)
Drilling Method/Rig: Drive and Wash/CME
Total Depth (ft.): 31
Drillers: Tom Shaefer, Mark Titus
Abandonment Method: Bentonite Chips
Drilling Date: Start: 11 March 2019 **End:** 11 March 2019
Logged By: Zachary Tanguay
Borehole Coordinates:
N 686,030.30 E 3,038,601.86

Sample Type	Blows per 6 inches	Sample Recovery (Inches)	Elev. Depth (ft.)	Graphic Log	USCS Stratum Designation	Material Description
			0			(0'-1') Roller bit through ice and frost.
SS	2 5 6 7	24/16			SP	(1'-2.3') Dry, medium dense, brown, medium to fine SAND, little silt, little organics (SP)
SS	5 8 9 8	24/18			SP	(3'-4.5') Dry, medium dense, brown, medium to fine SAND, little silt, trace organics (SP)
SS	5 9 9 10	24/14	5		SP	(5'-6.2') Moist, medium dense, brown, medium to fine SAND, little silt (SP)
SS	7 10 12 13	24/13			SP	(7'-8.1') Wet, medium dense, brown, medium to fine SAND, little silt (SP)
SS	6 10 11 12	24/9	10		SP	(9'-9.8') Wet, medium dense, brown, medium to fine SAND, little silt (SP)
SS	10 19 19 19	24/13			SP	(11'-12.1') Wet, dense, brown, medium to fine SAND, little silt (SP)
SS	6 10 16 16	24/23			CL	(13'-14.9') Wet, very stiff, brown, CLAY, some silt, little fine sand (CL)
SS	7 10 12 10	24/24	15		CL	(15'-17') Wet, very stiff, brown, CLAY, some silt, little fine sand (CL)
SS	4 11 20 11	24/24			CL	(17'-19') Wet, hard, brown, CLAY, little silt (CL)
					CL	(19'-20.8') Shelby tube collected. Wet, brown, CLAY (CL) Pocket Penetrometer: 1.25, 1.5, and 1.75 Tons/FT2

EXPLANATION OF ABBREVIATIONS

DRILLING METHODS:
HSA - Hollow Stem Auger
SSA - Solid Stem Auger
HA - Hand Auger
AR - Air Rotary
DTR - Dual Tube Rotary
FR - Foam Rotary
MR - Mud Rotary
RC - Reverse Circulation
CT - Cable Tool
JET - Jetting
D - Driving
DTC - Drill Through Casing

SAMPLING TYPES:
AS - Auger/Grab Sample
CS - California Sampler
BX - 1.5" Rock Core
NX - 2.1" Rock Core
GP - Geoprobe
HP - Hydro Punch
SS - Split Spoon
ST - Shelby Tube
WS - Wash Sample
OTHER:
AGS - Above Ground Surface

REMARKS

1. Wash water started at 7 ft bgs.
2. Depth measured from top of 1-ft thick ice and frost.

Reviewed by: NJY & YMC **Date:** 17 June 2019

Geosyntec consultants

BOREHOLE LOG

GB-01

Client: WMDSM - Crossroads Landfill

Project Location: Norridgewock, Maine

Project Name: 2019 Phase 14 Geotechnical Investigation

Project Number: BE0232

Sample Type	Blows per 6 inches	Sample Recovery (Inches)	Elev. Depth (ft.)	Graphic Log	USCS Stratum Designation	Material Description
SH		22/22	20			
			25			Drilled through refusal.
SS	20 13 11 11	24/8			ML	(26'-26.7') Wet, very stiff, brown, SILT, some coarse to fine sand, some medium to fine gravel (ML)
			30 35 40 45 50			Bedrock encountered at 29.3 ft bgs. Roller bit 2 ft into bedrock for confirmation. End of exploration at 31 ft bgs.

Geosyntec consultants

BOREHOLE LOG

GB-02

Client: WMDSM - Crossroads Landfill
Project Name: 2019 Phase 14 Geotechnical Investigation
Project Location: Norridgewock, Maine
Project Number: BE0232

Drilling Contractor: New England Boring Contractors
Surface Elevation (ft.): 295.03 (NAVD 88)
Drilling Method/Rig: Drive and Wash/CME
Total Depth (ft.): 17.5
Drillers: Tom Shaefer, Mark Titus
Abandonment Method: Bentonite Chips
Drilling Date: Start: 12 March 2019 **End:** 12 March 2019
Logged By: Zachary Tanguay
Borehole Coordinates:
N 685,714.16 E 3,039,269.62

Sample Type	Blows per 6 inches	Sample Recovery (Inches)	Elev. Depth (ft.)	Graphic Log	USCS Stratum Designation	Material Description
			0			(0'-1') Roller bit through ice and frost.
SS	2 5 6 8	24/18			SP	(1'-2.5') Moist, medium dense, brown, medium to fine SAND, little silt, little organics (SP)
SS	7 9 9 11	24/18			SP	(3'-4.5') Moist, medium dense, brown, medium to fine SAND, little silt (SP)
SS	6 10 11 16	24/19	5		SP	(5'-6.6') Moist, medium dense, brown, medium to fine SAND, little silt (SP)
SS	4 5 6 7	24/17			SP CL CL	(7'-7.5') Wet, medium dense, brown, medium to fine SAND, little silt (SP) (7.5'-8') Wet, stiff, brown, CLAY, some medium to fine sand, some silt (CL) (8'-8.4') Wet, stiff, gray, CLAY, trace silt (CL)
SH		24/24	10		CL	(9'-11') Shelby tube collected. Wet, gray, CLAY, little silt (CL)
SS	2 2 5 3	24/20			CL	(11'-12.8') Wet, firm, gray, CLAY, little silt (CL) 1/8 inch thick medium to fine sand lens at 11.9 ft bgs
SS	2 3 2 9	24/20			CL	(13'-14.8') Wet, firm, gray, CLAY, little silt (CL)
SS	50/4"	4/4	15		ML	(15'-15.4') Wet, very hard, gray, SILT, some coarse to fine sand, trace fine gravel (ML) Bedrock encountered at 15.4 ft bgs. Roller bit 2 ft into bedrock for confirmation. End of exploration at 17.5 ft bgs.

EXPLANATION OF ABBREVIATIONS

DRILLING METHODS:
- HSA - Hollow Stem Auger
- SSA - Solid Stem Auger
- HA - Hand Auger
- AR - Air Rotary
- DTR - Dual Tube Rotary
- FR - Foam Rotary
- MR - Mud Rotary
- RC - Reverse Circulation
- CT - Cable Tool
- JET - Jetting
- D - Driving
- DTC - Drill Through Casing

SAMPLING TYPES:
- AS - Auger/Grab Sample
- CS - California Sampler
- BX - 1.5" Rock Core
- NX - 2.1" Rock Core
- GP - Geoprobe
- HP - Hydro Punch
- SS - Split Spoon
- ST - Shelby Tube
- WS - Wash Sample

OTHER:
- AGS - Above Ground Surface

REMARKS

1. Wash water started at 9 ft bgs.
2. Depth measured from top of 1-ft thick ice and frost.

Reviewed by: NJY & YMC
Date: 17 June 2019

Geosyntec consultants

BOREHOLE LOG

GB-03

Client: WMDSM - Crossroads Landfill
Project Name: 2019 Phase 14 Geotechnical Investigation
Project Location: Norridgewock, Maine
Project Number: BE0232

Drilling Contractor: New England Boring Contractors
Surface Elevation (ft.): 285.02 (NAVD 88)
Drilling Method/Rig: Drive and Wash/CME
Total Depth (ft.): 21
Drillers: Tom Shaefer, Mark Titus
Abandonment Method: Bentonite Chips
Drilling Date: Start: 20 March 2019 **End:** 21 March 2019
Logged By: Zachary Tanguay
Borehole Coordinates:
N 685,510.93 E 3,039,072.22

Sample Type	Blows per 6 inches	Sample Recovery (Inches)	Elev. Depth (ft.)	Graphic Log	USCS Stratum Designation	Material Description
			0			(0'-1') Roller bit through ice and frost.
SS	5 6 5 7	24/17			ML CL	(1'-1.5') Wet, stiff, brown, SILT, little medium to fine sand, little organics (ML) (1.5'-2.6') Wet, stiff, brown, CLAY, little silt (CL)
SH		24/24			CL	(3'-5') Shelby tube collected. Wet, brown, CLAY, little silt (CL)
SS	5 4 4 4	24/24	5		CL	(5'-7') Wet, firm, brown, CLAY, little silt (CL) 1/8 inch thick lens of fine sand at 6 ft bgs
SS	10 19 17 23	24/17			CL ML	(7'-7.5') Wet, hard, brown, CLAY (CL) (7.5'-8.6') Wet, hard, brown, SILT, some coarse to fine sand, little medium to fine gravel (ML)
SS	4 7 50/6"	18/6	10		ML	(10'-10.5') Wet, very hard, grayish brown, SILT, some medium to fine sand, little medium to fine gravel (ML)
SS	11 8 7 7	24/9	15		SM	(15'-15.8') Wet, medium dense, brown, coarse to fine SAND, some silt, little medium to fine grave (SM)
						Bedrock encountered at 18.8 ft bgs. Drilled 2 ft into bedrock to confirm. End of exploration at 21 ft bgs.

EXPLANATION OF ABBREVIATIONS

DRILLING METHODS:
HSA - Hollow Stem Auger
SSA - Solid Stem Auger
HA - Hand Auger
AR - Air Rotary
DTR - Dual Tube Rotary
FR - Foam Rotary
MR - Mud Rotary
RC - Reverse Circulation
CT - Cable Tool
JET - Jetting
D - Driving
DTC - Drill Through Casing

SAMPLING TYPES:
AS - Auger/Grab Sample
CS - California Sampler
BX - 1.5" Rock Core
NX - 2.1" Rock Core
GP - Geoprobe
HP - Hydro Punch
SS - Split Spoon
ST - Shelby Tube
WS - Wash Sample
OTHER:
AGS - Above Ground Surface

REMARKS

1. Wash water started at 11.5 ft bgs.
2. Depth measured from top of 1-ft thick ice and frost.

Reviewed by: NJY & YMC
Date: 17 June 2019

Geosyntec consultants

BOREHOLE LOG

GB-04

Client: WMDSM - Crossroads Landfill
Project Name: 2019 Phase 14 Geotechnical Investigation
Project Location: Norridgewock, Maine
Project Number: BE0232

Drilling Contractor: New England Boring Contractors
Surface Elevation (ft.): 287.15 (NAVD 88)
Drilling Method/Rig: Drive and Wash/CME
Total Depth (ft.): 34.5
Drillers: Tom Shaefer, Mark Titus
Abandonment Method: Bentonite Chips
Drilling Date: Start: 26 March 2019 **End:** 26 March 2019
Logged By: Zachary Tanguay
Borehole Coordinates:
N 685,210.82 E 3,039,100.49

Sample Type	Blows per 6 inches	Sample Recovery (Inches)	Elev. Depth (ft.)	Graphic Log	USCS Stratum Designation	Material Description
			0			(0'-1') Roller bit through ice and frost.
SS	7 7 5 4	24/3			ML	(1'-1.3') Moist, stiff, brown, SILT, some coarse to fine sand, little fine gravel (ML)
SS	3 5 6 7	24/10			ML SP	(3'-3.4') Moist, stiff, brown, SILT, some clay, some medium to fine sand (ML) (3.4'-3.9') Moist, medium dense, brown, medium to fine SAND, little silt (SP)
SS	18 15 14 15	24/21	5		SP	(5'-6.8') Moist, medium dense, brown, medium to fine SAND, little silt (SP)
SS	6 9 9 8	24/18			SP CL	(7'-7.5') Wet, medium dense, brown, medium to fine SAND, little silt (SP) (7.5'-8.5') Wet, very stiff, brown, CLAY, little silt (CL)
SS	4 8 8 13	24/19	10		CL	(9'-10.6') Wet, very stiff, grayish brown, CLAY, little silt (CL)
SH		24/20			CL	(11'-12.7') Shelby tube collected. Wet, grayish brown, CLAY (CL)
SS	7 12 19 26	24/24			CL	(13'-15') Wet, hard, gray, CLAY, little silt (CL)
SS	11 10 13 15	24/24	15		CL	(15'-17') Wet, very stiff, gray, CLAY, little silt (CL) 1/8 inch thick lens of fine sand at 16.8 ft bgs
SS	WOH WOH WOH WOH	24/24			CL	(17'-19') Wet, very soft, CLAY (CL)
					CL	(19'-21') Shelby tube collected. Wet, gray, CLAY (CL)

EXPLANATION OF ABBREVIATIONS

DRILLING METHODS:
HSA - Hollow Stem Auger
SSA - Solid Stem Auger
HA - Hand Auger
AR - Air Rotary
DTR - Dual Tube Rotary
FR - Foam Rotary
MR - Mud Rotary
RC - Reverse Circulation
CT - Cable Tool
JET - Jetting
D - Driving
DTC - Drill Through Casing

SAMPLING TYPES:
AS - Auger/Grab Sample
CS - California Sampler
BX - 1.5" Rock Core
NX - 2.1" Rock Core
GP - Geoprobe
HP - Hydro Punch
SS - Split Spoon
ST - Shelby Tube
WS - Wash Sample
OTHER:
AGS - Above Ground Surface

REMARKS

1. Wash water started at 9 ft bgs.
2. Depth measured from top of 1-ft thick ice and frost.

Reviewed by: NJY & YMC **Date:** 17 June 2019

Geosyntec consultants

BOREHOLE LOG

GB-04

Client: WMDSM - Crossroads Landfill
Project Name: 2019 Phase 14 Geotechnical Investigation
Project Location: Norridgewock, Maine
Project Number: BE0232

Sample Type	Blows per 6 inches	Sample Recovery (Inches)	Elev. Depth (ft.)	Graphic Log	USCS Stratum Designation	Material Description
SH		24/24	20			
SS	WOH WOH WOH 6	24/24			CL	(21'-22.9') Wet, very soft, gray, CLAY (CL) 1/8 inch thick lens of fine sand at 21.7 ft bgs
					ML	(22.9'-23') Wet, very soft, gray, SILT, some coarse to fine sand, little clay (ML)
SS	17 12 11 6	24/6	25		SM	(25'-25.5') Wet, medium dense, gray, coarse to fine SAND, some silt, some medium to fine gravel (SM)
SS	17 18 31 33	24/15	30		SM	(29'-30.3') Wet, dense, gray, coarse to fine SAND, some silt, some medium to fine gravel (SM)
						Bedrock encountered at 32.7ft bgs. Drilled 2 ft into bedrock to confirm. End of exploration.
			35			
			40			
			45			
			50			

GEOSYNTEC BL_NO SAMPLE_NO PPM CROSSROADS 4.GPJ CDM_MA.GDT 8/5/19

Geosyntec consultants

BOREHOLE LOG

GB-05

Client: WMDSM - Crossroads Landfill
Project Name: 2019 Phase 14 Geotechnical Investigation
Project Location: Norridgewock, Maine
Project Number: BE0232

Drilling Contractor: New England Boring Contractors
Surface Elevation (ft.): 294.18 (NAVD 88)
Drilling Method/Rig: Drive and Wash/CME
Total Depth (ft.): 43
Drillers: Tom Shaefer, Mark Titus
Abandonment Method: Bentonite Chips
Drilling Date: Start: 25 March 2019 **End:** 25 March 2019
Logged By: Zachary Tanguay
Borehole Coordinates:
N 685,141.23 E 3,038,807.03

Sample Type	Blows per 6 inches	Sample Recovery (Inches)	Elev. Depth (ft.)	Graphic Log	USCS Stratum Designation	Material Description
			0			(0'-1') Roller bit through ice and frost.
SS	6 5 5 9	24/16			ML	(1'-2.4') Moist, stiff, grayish brown, SILT, some clay, some medium to fine sand (ML)
SS	6 7 7 10	24/18			ML	(3'-4.5') Moist, stiff, grayish brown, SILT, some clay, some coarse to fine sand, little fine gravel (ML)
SS	3 5 4 4	24/15	5		ML CL	(5'-5.9') Moist, stiff, grayish brown, SILT, some clay, some coarse to fine sand, little fine gravel (ML) 1/8 inch thick lens of medium to fine sand at 5.8 ft bgs (5.9'-6.3') Moist, stiff, gray, CLAY, little silt, little fine sand (CL)
SS	1 3 3 3	24/13			CL SM	brown staining at 6.2 ft bgs (7'-7.9') Moist, firm, grayish brown, CLAY, some silt, little coarse to fine sand, trace fine gravel (CL) (7.9'-8.1') Moist, loose, brown, medium to fine SAND, some silt, trace fine gravel (SM)
SS	2 5 5 6	24/16	10		SM	(9'-10.4') Moist, loose, brown, medium to fine SAND, some silt, some clay, trace fine gravel (SM)
SS	3 3 3 5	24/12			ML SM	(11'-11.8') Wet, firm, grayish brown, SILT, some coarse to fine sand, some clay, trace fine gravel (ML) (11.8'-12') Wet, loose, gray, medium to fine SAND, some silt (SM)
SS	3 6 5 6	24/12			SM	(13'-14') Wet, medium dense, gray, medium to fine SAND, some silt, some clay, trace fine gravel (SM)
SS	6 13 17 17	24/12	15		SM SP	(15'-15.4') Wet, medium dense, gray, medium to fine SAND, some silt, some clay, little fine gravel (SM) (15.4'-16') Wet, medium dense, brown, medium to fine SAND, little silt (SP)
SS	23 33 25 19	24/0				(17'-19') No Recovery.
	7 9				CL	(19'-20.8') Wet, very stiff, brown, CLAY, some silt, trace fine sand (CL)

EXPLANATION OF ABBREVIATIONS

DRILLING METHODS:
HSA - Hollow Stem Auger
SSA - Solid Stem Auger
HA - Hand Auger
AR - Air Rotary
DTR - Dual Tube Rotary
FR - Foam Rotary
MR - Mud Rotary
RC - Reverse Circulation
CT - Cable Tool
JET - Jetting
D - Driving
DTC - Drill Through Casing

SAMPLING TYPES:
AS - Auger/Grab Sample
CS - California Sampler
BX - 1.5" Rock Core
NX - 2.1" Rock Core
GP - Geoprobe
HP - Hydro Punch
SS - Split Spoon
ST - Shelby Tube
WS - Wash Sample
OTHER:
AGS - Above Ground Surface

REMARKS

1. Wash water started at 11 ft bgs.
2. Depth measured from top of 1-ft thick ice and frost.

Reviewed by: NJY & YMC **Date:** 17 June 2019

Geosyntec consultants

BOREHOLE LOG

GB-05

Client: WMDSM - Crossroads Landfill
Project Location: Norridgewock, Maine
Project Name: 2019 Phase 14 Geotechnical Investigation
Project Number: BE0232

Sample Type	Blows per 6 inches	Sample Recovery (Inches)	Elev. Depth (ft.)	Graphic Log	USCS Stratum Designation	Material Description
SS	9 14	24/21	20			
SS	10 8 9 11	24/0				(21'-23') No Recovery.
SS	5 7 10 9	24/21			CL	(23'-24.8') Wet, very stiff, gray, CLAY, little silt (CL)
SS	10 11 12 9	24/11	25		CL	(25'-25.9') Wet, very stiff, gray, CLAY, little silt (CL)
SS	WOH 5 5 7	24/24			CL	(27'-29') Wet, stiff, gray, CLAY (CL)
SS	WOH WOH WOH 3	24/24	30		CL	(29'-31') Wet, very soft, gray, CLAY (CL)
SH		24/24			CL	(31'-33') Shelby tube collected. Wet, gray, CLAY (CL)
SS	WOH WOH WOH WOH	24/24			CL	(33'-35') Wet, very soft, gray, CLAY (CL)
SS	WOH WOH WOH WOH	24/24	35		CL	(35'-37') Wet, very soft, gray, CLAY (CL)
SS	WOH WOH 13 27	24/13			CL	(37'-37.8') Wet, stiff, gray, CLAY (CL)
					ML	(37.8'-38.1') Wet, stiff, gray, SILT, some coarse to fine sand, little medium to fine gravel (ML)
						Drilled to 40 ft bgs.
SS	47 50/4"	10/4	40		SM	(40'-40.4') Wet, very dense, gray, coarse to fine SAND, some silt, some medium to fine gravel (SM)
			45 50			Bedrock encountered at 41 ft bgs. Drilled 2 ft into bedrock to confirm. End of exploration. PZ-19 installed. Screen Interval: 25-35 ft bgs Sand Interval: 24-35.5 ft bgs Screen: 10,000 Sand: 1 S Remainder of borehole backfilled with bentonite chips.

Geosyntec consultants

BOREHOLE LOG

GB-06

Client: WMDSM - Crossroads Landfill
Project Name: 2019 Phase 14 Geotechnical Investigation
Project Location: Norridgewock, Maine
Project Number: BE0232

Drilling Contractor: New England Boring Contractors
Surface Elevation (ft.): 288.09 (NAVD 88)
Drilling Method/Rig: Drive and Wash/CME
Total Depth (ft.): 38
Drillers: Tom Shaefer, Mark Titus
Abandonment Method: Bentonite Chips
Drilling Date: Start: 21 March 2019 **End:** 22 March 2019
Logged By: Zachary Tanguay
Borehole Coordinates:
N 684,980.66 E 3,038,606.99

Sample Type	Blows per 6 inches	Sample Recovery (Inches)	Elev. Depth (ft.)	Graphic Log	USCS Stratum Designation	Material Description
			0			(0'-1') Roller bit through ice and frost.
SS	1 3 5 6	24/11			SP	(1'-1.9') Moist, loose, brown, medium to fine SAND, some organics, little silt (SP)
SS	5 5 6 9	24/18			SP	(3'-4.5') Moist, medium dense, brown, medium to fine SAND, trace silt (SP)
SS	6 7 11 11	24/17	5		SP	(5'-6.4') Moist, medium dense, brown, medium to fine SAND, trace silt (SP)
SS	5 6 8 9	24/15			SP	(7'-8.3') Moist, medium dense, brown, medium to fine SAND, trace silt (SP)
SS	5 6 5 5	24/20	10		SP	(9'-10.8') Moist, medium dense, brown, medium to fine SAND, trace silt (SP) 1/8 inch thick lens of medium sand at 9.8, 10.3, and 10.4 ft bgs
SS	5 5 6 5	24/9			SP	(11'-11.8') Moist, medium dense, brown, medium to fine SAND, trace silt (SP)
SS	4 3 5 5	24/11			SP	(13'-13.9') Wet, loose, brown, medium to fine SAND, trace silt (SP)
SS	4 5 6 11	24/10	15		SP	(15'-15.8') Moist, medium dense, brown, medium to fine SAND, trace silt (SP)
SS	6 5 4 6	24/14			SP CL	(17'-17.8') Wet, loose, brown, medium to fine SAND, little silt (SP) (17.8'-18.2') Wet, stiff, brown, CLAY, little silt, trace fine sand (CL)
	4 5				CL	(19'-21') Wet, stiff, brown, CLAY, little silt (CL)

EXPLANATION OF ABBREVIATIONS

DRILLING METHODS:
HSA - Hollow Stem Auger
SSA - Solid Stem Auger
HA - Hand Auger
AR - Air Rotary
DTR - Dual Tube Rotary
FR - Foam Rotary
MR - Mud Rotary
RC - Reverse Circulation
CT - Cable Tool
JET - Jetting
D - Driving
DTC - Drill Through Casing

SAMPLING TYPES:
AS - Auger/Grab Sample
CS - California Sampler
BX - 1.5" Rock Core
NX - 2.1" Rock Core
GP - Geoprobe
HP - Hydro Punch
SS - Split Spoon
ST - Shelby Tube
WS - Wash Sample
OTHER:
AGS - Above Ground Surface

REMARKS

1. Wash water started at 11 ft bgs.
2. Depth measured from top of 1-ft thick ice and frost.

Reviewed by: NJY & YMC **Date:** 17 June 2019

Geosyntec consultants

BOREHOLE LOG

GB-06

Client: WMDSM - Crossroads Landfill
Project Location: Norridgewock, Maine
Project Name: 2019 Phase 14 Geotechnical Investigation
Project Number: BE0232

Sample Type	Blows per 6 inches	Sample Recovery (Inches)	Elev. Depth (ft.)	Graphic Log	USCS Stratum Designation	Material Description
SS	5 7	24/24	20			
SH		24/24			CL	(21'-23') Shelby tube collected. Wet, grayish brown, CLAY, little silt (CL)
SS	6 6 10 9	24/24			CL	(23'-25') Wet, very stiff, gray, CLAY, little silt (CL)
SS	3 4 5 4	24/24	25		CL	(25'-27') Wet, stiff, gray, CLAY (CL)
SS	WOH WOH WOH 4	24/24			CL	(27'-29') Wet, very soft, gray, CLAY (CL)
SH		24/24	30		CL	(29'-31') Shelby tube collected. Wet, gray, CLAY (CL)
SS	WOH WOH WOH WOH	24/24			CL	(31'-33') Wet, very soft, gray, CLAY (CL)
SS	1 4 7 15	24/12			CL ML	(33'-33.4') Wet, stiff, gray, CLAY (CL) (33.4'-34') Wet, stiff, gray, SILT, some coarse to fine sand, little fine gravel, little clay (ML)
			35			Bedrock encountered at 35.8 ft bgs. Drilled 2 ft into bedrock to confirm. End of exploration.
			40			
			45			
			50			

Geosyntec consultants

BOREHOLE LOG

GB-07

Client: WMDSM - Crossroads Landfill
Project Name: 2019 Phase 14 Geotechnical Investigation
Project Location: Norridgewock, Maine
Project Number: BE0232

Drilling Contractor: New England Boring Contractors
Surface Elevation (ft.): 286.87 (NAVD 88)
Drilling Method/Rig: Drive and Wash/CME
Total Depth (ft.): 36
Drillers: Tom Shaefer, Mark Titus
Abandonment Method: Bentonite Chips
Drilling Date: Start: 6 March 2019 **End:** 6 March 2019
Logged By: Zachary Tanguay
Borehole Coordinates:
N 685,137.35 E 3,039,242.06

Sample Type	Blows per 6 inches	Sample Recovery (Inches)	Elev. Depth (ft.)	Graphic Log	USCS Stratum Designation	Material Description
			0			(0'-1') Roller bit through ice and frost.
SS	6 6 4 5	24/12			ML SP	(1'-1.6') Dry, stiff, brown, SILT, some coarse to fine sand, little fine gravel, little organics (ML) (1.6-2') Dry, loose, brown, medium to fine SAND, little silt, little organics (SP)
SS	2 2 3 3	24/10			SM	(3'-3.8') Dry, loose, brown, medium to fine SAND, some silt (SM)
SS	4 5 6 7	24/18	5		SP	(5'-6.5') Moist, medium dense, brown, medium to fine SAND, little silt (SP) Red staining observed at 6 ft bgs.
SS	4 8 9 4	24/18			SP	(7'-8.5') Wet, medium dense, grayish brown, medium to fine SAND, little silt (SP) Red staining observed at 8 ft bgs.
SS	3 5 6 10	24/14	10		CL	(9'-10.2') Wet, stiff, grayish brown, CLAY, some silt, little fine sand (CL)
SS	4 6 9 8	24/21			CL	(11'-12.7') Wet, stiff, gray, CLAY, some silt, trace fine sand (CL)
SS	3 4 6 6	24/22			CL	(13'-14.8') Wet, stiff, gray, CLAY, some silt (CL)
SS	2 3 4 4	24/24	15		CL	(15'-17') Wet, firm, gray, CLAY, little silt (CL)
SH		24/22				(17'-19') Shelby Tube collected.
	WOH WOH				CL	(19'-20.8') Wet, very soft, gray, CLAY (CL) 1/8 inch thick fine sand lens at 22.7 ft bgs.

EXPLANATION OF ABBREVIATIONS

DRILLING METHODS:
HSA - Hollow Stem Auger
SSA - Solid Stem Auger
HA - Hand Auger
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DTR - Dual Tube Rotary
FR - Foam Rotary
MR - Mud Rotary
RC - Reverse Circulation
CT - Cable Tool
JET - Jetting
D - Driving
DTC - Drill Through Casing

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BX - 1.5" Rock Core
NX - 2.1" Rock Core
GP - Geoprobe
HP - Hydro Punch
SS - Split Spoon
ST - Shelby Tube
WS - Wash Sample
OTHER:
AGS - Above Ground Surface

REMARKS

1. Wash water started at 9 ft bgs.
2. Depth measured from top of 1-ft thick ice and frost.

Reviewed by: NJY & YMC **Date:** 17 June 2019

Geosyntec consultants

BOREHOLE LOG

GB-07

Client: WMDSM - Crossroads Landfill
Project Name: 2019 Phase 14 Geotechnical Investigation
Project Location: Norridgewock, Maine
Project Number: BE0232

Sample Type	Blows per 6 inches	Sample Recovery (Inches)	Elev. Depth (ft.)	Graphic Log	USCS Stratum Designation	Material Description
SS	WOH 10	24/24	20		SM	(20.8'-21') Wet, very loose, gray, coarse to fine SAND, some silt, little fine gravel (SM)
SS	10 7 3 3	24/0	25			No Recovery.
SS	72/6"	6/6	30		ML	(30'-30.5') Wet, very hard, gray, SILT, some coarse to fine sand, little fine gravel (ML)
						Bedrock encountered at 33.8 ft bgs. Roller bit 2 ft into bedrock for confirmation. End of exploration at 36 ft bgs.
			35			
			40			
			45			
			50			

Geosyntec consultants

BOREHOLE LOG

GB-08

Client: WMDSM - Crossroads Landfill
Project Name: 2019 Phase 14 Geotechnical Investigation
Project Location: Norridgewock, Maine
Project Number: BE0232

Drilling Contractor: New England Boring Contractors
Surface Elevation (ft.): 289.01 (NAVD 88)
Drilling Method/Rig: Drive and Wash/CME
Total Depth (ft.): 41
Drillers: Tom Shaefer, Mark Titus
Abandonment Method: Bentonite Chips
Drilling Date: Start: 26 March 2019 **End:** 27 March 2019
Logged By: Zachary Tanguay
Borehole Coordinates:
N 684,873.25 E 3,039,143.84

Sample Type	Blows per 6 inches	Sample Recovery (Inches)	Elev. Depth (ft.)	Graphic Log	USCS Stratum Designation	Material Description
			0			(0'-1') Roller bit through ice and frost.
SS	3 5 4 4	24/13			SP	(1'-1.5') Moist, loose, brown, medium to fine SAND, little silt, little organics (SP)
					CL	(1.5'-2.1') Moist, stiff, gray, CLAY, some silt, little medium to fine sand (CL)
SS	3 3 4 7	24/18			CL	(3'-4.5') Moist, firm, gray, CLAY, some medium to fine sand, some silt (CL)
SS	3 5 5 7	24/13	5		CL	(5'-6.1') Moist, stiff, gray, CLAY, some silt, little medium to fine sand (CL) 1/8 inch thick lens of fine sand at 5.6 ft bgs
SS	2 4 6 7	24/17			ML	(7'-8.4') Moist, stiff, gray, SILT, some clay, trace fine sand (ML) 1 inch thick lens of coarse to fine sand at 7.3 ft bgs
SS	27 17 29 19	24/20	10		SP	(9'-10.8') Moist, dense, brown, medium to fine SAND, little silt (SP)
SS	10 12 13 15	24/15			SP	(11'-12.3') Wet, medium dense, brown, medium to fine SAND, little silt (SP)
SS	10 13 12 13	24/13			SP	(13'-14.1') Wet, medium dense, brown, medium to fine SAND, little silt (SP)
SS	8 5 8 8	24/16	15		SP	(15'-15.3') Wet, medium dense, brown, medium to fine SAND, little silt (SP)
					CL	(15.3'-16.3') Wet, stiff, brown, CLAY, little silt (CL)
SS	4 4 6 7	24/24			CL	(17'-19') Wet, stiff, grayish brown, CLAY, trace silt (CL)
	2 19				CL	(19'-18.6') Wet, hard, grayish brown, CLAY, trace silt (CL) 1/8 inch thick lens of silt at 19.2 ft bgs

EXPLANATION OF ABBREVIATIONS

DRILLING METHODS:
HSA - Hollow Stem Auger
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FR - Foam Rotary
MR - Mud Rotary
RC - Reverse Circulation
CT - Cable Tool
JET - Jetting
D - Driving
DTC - Drill Through Casing

SAMPLING TYPES:
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BX - 1.5" Rock Core
NX - 2.1" Rock Core
GP - Geoprobe
HP - Hydro Punch
SS - Split Spoon
ST - Shelby Tube
WS - Wash Sample
OTHER:
AGS - Above Ground Surface

REMARKS

1. Wash water started at 11 ft bgs.
2. Depth measured from top of 1-ft thick ice and frost.

Reviewed by: NJY & YMC **Date:** 17 June 2019

Geosyntec consultants

BOREHOLE LOG

GB-08

Client: WMDSM - Crossroads Landfill
Project Name: 2019 Phase 14 Geotechnical Investigation
Project Location: Norridgewock, Maine
Project Number: BE0232

Sample Type	Blows per 6 inches	Sample Recovery (Inches)	Elev. Depth (ft.)	Graphic Log	USCS Stratum Designation	Material Description
SS	26 34	24/19	20			
SS	6 8 10 16	24/24			CL	(21'-23') Wet, very stiff, grayish brown, CLAY, little silt (CL)
SS	6 4 4 5	24/24			CL	(23'-25') Wet, firm, gray, CLAY, trace silt (CL)
SS	WOH WOH WOH WOH	24/24	25		CL	(25'-27') Wet, very soft, gray, CLAY (CL)
SH		24/24			CL	(27'-29') Shelby tube collected. Wet, gray CLAY (CL)
SS	WOH WOH WOH WOH	24/24	30		CL	(29'-31') Wet, very soft, gray, CLAY (CL)
SS	WOH WOH WOH WOH	24/24			CL	(31'-33') Wet, very soft, gray, CLAY (CL)
SS	WOH WOH WOH WOH	24/24			CL	(33'-34.8') Wet, very soft, gray, CLAY (CL)
SS	WOH WOH 12 14	24/17	35		CL CL ML	(34.8'-35') Wet, very soft, gray, CLAY, some medium to fine sand (CL) (35'-36.3') Wet, stiff, gray, CLAY, little silt (CL) (36.3'-36.4') Wet, stiff, gray, SILT, some coarse to fine sand, little fine gravel (ML)
			40 45 50			Bedrock encountered at 39.2 ft bgs. Drilled 2 ft into bedrock to confirm. End of exploration.

Geosyntec consultants

BOREHOLE LOG

GB-09

Client: WMDSM - Crossroads Landfill
Project Name: 2019 Phase 14 Geotechnical Investigation
Project Location: Norridgewock, Maine
Project Number: BE0232

Drilling Contractor: New England Boring Contractors
Surface Elevation (ft.): 279.72 (NAVD 88)
Drilling Method/Rig: Drive and Wash/CME
Total Depth (ft.): 26
Drillers: Tom Shaefer, Mark Titus
Abandonment Method: Bentonite Chips
Drilling Date: Start: 8 March 2019 **End:** 8 March 2019
Logged By: Zachary Tanguay
Borehole Coordinates:
N 684,683.22 E 3,039,038.39

Sample Type	Blows per 6 inches	Sample Recovery (Inches)	Elev. Depth (ft.)	Graphic Log	USCS Stratum Designation	Material Description
			0			(0'-1') Roller bit through ice and frost.
SS	3 2 2 6	24/14			SP	(1'-2.2') Dry, very loose, brown, medium to fine SAND, little silt, little organics (SP)
SS	6 6 6 5	24/20			SP	(3'-4.7') Wet, medium dense, brown, medium to fine SAND, little silt (SP) Red staining at 3.5 ft bgs and 4.6 ft bgs.
SS	3 6 7 7	24/10	5		SP	(5'-5.8') Wet, medium dense, brown, medium to fine SAND, little silt (SP)
SS	4 7 8 8	24/12			SP	(7'-8') Wet, medium dense, brown, medium to fine SAND, little silt (SP)
SS	2 4 6 8	24/22	10		CL	(9'-10.8') Wet, stiff, brown, CLAY, some silt, little fine sand (CL)
SS	8 10 10 13	24/24			CL	(11'-13') Wet, very stiff, brown, CLAY, some silt, little fine sand (CL)
SS	5 6 8 7	24/24			CL	(13'-15') Wet, stiff, brown, CLAY, some silt, trace fine sand (CL)
SS	4 5 6 6	24/24	15		CL	(15'-17') Wet, stiff, brown, CLAY, little silt (CL)
SS	6 17 34 29	24/14			CL ML	(17'-17.8') Wet, very hard, brown, CLAY (CL) (17.8'-18.2') Wet, very hard, brown, SILT, some coarse to fine sand, some medium to fine gravel (ML)
	18 19				ML	(19'-19.7') Wet, hard, brown, SILT, some coarse to fine sand, some medium to fine gravel (ML)

EXPLANATION OF ABBREVIATIONS

DRILLING METHODS:
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HA - Hand Auger
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DTR - Dual Tube Rotary
FR - Foam Rotary
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RC - Reverse Circulation
CT - Cable Tool
JET - Jetting
D - Driving
DTC - Drill Through Casing

SAMPLING TYPES:
AS - Auger/Grab Sample
CS - California Sampler
BX - 1.5" Rock Core
NX - 2.1" Rock Core
GP - Geoprobe
HP - Hydro Punch
SS - Split Spoon
ST - Shelby Tube
WS - Wash Sample
OTHER:
AGS - Above Ground Surface

REMARKS

1. Wash water started at 5 ft bgs.
2. Depth measured from top of 1-ft thick ice and frost.

Reviewed by: NJY & YMC **Date:** 17 June 2019

Geosyntec consultants

BOREHOLE LOG

GB-09

Client: WMDSM - Crossroads Landfill | **Project Name:** 2019 Phase 14 Geotechnical Investigation

Project Location: Norridgewock, Maine | **Project Number:** BE0232

Sample Type	Blows per 6 inches	Sample Recovery (Inches)	Elev. Depth (ft.)	Graphic Log	USCS Stratum Designation	Material Description
SS	29 43	24/8	20			
						Bedrock encountered at 23.6 ft bgs. Roller bit 2 ft into bedrock for confirmation. End of exploration at 26 ft bgs.
			25			
			30			
			35			
			40			
			45			
			50			

Geosyntec consultants

BOREHOLE LOG

GB-10

Client: WMDSM - Crossroads Landfill
Project Name: 2019 Phase 14 Geotechnical Investigation
Project Location: Norridgewock, Maine
Project Number: BE0232

Drilling Contractor: New England Boring Contractors
Surface Elevation (ft.): 291.36 (NAVD 88)
Drilling Method/Rig: Drive and Wash/CME
Total Depth (ft.): 33
Drillers: Tom Shaefer, Mark Titus
Abandonment Method: Bentonite Chips
Drilling Date: Start: 7 March 2019 **End:** 7 March 2019
Logged By: Zachary Tanguay
Borehole Coordinates:
N 684,553.32 E 3,039,011.86

Sample Type	Blows per 6 inches	Sample Recovery (Inches)	Elev. Depth (ft.)	Graphic Log	USCS Stratum Designation	Material Description
			0			(0'-1') Roller bit through ice and frost.
SS	1 4 5 6	24/9			SM	(1'-1.7') Dry, loose, brown, medium to fine SAND, some silt, little organics (SM)
SS	4 6 6 7	24/18			SM	(3'-4.5') Wet, medium dense, brown, medium to fine SAND, some silt (SM)
SS	4 5 6 4	24/13	5		SP	(5'-5.9') Wet, medium dense, brown, medium to fine SAND, little silt (SP)
					CL	(5.9'-6.1') Wet, stiff, brown, CLAY, some silt, some medium to fine sand (CL)
SS	3 4 7 8	24/21			CL	(7'-8.8') Wet, stiff, brown, CLAY, some silt, trace fine sand (CL)
SS	4 5 7 12	24/24	10		CL	(9'-11') Wet, stiff, brown, CLAY, some silt, trace fine sand (CL)
SS	5 6 8 8	24/24			CL	(11'-13') Wet, stiff, brown, CLAY, some silt (CL)
SS	4 4 5 6	24/24			CL	(13'-15') Wet, stiff, grayish brown, CLAY, little silt (CL)
SS	4 4 5 5	24/24	15		CL	(15'-17') Wet, stiff, grayish brown, CLAY, little silt (CL)
SS	3 7 8 12	24/24			CL	(17'-18.5') Wet, stiff, grayish brown, CLAY, little silt (CL)
					ML	(18.5'-19') Wet, stiff, brown, SILT, some coarse to fine sand, little fine gravel (ML)
SS	50/5"	5/5			ML	(19'-19.4') Wet, very hard, brown, SILT, some coarse to fine sand, little fine gravel (ML)

EXPLANATION OF ABBREVIATIONS

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MR - Mud Rotary
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CT - Cable Tool
JET - Jetting
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BX - 1.5" Rock Core
NX - 2.1" Rock Core
GP - Geoprobe
HP - Hydro Punch
SS - Split Spoon
ST - Shelby Tube
WS - Wash Sample
OTHER:
AGS - Above Ground Surface

REMARKS

1. Wash water started at 5 ft bgs.
2. Depth measured from top of 1-ft thick ice and frost.

Reviewed by: NJY & YMC
Date: 17 June 2019

Geosyntec consultants

BOREHOLE LOG

GB-10

Client: WMDSM - Crossroads Landfill
Project Name: 2019 Phase 14 Geotechnical Investigation
Project Location: Norridgewock, Maine
Project Number: BE0232

Sample Type	Blows per 6 inches	Sample Recovery (Inches)	Elev. Depth (ft.)	Graphic Log	USCS Stratum Designation	Material Description
SS	20 15 15 22	24/7	20		ML	(20'-20.6') Wet, very stiff, brown, SILT, some coarse to fine sand, little fine gravel (ML)
SS	12 14 10 9	24/8	25		SM	(25'-25.8') Wet, medium dense, brown, coarse to fine SAND, some medium to fine gravel, some silt (SM)
SS	47 50/2"	8/7	30		ML	(30'-30.6') Wet, very hard, brown, SILT, some coarse to fine sand, little fine gravel (ML)
						Bedrock encountered at 31.0 ft bgs. Roller bit 2 ft into bedrock for confirmation. End of exploration at 33 ft bgs.
			35			
			40			
			45			
			50			

Geosyntec consultants

BOREHOLE LOG

GB-11

Client: WMDSM - Crossroads Landfill
Project Name: 2019 Phase 14 Geotechnical Investigation
Project Location: Norridgewock, Maine
Project Number: BE0232

Drilling Contractor: New England Boring Contractors
Surface Elevation (ft.): 294.84 (NAVD 88)
Drilling Method/Rig: Drive and Wash/CME
Total Depth (ft.): 21
Drillers: Tom Shaefer, Mark Titus
Abandonment Method: Bentonite Chips
Drilling Date: Start: 25 February 2019 **End:** 25 February 2019
Logged By: Zachary Tanguay
Borehole Coordinates:
N 685,176.32 E 3,039,569.79

Sample Type	Blows per 6 inches	Sample Recovery (Inches)	Elev. Depth (ft.)	Graphic Log	USCS Stratum Designation	Material Description
			0			(0-1) Roller bit through ice and frost.
SS	42 34 12 15	24/16			SM	(1'-2.3') Dry, dense, brown, coarse to fine SAND, some silt, little fine gravel (SM)
SS	5 3 3 3	24/9			SM CL	(3'-3.5') Dry, very loose, brown, coarse to fine SAND, some silt, little fine gravel (SM) (3.5'-3.7') Moist, firm, brown, CLAY, little medium to fine sand (CL)
SS	WOH 3 15 18	24/16	5		SM SP	(5'-5.5') Moist, very stiff, brown, SILT, some coarse to fine sand, trace fine gravel (SM) (5.5'-6.3') Moist, medium dense, brown, medium to fine SAND, little silt (SP)
SS	11 14 16 16	24/16			SP	(7'-8.4') Wet, medium dense, brown, medium to fine SAND, little silt (SP)
SS	6 7 6 11	24/18	10		SM CL	(9'-9.5') Wet, medium dense, brown, medium to fine SAND, little silt (SM) (9.5'-10.5') Wet, stiff, brown, CLAY, little medium to fine sand, little silt (CL)
SS	4 9 14 11	24/24			CL	(11'-13') Wet, very stiff, brown, CLAY, little silt (CL)
SS	4 5 6 7	24/24			CL	(13'-15') Wet, stiff, grayish brown, CLAY, little silt, trace fine sand (CL)
SS	1 3 2 3	24/24	15		CL	(15'-16') Wet, firm, grayish brown, CLAY, little silt, trace fine sand (CL)
SH		24/24			CL	Shelby Tube Collected.
	10 27				ML	(19'-19.9') Wet, very hard, gray, SILT, some coarse to fine sand, little fine gravel (ML)

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HP - Hydro Punch
SS - Split Spoon
ST - Shelby Tube
WS - Wash Sample
OTHER:
AGS - Above Ground Surface

REMARKS

1. Wash water started at 7 ft bgs.
2. Depth measured from top of 1-ft thick ice and frost.

Reviewed by: NJY & YMC
Date: 17 June 2019

Geosyntec consultants

BOREHOLE LOG

GB-11

Client: WMDSM - Crossroads Landfill
Project Name: 2019 Phase 14 Geotechnical Investigation
Project Location: Norridgewock, Maine
Project Number: BE0232

Sample Type	Blows per 6 inches	Sample Recovery (Inches)	Elev. Depth (ft.)	Graphic Log	USCS Stratum Designation	Material Description
SS	34 50/3"	21/10	20			
			25 30 35 40 45 50			Bedrock encountered at 21 ft bgs. Roller bit 2 ft into bedrock for confirmation. End of exploration at 23 ft bgs. PZ-18 installed. Screen Interval: 14-17 ft bgs Sand Interval: 13-17.5 ft bgs Screen: 10,000 Sand: 0 S Remainder of borehole backfilled with bentonite chips.

Geosyntec consultants

BOREHOLE LOG

GB-12

Client: WMDSM - Crossroads Landfill
Project Name: 2019 Phase 14 Geotechnical Investigation
Project Location: Norridgewock, Maine
Project Number: BE0232

Drilling Contractor: New England Boring Contractors
Surface Elevation (ft.): 291.66 (NAVD 88)
Drilling Method/Rig: Drive and Wash/CME
Total Depth (ft.): 28
Drillers: Tom Shaefer, Mark Titus
Abandonment Method: Bentonite Chips
Drilling Date: Start: 25 February 2019 **End:** 26 February 2019
Logged By: Zachary Tanguay
Borehole Coordinates:
N 685,023.18 E 3,039,774.82

Sample Type	Blows per 6 inches	Sample Recovery (Inches)	Elev. Depth (ft.)	Graphic Log	USCS Stratum Designation	Material Description
~~SS~~	~~50/3"~~	~~3/3~~	0		SM	(0'-0.25') Dry, very dense, brown, medium to fine SAND, some coarse to medium gravel, little silt (SM). Drilled to 1 ft bgs.
SS	48 48 40 22	24/24			SM	(1'-3') Dry, very dense, brown, medium to fine SAND, some silt, trace fine gravel (SM)
SS	6 12 18 18	24/22			SP	(3'-4') Dry, medium dense, brown, medium to fine SAND, trace silt (SP)
					SM	(4'-4.8') Dry, medium dense, brown, medium to fine SAND, little silt (SM)
SS	7 10 10 12	24/15	5		SM	(5'-6.25') Dry, medium dense, brown, medium to fine SAND, little silt (SM)
SS	7 7 9 11	24/16			SM	(7'-8.4') Moist, medium dense, brown, medium to fine SAND, little silt (SM)
SS	6 10 10 8	24/20	10		SM	(9'-10.8') Wet, medium dense, brown, medium to fine SAND, little silt (SM)
SS	3 5 6 12	24/12			ML	(11'-12') Wet, stiff, brown, SILT, some medium to fine sand (ML)
SS	6 10 11 16	24/24			ML	(13'-15') Wet, very stiff, brown, SILT, some clay, little fine sand (ML)
SS	6 7 10 12	24/20	15		CL	(15'-16.8') Wet, very stiff, grayish brown, CLAY, some silt, trace fine sand (CL)
SH		24/24			CL	(17'-19') Shelby Tube collected. Wet, grayish brown, CLAY, little silt (CL) Pocket Penetrometer: 2.0, 1.75, and 1.75 Tons/FT2
	5 4				CL	(19'-21') Wet, firm, gray, CLAY, little silt (CL)

EXPLANATION OF ABBREVIATIONS

DRILLING METHODS:
HSA - Hollow Stem Auger
SSA - Solid Stem Auger
HA - Hand Auger
AR - Air Rotary
DTR - Dual Tube Rotary
FR - Foam Rotary
MR - Mud Rotary
RC - Reverse Circulation
CT - Cable Tool
JET - Jetting
D - Driving
DTC - Drill Through Casing

SAMPLING TYPES:
AS - Auger/Grab Sample
CS - California Sampler
BX - 1.5" Rock Core
NX - 2.1" Rock Core
GP - Geoprobe
HP - Hydro Punch
SS - Split Spoon
ST - Shelby Tube
WS - Wash Sample
OTHER:
AGS - Above Ground Surface

REMARKS

1. Wash water started at 11 ft bgs.

Reviewed by: NJY & YMC
Date: 17 June 2019

Geosyntec consultants

BOREHOLE LOG

GB-12

Client: WMDSM - Crossroads Landfill

Project Location: Norridgewock, Maine

Project Name: 2019 Phase 14 Geotechnical Investigation

Project Number: BE0232

Sample Type	Blows per 6 inches	Sample Recovery (Inches)	Elev. Depth (ft.)	Graphic Log	USCS Stratum Designation	Material Description
SS	4 6	24/24	20			
SS	5 4 4 5	24/24			CL	(21'-23') Wet, firm, gray, CLAY, little silt (CL) Two - 1/8 inch thick fine sand seams
SS	WOH WOH 7 18	24/24			CL	(23'-24.5') Wet, firm, gray, CLAY, trace silt (CL)
					ML	(24.5'-25') Wet, firm, gray, SILT, some coarse to fine sand, little fine gravel (ML)
SS	31 50/5"	11/10	25		ML	(25'-25.8') Wet, very hard, gray, SILT, some medium to fine sand, little fine gravel (ML)
			30			
			35			
			40			
			45			
			50			

Bedrock encountered at 26 ft bgs. Roller bit 2 ft into bedrock for confirmation. End of exploration at 28 ft bgs.
PZ-16 installed.
Screen Interval: 16-21 ft bgs
Sand Interval: 15-21.5 ft bgs
Screen: 10,000
Sand: 0 S
Remainder of borehole backfilled with bentonite chips.

Geosyntec consultants

BOREHOLE LOG

GB-13

Client: WMDSM - Crossroads Landfill
Project Name: 2019 Phase 14 Geotechnical Investigation
Project Location: Norridgewock, Maine
Project Number: BE0232

Drilling Contractor: New England Boring Contractors
Surface Elevation (ft.): 290.42 (NAVD 88)
Drilling Method/Rig: Drive and Wash/CME
Total Depth (ft.): 27
Drillers: Tom Shaefer, Mark Titus
Abandonment Method: Bentonite Chips
Drilling Date: Start: 27 February 2019 **End:** 27 February 2019
Logged By: Zachary Tanguay
Borehole Coordinates:
N 685,193.13 E 3,040,012.07

Sample Type	Blows per 6 inches	Sample Recovery (Inches)	Elev. Depth (ft.)	Graphic Log	USCS Stratum Designation	Material Description
			0			(0'-1') Roller bit through ice and frost.
SS	3 4 4 5	24/12			SM	(1'-2') Dry, loose, reddish brown, medium to fine SAND, little silt, little fine gravel, organics (SM)
SS	4 4 5 6	24/22			SM	(3'-4.8') Moist, loose, brown, medium to fine SAND, some silt, trace organics (SM)
SS	12 18 20 22	24/20	5		SM	(5'-6.7') Moist, dense, brown, medium to fine SAND, some silt (SM)
SS	9 11 13 8	24/18			SM	(7'-8.5') Wet, medium dense, brown, medium to fine SAND, some silt (SM)
SS	3 5 7 11	24/18	10		CL	(9'-10.5') Wet, stiff, brown, CLAY, some silt, little coarse to fine sand (CL)
SS	5 8 9 11	24/20			CL	(11'-12.8') Wet, very stiff, gray, CLAY, some silt, trace medium to fine sand (CL)
SS	4 5 6 6	24/24			CL	(13'-15') Wet, stiff, gray, CLAY, little silt (CL) 1/8 inch thick lens of fine sand observed at 14 and 14.8 ft bgs
			15			Roller bit to 17 ft bgs. No sample collected.
SH		24/24			CL	(17'-19') Shelby Tube collected. Wet, gray, CLAY, little silt (CL) Pocket Penetrometer: 1.25, 1.25, and 1.25 Tons/FT2
	WOH WOH				CL	(19'-21') Wet, very soft, gray, CLAY (CL)

EXPLANATION OF ABBREVIATIONS

DRILLING METHODS:
HSA - Hollow Stem Auger
SSA - Solid Stem Auger
HA - Hand Auger
AR - Air Rotary
DTR - Dual Tube Rotary
FR - Foam Rotary
MR - Mud Rotary
RC - Reverse Circulation
CT - Cable Tool
JET - Jetting
D - Driving
DTC - Drill Through Casing

SAMPLING TYPES:
AS - Auger/Grab Sample
CS - California Sampler
BX - 1.5" Rock Core
NX - 2.1" Rock Core
GP - Geoprobe
HP - Hydro Punch
SS - Split Spoon
ST - Shelby Tube
WS - Wash Sample
OTHER:
AGS - Above Ground Surface

REMARKS

1. Wash water started at 9 ft bgs.
2. Depth measured from top of 1-ft thick ice and frost.

Reviewed by: NJY & YMC **Date:** 17 June 2019

Geosyntec consultants

BOREHOLE LOG

GB-13

Client: WMDSM - Crossroads Landfill

Project Name: 2019 Phase 14 Geotechnical Investigation

Project Location: Norridgewock, Maine

Project Number: BE0232

Sample Type	Blows per 6 inches	Sample Recovery (Inches)	Elev. Depth (ft.)	Graphic Log	USCS Stratum Designation	Material Description
SS	WOH WOH	24/24	20			
SS	WOH 20 20 20	24/16			CL	(21'-22') Wet, hard, gray, CLAY (CL)
					ML	(22'-22.4') Wet, hard, gray, SILT, some coarse to fine sand, little fine gravel (ML)
			25			Bedrock encountered at 24.8 ft bgs. Roller bit 2 ft into bedrock for confirmation. End of exploration at 27 ft bgs.
			30			
			35			
			40			
			45			
			50			

Geosyntec consultants

BOREHOLE LOG

GB-14

Client: WMDSM - Crossroads Landfill
Project Location: Norridgewock, Maine
Project Name: 2019 Phase 14 Geotechnical Investigation
Project Number: BE0232

Drilling Contractor: New England Boring Contractors
Drilling Method/Rig: Drive and Wash/CME
Drillers: Tom Shaefer, Mark Titus
Drilling Date: Start: 13 March 2019 **End:** 13 March 2019
Borehole Coordinates:
N 685,296.33 E 3,040,174.01

Surface Elevation (ft.): 280.00 (NAVD 88)
Total Depth (ft.): 17.5
Abandonment Method: Bentonite Chips
Logged By: Zachary Tanguay

Sample Type	Blows per 6 inches	Sample Recovery (Inches)	Elev. Depth (ft.)	Graphic Log	USCS Stratum Designation	Material Description
			0			(0'-1') Roller bit through ice and frost.
SS	1 2 3 2	24/14			SM CL	(1'-1.3') Moist, loose, dark brown, coarse to fine SAND, some silt, little organics (SM) (1.3'-2.2') Wet, firm, gray, CLAY, little silt (CL)
SS	3 5 3 3	24/21			CL	(3'-4.7') Wet, firm, gray, CLAY, little silt (CL)
SS	1 2 3 2	24/24	5		CL	(5'-7') Wet, firm, gray, CLAY (CL) 1/8 inch thick lens of silt at 5.8 ft bgs
SS	WOH WOH WOH WOH	24/24			CL	(7'-9') Wet, very soft, gray, CLAY (CL)
SH		24/21	10		CL	(9'-10.8') Shelby tube collected. Wet, gray, CLAY (CL)
SS	WOH WOH WOH 25	24/22			CL	(11'-12.8') Wet, very soft, gray, CLAY (CL)
			15			Bedrock encountered at 15.4 ft bgs. Roller bit 2 ft into bedrock for confirmation. End of exploration at 17.5 ft bgs. PZ-17 installed. Screen Interval: 5-10 ft bgs Sand Interval: 4-10.5 ft bgs Screen: 10,000 Sand: 1 S Remainder of borehole backfilled with bentonite chips.

EXPLANATION OF ABBREVIATIONS

DRILLING METHODS:
HSA - Hollow Stem Auger
SSA - Solid Stem Auger
HA - Hand Auger
AR - Air Rotary
DTR - Dual Tube Rotary
FR - Foam Rotary
MR - Mud Rotary
RC - Reverse Circulation
CT - Cable Tool
JET - Jetting
D - Driving
DTC - Drill Through Casing

SAMPLING TYPES:
AS - Auger/Grab Sample
CS - California Sampler
BX - 1.5" Rock Core
NX - 2.1" Rock Core
GP - Geoprobe
HP - Hydro Punch
SS - Split Spoon
ST - Shelby Tube
WS - Wash Sample
OTHER:
AGS - Above Ground Surface

REMARKS

1. Wash water started at 7 ft bgs.
2. Depth measured from top of 1-ft thick ice and frost.

Reviewed by: NJY & YMC
Date: 17 June 2019

Geosyntec consultants

BOREHOLE LOG

GB-15

Client: WMDSM - Crossroads Landfill
Project Location: Norridgewock, Maine
Project Name: 2019 Phase 14 Geotechnical Investigation
Project Number: BE0232

Drilling Contractor: New England Boring Contractors
Drilling Method/Rig: Drive and Wash/CME
Drillers: Tom Shaefer, Mark Titus
Drilling Date: Start: 12 March 2019 **End:** 13 March 2019
Borehole Coordinates:
N 685,379.41 E 3,040,280.31

Surface Elevation (ft.): 280.27 (NAVD 88)
Total Depth (ft.): 19.5
Abandonment Method: Bentonite Chips
Logged By: Zachary Tanguay

Sample Type	Blows per 6 inches	Sample Recovery (Inches)	Elev. Depth (ft.)	Graphic Log	USCS Stratum Designation	Material Description
			0			(0'-1') Roller bit through ice and frost.
SS	1 2 2 9	24/18			SM	(1'-2.1') Moist, very loose, brown, medium to fine SAND, some silt, some organics (SM)
					ML	(2.1'-2.5') Moist, soft, grayish brown, SILT, some medium to fine sand (ML)
SS	8 8 10 9	24/24			CL	(3'-5') Moist, very stiff, brown, CLAY, little silt (CL)
SS	5 7 8 11	24/24	5		CL	(5'-7') Moist, stiff, brown, CLAY, little silt (CL)
SH		24/24			CL	(7'-9') Shelby tube collected. Wet, brown, CLAY, little silt (CL)
SS	WOH 1 2 1	24/11	10		CL	(9'-9.9') Wet, soft, gray, CLAY (CL)
SH		24/24			CL	(11'-13') Shelby tube collected. Wet, gray, CLAY (CL)
SS	WOH WOH WOH WOH	24/24			CL	(13'-15') Wet, very soft, gray, CLAY (CL)
SS	WOH 15 20 17	24/7	15		CL	(15'-15.6') Wet, hard, gray, CLAY (CL) Rock in tip of split spoon.
SS	50/3"	3/0				No recovery.
						Bedrock encountered at 17.5 ft bgs. Roller bit 2 ft into bedrock for confirmation. End of exploration at 19.5 ft bgs.

EXPLANATION OF ABBREVIATIONS

DRILLING METHODS:
HSA - Hollow Stem Auger
SSA - Solid Stem Auger
HA - Hand Auger
AR - Air Rotary
DTR - Dual Tube Rotary
FR - Foam Rotary
MR - Mud Rotary
RC - Reverse Circulation
CT - Cable Tool
JET - Jetting
D - Driving
DTC - Drill Through Casing

SAMPLING TYPES:
AS - Auger/Grab Sample
CS - California Sampler
BX - 1.5" Rock Core
NX - 2.1" Rock Core
GP - Geoprobe
HP - Hydro Punch
SS - Split Spoon
ST - Shelby Tube
WS - Wash Sample
OTHER:
AGS - Above Ground Surface

REMARKS

1. Wash water started at 7 ft bgs.
2. Depth measured from top of 1-ft thick ice and frost.

Reviewed by: NJY & YMC **Date:** 17 June 2019

BOREHOLE LOG

GB-16

Client: WMDSM - Crossroads Landfill
Project Name: 2019 Phase 14 Geotechnical Investigation
Project Location: Norridgewock, Maine
Project Number: BE0232

Drilling Contractor: New England Boring Contractors
Surface Elevation (ft.): 289.16 (NAVD 88)
Drilling Method/Rig: Drive and Wash/CME
Total Depth (ft.): 46
Drillers: Tom Shaefer, Mark Titus
Abandonment Method: Bentonite Chips
Drilling Date: Start: 14 March 2019 **End:** 18 March 2019
Logged By: Zachary Tanguay
Borehole Coordinates:
N 684,685.14 E 3,040,168.85

Sample Type	Blows per 6 inches	Sample Recovery (Inches)	Elev. Depth (ft.)	Graphic Log	USCS Stratum Designation	Material Description
			0			(0'-1') Roller bit through ice and frost.
SS	5 7 8 8	24/9			ML	(1'-1.8') Moist, stiff, brown, SILT, some coarse to fine sand, little fine gravel (ML)
SS	4 4 3 4	24/13			ML	(3'-3.5') Moist, firm, brown, SILT, some coarse to fine sand, little fine gravel (ML)
					CL	(3.5'-4.1') Moist, firm, gray, CLAY, little silt, trace fine sand (CL) 1/8 inch thick lens of fine sand at 3.7 ft bgs.
SS	2 2 1 1	24/17	5		CL	(5'-6.4') Wet, soft, gray, CLAY, little silt, little fine sand (CL) 1/8 inch thick lens of fine sand at 5.5, 5.7, and 6 ft bgs.
SS	1 2 2 15	24/16			CL	(7'-7.5') Wet, soft, gray, CLAY, little silt, little fine sand (CL)
					SM	(7.5'-8.3') Moist, very loose, brown, medium to fine SAND, some silt (SM)
SS	14 18 18 14	24/14	10		SP	(9'-10.2') Wet, dense, brown, medium to fine SAND, little silt (SP)
SS	8 8 9 8	24/13			SP	(11'-12.1') Wet, medium dense, grayish brown, medium to fine SAND, trace silt (SP)
SS	6 8 9 4	24/11			SP	(13'-13.8') Wet, medium dense, grayish brown, medium to fine SAND, little silt (SP)
					CL	(13.8'-13.9') Wet, very stiff, brown, CLAY, little silt (CL)
SS	3 5 7 8	24/24	15		CL	(15'-17') Wet, stiff, brown, CLAY, little silt (CL)
SH		24/17			CL	(17'-18.4') Shelby tube collected. Wet, brown, CLAY, little silt (CL)
	3 5				CL	(19'-20') Wet, stiff, grayish brown, CLAY, little silt (CL)

EXPLANATION OF ABBREVIATIONS

DRILLING METHODS:
HSA - Hollow Stem Auger
SSA - Solid Stem Auger
HA - Hand Auger
AR - Air Rotary
DTR - Dual Tube Rotary
FR - Foam Rotary
MR - Mud Rotary
RC - Reverse Circulation
CT - Cable Tool
JET - Jetting
D - Driving
DTC - Drill Through Casing

SAMPLING TYPES:
AS - Auger/Grab Sample
CS - California Sampler
BX - 1.5" Rock Core
NX - 2.1" Rock Core
GP - Geoprobe
HP - Hydro Punch
SS - Split Spoon
ST - Shelby Tube
WS - Wash Sample
OTHER:
AGS - Above Ground Surface

REMARKS

1. Wash water started at 11 ft bgs.
2. Depth measured from top of 1-ft thick ice and frost.

Reviewed by: NJY & YMC **Date:** 17 June 2019

Geosyntec consultants

BOREHOLE LOG

GB-16

Client: WMDSM - Crossroads Landfill
Project Name: 2019 Phase 14 Geotechnical Investigation
Project Location: Norridgewock, Maine
Project Number: BE0232

Sample Type	Blows per 6 inches	Sample Recovery (Inches)	Elev. Depth (ft.)	Graphic Log	USCS Stratum Designation	Material Description
SS	7 7	24/24	20		CL	(20'-21') Wet, stiff, gray, CLAY, little silt (CL)
SS	3 5 5 6	24/21			CL	(21'-22.7') Wet, stiff, gray, CLAY, trace silt (CL) 1/8 inch thick lens at 21.6 ft bgs.
SS	3 3 4 4	24/24			CL	(23'-25') Wet, firm, gray, CLAY (CL)
SS	WOH WOH WOH 5	24/24	25		CL	(25'-27') Wet, very soft, gray, CLAY (CL) 1/8 inch thick silt lens at 26.4 ft bgs.
SH		24/24			CL	(27'-29') Shelby tube collected. Wet, gray, CLAY (CL)
SS	WOH WOH WOH WOH	24/24	30		CL	(29'-31') Wet, very soft, gray, CLAY (CL)
SS	WOH WOH 5 22	24/22			CL	(31'-32.6') Wet, firm, gray, CLAY (CL)
					SM	(32.6'-32.8') Wet, loose, gray, coarse to fine SAND, some silt, little fine gravel (SM)
SS	11 11 8 6	24/9	35		SM	(35'-35.8') Wet, medium dense, gray, coarse to fine SAND, some silt, little medium to fine gravel (SM)
SS	11 12 15 16	24/11	40		ML	(40'-40.9') Wet, very stiff, gray, SILT, some coarse to fine sand, some medium to fine gravel (ML)
			45			Bedrock encountered at 44.2 ft bgs. Roller bit 2 ft into bedrock for confirmation. End of exploration at 46 ft bgs.
			50			

Geosyntec consultants

BOREHOLE LOG

GB-17

Client: WMDSM - Crossroads Landfill
Project Name: 2019 Phase 14 Geotechnical Investigation
Project Location: Norridgewock, Maine
Project Number: BE0232

Drilling Contractor: New England Boring Contractors
Surface Elevation (ft.): 273.77 (NAVD 88)
Drilling Method/Rig: Drive and Wash/CME
Total Depth (ft.): 27.5
Drillers: Tom Shaefer, Mark Titus
Abandonment Method: Bentonite Chips
Drilling Date: Start: 13 March 2019 **End:** 14 March 2019
Logged By: Zachary Tanguay
Borehole Coordinates:
N 684,549.23 E 3,040,314.07

Sample Type	Blows per 6 inches	Sample Recovery (Inches)	Elev. Depth (ft.)	Graphic Log	USCS Stratum Designation	Material Description
			0			(0'-1') Roller bit through ice and frost.
SS	5 1 2 4	24/11			SM	(1'-1.9') Moist, very loose, brown, medium to fine SAND, some silt, little organics (SM)
SS	WOH 4 4 4	24/16			SP CL	(3'-3.5') Moist, loose, brown, medium to fine SAND, little silt (SP) (3.5'-4.4') Moist, firm, brown, CLAY, little silt (CL)
SS	3 5 7 7	24/24	5		CL	(5'-7') Moist, stiff, brown, CLAY, little silt (CL)
SS	1 4 5 6	24/22			CL CL	(7'-7.9') Moist, stiff, grayish brown, CLAY, little silt (CL) (7.9'-8.9') Moist, stiff, gray, CLAY (CL)
SS	2 3 4 5	24/20	10		CL	(9'-10.8') Wet, firm, gray, CLAY, little silt (CL)
SS	1 2 3 3	24/24			CL	(11'-13') Wet, firm, gray, CLAY (CL)
					CL	(13'-15') Shelby tube attempted. No recovery. Split spoon hydraulically advanced. Wet, gray, CLAY (CL)
SH		24/24	15		CL	(15'-17') Shelby tube collected. Wet, gray, CLAY (CL)
SS	WOH WOH WOH WOH	24/24			CL	(17'-19') Wet, very soft, gray, CLAY (CL)
	WOH WOH				CL	(19'-21') Wet, very soft, gray, CLAY (CL) 1/8 inch thick lens of silt at 20.3 ft bgs.

EXPLANATION OF ABBREVIATIONS

DRILLING METHODS:
HSA - Hollow Stem Auger
SSA - Solid Stem Auger
HA - Hand Auger
AR - Air Rotary
DTR - Dual Tube Rotary
FR - Foam Rotary
MR - Mud Rotary
RC - Reverse Circulation
CT - Cable Tool
JET - Jetting
D - Driving
DTC - Drill Through Casing

SAMPLING TYPES:
AS - Auger/Grab Sample
CS - California Sampler
BX - 1.5" Rock Core
NX - 2.1" Rock Core
GP - Geoprobe
HP - Hydro Punch
SS - Split Spoon
ST - Shelby Tube
WS - Wash Sample
OTHER:
AGS - Above Ground Surface

REMARKS

1. Wash water started at 9 ft bgs.
2. Depth measured from top of 1-ft thick ice and frost.

Reviewed by: NJY & YMC **Date:** 17 June 2019

Geosyntec consultants

BOREHOLE LOG

GB-17

Client: WMDSM - Crossroads Landfill

Project Name: 2019 Phase 14 Geotechnical Investigation

Project Location: Norridgewock, Maine

Project Number: BE0232

Sample Type	Blows per 6 inches	Sample Recovery (Inches)	Elev. Depth (ft.)	Graphic Log	USCS Stratum Designation	Material Description
SS	WOH WOH	24/24	20			
SS	WOH WOH WOH WOH	24/24			CL	(21'-23') Wet, very soft, gray, CLAY (CL)
SS	WOH WOH WOH 7	24/24			CL	(23'-25') Wet, very soft, gray, CLAY (CL)
			25			Bedrock encountered at 25.6 ft bgs. Roller bit 2 ft into bedrock for confirmation. End of exploration at 27.5 ft bgs.
			30			
			35			
			40			
			45			
			50			

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BOREHOLE LOG

GB-17B

Client: WMDSM - Crossroads Landfill
Project Name: 2019 Phase 14 Geotechnical Investigation
Project Location: Norridgewock, Maine
Project Number: BE0232

Drilling Contractor: New England Boring Contractors
Surface Elevation (ft.): 274.35 (NAVD 88)
Drilling Method/Rig: Drive and Wash/CME
Total Depth (ft.): 7
Drillers: Tom Shaefer, Mark Titus
Abandonment Method: Bentonite Chips
Drilling Date: Start: 14 March 2019 **End:** 14 March 2019
Logged By: Zachary Tanguay
Borehole Coordinates:
N 684,550.44 E 3,040,310.48

Sample Type	Blows per 6 inches	Sample Recovery (Inches)	Elev. Depth (ft.)	Graphic Log	USCS Stratum Designation	Material Description
			0			(0'-5') Roller bit to 5 ft bgs to collect Shelby tube.
			5		CL	(5'-7') Shelby tube collected. Wet, brown, CLAY, little silt (CL)
						End of exploration at 7 ft bgs.
			10			
			15			

EXPLANATION OF ABBREVIATIONS

DRILLING METHODS:
HSA - Hollow Stem Auger
SSA - Solid Stem Auger
HA - Hand Auger
AR - Air Rotary
DTR - Dual Tube Rotary
FR - Foam Rotary
MR - Mud Rotary
RC - Reverse Circulation
CT - Cable Tool
JET - Jetting
D - Driving
DTC - Drill Through Casing

SAMPLING TYPES:
AS - Auger/Grab Sample
CS - California Sampler
BX - 1.5" Rock Core
NX - 2.1" Rock Core
GP - Geoprobe
HP - Hydro Punch
SS - Split Spoon
ST - Shelby Tube
WS - Wash Sample
OTHER:
AGS - Above Ground Surface

REMARKS

Reviewed by: NJY & YMC **Date:** 17 June 2019

Geosyntec consultants

BOREHOLE LOG

GB-18

Client: WMDSM - Crossroads Landfill
Project Name: 2019 Phase 14 Geotechnical Investigation
Project Location: Norridgewock, Maine
Project Number: BE0232

Drilling Contractor: New England Boring Contractors
Surface Elevation (ft.): 285.96 (NAVD 88)
Drilling Method/Rig: Drive and Wash/CME
Total Depth (ft.): 30
Drillers: Tom Shaefer, Mark Titus
Abandonment Method: Bentonite Chips
Drilling Date: Start: 5 March 2019 **End:** 5 March 2019
Logged By: Zachary Tanguay
Borehole Coordinates:
N 685,036.93 E 3,040,210.12

Sample Type	Blows per 6 inches	Sample Recovery (Inches)	Elev. Depth (ft.)	Graphic Log	USCS Stratum Designation	Material Description
			0			(0'-1') Roller bit through ice and frost.
SS	4 4 7 9	24/14			SM	(1'-2.2') Moist, medium dense, brown, medium to fine SAND, some silt, little organics (SM)
SS	9 6 4 5	24/16			SP	(3'-4.3') Moist, loose, brown, medium to fine SAND, little silt, trace organics, trace fine gravel (SP)
SS	4 7 8 9	24/20	5		SP	(5'-6.8') Moist, medium dense, brown, medium to fine SAND, little silt (SP)
SS	4 6 5 3	24/16			SM	(7'-8.2') Wet, medium dense, brown, medium to fine SAND, little silt (SM)
					CL	(8.2'-8.3') Wet, stiff, brown, CLAY, some silt, little fine sand (CL)
SS	4 4 8 9	24/14	10		CL	(9'-10.2') Wet, stiff, brown, CLAY, little silt, trace fine sand (CL)
SS	4 7 8 11	24/24			CL	(11'-13') Wet, stiff, brown, CLAY, little silt (CL)
SS	4 7 8 10	24/24			CL	(13'-15') Wet, stiff, grayish brown, CLAY, trace silt (CL)
SS	5 7 8 10	24/24	15		CL	(15'-17') Wet, stiff, gray, CLAY, trace silt (CL)
SH		24/24			CL	(17'-19') Shelby tube collected. Wet, gray, CLAY, trace silt (CL) Pocket Penetrometer: 1.25, 1.25, and 1.25 Tons/FT2
	WOH WOH				CL	(19'-21') Wet, very soft, gray, CLAY (CL)

EXPLANATION OF ABBREVIATIONS

DRILLING METHODS:
HSA - Hollow Stem Auger
SSA - Solid Stem Auger
HA - Hand Auger
AR - Air Rotary
DTR - Dual Tube Rotary
FR - Foam Rotary
MR - Mud Rotary
RC - Reverse Circulation
CT - Cable Tool
JET - Jetting
D - Driving
DTC - Drill Through Casing

SAMPLING TYPES:
AS - Auger/Grab Sample
CS - California Sampler
BX - 1.5" Rock Core
NX - 2.1" Rock Core
GP - Geoprobe
HP - Hydro Punch
SS - Split Spoon
ST - Shelby Tube
WS - Wash Sample
OTHER:
AGS - Above Ground Surface

REMARKS

1. Wash water started at 9 ft bgs.
2. Depth measured from top of 1-ft thick ice and frost.

Reviewed by: NJY & YMC **Date:** 17 June 2019

Geosyntec consultants

BOREHOLE LOG

GB-18

Client: WMDSM - Crossroads Landfill
Project Location: Norridgewock, Maine
Project Name: 2019 Phase 14 Geotechnical Investigation
Project Number: BE0232

Sample Type	Blows per 6 inches	Sample Recovery (Inches)	Elev. Depth (ft.)	Graphic Log	USCS Stratum Designation	Material Description
SS	WOH WOH	24/24	20			
SS	15 27 27 25	24/24			CL	(21'-22') Wet, very hard, gray, CLAY (CL)
					ML	(22'-23') Wet, very hard, gray, SILT, some coarse to fine sand, little fine gravel (ML)
			25			Bedrock encountered at 27.7 ft bgs. Roller bit 2 ft into bedrock for confirmation. End of exploration at 30 ft bgs.
			30			
			35			
			40			
			45			
			50			

Geosyntec consultants

BOREHOLE LOG

GB-19

Client: WMDSM - Crossroads Landfill
Project Name: 2019 Phase 14 Geotechnical Investigation
Project Location: Norridgewock, Maine
Project Number: BE0232

Drilling Contractor: New England Boring Contractors
Surface Elevation (ft.): 270.31 (NAVD 88)
Drilling Method/Rig: Drive and Wash/CME
Total Depth (ft.): 39
Drillers: Tom Shaefer, Mark Titus
Abandonment Method: Bentonite Chips
Drilling Date: Start: 18 March 2019 **End:** 20 March 2019
Logged By: Zachary Tanguay
Borehole Coordinates:
N 684,294.44 E 3,039,831.73

Sample Type	Blows per 6 inches	Sample Recovery (Inches)	Elev. Depth (ft.)	Graphic Log	USCS Stratum Designation	Material Description
			0			(0'-1') Roller bit through ice and frost.
SS	5 8 8 8	24/20			SP ML	(1'-1.7') Moist, medium dense, brown, medium to fine SAND, some organics, little silt (SP) (1.7'-2.8') Moist, very stiff, gray, SILT, little clay (ML)
SS	4 5 7 8	24/24			CL	(3'-5') Moist, stiff, grayish brown, CLAY, little silt (CL)
SS	5 5 6 7	24/24	5		CL	(5'-7') Moist, stiff, grayish brown, CLAY, little silt (CL)
SS	3 4 5 5	24/22			CL	(7'-8.8') Moist, stiff, gray, CLAY, trace silt (CL)
SS	4 3 3 5	24/22	10		CL	(9'-10.8') Wet, firm, gray, CLAY, little silt (CL)
SS	WOH 3 4 3	24/22			CL	(11'-12.8') Wet, firm, gray, CLAY, trace silt (CL)
SS	WOH WOH WOH 4	24/24			CL	(13'-15') Wet, very soft, gray, CLAY (CL)
SS	WOH WOH WOH WOH	24/24	15		CL	(15'-17') Wet, very soft, gray, CLAY (CL)
SH		24/20			CL	(17'-18.8') Shelby tube collected. Wet, gray, CLAY (CL)
	WOH WOH				CL	(19'-21') Wet, very soft, gray, CLAY (CL)

EXPLANATION OF ABBREVIATIONS

DRILLING METHODS:
HSA - Hollow Stem Auger
SSA - Solid Stem Auger
HA - Hand Auger
AR - Air Rotary
DTR - Dual Tube Rotary
FR - Foam Rotary
MR - Mud Rotary
RC - Reverse Circulation
CT - Cable Tool
JET - Jetting
D - Driving
DTC - Drill Through Casing

SAMPLING TYPES:
AS - Auger/Grab Sample
CS - California Sampler
BX - 1.5" Rock Core
NX - 2.1" Rock Core
GP - Geoprobe
HP - Hydro Punch
SS - Split Spoon
ST - Shelby Tube
WS - Wash Sample
OTHER:
AGS - Above Ground Surface

REMARKS

Wash water started at 11 ft bgs

Reviewed by: NJY & YMC **Date:** 17 June 2019

Geosyntec consultants

BOREHOLE LOG

GB-19

Client: WMDSM - Crossroads Landfill
Project Location: Norridgewock, Maine
Project Name: 2019 Phase 14 Geotechnical Investigation
Project Number: BE0232

Sample Type	Blows per 6 inches	Sample Recovery (Inches)	Elev. Depth (ft.)	Graphic Log	USCS Stratum Designation	Material Description
SS	WOH WOH	24/24	20			
SS	WOH WOH WOH WOH	24/24			CL	(21'-23') Wet, very soft, gray, CLAY (CL)
SS	WOH WOH WOH WOH	24/24			CL	(23'-25') Wet, very soft, gray, CLAY (CL) 1/8 inch thick lens of medium to fine sand at 23.2 ft bgs
SS	WOH WOH WOH 22	24/24	25		CL	(25'-26.8') Wet, very soft, gray, CLAY (CL)
					SM	(26.8'-27') Wet, very loose, gray, medium to fine SAND, some silt, little fine gravel (SM)
			30			
SS	17 8 6 10	24/11			SM	(31'-31.9') Wet, medium dense, gray, coarse to fine SAND, some silt, some coarse to fine gravel (SM)
SS	5 4 6 8	24/10	35		SM	(35'-35.8') Wet, loose, gray, coarse to fine SAND, some silt, little medium to fine gravel (SM)
						Bedrock encountered at 37.2 ft bgs. Drilled 2 ft into bedrock to confirm. End of exploration at 39 ft bgs.
			40			
			45			
			50			

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BOREHOLE LOG

GB-21

Client: WMDSM - Crossroads Landfill
Project Name: 2019 Phase 14 Geotechnical Investigation
Project Location: Norridgewock, Maine
Project Number: BE0232

Drilling Contractor: New England Boring Contractors
Surface Elevation (ft.): 286.77 (NAVD 88)
Drilling Method/Rig: Drive and Wash/CME
Total Depth (ft.): 32.6
Drillers: Tom Shaefer, Mark Titus
Abandonment Method: Bentonite Chips
Drilling Date: Start: 27 March 2019 **End:** 28 March 2019
Logged By: Zachary Tanguay
Borehole Coordinates:
N 684,885.90 E 3,039,433.45

Sample Type	Blows per 6 inches	Sample Recovery (Inches)	Elev. Depth (ft.)	Graphic Log	USCS Stratum Designation	Material Description
			0			(0'-1') Roller bit through ice and frost.
SS	24 28 28 25	24/18			ML	(1'-1.5') Moist, very hard, brown, SILT, little medium to fine sand (ML)
SS	31 25 24 47	24/18			ML	(3'-4.2') Moist, hard, brown, SILT, little medium to fine sand (ML)
					SP	(4.2'-4.5') Moist, dense, brown, medium to fine SAND, little silt (SP)
SS	12 20 18 17	24/18	5		SP	(5'-6.5') Moist, dense, brown, medium to fine SAND, little silt (SP)
SS	5 10 16 14	24/17			SP	(7'-8.4') Wet, medium dense, brown, medium to fine SAND, little silt (SP) Red staining observed at 7.5 ft bgs.
SS	9 14 13 10	24/13			SP	(9'-10') Wet, medium dense, brown, medium to fine SAND, little silt (SP)
			10		CL	(10'-10.1') Wet, very stiff, brown, CLAY, little silt (CL)
SS	3 7 7 8	24/18			CL	(11'-11.8') Wet, stiff, CLAY, brown, little silt (CL)
					CL	(11.8'-12.5') Wet, stiff, gray, CLAY (CL)
SS	4 4 6 8	24/22			CL	(13'-14.8') Wet, stiff, gray, CLAY (CL)
SS	5 6 8 10	24/24	15		CL	(15'-17') Wet, stiff, brownish gray, CLAY, trace of silt (CL)
SS	1 4 4 6	24/24			CL	(17'-19') Wet, firm, gray, CLAY (CL)
	2 2				CL	(19'-21') Wet, soft, gray, CLAY (CL)

EXPLANATION OF ABBREVIATIONS

DRILLING METHODS:
HSA - Hollow Stem Auger
SSA - Solid Stem Auger
HA - Hand Auger
AR - Air Rotary
DTR - Dual Tube Rotary
FR - Foam Rotary
MR - Mud Rotary
RC - Reverse Circulation
CT - Cable Tool
JET - Jetting
D - Driving
DTC - Drill Through Casing

SAMPLING TYPES:
AS - Auger/Grab Sample
CS - California Sampler
BX - 1.5" Rock Core
NX - 2.1" Rock Core
GP - Geoprobe
HP - Hydro Punch
SS - Split Spoon
ST - Shelby Tube
WS - Wash Sample
OTHER:
AGS - Above Ground Surface

REMARKS

1. Wash water started at 9 ft bgs.
2. Depth measured from top of 1-ft thick ice and frost.

Reviewed by: NJY & YMC **Date:** 17 June 2019

Geosyntec consultants

BOREHOLE LOG

GB-21

Client: WMDSM - Crossroads Landfill
Project Name: 2019 Phase 14 Geotechnical Investigation
Project Location: Norridgewock, Maine
Project Number: BE0232

Sample Type	Blows per 6 inches	Sample Recovery (Inches)	Elev. Depth (ft.)	Graphic Log	USCS Stratum Designation	Material Description
SS	2 2	24/24	20			
SS	WOH WOH WOH WOH	24/24			CL	(21'-23') Wet, very soft, gray, CLAY (CL)
SH		24/24			CL	(23'-25') Shelby tube collected. Wet, gray, CLAY (CL)
SS	WOH WOH WOH 11	24/24	25		CL	(25'-27') Wet, very soft, gray, CLAY (CL)
SS	15 17 14 13	24/10			CL	(27'-27.8') Wet, hard, gray, gravely CLAY, some sand (CL)
SS	20 56 27 25	24/5	30		ML	(29'-29.4') Wet, very hard, gray, gravely SILT, some fine sand (ML)
			35 40 45 50			Bedrock encountered at 32.6 ft bgs. Drilled 2 ft into bedrock to confirm. End of exploration.

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BOREHOLE LOG

PZ-1M

Client: WMDSM - Crossroads Landfill
Project Location: Norridgewock, Maine
Project Name: 2019 Phase 14 Geotechnical Investigation
Project Number: BE0232

Drilling Contractor: New England Boring Contractors
Drilling Method/Rig: Drive and Wash/CME
Drillers: Tom Shaefer, Mark Titus
Drilling Date: Start: 28 March 2019 **End:** 28 March 2019
Borehole Coordinates:
N E

Surface Elevation (ft.):
Total Depth (ft.): 7.4
Abandonment Method:
Logged By: M. Mirshekari

Sample Type	Blows per 6 inches	Sample Recovery (Inches)	Elev. Depth (ft.)	Graphic Log	USCS Stratum Designation	Material Description
			0			(0'-1') Roller bit through ice and frost.
SS	10 15 18 24	24/15			SM	(1'-2.25') Wet, dense, brown, silty fine SAND (SM)
SS	23 23 27 19	24/18			SM	(3'-4.5') Wet, dense, brown, silty fine SAND, with some gravel (SM)
SS	8 6 5 4	24/6	5		SM	(5'-5.5') Wet, medium dense, brown, silty fine SAND, trace of gravel (SM)
SS	75 68 24 16	24/5			SM GW	(7'-7.25') Wet, very dense, brown, silty fine SAND (SM) (7.25'-7.4') Very dense, white Gravel Refusal. Cobbles encountered.
			10			
			15			

EXPLANATION OF ABBREVIATIONS

DRILLING METHODS:
HSA - Hollow Stem Auger
SSA - Solid Stem Auger
HA - Hand Auger
AR - Air Rotary
DTR - Dual Tube Rotary
FR - Foam Rotary
MR - Mud Rotary
RC - Reverse Circulation
CT - Cable Tool
JET - Jetting
D - Driving
DTC - Drill Through Casing

SAMPLING TYPES:
AS - Auger/Grab Sample
CS - California Sampler
BX - 1.5" Rock Core
NX - 2.1" Rock Core
GP - Geoprobe
HP - Hydro Punch
SS - Split Spoon
ST - Shelby Tube
WS - Wash Sample
OTHER:
AGS - Above Ground Surface

REMARKS

Reviewed by: NJY & YMC
Date: 17 June 2019

Geosyntec consultants

BOREHOLE LOG

PZ-1MR

Client: WMDSM - Crossroads Landfill
Project Name: 2019 Phase 14 Geotechnical Investigation
Project Location: Norridgewock, Maine
Project Number: BE0232

Drilling Contractor: New England Boring Contractors
Surface Elevation (ft.): 292.55 (NAVD 88)
Drilling Method/Rig: Drive and Wash/CME
Total Depth (ft.): 28.5
Drillers: Tom Shaefer, Mark Titus
Abandonment Method: Bentonite Chips
Drilling Date: Start: 28 March 2019 **End:** 28 March 2019
Logged By: M. Mirshekari
Borehole Coordinates:
N 684,739.05 E 3,039,786.84

Sample Type	Blows per 6 inches	Sample Recovery (Inches)	Elev. Depth (ft.)	Graphic Log	USCS Stratum Designation	Material Description
			0			See PZ-1M log.
			5			
SS	40 23 21 48	24/12	10		SM SM	(9'-9.5') Wet, dense, brownish gray, silty fine SAND, some gravel (SM) (9.5'-10') Wet, dense, brown, silty fine SAND (SM)
SS	43 45 50 45	24/0				(11'-13') No Recovery.
SS	13 12 11 14	24/13			SM	(13'-14.1') Wet, medium dense, brown, silty fine SAND (SM)
SS	11 15 15 14	24/12	15		SM	(15'-16') Wet, medium dense, brownish gray, silty fine SAND (SM)
SS	3 5 9 13	24/20			SM CL	(17'-17.1') Wet, medium dense, brownish gray, silty fine SAND (SM) (17.1'-18.7') Wet, stiff, brown, silty CLAY (CL)
	4 5				CL	(19'-21') Wet, stiff, brown, silty CLAY (CL)

EXPLANATION OF ABBREVIATIONS

DRILLING METHODS:
HSA - Hollow Stem Auger
SSA - Solid Stem Auger
HA - Hand Auger
AR - Air Rotary
DTR - Dual Tube Rotary
FR - Foam Rotary
MR - Mud Rotary
RC - Reverse Circulation
CT - Cable Tool
JET - Jetting
D - Driving
DTC - Drill Through Casing

SAMPLING TYPES:
AS - Auger/Grab Sample
CS - California Sampler
BX - 1.5" Rock Core
NX - 2.1" Rock Core
GP - Geoprobe
HP - Hydro Punch
SS - Split Spoon
ST - Shelby Tube
WS - Wash Sample
OTHER:
AGS - Above Ground Surface

REMARKS

Reviewed by: NJY & YMC **Date:** 17 June 2019

Geosyntec consultants

BOREHOLE LOG

PZ-1MR

Client: WMDSM - Crossroads Landfill
Project Name: 2019 Phase 14 Geotechnical Investigation
Project Location: Norridgewock, Maine
Project Number: BE0232

Sample Type	Blows per 6 inches	Sample Recovery (Inches)	Elev. Depth (ft.)	Graphic Log	USCS Stratum Designation	Material Description
SS	7 19	24/24	20			
SS	4 5 7 7	24/24			CL	(21'-23') Wet, stiff, brown, CLAY, little silt (CL)
SS	2 3 4 4	24/24			CL	(23'-25') Wet, firm, brownish gray, CLAY, trace silt (CL)
SS	WOH 2 3 3	24/24	25		CL	(25'-27') Wet, firm, gray, CLAY (CL)
SS	WOH WOH WOH	18/18			CL	(27'-28.5') Wet, very soft, gray, CLAY (CL)
						End of exploration at 28.5 ft bgs
			30			
			35			
			40			
			45			
			50			

BOREHOLE LOG

PZ-5M

Geosyntec consultants

Client: WMDSM - Crossroads Landfill
Project Location: Norridgewock, Maine
Project Name: 2019 Phase 14 Geotechnical Investigation
Project Number: BE0232

Drilling Contractor: New England Boring Contractors
Drilling Method/Rig: Drive and Wash/CME
Drillers: Tom Shaefer, Mark Titus
Drilling Date: Start: 20 March 2019 **End:** 20 March 2019
Borehole Coordinates:
N 685,620.52 E 3,038,720.59

Surface Elevation (ft.): 286.12 (NAVD 88)
Total Depth (ft.): 15
Abandonment Method: Piezometer, Sand, and Bentonite Chips
Logged By: Zachary Tanguay

Sample Type	Blows per 6 inches	Sample Recovery (Inches)	Elev. Depth (ft.)	Graphic Log	USCS Stratum Designation	Material Description
			0			(0'-1') Roller bit through ice and frost.
SS	3 3 4 5	24/14			SP	(1'-2.2') Moist, loose, brown, medium to fine SAND, some organics, little silt (SP)
SS	3 3 5 7	24/20			SP CL	(3'-4.3') Moist, loose, brown, medium to fine SAND, little silt, little organics (SP) (4.3'-4.8') Moist, firm, brown, CLAY, little silt (CL)
SS	5 5 6 10	24/19	5		CL	(5'-6.6') Moist, stiff, brown, CLAY, little silt (CL) 3 inch thick lens of silt at 6.3 ft bgs.
SS	4 5 7 7	24/20			CL	(7'-8.7') Moist, stiff, brown, CLAY, little silt (CL)
SS	3 4 5 4	24/24	10		CL	(9'-11') Wet, stiff, brown, CLAY, little silt (CL) 2 inch thick lens of coarse to fine sand at 10.3 ft bgs.
SS	1 2 1 2	24/18			CL	(11'-12.5') Wet, soft, gray, CLAY (CL)
SS	12 20 17 29	24/3			ML	(13'-13.3') Wet, hard, gray, SILT, some medium to fine gravel, little coarse to fine sand (ML)
			15			End of exploration at 15 ft bgs. PZ-5M installed. Screen Interval: 7-12 ft bgs Sand Interval: 6-12.5 ft bgs Screen: 10,000 Sand: 1 S Remainder of borehole backfilled with bentonite chips.

EXPLANATION OF ABBREVIATIONS

DRILLING METHODS:
HSA - Hollow Stem Auger
SSA - Solid Stem Auger
HA - Hand Auger
AR - Air Rotary
DTR - Dual Tube Rotary
FR - Foam Rotary
MR - Mud Rotary
RC - Reverse Circulation
CT - Cable Tool
JET - Jetting
D - Driving
DTC - Drill Through Casing

SAMPLING TYPES:
AS - Auger/Grab Sample
CS - California Sampler
BX - 1.5" Rock Core
NX - 2.1" Rock Core
GP - Geoprobe
HP - Hydro Punch
SS - Split Spoon
ST - Shelby Tube
WS - Wash Sample
OTHER:
AGS - Above Ground Surface

REMARKS

1. Wash water started at 7 ft bgs.
2. Depth measured from top of 1-ft thick ice and frost.

Reviewed by: NJY & YMC **Date:** 17 June 2019

APPENDIX C
Laboratory Test Results

APPENDIX C-1

Classification Tests

GeoTesting EXPRESS

Client:	Geosyntec Consultants				
Project:	Crossroads Phase 14				
Location:	Norridgewock, ME			Project No:	GTX-309940
Boring ID:	---	Sample Type:	---	Tested By:	cam
Sample ID:	---	Test Date:	07/12/19	Checked By:	emm
Depth :	---	Test Id:	510145		

USCS Classification - ASTM D2487

Boring ID	Sample ID	Depth	Group Name	Group Symbol	Gravel, %	Sand, %	Fines, %
GB-06	21-23	21-23 ft	Lean CLAY	CL	0.0	0.4	99.6
GB-06	29-31	29-31 ft	Lean CLAY	CL	0.0	0.3	99.7
GB-16	17-19	17-19 ft	Lean CLAY	CL	0.0	0.3	99.7
GB-16	27-29	27-29 ft	Lean CLAY	CL	0.0	0.1	99.9

Remarks: Grain Size analysis performed by ASTM D6913/D7928 results enclosed
Atterberg Limits performed by ASTM D4318, results enclosed

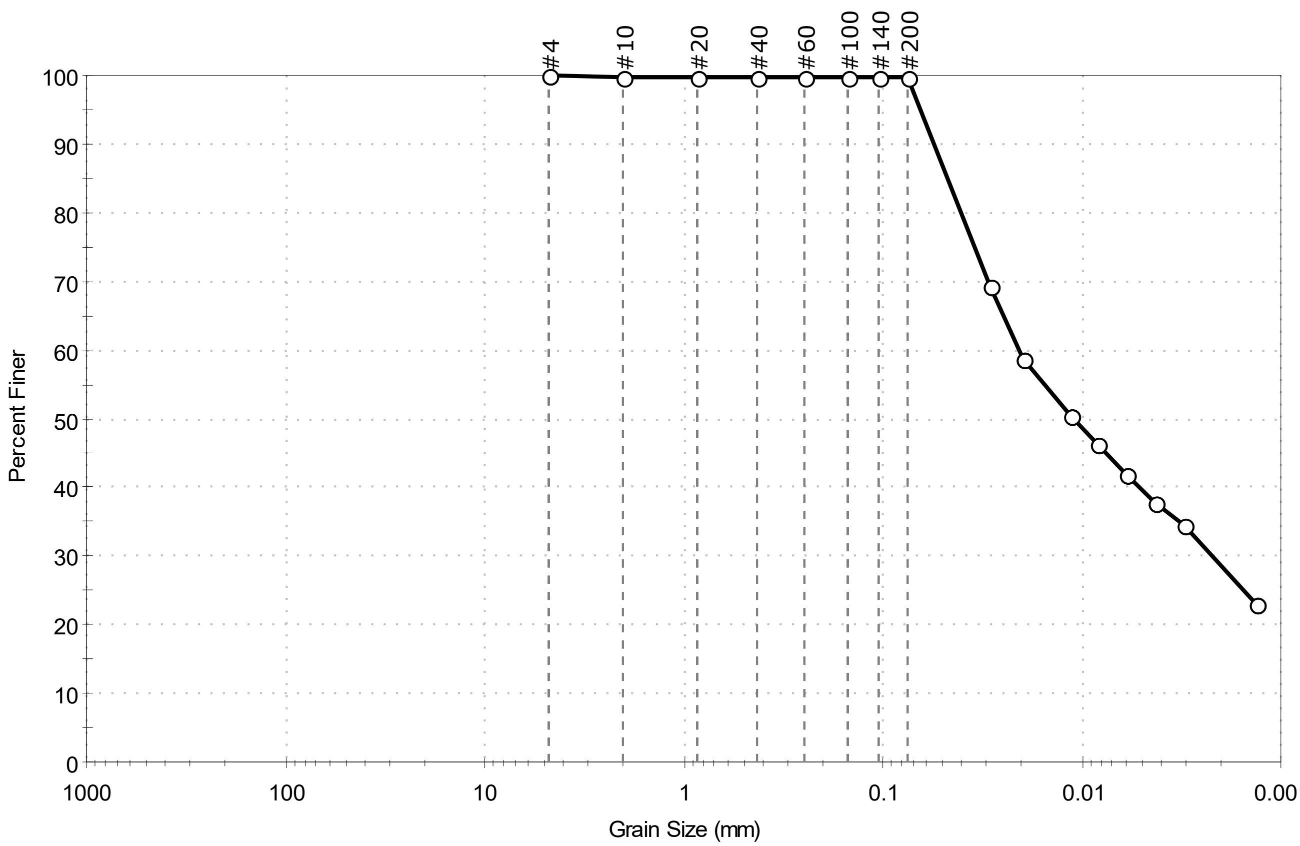
Client:	Geosyntec Consultants				
Project:	Crossroads Phase 14				
Location:	Norridgewock, ME			Project No:	GTX-309940
Boring ID:	GB-06	Sample Type:	tube	Tested By:	ckg
Sample ID:	21-23	Test Date:	07/01/19	Checked By:	emm
Depth :	21-23 ft	Test Id:	510157		

Test Comment: ---

Visual Description: Moist, dark gray clay

Sample Comment: ---

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
–	0.0	0.4	99.6

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	100		
#60	0.25	100		
#100	0.15	100		
#140	0.11	100		
#200	0.075	100		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0286	69		
---	0.0198	59		
---	0.0115	50		
---	0.0084	46		
---	0.0060	42		
---	0.0043	38		
---	0.0031	35		
---	0.0013	23		

Coefficients

D_{85} =0.0472 mm D_{30} =0.0022 mm

D_{60} =0.0206 mm D_{15} =N/A

D_{50} =0.0111 mm D_{10} =N/A

C_u =N/A C_c =N/A

Classification

ASTM Lean CLAY (CL)

AASHTO Clayey Soils (A-6 (14))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : HARD

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

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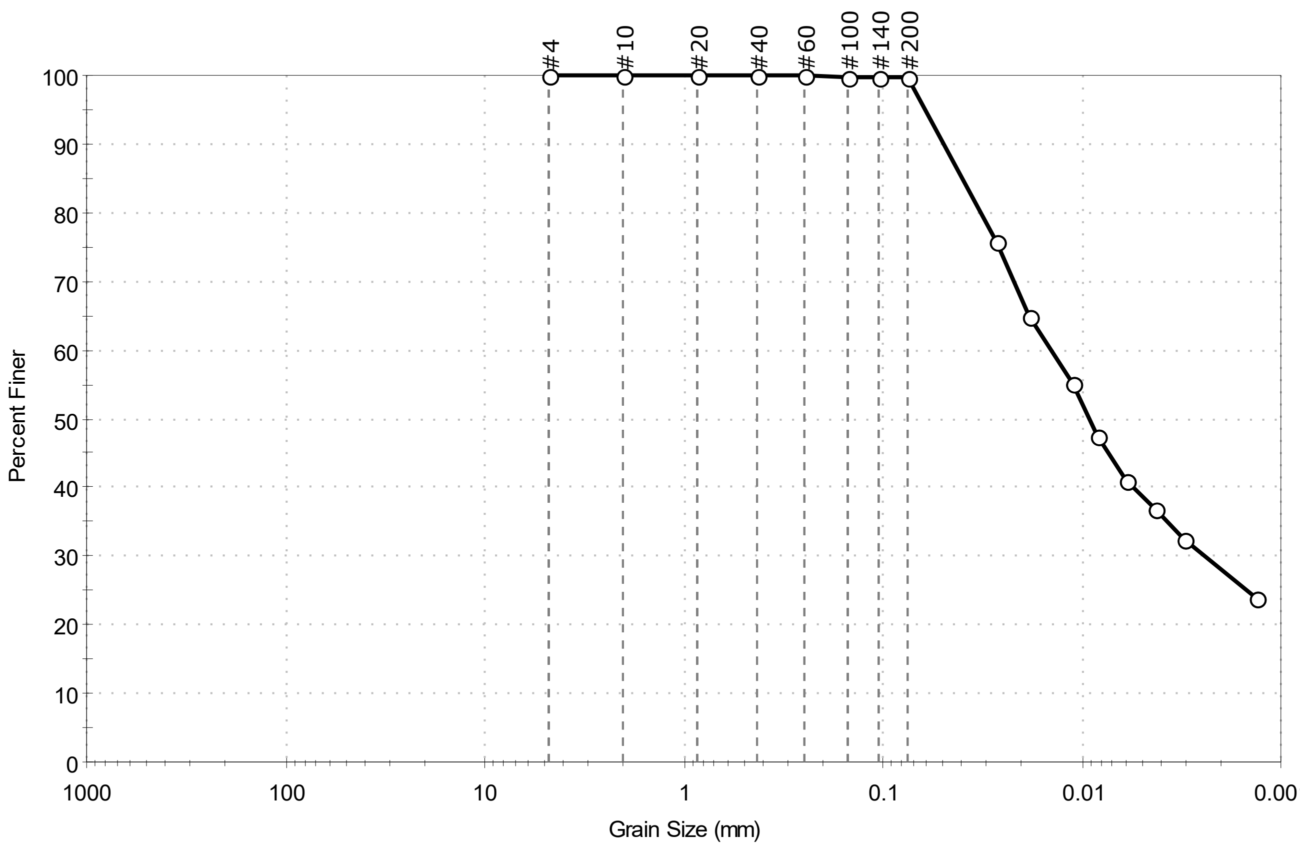
Client:	Geosyntec Consultants
Project:	Crossroads Phase 14
Location:	Norridgewock, ME
Project No:	GTX-309940
Boring ID:	GB-06
Sample ID:	29-31
Depth :	29-31 ft
Sample Type:	tube
Test Date:	06/30/19
Test Id:	510158
Tested By:	ckg
Checked By:	emm
Test Comment:	---
Visual Description:	Moist, olive gray clay
Sample Comment:	---

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	0.0	0.3	99.7

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	100		
#60	0.25	100		
#100	0.15	100		
#140	0.11	100		
#200	0.075	100		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0270	76		
---	0.0185	65		
---	0.0113	55		
---	0.0084	48		
---	0.0060	41		
---	0.0043	37		
---	0.0031	32		
---	0.0013	24		

Coefficients

D_{85} =0.0401 mm — D_{30} =0.0024 mm

D_{60} =0.0144 mm — D_{15} =N/A

D_{50} =0.0092 mm — D_{10} =N/A

C_u =N/A — C_c =N/A

Classification

ASTM — Lean CLAY (CL)

AASHTO — Clayey Soils (A-6 (11))

Sample/Test Description

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: Sieve

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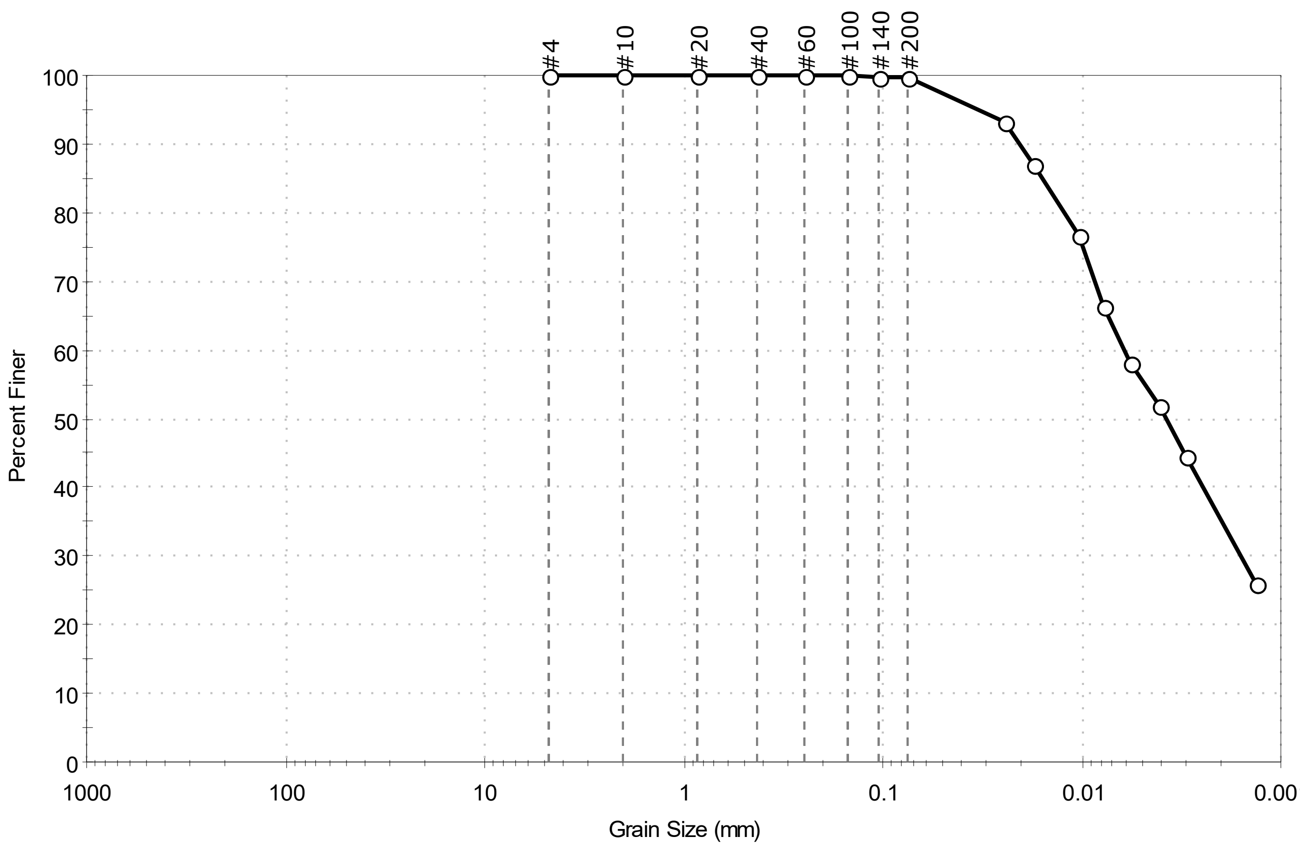
Client:	Geosyntec Consultants		
Project:	Crossroads Phase 14		
Location:	Norridgewock, ME	Project No:	GTX-309940
Boring ID: GB-16	Sample Type: tube	Tested By:	ckg
Sample ID: 17-19	Test Date: 07/01/19	Checked By:	emm
Depth : 17-19 ft	Test Id: 510167		
Test Comment:	---		
Visual Description:	Moist, olive gray clay		
Sample Comment:	---		

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	0.0	0.3	99.7

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	100		
#60	0.25	100		
#100	0.15	100		
#140	0.11	100		
#200	0.075	100		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0244	93		
---	0.0174	87		
---	0.0104	77		
---	0.0078	66		
---	0.0057	58		
---	0.0041	52		
---	0.0030	45		
---	0.0013	26		

Coefficients

D_{85} =0.0157 mm | D_{30} =0.0016 mm

D_{60} =0.0061 mm | D_{15} =N/A

D_{50} =0.0038 mm | D_{10} =N/A

C_u =N/A | C_c =N/A

Classification

ASTM Lean CLAY (CL)

AASHTO Clayey Soils (A-6 (14))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : HARD

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

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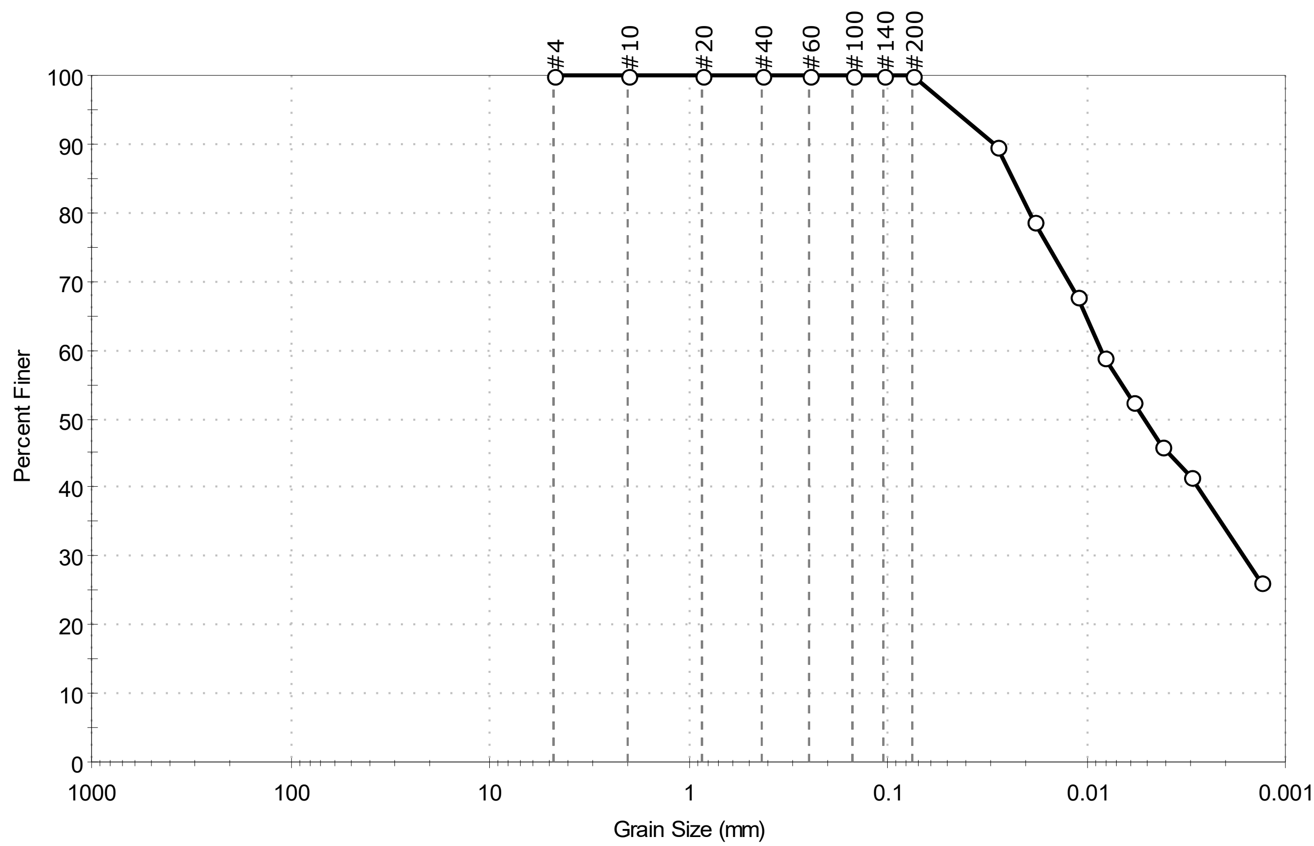
Client:	Geosyntec Consultants			
Project:	Crossroads Phase 14			
Location:	Norridgewock, ME		Project No:	GTX-309940
Boring ID:	GB-16	Sample Type: tube	Tested By:	ckg
Sample ID:	27-29	Test Date: 07/01/19	Checked By:	emm
Depth :	27-29 ft	Test Id: 510168		

Test Comment: ---
Visual Description: Moist, olive gray clay
Sample Comment: ---

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	0.0	0.1	99.9

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	100		
#60	0.25	100		
#100	0.15	100		
#140	0.11	100		
#200	0.075	100		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0284	90		
---	0.0184	79		
---	0.0110	68		
---	0.0081	59		
---	0.0058	52		
---	0.0042	46		
---	0.0030	42		
---	0.0013	26		

Coefficients

D_{85} =0.0237 mm
D_{30} =0.0016 mm
D_{60} =0.0084 mm
D_{15} =N/A
D_{50} =0.0052 mm
D_{10} =N/A
C_u =N/A
C_c =N/A

Classification

ASTM Lean CLAY (CL)

AASHTO Clayey Soils (A-6 (13))

Sample/Test Description

Sand/Gravel Particle Shape : ---
Sand/Gravel Hardness : HARD
Dispersion Device : Apparatus A - Mech Mixer
Dispersion Period : 1 minute
Est. Specific Gravity : 2.65
Separation of Sample: #200 Sieve

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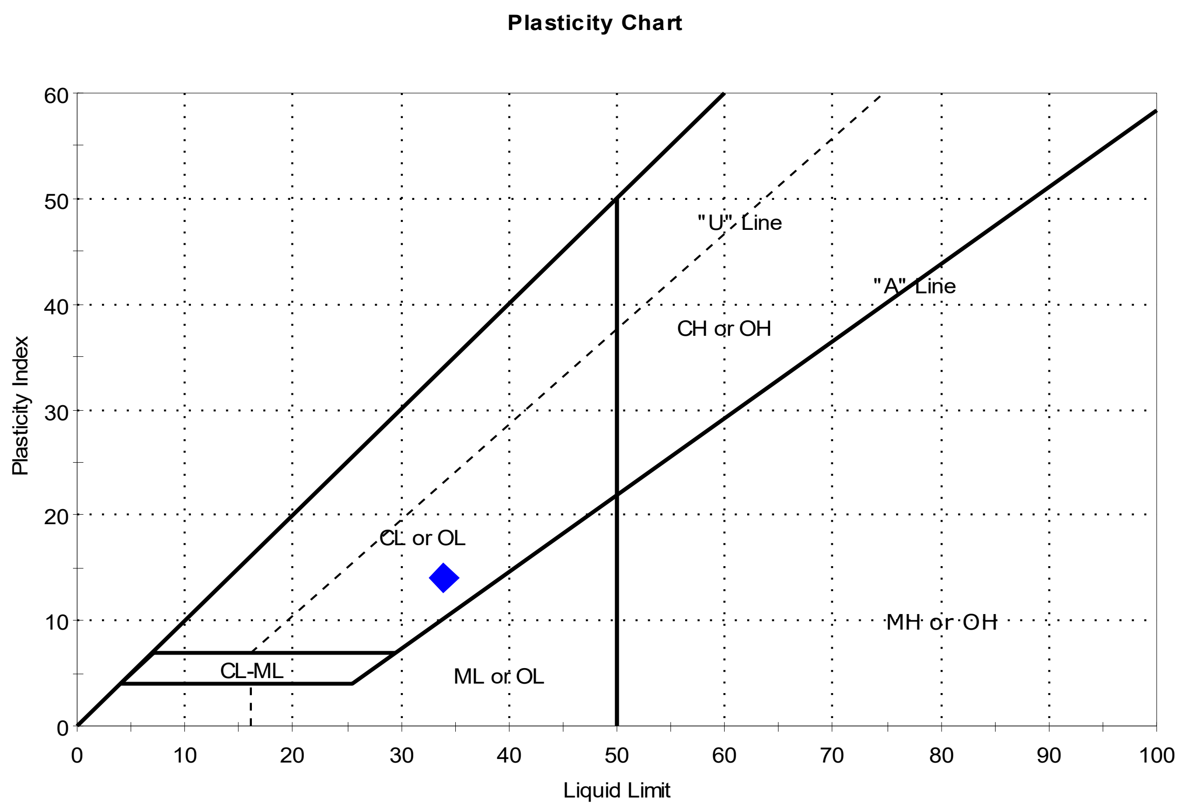
Client:	Geosyntec Consultants				
Project:	Crossroads Phase 14				
Location:	Norridgewock, ME			Project No:	GTX-309940
Boring ID:	GB-06	Sample Type:	tube	Tested By:	cam
Sample ID:	21-23	Test Date:	06/26/19	Checked By:	emm
Depth :	21-23 ft	Test Id:	510111		

Test Comment: ---
Visual Description: Moist, dark gray 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
◆	21-23	GB-06	21-23 ft	25	34	20	14	0.3	Lean CLAY (CL)

Sample Prepared using the WET method
0% Retained on #40 Sieve
Dry Strength: VERY HIGH
Dilatancy: SLOW
Toughness: MEDIUM

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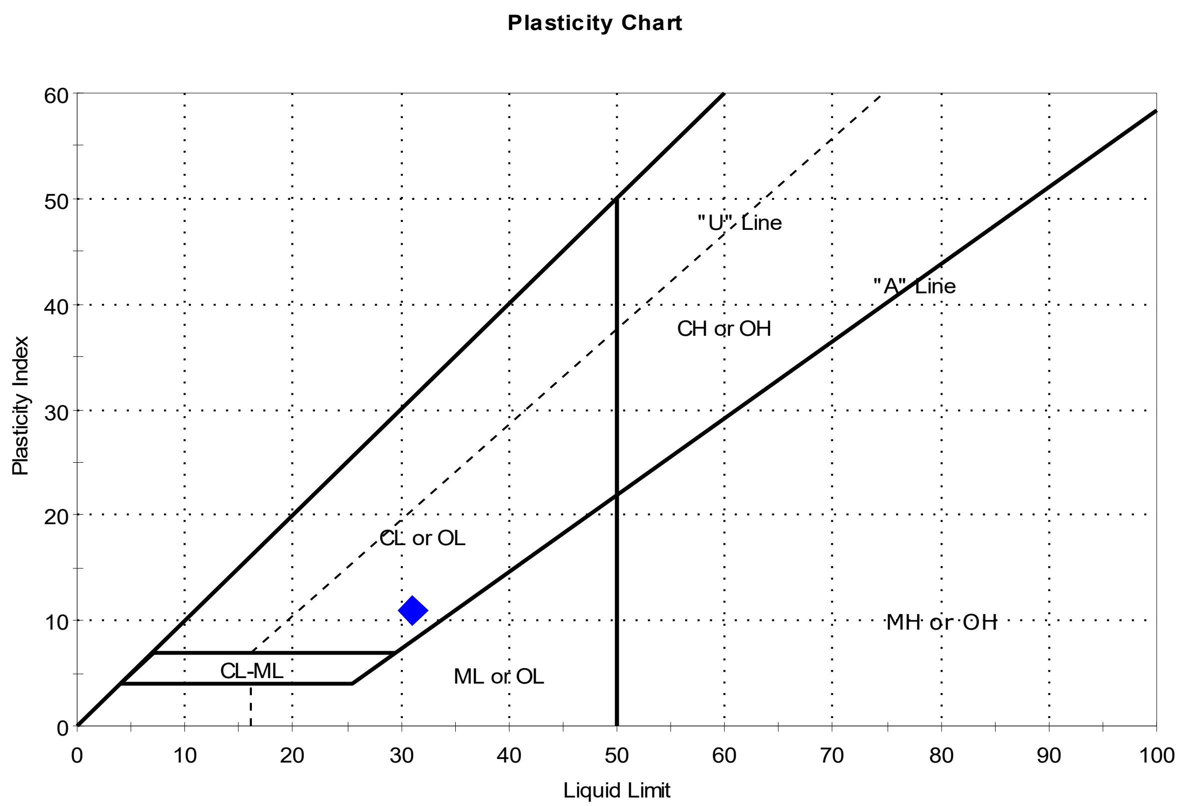
Client:	Geosyntec Consultants		
Project:	Crossroads Phase 14		
Location:	Norridgewock, ME	Project No:	GTX-309940
Boring ID: GB-06	Sample Type: tube	Tested By:	cam
Sample ID: 29-31	Test Date: 06/26/19	Checked By:	emm
Depth : 29-31 ft	Test Id: 510112		
Test Comment:	---		
Visual Description:	Moist, olive gray 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
◆	29-31	GB-06	29-31 ft	30	31	20	11	0.9	Lean CLAY (CL)

Sample Prepared using the WET method

0% Retained on #40 Sieve

Dry Strength: VERY HIGH

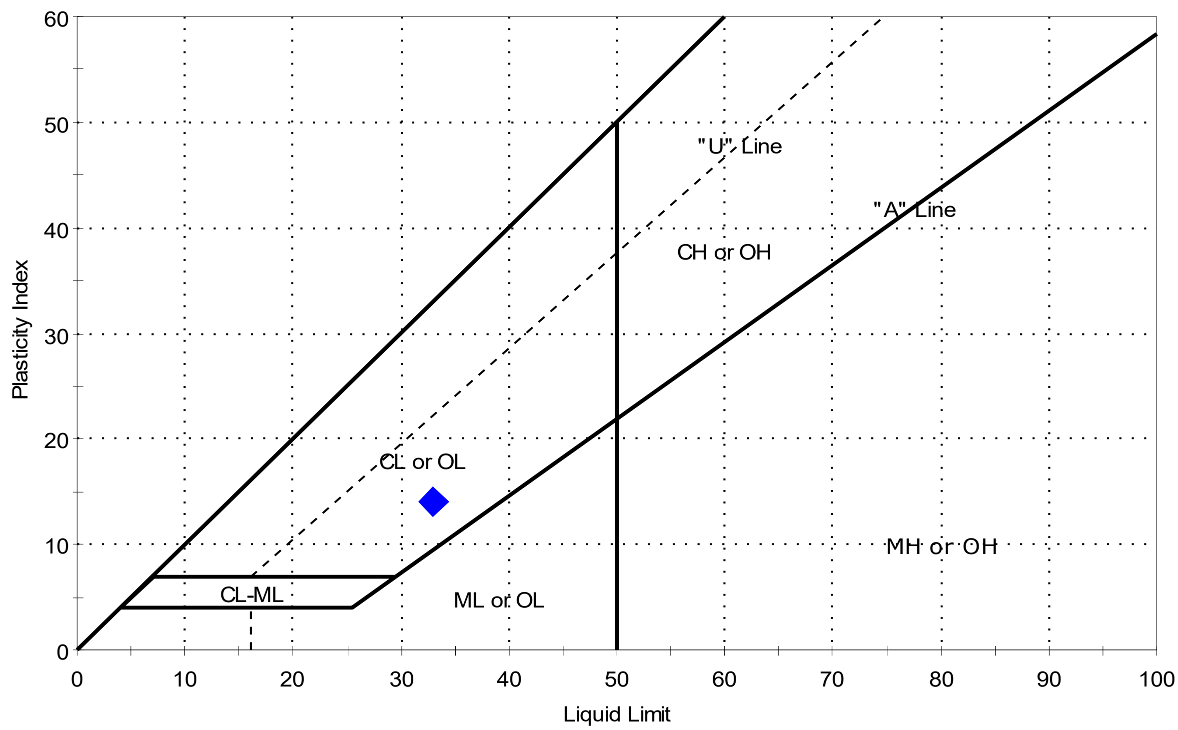
Dilatancy: SLOW

Toughness: LOW

Client:	Geosyntec Consultants		
Project:	Crossroads Phase 14		
Location:	Norridgewock, ME	Project No:	GTX-309940
Boring ID: GB-16	Sample Type: tube	Tested By:	cam
Sample ID: 17-19	Test Date: 06/26/19	Checked By:	emm
Depth : 17-19 ft	Test Id: 510121		
Test Comment:	---		
Visual Description:	Moist, olive gray clay		
Sample Comment:	---		

Atterberg Limits - ASTM D4318

Plasticity Chart



Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	7-19	GB-16	17-19 ft	28	33	19	14	0.7	Lean CLAY (CL)

Sample Prepared using the WET method

0% Retained on #40 Sieve

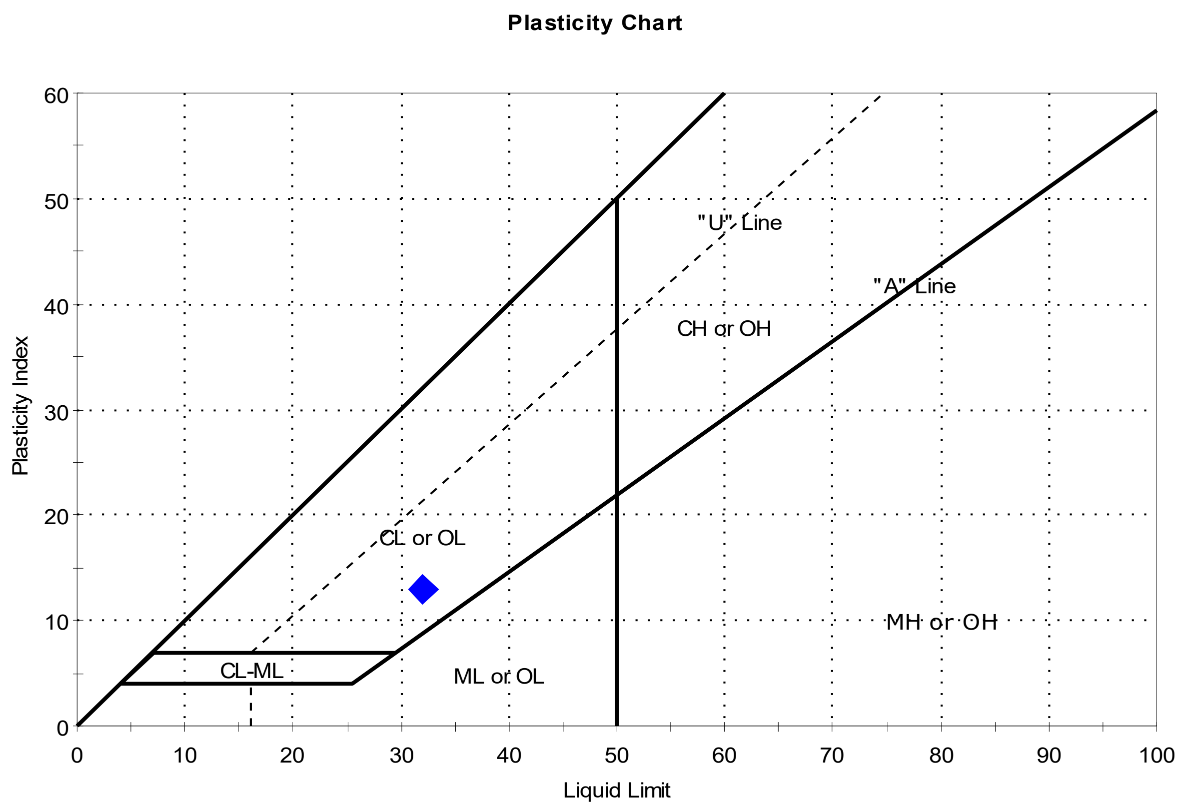
Dry Strength: VERY HIGH

Dilatancy: SLOW

Toughness: HIGH

Client:	Geosyntec Consultants		
Project:	Crossroads Phase 14		
Location:	Norridgewock, ME	Project No:	GTX-309940
Boring ID: GB-16	Sample Type: tube	Tested By:	cam
Sample ID: 27-29	Test Date: 06/26/19	Checked By:	emm
Depth : 27-29 ft	Test Id: 510122		
Test Comment: ---			
Visual Description: Moist, olive gray 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
◆	27-29	GB-16	27-29 ft	31	32	19	13	0.9	Lean CLAY (CL)

Sample Prepared using the WET method

0% Retained on #40 Sieve

Dry Strength: VERY HIGH

Dilatancy: SLOW

Toughness: LOW

Client:	Geosyntec Consultants				
Project:	Crossroads Phase 14				
Location:	Norridgewock, ME			Project No:	GTX-309940
Boring ID:	GB-15	Sample Type:	tube	Tested By:	cam
Sample ID:	11-13	Test Date:	07/17/19	Checked By:	emm
Depth :	11-13 ft	Test Id:	510143		

Test Comment: ---
Visual Description: Moist, gray clay
Sample Comment: ---

USCS Classification - ASTM D2487

Boring ID	Sample ID	Depth	Group Name	Group Symbol	Gravel, %	Sand, %	Fines, %
GB-15	11-13	11-13 ft	Lean CLAY	CL	0.0	1.1	98.9

Remarks: Grain Size analysis performed by ASTM D6913/D7928 results enclosed
Atterberg Limits performed by ASTM D4318, results enclosed

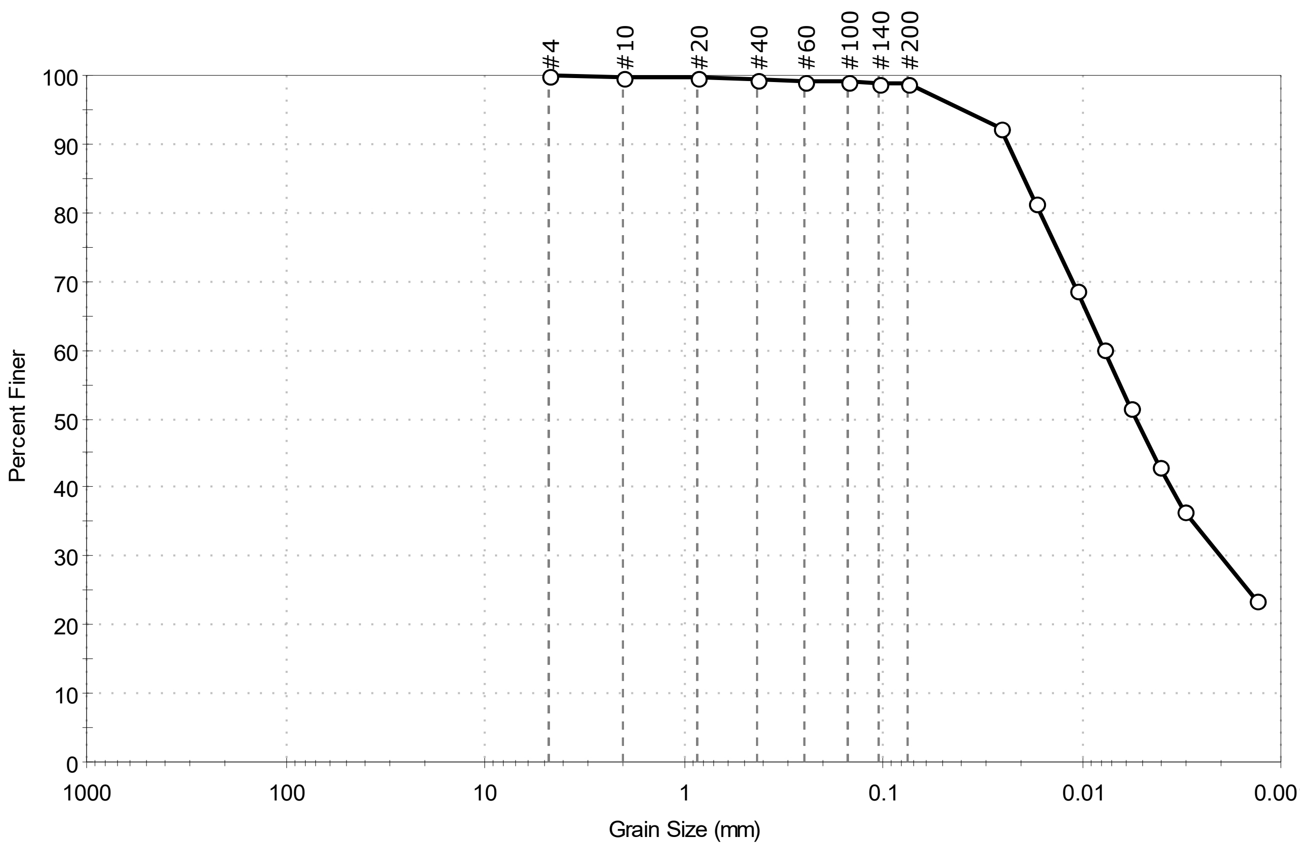
Client:	Geosyntec Consultants				
Project:	Crossroads Phase 14				
Location:	Norridgewock, ME			Project No:	GTX-309940
Boring ID:	GB-15	Sample Type:	tube	Tested By:	ckg
Sample ID:	11-13	Test Date:	07/16/19	Checked By:	emm
Depth :	11-13 ft	Test Id:	514022		

Test Comment: ---

Visual Description: Moist, gray clay

Sample Comment: ---

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	0.0	1.1	98.9

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	99		
#60	0.25	99		
#100	0.15	99		
#140	0.11	99		
#200	0.075	99		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0254	92		
---	0.0171	82		
---	0.0106	69		
---	0.0078	60		
---	0.0057	52		
---	0.0041	43		
---	0.0030	36		
---	0.0013	24		

Coefficients

D_{85} =0.0194 mm | D_{30} =0.0020 mm

D_{60} =0.0078 mm | D_{15} =N/A

D_{50} =0.0054 mm | D_{10} =N/A

C_u =N/A | C_c =N/A

Classification

ASTM Lean CLAY (CL)

AASHTO Clayey Soils (A-6 (11))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

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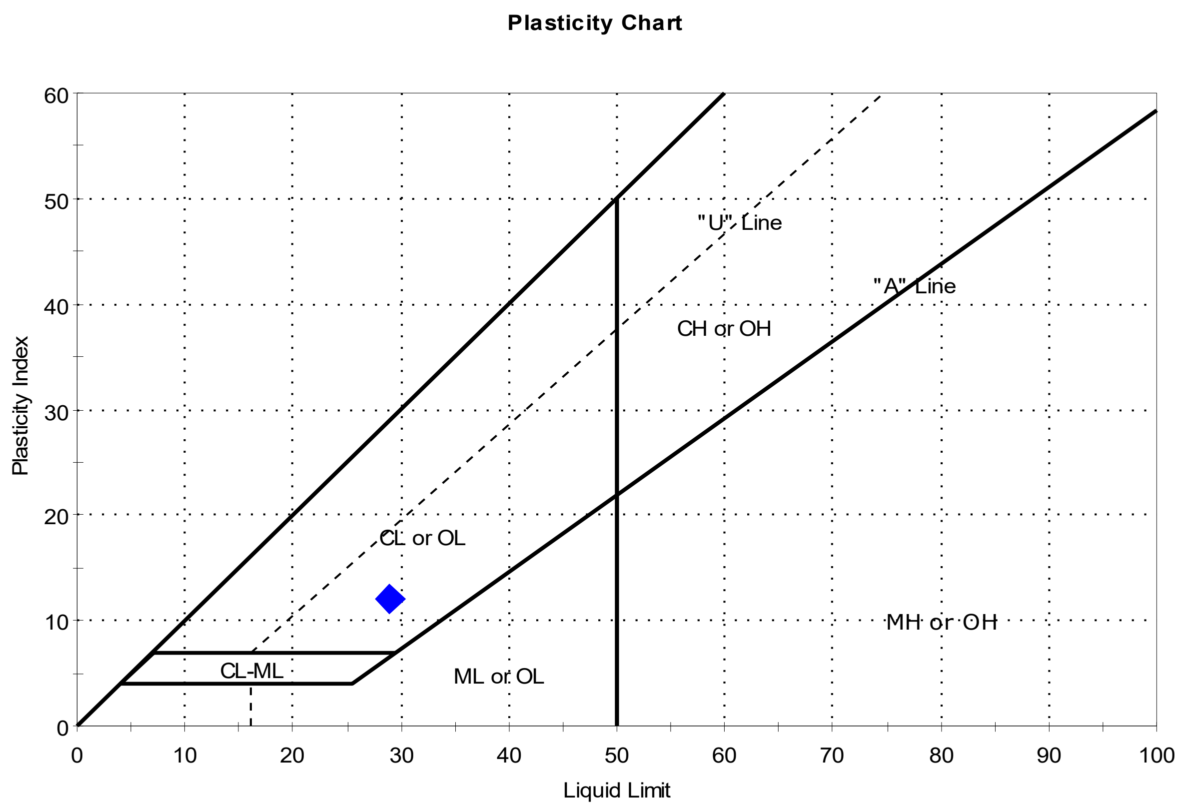
Client:	Geosyntec Consultants			
Project:	Crossroads Phase 14			
Location:	Norridgewock, ME		Project No:	GTX-309940
Boring ID:	GB-15	Sample Type: tube	Tested By:	cam
Sample ID:	11-13	Test Date: 07/16/19	Checked By:	emm
Depth :	11-13 ft	Test Id: 513852		

Test Comment: ---
Visual Description: Moist, gray 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
◆	11-13	GB-15	11-13 ft	30	29	17	12	1.1	Lean CLAY (CL)

Sample Prepared using the WET method
1% Retained on #40 Sieve
Dry Strength: VERY HIGH
Dilatancy: SLOW
Toughness: LOW

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USCS Classification - ASTM D2487

Boring ID	Sample ID	Depth	Group Name	Group Symbol	Gravel, %	Sand, %	Fines, %
GB-03	3-5	3-5 ft	Lean CLAY	CL	0.0	0.2	99.8
GB-04	11-13	11-13 ft	Lean CLAY	CL	0.0	0.4	99.6
GB-04	19-21	19-21 ft	Lean CLAY	CL	0.0	0.5	99.5
GB-05	31-33	31-33 ft	Lean CLAY	CL	0.0	0.3	99.7
GB-07	17-19	17-19 ft	Lean CLAY	CL	0.0	0.1	99.9
GB-08	27-29	27-29 ft	Lean CLAY	CL	0.0	0.1	99.9
GB-11	17-19	17-19 ft	Lean CLAY	CL	0.0	0.2	99.8
GB-13	17-19	17-19 ft	Lean CLAY	CL	0.0	0.3	99.7
GB-14	9-11	9-10.8 ft	Lean CLAY	CL	0.0	0.2	99.8
GB-15	7-9	7-9 ft	Lean CLAY	CL	0.0	0.9	99.1

Remarks: Grain Size analysis performed by ASTM D6913/D7928 results enclosed
Atterberg Limits performed by ASTM D4318, results enclosed

GeoTesting EXPRESS

Client:	Geosyntec Consultants				
Project:	Crossroads Phase 14				
Location:	Norridgewock, ME			Project No:	GTX-309940
Boring ID:	---	Sample Type:	---	Tested By:	cam
Sample ID:	---	Test Date:	07/23/19	Checked By:	emm
Depth :	---	Test Id:	510150		

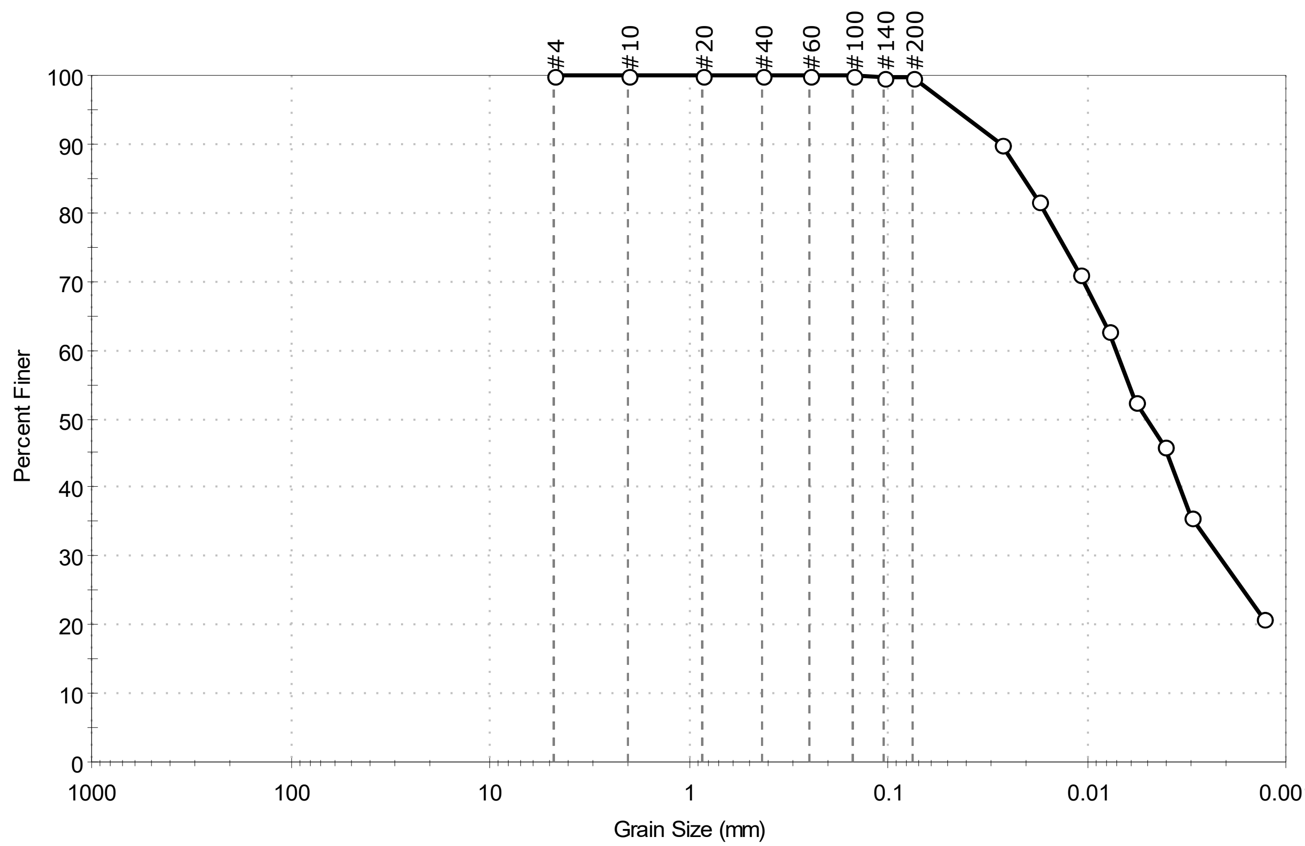
USCS Classification - ASTM D2487

Boring ID	Sample ID	Depth	Group Name	Group Symbol	Gravel, %	Sand, %	Fines, %
GB-17	15-17	15-17 ft	Lean CLAY	CL	0.0	0.2	99.8
GB-17B	5-7	5-7 ft	Lean CLAY	CL	0.0	0.0	100.0
GB-19	17-19	17-18.8 ft	Lean CLAY	CL	0.0	0.2	99.8
GB-21	23-25	23-25 ft	Lean CLAY	CL	0.0	0.1	99.9

Remarks: Grain Size analysis performed by ASTM D6913/D7928 results enclosed
Atterberg Limits performed by ASTM D4318, results enclosed

Client:	Geosyntec Consultants			
Project:	Crossroads Phase 14			
Location:	Norridgewock, ME		Project No:	GTX-309940
Boring ID:	GB-03	Sample Type: tube	Tested By:	ckg
Sample ID:	3-5	Test Date: 07/22/19	Checked By:	emm
Depth :	3-5 ft	Test Id: 510153		
Test Comment:	---			
Visual Description:	Moist, light olive brown clay			
Sample Comment:	---			

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	0.0	0.2	99.8

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	100		
#60	0.25	100		
#100	0.15	100		
#140	0.11	100		
#200	0.075	100		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0267	90		
---	0.0175	82		
---	0.0109	71		
---	0.0078	63		
---	0.0057	52		
---	0.0041	46		
---	0.0030	36		
---	0.0013	21		

Coefficients

D_{85} =0.0207 mm
D_{30} =0.0022 mm
D_{60} =0.0072 mm
D_{15} =N/A
D_{50} =0.0051 mm
D_{10} =N/A
C_u =N/A
C_c =N/A

Classification

ASTM Lean CLAY (CL)

AASHTO Clayey Soils (A-6 (11))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

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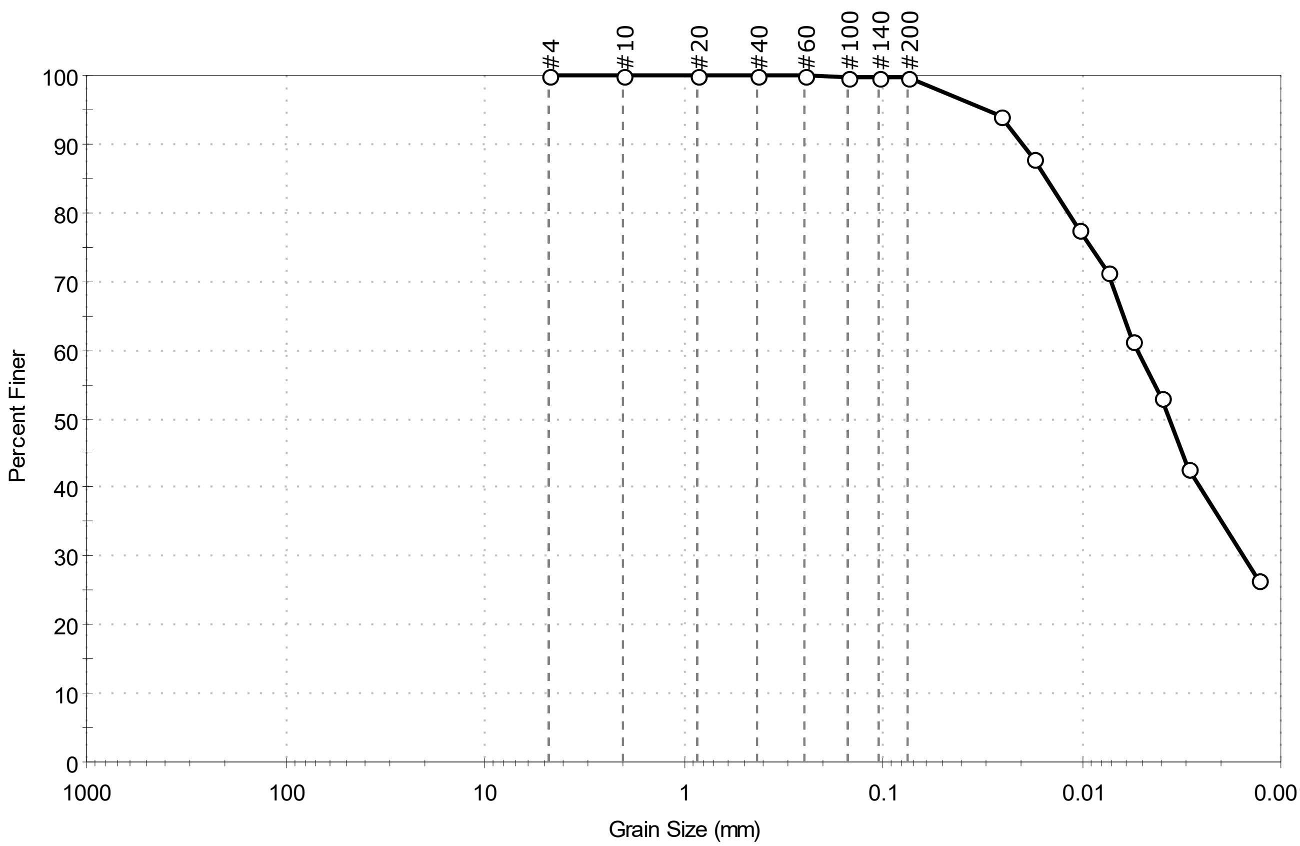
Client:	Geosyntec Consultants		
Project:	Crossroads Phase 14		
Location:	Norridgewock, ME	Project No:	GTX-309940
Boring ID: GB-04	Sample Type: tube	Tested By:	ckg
Sample ID: 11-13	Test Date: 07/22/19	Checked By:	emm
Depth : 11-13 ft	Test Id: 510155		

Test Comment: ---
Visual Description: Moist, olive clay
Sample Comment: ---

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	0.0	0.4	99.6

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	100		
#60	0.25	100		
#100	0.15	100		
#140	0.11	100		
#200	0.075	100		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0255	94		
---	0.0175	88		
---	0.0105	78		
---	0.0074	72		
---	0.0056	61		
---	0.0040	53		
---	0.0029	43		
---	0.0013	27		

Coefficients

D_{85} =0.0152 mm D_{30} =0.0015 mm
D_{60} =0.0053 mm D_{15} =N/A
D_{50} =0.0037 mm D_{10} =N/A
C_u =N/A C_c =N/A

Classification

ASTM Lean CLAY (CL)

AASHTO Clayey Soils (A-6 (16))

Sample/Test Description

Sand/Gravel Particle Shape : ---
Sand/Gravel Hardness : ---
Dispersion Device : Apparatus A - Mech Mixer
Dispersion Period : 1 minute
Est. Specific Gravity : 2.65
Separation of Sample: #200 Sieve

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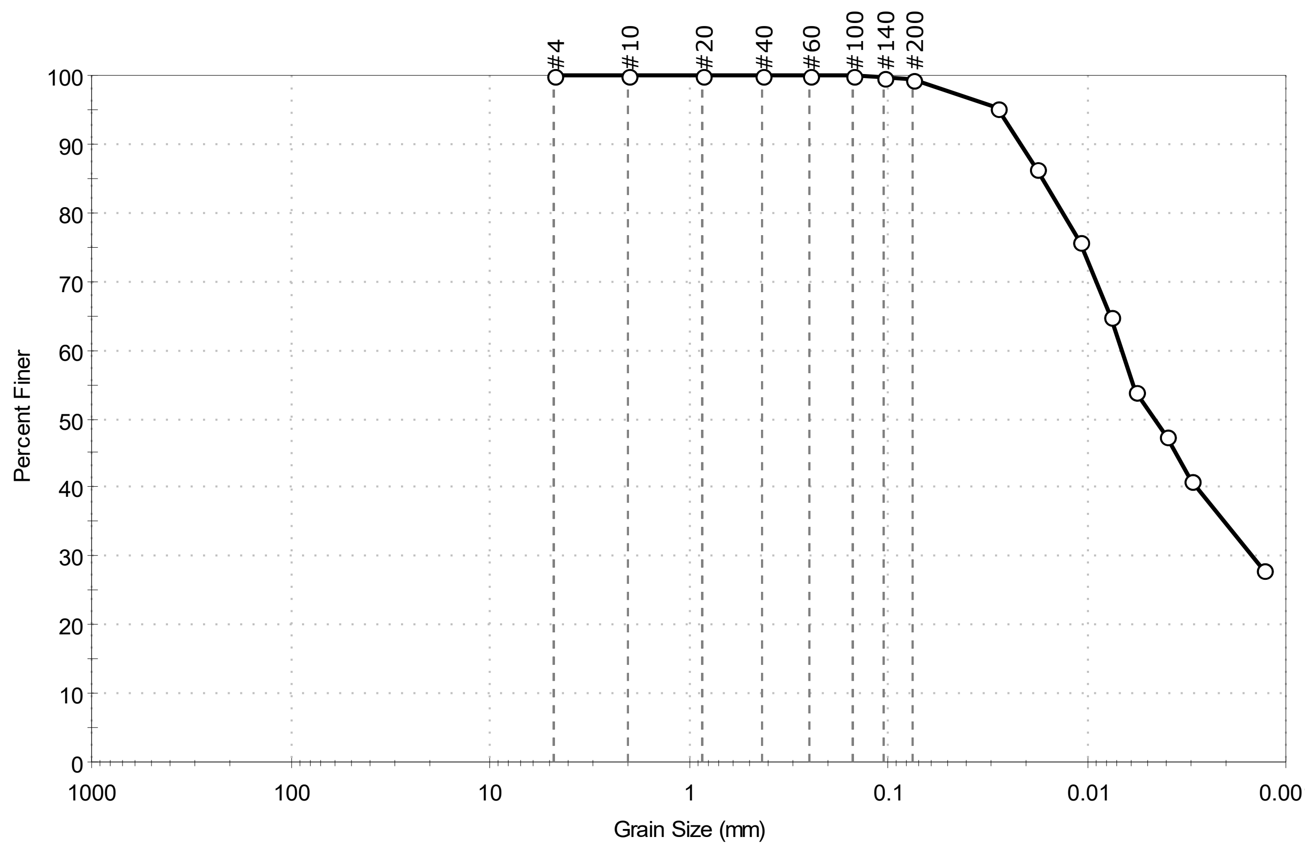
Client:	Geosyntec Consultants		
Project:	Crossroads Phase 14		
Location:	Norridgewock, ME	Project No:	GTX-309940
Boring ID: GB-04	Sample Type: tube	Tested By:	ckg
Sample ID: 19-21	Test Date: 07/22/19	Checked By:	emm
Depth : 19-21 ft	Test Id: 510154		
Test Comment:	---		
Visual Description:	Moist, gray clay		
Sample Comment:	---		

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	0.0	0.5	99.5

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	100		
#60	0.25	100		
#100	0.15	100		
#140	0.11	100		
#200	0.075	99		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0280	95		
---	0.0180	87		
---	0.0107	76		
---	0.0077	65		
---	0.0058	54		
---	0.0040	48		
---	0.0030	41		
---	0.0013	28		

Coefficients

D_{85} =0.0168 mm | D_{30} =0.0015 mm
D_{60} =0.0067 mm | D_{15} =N/A
D_{50} =0.0046 mm | D_{10} =N/A
C_u =N/A | C_c =N/A

Classification

ASTM Lean CLAY (CL)

AASHTO Clayey Soils (A-6 (15))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

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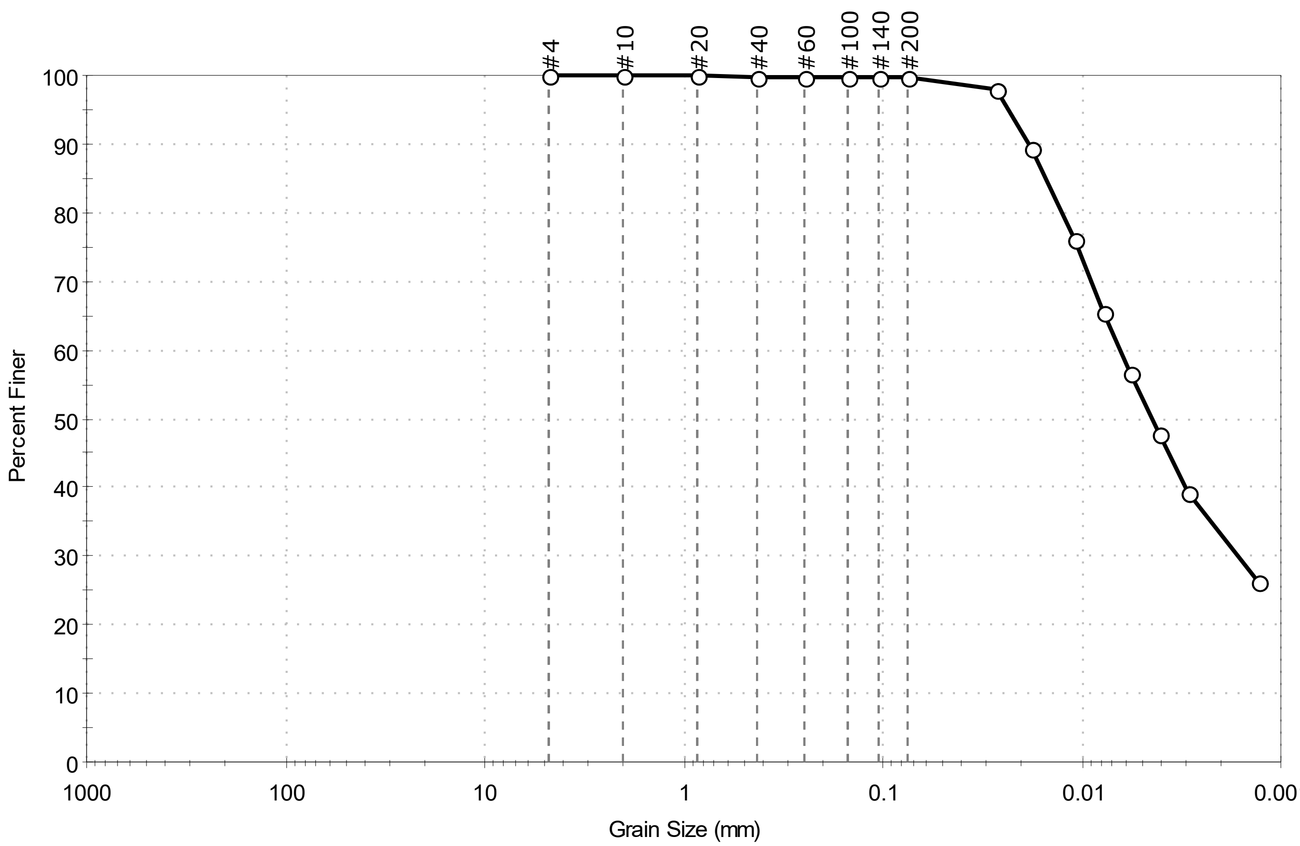
Client:	Geosyntec Consultants
Project:	Crossroads Phase 14
Location:	Norridgewock, ME
Project No:	GTX-309940
Boring ID:	GB-05
Sample Type:	tube
Tested By:	ckg
Sample ID:	31-33
Test Date:	07/22/19
Checked By:	emm
Depth :	31-33 ft
Test Id:	510156
Test Comment:	---
Visual Description:	Wet, gray clay
Sample Comment:	---

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	0.0	0.3	99.7

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	100		
#60	0.25	100		
#100	0.15	100		
#140	0.11	100		
#200	0.075	100		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0270	98		
---	0.0179	89		
---	0.0108	76		
---	0.0079	65		
---	0.0057	57		
---	0.0041	48		
---	0.0029	39		
---	0.0013	26		

Coefficients

D_{85} =0.0152 mm
D_{30} =0.0017 mm
D_{60} =0.0065 mm
D_{15} =N/A
D_{50} =0.0044 mm
D_{10} =N/A
C_u =N/A
C_c =N/A

Classification

ASTM Lean CLAY (CL)

AASHTO Silty Soils (A-4 (9))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: Sieve

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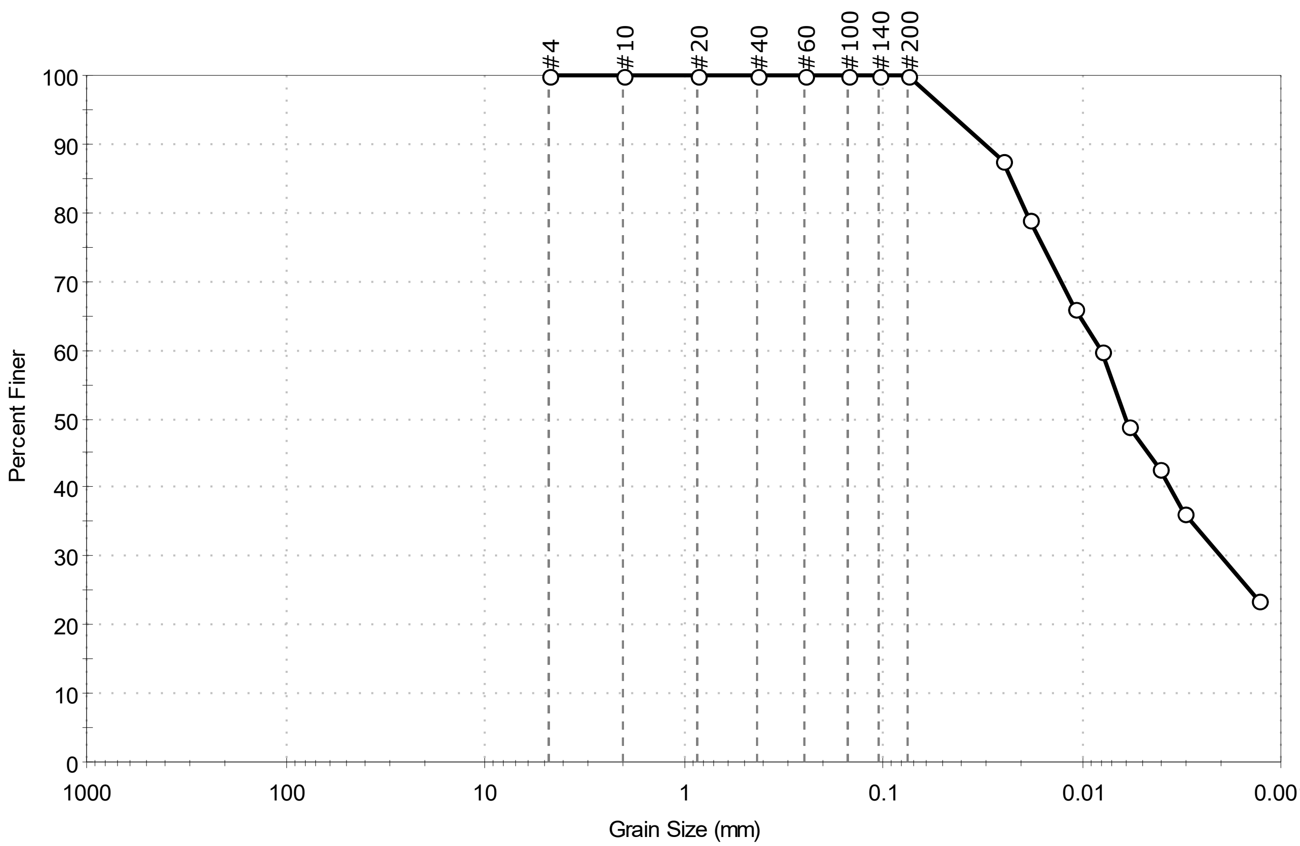
Client: Geosyntec Consultants
Project: Crossroads Phase 14
Location: Norridgewock, ME | Project No: GTX-309940

Boring ID:	GB-07	Sample Type:	tube	Tested By:	ckg
Sample ID:	17-19	Test Date:	07/22/19	Checked By:	emm
Depth :	17-19 ft	Test Id:	510159		

Test Comment: ---
Visual Description: Moist, gray clay
Sample Comment: ---

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	0.0	0.1	99.9

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	100		
#60	0.25	100		
#100	0.15	100		
#140	0.11	100		
#200	0.075	100		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0249	87		
---	0.0183	79		
---	0.0109	66		
---	0.0080	60		
---	0.0058	49		
---	0.0041	43		
---	0.0030	36		
---	0.0013	23		

Coefficients

D_{85} =0.0227 mm | D_{30} =0.0020 mm
D_{60} =0.0081 mm | D_{15} =N/A
D_{50} =0.0060 mm | D_{10} =N/A
C_u =N/A | C_c =N/A

Classification

ASTM Lean CLAY (CL)

AASHTO Clayey Soils (A-6 (10))

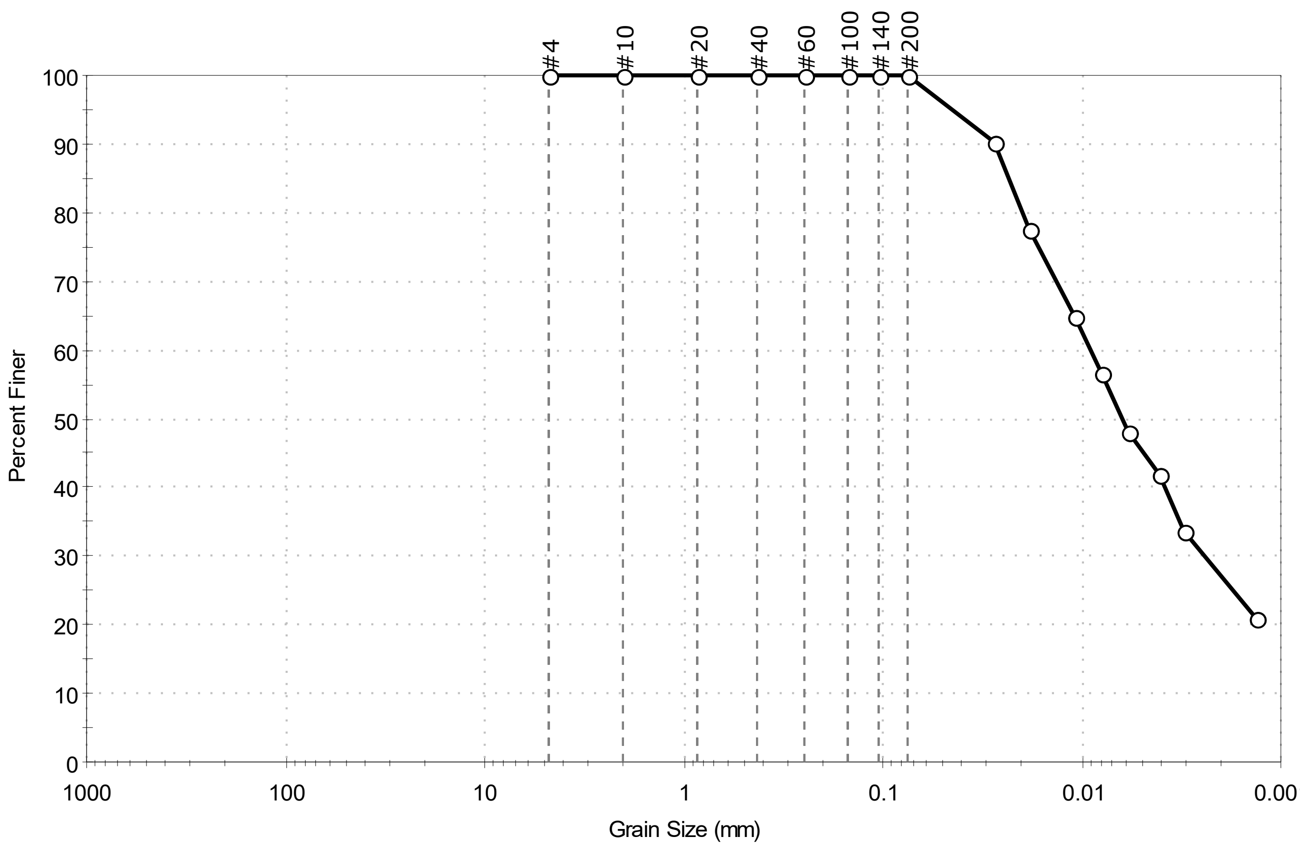
Sample/Test Description

Sand/Gravel Particle Shape : ---
Sand/Gravel Hardness : ---
Dispersion Device : Apparatus A - Mech Mixer
Dispersion Period : 1 minute
Est. Specific Gravity : 2.65
Separation of Sample: #200 Sieve

Client:	Geosyntec Consultants		
Project:	Crossroads Phase 14		
Location:	Norridgewock, ME	Project No:	GTX-309940
Boring ID: GB-08	Sample Type: tube	Tested By:	ckg
Sample ID: 27-29	Test Date: 07/22/19	Checked By:	emm
Depth : 27-29 ft	Test Id: 510160		

Test Comment: ---
Visual Description: Moist, gray clay
Sample Comment: ---

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	0.0	0.1	99.9

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	100		
#60	0.25	100		
#100	0.15	100		
#140	0.11	100		
#200	0.075	100		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0279	90		
---	0.0184	78		
---	0.0108	65		
---	0.0079	57		
---	0.0058	48		
---	0.0041	42		
---	0.0031	34		
---	0.0013	21		

Coefficients

D_{85} =0.0235 mm
D_{30} =0.0024 mm
D_{60} =0.0090 mm
D_{15} =N/A
D_{50} =0.0062 mm
D_{10} =N/A
C_u =N/A
C_c =N/A

Classification

ASTM Lean CLAY (CL)

AASHTO Silty Soils (A-4 (9))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

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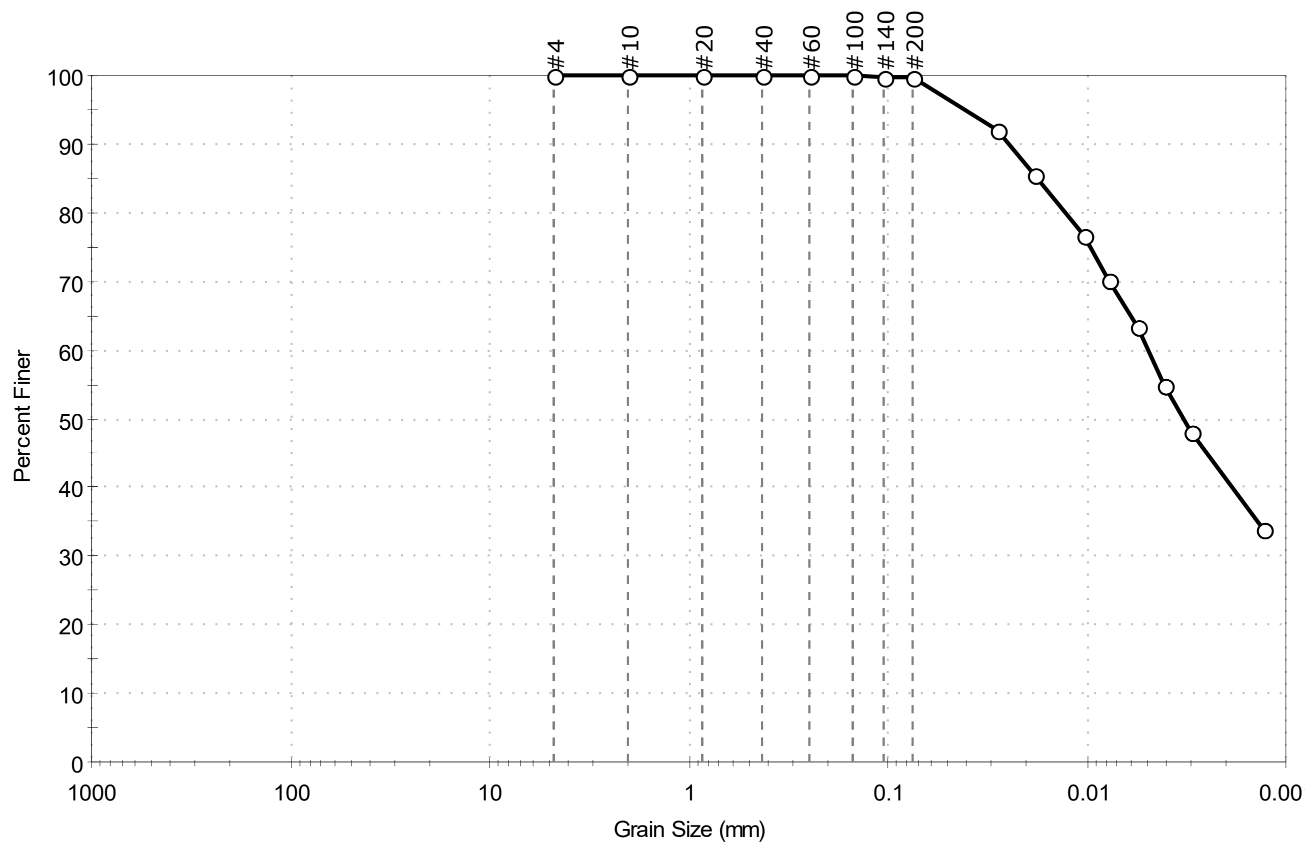
Client:	Geosyntec Consultants			
Project:	Crossroads Phase 14			
Location:	Norridgewock, ME		Project No:	GTX-309940
Boring ID: GB-11		Sample Type: tube	Tested By:	ckg
Sample ID: 17-19		Test Date: 07/22/19	Checked By:	emm
Depth : 17-19 ft		Test Id: 510161		
Test Comment:	---			
Visual Description:	Wet, gray clay			
Sample Comment:	---			

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	0.0	0.2	99.8

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	100		
#60	0.25	100		
#100	0.15	100		
#140	0.11	100		
#200	0.075	100		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0281	92		
---	0.0183	85		
---	0.0103	77		
---	0.0078	70		
---	0.0056	64		
---	0.0041	55		
---	0.0030	48		
---	0.0013	34		

Coefficients

D_{85} =0.0177 mm | D_{30} =N/A
D_{60} =0.0049 mm | D_{15} =N/A
D_{50} =0.0033 mm | D_{10} =N/A
C_u =N/A | C_c =N/A

Classification

ASTM Lean CLAY (CL)

AASHTO Clayey Soils (A-6 (13))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

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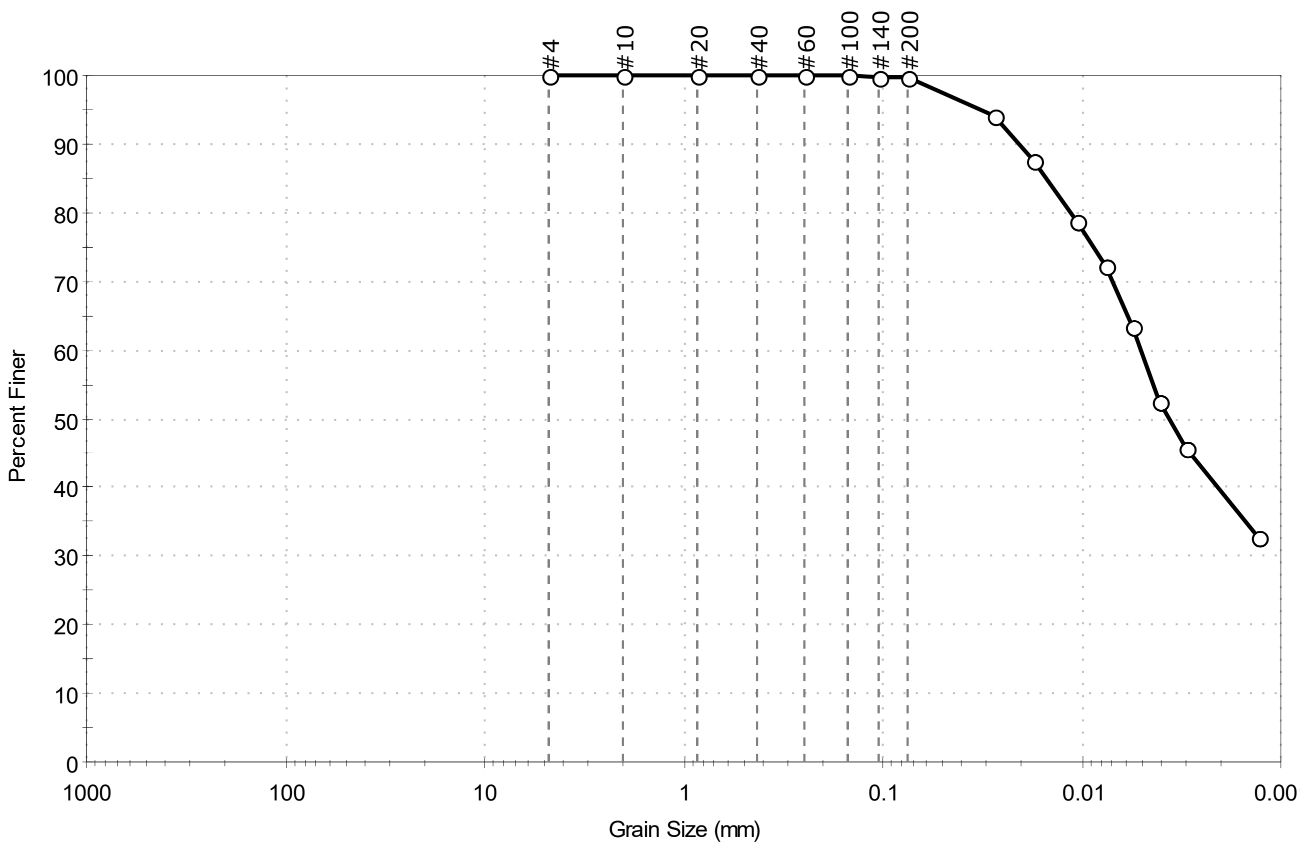
Client:	Geosyntec Consultants		
Project:	Crossroads Phase 14		
Location:	Norridgewock, ME	Project No:	GTX-309940

Boring ID:	GB-13	Sample Type:	tube	Tested By:	ckg
Sample ID:	17-19	Test Date:	07/22/19	Checked By:	emm
Depth :	17-19 ft	Test Id:	510163		

Test Comment:	---
Visual Description:	Moist, gray clay
Sample Comment:	---

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	0.0	0.3	99.7

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	100		
#60	0.25	100		
#100	0.15	100		
#140	0.11	100		
#200	0.075	100		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0278	94		
---	0.0177	88		
---	0.0105	79		
---	0.0075	72		
---	0.0056	63		
---	0.0041	52		
---	0.0030	46		
---	0.0013	33		

Coefficients

D_{85} =0.0152 mm	D_{30} =N/A
D_{60} =0.0051 mm	D_{15} =N/A
D_{50} =0.0036 mm	D_{10} =N/A
C_u =N/A	C_c =N/A

Classification

ASTM Lean CLAY (CL)

AASHTO Clayey Soils (A-6 (11))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

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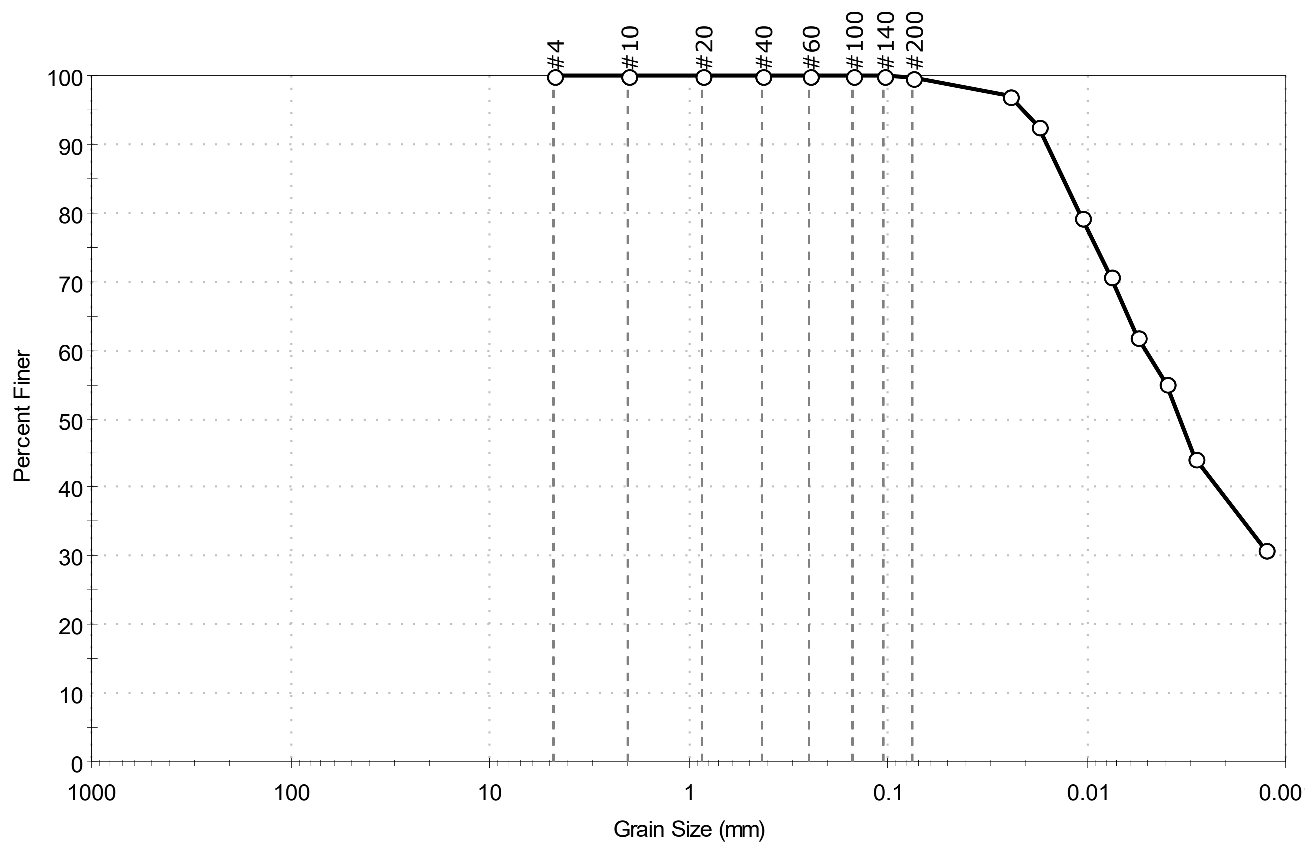
Client:	Geosyntec Consultants		
Project:	Crossroads Phase 14		
Location:	Norridgewock, ME	Project No:	GTX-309940
Boring ID: GB-14	Sample Type: tube	Tested By:	ckg
Sample ID: 9-11	Test Date: 07/22/19	Checked By:	emm
Depth : 9-10.8 ft	Test Id: 510164		

Test Comment: ---
Visual Description: Wet, gray clay
Sample Comment: ---

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	0.0	0.2	99.8

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	100		
#60	0.25	100		
#100	0.15	100		
#140	0.11	100		
#200	0.075	100		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0244	97		
---	0.0174	93		
---	0.0107	79		
---	0.0077	71		
---	0.0056	62		
---	0.0040	55		
---	0.0029	44		
---	0.0013	31		

Coefficients

D_{85} =0.0131 mm	D_{30} =N/A
D_{60} =0.0051 mm	D_{15} =N/A
D_{50} =0.0034 mm	D_{10} =N/A
C_u =N/A	C_c =N/A

Classification

ASTM Lean CLAY (CL)

AASHTO Clayey Soils (A-6 (12))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

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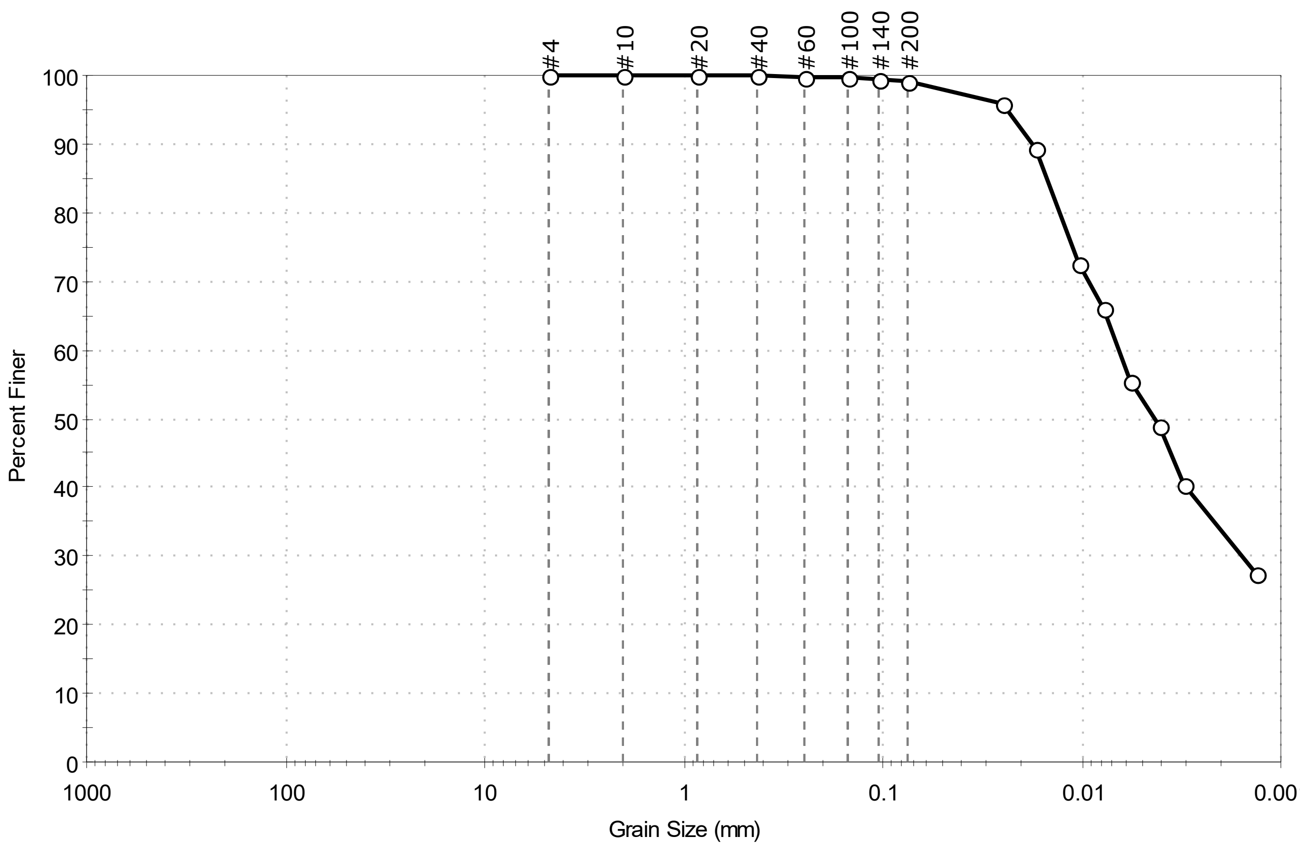
GeoTesting EXPRESS

Client:	Geosyntec Consultants		
Project:	Crossroads Phase 14		
Location:	Norridgewock, ME	Project No:	GTX-309940
Boring ID: GB-15	Sample Type: tube	Tested By:	ckg
Sample ID: 7-9	Test Date: 07/22/19	Checked By:	emm
Depth : 7-9 ft	Test Id: 510165		
Test Comment:	---		
Visual Description:	Moist, olive gray clay		
Sample Comment:	---		

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
–	0.0	0.9	99.1

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	100		
#60	0.25	100		
#100	0.15	100		
#140	0.11	99		
#200	0.075	99		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0253	96		
---	0.0173	90		
---	0.0104	72		
---	0.0079	66		
---	0.0057	55		
---	0.0041	49		
---	0.0030	40		
---	0.0013	28		

Coefficients

D_{85} =0.0151 mm D_{30} =0.0015 mm

D_{60} =0.0066 mm D_{15} =N/A

D_{50} =0.0043 mm D_{10} =N/A

C_u =N/A C_c =N/A

Classification

ASTM   Lean CLAY (CL)

AASHTO   Silty Soils (A-4 (10))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

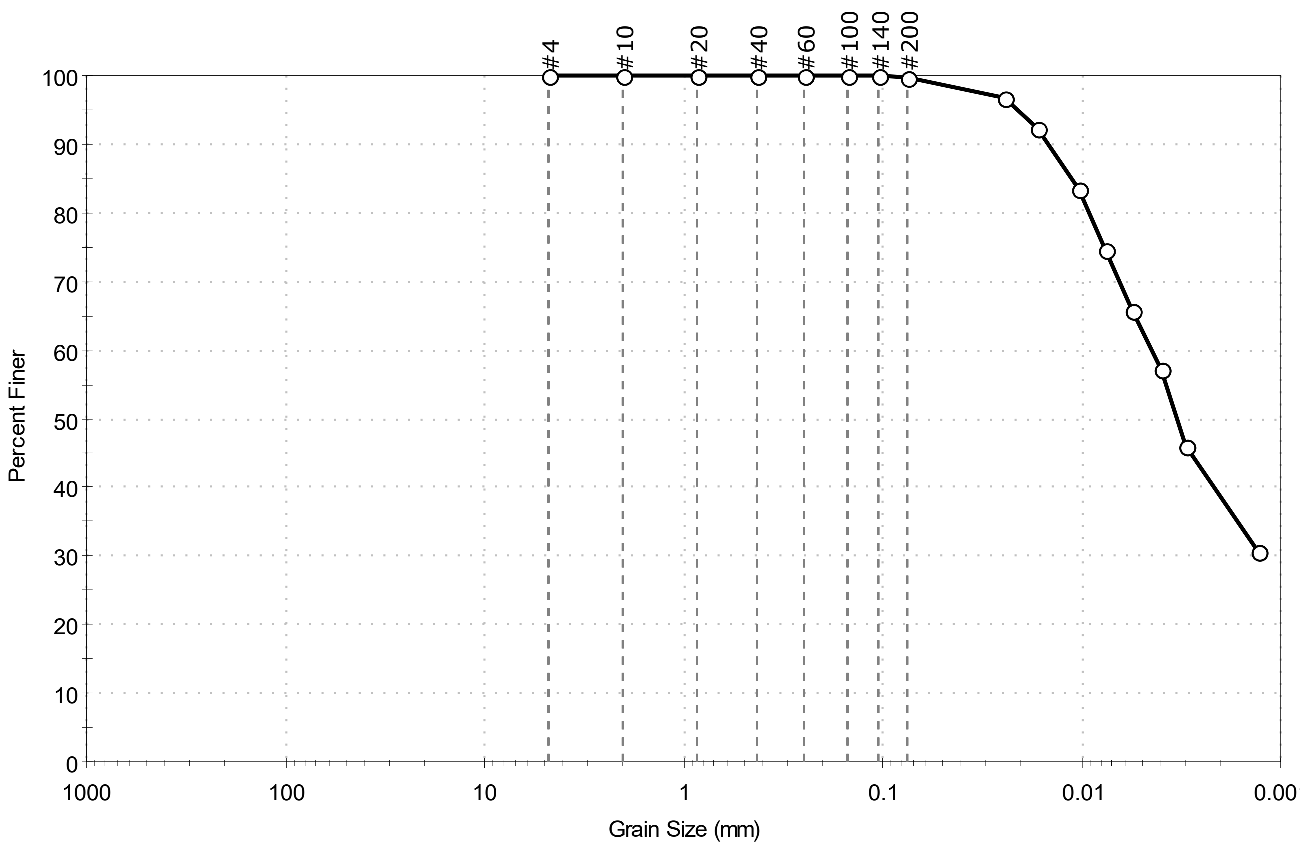
Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

Client:	Geosyntec Consultants				
Project:	Crossroads Phase 14				
Location:	Norridgewock, ME			Project No:	GTX-309940
Boring ID:	GB-17	Sample Type:	tube	Tested By:	ckg
Sample ID:	15-17	Test Date:	07/22/19	Checked By:	emm
Depth :	15-17 ft	Test Id:	510169		

Test Comment: ---
Visual Description: Moist, dark gray clay
Sample Comment: ---

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
–	0.0	0.2	99.8

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	100		
#60	0.25	100		
#100	0.15	100		
#140	0.11	100		
#200	0.075	100		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0247	97		
---	0.0166	92		
---	0.0103	84		
---	0.0076	75		
---	0.0056	66		
---	0.0040	57		
---	0.0030	46		
---	0.0013	31		

Coefficients

D_{85} =0.0111 mm D_{30} =N/A
D_{60} =0.0045 mm D_{15} =N/A
D_{50} =0.0033 mm D_{10} =N/A
C_u =N/A C_c =N/A

Classification

ASTM Lean CLAY (CL)

AASHTO Clayey Soils (A-6 (15))

Sample/Test Description

Sand/Gravel Particle Shape : ---
Sand/Gravel Hardness : ---
Dispersion Device : Apparatus A - Mech Mixer
Dispersion Period : 1 minute
Est. Specific Gravity : 2.65
Separation of Sample: #200 Sieve

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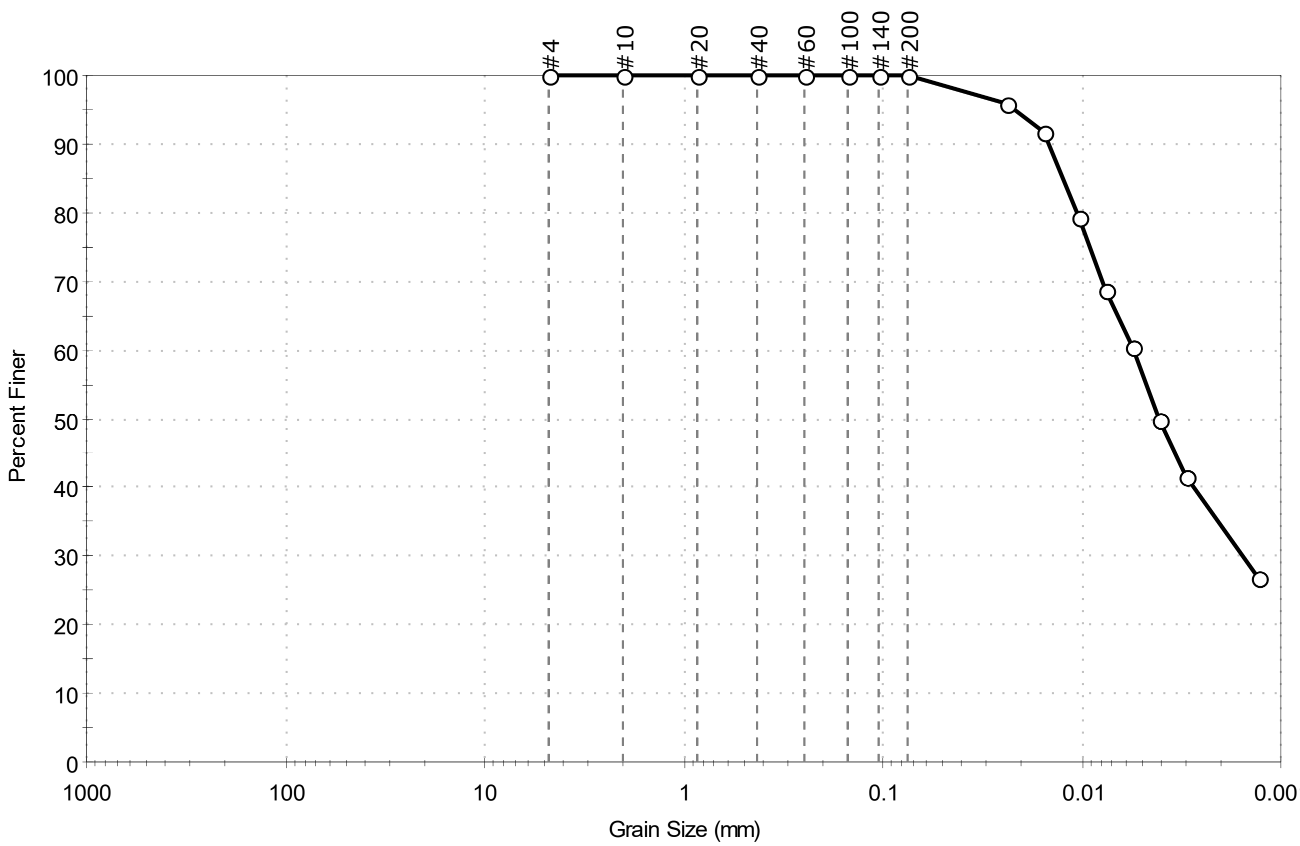
Client:	Geosyntec Consultants				
Project:	Crossroads Phase 14				
Location:	Norridgewock, ME			Project No:	GTX-309940
Boring ID:	GB-17B	Sample Type:	tube	Tested By:	ckg
Sample ID:	5-7	Test Date:	07/22/19	Checked By:	emm
Depth :	5-7 ft	Test Id:	510170		
Test Comment:	---				
Visual Description:	Moist, dark gray clay				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	0.0	0.0	100.0

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	100		
#60	0.25	100		
#100	0.15	100		
#140	0.11	100		
#200	0.075	100		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0239	96		
---	0.0156	92		
---	0.0103	79		
---	0.0075	69		
---	0.0056	60		
---	0.0041	50		
---	0.0030	42		
---	0.0013	27		

Coefficients

D_{85} =0.0125 mm
D_{30} =0.0016 mm
D_{60} =0.0056 mm
D_{15} =N/A
D_{50} =0.0041 mm
D_{10} =N/A
C_u =N/A
C_c =N/A

Classification

ASTM Lean CLAY (CL)

AASHTO Clayey Soils (A-6 (11))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

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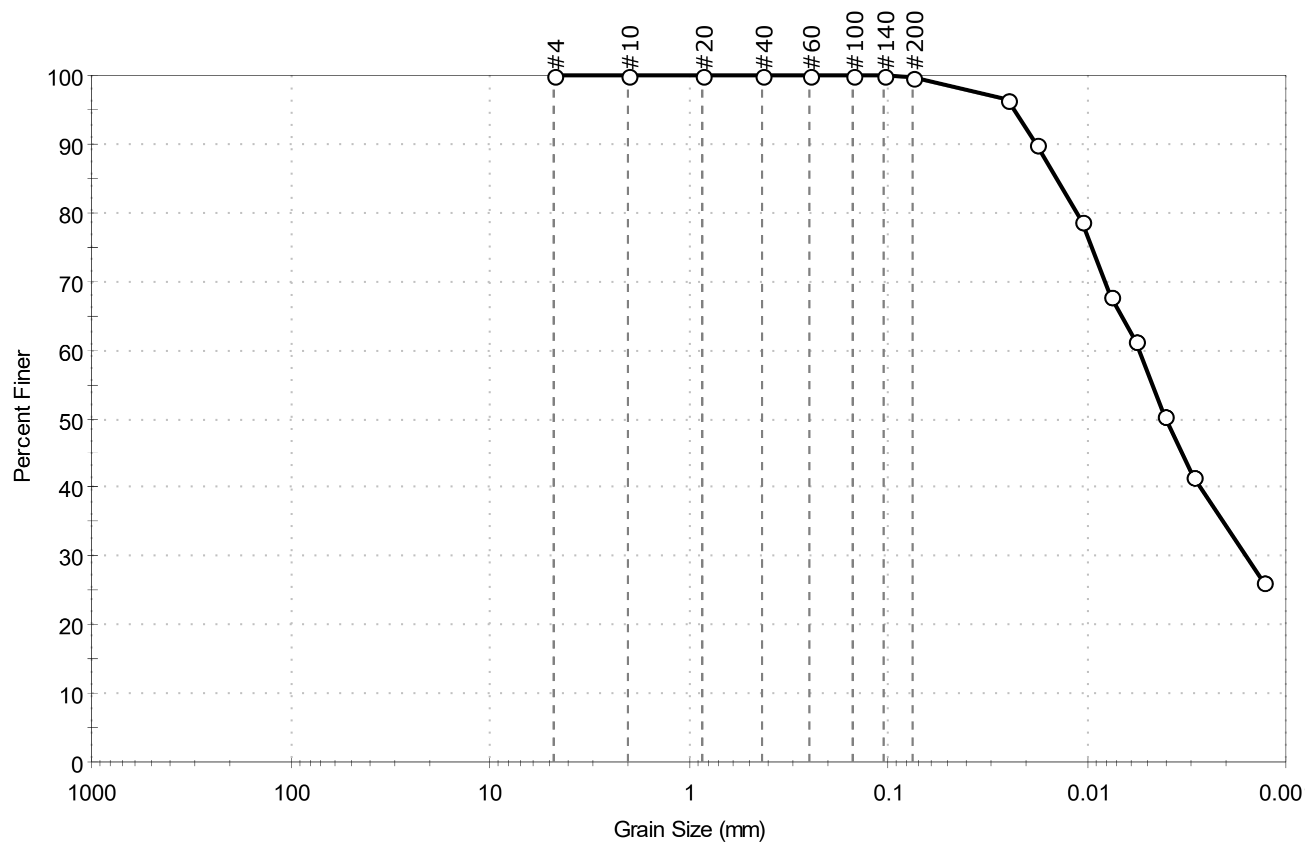
Client:	Geosyntec Consultants
Project:	Crossroads Phase 14
Location:	Norridgewock, ME
Project No:	GTX-309940
Boring ID:	GB-19
Sample ID:	17-19
Depth :	17-18.8 ft
Sample Type:	tube
Test Date:	07/22/19
Test Id:	510172
Tested By:	ckg
Checked By:	emm
Test Comment:	---
Visual Description:	Moist, gray clay
Sample Comment:	---

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	0.0	0.2	99.8

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	100		
#60	0.25	100		
#100	0.15	100		
#140	0.11	100		
#200	0.075	100		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0251	96		
---	0.0178	90		
---	0.0107	79		
---	0.0077	68		
---	0.0057	61		
---	0.0041	50		
---	0.0029	42		
---	0.0013	26		

Coefficients

D_{85} =0.0142 mm
D_{30} =0.0016 mm
D_{60} =0.0054 mm
D_{15} =N/A
D_{50} =0.0040 mm
D_{10} =N/A
C_u =N/A
C_c =N/A

Classification

ASTM Lean CLAY (CL)

AASHTO Clayey Soils (A-6 (11))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

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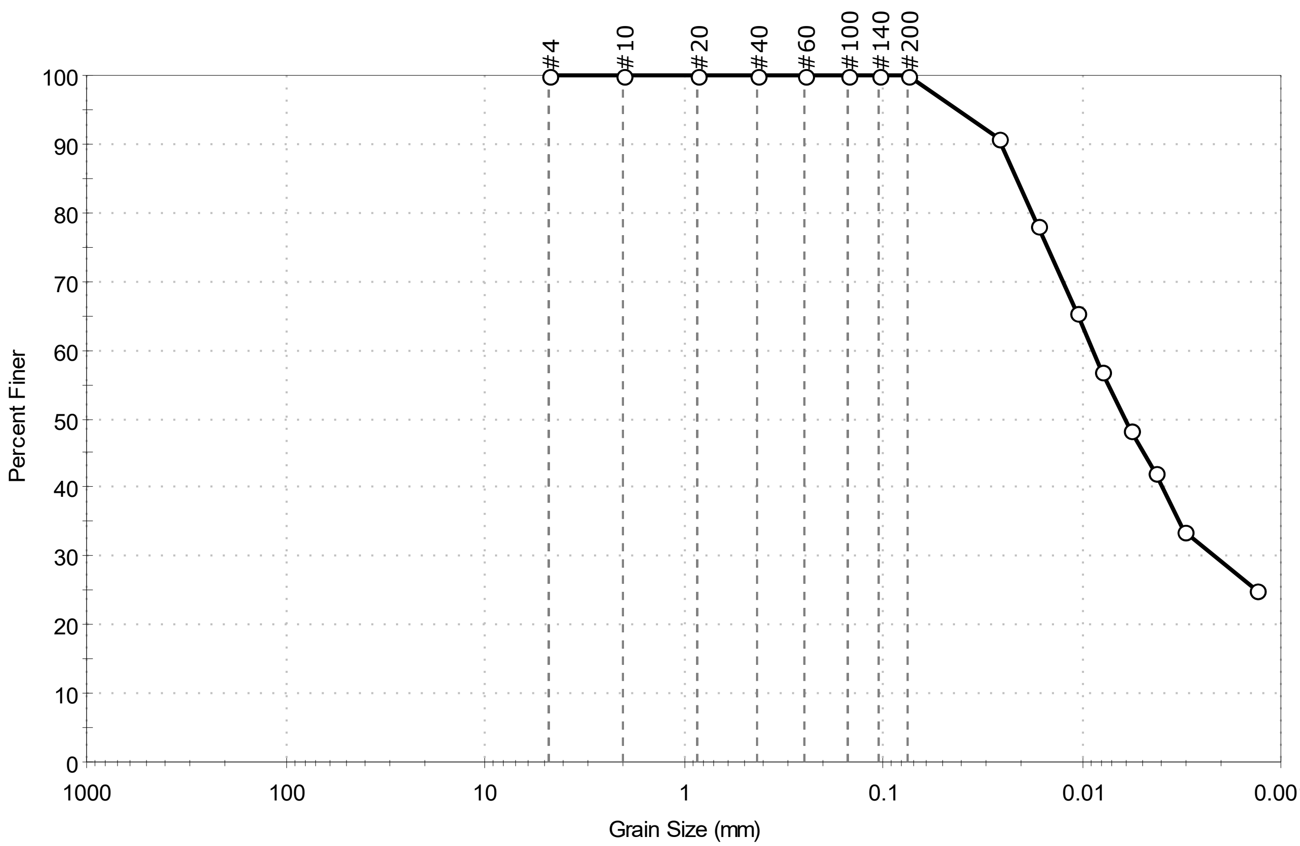
Client:	Geosyntec Consultants
Project:	Crossroads Phase 14
Location:	Norridgewock, ME
Project No:	GTX-309940
Boring ID:	GB-21
Sample ID:	23-25
Depth :	23-25 ft
Sample Type:	tube
Test Date:	07/22/19
Test Id:	510173
Tested By:	ckg
Checked By:	emm
Test Comment:	---
Visual Description:	Moist, dark gray clay
Sample Comment:	---

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	0.0	0.1	99.9

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	100		
#60	0.25	100		
#100	0.15	100		
#140	0.11	100		
#200	0.075	100		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0262	91		
---	0.0169	78		
---	0.0107	65		
---	0.0080	57		
---	0.0058	48		
---	0.0042	42		
---	0.0031	34		
---	0.0013	25		

Coefficients

D_{85} =0.0215 mm　D_{30} =0.0021 mm

D_{60} =0.0089 mm　D_{15} =N/A

D_{50} =0.0061 mm　D_{10} =N/A

C_u =N/A　C_c =N/A

Classification

ASTM　Lean CLAY (CL)

AASHTO　Silty Soils (A-4 (8))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: Sieve

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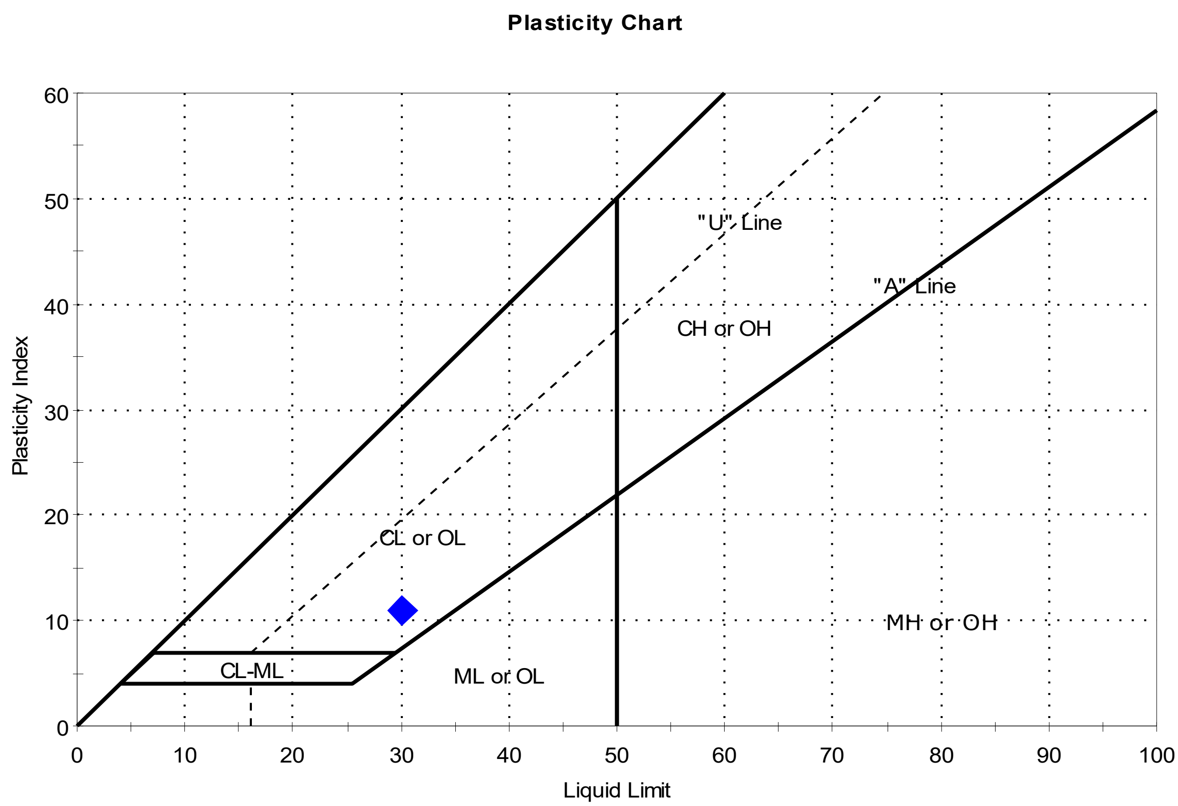
Client:	Geosyntec Consultants				
Project:	Crossroads Phase 14				
Location:	Norridgewock, ME			Project No:	GTX-309940
Boring ID:	GB-03	Sample Type:	tube	Tested By:	cam
Sample ID:	3-5	Test Date:	07/22/19	Checked By:	emm
Depth :	3-5 ft	Test Id:	510107		
Test Comment:	---				
Visual Description:	Moist, light olive 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
◆	3-5	GB-03	3-5 ft	26	30	19	11	0.7	Lean CLAY (CL)

Sample Prepared using the WET method

0% Retained on #40 Sieve

Dry Strength: VERY HIGH

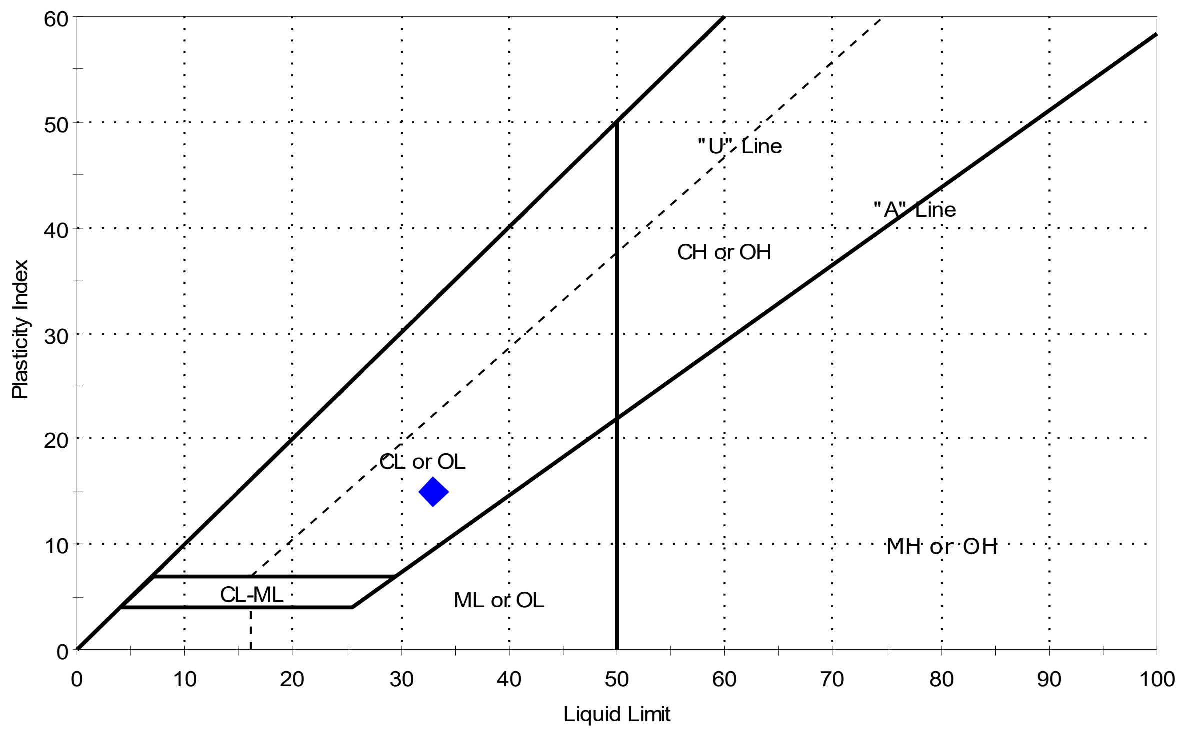
Dilatancy: SLOW

Toughness: LOW

Client:	Geosyntec Consultants				
Project:	Crossroads Phase 14				
Location:	Norridgewock, ME			Project No:	GTX-309940
Boring ID:	GB-04	Sample Type:	tube	Tested By:	cam
Sample ID:	19-21	Test Date:	07/23/19	Checked By:	emm
Depth :	19-21 ft	Test Id:	510108		

Test Comment: ---
Visual Description: Moist, gray 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
◆	19-21	GB-04	19-21 ft	33	33	18	15	1	Lean CLAY (CL)

Sample Prepared using the WET method
0% Retained on #40 Sieve
Dry Strength: VERY HIGH
Dilatancy: SLOW
Toughness: LOW

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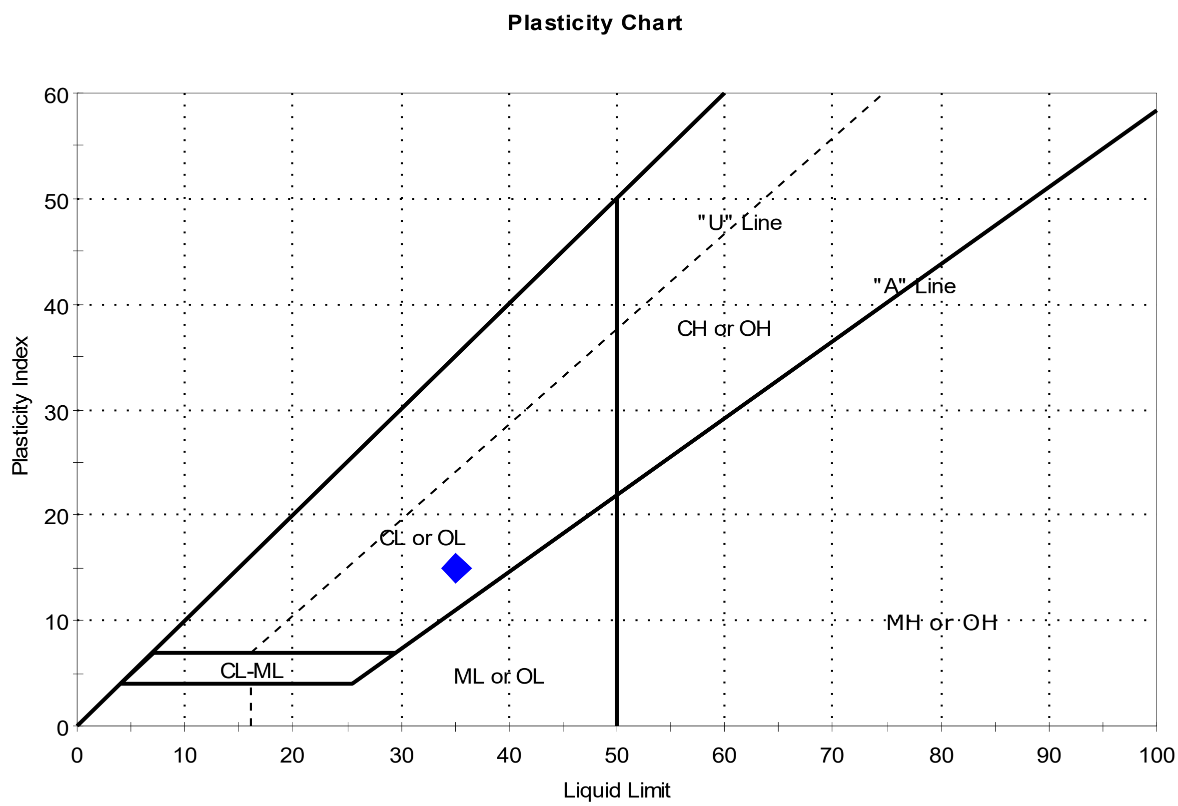
GeoTesting EXPRESS

Client:	Geosyntec Consultants		
Project:	Crossroads Phase 14		
Location:	Norridgewock, ME	Project No:	GTX-309940
Boring ID: GB-04	Sample Type: tube	Tested By:	cam
Sample ID: 11-13	Test Date: 07/23/19	Checked By:	emm
Depth : 11-13 ft	Test Id: 510109		
Test Comment:	---		
Visual Description:	Moist, olive 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
◆	11-13	GB-04	11-13 ft	24	35	20	15	0.3	Lean CLAY (CL)

Sample Prepared using the WET method

0% Retained on #40 Sieve

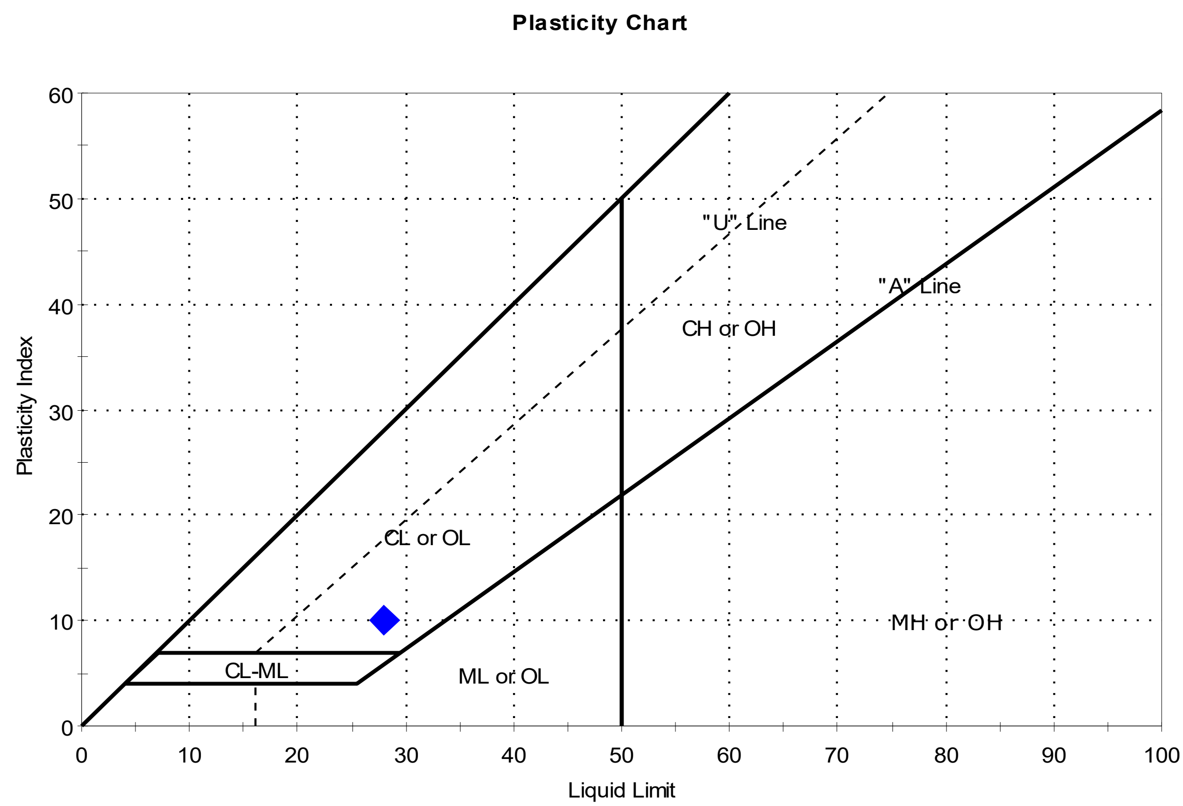
Dry Strength: VERY HIGH

Dilatancy: SLOW

Toughness: LOW

Client:	Geosyntec Consultants
Project:	Crossroads Phase 14
Location:	Norridgewock, ME
Project No:	GTX-309940
Boring ID:	GB-05
Sample Type:	tube
Tested By:	cam
Sample ID:	31-33
Test Date:	07/22/19
Checked By:	emm
Depth :	31-33 ft
Test Id:	510110
Test Comment:	---
Visual Description:	Wet, gray 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
◆	31-33	GB-05	31-33 ft	32	28	18	10	1.4	Lean CLAY (CL)

Sample Prepared using the WET method

0% Retained on #40 Sieve

Dry Strength: VERY HIGH

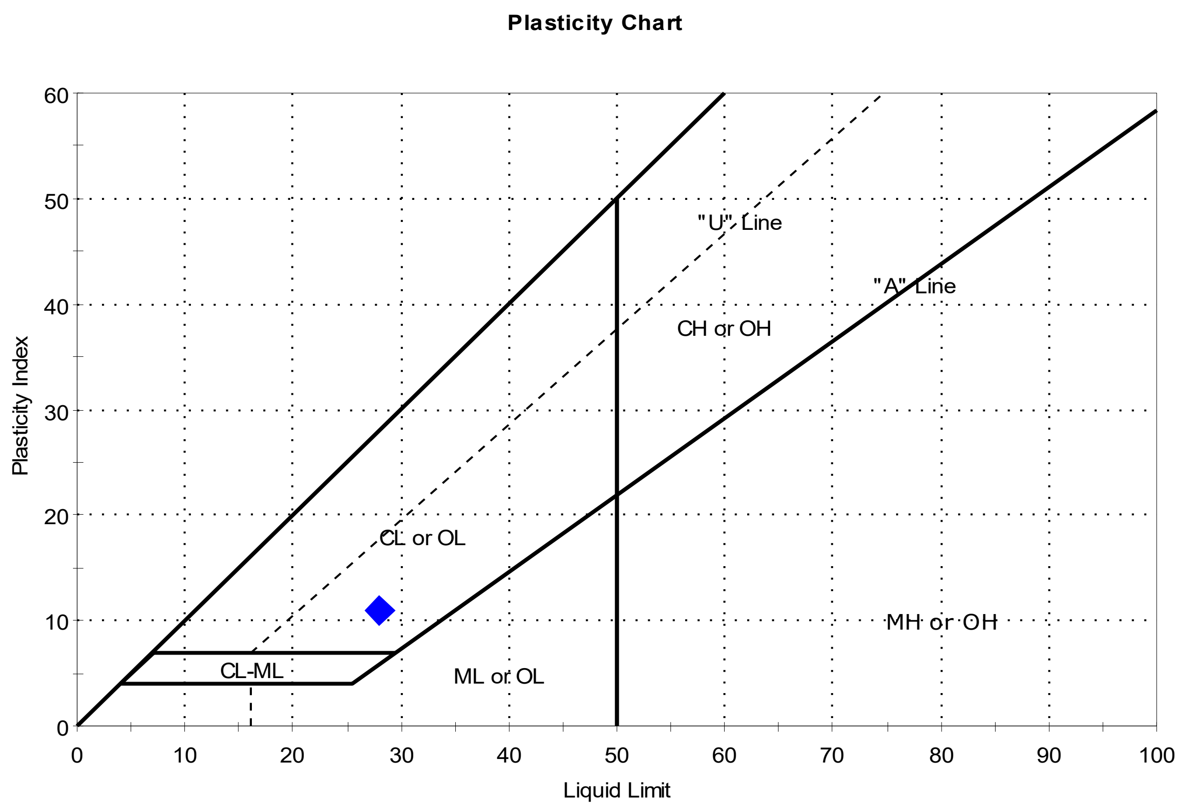
Dilatancy: SLOW

Toughness: LOW

Client:	Geosyntec Consultants				
Project:	Crossroads Phase 14				
Location:	Norridgewock, ME			Project No:	GTX-309940
Boring ID:	GB-07	Sample Type:	tube	Tested By:	cam
Sample ID:	17-19	Test Date:	07/23/19	Checked By:	emm
Depth :	17-19 ft	Test Id:	510113		

Test Comment: ---
Visual Description: Moist, gray clay
Sample Comment: ---

Atterberg Limits - ASTM D4318

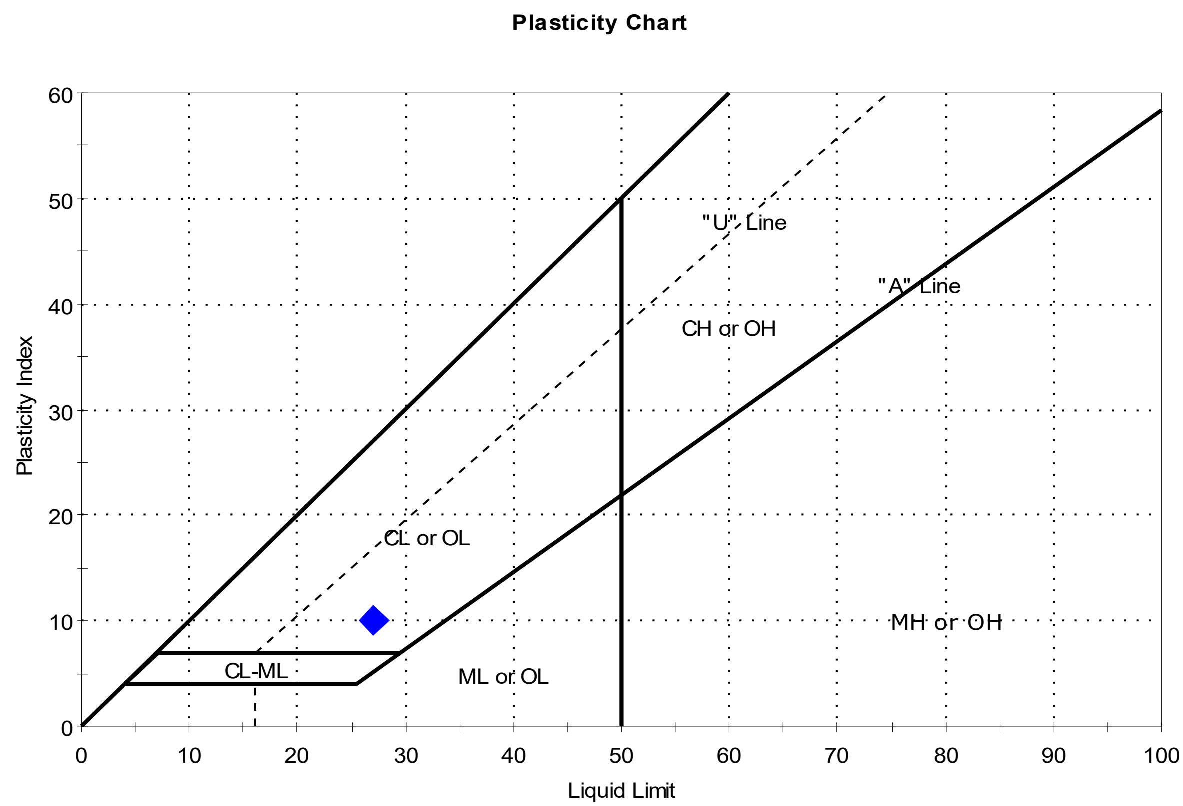


Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	17-19	GB-07	17-19 ft	29	28	17	11	1.1	Lean CLAY (CL)

Sample Prepared using the WET method
0% Retained on #40 Sieve
Dry Strength: VERY HIGH
Dilatancy: SLOW
Toughness: LOW

Client:	Geosyntec Consultants
Project:	Crossroads Phase 14
Location:	Norridgewock, ME
Project No:	GTX-309940
Boring ID:	GB-08
Sample Type:	tube
Tested By:	cam
Sample ID:	27-29
Test Date:	07/23/19
Checked By:	emm
Depth :	27-29 ft
Test Id:	510114
Test Comment:	---
Visual Description:	Moist, gray 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
◆	27-29	GB-08	27-29 ft	30	27	17	10	1.3	Lean CLAY (CL)

Sample Prepared using the WET method

0% Retained on #40 Sieve

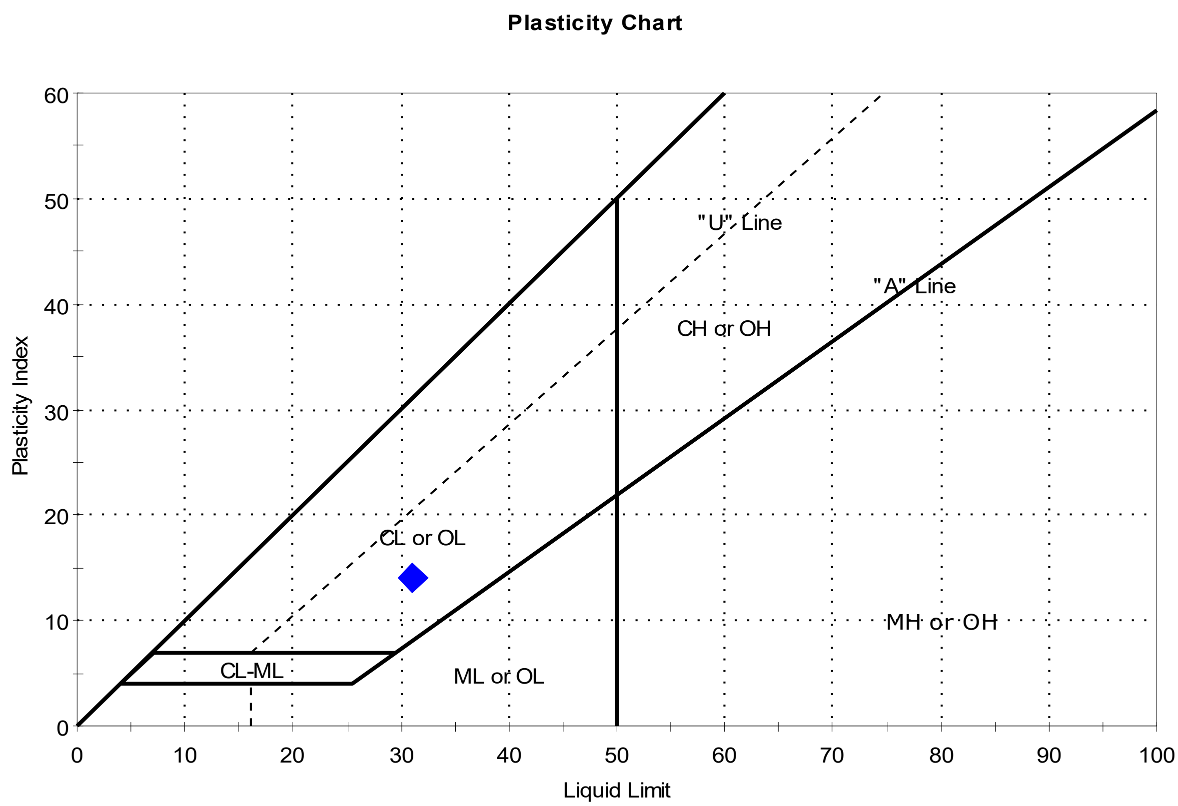
Dry Strength: VERY HIGH

Dilatancy: SLOW

Toughness: LOW

Client:	Geosyntec Consultants
Project:	Crossroads Phase 14
Location:	Norridgewock, ME
Project No:	GTX-309940
Boring ID:	GB-11
Sample Type:	tube
Tested By:	cam
Sample ID:	17-19
Test Date:	07/23/19
Checked By:	emm
Depth :	17-19 ft
Test Id:	510115
Test Comment:	---
Visual Description:	Wet, gray 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
◆	17-19	GB-11	17-19 ft	35	31	17	14	1.3	Lean CLAY (CL)

Sample Prepared using the WET method

0% Retained on #40 Sieve

Dry Strength: VERY HIGH

Dilatancy: SLOW

Toughness: LOW

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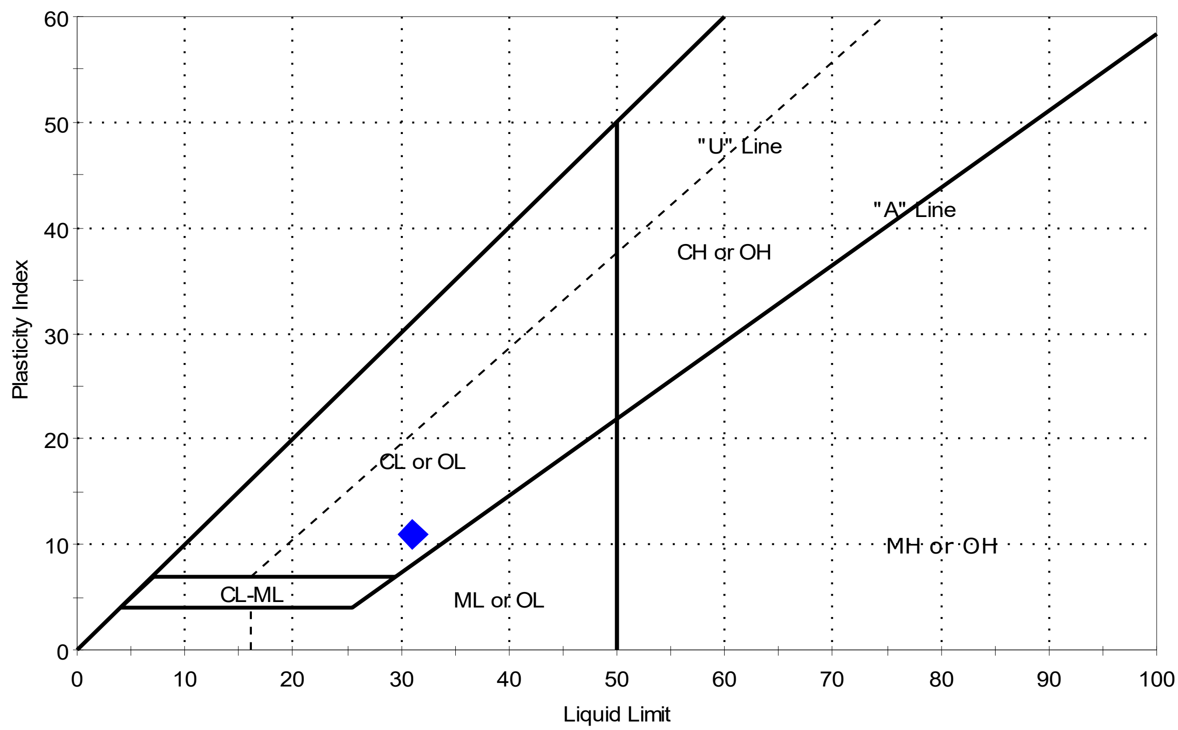
Client:	Geosyntec Consultants				
Project:	Crossroads Phase 14				
Location:	Norridgewock, ME			Project No:	GTX-309940
Boring ID:	GB-13	Sample Type:	tube	Tested By:	cam
Sample ID:	17-19	Test Date:	07/23/19	Checked By:	emm
Depth :	17-19 ft	Test Id:	510117		
Test Comment:	---				
Visual Description:	Moist, gray 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
◆	17-19	GB-13	17-19 ft	32	31	20	11	1.1	Lean CLAY (CL)

Sample Prepared using the WET method

0% Retained on #40 Sieve

Dry Strength: VERY HIGH

Dilatancy: SLOW

Toughness: LOW

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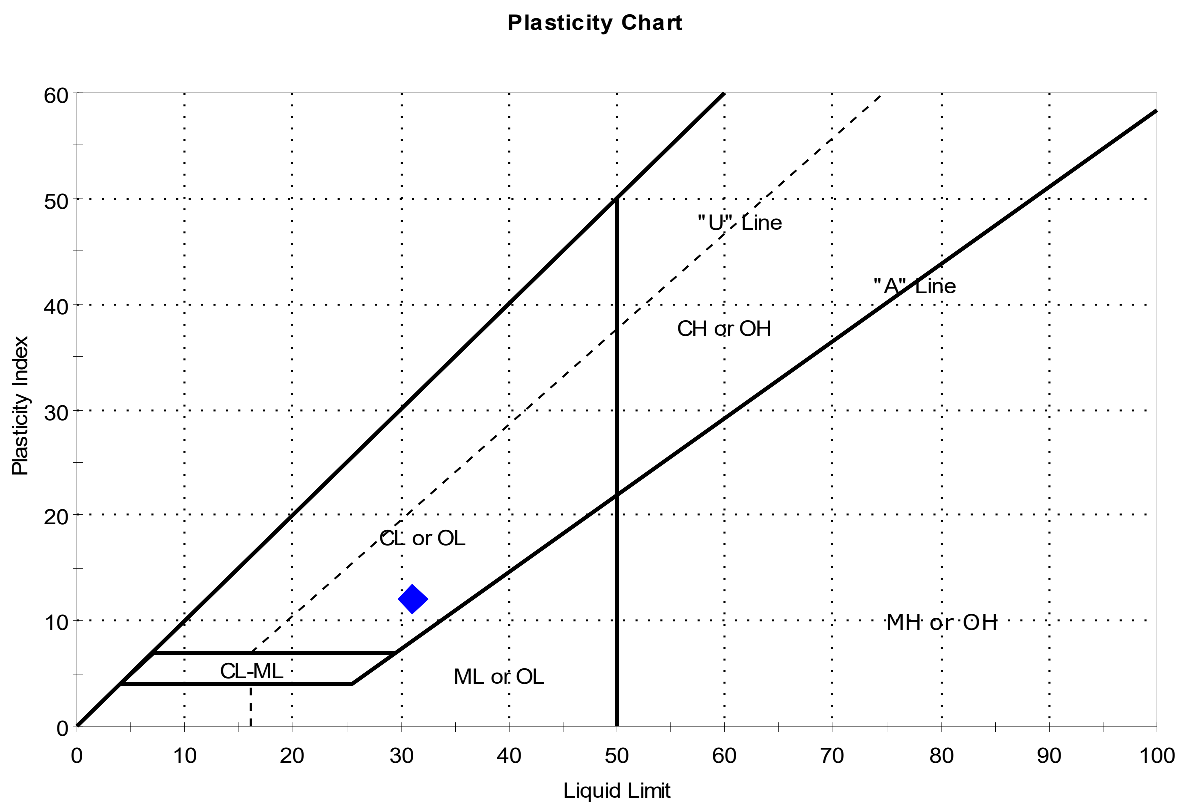
GeoTesting EXPRESS

Client:	Geosyntec Consultants		
Project:	Crossroads Phase 14		
Location:	Norridgewock, ME	Project No:	GTX-309940
Boring ID: GB-14	Sample Type: tube	Tested By:	cam
Sample ID: 9-11	Test Date: 07/22/19	Checked By:	emm
Depth : 9-10.8 ft	Test Id: 510118		
Test Comment:	---		
Visual Description:	Wet, gray 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
◆	9-11	GB-14	9-10.8 ft	35	31	19	12	1.4	Lean CLAY (CL)

Sample Prepared using the WET method

0% Retained on #40 Sieve

Dry Strength: VERY HIGH

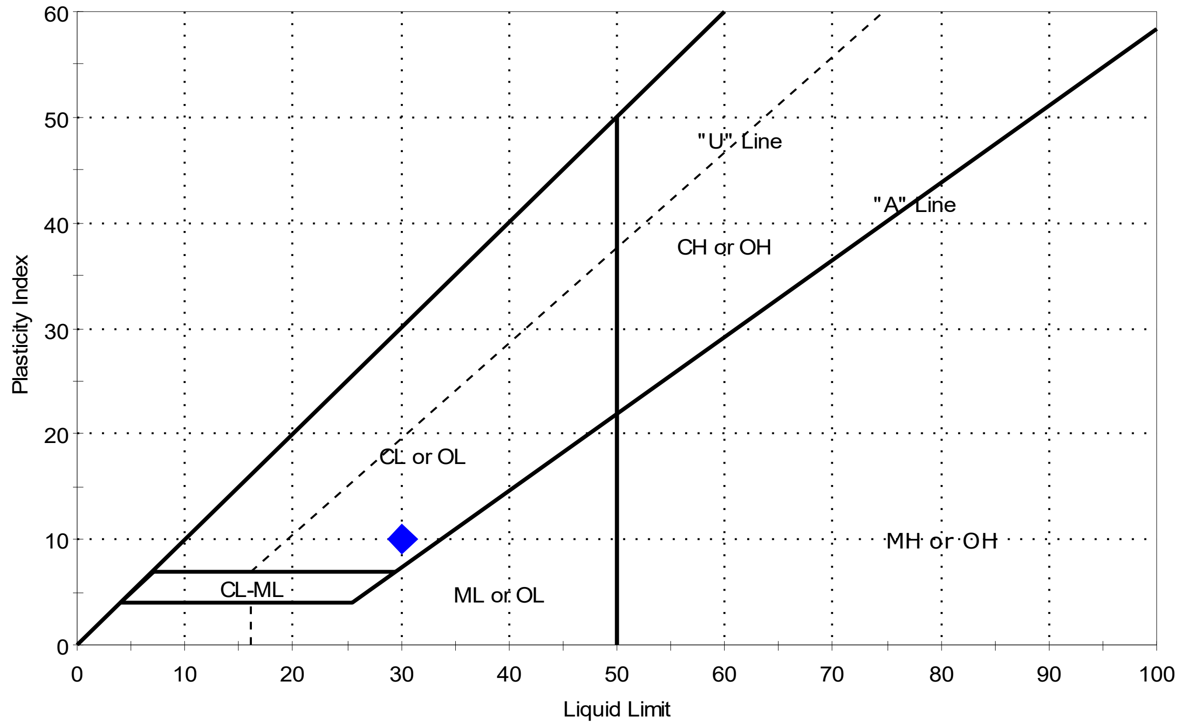
Dilatancy: SLOW

Toughness: LOW

Client:	Geosyntec Consultants				
Project:	Crossroads Phase 14				
Location:	Norridgewock, ME			Project No:	GTX-309940
Boring ID:	GB-15	Sample Type:	tube	Tested By:	cam
Sample ID:	7-9	Test Date:	07/23/19	Checked By:	emm
Depth :	7-9 ft	Test Id:	510119		

Test Comment: ---
Visual Description: Moist, olive gray 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
◆	7-9	GB-15	7-9 ft	29	30	20	10	0.9	Lean CLAY (CL)

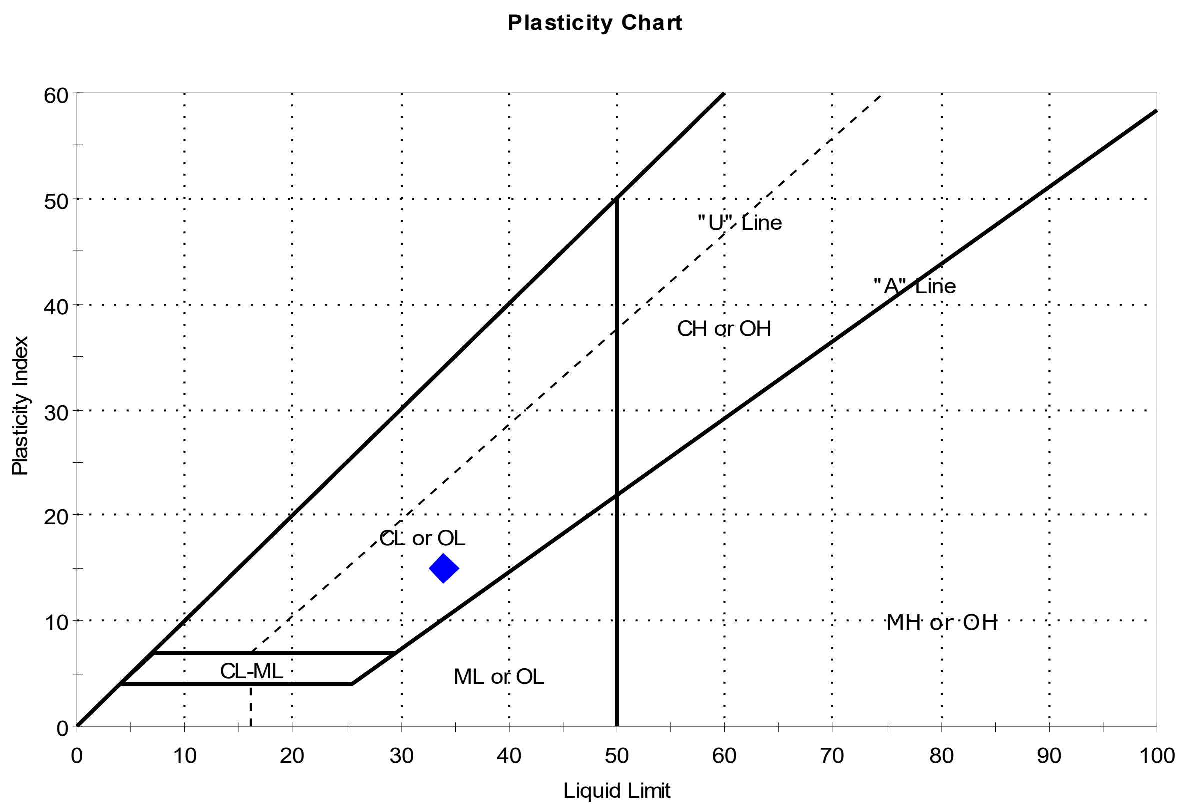
Sample Prepared using the WET method
0% Retained on #40 Sieve
Dry Strength: VERY HIGH
Dilatancy: SLOW
Toughness: LOW

Client:	Geosyntec Consultants		
Project:	Crossroads Phase 14		
Location:	Norridgewock, ME	Project No:	GTX-309940

Boring ID:	GB-17	Sample Type:	tube	Tested By:	cam
Sample ID:	15-17	Test Date:	07/23/19	Checked By:	emm
Depth :	15-17 ft	Test Id:	510123		

Test Comment:	---
Visual Description:	Moist, dark gray 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
◆	15-17	GB-17	15-17 ft	33	34	19	15	0.9	Lean CLAY (CL)

Sample Prepared using the WET method

0% Retained on #40 Sieve

Dry Strength: VERY HIGH

Dilatancy: SLOW

Toughness: LOW

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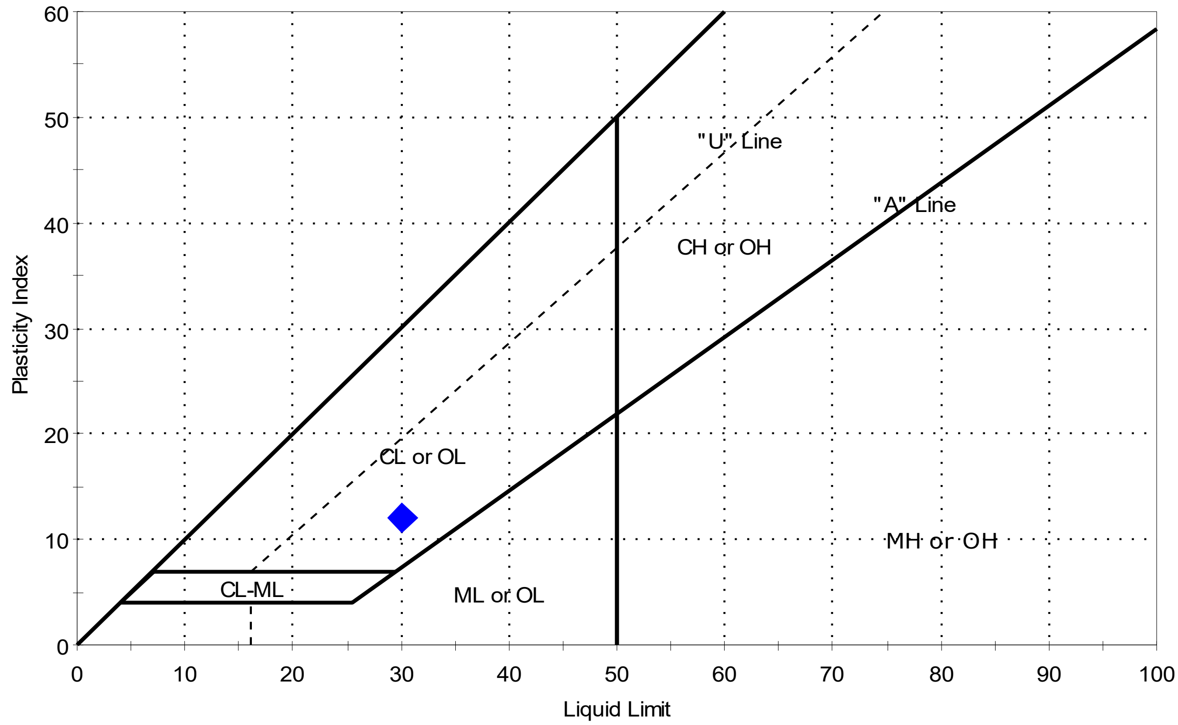
Client:	Geosyntec Consultants				
Project:	Crossroads Phase 14				
Location:	Norridgewick, ME			Project No:	GTX-309940
Boring ID:	GB-17B	Sample Type:	tube	Tested By:	cam
Sample ID:	5-7	Test Date:	07/23/19	Checked By:	emm
Depth :	5-7 ft	Test Id:	510124		

Test Comment: ---

Visual Description: Moist, dark gray 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
◆	5-7	GB-17B	5-7 ft	26	30	18	12	0.7	Lean CLAY (CL)

Sample Prepared using the WET method

0% Retained on #40 Sieve

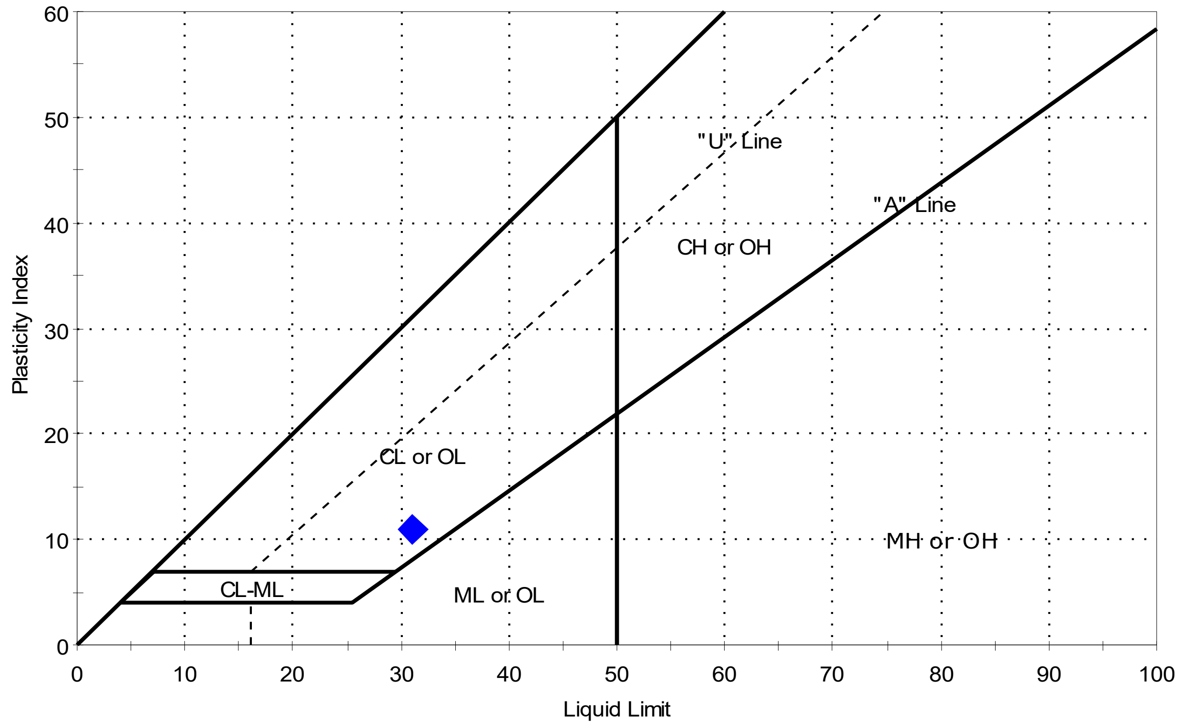
Dry Strength: VERY HIGH

Dilatancy: SLOW

Toughness: LOW

Client:	Geosyntec Consultants				
Project:	Crossroads Phase 14				
Location:	Norridgewock, ME			Project No:	GTX-309940
Boring ID:	GB-19	Sample Type:	tube	Tested By:	cam
Sample ID:	17-19	Test Date:	07/23/19	Checked By:	emm
Depth :	17-18.8 ft	Test Id:	510126		
Test Comment:	---				
Visual Description:	Moist, gray 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
◆	17-19	GB-19	17-18.8 ft	32	31	20	11	1.1	Lean CLAY (CL)

Sample Prepared using the WET method

0% Retained on #40 Sieve

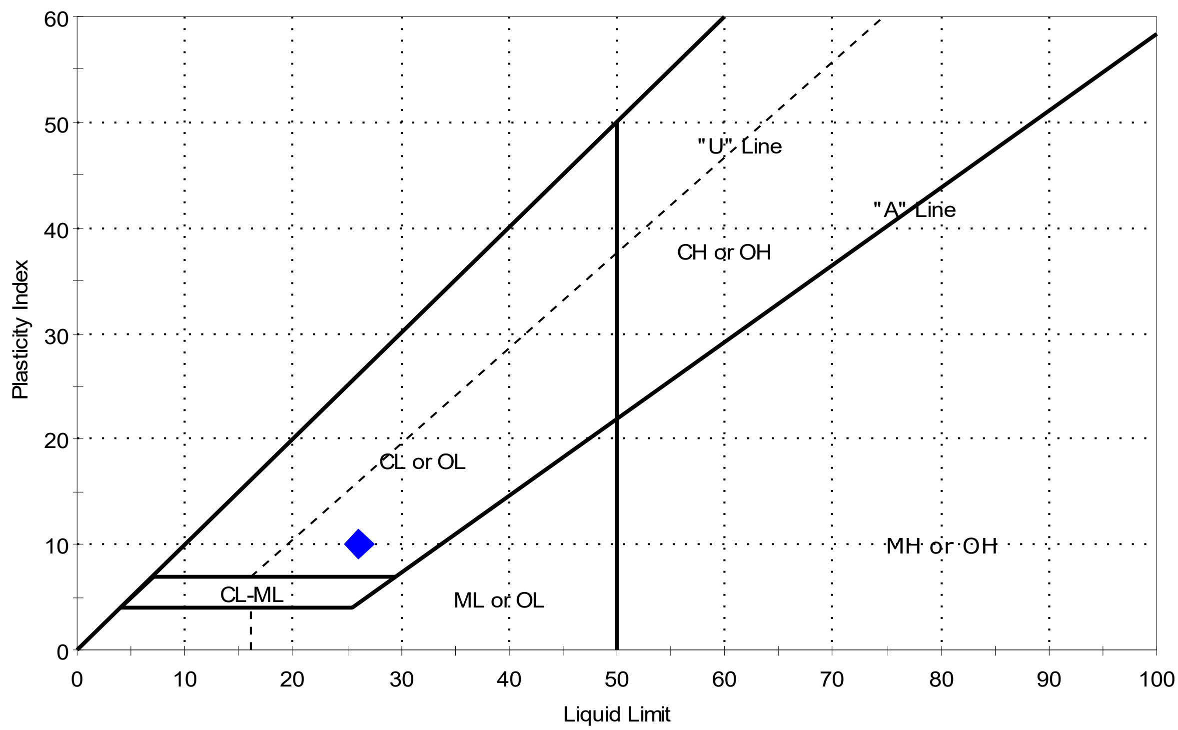
Dry Strength: VERY HIGH

Dilatancy: SLOW

Toughness: LOW

Client:	Geosyntec Consultants		
Project:	Crossroads Phase 14		
Location:	Norridgewock, ME	Project No:	GTX-309940
Boring ID: GB-21	Sample Type: tube	Tested By:	cam
Sample ID: 23-25	Test Date: 07/23/19	Checked By:	emm
Depth : 23-25 ft	Test Id: 510127		
Test Comment:	---		
Visual Description:	Moist, dark gray 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
◆	23-25	GB-21	23-25 ft	28	26	16	10	1.2	Lean CLAY (CL)

Sample Prepared using the WET method

0% Retained on #40 Sieve

Dry Strength: VERY HIGH

Dilatancy: SLOW

Toughness: LOW

APPENDIX C-2
Hydraulic Conductivity Tests

Client:	Geosyntec Consultants
Project Name:	Crossroads Phase 14
Project Location:	Norridgewock, ME
GTX #:	309940
Start Date:	6/25/2019	Tested By: jlw
End Date:	6/28/2019	Checked By: emm
Boring #:	GB-06
Sample #:	21-23
Depth:	21-23 ft
Visual Description:	Moist, dark gray clay

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter by ASTM D5084

Constant Volume

Sample Type: Intact
Permeant Fluid: De-aired Distilled water
Orientation: Vertical
Cell #: ---

Sample Preparation: Extruded from tube, cut, trimmed and placed into permeameter at as-received density and moisture content. Trimmings moisture content = 24.6%.

Assumed Specific Gravity: 2.75

Parameter	Initial	Final
Height, in	2.00	2.00
Diameter, in	2.86	2.86
Area, in^2	6.42	6.42
Volume, in^3	12.8	12.8
Mass, g	427.8	428.2
Bulk Density, pcf	126.6	126.7
Moisture Content, %	24.6	24.7
Dry Density, pcf	101.6	101.6
Degree of Saturation, %	98	99

B COEFFICIENT DETERMINATION

Cell Pressure, psi: 90.00
Sample Pressure, psi: 71.70
Increased Cell Pressure, psi: 95.01
Corresponding Sample Pressure, psi: 75.95
Cell Pressure Increment, psi: 5.01
Sample Pressure Increment, psi: 4.25
B Coefficient: 0.85
*B value did not increase with increase in pressure. Final degree of saturation >95%.

FLOW DATA

Date	Trial #	Pressure, psi Cell	Pressure, psi Sample	Manometer Readings Z_1	Manometer Readings Z_2	Z_1-Z_2	Elapsed Time, sec	Gradient	Permeability K, cm/sec	Temp, °C	R_t	Permeability K @ 20 °C, cm/sec
6/27	1	90.0	71.7	11.0	10.9	0.1	37	27.3	7.5E-08	19.5	1.013	7.6E-08
6/27	2	90.0	71.7	11.0	10.9	0.1	35	27.3	8.0E-08	19.5	1.013	8.1E-08
6/27	3	90.0	71.7	11.0	10.9	0.1	37	27.3	7.5E-08	19.5	1.013	7.6E-08
6/27	4	90.0	71.7	11.0	10.9	0.1	38	27.3	7.3E-08	19.5	1.013	7.4E-08

PERMEABILITY AT 20° C: 7.7×10^{-8} cm/sec (@ 22.0 psi effective stress)

GeoTesting EXPRESS

Client:	Geosyntec Consultants		
Project Name:	Crossroads Phase 14		
Project Location:	Norridgewock, ME		
GTX #:	309940		
Start Date:	6/24/2019	Tested By:	jlw
End Date:	7/1/2019	Checked By:	emm
Boring #:	GB-06		
Sample #:	29-31		
Depth:	29-31 ft		
Visual Description:	Moist, olive gray clay		

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter by ASTM D5084
Constant Volume

Sample Type:	Intact	Permeant Fluid:	De-aired Distilled water
Orientation:	Vertical	Cell #:	---

Sample Preparation: Extruded from tube, cut, trimmed and placed into permeameter at as-received density and moisture content. Trimmings moisture content = 30.2%.

Assumed Specific Gravity: 2.75

Parameter	Initial	Final
Height, in	2.21	2.10
Diameter, in	2.86	2.75
Area, in^2	6.42	5.94
Volume, in^3	14.2	12.5
Mass, g	413.3	404.7
Bulk Density, pcf	110.7	123.3
Moisture Content, %	30.2	27.5
Dry Density, pcf	85.0	96.7
Degree of Saturation, %	81	98

B COEFFICIENT DETERMINATION

Cell Pressure, psi:	90.01	Increased Cell Pressure, psi:	95.05	Cell Pressure Increment, psi:	5.04
Sample Pressure, psi:	67.97	Corresponding Sample Pressure, psi:	72.17	Sample Pressure Increment, psi:	4.20
				B Coefficient:	0.83

*B value did not increase with increase in pressure. Final degree of saturation >95%.

FLOW DATA

Date	Trial #	Pressure, psi Cell	Pressure, psi Sample	Manometer Readings Z_1	Manometer Readings Z_2	Manometer Readings Z_1-Z_2	Elapsed Time, sec	Gradient	Permeability K, cm/sec	Temp, °C	R_t	Permeability K @ 20 °C, cm/sec
6/25	1	90.0	68.0	8.0	7.9	0.1	37	18.9	1.2E-07	19.5	1.013	1.2E-07
6/25	2	90.0	68.0	8.0	7.9	0.1	33	18.9	1.3E-07	19.5	1.013	1.3E-07
6/25	3	90.0	68.0	8.0	7.9	0.1	37	18.9	1.2E-07	19.5	1.013	1.2E-07
6/25	4	90.0	68.0	8.0	7.9	0.1	40	18.9	1.1E-07	19.5	1.013	1.1E-07

PERMEABILITY AT 20° C: 1.2×10^{-7} cm/sec (@ 22.0 psi effective stress)

Client:	Geosyntec Consultants		
Project Name:	Crossroads Phase 14		
Project Location:	Norridgewock, ME		
GTX #:	309940		
Start Date:	6/24/2019	Tested By:	jlw
End Date:	7/1/2019	Checked By:	emm
Boring #:	GB-16		
Sample #:	17-19		
Depth:	17-19		
Visual Description:	Moist, olive gray clay		

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter by ASTM D5084

Constant Volume

Sample Type:	Intact	Permeant Fluid:	De-aired Distilled water
Orientation:	Vertical	Cell #:	---

Sample Preparation: Extruded from tube, cut, trimmed and placed into permeameter at as-received density and moisture content. Trimmings moisture content = 28.2%.

Assumed Specific Gravity: 2.75

Parameter	Initial	Final
Height, in	2.00	1.98
Diameter, in	2.86	2.85
Area, in^2	6.42	6.38
Volume, in^3	12.8	12.6
Mass, g	420.4	416.6
Bulk Density, pcf	124.4	125.4
Moisture Content, %	28.0	26.9
Dry Density, pcf	97.2	98.8
Degree of Saturation, %	100	100

B COEFFICIENT DETERMINATION

Cell Pressure, psi:	90.00	Increased Cell Pressure, psi:	94.98	Cell Pressure Increment, psi:	4.98
Sample Pressure, psi:	75.20	Corresponding Sample Pressure, psi:	79.36	Sample Pressure Increment, psi:	4.16
				B Coefficient:	0.84

*B value did not increase with increase in pressure. Final degree of saturation >95%.

FLOW DATA

Date	Trial #	Pressure, psi		Manometer Readings			Elapsed Time, sec	Gradient	Permeability K, cm/sec	Temp, °C	R_t	Permeability K @ 20 °C, cm/sec
		Cell	Sample	Z_1	Z_2	Z_1-Z_2						
6/25	1	90.0	75.2	8.0	7.7	0.3	38	20.0	3.1E-07	19.5	1.013	3.1E-07
6/25	2	90.0	75.2	8.0	7.7	0.3	39	20.0	3.0E-07	19.5	1.013	3.0E-07
6/25	3	90.0	75.2	8.0	7.7	0.3	47	20.0	2.5E-07	19.5	1.013	2.5E-07
6/25	4	90.0	75.2	8.0	7.7	0.3	40	20.0	2.9E-07	19.5	1.013	2.9E-07

PERMEABILITY AT 20° C: 2.9 x 10^{-7} cm/sec (@ 14.8 psi effective stress)

Client:	Geosyntec Consultants
Project Name:	Crossroads Phase 14
Project Location:	Norridgewock, ME
GTX #:	309940
Start Date:	6/25/2019
End Date:	6/28/2019
Tested By:	jlw
Checked By:	emm
Boring #:	GB-16
Sample #:	27-29
Depth:	27-29
Visual Description:	Moist, olive gray clay

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter by ASTM D5084
Constant Volume

Sample Type: Intact
Permeant Fluid: De-aired Distilled water
Orientation: Vertical
Cell #: ---

Sample Preparation: Extruded from tube, cut, trimmed and placed into permeameter at as-received density and moisture content. Trimmings moisture content = 30.9%.

Assumed Specific Gravity: 2.75

Parameter	Initial	Final
Height, in	1.87	1.82
Diameter, in	2.86	2.80
Area, in^2	6.42	6.16
Volume, in^3	12.0	11.2
Mass, g	352.0	351.0
Bulk Density, pcf	111.4	119.1
Moisture Content, %	30.9	30.5
Dry Density, pcf	85.1	91.2
Degree of Saturation, %	84	95

B COEFFICIENT DETERMINATION

Cell Pressure, psi: 90.00
Increased Cell Pressure, psi: 95.03
Cell Pressure Increment, psi: 5.03
Sample Pressure, psi: 68.29
Corresponding Sample Pressure, psi: 72.43
Sample Pressure Increment, psi: 4.14
B Coefficient: 0.82
*B value did not increase with increase in pressure. Final degree of saturation >95%.

FLOW DATA

Date	Trial #	Pressure, psi		Manometer Readings			Elapsed Time,	Gradient	Permeability K,	Temp,	R_t	Permeability K @ 20 °C,
		Cell	Sample	Z_1	Z_2	Z_1-Z_2	sec		cm/sec	°C		cm/sec
6/27	1	90.0	68.3	8.0	7.9	0.1	44	21.8	8.3E-08	19.5	1.013	8.4E-08
6/27	2	90.0	68.3	8.0	7.9	0.1	45	21.8	8.1E-08	19.5	1.013	8.2E-08
6/27	3	90.0	68.3	8.0	7.9	0.1	44	21.8	8.3E-08	19.5	1.013	8.4E-08
6/27	4	90.0	68.3	8.0	7.9	0.1	44	21.8	8.3E-08	19.5	1.013	8.4E-08

PERMEABILITY AT 20° C: 8.4×10^{-8} cm/sec (@ 21.7 psi effective stress)

APPENDIX C
Laboratory Test Results

APPENDIX C-1
Classification Tests

Client:	Geosyntec Consultants			
Project:	Crossroads Phase 14			
Location:	Norridgewock, ME		Project No:	GTX-309940
Boring ID: ---		Sample Type: ---	Tested By:	cam
Sample ID: ---		Test Date: 07/12/19	Checked By:	emm
Depth : ---		Test Id: 510145		

USCS Classification - ASTM D2487

Boring ID	Sample ID	Depth	Group Name	Group Symbol	Gravel, %	Sand, %	Fines, %
GB-06	21-23	21-23 ft	Lean CLAY	CL	0.0	0.4	99.6
GB-06	29-31	29-31 ft	Lean CLAY	CL	0.0	0.3	99.7
GB-16	17-19	17-19 ft	Lean CLAY	CL	0.0	0.3	99.7
GB-16	27-29	27-29 ft	Lean CLAY	CL	0.0	0.1	99.9

Remarks: Grain Size analysis performed by ASTM D6913/D7928 results enclosed
Atterberg Limits performed by ASTM D4318, results enclosed

GeoTesting EXPRESS

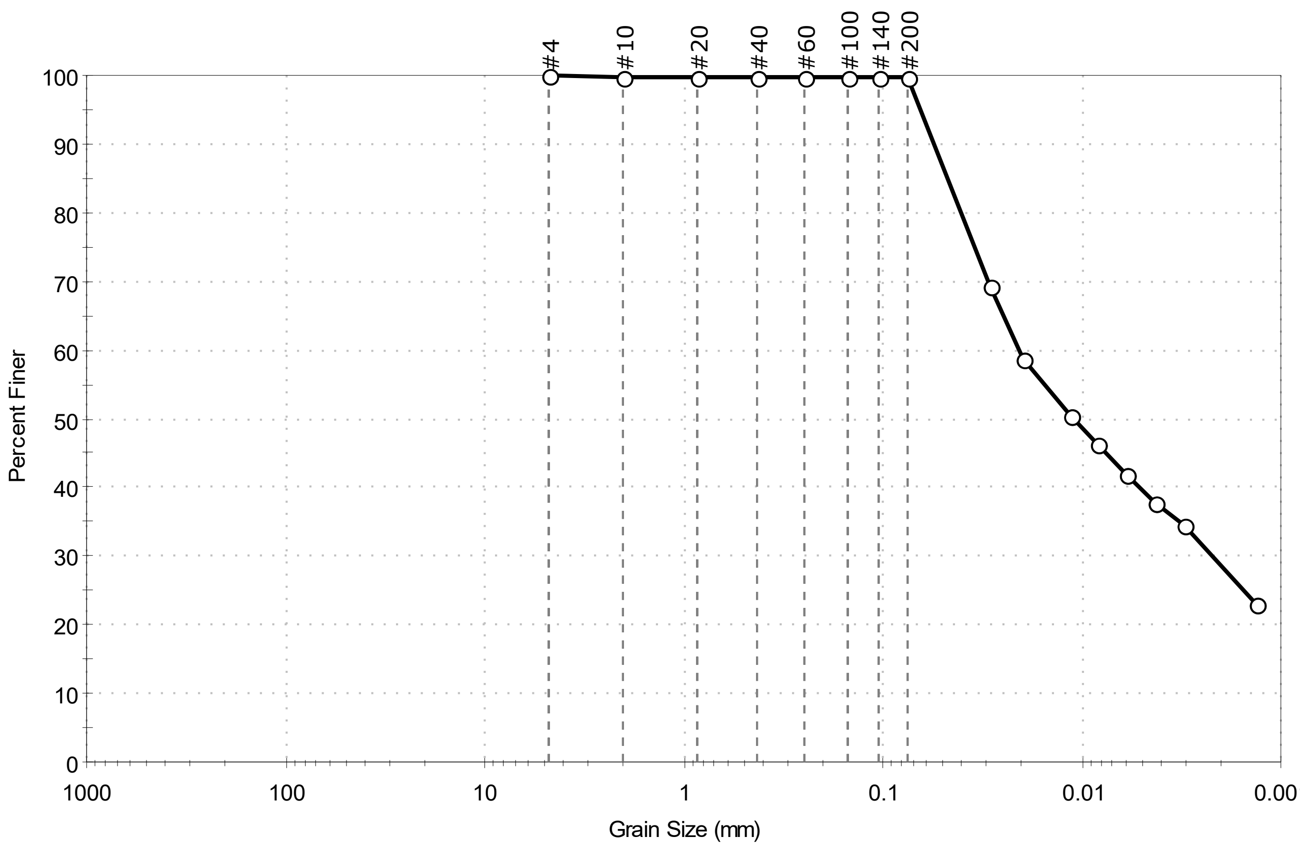
Client:	Geosyntec Consultants		
Project:	Crossroads Phase 14		
Location:	Norridgewock, ME	Project No:	GTX-309940
Boring ID: GB-06	Sample Type: tube	Tested By:	ckg
Sample ID: 21-23	Test Date: 07/01/19	Checked By:	emm
Depth : 21-23 ft	Test Id: 510157		

Test Comment: ---

Visual Description: Moist, dark gray clay

Sample Comment: ---

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	0.0	0.4	99.6

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	100		
#60	0.25	100		
#100	0.15	100		
#140	0.11	100		
#200	0.075	100		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0286	69		
---	0.0198	59		
---	0.0115	50		
---	0.0084	46		
---	0.0060	42		
---	0.0043	38		
---	0.0031	35		
---	0.0013	23		

Coefficients

D_{85} =0.0472 mm — D_{30} =0.0022 mm

D_{60} =0.0206 mm — D_{15} =N/A

D_{50} =0.0111 mm — D_{10} =N/A

C_u =N/A — C_c =N/A

Classification

ASTM Lean CLAY (CL)

AASHTO Clayey Soils (A-6 (14))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : HARD

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

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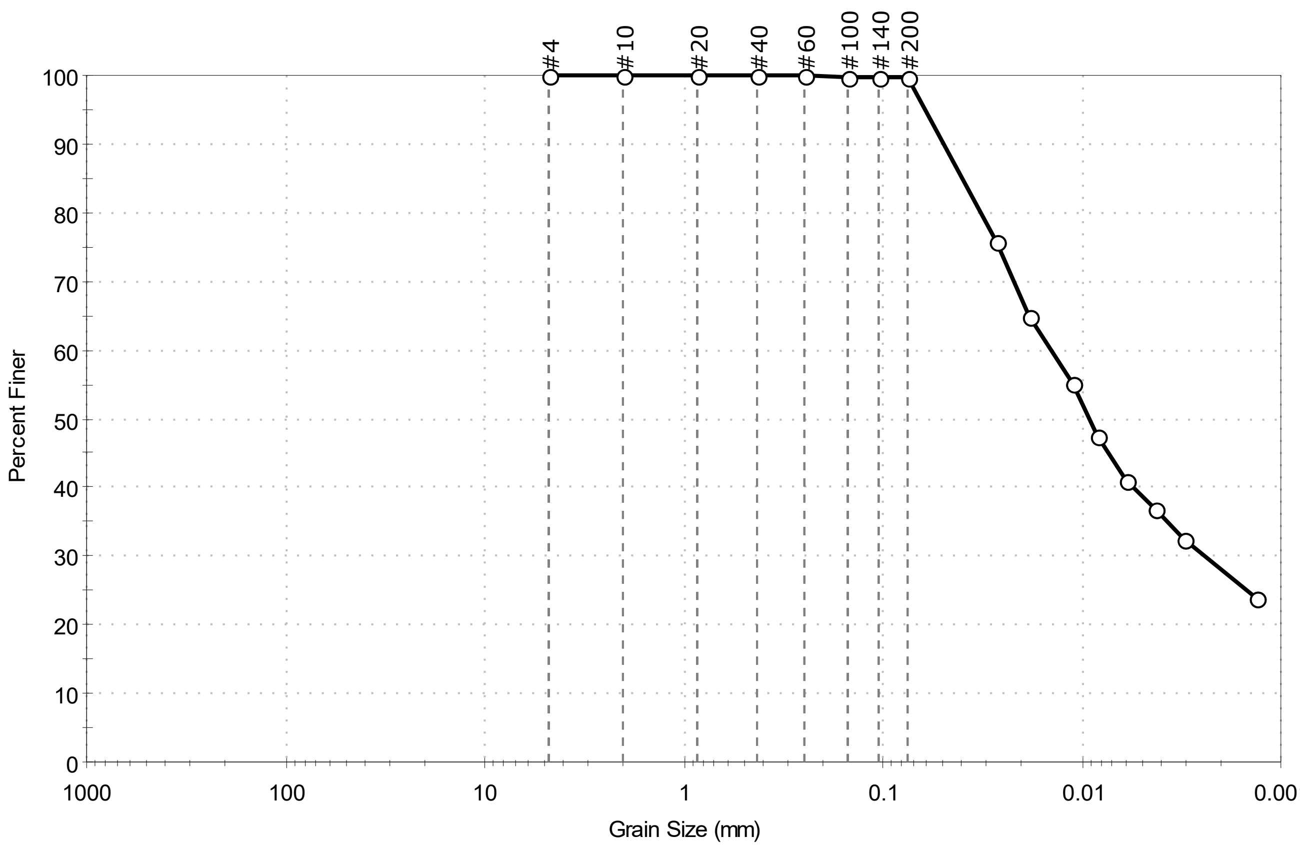
GeoTesting EXPRESS

Client:	Geosyntec Consultants				
Project:	Crossroads Phase 14				
Location:	Norridgewock, ME			Project No:	GTX-309940
Boring ID:	GB-06	Sample Type:	tube	Tested By:	ckg
Sample ID:	29-31	Test Date:	06/30/19	Checked By:	emm
Depth :	29-31 ft	Test Id:	510158		
Test Comment:	---				
Visual Description:	Moist, olive gray clay				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	0.0	0.3	99.7

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	100		
#60	0.25	100		
#100	0.15	100		
#140	0.11	100		
#200	0.075	100		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0270	76		
---	0.0185	65		
---	0.0113	55		
---	0.0084	48		
---	0.0060	41		
---	0.0043	37		
---	0.0031	32		
---	0.0013	24		

Coefficients

D_{85} =0.0401 mm | D_{30} =0.0024 mm

D_{60} =0.0144 mm | D_{15} =N/A

D_{50} =0.0092 mm | D_{10} =N/A

C_u =N/A | C_c =N/A

Classification

ASTM Lean CLAY (CL)

AASHTO Clayey Soils (A-6 (11))

Sample/Test Description

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: Sieve

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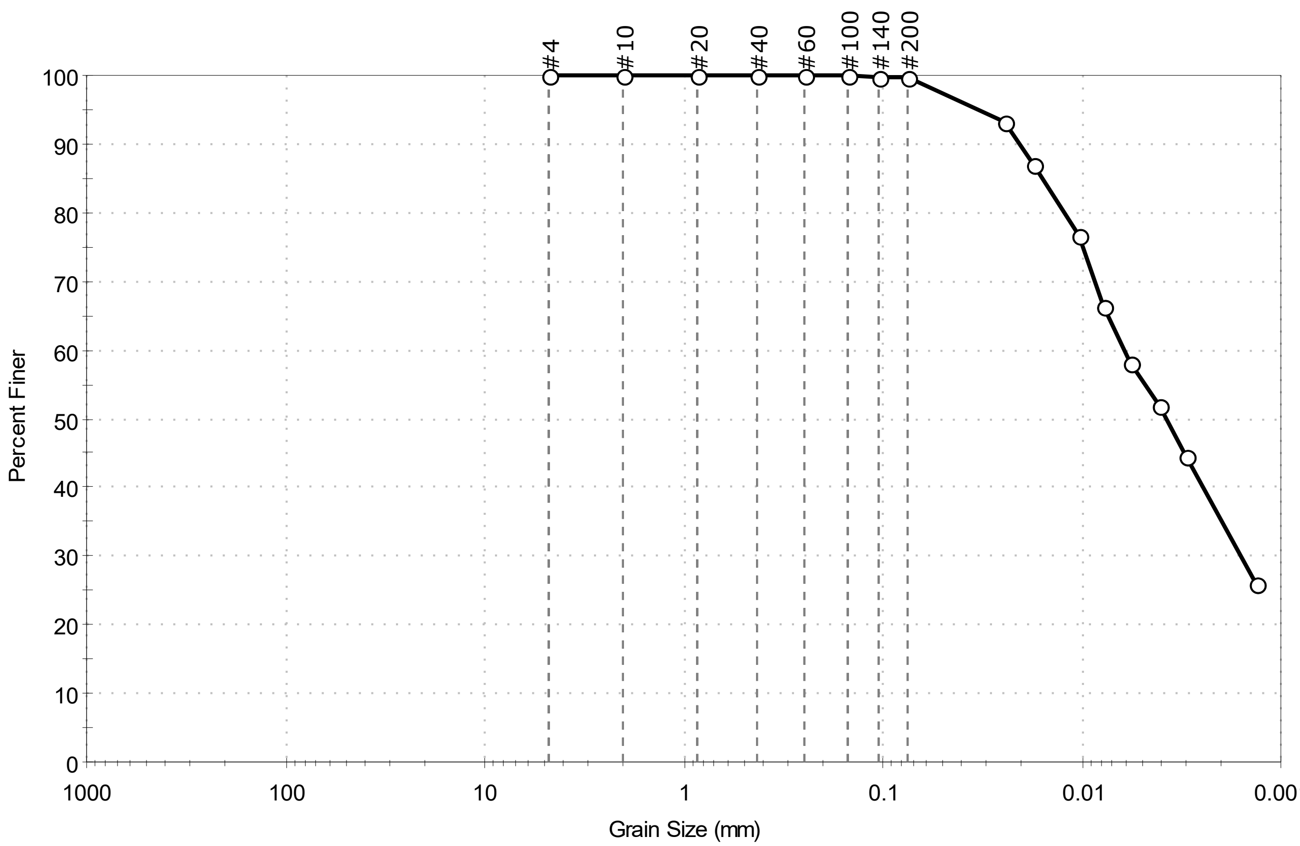
Client:	Geosyntec Consultants		
Project:	Crossroads Phase 14		
Location:	Norridgewock, ME	Project No:	GTX-309940
Boring ID: GB-16	Sample Type: tube	Tested By:	ckg
Sample ID: 17-19	Test Date: 07/01/19	Checked By:	emm
Depth : 17-19 ft	Test Id: 510167		

Test Comment: ---
Visual Description: Moist, olive gray clay
Sample Comment: ---

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	0.0	0.3	99.7

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	100		
#60	0.25	100		
#100	0.15	100		
#140	0.11	100		
#200	0.075	100		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0244	93		
---	0.0174	87		
---	0.0104	77		
---	0.0078	66		
---	0.0057	58		
---	0.0041	52		
---	0.0030	45		
---	0.0013	26		

Coefficients

D_{85} =0.0157 mm	D_{30} =0.0016 mm
D_{60} =0.0061 mm	D_{15} =N/A
D_{50} =0.0038 mm	D_{10} =N/A
C_u =N/A	C_c =N/A

Classification

ASTM Lean CLAY (CL)

AASHTO Clayey Soils (A-6 (14))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : HARD

Dispersion Device : Apparatus A - Mech Mixer

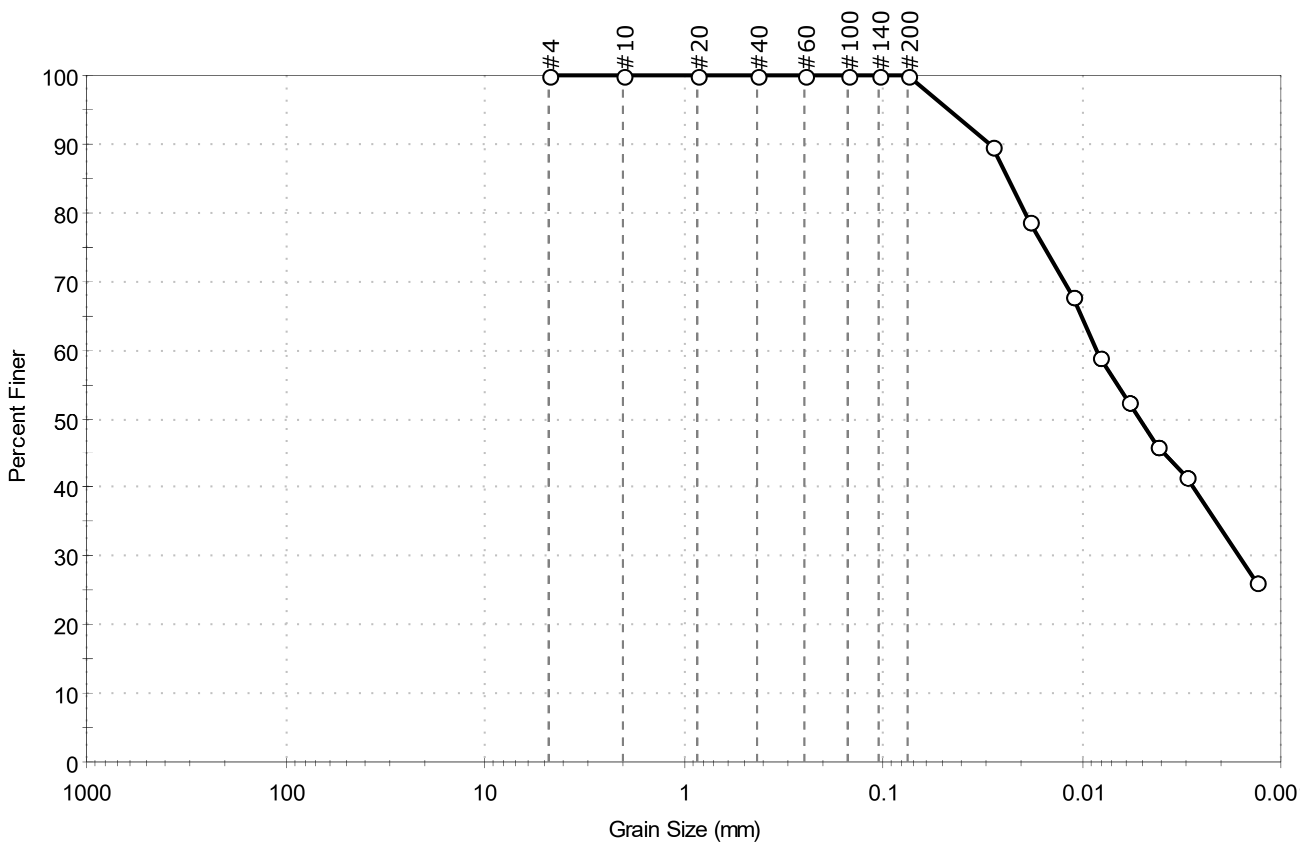
Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

Client:	Geosyntec Consultants			
Project:	Crossroads Phase 14			
Location:	Norridgewock, ME		Project No:	GTX-309940
Boring ID:	GB-16	Sample Type: tube	Tested By:	ckg
Sample ID:	27-29	Test Date: 07/01/19	Checked By:	emm
Depth :	27-29 ft	Test Id: 510168		
Test Comment:	---			
Visual Description:	Moist, olive gray clay			
Sample Comment:	---			

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
–	0.0	0.1	99.9

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	100		
#60	0.25	100		
#100	0.15	100		
#140	0.11	100		
#200	0.075	100		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0284	90		
---	0.0184	79		
---	0.0110	68		
---	0.0081	59		
---	0.0058	52		
---	0.0042	46		
---	0.0030	42		
---	0.0013	26		

Coefficients

D_{85} =0.0237 mm
D_{30} =0.0016 mm
D_{60} =0.0084 mm
D_{15} =N/A
D_{50} =0.0052 mm
D_{10} =N/A
C_u =N/A
C_c =N/A

Classification

ASTM Lean CLAY (CL)

AASHTO Clayey Soils (A-6 (13))

Sample/Test Description

Sand/Gravel Particle Shape : ---
Sand/Gravel Hardness : HARD
Dispersion Device : Apparatus A - Mech Mixer
Dispersion Period : 1 minute
Est. Specific Gravity : 2.65
Separation of Sample: #200 Sieve

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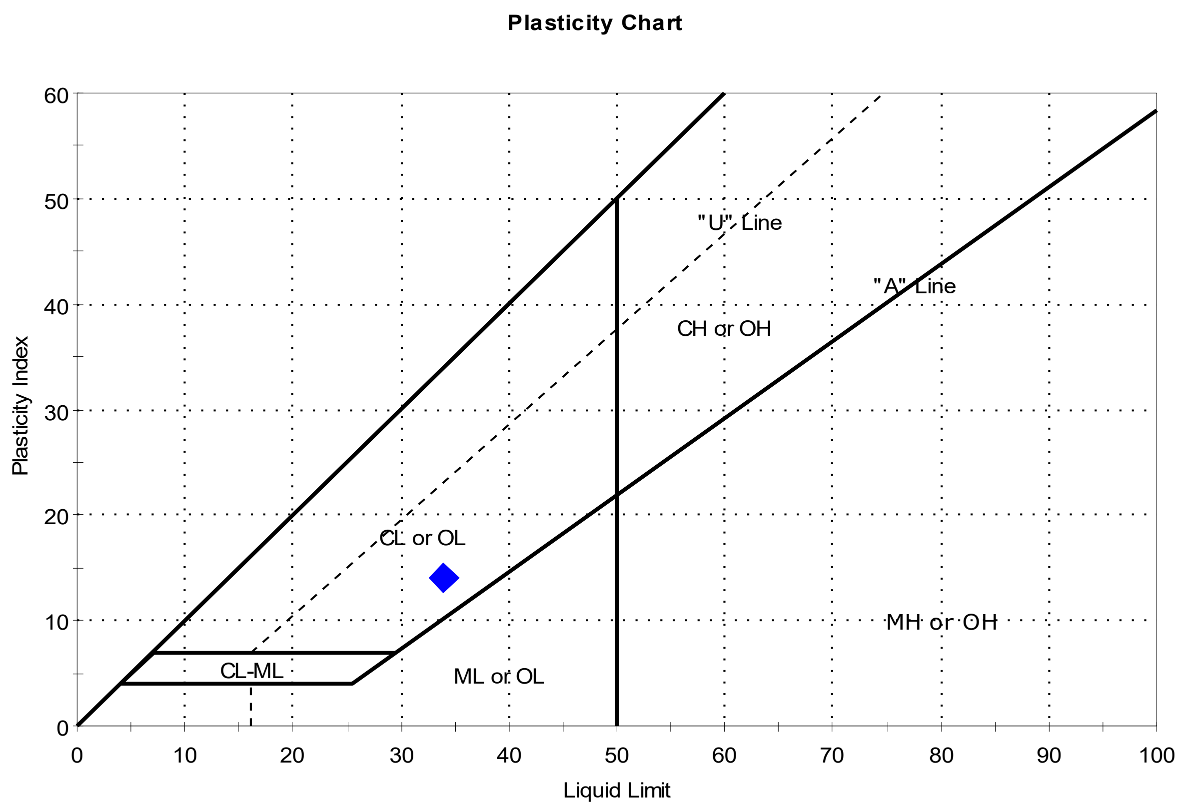
Client:	Geosyntec Consultants				
Project:	Crossroads Phase 14				
Location:	Norridgewock, ME			Project No:	GTX-309940
Boring ID:	GB-06	Sample Type:	tube	Tested By:	cam
Sample ID:	21-23	Test Date:	06/26/19	Checked By:	emm
Depth :	21-23 ft	Test Id:	510111		

Test Comment: ---
Visual Description: Moist, dark gray clay
Sample Comment: ---

Atterberg Limits - ASTM D4318



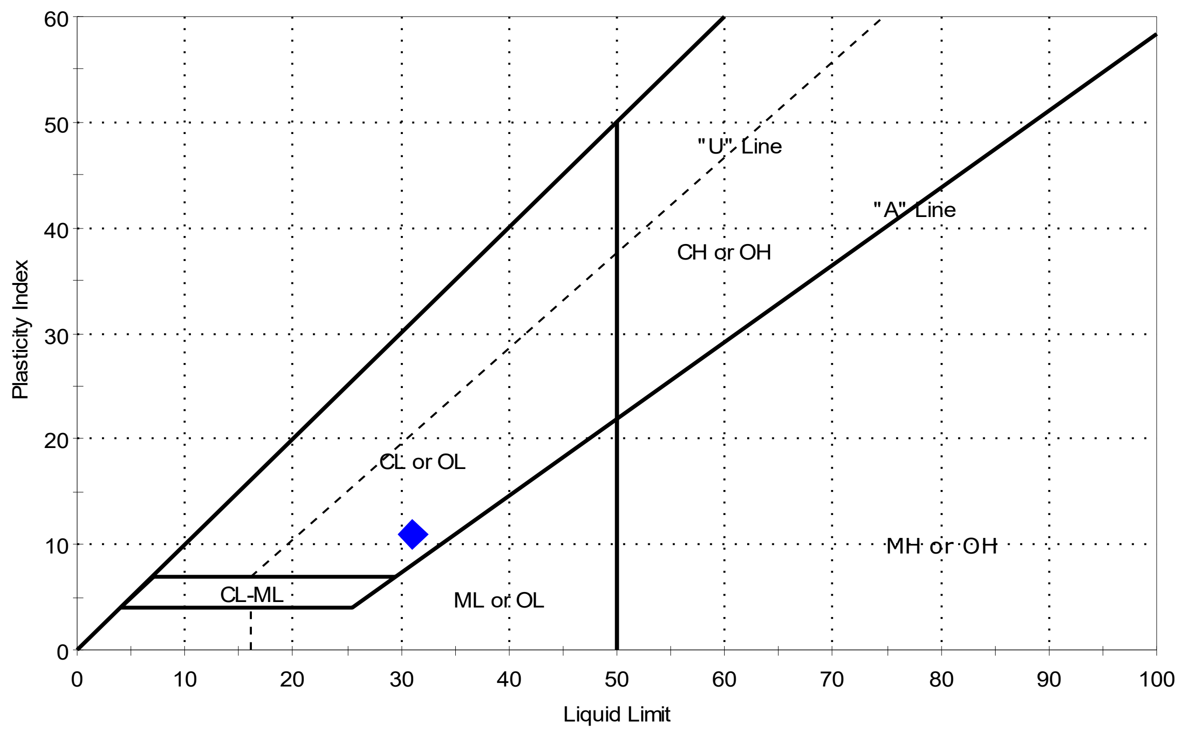
Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	21-23	GB-06	21-23 ft	25	34	20	14	0.3	Lean CLAY (CL)

Sample Prepared using the WET method
0% Retained on #40 Sieve
Dry Strength: VERY HIGH
Dilatancy: SLOW
Toughness: MEDIUM

Client:	Geosyntec Consultants				
Project:	Crossroads Phase 14				
Location:	Norridgewock, ME			Project No:	GTX-309940
Boring ID:	GB-06	Sample Type:	tube	Tested By:	cam
Sample ID:	29-31	Test Date:	06/26/19	Checked By:	emm
Depth :	29-31 ft	Test Id:	510112		

Test Comment: ---
Visual Description: Moist, olive gray 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
◆	29-31	GB-06	29-31 ft	30	31	20	11	0.9	Lean CLAY (CL)

Sample Prepared using the WET method
0% Retained on #40 Sieve
Dry Strength: VERY HIGH
Dilatancy: SLOW
Toughness: LOW

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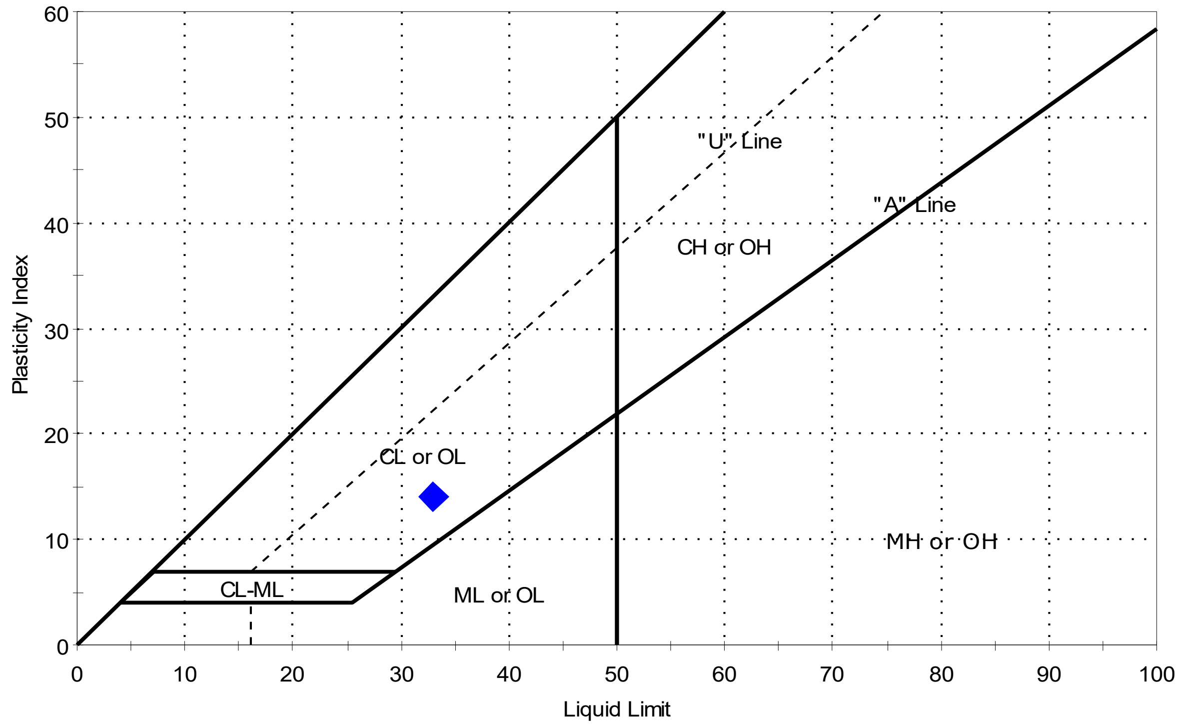
Client:	Geosyntec Consultants				
Project:	Crossroads Phase 14				
Location:	Norridgewock, ME			Project No:	GTX-309940
Boring ID:	GB-16	Sample Type:	tube	Tested By:	cam
Sample ID:	17-19	Test Date:	06/26/19	Checked By:	emm
Depth :	17-19 ft	Test Id:	510121		

Test Comment: ---
Visual Description: Moist, olive gray clay
Sample Comment: ---

Atterberg Limits - ASTM D4318

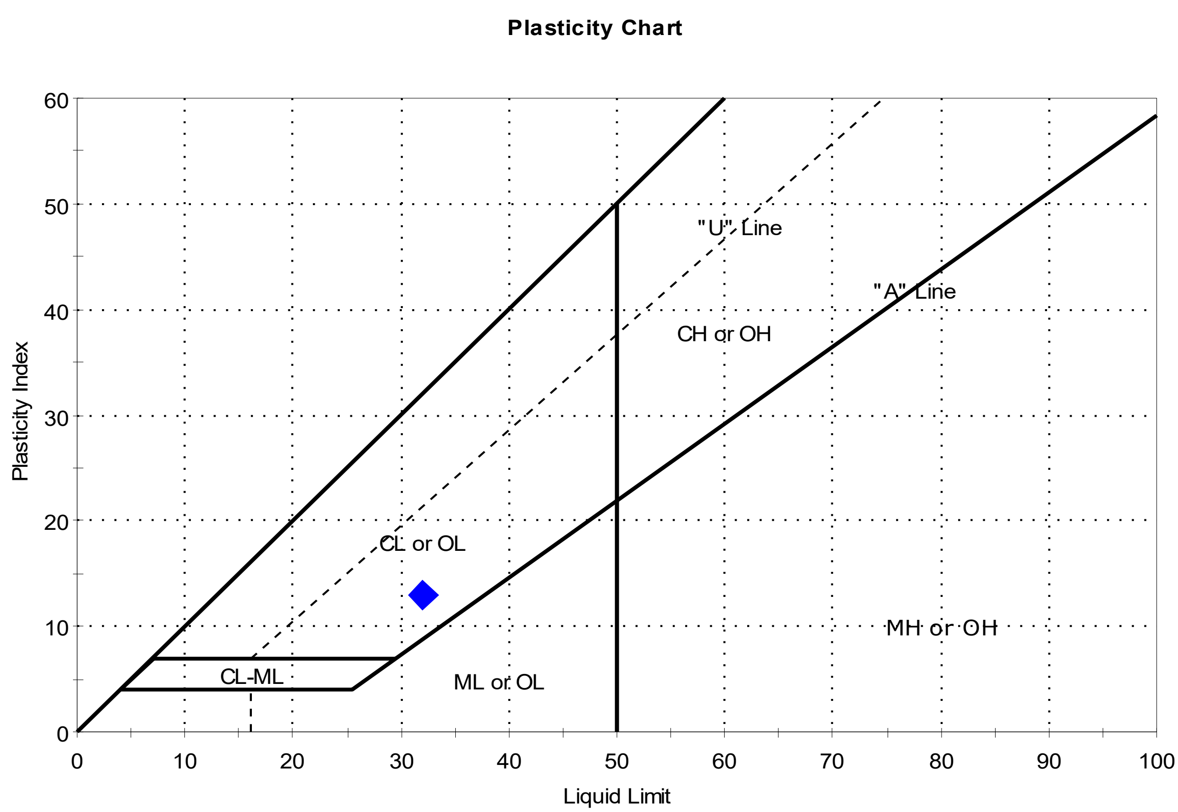


Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	7-19	GB-16	17-19 ft	28	33	19	14	0.7	Lean CLAY (CL)

Sample Prepared using the WET method
0% Retained on #40 Sieve
Dry Strength: VERY HIGH
Dilatancy: SLOW
Toughness: HIGH

Client:	Geosyntec Consultants		
Project:	Crossroads Phase 14		
Location:	Norridgewock, ME	Project No:	GTX-309940
Boring ID: GB-16	Sample Type: tube	Tested By:	cam
Sample ID: 27-29	Test Date: 06/26/19	Checked By:	emm
Depth : 27-29 ft	Test Id: 510122		
Test Comment:	---		
Visual Description:	Moist, olive gray 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
◆	27-29	GB-16	27-29 ft	31	32	19	13	0.9	Lean CLAY (CL)

Sample Prepared using the WET method

0% Retained on #40 Sieve

Dry Strength: VERY HIGH

Dilatancy: SLOW

Toughness: LOW

Client:	Geosyntec Consultants				
Project:	Crossroads Phase 14				
Location:	Norridgewock, ME			Project No:	GTX-309940
Boring ID:	GB-15	Sample Type:	tube	Tested By:	cam
Sample ID:	11-13	Test Date:	07/17/19	Checked By:	emm
Depth :	11-13 ft	Test Id:	510143		

Test Comment: ---
Visual Description: Moist, gray clay
Sample Comment: ---

USCS Classification - ASTM D2487

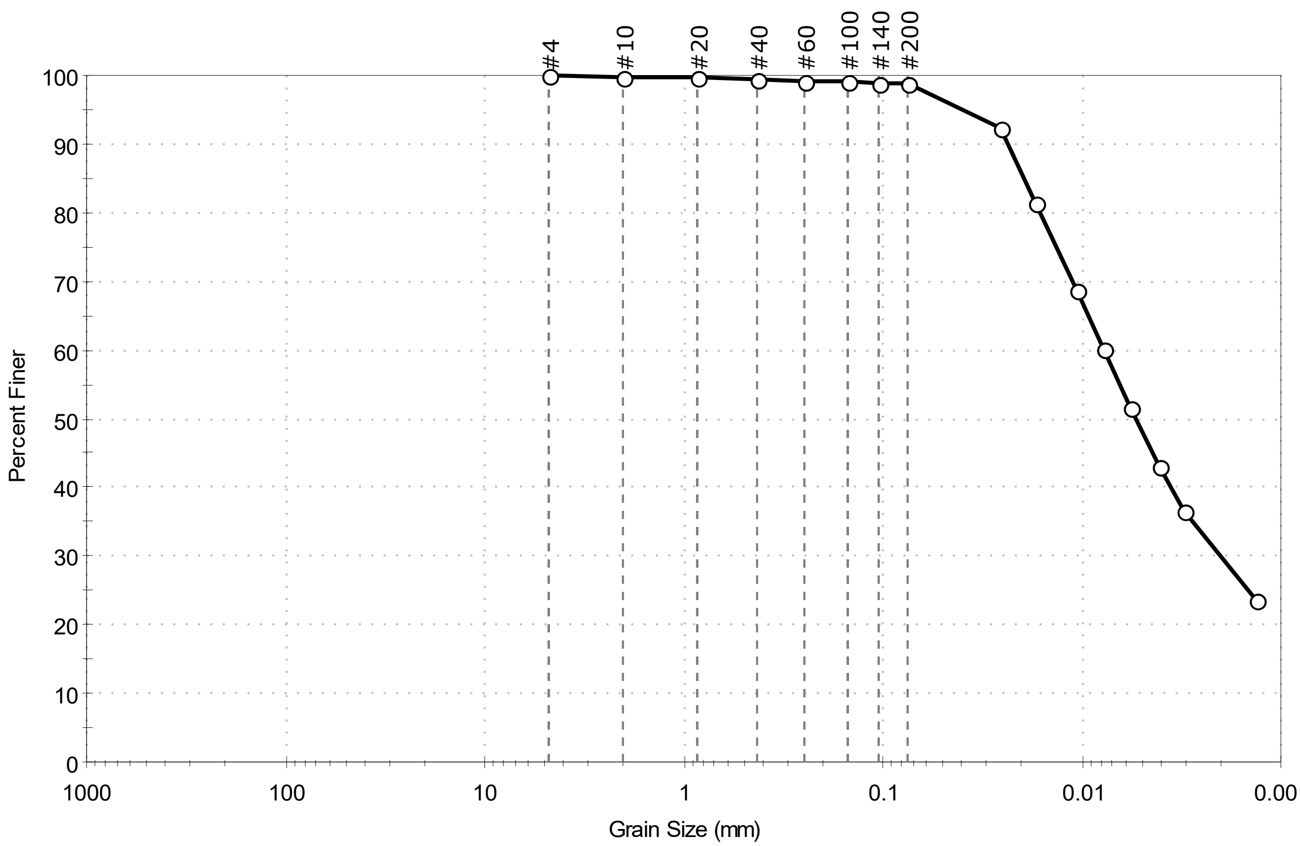
Boring ID	Sample ID	Depth	Group Name	Group Symbol	Gravel, %	Sand, %	Fines, %
GB-15	11-13	11-13 ft	Lean CLAY	CL	0.0	1.1	98.9

Remarks: Grain Size analysis performed by ASTM D6913/D7928 results enclosed
Atterberg Limits performed by ASTM D4318, results enclosed

Client:	Geosyntec Consultants		
Project:	Crossroads Phase 14		
Location:	Norridgewock, ME	Project No:	GTX-309940
Boring ID: GB-15	Sample Type: tube	Tested By:	ckg
Sample ID: 11-13	Test Date: 07/16/19	Checked By:	emm
Depth : 11-13 ft	Test Id: 514022		

Test Comment: ---
Visual Description: Moist, gray clay
Sample Comment: ---

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	0.0	1.1	98.9

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	99		
#60	0.25	99		
#100	0.15	99		
#140	0.11	99		
#200	0.075	99		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0254	92		
---	0.0171	82		
---	0.0106	69		
---	0.0078	60		
---	0.0057	52		
---	0.0041	43		
---	0.0030	36		
---	0.0013	24		

Coefficients

D_{85} =0.0194 mm
D_{30} =0.0020 mm
D_{60} =0.0078 mm
D_{15} =N/A
D_{50} =0.0054 mm
D_{10} =N/A
C_u =N/A
C_c =N/A

Classification

ASTM Lean CLAY (CL)

AASHTO Clayey Soils (A-6 (11))

Sample/Test Description

Sand/Gravel Particle Shape : ---
Sand/Gravel Hardness : ---
Dispersion Device : Apparatus A - Mech Mixer
Dispersion Period : 1 minute
Est. Specific Gravity : 2.65
Separation of Sample: #200 Sieve

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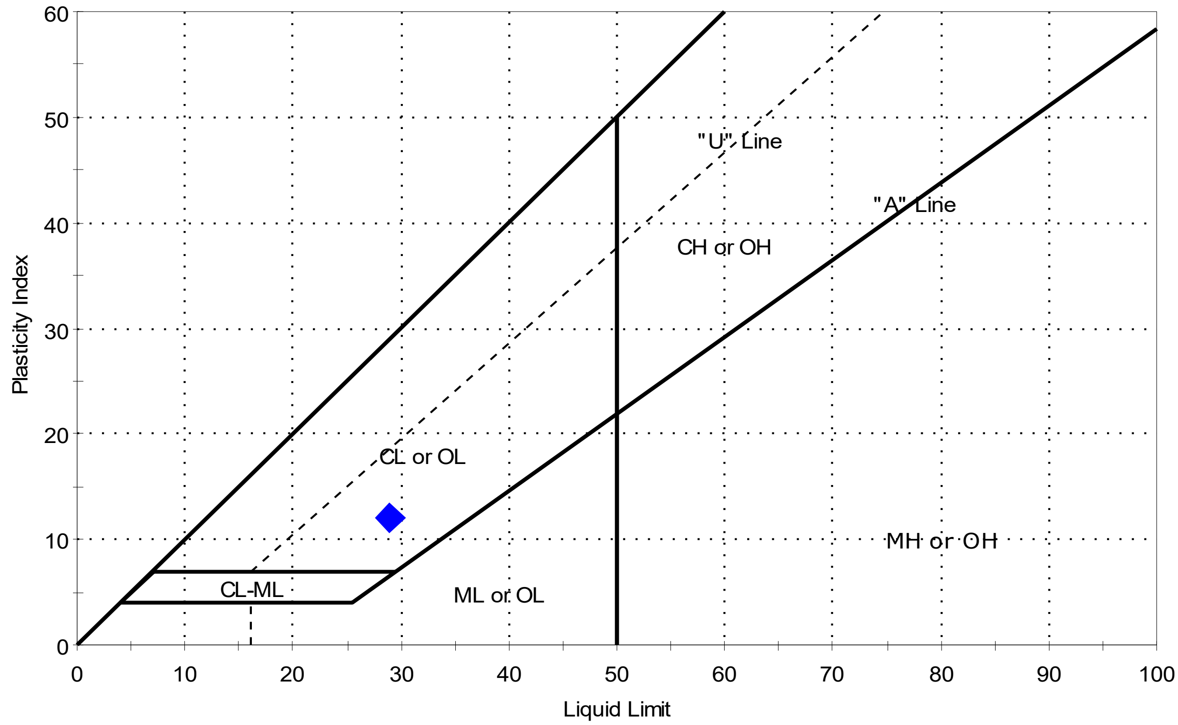
Client:	Geosyntec Consultants				
Project:	Crossroads Phase 14				
Location:	Norridgewock, ME			Project No:	GTX-309940
Boring ID:	GB-15	Sample Type:	tube	Tested By:	cam
Sample ID:	11-13	Test Date:	07/16/19	Checked By:	emm
Depth :	11-13 ft	Test Id:	513852		

Test Comment: ---
Visual Description: Moist, gray 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
◆	11-13	GB-15	11-13 ft	30	29	17	12	1.1	Lean CLAY (CL)

Sample Prepared using the WET method
1% Retained on #40 Sieve
Dry Strength: VERY HIGH
Dilatancy: SLOW
Toughness: LOW

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Client:	Geosyntec Consultants				
Project:	Crossroads Phase 14				
Location:	Norridgewock, ME			Project No:	GTX-309940
Boring ID:	---	Sample Type:	---	Tested By:	cam
Sample ID:	---	Test Date:	07/23/19	Checked By:	emm
Depth :	---	Test Id:	510142		

USCS Classification - ASTM D2487

Boring ID	Sample ID	Depth	Group Name	Group Symbol	Gravel, %	Sand, %	Fines, %
GB-03	3-5	3-5 ft	Lean CLAY	CL	0.0	0.2	99.8
GB-04	11-13	11-13 ft	Lean CLAY	CL	0.0	0.4	99.6
GB-04	19-21	19-21 ft	Lean CLAY	CL	0.0	0.5	99.5
GB-05	31-33	31-33 ft	Lean CLAY	CL	0.0	0.3	99.7
GB-07	17-19	17-19 ft	Lean CLAY	CL	0.0	0.1	99.9
GB-08	27-29	27-29 ft	Lean CLAY	CL	0.0	0.1	99.9
GB-11	17-19	17-19 ft	Lean CLAY	CL	0.0	0.2	99.8
GB-13	17-19	17-19 ft	Lean CLAY	CL	0.0	0.3	99.7
GB-14	9-11	9-10.8 ft	Lean CLAY	CL	0.0	0.2	99.8
GB-15	7-9	7-9 ft	Lean CLAY	CL	0.0	0.9	99.1

Remarks: Grain Size analysis performed by ASTM D6913/D7928 results enclosed
Atterberg Limits performed by ASTM D4318, results enclosed

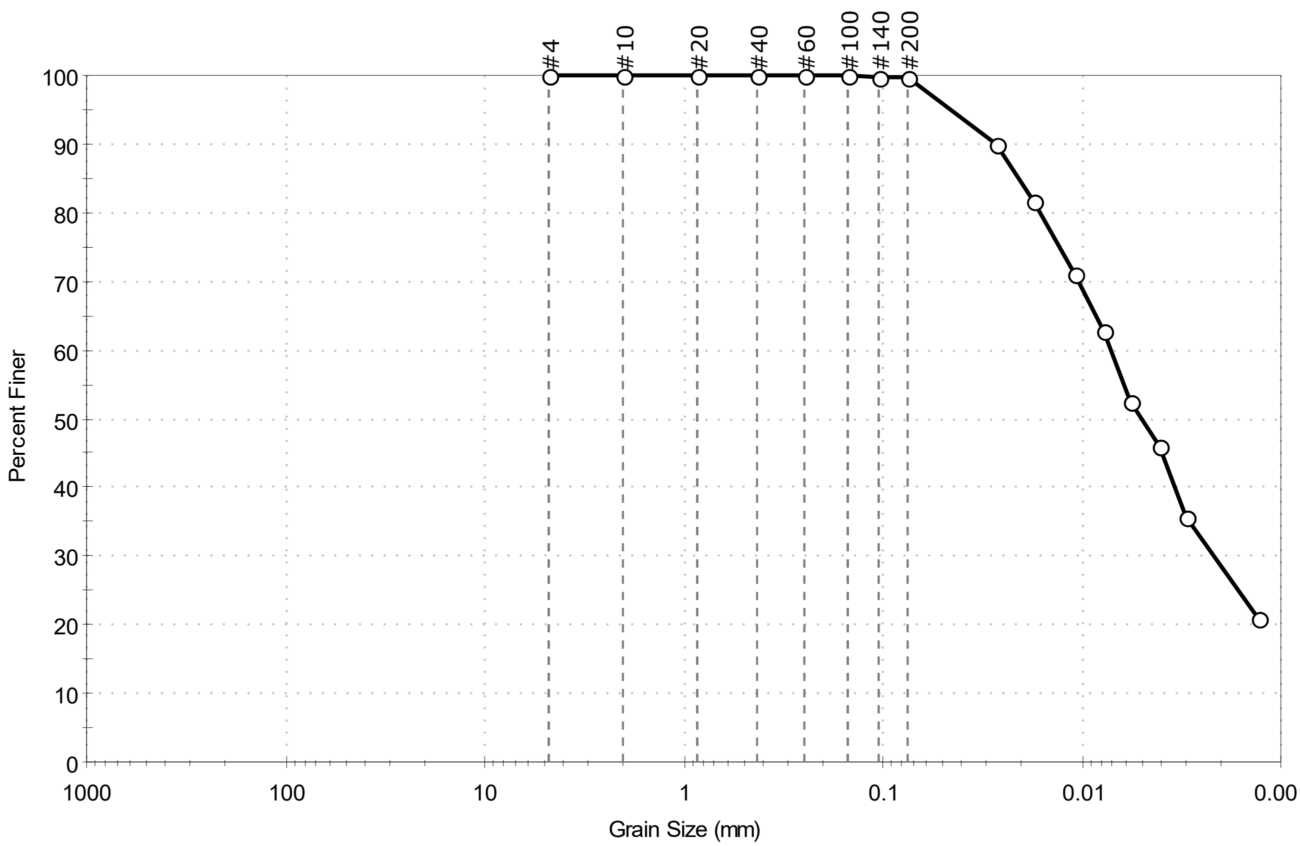
USCS Classification - ASTM D2487

Boring ID	Sample ID	Depth	Group Name	Group Symbol	Gravel, %	Sand, %	Fines, %
GB-17	15-17	15-17 ft	Lean CLAY	CL	0.0	0.2	99.8
GB-17B	5-7	5-7 ft	Lean CLAY	CL	0.0	0.0	100.0
GB-19	17-19	17-18.8 ft	Lean CLAY	CL	0.0	0.2	99.8
GB-21	23-25	23-25 ft	Lean CLAY	CL	0.0	0.1	99.9

Remarks: Grain Size analysis performed by ASTM D6913/D7928 results enclosed
Atterberg Limits performed by ASTM D4318, results enclosed

Client:	Geosyntec Consultants		
Project:	Crossroads Phase 14		
Location:	Norridgewock, ME	Project No:	GTX-309940
Boring ID: GB-03	Sample Type: tube	Tested By:	ckg
Sample ID: 3-5	Test Date: 07/22/19	Checked By:	emm
Depth : 3-5 ft	Test Id: 510153		
Test Comment:	---		
Visual Description:	Moist, light olive brown clay		
Sample Comment:	---		

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	0.0	0.2	99.8

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	100		
#60	0.25	100		
#100	0.15	100		
#140	0.11	100		
#200	0.075	100		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0267	90		
---	0.0175	82		
---	0.0109	71		
---	0.0078	63		
---	0.0057	52		
---	0.0041	46		
---	0.0030	36		
---	0.0013	21		

Coefficients

D_{85} =0.0207 mm D_{30} =0.0022 mm

D_{60} =0.0072 mm D_{15} =N/A

D_{50} =0.0051 mm D_{10} =N/A

C_u =N/A C_c =N/A

Classification

ASTM Lean CLAY (CL)

AASHTO Clayey Soils (A-6 (11))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

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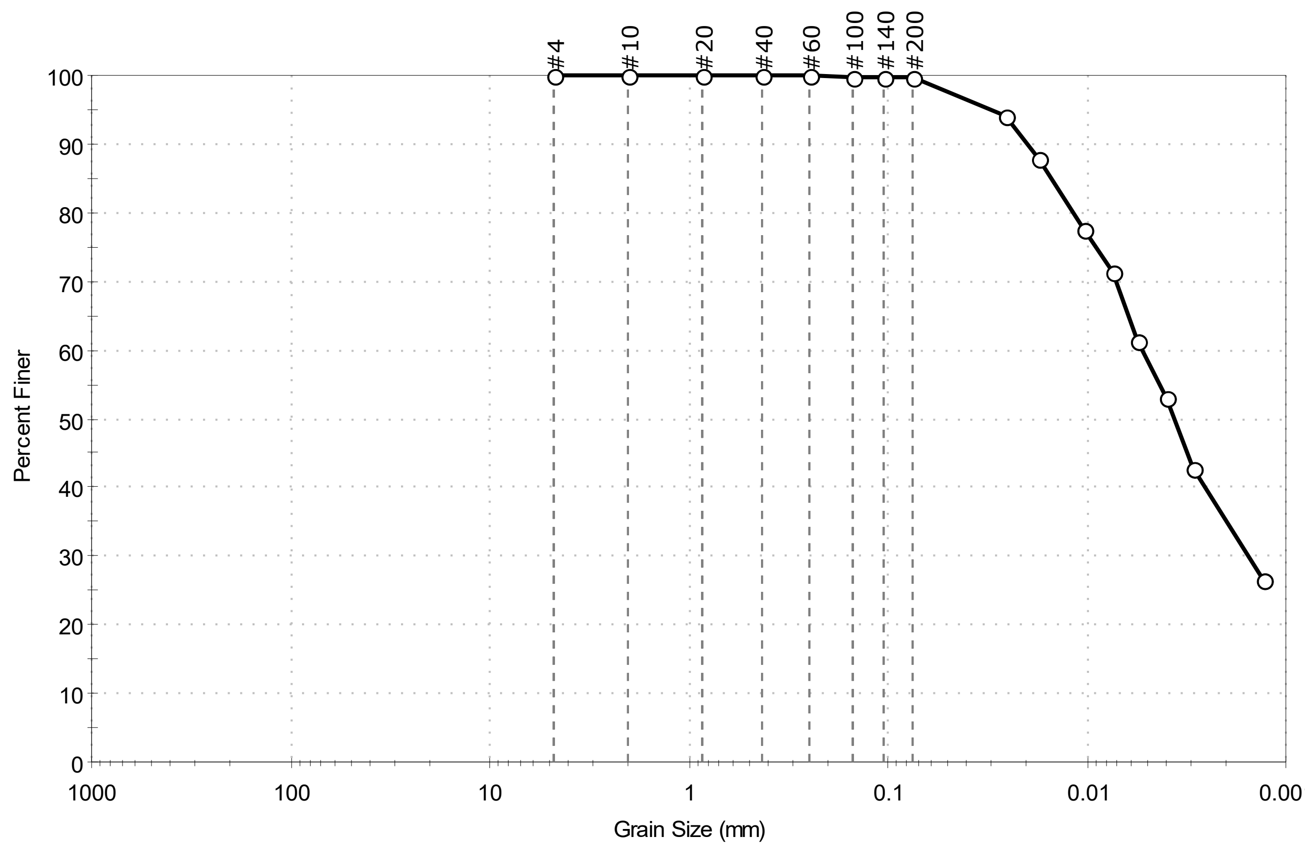
Client:	Geosyntec Consultants			
Project:	Crossroads Phase 14			
Location:	Norridgewock, ME		Project No:	GTX-309940
Boring ID:	GB-04	Sample Type: tube	Tested By:	ckg
Sample ID:	11-13	Test Date: 07/22/19	Checked By:	emm
Depth :	11-13 ft	Test Id: 510155		

Test Comment: ---
Visual Description: Moist, olive clay
Sample Comment: ---

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	0.0	0.4	99.6

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	100		
#60	0.25	100		
#100	0.15	100		
#140	0.11	100		
#200	0.075	100		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0255	94		
---	0.0175	88		
---	0.0105	78		
---	0.0074	72		
---	0.0056	61		
---	0.0040	53		
---	0.0029	43		
---	0.0013	27		

Coefficients

D_{85} =0.0152 mm
D_{30} =0.0015 mm
D_{60} =0.0053 mm
D_{15} =N/A
D_{50} =0.0037 mm
D_{10} =N/A
C_u =N/A
C_c =N/A

Classification

ASTM Lean CLAY (CL)

AASHTO Clayey Soils (A-6 (16))

Sample/Test Description

Sand/Gravel Particle Shape : ---
Sand/Gravel Hardness : ---
Dispersion Device : Apparatus A - Mech Mixer
Dispersion Period : 1 minute
Est. Specific Gravity : 2.65
Separation of Sample: #200 Sieve

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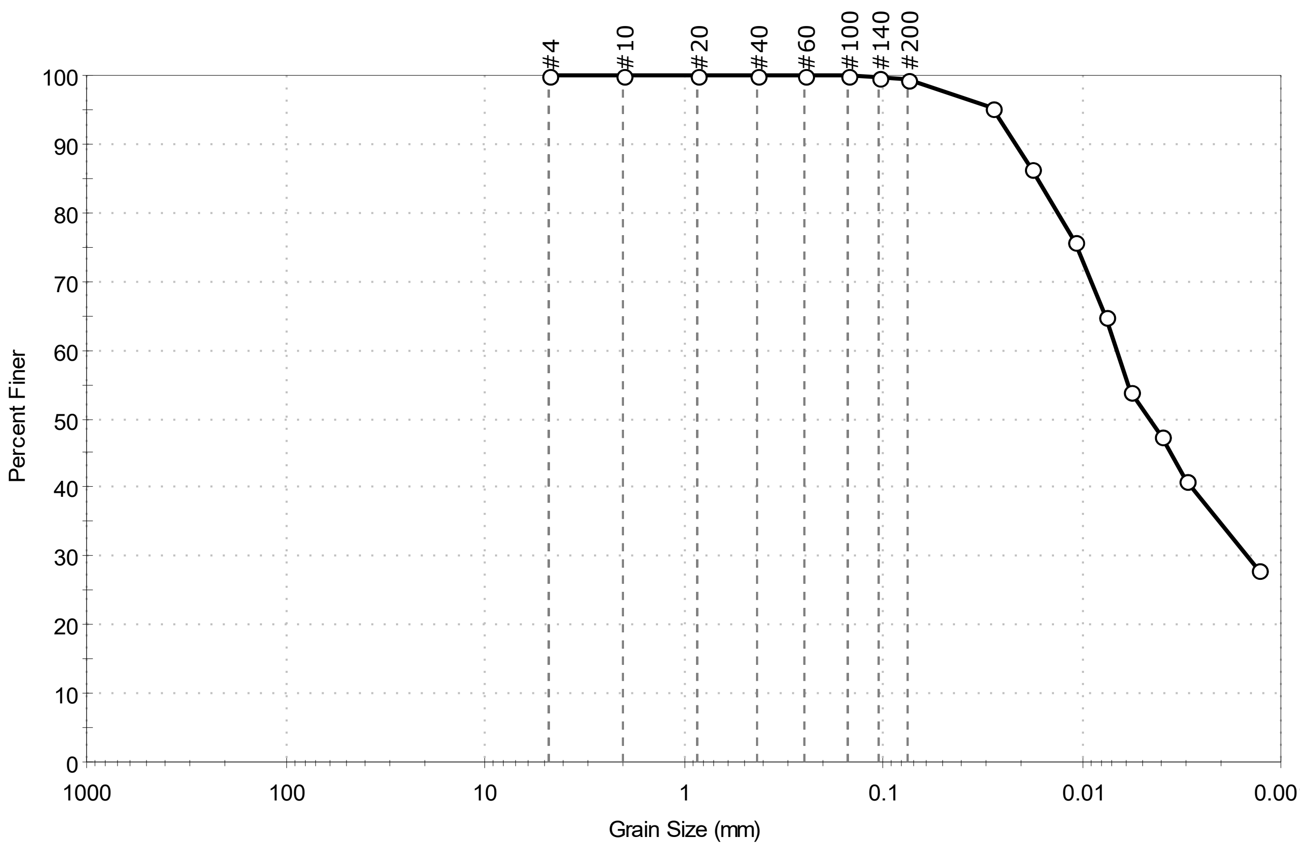
Client:	Geosyntec Consultants		
Project:	Crossroads Phase 14		
Location:	Norridgewock, ME	Project No:	GTX-309940
Boring ID: GB-04	Sample Type: tube	Tested By:	ckg
Sample ID: 19-21	Test Date: 07/22/19	Checked By:	emm
Depth : 19-21 ft	Test Id: 510154		

Test Comment: ---
Visual Description: Moist, gray clay
Sample Comment: ---

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	0.0	0.5	99.5

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	100		
#60	0.25	100		
#100	0.15	100		
#140	0.11	100		
#200	0.075	99		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0280	95		
---	0.0180	87		
---	0.0107	76		
---	0.0077	65		
---	0.0058	54		
---	0.0040	48		
---	0.0030	41		
---	0.0013	28		

Coefficients

D_{85} =0.0168 mm
D_{30} =0.0015 mm
D_{60} =0.0067 mm
D_{15} =N/A
D_{50} =0.0046 mm
D_{10} =N/A
C_u =N/A
C_c =N/A

Classification

ASTM Lean CLAY (CL)

AASHTO Clayey Soils (A-6 (15))

Sample/Test Description

Sand/Gravel Particle Shape : ---
Sand/Gravel Hardness : ---
Dispersion Device : Apparatus A - Mech Mixer
Dispersion Period : 1 minute
Est. Specific Gravity : 2.65
Separation of Sample: #200 Sieve

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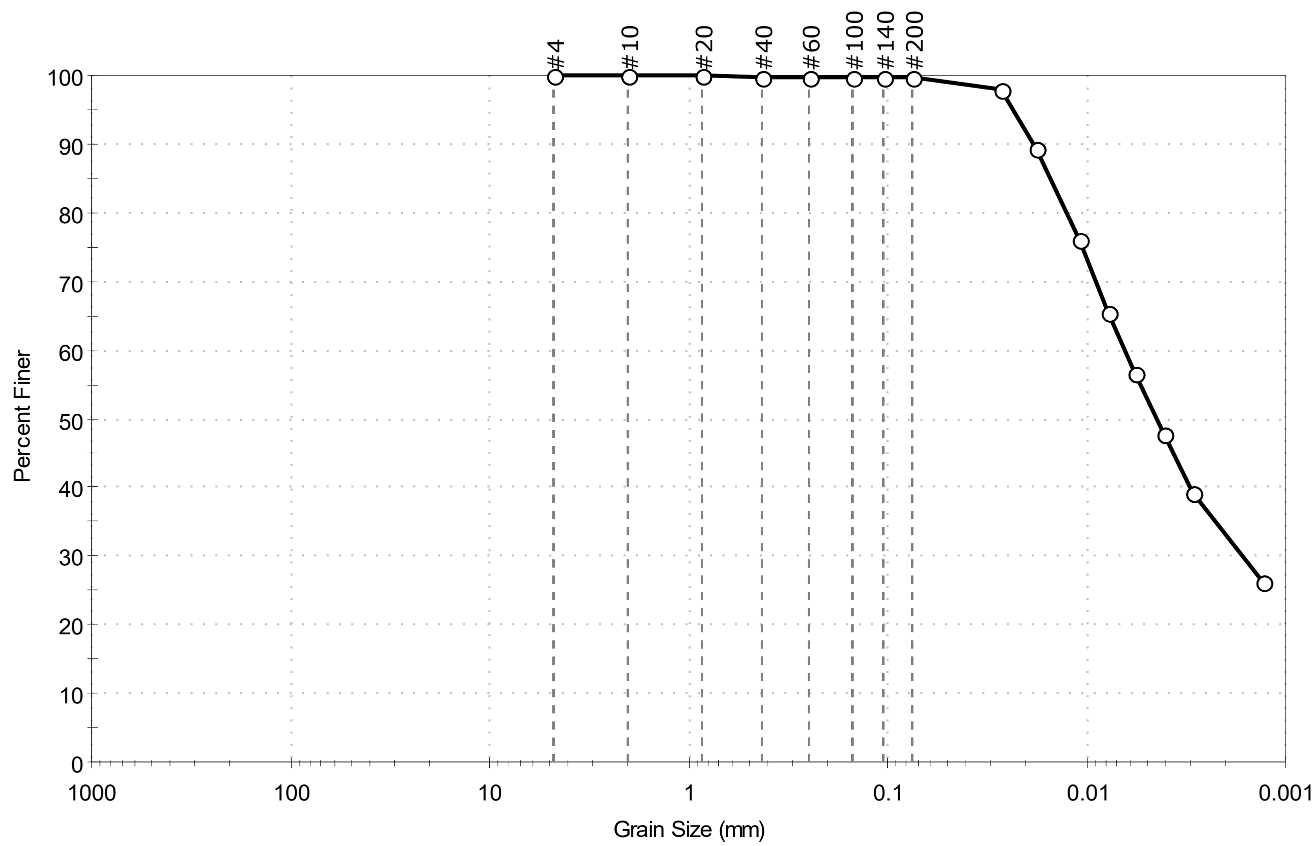
Client:	Geosyntec Consultants
Project:	Crossroads Phase 14
Location:	Norridgewock, ME
Project No:	GTX-309940
Boring ID:	GB-05
Sample Type:	tube
Tested By:	ckg
Sample ID:	31-33
Test Date:	07/22/19
Checked By:	emm
Depth :	31-33 ft
Test Id:	510156
Test Comment:	---
Visual Description:	Wet, gray clay
Sample Comment:	---

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	0.0	0.3	99.7

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	100		
#60	0.25	100		
#100	0.15	100		
#140	0.11	100		
#200	0.075	100		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0270	98		
---	0.0179	89		
---	0.0108	76		
---	0.0079	65		
---	0.0057	57		
---	0.0041	48		
---	0.0029	39		
---	0.0013	26		

Coefficients

D_{85} =0.0152 mm
D_{30} =0.0017 mm
D_{60} =0.0065 mm
D_{15} =N/A
D_{50} =0.0044 mm
D_{10} =N/A
C_u =N/A
C_c =N/A

Classification

ASTM Lean CLAY (CL)

AASHTO Silty Soils (A-4 (9))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: Sieve

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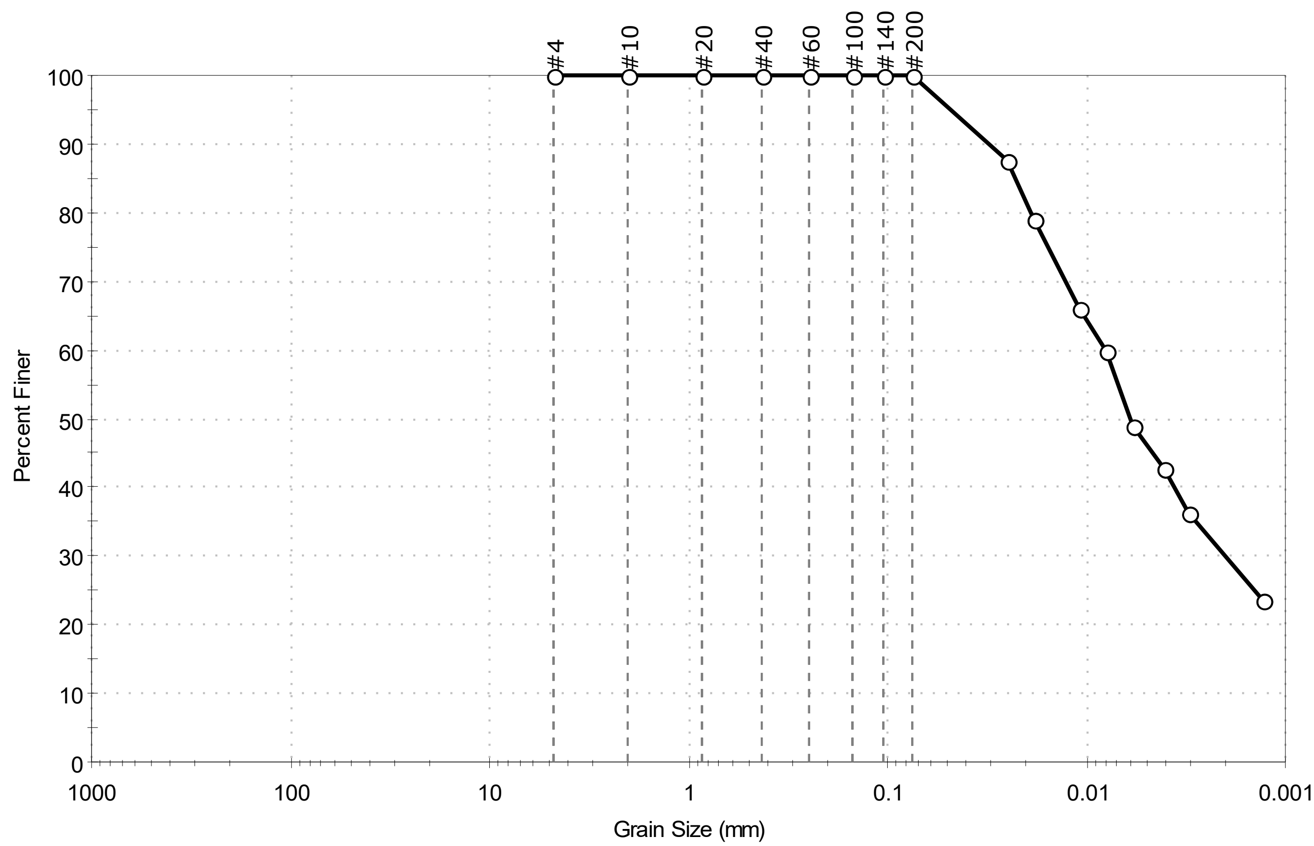
Client:	Geosyntec Consultants				
Project:	Crossroads Phase 14				
Location:	Norridgewock, ME			Project No:	GTX-309940
Boring ID:	GB-07	Sample Type:	tube	Tested By:	ckg
Sample ID:	17-19	Test Date:	07/22/19	Checked By:	emm
Depth :	17-19 ft	Test Id:	510159		

Test Comment: ---
Visual Description: Moist, gray clay
Sample Comment: ---

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	0.0	0.1	99.9

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	100		
#60	0.25	100		
#100	0.15	100		
#140	0.11	100		
#200	0.075	100		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0249	87		
---	0.0183	79		
---	0.0109	66		
---	0.0080	60		
---	0.0058	49		
---	0.0041	43		
---	0.0030	36		
---	0.0013	23		

Coefficients

D_{85} =0.0227 mm | D_{30} =0.0020 mm
D_{60} =0.0081 mm | D_{15} =N/A
D_{50} =0.0060 mm | D_{10} =N/A
C_u =N/A | C_c =N/A

Classification

ASTM Lean CLAY (CL)

AASHTO Clayey Soils (A-6 (10))

Sample/Test Description

Sand/Gravel Particle Shape : ---
Sand/Gravel Hardness : ---
Dispersion Device : Apparatus A - Mech Mixer
Dispersion Period : 1 minute
Est. Specific Gravity : 2.65
Separation of Sample: #200 Sieve

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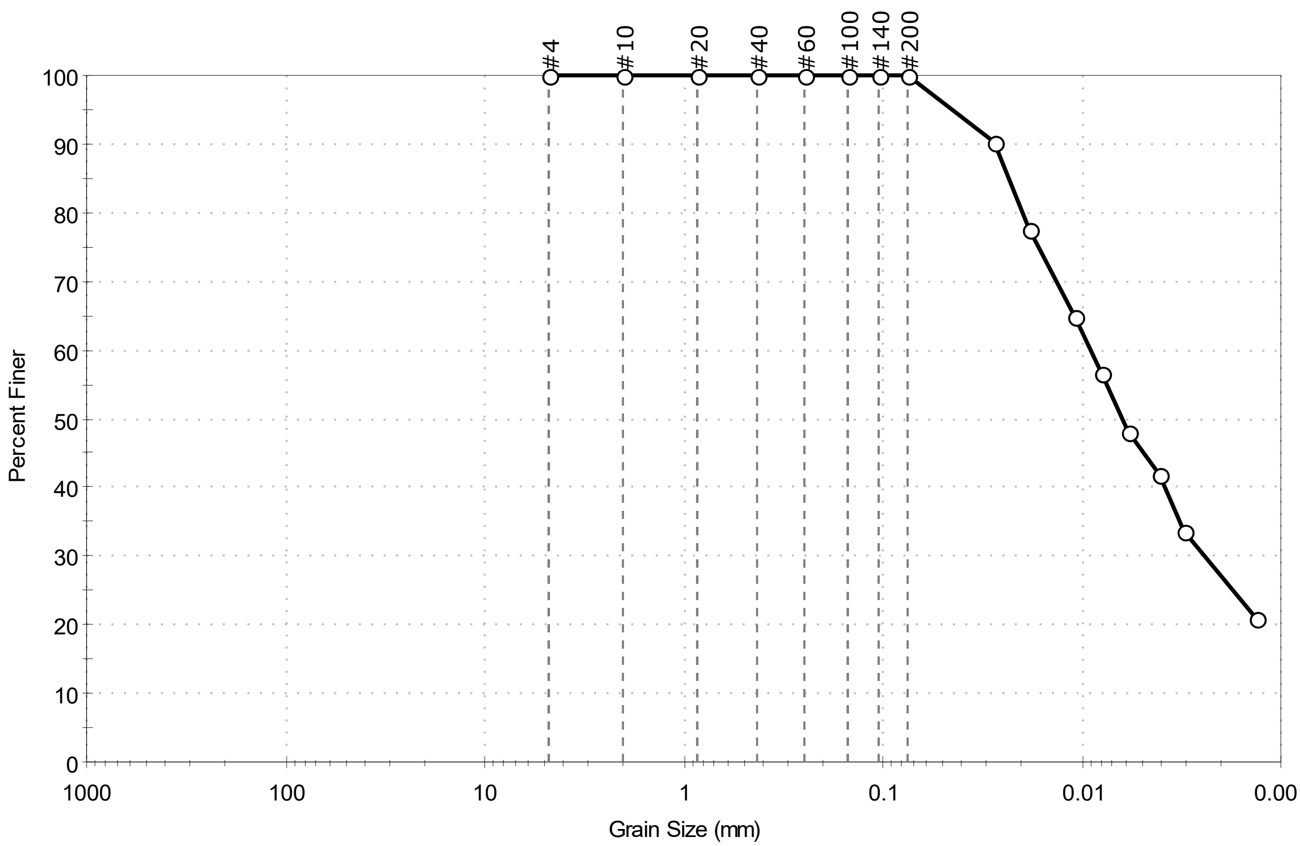
GeoTesting EXPRESS

Client:	Geosyntec Consultants		
Project:	Crossroads Phase 14		
Location:	Norridgewock, ME	Project No:	GTX-309940
Boring ID: GB-08	Sample Type: tube	Tested By:	ckg
Sample ID: 27-29	Test Date: 07/22/19	Checked By:	emm
Depth : 27-29 ft	Test Id: 510160		
Test Comment:	---		
Visual Description:	Moist, gray clay		
Sample Comment:	---		

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	0.0	0.1	99.9

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	100		
#60	0.25	100		
#100	0.15	100		
#140	0.11	100		
#200	0.075	100		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0279	90		
---	0.0184	78		
---	0.0108	65		
---	0.0079	57		
---	0.0058	48		
---	0.0041	42		
---	0.0031	34		
---	0.0013	21		

Coefficients

D_{85} =0.0235 mm
D_{30} =0.0024 mm
D_{60} =0.0090 mm
D_{15} =N/A
D_{50} =0.0062 mm
D_{10} =N/A
C_u =N/A
C_c =N/A

Classification

ASTM Lean CLAY (CL)

AASHTO Silty Soils (A-4 (9))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

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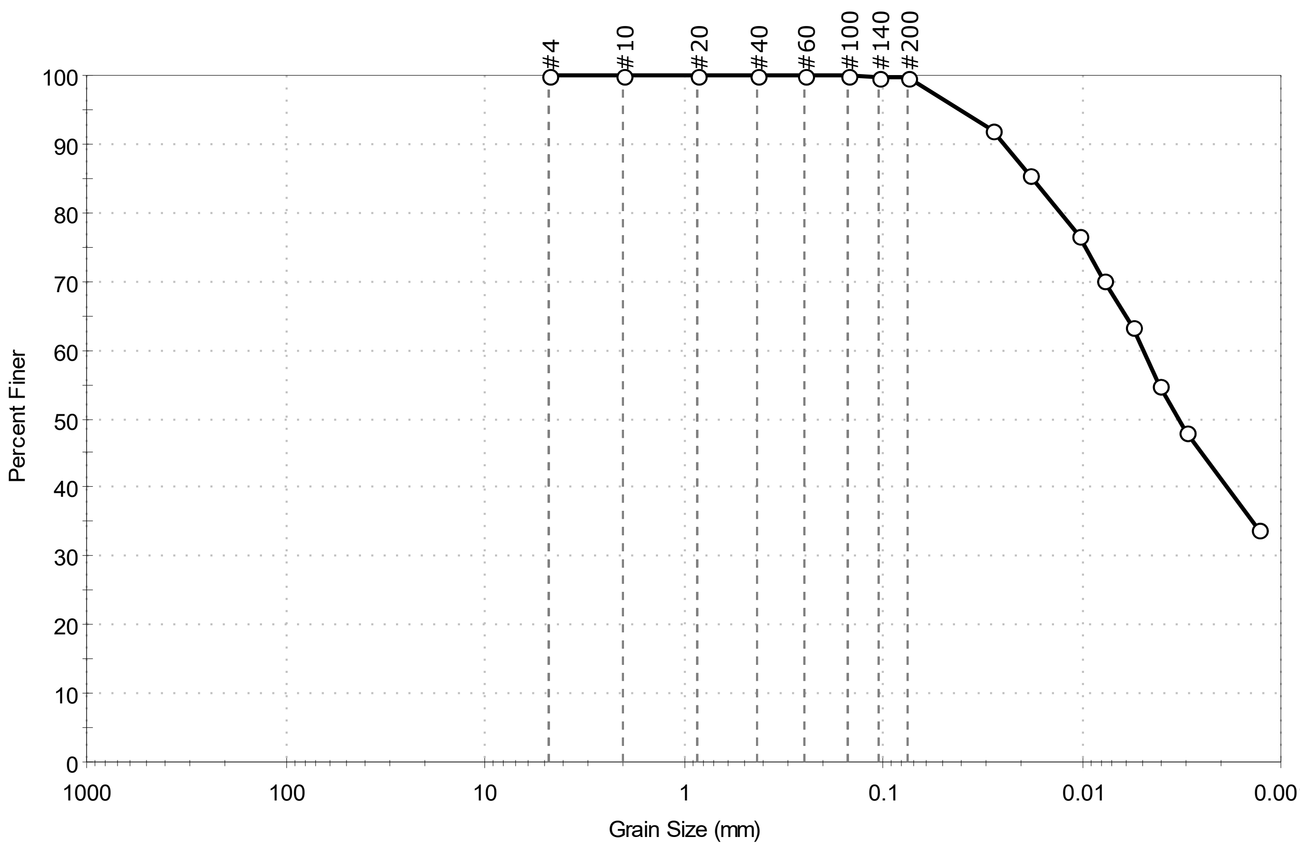
Client:	Geosyntec Consultants		
Project:	Crossroads Phase 14		
Location:	Norridgewock, ME	Project No:	GTX-309940
Boring ID: GB-11	Sample Type: tube	Tested By:	ckg
Sample ID: 17-19	Test Date: 07/22/19	Checked By:	emm
Depth : 17-19 ft	Test Id: 510161		
Test Comment:	---		
Visual Description:	Wet, gray clay		
Sample Comment:	---		

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	0.0	0.2	99.8

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	100		
#60	0.25	100		
#100	0.15	100		
#140	0.11	100		
#200	0.075	100		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0281	92		
---	0.0183	85		
---	0.0103	77		
---	0.0078	70		
---	0.0056	64		
---	0.0041	55		
---	0.0030	48		
---	0.0013	34		

Coefficients

D_{85} =0.0177 mm — D_{30} =N/A

D_{60} =0.0049 mm — D_{15} =N/A

D_{50} =0.0033 mm — D_{10} =N/A

C_u =N/A — C_c =N/A

Classification

ASTM Lean CLAY (CL)

AASHTO Clayey Soils (A-6 (13))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

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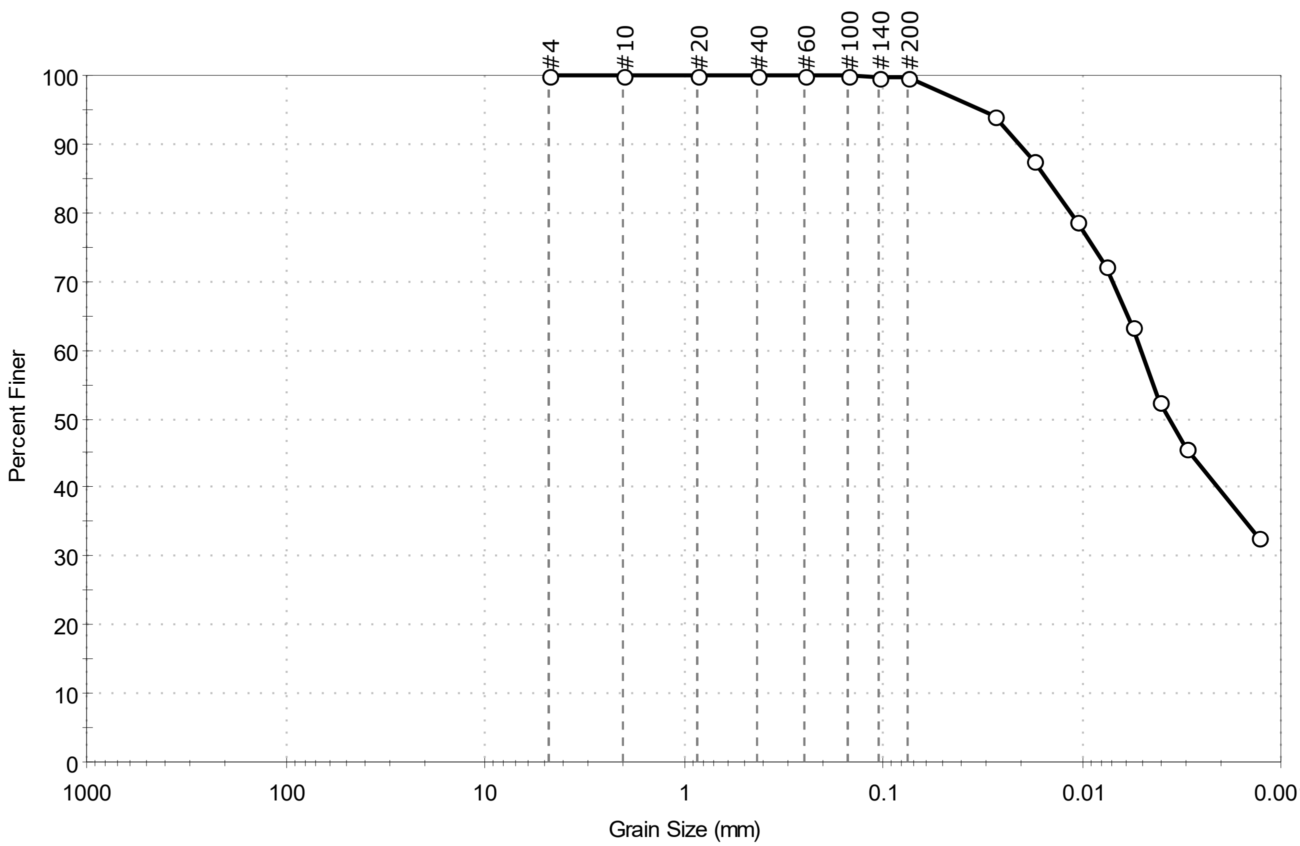
Client:	Geosyntec Consultants			
Project:	Crossroads Phase 14			
Location:	Norridgewock, ME		Project No:	GTX-309940
Boring ID:	GB-13	Sample Type: tube	Tested By:	ckg
Sample ID:	17-19	Test Date: 07/22/19	Checked By:	emm
Depth :	17-19 ft	Test Id: 510163		

Test Comment: ---
Visual Description: Moist, gray clay
Sample Comment: ---

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	0.0	0.3	99.7

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	100		
#60	0.25	100		
#100	0.15	100		
#140	0.11	100		
#200	0.075	100		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0278	94		
---	0.0177	88		
---	0.0105	79		
---	0.0075	72		
---	0.0056	63		
---	0.0041	52		
---	0.0030	46		
---	0.0013	33		

Coefficients

D_{85} =0.0152 mm | D_{30} =N/A
D_{60} =0.0051 mm | D_{15} =N/A
D_{50} =0.0036 mm | D_{10} =N/A
C_u =N/A | C_c =N/A

Classification

ASTM Lean CLAY (CL)

AASHTO Clayey Soils (A-6 (11))

Sample/Test Description

Sand/Gravel Particle Shape : ---
Sand/Gravel Hardness : ---
Dispersion Device : Apparatus A - Mech Mixer
Dispersion Period : 1 minute
Est. Specific Gravity : 2.65
Separation of Sample: #200 Sieve

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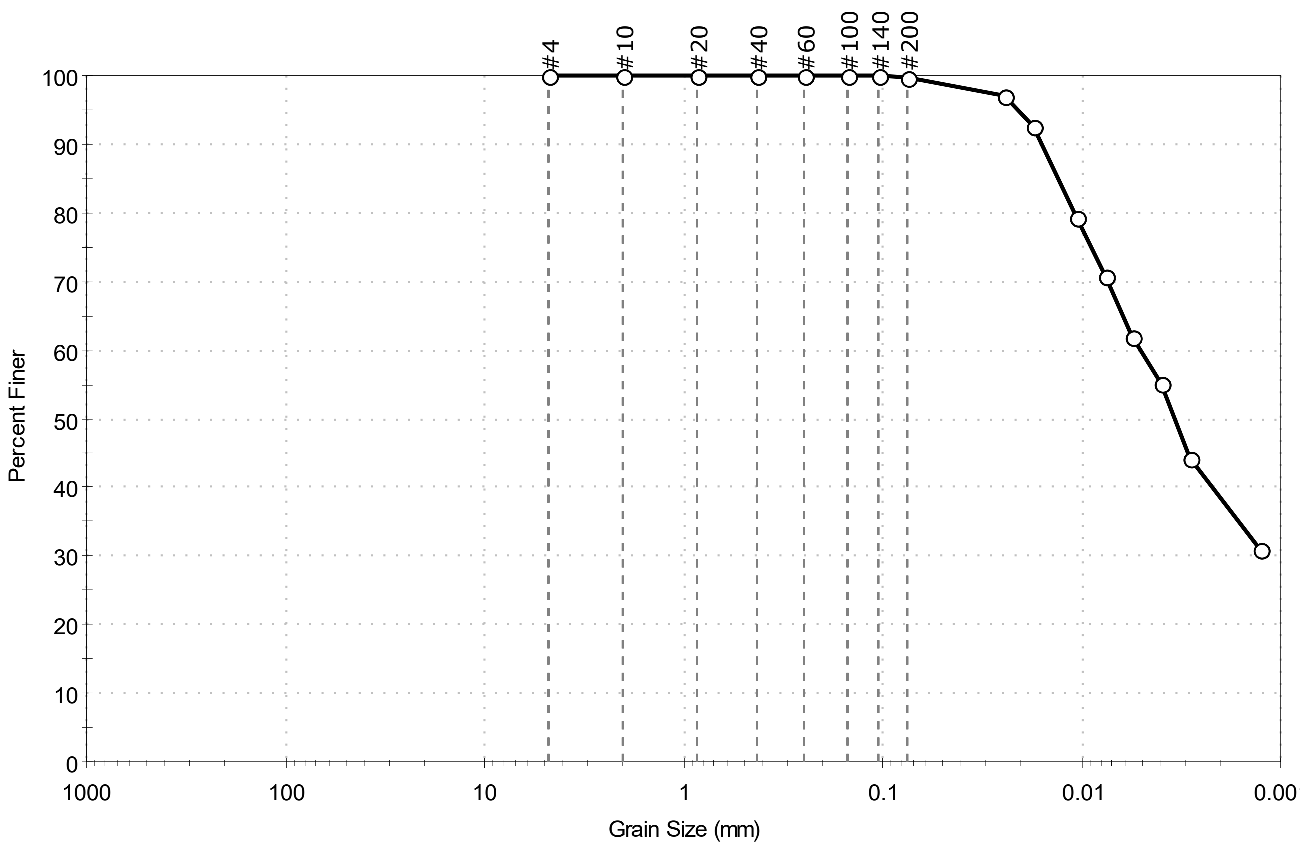
GeoTesting EXPRESS

Client:	Geosyntec Consultants				
Project:	Crossroads Phase 14				
Location:	Norridgewock, ME			Project No:	GTX-309940
Boring ID:	GB-14	Sample Type:	tube	Tested By:	ckg
Sample ID:	9-11	Test Date:	07/22/19	Checked By:	emm
Depth :	9-10.8 ft	Test Id:	510164		
Test Comment:	---				
Visual Description:	Wet, gray clay				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	0.0	0.2	99.8

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	100		
#60	0.25	100		
#100	0.15	100		
#140	0.11	100		
#200	0.075	100		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0244	97		
---	0.0174	93		
---	0.0107	79		
---	0.0077	71		
---	0.0056	62		
---	0.0040	55		
---	0.0029	44		
---	0.0013	31		

Coefficients

D_{85} =0.0131 mm　　D_{30} =N/A

D_{60} =0.0051 mm　　D_{15} =N/A

D_{50} =0.0034 mm　　D_{10} =N/A

C_u =N/A　　C_c =N/A

Classification

ASTM　Lean CLAY (CL)

AASHTO　Clayey Soils (A-6 (12))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

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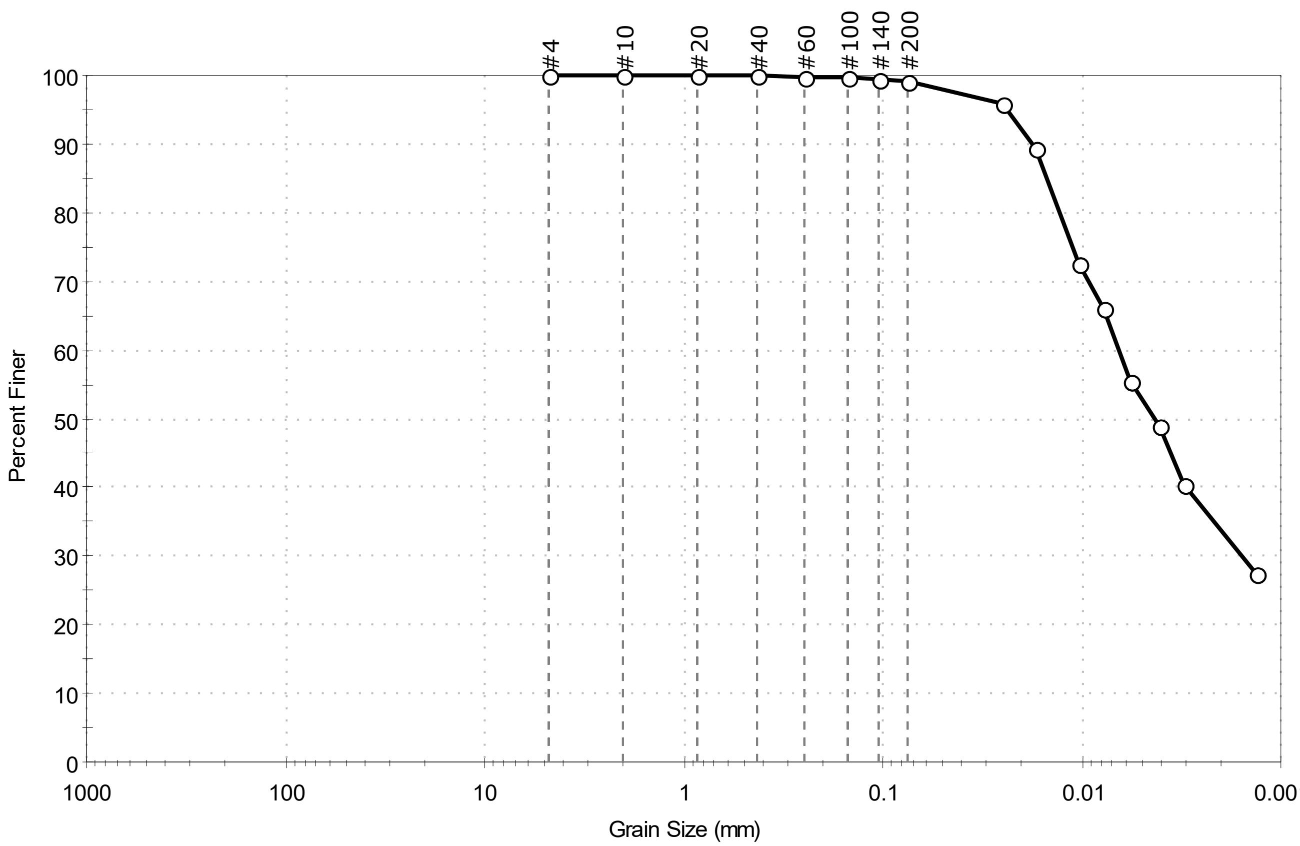
Client:	Geosyntec Consultants				
Project:	Crossroads Phase 14				
Location:	Norridgewock, ME			Project No:	GTX-309940
Boring ID:	GB-15	Sample Type:	tube	Tested By:	ckg
Sample ID:	7-9	Test Date:	07/22/19	Checked By:	emm
Depth :	7-9 ft	Test Id:	510165		
Test Comment:	---				
Visual Description:	Moist, olive gray clay				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	0.0	0.9	99.1

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	100		
#60	0.25	100		
#100	0.15	100		
#140	0.11	99		
#200	0.075	99		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0253	96		
---	0.0173	90		
---	0.0104	72		
---	0.0079	66		
---	0.0057	55		
---	0.0041	49		
---	0.0030	40		
---	0.0013	28		

Coefficients

D_{85} =0.0151 mm
D_{30} =0.0015 mm
D_{60} =0.0066 mm
D_{15} =N/A
D_{50} =0.0043 mm
D_{10} =N/A
C_u =N/A
C_c =N/A

Classification

ASTM Lean CLAY (CL)

AASHTO Silty Soils (A-4 (10))

Sample/Test Description

Sand/Gravel Particle Shape : ---
Sand/Gravel Hardness : ---
Dispersion Device : Apparatus A - Mech Mixer
Dispersion Period : 1 minute
Est. Specific Gravity : 2.65
Separation of Sample: #200 Sieve

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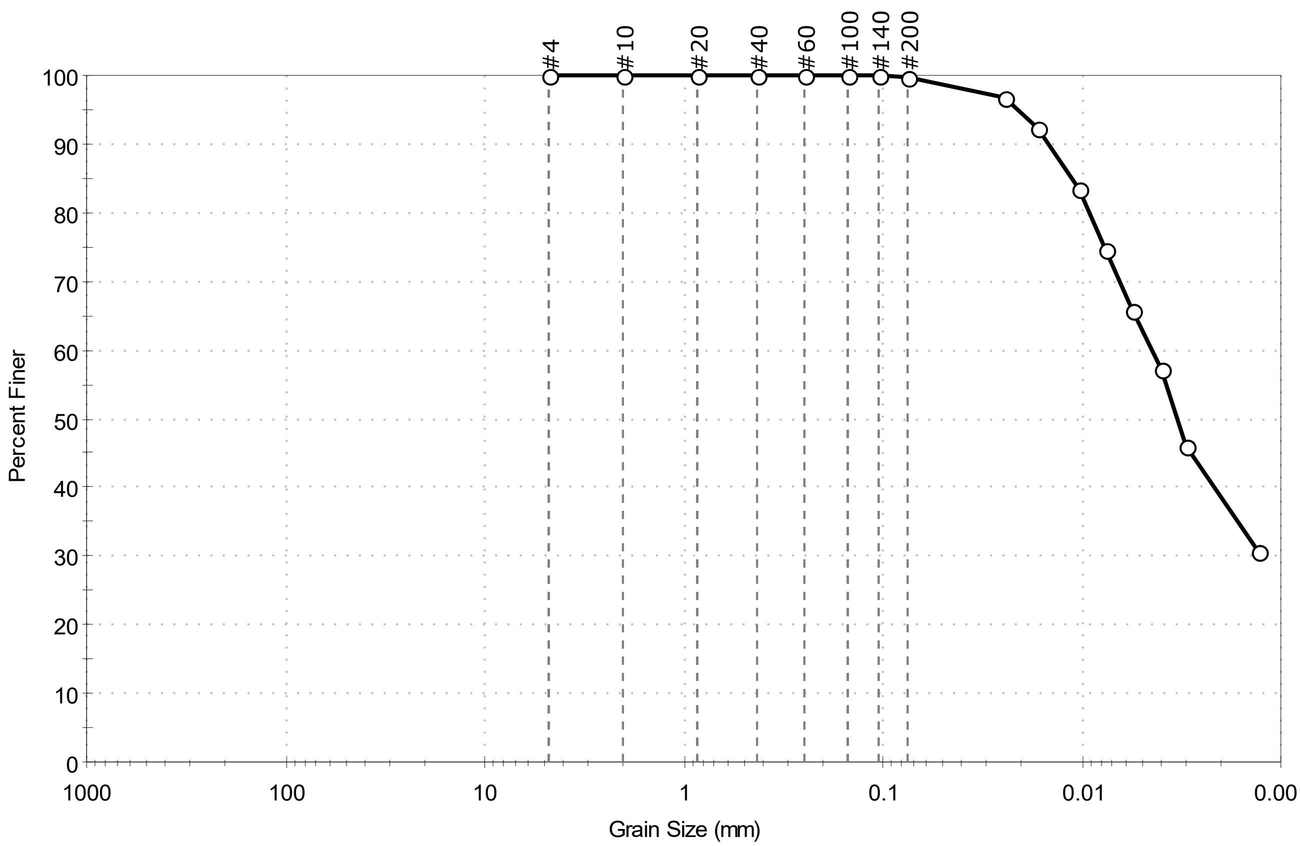
Client:	Geosyntec Consultants		
Project:	Crossroads Phase 14		
Location:	Norridgewock, ME	Project No:	GTX-309940
Boring ID: GB-17	Sample Type: tube	Tested By:	ckg
Sample ID: 15-17	Test Date: 07/22/19	Checked By:	emm
Depth : 15-17 ft	Test Id: 510169		
Test Comment:	---		
Visual Description:	Moist, dark gray clay		
Sample Comment:	---		

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	0.0	0.2	99.8

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	100		
#60	0.25	100		
#100	0.15	100		
#140	0.11	100		
#200	0.075	100		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0247	97		
---	0.0166	92		
---	0.0103	84		
---	0.0076	75		
---	0.0056	66		
---	0.0040	57		
---	0.0030	46		
---	0.0013	31		

Coefficients

D_{85} =0.0111 mm	D_{30} =N/A
D_{60} =0.0045 mm	D_{15} =N/A
D_{50} =0.0033 mm	D_{10} =N/A
C_u =N/A	C_c =N/A

Classification

ASTM Lean CLAY (CL)

AASHTO Clayey Soils (A-6 (15))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

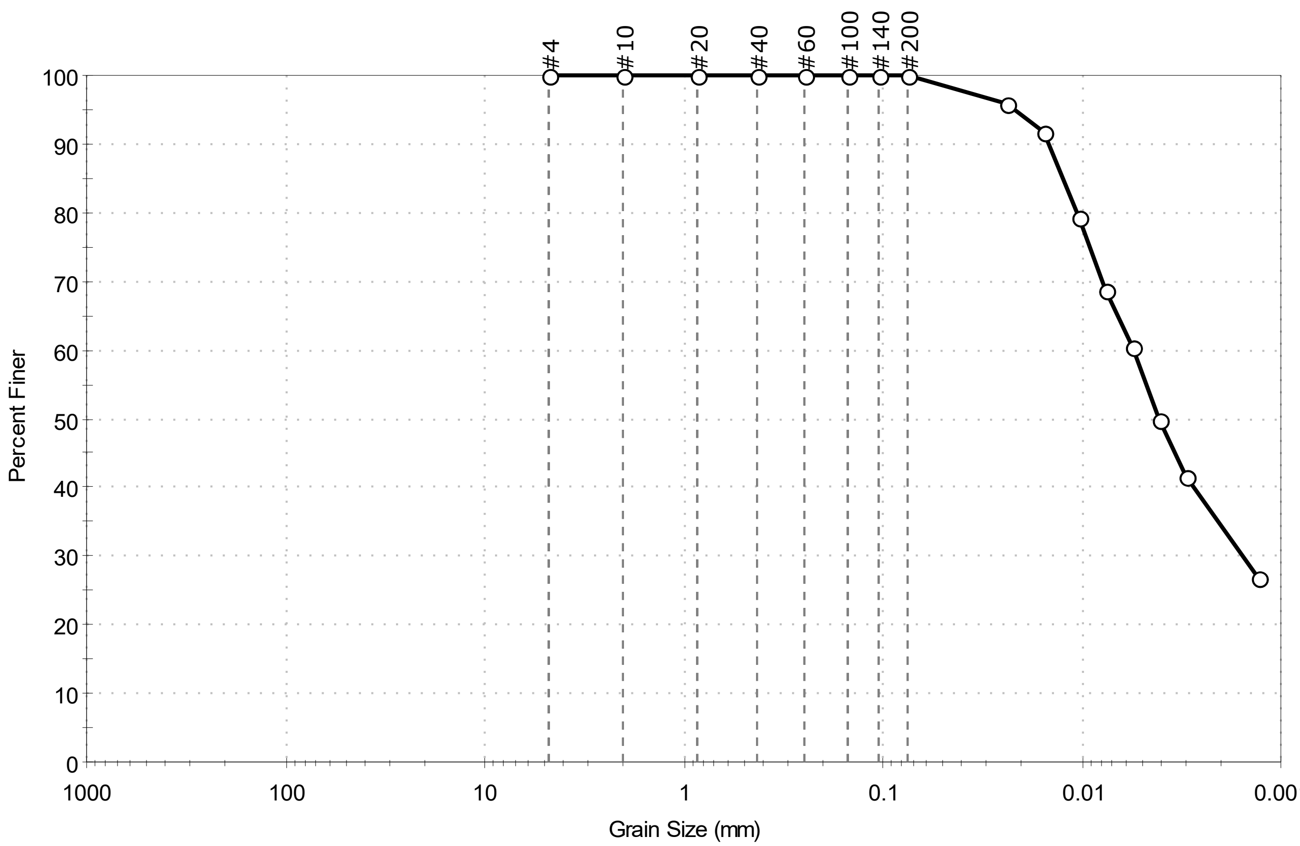
Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

Client:	Geosyntec Consultants		
Project:	Crossroads Phase 14		
Location:	Norridgewock, ME	Project No:	GTX-309940
Boring ID: GB-17B	Sample Type: tube	Tested By:	ckg
Sample ID: 5-7	Test Date: 07/22/19	Checked By:	emm
Depth : 5-7 ft	Test Id: 510170		
Test Comment:	---		
Visual Description:	Moist, dark gray clay		
Sample Comment:	---		

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	0.0	0.0	100.0

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	100		
#60	0.25	100		
#100	0.15	100		
#140	0.11	100		
#200	0.075	100		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0239	96		
---	0.0156	92		
---	0.0103	79		
---	0.0075	69		
---	0.0056	60		
---	0.0041	50		
---	0.0030	42		
---	0.0013	27		

Coefficients

D_{85} =0.0125 mm	D_{30} =0.0016 mm
D_{60} =0.0056 mm	D_{15} =N/A
D_{50} =0.0041 mm	D_{10} =N/A
C_u =N/A	C_c =N/A

Classification

ASTM Lean CLAY (CL)

AASHTO Clayey Soils (A-6 (11))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

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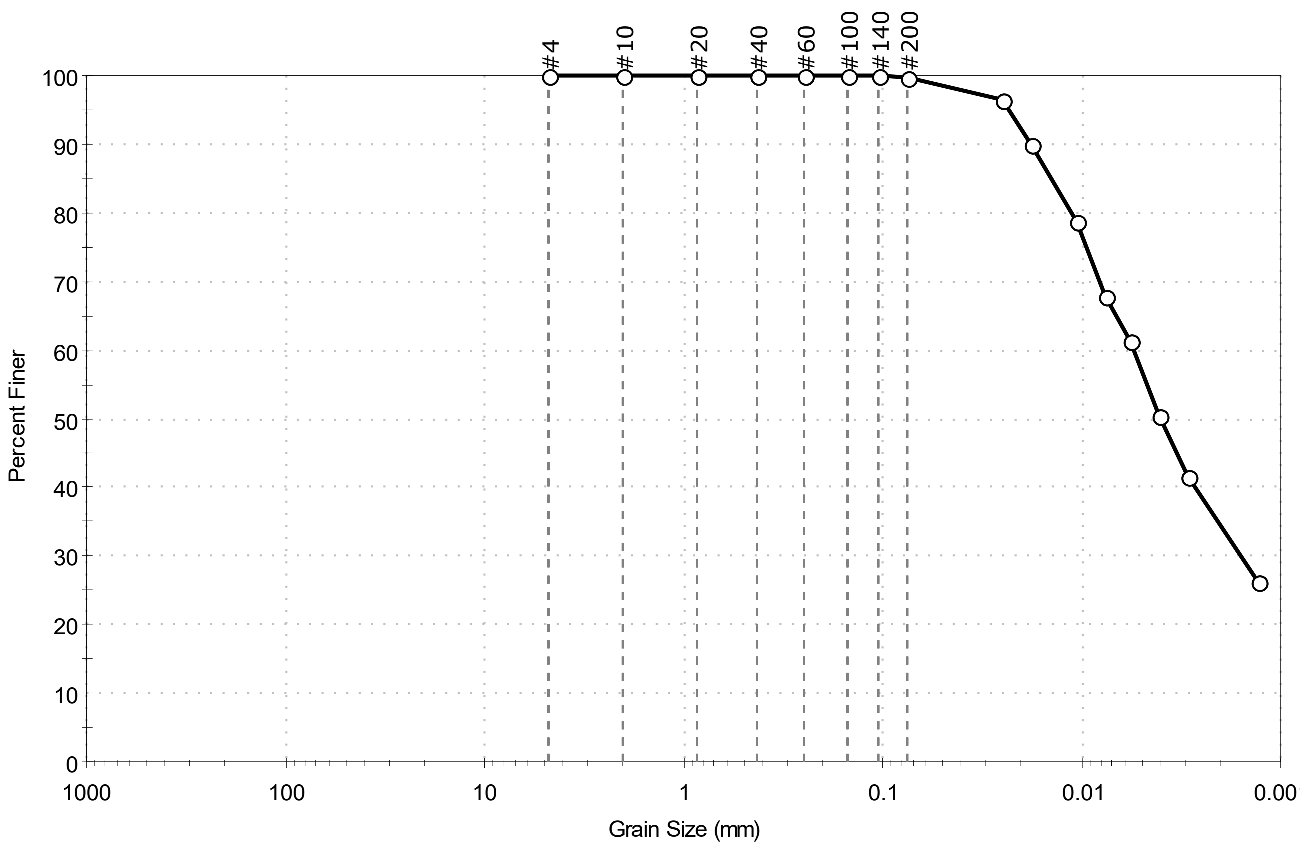
Client:	Geosyntec Consultants		
Project:	Crossroads Phase 14		
Location:	Norridgewock, ME	Project No:	GTX-309940
Boring ID: GB-19	Sample Type: tube	Tested By:	ckg
Sample ID: 17-19	Test Date: 07/22/19	Checked By:	emm
Depth : 17-18.8 ft	Test Id: 510172		
Test Comment:	---		
Visual Description:	Moist, gray clay		
Sample Comment:	---		

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	0.0	0.2	99.8

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	100		
#60	0.25	100		
#100	0.15	100		
#140	0.11	100		
#200	0.075	100		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0251	96		
---	0.0178	90		
---	0.0107	79		
---	0.0077	68		
---	0.0057	61		
---	0.0041	50		
---	0.0029	42		
---	0.0013	26		

Coefficients

D_{85} =0.0142 mm　D_{30} =0.0016 mm

D_{60} =0.0054 mm　D_{15} =N/A

D_{50} =0.0040 mm　D_{10} =N/A

C_u =N/A　C_c =N/A

Classification

ASTM　Lean CLAY (CL)

AASHTO　Clayey Soils (A-6 (11))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

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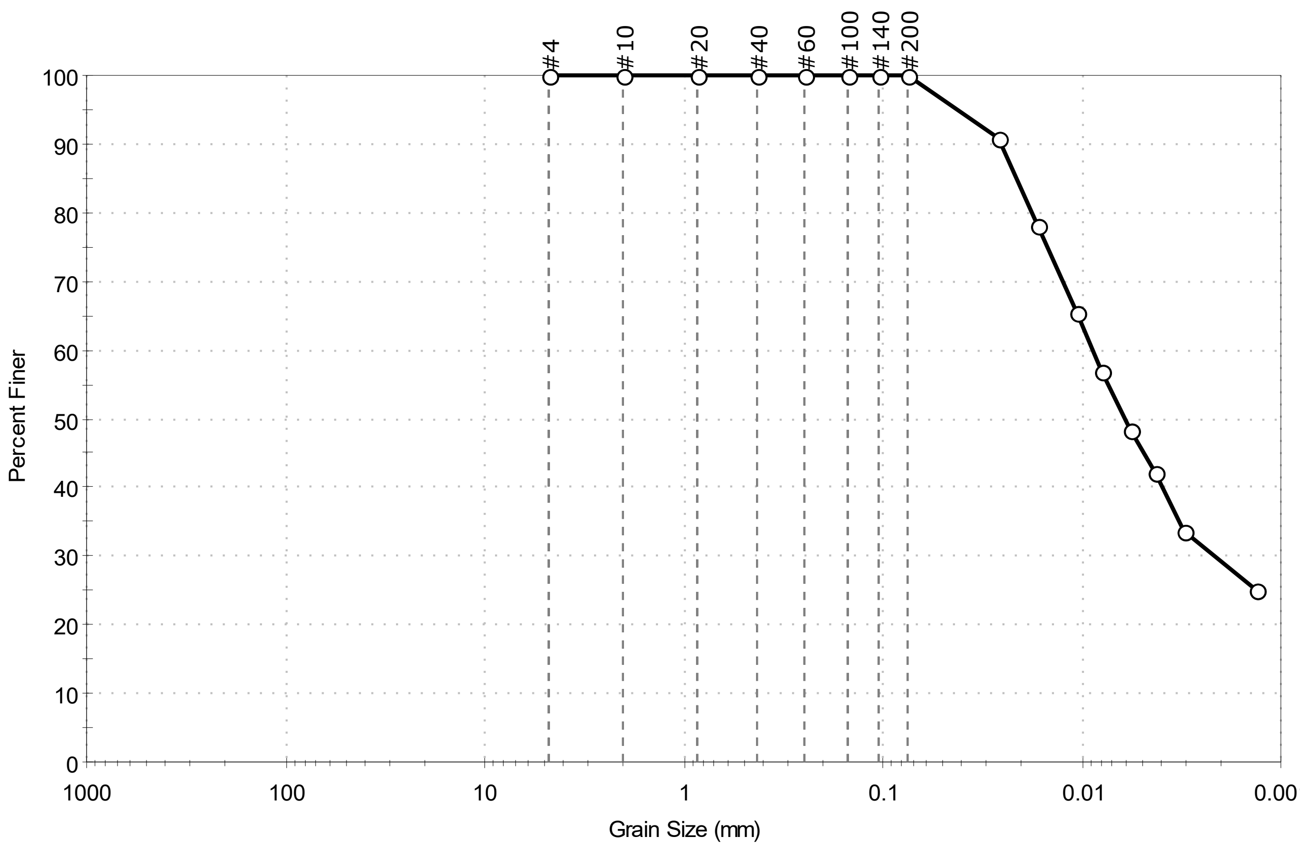
Client:	Geosyntec Consultants		
Project:	Crossroads Phase 14		
Location:	Norridgewock, ME	Project No:	GTX-309940
Boring ID: GB-21	Sample Type: tube	Tested By:	ckg
Sample ID: 23-25	Test Date: 07/22/19	Checked By:	emm
Depth : 23-25 ft	Test Id: 510173		
Test Comment:	---		
Visual Description:	Moist, dark gray clay		
Sample Comment:	---		

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	0.0	0.1	99.9

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#4	4.75	100		
#10	2.00	100		
#20	0.85	100		
#40	0.42	100		
#60	0.25	100		
#100	0.15	100		
#140	0.11	100		
#200	0.075	100		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0262	91		
---	0.0169	78		
---	0.0107	65		
---	0.0080	57		
---	0.0058	48		
---	0.0042	42		
---	0.0031	34		
---	0.0013	25		

Coefficients

D_{85} =0.0215 mm

D_{30} =0.0021 mm

D_{60} =0.0089 mm

D_{15} =N/A

D_{50} =0.0061 mm

D_{10} =N/A

C_u =N/A

C_c =N/A

Classification

ASTM Lean CLAY (CL)

AASHTO Silty Soils (A-4 (8))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: Sieve

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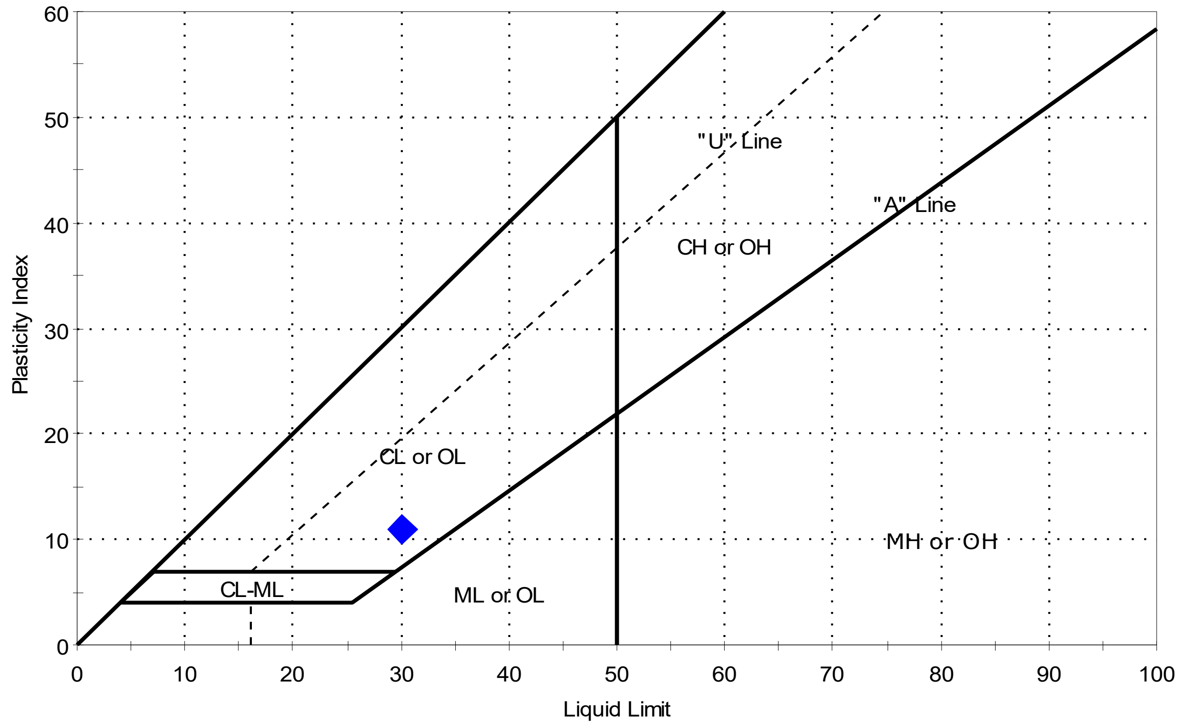
Client:	Geosyntec Consultants				
Project:	Crossroads Phase 14				
Location:	Norridgewock, ME			Project No:	GTX-309940
Boring ID:	GB-03	Sample Type:	tube	Tested By:	cam
Sample ID:	3-5	Test Date:	07/22/19	Checked By:	emm
Depth :	3-5 ft	Test Id:	510107		

Test Comment: ---
Visual Description: Moist, light olive brown clay
Sample Comment: ---

Atterberg Limits - ASTM D4318



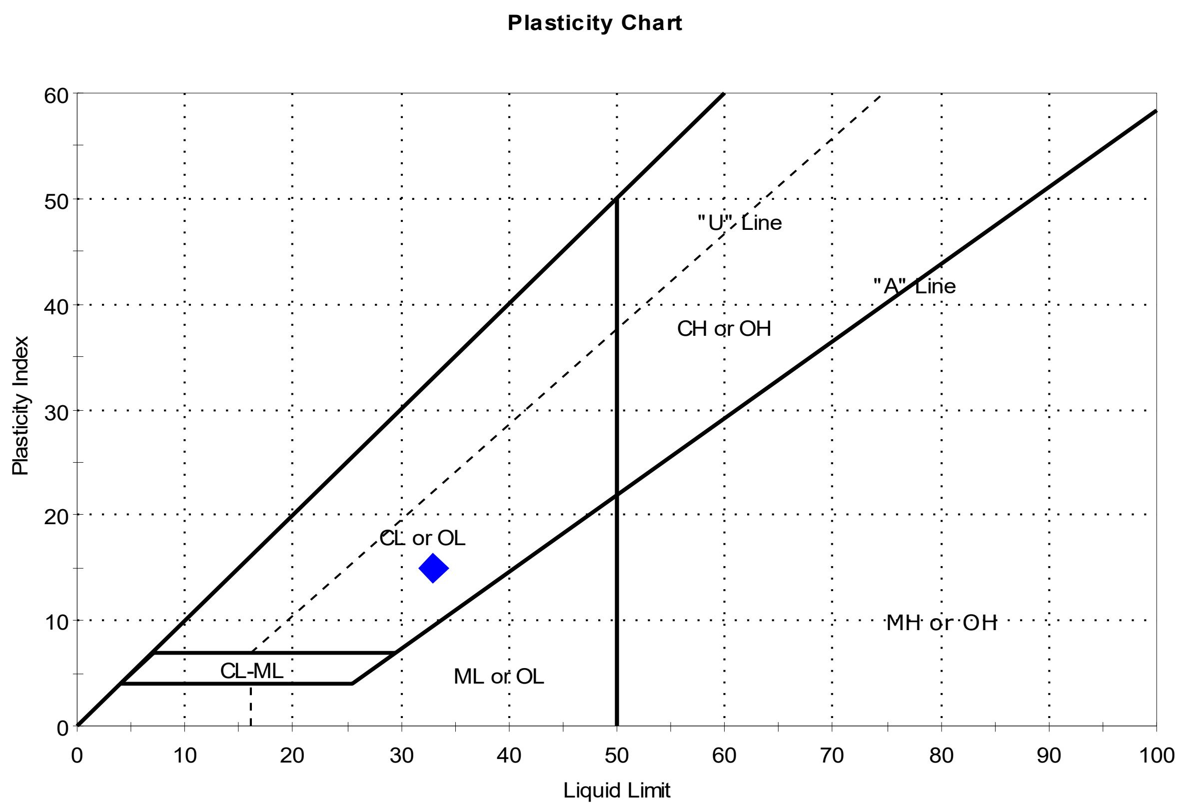
Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	3-5	GB-03	3-5 ft	26	30	19	11	0.7	Lean CLAY (CL)

Sample Prepared using the WET method
0% Retained on #40 Sieve
Dry Strength: VERY HIGH
Dilatancy: SLOW
Toughness: LOW

Client:	Geosyntec Consultants				
Project:	Crossroads Phase 14				
Location:	Norridgewock, ME			Project No:	GTX-309940
Boring ID:	GB-04	Sample Type:	tube	Tested By:	cam
Sample ID:	19-21	Test Date:	07/23/19	Checked By:	emm
Depth :	19-21 ft	Test Id:	510108		

Test Comment: ---
Visual Description: Moist, gray clay
Sample Comment: ---

Atterberg Limits - ASTM D4318



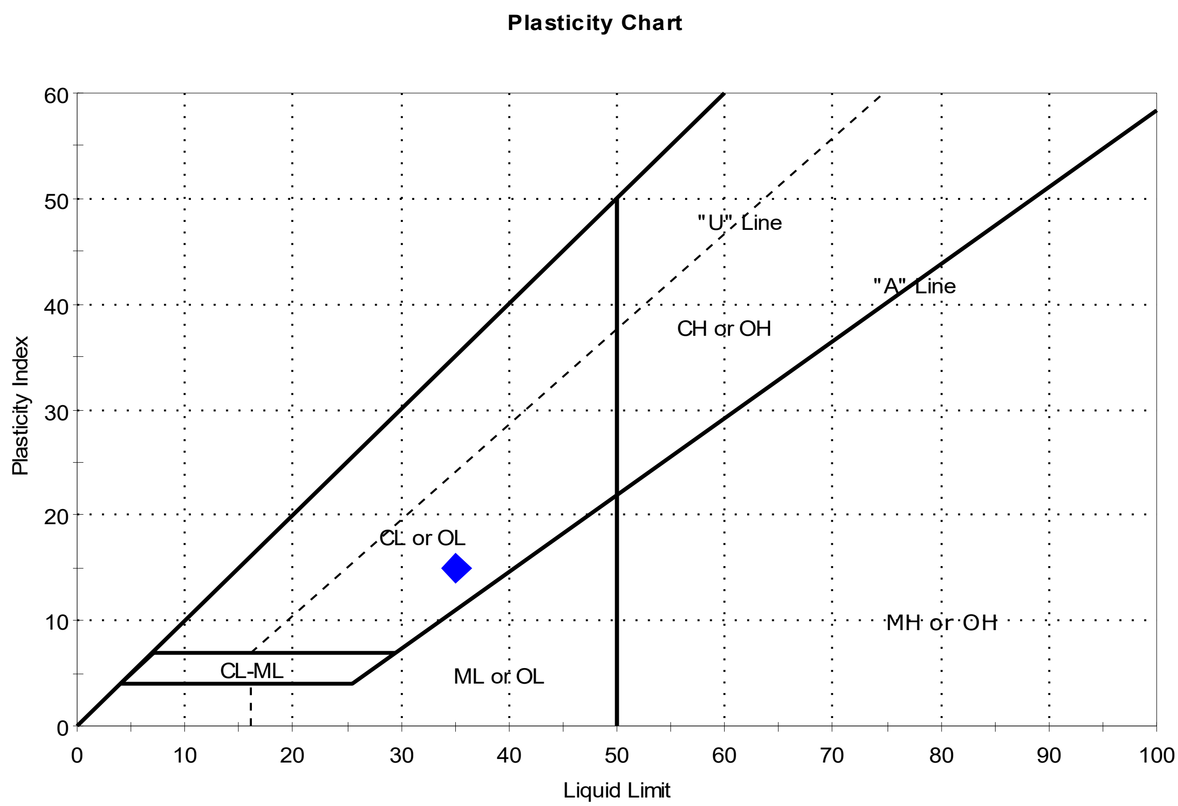
Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	19-21	GB-04	19-21 ft	33	33	18	15	1	Lean CLAY (CL)

Sample Prepared using the WET method
0% Retained on #40 Sieve
Dry Strength: VERY HIGH
Dilatancy: SLOW
Toughness: LOW

Client:	Geosyntec Consultants				
Project:	Crossroads Phase 14				
Location:	Norridgewock, ME			Project No:	GTX-309940
Boring ID:	GB-04	Sample Type:	tube	Tested By:	cam
Sample ID:	11-13	Test Date:	07/23/19	Checked By:	emm
Depth :	11-13 ft	Test Id:	510109		

Test Comment: ---
Visual Description: Moist, olive clay
Sample Comment: ---

Atterberg Limits - ASTM D4318

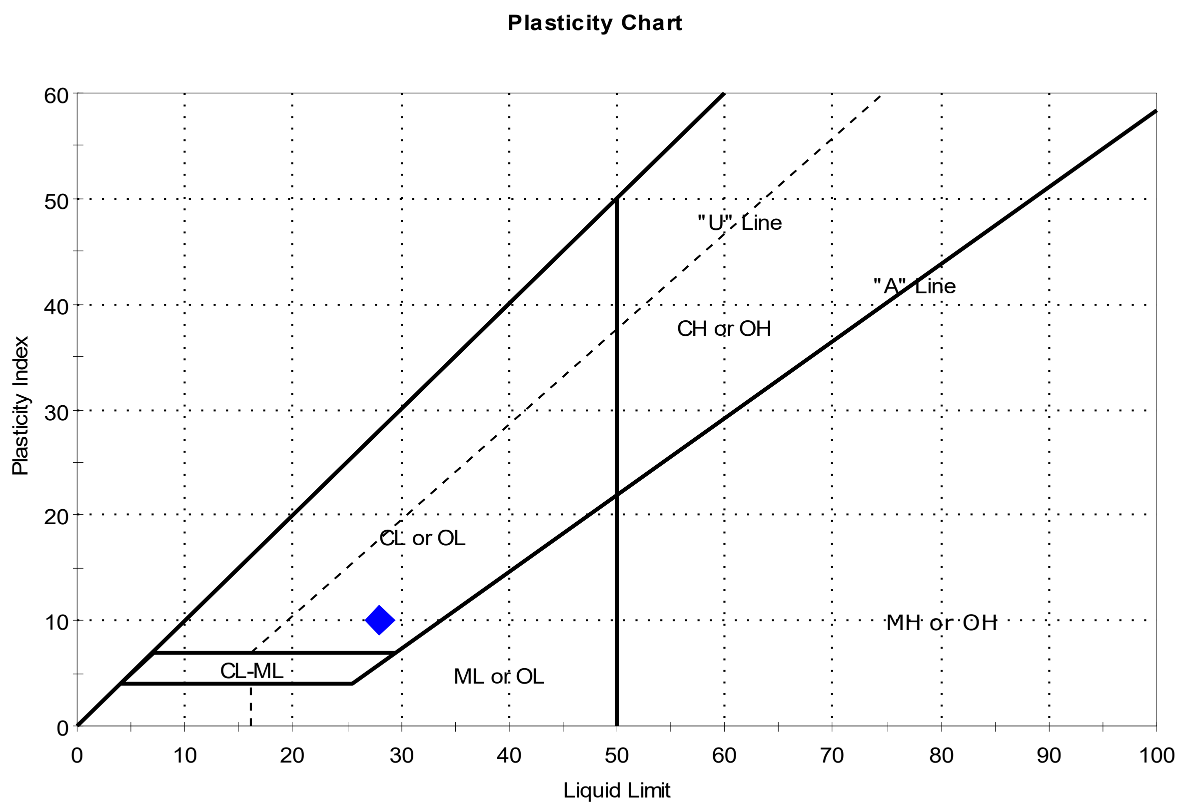


Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	11-13	GB-04	11-13 ft	24	35	20	15	0.3	Lean CLAY (CL)

Sample Prepared using the WET method
0% Retained on #40 Sieve
Dry Strength: VERY HIGH
Dilatancy: SLOW
Toughness: LOW

Client:	Geosyntec Consultants		
Project:	Crossroads Phase 14		
Location:	Norridgewock, ME	Project No:	GTX-309940
Boring ID: GB-05	Sample Type: tube	Tested By:	cam
Sample ID: 31-33	Test Date: 07/22/19	Checked By:	emm
Depth : 31-33 ft	Test Id: 510110		
Test Comment:	---		
Visual Description:	Wet, gray 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
◆	31-33	GB-05	31-33 ft	32	28	18	10	1.4	Lean CLAY (CL)

Sample Prepared using the WET method

0% Retained on #40 Sieve

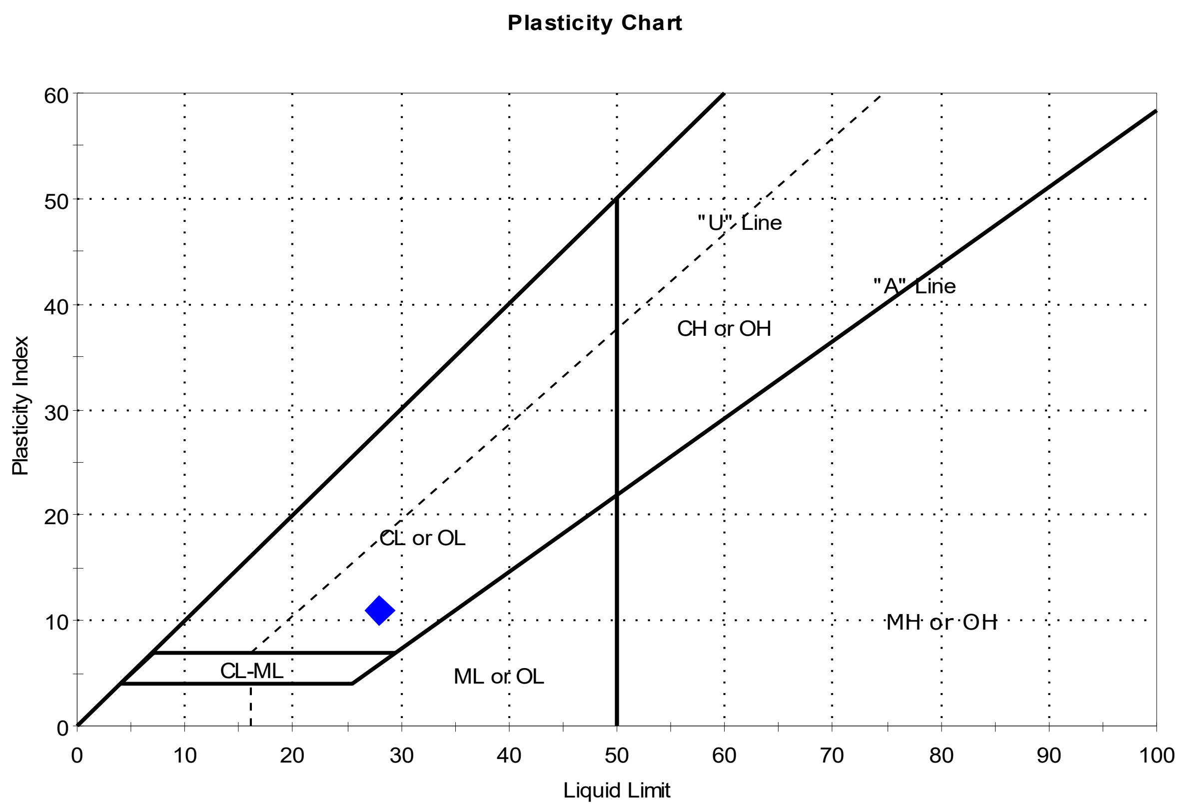
Dry Strength: VERY HIGH

Dilatancy: SLOW

Toughness: LOW

Client:	Geosyntec Consultants
Project:	Crossroads Phase 14
Location:	Norridgewock, ME
Project No:	GTX-309940
Boring ID:	GB-07
Sample ID:	17-19
Depth :	17-19 ft
Sample Type:	tube
Test Date:	07/23/19
Test Id:	510113
Tested By:	cam
Checked By:	emm
Test Comment:	---
Visual Description:	Moist, gray 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
◆	17-19	GB-07	17-19 ft	29	28	17	11	1.1	Lean CLAY (CL)

Sample Prepared using the WET method

0% Retained on #40 Sieve

Dry Strength: VERY HIGH

Dilatancy: SLOW

Toughness: LOW

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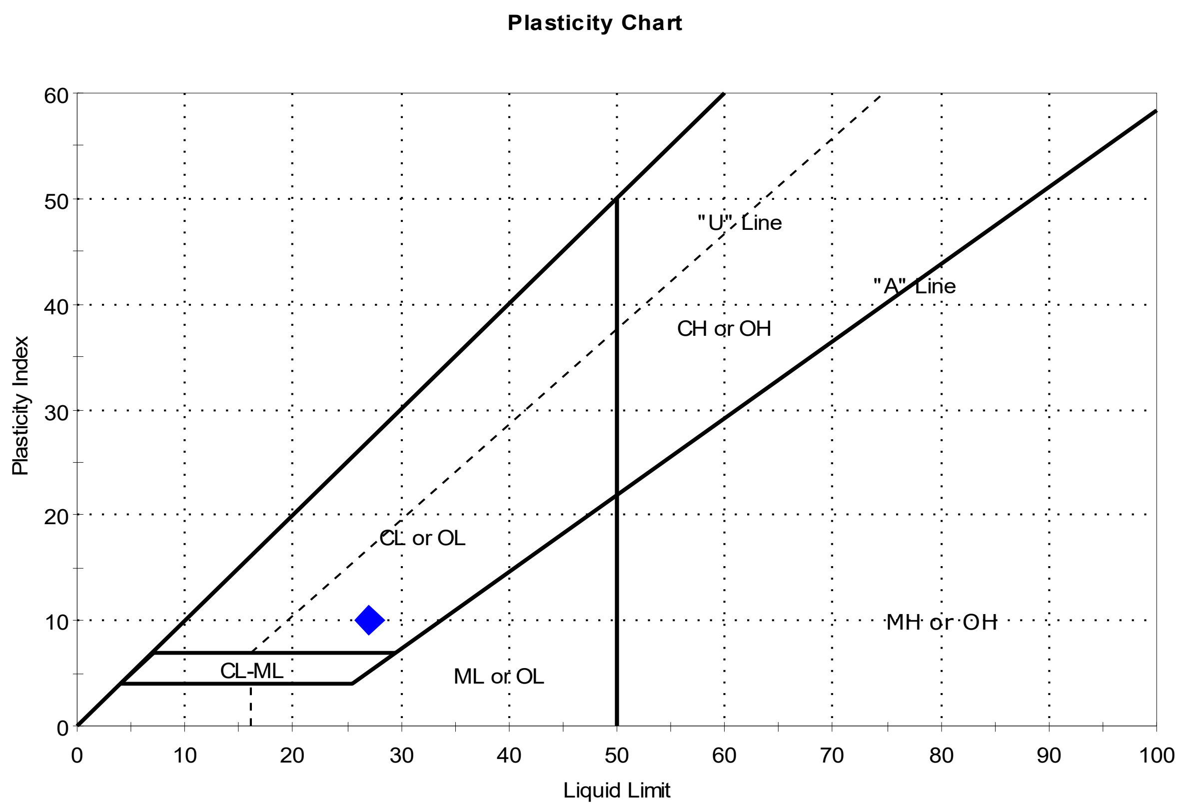
Client: Geosyntec Consultants			
Project: Crossroads Phase 14			
Location: Norridgewock, ME		Project No:	GTX-309940
Boring ID: GB-08	Sample Type: tube	Tested By:	cam
Sample ID: 27-29	Test Date: 07/23/19	Checked By:	emm
Depth : 27-29 ft	Test Id: 510114		
Test Comment: ---			
Visual Description: Moist, gray 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
◆	27-29	GB-08	27-29 ft	30	27	17	10	1.3	Lean CLAY (CL)

Sample Prepared using the WET method

0% Retained on #40 Sieve

Dry Strength: VERY HIGH

Dilatancy: SLOW

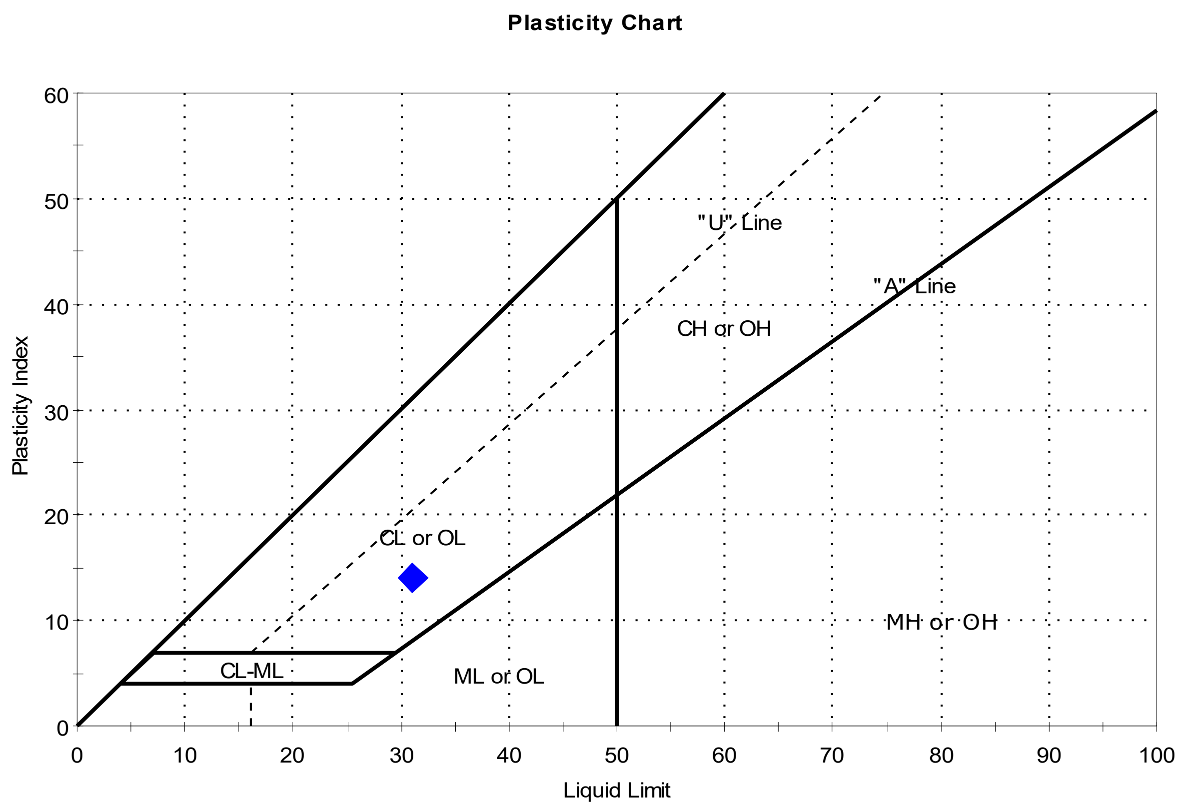
Toughness: LOW

GeoTesting EXPRESS

Client: Geosyntec Consultants			
Project: Crossroads Phase 14			
Location: Norridgewock, ME		Project No:	GTX-309940
Boring ID: GB-11	Sample Type: tube	Tested By:	cam
Sample ID: 17-19	Test Date: 07/23/19	Checked By:	emm
Depth : 17-19 ft	Test Id: 510115		

Test Comment: ---
Visual Description: Wet, gray 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
◆	17-19	GB-11	17-19 ft	35	31	17	14	1.3	Lean CLAY (CL)

Sample Prepared using the WET method

0% Retained on #40 Sieve

Dry Strength: VERY HIGH

Dilatancy: SLOW

Toughness: LOW

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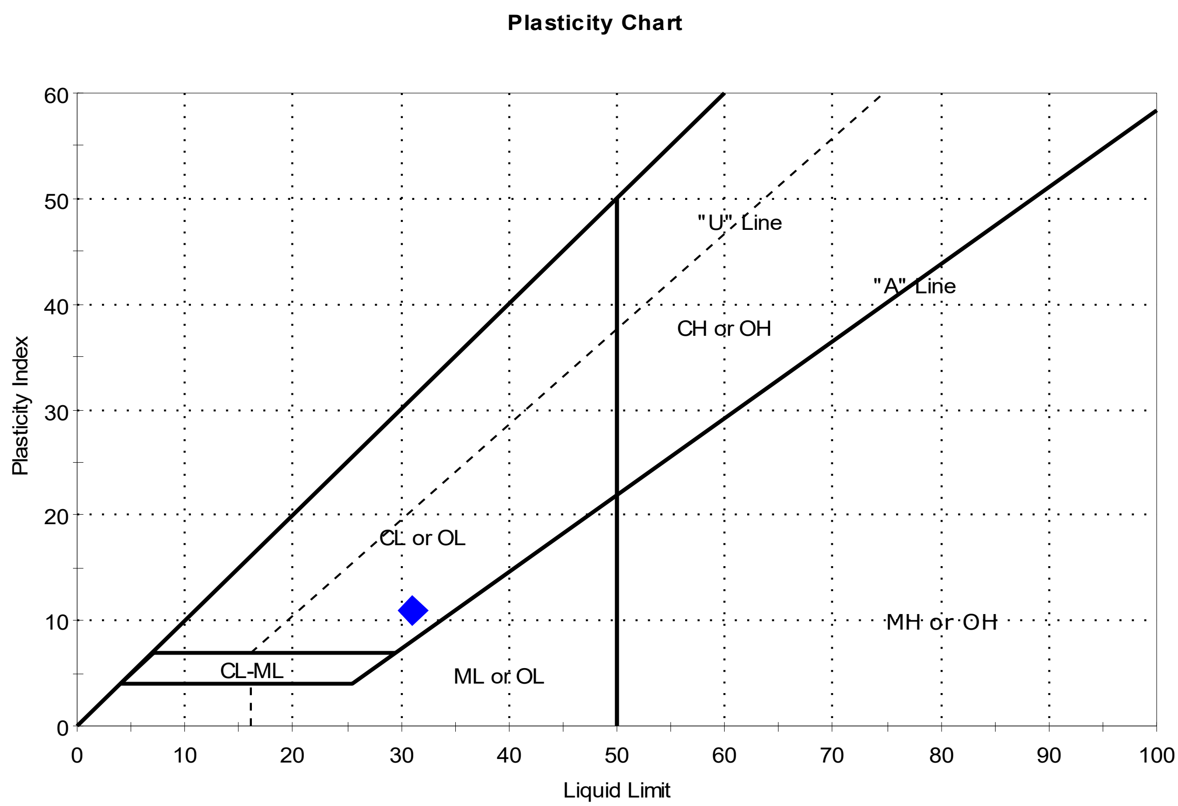
GeoTesting EXPRESS

Client:	Geosyntec Consultants		
Project:	Crossroads Phase 14		
Location:	Norridgewock, ME	Project No:	GTX-309940
Boring ID:	GB-13	Sample Type: tube	Tested By: cam
Sample ID:	17-19	Test Date: 07/23/19	Checked By: emm
Depth :	17-19 ft	Test Id: 510117	
Test Comment:	---		
Visual Description:	Moist, gray 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
◆	17-19	GB-13	17-19 ft	32	31	20	11	1.1	Lean CLAY (CL)

Sample Prepared using the WET method

0% Retained on #40 Sieve

Dry Strength: VERY HIGH

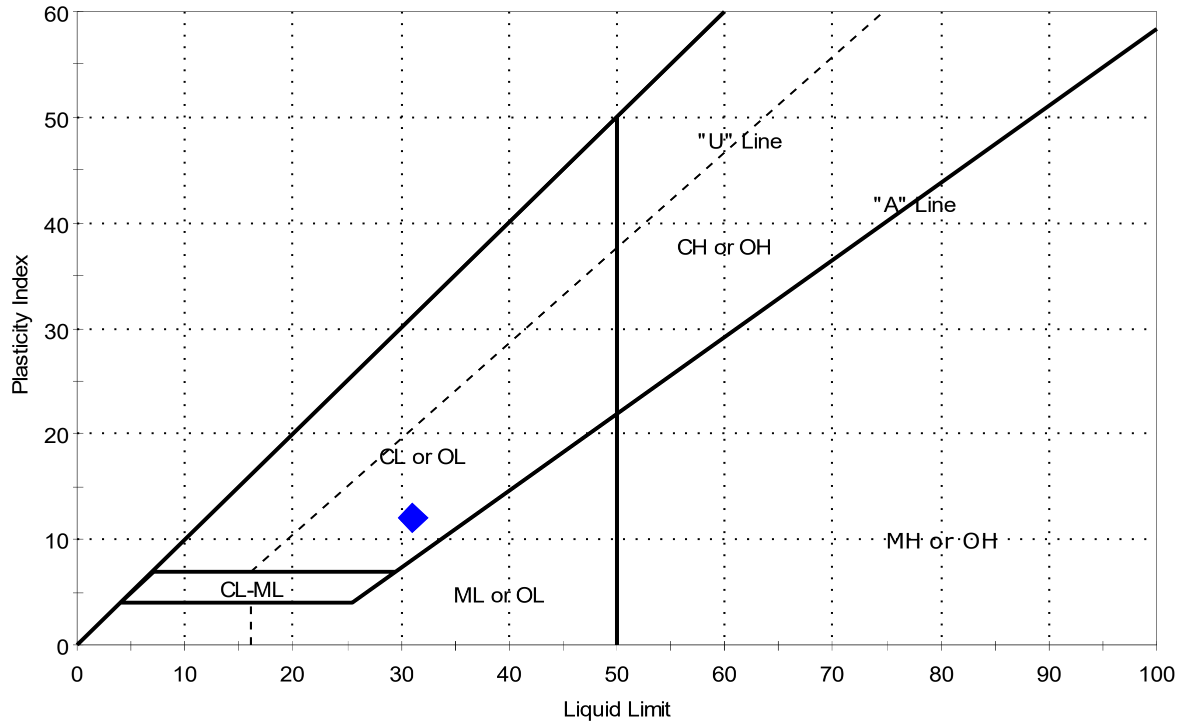
Dilatancy: SLOW

Toughness: LOW

Client:	Geosyntec Consultants				
Project:	Crossroads Phase 14				
Location:	Norridgewock, ME			Project No:	GTX-309940
Boring ID:	GB-14	Sample Type:	tube	Tested By:	cam
Sample ID:	9-11	Test Date:	07/22/19	Checked By:	emm
Depth :	9-10.8 ft	Test Id:	510118		

Test Comment: ---
Visual Description: Wet, gray clay
Sample Comment: ---

Atterberg Limits - ASTM D4318



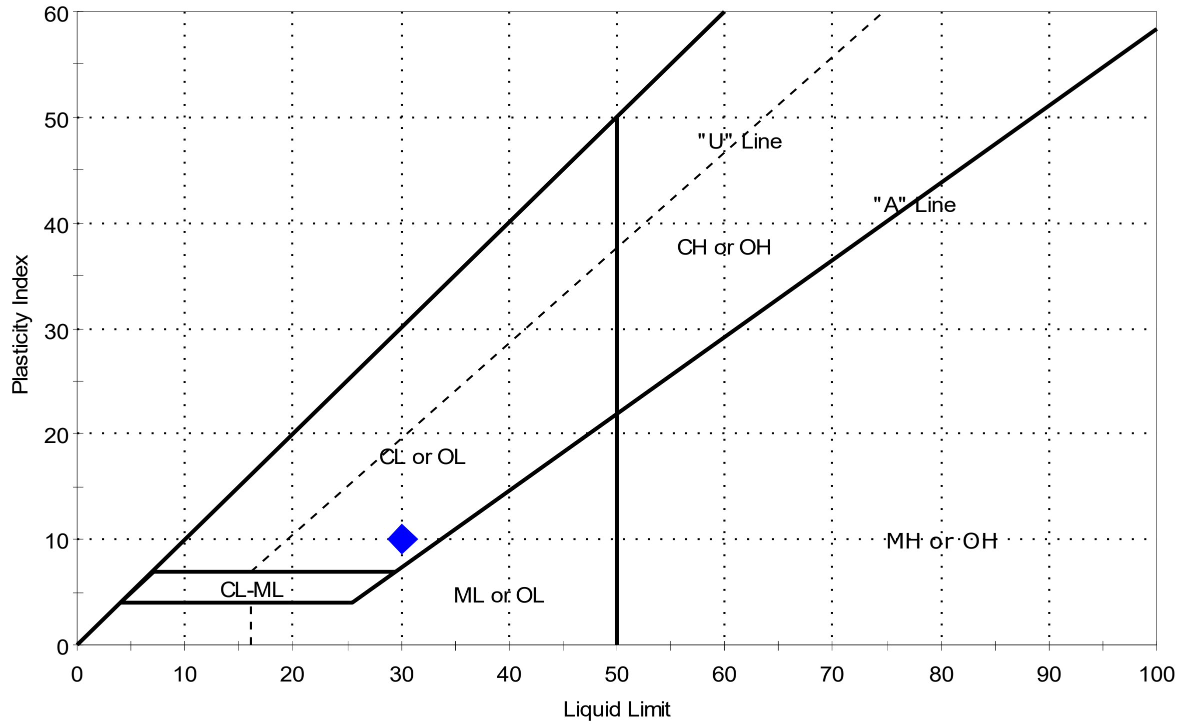
Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	9-11	GB-14	9-10.8 ft	35	31	19	12	1.4	Lean CLAY (CL)

Sample Prepared using the WET method
0% Retained on #40 Sieve
Dry Strength: VERY HIGH
Dilatancy: SLOW
Toughness: LOW

Client:	Geosyntec Consultants				
Project:	Crossroads Phase 14				
Location:	Norridgewock, ME			Project No:	GTX-309940
Boring ID:	GB-15	Sample Type:	tube	Tested By:	cam
Sample ID:	7-9	Test Date:	07/23/19	Checked By:	emm
Depth :	7-9 ft	Test Id:	510119		

Test Comment: ---
Visual Description: Moist, olive gray 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
◆	7-9	GB-15	7-9 ft	29	30	20	10	0.9	Lean CLAY (CL)

Sample Prepared using the WET method
0% Retained on #40 Sieve
Dry Strength: VERY HIGH
Dilatancy: SLOW
Toughness: LOW

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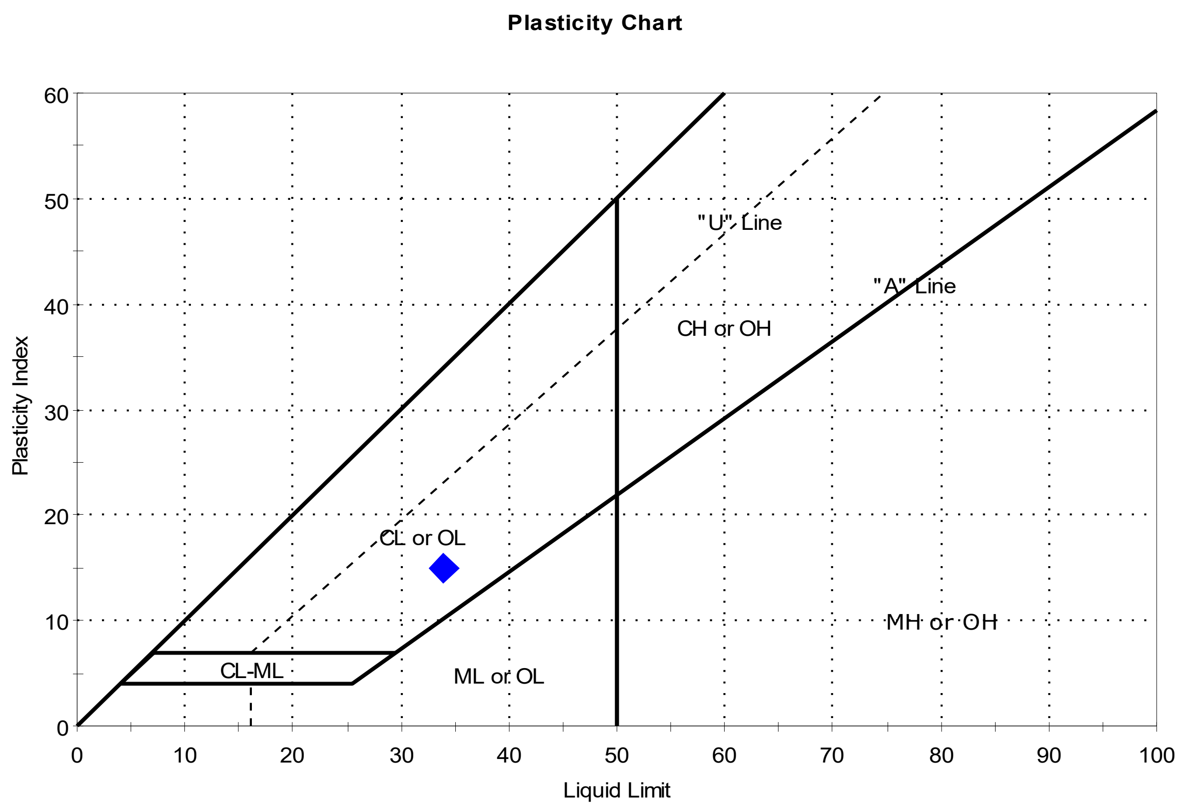
Client:	Geosyntec Consultants
Project:	Crossroads Phase 14
Location:	Norridgewock, ME
Project No:	GTX-309940
Boring ID:	GB-17
Sample ID:	15-17
Depth :	15-17 ft
Sample Type:	tube
Test Date:	07/23/19
Test Id:	510123
Tested By:	cam
Checked By:	emm
Test Comment:	---
Visual Description:	Moist, dark gray clay
Sample Comment:	---

Atterberg Limits - ASTM D4318



Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	15-17	GB-17	15-17 ft	33	34	19	15	0.9	Lean CLAY (CL)

Sample Prepared using the WET method

0% Retained on #40 Sieve

Dry Strength: VERY HIGH

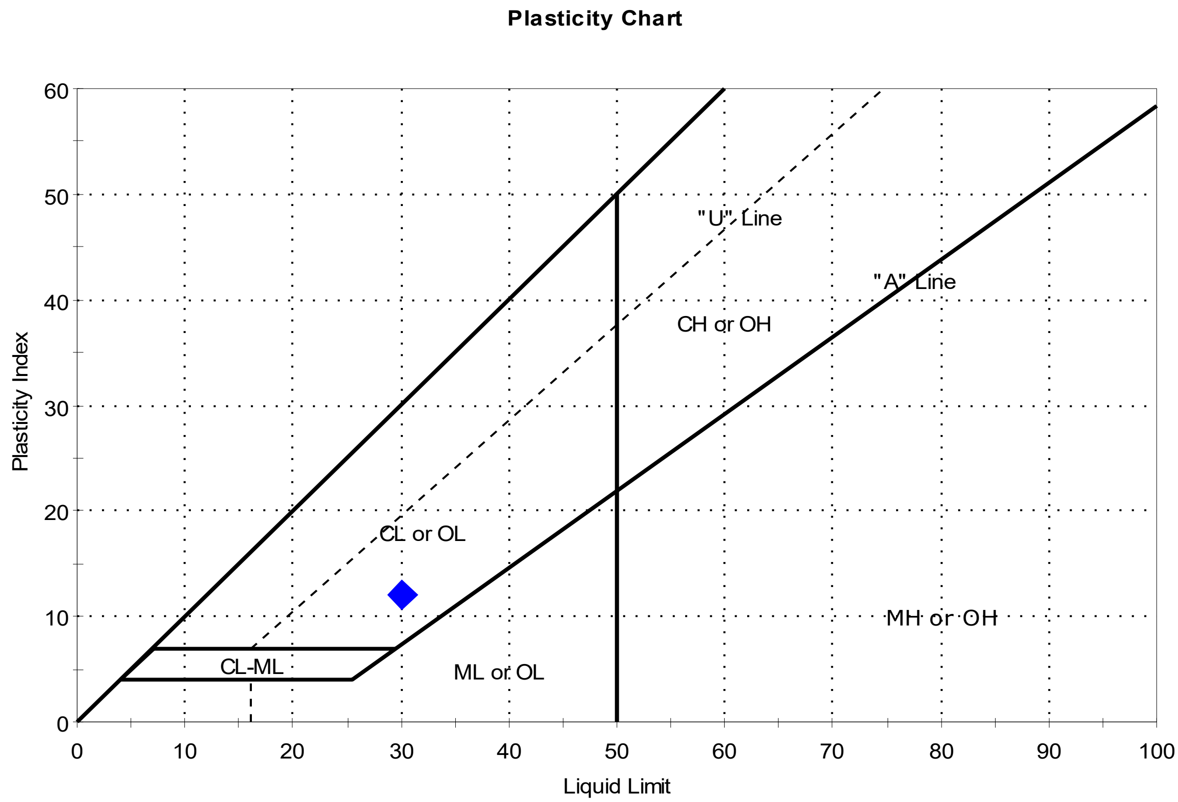
Dilatancy: SLOW

Toughness: LOW

Client:	Geosyntec Consultants				
Project:	Crossroads Phase 14				
Location:	Norridgewock, ME			Project No:	GTX-309940
Boring ID:	GB-17B	Sample Type:	tube	Tested By:	cam
Sample ID:	5-7	Test Date:	07/23/19	Checked By:	emm
Depth :	5-7 ft	Test Id:	510124		

Test Comment: ---
Visual Description: Moist, dark gray clay
Sample Comment: ---

Atterberg Limits - ASTM D4318



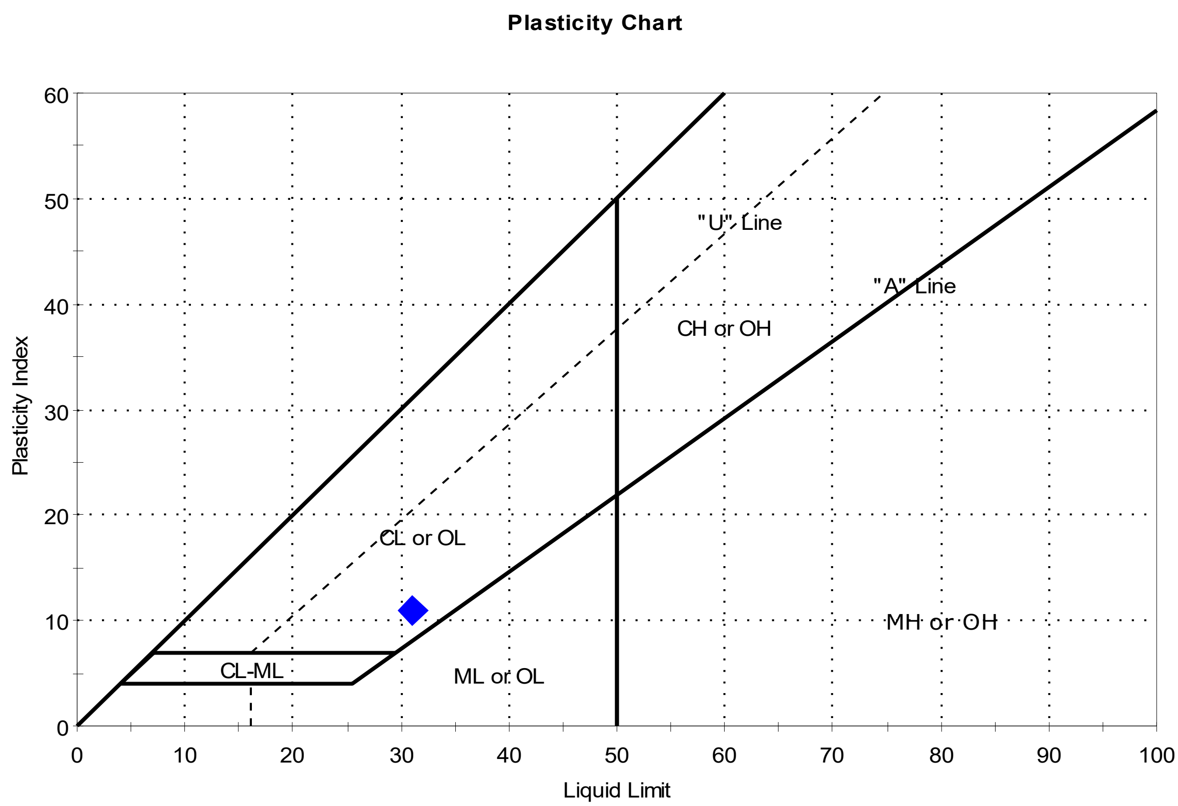
Symbol	Sample ID	Boring	Depth	Natural Moisture Content,%	Liquid Limit	Plastic Limit	Plasticity Index	Liquidity Index	Soil Classification
◆	5-7	GB-17B	5-7 ft	26	30	18	12	0.7	Lean CLAY (CL)

Sample Prepared using the WET method
0% Retained on #40 Sieve
Dry Strength: VERY HIGH
Dilatancy: SLOW
Toughness: LOW

GeoTesting EXPRESS

Client:	Geosyntec Consultants		
Project:	Crossroads Phase 14		
Location:	Norridgewock, ME	Project No:	GTX-309940
Boring ID: GB-19	Sample Type: tube	Tested By:	cam
Sample ID: 17-19	Test Date: 07/23/19	Checked By:	emm
Depth : 17-18.8 ft	Test Id: 510126		
Test Comment:	---		
Visual Description:	Moist, gray 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
◆	17-19	GB-19	17-18.8 ft	32	31	20	11	1.1	Lean CLAY (CL)

Sample Prepared using the WET method

0% Retained on #40 Sieve

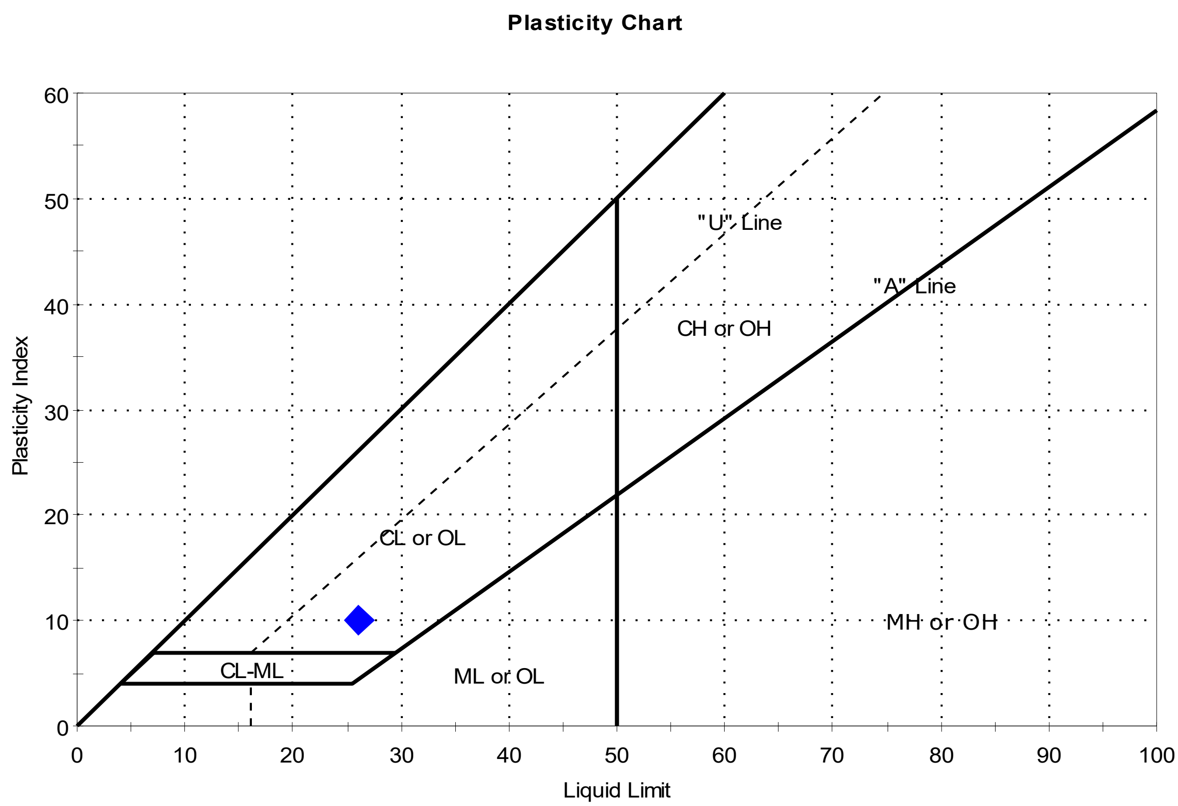
Dry Strength: VERY HIGH

Dilatancy: SLOW

Toughness: LOW

Client:	Geosyntec Consultants
Project:	Crossroads Phase 14
Location:	Norridgewock, ME
Project No:	GTX-309940
Boring ID:	GB-21
Sample Type:	tube
Tested By:	cam
Sample ID:	23-25
Test Date:	07/23/19
Checked By:	emm
Depth :	23-25 ft
Test Id:	510127
Test Comment:	---
Visual Description:	Moist, dark gray 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
◆	23-25	GB-21	23-25 ft	28	26	16	10	1.2	Lean CLAY (CL)

Sample Prepared using the WET method

0% Retained on #40 Sieve

Dry Strength: VERY HIGH

Dilatancy: SLOW

Toughness: LOW

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APPENDIX C-2
Hydraulic Conductivity Tests

GeoTesting EXPRESS

Client:	Geosyntec Consultants		
Project Name:	Crossroads Phase 14		
Project Location:	Norridgewock, ME		
GTX #:	309940		
Start Date:	6/25/2019	Tested By:	jlw
End Date:	6/28/2019	Checked By:	emm
Boring #:	GB-06		
Sample #:	21-23		
Depth:	21-23 ft		
Visual Description:	Moist, dark gray clay		

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter by ASTM D5084
Constant Volume

Sample Type: Intact | Permeant Fluid: De-aired Distilled water

Orientation: Vertical | Cell #: ---

Sample Preparation: Extruded from tube, cut, trimmed and placed into permeameter at as-received density and moisture content. Trimmings moisture content = 24.6%.

Assumed Specific Gravity: 2.75

Parameter	Initial	Final
Height, in	2.00	2.00
Diameter, in	2.86	2.86
Area, in^2	6.42	6.42
Volume, in^3	12.8	12.8
Mass, g	427.8	428.2
Bulk Density, pcf	126.6	126.7
Moisture Content, %	24.6	24.7
Dry Density, pcf	101.6	101.6
Degree of Saturation, %	98	99

B COEFFICIENT DETERMINATION

Cell Pressure, psi:	90.00	Increased Cell Pressure, psi:	95.01	Cell Pressure Increment, psi:	5.01
Sample Pressure, psi:	71.70	Corresponding Sample Pressure, psi:	75.95	Sample Pressure Increment, psi:	4.25
				B Coefficient:	0.85

*B value did not increase with increase in pressure. Final degree of saturation >95%.

FLOW DATA

Date	Trial #	Pressure, psi Cell	Pressure, psi Sample	Manometer Readings Z_1	Z_2	Z_1-Z_2	Elapsed Time, sec	Gradient	Permeability K, cm/sec	Temp, °C	R_t	Permeability K @ 20 °C, cm/sec
6/27	1	90.0	71.7	11.0	10.9	0.1	37	27.3	7.5E-08	19.5	1.013	7.6E-08
6/27	2	90.0	71.7	11.0	10.9	0.1	35	27.3	8.0E-08	19.5	1.013	8.1E-08
6/27	3	90.0	71.7	11.0	10.9	0.1	37	27.3	7.5E-08	19.5	1.013	7.6E-08
6/27	4	90.0	71.7	11.0	10.9	0.1	38	27.3	7.3E-08	19.5	1.013	7.4E-08

PERMEABILITY AT 20° C: 7.7×10^{-8} cm/sec (@ 22.0 psi effective stress)

GeoTesting EXPRESS

Client:	Geosyntec Consultants		
Project Name:	Crossroads Phase 14		
Project Location:	Norridgewock, ME		
GTX #:	309940		
Start Date:	6/24/2019	Tested By:	jlw
End Date:	7/1/2019	Checked By:	emm
Boring #:	GB-06		
Sample #:	29-31		
Depth:	29-31 ft		
Visual Description:	Moist, olive gray clay		

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter by ASTM D5084

Constant Volume

Sample Type: Intact Permeant Fluid: De-aired Distilled water

Orientation: Vertical Cell #: ---

Sample Preparation: Extruded from tube, cut, trimmed and placed into permeameter at as-received density and moisture content. Trimmings moisture content = 30.2%.

Assumed Specific Gravity: 2.75

Parameter	Initial	Final
Height, in	2.21	2.10
Diameter, in	2.86	2.75
Area, in^2	6.42	5.94
Volume, in^3	14.2	12.5
Mass, g	413.3	404.7
Bulk Density, pcf	110.7	123.3
Moisture Content, %	30.2	27.5
Dry Density, pcf	85.0	96.7
Degree of Saturation, %	81	98

B COEFFICIENT DETERMINATION

Cell Pressure, psi:	90.01	Increased Cell Pressure, psi:	95.05	Cell Pressure Increment, psi:	5.04
Sample Pressure, psi:	67.97	Corresponding Sample Pressure, psi:	72.17	Sample Pressure Increment, psi:	4.20
				B Coefficient:	0.83

*B value did not increase with increase in pressure. Final degree of saturation >95%.

FLOW DATA

Date	Trial #	Pressure, psi		Manometer Readings			Elapsed Time, sec	Gradient	Permeability K, cm/sec	Temp, °C	R_t	Permeability K @ 20 °C, cm/sec
		Cell	Sample	Z_1	Z_2	Z_1-Z_2						
6/25	1	90.0	68.0	8.0	7.9	0.1	37	18.9	1.2E-07	19.5	1.013	1.2E-07
6/25	2	90.0	68.0	8.0	7.9	0.1	33	18.9	1.3E-07	19.5	1.013	1.3E-07
6/25	3	90.0	68.0	8.0	7.9	0.1	37	18.9	1.2E-07	19.5	1.013	1.2E-07
6/25	4	90.0	68.0	8.0	7.9	0.1	40	18.9	1.1E-07	19.5	1.013	1.1E-07

PERMEABILITY AT 20° C: 1.2×10^{-7} cm/sec (@ 22.0 psi effective stress)

Client:	Geosyntec Consultants		
Project Name:	Crossroads Phase 14		
Project Location:	Norridgewock, ME		
GTX #:	309940		
Start Date:	6/24/2019	Tested By:	jlw
End Date:	7/1/2019	Checked By:	emm
Boring #:	GB-16		
Sample #:	17-19		
Depth:	17-19		
Visual Description:	Moist, olive gray clay		

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter by ASTM D5084

Constant Volume

Sample Type: Intact   Permeant Fluid: De-aired Distilled water

Orientation: Vertical   Cell #: ---

Sample Preparation: Extruded from tube, cut, trimmed and placed into permeameter at as-received density and moisture content. Trimmings moisture content = 28.2%.

Assumed Specific Gravity: 2.75

Parameter	Initial	Final
Height, in	2.00	1.98
Diameter, in	2.86	2.85
Area, in^2	6.42	6.38
Volume, in^3	12.8	12.6
Mass, g	420.4	416.6
Bulk Density, pcf	124.4	125.4
Moisture Content, %	28.0	26.9
Dry Density, pcf	97.2	98.8
Degree of Saturation, %	100	100

B COEFFICIENT DETERMINATION

Cell Pressure, psi: 90.00   Increased Cell Pressure, psi: 94.98   Cell Pressure Increment, psi: 4.98

Sample Pressure, psi: 75.20   Corresponding Sample Pressure, psi: 79.36   Sample Pressure Increment, psi: 4.16

B Coefficient: 0.84

*B value did not increase with increase in pressure. Final degree of saturation >95%.

FLOW DATA

Date	Trial #	Pressure, psi		Manometer Readings			Elapsed Time, sec	Gradient	Permeability K, cm/sec	Temp, °C	R_t	Permeability K @ 20 °C, cm/sec
		Cell	Sample	Z_1	Z_2	Z_1-Z_2						
6/25	1	90.0	75.2	8.0	7.7	0.3	38	20.0	3.1E-07	19.5	1.013	3.1E-07
6/25	2	90.0	75.2	8.0	7.7	0.3	39	20.0	3.0E-07	19.5	1.013	3.0E-07
6/25	3	90.0	75.2	8.0	7.7	0.3	47	20.0	2.5E-07	19.5	1.013	2.5E-07
6/25	4	90.0	75.2	8.0	7.7	0.3	40	20.0	2.9E-07	19.5	1.013	2.9E-07

PERMEABILITY AT 20° C: 2.9×10^{-7} cm/sec (@ 14.8 psi effective stress)

Client:	Geosyntec Consultants
Project Name:	Crossroads Phase 14
Project Location:	Norridgewock, ME
GTX #:	309940

Start Date:	6/25/2019	Tested By:	jlw
End Date:	6/28/2019	Checked By:	emm

Boring #:	GB-16
Sample #:	27-29
Depth:	27-29
Visual Description:	Moist, olive gray clay

Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter by ASTM D5084

Constant Volume

Sample Type:	Intact	Permeant Fluid:	De-aired Distilled water
Orientation:	Vertical	Cell #:	---

Sample Preparation: Extruded from tube, cut, trimmed and placed into permeameter at as-received density and moisture content. Trimmings moisture content = 30.9%.

Assumed Specific Gravity: 2.75

Parameter	Initial	Final
Height, in	1.87	1.82
Diameter, in	2.86	2.80
Area, in^2	6.42	6.16
Volume, in^3	12.0	11.2
Mass, g	352.0	351.0
Bulk Density, pcf	111.4	119.1
Moisture Content, %	30.9	30.5
Dry Density, pcf	85.1	91.2
Degree of Saturation, %	84	95

B COEFFICIENT DETERMINATION

Cell Pressure, psi:	90.00	Increased Cell Pressure, psi:	95.03	Cell Pressure Increment, psi:	5.03
Sample Pressure, psi:	68.29	Corresponding Sample Pressure, psi:	72.43	Sample Pressure Increment, psi:	4.14
				B Coefficient:	0.82

*B value did not increase with increase in pressure. Final degree of saturation >95%.

FLOW DATA

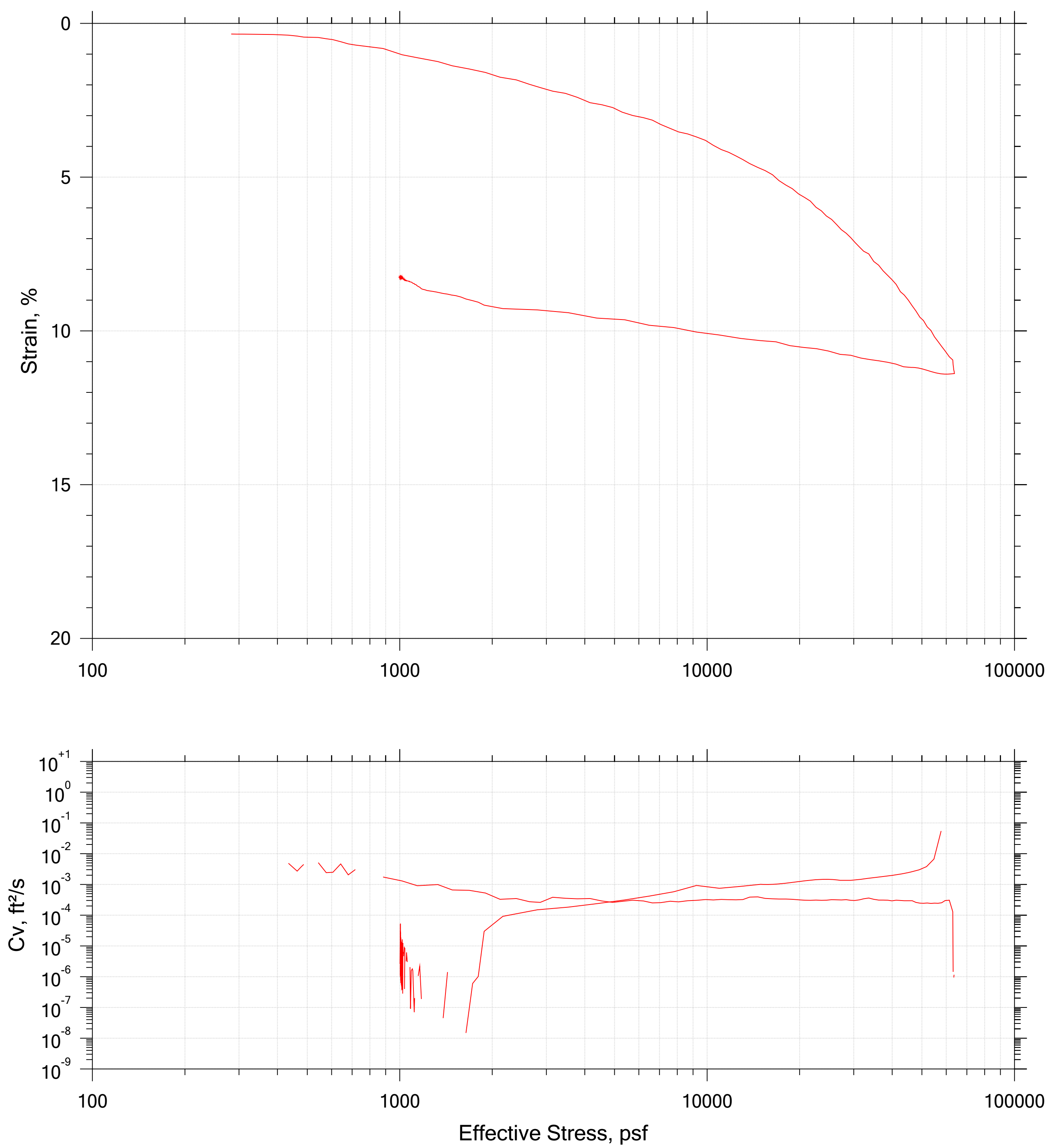
Date	Trial #	Pressure, psi: Cell	Pressure, psi: Sample	Manometer Readings: Z_1	Z_2	Z_1-Z_2	Elapsed Time, sec	Gradient	Permeability K, cm/sec	Temp, °C	R_t	Permeability K @ 20 °C, cm/sec
6/27	1	90.0	68.3	8.0	7.9	0.1	44	21.8	8.3E-08	19.5	1.013	8.4E-08
6/27	2	90.0	68.3	8.0	7.9	0.1	45	21.8	8.1E-08	19.5	1.013	8.2E-08
6/27	3	90.0	68.3	8.0	7.9	0.1	44	21.8	8.3E-08	19.5	1.013	8.4E-08
6/27	4	90.0	68.3	8.0	7.9	0.1	44	21.8	8.3E-08	19.5	1.013	8.4E-08

PERMEABILITY AT 20° C: 8.4×10^{-8} cm/sec (@ 21.7 psi effective stress)

APPENDIX C-3
Constant Rate of Strain (CRS) Tests

CRC Test

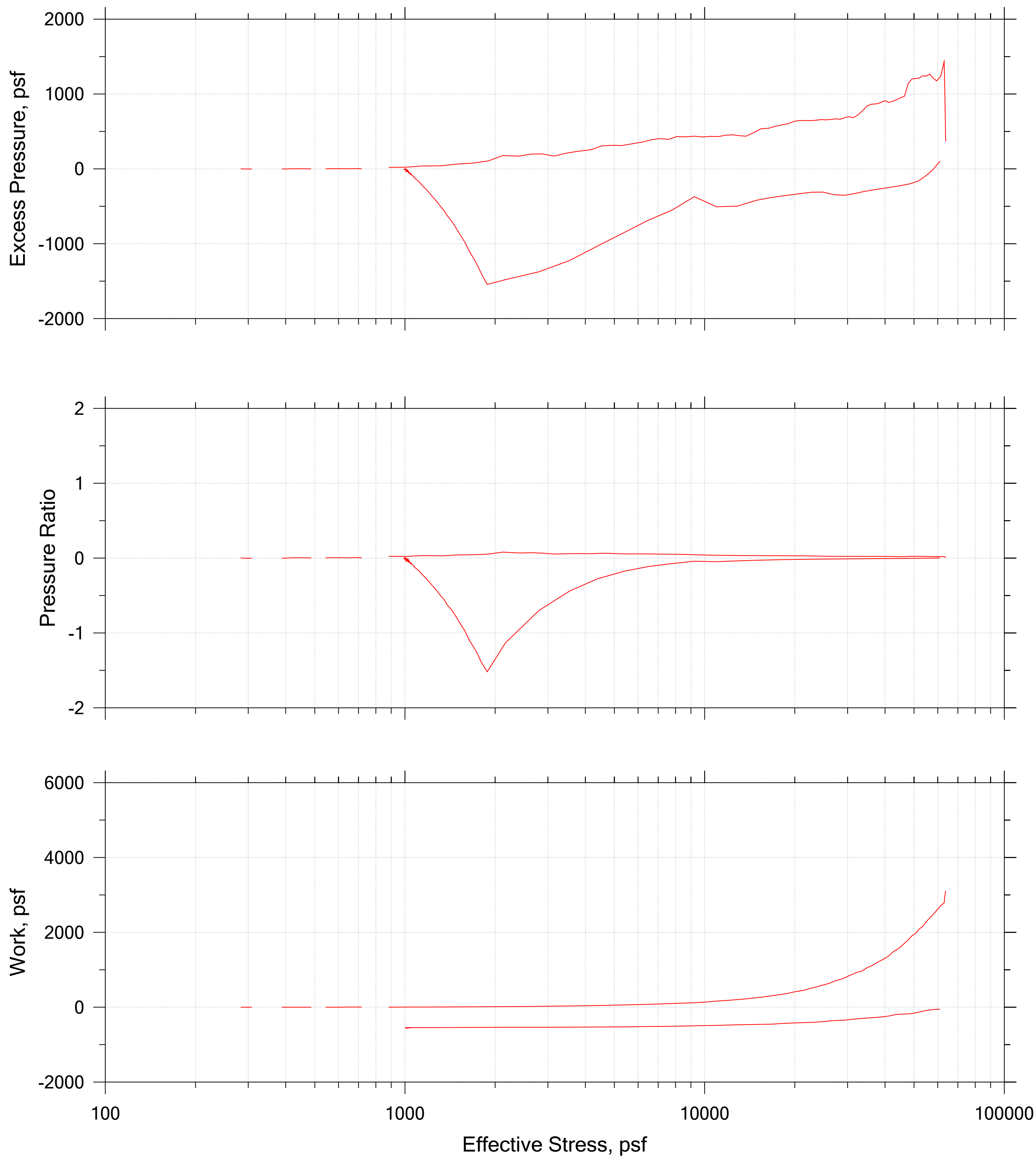
Summary



GeoTesting EXPRESS			
	Project Name: Crossroads Phase 14	Location: Norridgewock, ME	Project Number: GTX-309940
	Boring Number: GB-03	Tester: md	Checker: njh
	Sample Number: 3-5	Test Date: 05/13/19	Depth: 3-5 ft
	Test Number: CRC-1	Preparation: intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System S		
			Page 1 of 3

CRC Test

Pressure Curves



GeoTesting EXPRESS	Project Name: Crossroads Phase 14	Location: Norridgewock, ME	Project Number: GTX-309940
	Boring Number: GB-03	Tester: md	Checker: njh
	Sample Number: 3-5	Test Date: 05/13/19	Depth: 3-5 ft
	Test Number: CRC-1	Preparation: intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System S		

CRC Test

Specimen Diameter, in: 2.50	Specific Gravity: 2.69 (Estimated)	Liquid Limit: Unknown
Specimen Height, in: 1.00	Initial Void Ratio: 0.771	Plastic Limit: Unknown
Final Height, in: 0.94	Final Void Ratio: 0.665	Plasticity Index: Unknown

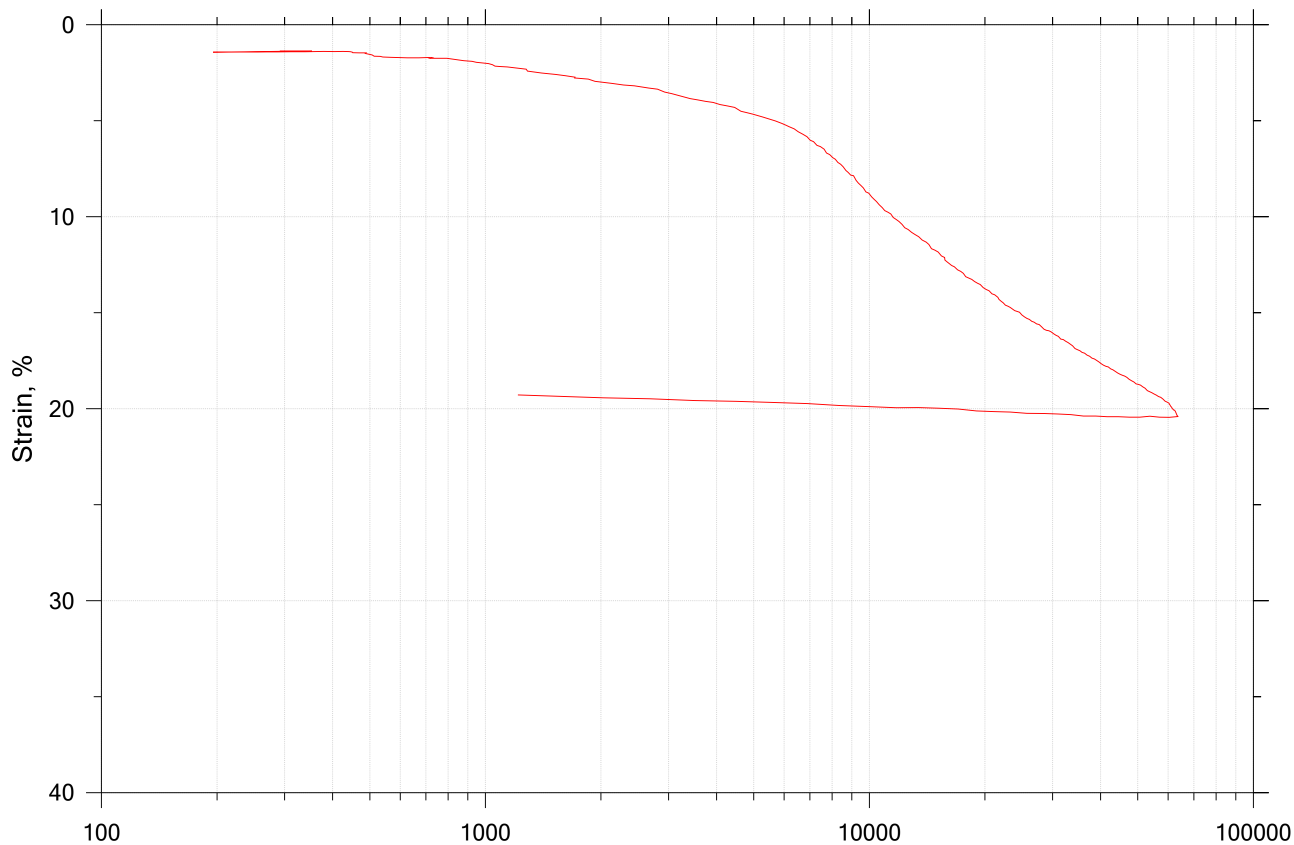
	Before Test Trimmings	Before Test Specimen	After Test Specimen	After Test Trimmings
Container ID	D-1787	---		C-1483
Mass Container, gm	8.23	108.4	108.4	8.08
Mass Container + Wet Soil, gm	212.82	265.58	260.95	160.96
Mass Container + Dry Soil, gm	171.14	230.76	230.76	130.7
Mass Dry Soil, gm	162.91	122.36	122.36	122.62
Water Content, %	25.58	28.46	24.68	24.68
Void Ratio	---	0.77	0.66	---
Degree of Saturation, %	---	99.44	100.00	---
Dry Unit Weight, pcf	---	94.958	101.02	---

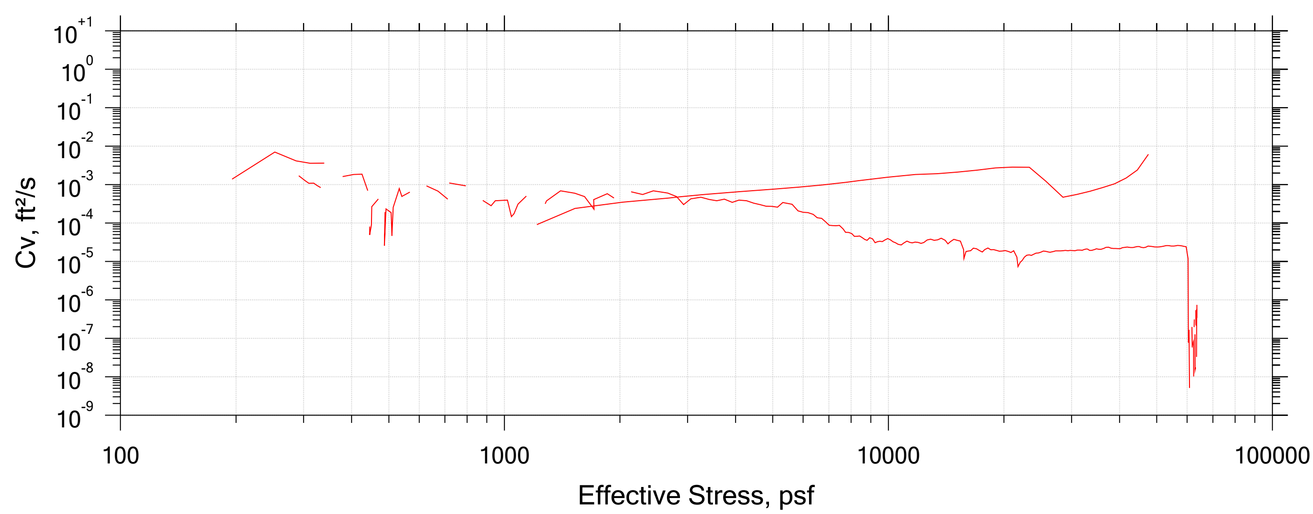
Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test.
Therefore, values may not represent actual values for the specimen.

GeoTesting EXPRESS	Project Name: Crossroads Phase 14	Location: Norridgewock, ME	Project Number: GTX-309940
	Boring Number: GB-03	Tester: md	Checker: njh
	Sample Number: 3-5	Test Date: 05/13/19	Depth: 3-5 ft
	Test Number: CRC-1	Preparation: intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System S		

CRC Test

Summary

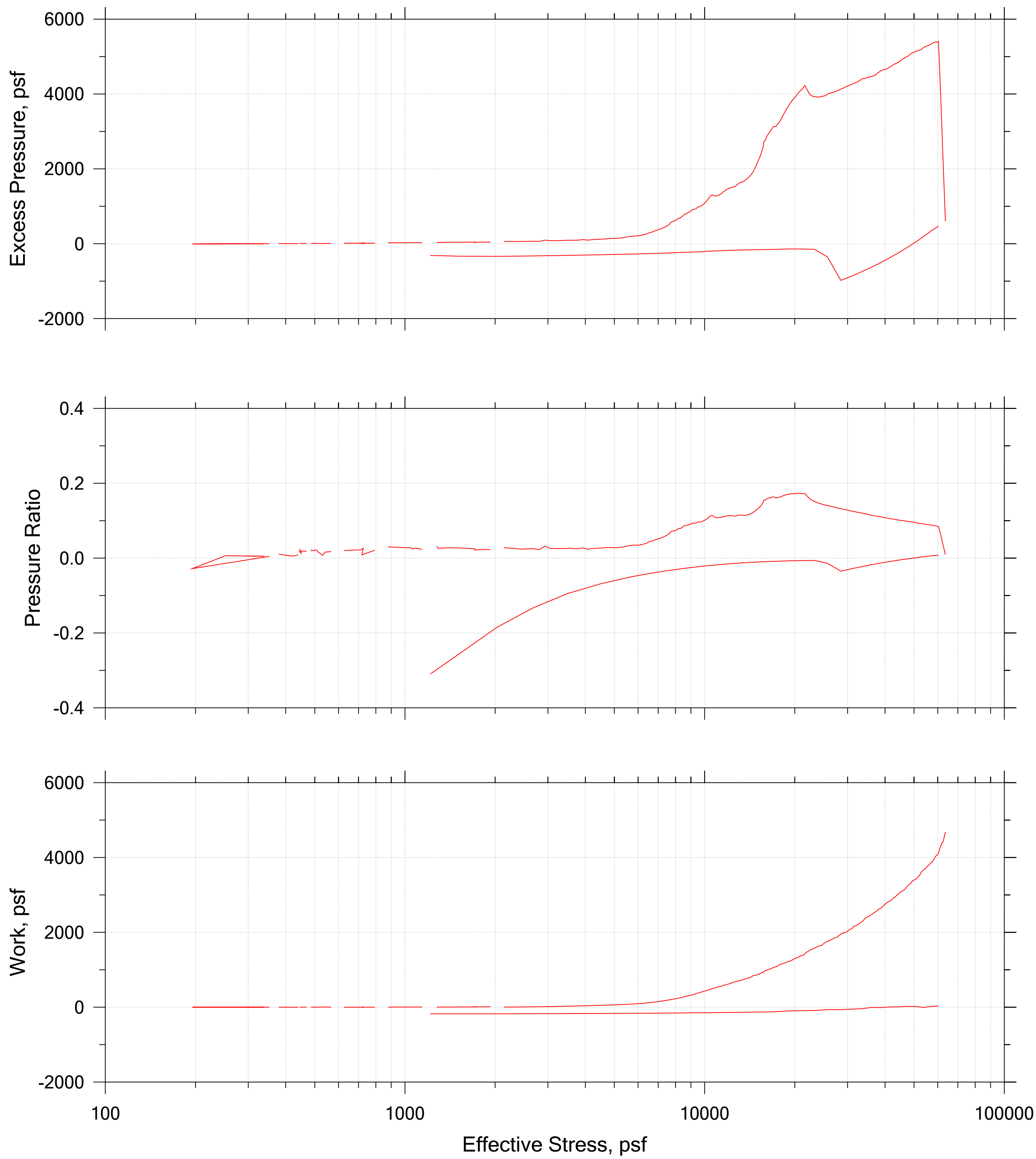




GeoTesting EXPRESS	Project Name: Crossroads Phase 14	Location: Norredgewock, ME	Project Number: GTX-309940
	Boring Number: GB-04	Tester: md	Checker: njh
	Sample Number: 19-21	Test Date: 05/13/19	Depth: 19-21 ft
	Test Number: CRC-2	Preparation: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: System T		
			Page 1 of 3

CRC Test

Pressure Curves



GeoTesting EXPRESS	Project Name: Crossroads Phase 14	Location: Norredgewock, ME	Project Number: GTX-309940
	Boring Number: GB-04	Tester: md	Checker: njh
	Sample Number: 19-21	Test Date: 05/13/19	Depth: 19-21 ft
	Test Number: CRC-2	Preparation: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: System T		

CRC Test

Specimen Diameter, in: 2.50	Specific Gravity: 2.75 (Estimated)	Liquid Limit: Unknown
Specimen Height, in: 1.00	Initial Void Ratio: 0.95	Plastic Limit: Unknown
Final Height, in: 0.84	Final Void Ratio: 0.638	Plasticity Index: Unknown

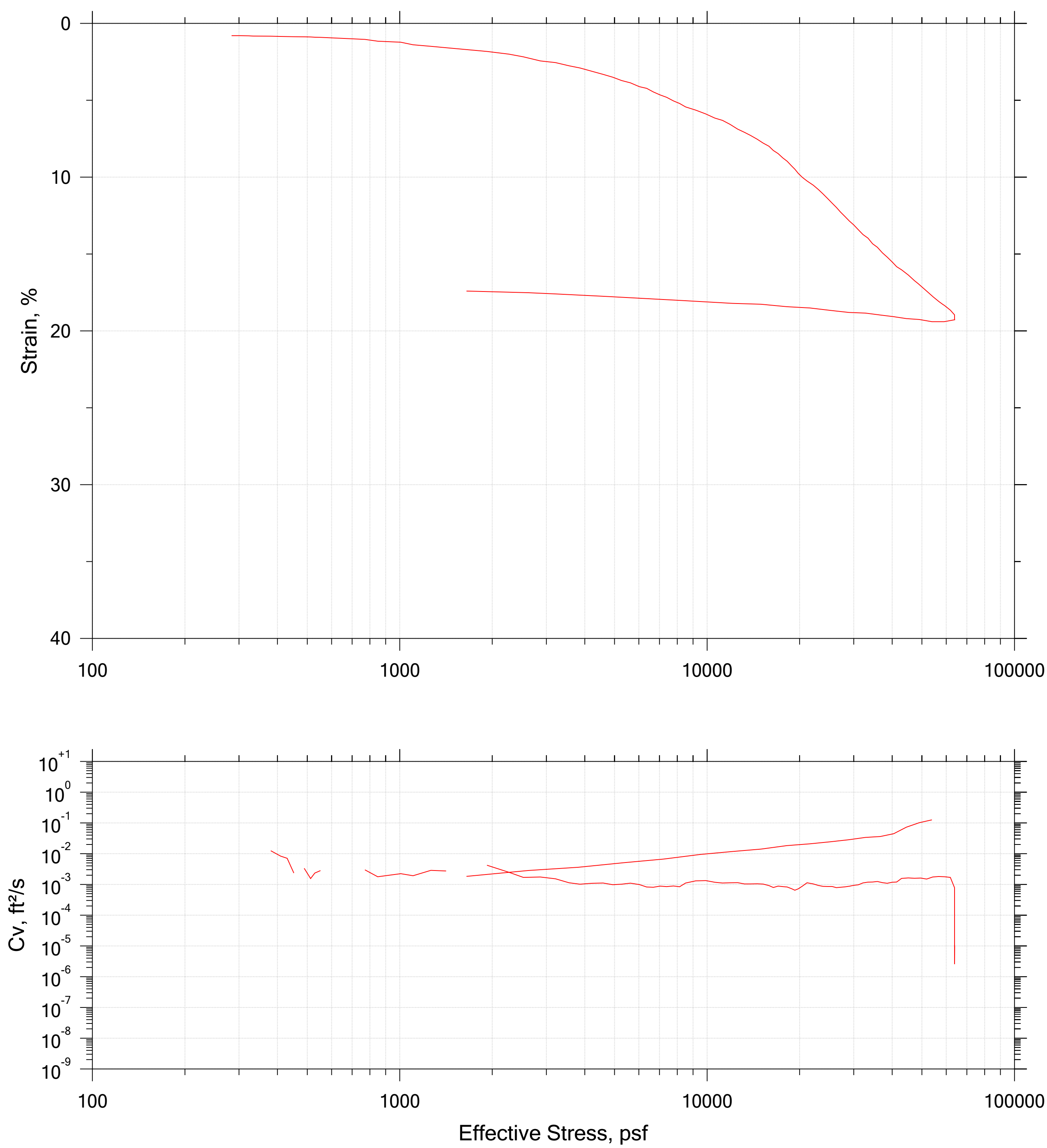
	Before Test Trimmings	Before Test Specimen	After Test Specimen	After Test Trimmings
Container ID	C-105	---		B-1680
Mass Container, gm	8.42	106.32	106.32	8.34
Mass Container + Wet Soil, gm	506.18	258.12	245.94	145.48
Mass Container + Dry Soil, gm	383.35	219.62	219.62	119.63
Mass Dry Soil, gm	374.93	113.3	113.3	111.29
Water Content, %	32.76	33.98	23.23	23.23
Void Ratio	---	0.95	0.64	---
Degree of Saturation, %	---	98.24	100.00	---
Dry Unit Weight, pcf	---	87.932	104.68	---

Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test.
Therefore, values may not represent actual values for the specimen.

Project Name: Crossroads Phase 14	Location: Norredgewock, ME	Project Number: GTX-309940
Boring Number: GB-04	Tester: md	Checker: njh
Sample Number: 19-21	Test Date: 05/13/19	Depth: 19-21 ft
Test Number: CRC-2	Preparation: intact	Elevation: ---
Description: Moist, gray clay		
Remarks: System T		

CRC Test

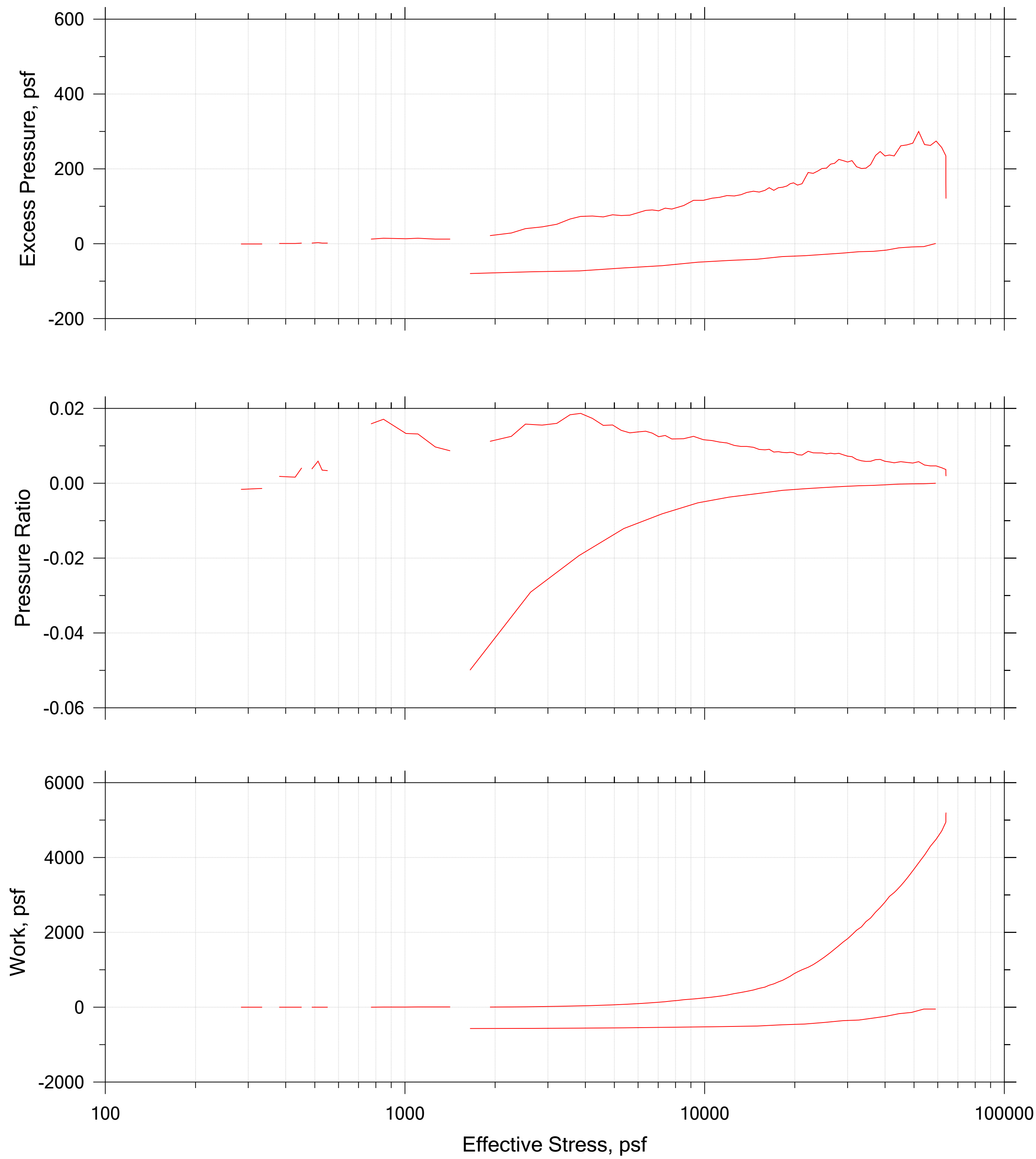
Summary



GeoTesting EXPRESS	Project Name: Crossroads Phase 14	Location: Norridgewock, ME	Project Number: GTX-309940
	Boring Number: GB-15	Tester: md	Checker: njh
	Sample Number: 11-13	Test Date: 07/12/19	Depth: 11-13 ft
	Test Number: CRC-3	Preparation: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: System S		
			Page 1 of 3

CRC Test

Pressure Curves



	Project Name: Crossroads Phase 14	Location: Norridgewock, ME	Project Number: GTX-309940
	Boring Number: GB-15	Tester: md	Checker: njh
	Sample Number: 11-13	Test Date: 07/12/19	Depth: 11-13 ft
GeoTesting EXPRESS	Test Number: CRC-3	Preparation: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: System S		

CRC Test

Specimen Diameter, in: 2.50	Specific Gravity: 2.76 (Estimated)	Liquid Limit: Unknown
Specimen Height, in: 1.00	Initial Void Ratio: 0.859	Plastic Limit: Unknown
Final Height, in: 0.83	Final Void Ratio: 0.543	Plasticity Index: Unknown

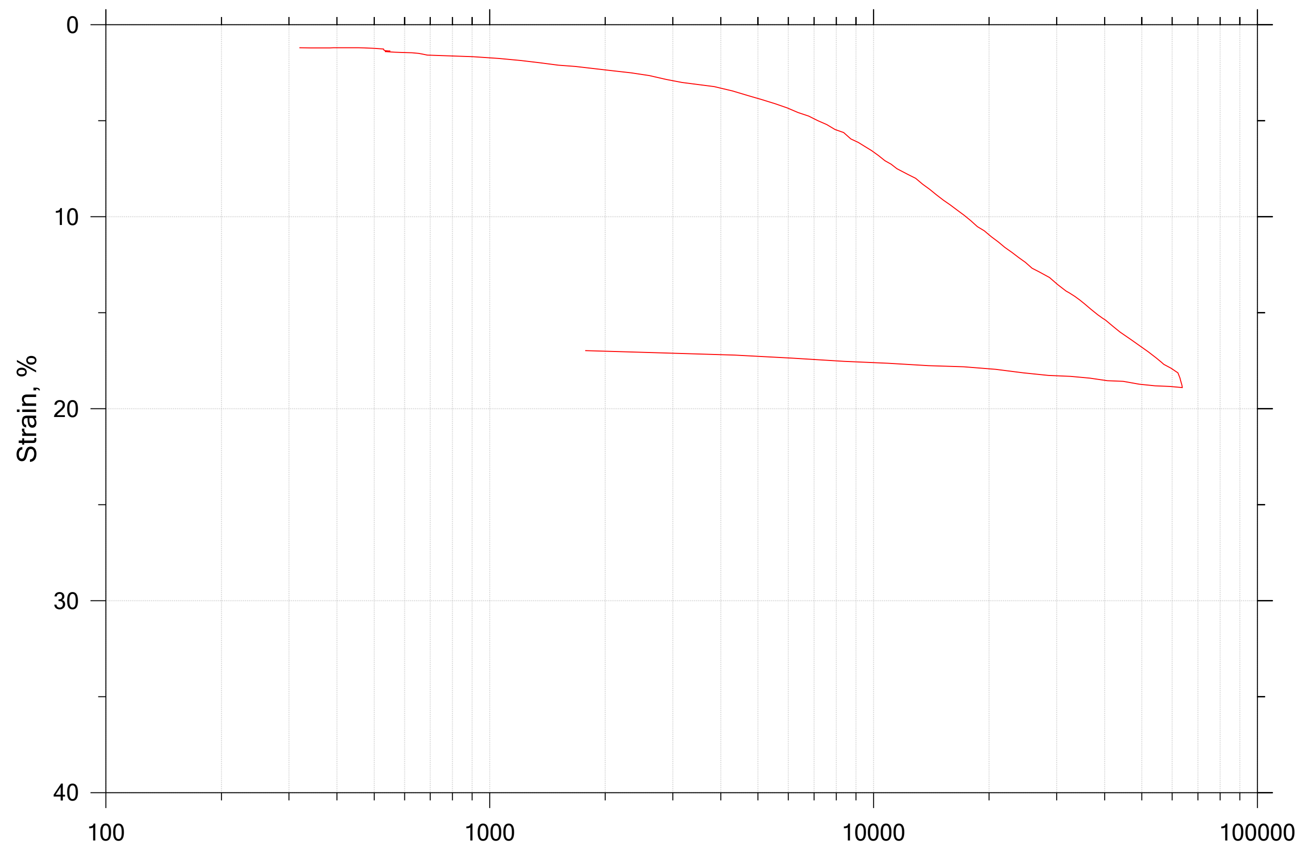
	Before Test Trimmings	Before Test Specimen	After Test Specimen	After Test Trimmings
Container ID	D-2676	---		D-2640
Mass Container, gm	8.3	110.88	110.88	8.62
Mass Container + Wet Soil, gm	153.51	267.15	253.93	153.1
Mass Container + Dry Soil, gm	119.86	230.42	230.42	129.36
Mass Dry Soil, gm	111.56	119.54	119.54	120.74
Water Content, %	30.16	30.72	19.66	19.66
Void Ratio	---	0.86	0.54	---
Degree of Saturation, %	---	98.78	100.00	---
Dry Unit Weight, pcf	---	92.777	111.78	---

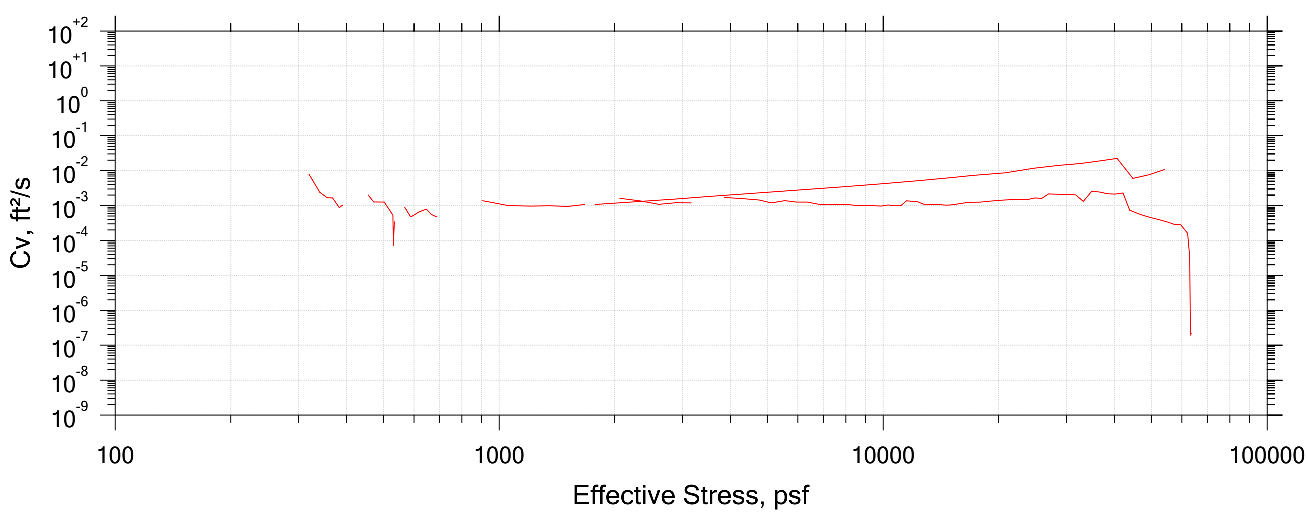
Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test.
Therefore, values may not represent actual values for the specimen.

GeoTesting EXPRESS	Project Name: Crossroads Phase 14	Location: Norridgewock, ME	Project Number: GTX-309940
	Boring Number: GB-15	Tester: md	Checker: njh
	Sample Number: 11-13	Test Date: 07/12/19	Depth: 11-13 ft
	Test Number: CRC-3	Preparation: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: System S		

CRC Test

Summary

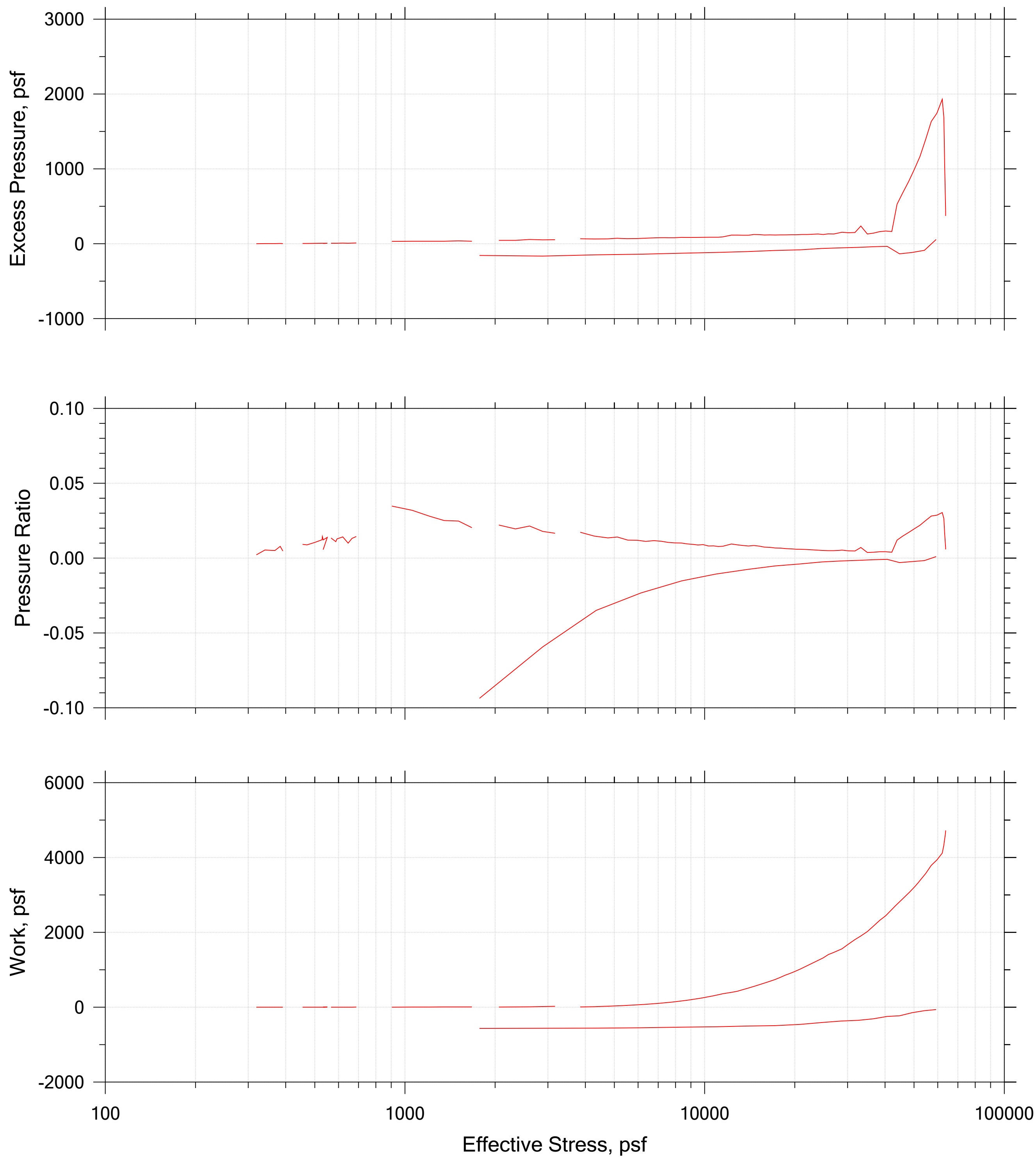




GeoTesting EXPRESS	Project Name: Crossroads Phase 14	Location: Norridgewock, ME	Project Number: GTX-309940
	Boring Number: GB-08	Tester: md	Checker: njh
	Sample Number: 27-29	Test Date: 07/13/19	Depth: 27-29 ft
	Test Number: CRC-4	Preparation: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: System S		
			Page 1 of 3

CRC Test

Pressure Curves



GeoTesting EXPRESS	Project Name: Crossroads Phase 14	Location: Norridgewock, ME	Project Number: GTX-309940
	Boring Number: GB-08	Tester: md	Checker: njh
	Sample Number: 27-29	Test Date: 07/13/19	Depth: 27-29 ft
	Test Number: CRC-4	Preparation: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: System S		

CRC Test

Specimen Diameter, in: 2.50	Specific Gravity: 2.74 (Estimated)	Liquid Limit: 27
Specimen Height, in: 1.00	Initial Void Ratio: 0.859	Plastic Limit: 17
Final Height, in: 0.85	Final Void Ratio: 0.58	Plasticity Index: 10

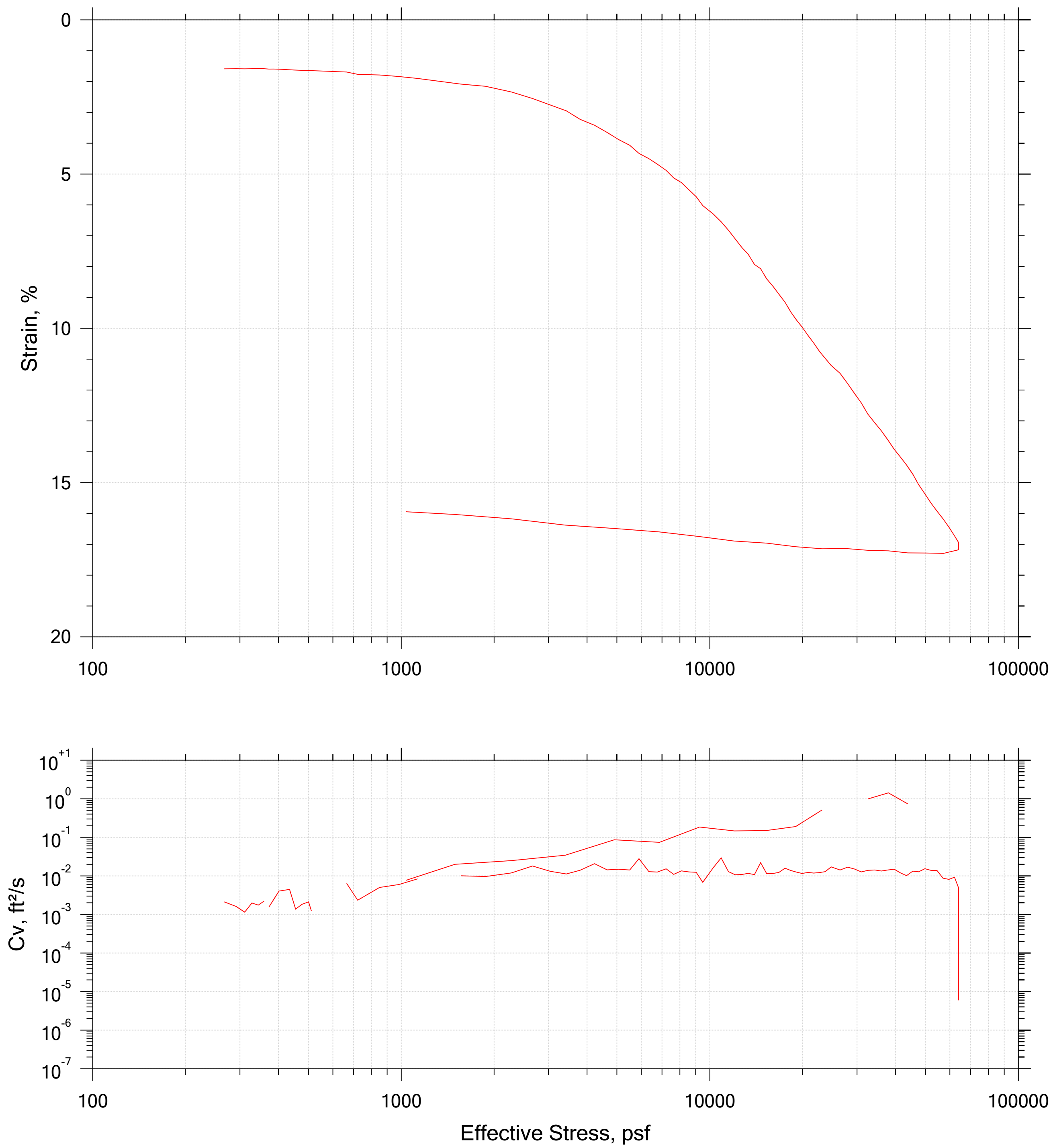
	Before Test Trimmings	Before Test Specimen	After Test Specimen	After Test Trimmings
Container ID	D-2328	---		D-2525
Mass Container, gm	8.28	110.43	110.43	8.46
Mass Container + Wet Soil, gm	138.27	266.29	254.25	153.73
Mass Container + Dry Soil, gm	106.89	229.15	229.15	128.38
Mass Dry Soil, gm	98.61	118.72	118.72	119.92
Water Content, %	31.82	31.28	21.14	21.14
Void Ratio	---	0.86	0.58	---
Degree of Saturation, %	---	99.93	100.00	---
Dry Unit Weight, pcf	---	92.139	108.4	---

Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test.
Therefore, values may not represent actual values for the specimen.

GeoTesting EXPRESS	Project Name: Crossroads Phase 14	Location: Norridgewock, ME	Project Number: GTX-309940
	Boring Number: GB-08	Tester: md	Checker: njh
	Sample Number: 27-29	Test Date: 07/13/19	Depth: 27-29 ft
	Test Number: CRC-4	Preparation: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: System S		

CRC Test

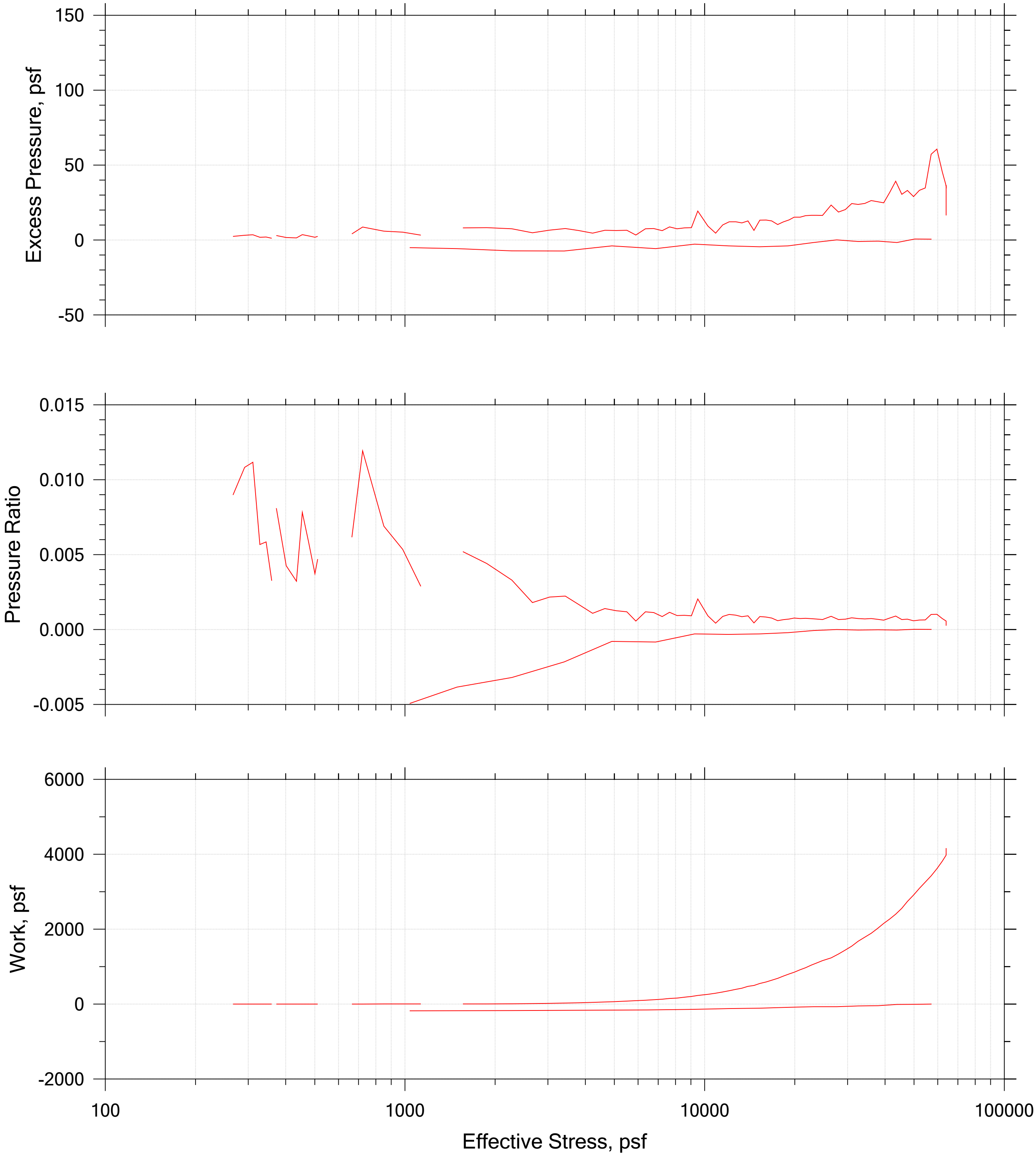
Summary



GeoTesting EXPRESS	Project Name: Crossroads Phase 14	Location: Norridgewock, ME	Project Number: GTX-309940
	Boring Number: GB-19	Tester: md	Checker: njh
	Sample Number: 17-19	Test Date: 07/24/19	Depth: 17-19 ft
	Test Number: CRC-5A	Preparation: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: System F		

CRC Test

Pressure Curves



GeoTesting EXPRESS	Project Name: Crossroads Phase 14	Location: Norridgewock, ME	Project Number: GTX-309940
	Boring Number: GB-19	Tester: md	Checker: njh
	Sample Number: 17-19	Test Date: 07/24/19	Depth: 17-19 ft
	Test Number: CRC-5A	Preparation: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: System F		
			Page 2 of 3

CRC Test

Specimen Diameter, in: 2.50	Specific Gravity: 2.74 (Estimated)	Liquid Limit: 31
Specimen Height, in: 1.00	Initial Void Ratio: 0.86	Plastic Limit: 20
Final Height, in: 0.89	Final Void Ratio: 0.656	Plasticity Index: 11

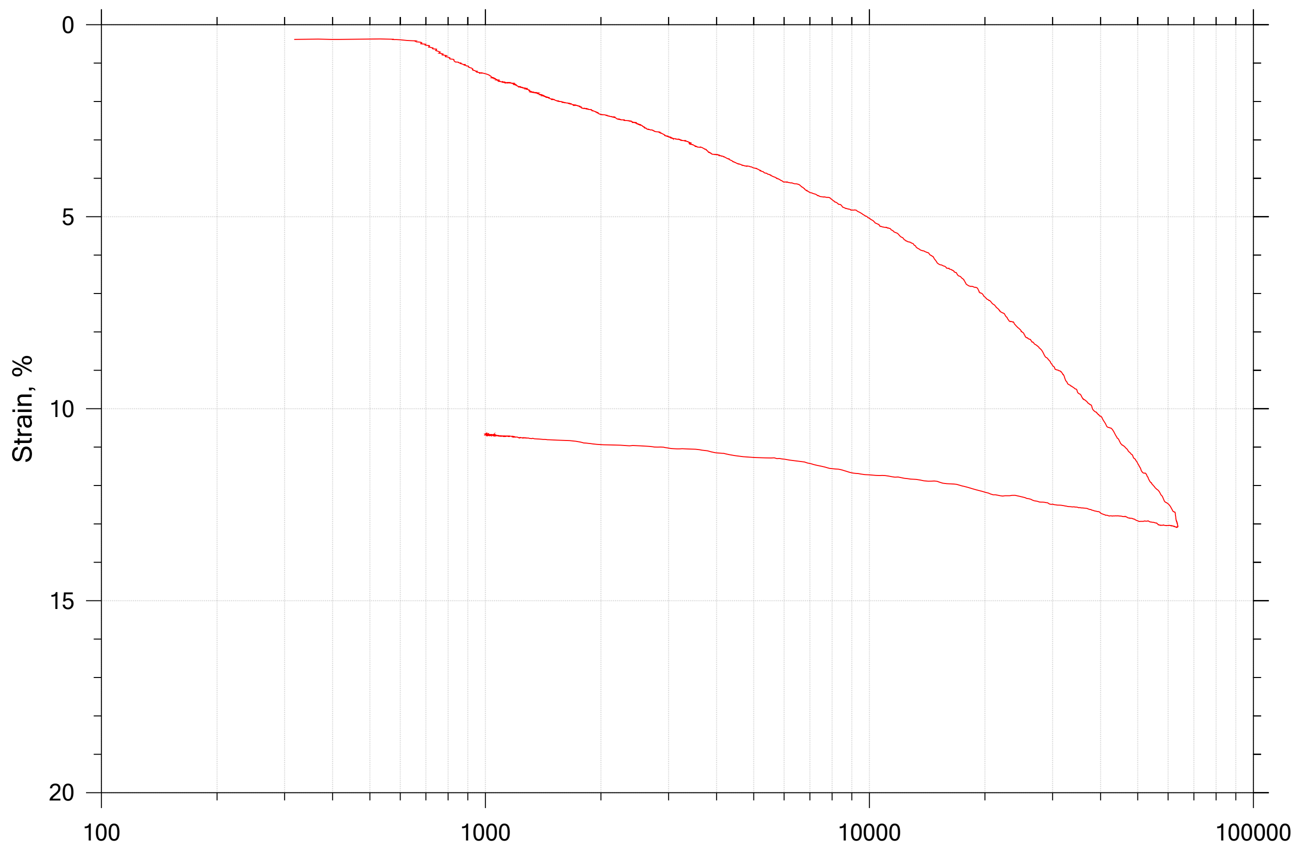
	Before Test Trimmings	Before Test Specimen	After Test Specimen	After Test Trimmings
Container ID	A-2355	---		B-2602
Mass Container, gm	8.22	109.43	109.43	8.33
Mass Container + Wet Soil, gm	206.58	264.93	256.22	152.46
Mass Container + Dry Soil, gm	158.82	227.87	227.87	124.62
Mass Dry Soil, gm	150.6	118.44	118.44	116.29
Water Content, %	31.71	31.29	23.94	23.94
Void Ratio	---	0.86	0.66	---
Degree of Saturation, %	---	99.63	100.00	---
Dry Unit Weight, pcf	---	91.916	103.28	---

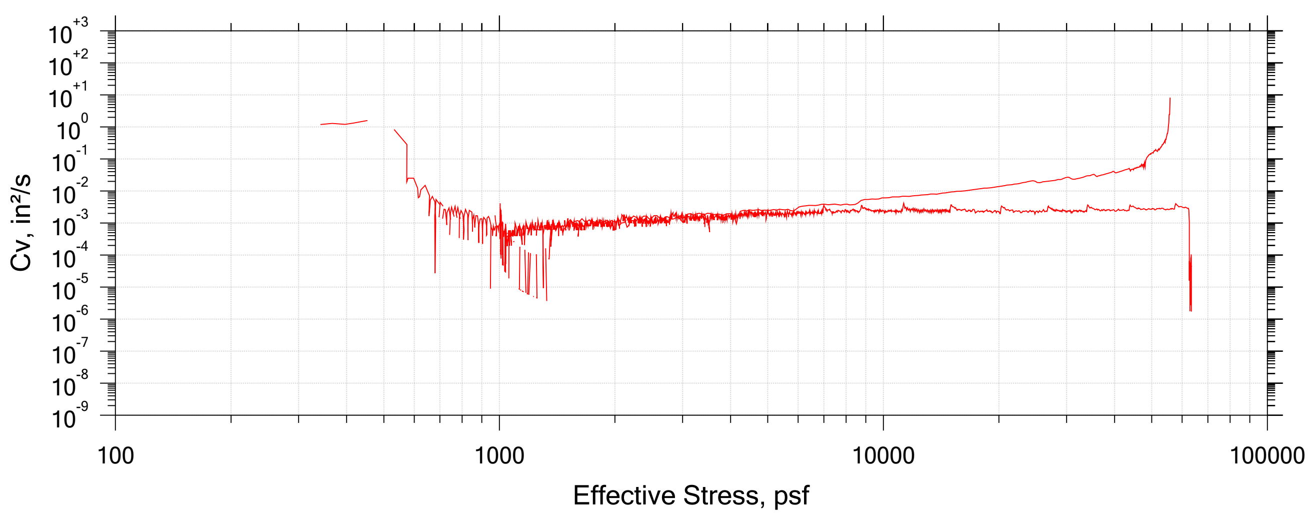
Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test.
Therefore, values may not represent actual values for the specimen.

Project Name: Crossroads Phase 14	Location: Norridgewock, ME	Project Number: GTX-309940
Boring Number: GB-19	Tester: md	Checker: njh
Sample Number: 17-19	Test Date: 07/24/19	Depth: 17-19 ft
Test Number: CRC-5A	Preparation: intact	Elevation: ---
Description: Moist, gray clay		
Remarks: System F		

CRC Test

Summary

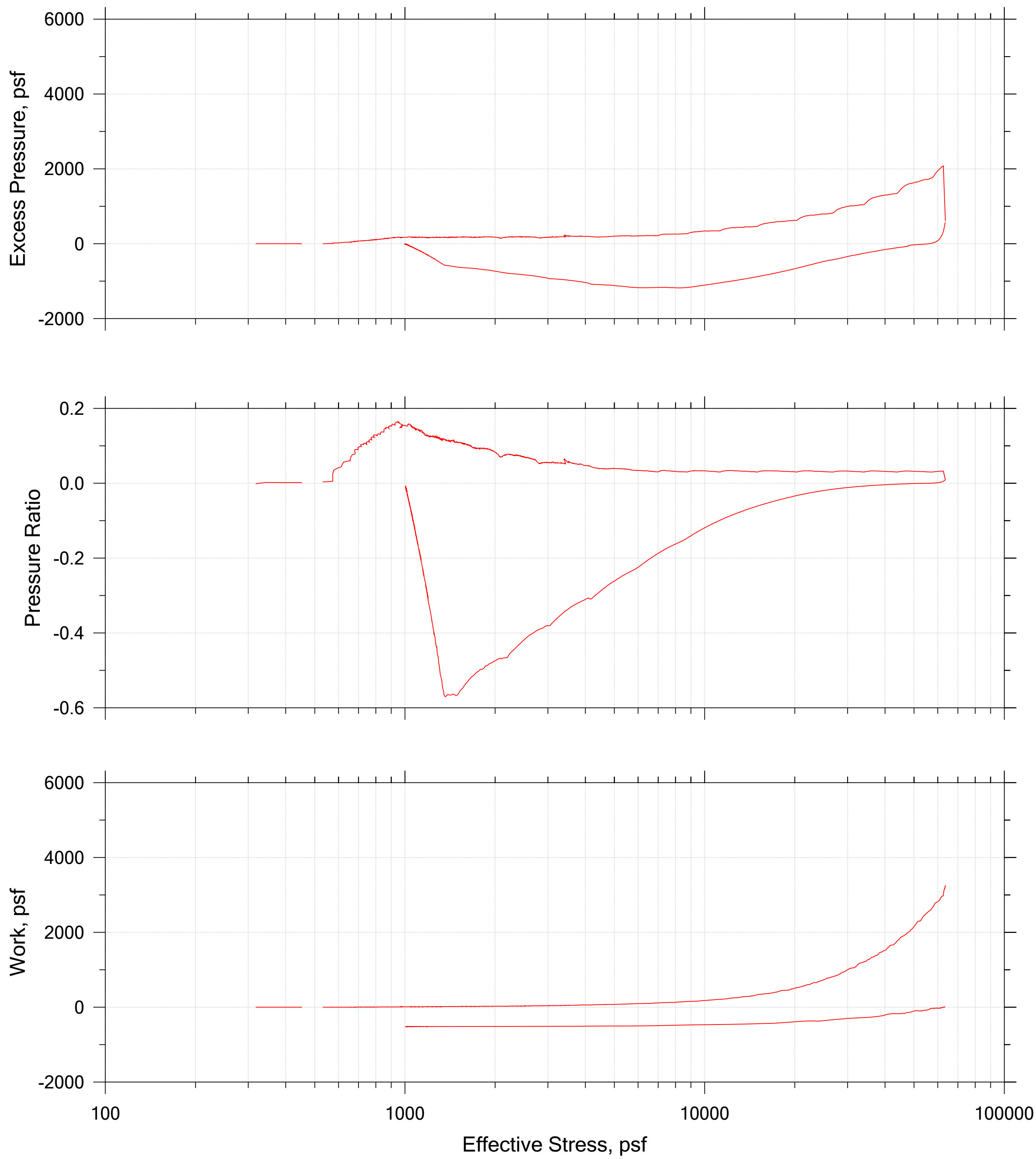




GeoTesting EXPRESS	Project Name: Crossroads Phase 14	Location: Norridgewock, ME	Project Number: GTX-309940
	Boring Number: GB-17B	Tester: md	Checker: njh
	Sample Number: 5-7	Test Date: 07/17/19	Depth: 5-7 ft
	Test Number: CRC-6B	Preparation: intact	Elevation: ---
	Description: Moist, dark gray clay		
	Remarks: System S		

CRC Test

Pressure Curves



GeoTesting EXPRESS	Project Name: Crossroads Phase 14	Location: Norridgewock, ME	Project Number: GTX-309940
	Boring Number: GB-17B	Tester: md	Checker: njh
	Sample Number: 5-7	Test Date: 07/17/19	Depth: 5-7 ft
	Test Number: CRC-6B	Preparation: intact	Elevation: ---
	Description: Moist, dark gray clay		
	Remarks: System S		
			Page 2 of 3

CRC Test

Specimen Diameter, in: 2.50	Specific Gravity: 2.76 (Estimated)	Liquid Limit: 30
Specimen Height, in: 1.00	Initial Void Ratio: 0.805	Plastic Limit: 18
Final Height, in: 0.93	Final Void Ratio: 0.679	Plasticity Index: 12

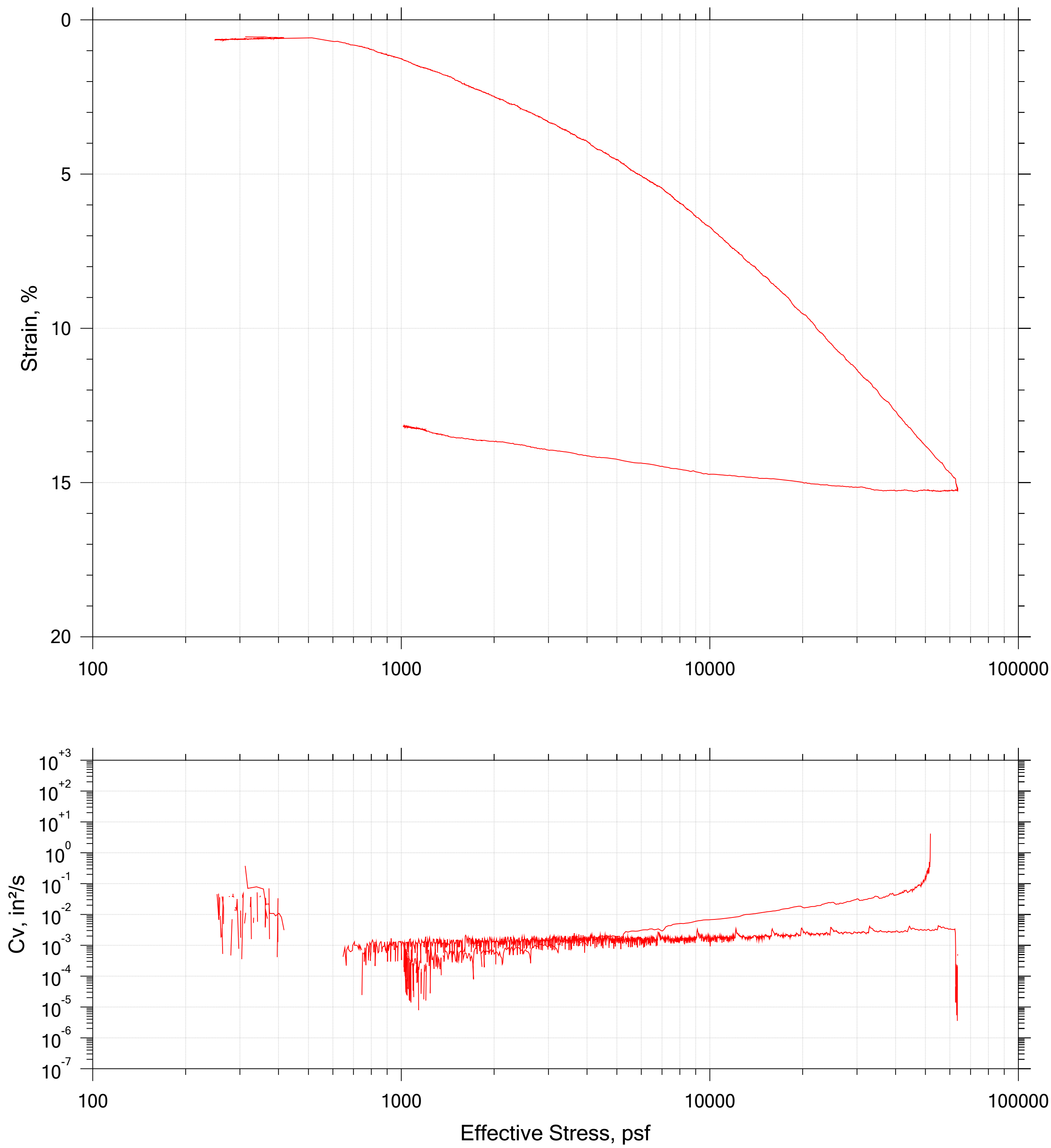
	Before Test Trimmings	Before Test Specimen	After Test Specimen	After Test Trimmings
Container ID	D-2169	---		A-1453
Mass Container, gm	8.48	109.43	109.43	8.2
Mass Container + Wet Soil, gm	143.17	267.88	262.47	161.67
Mass Container + Dry Soil, gm	115.65	232.22	232.22	131.33
Mass Dry Soil, gm	107.17	122.79	122.79	123.13
Water Content, %	25.68	29.05	24.64	24.64
Void Ratio	---	0.81	0.68	---
Degree of Saturation, %	---	99.38	100.00	---
Dry Unit Weight, pcf	---	95.291	102.46	---

Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test.
Therefore, values may not represent actual values for the specimen.

GeoTesting EXPRESS	Project Name: Crossroads Phase 14	Location: Norridgewock, ME	Project Number: GTX-309940
	Boring Number: GB-17B	Tester: md	Checker: njh
	Sample Number: 5-7	Test Date: 07/17/19	Depth: 5-7 ft
	Test Number: CRC-6B	Preparation: intact	Elevation: ---
	Description: Moist, dark gray clay		
	Remarks: System S		

CRC Test

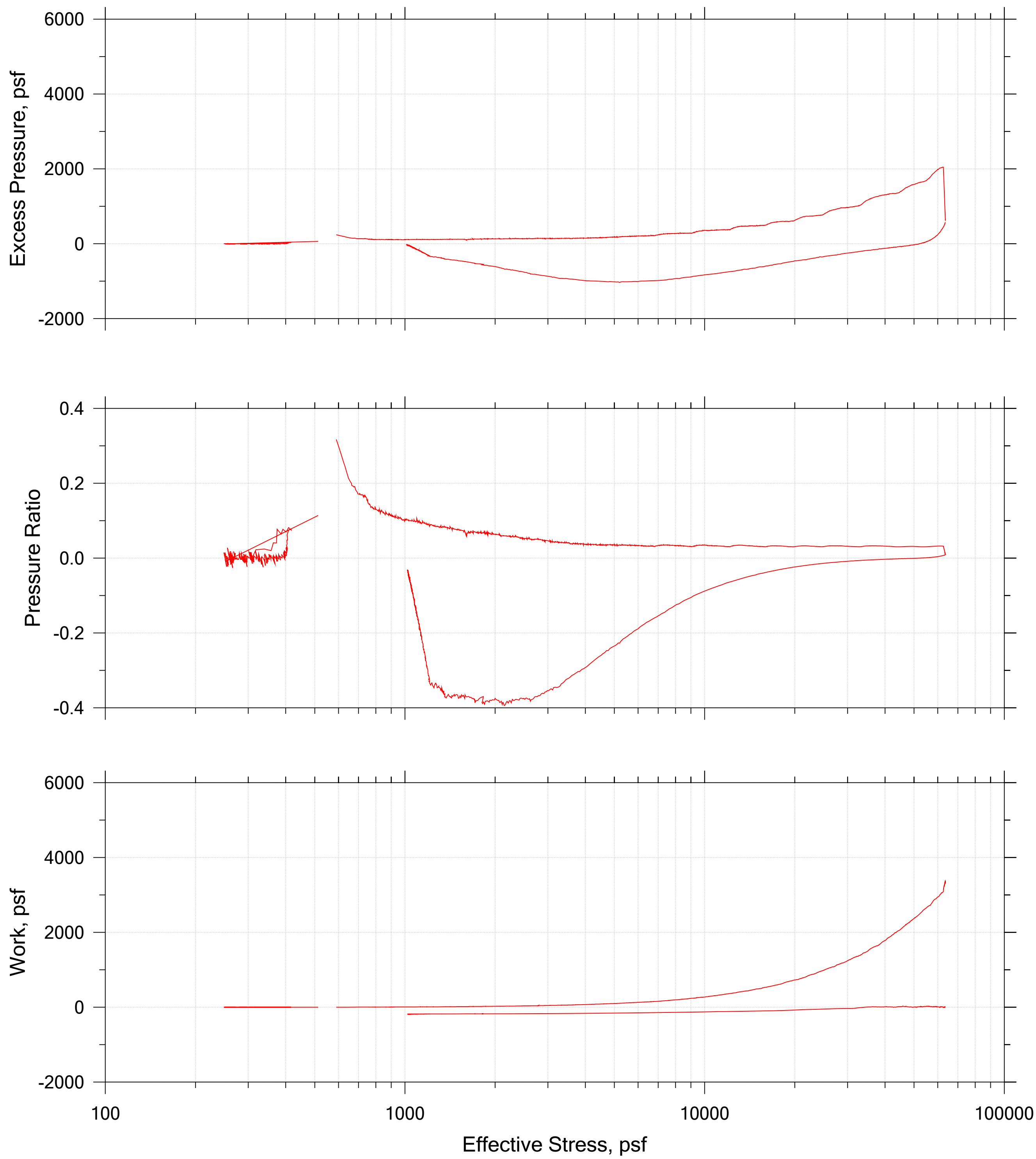
Summary



GeoTesting EXPRESS	Project Name: Crossroads Phase 14	Location: Norridgewock,ME	Project Number: GTX-309940
	Boring Number: GB-17	Tester: md	Checker:
	Sample Number: 15-17	Test Date: 07/15/19	Depth: 15-17 ft
	Test Number: CRC-7	Preparation: intact	Elevation: ---
	Description: Moist, dark gray clay		
	Remarks: System R		

CRC Test

Pressure Curves



GeoTesting EXPRESS	Project Name: Crossroads Phase 14	Location: Norridgewock,ME	Project Number: GTX-309940
	Boring Number: GB-17	Tester: md	Checker:
	Sample Number: 15-17	Test Date: 07/15/19	Depth: 15-17 ft
	Test Number: CRC-7	Preparation: intact	Elevation: ---
	Description: Moist, dark gray clay		
	Remarks: System R		

CRC Test

Specimen Diameter, in: 2.50	Specific Gravity: 2.73 (Estimated)	Liquid Limit: 34
Specimen Height, in: 1.00	Initial Void Ratio: 0.918	Plastic Limit: 19
Final Height, in: 0.89	Final Void Ratio: 0.707	Plasticity Index: 15

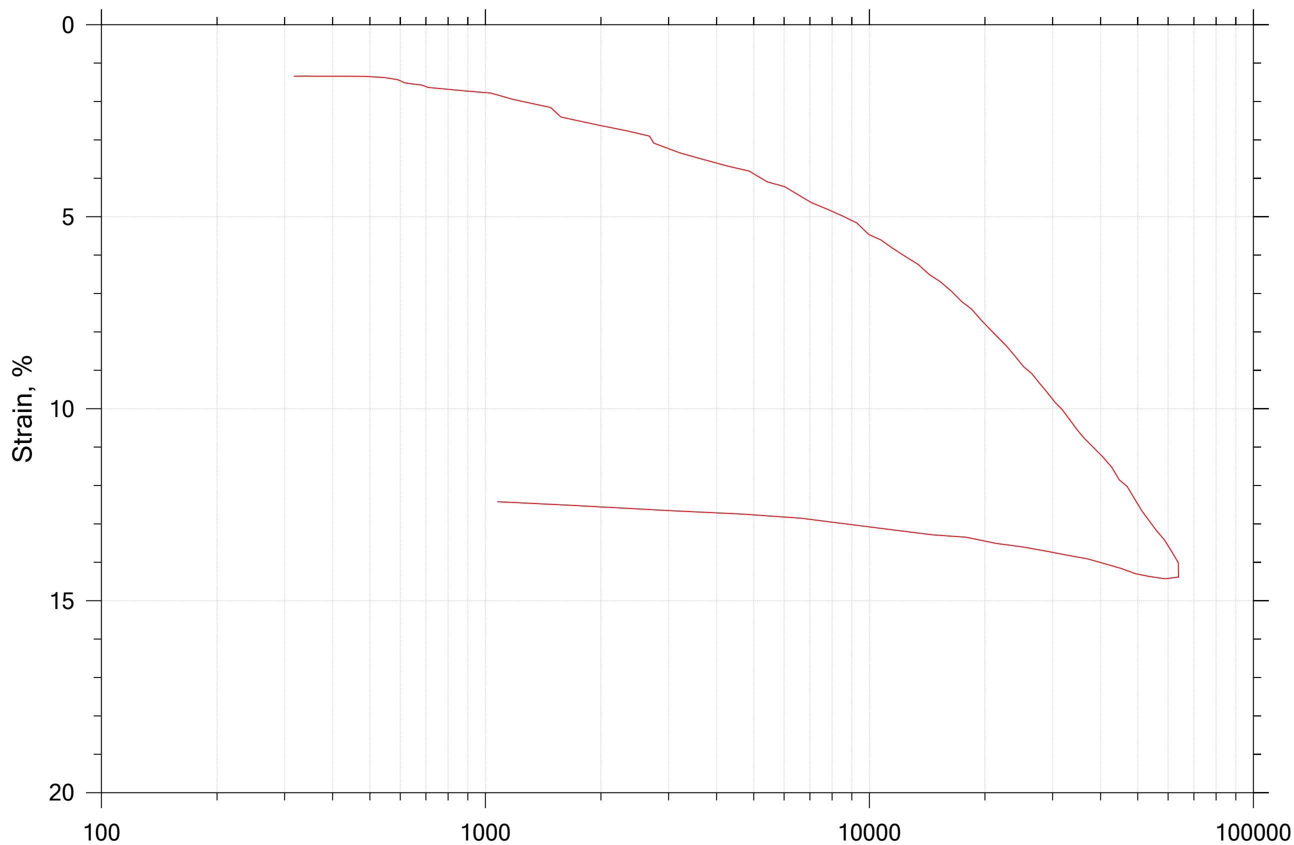
	Before Test Trimmings	Before Test Specimen	After Test Specimen	After Test Trimmings
Container ID	A-3053	---		B-2288
Mass Container, gm	8.26	110.69	110.69	8.26
Mass Container + Wet Soil, gm	190.67	263.3	254.67	151.46
Mass Container + Dry Soil, gm	145.76	225.01	225.01	121.96
Mass Dry Soil, gm	137.5	114.32	114.32	113.7
Water Content, %	32.66	33.49	25.95	25.95
Void Ratio	---	0.92	0.71	---
Degree of Saturation, %	---	99.43	100.00	---
Dry Unit Weight, pcf	---	88.721	99.687	---

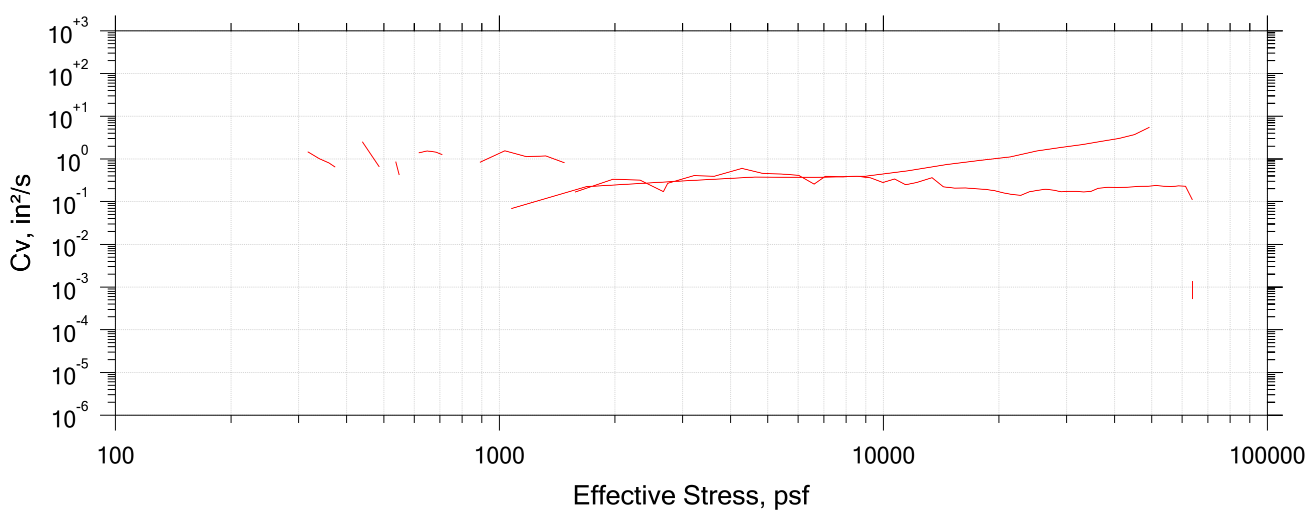
Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test. Therefore, values may not represent actual values for the specimen.

GeoTesting EXPRESS	Project Name: Crossroads Phase 14	Location: Norridgewock,ME	Project Number: GTX-309940
	Boring Number: GB-17	Tester: md	Checker:
	Sample Number: 15-17	Test Date: 07/15/19	Depth: 15-17 ft
	Test Number: CRC-7	Preparation: intact	Elevation: ---
	Description: Moist, dark gray clay		
	Remarks: System R		

CRC Test

Summary

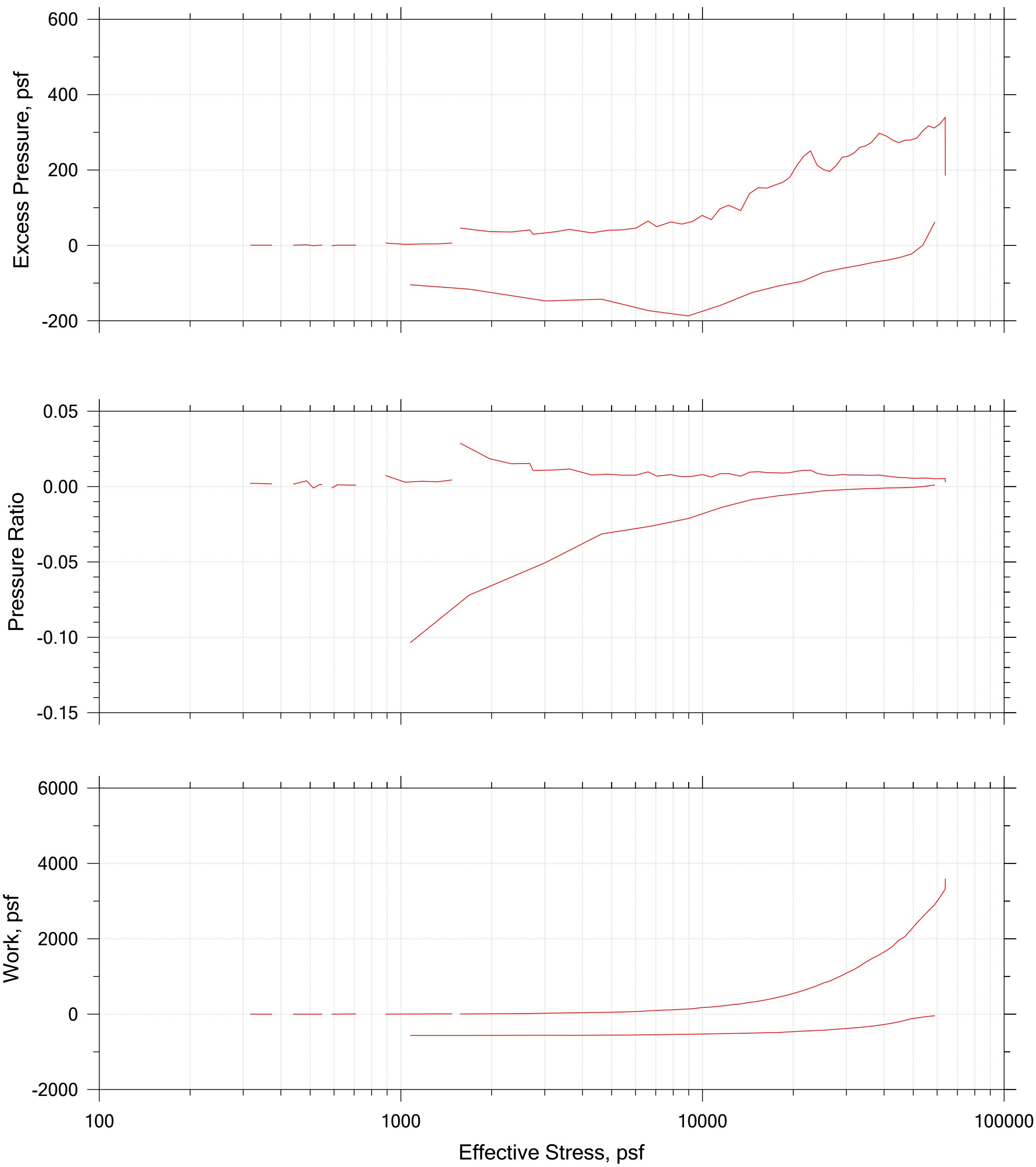




GeoTesting EXPRESS	Project Name: Crossroads Phase 14	Location: Norridgewock, ME	Project Number: GTX-309940
	Boring Number: GB-15	Tester: md	Checker: njh
	Sample Number: 7-9	Test Date: 07/16/19	Depth: 7-9 ft
	Test Number: CRC-8	Preparation: intact	Elevation: ---
	Description: Moist, olive gray clay		
	Remarks: System S		
			Page 1 of 3

CRC Test

Pressure Curves



GeoTesting EXPRESS			
	Project Name: Crossroads Phase 14	Location: Norridgewock, ME	Project Number: GTX-309940
	Boring Number: GB-15	Tester: md	Checker: njh
	Sample Number: 7-9	Test Date: 07/16/19	Depth: 7-9 ft
	Test Number: CRC-8	Preparation: intact	Elevation: ---
	Description: Moist, olive gray clay		
	Remarks: System S		

CRC Test

Specimen Diameter, in: 2.50	Specific Gravity: 2.74 (Estimated)	Liquid Limit: 30
Specimen Height, in: 1.00	Initial Void Ratio: 0.782	Plastic Limit: 20
Final Height, in: 0.89	Final Void Ratio: 0.586	Plasticity Index: 10

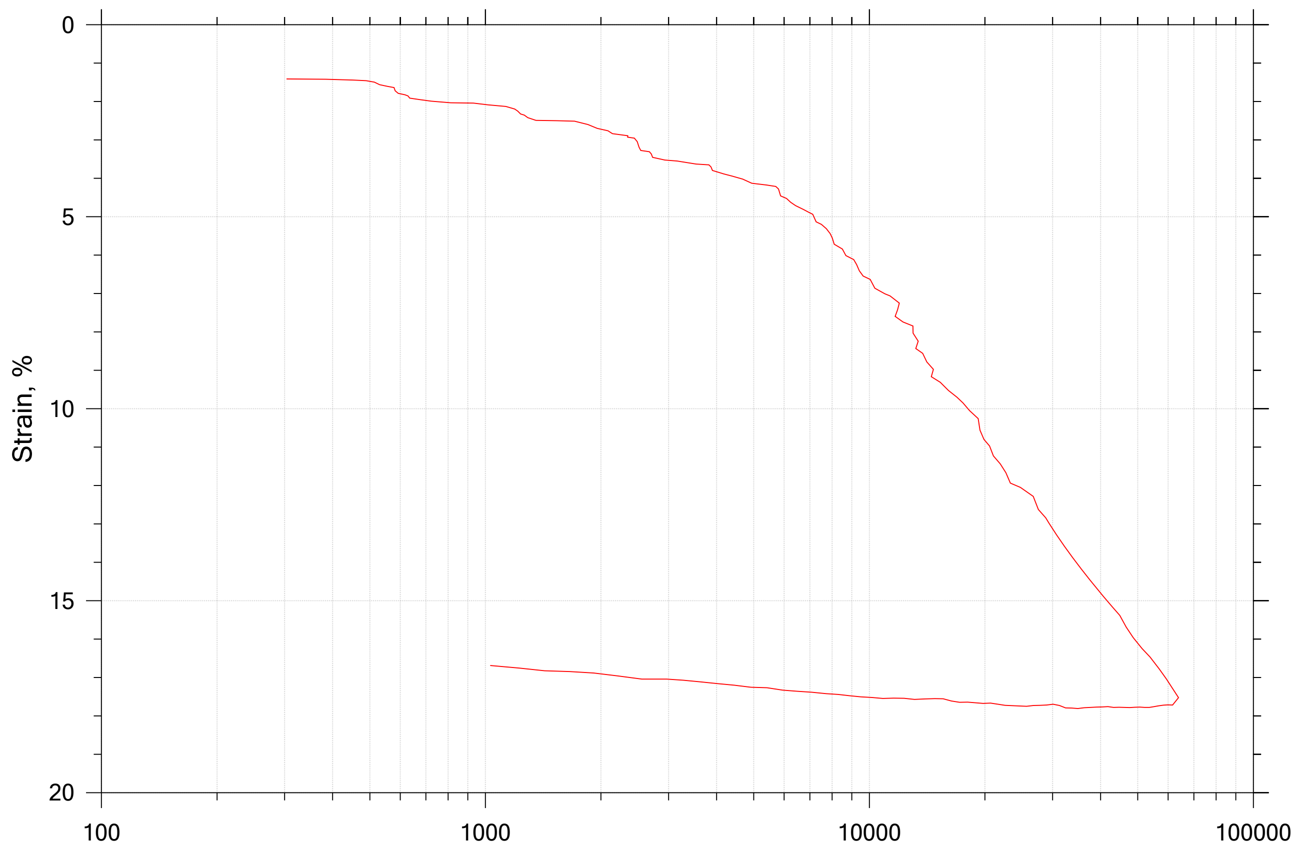
	Before Test Trimmings	Before Test Specimen	After Test Specimen	After Test Trimmings
Container ID	C-2294	---		A-2976
Mass Container, gm	9.02	110.45	110.45	8.24
Mass Container + Wet Soil, gm	232.89	268.89	260.63	160.2
Mass Container + Dry Soil, gm	185.03	234.17	234.17	133.43
Mass Dry Soil, gm	176.01	123.72	123.72	125.19
Water Content, %	27.19	28.06	21.38	21.38
Void Ratio	---	0.78	0.59	---
Degree of Saturation, %	---	98.33	100.00	---
Dry Unit Weight, pcf	---	96.02	107.89	---

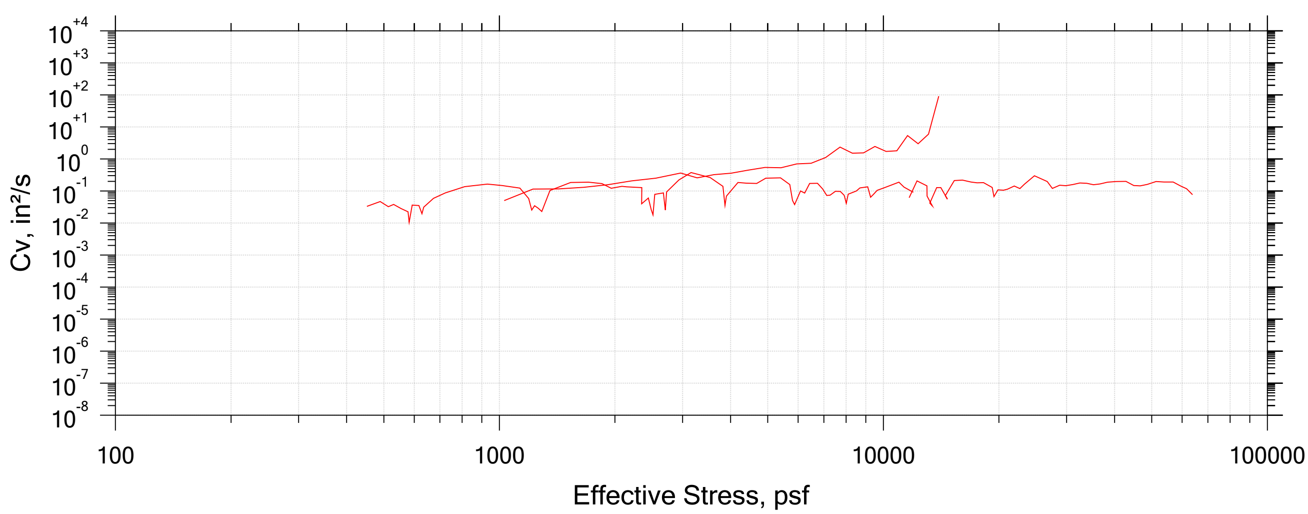
Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test.
Therefore, values may not represent actual values for the specimen.

Project Name: Crossroads Phase 14	Location: Norridgewock, ME	Project Number: GTX-309940
Boring Number: GB-15	Tester: md	Checker: njh
Sample Number: 7-9	Test Date: 07/16/19	Depth: 7-9 ft
Test Number: CRC-8	Preparation: intact	Elevation: ---
Description: Moist, olive gray clay		
Remarks: System S		

CRC Test

Summary

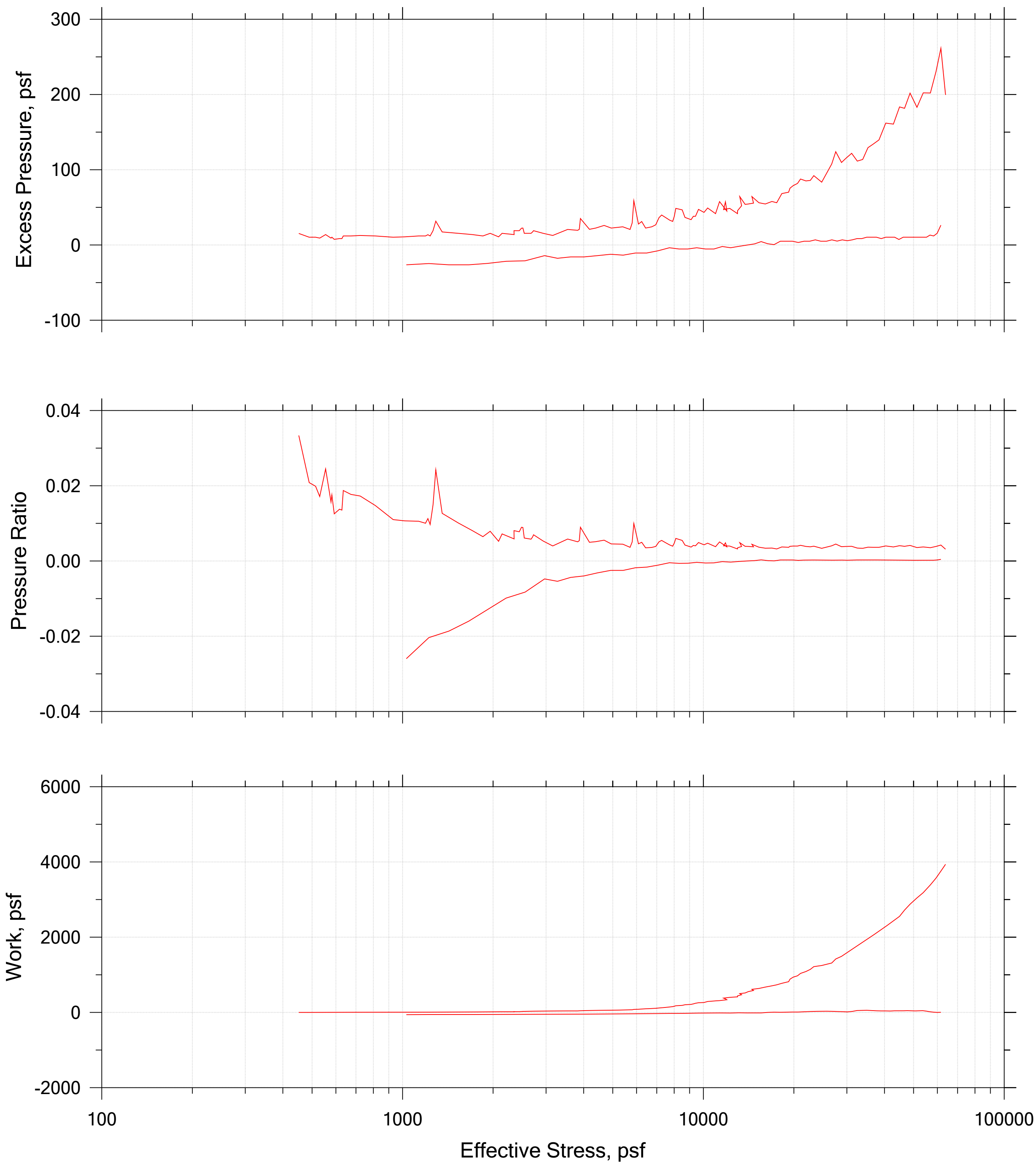




GeoTesting EXPRESS	Project Name: Crossroads Phase 14	Location: Norridgewock,ME	Project Number: GTX-309940
	Boring Number: GB-21	Tester: md	Checker: njh
	Sample Number: 23-25	Test Date: 07/17/19	Depth: 23-25 ft
	Test Number: CRC-9	Preparation: intact	Elevation: ---
	Description: Moist, dark gray clay		
	Remarks: System W		

CRC Test

Pressure Curves



Project Name: Crossroads Phase 14	Location: Norridgewock,ME	Project Number: GTX-309940
Boring Number: GB-21	Tester: md	Checker: njh
Sample Number: 23-25	Test Date: 07/17/19	Depth: 23-25 ft
Test Number: CRC-9	Preparation: intact	Elevation: ---
Description: Moist, dark gray clay		
Remarks: System W		

CRC Test

Specimen Diameter, in: 2.50	Specific Gravity: 2.75 (Estimated)	Liquid Limit: 26
Specimen Height, in: 1.00	Initial Void Ratio: 0.833	Plastic Limit: 16
Final Height, in: 0.83	Final Void Ratio: 0.521	Plasticity Index: 10

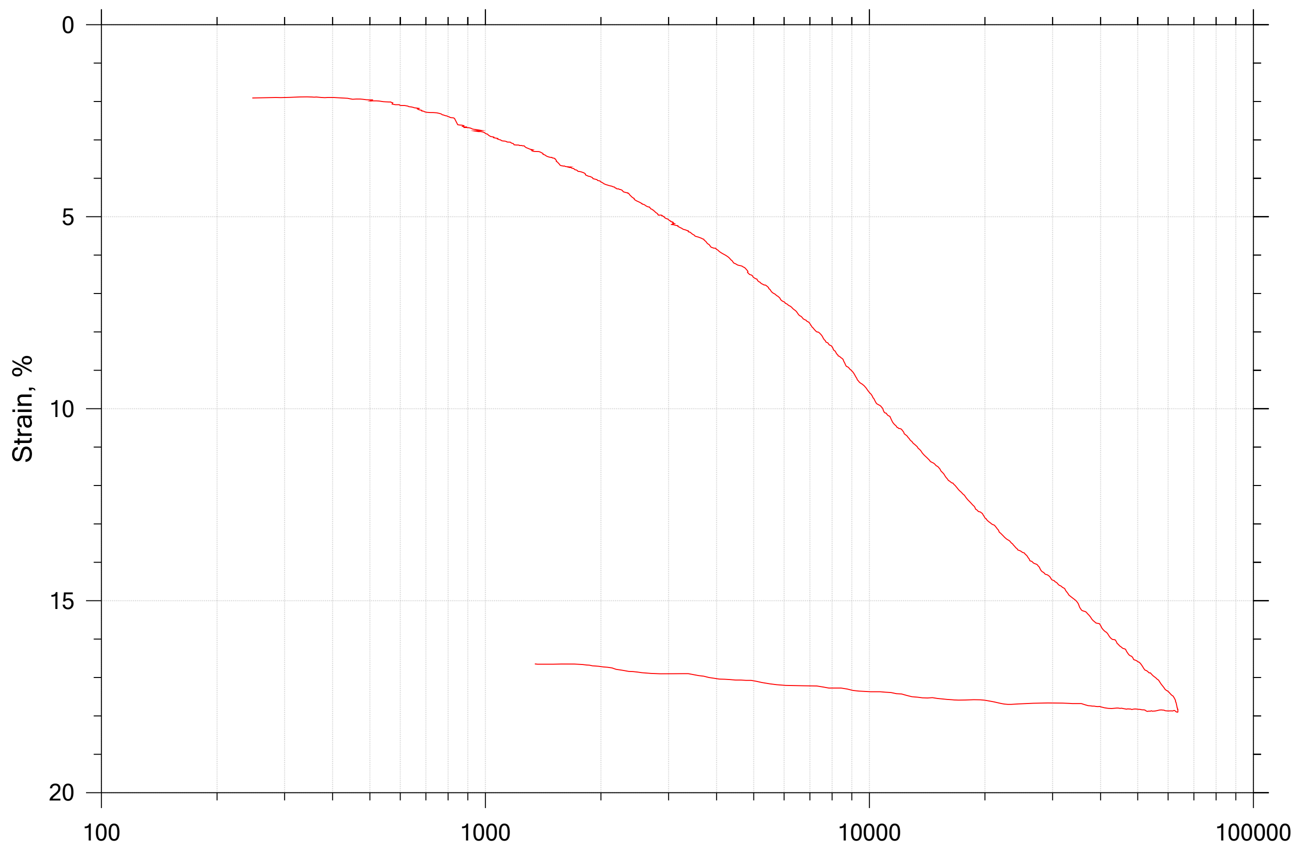
	Before Test Trimmings	Before Test Specimen	After Test Specimen	After Test Trimmings
Container ID	D-2423	---		D-1047
Mass Container, gm	8.66	110.87	110.87	8.26
Mass Container + Wet Soil, gm	146.51	267.27	254.3	153.41
Mass Container + Dry Soil, gm	116.56	231.42	231.42	130.26
Mass Dry Soil, gm	107.9	120.55	120.55	122
Water Content, %	27.76	29.73	18.98	18.98
Void Ratio	---	0.83	0.52	---
Degree of Saturation, %	---	98.07	100.00	---
Dry Unit Weight, pcf	---	93.56	112.72	---

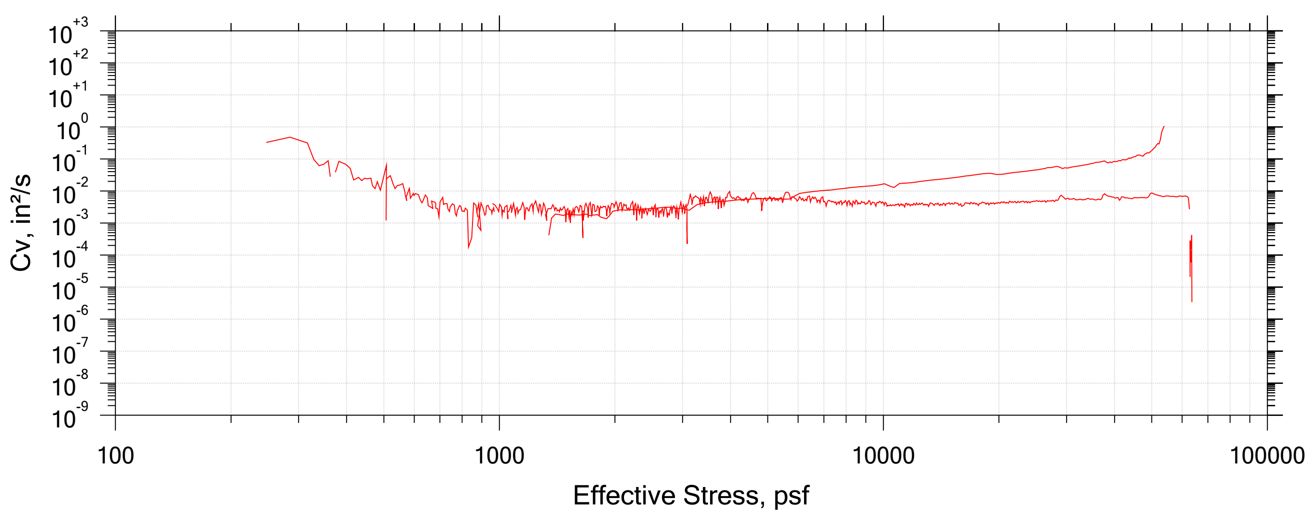
Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test.
Therefore, values may not represent actual values for the specimen.

GeoTesting EXPRESS	Project Name: Crossroads Phase 14	Location: Norridgewock,ME	Project Number: GTX-309940
	Boring Number: GB-21	Tester: md	Checker: njh
	Sample Number: 23-25	Test Date: 07/17/19	Depth: 23-25 ft
	Test Number: CRC-9	Preparation: intact	Elevation: ---
	Description: Moist, dark gray clay		
	Remarks: System W		

CRC Test

Summary

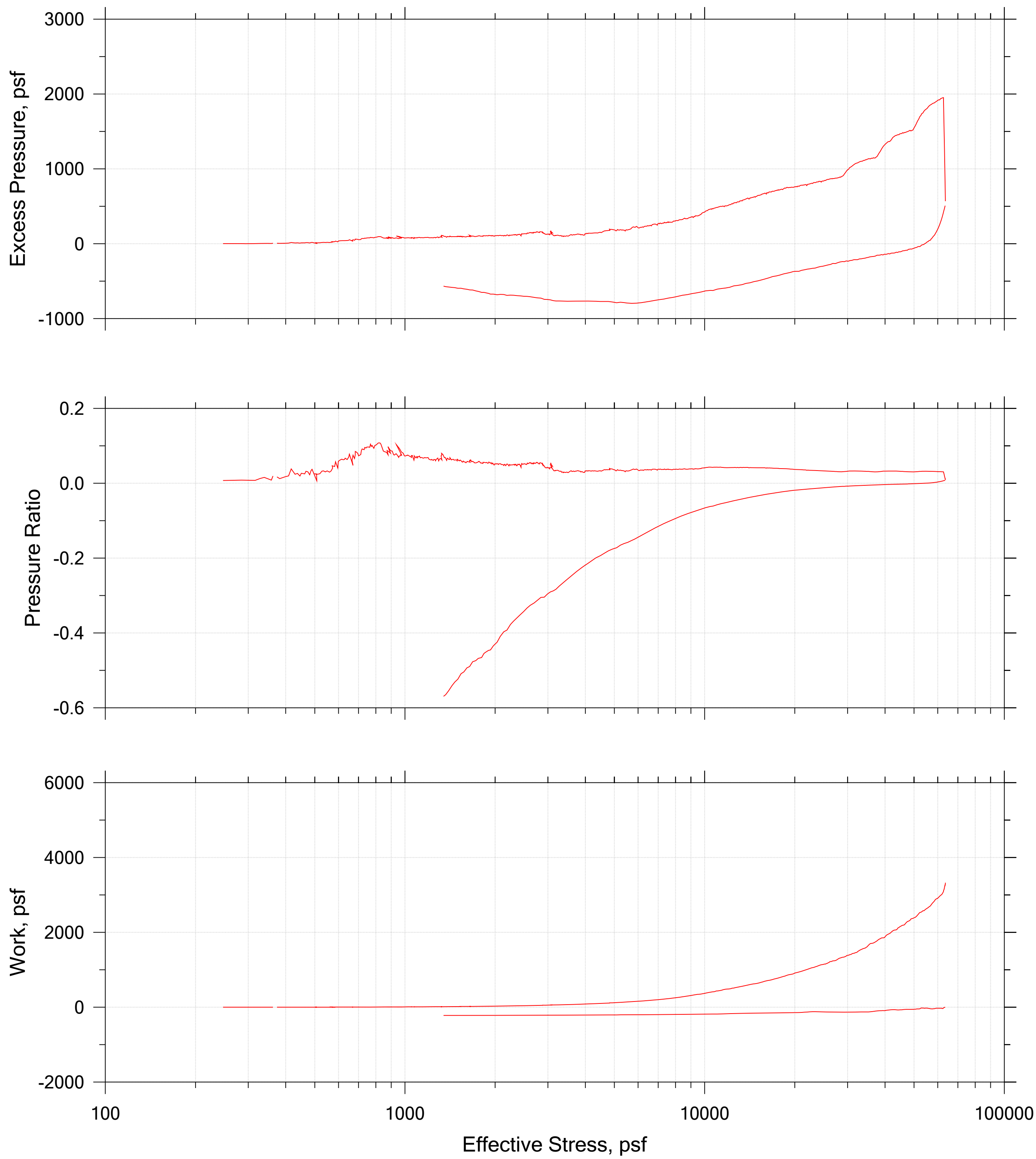




GeoTesting EXPRESS	Project Name: Crossroads Phase 14	Location: Norridgewock, ME	Project Number: GTX-309940
	Boring Number: GB-14	Tester: md	Checker: njh
	Sample Number: 9-11	Test Date: 07/17/19	Depth: 9-11 ft
	Test Number: CRC-10	Preparation: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: System F		
			Page 1 of 3

CRC Test

Pressure Curves



GeoTesting EXPRESS	Project Name: Crossroads Phase 14	Location: Norridgewock, ME	Project Number: GTX-309940
	Boring Number: GB-14	Tester: md	Checker: njh
	Sample Number: 9-11	Test Date: 07/17/19	Depth: 9-11 ft
	Test Number: CRC-10	Preparation: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: System F		

CRC Test

Specimen Diameter, in: 2.50	Specific Gravity: 2.74 (Estimated)	Liquid Limit: 31
Specimen Height, in: 1.00	Initial Void Ratio: 0.788	Plastic Limit: 19
Final Height, in: 0.88	Final Void Ratio: 0.573	Plasticity Index: 12

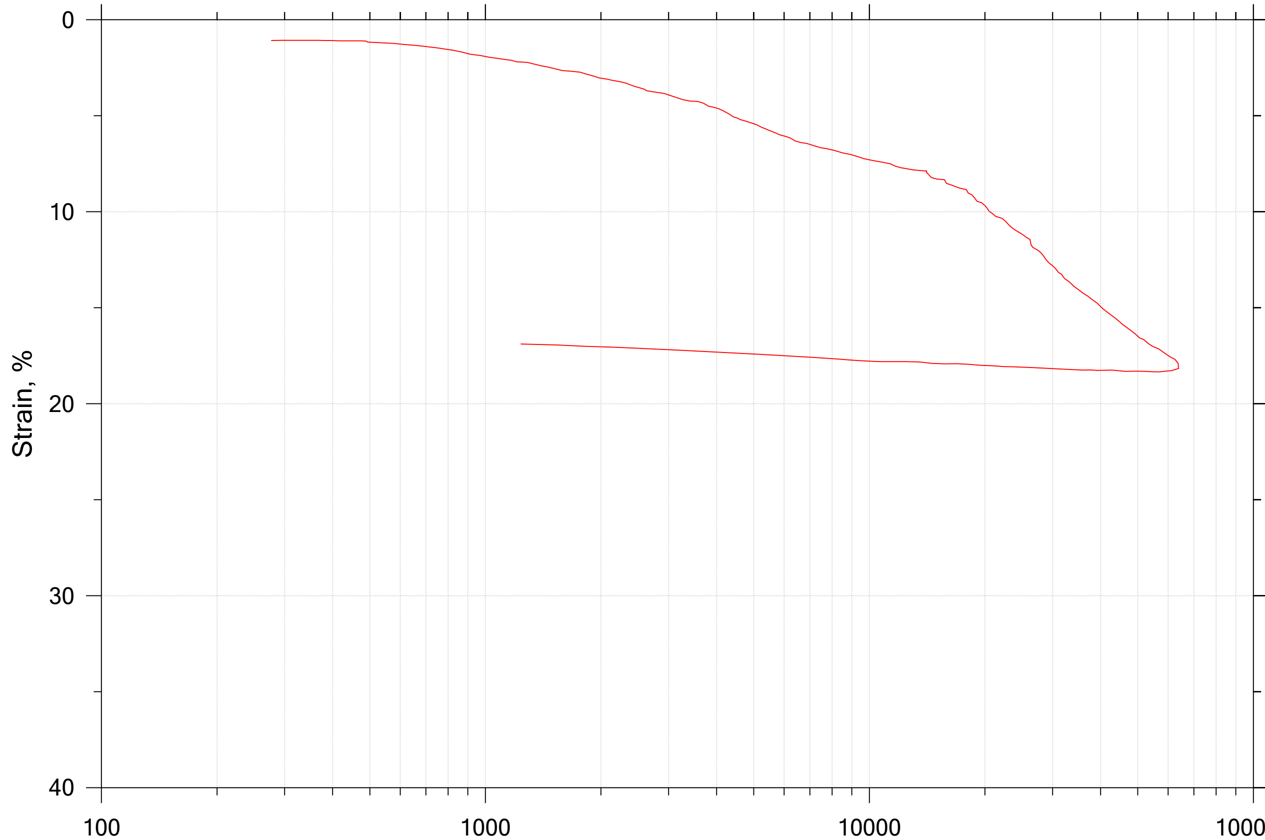
	Before Test Trimmings	Before Test Specimen	After Test Specimen	After Test Trimmings
Container ID	B-2466	---		B-2342
Mass Container, gm	9.17	108.37	108.37	9.09
Mass Container + Wet Soil, gm	129.02	267.01	257.47	156.63
Mass Container + Dry Soil, gm	102.06	231.68	231.68	131.11
Mass Dry Soil, gm	92.89	123.31	123.31	122.02
Water Content, %	29.02	28.65	20.91	20.91
Void Ratio	---	0.79	0.57	---
Degree of Saturation, %	---	99.68	100.00	---
Dry Unit Weight, pcf	---	95.699	108.75	---

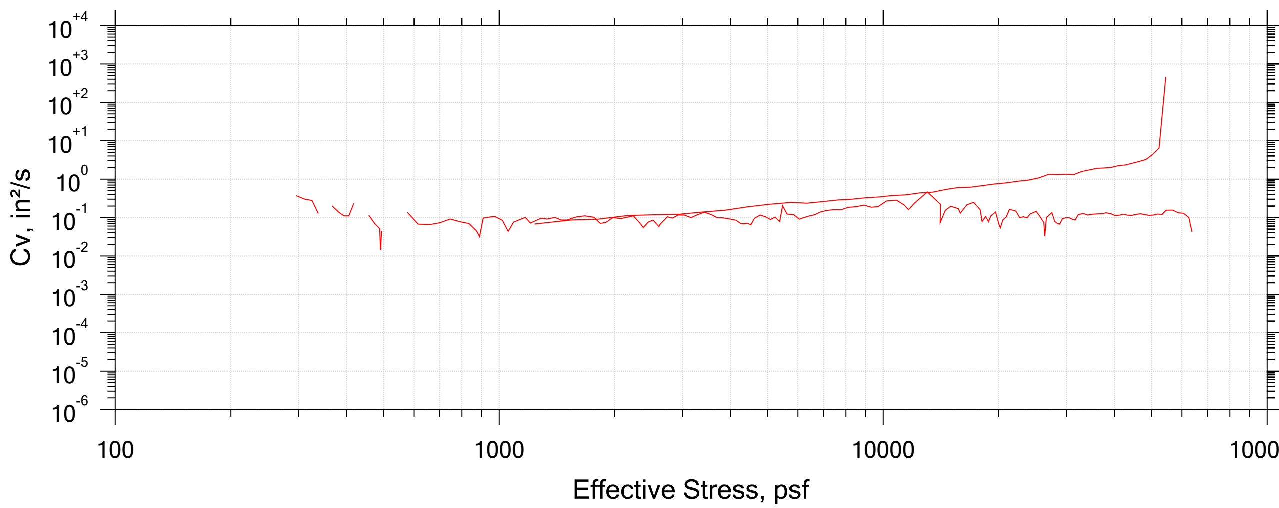
Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test.
Therefore, values may not represent actual values for the specimen.

Project Name: Crossroads Phase 14	Location: Norridgewock, ME	Project Number: GTX-309940
Boring Number: GB-14	Tester: md	Checker: njh
Sample Number: 9-11	Test Date: 07/17/19	Depth: 9-11 ft
Test Number: CRC-10	Preparation: intact	Elevation: ---
Description: Moist, gray clay		
Remarks: System F		

CRC Test

Summary

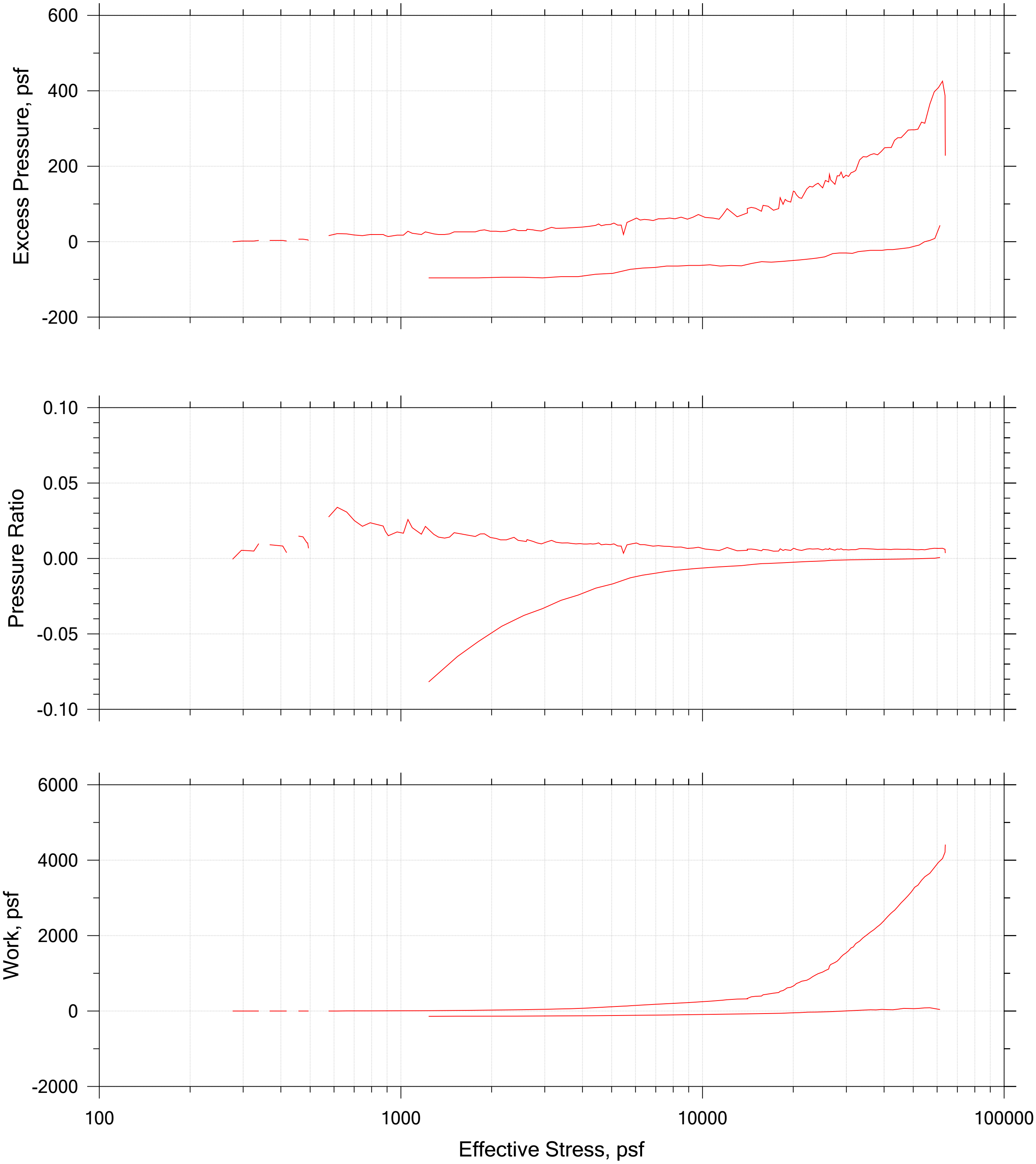




GeoTesting EXPRESS	Project Name: Crossroads Phase 14	Location: Norridgewock, ME	Project Number: GTX-309940
	Boring Number: GB-13	Tester: md	Checker: njh
	Sample Number: 17-19	Test Date: 07/18/19	Depth: 17-19 ft
	Test Number: CRC-11	Preparation: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: System W		

CRC Test

Pressure Curves



GeoTesting EXPRESS	Project Name: Crossroads Phase 14	Location: Norridgewock, ME	Project Number: GTX-309940
	Boring Number: GB-13	Tester: md	Checker: njh
	Sample Number: 17-19	Test Date: 07/18/19	Depth: 17-19 ft
	Test Number: CRC-11	Preparation: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: System W		

CRC Test

Specimen Diameter, in: 2.50	Specific Gravity: 2.74 (Estimated)	Liquid Limit: 31
Specimen Height, in: 1.00	Initial Void Ratio: 0.847	Plastic Limit: 20
Final Height, in: 0.89	Final Void Ratio: 0.644	Plasticity Index: 11

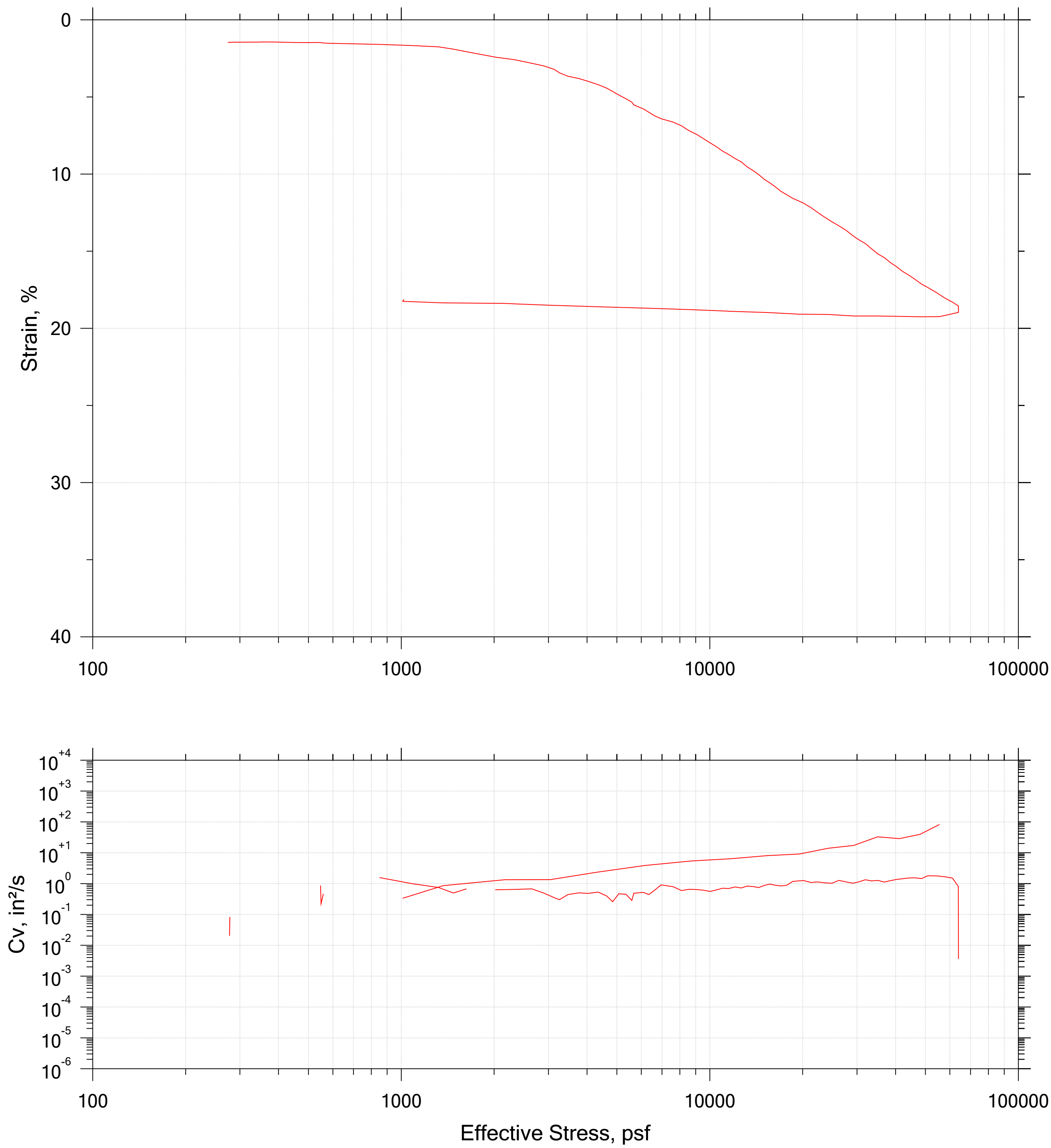
	Before Test Trimmings	Before Test Specimen	After Test Specimen	After Test Trimmings
Container ID	A-3000	---		A-2343
Mass Container, gm	8.29	110.87	110.87	8.16
Mass Container + Wet Soil, gm	189.57	266.59	258.04	154.76
Mass Container + Dry Soil, gm	146.48	230	230	126.83
Mass Dry Soil, gm	138.19	119.13	119.13	118.67
Water Content, %	31.18	30.71	23.54	23.54
Void Ratio	---	0.85	0.64	---
Degree of Saturation, %	---	99.19	100.00	---
Dry Unit Weight, pcf	---	92.456	103.88	---

Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test.
Therefore, values may not represent actual values for the specimen.

Project Name: Crossroads Phase 14	Location: Norridgewock, ME	Project Number: GTX-309940
Boring Number: GB-13	Tester: md	Checker: njh
Sample Number: 17-19	Test Date: 07/18/19	Depth: 17-19 ft
Test Number: CRC-11	Preparation: intact	Elevation: ---
Description: Moist, gray clay		
Remarks: System W		

CRC Test

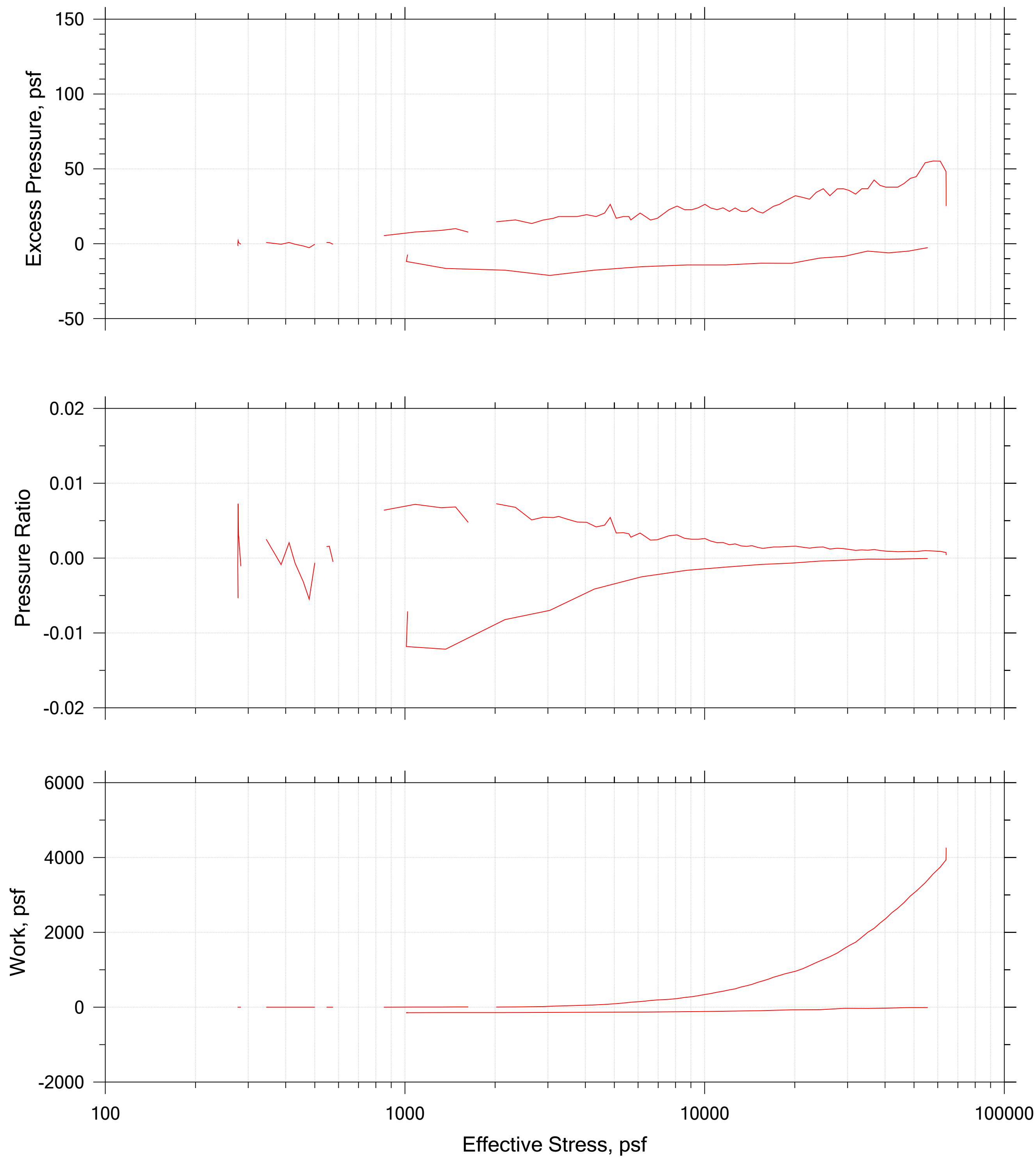
Summary



GeoTesting EXPRESS	Project Name: Crossroads Phase 14	Location: Norridgewock, ME	Project Number: GTX-309940
	Boring Number: GB-07	Tester: md	Checker: njh
	Sample Number: 17-19	Test Date: 07/18/19	Depth: 17-19 ft
	Test Number: CRC-12	Preparation: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: System JJ		

CRC Test

Pressure Curves



GeoTesting EXPRESS	Project Name: Crossroads Phase 14	Location: Norridgewock, ME	Project Number: GTX-309940
	Boring Number: GB-07	Tester: md	Checker: njh
	Sample Number: 17-19	Test Date: 07/18/19	Depth: 17-19 ft
	Test Number: CRC-12	Preparation: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: System JJ		

CRC Test

Specimen Diameter, in: 2.50	Specific Gravity: 2.76 (Estimated)	Liquid Limit: 28
Specimen Height, in: 1.00	Initial Void Ratio: 0.898	Plastic Limit: 17
Final Height, in: 0.82	Final Void Ratio: 0.557	Plasticity Index: 11

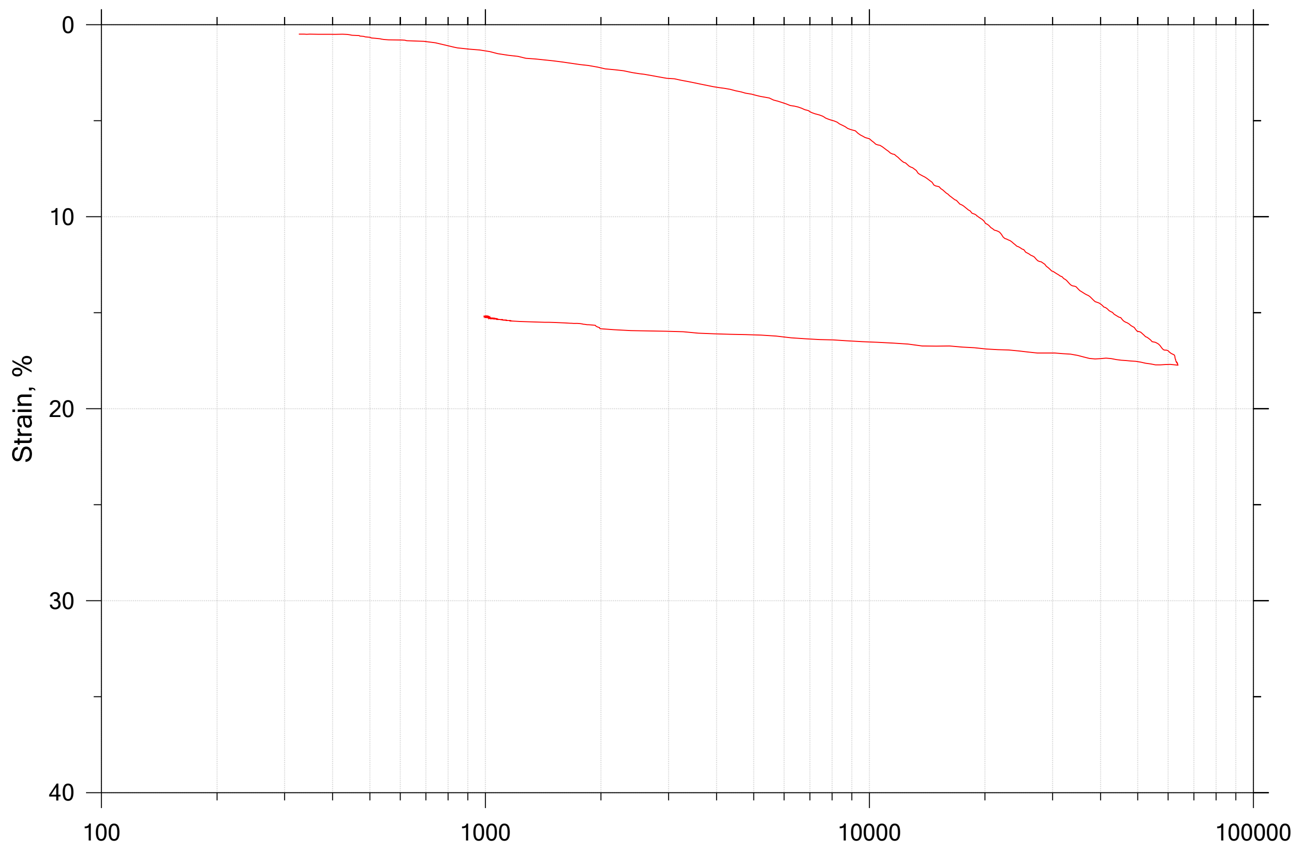
	Before Test Trimmings	Before Test Specimen	After Test Specimen	After Test Trimmings
Container ID	C-2604	---		C-130
Mass Container, gm	8.39	110.46	110.46	8.44
Mass Container + Wet Soil, gm	152.11	265.18	250.83	150.25
Mass Container + Dry Soil, gm	118.3	227.24	227.24	126.42
Mass Dry Soil, gm	109.91	116.78	116.78	117.98
Water Content, %	30.76	32.49	20.20	20.20
Void Ratio	---	0.90	0.56	---
Degree of Saturation, %	---	99.66	100.00	---
Dry Unit Weight, pcf	---	90.632	110.53	---

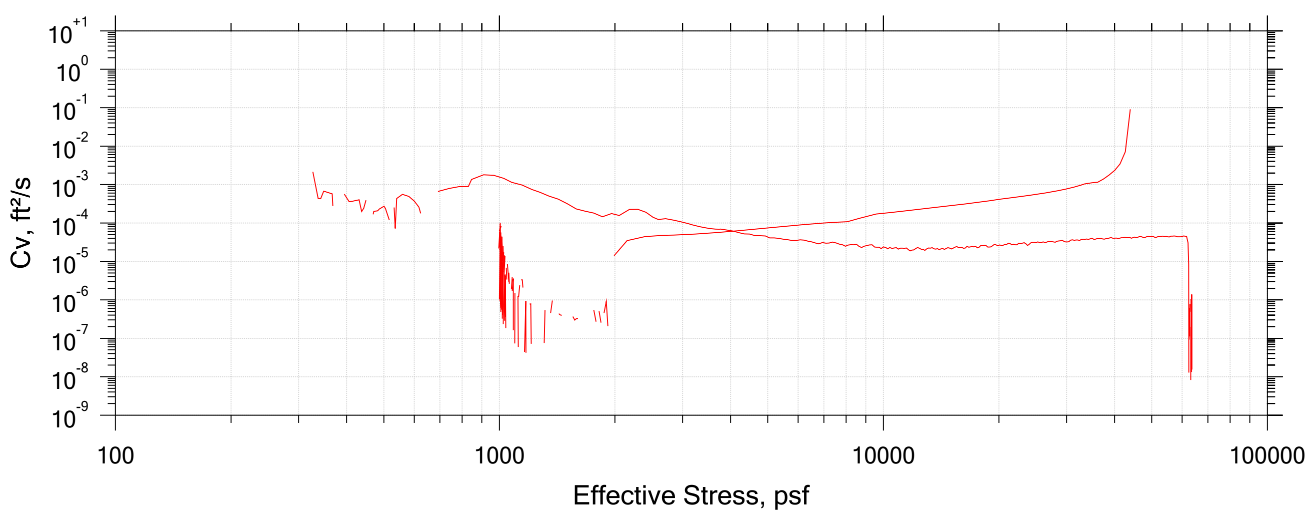
Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test.
Therefore, values may not represent actual values for the specimen.

Project Name: Crossroads Phase 14	Location: Norridgewock, ME	Project Number: GTX-309940
Boring Number: GB-07	Tester: md	Checker: njh
Sample Number: 17-19	Test Date: 07/18/19	Depth: 17-19 ft
Test Number: CRC-12	Preparation: intact	Elevation: ---
Description: Moist, gray clay		
Remarks: System JJ		

CRC Test

Summary

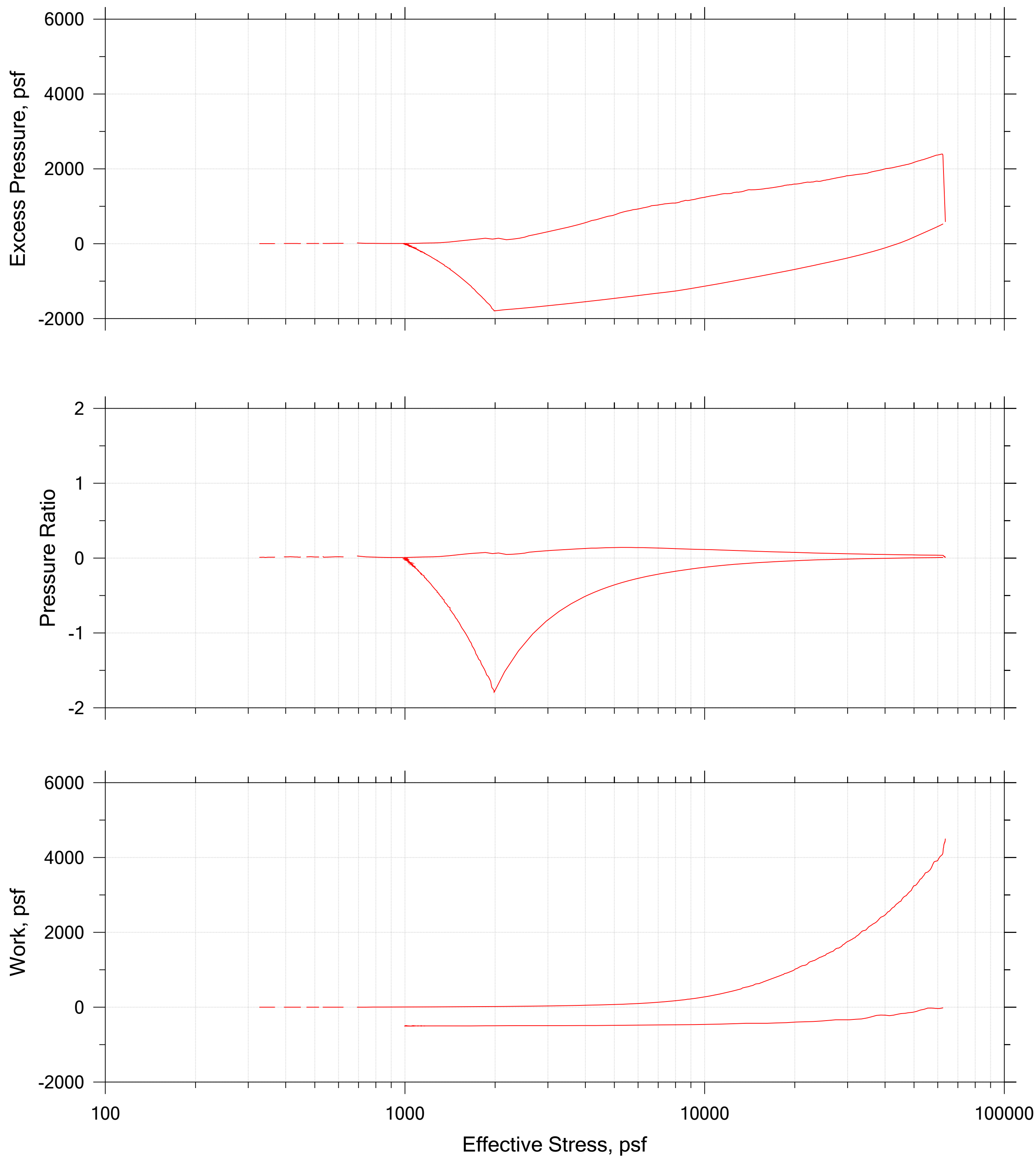




GeoTesting EXPRESS			
	Project Name: Crossroads Phase 14	Location: Norridgewock, ME	Project Number: GTX-309940
	Boring Number: GB-18	Tester: md	Checker: njh
	Sample Number: 17-19	Test Date: 07/22/19	Depth: 17-19 ft
	Test Number: CRC-13	Preparation: intact	Elevation: ---
	Description: Moist, dark olive gray clay		
	Remarks: System S		
			Page 1 of 3

CRC Test

Pressure Curves



GeoTesting EXPRESS	Project Name: Crossroads Phase 14	Location: Norridgewock, ME	Project Number: GTX-309940
	Boring Number: GB-18	Tester: md	Checker: njh
	Sample Number: 17-19	Test Date: 07/22/19	Depth: 17-19 ft
	Test Number: CRC-13	Preparation: intact	Elevation: ---
	Description: Moist, dark olive gray clay		
	Remarks: System S		

CRC Test

Specimen Diameter, in: 2.50	Specific Gravity: 2.77 (Estimated)	Liquid Limit: 34
Specimen Height, in: 1.00	Initial Void Ratio: 0.773	Plastic Limit: 19
Final Height, in: 0.89	Final Void Ratio: 0.578	Plasticity Index: 15

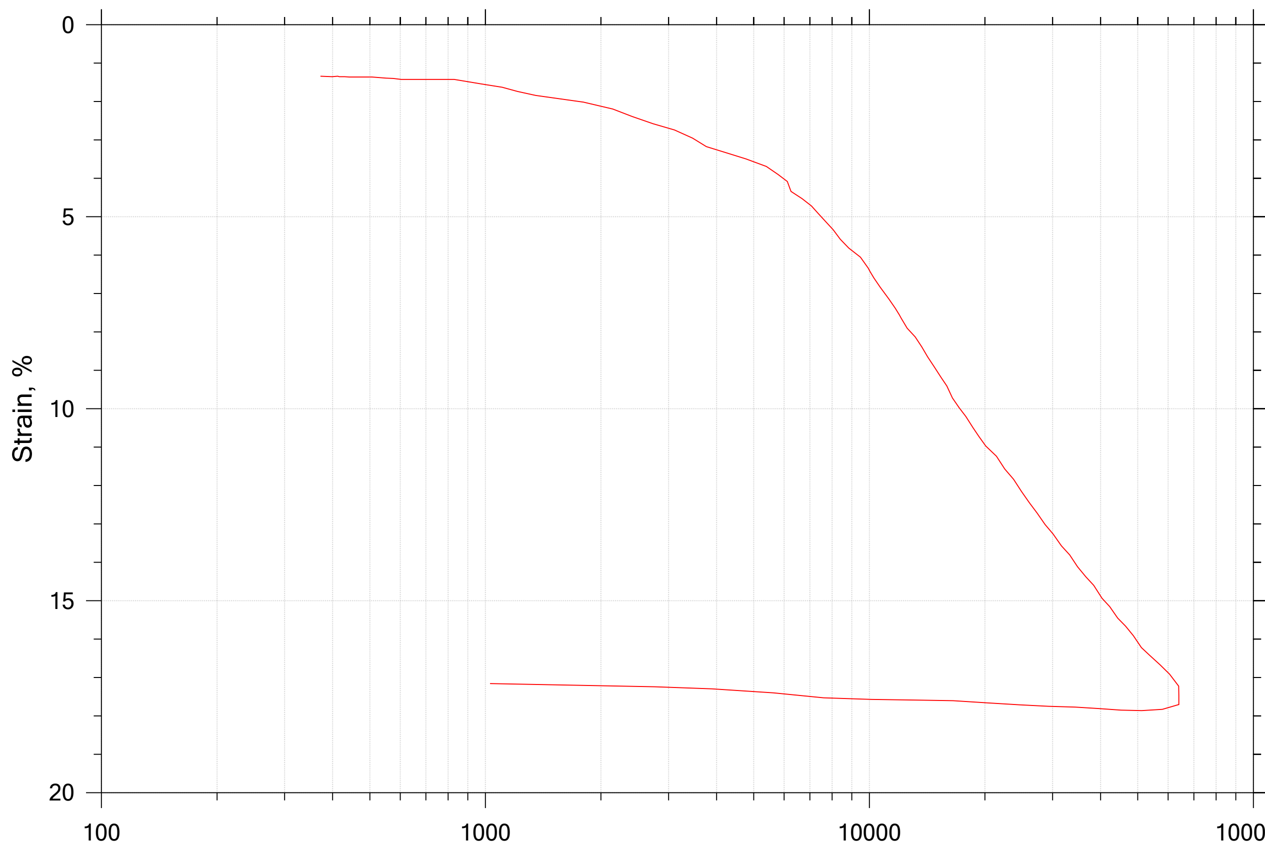
	Before Test Trimmings	Before Test Specimen	After Test Specimen	After Test Trimmings
Container ID	D-1659	---		B-2243
Mass Container, gm	8.19	110.42	110.42	8.23
Mass Container + Wet Soil, gm	114.32	270.82	262.17	159.66
Mass Container + Dry Soil, gm	90.55	235.95	235.95	133.5
Mass Dry Soil, gm	82.36	125.53	125.53	125.27
Water Content, %	28.86	27.77	20.88	20.88
Void Ratio	---	0.77	0.58	---
Degree of Saturation, %	---	99.43	100.00	---
Dry Unit Weight, pcf	---	97.425	109.47	---

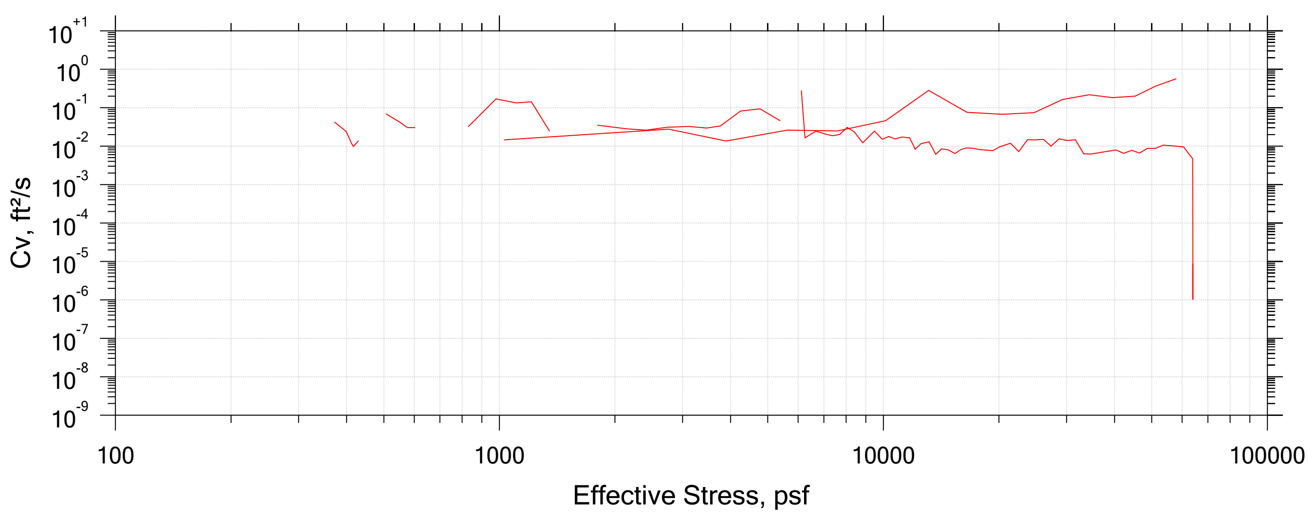
Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test.
Therefore, values may not represent actual values for the specimen.

GeoTesting EXPRESS			
	Project Name: Crossroads Phase 14	Location: Norridgewock, ME	Project Number: GTX-309940
	Boring Number: GB-18	Tester: md	Checker: njh
	Sample Number: 17-19	Test Date: 07/22/19	Depth: 17-19 ft
	Test Number: CRC-13	Preparation: intact	Elevation: ---
	Description: Moist, dark olive gray clay		
	Remarks: System S		

CRC Test

Summary

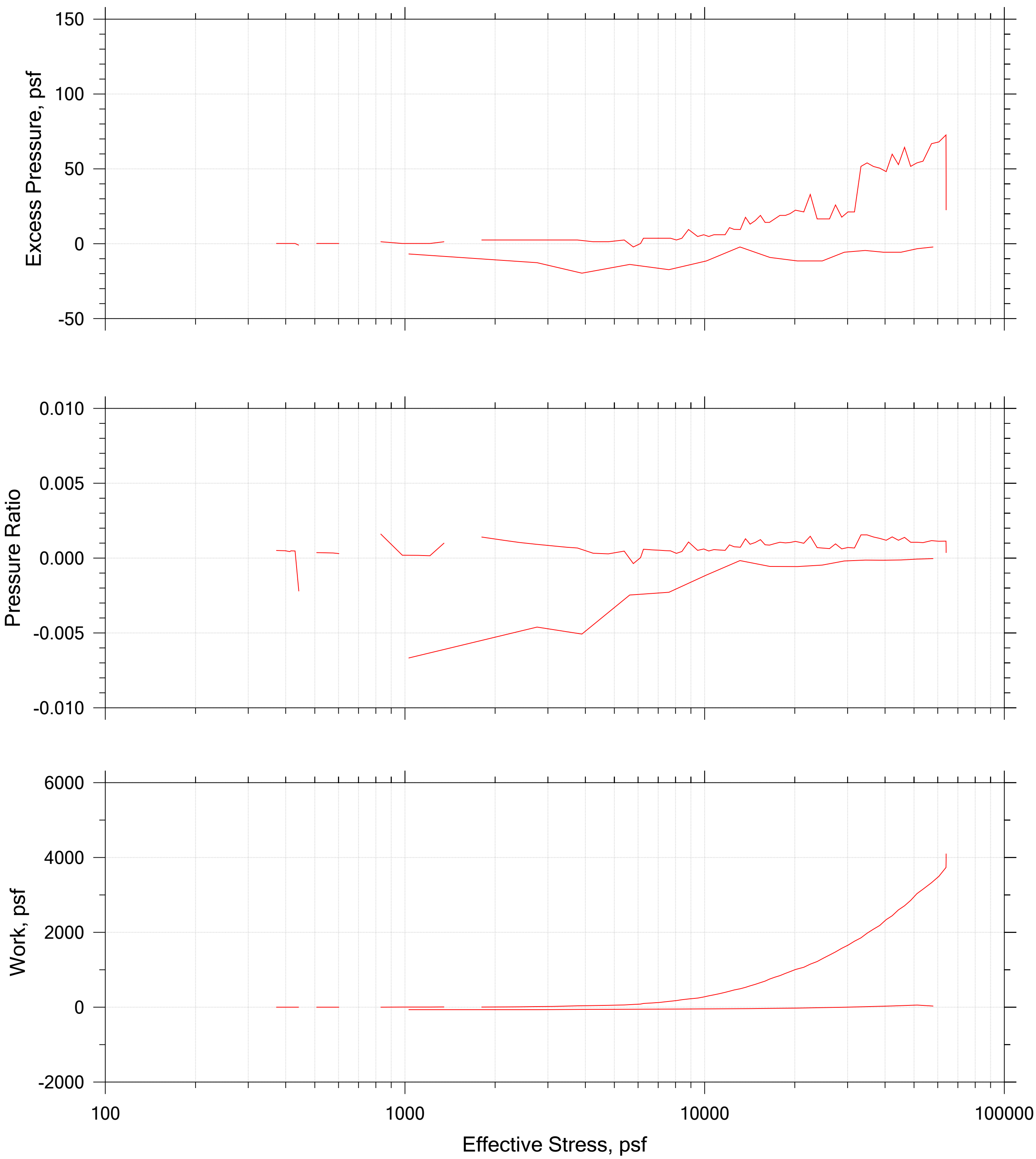




GeoTesting EXPRESS	Project Name: Crossroads Phase 14	Location: Norridgewock, ME	Project Number: GTX-309940
	Boring Number: GB-05	Tester: md	Checker: njh
	Sample Number: 31-33	Test Date: 07/23/19	Depth: 31-33 ft
	Test Number: CRC-14	Preparation: intact	Elevation: ---
	Description: Wet, gray clay		
	Remarks: System R		
			Page 1 of 3

CRC Test

Pressure Curves



GeoTesting EXPRESS	Project Name: Crossroads Phase 14	Location: Norridgewock, ME	Project Number: GTX-309940
	Boring Number: GB-05	Tester: md	Checker: njh
	Sample Number: 31-33	Test Date: 07/23/19	Depth: 31-33 ft
	Test Number: CRC-14	Preparation: intact	Elevation: ---
	Description: Wet, gray clay		
	Remarks: System R		

CRC Test

Specimen Diameter, in: 2.50	Specific Gravity: 2.75 (Estimated)	Liquid Limit: 28
Specimen Height, in: 1.00	Initial Void Ratio: 0.843	Plastic Limit: 18
Final Height, in: 0.86	Final Void Ratio: 0.585	Plasticity Index: 10

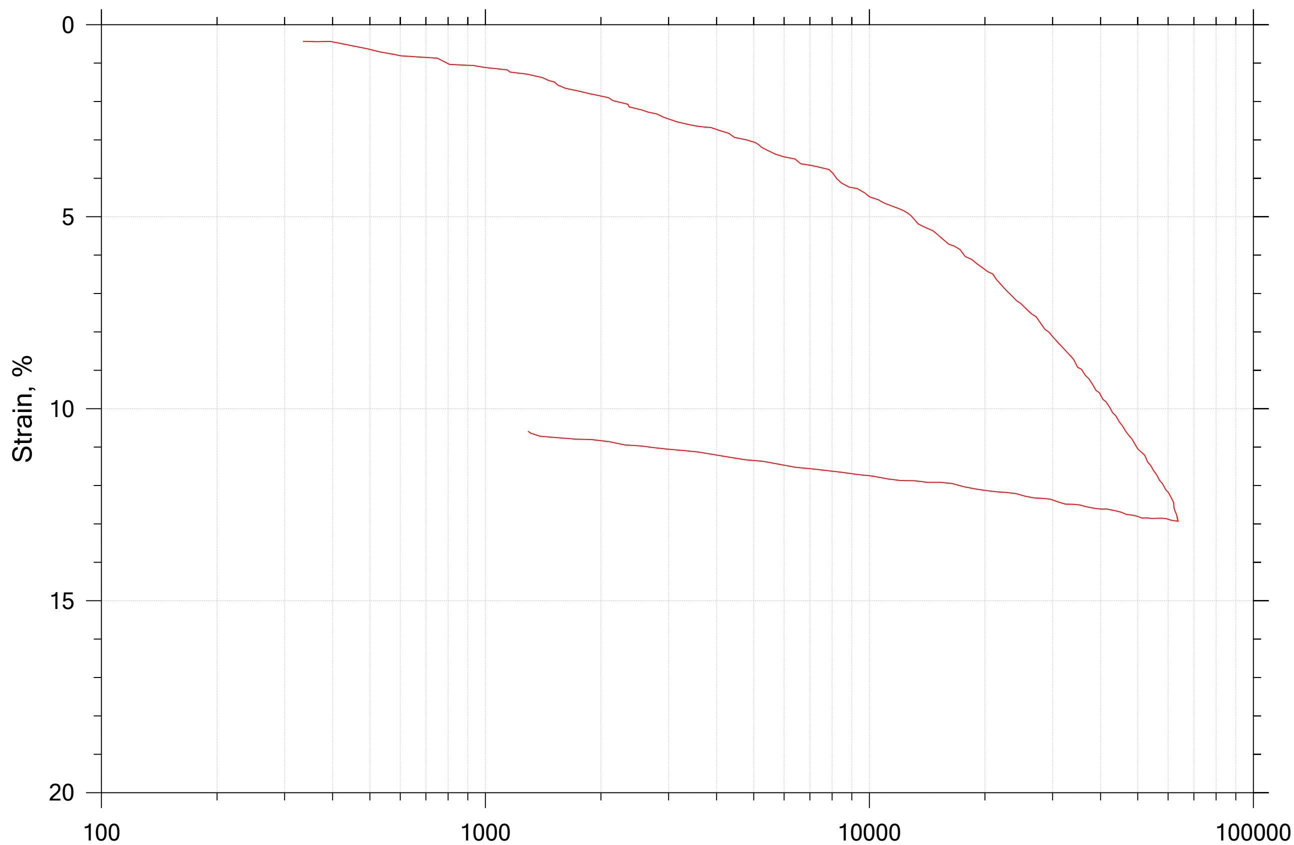
	Before Test Trimmings	Before Test Specimen	After Test Specimen	After Test Trimmings
Container ID	D-2450	---		A-2283
Mass Container, gm	0.44	109.79	109.79	8.26
Mass Container + Wet Soil, gm	237.92	266.7	255.5	153.1
Mass Container + Dry Soil, gm	182.03	229.97	229.97	127.72
Mass Dry Soil, gm	181.59	120.18	120.18	119.46
Water Content, %	30.78	30.57	21.25	21.25
Void Ratio	---	0.84	0.58	---
Degree of Saturation, %	---	99.83	100.00	---
Dry Unit Weight, pcf	---	93.268	108.45	---

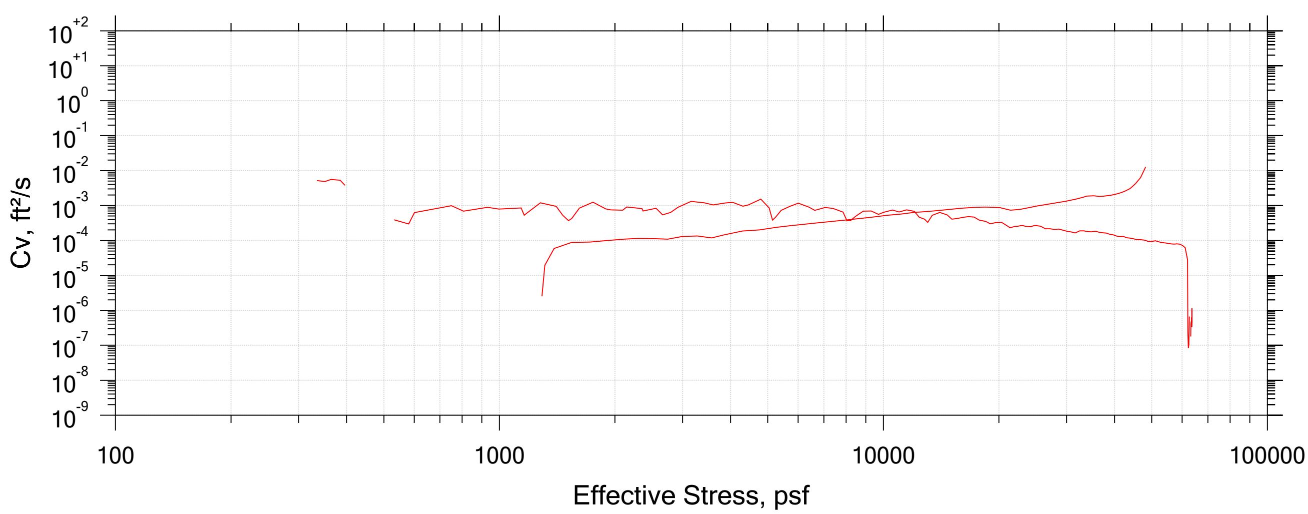
Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test.
Therefore, values may not represent actual values for the specimen.

GeoTesting EXPRESS	Project Name: Crossroads Phase 14	Location: Norridgewock, ME	Project Number: GTX-309940
	Boring Number: GB-05	Tester: md	Checker: njh
	Sample Number: 31-33	Test Date: 07/23/19	Depth: 31-33 ft
	Test Number: CRC-14	Preparation: intact	Elevation: ---
	Description: Wet, gray clay		
	Remarks: System R		

CRC Test

Summary

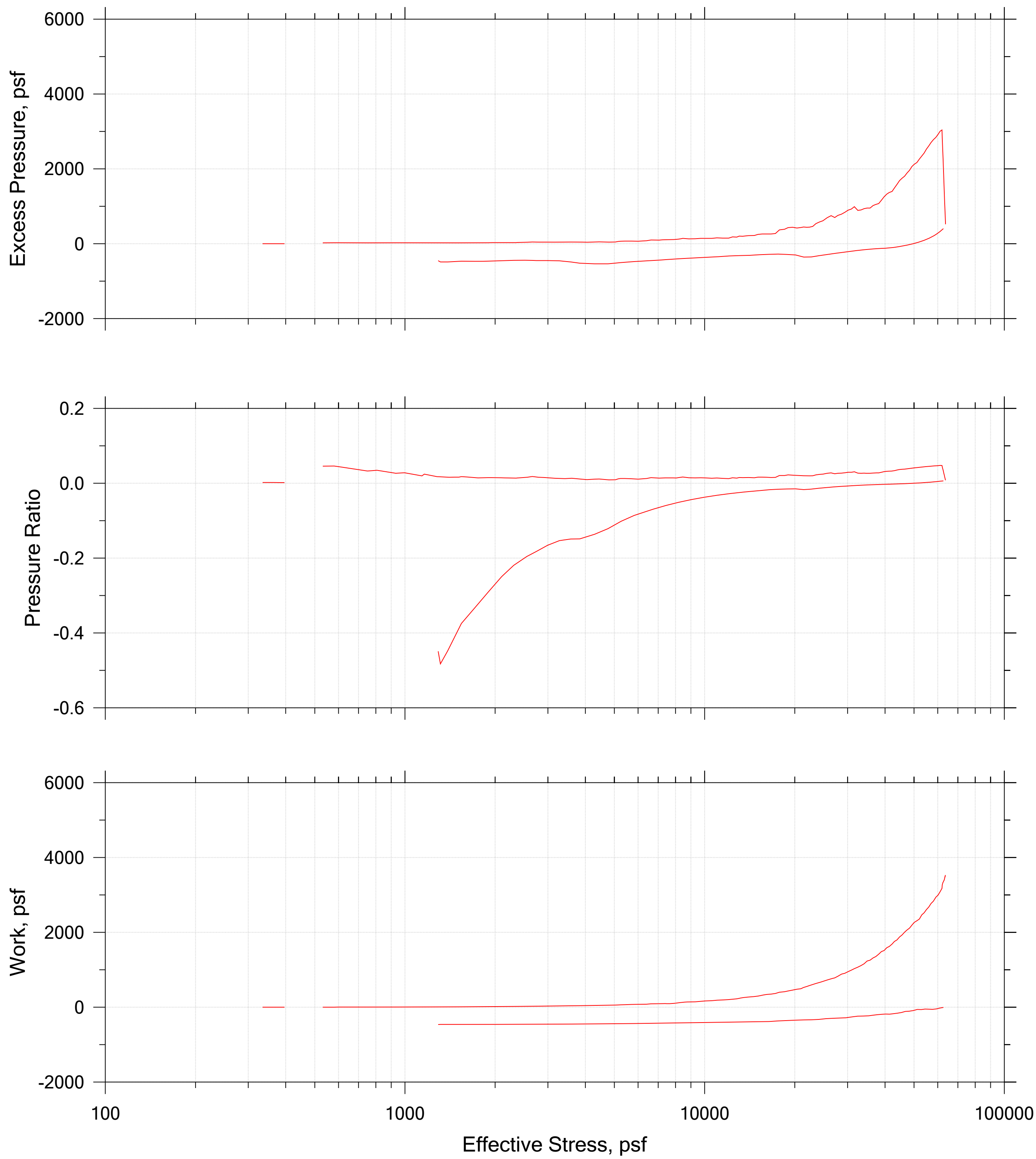




GeoTesting EXPRESS			
	Project Name: Crossroads Phase 14	Location: Norredgewock, ME	Project Number: GTX-309940
	Boring Number: GB-17B	Tester: md	Checker: njh
	Sample Number: 5-7	Test Date: 09/10/19	Depth: 5-7 ft
	Test Number: CRC-16	Preparation: intact	Elevation: ---
	Description: Moist, dark gray clay		
	Remarks: System S		
			Page 1 of 3

CRC Test

Pressure Curves



GeoTesting EXPRESS	Project Name: Crossroads Phase 14	Location: Norredgewock, ME	Project Number: GTX-309940
	Boring Number: GB-17B	Tester: md	Checker: njh
	Sample Number: 5-7	Test Date: 09/10/19	Depth: 5-7 ft
	Test Number: CRC-16	Preparation: intact	Elevation: ---
	Description: Moist, dark gray clay		
	Remarks: System S		

CRC Test

Specimen Diameter, in: 2.50	Specific Gravity: 2.70 (Estimated)	Liquid Limit: 30
Specimen Height, in: 1.00	Initial Void Ratio: 0.755	Plastic Limit: 18
Final Height, in: 0.94	Final Void Ratio: 0.65	Plasticity Index: 12

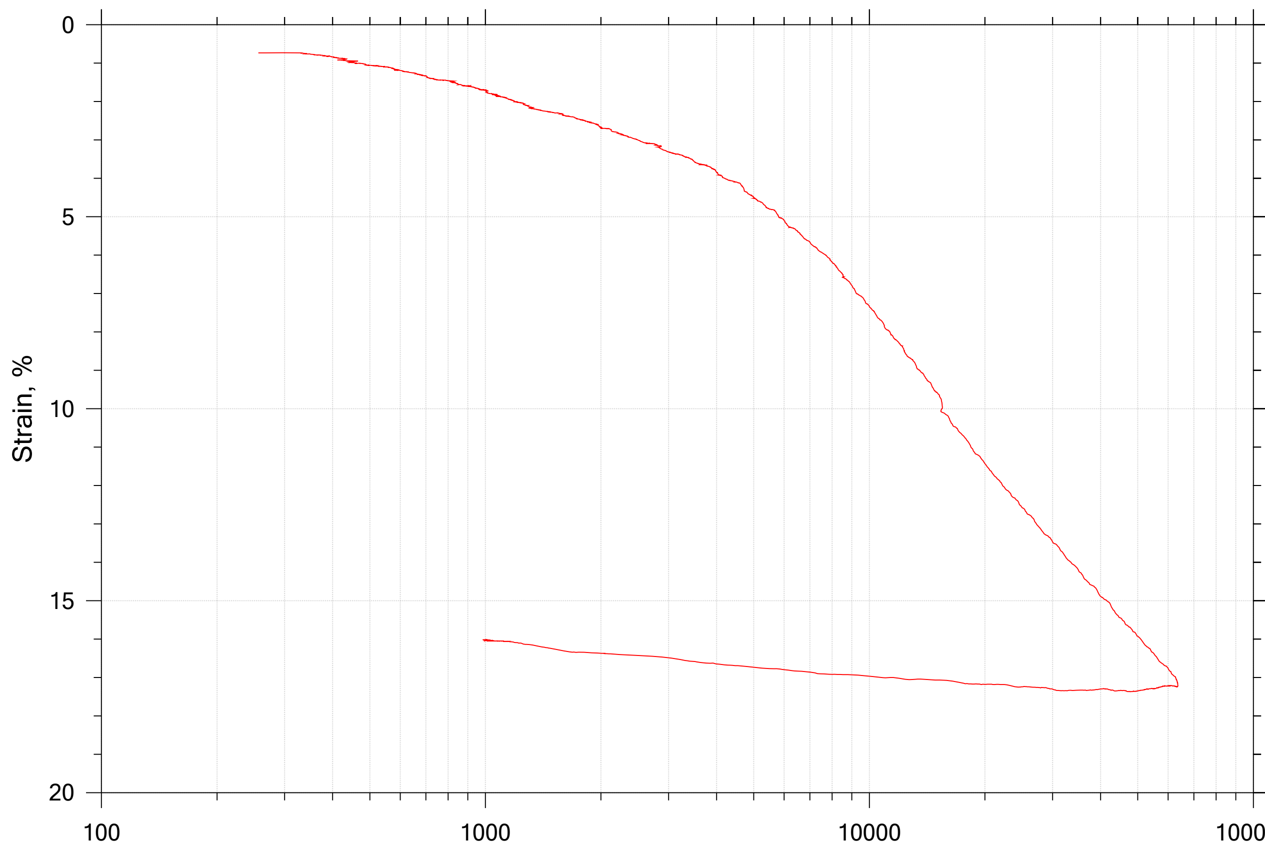
	Before Test Trimmings	Before Test Specimen	After Test Specimen	After Test Trimmings
Container ID	A-2881	---		C-406
Mass Container, gm	8.53	108.91	108.91	9.13
Mass Container + Wet Soil, gm	200.13	267.27	262.6	162.09
Mass Container + Dry Soil, gm	159.02	232.81	232.81	132.44
Mass Dry Soil, gm	150.49	123.9	123.9	123.31
Water Content, %	27.32	27.81	24.05	24.05
Void Ratio	---	0.76	0.65	---
Degree of Saturation, %	---	99.55	100.00	---
Dry Unit Weight, pcf	---	96.156	102.29	---

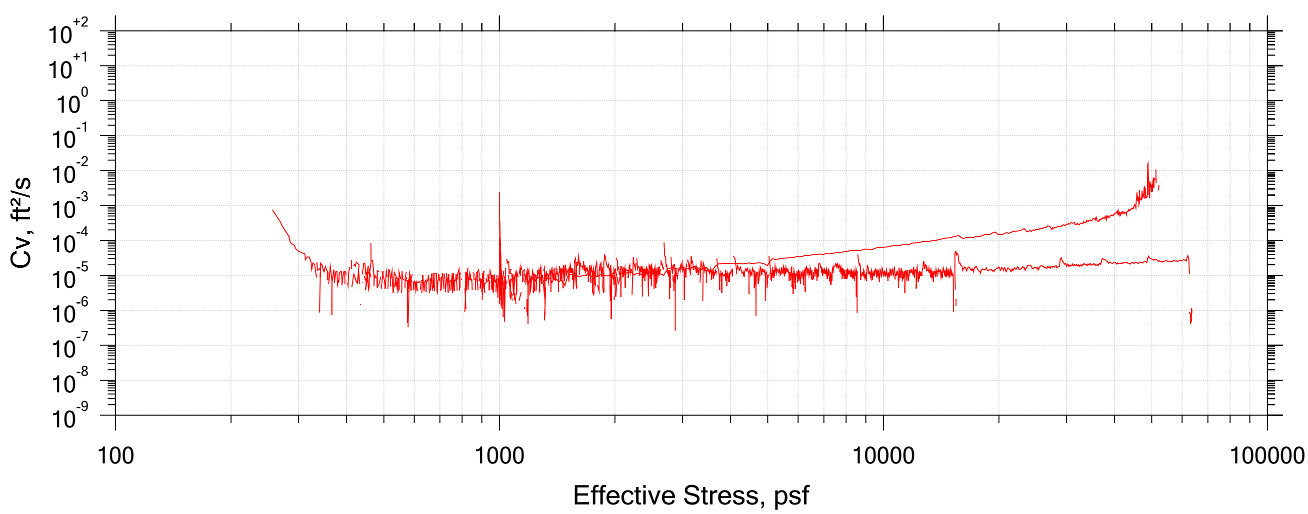
Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test.
Therefore, values may not represent actual values for the specimen.

Project Name: Crossroads Phase 14	Location: Norredgewock, ME	Project Number: GTX-309940
Boring Number: GB-17B	Tester: md	Checker: njh
Sample Number: 5-7	Test Date: 09/10/19	Depth: 5-7 ft
Test Number: CRC-16	Preparation: intact	Elevation: ---
Description: Moist, dark gray clay		
Remarks: System S		

CRC Test

Summary

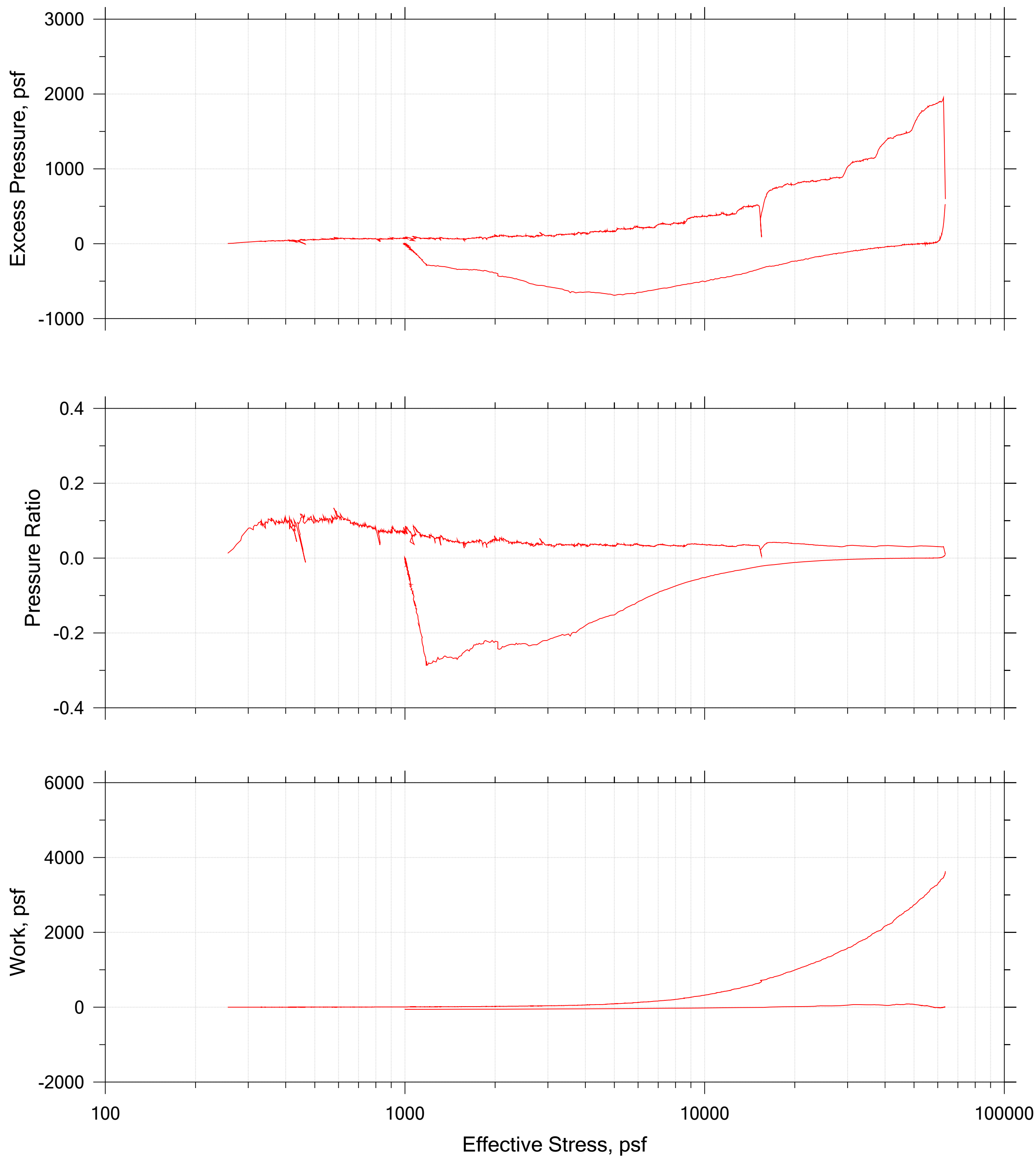




GeoTesting EXPRESS	Project Name: Crossroads Phase 14	Location: Norredgewock, ME	Project Number: GTX-309940
	Boring Number: GB-05	Tester: md	Checker: njh
	Sample Number: 31-33	Test Date: 09/10/19/19	Depth: 31-33 ft
	Test Number: CRC-17	Preparation: intact	Elevation: ---
	Description: Wet, gray clay		
	Remarks: System W		

CRC Test

Pressure Curves



GeoTesting EXPRESS	Project Name: Crossroads Phase 14	Location: Norredgewock, ME	Project Number: GTX-309940
	Boring Number: GB-05	Tester: md	Checker: njh
	Sample Number: 31-33	Test Date: 09/10/19/19	Depth: 31-33 ft
	Test Number: CRC-17	Preparation: intact	Elevation: ---
	Description: Wet, gray clay		
	Remarks: System W		
			Page 2 of 3

CRC Test

Specimen Diameter, in: 2.50	Specific Gravity: 2.75 (Estimated)	Liquid Limit: 28
Specimen Height, in: 1.00	Initial Void Ratio: 0.834	Plastic Limit: 19
Final Height, in: 0.86	Final Void Ratio: 0.578	Plasticity Index: 9

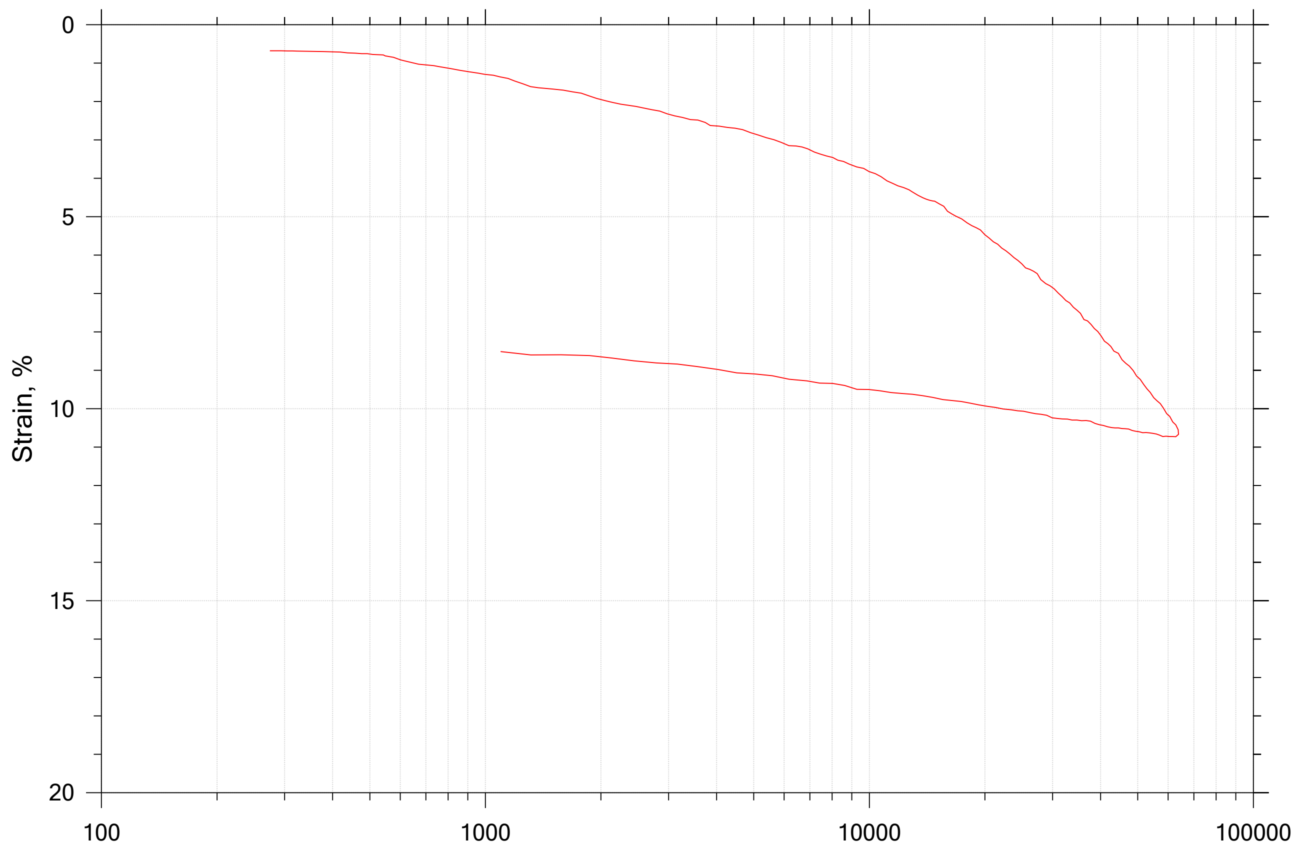
	Before Test Trimmings	Before Test Specimen	After Test Specimen	After Test Trimmings
Container ID	C-3033	---		C-2768
Mass Container, gm	9	110.49	110.49	9.03
Mass Container + Wet Soil, gm	230.81	267.08	256.61	154.99
Mass Container + Dry Soil, gm	179.55	231.28	231.28	129.69
Mass Dry Soil, gm	170.55	120.79	120.79	120.66
Water Content, %	30.06	29.64	20.97	20.97
Void Ratio	---	0.83	0.58	---
Degree of Saturation, %	---	97.84	100.00	---
Dry Unit Weight, pcf	---	93.745	109.01	---

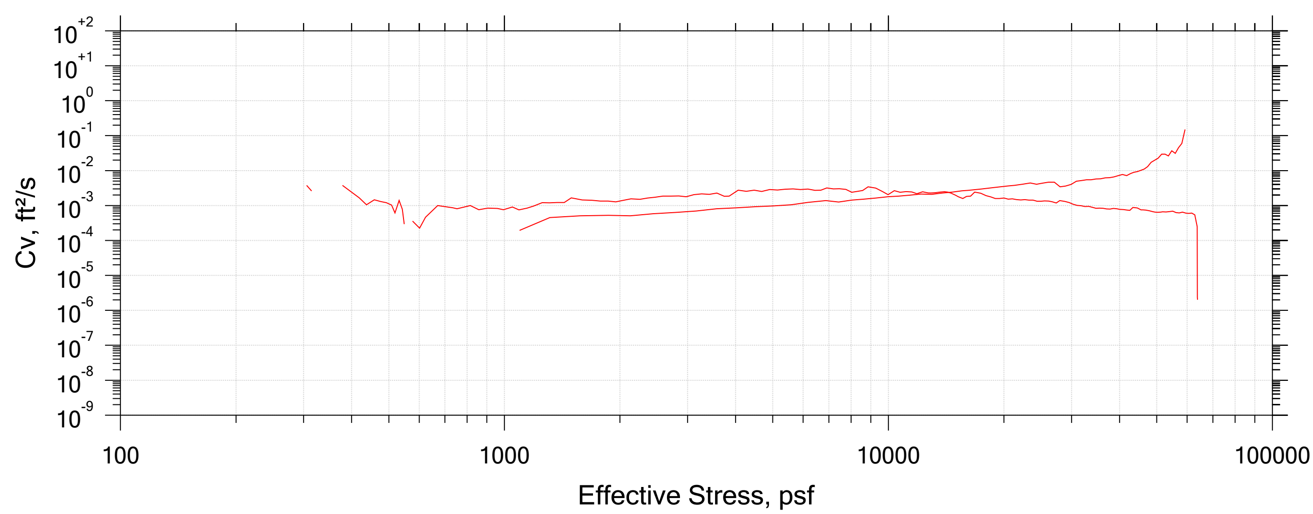
Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test.
Therefore, values may not represent actual values for the specimen.

GeoTesting EXPRESS			
	Project Name: Crossroads Phase 14	Location: Norredgewock, ME	Project Number: GTX-309940
	Boring Number: GB-05	Tester: md	Checker: njh
	Sample Number: 31-33	Test Date: 09/10/19/19	Depth: 31-33 ft
	Test Number: CRC-17	Preparation: intact	Elevation: ---
	Description: Wet, gray clay		
	Remarks: System W		

CRC Test

Summary

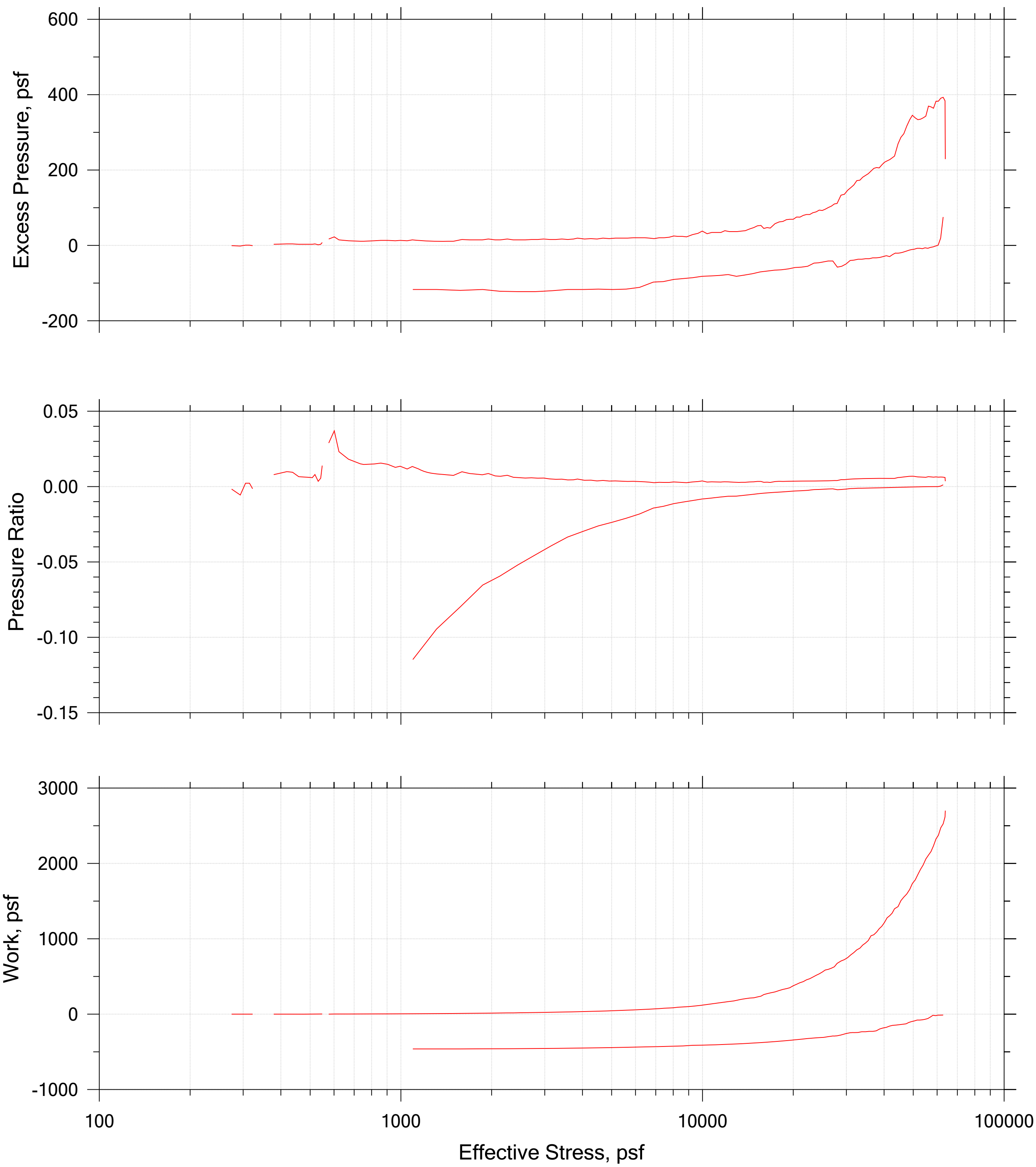




GeoTesting EXPRESS	Project Name: Crossroads Phase 14	Location: Norredgewock, ME	Project Number: GTX-309940
	Boring Number: GB-06	Tester: md/trm	Checker: njh
	Sample Number: 21-23	Test Date: 9/11/19	Depth: 21-23 ft
	Test Number: CRC-18	Preparation: intact	Elevation: ---
	Description: Moist, dark gray clay		
	Remarks: System S		
			Page 1 of 3

CRC Test

Pressure Curves



	Project Name: Crossroads Phase 14	Location: Norredgewock, ME	Project Number: GTX-309940
	Boring Number: GB-06	Tester: md/trm	Checker: njh
GeoTesting EXPRESS	Sample Number: 21-23	Test Date: 9/11/19	Depth: 21-23 ft
	Test Number: CRC-18	Preparation: intact	Elevation: ---
	Description: Moist, dark gray clay		
	Remarks: System S		
			Page 2 of 3

CRC Test

Specimen Diameter, in: 2.50	Specific Gravity: 2.74 (Estimated)	Liquid Limit: 34
Specimen Height, in: 1.00	Initial Void Ratio: 0.755	Plastic Limit: 20
Final Height, in: 0.93	Final Void Ratio: 0.632	Plasticity Index: 14

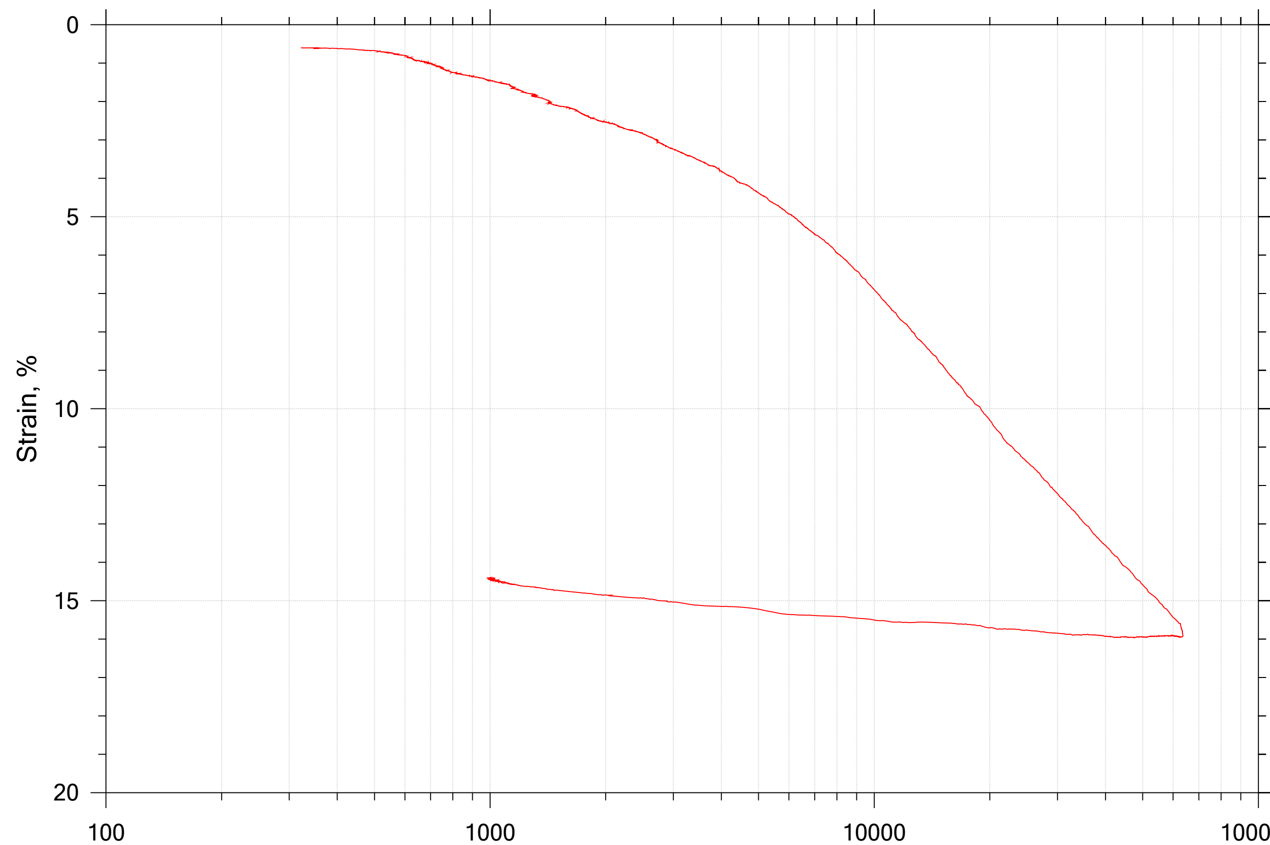
	Before Test Trimmings	Before Test Specimen	After Test Specimen	After Test Trimmings
Container ID	D2384	---		C-3065
Mass Container, gm	9.52	108.91	108.91	9.18
Mass Container + Wet Soil, gm	205.71	267.47	263.41	163.31
Mass Container + Dry Soil, gm	164.52	234.44	234.44	134.41
Mass Dry Soil, gm	155	125.53	125.53	125.23
Water Content, %	26.57	26.31	23.08	23.08
Void Ratio	---	0.75	0.63	---
Degree of Saturation, %	---	95.46	100.00	---
Dry Unit Weight, pcf	---	97.422	104.76	---

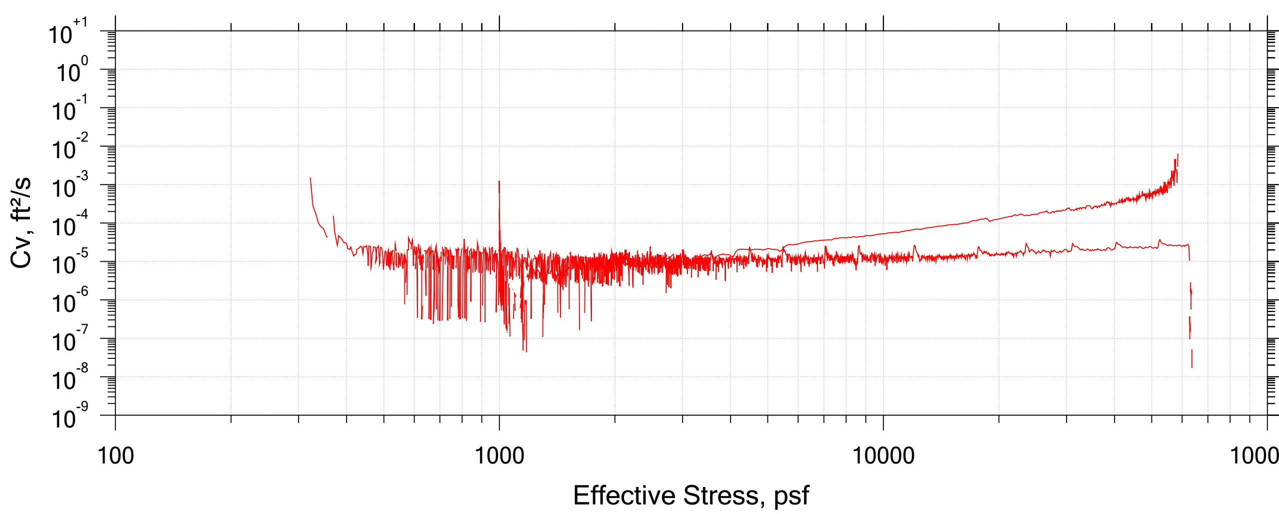
Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test.
Therefore, values may not represent actual values for the specimen.

GeoTesting EXPRESS			
	Project Name: Crossroads Phase 14	Location: Norredgewock, ME	Project Number: GTX-309940
	Boring Number: GB-06	Tester: md/trm	Checker: njh
	Sample Number: 21-23	Test Date: 9/11/19	Depth: 21-23 ft
	Test Number: CRC-18	Preparation: intact	Elevation: ---
	Description: Moist, dark gray clay		
	Remarks: System S		

CRC Test

Summary

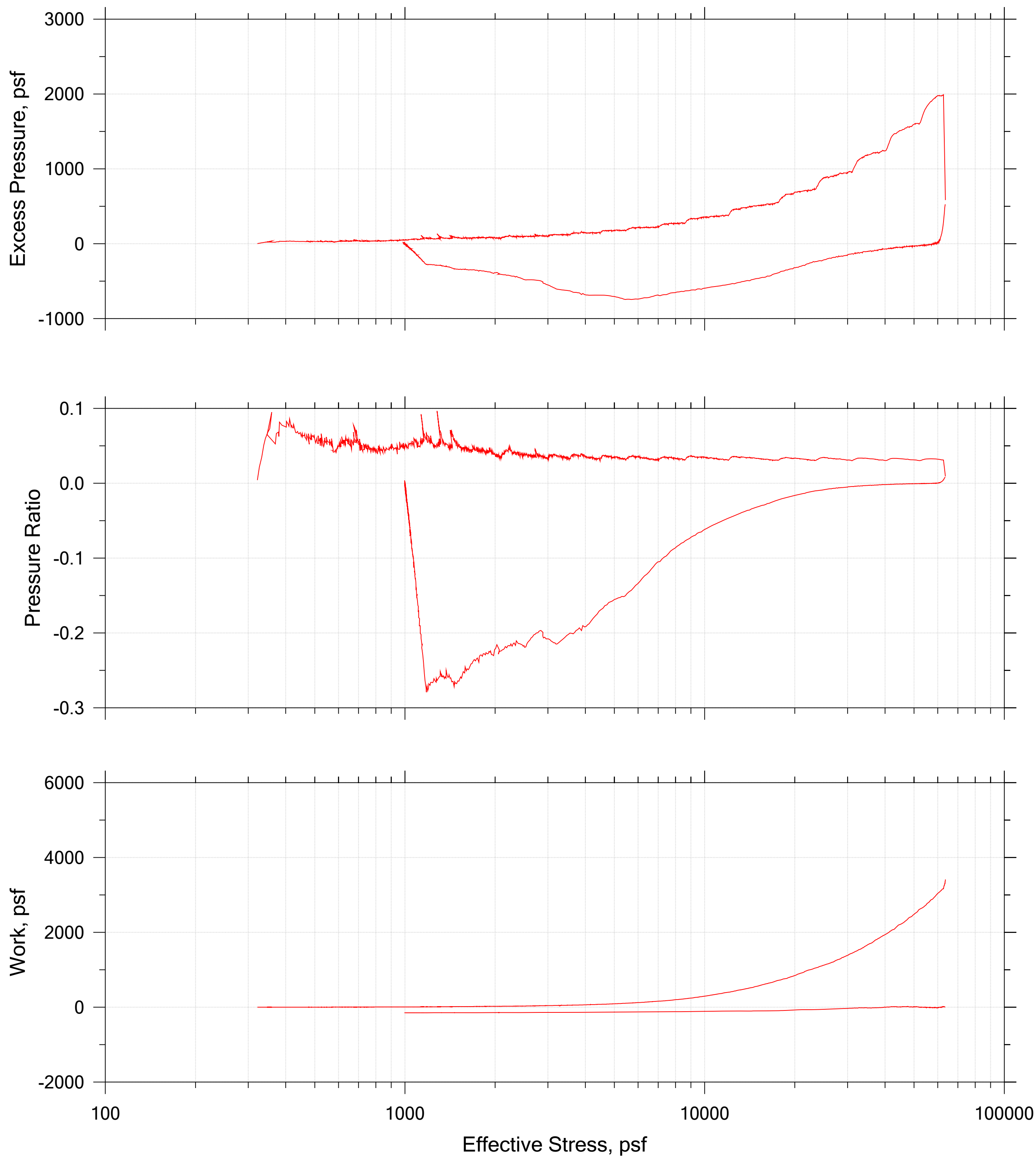




GeoTesting EXPRESS			
	Project Name: Crossroads Phase 14	Location: Norredgewock, ME	Project Number: GTX-309940
	Boring Number: GB-16	Tester: md	Checker: njh
	Sample Number: 27-29	Test Date: 09/12/19	Depth: 27-29 ft
	Test Number: CRC-20	Preparation: intact	Elevation: ---
	Description: Moist, olive gray clay		
	Remarks: System R		

CRC Test

Pressure Curves



GeoTesting EXPRESS	Project Name: Crossroads Phase 14	Location: Norredgewock, ME	Project Number: GTX-309940
	Boring Number: GB-16	Tester: md	Checker: njh
	Sample Number: 27-29	Test Date: 09/12/19	Depth: 27-29 ft
	Test Number: CRC-20	Preparation: intact	Elevation: ---
	Description: Moist, olive gray clay		
	Remarks: System R		

CRC Test

Specimen Diameter, in: 2.50	Specific Gravity: 2.75 (Estimated)	Liquid Limit: 32
Specimen Height, in: 1.00	Initial Void Ratio: 0.831	Plastic Limit: 19
Final Height, in: 0.87	Final Void Ratio: 0.593	Plasticity Index: 13

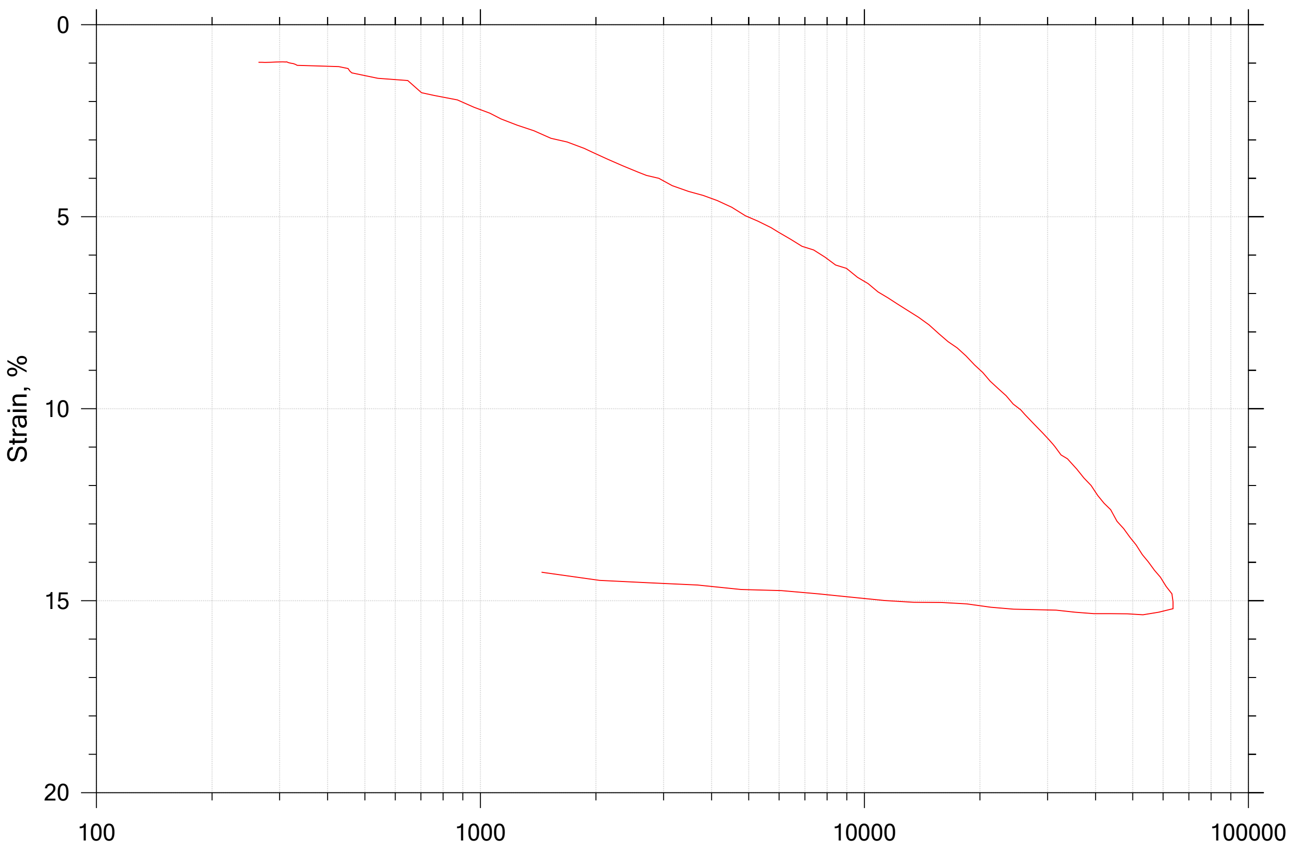
	Before Test Trimmings	Before Test Specimen	After Test Specimen	After Test Trimmings
Container ID	B-2299	---		D-2386
Mass Container, gm	8.75	110.49	110.49	8.45
Mass Container + Wet Soil, gm	384.68	267.56	257.19	154.68
Mass Container + Dry Soil, gm	299.63	231.15	231.15	128.72
Mass Dry Soil, gm	290.88	120.66	120.66	120.27
Water Content, %	29.24	30.18	21.58	21.58
Void Ratio	---	0.83	0.59	---
Degree of Saturation, %	---	99.76	100.00	---
Dry Unit Weight, pcf	---	93.639	107.63	---

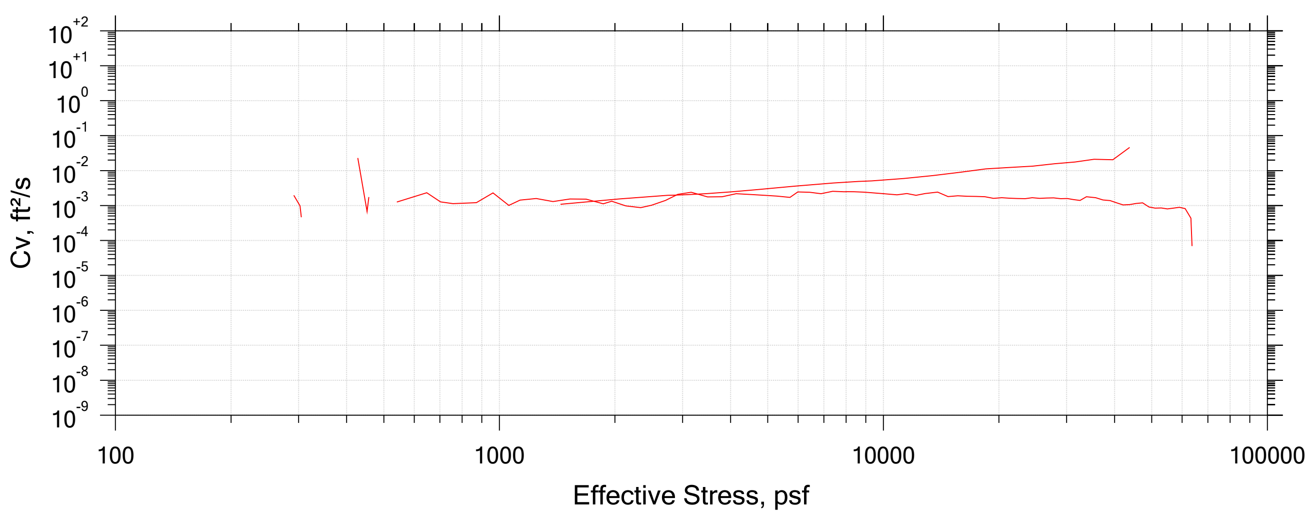
Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test.
Therefore, values may not represent actual values for the specimen.

Project Name: Crossroads Phase 14	Location: Norredgewock, ME	Project Number: GTX-309940
Boring Number: GB-16	Tester: md	Checker: njh
Sample Number: 27-29	Test Date: 09/12/19	Depth: 27-29 ft
Test Number: CRC-20	Preparation: intact	Elevation: ---
Description: Moist, olive gray clay		
Remarks: System R		

CRC Test

Summary

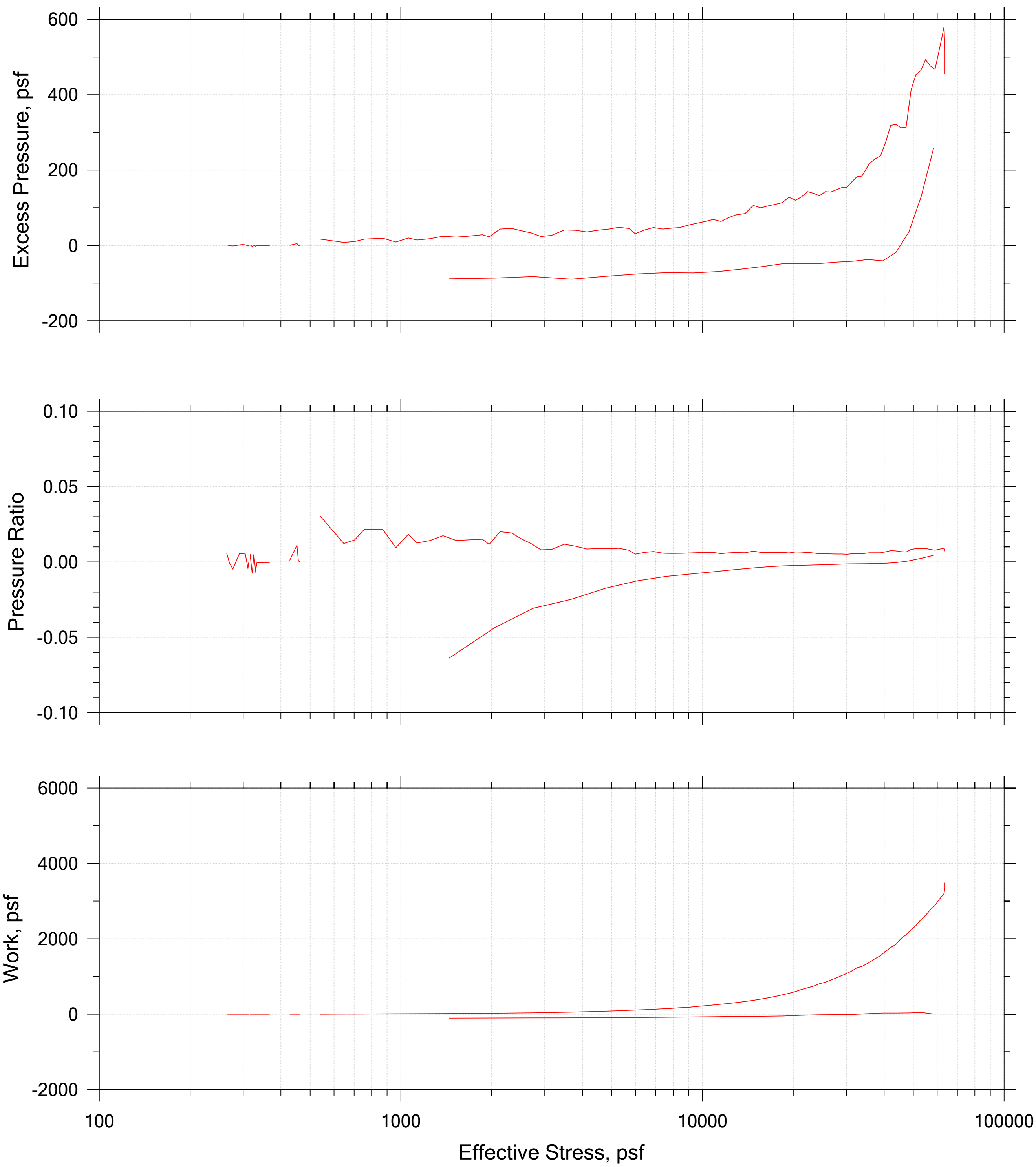




GeoTesting EXPRESS			
	Project Name: Crossroads Phase 14	Location: Norridgewock, ME	Project Number: GTX-309940
	Boring Number: GB-01	Tester: md	Checker: njh
	Sample Number: 19-20.8	Test Date: 09/18/19	Depth: 19-20.8 ft
	Test Number: CRC-21	Preparation: intact	Elevation: ---
	Description: Moist, olive clay		
	Remarks: System W		
			Page 1 of 3

CRC Test

Pressure Curves



GeoTesting EXPRESS	Project Name: Crossroads Phase 14	Location: Norridgewock, ME	Project Number: GTX-309940
	Boring Number: GB-01	Tester: md	Checker: njh
	Sample Number: 19-20.8	Test Date: 09/18/19	Depth: 19-20.8 ft
	Test Number: CRC-21	Preparation: intact	Elevation: ---
	Description: Moist, olive clay		
	Remarks: System W		
			Page 2 of 3

CRC Test

Specimen Diameter, in: 2.50	Specific Gravity: 2.76 (Estimated)	Liquid Limit: 30
Specimen Height, in: 1.00	Initial Void Ratio: 0.869	Plastic Limit: 20
Final Height, in: 0.89	Final Void Ratio: 0.663	Plasticity Index: 10

	Before Test Trimmings	Before Test Specimen	After Test Specimen	After Test Trimmings
Container ID	B-1818	---		C-2807
Mass Container, gm	8.29	110.4	110.4	9.09
Mass Container + Wet Soil, gm	156.52	264.95	257.76	157.56
Mass Container + Dry Soil, gm	123.53	229.22	229.22	128.8
Mass Dry Soil, gm	115.24	118.82	118.82	119.71
Water Content, %	28.63	30.08	24.02	24.02
Void Ratio	---	0.87	0.66	---
Degree of Saturation, %	---	95.57	100.00	---
Dry Unit Weight, pcf	---	92.21	103.61	---

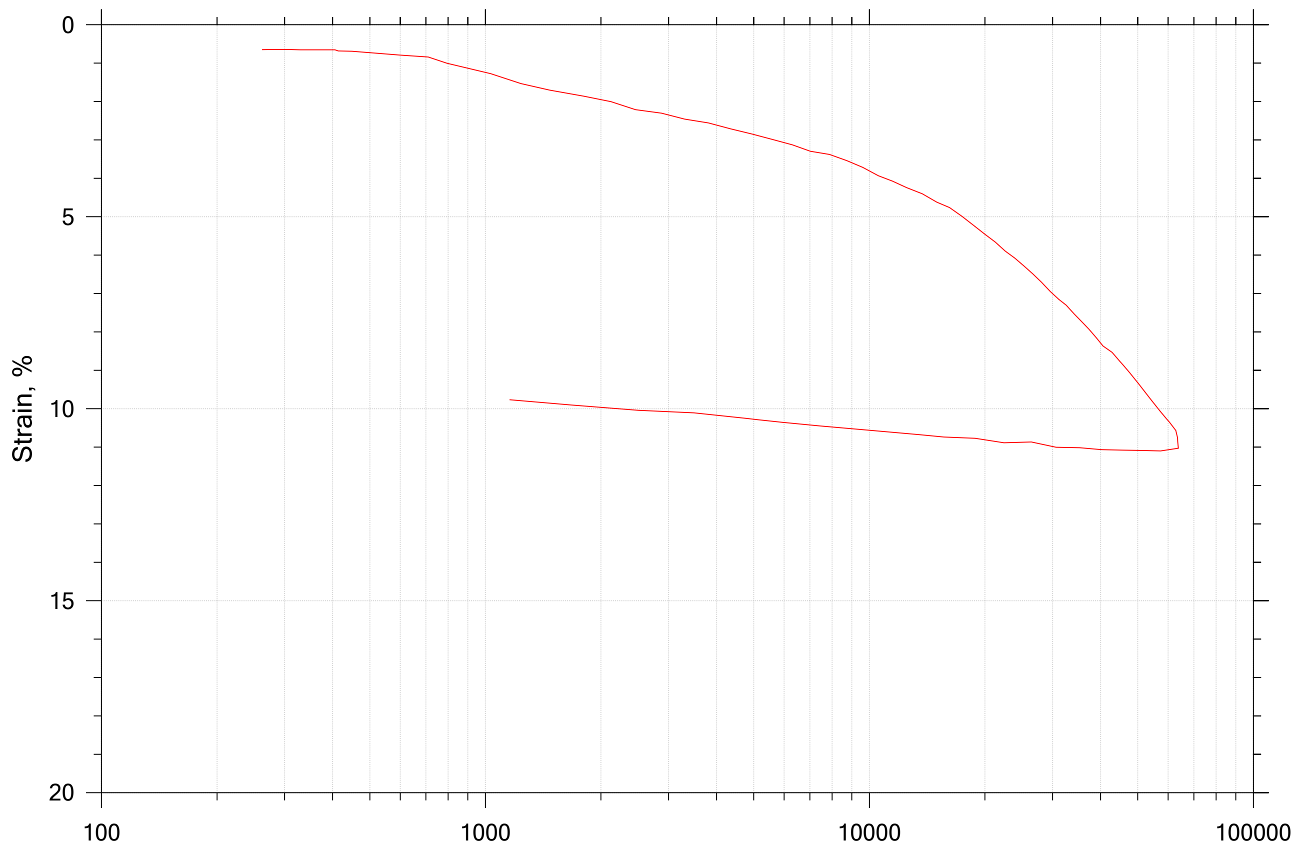
Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test.
Therefore, values may not represent actual values for the specimen.

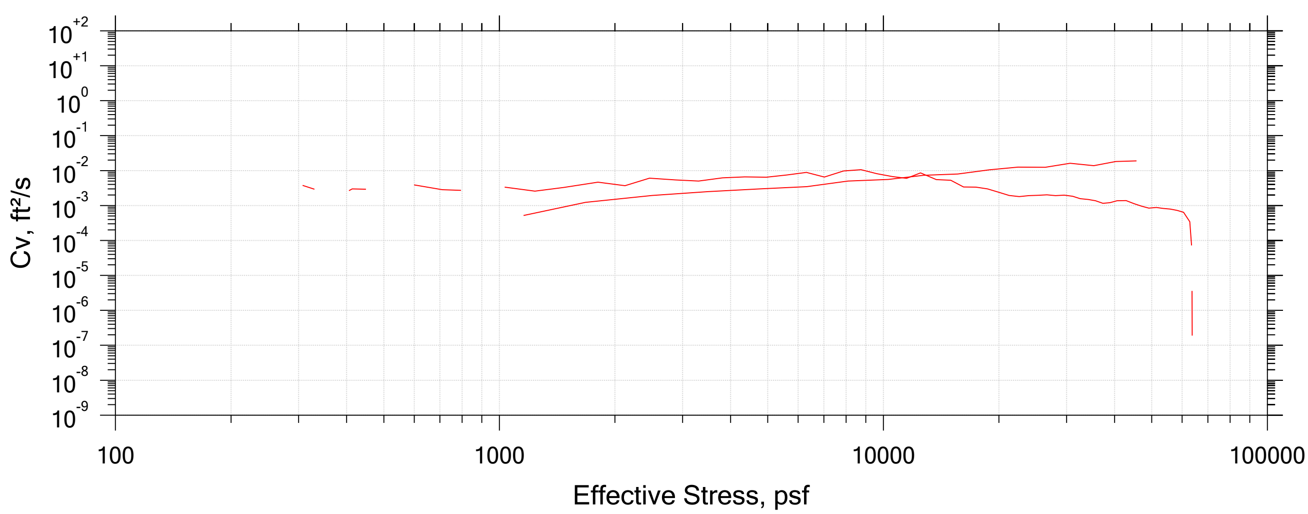
Project Name: Crossroads Phase 14	Location: Norridgewock, ME	Project Number: GTX-309940
Boring Number: GB-01	Tester: md	Checker: njh
Sample Number: 19-20.8	Test Date: 09/18/19	Depth: 19-20.8 ft
Test Number: CRC-21	Preparation: intact	Elevation: ---
Description: Moist, olive clay		
Remarks: System W		

GeoTesting EXPRESS

CRC Test

Summary

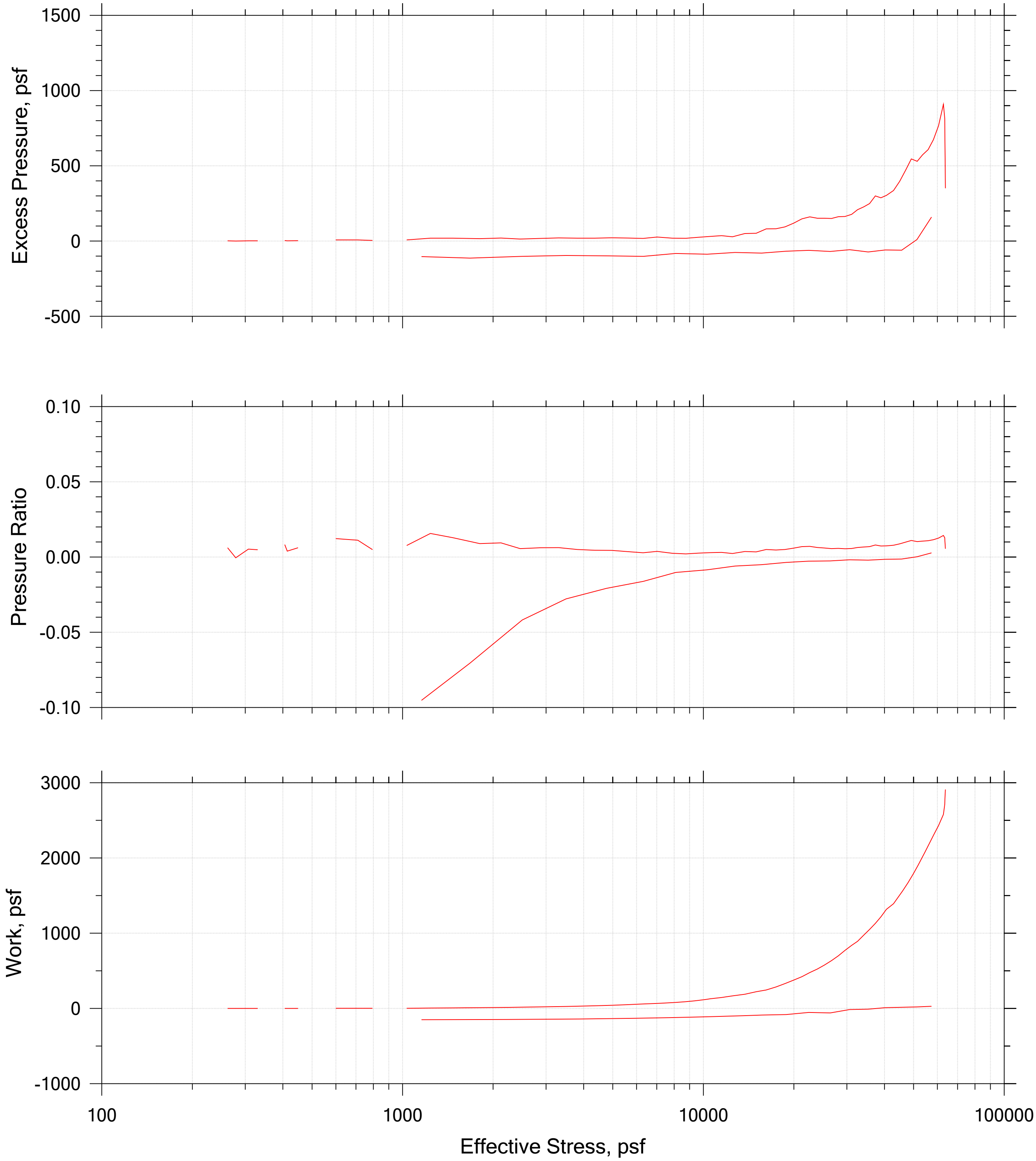




GeoTesting EXPRESS			
	Project Name: Crossroads Phase 14	Location: Norridgewock, ME	Project Number: GTX-309940
	Boring Number: GB-02	Tester: md	Checker: njh
	Sample Number: 9-11	Test Date: 09/19/19	Depth: 9-11 ft
	Test Number: CRC-22	Preparation: intact	Elevation: ---
	Description: Moist, olive gray clay		
	Remarks: System W		

CRC Test

Pressure Curves



GeoTesting EXPRESS	Project Name: Crossroads Phase 14	Location: Norridgewock, ME	Project Number: GTX-309940
	Boring Number: GB-02	Tester: md	Checker: njh
	Sample Number: 9-11	Test Date: 09/19/19	Depth: 9-11 ft
	Test Number: CRC-22	Preparation: intact	Elevation: ---
	Description: Moist, olive gray clay		
	Remarks: System W		
			Page 2 of 3

CRC Test

Specimen Diameter, in: 2.50	Specific Gravity: 2.75 (Estimated)	Liquid Limit: 34
Specimen Height, in: 1.00	Initial Void Ratio: 0.791	Plastic Limit: 20
Final Height, in: 0.92	Final Void Ratio: 0.647	Plasticity Index: 14

	Before Test Trimmings	Before Test Specimen	After Test Specimen	After Test Trimmings
Container ID	A-2882	---		B-2782
Mass Container, gm	8.4	108.91	108.91	10.46
Mass Container + Wet Soil, gm	209.42	267.63	261.5	164.34
Mass Container + Dry Soil, gm	165.84	232.42	232.42	135.01
Mass Dry Soil, gm	157.44	123.51	123.51	124.55
Water Content, %	27.68	28.51	23.55	23.55
Void Ratio	---	0.79	0.65	---
Degree of Saturation, %	---	99.14	100.00	---
Dry Unit Weight, pcf	---	95.851	104.19	---

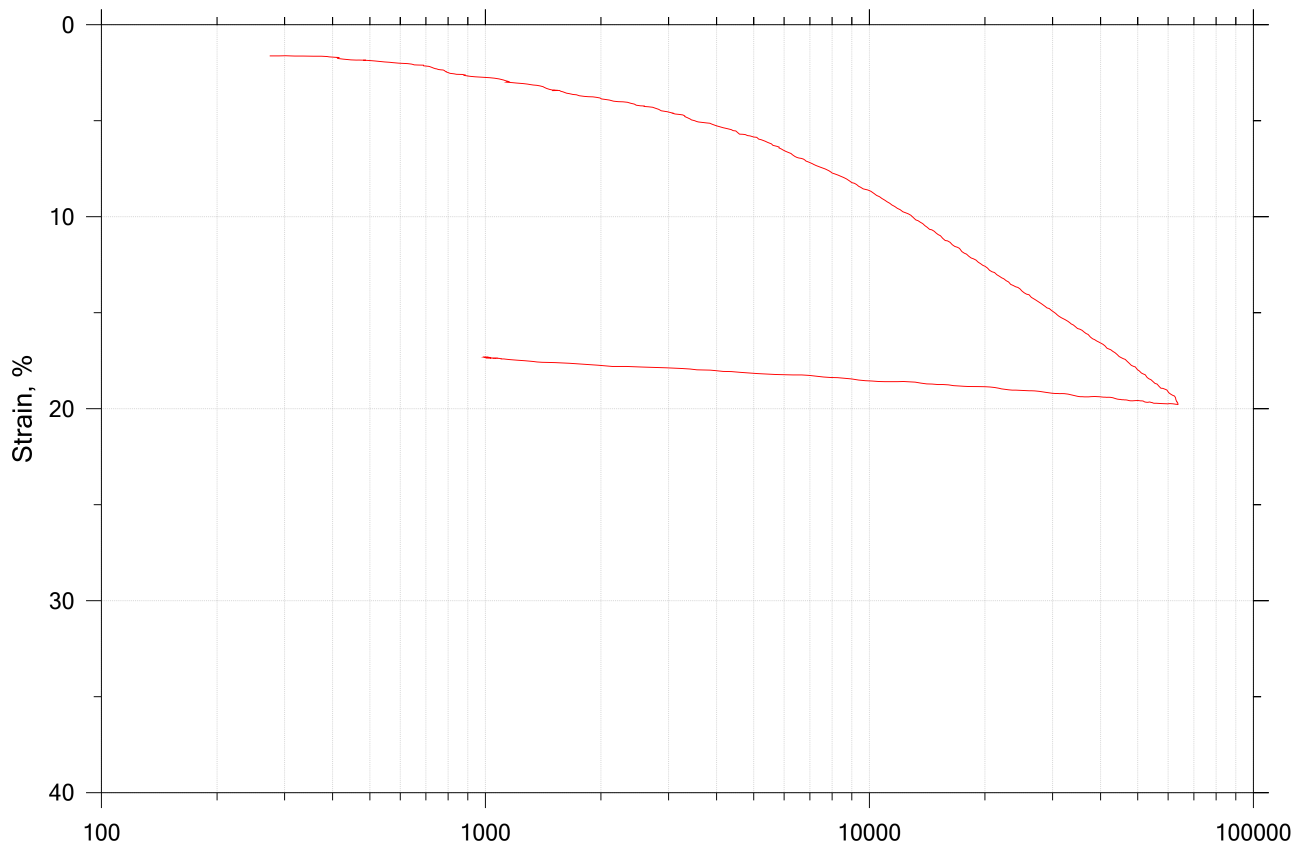
Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test.
Therefore, values may not represent actual values for the specimen.

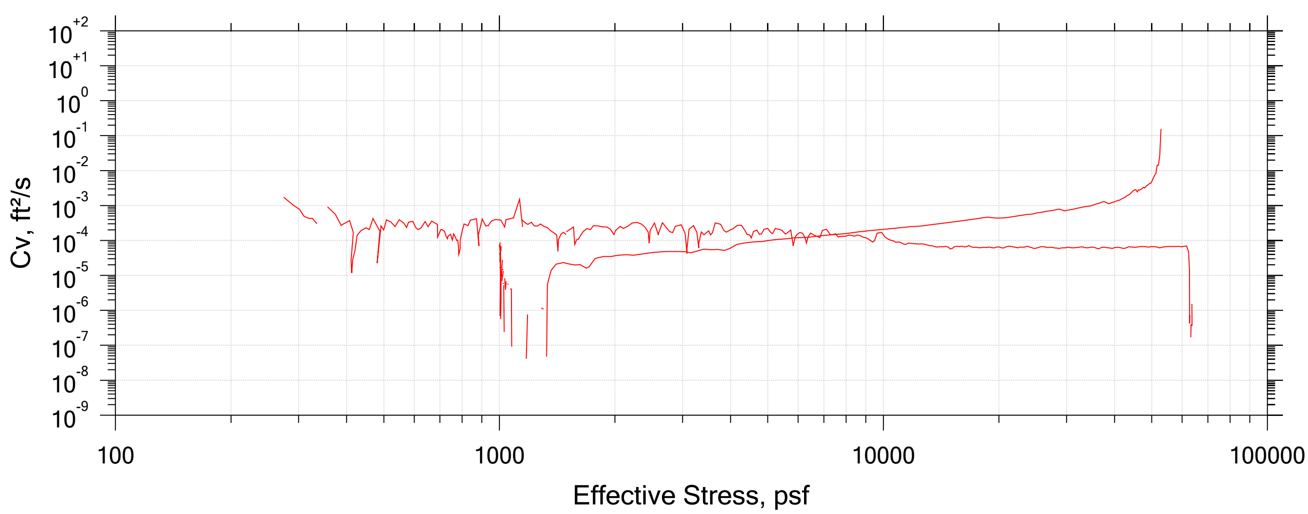
Project Name: Crossroads Phase 14	Location: Norridgewock, ME	Project Number: GTX-309940
Boring Number: GB-02	Tester: md	Checker: njh
Sample Number: 9-11	Test Date: 09/19/19	Depth: 9-11 ft
Test Number: CRC-22	Preparation: intact	Elevation: ---
Description: Moist, olive gray clay		
Remarks: System W		

GeoTesting EXPRESS

CRC Test

Summary

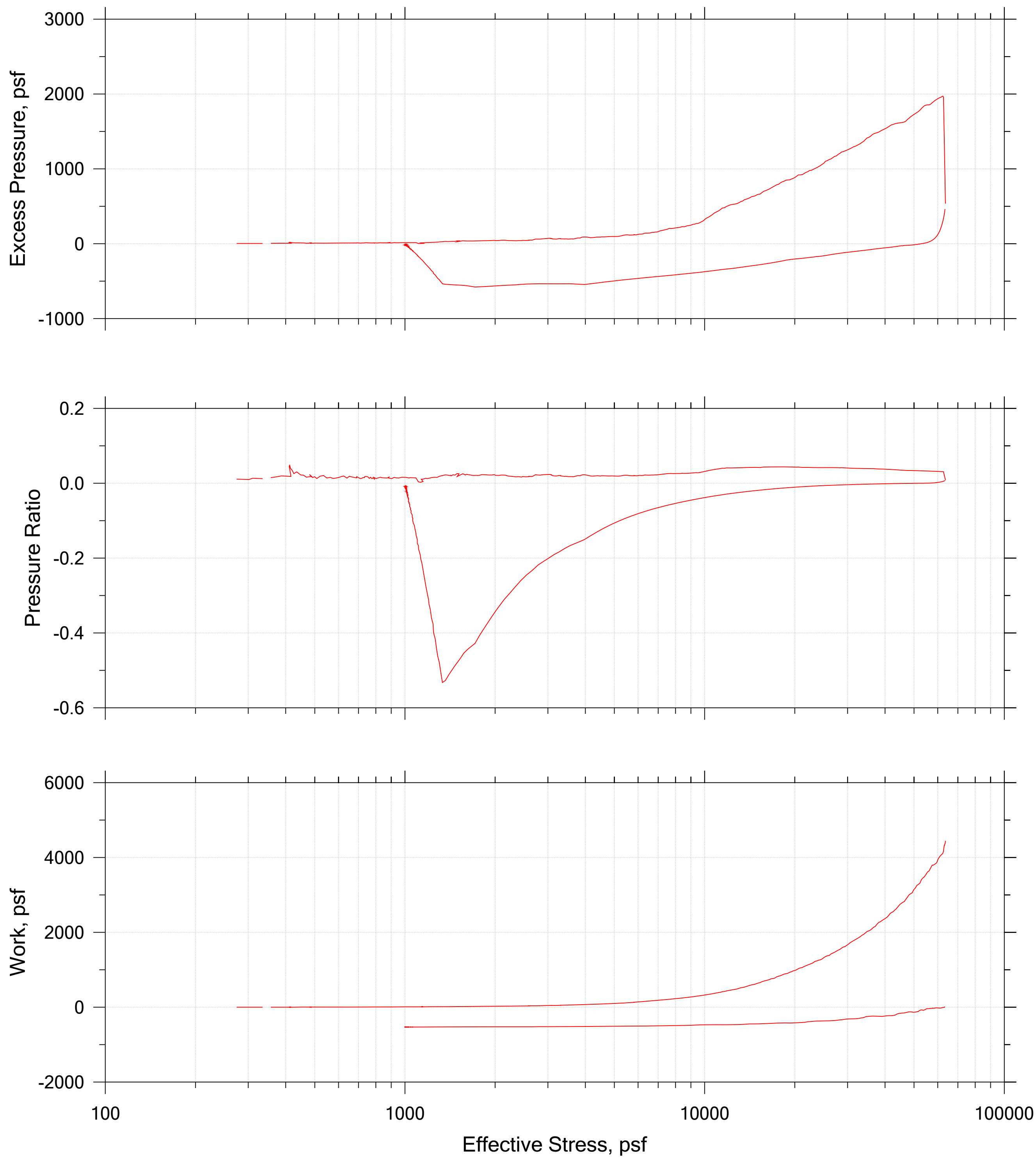




GeoTesting EXPRESS	Project Name: Crossroads Phase 14	Location: Norridgewock, ME	Project Number: GTX-309940
	Boring Number: GB-06	Tester: md/trm	Checker: njh
	Sample Number: 29-31	Test Date: 9/23/19	Depth: 29-31 ft
	Test Number: CRC-24	Preparation: intact	Elevation: ---
	Description: Moist, olive gray clay		
	Remarks: System S		

CRC Test

Pressure Curves



GeoTesting EXPRESS	Project Name: Crossroads Phase 14	Location: Norridgewock, ME	Project Number: GTX-309940
	Boring Number: GB-06	Tester: md/trm	Checker: njh
	Sample Number: 29-31	Test Date: 9/23/19	Depth: 29-31 ft
	Test Number: CRC-24	Preparation: intact	Elevation: ---
	Description: Moist, olive gray clay		
	Remarks: System S		

CRC Test

Specimen Diameter, in: 2.50	Specific Gravity: 2.75 (Estimated)	Liquid Limit: 31
Specimen Height, in: 1.00	Initial Void Ratio: 0.832	Plastic Limit: 20
Final Height, in: 0.90	Final Void Ratio: 0.648	Plasticity Index: 11

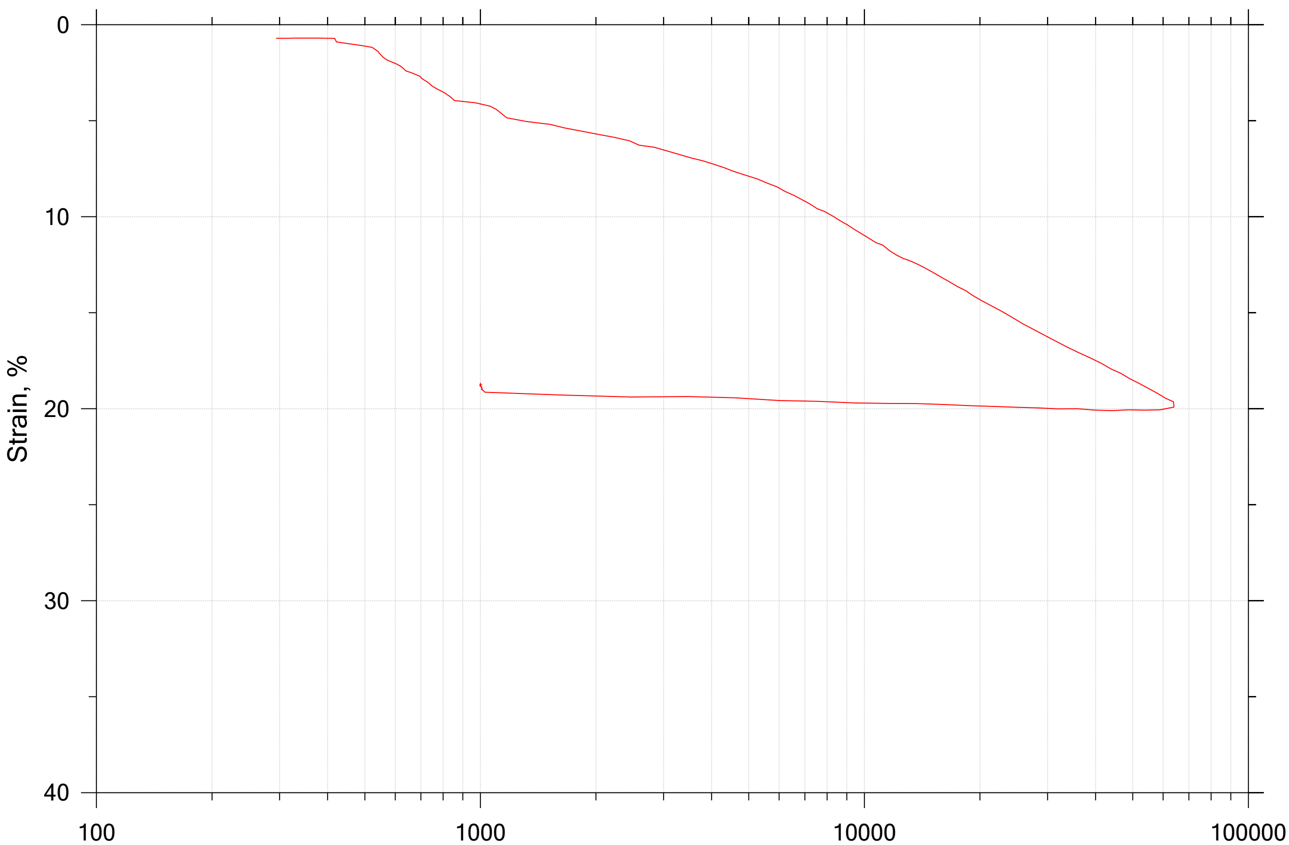
	Before Test Trimmings	Before Test Specimen	After Test Specimen	After Test Trimmings
Container ID	B-2469	---		B-2385
Mass Container, gm	9.07	108.95	108.95	9.11
Mass Container + Wet Soil, gm	184.03	266.16	258.31	158.12
Mass Container + Dry Soil, gm	144.94	229.83	229.83	129.71
Mass Dry Soil, gm	135.87	120.88	120.88	120.6
Water Content, %	28.77	30.05	23.56	23.56
Void Ratio	---	0.83	0.65	---
Degree of Saturation, %	---	99.47	100.00	---
Dry Unit Weight, pcf	---	93.815	104.24	---

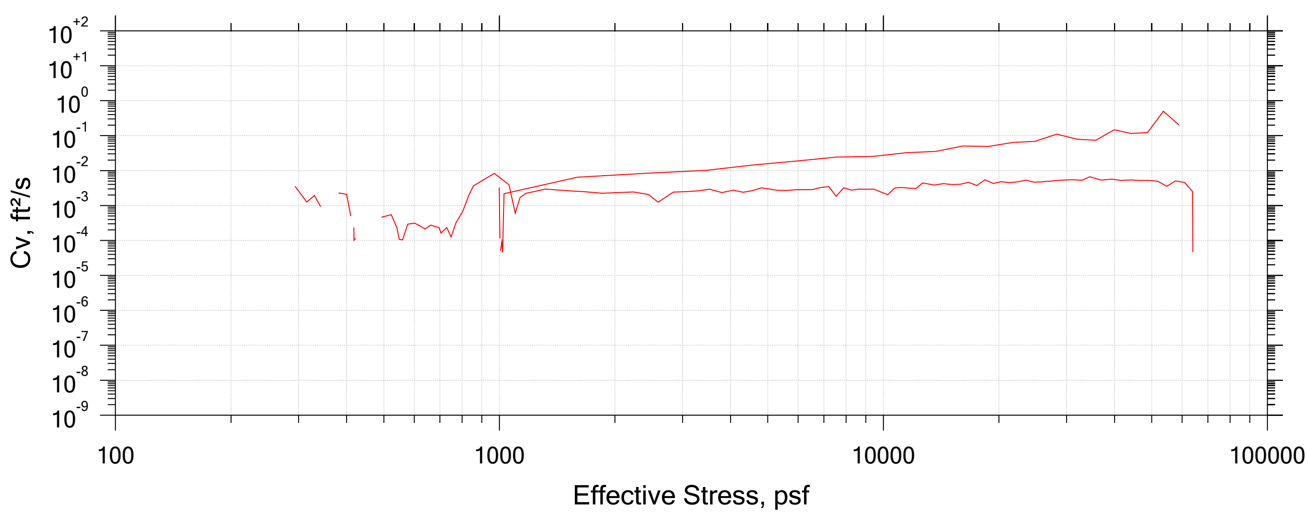
Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test.
Therefore, values may not represent actual values for the specimen.

Project Name: Crossroads Phase 14	Location: Norridgewock, ME	Project Number: GTX-309940
Boring Number: GB-06	Tester: md/trm	Checker: njh
Sample Number: 29-31	Test Date: 9/23/19	Depth: 29-31 ft
Test Number: CRC-24	Preparation: intact	Elevation: ---
Description: Moist, olive gray clay		
Remarks: System S		

CRC Test

Summary

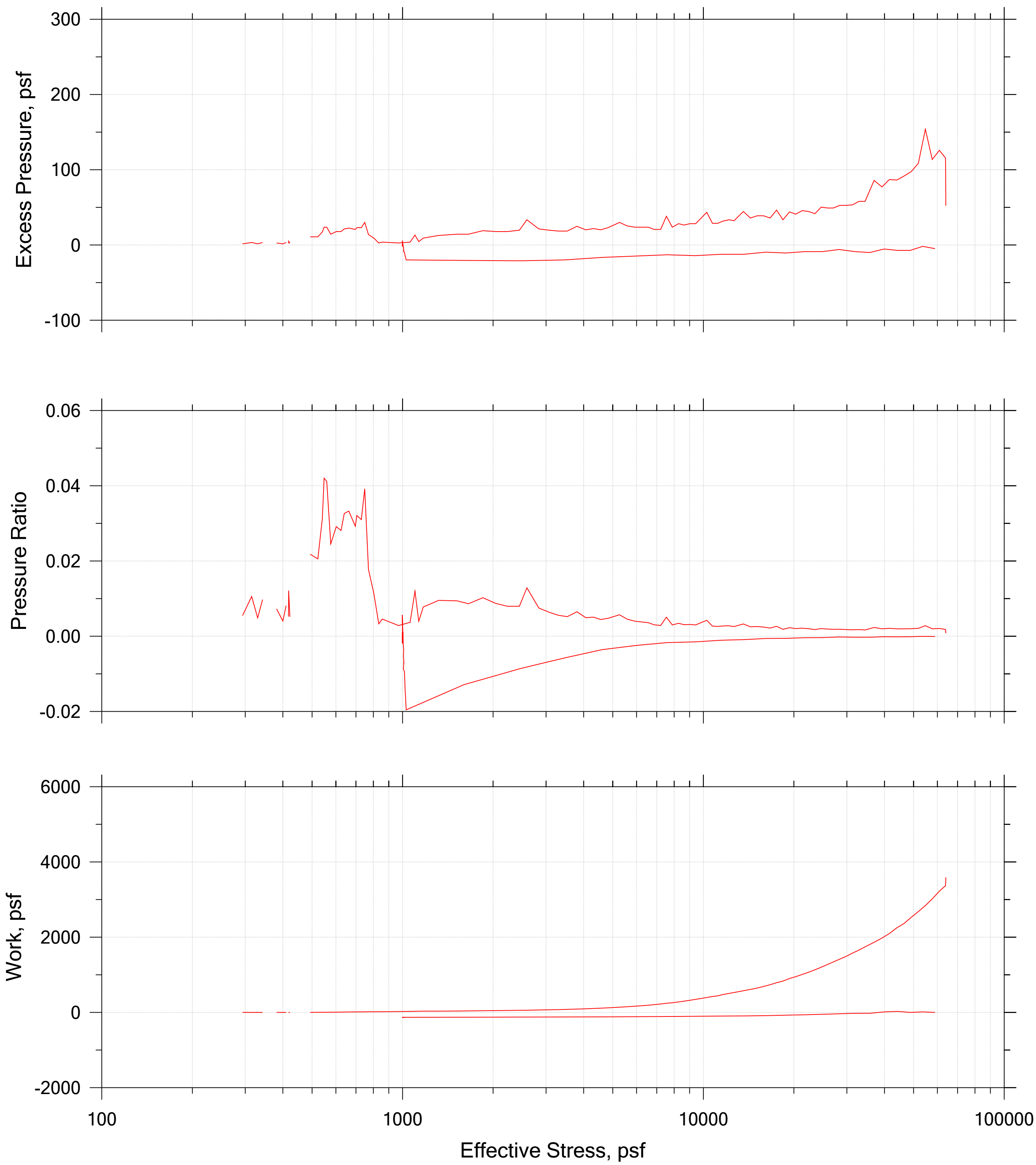




GeoTesting EXPRESS	Project Name: Crossroads Phase 14	Location: Norridgewock, ME	Project Number: GTX-309940
	Boring Number: GB-11	Tester: md	Checker: njh
	Sample Number: 17-19	Test Date: 09/20/19	Depth: 17-19 ft
	Test Number: CRC-15A	Preparation: intact	Elevation: ---
	Description: Wet, gray clay		
	Remarks: System W		
			Page 1 of 3

CRC Test

Pressure Curves



GeoTesting EXPRESS	Project Name: Crossroads Phase 14	Location: Norridgewock, ME	Project Number: GTX-309940
	Boring Number: GB-11	Tester: md	Checker: njh
	Sample Number: 17-19	Test Date: 09/20/19	Depth: 17-19 ft
	Test Number: CRC-15A	Preparation: intact	Elevation: ---
	Description: Wet, gray clay		
	Remarks: System W		

CRC Test

Specimen Diameter, in: 2.50	Specific Gravity: 2.76 (Estimated)	Liquid Limit: 31
Specimen Height, in: 1.00	Initial Void Ratio: 0.851	Plastic Limit: 17
Final Height, in: 0.84	Final Void Ratio: 0.555	Plasticity Index: 14

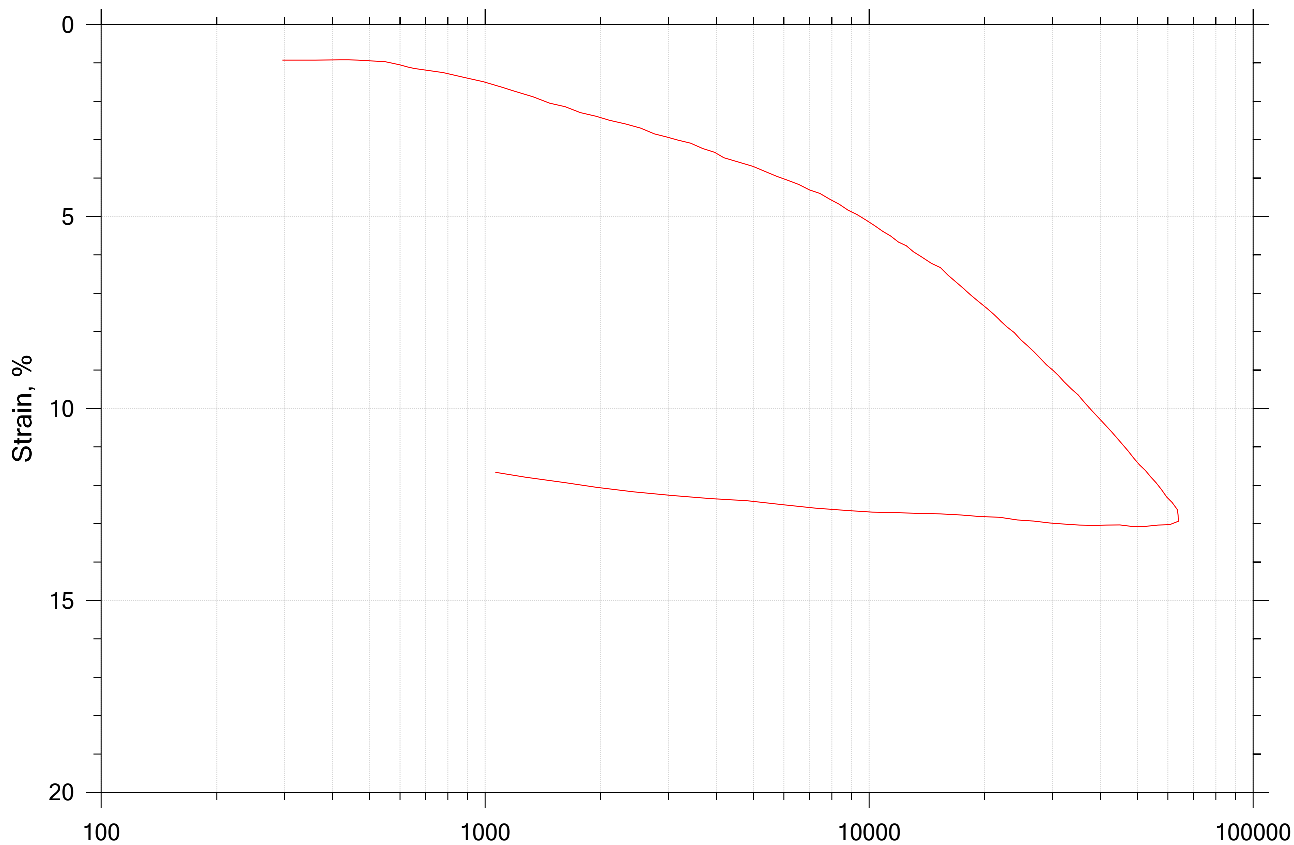
	Before Test Trimmings	Before Test Specimen	After Test Specimen	After Test Trimmings
Container ID	C-961	---		C-3002
Mass Container, gm	8.59	108.91	108.91	9.21
Mass Container + Wet Soil, gm	132.61	265.52	252.76	153.31
Mass Container + Dry Soil, gm	103.43	228.65	228.65	129.16
Mass Dry Soil, gm	94.84	119.74	119.74	119.95
Water Content, %	30.77	30.79	20.13	20.13
Void Ratio	---	0.85	0.55	---
Degree of Saturation, %	---	99.70	100.00	---
Dry Unit Weight, pcf	---	92.93	110.63	---

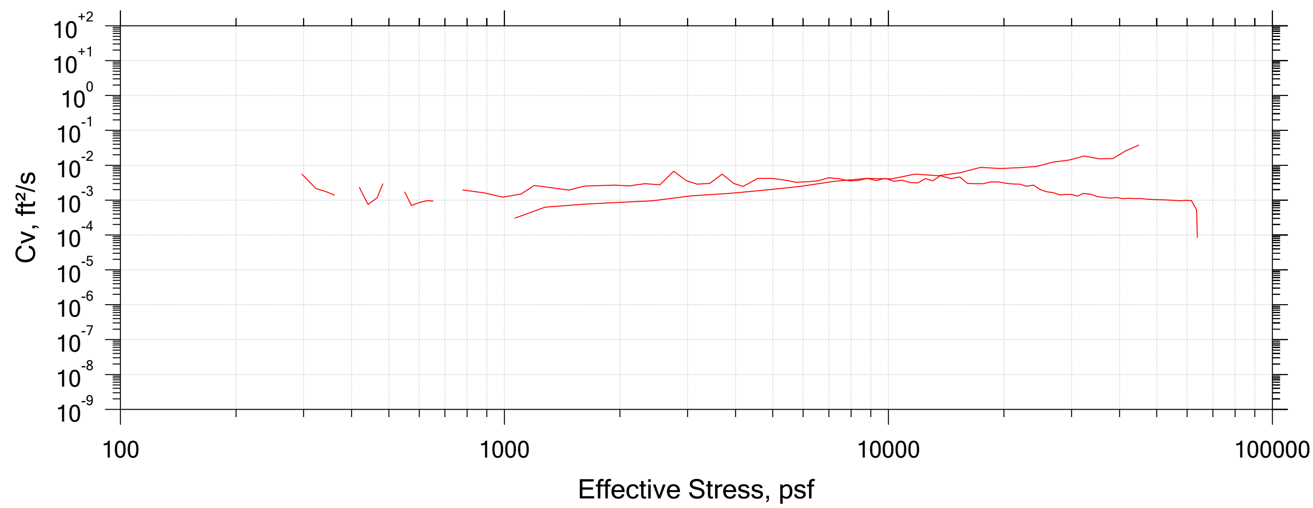
Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test.
Therefore, values may not represent actual values for the specimen.

GeoTesting EXPRESS			
	Project Name: Crossroads Phase 14	Location: Norridgewock, ME	Project Number: GTX-309940
	Boring Number: GB-11	Tester: md	Checker: njh
	Sample Number: 17-19	Test Date: 09/20/19	Depth: 17-19 ft
	Test Number: CRC-15A	Preparation: intact	Elevation: ---
	Description: Wet, gray clay		
	Remarks: System W		

CRC Test

Summary

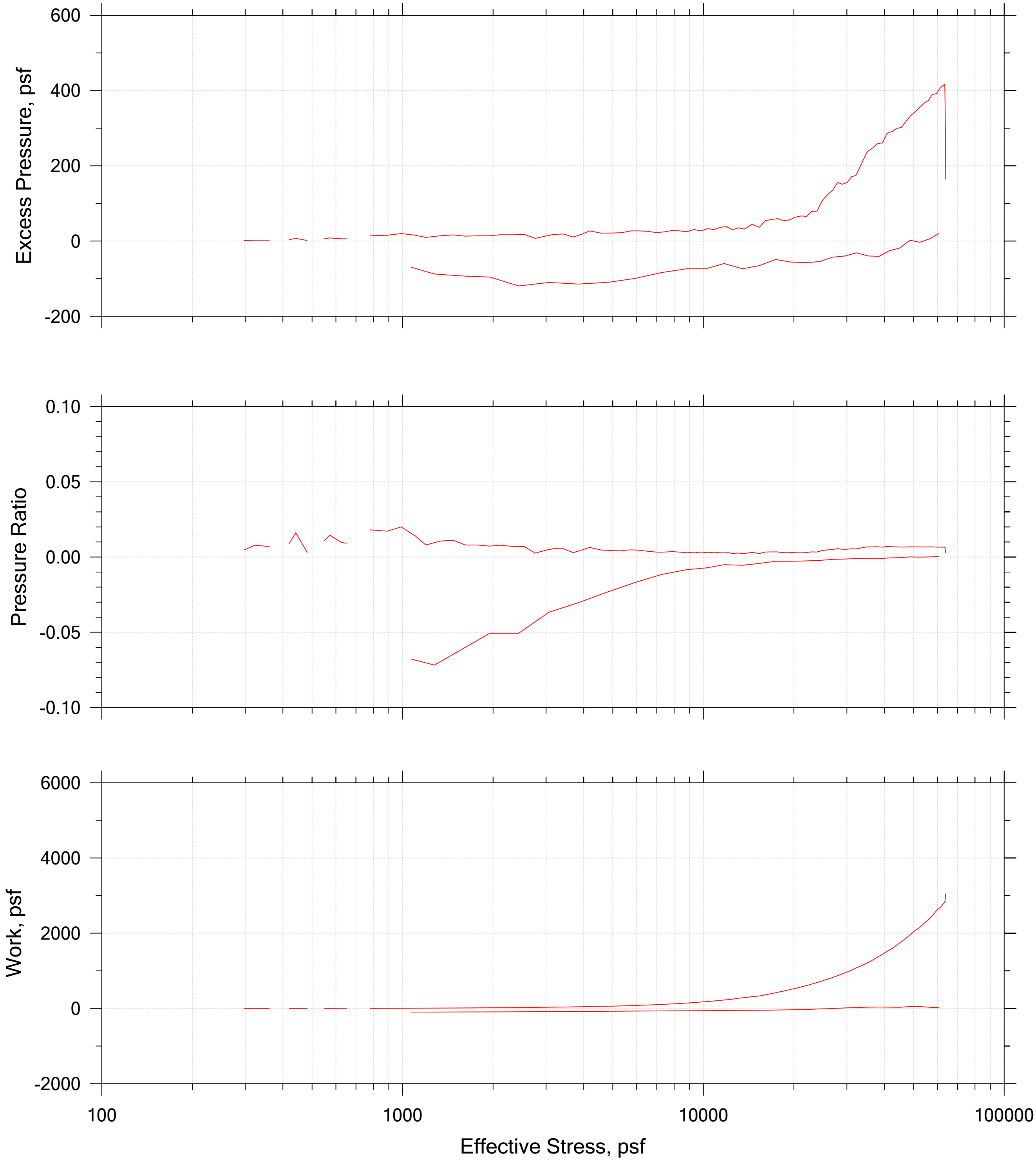




GeoTesting EXPRESS	Project Name: Crossroads Phase 14	Location: Norridgewock, ME	Project Number: GTX-309940
	Boring Number: GB-12	Tester: md	Checker: njh
	Sample Number: 17-19	Test Date: 09/23/19	Depth: 17-19 ft
	Test Number: CRC-23	Preparation: intact	Elevation: ---
	Description: Moist, dark gray clay		
	Remarks: System R		

CRC Test

Pressure Curves



Project Name: Crossroads Phase 14	Location: Norridgewock, ME	Project Number: GTX-309940
Boring Number: GB-12	Tester: md	Checker: njh
Sample Number: 17-19	Test Date: 09/23/19	Depth: 17-19 ft
Test Number: CRC-23	Preparation: intact	Elevation: ---
Description: Moist, dark gray clay		
Remarks: System R		

CRC Test

Specimen Diameter, in: 2.50	Specific Gravity: 2.73 (Estimated)	Liquid Limit: 31
Specimen Height, in: 1.00	Initial Void Ratio: 0.822	Plastic Limit: 19
Final Height, in: 0.90	Final Void Ratio: 0.64	Plasticity Index: 12

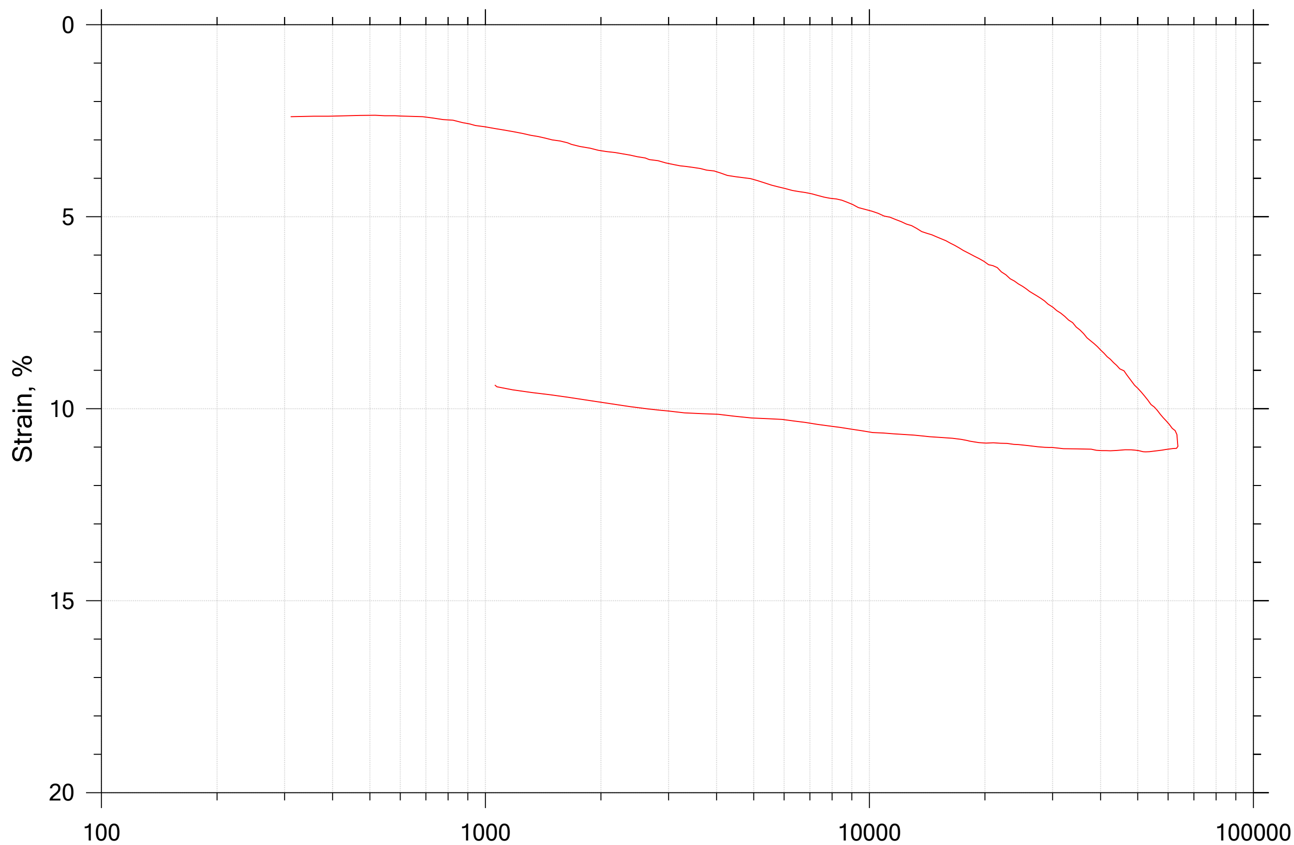
	Before Test Trimmings	Before Test Specimen	After Test Specimen	After Test Trimmings
Container ID	C-2880	---		C-3016
Mass Container, gm	9.27	109.4	109.4	9.25
Mass Container + Wet Soil, gm	213.03	265.48	258.01	161.49
Mass Container + Dry Soil, gm	168.69	229.77	229.77	132.56
Mass Dry Soil, gm	159.42	120.37	120.37	123.31
Water Content, %	27.81	29.67	23.46	23.46
Void Ratio	---	0.82	0.64	---
Degree of Saturation, %	---	98.42	100.00	---
Dry Unit Weight, pcf	---	93.417	103.8	---

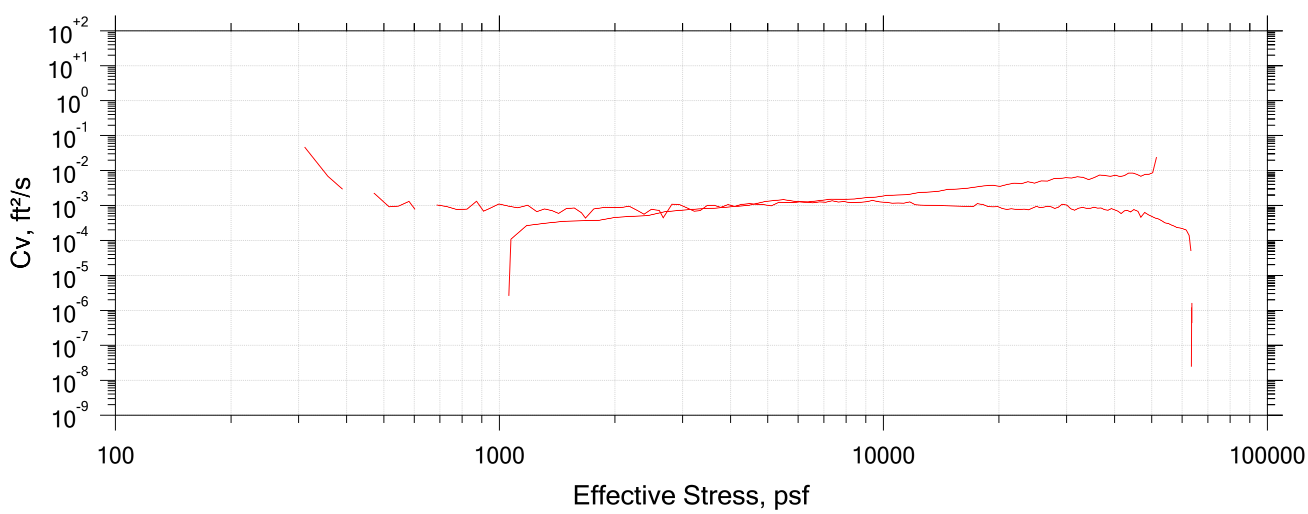
Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test.
Therefore, values may not represent actual values for the specimen.

Project Name: Crossroads Phase 14	Location: Norridgewock, ME	Project Number: GTX-309940
Boring Number: GB-12	Tester: md	Checker: njh
Sample Number: 17-19	Test Date: 09/23/19	Depth: 17-19 ft
Test Number: CRC-23	Preparation: intact	Elevation: ---
Description: Moist, dark gray clay		
Remarks: System R		

CRC Test

Summary

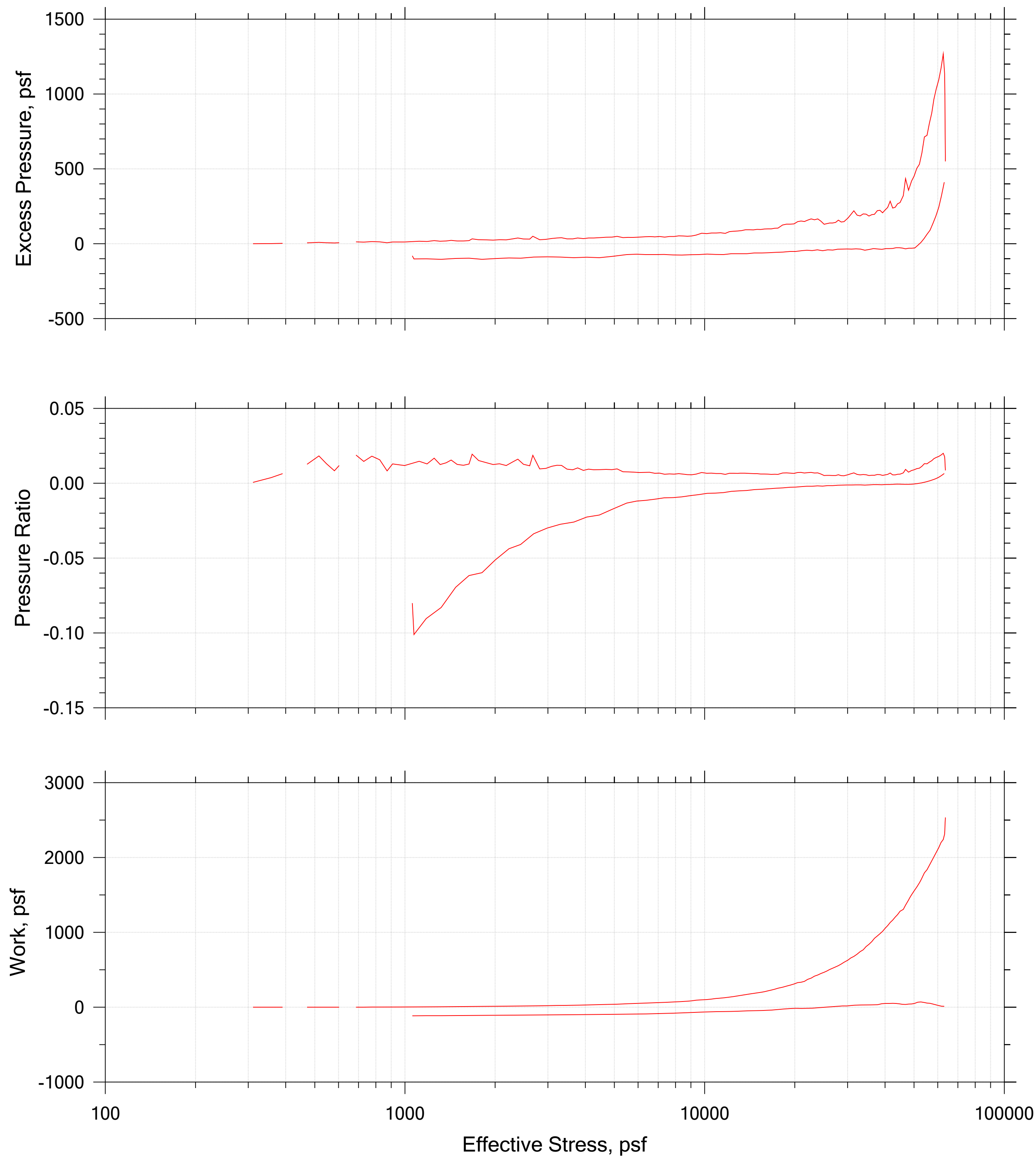




GeoTesting EXPRESS			
	Project Name: Crossroads Phase 14	Location: Norridgewock, ME	Project Number: GTX-309940
	Boring Number: GB-16	Tester: md	Checker:
	Sample Number: 17-19	Test Date: 09/24/19	Depth: 17-19 ft
	Test Number: CRC-19A	Preparation: intact	Elevation: ---
	Description: Moist, olive gray clay		
	Remarks: System R		
			Page 1 of 3

CRC Test

Pressure Curves



GeoTesting EXPRESS	Project Name: Crossroads Phase 14	Location: Norridgewock, ME	Project Number: GTX-309940
	Boring Number: GB-16	Tester: md	Checker:
	Sample Number: 17-19	Test Date: 09/24/19	Depth: 17-19 ft
	Test Number: CRC-19A	Preparation: intact	Elevation: ---
	Description: Moist, olive gray clay		
	Remarks: System R		

CRC Test

Specimen Diameter, in: 2.50	Specific Gravity: 2.77 (Estimated)	Liquid Limit: 33
Specimen Height, in: 1.00	Initial Void Ratio: 0.82	Plastic Limit: 19
Final Height, in: 0.92	Final Void Ratio: 0.675	Plasticity Index: 14

	Before Test Trimmings	Before Test Specimen	After Test Specimen	After Test Trimmings
Container ID	D-787	---		C-2132
Mass Container, gm	8.3	108.94	108.94	9.24
Mass Container + Wet Soil, gm	199.07	267.27	261.16	164.27
Mass Container + Dry Soil, gm	157	231.35	231.35	133.91
Mass Dry Soil, gm	148.7	122.41	122.41	124.67
Water Content, %	28.29	29.34	24.35	24.35
Void Ratio	---	0.82	0.67	---
Degree of Saturation, %	---	99.10	100.00	---
Dry Unit Weight, pcf	---	95.001	103.26	---

Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test. Therefore, values may not represent actual values for the specimen.

GeoTesting EXPRESS			
	Project Name: Crossroads Phase 14	Location: Norridgewock, ME	Project Number: GTX-309940
	Boring Number: GB-16	Tester: md	Checker:
	Sample Number: 17-19	Test Date: 09/24/19	Depth: 17-19 ft
	Test Number: CRC-19A	Preparation: intact	Elevation: ---
	Description: Moist, olive gray clay		
	Remarks: System R		

APPENDIX C-4
Direct Simple Shear (DSS)

GeoTesting EXPRESS

Consolidated Undrained Direct Simple Shear Testing of Cohesive Soils by ASTM D6528

Client:	Geosyntec Consultants	GTX#:	309940
Project Name:	Crossroads Phase 14	Test Date:	9/19/19
Project Location:	Norridgewock, ME		

Boring ID: GB-08
Sample ID: 27-29
Depth, ft: 27-29

Visual Description: Moist, gray clay

Test Equipment: Top and bottom box (circular) = 2.50 in diameter. Load cells and LVDT's connected to data acquisition system for shear force, normal load, horizontal and vertical displacement; surface area = 4.91 in^2, soil height = 1 inch. Stacked rings used. Set up included porous stones with pins.

Test Condition: Inundated prior to consolidation

Sample Type and Preparation: density: Extruded from tube, cut, trimmed and placed into apparatus at as-received and moisture

Parameter	Point 1	Point 2	Point 3	Point 4	Point 5
Test No.	DSS-16				
Initial Moisture Content, %	31.6				
Initial Dry Density, pcf	92.2				
Nominal Rate of Shear Strain, %/hr	5.0				
Maximum Vertical Consolidation Stress, psf	10,625				
Vertical Consolidation Stress at Shear, psf	1,770				
Final Moisture Content, %	26.8				
Measured Peak Shear Stress, psf	1,328				
Shear Strain at Peak Shear Stress, %	13.4				
Membrane Correction, psf	60				
Corrected Peak Shear Stress, psf	1,268				
S_u / σ'_{vc}	0.72				

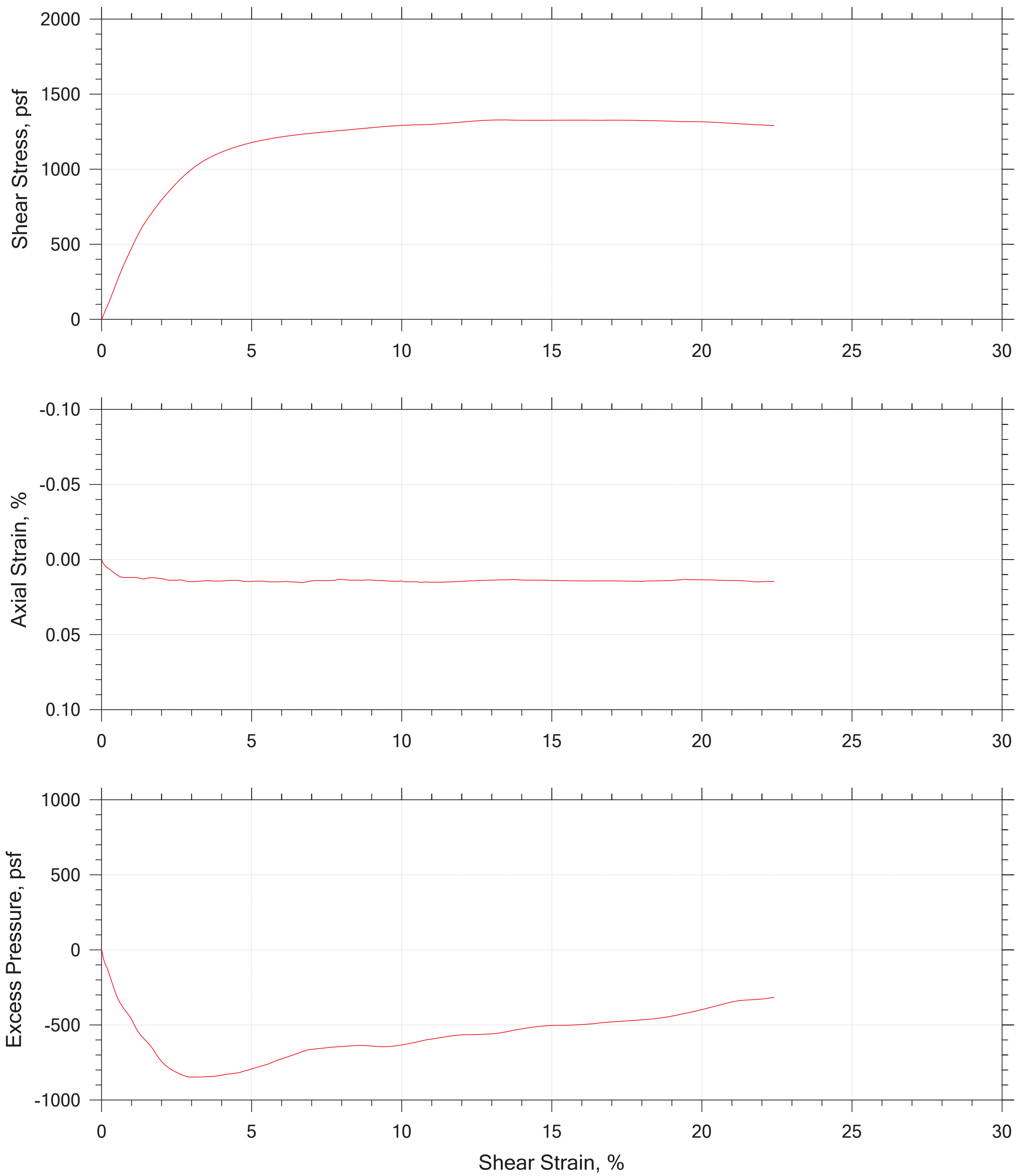
Comments:

Tested By: md

Checked By: njh

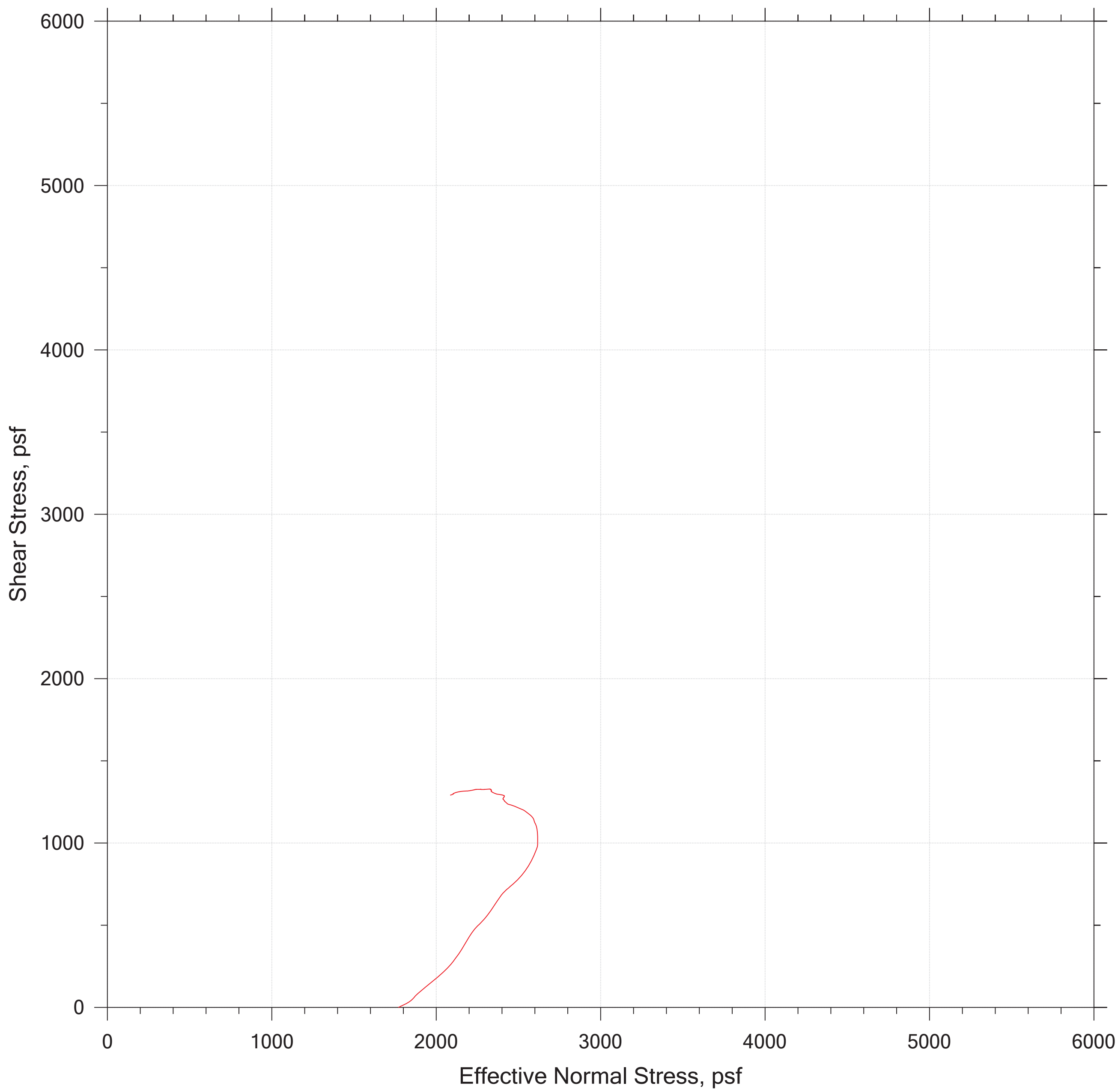
Notes: These results apply only to the sample tested for the specific test conditions. The test procedures employed follow accepted industry practice and the indicated test method. GeoTesting Express has no specific knowledge as to conditioning, origin, sampling procedure or intended use of the material.

DIRECT SIMPLE SHEAR TEST



GeoTesting EXPRESS	Project: Crossroads Phase 14	Location: Norridgewock, ME	Project No.: GTX-309940
	Boring No.: GB-08	Tested By: md	Checked By: njh
	Sample No.: 27-29	Test Date: 09/19/19	Depth: 27-29 ft
	Test No.: DSS-16	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: System N		
			Page 2 of 3

DIRECT SIMPLE SHEAR TEST



GeoTesting EXPRESS	Project: Crossroads Phase 14	Location: Norridgewock, ME	Project No.: GTX-309940
	Boring No.: GB-08	Tested By: md	Checked By: njh
	Sample No.: 27-29	Test Date: 09/19/19	Depth: 27-29 ft
	Test No.: DSS-16	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: System N		

GeoTesting EXPRESS

Consolidated Undrained Direct Simple Shear Testing of Cohesive Soils by ASTM D6528

Client: Geosyntec Consultants
GTX#: 309940
Project Name: Crossroads Phase 14
Test Date: 9/20/19
Project Location: Norridgewock, ME

Boring ID: GB-14
Sample ID: 9-11
Depth, ft: 9-10.8

Visual Description: Wet, gray clay

Test Equipment: Top and bottom box (circular) = 2.50 in diameter. Load cells and LVDT's connected to data acquisition system for shear force, normal load, horizontal and vertical displacement; surface area = 4.91 in^2, soil height = 1 inch. Stacked rings used. Set up included porous stones with pins.

Test Condition: Inundated prior to consolidation

Sample Type and Preparation: Extruded from tube, cut, trimmed and placed into apparatus at as-received density and moisture

Parameter	Point 1	Point 2	Point 3	Point 4	Point 5
Test No.	DSS-17				
Initial Moisture Content, %	30.0				
Initial Dry Density, pcf	88.3				
Nominal Rate of Shear Strain, %/hr	5.0				
Maximum Vertical Consolidation Stress, psf	2,625				
Vertical Consolidation Stress at Shear, psf	1,310				
Final Moisture Content, %	30.8				
Measured Peak Shear Stress, psf	712				
Shear Strain at Peak Shear Stress, %	6.9				
Membrane Correction, psf	52				
Corrected Peak Shear Stress, psf	660				
S_u / σ'_{vc}	0.50				

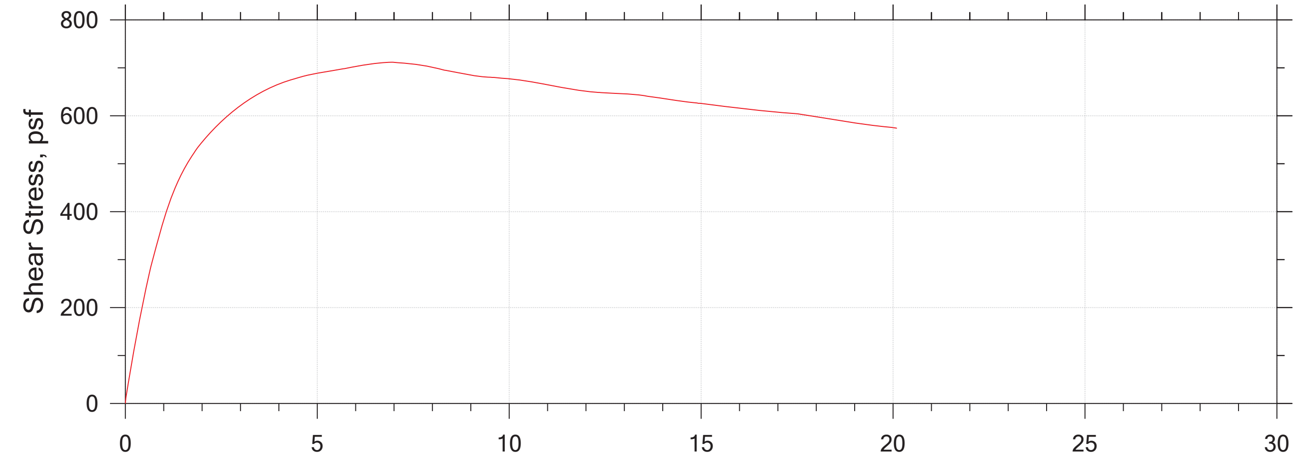
Comments:

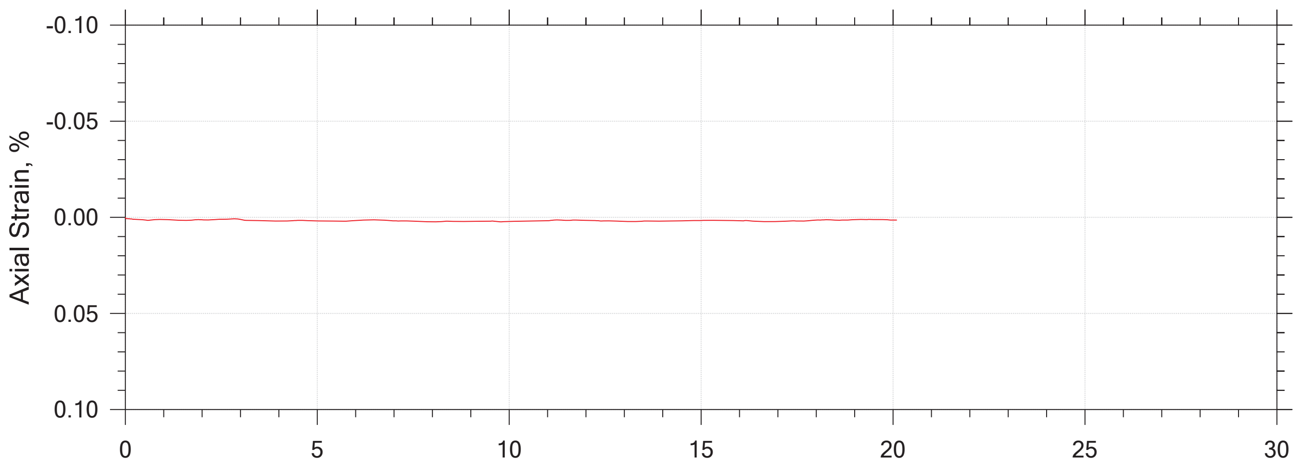
Tested By: md

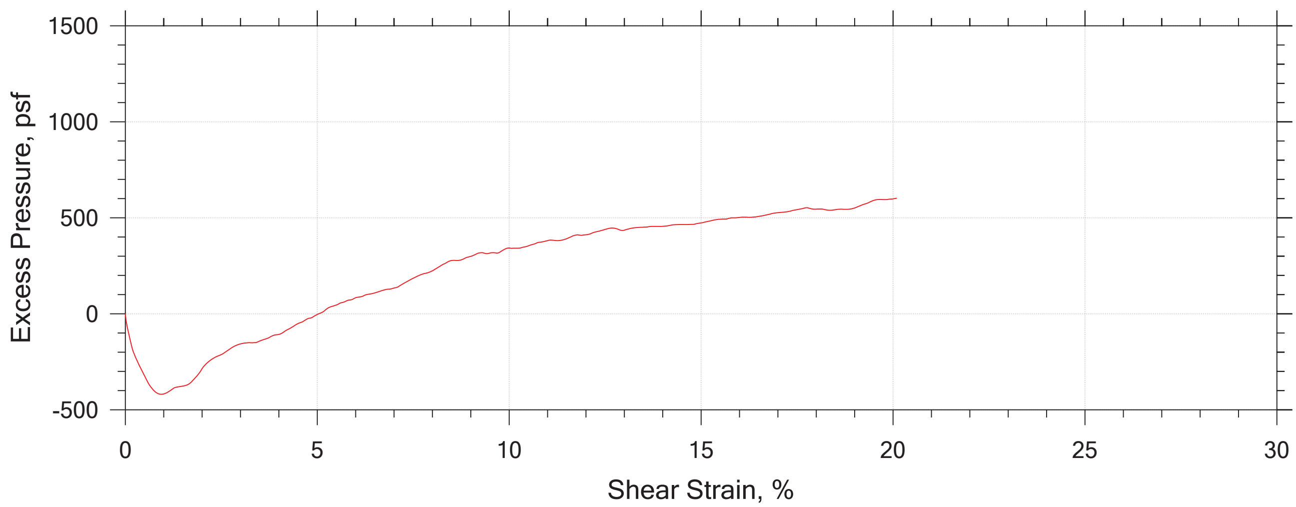
Checked By: njh

Notes: These results apply only to the sample tested for the specific test conditions. The test procedures employed follow accepted industry practice and the indicated test method. GeoTesting Express has no specific knowledge as to conditioning, origin, sampling procedure or intended use of the material.

DIRECT SIMPLE SHEAR TEST

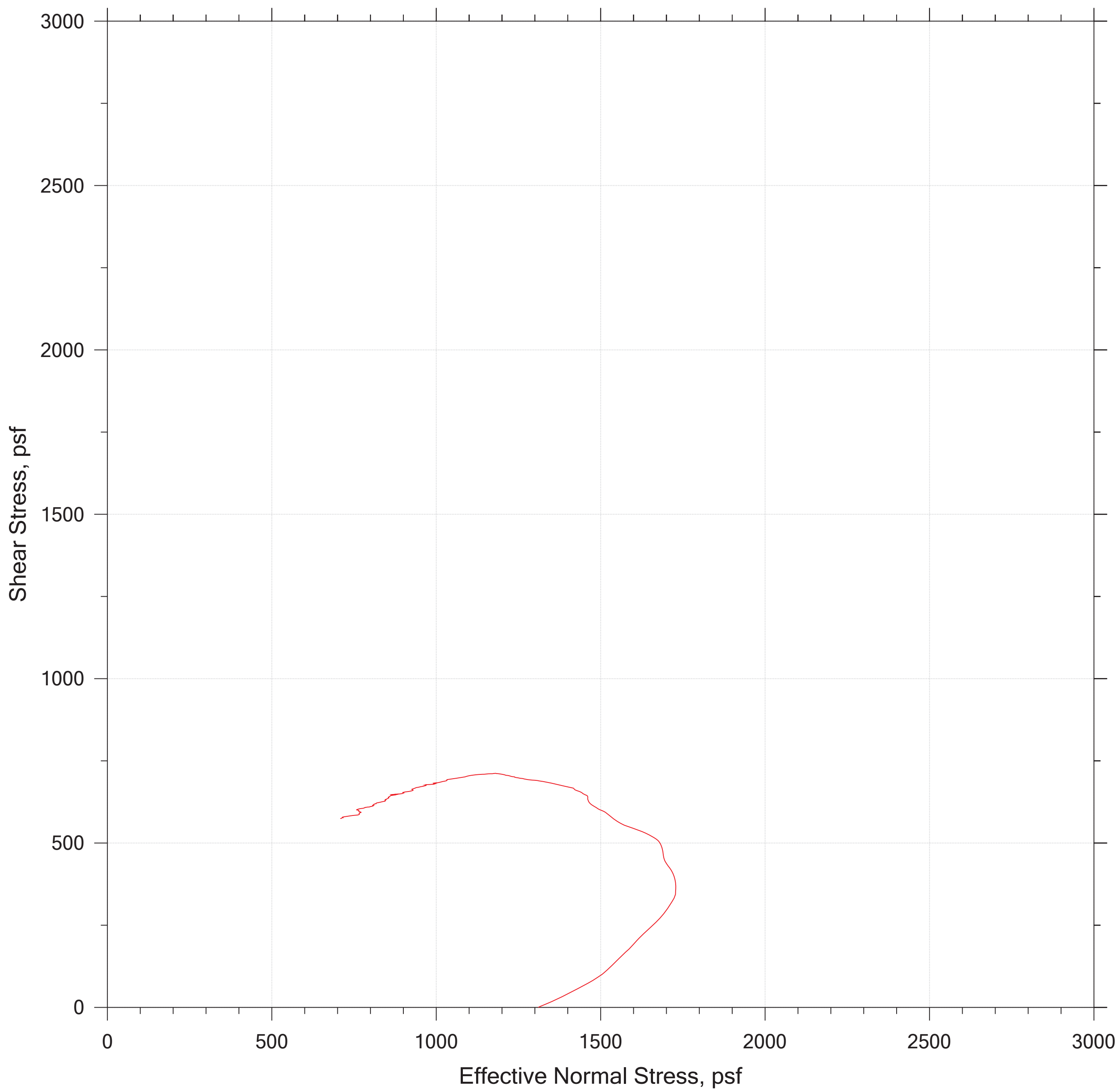






GeoTesting EXPRESS	Project: Crossroads Phase 14	Location: Norridgewock, ME	Project No.: GTX-309940
	Boring No.: GB-14	Tested By: md	Checked By: njh
	Sample No.: 9-11	Test Date: 09/20/19	Depth: 9-10.8 ft
	Test No.: DSS-17	Sample Type: intact	Elevation: ---
	Description: Wet, gray clay		
	Remarks: System SS		
			Page 2 of 3

DIRECT SIMPLE SHEAR TEST



GeoTesting EXPRESS	Project: Crossroads Phase 14	Location: Norridgewock, ME	Project No.: GTX-309940
	Boring No.: GB-14	Tested By: md	Checked By: njh
	Sample No.: 9-11	Test Date: 09/20/19	Depth: 9-10.8 ft
	Test No.: DSS-17	Sample Type: intact	Elevation: ---
	Description: Wet, gray clay		
	Remarks: System SS		

GeoTesting EXPRESS

Consolidated Undrained Direct Simple Shear Testing of Cohesive Soils by ASTM D6528

Client: Geosyntec Consultants
Project Name: Crossroads Phase 14
Project Location: Norridgewock, ME
GTX#: 309940
Test Date: 9/22/19

Boring ID: GB-18
Sample ID: 17-19
Depth, ft: 17-19

Visual Description: Moist, dark olive gray clay

Test Equipment: Top and bottom box (circular) = 2.50 in diameter. Load cells and LVDT's connected to data acquisition system for shear force, normal load, horizontal and vertical displacement; surface area = 4.91 in^2, soil height = 1 inch. Stacked rings used. Set up included porous stones with pins.

Test Condition: Inundated prior to consolidation

Sample Type and Preparation: density: Extruded from tube, cut, trimmed and placed into apparatus at as-received and moisture

Parameter	Point 1	Point 2	Point 3	Point 4	Point 5
Test No.	DSS-20				
Initial Moisture Content, %	29.7				
Initial Dry Density, pcf	90.3				
Nominal Rate of Shear Strain, %/hr	5.0				
Maximum Vertical Consolidation Stress, psf	18,750				
Vertical Consolidation Stress at Shear, psf	3,125				
Final Moisture Content, %	22.6				
Measured Peak Shear Stress, psf	2,595				
Shear Strain at Peak Shear Stress, %	16.3				
Membrane Correction, psf	56				
Corrected Peak Shear Stress, psf	2,539				
S_u / σ'_{vc}	0.81				

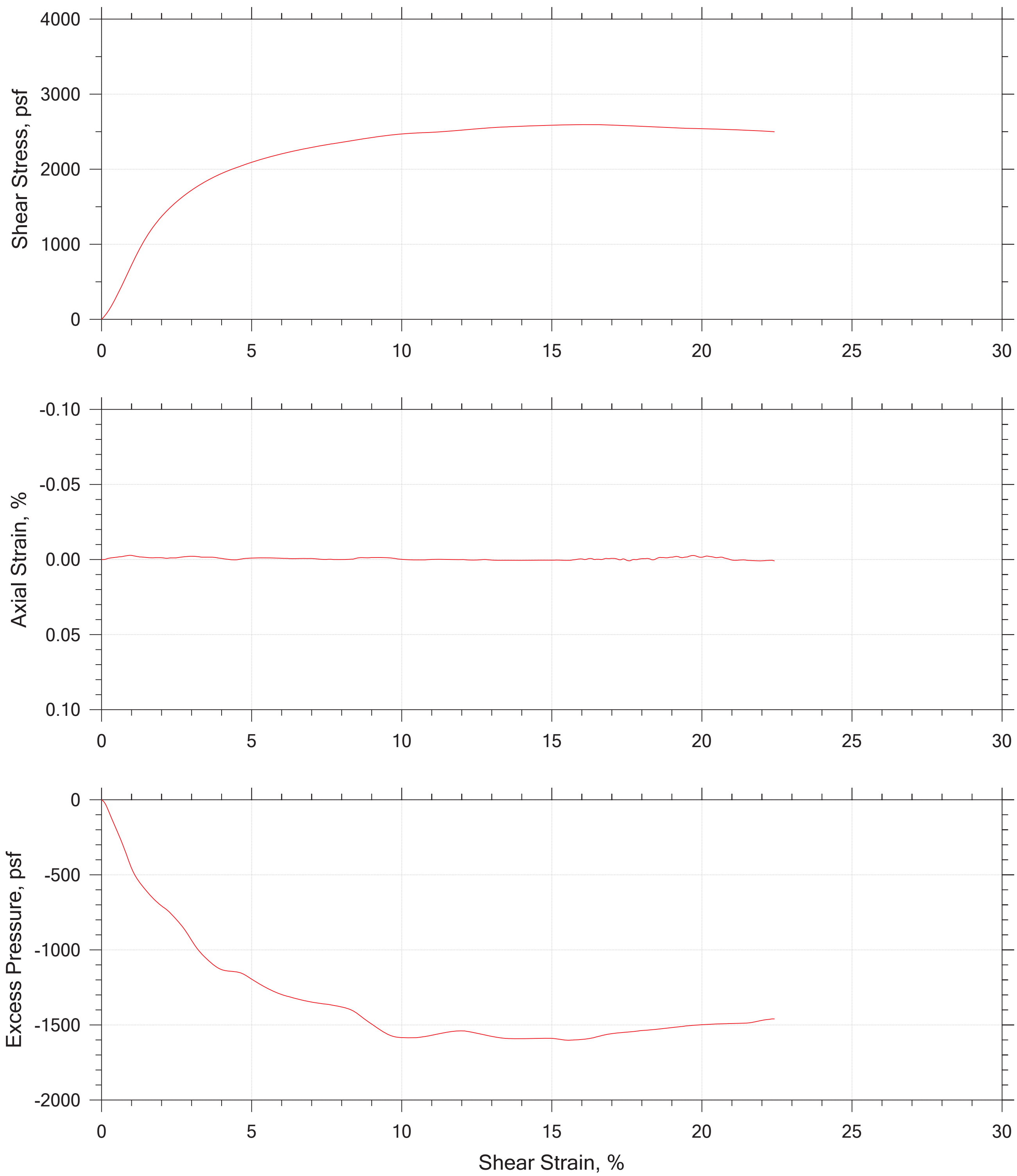
Comments:

Tested By: md

Checked By: njh

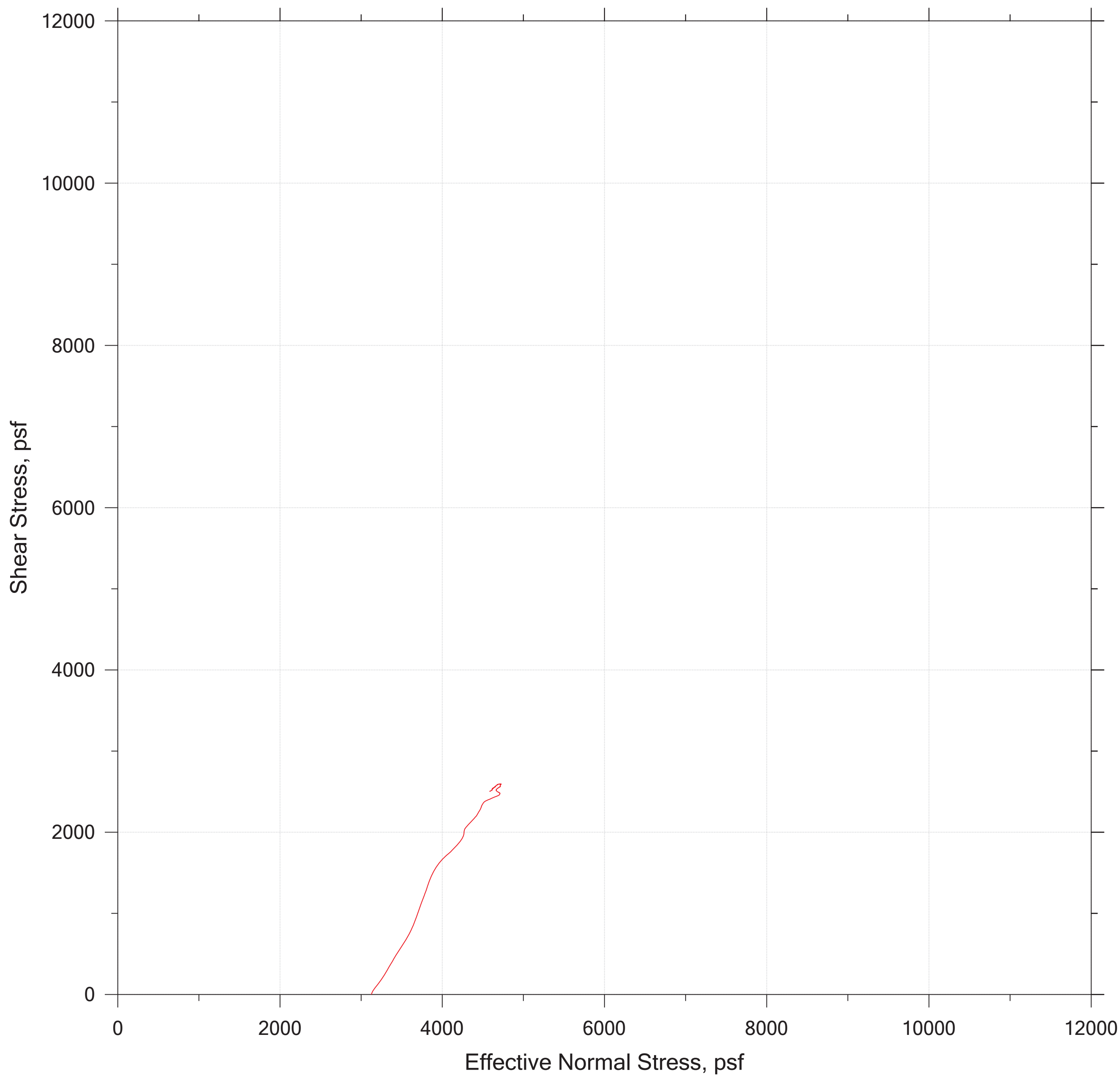
Notes: These results apply only to the sample tested for the specific test conditions. The test procedures employed follow accepted industry practice and the indicated test method. GeoTesting Express has no specific knowledge as to conditioning, origin, sampling procedure or intended use of the material.

DIRECT SIMPLE SHEAR TEST



GeoTesting EXPRESS	Project: Crossroads Phase 14	Location: Norridgewock, ME	Project No.: GTX-309940
	Boring No.: GB-18	Tested By: md	Checked By: njh
	Sample No.: 17-19	Test Date: 09/22/19	Depth: 17-19 ft
	Test No.: DSS-20	Sample Type: intact	Elevation: ---
	Description: Moist, dark olive gray clay		
	Remarks: System N		
			Page 2 of 3

DIRECT SIMPLE SHEAR TEST



Project: Crossroads Phase 14	Location: Norridgewock, ME	Project No.: GTX-309940
Boring No.: GB-18	Tested By: md	Checked By: njh
Sample No.: 17-19	Test Date: 09/22/19	Depth: 17-19 ft
Test No.: DSS-20	Sample Type: intact	Elevation: ---
Description: Moist, dark olive gray clay		
Remarks: System N		

Consolidated Undrained Direct Simple Shear Testing of Cohesive Soils by ASTM D6528

Client: Geosyntec Consultants
GTX#: 309940
Project Name: Crossroads Phase 14
Test Date: 8/14/19
Project Location: Norridgewock, ME

Boring ID: GB-15
Sample ID: 7-9
Depth, ft: 7-9

Visual Description: Moist, olive gray clay

Test Equipment: Top and bottom box (circular) = 2.50 in diameter. Load cells and LVDT's connected to data acquisition system for shear force, normal load, horizontal and vertical displacement; surface area = 4.91 in^2, soil height = 1 inch.
Stacked rings used. Set up included porous stones with pins.

Test Condition: Inundated prior to consolidation

Sample Type and Preparation: Extruded from tube, cut, trimmed and placed into apparatus at as-received density and moisture

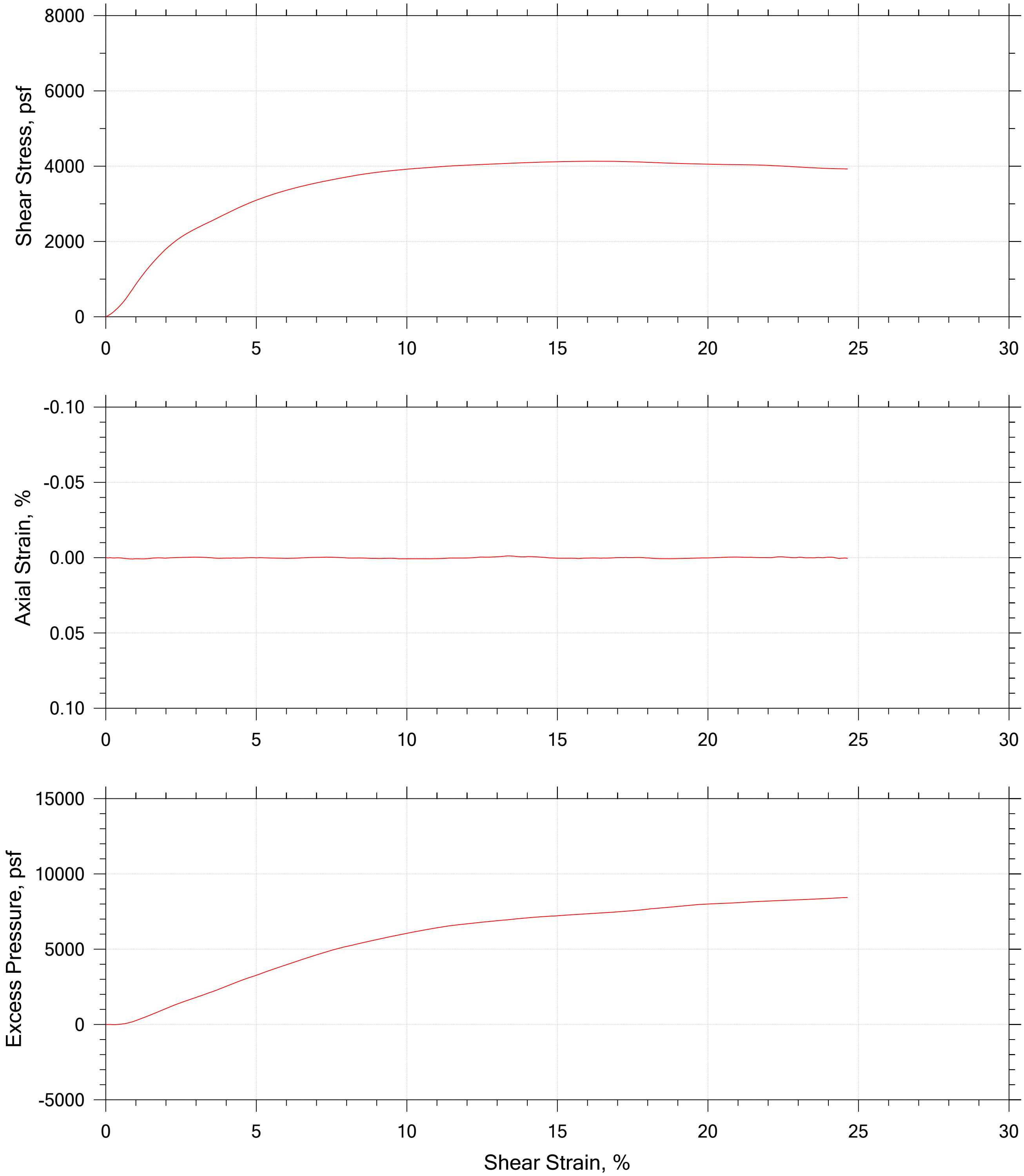
Parameter	Point 1	Point 2	Point 3	Point 4	Point 5
Test No.	DSS-4	DSS-5	DSS-6		
Initial Moisture Content, %	28.5	28.7	28.1		
Initial Dry Density, pcf	90.0	90.7	90.6		
Nominal Rate of Shear Strain, %/hr	5.0	5.0	5.0		
Maximum Vertical Consolidation Stress, psf	16,500	27,500	44,000		
Final Moisture Content, %	24.7	25.9	24.0		
Measured Peak Shear Stress, psf	4,135	6,265	8,794		
Shear Strain at Peak Shear Stress, %	16.3	15.0	17.3		
Membrane Correction, psf	56	60	54		
Corrected Peak Shear Stress, psf	4,079	6,205	8,740		
S_u / σ'_{vc}	0.25	0.23	0.20		

Comments:

Tested By: md
Checked By: njh

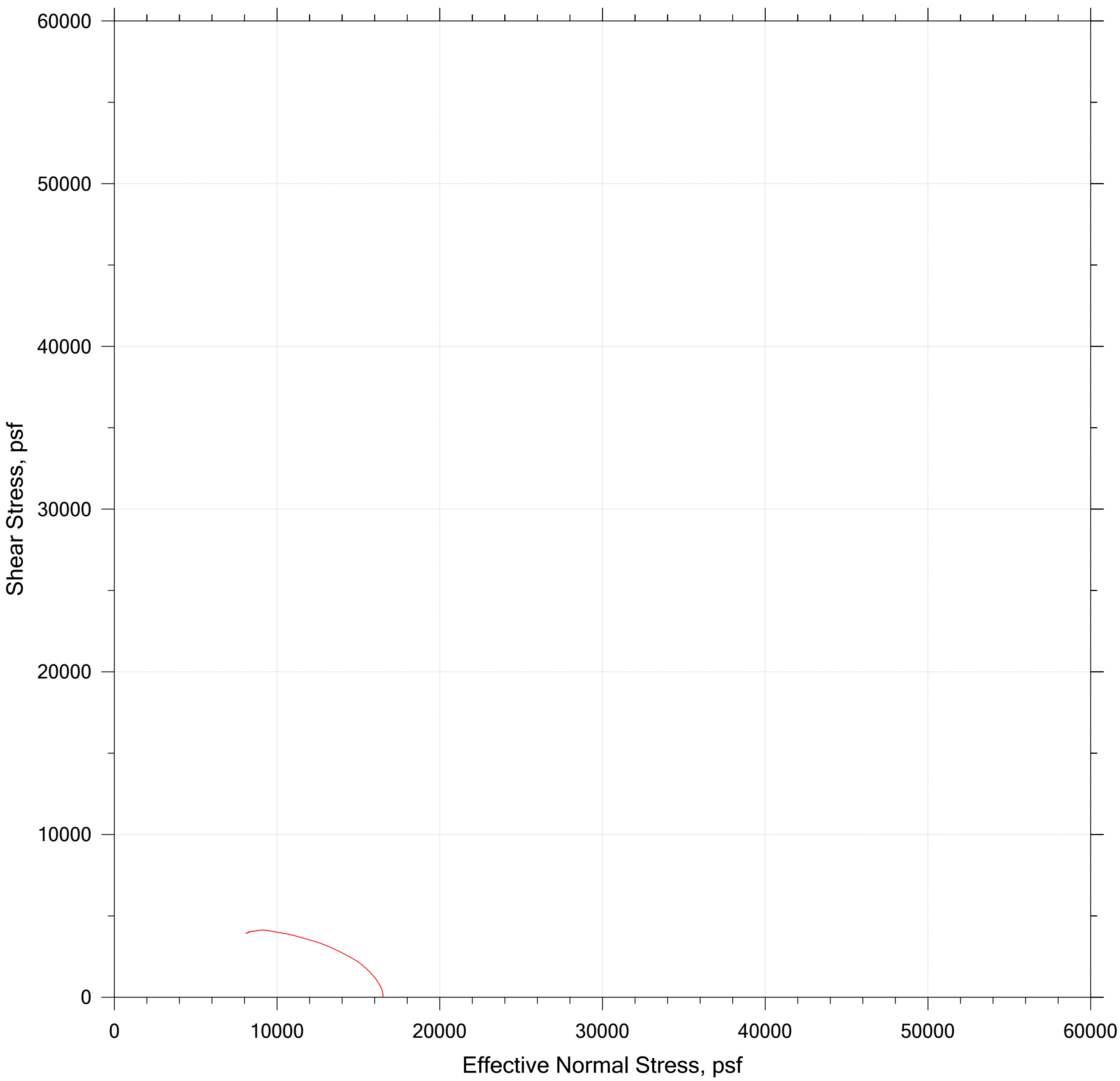
Notes: These results apply only to the sample tested for the specific test conditions. The test procedures employed follow accepted industry practice and the indicated test method. GeoTesting Express has no specific knowledge as to conditioning, origin, sampling procedure or intended use of the material.

DIRECT SIMPLE SHEAR TEST



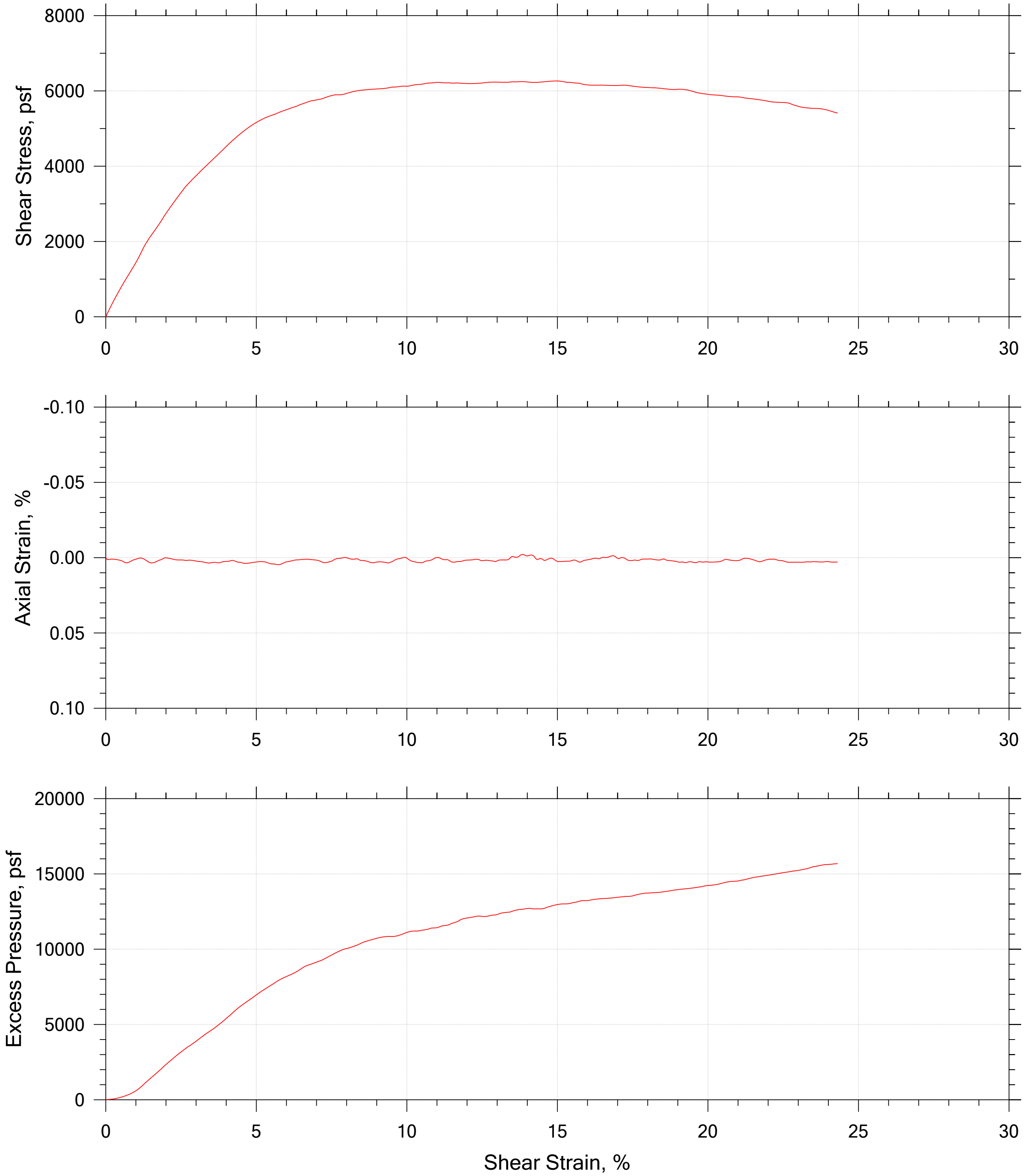
GeoTesting EXPRESS			
	Project: Crossroads Phase 14	Location: Norridgewock, ME	Project No.: GTX-309940
	Boring No.: GB-15	Tested By: md	Checked By: njh
	Sample No.: 7-9	Test Date: 08/14/19	Depth: 7-9 ft
	Test No.: DSS-4	Sample Type: intact	Elevation: ---
	Description: Moist, olive gray clay		
	Remarks: System HH		

DIRECT SIMPLE SHEAR TEST



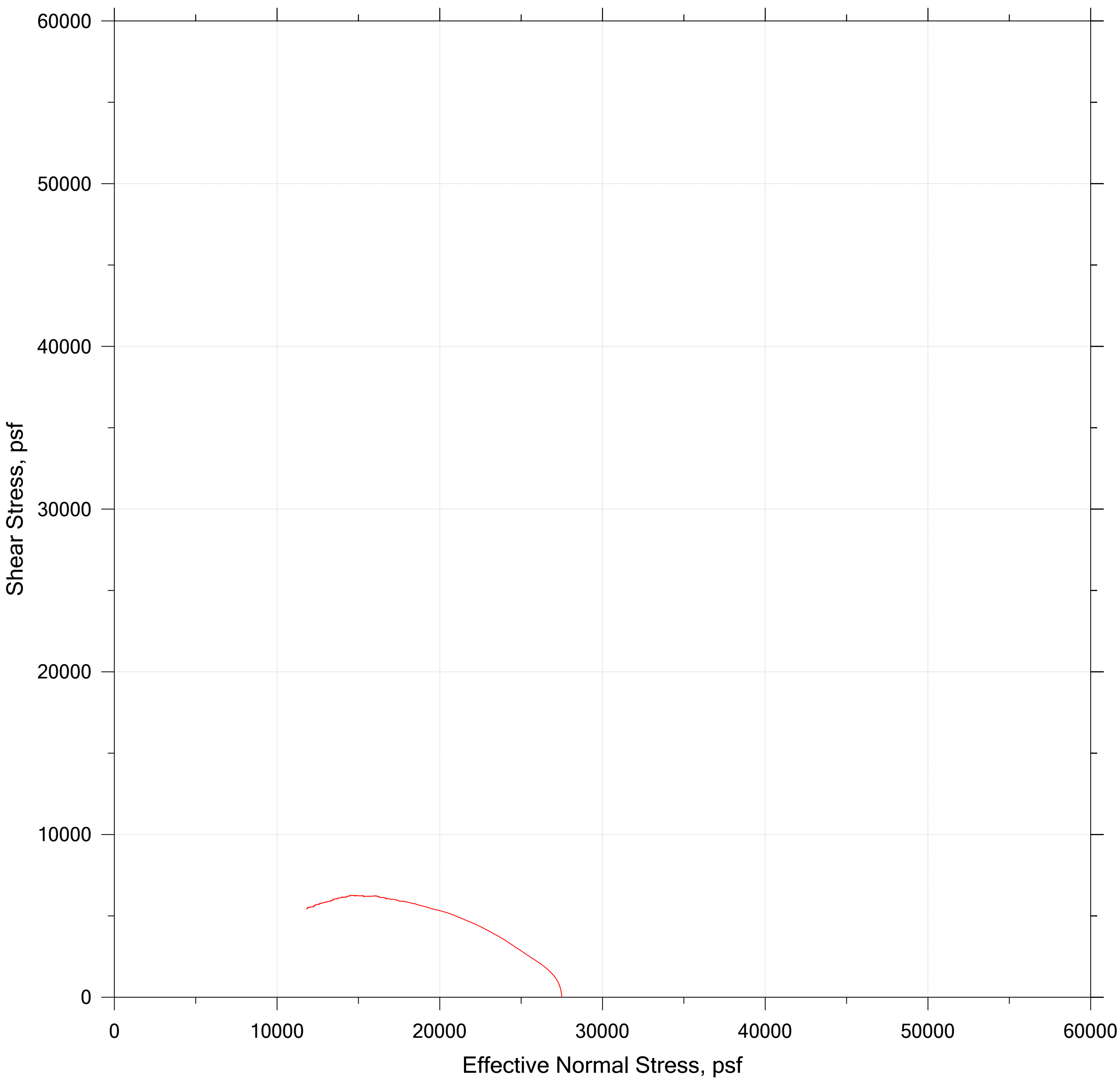
GeoTesting EXPRESS	Project: Crossroads Phase 14	Location: Norridgewock, ME	Project No.: GTX-309940
	Boring No.: GB-15	Tested By: md	Checked By: njh
	Sample No.: 7-9	Test Date: 08/14/19	Depth: 7-9 ft
	Test No.: DSS-4	Sample Type: intact	Elevation: ---
	Description: Moist, olive gray clay		
	Remarks: System HH		

DIRECT SIMPLE SHEAR TEST



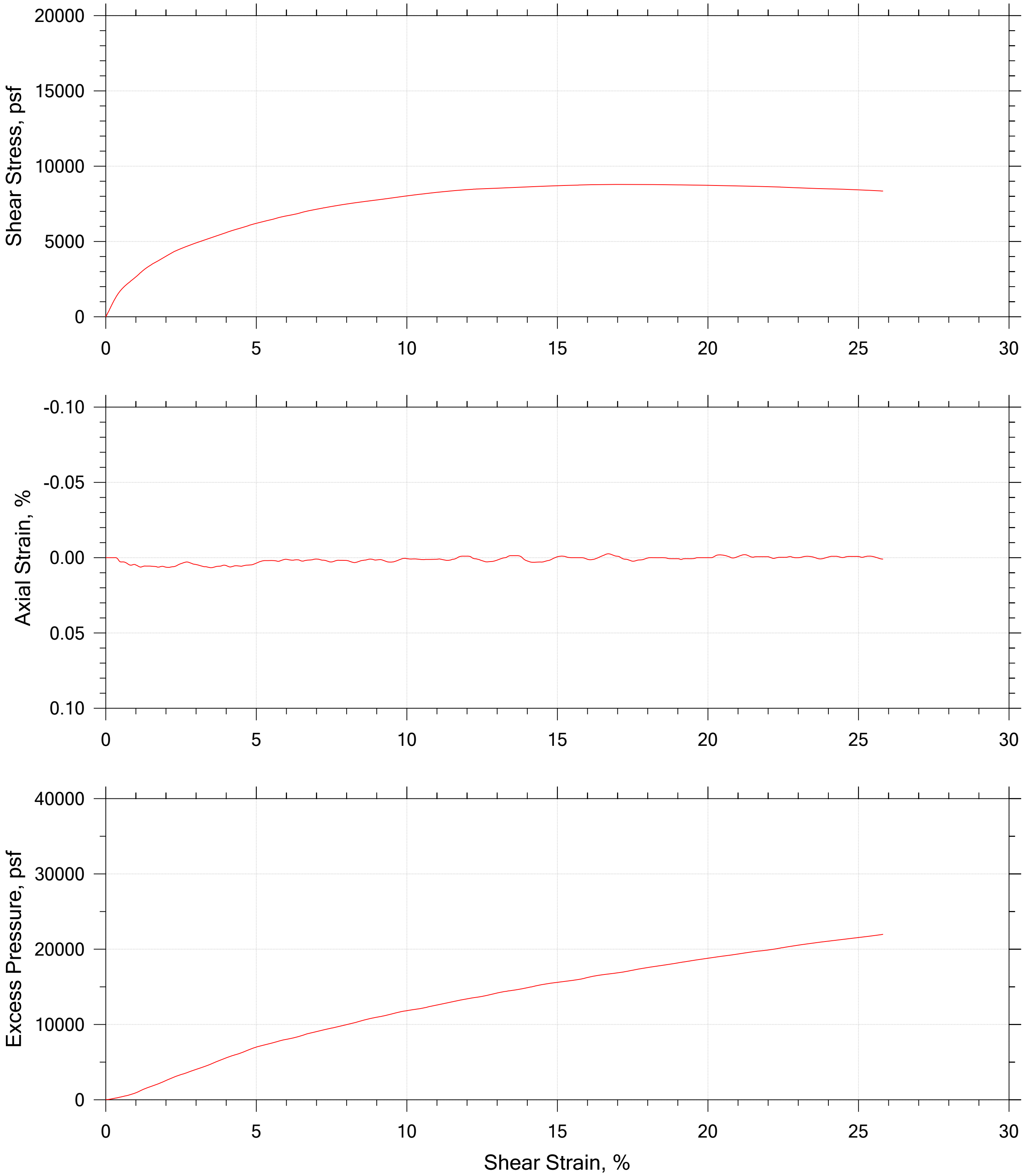
GeoTesting EXPRESS			
	Project: Crossroads Phase 14	Location: Norridgewock, ME	Project No.: GTX-309940
	Boring No.: GB-15	Tested By: md	Checked By: njh
	Sample No.: 7-9	Test Date: 08/14/19	Depth: 7-9 ft
	Test No.: DSS-5	Sample Type: intact	Elevation: ---
	Description: Moist, olive gray clay		
	Remarks: System SS		

DIRECT SIMPLE SHEAR TEST



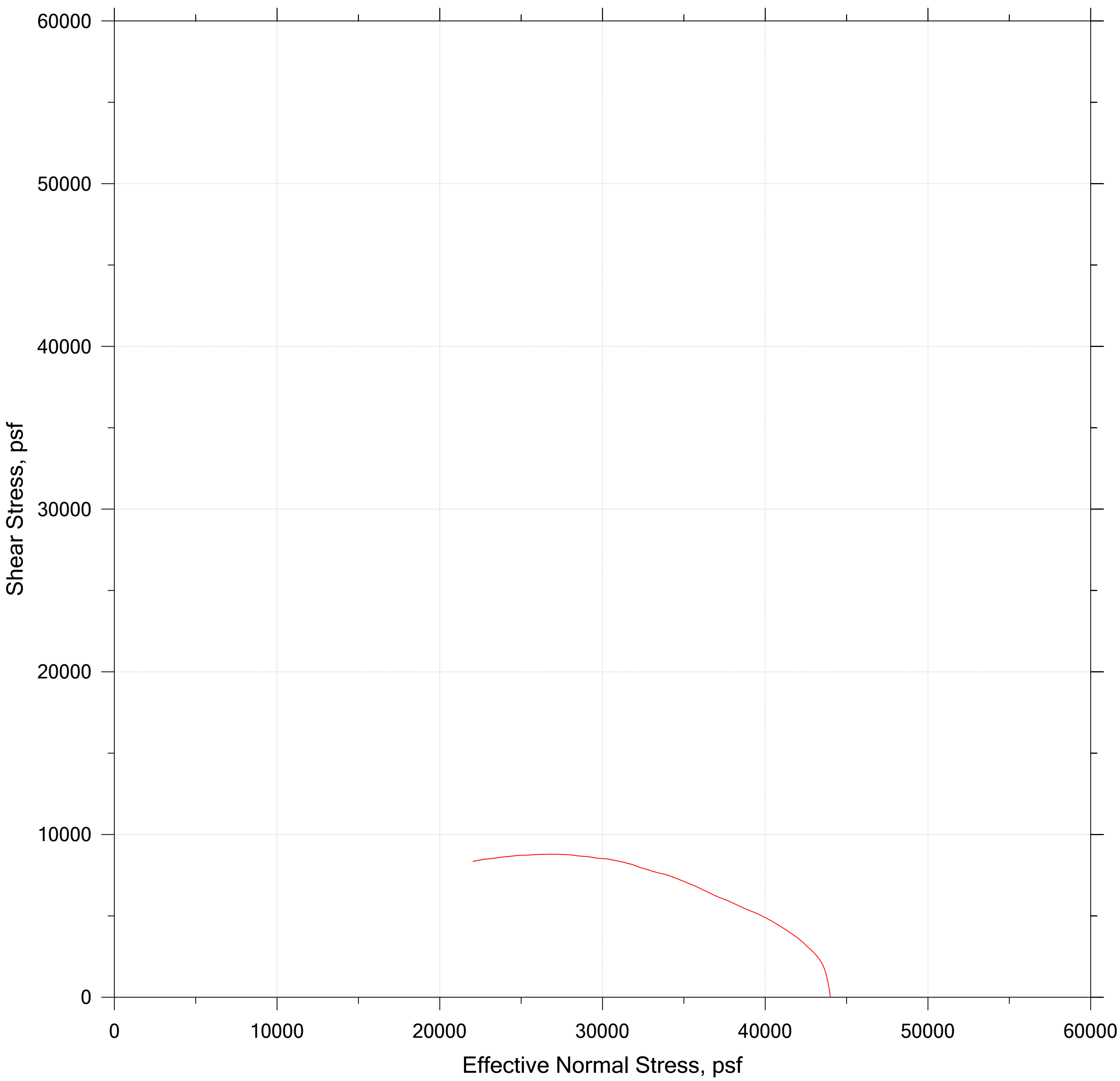
GeoTesting EXPRESS	Project: Crossroads Phase 14	Location: Norridgewock, ME	Project No.: GTX-309940
	Boring No.: GB-15	Tested By: md	Checked By: njh
	Sample No.: 7-9	Test Date: 08/14/19	Depth: 7-9 ft
	Test No.: DSS-5	Sample Type: intact	Elevation: ---
	Description: Moist, olive gray clay		
	Remarks: System SS		

DIRECT SIMPLE SHEAR TEST



GeoTesting EXPRESS	Project: Crossroads Phase 14	Location: Norridgewock, ME	Project No.: GTX-309940
	Boring No.: GB-15	Tested By: md	Checked By: njh
	Sample No.: 7-9	Test Date: 08/19/19	Depth: 7-9 ft
	Test No.: DSS-6	Sample Type: intact	Elevation: ---
	Description: Moist, olive gray clay		
	Remarks: System N		

DIRECT SIMPLE SHEAR TEST



GeoTesting EXPRESS	Project: Crossroads Phase 14	Location: Norridgewock, ME	Project No.: GTX-309940
	Boring No.: GB-15	Tested By: md	Checked By: njh
	Sample No.: 7-9	Test Date: 08/19/19	Depth: 7-9 ft
	Test No.: DSS-6	Sample Type: intact	Elevation: ---
	Description: Moist, olive gray clay		
	Remarks: System N		

GeoTesting EXPRESS

Consolidated Undrained Direct Simple Shear Testing of Cohesive Soils by ASTM D6528

Client: Geosyntec Consultants | GTX#: 309940
Project Name: Crossroads Phase 14 | Test Date: 8/29/19
Project Location: Norridgewock, ME

Boring ID: GB-15
Sample ID: 7-9
Depth, ft: 7-9

Visual Description: Moist, olive gray clay

Test Equipment: Top and bottom box (circular) = 2.50 in diameter. Load cells and LVDT's connected to data acquisition system for shear force, normal load, horizontal and vertical displacement; surface area = 4.91 in^2, soil height = 1 inch. Stacked rings used. Set up included porous stones with pins.

Test Condition: Inundated prior to consolidation

Sample Type and Preparation: density: Extruded from tube, cut, trimmed and placed into apparatus at as-received and moisture

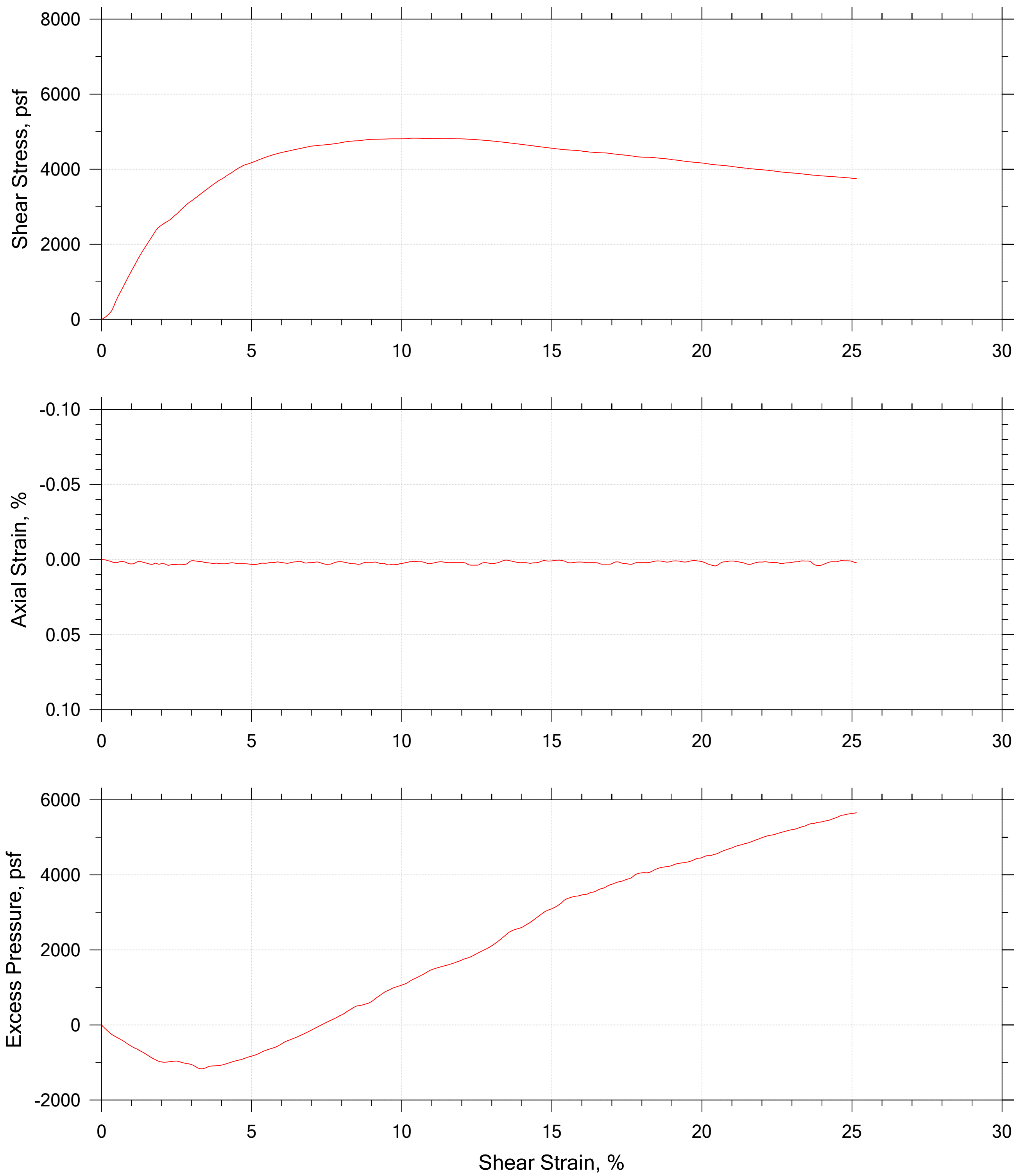
Parameter	Point 1	Point 2	Point 3	Point 4	Point 5
Test No.	DSS-10	DSS-11	DSS-12		
Initial Moisture Content, %	28.2	27.5	27.2		
Initial Dry Density, pcf	90.7	90.3	90.5		
Nominal Rate of Shear Strain, %/hr	5.0	5.0	5.0		
Maximum Vertical Consolidation Stress, psf	27,500	27,500	27,500		
Vertical Consolidation Stress at shear, psf	13,750	6,875	4,585		
Final Moisture Content, %	27.7	26.1	26.0		
Measured Peak Shear Stress, psf	4,828	4,363	4,065		
Shear Strain at Peak Shear Stress, %	10.4	14.3	16.9		
Membrane Correction, psf	61	60	56		
Corrected Peak Shear Stress, psf	4,767	4,303	4,009		
S_u / σ'_{vc}	0.35	0.63	0.87		

Comments:

Tested By: md | Checked By: njh

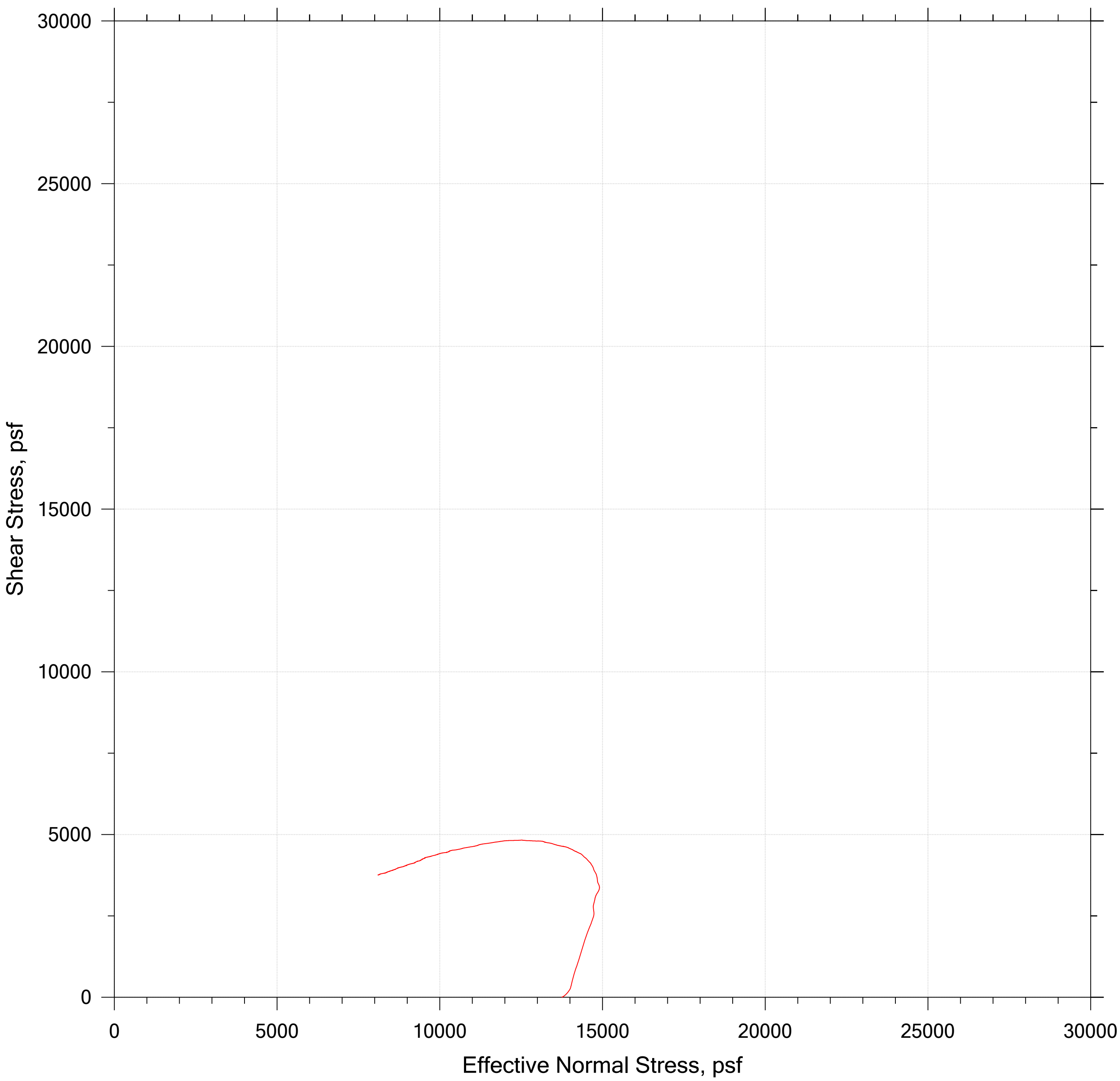
Notes: These results apply only to the sample tested for the specific test conditions. The test procedures employed follow accepted industry practice and the indicated test method. GeoTesting Express has no specific knowledge as to conditioning, origin, sampling procedure or intended use of the material.

DIRECT SIMPLE SHEAR TEST



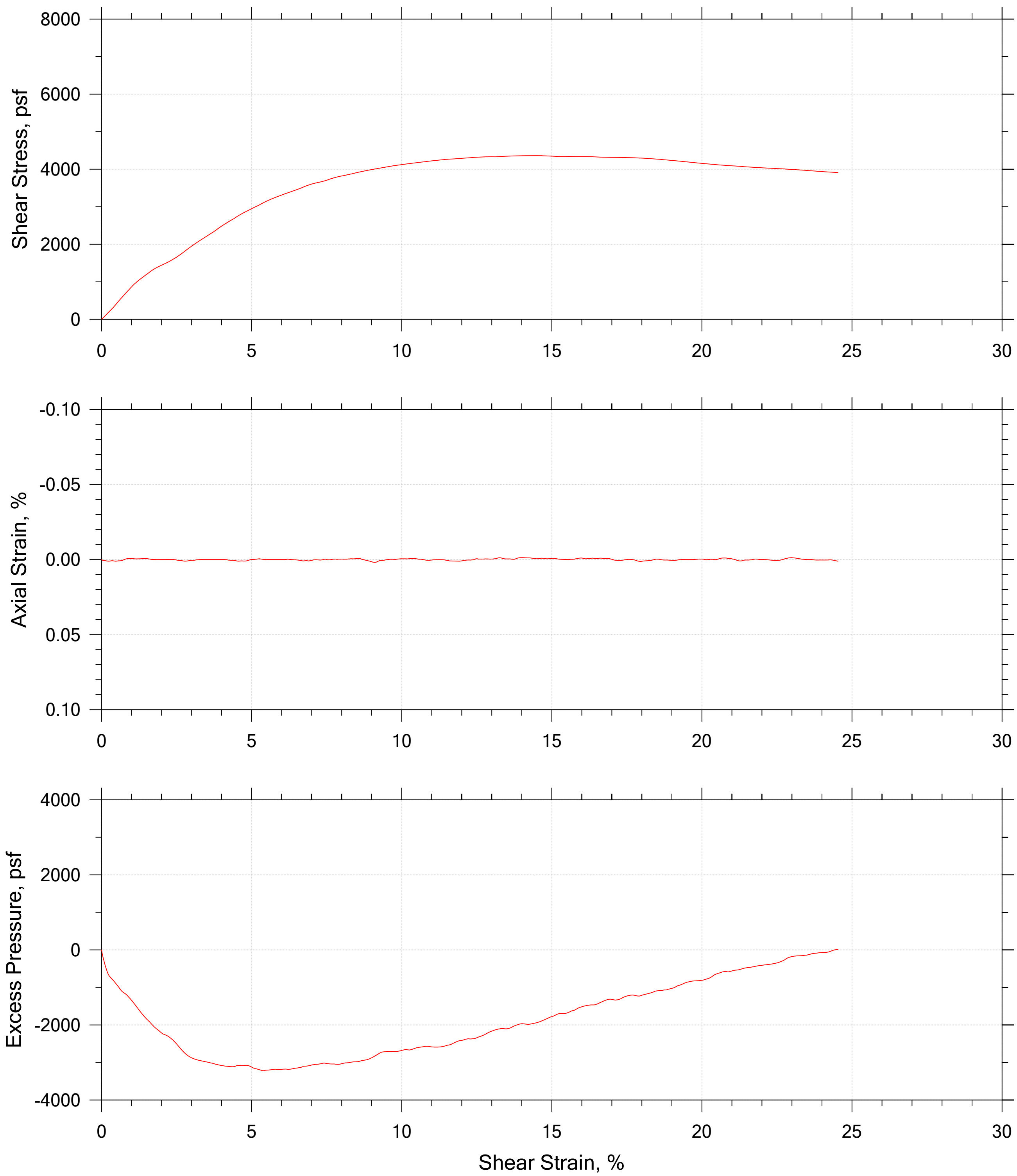
GeoTesting EXPRESS	Project: Crossroads Phase 14	Location: Norridgewock, ME	Project No.: GTX-309940
	Boring No.: GB-15	Tested By: md	Checked By: njh
	Sample No.: 7-9	Test Date: 08/29/19	Depth: 7-9 ft
	Test No.: DSS-10	Sample Type: intact	Elevation: ---
	Description: Moist, olive gray clay		
	Remarks: System GG		
			Page 2 of 7

DIRECT SIMPLE SHEAR TEST



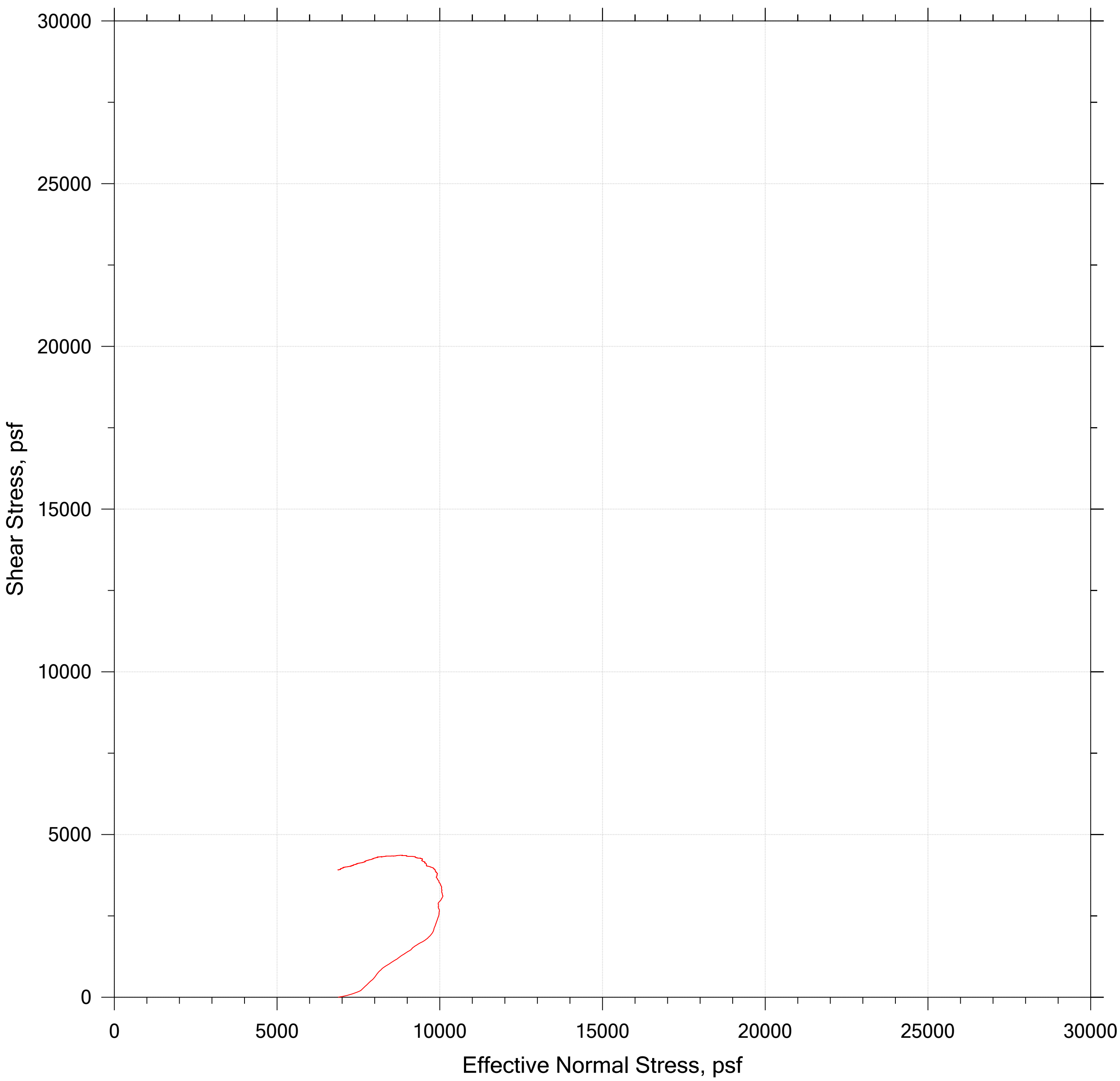
GeoTesting EXPRESS	Project: Crossroads Phase 14	Location: Norridegwock, ME	Project No.: GTX-309940
	Boring No.: GB-15	Tested By: md	Checked By: njh
	Sample No.: 7-9	Test Date: 08/29/19	Depth: 7-9 ft
	Test No.: DSS-10	Sample Type: intact	Elevation: ---
	Description: Moist, olive gray clay		
	Remarks: System GG		

DIRECT SIMPLE SHEAR TEST



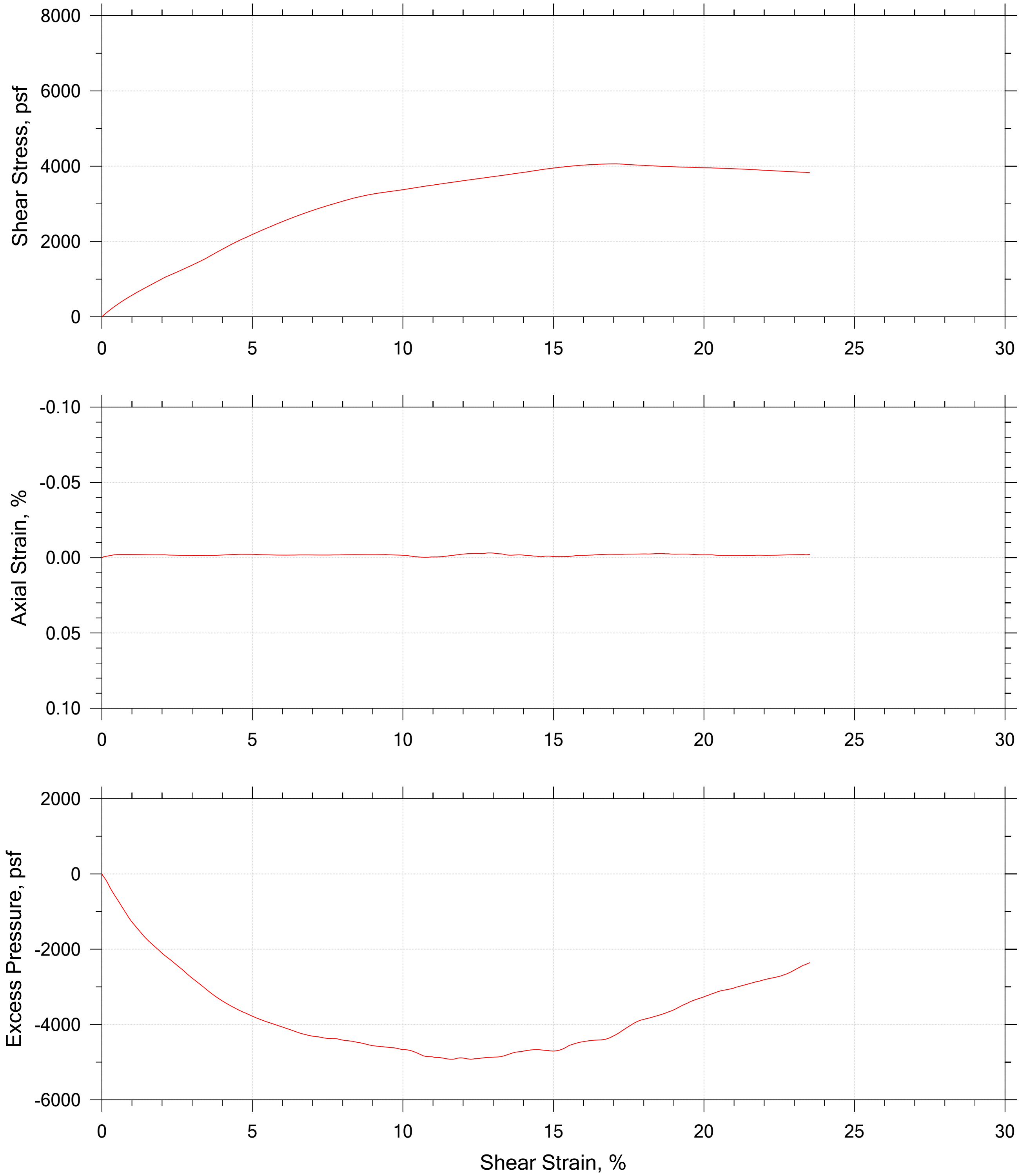
GeoTesting EXPRESS	Project: Crossroads Phase 14	Location: Norridegwock, ME	Project No.: GTX-309940
	Boring No.: GB-15	Tested By: md	Checked By: njh
	Sample No.: 7-9	Test Date: 08/11/19	Depth: 7-9 ft
	Test No.: DSS-11	Sample Type: intact	Elevation: ---
	Description: Moist, olive gray clay		
	Remarks: System HH		

DIRECT SIMPLE SHEAR TEST



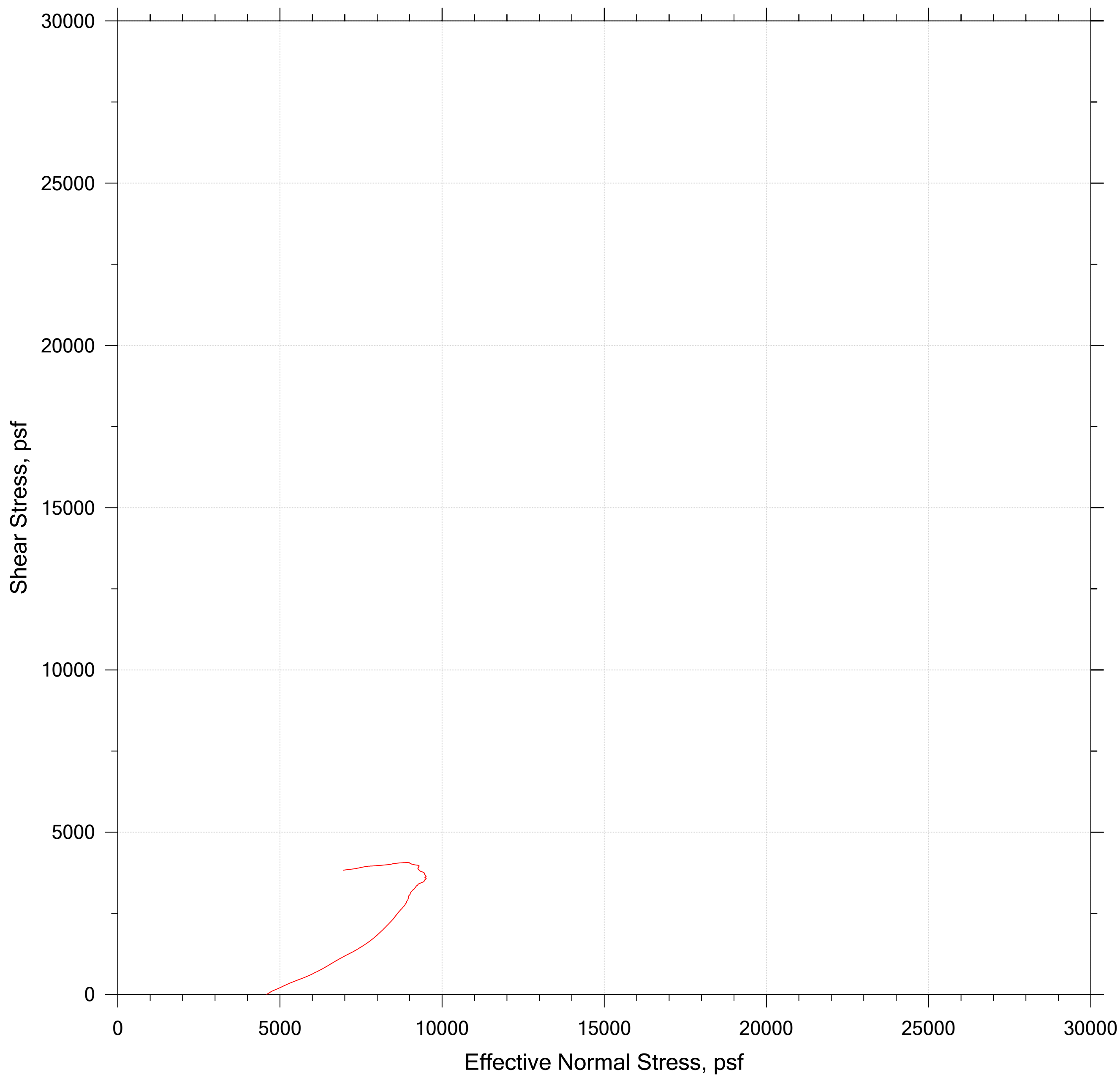
GeoTesting EXPRESS	Project: Crossroads Phase 14	Location: Norridegwock, ME	Project No.: GTX-309940
	Boring No.: GB-15	Tested By: md	Checked By: njh
	Sample No.: 7-9	Test Date: 08/11/19	Depth: 7-9 ft
	Test No.: DSS-11	Sample Type: intact	Elevation: ---
	Description: Moist, olive gray clay		
	Remarks: System HH		

DIRECT SIMPLE SHEAR TEST



GeoTesting EXPRESS	Project: Crossroads Phase 14	Location: Norridegwock, ME	Project No.: GTX-309940
	Boring No.: GB-15	Tested By: md	Checked By: njh
	Sample No.: 7-9	Test Date: 09/03/19	Depth: 7-9 ft
	Test No.: DSS-12	Sample Type: intact	Elevation: ---
	Description: Moist, olive gray clay		
	Remarks: System HH		

DIRECT SIMPLE SHEAR TEST



GeoTesting EXPRESS	Project: Crossroads Phase 14	Location: Norridegwock, ME	Project No.: GTX-309940
	Boring No.: GB-15	Tested By: md	Checked By: njh
	Sample No.: 7-9	Test Date: 09/03/19	Depth: 7-9 ft
	Test No.: DSS-12	Sample Type: intact	Elevation: ---
	Description: Moist, olive gray clay		
	Remarks: System HH		
			Page 7 of 7

Consolidated Undrained Direct Simple Shear Testing of Cohesive Soils by ASTM D6528

Client:	Geosyntec Consultants	GTX#:	309940
Project Name:	Crossroads Phase 14	Test Date:	8/20/19
Project Location:	Norridgewock, ME		

Boring ID: GB-21
Sample ID: 23-25
Depth, ft: 23-25

Visual Description: Moist, dark gray clay

Test Equipment: Top and bottom box (circular) = 2.50 in diameter. Load cells and LVDT's connected to data acquisition system for shear force, normal load, horizontal and vertical displacement; surface area = 4.91 in^2, soil height = 1 inch. Stacked rings used. Set up included porous stones with pins.

Test Condition: Inundated prior to consolidation

Sample Type and Preparation: Extruded from tube, cut, trimmed and placed into apparatus at as-received density and moisture

Parameter	Point 1	Point 2	Point 3	Point 4	Point 5
Test No.	DSS-7	DSS-8	DSS-9		
Initial Moisture Content, %	26.7	30.9	28.7		
Initial Dry Density, pcf	93.8	88.8	90.9		
Nominal Rate of Shear Strain, %/hr	5.0	5.0	5.0		
Maximum Vertical Consolidation Stress, psf	11,250	18,750	30,000		
Final Moisture Content, %	23.1	23.8	21.4		
Measured Peak Shear Stress, psf	2,281	3,443	6,226		
Shear Strain at Peak Shear Stress, %	9.1	11.1	18.3		
Membrane Correction, psf	60	62	52		
Corrected Peak Shear Stress, psf	2,221	3,381	6,174		
S_u / σ'_{vc}	0.20	0.18	0.21		

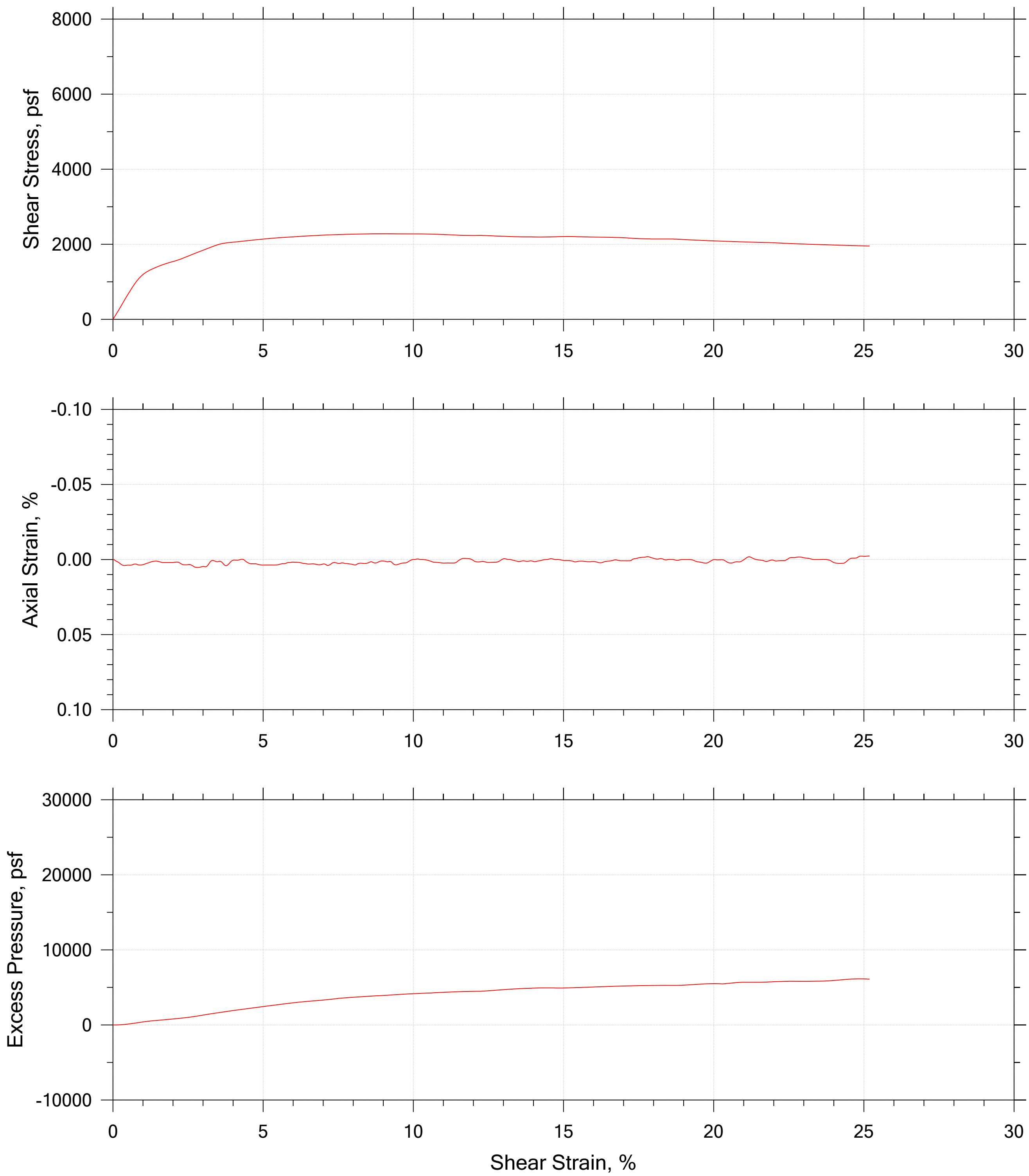
Comments:

Tested By: md

Checked By: njh

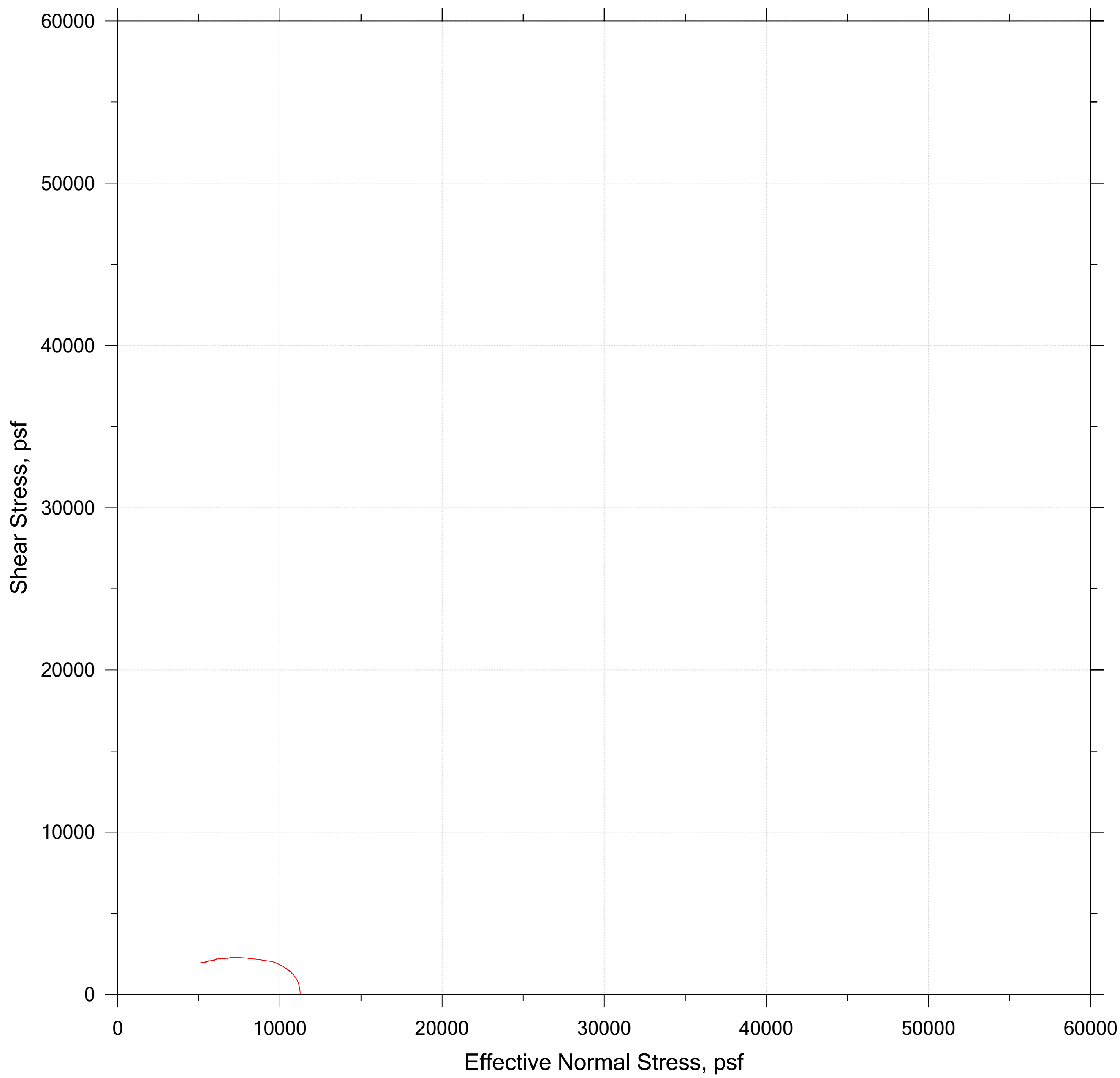
Notes: These results apply only to the sample tested for the specific test conditions. The test procedures employed follow accepted industry practice and the indicated test method. GeoTesting Express has no specific knowledge as to conditioning, origin, sampling procedure or intended use of the material.

DIRECT SIMPLE SHEAR TEST by ASTM D6528



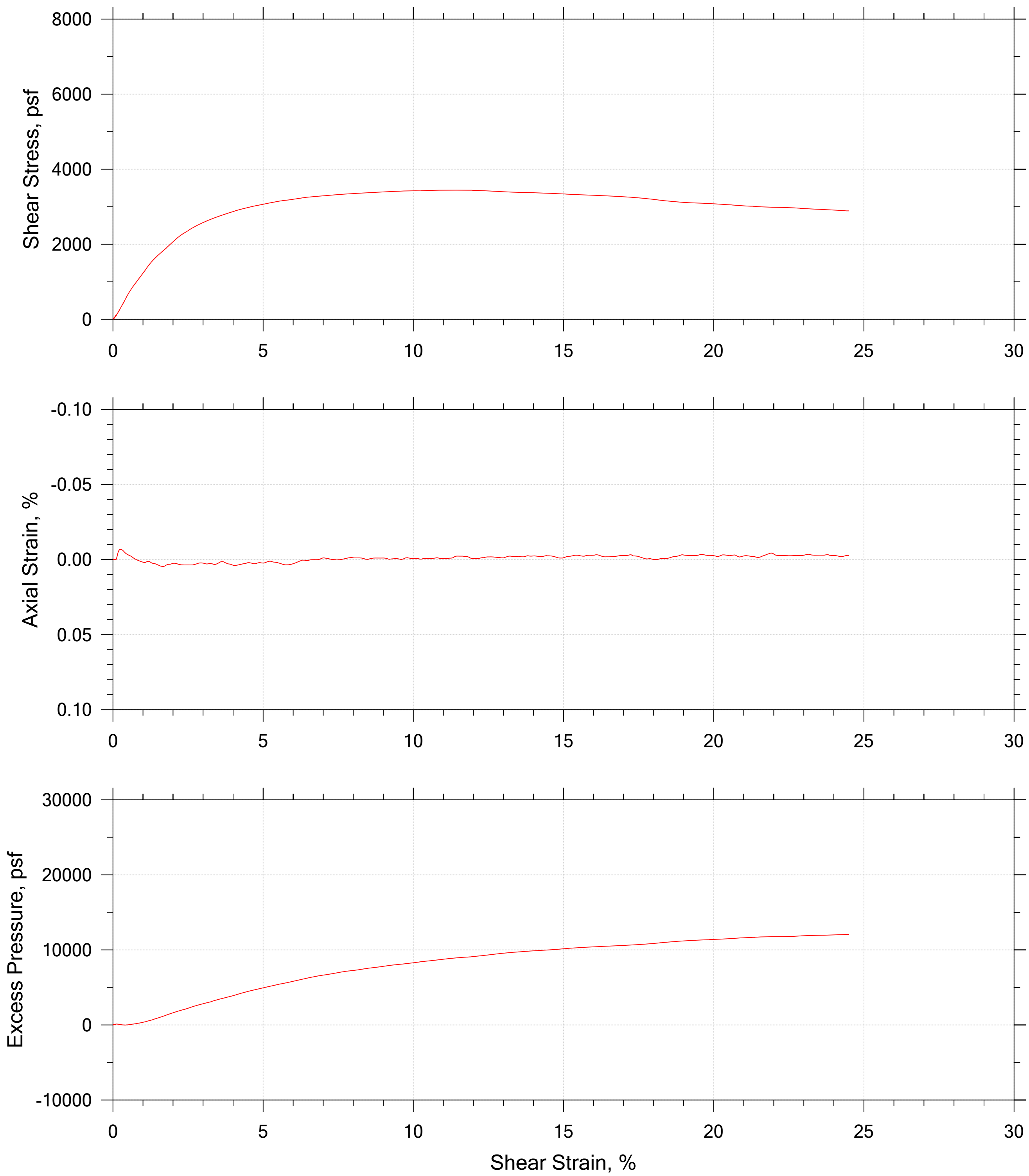
GeoTesting EXPRESS	Project: Crossroads Phase 14	Location: Norridgewock, ME	Project No.: GTX-309940
	Boring No.: GB-21	Tested By: md	Checked By: njh
	Sample No.: 23-25	Test Date: 08/21/19	Depth: 23-25 ft
	Test No.: DSS-7	Sample Type: intact	Elevation: ---
	Description: Moist, dark gray clay		
	Remarks: System M		

DIRECT SIMPLE SHEAR TEST by ASTM D6528



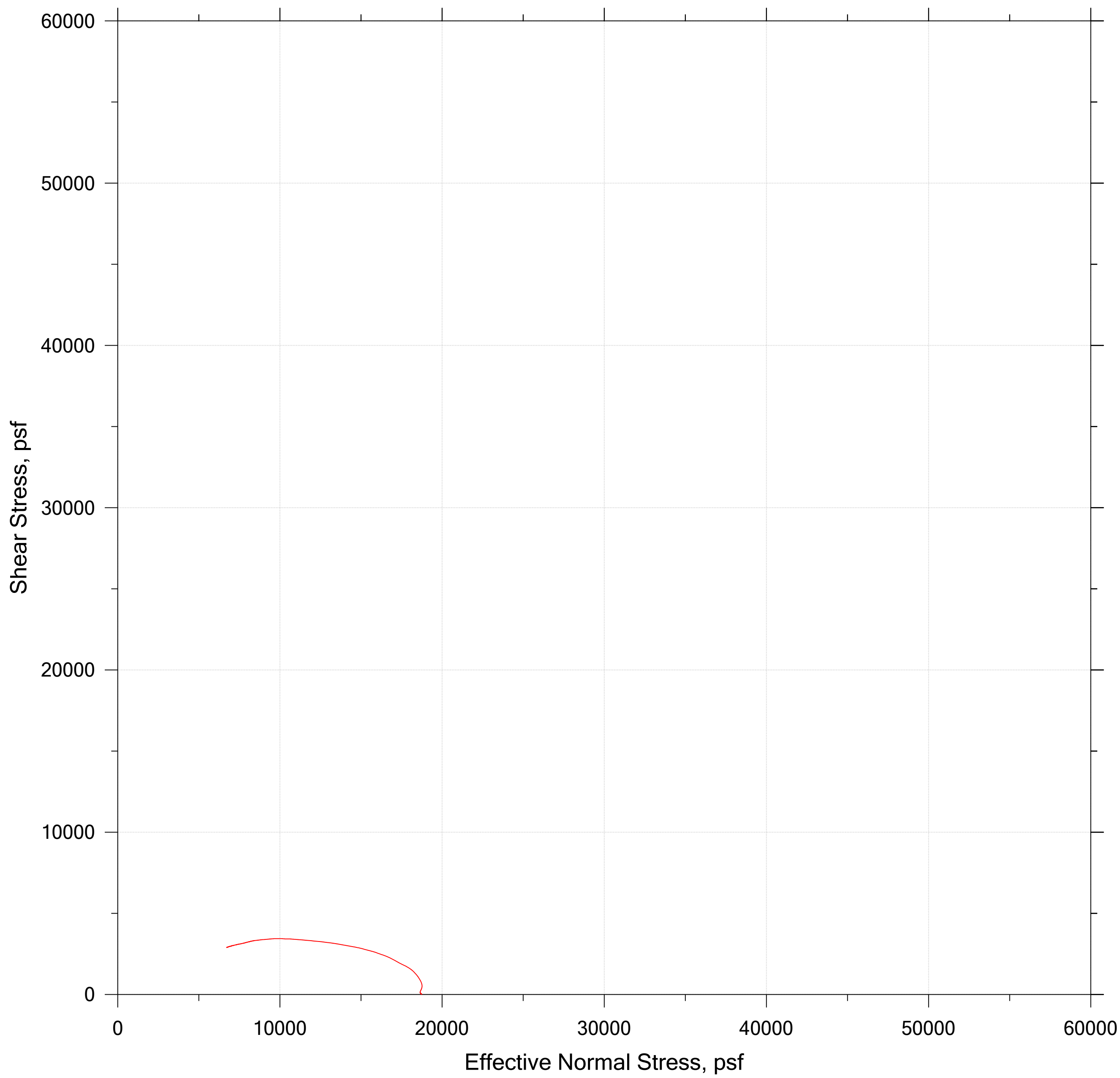
Project: Crossroads Phase 14	Location: Norridgewock, ME	Project No.: GTX-309940
Boring No.: GB-21	Tested By: md	Checked By: njh
Sample No.: 23-25	Test Date: 08/21/19	Depth: 23-25 ft
Test No.: DSS-7	Sample Type: intact	Elevation: ---
Description: Moist, dark gray clay		
Remarks: System M		

DIRECT SIMPLE SHEAR TEST by ASTM D6528



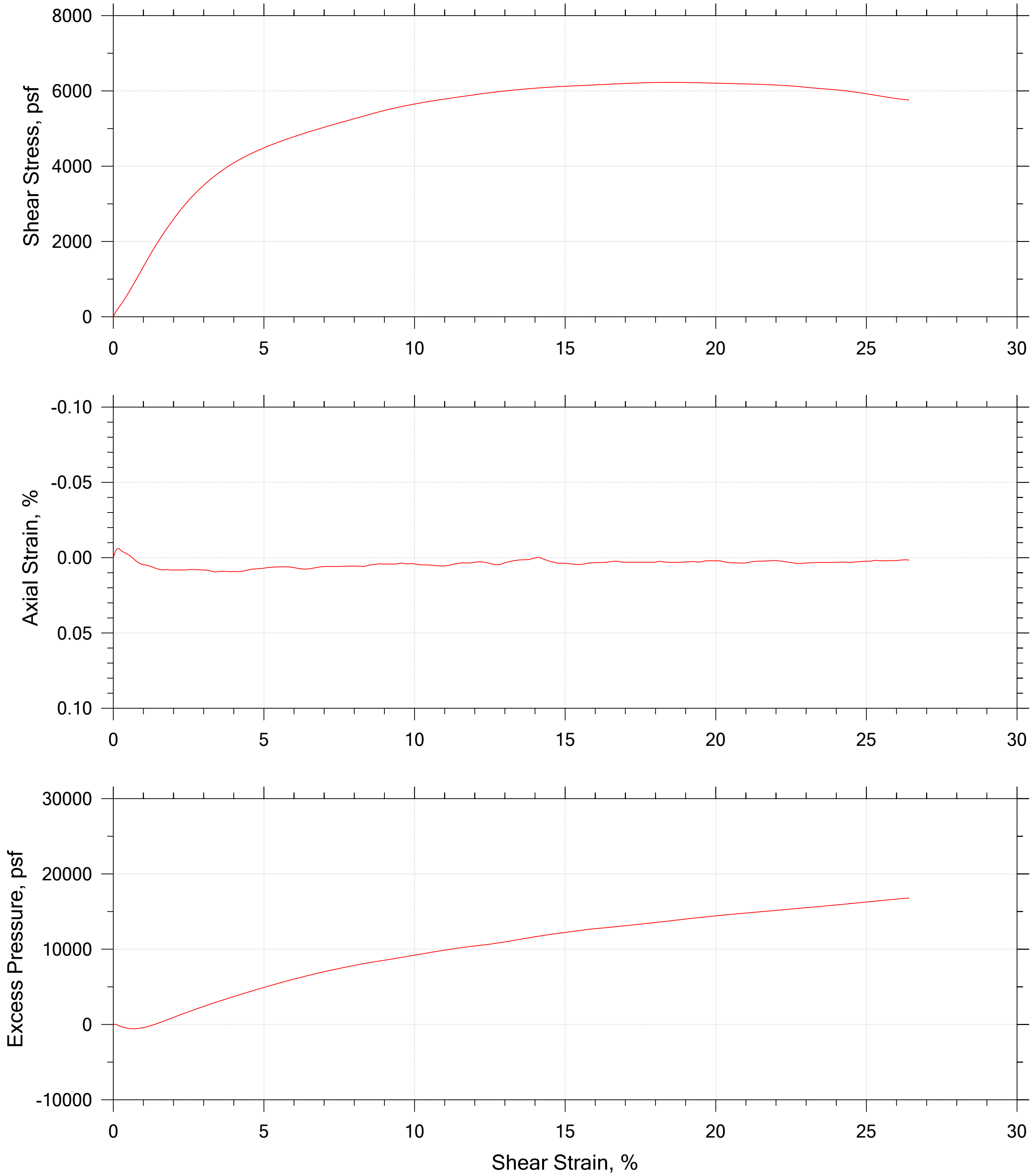
Project: Crossroads Phase 14	Location: Norridgewock, ME	Project No.: GTX-309940
Boring No.: GB-21	Tested By: md	Checked By: njh
Sample No.: 23-25	Test Date: 08/21/19	Depth: 23-25 ft
Test No.: DSS-8	Sample Type: intact	Elevation: ---
Description: Moist, dark gray clay		
Remarks: System N		

DIRECT SIMPLE SHEAR TEST by ASTM D6528



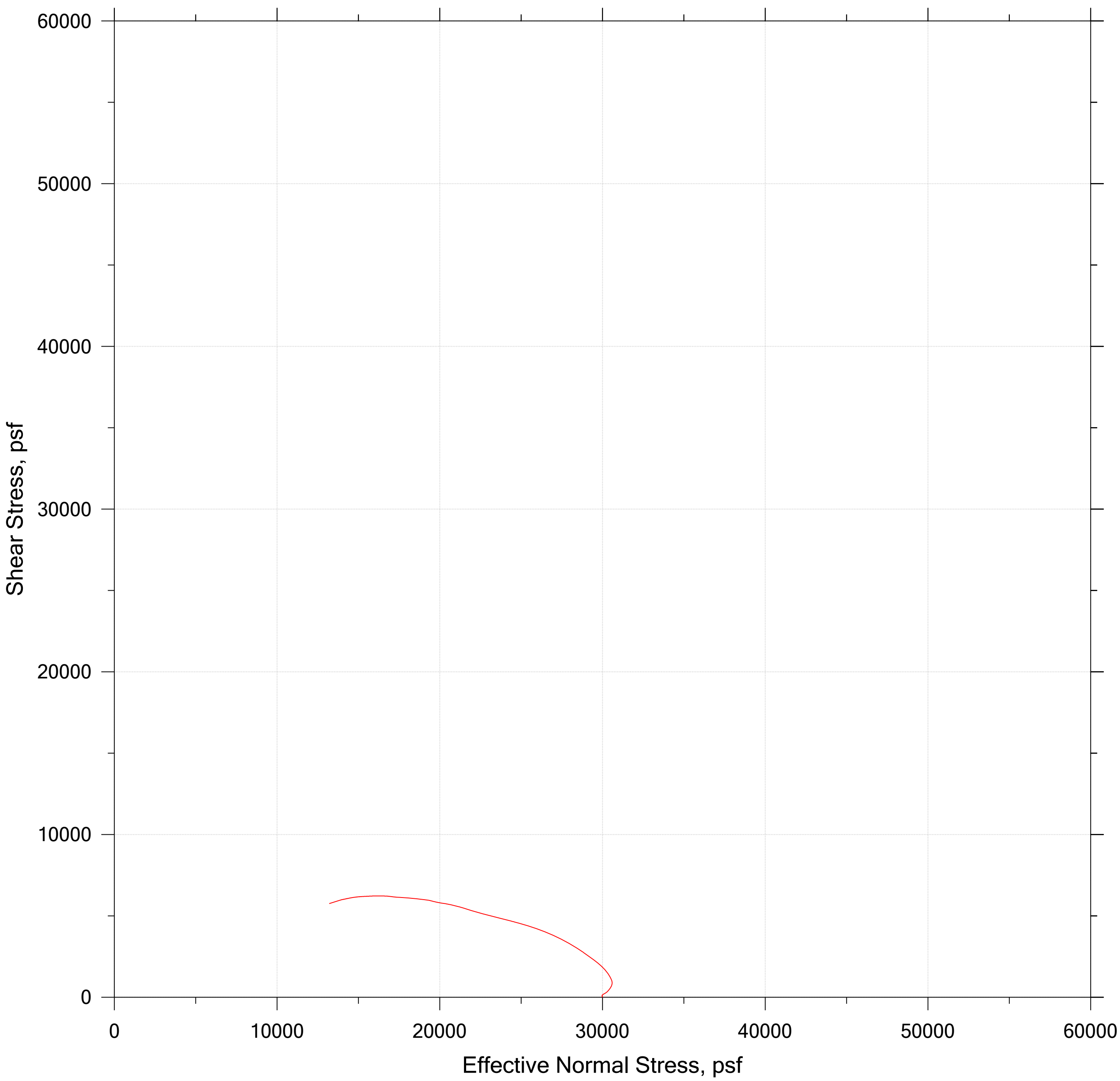
Project: Crossroads Phase 14	Location: Norridgewock, ME	Project No.: GTX-309940
Boring No.: GB-21	Tested By: md	Checked By: njh
Sample No.: 23-25	Test Date: 08/21/19	Depth: 23-25 ft
Test No.: DSS-8	Sample Type: intact	Elevation: ---
Description: Moist, dark gray clay		
Remarks: System N		

DIRECT SIMPLE SHEAR TEST by ASTM D6528



GeoTesting EXPRESS	Project: Crossroads Phase 14	Location: Norridgewock, ME	Project No.: GTX-309940
	Boring No.: GB-21	Tested By: md	Checked By: njh
	Sample No.: 23-25	Test Date: 08/20/19	Depth: 23-25 ft
	Test No.: DSS-9	Sample Type: intact	Elevation: ---
	Description: Moist, dark gray clay		
	Remarks: System N		
			Page 6 of 7

DIRECT SIMPLE SHEAR TEST by ASTM D6528



Project: Crossroads Phase 14	Location: Norridgewock, ME	Project No.: GTX-309940
Boring No.: GB-21	Tested By: md	Checked By: njh
Sample No.: 23-25	Test Date: 08/20/19	Depth: 23-25 ft
Test No.: DSS-9	Sample Type: intact	Elevation: ---
Description: Moist, dark gray clay		
Remarks: System N		

GeoTesting EXPRESS

Consolidated Undrained Direct Simple Shear Testing of Cohesive Soils by ASTM D6528

Client: Geosyntec Consultants
Project Name: Crossroads Phase 14
Project Location: Norridgewock, ME

GTX#: 309940
Test Date: 9/9/19

Boring ID: GB-21
Sample ID: 23-25
Depth, ft: 23-25

Visual Description: Moist, dark gray clay

Test Equipment: Top and bottom box (circular) = 2.50 in diameter. Load cells and LVDT's connected to data acquisition system for shear force, normal load, horizontal and vertical displacement; surface area = 4.91 in^2, soil height = 1 inch.
Stacked rings used. Set up included porous stones with pins.

Test Condition: Inundated prior to consolidation

Sample Type and Preparation: density — Extruded from tube, cut, trimmed and placed into apparatus at as-received density and moisture

Parameter	Point 1	Point 2	Point 3	Point 4	Point 5
Test No.	DSS-13	DSS-14	DSS-15		
Initial Moisture Content, %	32.7	28.4	27.6		
Initial Dry Density, pcf	86.4	91.4	91.4		
Nominal Rate of Shear Strain, %/hr	5.0	5.0	5.0		
Maximum Vertical Consolidation Stress, psf	18,750	18,750	18,750		
Vertical Consolidation Stress at shear, psf	3,125	4,700	9,375		
Final Moisture Content, %	25.4	22.2	22.5		
Measured Peak Shear Stress, psf	2,077	2,292	3,338		
Shear Strain at Peak Shear Stress, %	13.9	15.6	12.0		
Membrane Correction, psf	61	56	62		
Corrected Peak Shear Stress, psf	2,016	2,236	3,276		
S_u / σ'_{vc}	0.65	0.48	0.35		

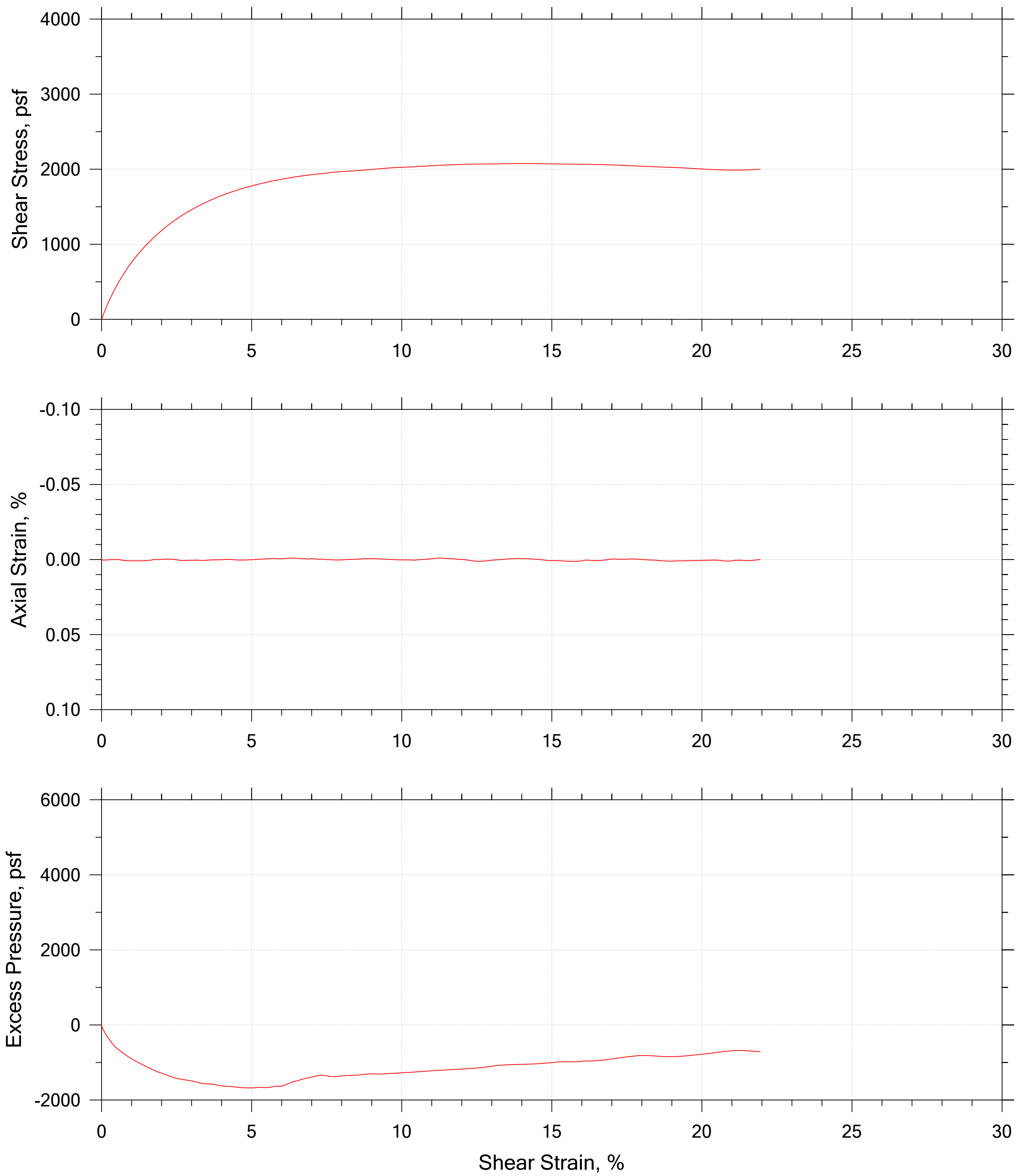
Comments:

Tested By: md

Checked By: njh

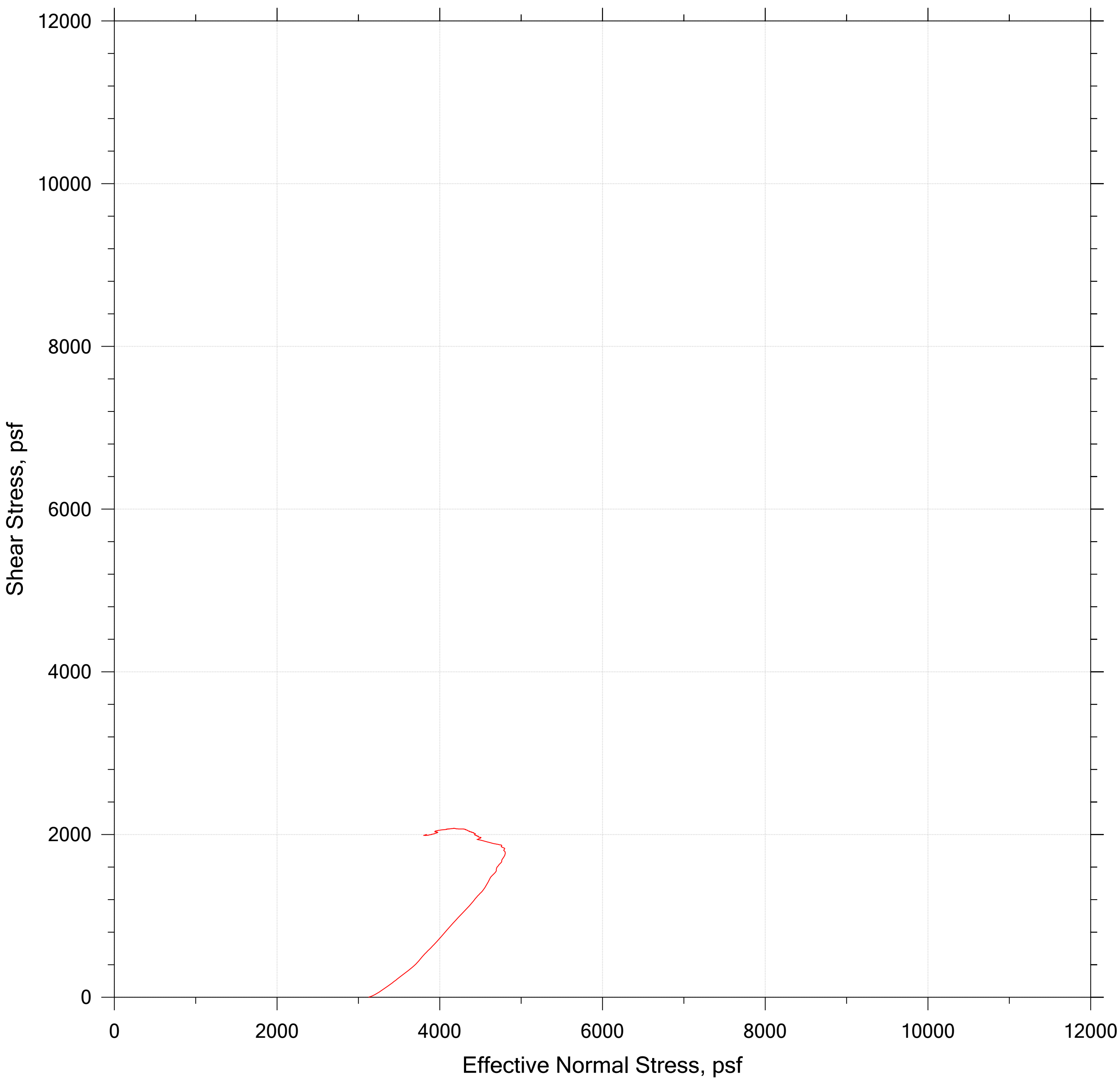
Notes: These results apply only to the sample tested for the specific test conditions. The test procedures employed follow accepted industry practice and the indicated test method. GeoTesting Express has no specific knowledge as to conditioning, origin, sampling procedure or intended use of the material.

DIRECT SIMPLE SHEAR TEST



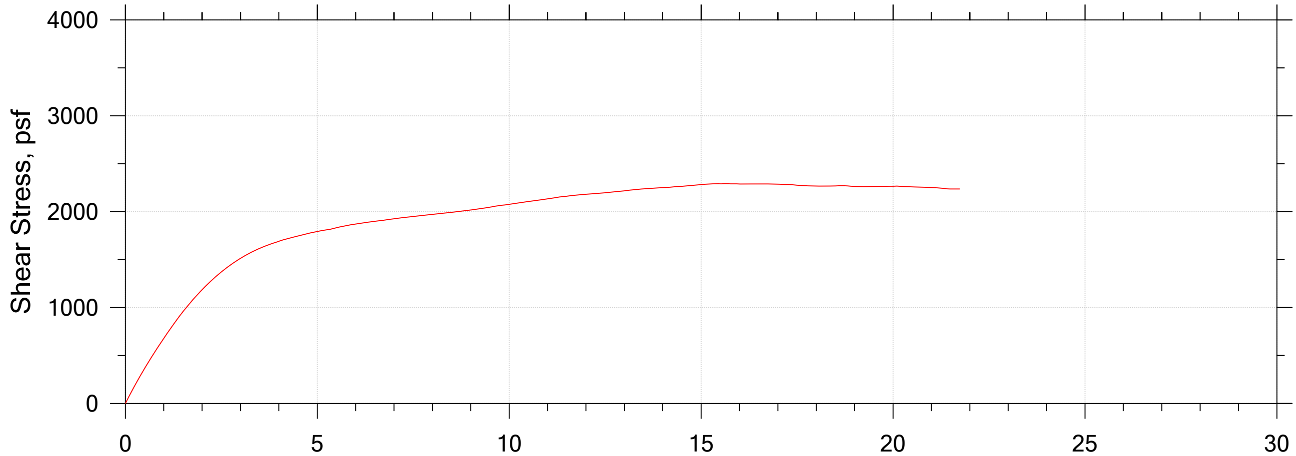
Project: Crossroads Phase 14	Location: Norridgewock, ME	Project No.: GTX-309940
Boring No.: GB-21	Tested By: md	Checked By: njh
Sample No.: 23-25	Test Date: 09/19/19	Depth: 23-25 ft
Test No.: DSS-13	Sample Type: intact	Elevation: ---
Description: Moist, dark gray clay		
Remarks: System HH		

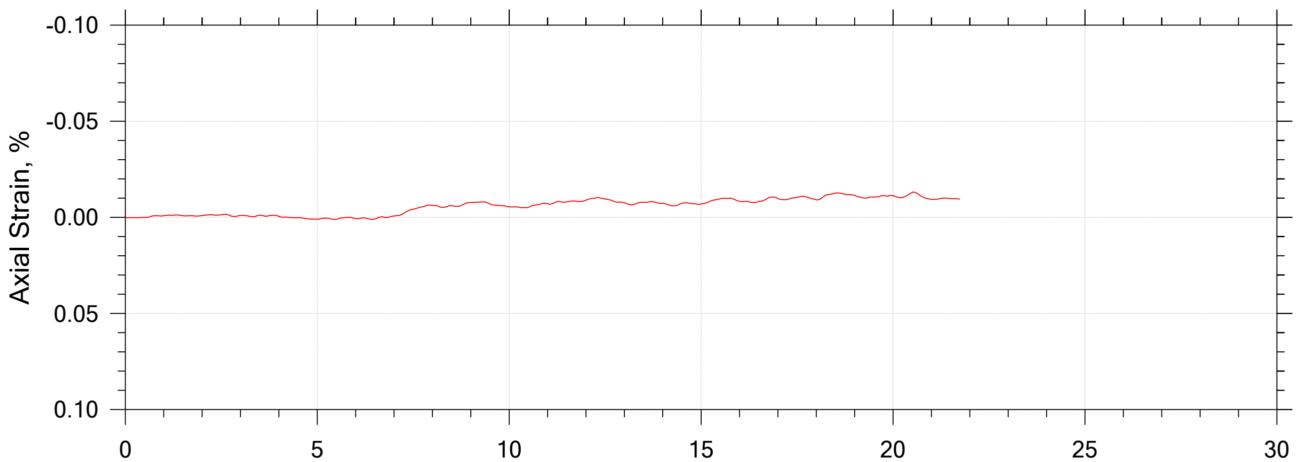
DIRECT SIMPLE SHEAR TEST

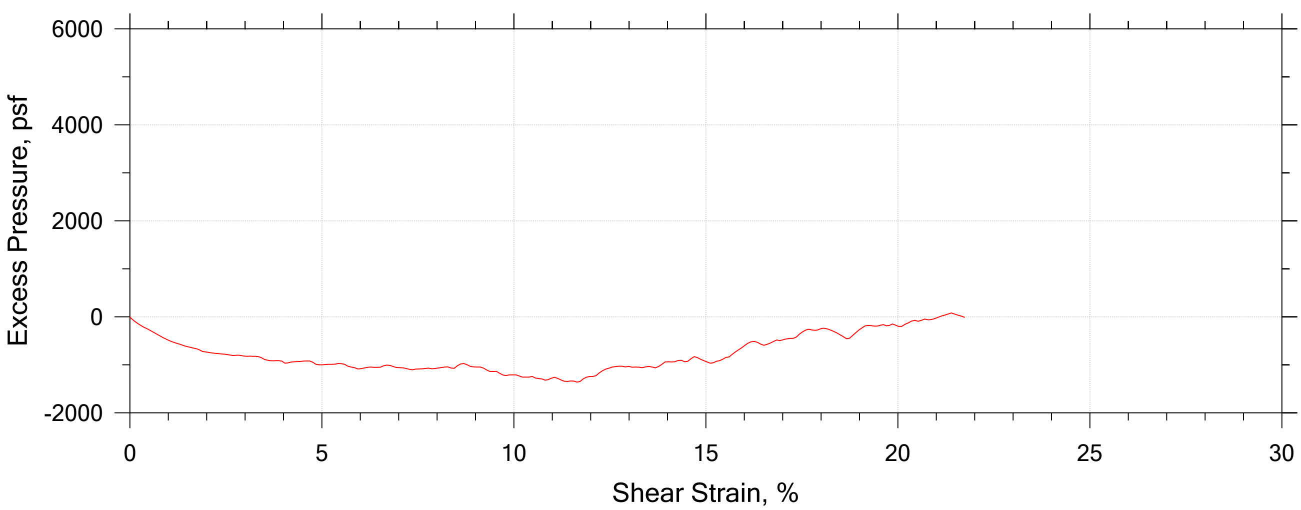


GeoTesting EXPRESS	Project: Crossroads Phase 14	Location: Norridgewock, ME	Project No.: GTX-309940
	Boring No.: GB-21	Tested By: md	Checked By: njh
	Sample No.: 23-25	Test Date: 09/19/19	Depth: 23-25 ft
	Test No.: DSS-13	Sample Type: intact	Elevation: ---
	Description: Moist, dark gray clay		
	Remarks: System HH		

DIRECT SIMPLE SHEAR TEST

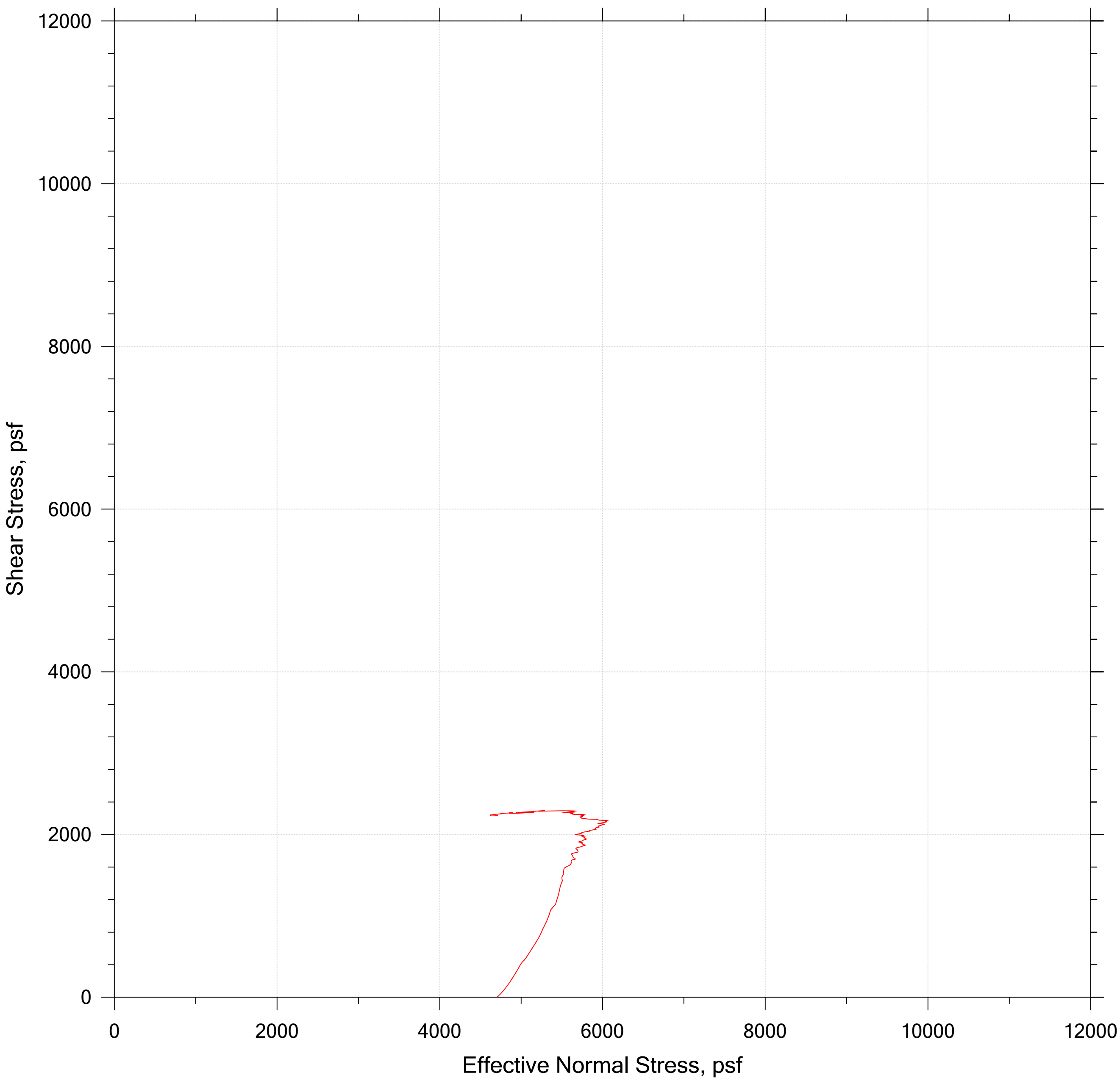






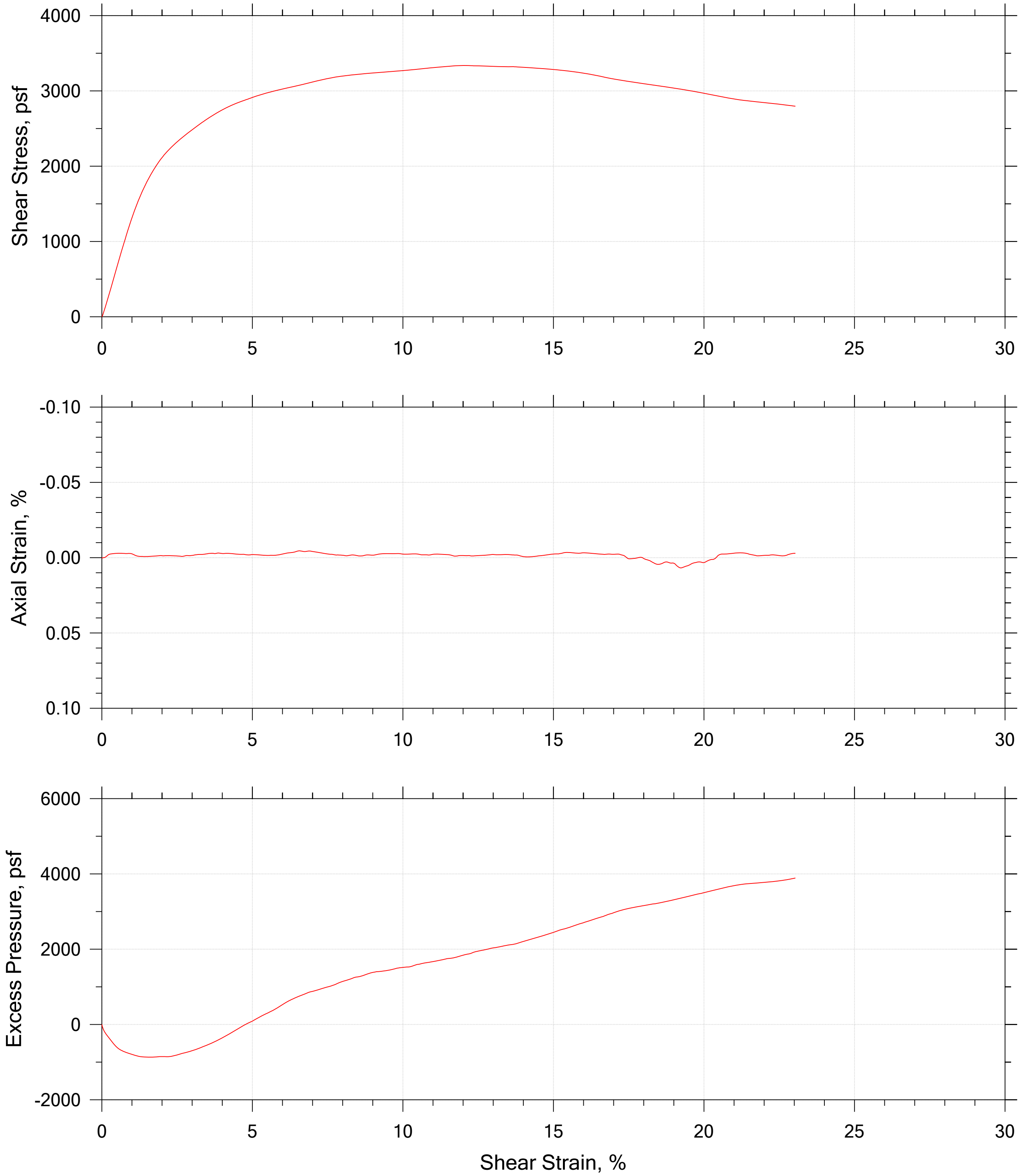
GeoTesting EXPRESS			
	Project: Crossroads Phase 14	Location: Norridgewock, ME	Project No.: GTX-309940
	Boring No.: GB-21	Tested By: md	Checked By: njh
	Sample No.: 23-25	Test Date: 09/13/19	Depth: 23-25 ft
	Test No.: DSS-14	Sample Type: intact	Elevation: ---
	Description: Moist, dark gray clay		
	Remarks: System HH		
			Page 4 of 7

DIRECT SIMPLE SHEAR TEST



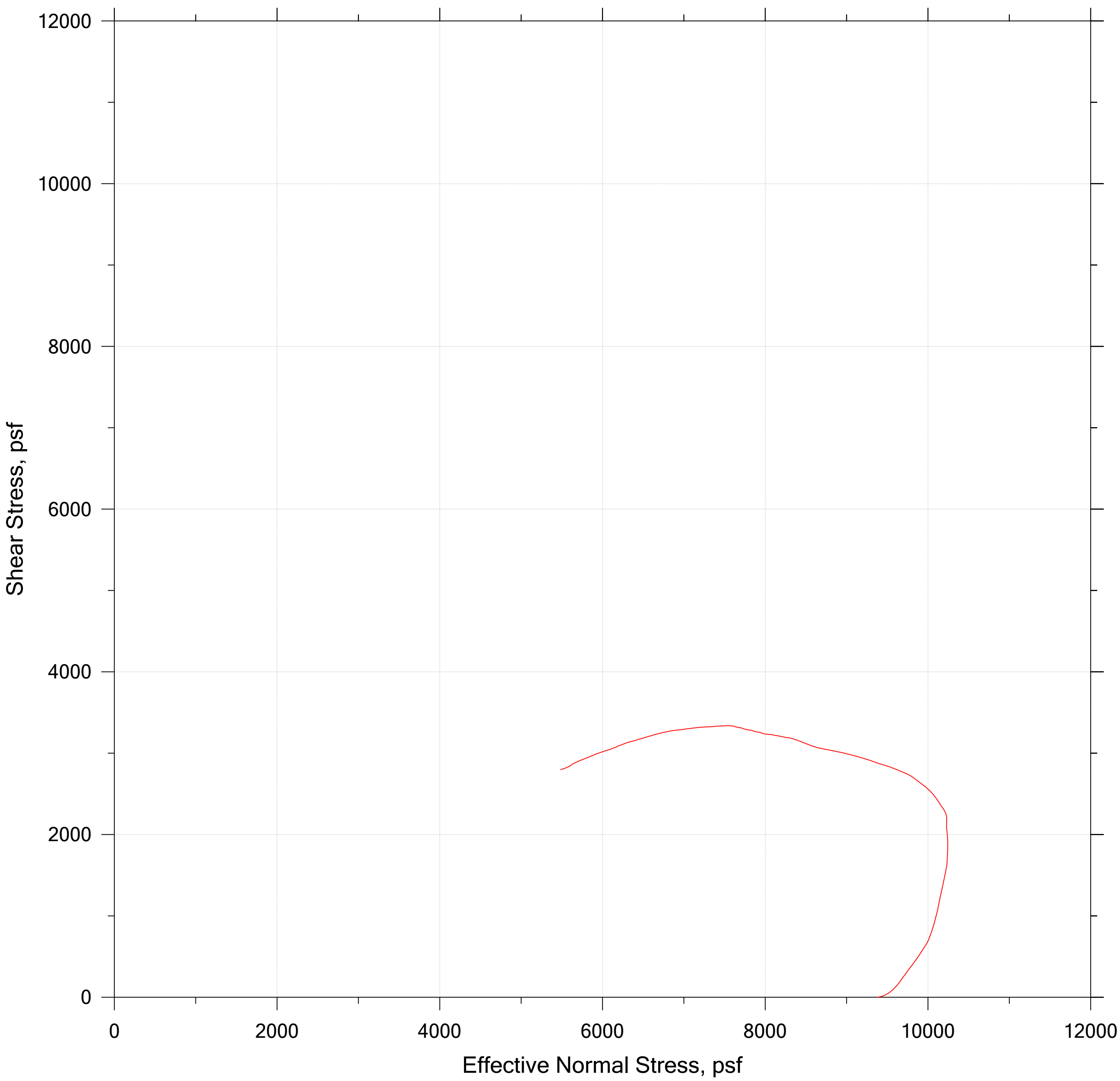
GeoTesting EXPRESS	Project: Crossroads Phase 14	Location: Norridgewock, ME	Project No.: GTX-309940
	Boring No.: GB-21	Tested By: md	Checked By: njh
	Sample No.: 23-25	Test Date: 09/13/19	Depth: 23-25 ft
	Test No.: DSS-14	Sample Type: intact	Elevation: ---
	Description: Moist, dark gray clay		
	Remarks: System HH		
			Page 5 of 7

DIRECT SIMPLE SHEAR TEST



GeoTesting EXPRESS	Project: Crossroads Phase 14	Location: Norridgewock, ME	Project No.: GTX-309940
	Boring No.: GB-21	Tested By: md	Checked By: njh
	Sample No.: 23-25	Test Date: 09/09/19	Depth: 23-25 ft
	Test No.: DSS-15	Sample Type: intact	Elevation: ---
	Description: Moist, dark gray clay		
	Remarks: System GG		
			Page 6 of 7

DIRECT SIMPLE SHEAR TEST



GeoTesting EXPRESS	Project: Crossroads Phase 14	Location: Norridgewock, ME	Project No.: GTX-309940
	Boring No.: GB-21	Tested By: md	Checked By: njh
	Sample No.: 23-25	Test Date: 09/09/19	Depth: 23-25 ft
	Test No.: DSS-15	Sample Type: intact	Elevation: ---
	Description: Moist, dark gray clay		
	Remarks: System GG		

Consolidated Undrained Direct Simple Shear Testing of Cohesive Soils by ASTM D6528

Client:	Geosyntec Consultants	GTX#:	309940
Project Name:	Crossroads Phase 14	Test Date:	9/20/19
Project Location:	Norridgewock, ME		

Boring ID: GB-15
Sample ID: 11-13
Depth, ft: 11-13

Visual Description: Moist, gray clay

Test Equipment: Top and bottom box (circular) = 2.50 in diameter. Load cells and LVDT's connected to data acquisition system for shear force, normal load, horizontal and vertical displacement; surface area = 4.91 in^2, soil height = 1 inch. Stacked rings used. Set up included porous stones with pins.

Test Condition: Inundated prior to consolidation

Sample Type and Preparation: density: Extruded from tube, cut, trimmed and placed into apparatus at as-received and moisture

Parameter	Point 1	Point 2	Point 3	Point 4	Point 5
Test No.	DSS-18				
Initial Moisture Content, %	27.5				
Initial Dry Density, pcf	90.84				
Nominal Rate of Shear Strain, %/hr	5.0				
Maximum Vertical Consolidation Stress, psf	13,750				
Vertical Consolidation Stress at Shear, psf	3,440				
Final Moisture Content, %	25.4				
Measured Peak Shear Stress, psf	1,850				
Shear Strain at Peak Shear Stress, %	13.4				
Membrane Correction, psf	61				
Corrected Peak Shear Stress, psf	1,789				
S_u / σ'_{vc}	0.52				

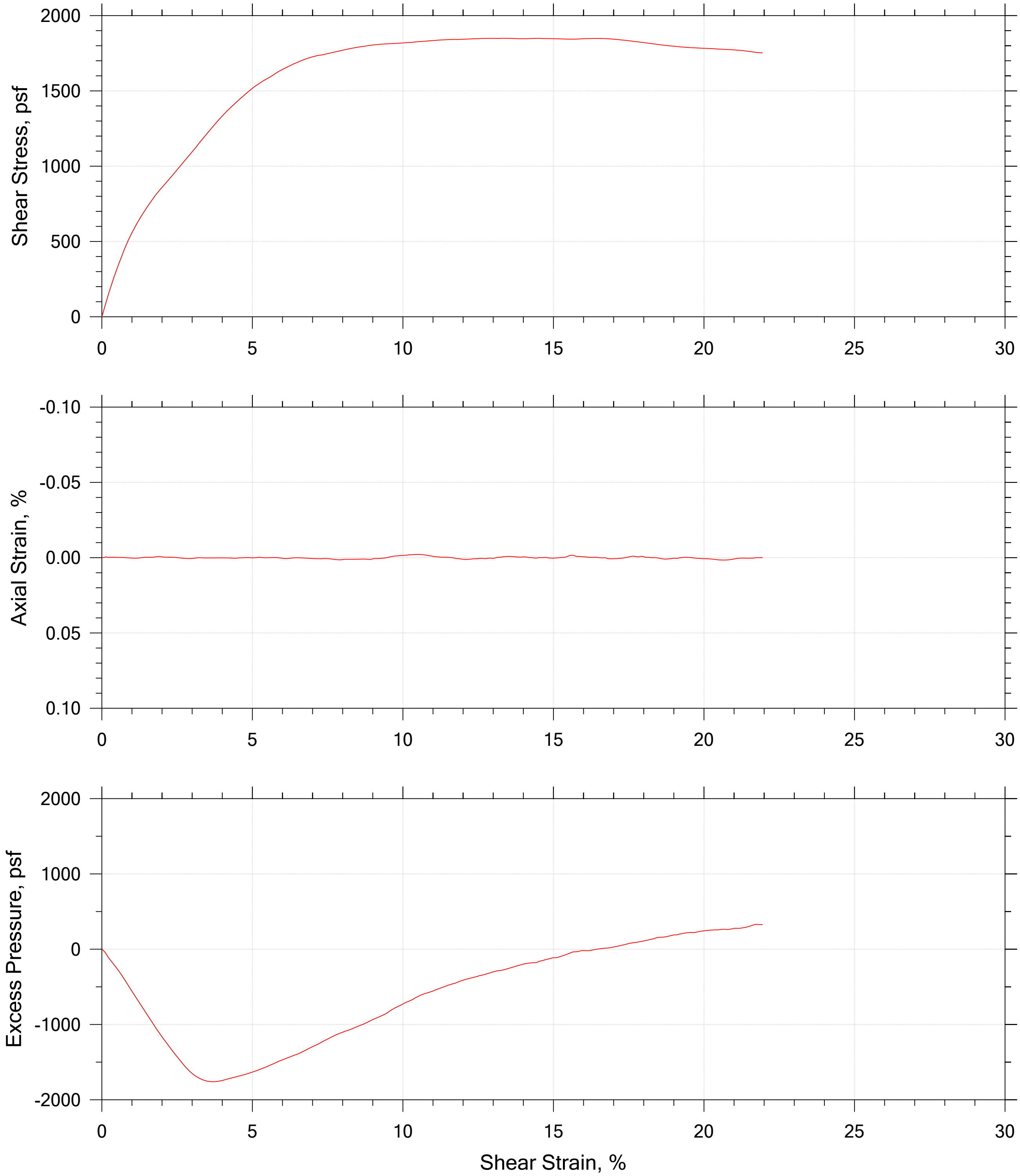
Comments:

Tested By: md

Checked By: njh

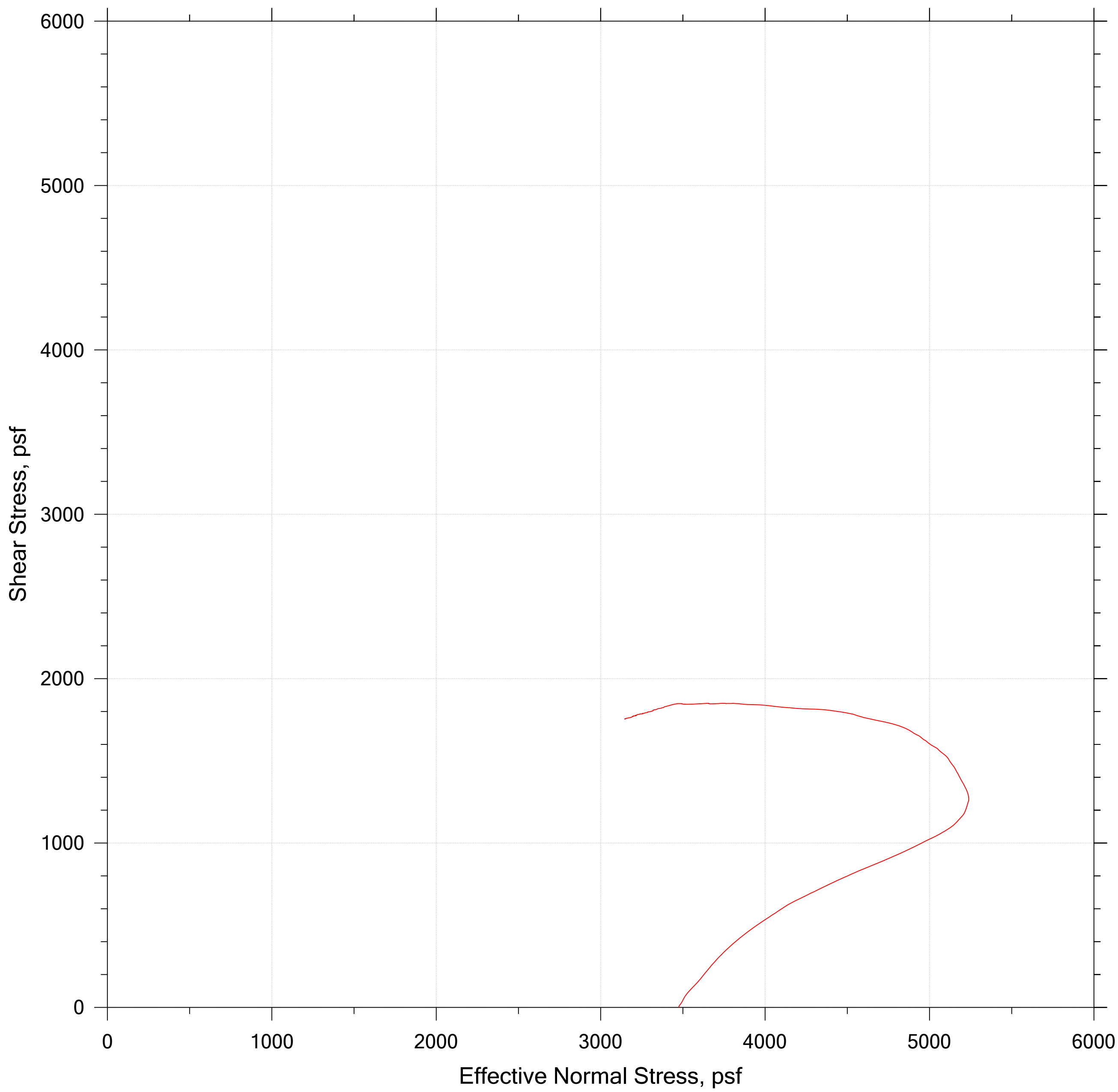
Notes: These results apply only to the sample tested for the specific test conditions. The test procedures employed follow accepted industry practice and the indicated test method. GeoTesting Express has no specific knowledge as to conditioning, origin, sampling procedure or intended use of the material.

DIRECT SIMPLE SHEAR TEST



GeoTesting EXPRESS	Project: Crossroads Phase 14	Location: Norridgewock, ME	Project No.: GTX-309940
	Boring No.: GB-15	Tested By: md	Checked By: njh
	Sample No.: 11-13	Test Date: 09/20/19	Depth: 11-13 ft
	Test No.: DSS-18	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: System GG		
			Page 2 of 3

DIRECT SIMPLE SHEAR TEST



GeoTesting EXPRESS	Project: Crossroads Phase 14	Location: Norridgewock, ME	Project No.: GTX-309940
	Boring No.: GB-15	Tested By: md	Checked By: njh
	Sample No.: 11-13	Test Date: 09/20/19	Depth: 11-13 ft
	Test No.: DSS-18	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: System GG		
			Page 3 of 3

Consolidated Undrained Direct Simple Shear Testing of Cohesive Soils by ASTM D6528

Client:	Geosyntec Consultants	GTX#:	309940
Project Name:	Crossroads Phase 14	Test Date:	9/22/19
Project Location:	Norridgewock, ME		

Boring ID: GB-17
Sample ID: 15-17
Depth, ft: 15-17

Visual Description: Moist, dark gray clay

Test Equipment: Top and bottom box (circular) = 2.50 in diameter. Load cells and LVDT's connected to data acquisition system for shear force, normal load, horizontal and vertical displacement; surface area = 4.91 in^2, soil height = 1 inch. Stacked rings used. Set up included porous stones with pins.

Test Condition: Inundated prior to consolidation

Sample Type and Preparation: density: Extruded from tube, cut, trimmed and placed into apparatus at as-received and moisture

Parameter	Point 1	Point 2	Point 3	Point 4	Point 5
Test No.	DSS-19				
Initial Moisture Content, %	30.5				
Initial Dry Density, pcf	88.1				
Nominal Rate of Shear Strain, %/hr	5.0				
Maximum Vertical Consolidation Stress, psf	4,000				
Vertical Consolidation Stress at Shear, psf	2,000				
Final Moisture Content, %	30.4				
Measured Peak Shear Stress, psf	831				
Shear Strain at Peak Shear Stress, %	10.0				
Membrane Correction, psf	61				
Corrected Peak Shear Stress, psf	770				
S_u / σ'_{vc}	0.39				

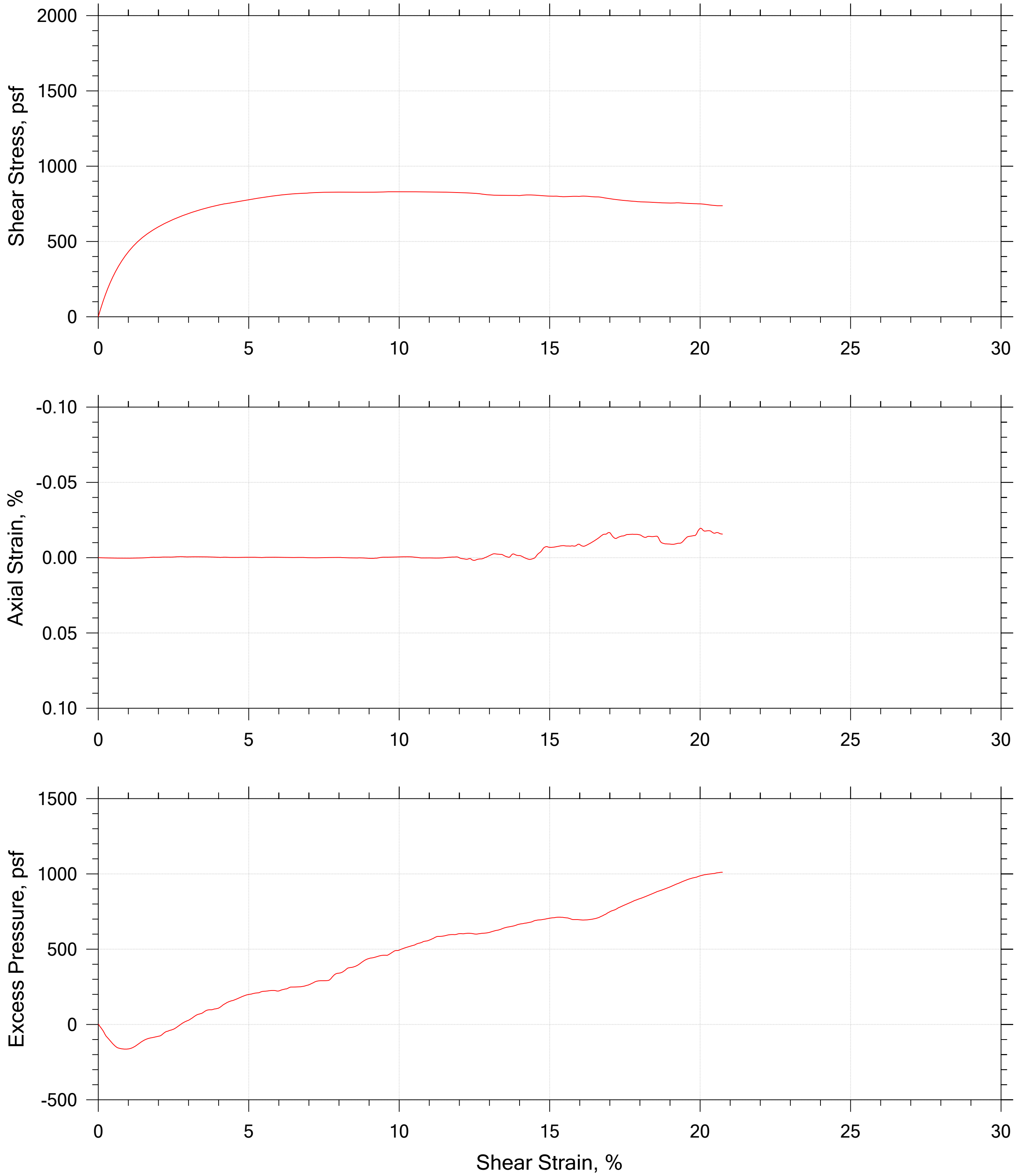
Comments:

Tested By: md

Checked By: njh

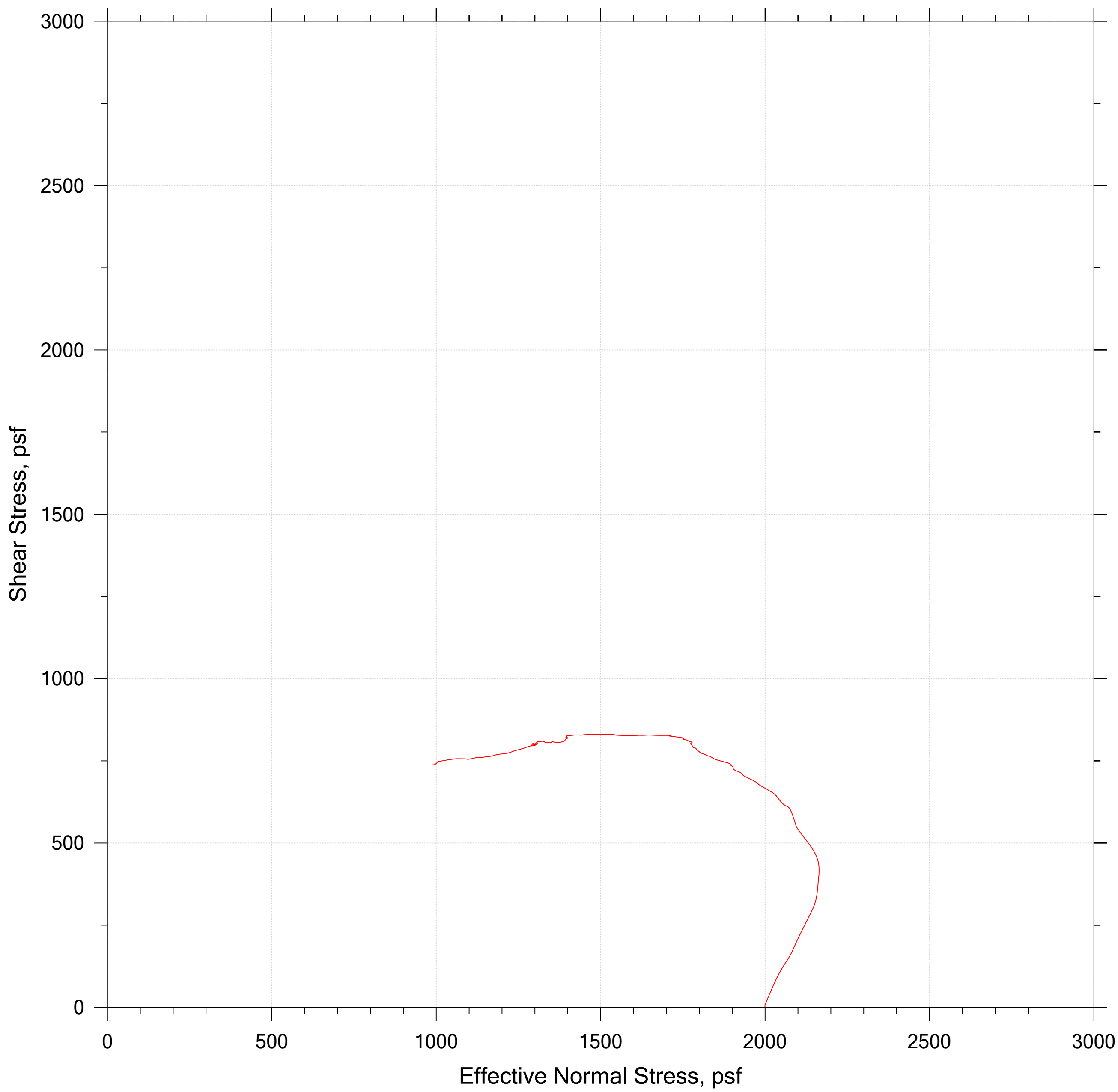
Notes: These results apply only to the sample tested for the specific test conditions. The test procedures employed follow accepted industry practice and the indicated test method. GeoTesting Express has no specific knowledge as to conditioning, origin, sampling procedure or intended use of the material.

DIRECT SIMPLE SHEAR TEST



GeoTesting EXPRESS	Project: Crossroads Phase 14	Location: Norridgewock, ME	Project No.: GTX-309940
	Boring No.: GB-17	Tested By: md	Checked By: njh
	Sample No.: 15-17	Test Date: 09/22/19	Depth: 15-17
	Test No.: DSS-19	Sample Type: intact	Elevation: ---
	Description: Moist, dark gray clay		
	Remarks: System HH		
			Page 2 of 3

DIRECT SIMPLE SHEAR TEST



GeoTesting EXPRESS	Project: Crossroads Phase 14	Location: Norridgewock, ME	Project No.: GTX-309940
	Boring No.: GB-17	Tested By: md	Checked By: njh
	Sample No.: 15-17	Test Date: 09/22/19	Depth: 15-17
	Test No.: DSS-19	Sample Type: intact	Elevation: ---
	Description: Moist, dark gray clay		
	Remarks: System HH		

GeoTesting
9 EXPRESS

Consolidated Undrained Direct Simple Shear Testing of Cohesive Soils by ASTM D6528

Client:	Geosyntec Consultants	GTX#:	309940
Project Name:	Crossroads Phase 14	Test Date:	9/9/19
Project Location:	Norridgewock, ME		

Boring ID: GB-21
Sample ID: 23-25
Depth, ft: 23-25

Visual Description: Moist, dark gray clay

Test Equipment: Top and bottom box (circular) = 2.50 in diameter. Load cells and LVDT's connected to data acquisition system for shear force, normal load, horizontal and vertical displacement; surface area = 4.91 in^2, soil height = 1 inch.
Stacked rings used. Set up included porous stones with pins.

Test Condition: Inundated prior to consolidation

Sample Type and Preparation: density: Extruded from tube, cut, trimmed and placed into apparatus at as-received and moisture

Parameter	Point 1	Point 2	Point 3	Point 4	Point 5
Test No.	DSS-13	DSS-14	DSS-15		
Initial Moisture Content, %	32.7	28.4	27.6		
Initial Dry Density, pcf	86.4	91.4	91.4		
Nominal Rate of Shear Strain, %/hr	5.0	5.0	5.0		
Maximum Vertical Consolidation Stress, psf	18,750	18,750	18,750		
Vertical Consolidation Stress at shear, psf	3,125	4,700	9,375		
Final Moisture Content, %	25.4	22.2	22.5		
Measured Peak Shear Stress, psf	2,077	2,292	3,338		
Shear Strain at Peak Shear Stress, %	13.9	15.6	12.0		
Membrane Correction, psf	61	56	62		
Corrected Peak Shear Stress, psf	2,016	2,236	3,276		
S_u / σ'_{vc}	0.65	0.48	0.35		

Comments:

Tested By: md   Checked By: njh

Notes: These results apply only to the sample tested for the specific test conditions. The test procedures employed follow accepted industry practice and the indicated test method. GeoTesting Express has no specific knowledge as to conditioning, origin, sampling procedure or intended use of the material.

GeoTesting EXPRESS

Consolidated Undrained Direct Simple Shear Testing of Cohesive Soils by ASTM D6528

Client: Geosyntec Consultants
GTX#: 309940
Project Name: Crossroads Phase 14
Test Date: 8/08/19
Project Location: Norridgewock, ME

Boring ID: GB-03
Sample ID: 3-5
Depth, ft: 3-5

Visual Description: Moist, light olive brown clay

Test Equipment: Top and bottom box (circular) = 2.50 in diameter. Load cells and LVDT's connected to data acquisition system for shear force, normal load, horizontal and vertical displacement; surface area = 4.91 in^2, soil height = 1 inch. Stacked rings used. Set up included porous stones with pins.

Test Condition: Inundated prior to consolidation

Sample Type and Preparation: Extruded from tube, cut, trimmed and placed into apparatus at as-received density and moisture

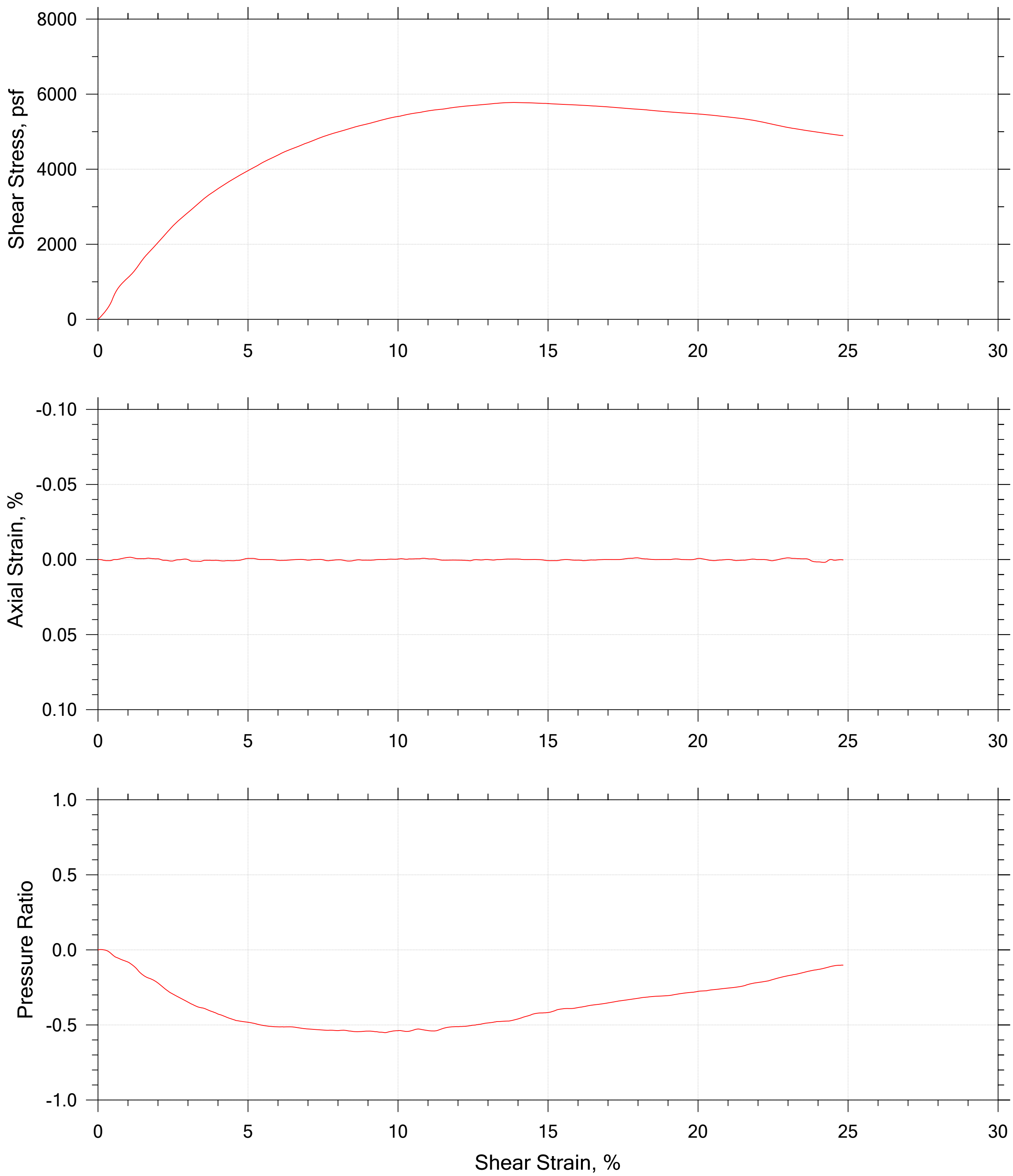
Parameter	Point 1	Point 2	Point 3	Point 4	Point 5
Test No.	DSS-1				
Initial Moisture Content, %	25.3				
Initial Dry Density, pcf	98.7				
Nominal Rate of Shear Strain, %/hr	5.0				
Maximum Vertical Consolidation Stress, psf	26,250				
Vertical Consolidation Stress at Shear, psf	6,560				
Final Moisture Content, %	24.8				
Measured Peak Shear Stress, psf	5,780				
Shear Strain at Peak Shear Stress, %	13.8				
Membrane Correction, psf	61				
Corrected Peak Shear Stress, psf	5,719				
S_u / σ'_{vc}	0.87				

Comments:

Tested By: md
Checked By: njh

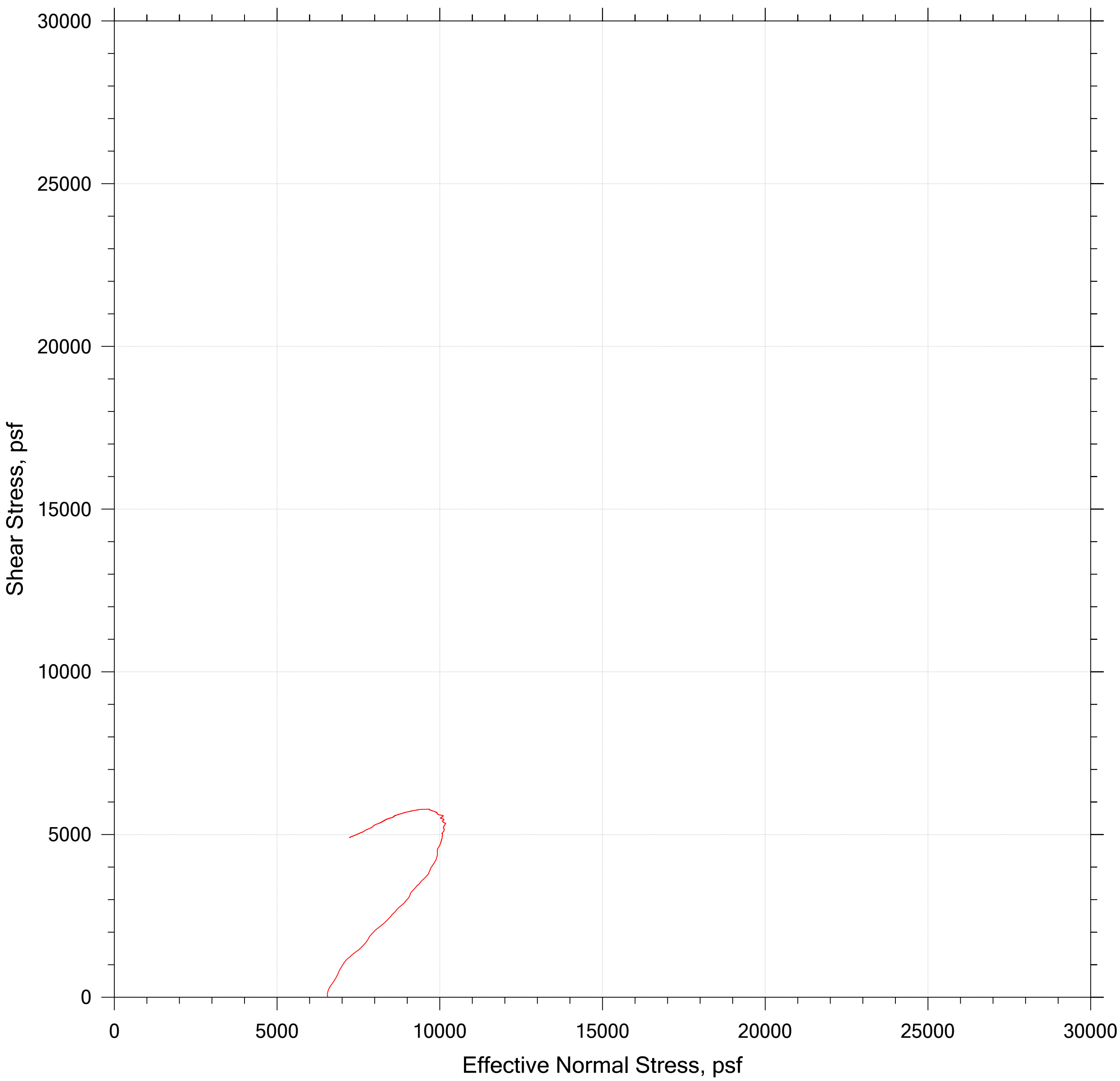
Notes: These results apply only to the sample tested for the specific test conditions. The test procedures employed follow accepted industry practice and the indicated test method. GeoTesting Express has no specific knowledge as to conditioning, origin, sampling procedure or intended use of the material.

Direct Simple Shear Test



GeoTesting EXPRESS	Project Name: Crossroads Phase 14	Location: Norridgewock, ME	Project Number: GTX-309940
	Boring Number: GB-03	Tester: md	Checker: njh
	Sample Number: 3-5	Test Date: 08/08/19	Depth: 3-5 ft
	Test Number: DSS-1	Preparation: intact	Elevation: ---
	Description: Moist, light olive brown clay		
	Remarks: System HH		

Direct Simple Shear Test



GeoTesting EXPRESS	Project Name: Crossroads Phase 14	Location: Norridgewock, ME	Project Number: GTX-309940
	Boring Number: GB-03	Tester: md	Checker: njh
	Sample Number: 3-5	Test Date: 08/08/19	Depth: 3-5 ft
	Test Number: DSS-1	Preparation: intact	Elevation: ---
	Description: Moist, light olive brown clay		
	Remarks: System HH		

GeoTesting EXPRESS

Consolidated Undrained Direct Simple Shear Testing of Cohesive Soils by ASTM D6528

Client: Geosyntec Consultants
GTX#: 309940
Project Name: Crossroads Phase 14
Test Date: 8/12/19
Project Location: Norridgewock, ME

Boring ID: GB-04
Sample ID: 19-21
Depth, ft: 19-21

Visual Description: Moist, gray clay

Test Equipment: Top and bottom box (circular) = 2.50 in diameter. Load cells and LVDT's connected to data acquisition system for shear force, normal load, horizontal and vertical displacement; surface area = 4.91 in^2, soil height = 1 inch. Stacked rings used. Set up included porous stones with pins.

Test Condition: Inundated prior to consolidation

Sample Type and Preparation: density
Extruded from tube, cut, trimmed and placed into apparatus at as-received and moisture

Parameter	Point 1	Point 2	Point 3	Point 4	Point 5
Test No.	DSS-3				
Initial Moisture Content, %	32.4				
Initial Dry Density, pcf	89.0				
Nominal Rate of Shear Strain, %/hr	5.0				
Maximum Vertical Consolidation Stress, psf	8,750				
Vertical Consolidation Stress at Shear, psf	4,375				
Final Moisture Content, %	30.6				
Measured Peak Shear Stress, psf	1,408				
Shear Strain at Peak Shear Stress, %	8.1				
Membrane Correction, psf	56				
Corrected Peak Shear Stress, psf	1,352				
S_u / σ'_{vc}	0.31				

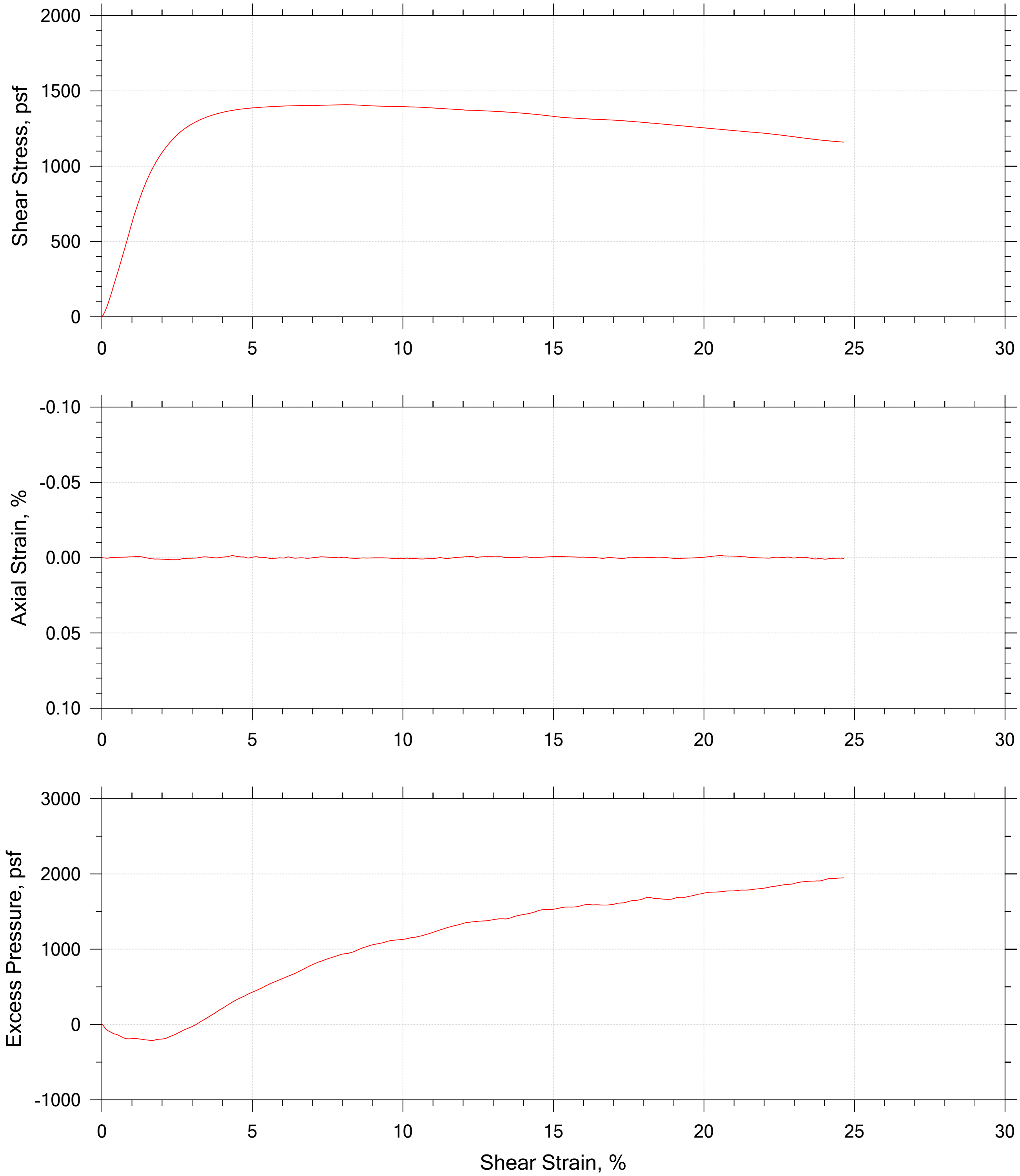
Comments:

Tested By: md

Checked By: njh

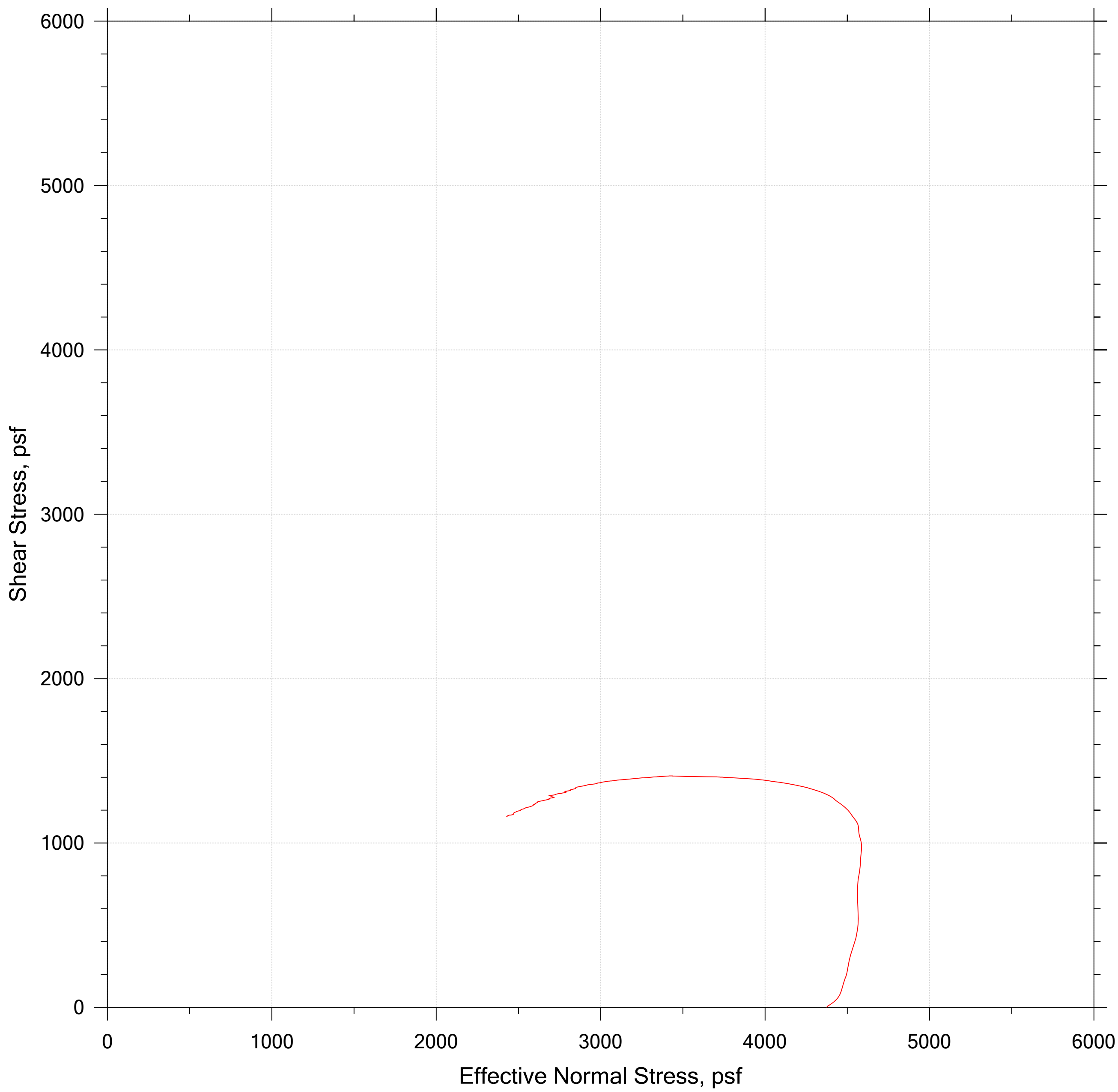
Notes: These results apply only to the sample tested for the specific test conditions. The test procedures employed follow accepted industry practice and the indicated test method. GeoTesting Express has no specific knowledge as to conditioning, origin, sampling procedure or intended use of the material.

DIRECT SIMPLE SHEAR TEST by ASTM D6528



GeoTesting EXPRESS			
	Project: Crossroads Phase 14	Location: Norridgewock, ME	Project No.: GTX-309940
	Boring No.: GB-04	Tested By: md	Checked By: njh
	Sample No.: 19-21	Test Date: 08/12/19	Depth: 19-21 ft
	Test No.: DSS-3	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: System HH		

DIRECT SIMPLE SHEAR TEST by ASTM D6528



GeoTesting EXPRESS	Project: Crossroads Phase 14	Location: Norridgewock, ME	Project No.: GTX-309940
	Boring No.: GB-04	Tested By: md	Checked By: njh
	Sample No.: 19-21	Test Date: 08/12/19	Depth: 19-21 ft
	Test No.: DSS-3	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: System HH		
			Page 3 of 3

GeoTesting EXPRESS

Consolidated Undrained Direct Simple Shear Testing of Cohesive Soils by ASTM D6528

Client: Geosyntec Consultants — GTX#: 309940
Project Name: Crossroads Phase 14 — Test Date: 8/12/19
Project Location: Norridgewock, ME

Boring ID: GB-07
Sample ID: 17-19
Depth, ft: 17-19

Visual Description: Moist, gray clay

Test Equipment: Top and bottom box (circular) = 2.50 in diameter. Load cells and LVDT's connected to data acquisition system for shear force, normal load, horizontal and vertical displacement; surface area = 4.91 in^2, soil height = 1 inch. Stacked rings used. Set up included porous stones with pins.

Test Condition: Inundated prior to consolidation

Sample Type and Preparation: Extruded from tube, cut, trimmed and placed into apparatus at as-received density and moisture

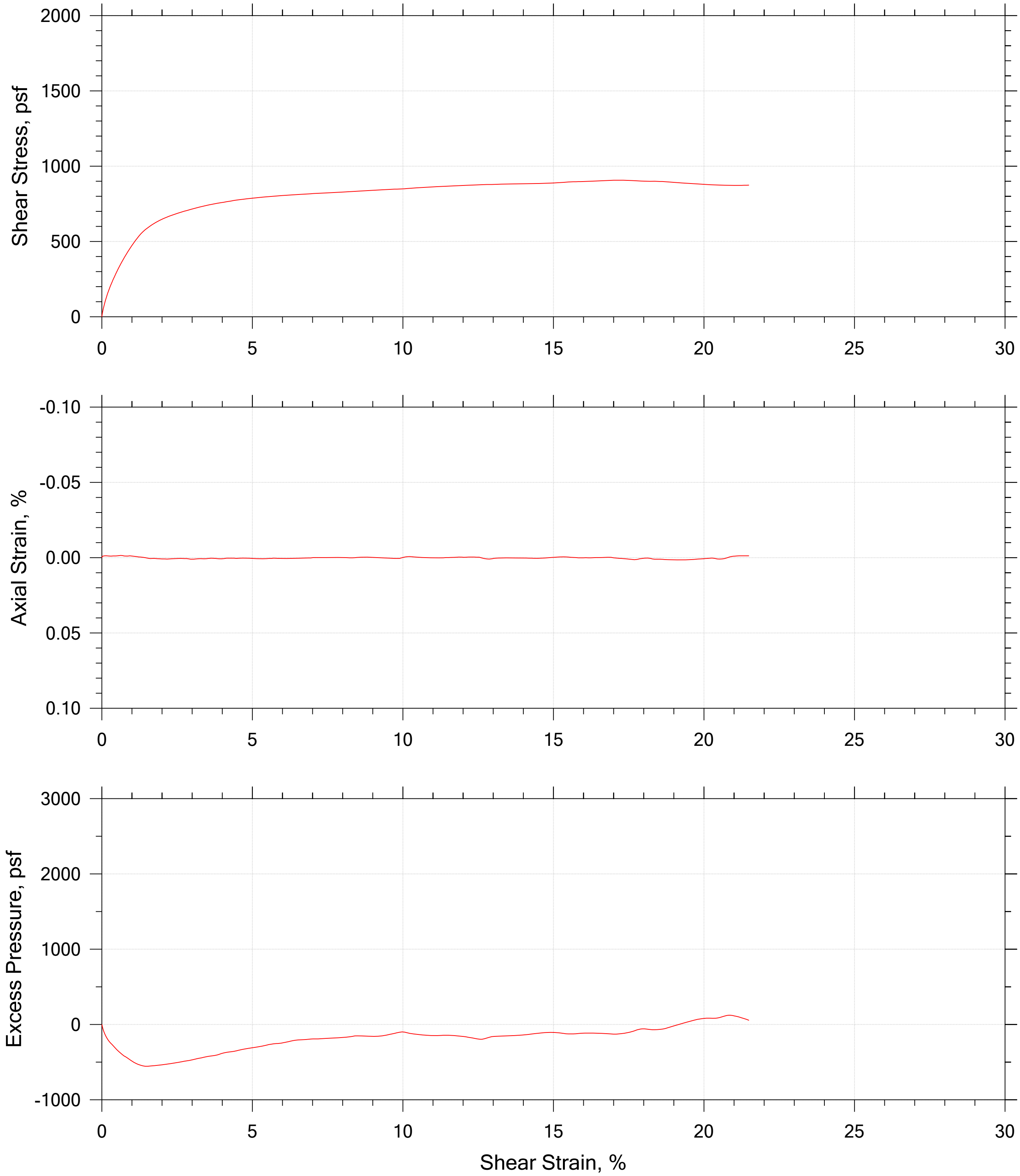
Parameter	Point 1	Point 2	Point 3	Point 4	Point 5
Test No.	DSS-2				
Initial Moisture Content, %	29.6				
Initial Dry Density, pcf	93.1				
Nominal Rate of Shear Strain, %/hr	5.0				
Maximum Vertical Consolidation Stress, psf	5,125				
Vertical Consolidation Stress at Shear, psf	1,280				
Final Moisture Content, %	26.6				
Measured Peak Shear Stress, psf	907				
Shear Strain at Peak Shear Stress, %	17.2				
Membrane Correction, psf	54				
Corrected Peak Shear Stress, psf	853				
S_u / σ'_{vc}	0.67				

Comments:

Tested By: md — Checked By: njh

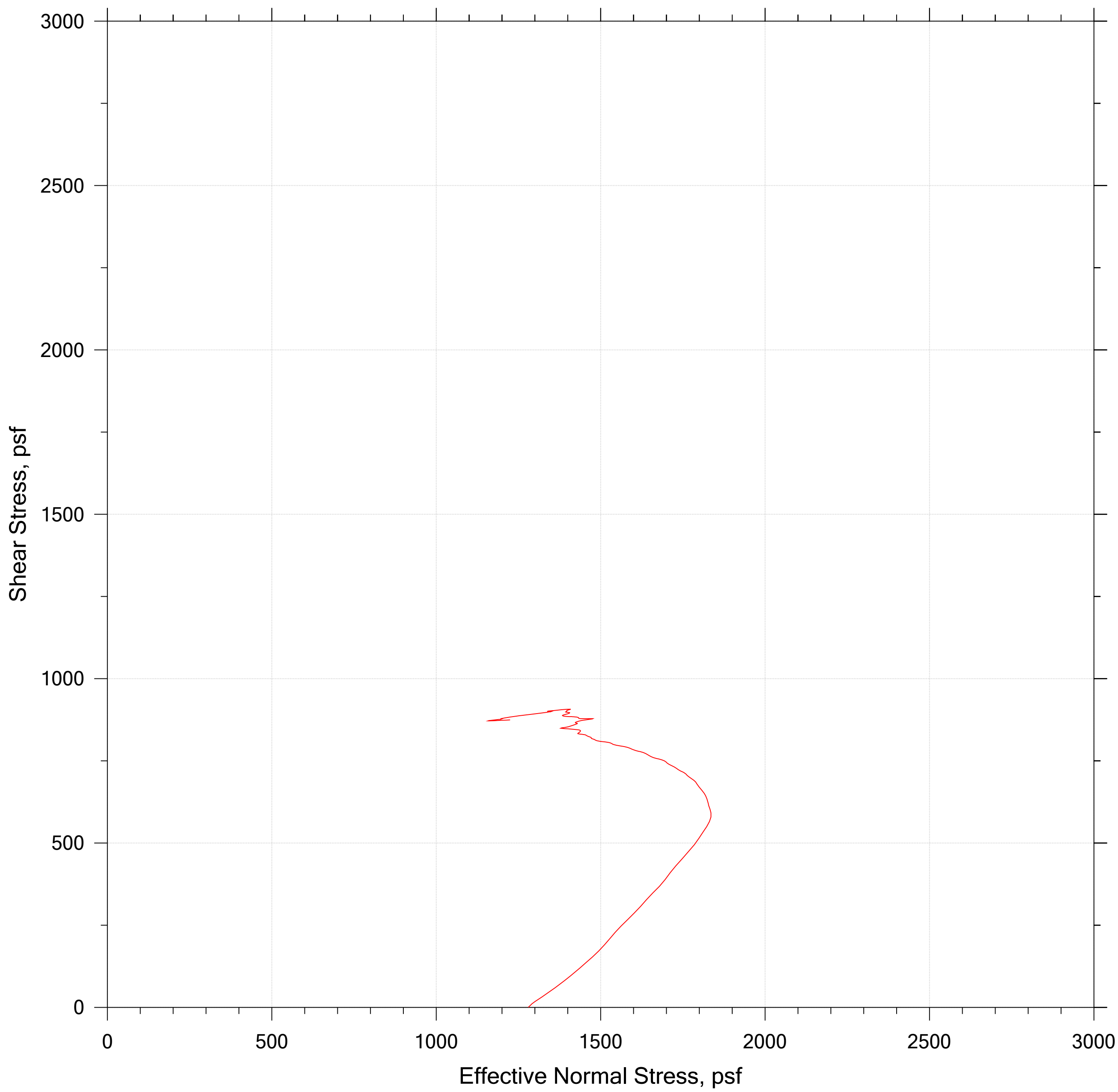
Notes: These results apply only to the sample tested for the specific test conditions. The test procedures employed follow accepted industry practice and the indicated test method. GeoTesting Express has no specific knowledge as to conditioning, origin, sampling procedure or intended use of the material.

DIRECT SIMPLE SHEAR TEST by ASTM D6528



GeoTesting EXPRESS	Project: Crossroads Phase 14	Location: Norridgewock, ME	Project No.: GTX-309940
	Boring No.: GB-07	Tested By: md	Checked By: njh
	Sample No.: 17-19	Test Date: 08/12/19	Depth: 17-19 ft
	Test No.: DSS-2	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: System M		

DIRECT SIMPLE SHEAR TEST by ASTM D6528



GeoTesting EXPRESS	Project: Crossroads Phase 14	Location: Norridgewock, ME	Project No.: GTX-309940
	Boring No.: GB-07	Tested By: md	Checked By: njh
	Sample No.: 17-19	Test Date: 08/12/19	Depth: 17-19 ft
	Test No.: DSS-2	Sample Type: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: System M		

APPENDIX IV(c)
Stability Calculations

APPENDIX IV(c)(i)
General Slope Stability

Written by: M. Nolden Date: 8/22/2019 Reviewed by: N. Yafrate Date: 10/18/2019

Client: WMDSM Project: Phase 14 Permit Project/Proposal No.: BE0232C Phase No.: 02

STABILITY ANALYSIS
WMDSM - CROSSROADS LANDFILL PHASE 14
NORRIDGEWOCK, ME

OVERVIEW

Detailed analyses were performed to evaluate the slope stability of the Phase 14 Landfill. The analyses presented herein were conducted at Stability Sections I through VII around the perimeter of Phase 14 and Section VIII for the ramp up to Phase 14; the locations of these sections are shown in Figure 1. Analyses were performed for Construction and Post-Closure conditions, as described below.

- The Construction Condition considers the slope geometry and material strengths immediately following excavation of the existing ground and construction of the mechanically stabilized earth (MSE) perimeter berm adjacent to the excavation, but prior to waste placement. The Construction Condition represents staged construction that may be necessary to achieve the required factors of safety at two locations.
- The Post-Closure Condition represents the proposed top of final cover system design grades, which include the full height of waste in the landfill with a 2-foot thick final cover system to the proposed peak elevation at each section, thereby representing the maximum anticipated slope elevations.

SUBSURFACE STRATIGRAPHY

The subsurface stratigraphy in the Phase 14 area generally consists of the following layers from the ground surface down.

- Topsoil (to be removed prior to Phase 14 construction)
- Silty Sand and/or Sand (to be removed from within the base of the landfill footprint)
- Brown Clay (also referred to as Stiff Clay)
- Gray Clay (also referred to as Soft Clay)
- Glacial Till (Till)
- Bedrock

Detailed descriptions of these stratigraphic layers, including physical characteristics, soil classification, etc., are presented in the *Geotechnical Site Assessment Report* included in Appendix IV(b) of the Phase 14 Landfill Engineering Report (i.e., Volume IV of the Permit Application).

In addition to the stratigraphic layers listed above, areas of surficial fill are present in the Phase 14 area. The material is generally silty or clayey with stumps, roots, etc. that was excavated during construction of Phase 8 and stockpiled in the vicinity of Phase 14. The stockpiled material is not included in the slope stability models because it will be removed prior to Phase 14 construction.

The stratigraphic layers used in Sections I through VIII were made using subsurface stratigraphy developed by Golder Associates, which was provided to Geosyntec as electronic shape files for incorporation into our Slide® models. The stratigraphy is presented in detail in the Phase 14 Geologic and Hydrogeologic Assessment Report, prepared by Golder Associates (i.e., Volume III of the Phase 14 Permit Application). Golder developed the stratigraphy using the results of cone penetrometer tests (CPTs), geotechnical exploration borings, and borings performed for piezometer and monitor well installation.

During construction of Phase 14, sand overlying the clay foundations soils within the horizontal limit of the proposed liner bottom will be excavated to achieve the design subgrade elevations. In some localized areas, the sand will be over-excavated and replaced with compacted clay.

The subsurface stratigraphy and materials of construction for the Post-Closure Conditions of each stability section are shown in Figures 2A through 2H[1]. The same dimensions and geometry of the MSE berm shown in Figures 2A through 2H are evaluated for the Construction Condition, except the liner materials and waste against the MSE berm is not modeled for the Construction Condition.

GROUNDWATER AND LEACHATE ELEVATIONS

The piezometric elevations below the landfill used in the slope stability analyses are modeled based on the potentiometric surfaces developed by Golder Associates, as shown on the figures presented as Attachment 1 to this calculation.

Piezometric Line 1 corresponds to the "Water Level in Clay" in which measurements were taken in the clay layer and is therefore applied to both the Brown and Gray Clays. Piezometric Line 2 corresponds to the "Water Level in Sand" and is applied to the Sand, Silty Sand, MSE Berm, and Compacted Clay materials. Piezometric Line 3 corresponds to the "Potentiometric Surface in Till" and is applied to the Till only.

Leachate elevations used in the slope stability analyses coincide with the top of the leachate collection system (LCS) layer. They are modeled in the slope stability analyses as Piezometric Line 4.

[1] Note that the existing ground survey beyond the landfill and MSE berm limits on Section VII was interpolated from aerial survey. Ground survey should be performed in this area prior to development of construction documents.

Written by:	M. Nolden	Date:	8/22/2019	Reviewed by:	N. Yafrate	Date:	10/18/2019
Client:	WMDSM	Project:	Phase 14 Permit	Project/Proposal No.:	BE0232C	Phase No.:	02

MATERIAL PROPERTIES

Material properties for foundation soils, waste, and MSE berm fill materials used in the stability models are presented in Table 1. Specific material properties are described below.

Granular Soils

As mentioned previously, the in-situ silty-sand will be excavated from under the base of Phase 14. However, the material will remain in areas exterior to the landfill and therefore contribute to the resisting forces against slope movement. The material properties of the in-situ silty sand layer in the vicinity of the Phase 14 were selected based on typical values and correlations with standard penetration test (SPT) blowcounts obtained during the geotechnical investigation. Soil strength properties were estimated using standard penetration test (SPT) N-value correlations presented by Das (2006) and Sabatini et al. (2002). The calculation table is presented as Attachment 2. Soil moist unit weights presented in Table 1 were estimated based on typical values as presented by Coduto (2001).

Brown and Gray Clay

SHANSEP

The undrained shear strength of the Brown and Gray Clay was calculated using the Stress History and Normalized Soil Engineering Properties (SHANSEP) method as presented by Ladd and DeGroot (2004):

$$s_u = \sigma'_v S(OCR)^m$$

where

σ'_v = vertical effective stress;

S = normally consolidated stress ratio given by s_u/σ'_v measured from tests of normally consolidated specimens;

OCR = overconsolidation ratio (σ_p'/σ'_v where σ'_p is the effective preconsolidation stress); and

m = exponent typically between 0.75 and 1.0.

Stress history parameters (SHPs) S and m and effective preconsolidation stress were used in Slide® to calculate shear strengths.

Effective preconsolidation stresses were estimated from the results of constant rate of strain (CRS) consolidation tests performed on thin-walled tube samples collected during the Phase 14 geotechnical investigation. A summary of the preconsolidation stresses selected for each cross-section analyzed is presented in Table 2.

The SHPs for this analysis were selected based on laboratory strength testing performed on thin-walled tube samples collected during the Phase 14 geotechnical investigation. The analysis is performed using SHPs developed from the results of direct simple shear (DSS) testing. Strengths measured by DSS tests are typically between the strengths measured by triaxial compression tests (which have higher SHPs) and triaxial extension tests (which have lower SHPs), and, therefore, provide an intermediate value on which strength calculations are based.

For this stability analysis, SHP S is 0.22 and 0.19 for the Brown and Gray Clays, respectively. SHP m is 0.76 for Brown Clay and 0.66 for Gray Clay.

The results of relevant consolidation and strength tests are included in Attachments 3 and 4, respectively.

Modeling Short-Term Construction Conditions and Long-term Post-Closure Conditions

Construction of the MSE berm will create excess pore pressures in the soft clay foundation soils resulting from the weight of the berm. As the pore pressures dissipate and effective stress increases relative to the initial conditions, undrained shear strength also increases.

While the pore pressures will dissipate to some extent during construction, for the analysis of Sections I, II, IV, V, VI, and VIII, the degree of consolidation (i.e. pore pressure dissipation) is conservatively assumed to be zero for short-term conditions. As such, undrained shear strength for the Construction Condition at these locations is calculated using the initial vertical effective stress prior to MSE berm construction.

For Sections III and VII, at which early analysis indicated that staged construction may be necessary to achieve the target FS, it is assumed that initial stages of the MSE berm will have been in place for a sufficient amount of time to allow for partial dissipation of excess pore pressures and the resulting strength gain.

After loading is complete and the pore pressures have dissipated, the degree of consolidation is taken to be 1.0 (i.e., 100%). For the Post-Closure (i.e., long-term) analyses, pore pressures are expected to have dissipated such that the total surcharge load of the berm and waste are used in calculating the undrained shear strength of the clay.

Waste

For global stability, a Mohr-Coulomb shear strength envelope was considered for the waste characterized by a friction angle (ϕ) of 30 degrees and a cohesion (c) of 30 pounds per square foot (psf). This strength is consistent with the strength used for previous global stability analyses for the Crossroads site (e.g., Geosyntec 2010).

For the liner waste block (LWB) failure mechanism, a bilinear strength relationship was considered for waste presented by Kavazanjian et al. (1995) as recommended in Geosyntec's *Shear Strength Properties and Density of Waste* memorandum dated 18 June 2008. Kavazanjian et al. (1995) defined the shear strength envelope as:

- $c = 501$ lb/ft^2, $\phi = 0°$ at vertical stress $\sigma'_v < 627$ lb/ft^2; and
- $c = 0$ lb/ft^2, $\phi = 33°$ at vertical stress $\sigma'_v > 627$ lb/ft^2.

Liner Interface Friction

Based on interface friction shear strengths measured recently for Crossroads Landfill Phase 8C″ construction, the following interface shear strengths were considered for the evaluation of LWB mode:

- Along the sideslope portion of the Phase 14 liner, a residual internal friction angle of 8.2° was used; and
- Along the base portion of the Phase 14 liner, a peak internal friction angle of 18.3° was used.

Although some interface adhesion was measured during previous testing at Crossroads, it was conservatively not included in the analysis.

MSE Berm

The material properties for the MSE berm were selected to be consistent with those used in previous stability analyses at Crossroads Landfill. For global stability and construction stability of the MSE berm, the strength of the reinforced and unreinforced fill was modeled as a Mohr-Coulomb strength envelope with $\phi = 32°$ and $c = 100$ psf.

Since the intention of this analysis is to evaluate the global stability of the waste and foundation soils rather than the internal stability of the MSE berm, the reinforcement in the reinforced fill was modeled to be sufficiently strong to achieve a satisfactory factor of safety for critical surfaces passing through the reinforced zone. A separate analysis will be performed during preparation of the construction drawings for each cell to design the exact lengths and strengths of the reinforcing layers and demonstrate internal stability of the MSE berm.

Compacted Clay

The unit weight of the compacted clay was assumed to be 125 pounds per cubic foot (pcf). The strength properties of the compacted clay was modeled as a Mohr-Coulomb strength envelope with $\phi = 32°$ and c = 100 psf.

STABILITY ANALYSES

This slope stability analysis used Slide® software, version 8.028 (Rocscience 2018). Global static and seismic (pseudo-static) slope stability analyses were performed using the Spencer (1967) method, which assumes a constant orientation of the inter-slice forces and accounts for both horizontal forces and moment equilibrium. Parameters input into Slide® to develop the slope stability models are presented in Attachment 5.

Stability Failure Modes

In general, four stability failure modes were considered in static and seismic (i.e., pseudo static) analyses:

i. global circular critical surface passing through the waste, berm, and/or the foundation;
ii. global non-circular block critical surface passing through the waste, berm, and/or the foundation;
iii. non-circular critical surface along the liner system (i.e., LWB); and
iv. horizontal sliding of the MSE berm.

The analysis did not consider LWB or horizontal sliding for the Construction Condition because it is not applicable to the geometry before waste is placed in the landfill.

The stability failure modes evaluated for the Construction Condition are illustrated in Figures 3A and 3B. The stability failure modes evaluated for the Post-Closure Condition are illustrated in Figures 4A, 4B, and 4C. Note that a 'waste slope' failure mode (Failure Mode B in Figure 4b) was not explicitly evaluated. Instead the waste slope failure mode is considered during the Post-Closure Condition global stability analysis. However, the strength of the waste relative to the clay foundation soils precludes a waste-only failure from being the critical failure.

Note that veneer stability of the liner and cover systems and punching shear of the MSE berm are presented in separate calculation packages.

Target Stability Criteria

Pursuant to the requirements of the Maine Solid Waste Management Rules (SWMR) and Resource Conservation and Recovery Act (RCRA) Subtitle D (258) (USEPA, 1995) the target design criteria for the Phase 14 slope stability are as follows:

- Construction Conditions:
  - Static factor of safety (FS) no less than 1.3; and
  - Seismic (pseudo-static) for the 475-year seismic event (i.e., a seismic event with a ten percent probability of exceedance in 50 years) FS no less than 1.1 or calculated displacement of the landfill resulting from the design earthquake no greater than 6 to 12 inches.
- Post-Closure Conditions:
  - Static FS no less than 1.5; and
  - Seismic (pseudo-static) for the 2,500-year seismic event (i.e., a seismic event with a two percent probability of exceedance in 50 years) FS no less than 1.0 or a calculated displacement of the landfill resulting from the design earthquake no greater than 6 to 12 inches.

Tension Cracks

Tension cracks were included in the stability models where an evaluation of the interslice forces indicated that tension could occur. Tension cracks are used to remove the strength contribution of soil in tension, since many types of soil have minimal tensile strength. The depth of the tension zone is modeled as approximately the depth of the first slice (counted from the crest of the slope) in tension. Tension cracks were not included in the reinforced zone of the MSE berm because the purpose of the reinforcement is to provide tensile strength.

Seismic Analyses

Seismic analyses were performed in general accordance with the recommendations outlined in the USEPA's guidance (USEPA, 1995). Seismic parameters were selected for the Construction and Post-Closure Conditions based on a seismic event with return periods of 475 years and 2,500 years, respectively. The basis for parameter selection for the Post-Closure Condition are summarized below.

- Bedrock Maximum Horizontal Acceleration (MHA) taken as 0.16g obtained from U.S. Geological Survey (USGS) 2014 National Seismic Hazard Map (Figure A6-1a of Attachment 6).
- Foundation soils conservatively assumed to consist of medium stiff clays (500 lb/ft^2 < S_u < 2000 lb/ft^2) per clay strengths calculated from the results of laboratory testing.
- Soil Peak Horizontal Acceleration at Ground Surface (a_{max}) taken as the average between bedrock MHA and soft soil MHA, since foundation soils consist of medium stiff soils. Based on the soft soil MHA curve by Kavazanjian and Matasovic (1994)

(Figure A6-2 of Attachment 6), the soft soil MHA is approximately 0.265g for a 2,500-year seismic event.

$$a_{max} = \frac{MHA_{Bedrock} + MHA_{Soil}}{2} = 0.213g$$

- Seismic coefficient (K_s) is taken as half of the soil peak horizontal acceleration at ground surface

$$K_s = 0.5 \times \frac{a_{max}}{g} = 0.106$$

The same process is used to develop the K_s for the Construction Condition from the MHA on Figure A6-1b of Attachment 6.

RESULTS

Construction Condition Static Analysis Results

The results of the static stability analyses for Construction Conditions are presented in Attachment 7 and are summarized in Table 3. As shown, the calculated factors of safety for the static conditions during construction meet or exceed the minimum target FS of 1.3.

Note that the calculated FS values presented for Sections III and VII are achieved using staged construction. The height of the first stage of the MSE berm was preliminarily designed such that the calculated factors of safety for the static conditions at Sections III and VII during construction meet or exceed the minimum target FS of 1.3. The FS values for the first stage are not presented in Table 3.

Construction Condition Seismic Analysis Results

The results of the seismic analyses for the Construction Conditions are presented in Attachment 8 and are summarize in Table 4. As shown, the calculated factors of safety for the 475-year seismic event meet or exceed the minimum target FS of 1.1. Therefore, no deformation analyses were performed for the Construction Conditions.

Note that the calculated FS values presented for Sections III and VII are achieved using staged construction. As mentioned above, the height of the first stage of the MSE berm was preliminarily designed such that the calculated factors of safety for the seismic conditions at Sections III and VII during construction meet or exceed the minimum target FS of 1.1. The FS values for the first stage are not presented in Table 4.

Post-Closure Condition Static Analysis Results

The results of the static stability analyses for Post-Closure Conditions are presented in Attachment 9 and are summarized in Table 5. As shown, the calculated factors of safety for the post-closure static conditions meet or exceed the minimum target FS of 1.5.

Post-Closure Condition Seismic Analysis Results

The results of the seismic stability analyses for the Post-Closure Conditions are presented in Attachment 10 and are summarized in Table 6. As shown, the calculated factors of safety for the 2,500-year seismic event meet or exceed the minimum target FS of 1.0. Therefore, no deformation analyses were performed for the Post-Closure Conditions.

CONCLUSIONS AND RECOMMENDATIONS

The following conclusions and recommendations are based on the results of the analyses presented herein.

- The proposed MSE berm may be constructed to its full height in a single construction stage at Sections I, II, IV, V, VI, and VIII and achieve the target FS for the Construction Condition under static and seismic loading.
- The proposed MSE berm at Sections III and VII can be constructed in stages to achieve the target FS for Construction Conditions as staging will allow for strength gain in the clay foundation soils. The analyses presented herein demonstrate that staged construction is an option for achieving the target FS. However, during preparation of the construction documents, the maximum height of the first construction stage and time to achieve strength gain resulting in the target FS will be further assessed to refine the requirements of the staged construction (e.g., maximum intermediate height, estimated length of time required prior to the next stage of berm construction, etc.). Alternatively, WMDSM may perform additional and/or more advance soil strength testing and analyses in the vicinity of these sections to assess if the clay is sufficiently strong to construct the berm to full height without staging.
- The proposed MSE berm and landfill meets the required FS at all sections analyzed for the Post-Closure Conditions under static and seismic loading.
- Additional ground survey beyond the limit of the MSE berm and landfill is recommend prior to development of construction documents, specifically for Section VII.

Written by: M. Nolden Date: 8/22/2019 Reviewed by: N. Yafrate Date: 10/18/2019

Client: WMDSM Project: Phase 14 Permit Project/Proposal No.: BE0232C Phase No.: 02

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TABLES

Table 1. Summary of material properties used in the slope stability analysis.

Material	Unit Weight γ (pcf)	Saturated Unit Weight γ_{sat} (pcf)	Strength Type	Effective Friction Angle φ' (deg)	Cohesion c' (psf)	Reference
Silty Sand	110	-	Mohr-Coulomb	32	0	(1)
Sand	110	125	Mohr-Coulomb	36	0	(1) (2) (3)
Brown Clay	125	-	SHANSEP (Table 2)	-	-	(4) (5)
Gray Clay	120	-	SHANSEP (Table 2)	-	-	(4) (5)
Till	150	-	-	50	10000	(5)
MSE Berm	125	-	Mohr-Coulomb	32	100	(5)
Compacted Clay	120	-	Mohr-Coulomb	32	100	(5)
MSW (Global)	75	-	Mohr-Coulomb	30	30	(5)
MSW (LWB σ'_v < 627 lb/ft2)	75	-	Mohr-Coulomb	0	501	(6)
MSW (LWB σ'_v > 627 lb/ft2)	75		Mohr-Coulomb	33	0	(6)
Liner Bottom	120	-	Mohr-Coulomb	18.3	0	(5)
Liner Slope	120	-	Mohr-Coulomb	8.2	0	(5)
Cover System	120	-	Mohr-Coulomb	30	0	(5)

Notes: (1) Coduto (2001)
(2) Das (2007)
(3) Sabatini, et al. (2002)
(4) Phase 14 Laboratory Testing (Attachments 3 and 4)
(5) Previous Crossroads LF Analyses.
(6) Kavazanjian et al. (1995)

Table 2. Effective preconsolidation stresses selected for calculating the undrained shear strength of the clay foundation soils using SHANSEP.

	Brown Clay		Gray Clay	
Section	**Representative Sample**	**Preconsolidation Stress (psf)**	**Representative Sample**	**Preconsolidation Stress (psf)**
I	GB-01 (19-21)	16,500	GB-05 (31-33)	6,500
II	GB-03 (3-5)	21,000	GB-04 (19-21)	7,000
III	GB-15 (7-9)	11,500	Note 1.	8,775
IV	GB-12 (17-19)	12,250	GB-17 (15-17)	4,600
V	GB-12 (17-19)	12,250	GB-11 (17-19)	4,750
VI	GB-03 (3-5)	21,000	GB-05 (31-33)	6,500
VII	GB-03 (3-5)	21,000	GB-05 (31-33)	6,500
VIII	GB-17B (5-7)	15,500	GB-17 (15-17)	4,600

Notes
1. The Gray Clay in Section III is modeled using the average of the preconsolidation stresses measured for GB-14 (9-11), and GB-15 (11-13).

Table 3. Calculated factor of safety for static Construction Condition.

Potential Failure Mode	Stability Section							
	I	**II**	**III[(1)]**	**IV**	**V**	**VI**	**VII[(1)]**	**VIII [(2)]**
Inward Circular	2.4	2.6	2.3	2.2	1.7	2.1	1.8	2.2
Inward Non-Circular	3.0	2.8	2.4	2.1	1.6	2.1	2.1	1.6
Outward Circular	2.3	4.8	1.3	1.8	1.3	1.6	1.3	1.6
Outward Non-Circular	2.4	3.5	1.4	1.8	1.5	1.8	1.4	1.4

Notes: (1) Reported factors of safety for Section III and VII are based on staged construction.
(2) For Section VIII, the ‘outward’ failure mode considers a failure from right to left when referring to the cross-section presented in Figure 2H. The ‘inward’ failure mode considers a failure from left to right.

Table 4. Calculated factor of safety for seismic Construction Condition.

Potential Failure Mode	**Stability Section**							
	I	**II**	**III**(1)	**IV**	**V**	**VI**	**VII**(1)	**VIII** (2)
Inward Circular	2.0	2.2	1.9	1.8	1.4	1.8	1.5	1.8
Inward Non-Circular	2.6	2.4	2.0	1.6	1.3	1.7	1.8	1.7
Outward Circular	2.2	3.7	1.2	1.6	1.3	1.4	1.2	1.4
Outward Non-Circular	1.9	3.2	1.3	1.6	1.4	1.5	1.4	1.3

Notes:
(1) Reported factors of safety for Sections III and VII are based on staged construction.
(2) For Section VIII, the ‘outward’ failure mode considers a failure from right to left when referring to the cross-section presented in Figure 2H. The ‘inward’ failure mode considers a failure from left to right.

Table 5. Calculated factor of safety for static Post-Closure Condition.

Potential Failure Mode	Stability Section								
	I	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII (2)**	
Global Circular	1.9	1.9	1.6	1.6	1.6	1.7	1.6	2.2	1.7
Global Non-Circular	2.4	2.5	1.7	1.6	1.7	1.7	2.2	1.9	1.6
Liner Waste Block (LWB)	1.7	1.7	1.7	1.7	1.8	1.8	1.7	-	-
Horizontal Sliding of MSE Berm	2.0	1.9	2.1	2.1	2.3	2.2	2.2	-	-

Notes: (1) For Section VIII, the first FS presented considers a failure from right to left when referring to the cross-section presented in Figure 2H. The second FS considers a failure from left to right.

Table 6. Calculated factor of safety for seismic Post-Closure Condition.

Potential Failure Mode	Stability Section								
	I	II	III	IV	V	VI	VII	VIII [(1)]	
Global Circular	1.4	1.4	1.1	1.1	1.1	1.2	1.3	1.8	1.3
Global Non-Circular	1.7	1.8	1.2	1.1	1.1	1.1	1.5	1.4	1.3
Liner Waste Block (LWB)	1.2	1.2	1.2	1.2	1.2	1.3	1.2	-	-
Horizontal Sliding of MSE Berm	1.5	1.4	1.5	1.5	1.6	1.6	1.6	-	-

Notes: (1) For Section VIII, the first FS presented considers a failure from right to left when referring to the cross-section presented in Figure 2H. The second FS considers a failure from left to right.

FIGURES

LEGEND

- GROUND SURFACE ELEVATION CONTOUR (NOTE 1)
- LIMIT OF WASTE
- TOP OF WASTE
- CPT TEST LOCATION (NOTE 2)
- BORING LOCATION (NOTE 3)

NOTES:

1. EXISTING GROUND SURFACE AND FEATURES OBTAINED FROM TOPOGRAPHIC SURVEYS, DATED NOV 2017, AND SEPT 2018, PROVIDED BY BOYNTON & PICKETT. HORIZONTAL DATUM IS NORTH AMERICAN DATUM OF 1983 (NAD 83) MAINE WEST STATE PLAN. VERTICAL DATUM IS NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88).
2. CPT PERFORMED IN AUGUST AND SEPTEMBER 2018 BY GEOSYNTEC. LOCATIONS FROM SURVEY POINT FILE PREPARED BY BOYNTON & PICKETT RECEIVED 4 SEPT 2018.
3. GEOTECHNICAL BORINGS PERFORMED BY GEOSYNTEC FEBRUARY AND MARCH 2019. LOCATIONS FROM SURVEY POINT FILE PREPARED BY BOYNTON & PICKET RECEIVE DATED 17 APRIL 2019.

0 150' 300'
SCALE IN FEET

SLOPE STABILITY SECTION LOCATIONS AND TOP OF WASTE GRADES
PHASE 14

WASTE MANAGEMENT DISPOSAL SERVICES OF MAINE, INC.
CROSSROADS LANDFILL
NORRIDGEWOCK, MAINE

Geosyntec consultants

FIGURE 1

PROJECT NO: BE0232

OCTOBER 2019

T:\PROJECTS_CADD\C\CROSSROADS LANDFILL\PHASE 14 EXPANSION\PERMIT\FIGURES\2019.08.30 SLOPE STABL SECT\BE0232 F1070 (STABL SECT PLAN)

SECTION COORDINATES:
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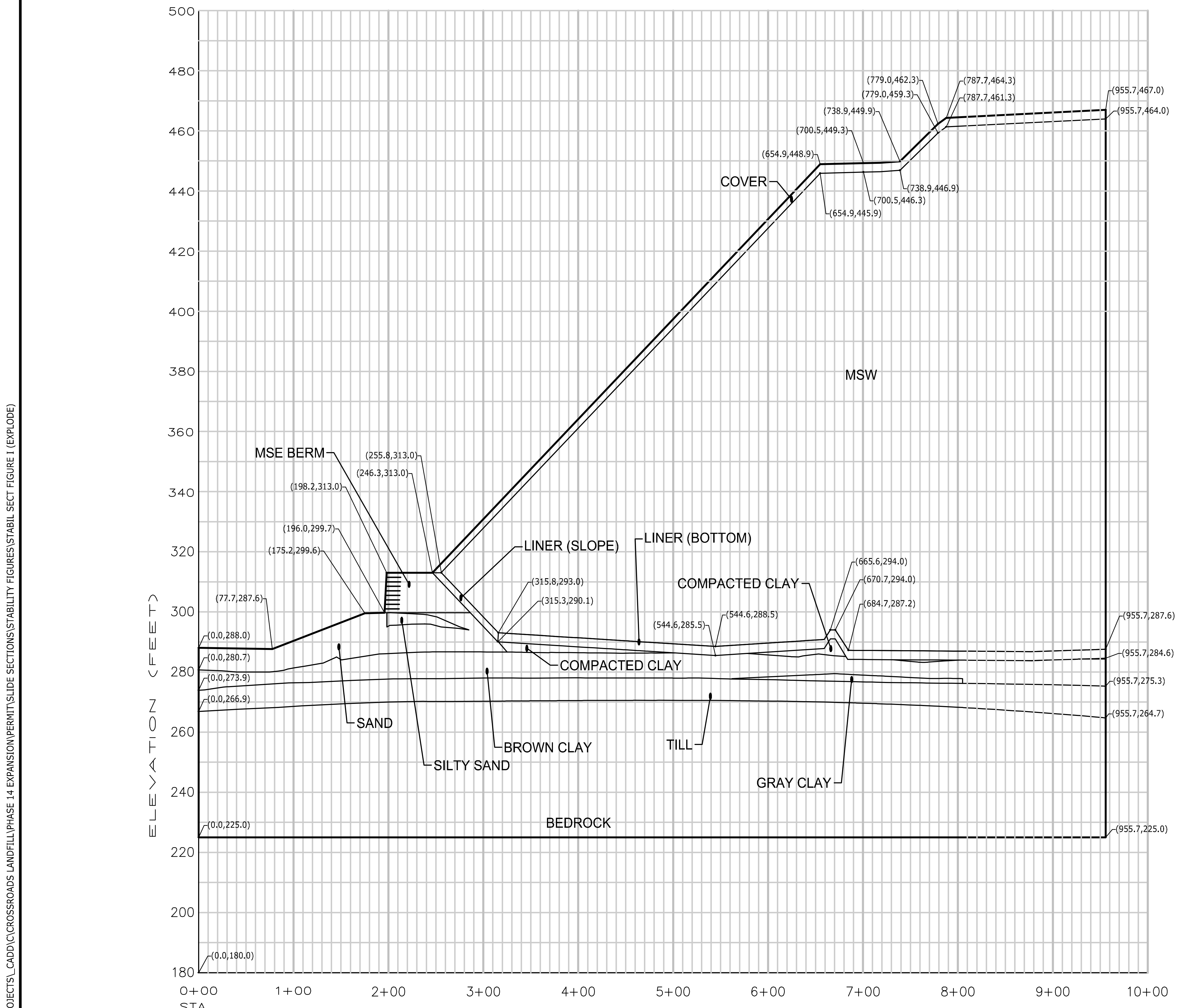


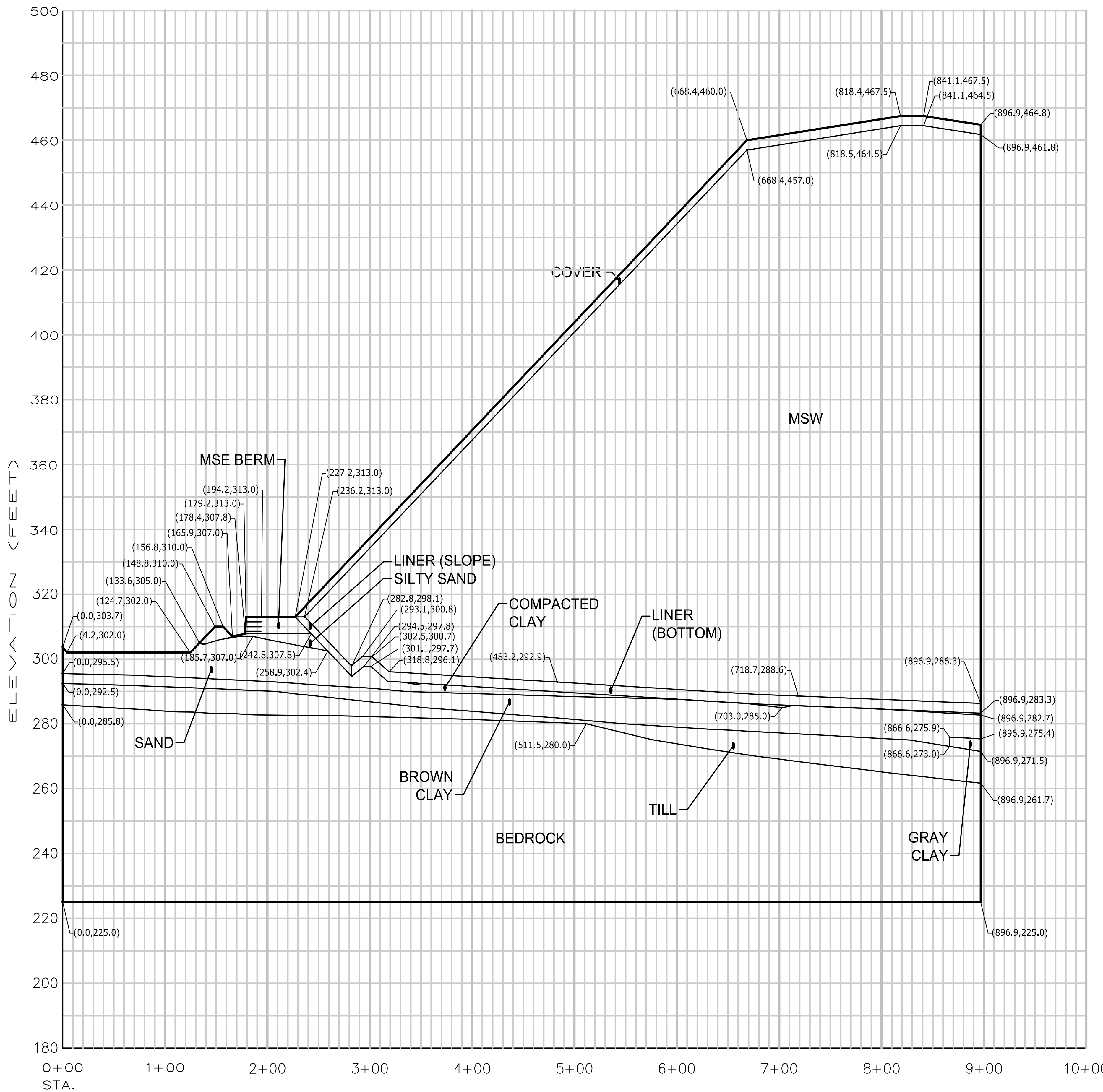
STABILITY ANALYSIS SECTION I
PHASE 14 PERMIT APPLICATION

CROSSROADS LANDFILL
NORRIDGEWOCK, MAINE

Geosyntec consultants

Acton, MA | OCTOBER 2019

Figure: 2A



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START N = 686152.70 E = 3039496.26
END N = 685387.13 E = 3039029.07

STABILITY ANALYSIS SECTION II
PHASE 14 PERMIT APPLICATION

CROSSROADS LANDFILL
NORRIDGEWOCK, MAINE

Geosyntec consultants

Figure: 2B

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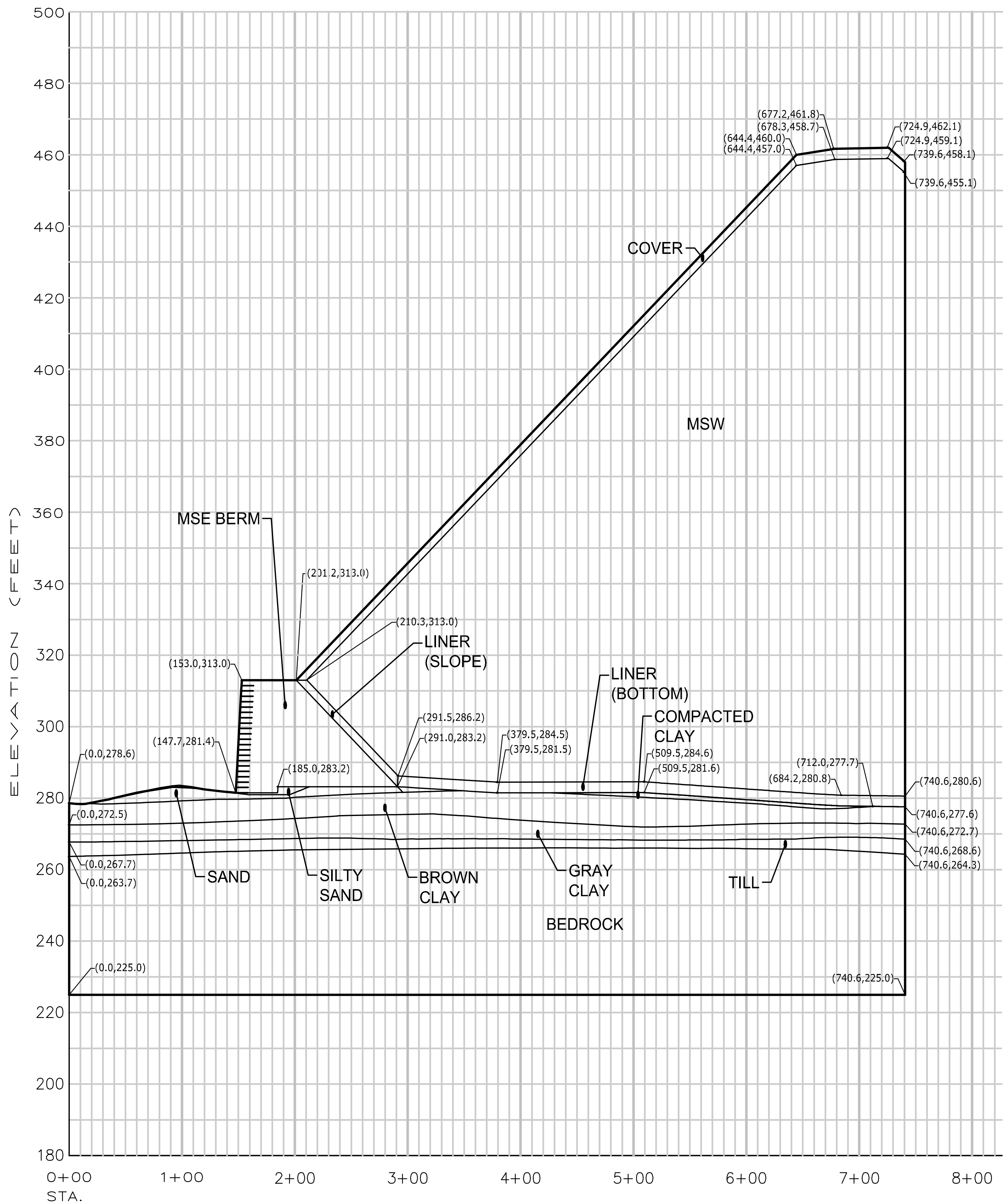
T:\PROJECTS_CADD\C\CROSSROADS LANDFILL\PHASE 14 EXPANSION\PERMIT\SLIDE SECTIONS\STABILITY FIGURES\STABIL SECT FIGURE II (EXPLODE)



SECTION COORDINATES:
START N = 685407.07 E = 3040321.77
END N = 684987.55 E = 3039711.42

STABILITY ANALYSIS SECTION III
PHASE 14 PERMIT APPLICATION

CROSSROADS LANDFILL
NORRIDGEWOCK, MAINE

Geosyntec consultants

Figure: 2C

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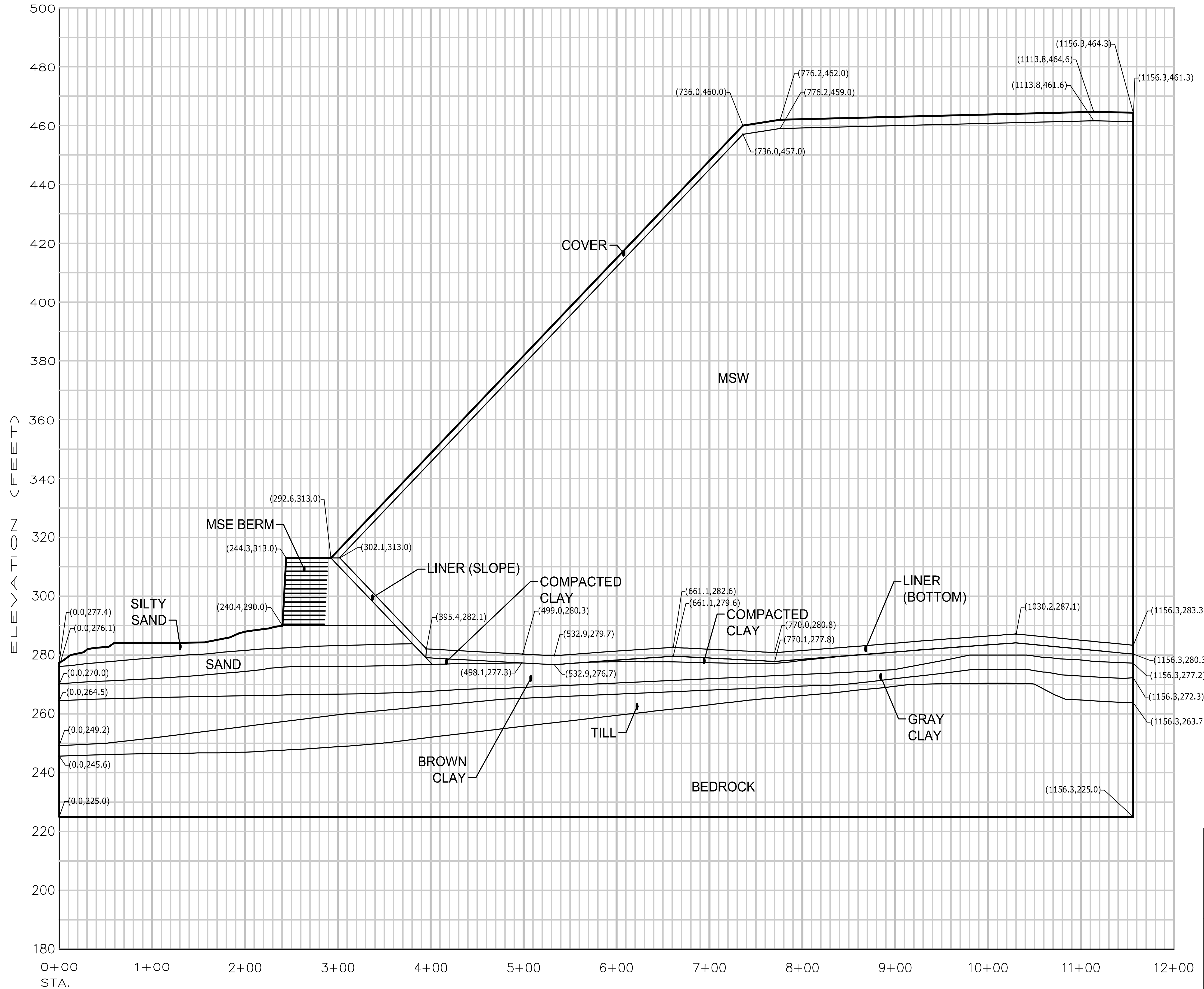
T:\PROJECTS_CADD\C\CROSSROADS LANDFILL\PHASE 14 EXPANSION\PERMIT\SLIDE SECTIONS\STABILITY FIGURES\STABIL SECT FIGURE III (EXPLODE)

SECTION COORDINATES:
START N = 684515.51 E = 3040341.24
END N = 685272.08 E = 3039466.83



STABILITY ANALYSIS SECTION IV
PHASE 14 PERMIT APPLICATION

CROSSROADS LANDFILL
NORRIDGEWOCK, MAINE

Geosyntec consultants

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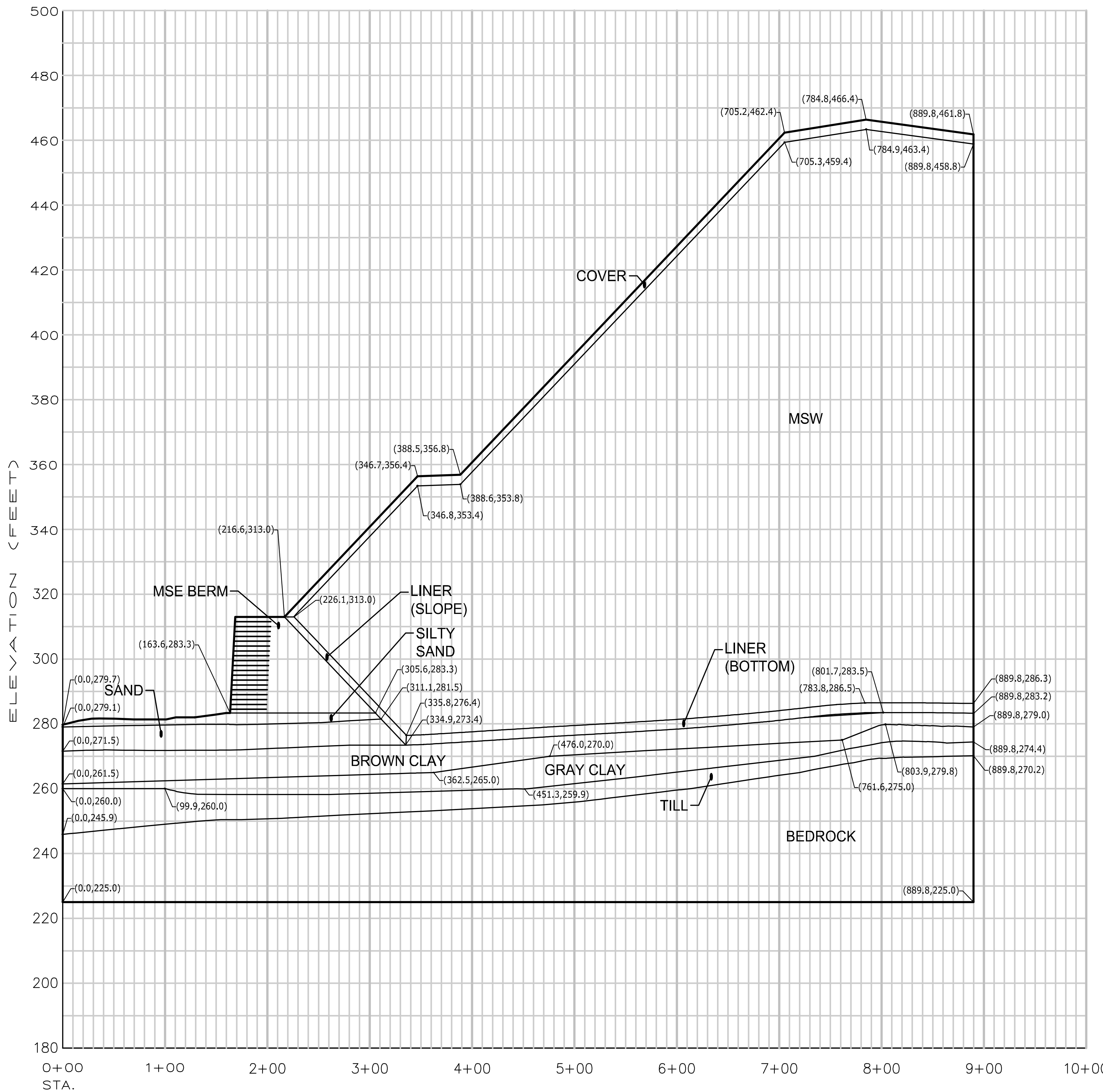
Figure: 2D

T:\PROJECTS_CADD\C\CROSSROADS LANDFILL\PHASE 14 EXPANSION\PERMIT\SLIDE SECTIONS\STABILITY FIGURES\STABIL SECT FIGURE IV (EXPLODE)

SECTION COORDINATES:
START N = 684414.78 E = 3039269.12
END N = 685254.40 E = 3039563.74



STABILITY ANALYSIS SECTION V
PHASE 14 PERMIT APPLICATION

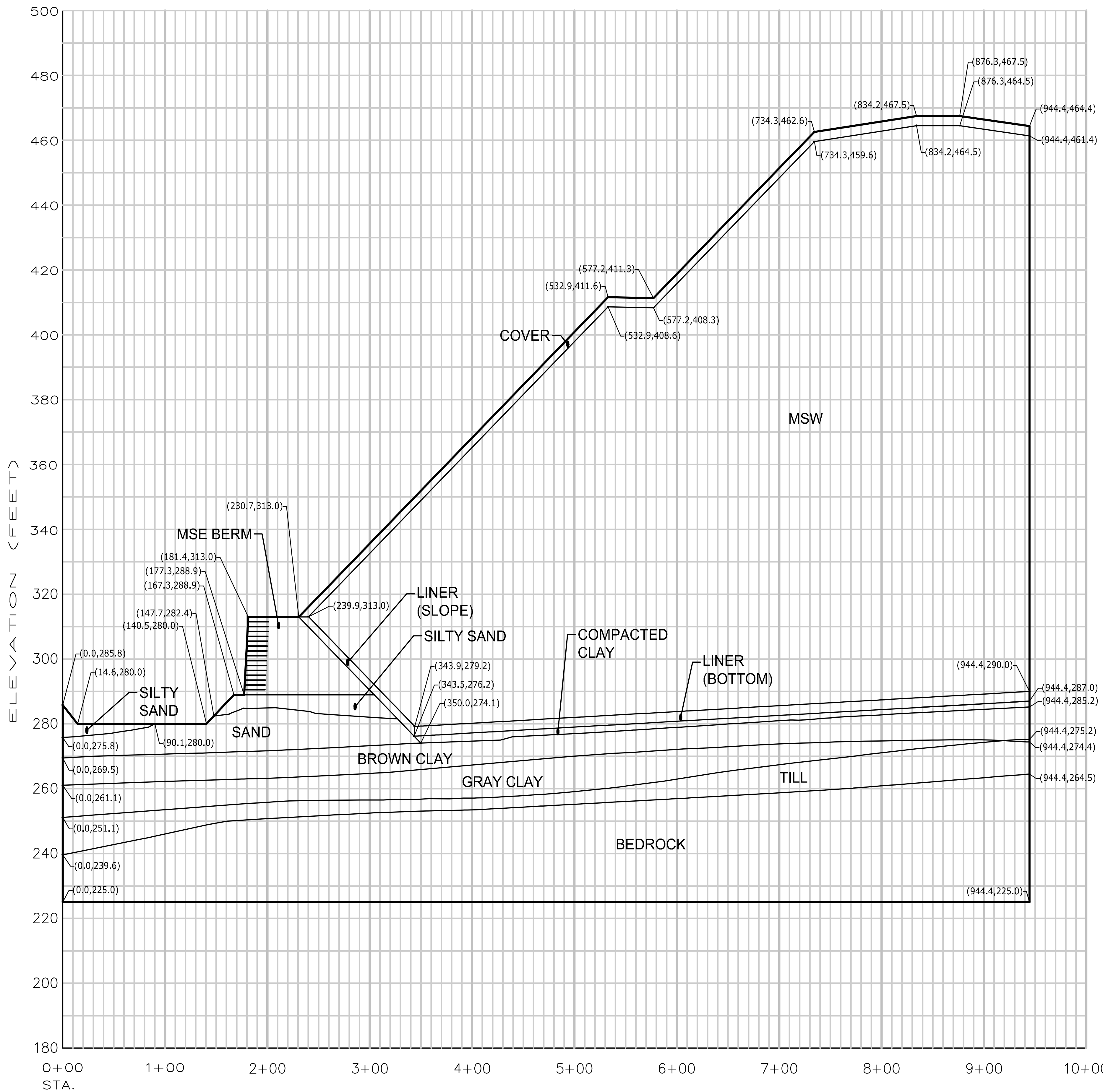
CROSSROADS LANDFILL
NORRIDGEWOCK, MAINE

Geosyntec consultants

Figure: 2E

Acton, MA | OCTOBER 2019

T:\PROJECTS_CADD\C\CROSSROADS LANDFILL\PHASE 14 EXPANSION\PERMIT\SLIDE SECTIONS\STABILITY FIGURES\STABIL SECT FIGURE V (EXPLODE)



SECTION COORDINATES:
START N = 684909.13 E = 3038426.76
END N = 685438.94 E = 3039208.60

STABILITY ANALYSIS SECTION VI
PHASE 14 PERMIT APPLICATION

CROSSROADS LANDFILL
NORRIDGEWOCK, MAINE

Geosyntec consultants

Figure: 2F

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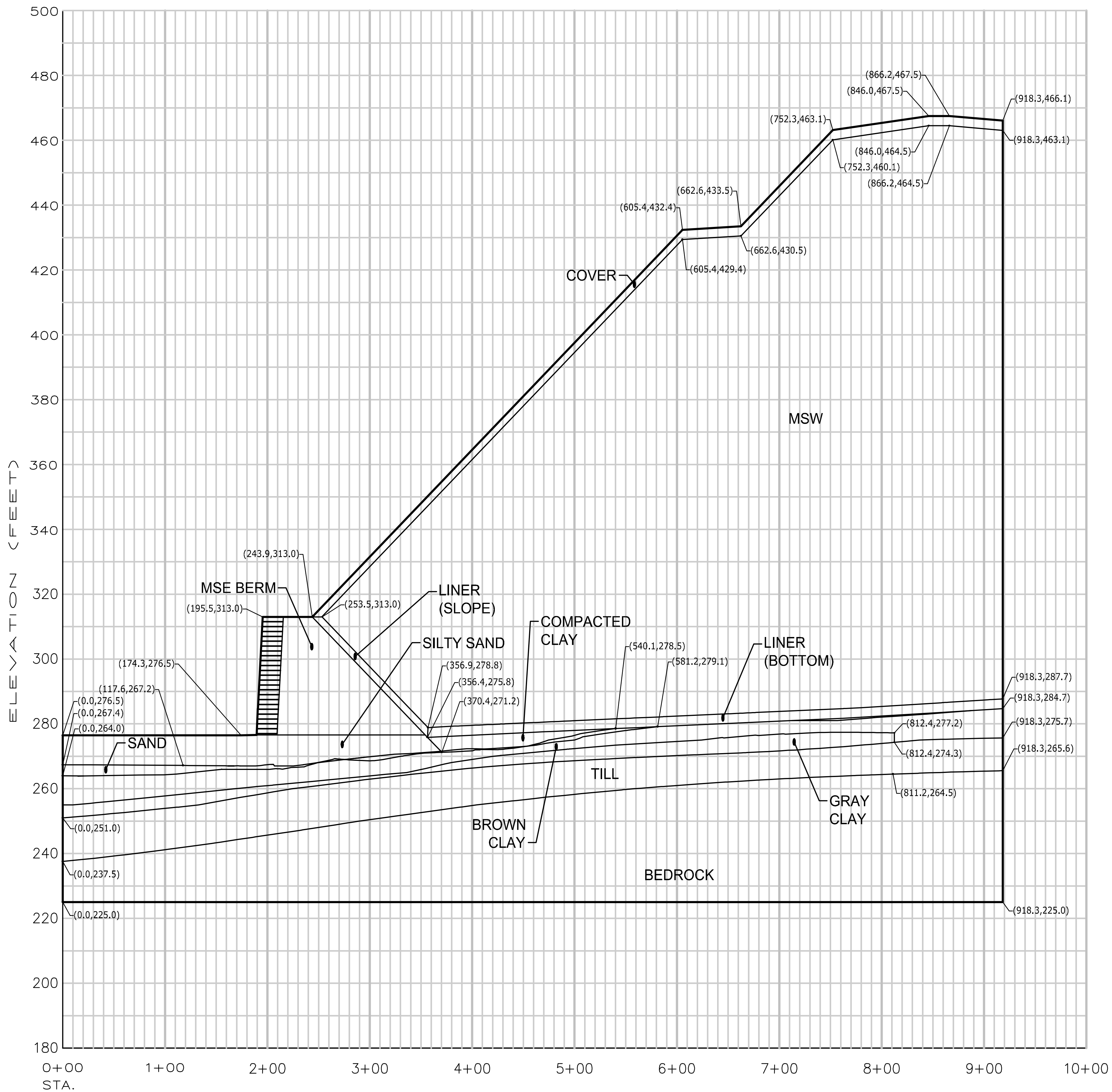
T:\PROJECTS_CADD\C\CROSSROADS LANDFILL\PHASE 14 EXPANSION\PERMIT\SLIDE SECTIONS\STABILITY FIGURES\STABIL SECT FIGURE VI (EXPLODE)



SECTION COORDINATES:
START N = 685470.80 E = 3038168.29
END N = 685477.43 E = 3039086.57

T:\PROJECTS_CADD\C\CROSSROADS LANDFILL\PHASE 14 EXPANSION\PERMIT\SLIDE SECTIONS\STABILITY FIGURES\STABIL SECT FIGURE VII (EXPLODE)

STABILITY ANALYSIS SECTION VII
PHASE 14 PERMIT APPLICATION

CROSSROADS LANDFILL
NORRIDGEWOCK, MAINE

Geosyntec consultants

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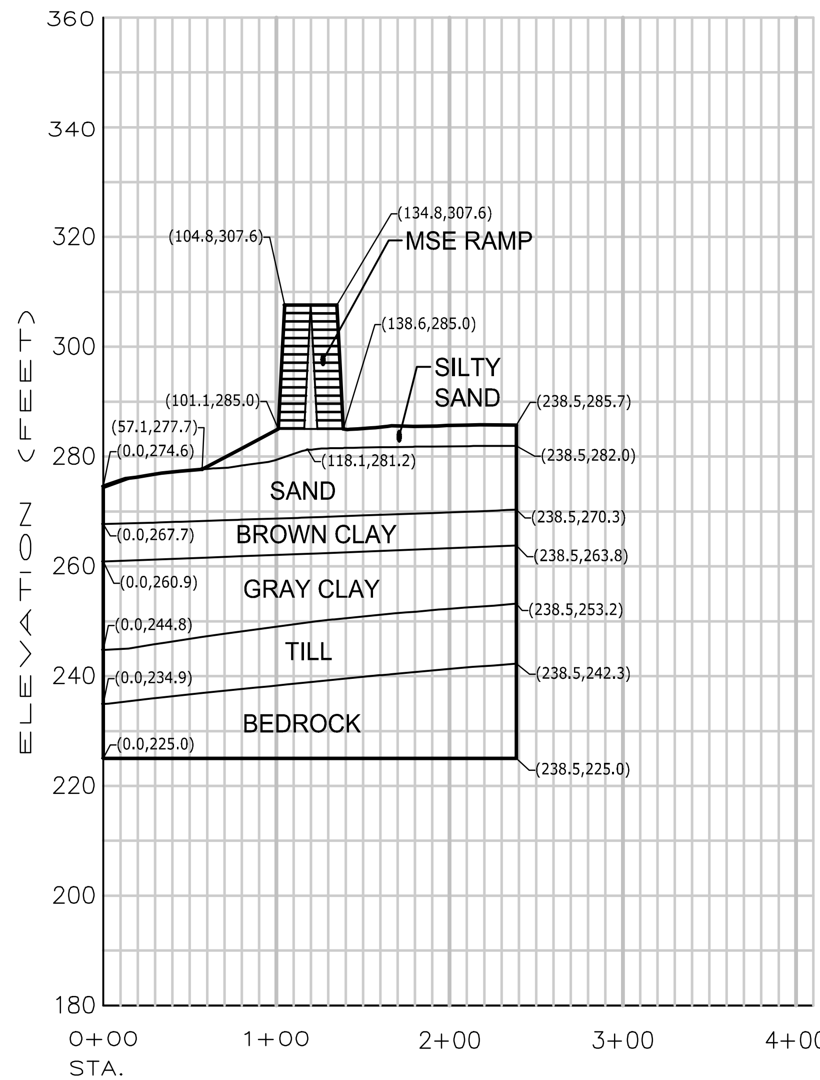
Figure: 2G

SECTION COORDINATES:
START N = 684288.91 E =3039898.53
END N = 684474.91 E = 3040047.80



STABILITY ANALYSIS SECTION VIII
PHASE 14 PERMIT APPLICATION

CROSSROADS LANDFILL
NORRIDGEWOCK, MAINE

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Figure: 2H

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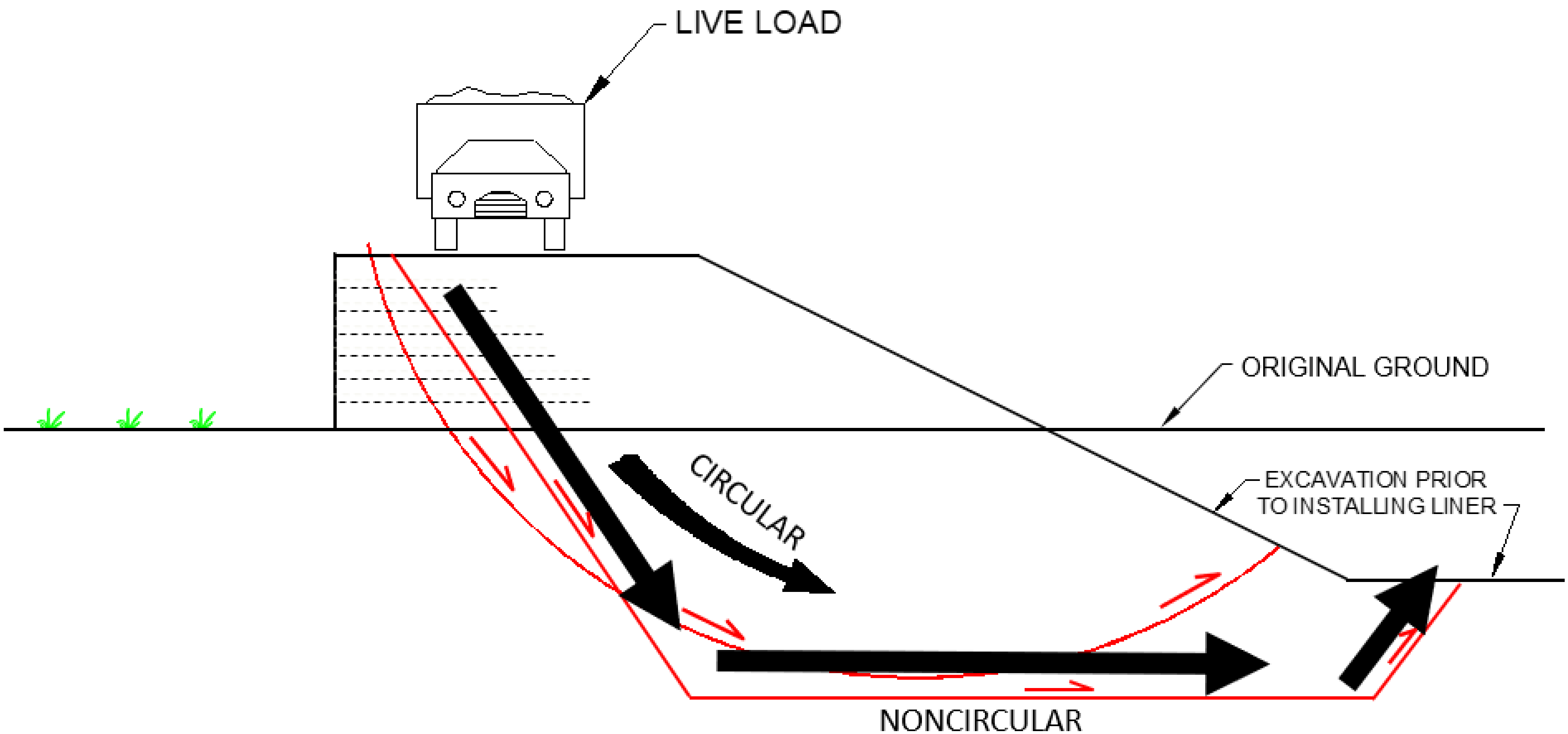
T:\PROJECTS_CADD\C\CROSSROADS LANDFILL\PHASE 14 EXPANSION\PERMIT\SLIDE SECTIONS\STABILITY FIGURES\STABIL SECT FIGURE VIII (ROAD) EXPLODE



INWARD STABILITY OF MSE BERM
CONSTRUCTION CONDITION

CROSSROADS LANDFILL PHASE 14
Norridgewock, Maine

Geosyntec consultants

FIG 3A

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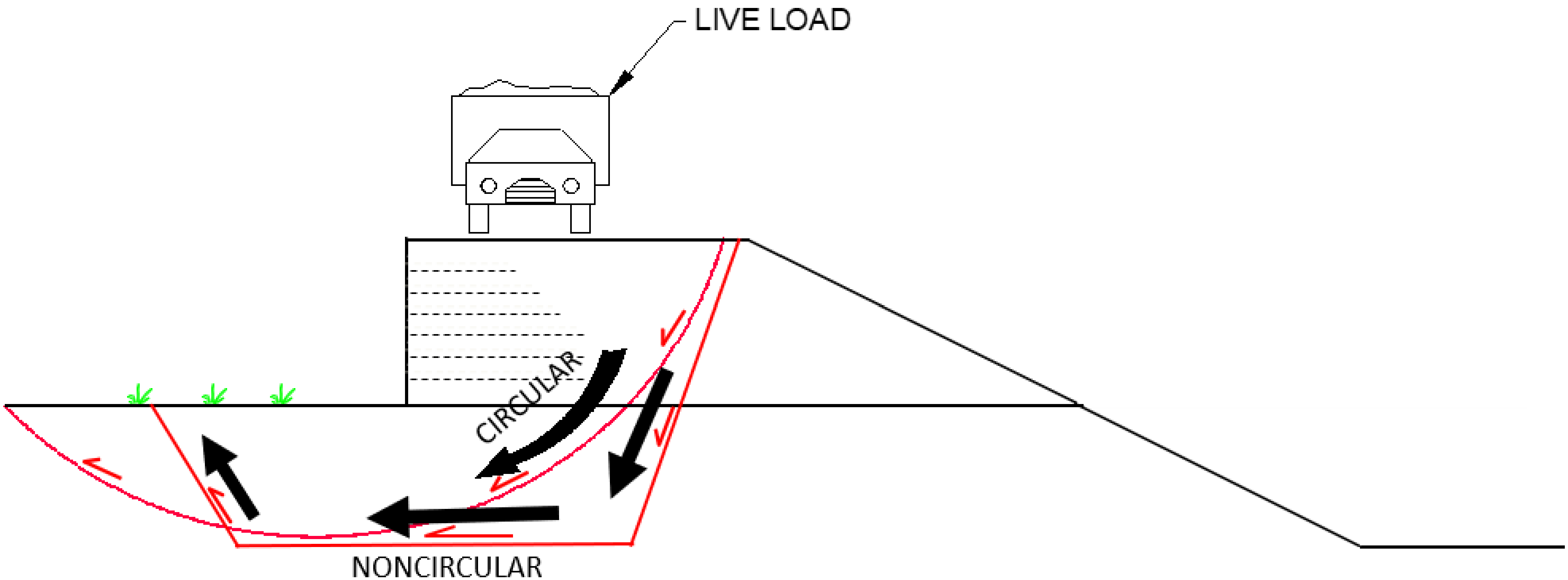

OUTWARD STABILITY OF MSE BERM
CONSTRUCTION CONDITION

CROSSROADS LANDFILL PHASE 14
Norridgewock, Maine

Geosyntec consultants

FIG
3B

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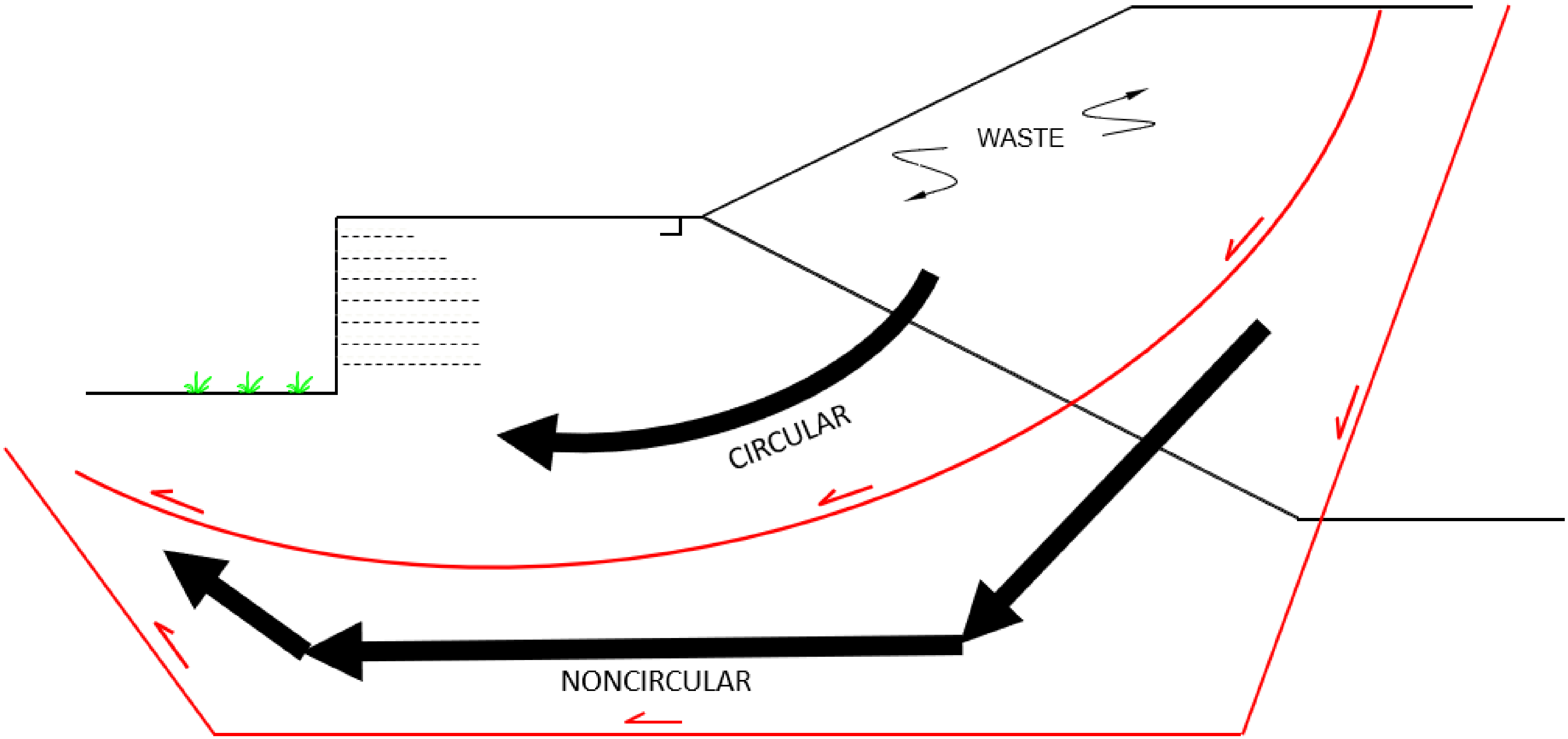

GLOBAL STABILITY
POST-CLOSURE CONDITION

CROSSROADS LANDFILL PHASE 14
Norridgewock, Maine

Geosyntec consultants

FIG 4A

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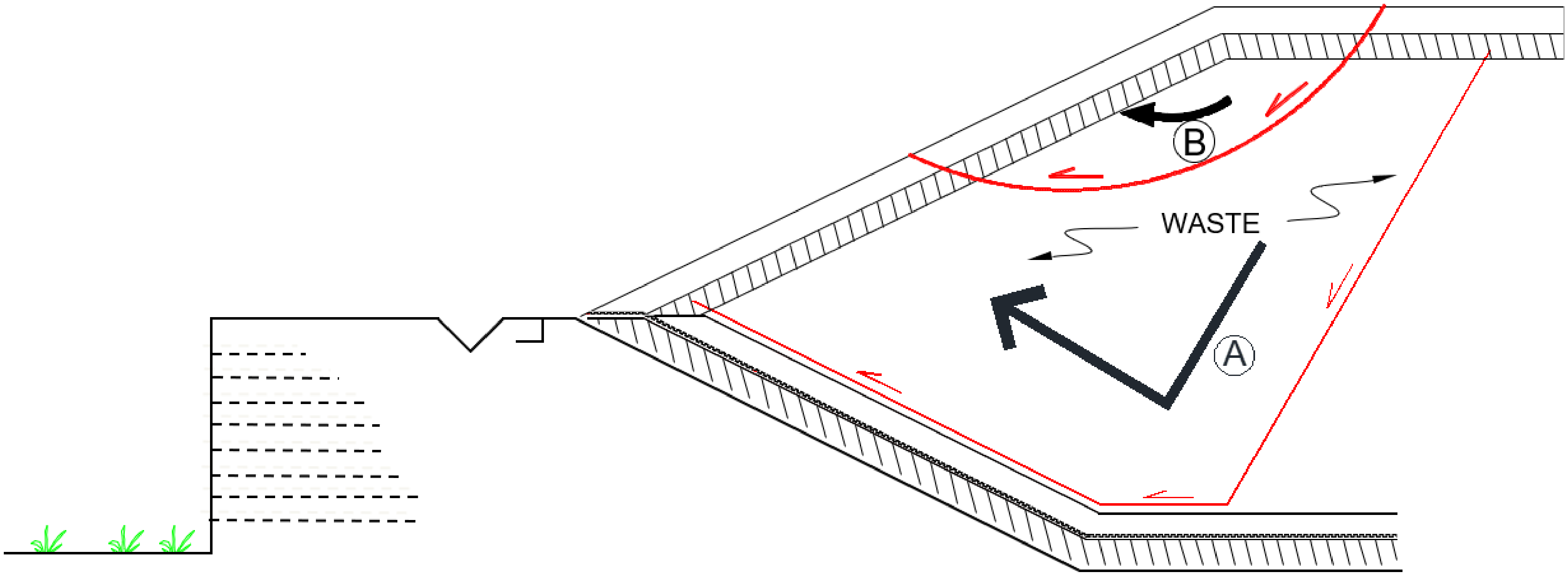
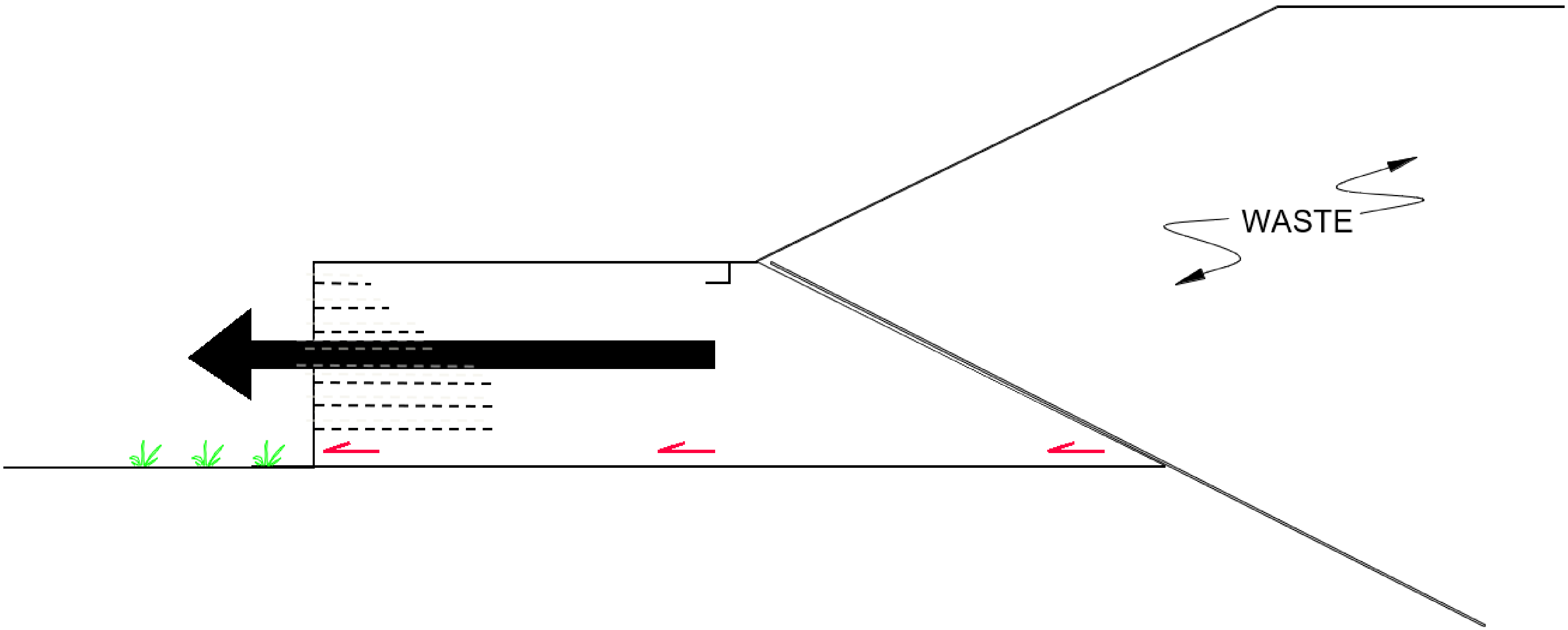


Ⓐ Liner Waste Block (or Sliding-on-Liner)

Ⓑ Waste Slope

Note: The 'waste slope' failure mode (B) was not explicitly evaluated for this analysis. Instead the waste slope failure mode is considered during the Post-Closure Condition global stability analysis. However, the strength of the waste relative to the clay foundation soils precludes a waste-only failure from being the critical failure.

LINER-WASTE BLOCK FAILURE MODE POST-CLOSURE CONDITION CROSSROADS LANDFILL PHASE 14 Norridgewock, Maine		
Geosyntec consultants		FIG **4B**
Acton, MA	October 2019	



HORIZONTAL SLIDING
POST-CLOSURE CONDITION

CROSSROADS LANDFILL PHASE 14
Norridgewock, Maine

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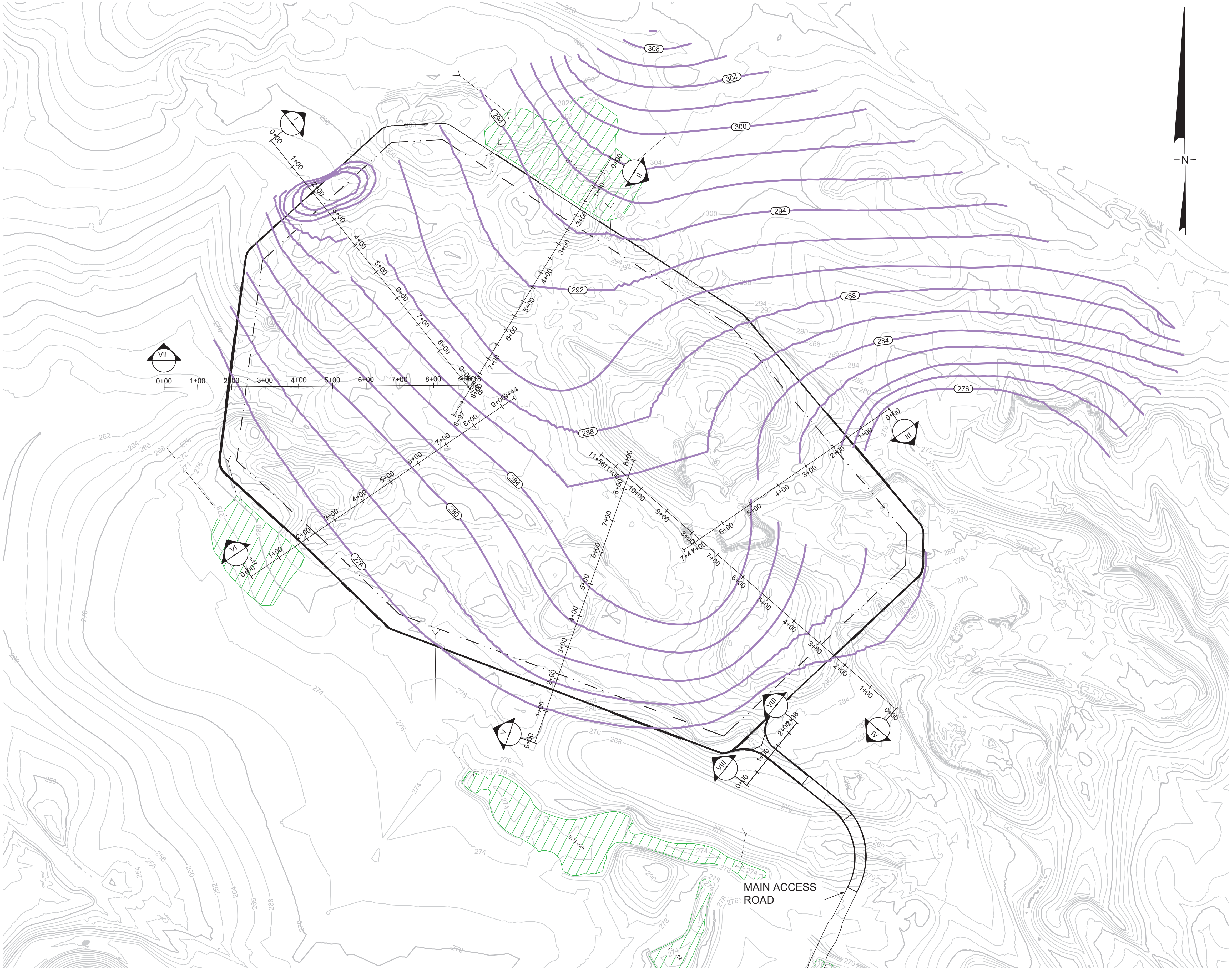
October 2019

FIG

4C

ATTACHMENT 1
Potentiometric Surfaces



LEGEND

GROUND SURFACE ELEVATION CONTOUR (NOTE 1)

LIMIT OF WASTE

WATER LEVEL IN SAND (NOTE 2)

NOTES:

1. EXISTING GROUND SURFACE AND FEATURES OBTAINED FROM TOPOGRAPHIC SURVEYS, DATED NOV 2017, AND SEPT 2018, PROVIDED BY BOYNTON & PICKETT. HORIZONTAL DATUM IS NORTH AMERICAN DATUM OF 1983 (NAD 83) MAINE WEST STATE PLAN. VERTICAL DATUM IS NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88).

2. GROUNDWATER LEVELS OBTAINED FROM GOLDER ASSOCIATES, INC. BASED ON FIELD OBSERVATIONS MADE 2 MAY 2019.

SLOPE STABILITY SECTION LOCATIONS AND
WATER LEVELS IN SAND
PHASE 14

WASTE MANAGEMENT DISPOSAL SERVICES OF MAINE, INC.
CROSSROADS LANDFILL
NORRIDGEWOCK, MAINE

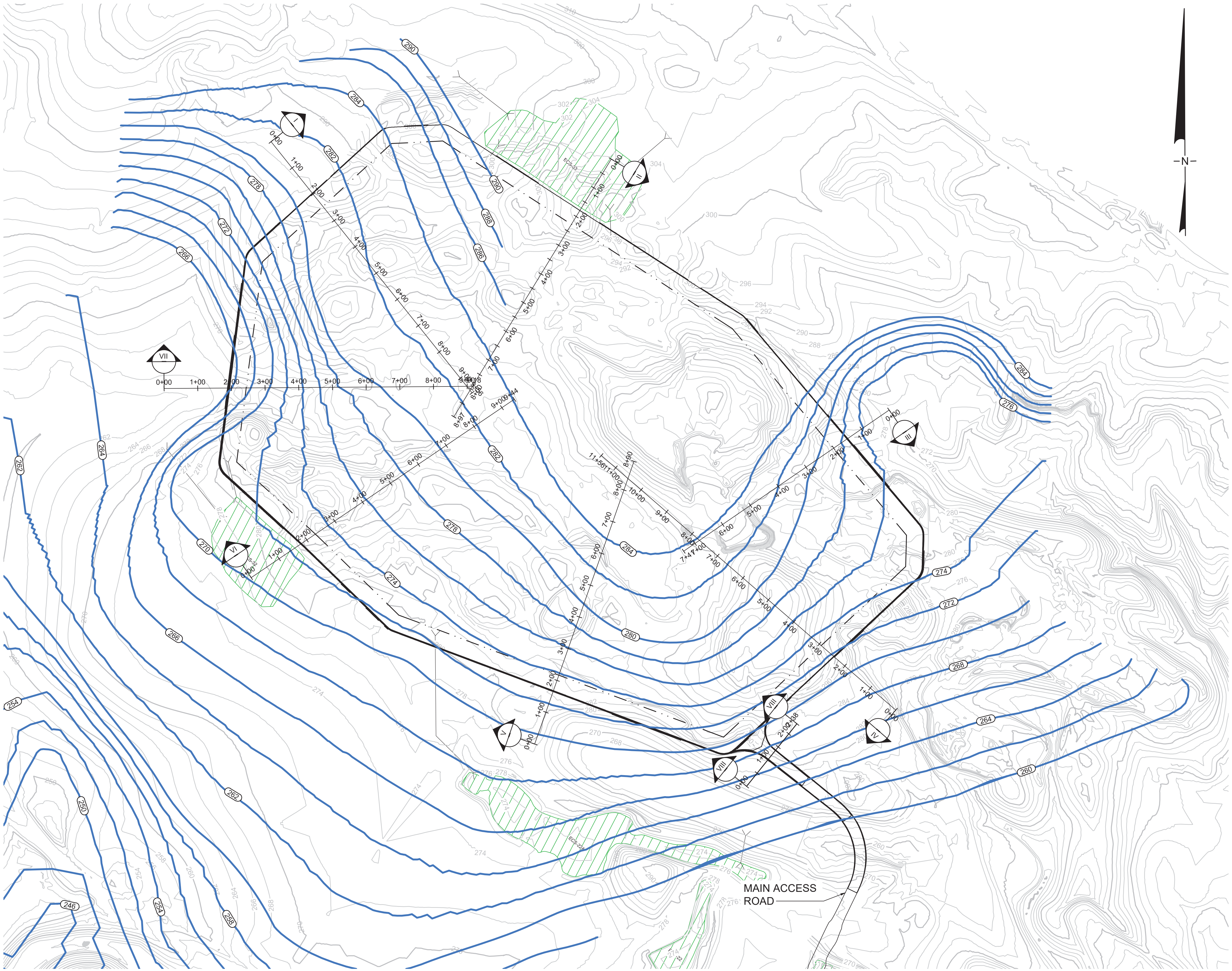
Geosyntec consultants

FIGURE A1

PROJECT NO: BE0232

OCTOBER 2019

T:\PROJECTS_CADD\C\CROSSROADS LANDFILL\PHASE 14 EXPANSION\PERMIT\FIGURES\2019.08.30 SLOPE STABL SECT\BE0232 F1070 (STABL SECT PLAN)



LEGEND

- GROUND SURFACE ELEVATION CONTOUR (NOTE 1)
- LIMIT OF WASTE
- WATER LEVEL IN CLAY (NOTE 2)

NOTES:

1. EXISTING GROUND SURFACE AND FEATURES OBTAINED FROM TOPOGRAPHIC SURVEYS, DATED NOV 2017, AND SEPT 2018, PROVIDED BY BOYNTON & PICKETT. HORIZONTAL DATUM IS NORTH AMERICAN DATUM OF 1983 (NAD 83) MAINE WEST STATE PLAN. VERTICAL DATUM IS NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88).
2. GROUNDWATER LEVELS OBTAINED FROM GOLDER ASSOCIATES, INC. BASED ON FIELD OBSERVATIONS MADE 2 MAY 2019.

0 150' 300'
SCALE IN FEET

SLOPE STABILITY SECTION LOCATIONS AND
WATER LEVELS IN CLAY
PHASE 14

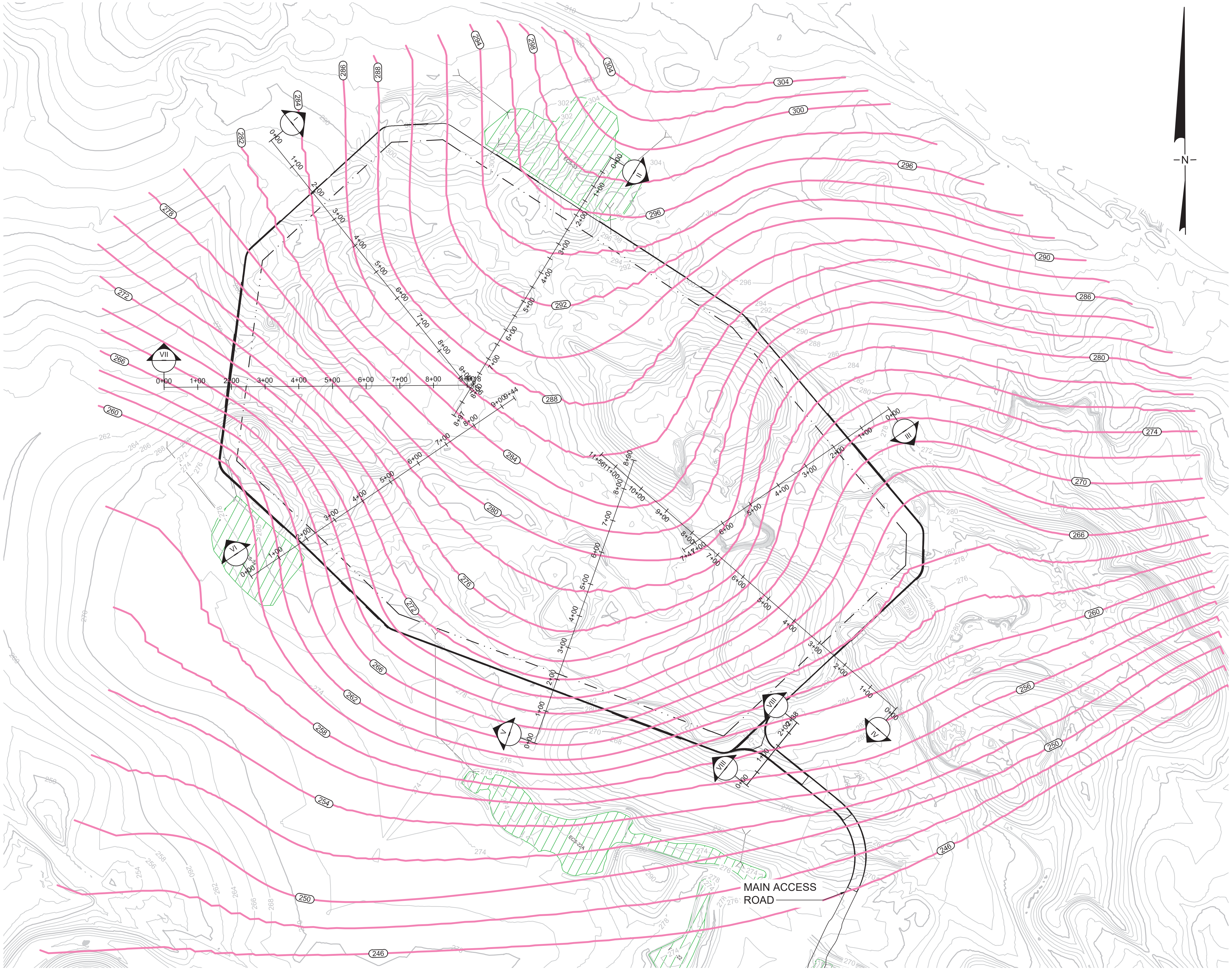
WASTE MANAGEMENT DISPOSAL SERVICES OF MAINE, INC.
CROSSROADS LANDFILL
NORRIDGEWOCK, MAINE

Geosyntec consultants

FIGURE A2

PROJECT NO: BE0232 | OCTOBER 2019

T:\PROJECTS_CADD\C\CROSSROADS LANDFILL\PHASE 14 EXPANSION\PERMIT\FIGURES\2019.08.30 SLOPE STABL SECT\BE0232 F1070 (STABL SECT PLAN)



LEGEND

- GROUND SURFACE ELEVATION CONTOUR (NOTE 1)
- LIMIT OF WASTE
- WATER LEVEL IN TILL (NOTE 2)

NOTES:

1. EXISTING GROUND SURFACE AND FEATURES OBTAINED FROM TOPOGRAPHIC SURVEYS, DATED NOV 2017, AND SEPT 2018, PROVIDED BY BOYNTON & PICKETT. HORIZONTAL DATUM IS NORTH AMERICAN DATUM OF 1983 (NAD 83) MAINE WEST STATE PLAN. VERTICAL DATUM IS NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88).
2. GROUNDWATER LEVELS OBTAINED FROM GOLDER ASSOCIATES, INC. BASED ON FIELD OBSERVATIONS MADE 2 MAY 2019.

0 150' 300'
SCALE IN FEET

SLOPE STABILITY SECTION LOCATIONS AND WATER LEVELS IN TILL
PHASE 14

WASTE MANAGEMENT DISPOSAL SERVICES OF MAINE, INC.
CROSSROADS LANDFILL
NORRIDGEWOCK, MAINE

Geosyntec consultants

FIGURE A3

PROJECT NO: BE0232

OCTOBER 2019

T:\PROJECTS_CADD\C\CROSSROADS LANDFILL\PHASE 14 EXPANSION\PERMIT\FIGURES\2019.08.30 SLOPE STABL SECT\BE0232 F1070 (STABL SECT PLAN)

ATTACHMENT 2

Cohesionless Soil Strength Correlation to SPT Results

Boring	Stratum	Ground El. (ft)	GW El. (ft)	Elevation (ft)	Effective Stress (psf)	Blow Count				N	η_R	N_{60} (1)	CN (2)	$(N_1)_{60}$ (2)	ϕ' (2)
GB-01	Sand	298.4	295	296	267	2	5	6	7	11	0.75	12	2.8	32.9	42.5
	Sand	298.4	295	294	435	5	8	9	8	17	0.75	18	2.2	39.8	44.8
	Sand	298.4	295	292	550	5	9	9	10	18	0.75	19	2.0	37.5	44.0
	Sand	298.4	295	290	665	7	10	12	13	22	0.75	23	1.8	41.7	45.3
	Sand	298.4	295	288	781	6	10	11	12	21	0.75	22	1.6	36.7	43.8
	Sand	298.4	295	286	896	10	19	19	19	38	0.75	40	1.5	62.1	50.9
GB-02	Sand	295.0	292	293	220	2	5	6	8	11	0.75	12	3.1	36.2	43.6
	Sand	295.0	292	291	388	7	9	9	11	18	0.75	19	2.3	44.7	46.2
	Sand	295.0	292	289	503	6	10	11	16	21	0.75	22	2.1	45.8	46.6
GB-04	Sand	287.2	280	281	676	18	15	14	15	29	0.75	31	1.8	54.5	49.0
GB-05	Sand	294.2	278	284	1120	2	5	5	6	10	0.75	11	1.4	14.6	35.0
	Sand	294.2	278	280	1560	3	6	5	6	11	0.85	13	1.2	15.4	35.4
	Sand	294.2	278	276	1895	6	13	17	17	30	0.85	36	1.1	38.2	44.2
GB-06	Sand	288.1	276	286	231	1	3	5	6	8	0.75	9	3.0	25.7	39.9
	Sand	288.1	276	284	451	5	5	6	9	11	0.75	12	2.2	25.3	39.7
	Sand	288.1	276	282	671	6	7	11	11	18	0.75	19	1.8	34.0	42.9
	Sand	288.1	276	280	891	5	6	8	9	14	0.75	15	1.5	22.9	38.8
	Sand	288.1	276	278	1111	5	6	5	5	11	0.75	12	1.4	16.1	35.8
	Sand	288.1	276	276	1331	5	5	6	5	11	0.75	12	1.3	14.7	35.1
	Sand	288.1	276	274	1446	4	3	5	5	8	0.85	10	1.2	11.7	33.4
	Sand	288.1	276	272	1561	4	5	6	11	11	0.85	13	1.2	15.4	35.4
GB-07	Sand	286.9	284	285	206	2	2	3	3	5	0.75	5	3.2	17.0	36.2
	Sand	286.9	284	283	373	4	5	6	7	11	0.75	12	2.4	27.8	40.7
	Sand	286.9	284	281	489	4	8	9	4	17	0.75	18	2.1	37.6	44.1
GB-08	Sand	289.0	279	279	1190	27	17	29	19	46	0.75	49	1.3	65.2	51.7
	Sand	289.0	279	277	1410	10	12	13	15	25	0.75	27	1.2	32.5	42.4
	Sand	289.0	279	275	1525	10	13	12	13	25	0.85	30	1.2	35.5	43.4
GB-09	Sand	279.7	276	278	189	3	2	2	6	4	0.75	4	3.3	14.2	34.8
	Sand	279.7	276	276	409	6	6	6	5	12	0.75	13	2.3	29.0	41.1
	Sand	279.7	276	274	524	3	6	7	7	13	0.75	14	2.0	27.7	40.7
	Sand	279.7	276	272	640	4	7	8	8	15	0.75	16	1.8	29.0	41.1
GB-10	Sand	291.4	276	289	260	1	4	5	6	9	0.75	10	2.9	27.3	40.5
	Sand	291.4	276	287	480	4	6	6	7	12	0.75	13	2.1	26.8	40.3
GB-11	Sand	294.8	286	293	202	42	34	12	15	46	0.75	49	3.2	158.0	69.3
	Sand	294.8	286	289	642	WOH	3	15	18	18	0.75	19	1.8	34.7	43.1
	Sand	294.8	286	287	862	11	14	16	16	30	0.75	32	1.6	49.9	47.7
GB-12	Sand	291.7	286	290	183	48	48	40	22	88	0.75	94	3.4	318.3	90.0
	Sand	291.7	286	288	403	6	12	18	18	30	0.75	32	2.3	73.1	53.5
	Sand	291.7	286	286	623	7	10	10	12	20	0.75	21	1.8	39.2	44.6
	Sand	291.7	286	284	738	7	7	9	11	16	0.75	17	1.7	28.8	41.1
	Sand	291.7	286	282	853	6	10	10	8	20	0.75	21	1.6	33.5	42.7
GB-13	Sand	290.4	282	288	266	3	4	4	5	8	0.75	9	2.8	24.0	39.2
	Sand	290.4	282	286	486	4	4	5	6	9	0.75	10	2.1	19.9	37.5
	Sand	290.4	282	284	706	12	18	20	22	38	0.75	40	1.7	69.9	52.8
	Sand	290.4	282	282	926	9	11	13	8	24	0.75	26	1.5	38.5	44.4
GB-16	Sand	289.2	276	277	1380	14	18	18	14	36	0.75	38	1.2	47.4	47.0
	Sand	289.2	276	275	1600	8	8	9	8	17	0.85	20	1.2	23.5	39.0
GB-17	Sand	273.8	273	272	142	5	1	2	4	3	0.75	3	3.9	12.3	33.8
GB-18	Sand	286.0	278	284	216	4	4	7	9	11	0.75	12	3.1	36.6	43.7
	Sand	286.0	278	282	436	9	6	4	5	10	0.75	11	2.2	23.4	39.0
	Sand	286.0	278	280	656	4	7	8	9	15	0.75	16	1.8	28.6	41.0
	Sand	286.0	278	278	876	4	6	5	3	11	0.75	12	1.6	18.2	36.7
GB-21	Sand	286.8	280	283	415	12	20	18	17	38	0.75	40	2.3	91.2	57.5
	Sand	286.8	280	281	635	5	10	16	14	26	0.75	28	1.8	50.4	47.9

Notes
(1) After Das (2007).
(2) After Sabatini et al. (2002).
(3) Assumptions

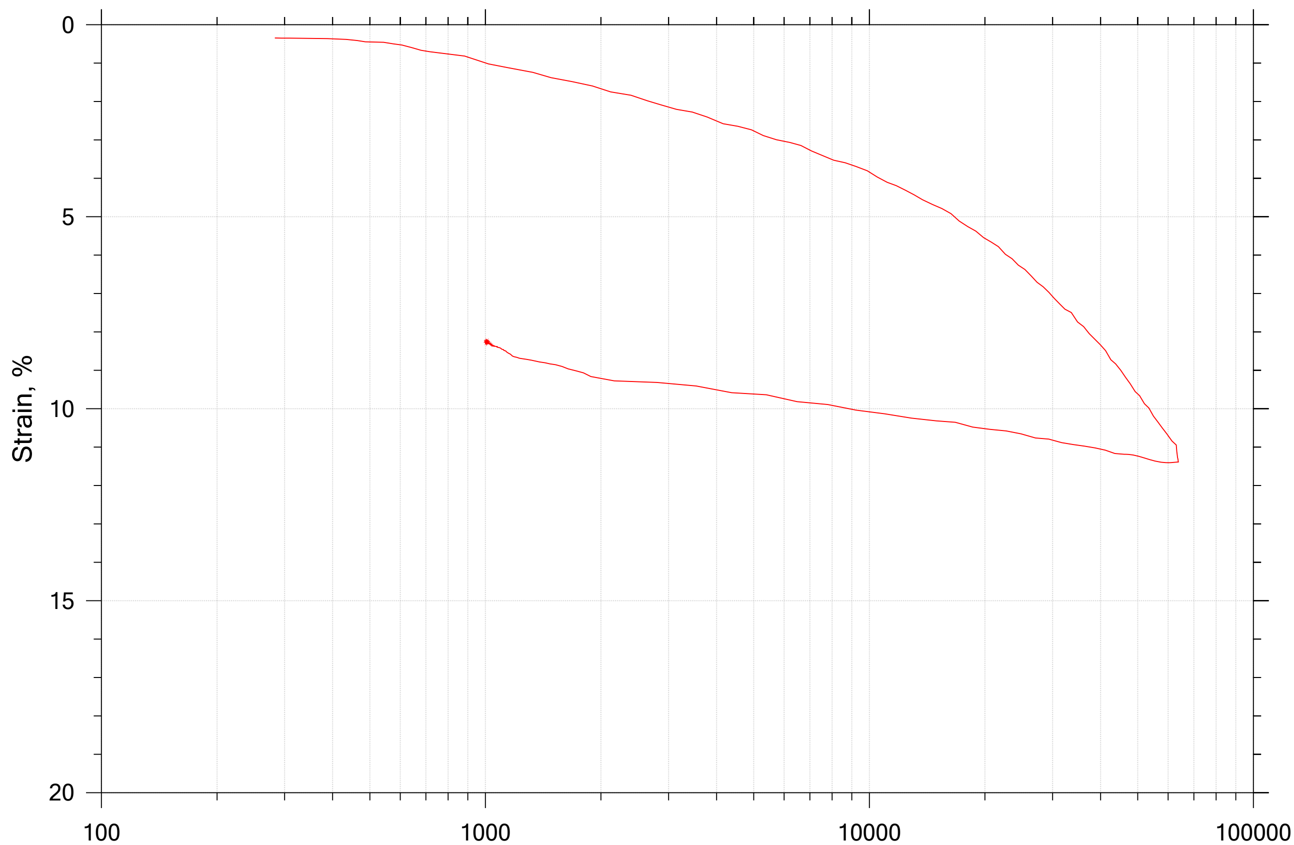
Hammer Type Correction (η_H)	85	
Atmospheric Pressure (Pa)	2116	psf
Stress Exponent (n)	0.5	

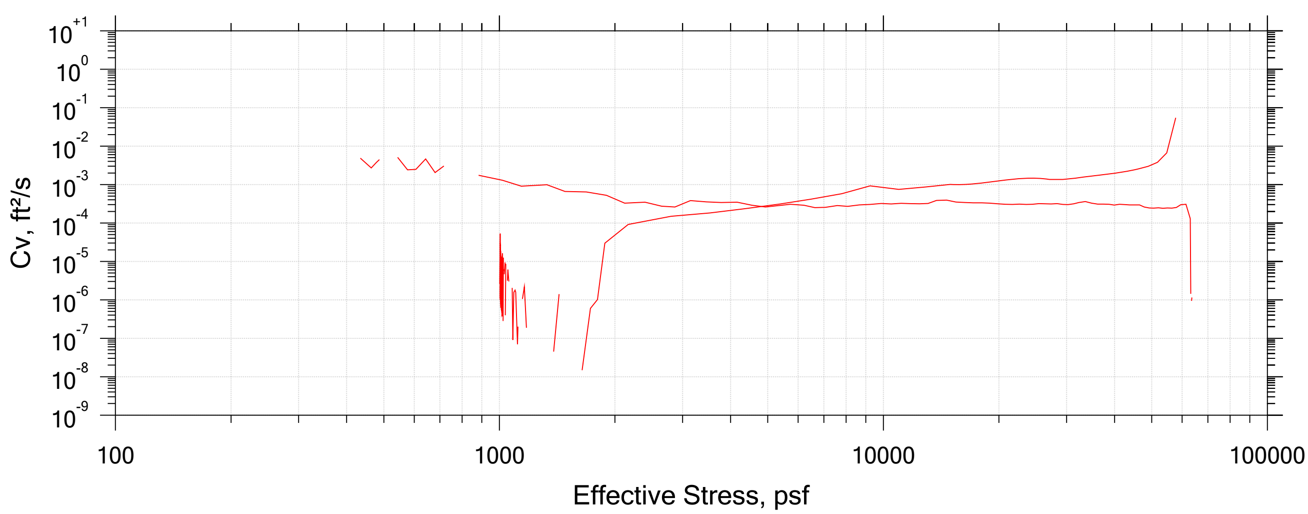
ATTACHMENT 3

Results of Relevant Consolidation Tests

CRC Test

Summary

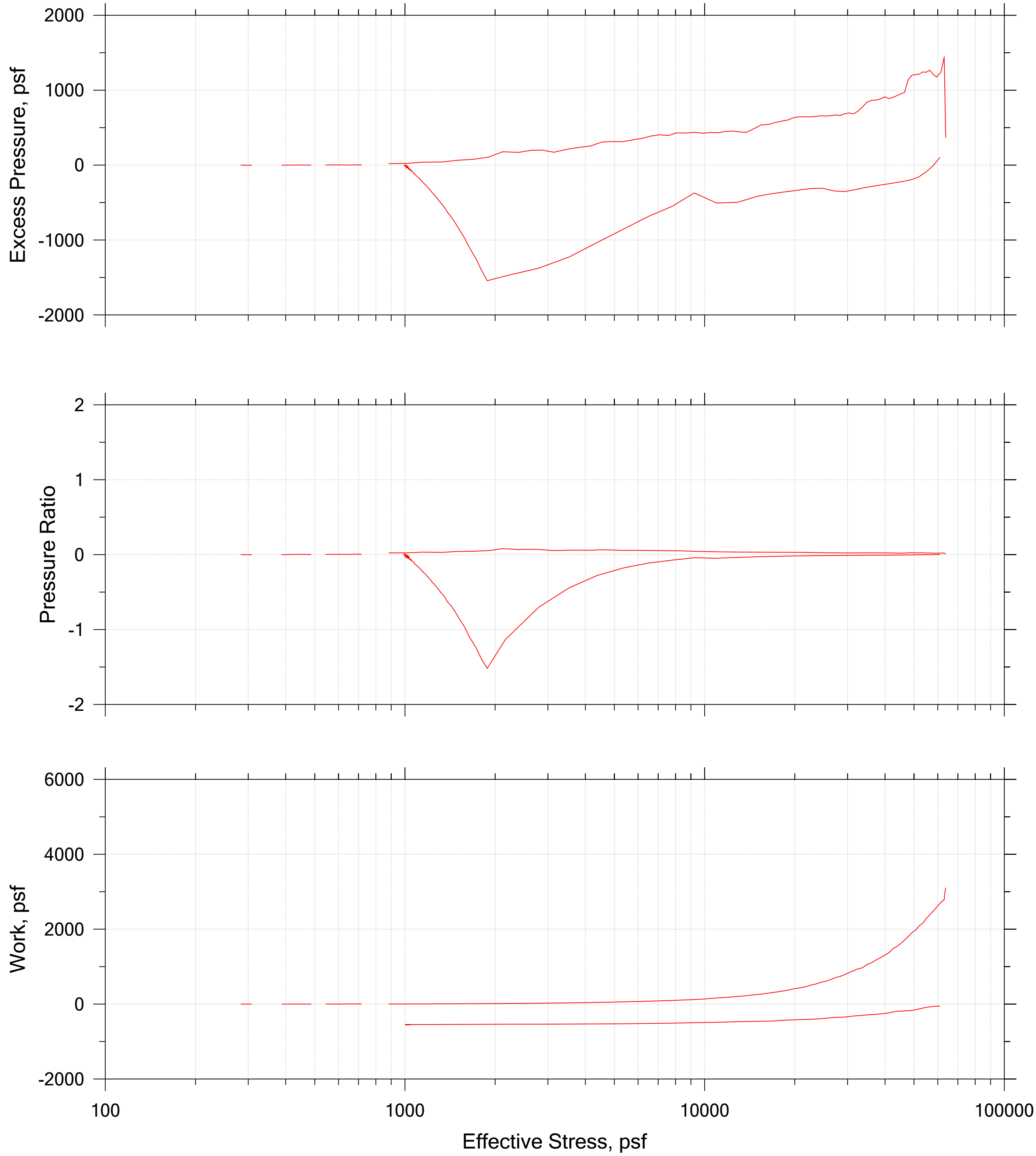




GeoTesting EXPRESS			
	Project Name: Crossroads Phase 14	Location: Norridgewock, ME	Project Number: GTX-309940
	Boring Number: GB-03	Tester: md	Checker: njh
	Sample Number: 3-5	Test Date: 05/13/19	Depth: 3-5 ft
	Test Number: CRC-1	Preparation: intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System S		

CRC Test

Pressure Curves



Project Name: Crossroads Phase 14	Location: Norridgewock, ME	Project Number: GTX-309940
Boring Number: GB-03	Tester: md	Checker: njh
Sample Number: 3-5	Test Date: 05/13/19	Depth: 3-5 ft
Test Number: CRC-1	Preparation: intact	Elevation: ---
Description: Moist, greenish gray clay		
Remarks: System S		

CRC Test

Specimen Diameter, in: 2.50	Specific Gravity: 2.69 (Estimated)	Liquid Limit: Unknown
Specimen Height, in: 1.00	Initial Void Ratio: 0.771	Plastic Limit: Unknown
Final Height, in: 0.94	Final Void Ratio: 0.665	Plasticity Index: Unknown

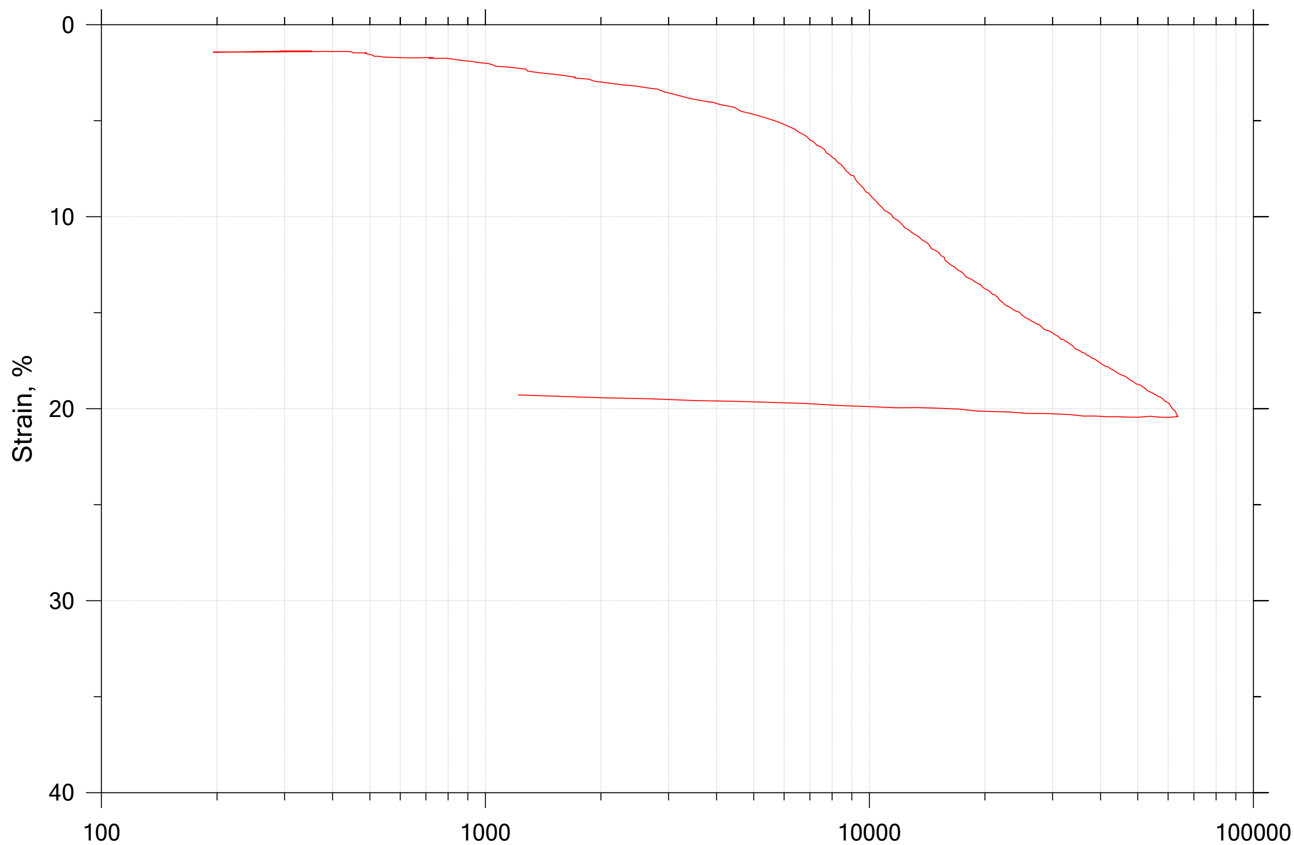
	Before Test Trimmings	Before Test Specimen	After Test Specimen	After Test Trimmings
Container ID	D-1787	---		C-1483
Mass Container, gm	8.23	108.4	108.4	8.08
Mass Container + Wet Soil, gm	212.82	265.58	260.95	160.96
Mass Container + Dry Soil, gm	171.14	230.76	230.76	130.7
Mass Dry Soil, gm	162.91	122.36	122.36	122.62
Water Content, %	25.58	28.46	24.68	24.68
Void Ratio	---	0.77	0.66	---
Degree of Saturation, %	---	99.44	100.00	---
Dry Unit Weight, pcf	---	94.958	101.02	---

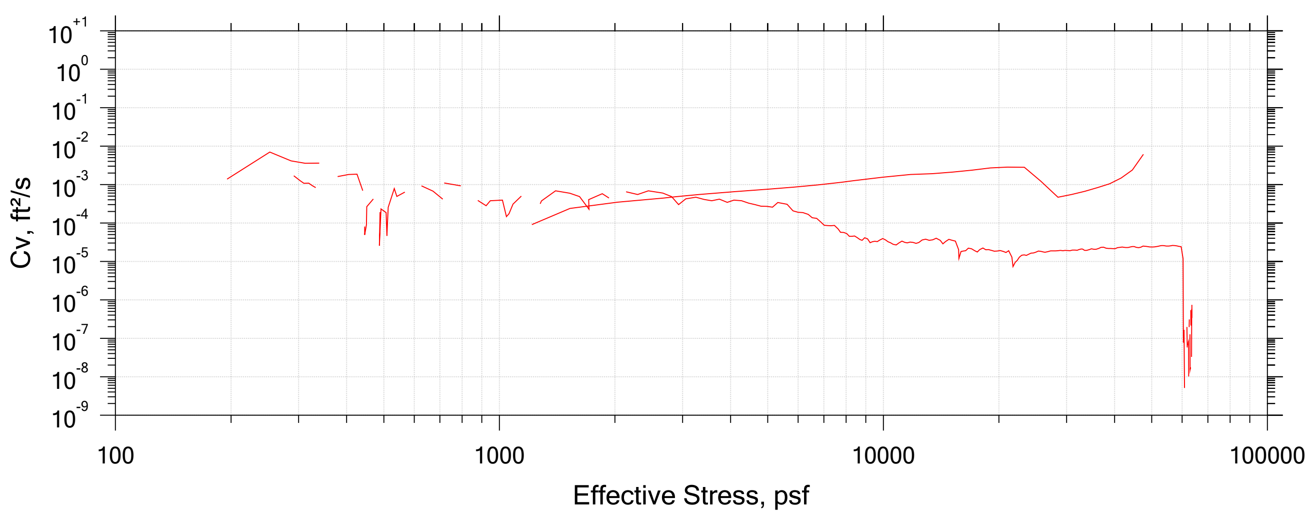
Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test. Therefore, values may not represent actual values for the specimen.

GeoTesting EXPRESS	Project Name: Crossroads Phase 14	Location: Norridgewock, ME	Project Number: GTX-309940
	Boring Number: GB-03	Tester: md	Checker: njh
	Sample Number: 3-5	Test Date: 05/13/19	Depth: 3-5 ft
	Test Number: CRC-1	Preparation: intact	Elevation: ---
	Description: Moist, greenish gray clay		
	Remarks: System S		

CRC Test

Summary

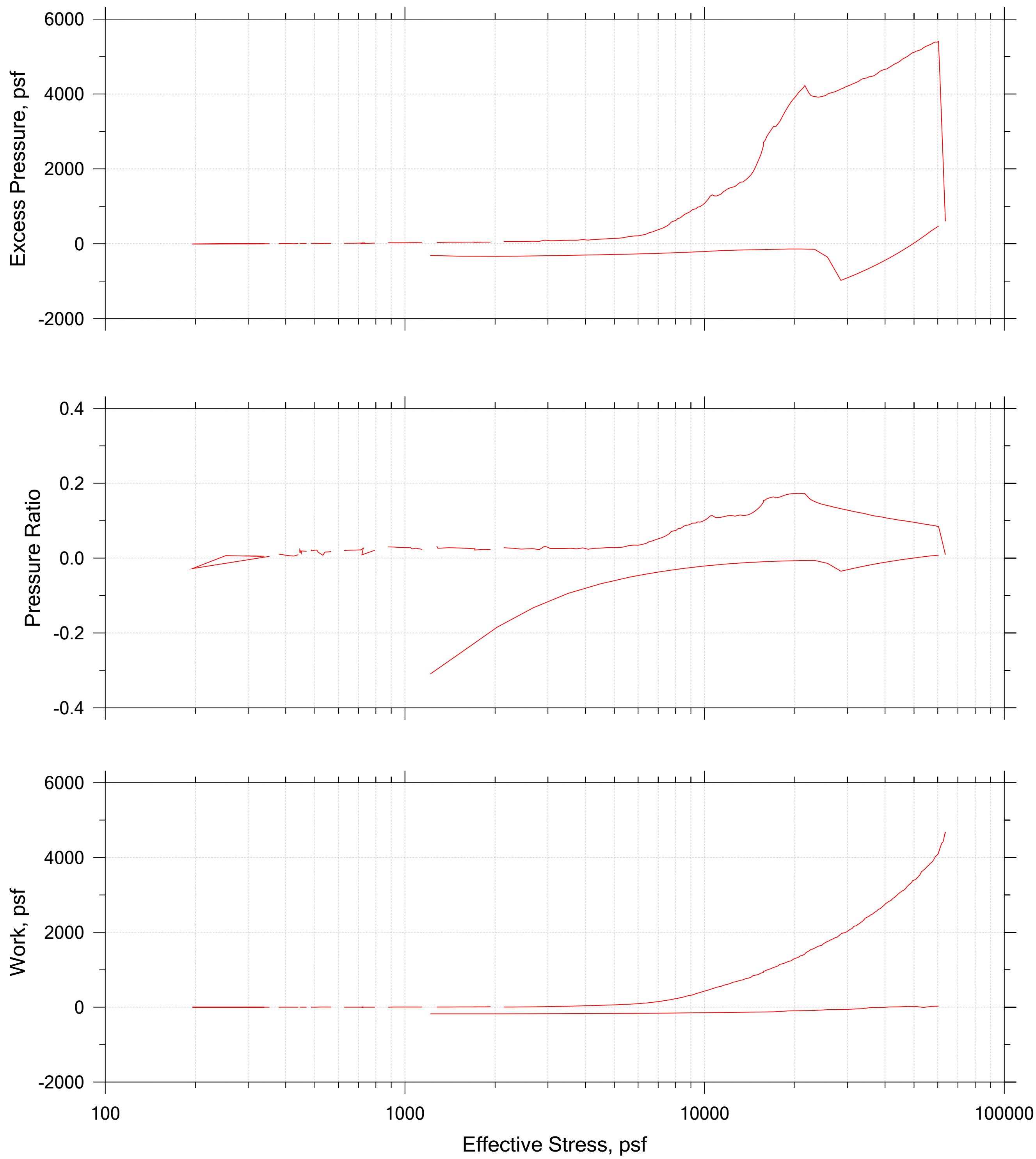




	Project Name: Crossroads Phase 14	Location: Norredgewock, ME	Project Number: GTX-309940
	Boring Number: GB-04	Tester: md	Checker: njh
GeoTesting EXPRESS	Sample Number: 19-21	Test Date: 05/13/19	Depth: 19-21 ft
	Test Number: CRC-2	Preparation: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: System T		
			Page 1 of 3

CRC Test

Pressure Curves



GeoTesting EXPRESS	Project Name: Crossroads Phase 14	Location: Norredgewock, ME	Project Number: GTX-309940
	Boring Number: GB-04	Tester: md	Checker: njh
	Sample Number: 19-21	Test Date: 05/13/19	Depth: 19-21 ft
	Test Number: CRC-2	Preparation: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: System T		

CRC Test

Specimen Diameter, in: 2.50	Specific Gravity: 2.75 (Estimated)	Liquid Limit: Unknown
Specimen Height, in: 1.00	Initial Void Ratio: 0.95	Plastic Limit: Unknown
Final Height, in: 0.84	Final Void Ratio: 0.638	Plasticity Index: Unknown

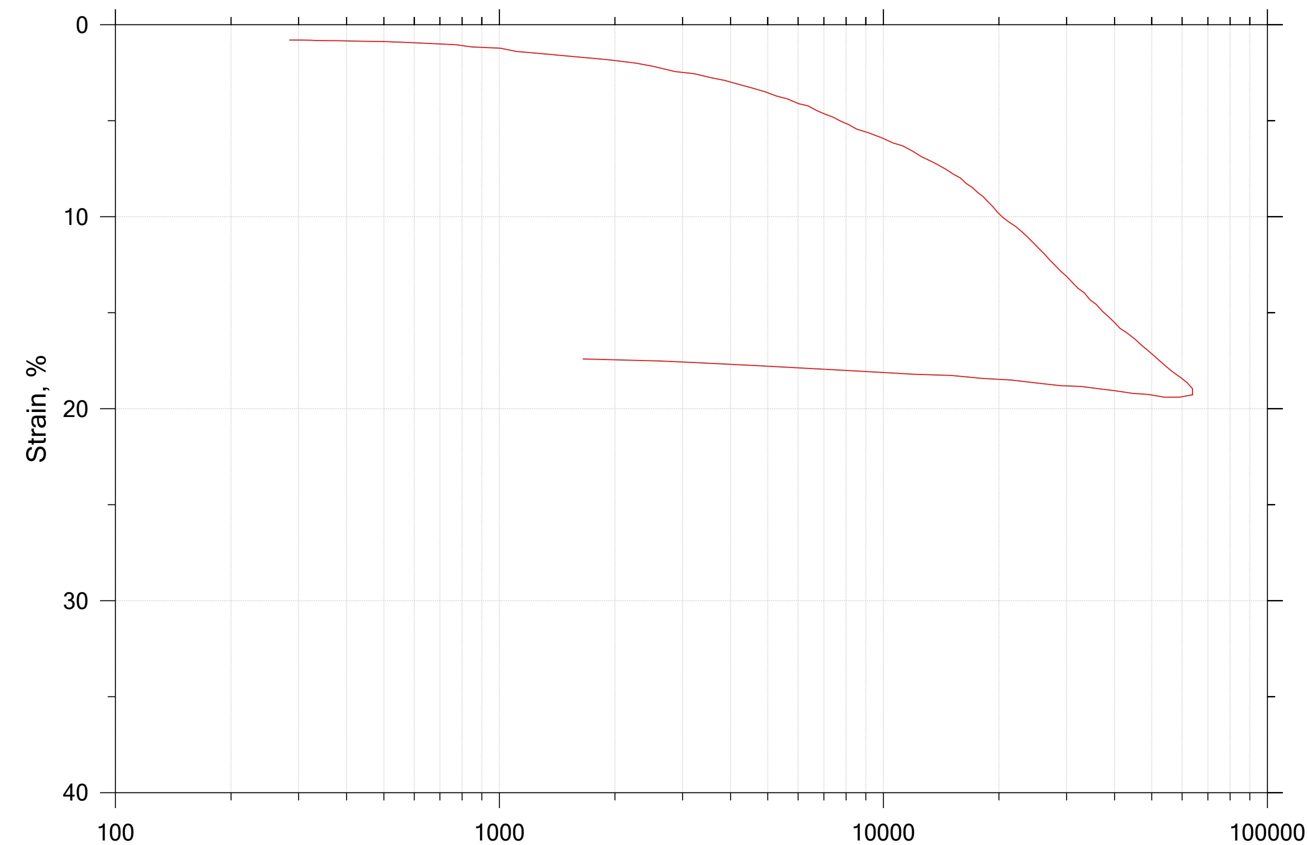
	Before Test Trimmings	Before Test Specimen	After Test Specimen	After Test Trimmings
Container ID	C-105	---		B-1680
Mass Container, gm	8.42	106.32	106.32	8.34
Mass Container + Wet Soil, gm	506.18	258.12	245.94	145.48
Mass Container + Dry Soil, gm	383.35	219.62	219.62	119.63
Mass Dry Soil, gm	374.93	113.3	113.3	111.29
Water Content, %	32.76	33.98	23.23	23.23
Void Ratio	---	0.95	0.64	---
Degree of Saturation, %	---	98.24	100.00	---
Dry Unit Weight, pcf	---	87.932	104.68	---

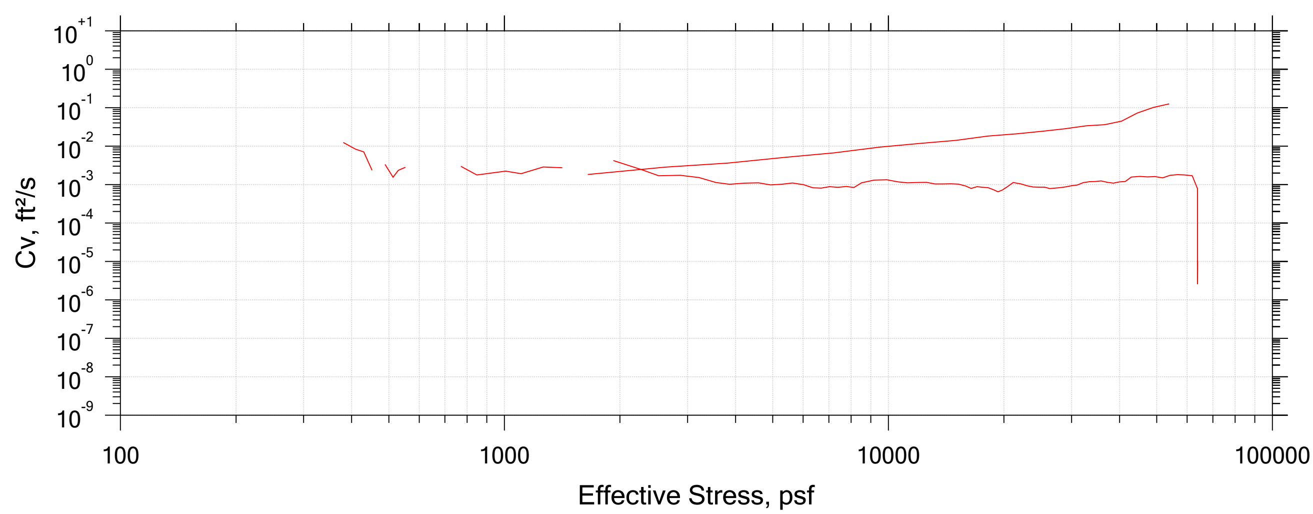
Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test.
Therefore, values may not represent actual values for the specimen.

GeoTesting EXPRESS	Project Name: Crossroads Phase 14	Location: Norredgewock, ME	Project Number: GTX-309940
	Boring Number: GB-04	Tester: md	Checker: njh
	Sample Number: 19-21	Test Date: 05/13/19	Depth: 19-21 ft
	Test Number: CRC-2	Preparation: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: System T		

CRC Test

Summary

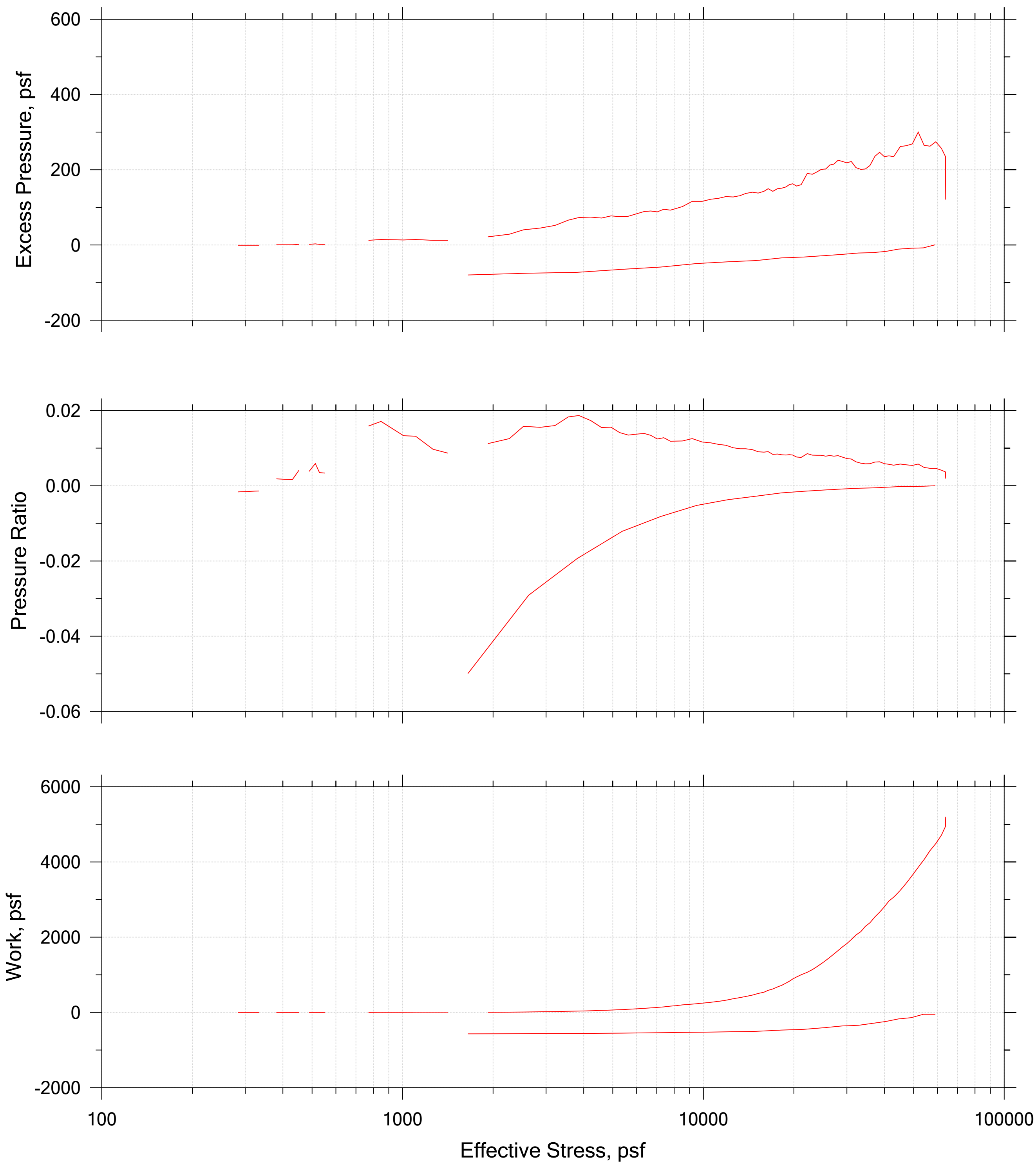




GeoTesting EXPRESS	Project Name: Crossroads Phase 14	Location: Norridgewock, ME	Project Number: GTX-309940
	Boring Number: GB-15	Tester: md	Checker: njh
	Sample Number: 11-13	Test Date: 07/12/19	Depth: 11-13 ft
	Test Number: CRC-3	Preparation: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: System S		

CRC Test

Pressure Curves



GeoTesting EXPRESS	Project Name: Crossroads Phase 14	Location: Norridgewock, ME	Project Number: GTX-309940
	Boring Number: GB-15	Tester: md	Checker: njh
	Sample Number: 11-13	Test Date: 07/12/19	Depth: 11-13 ft
	Test Number: CRC-3	Preparation: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: System S		

CRC Test

Specimen Diameter, in: 2.50	Specific Gravity: 2.76 (Estimated)	Liquid Limit: Unknown
Specimen Height, in: 1.00	Initial Void Ratio: 0.859	Plastic Limit: Unknown
Final Height, in: 0.83	Final Void Ratio: 0.543	Plasticity Index: Unknown

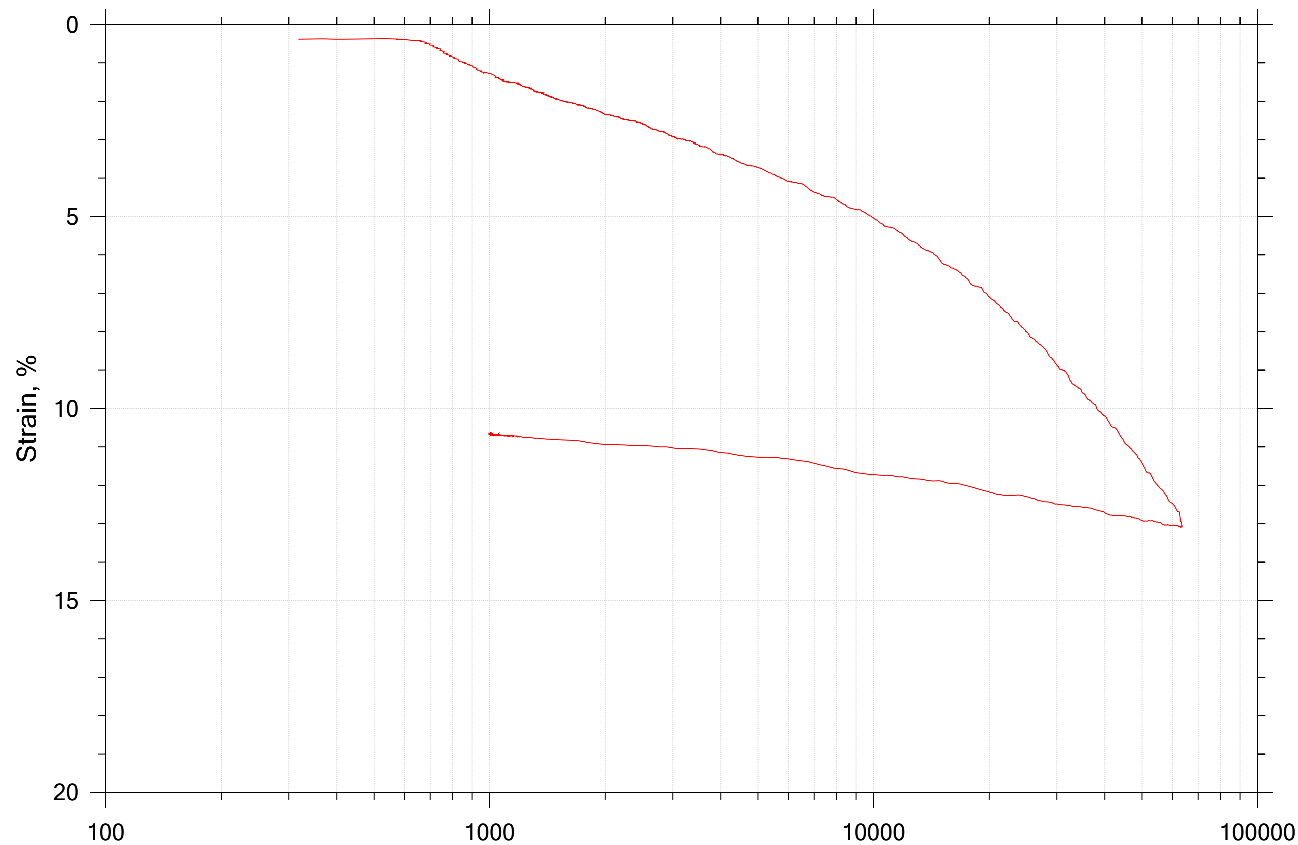
	Before Test Trimmings	Before Test Specimen	After Test Specimen	After Test Trimmings
Container ID	D-2676	---		D-2640
Mass Container, gm	8.3	110.88	110.88	8.62
Mass Container + Wet Soil, gm	153.51	267.15	253.93	153.1
Mass Container + Dry Soil, gm	119.86	230.42	230.42	129.36
Mass Dry Soil, gm	111.56	119.54	119.54	120.74
Water Content, %	30.16	30.72	19.66	19.66
Void Ratio	---	0.86	0.54	---
Degree of Saturation, %	---	98.78	100.00	---
Dry Unit Weight, pcf	---	92.777	111.78	---

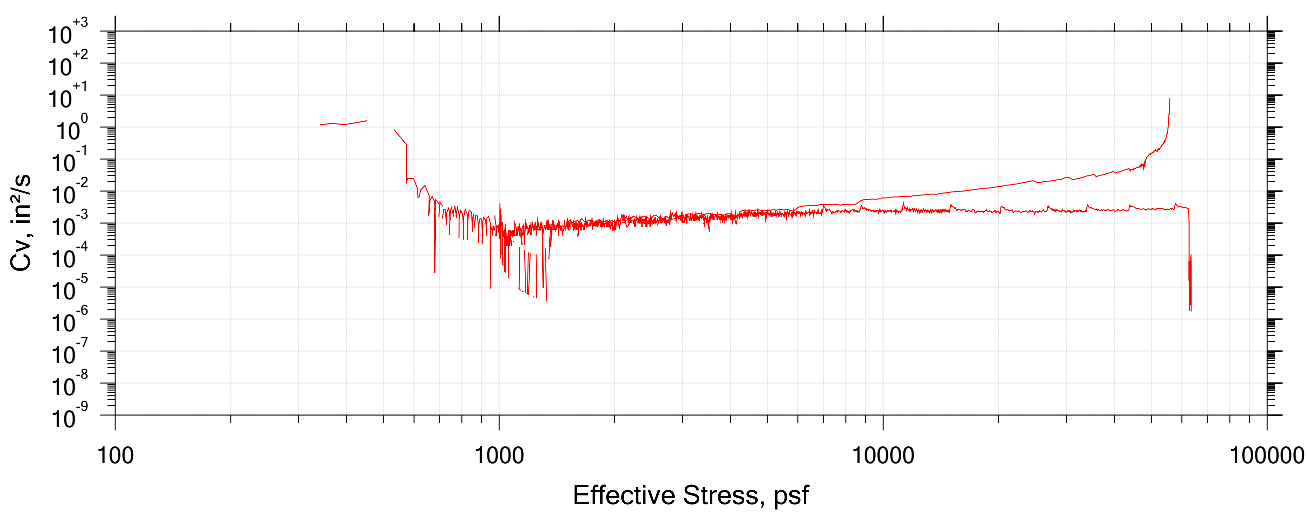
Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test.
Therefore, values may not represent actual values for the specimen.

Project Name: Crossroads Phase 14	Location: Norridgewock, ME	Project Number: GTX-309940
Boring Number: GB-15	Tester: md	Checker: njh
Sample Number: 11-13	Test Date: 07/12/19	Depth: 11-13 ft
Test Number: CRC-3	Preparation: intact	Elevation: ---
Description: Moist, gray clay		
Remarks: System S		

CRC Test

Summary

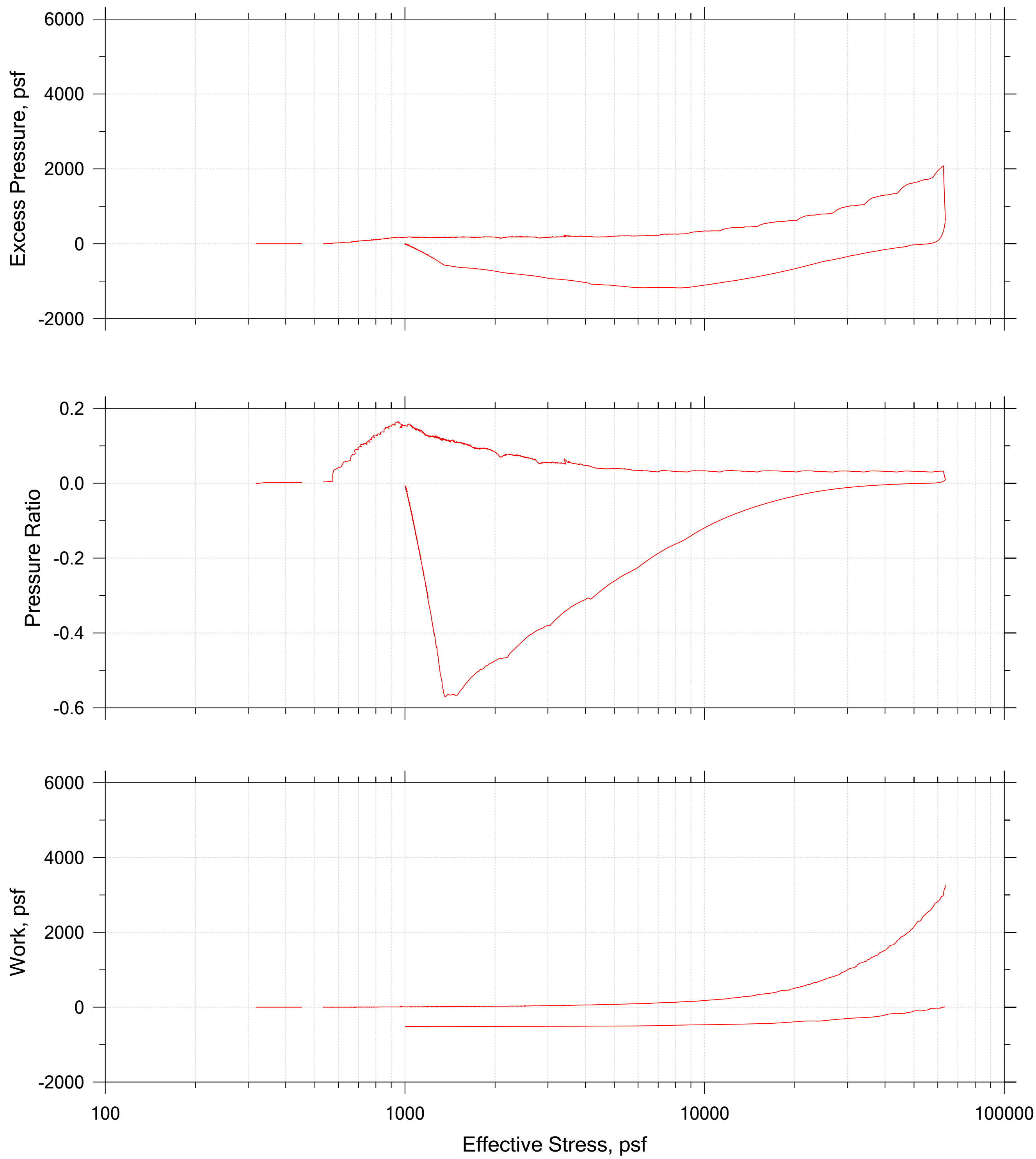




GeoTesting EXPRESS	Project Name: Crossroads Phase 14	Location: Norridgewock, ME	Project Number: GTX-309940
	Boring Number: GB-17B	Tester: md	Checker: njh
	Sample Number: 5-7	Test Date: 07/17/19	Depth: 5-7 ft
	Test Number: CRC-6B	Preparation: intact	Elevation: ---
	Description: Moist, dark gray clay		
	Remarks: System S		

CRC Test

Pressure Curves



GeoTesting EXPRESS			
	Project Name: Crossroads Phase 14	Location: Norridgewock, ME	Project Number: GTX-309940
	Boring Number: GB-17B	Tester: md	Checker: njh
	Sample Number: 5-7	Test Date: 07/17/19	Depth: 5-7 ft
	Test Number: CRC-6B	Preparation: intact	Elevation: ---
	Description: Moist, dark gray clay		
	Remarks: System S		
			Page 2 of 3

CRC Test

Specimen Diameter, in: 2.50	Specific Gravity: 2.76 (Estimated)	Liquid Limit: 30
Specimen Height, in: 1.00	Initial Void Ratio: 0.805	Plastic Limit: 18
Final Height, in: 0.93	Final Void Ratio: 0.679	Plasticity Index: 12

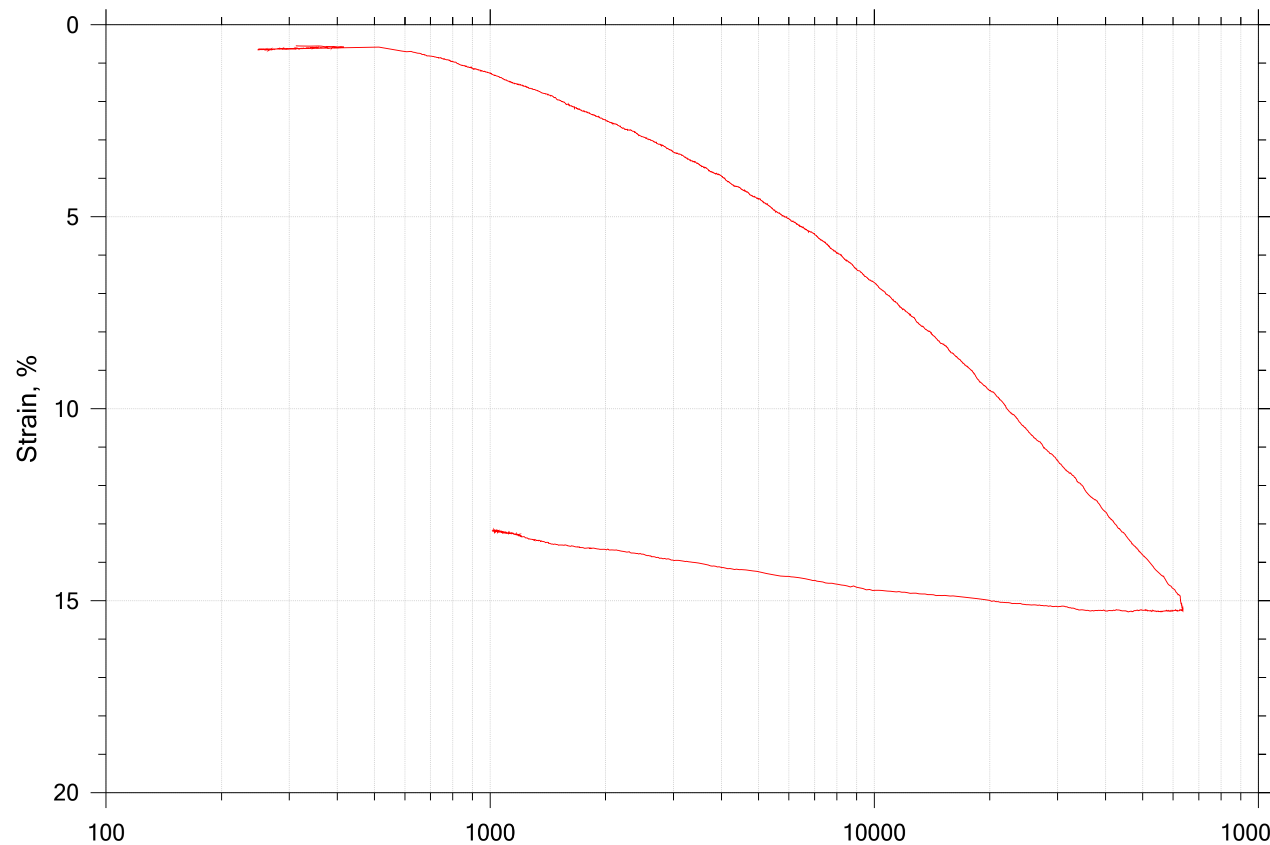
	Before Test Trimmings	Before Test Specimen	After Test Specimen	After Test Trimmings
Container ID	D-2169	---		A-1453
Mass Container, gm	8.48	109.43	109.43	8.2
Mass Container + Wet Soil, gm	143.17	267.88	262.47	161.67
Mass Container + Dry Soil, gm	115.65	232.22	232.22	131.33
Mass Dry Soil, gm	107.17	122.79	122.79	123.13
Water Content, %	25.68	29.05	24.64	24.64
Void Ratio	---	0.81	0.68	---
Degree of Saturation, %	---	99.38	100.00	---
Dry Unit Weight, pcf	---	95.291	102.46	---

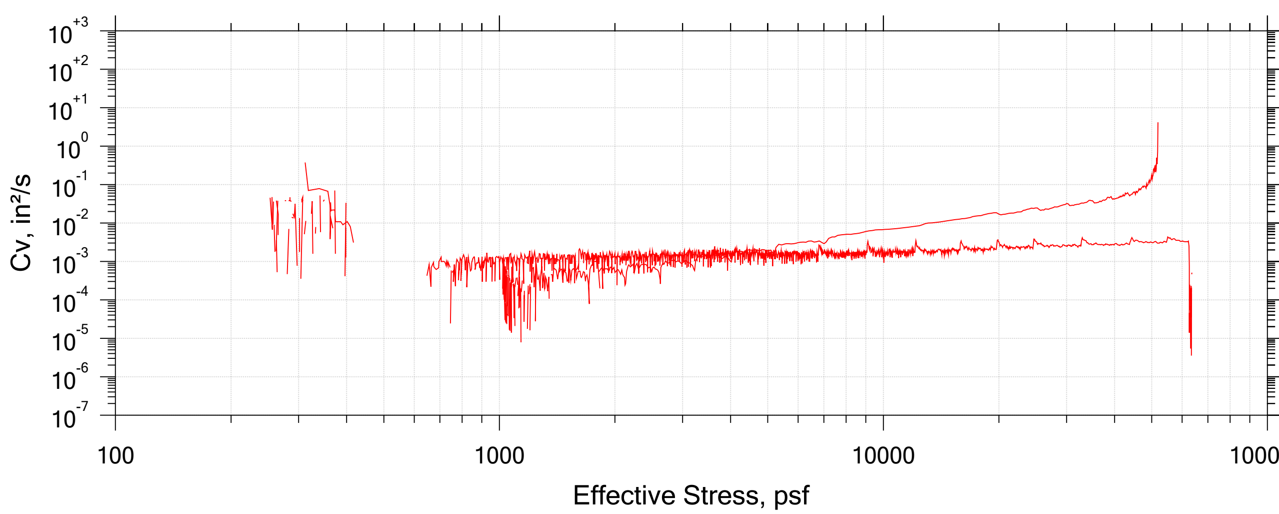
Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test.
Therefore, values may not represent actual values for the specimen.

GeoTesting EXPRESS	Project Name: Crossroads Phase 14	Location: Norridgewock, ME	Project Number: GTX-309940
	Boring Number: GB-17B	Tester: md	Checker: njh
	Sample Number: 5-7	Test Date: 07/17/19	Depth: 5-7 ft
	Test Number: CRC-6B	Preparation: intact	Elevation: ---
	Description: Moist, dark gray clay		
	Remarks: System S		

CRC Test

Summary

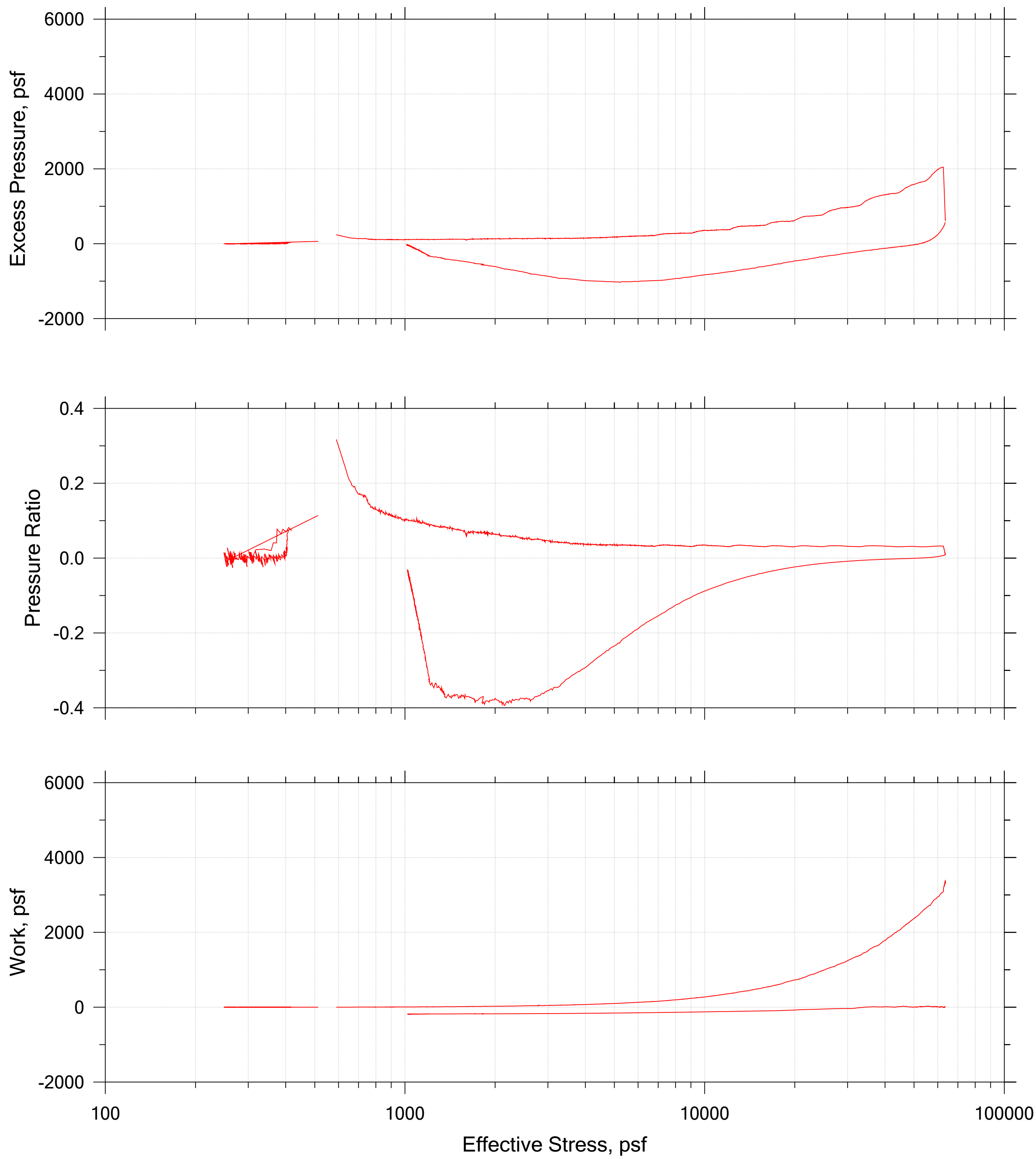




GeoTesting EXPRESS	Project Name: Crossroads Phase 14	Location: Norridgewock,ME	Project Number: GTX-309940
	Boring Number: GB-17	Tester: md	Checker:
	Sample Number: 15-17	Test Date: 07/15/19	Depth: 15-17 ft
	Test Number: CRC-7	Preparation: intact	Elevation: ---
	Description: Moist, dark gray clay		
	Remarks: System R		
			Page 1 of 3

CRC Test

Pressure Curves



GeoTesting EXPRESS			
	Project Name: Crossroads Phase 14	Location: Norridgewock,ME	Project Number: GTX-309940
	Boring Number: GB-17	Tester: md	Checker:
	Sample Number: 15-17	Test Date: 07/15/19	Depth: 15-17 ft
	Test Number: CRC-7	Preparation: intact	Elevation: ---
	Description: Moist, dark gray clay		
	Remarks: System R		

CRC Test

Specimen Diameter, in: 2.50	Specific Gravity: 2.73 (Estimated)	Liquid Limit: 34
Specimen Height, in: 1.00	Initial Void Ratio: 0.918	Plastic Limit: 19
Final Height, in: 0.89	Final Void Ratio: 0.707	Plasticity Index: 15

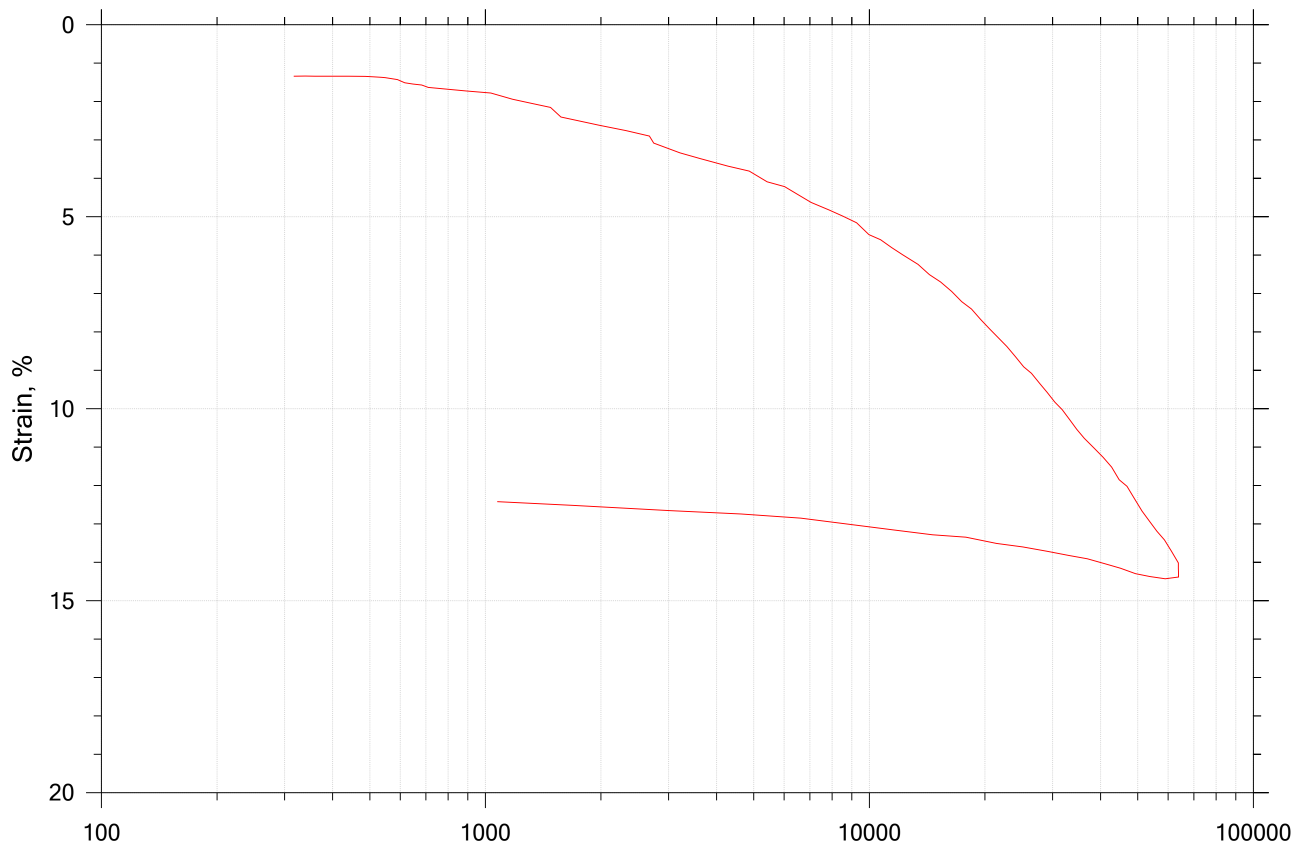
	Before Test Trimmings	Before Test Specimen	After Test Specimen	After Test Trimmings
Container ID	A-3053	---		B-2288
Mass Container, gm	8.26	110.69	110.69	8.26
Mass Container + Wet Soil, gm	190.67	263.3	254.67	151.46
Mass Container + Dry Soil, gm	145.76	225.01	225.01	121.96
Mass Dry Soil, gm	137.5	114.32	114.32	113.7
Water Content, %	32.66	33.49	25.95	25.95
Void Ratio	---	0.92	0.71	---
Degree of Saturation, %	---	99.43	100.00	---
Dry Unit Weight, pcf	---	88.721	99.687	---

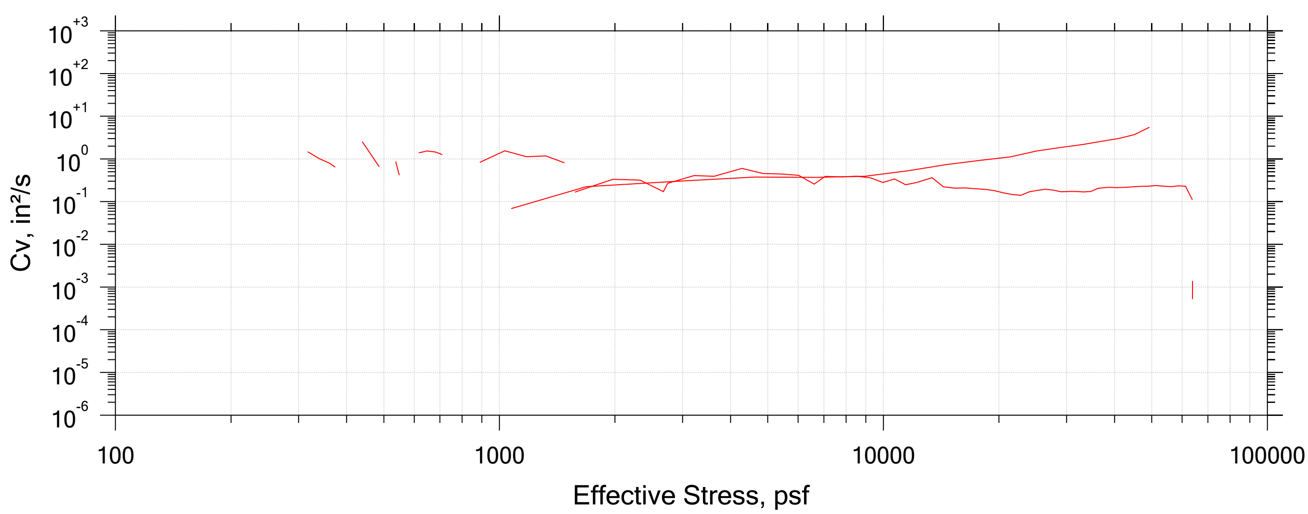
Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test.
Therefore, values may not represent actual values for the specimen.

GeoTesting EXPRESS			
	Project Name: Crossroads Phase 14	Location: Norridgewock,ME	Project Number: GTX-309940
	Boring Number: GB-17	Tester: md	Checker:
	Sample Number: 15-17	Test Date: 07/15/19	Depth: 15-17 ft
	Test Number: CRC-7	Preparation: intact	Elevation: ---
	Description: Moist, dark gray clay		
	Remarks: System R		

CRC Test

Summary

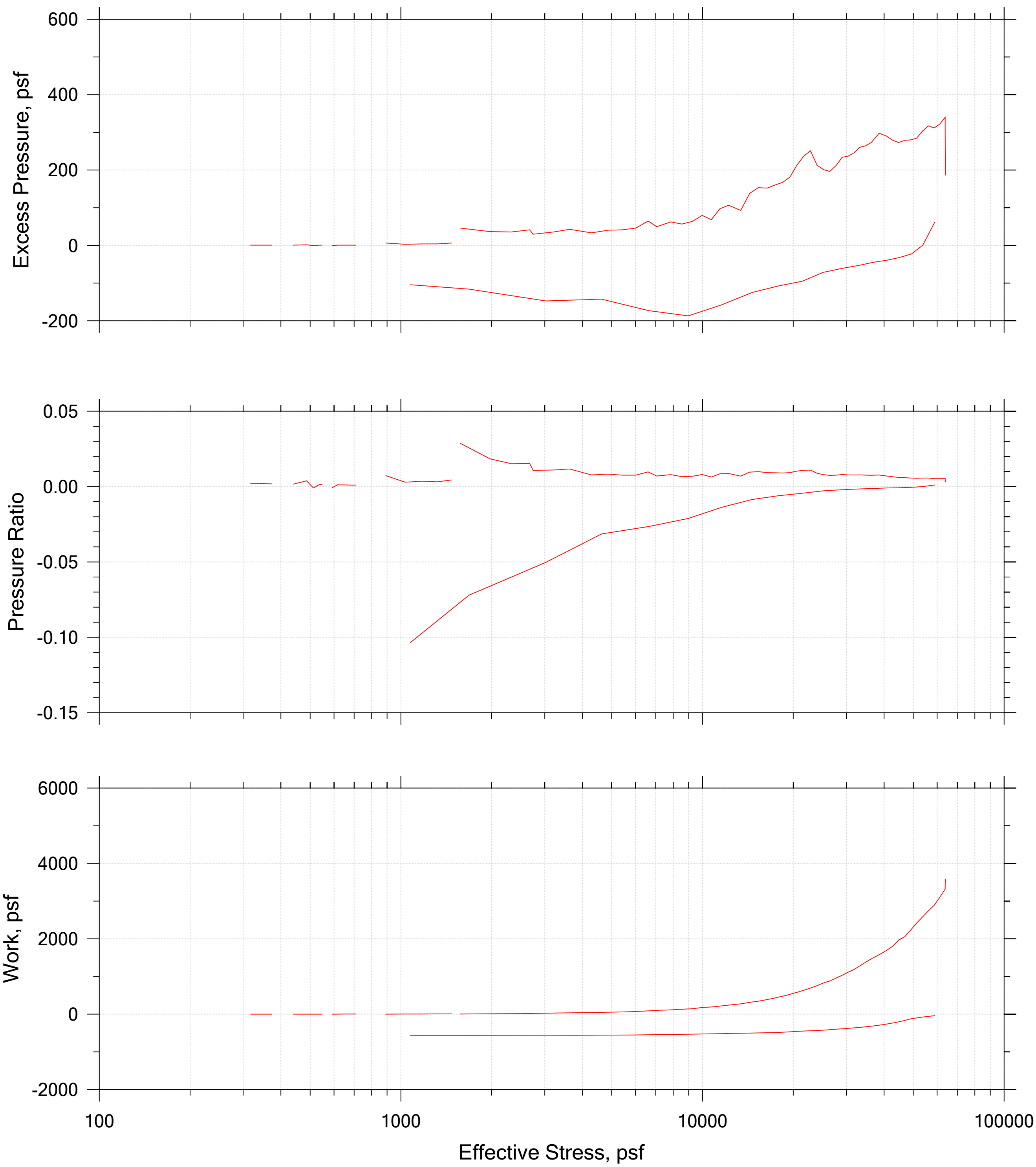




GeoTesting EXPRESS			
	Project Name: Crossroads Phase 14	Location: Norridgewock, ME	Project Number: GTX-309940
	Boring Number: GB-15	Tester: md	Checker: njh
	Sample Number: 7-9	Test Date: 07/16/19	Depth: 7-9 ft
	Test Number: CRC-8	Preparation: intact	Elevation: ---
	Description: Moist, olive gray clay		
	Remarks: System S		

CRC Test

Pressure Curves



GeoTesting EXPRESS	Project Name: Crossroads Phase 14	Location: Norridgewock, ME	Project Number: GTX-309940
	Boring Number: GB-15	Tester: md	Checker: njh
	Sample Number: 7-9	Test Date: 07/16/19	Depth: 7-9 ft
	Test Number: CRC-8	Preparation: intact	Elevation: ---
	Description: Moist, olive gray clay		
	Remarks: System S		

CRC Test

Specimen Diameter, in: 2.50	Specific Gravity: 2.74 (Estimated)	Liquid Limit: 30
Specimen Height, in: 1.00	Initial Void Ratio: 0.782	Plastic Limit: 20
Final Height, in: 0.89	Final Void Ratio: 0.586	Plasticity Index: 10

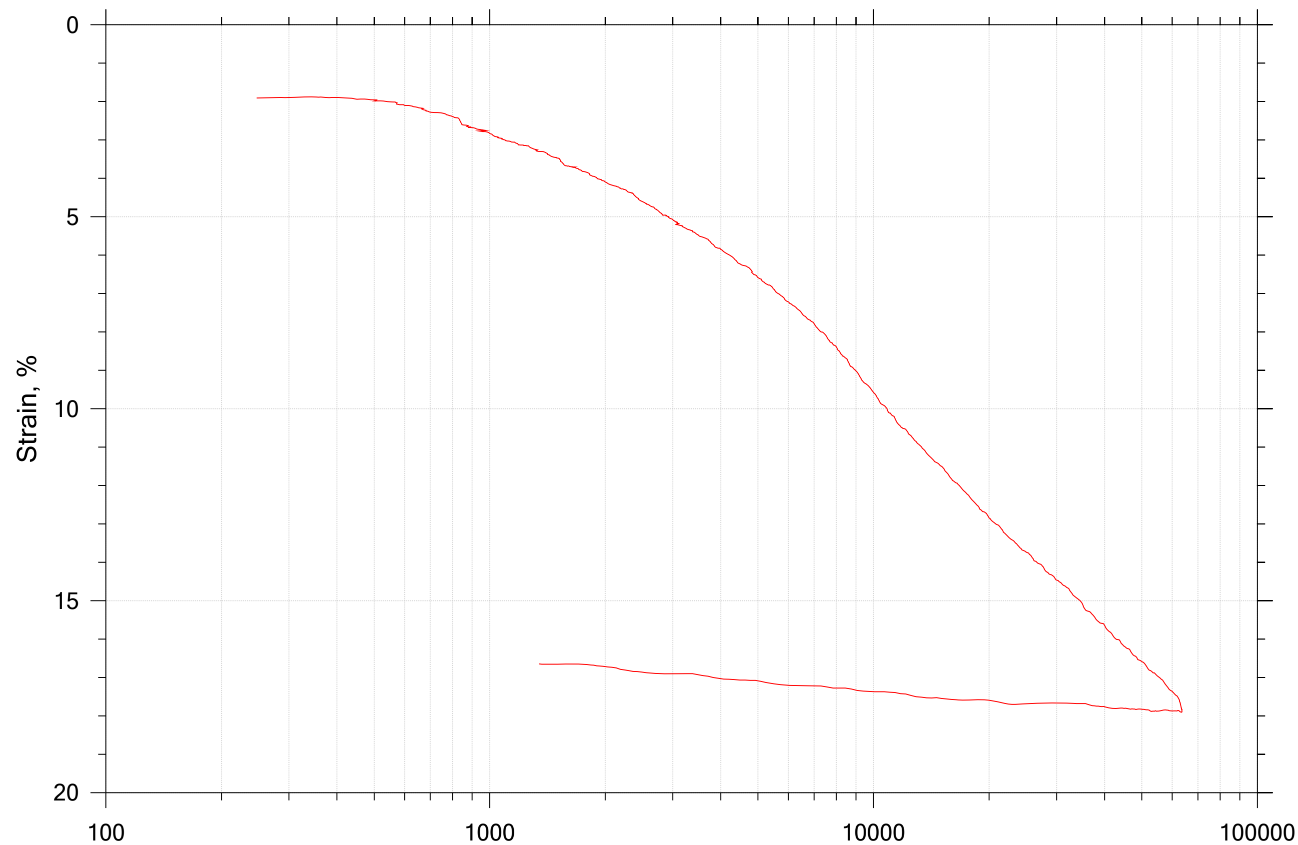
	Before Test Trimmings	Before Test Specimen	After Test Specimen	After Test Trimmings
Container ID	C-2294	---		A-2976
Mass Container, gm	9.02	110.45	110.45	8.24
Mass Container + Wet Soil, gm	232.89	268.89	260.63	160.2
Mass Container + Dry Soil, gm	185.03	234.17	234.17	133.43
Mass Dry Soil, gm	176.01	123.72	123.72	125.19
Water Content, %	27.19	28.06	21.38	21.38
Void Ratio	---	0.78	0.59	---
Degree of Saturation, %	---	98.33	100.00	---
Dry Unit Weight, pcf	---	96.02	107.89	---

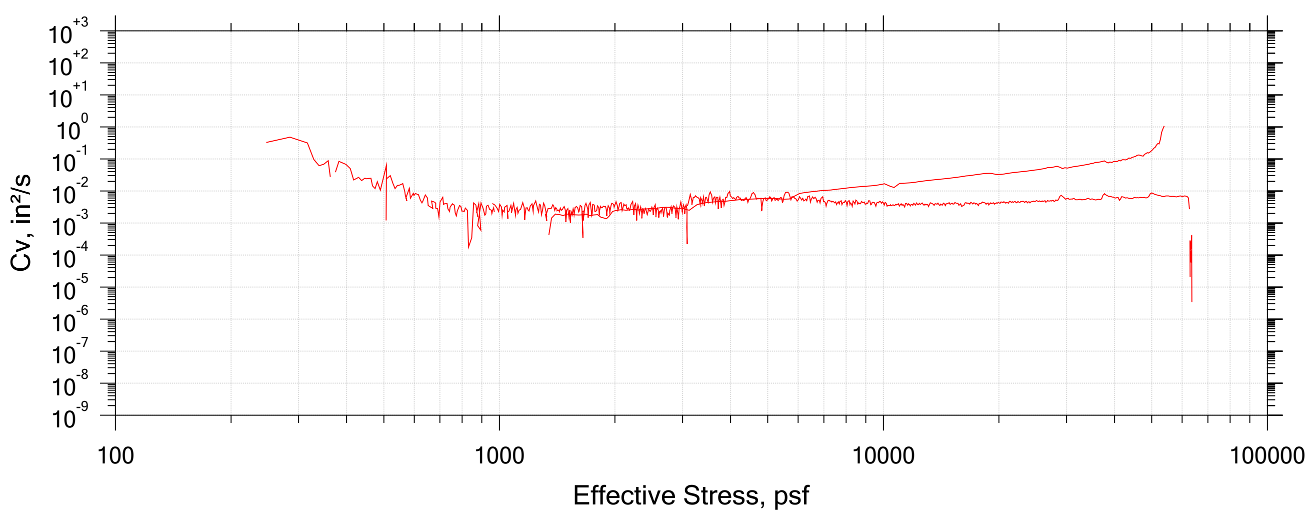
Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test.
Therefore, values may not represent actual values for the specimen.

Project Name: Crossroads Phase 14	Location: Norridgewock, ME	Project Number: GTX-309940
Boring Number: GB-15	Tester: md	Checker: njh
Sample Number: 7-9	Test Date: 07/16/19	Depth: 7-9 ft
Test Number: CRC-8	Preparation: intact	Elevation: ---
Description: Moist, olive gray clay		
Remarks: System S		

CRC Test

Summary

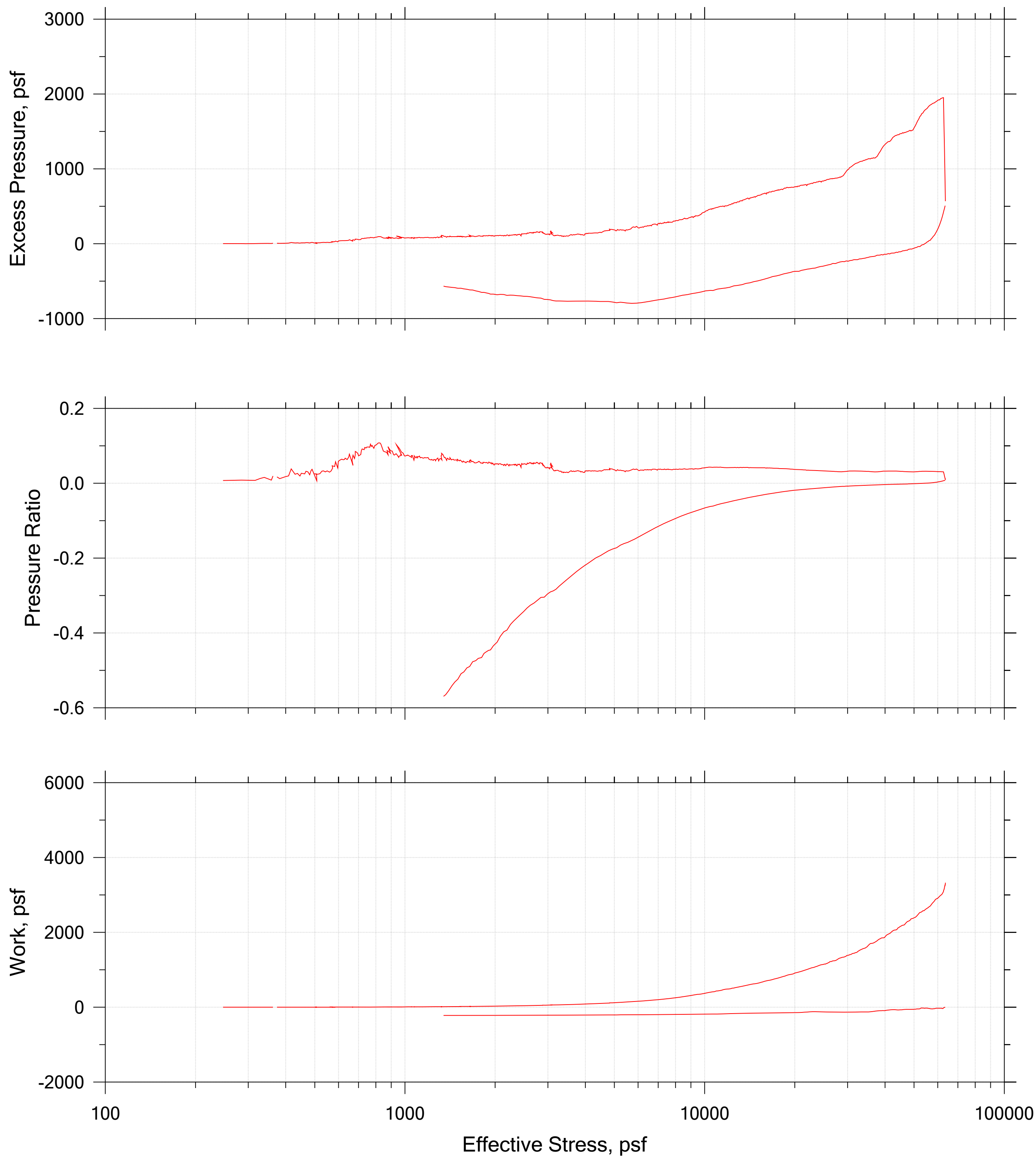




GeoTesting EXPRESS			
	Project Name: Crossroads Phase 14	Location: Norridgewock, ME	Project Number: GTX-309940
	Boring Number: GB-14	Tester: md	Checker: njh
	Sample Number: 9-11	Test Date: 07/17/19	Depth: 9-11 ft
	Test Number: CRC-10	Preparation: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: System F		

CRC Test

Pressure Curves



GeoTesting EXPRESS	Project Name: Crossroads Phase 14	Location: Norridgewock, ME	Project Number: GTX-309940
	Boring Number: GB-14	Tester: md	Checker: njh
	Sample Number: 9-11	Test Date: 07/17/19	Depth: 9-11 ft
	Test Number: CRC-10	Preparation: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: System F		

CRC Test

Specimen Diameter, in: 2.50	Specific Gravity: 2.74 (Estimated)	Liquid Limit: 31
Specimen Height, in: 1.00	Initial Void Ratio: 0.788	Plastic Limit: 19
Final Height, in: 0.88	Final Void Ratio: 0.573	Plasticity Index: 12

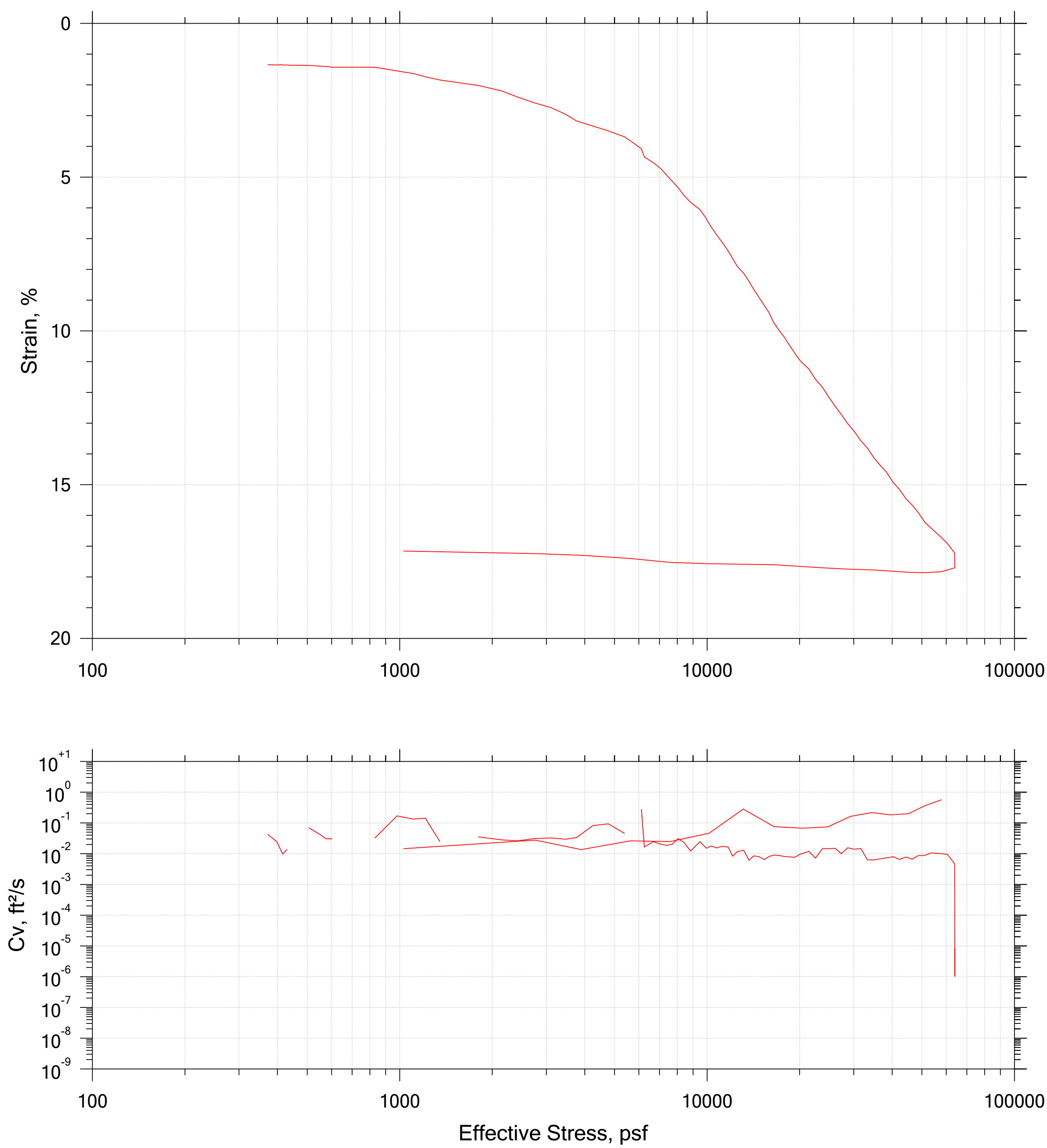
	Before Test Trimmings	Before Test Specimen	After Test Specimen	After Test Trimmings
Container ID	B-2466	---		B-2342
Mass Container, gm	9.17	108.37	108.37	9.09
Mass Container + Wet Soil, gm	129.02	267.01	257.47	156.63
Mass Container + Dry Soil, gm	102.06	231.68	231.68	131.11
Mass Dry Soil, gm	92.89	123.31	123.31	122.02
Water Content, %	29.02	28.65	20.91	20.91
Void Ratio	---	0.79	0.57	---
Degree of Saturation, %	---	99.68	100.00	---
Dry Unit Weight, pcf	---	95.699	108.75	---

Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test.
Therefore, values may not represent actual values for the specimen.

GeoTesting EXPRESS			
	Project Name: Crossroads Phase 14	Location: Norridgewock, ME	Project Number: GTX-309940
	Boring Number: GB-14	Tester: md	Checker: njh
	Sample Number: 9-11	Test Date: 07/17/19	Depth: 9-11 ft
	Test Number: CRC-10	Preparation: intact	Elevation: ---
	Description: Moist, gray clay		
	Remarks: System F		

CRC Test

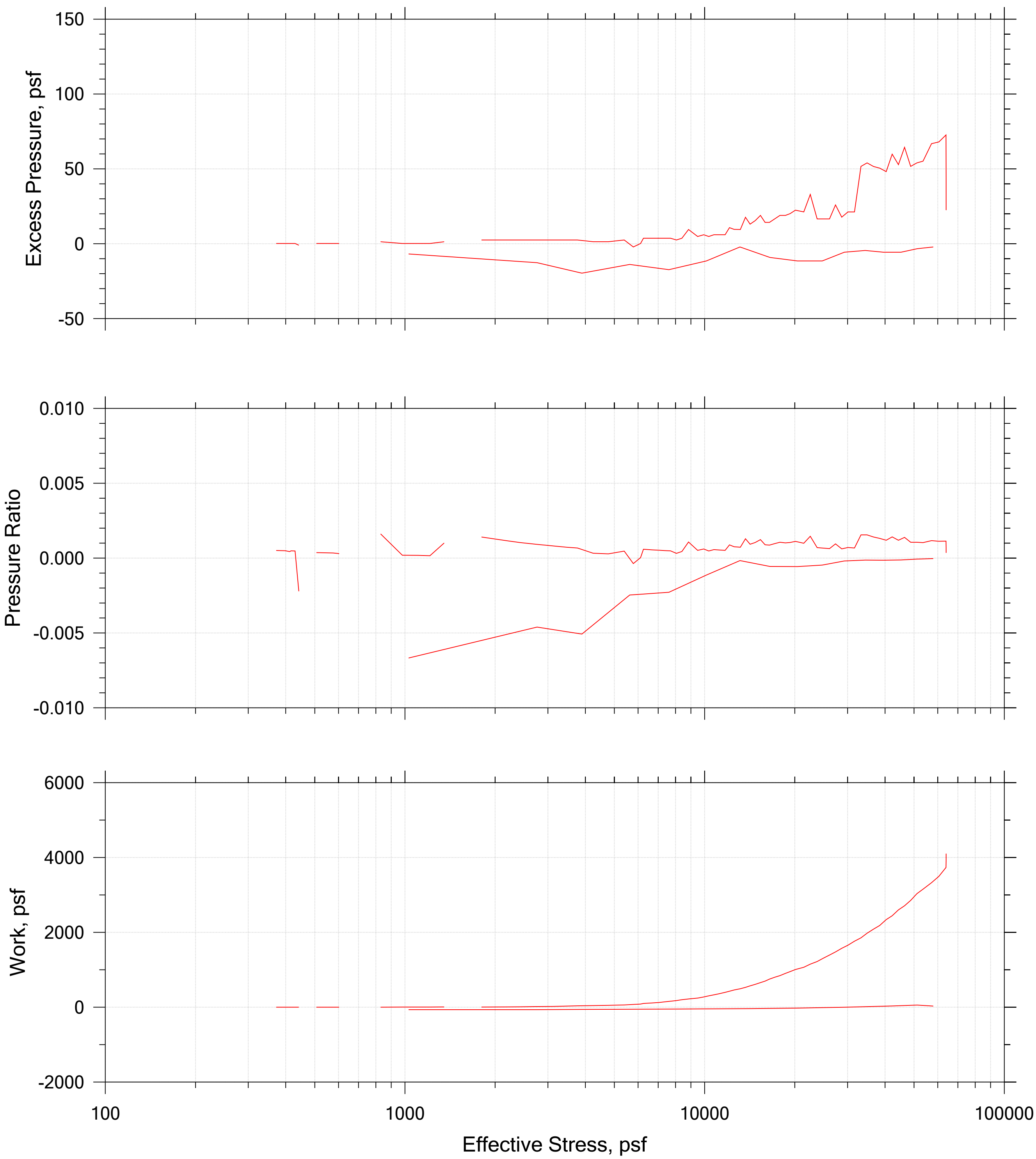
Summary



GeoTesting EXPRESS			
	Project Name: Crossroads Phase 14	Location: Norridgewock, ME	Project Number: GTX-309940
	Boring Number: GB-05	Tester: md	Checker: njh
	Sample Number: 31-33	Test Date: 07/23/19	Depth: 31-33 ft
	Test Number: CRC-14	Preparation: intact	Elevation: ---
	Description: Wet, gray clay		
	Remarks: System R		
			Page 1 of 3

CRC Test

Pressure Curves



GeoTesting EXPRESS	Project Name: Crossroads Phase 14	Location: Norridgewock, ME	Project Number: GTX-309940
	Boring Number: GB-05	Tester: md	Checker: njh
	Sample Number: 31-33	Test Date: 07/23/19	Depth: 31-33 ft
	Test Number: CRC-14	Preparation: intact	Elevation: ---
	Description: Wet, gray clay		
	Remarks: System R		

CRC Test

Specimen Diameter, in: 2.50	Specific Gravity: 2.75 (Estimated)	Liquid Limit: 28
Specimen Height, in: 1.00	Initial Void Ratio: 0.843	Plastic Limit: 18
Final Height, in: 0.86	Final Void Ratio: 0.585	Plasticity Index: 10

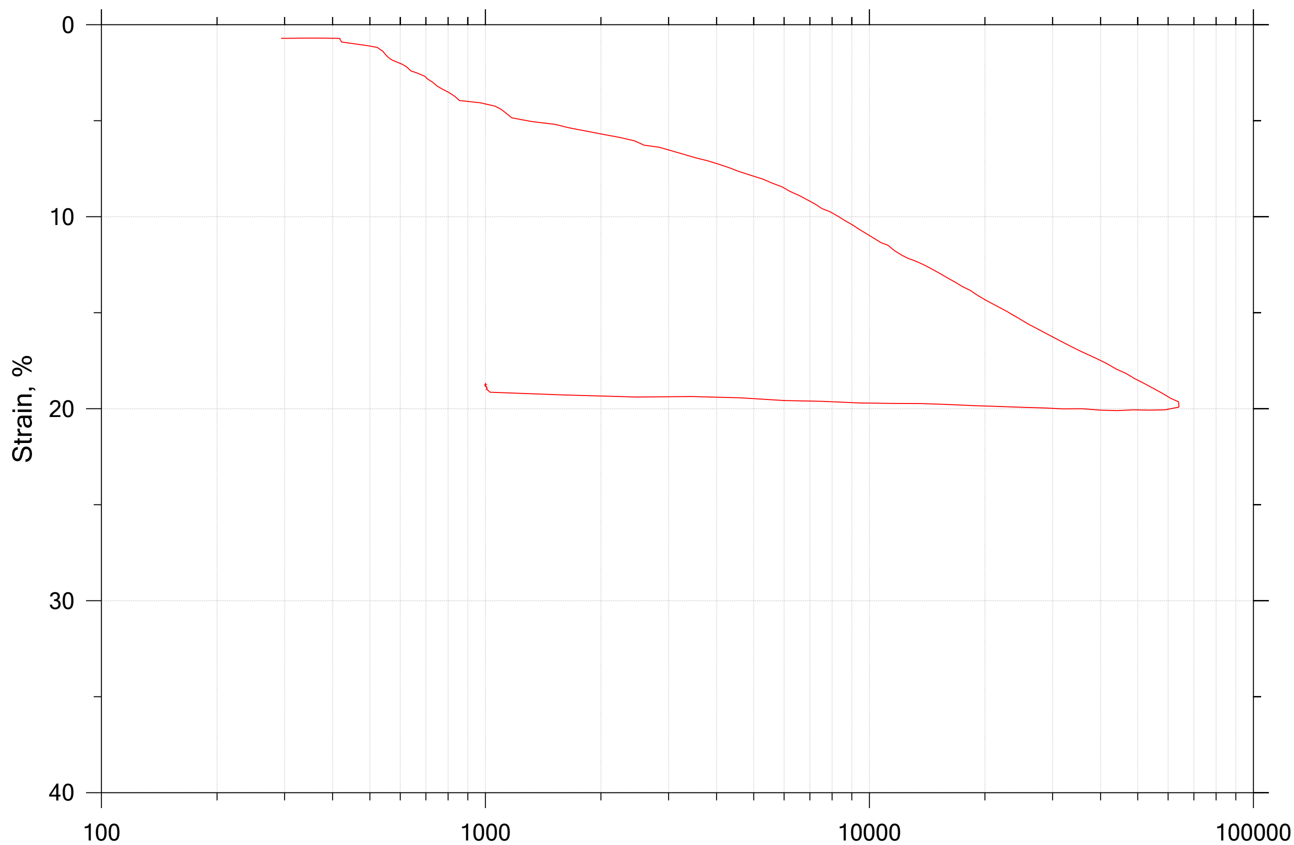
	Before Test Trimmings	Before Test Specimen	After Test Specimen	After Test Trimmings
Container ID	D-2450	---		A-2283
Mass Container, gm	0.44	109.79	109.79	8.26
Mass Container + Wet Soil, gm	237.92	266.7	255.5	153.1
Mass Container + Dry Soil, gm	182.03	229.97	229.97	127.72
Mass Dry Soil, gm	181.59	120.18	120.18	119.46
Water Content, %	30.78	30.57	21.25	21.25
Void Ratio	---	0.84	0.58	---
Degree of Saturation, %	---	99.83	100.00	---
Dry Unit Weight, pcf	---	93.268	108.45	---

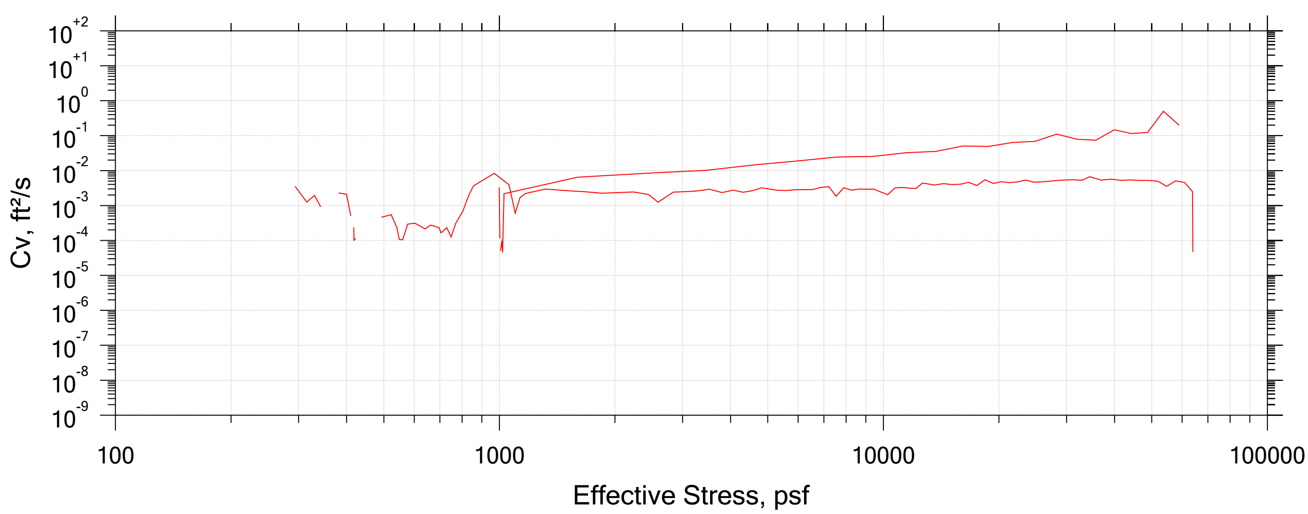
Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test.
Therefore, values may not represent actual values for the specimen.

GeoTesting EXPRESS			
	Project Name: Crossroads Phase 14	Location: Norridgewock, ME	Project Number: GTX-309940
	Boring Number: GB-05	Tester: md	Checker: njh
	Sample Number: 31-33	Test Date: 07/23/19	Depth: 31-33 ft
	Test Number: CRC-14	Preparation: intact	Elevation: ---
	Description: Wet, gray clay		
	Remarks: System R		

CRC Test

Summary

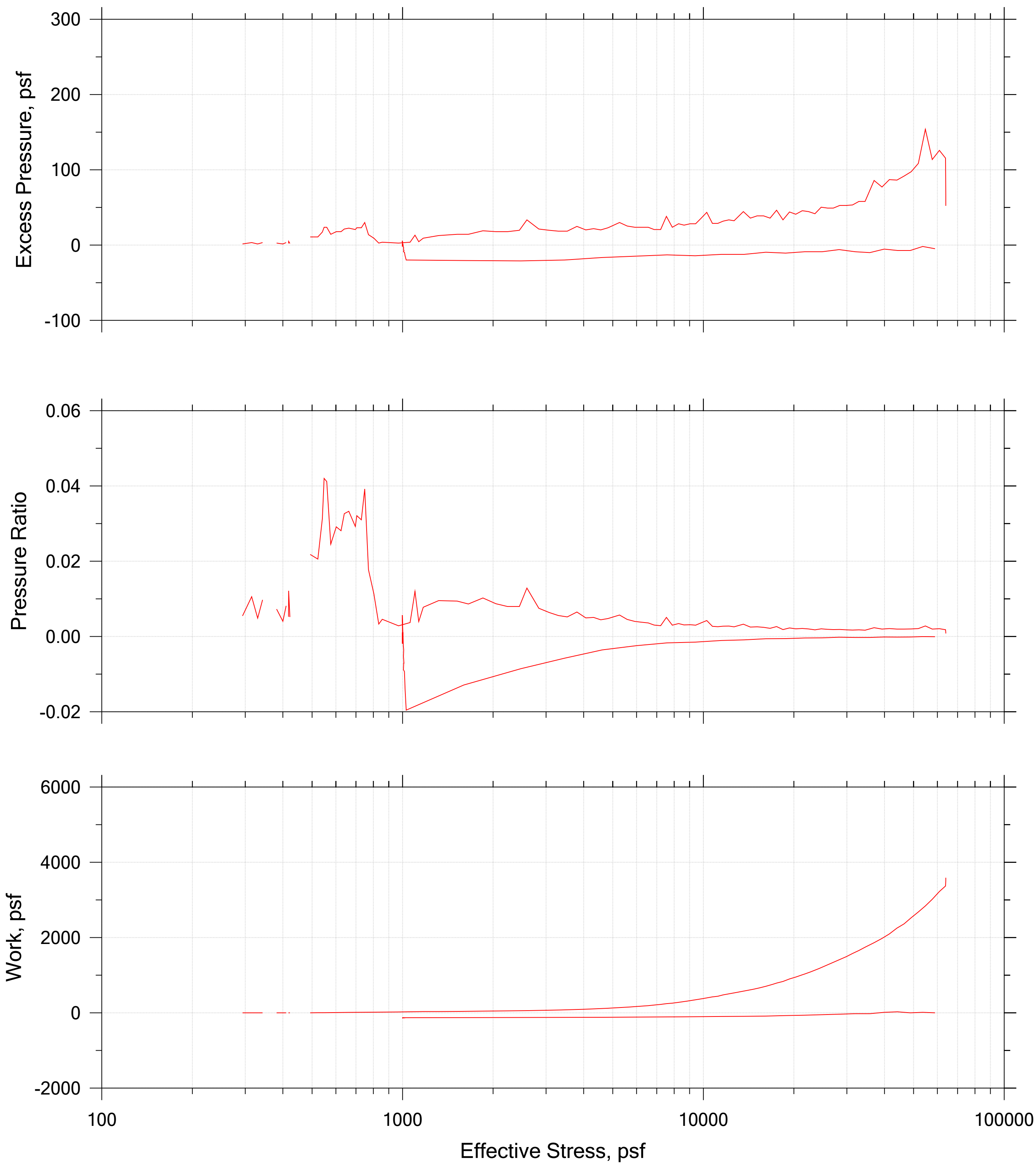




GeoTesting EXPRESS	Project Name: Crossroads Phase 14	Location: Norridgewock, ME	Project Number: GTX-309940
	Boring Number: GB-11	Tester: md	Checker: njh
	Sample Number: 17-19	Test Date: 09/20/19	Depth: 17-19 ft
	Test Number: CRC-15A	Preparation: intact	Elevation: ---
	Description: Wet, gray clay		
	Remarks: System W		
			Page 1 of 3

CRC Test

Pressure Curves



GeoTesting EXPRESS	Project Name: Crossroads Phase 14	Location: Norridgewock, ME	Project Number: GTX-309940
	Boring Number: GB-11	Tester: md	Checker: njh
	Sample Number: 17-19	Test Date: 09/20/19	Depth: 17-19 ft
	Test Number: CRC-15A	Preparation: intact	Elevation: ---
	Description: Wet, gray clay		
	Remarks: System W		
			Page 2 of 3

CRC Test

Specimen Diameter, in: 2.50	Specific Gravity: 2.76 (Estimated)	Liquid Limit: 31
Specimen Height, in: 1.00	Initial Void Ratio: 0.851	Plastic Limit: 17
Final Height, in: 0.84	Final Void Ratio: 0.555	Plasticity Index: 14

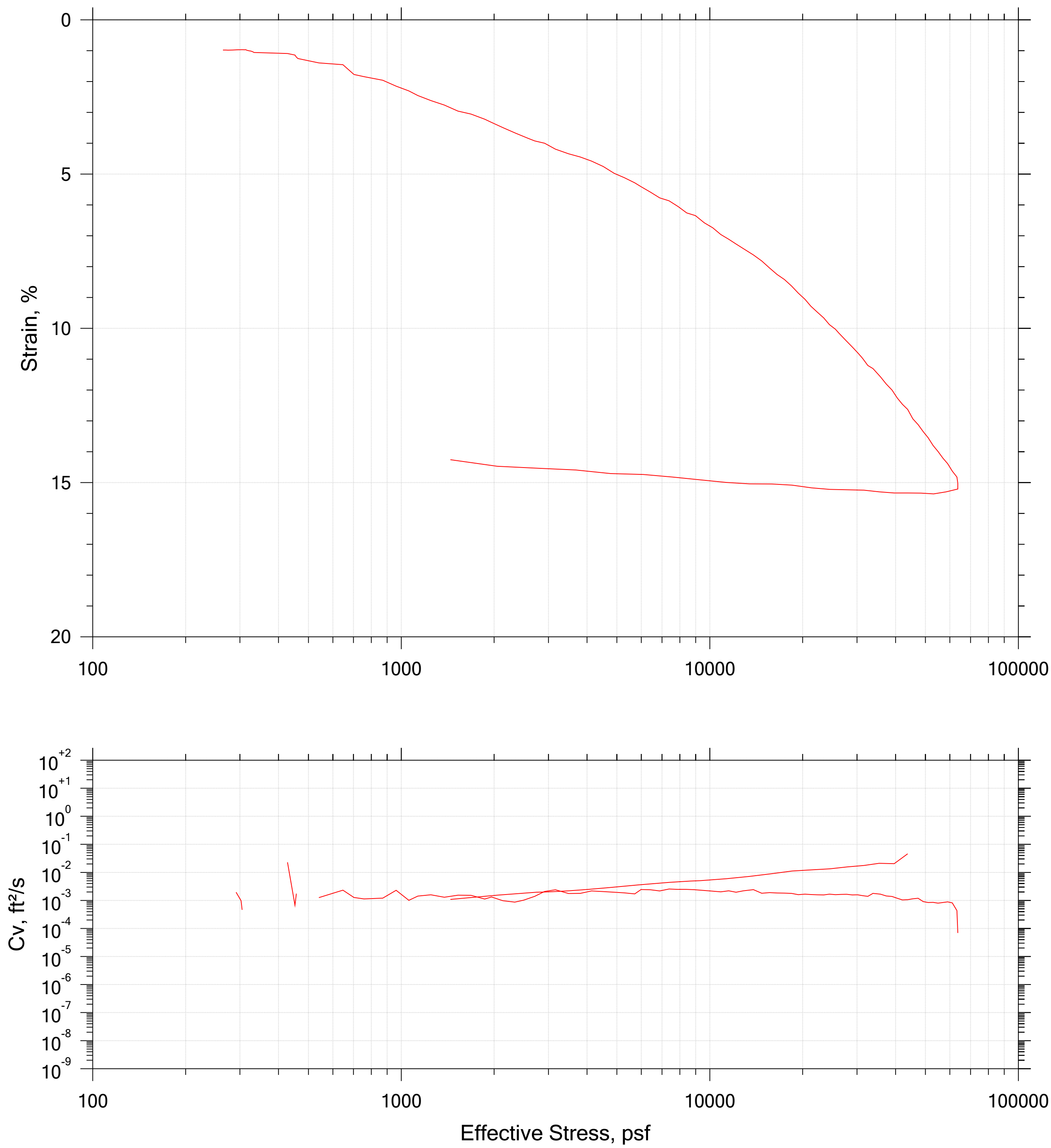
	Before Test Trimmings	Before Test Specimen	After Test Specimen	After Test Trimmings
Container ID	C-961	---		C-3002
Mass Container, gm	8.59	108.91	108.91	9.21
Mass Container + Wet Soil, gm	132.61	265.52	252.76	153.31
Mass Container + Dry Soil, gm	103.43	228.65	228.65	129.16
Mass Dry Soil, gm	94.84	119.74	119.74	119.95
Water Content, %	30.77	30.79	20.13	20.13
Void Ratio	---	0.85	0.55	---
Degree of Saturation, %	---	99.70	100.00	---
Dry Unit Weight, pcf	---	92.93	110.63	---

Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test.
Therefore, values may not represent actual values for the specimen.

GeoTesting EXPRESS			
	Project Name: Crossroads Phase 14	Location: Norridgewock, ME	Project Number: GTX-309940
	Boring Number: GB-11	Tester: md	Checker: njh
	Sample Number: 17-19	Test Date: 09/20/19	Depth: 17-19 ft
	Test Number: CRC-15A	Preparation: intact	Elevation: ---
	Description: Wet, gray clay		
	Remarks: System W		

CRC Test

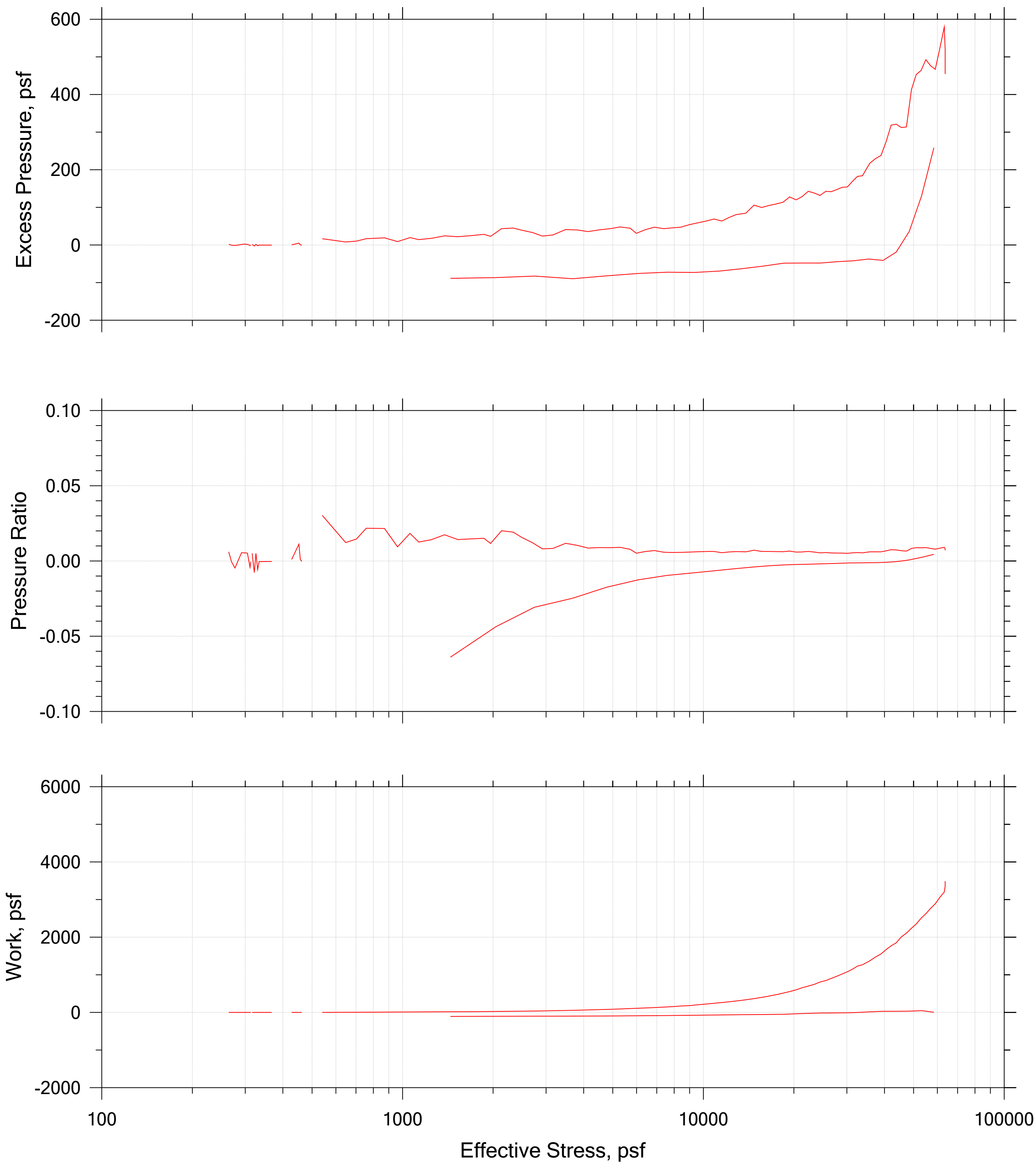
Summary



GeoTesting EXPRESS	Project Name: Crossroads Phase 14	Location: Norridgewock, ME	Project Number: GTX-309940
	Boring Number: GB-01	Tester: md	Checker: njh
	Sample Number: 19-20.8	Test Date: 09/18/19	Depth: 19-20.8 ft
	Test Number: CRC-21	Preparation: intact	Elevation: ---
	Description: Moist, olive clay		
	Remarks: System W		
			Page 1 of 3

CRC Test

Pressure Curves



GeoTesting EXPRESS			
	Project Name: Crossroads Phase 14	Location: Norridgewock, ME	Project Number: GTX-309940
	Boring Number: GB-01	Tester: md	Checker: njh
	Sample Number: 19-20.8	Test Date: 09/18/19	Depth: 19-20.8 ft
	Test Number: CRC-21	Preparation: intact	Elevation: ---
	Description: Moist, olive clay		
	Remarks: System W		

CRC Test

Specimen Diameter, in: 2.50	Specific Gravity: 2.76 (Estimated)	Liquid Limit: 30
Specimen Height, in: 1.00	Initial Void Ratio: 0.869	Plastic Limit: 20
Final Height, in: 0.89	Final Void Ratio: 0.663	Plasticity Index: 10

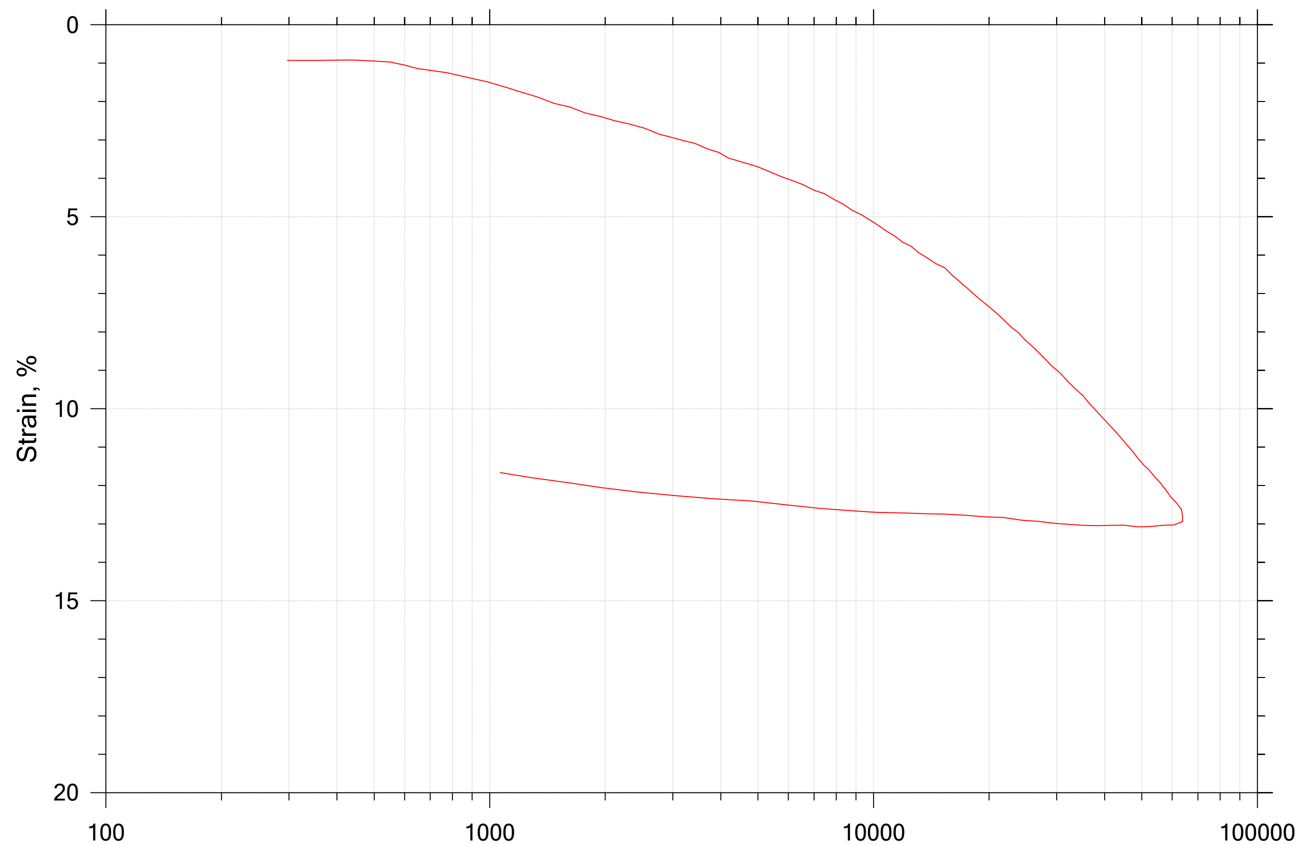
	Before Test Trimmings	Before Test Specimen	After Test Specimen	After Test Trimmings
Container ID	B-1818	---		C-2807
Mass Container, gm	8.29	110.4	110.4	9.09
Mass Container + Wet Soil, gm	156.52	264.95	257.76	157.56
Mass Container + Dry Soil, gm	123.53	229.22	229.22	128.8
Mass Dry Soil, gm	115.24	118.82	118.82	119.71
Water Content, %	28.63	30.08	24.02	24.02
Void Ratio	---	0.87	0.66	---
Degree of Saturation, %	---	95.57	100.00	---
Dry Unit Weight, pcf	---	92.21	103.61	---

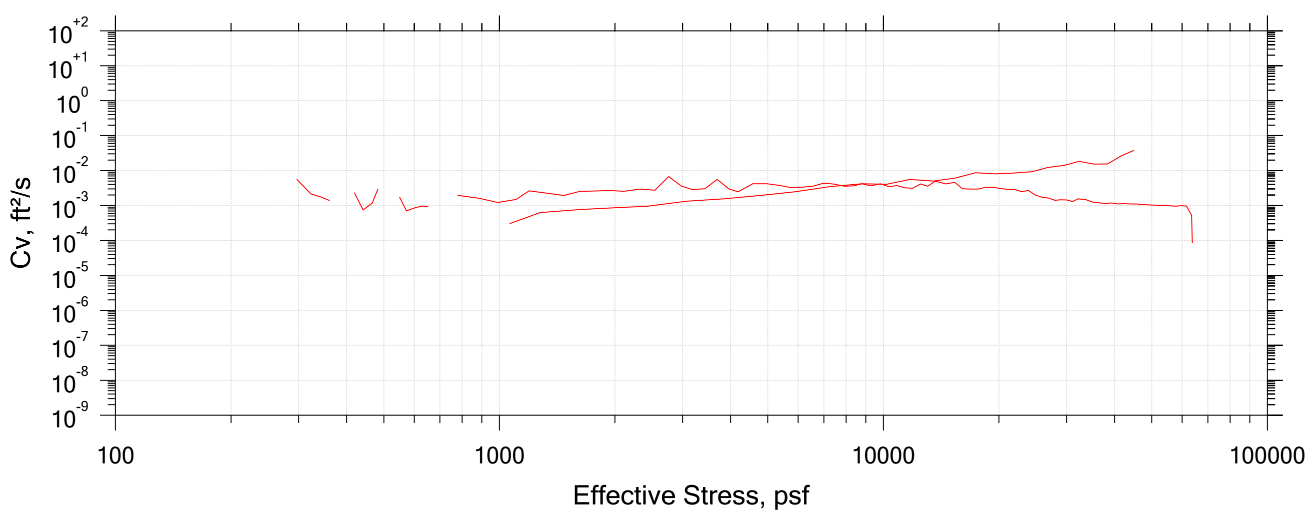
Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test.
Therefore, values may not represent actual values for the specimen.

GeoTesting EXPRESS			
	Project Name: Crossroads Phase 14	Location: Norridgewock, ME	Project Number: GTX-309940
	Boring Number: GB-01	Tester: md	Checker: njh
	Sample Number: 19-20.8	Test Date: 09/18/19	Depth: 19-20.8 ft
	Test Number: CRC-21	Preparation: intact	Elevation: ---
	Description: Moist, olive clay		
	Remarks: System W		

CRC Test

Summary

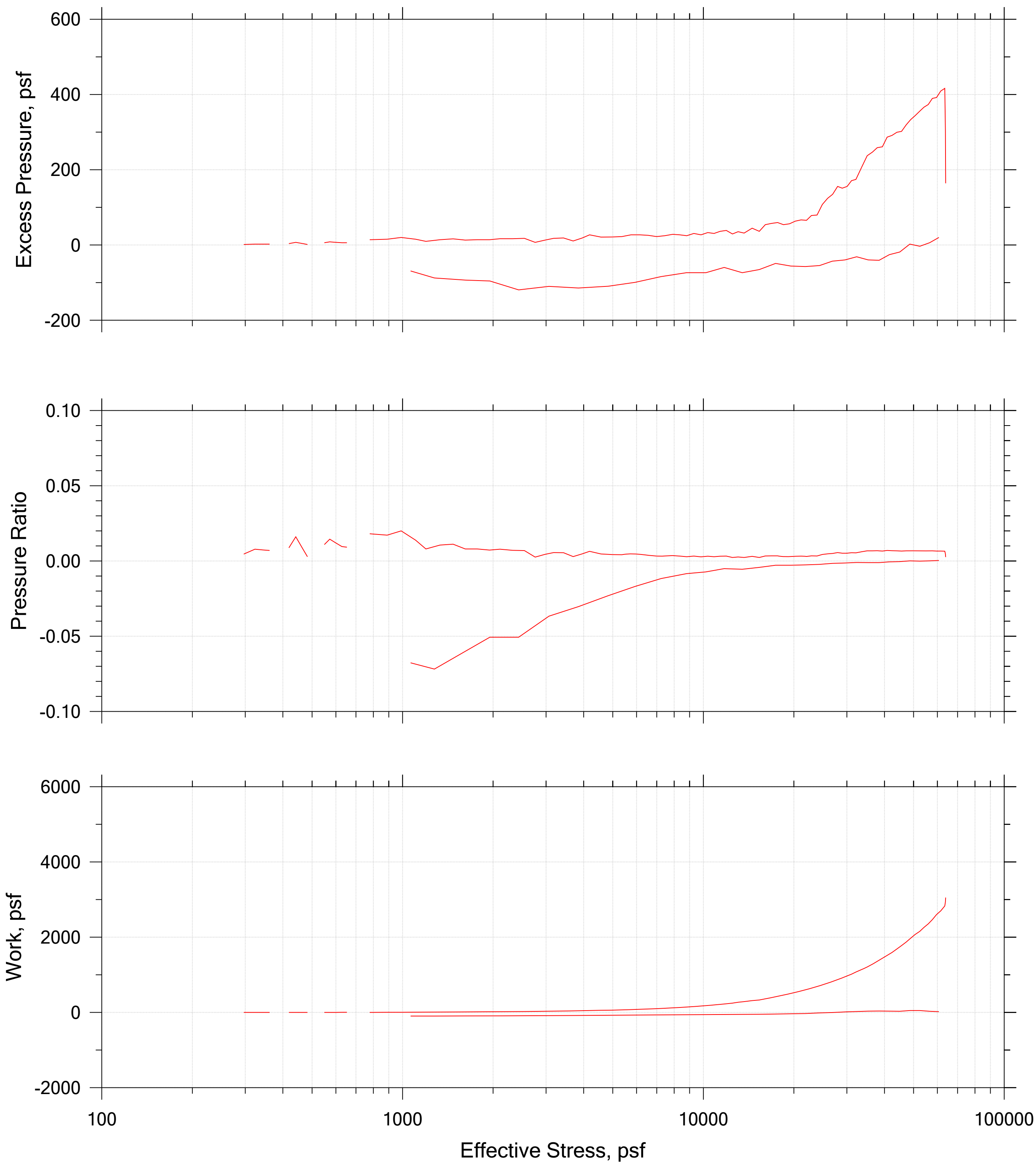




GeoTesting EXPRESS			
	Project Name: Crossroads Phase 14	Location: Norridgewock, ME	Project Number: GTX-309940
	Boring Number: GB-12	Tester: md	Checker: njh
	Sample Number: 17-19	Test Date: 09/23/19	Depth: 17-19 ft
	Test Number: CRC-23	Preparation: intact	Elevation: ---
	Description: Moist, dark gray clay		
	Remarks: System R		
			Page 1 of 3

CRC Test

Pressure Curves



GeoTesting EXPRESS	Project Name: Crossroads Phase 14	Location: Norridgewock, ME	Project Number: GTX-309940
	Boring Number: GB-12	Tester: md	Checker: njh
	Sample Number: 17-19	Test Date: 09/23/19	Depth: 17-19 ft
	Test Number: CRC-23	Preparation: intact	Elevation: ---
	Description: Moist, dark gray clay		
	Remarks: System R		

CRC Test

Specimen Diameter, in: 2.50	Specific Gravity: 2.73 (Estimated)	Liquid Limit: 31
Specimen Height, in: 1.00	Initial Void Ratio: 0.822	Plastic Limit: 19
Final Height, in: 0.90	Final Void Ratio: 0.64	Plasticity Index: 12

	Before Test Trimmings	Before Test Specimen	After Test Specimen	After Test Trimmings
Container ID	C-2880	---		C-3016
Mass Container, gm	9.27	109.4	109.4	9.25
Mass Container + Wet Soil, gm	213.03	265.48	258.01	161.49
Mass Container + Dry Soil, gm	168.69	229.77	229.77	132.56
Mass Dry Soil, gm	159.42	120.37	120.37	123.31
Water Content, %	27.81	29.67	23.46	23.46
Void Ratio	---	0.82	0.64	---
Degree of Saturation, %	---	98.42	100.00	---
Dry Unit Weight, pcf	---	93.417	103.8	---

Note: Specific Gravity and Void Ratios are calculated assuming the degree of saturation equals 100% at the end of the test.
Therefore, values may not represent actual values for the specimen.

GeoTesting EXPRESS			
	Project Name: Crossroads Phase 14	Location: Norridgewock, ME	Project Number: GTX-309940
	Boring Number: GB-12	Tester: md	Checker: njh
	Sample Number: 17-19	Test Date: 09/23/19	Depth: 17-19 ft
	Test Number: CRC-23	Preparation: intact	Elevation: ---
	Description: Moist, dark gray clay		
	Remarks: System R		

ATTACHMENT 4

Results of Relevant Shear Strength Tests

Consolidated Undrained Direct Simple Shear Testing of Cohesive Soils by ASTM D6528

Client: Geosyntec Consultants
GTX#: 309940
Project Name: Crossroads Phase 14
Test Date: 8/14/19
Project Location: Norridgewock, ME

Boring ID: GB-15
Sample ID: 7-9
Depth, ft: 7-9

Visual Description: Moist, olive gray clay

Test Equipment: Top and bottom box (circular) = 2.50 in diameter. Load cells and LVDT's connected to data acquisition system for shear force, normal load, horizontal and vertical displacement; surface area = 4.91 in^2, soil height = 1 inch. Stacked rings used. Set up included porous stones with pins.

Test Condition: Inundated prior to consolidation

Sample Type and Preparation: Extruded from tube, cut, trimmed and placed into apparatus at as-received density and moisture

Parameter	Point 1	Point 2	Point 3	Point 4	Point 5
Test No.	DSS-4	DSS-5	DSS-6		
Initial Moisture Content, %	28.5	28.7	28.1		
Initial Dry Density, pcf	90.0	90.7	90.6		
Nominal Rate of Shear Strain, %/hr	5.0	5.0	5.0		
Maximum Vertical Consolidation Stress, psf	16,500	27,500	44,000		
Final Moisture Content, %	24.7	25.9	24.0		
Measured Peak Shear Stress, psf	4,135	6,265	8,794		
Shear Strain at Peak Shear Stress, %	16.3	15.0	17.3		
Membrane Correction, psf	56	60	54		
Corrected Peak Shear Stress, psf	4,079	6,205	8,740		
S_u / σ'_{vc}	0.25	0.23	0.20		

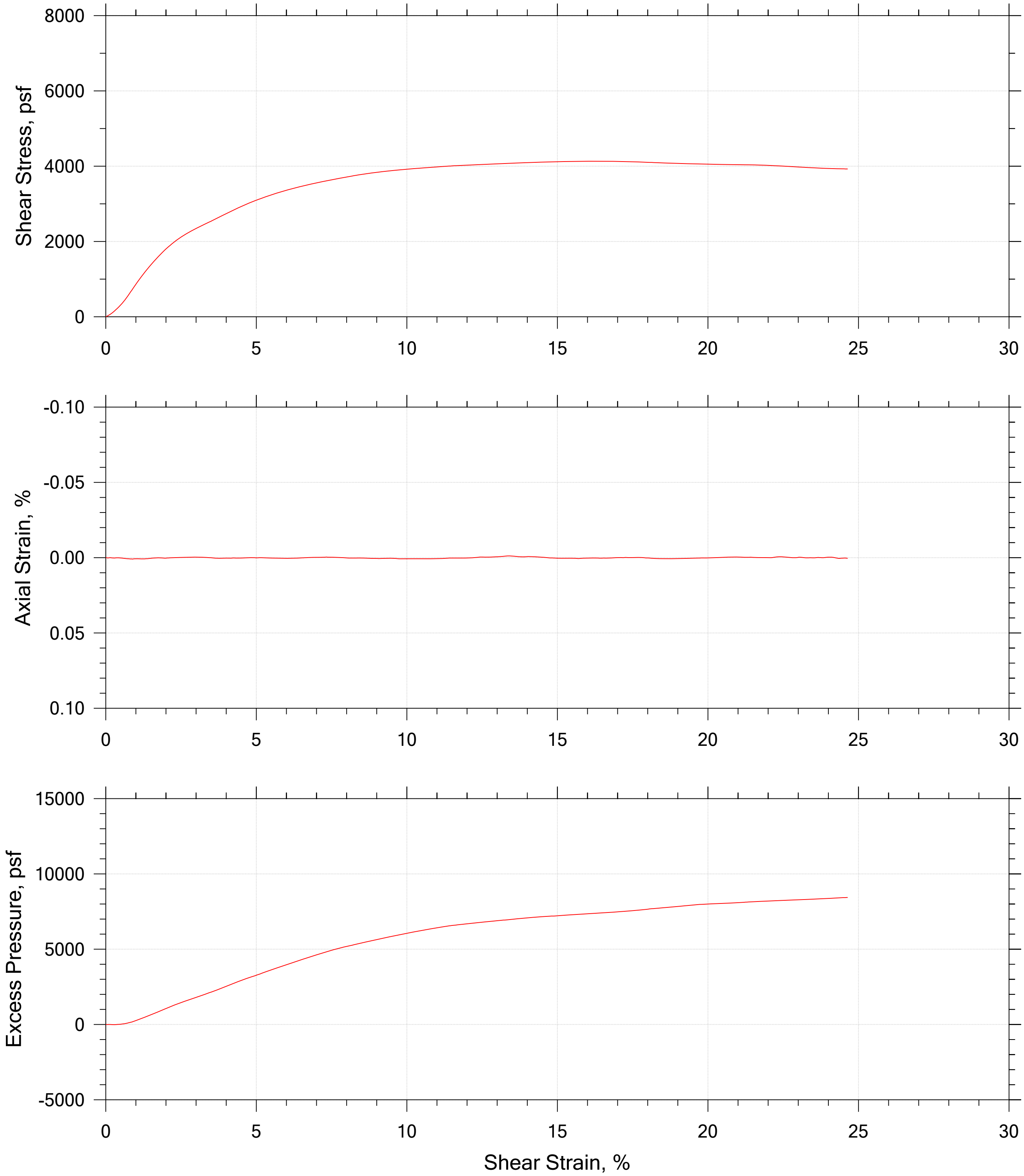
Comments:

Tested By: md

Checked By: njh

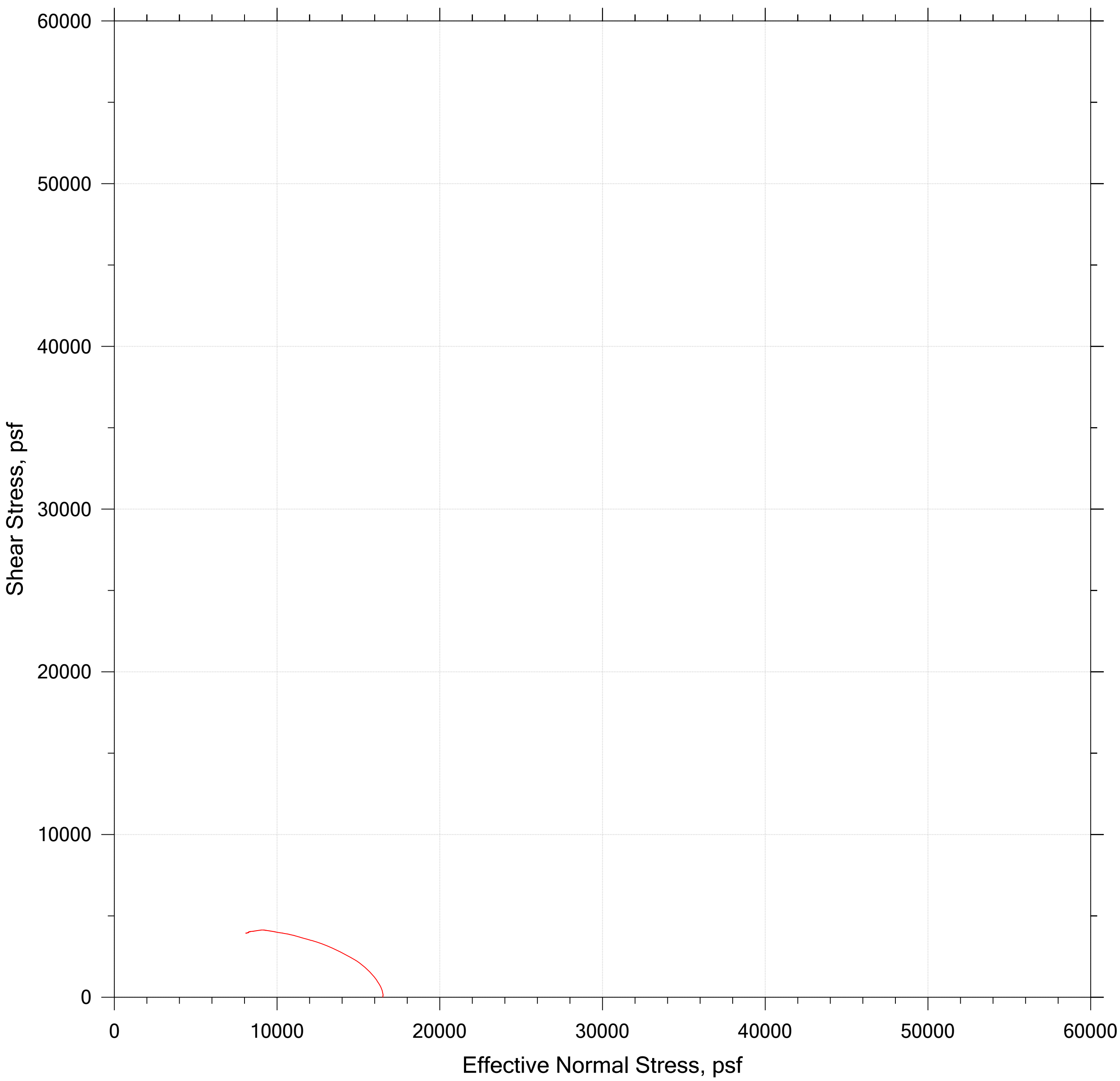
Notes: These results apply only to the sample tested for the specific test conditions. The test procedures employed follow accepted industry practice and the indicated test method. GeoTesting Express has no specific knowledge as to conditioning, origin, sampling procedure or intended use of the material.

DIRECT SIMPLE SHEAR TEST



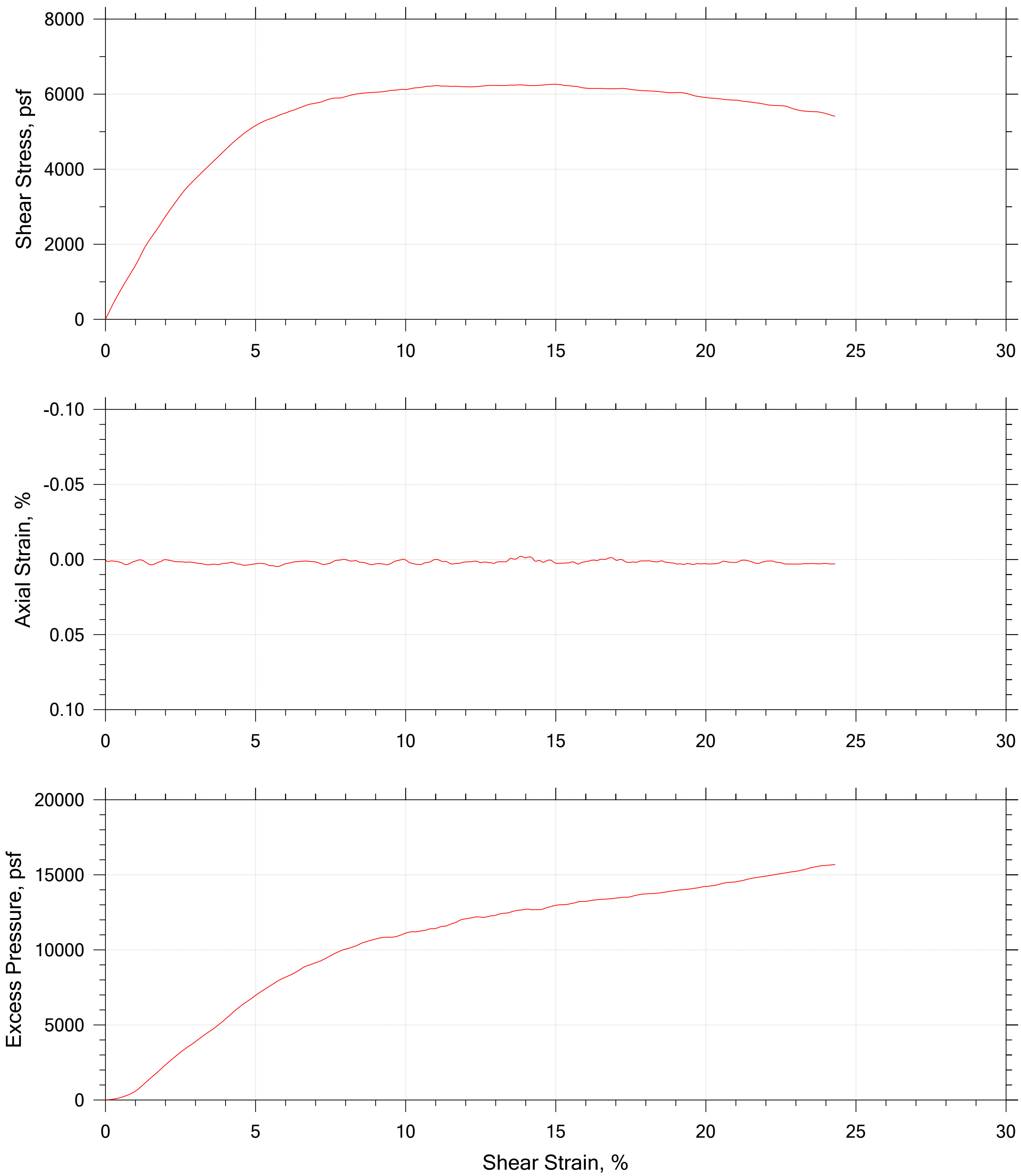
GeoTesting EXPRESS			
	Project: Crossroads Phase 14	Location: Norridgewock, ME	Project No.: GTX-309940
	Boring No.: GB-15	Tested By: md	Checked By: njh
	Sample No.: 7-9	Test Date: 08/14/19	Depth: 7-9 ft
	Test No.: DSS-4	Sample Type: intact	Elevation: ---
	Description: Moist, olive gray clay		
	Remarks: System HH		
			Page 2 of 7

DIRECT SIMPLE SHEAR TEST



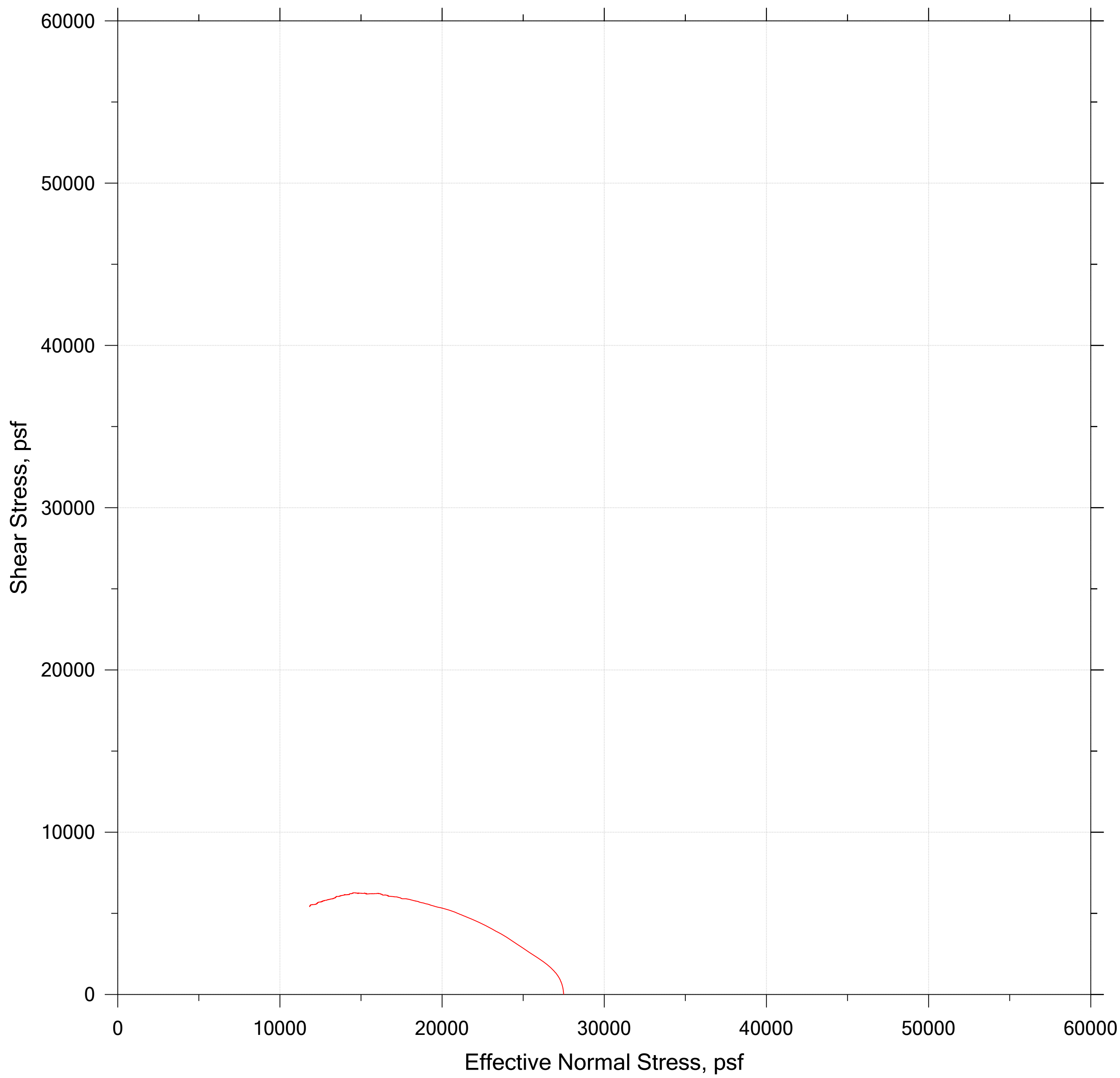
GeoTesting EXPRESS	Project: Crossroads Phase 14	Location: Norridgewock, ME	Project No.: GTX-309940
	Boring No.: GB-15	Tested By: md	Checked By: njh
	Sample No.: 7-9	Test Date: 08/14/19	Depth: 7-9 ft
	Test No.: DSS-4	Sample Type: intact	Elevation: ---
	Description: Moist, olive gray clay		
	Remarks: System HH		

DIRECT SIMPLE SHEAR TEST



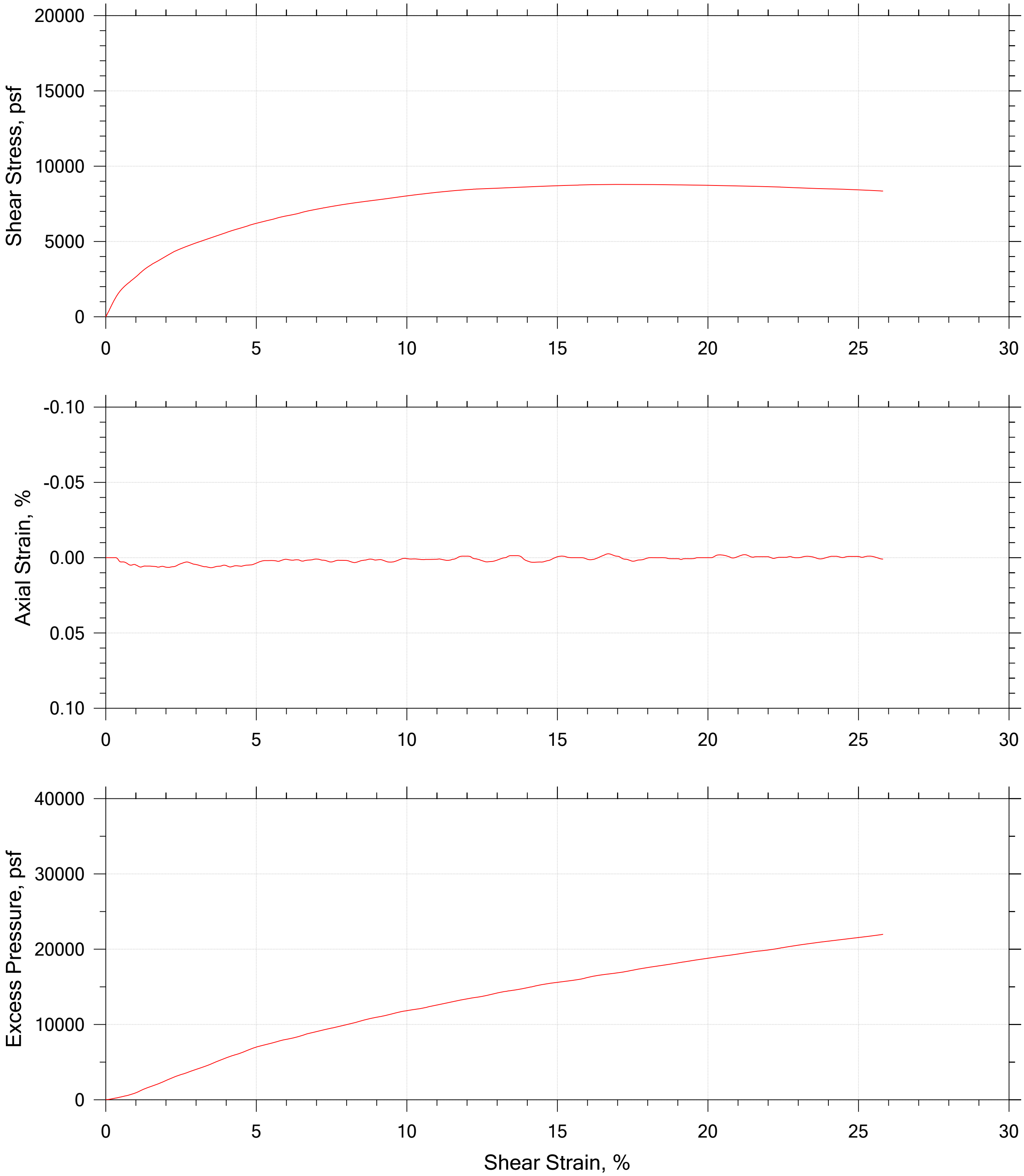
GeoTesting EXPRESS	Project: Crossroads Phase 14	Location: Norridgewock, ME	Project No.: GTX-309940
	Boring No.: GB-15	Tested By: md	Checked By: njh
	Sample No.: 7-9	Test Date: 08/14/19	Depth: 7-9 ft
	Test No.: DSS-5	Sample Type: intact	Elevation: ---
	Description: Moist, olive gray clay		
	Remarks: System SS		

DIRECT SIMPLE SHEAR TEST



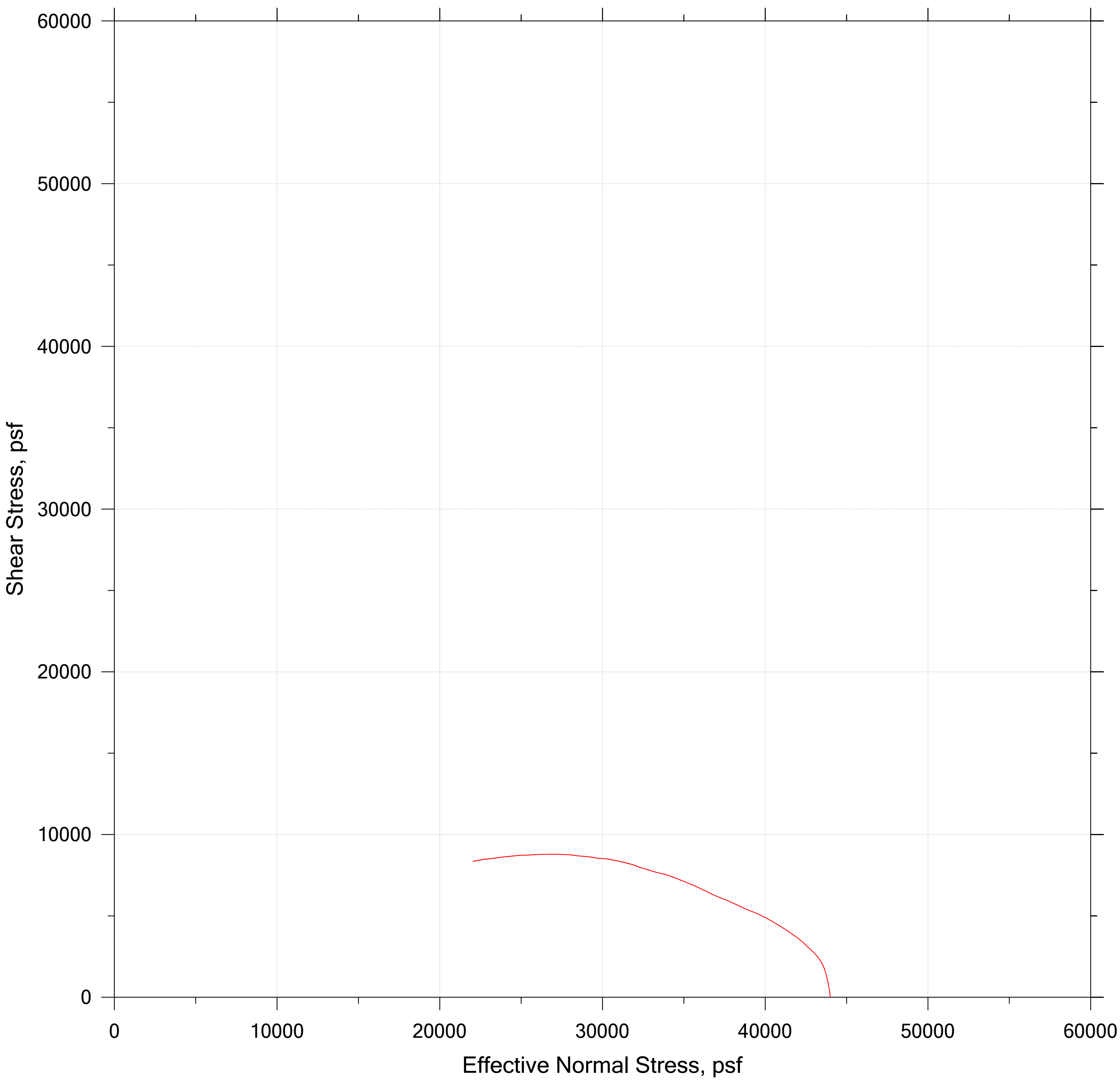
GeoTesting EXPRESS	Project: Crossroads Phase 14	Location: Norridgewock, ME	Project No.: GTX-309940
	Boring No.: GB-15	Tested By: md	Checked By: njh
	Sample No.: 7-9	Test Date: 08/14/19	Depth: 7-9 ft
	Test No.: DSS-5	Sample Type: intact	Elevation: ---
	Description: Moist, olive gray clay		
	Remarks: System SS		

DIRECT SIMPLE SHEAR TEST



GeoTesting EXPRESS			
	Project: Crossroads Phase 14	Location: Norridgewock, ME	Project No.: GTX-309940
	Boring No.: GB-15	Tested By: md	Checked By: njh
	Sample No.: 7-9	Test Date: 08/19/19	Depth: 7-9 ft
	Test No.: DSS-6	Sample Type: intact	Elevation: ---
	Description: Moist, olive gray clay		
	Remarks: System N		
			Page 6 of 7

DIRECT SIMPLE SHEAR TEST



GeoTesting EXPRESS	Project: Crossroads Phase 14	Location: Norridgewock, ME	Project No.: GTX-309940
	Boring No.: GB-15	Tested By: md	Checked By: njh
	Sample No.: 7-9	Test Date: 08/19/19	Depth: 7-9 ft
	Test No.: DSS-6	Sample Type: intact	Elevation: ---
	Description: Moist, olive gray clay		
	Remarks: System N		
			Page 7 of 7

9 EXPRESS

Consolidated Undrained Direct Simple Shear Testing of Cohesive Soils by ASTM D6528

Client: Geosyntec Consultants
GTX#: 309940
Project Name: Crossroads Phase 14
Test Date: 8/29/19
Project Location: Norridgewock, ME

Boring ID: GB-15
Sample ID: 7-9
Depth, ft: 7-9

Visual Description: Moist, olive gray clay

Test Equipment: Top and bottom box (circular) = 2.50 in diameter. Load cells and LVDT's connected to data acquisition system for shear force, normal load, horizontal and vertical displacement; surface area = 4.91 in^2, soil height = 1 inch.
Stacked rings used. Set up included porous stones with pins.

Test Condition: Inundated prior to consolidation

Sample Type and Preparation: density Extruded from tube, cut, trimmed and placed into apparatus at as-received and moisture

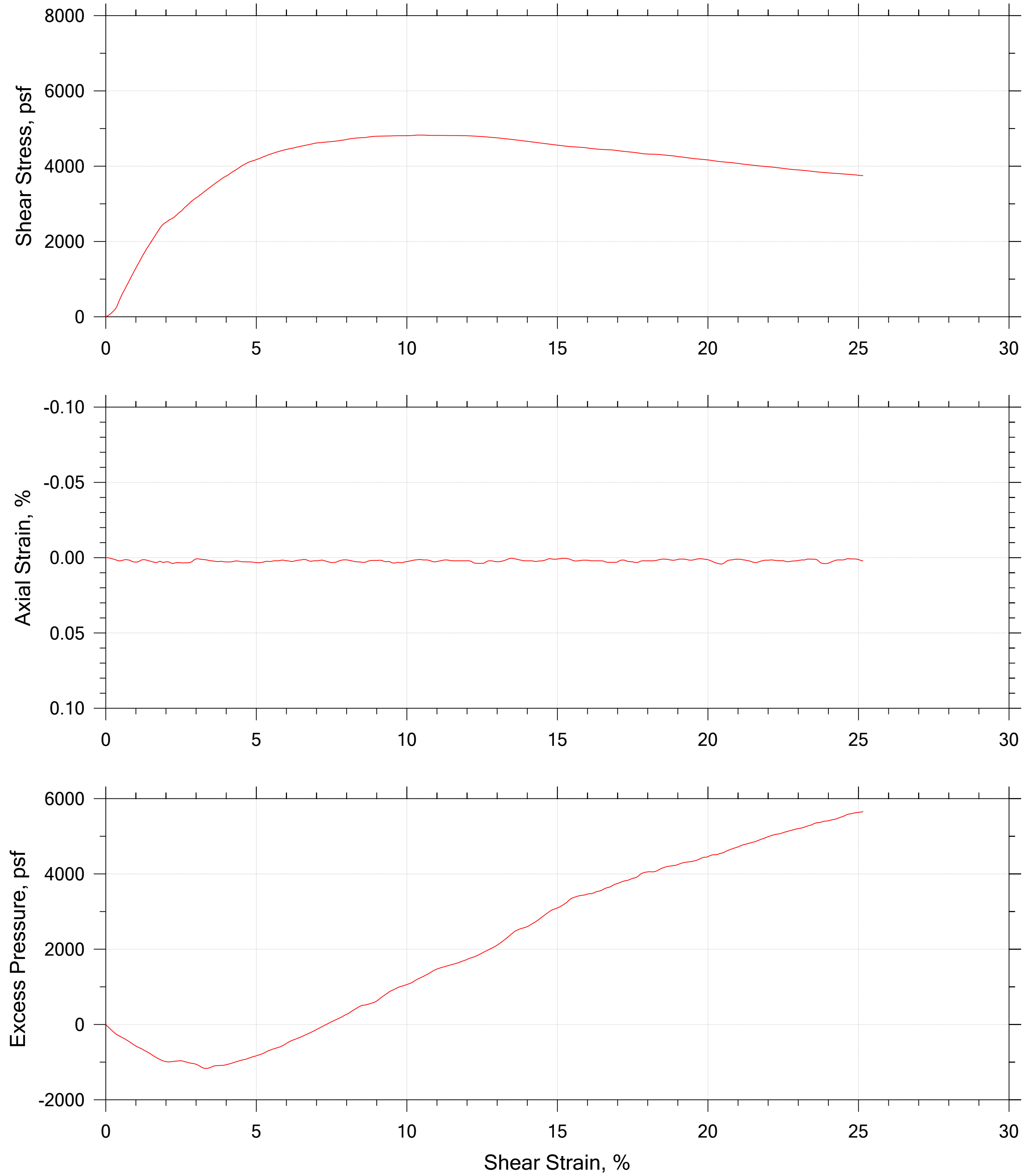
Parameter	Point 1	Point 2	Point 3	Point 4	Point 5
Test No.	DSS-10	DSS-11	DSS-12		
Initial Moisture Content, %	28.2	27.5	27.2		
Initial Dry Density, pcf	90.7	90.3	90.5		
Nominal Rate of Shear Strain, %/hr	5.0	5.0	5.0		
Maximum Vertical Consolidation Stress, psf	27,500	27,500	27,500		
Vertical Consolidation Stress at shear, psf	13,750	6,875	4,585		
Final Moisture Content, %	27.7	26.1	26.0		
Measured Peak Shear Stress, psf	4,828	4,363	4,065		
Shear Strain at Peak Shear Stress, %	10.4	14.3	16.9		
Membrane Correction, psf	61	60	56		
Corrected Peak Shear Stress, psf	4,767	4,303	4,009		
S_u / σ'_{vc}	0.35	0.63	0.87		

Comments:

Tested By: md
Checked By: njh

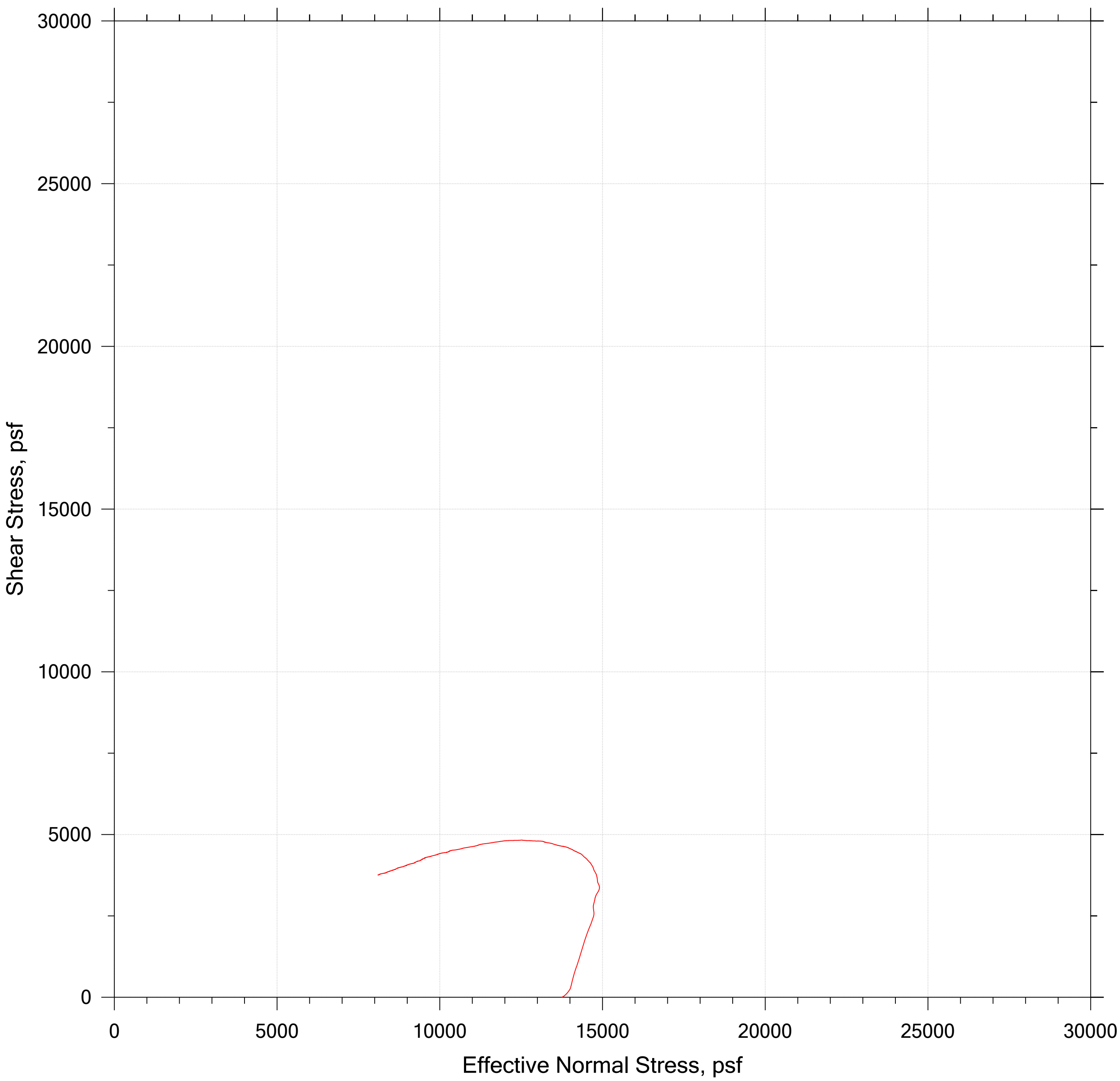
Notes: These results apply only to the sample tested for the specific test conditions. The test procedures employed follow accepted industry practice and the indicated test method. GeoTesting Express has no specific knowledge as to conditioning, origin, sampling procedure or intended use of the material.

DIRECT SIMPLE SHEAR TEST



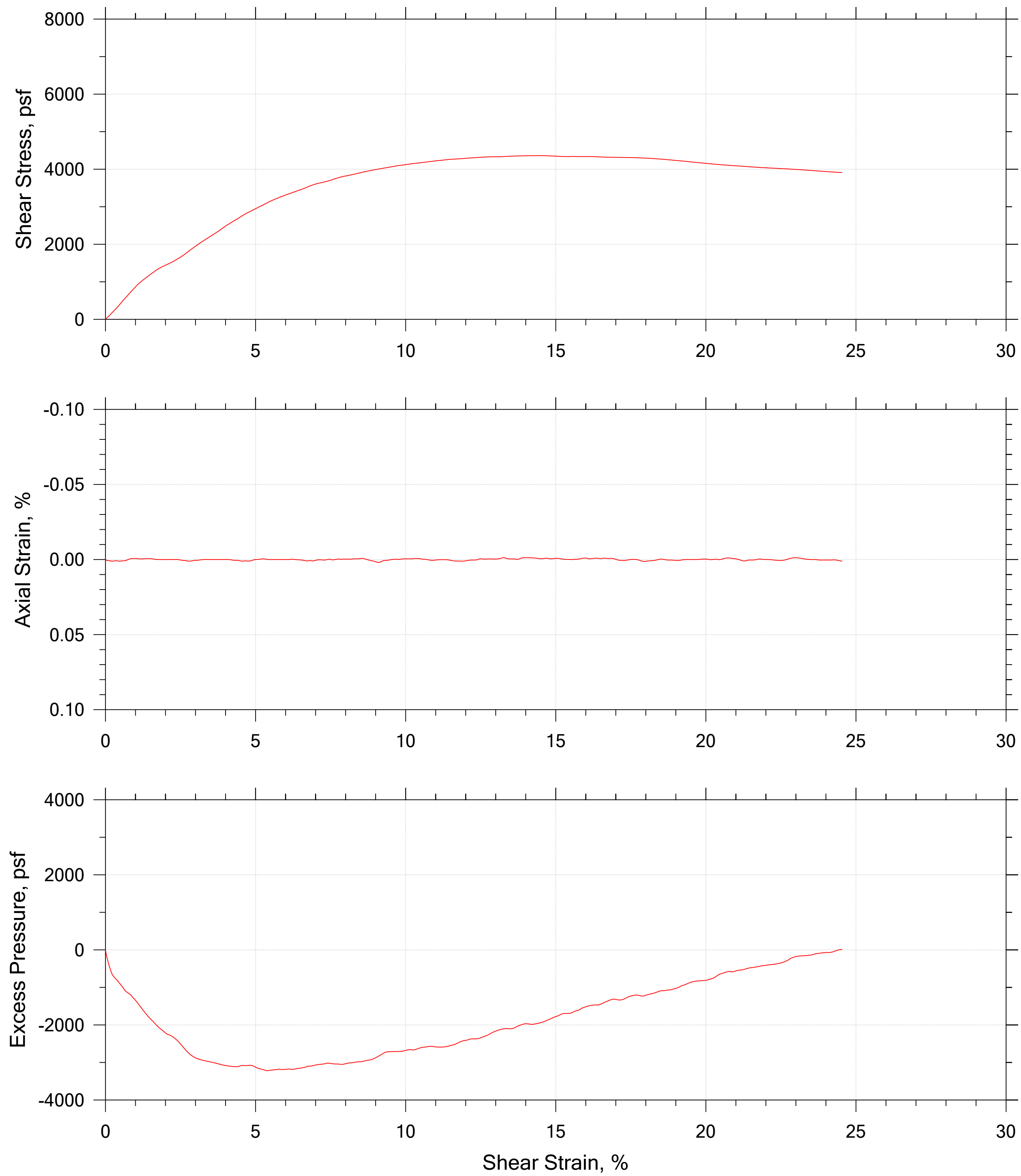
GeoTesting EXPRESS	Project: Crossroads Phase 14	Location: Norridegwock, ME	Project No.: GTX-309940
	Boring No.: GB-15	Tested By: md	Checked By: njh
	Sample No.: 7-9	Test Date: 08/29/19	Depth: 7-9 ft
	Test No.: DSS-10	Sample Type: intact	Elevation: ---
	Description: Moist, olive gray clay		
	Remarks: System GG		
	Page 2 of 7		

DIRECT SIMPLE SHEAR TEST



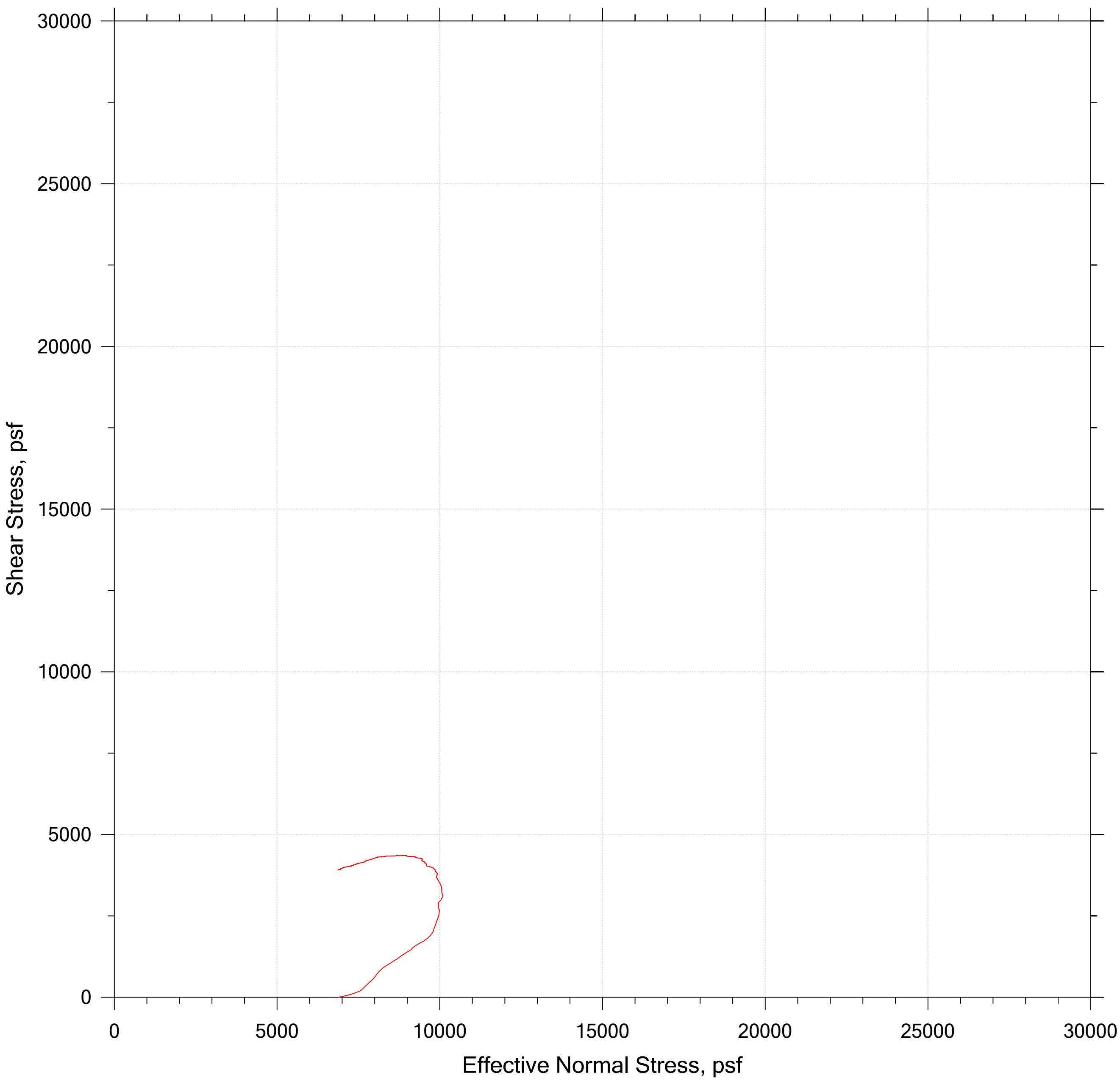
GeoTesting EXPRESS			
	Project: Crossroads Phase 14	Location: Norridegwock, ME	Project No.: GTX-309940
	Boring No.: GB-15	Tested By: md	Checked By: njh
	Sample No.: 7-9	Test Date: 08/29/19	Depth: 7-9 ft
	Test No.: DSS-10	Sample Type: intact	Elevation: ---
	Description: Moist, olive gray clay		
	Remarks: System GG		

DIRECT SIMPLE SHEAR TEST



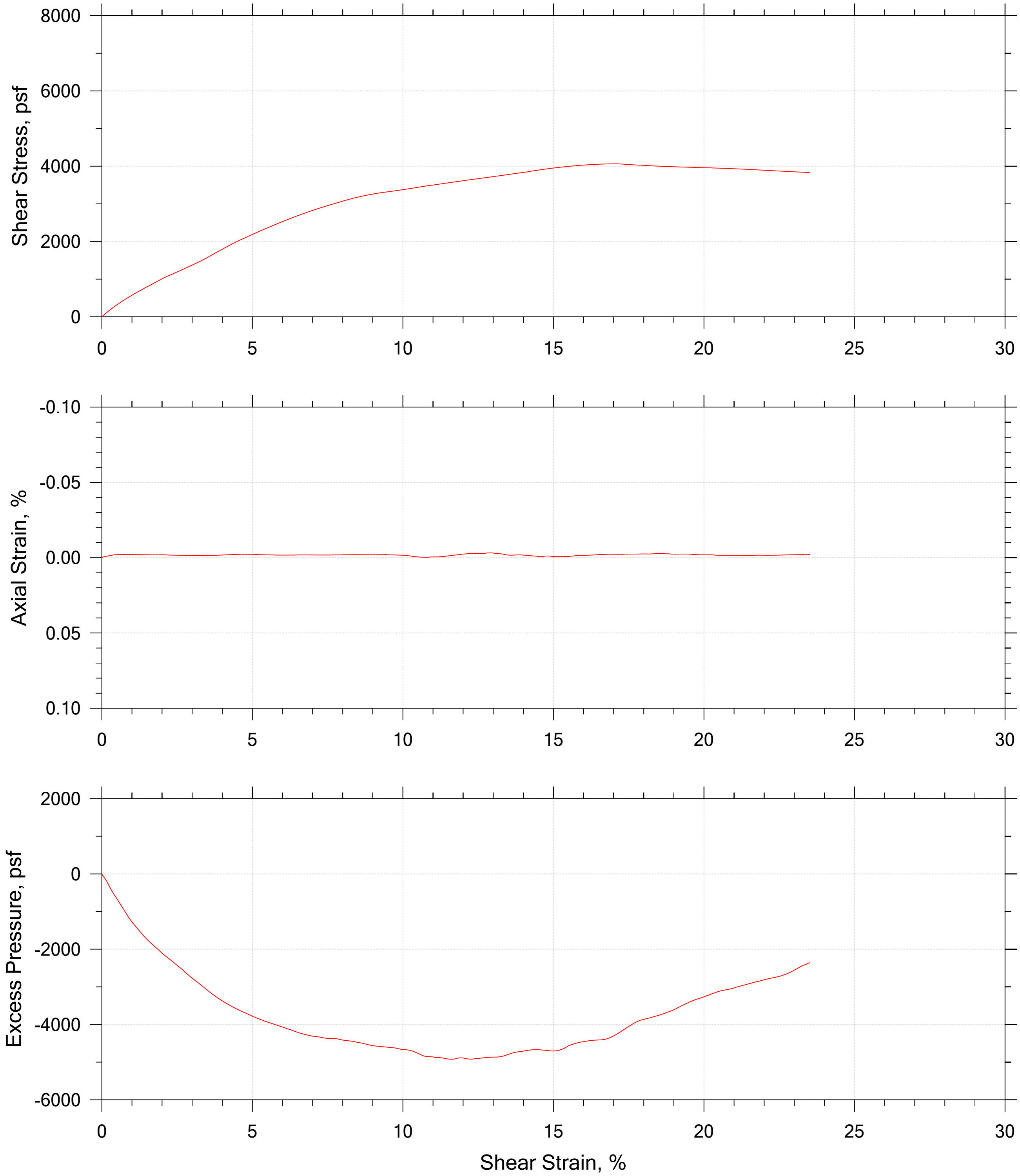
GeoTesting EXPRESS	Project: Crossroads Phase 14	Location: Norridegwock, ME	Project No.: GTX-309940
	Boring No.: GB-15	Tested By: md	Checked By: njh
	Sample No.: 7-9	Test Date: 08/11/19	Depth: 7-9 ft
	Test No.: DSS-11	Sample Type: intact	Elevation: ---
	Description: Moist, olive gray clay		
	Remarks: System HH		
			Page 4 of 7

DIRECT SIMPLE SHEAR TEST



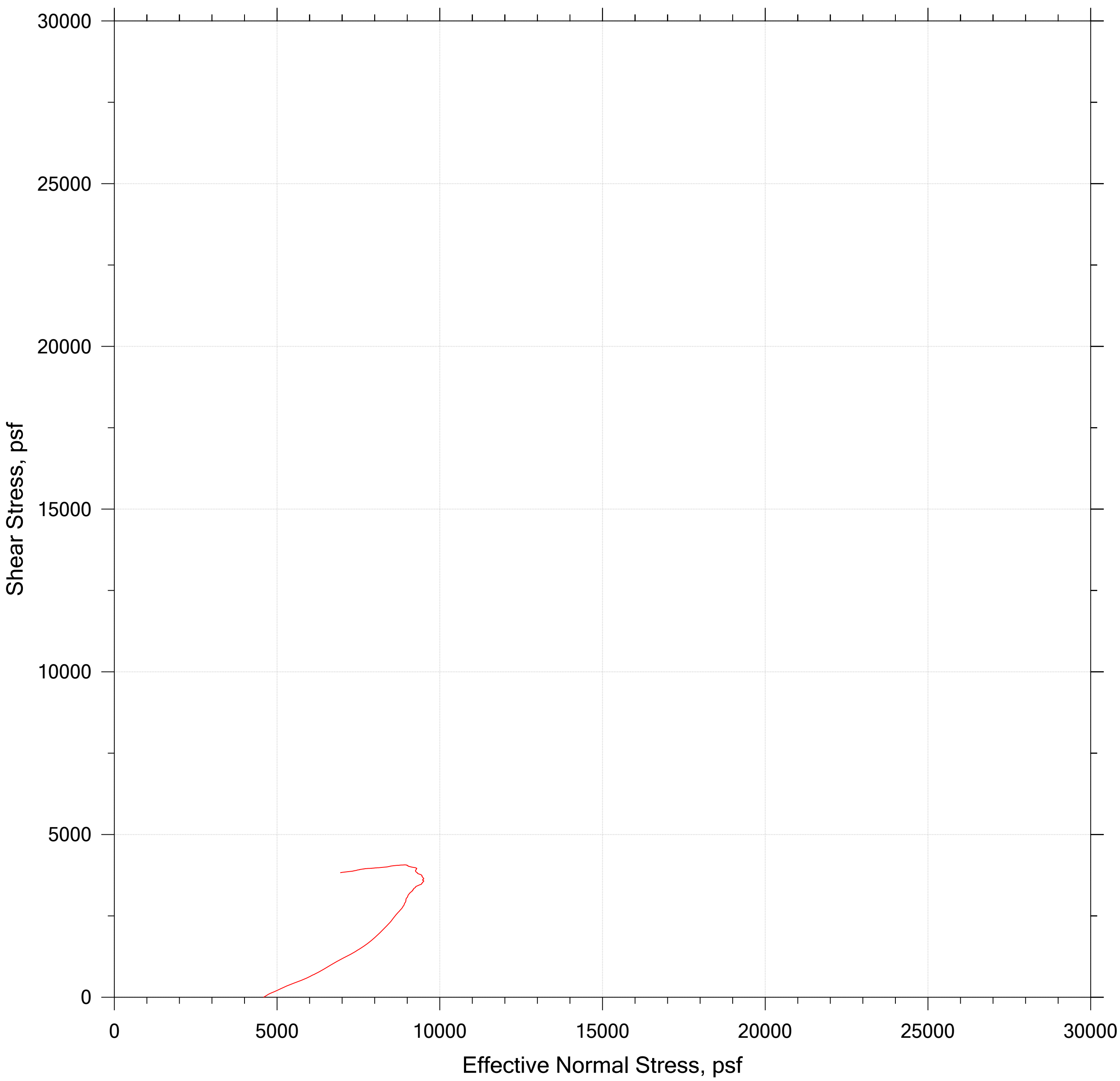
GeoTesting EXPRESS	Project: Crossroads Phase 14	Location: Norridegwock, ME	Project No.: GTX-309940
	Boring No.: GB-15	Tested By: md	Checked By: njh
	Sample No.: 7-9	Test Date: 08/11/19	Depth: 7-9 ft
	Test No.: DSS-11	Sample Type: intact	Elevation: ---
	Description: Moist, olive gray clay		
	Remarks: System HH		
			Page 5 of 7

DIRECT SIMPLE SHEAR TEST



GeoTesting EXPRESS	Project: Crossroads Phase 14	Location: Norridegwock, ME	Project No.: GTX-309940
	Boring No.: GB-15	Tested By: md	Checked By: njh
	Sample No.: 7-9	Test Date: 09/03/19	Depth: 7-9 ft
	Test No.: DSS-12	Sample Type: intact	Elevation: ---
	Description: Moist, olive gray clay		
	Remarks: System HH		

DIRECT SIMPLE SHEAR TEST



GeoTesting EXPRESS	Project: Crossroads Phase 14	Location: Norridegwock, ME	Project No.: GTX-309940
	Boring No.: GB-15	Tested By: md	Checked By: njh
	Sample No.: 7-9	Test Date: 09/03/19	Depth: 7-9 ft
	Test No.: DSS-12	Sample Type: intact	Elevation: ---
	Description: Moist, olive gray clay		
	Remarks: System HH		
			Page 7 of 7

Consolidated Undrained Direct Simple Shear Testing of Cohesive Soils by ASTM D6528

Client:	Geosyntec Consultants	GTX#:	309940
Project Name:	Crossroads Phase 14	Test Date:	8/20/19
Project Location:	Norridgewock, ME		

Boring ID: GB-21
Sample ID: 23-25
Depth, ft: 23-25

Visual Description: Moist, dark gray clay

Test Equipment: Top and bottom box (circular) = 2.50 in diameter. Load cells and LVDT's connected to data acquisition system for shear force, normal load, horizontal and vertical displacement; surface area = 4.91 in^2, soil height = 1 inch. Stacked rings used. Set up included porous stones with pins.

Test Condition: Inundated prior to consolidation

Sample Type and Preparation: Extruded from tube, cut, trimmed and placed into apparatus at as-received density and moisture

Parameter	Point 1	Point 2	Point 3	Point 4	Point 5
Test No.	DSS-7	DSS-8	DSS-9		
Initial Moisture Content, %	26.7	30.9	28.7		
Initial Dry Density, pcf	93.8	88.8	90.9		
Nominal Rate of Shear Strain, %/hr	5.0	5.0	5.0		
Maximum Vertical Consolidation Stress, psf	11,250	18,750	30,000		
Final Moisture Content, %	23.1	23.8	21.4		
Measured Peak Shear Stress, psf	2,281	3,443	6,226		
Shear Strain at Peak Shear Stress, %	9.1	11.1	18.3		
Membrane Correction, psf	60	62	52		
Corrected Peak Shear Stress, psf	2,221	3,381	6,174		
S_u / σ'_{vc}	0.20	0.18	0.21		

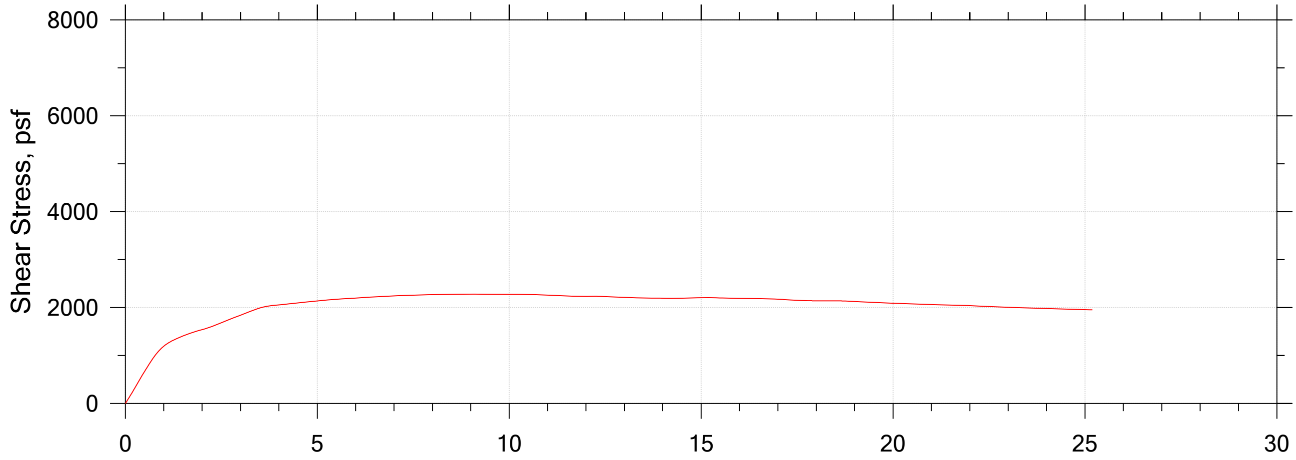
Comments:

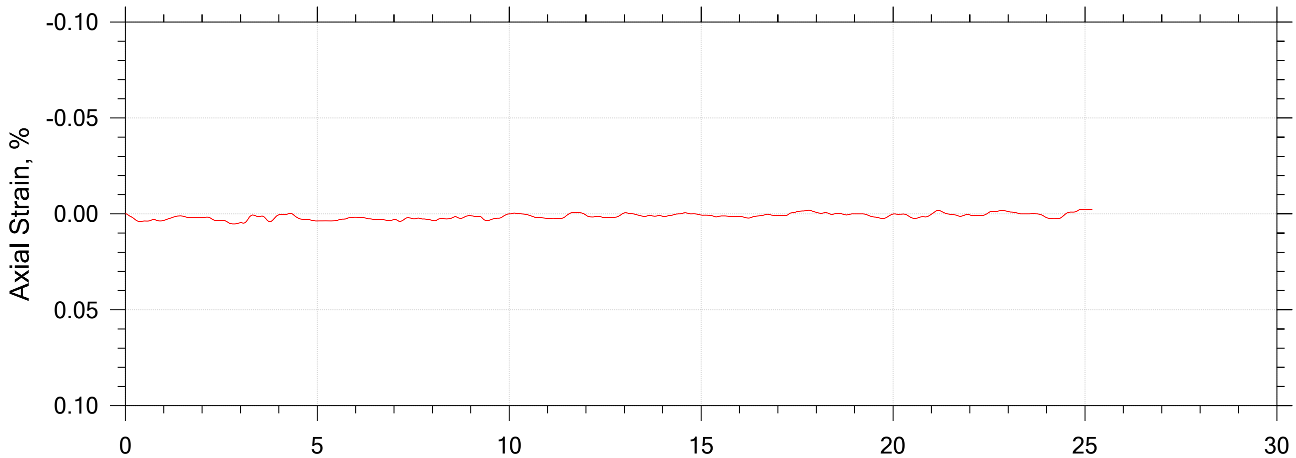
Tested By: md

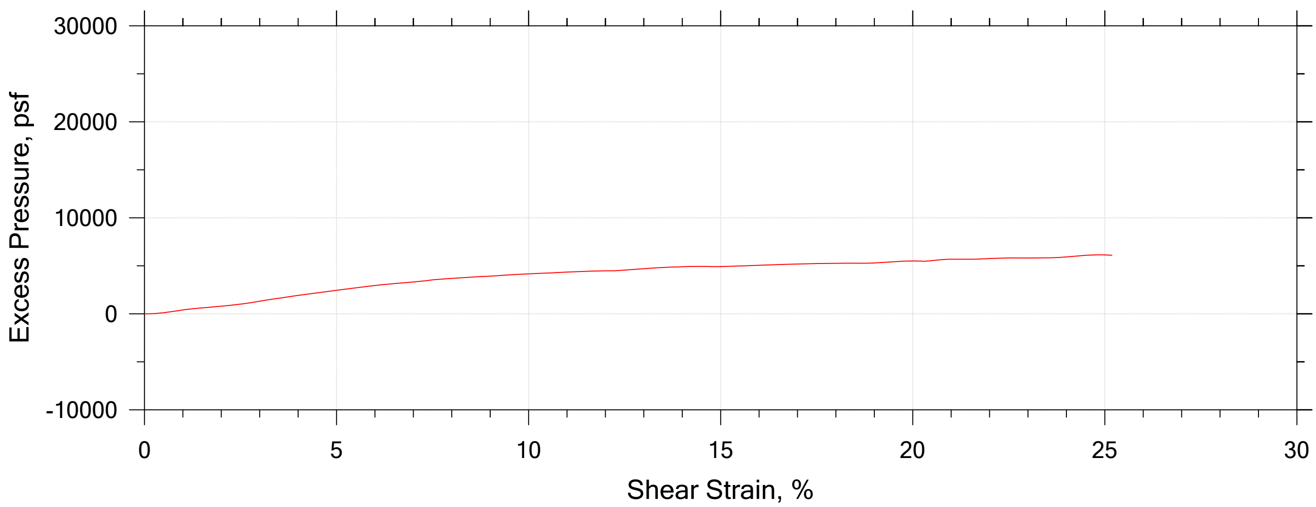
Checked By: njh

Notes: These results apply only to the sample tested for the specific test conditions. The test procedures employed follow accepted industry practice and the indicated test method. GeoTesting Express has no specific knowledge as to conditioning, origin, sampling procedure or intended use of the material.

DIRECT SIMPLE SHEAR TEST by ASTM D6528

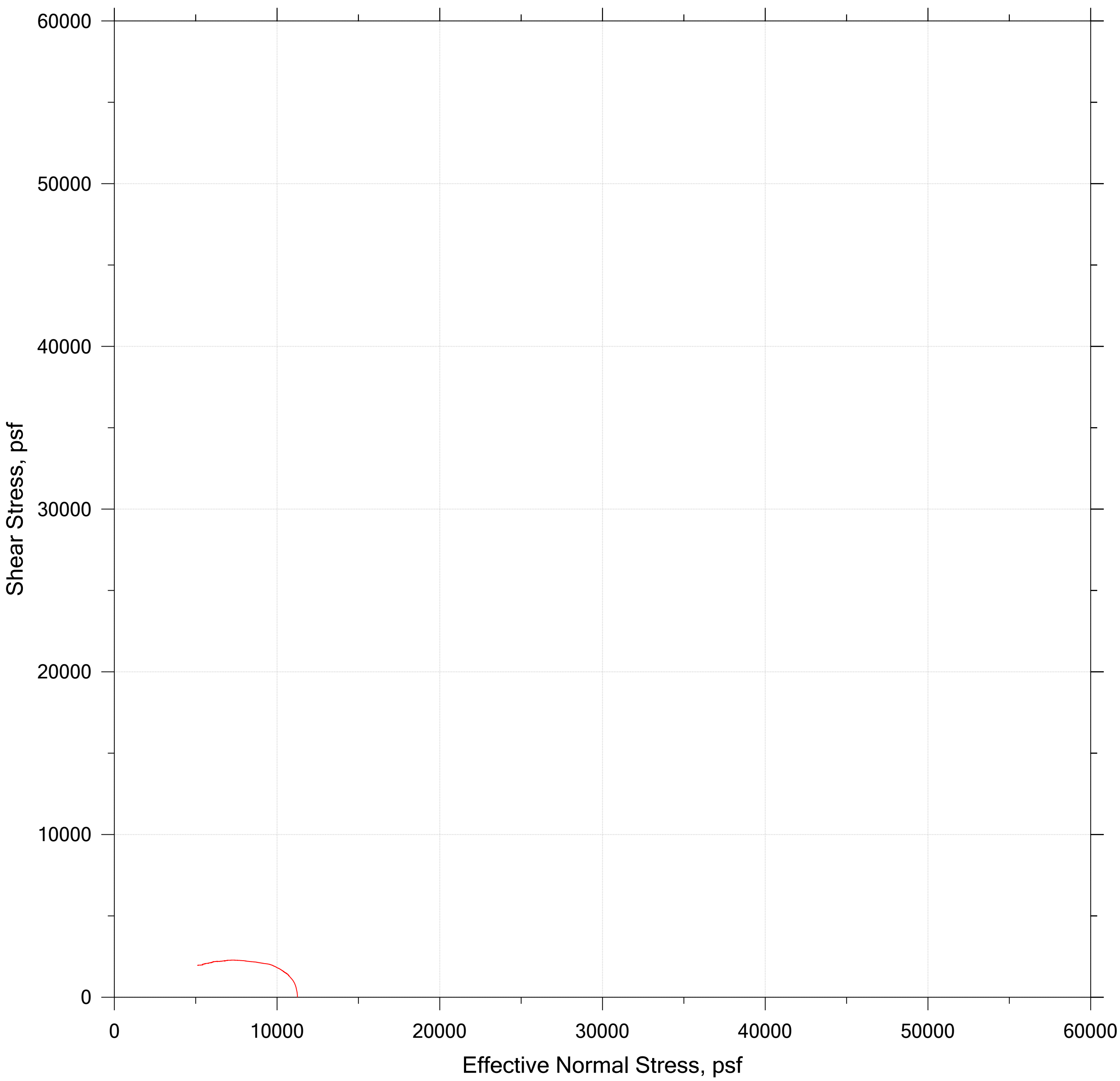






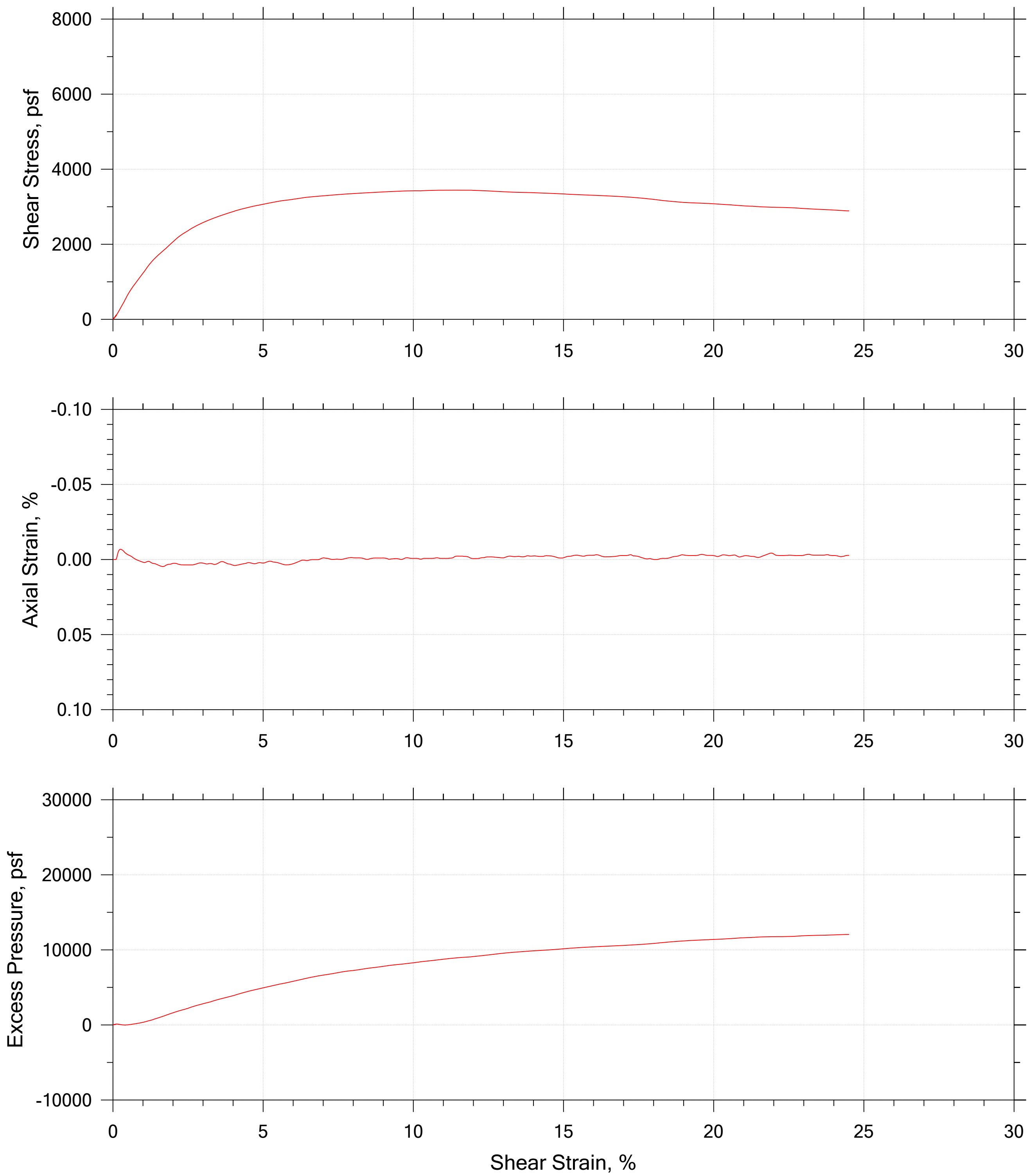
GeoTesting EXPRESS	Project: Crossroads Phase 14	Location: Norridgewock, ME	Project No.: GTX-309940
	Boring No.: GB-21	Tested By: md	Checked By: njh
	Sample No.: 23-25	Test Date: 08/21/19	Depth: 23-25 ft
	Test No.: DSS-7	Sample Type: intact	Elevation: ---
	Description: Moist, dark gray clay		
	Remarks: System M		

DIRECT SIMPLE SHEAR TEST by ASTM D6528



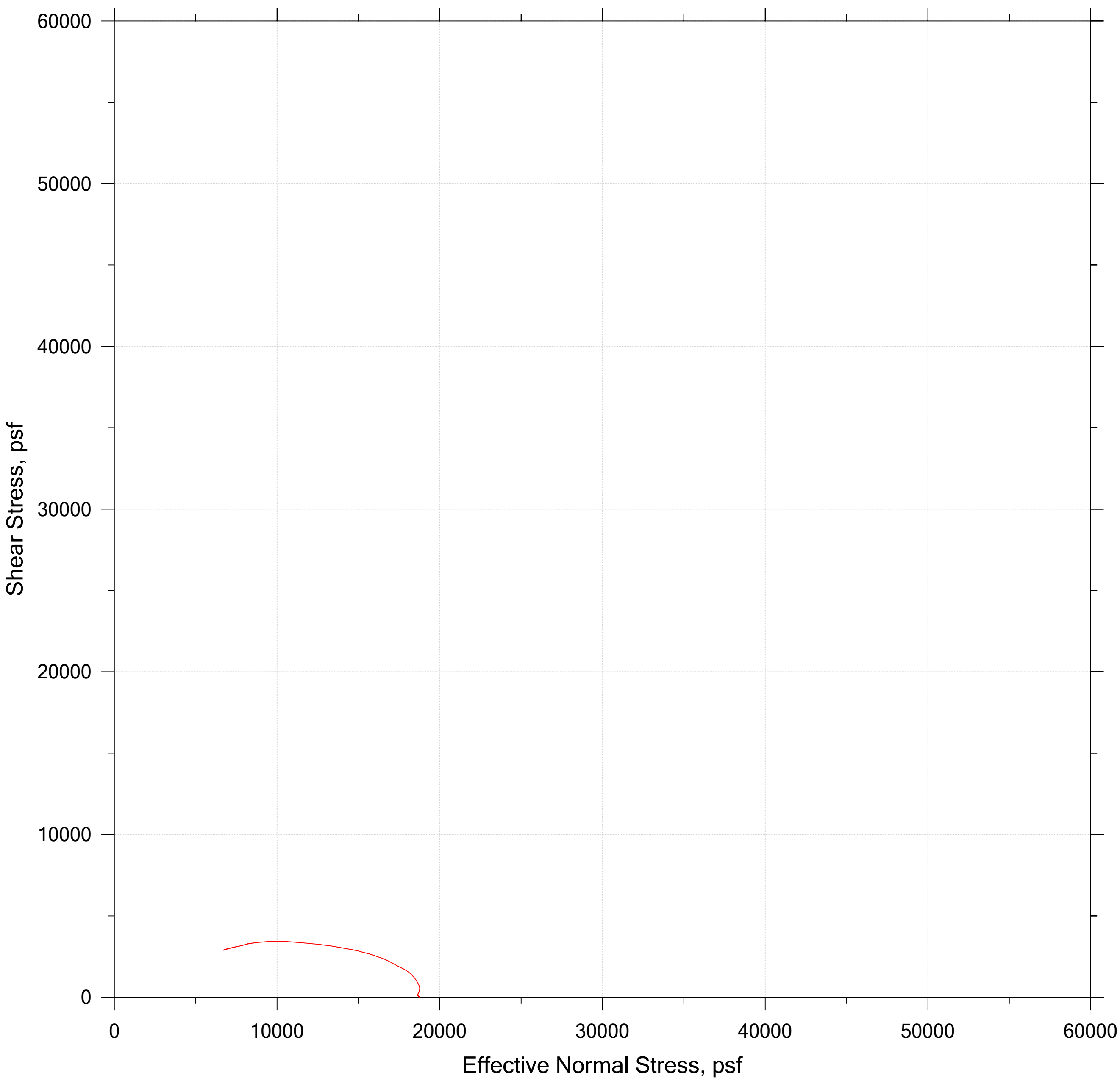
GeoTesting EXPRESS	Project: Crossroads Phase 14	Location: Norridgewock, ME	Project No.: GTX-309940
	Boring No.: GB-21	Tested By: md	Checked By: njh
	Sample No.: 23-25	Test Date: 08/21/19	Depth: 23-25 ft
	Test No.: DSS-7	Sample Type: intact	Elevation: ---
	Description: Moist, dark gray clay		
	Remarks: System M		

DIRECT SIMPLE SHEAR TEST by ASTM D6528



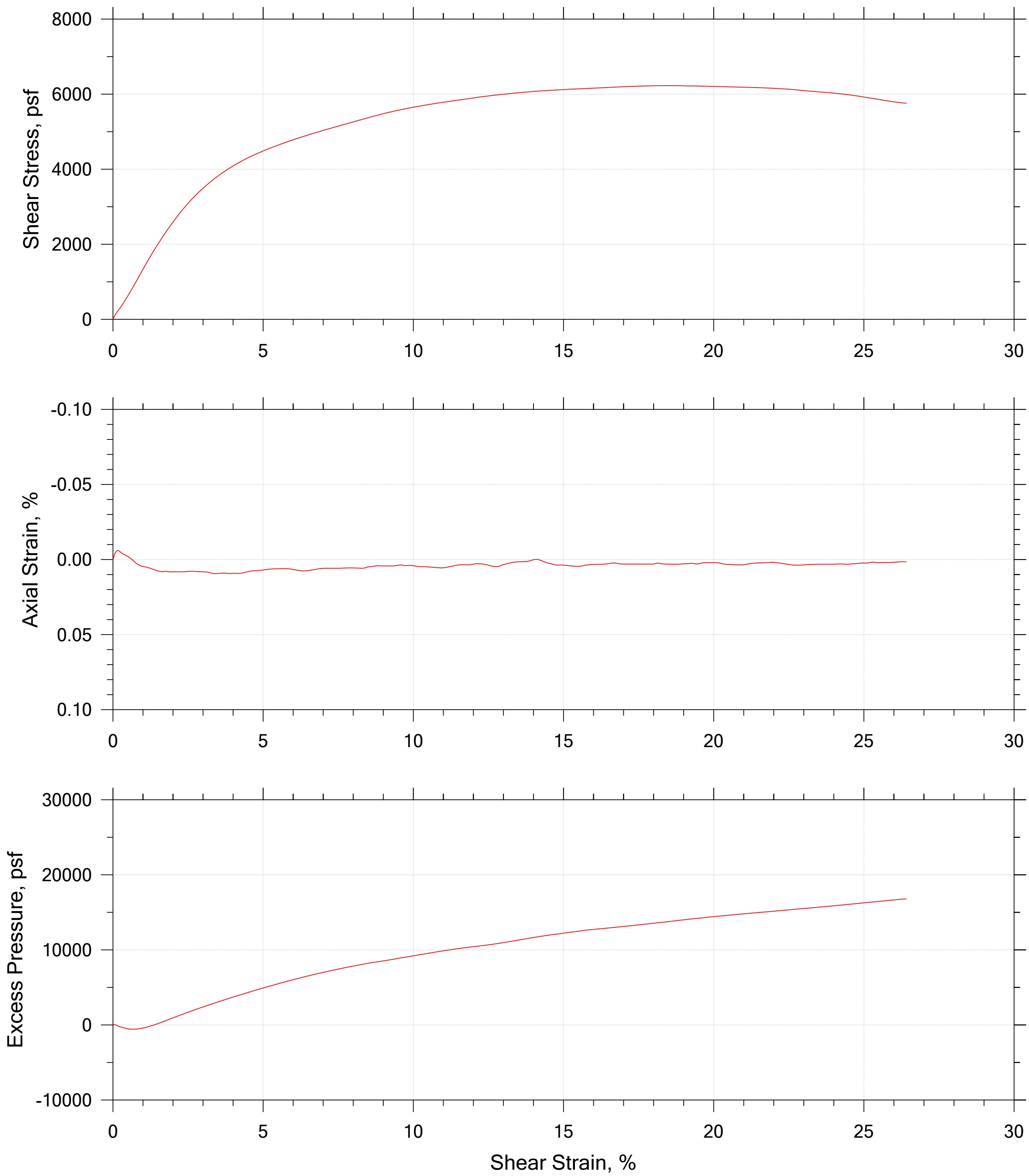
Project: Crossroads Phase 14	Location: Norridgewock, ME	Project No.: GTX-309940
Boring No.: GB-21	Tested By: md	Checked By: njh
Sample No.: 23-25	Test Date: 08/21/19	Depth: 23-25 ft
Test No.: DSS-8	Sample Type: intact	Elevation: ---
Description: Moist, dark gray clay		
Remarks: System N		

DIRECT SIMPLE SHEAR TEST by ASTM D6528



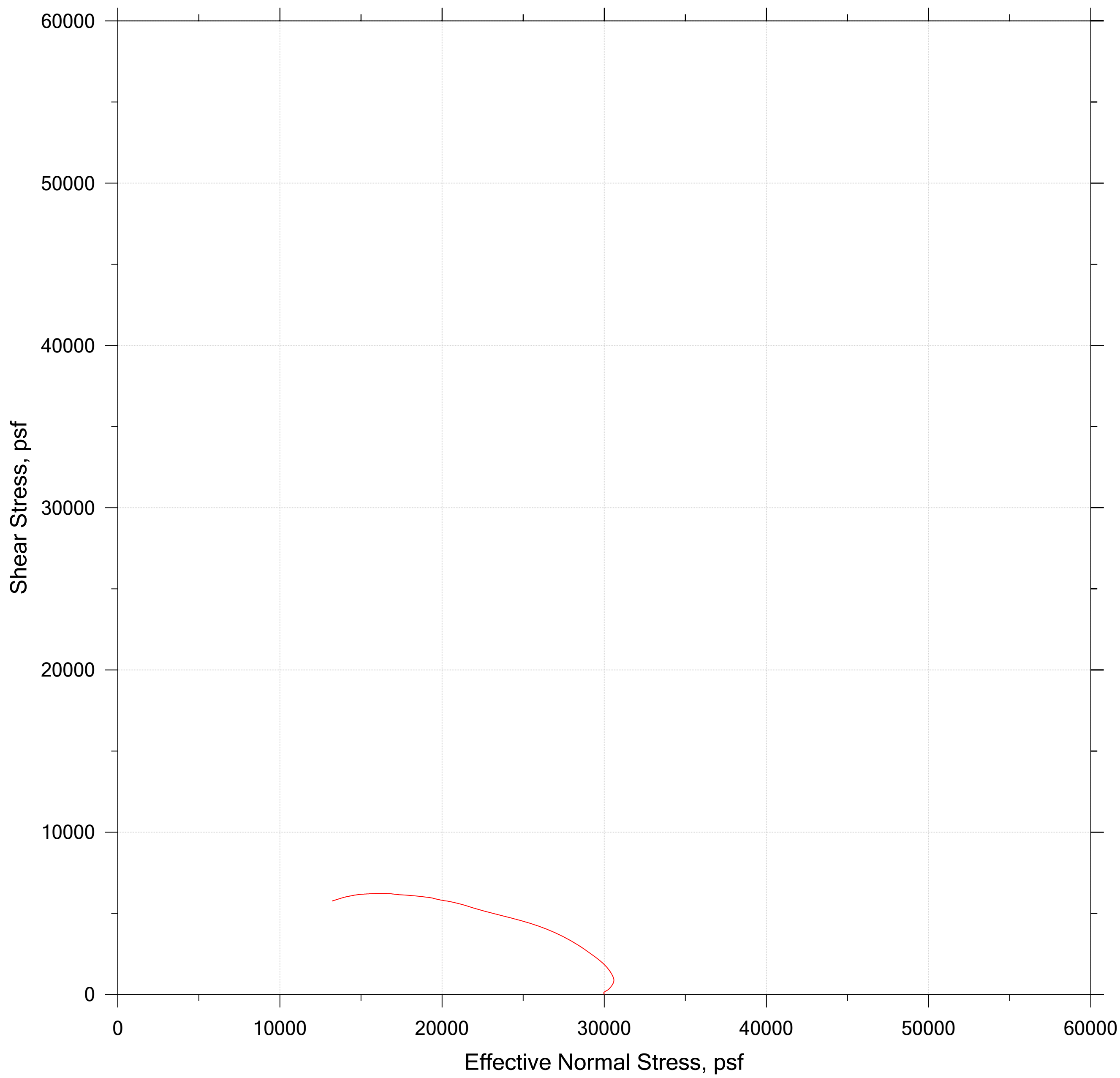
GeoTesting EXPRESS	Project: Crossroads Phase 14	Location: Norridgewock, ME	Project No.: GTX-309940
	Boring No.: GB-21	Tested By: md	Checked By: njh
	Sample No.: 23-25	Test Date: 08/21/19	Depth: 23-25 ft
	Test No.: DSS-8	Sample Type: intact	Elevation: ---
	Description: Moist, dark gray clay		
	Remarks: System N		

DIRECT SIMPLE SHEAR TEST by ASTM D6528



GeoTesting EXPRESS	Project: Crossroads Phase 14	Location: Norridgewock, ME	Project No.: GTX-309940
	Boring No.: GB-21	Tested By: md	Checked By: njh
	Sample No.: 23-25	Test Date: 08/20/19	Depth: 23-25 ft
	Test No.: DSS-9	Sample Type: intact	Elevation: ---
	Description: Moist, dark gray clay		
	Remarks: System N		
			Page 6 of 7

DIRECT SIMPLE SHEAR TEST by ASTM D6528



GeoTesting EXPRESS	Project: Crossroads Phase 14	Location: Norridgewock, ME	Project No.: GTX-309940
	Boring No.: GB-21	Tested By: md	Checked By: njh
	Sample No.: 23-25	Test Date: 08/20/19	Depth: 23-25 ft
	Test No.: DSS-9	Sample Type: intact	Elevation: ---
	Description: Moist, dark gray clay		
	Remarks: System N		

GeoTesting EXPRESS

Consolidated Undrained Direct Simple Shear Testing of Cohesive Soils by ASTM D6528

Client: Geosyntec Consultants GTX#: 309940
Project Name: Crossroads Phase 14 Test Date: 9/9/19
Project Location: Norridgewock, ME

Boring ID: GB-21
Sample ID: 23-25
Depth, ft: 23-25

Visual Description: Moist, dark gray clay

Test Equipment: Top and bottom box (circular) = 2.50 in diameter. Load cells and LVDT's connected to data acquisition system for shear force, normal load, horizontal and vertical displacement; surface area = 4.91 in^2, soil height = 1 inch. Stacked rings used. Set up included porous stones with pins.

Test Condition: Inundated prior to consolidation

Sample Type and Preparation: density Extruded from tube, cut, trimmed and placed into apparatus at as-received and moisture

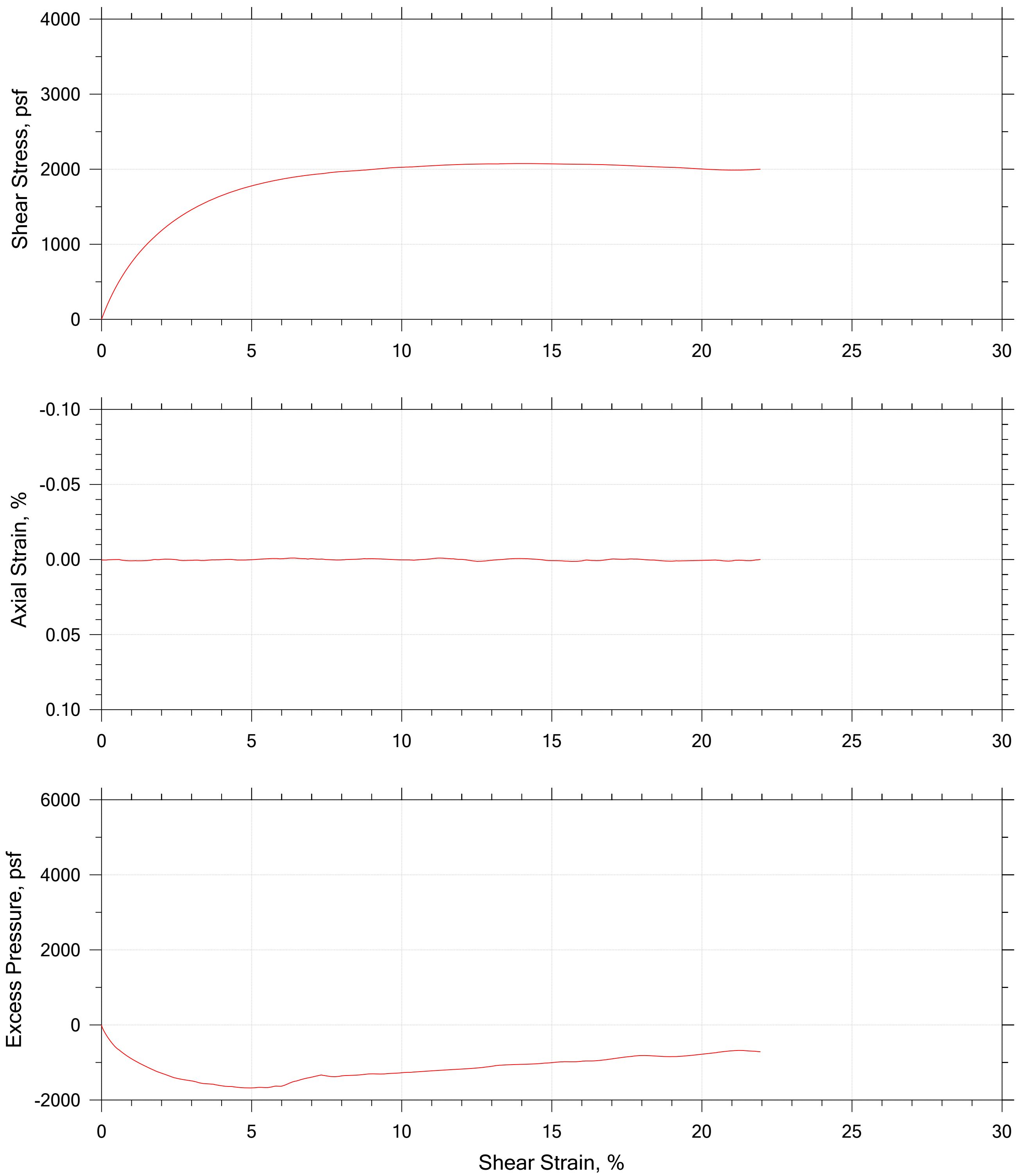
Parameter	Point 1	Point 2	Point 3	Point 4	Point 5
Test No.	DSS-13	DSS-14	DSS-15		
Initial Moisture Content, %	32.7	28.4	27.6		
Initial Dry Density, pcf	86.4	91.4	91.4		
Nominal Rate of Shear Strain, %/hr	5.0	5.0	5.0		
Maximum Vertical Consolidation Stress, psf	18,750	18,750	18,750		
Vertical Consolidation Stress at shear, psf	3,125	4,700	9,375		
Final Moisture Content, %	25.4	22.2	22.5		
Measured Peak Shear Stress, psf	2,077	2,292	3,338		
Shear Strain at Peak Shear Stress, %	13.9	15.6	12.0		
Membrane Correction, psf	61	56	62		
Corrected Peak Shear Stress, psf	2,016	2,236	3,276		
S_u / σ'_{vc}	0.65	0.48	0.35		

Comments:

Tested By: md Checked By: njh

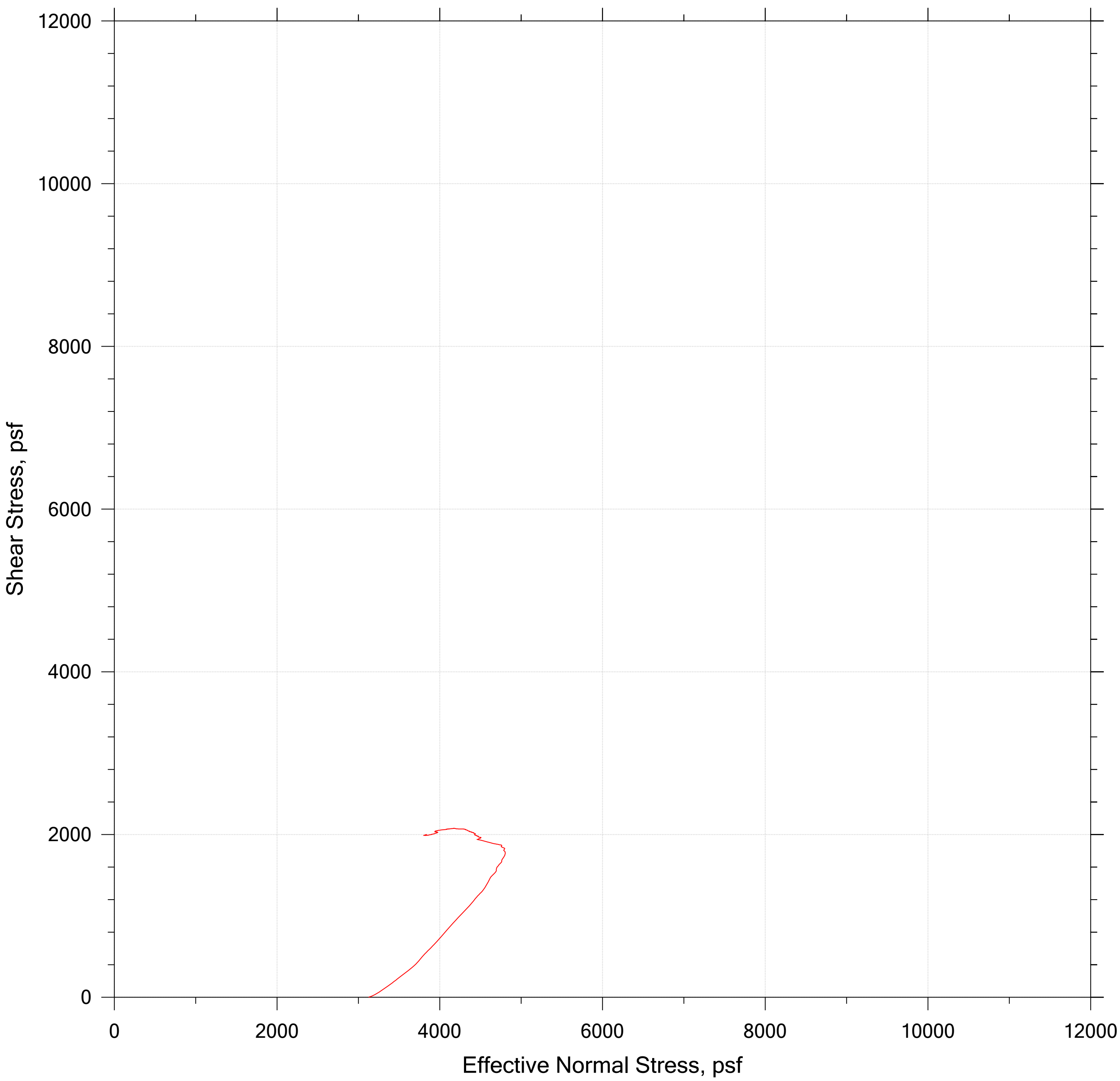
Notes: These results apply only to the sample tested for the specific test conditions. The test procedures employed follow accepted industry practice and the indicated test method. GeoTesting Express has no specific knowledge as to conditioning, origin, sampling procedure or intended use of the material.

DIRECT SIMPLE SHEAR TEST



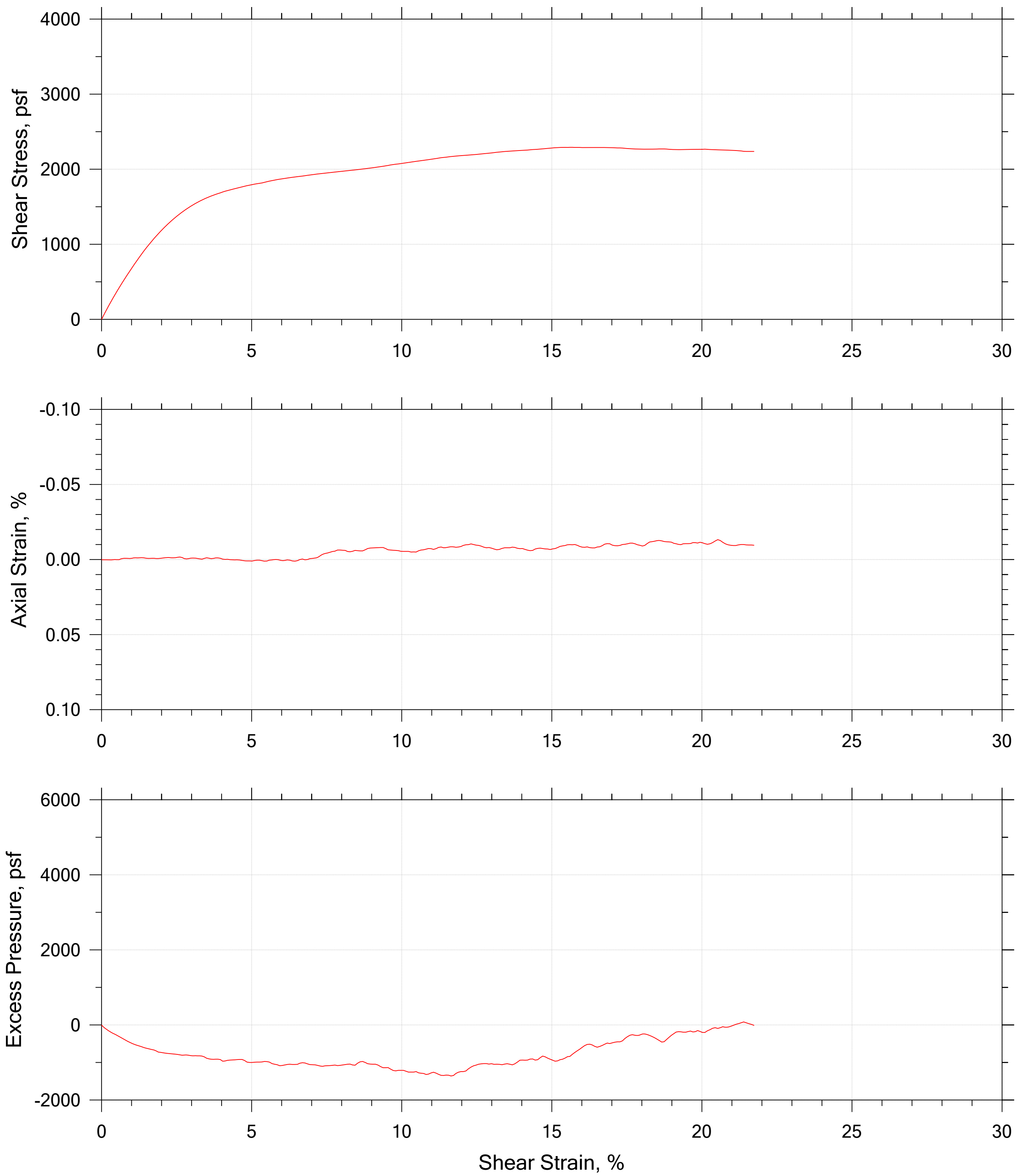
GeoTesting EXPRESS	Project: Crossroads Phase 14	Location: Norridgewock, ME	Project No.: GTX-309940
	Boring No.: GB-21	Tested By: md	Checked By: njh
	Sample No.: 23-25	Test Date: 09/19/19	Depth: 23-25 ft
	Test No.: DSS-13	Sample Type: intact	Elevation: ---
	Description: Moist, dark gray clay		
	Remarks: System HH		
			Page 2 of 7

DIRECT SIMPLE SHEAR TEST



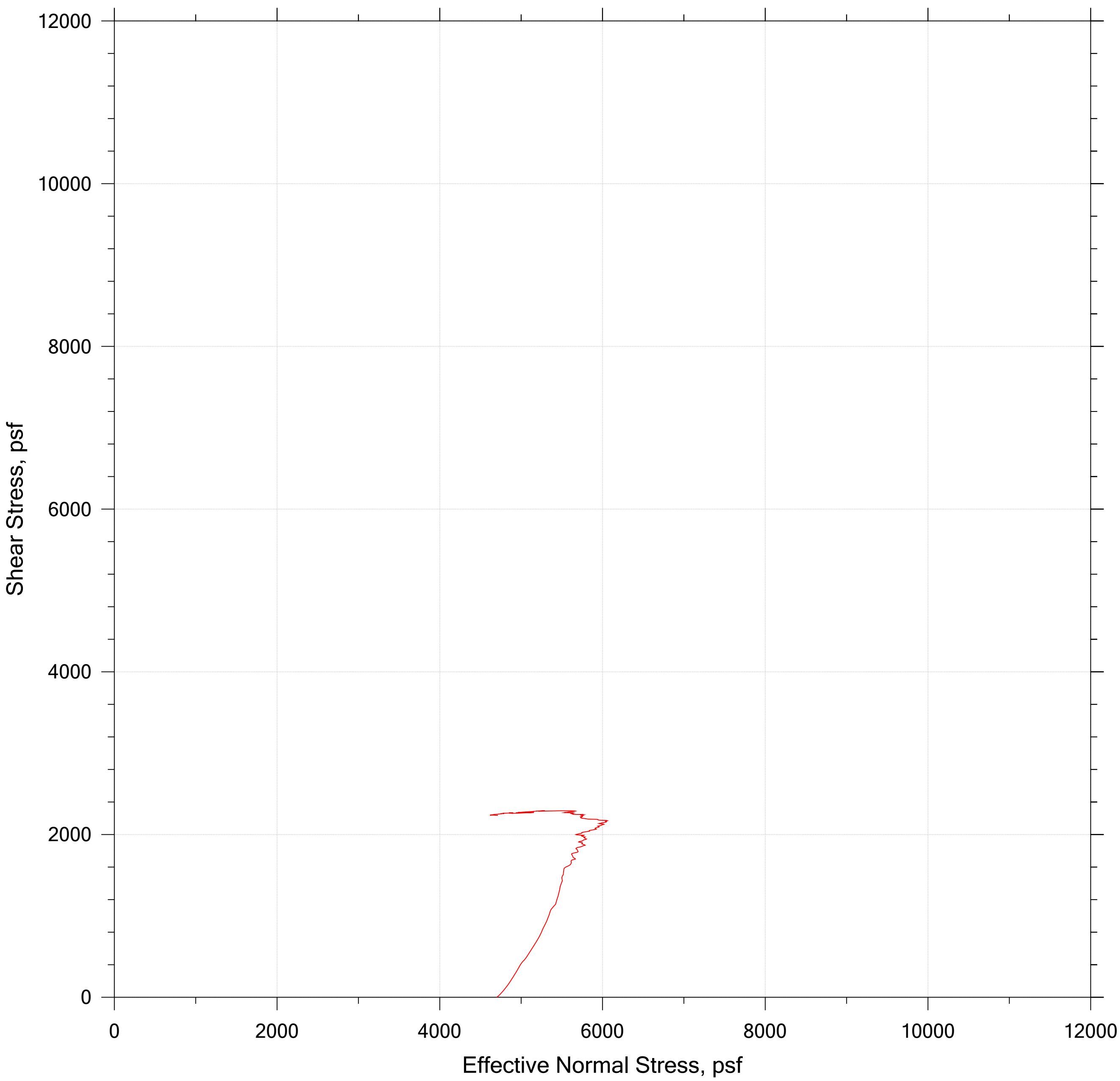
	Project: Crossroads Phase 14	Location: Norridgewock, ME	Project No.: GTX-309940
	Boring No.: GB-21	Tested By: md	Checked By: njh
GeoTesting EXPRESS	Sample No.: 23-25	Test Date: 09/19/19	Depth: 23-25 ft
	Test No.: DSS-13	Sample Type: intact	Elevation: ---
	Description: Moist, dark gray clay		
	Remarks: System HH		

DIRECT SIMPLE SHEAR TEST



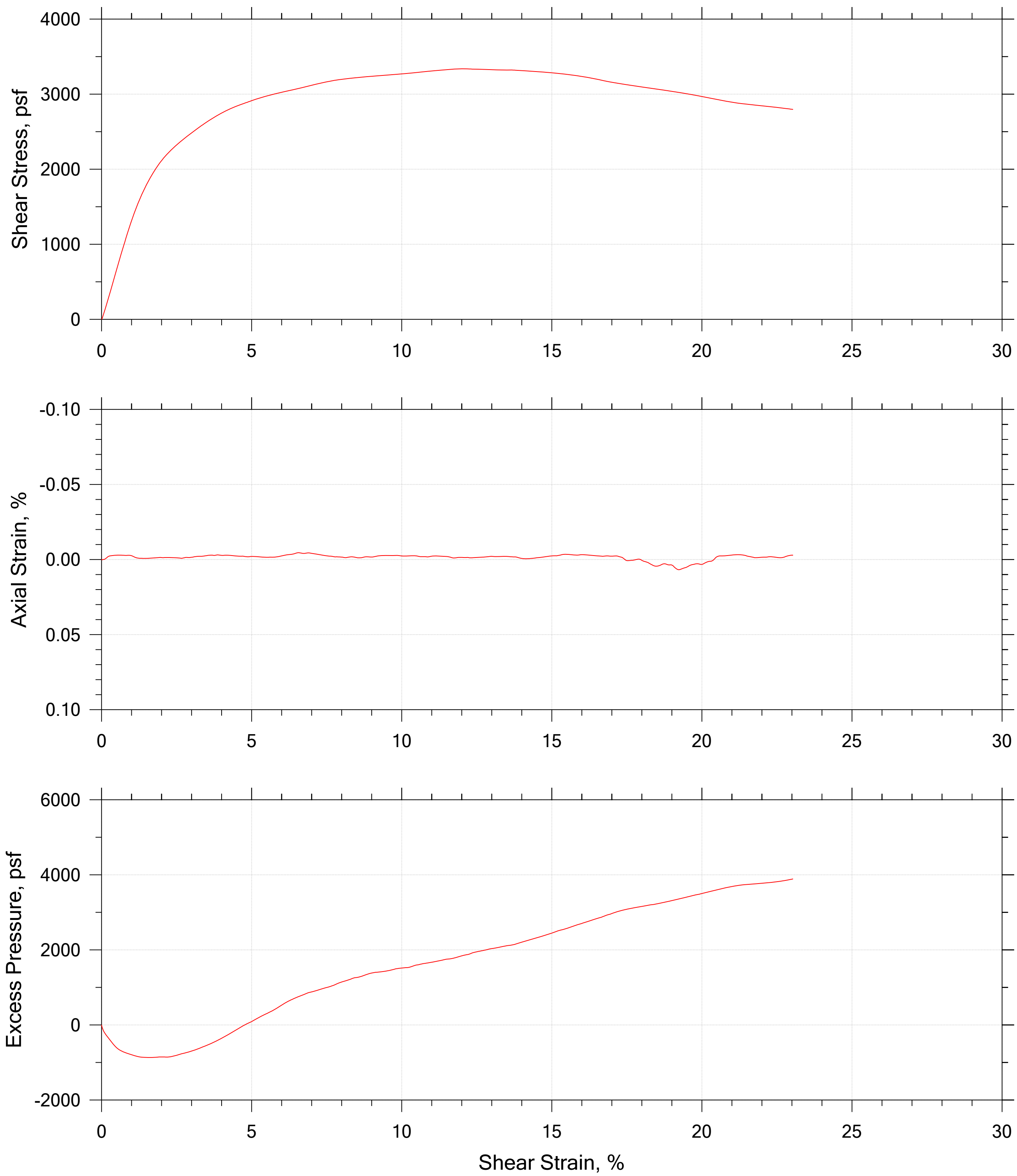
GeoTesting EXPRESS	Project: Crossroads Phase 14	Location: Norridgewock, ME	Project No.: GTX-309940
	Boring No.: GB-21	Tested By: md	Checked By: njh
	Sample No.: 23-25	Test Date: 09/13/19	Depth: 23-25 ft
	Test No.: DSS-14	Sample Type: intact	Elevation: ---
	Description: Moist, dark gray clay		
	Remarks: System HH		

DIRECT SIMPLE SHEAR TEST



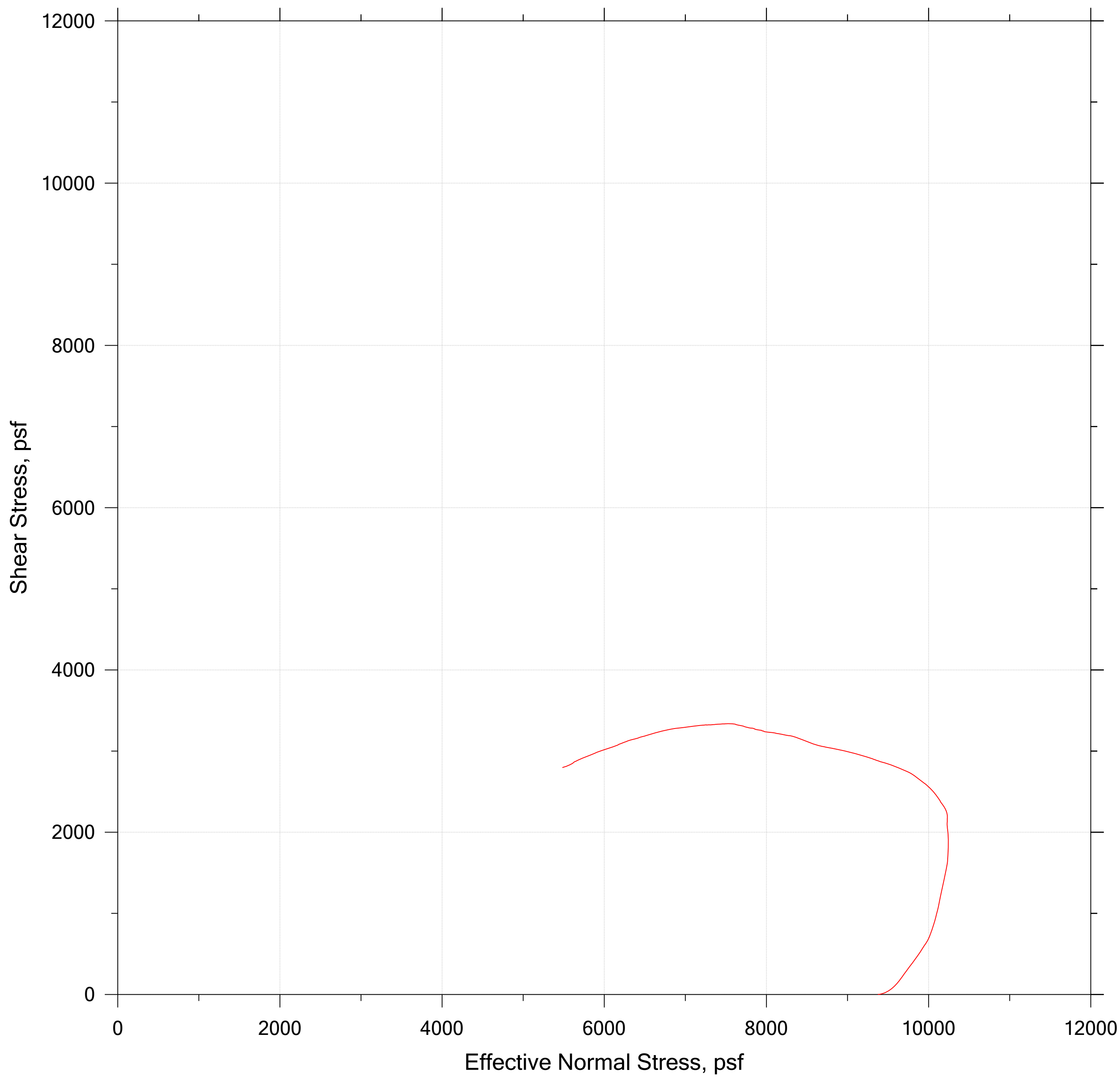
GeoTesting EXPRESS	Project: Crossroads Phase 14	Location: Norridgewock, ME	Project No.: GTX-309940
	Boring No.: GB-21	Tested By: md	Checked By: njh
	Sample No.: 23-25	Test Date: 09/13/19	Depth: 23-25 ft
	Test No.: DSS-14	Sample Type: intact	Elevation: ---
	Description: Moist, dark gray clay		
	Remarks: System HH		

DIRECT SIMPLE SHEAR TEST



GeoTesting EXPRESS	Project: Crossroads Phase 14	Location: Norridgewock, ME	Project No.: GTX-309940
	Boring No.: GB-21	Tested By: md	Checked By: njh
	Sample No.: 23-25	Test Date: 09/09/19	Depth: 23-25 ft
	Test No.: DSS-15	Sample Type: intact	Elevation: ---
	Description: Moist, dark gray clay		
	Remarks: System GG		

DIRECT SIMPLE SHEAR TEST



Project: Crossroads Phase 14	Location: Norridgewock, ME	Project No.: GTX-309940
Boring No.: GB-21	Tested By: md	Checked By: njh
Sample No.: 23-25	Test Date: 09/09/19	Depth: 23-25 ft
Test No.: DSS-15	Sample Type: intact	Elevation: ---
Description: Moist, dark gray clay		
Remarks: System GG		

ATTACHMENT 5
Slope Stability Inputs

Construction Condition

Section I

Slide Analysis Information

2019.10.01 Ph14 I Con

Project Summary

File Name:	2019.10.01 Ph14 I Con.slmd
Last saved with Slide version:	8.028
Project Title:	SLIDE - An Interactive Slope Stability Program
Date Created:	7/16/2019, 9:54:59 AM

Currently Open Scenarios

Group Name	Scenario Name	Compute Time
Construction	Master Scenario	
	Berm Inward	
	Berm Inward NC	
	Berm Outward	
	Berm Outward NC	
Construction Seismic	Master Scenario	
	Berm Inward	
	Berm Inward NC	
	Berm Outward	
	Berm Outward NC	

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard

	Master Scenario	Berm Inward	Berm Inward NC	Berm Outward	Berm Outward NC	Master Scenario	Berm Inward	Berm Inward NC	Berm Outward	Berm Outward NC
Failure Direction:	Right to Left	Left to Right	Left to Right	Right to Left	Right to Left	Right to Left	Left to Right	Left to Right	Right to Left	Right to Left

Analysis Options

All Open Scenarios	
Slices Type:	Vertical
Analysis Methods Used	
	Spencer
Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

All Open Scenarios	
Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

All Open Scenarios	
Pseudo-random Seed:	10116
Random Number Generation Method:	Park and Miller v.3

Surface Options

	Construction - Master Scenario	Construction - Berm Inward	Construction - Berm Inward NC	Construction - Berm Outward	Construction - Berm Outward NC	Construction Seismic - Master Scenario	Construction Seismic - Berm Inward	Construction Seismic - Berm Inward NC	Construction Seismic - Berm Outward	Construction Seismic - Berm Outward NC
Surface Type:	Circular	Circular	Non-Circular Block Search	Circular	Non-Circular Block Search	Circular	Circular	Non-Circular Block Search	Circular	Non-Circular Block Search
Search Method:	Grid Search	Grid Search		Grid Search		Grid Search	Grid Search		Grid Search	
Radius Increment:	10	10		10		10	10		10	
Number of Surfaces:			5000		5000			5000		5000
Composite Surfaces:	Disabled	Disabled		Disabled		Disabled	Disabled		Disabled	
Multiple Groups:			Disabled		Disabled			Disabled		Disabled
Reverse Curvature:	Invalid Surfaces	Invalid Surfaces		Invalid Surfaces		Invalid Surfaces	Invalid Surfaces		Invalid Surfaces	
Pseudo-Random Surfaces:			Enabled		Enabled			Enabled		Enabled
Minimum Elevation:	Not Defined	Not Defined		Not Defined		Not Defined	Not Defined		Not Defined	
Convex Surfaces Only:			Disabled		Disabled			Disabled		Disabled
Minimum Depth [ft]:	10	10		10		10	10		10	
Left Projection Angle (Start Angle) [°]:			105		105			105		105
Minimum Area:	Not Defined	Not Defined		Not Defined		Not Defined	Not Defined		Not Defined	
Left Projection Angle (End Angle) [°]:			165		165			165		165
Minimum Weight:	Not Defined	Not Defined		Not Defined		Not Defined	Not Defined		Not Defined	
Right Projection Angle (Start			15		15			15		15

Seismic Loading

Construction		Construction Seismic	
Advanced seismic analysis:	No	Advanced seismic analysis:	No
Staged pseudostatic analysis:	No	Staged pseudostatic analysis:	No
		Seismic Load Coefficient (Horizontal):	0.05

Loading

All Open Scenarios	
2 Distributed Loads present	
Distributed Load 1	
Distribution:	Constant
Magnitude [psf]:	2350
Orientation:	Normal to boundary
Distributed Load 2	
Distribution:	Constant
Magnitude [psf]:	2350
Orientation:	Normal to boundary

Tension Crack

Construction - Master Scenario	Construction - Berm Inward	Construction - Berm Inward NC	Construction - Berm Outward	Construction - Berm Outward NC	Construction Seismic - Master Scenario	Construction Seismic - Berm Inward	Construction Seismic - Berm Inward NC	Construction Seismic - Berm Outward	Construction Seismic - Berm Outward NC
		Water level: dry					Water level: dry		

Materials

Property	Till	Stiff Clay	Sand	Silty Sand	MSE Berm	Gray Clay (Construction)	Brown Clay (Construction)	Compacted Clay
Color								
Strength Type	Mohr-Coulomb	SHANSEP	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	SHANSEP	SHANSEP	Mohr-Coulomb
Unit Weight [lbs/ft3]	150	125	110	110	120	120	125	125
Cohesion [psf]	10000		0	0	100			100
Friction Angle [°]	50		36	32	32			32
A [psf]		0				0	0	
S		0.22				0.19	0.22	
m		0.76				0.66	0.76	
Stress History Type		Preconsolidation Pressure				Preconsolidation Pressure	Preconsolidation Pressure	
Definition Method		Constant [16500]				Constant [6500]	Constant [16500]	
Material Dependent Vertical Stress		No				Yes	Yes	
Water Surface	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario
Hu Value	1	1	1	1	1	1	1	1

SHANSEP Material Dependent Vertical Stress

Gray Clay (Construction)

Vertical stress computed using the following factored materials:

MSE Berm Factor=0

Brown Clay (Construction)

Vertical stress computed using the following factored materials:

MSE Berm Factor=0

Property	Bedrock
Color	
Strength Type	Infinite strength
Unit Weight [lbs/ft3]	165
Allow Sliding Along Boundary	Yes
Water Surface	Assigned per scenario
Ru Value	0

Materials In Use

Material	Master Scenario	Berm Inward	Berm Inward NC	Berm Outward	Berm Outward NC	Master Scenario	Berm Inward	Berm Inward NC	Berm Outward	Berm Outward NC
Till	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Stiff Clay	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Sand	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Silty Sand	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
MSE Berm	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Gray Clay (Construction)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Brown Clay (Construction)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Compacted Clay	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Bedrock	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Support

Tensar UX 1400HS

Support Type: GeoTextile
Force Application: Passive
Force Orientation: Tangent to Slip Surface
Anchorage: None
Shear Strength Model: Linear
Use External Loads for Strength: yes
Strip Coverage: 100 percent
Tensile Strength: 1760 lb/ft
Pullout Strength Adhesion: 0 psf
Pullout Strength Friction Angle: 32 degrees

Entity Information

Group: Construction

Shared Entities

Type	Coordinates X	Coordinates Y
	0	281
	0	280.708
	0	273.939
	0	266.891
	0	225
	955.688	225
	955.688	264.743
	955.688	275.3
	955.688	284.411
	955.688	284.461
	955.688	284.583
	948.65	284.512
	944.8	284.474
	929.465	284.32
	921.703	284.214
	915.325	284.178
	912.11	284.16
	912.098	284.16
	910.833	284.166
	898.456	284.029
	896.643	284.009
	877.063	283.793
	867.823	283.813
	865.575	283.827
	813.708	283.93
	811.444	283.935
	807.14	283.944
	801.376	283.956
	795.262	283.969
	778.517	284.006
	763.325	284.038
	757.261	284.051
	729.829	284.111
	707.026	284.16
	705.228	284.164
	697.819	284.18
	690.457	284.196
	683.979	284.21
	682.049	285.146
	680.153	286.067
	676.133	288.018
	669.966	291.011
	667.217	291.003
	666.301	291.001
	660.554	288.177
	659.866	287.839
	658.192	287.805
	642.479	287.488
	637.6	287.39
External Boundary	630.214	287.241
	623.011	287.096
	620.376	287.042
	619.033	287.015
	617.585	286.986
	577.803	286.183
	544.553	285.513
	502.138	286.353
	501.844	286.359
	472.81	286.934
	471.567	286.959
	469.326	287.003
	466.153	287.066
	464.119	287.106
	462.218	287.144
	460.096	287.186
	455.113	287.285
	454.875	287.29
	449.759	287.391
	447.777	287.43
	443.093	287.523
	439.515	287.594
	435.399	287.676
	427.563	287.831
	419.771	287.985
	417.173	288.037
	406.158	288.255
	405.978	288.259
	392.013	288.535
	383.976	288.695
	374.768	288.877
	354.023	289.288
	324.277	289.878
	318.242	289.997
	318.22	289.998
	315.888	290.044
	315.29	290.056
	314.919	290.179
	286.235	299.72
	246.306	313
	198.2	313
	195.982	299.72
	192.819	299.706
	182.055	299.543

Material Boundary

X	Y
619.033	287.015
619.52	287
630.718	286.662
632.557	286.606
641.994	286.33
644.627	286.265
646.34	286.223
646.7	286.217
648.69	286.182
649.594	286.169
649.807	286.167

Material Boundary

X	Y
948.65	284.512
955.688	284.461

Material Boundary

X	Y
561.949	277.79
572.269	277.949
641.067	279.011
644.22	279.06
646.186	279.09
652.393	279.186
653.747	279.207
659.538	279.297
660.83	279.316
666.909	279.41
667.378	279.418
669.718	279.454
673.447	279.395
675.357	279.365
679.604	279.298
684.364	279.223
686.311	279.192
693.346	279.082
693.657	279.077
700.598	278.967
701.752	278.949
708.374	278.845
712.489	278.78
712.693	278.777
712.863	278.774
713.785	278.76
715.445	278.734
716.164	278.722
717.896	278.695
721.891	278.632
723.528	278.606
727.723	278.54
735.435	278.419
739.571	278.354
744.463	278.277
755.326	278.106
755.732	278.099
771.022	277.859
771.637	277.849
772.652	277.851
776.697	277.858
778.213	277.862
779.795	277.866
785.351	277.88
786.249	277.881
790.806	277.885
792.366	277.886
794.888	277.844
795.384	277.844
802.016	277.837
804.92	277.792
804.92	276.213
804.92	268.199

Material Boundary

X	Y
561.949	270.487
561.949	277.678
561.949	277.79

X	Y
0	280.708
24.6958	280.409
40.2025	280
48.5504	280
57.9793	280
67.9982	280
74.306	280
74.704	280.013
74.7562	280.015
74.794	280.018
83.7541	280.296
89.8842	280.576
93.9549	281
100.984	281.404
112.746	282
127.83	282.826
131.196	283
[illegible]	[illegible]

X	Y
0	273.939
6.29333	274.079
25.8975	275
29.9123	275.111
31.6455	275.123
94.7822	276.378
116.114	276.502
161.458	277.232
185.649	277.524
195.982	277.62
204.894	277.702
211.751	277.723
211.852	277.723
212.526	277.725
226.008	277.761
227.871	277.765
240.504	277.78
242.726	277.782
249.207	277.784
255.378	277.786
302.483	278.011
304.015	278.012
316.187	278.009
321.31	278.006
329.233	278.001
330.25	277.999
341.923	277.989
344.698	277.985
354.694	277.975
396.385	278.061
400.868	278.055
407.627	278.048
408.579	278.047
415.05	278.038
420.957	278.032
429.459	278.021
470.347	278.021
474.364	278.017
477.742	278.013

Material Boundary

X	Y
139.918	287
143.096	287.095
143.205	287.102

Material Boundary

X	Y
352.685	287.194
354.933	287.082
356.598	287.007
356.764	287
357.029	287
357.166	286.993
357.435	286.998
357.518	287
357.779	287
364.935	287.439

Material Boundary

X	Y
637.6	287.39
641.293	287.034
649.807	286.167
651.149	286.152
651.473	286.149
652.312	286.144
653.352	286.137
654.038	286.133
654.788	286.131
655.925	286.127
656.676	286.125
657.083	286.125
658.708	286.123
658.827	286.123
660.517	286.115
662.033	286.11
662.232	286.11
664.437	286.114
665.265	286.112
667.015	286.117
667.949	286.12
669.33	286.126
680.153	286.067

Material Boundary

X	Y
813.708	283.93
867.823	283.813

Material Boundary

X	Y
577.803	286.183
623.787	285.113
624.668	285.106
625.499	285.099
626.233	285.092
632.124	285
635.181	285.228

Material Boundary

X	Y
729.829	284.111
730.883	284.083
733.562	284
740.975	283.806
753.073	283.445
757.465	283.317
758.709	283.294
762.746	283.229
764.959	283.234
768.236	283.292
769.206	283.334
780.078	283.583
785.167	283.673
785.209	283.674
788.586	283.728
801.376	283.956

Material Boundary

X	Y
877.063	283.793
894.385	283.967
915.325	284.178

Material Boundary

X	Y
867.823	283.813
877.937	283.75
889.736	283.901
889.869	283.902
894.385	283.967
896.643	284.009

Material Boundary

X	Y
944.8	284.474
950.496	284.441
955.688	284.411

Material Boundary

X	Y
0	281
8.4871	280.995
10.3132	280.995
12.7777	280.994
25.3074	280.985
33.3017	280.984
33.5149	280.984
33.7094	280.984
37.293	280.985
37.803	280.985
48.2248	280.991
49.4209	280.991
51.3305	280.992
56.7029	280.994
72.0436	281
73.7329	281.134
84.6255	282
89.3342	282.374
93.4125	283
99.638	283.955
99.93	284
100.29	284.052
109.448	285
115.628	285.938
116.004	286
116.454	286
116.893	286.074
139.918	287
143.096	287.128
143.205	287.102
143.237	287.102
144.62	287
157.512	286.234
157.528	286.236
161.628	286.694
164.365	287
169.055	287.524
170.207	288
171.308	288.455
172.629	289
176.536	290.613
177.473	291
177.619	291.06
179.894	292
181.676	292.736
182.316	293
186.271	293.973
186.351	294
186.531	294.015
194.951	294.704
195.982	294.789
195.982	299.72

Material Boundary

X	Y
195.982	299.72
198.264	299.72
204	299.72
286.235	299.72

Material Boundary

X	Y
116.004	286
116.454	286.056
116.893	286.074

Material Boundary

X	Y
195.982	294.789
198.264	294.976
198.564	295
201.454	295.544
207.049	295.565
208.002	295.575
221.269	295.851
224.774	295.926
238.208	296
244.382	295.901
255.416	295
273.528	294.503
284.751	294.006
284.887	294
288.791	293.526
290.322	293.34
293.116	293
298.419	292.356
301.418	292
303.444	291.771
309.039	291
312.834	290.47
314.919	290.179

Material Boundary

X	Y
364.935	287.439
371.251	287.826
374.089	288
374.396	288.025
375.154	288.076
383.976	288.695

Material Boundary

X	Y
315.888	290.044
323.365	289
330.28	288.444
334.205	288.129
336.463	288
349.296	287.362
352.685	287.194

Material Boundary

X	Y
290.322	293.34
303.444	291.771
306.051	291.459
309.942	291
310.305	290.954

Material Boundary

X	Y
318.242	289.997
330.28	288.444

Material Boundary

X	Y
198.264	294.976
198.264	299.72
201.738	299.757
204	299.72
228.278	299.317
236.652	299.204
241.367	299
251.167	298.288
275.39	295
283.422	294.177
284.751	294.006

Material Boundary

X	Y
315.29	290.056
325.555	286.641

X	Y
0	266.891
42.8393	267.653
83.6564	268.205
108.489	268.757
145.69	269.348
156.537	269.506
200.693	270
236.911	270.244
240.666	270.221
241.514	270.228
265.887	270.217
266.727	270.225
267.722	270.225
292.818	270.266
293.687	270.272
294.703	270.273
295.952	270.285
320.596	270.334
321.247	270.341
322.584	270.343
324.09	270.356
348.11	270.404
348.906	270.41
350.464	270.412
351.709	270.422

Scenario-based Entities

Type	Coordinates	Master Scenario	Berm Inward	Berm Inward NC	Berm Outward	Berm Outward NC
Piezoline	X / Y 0 / 283 955.688 / 283	Assigned to materials: Stiff Clay Gray Clay (Construction) Brown Clay (Construction)	Assigned to materials: Stiff Clay Gray Clay (Construction) Brown Clay (Construction)	Assigned to materials: Stiff Clay Gray Clay (Construction) Brown Clay (Construction)	Assigned to materials: Stiff Clay Gray Clay (Construction) Brown Clay (Construction)	Assigned to materials: Stiff Clay Gray Clay (Construction) Brown Clay (Construction)
Piezoline	X / Y 0 / 295 75 / 290 955.688 / 287	Assigned to materials: Sand Silty Sand MSE Berm Compacted Clay	Assigned to materials: Sand Silty Sand MSE Berm Compacted Clay	Assigned to materials: Sand Silty Sand MSE Berm Compacted Clay	Assigned to materials: Sand Silty Sand MSE Berm Compacted Clay	Assigned to materials: Sand Silty Sand MSE Berm Compacted Clay
Piezoline	X / Y 0 / 283	Assigned to materials:	Assigned to materials:	Assigned to materials:	Assigned to materials:	Assigned to materials:

		Till	Till	Till	Till	Till
Distributed Load	X, Y 205.662, 313 203.998, 313	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No
Distributed Load	X, Y 215.996, 313 214.332, 313	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No
Bolt	X, Y 196.196, 301 231.196, 301	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS
Bolt	X, Y 196.447, 302.5 231.447, 302.5	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS
Bolt	X, Y 196.697, 304 231.697, 304	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS
Bolt	X, Y 196.948, 305.5 231.948, 305.5	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS
Bolt	X, Y 197.198, 307 232.198, 307	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS
Bolt	X, Y 197.449, 308.5 232.449, 308.5	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS
Bolt	X, Y 197.699, 310 232.699, 310	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS
Bolt	X, Y 197.95, 311.5 232.95, 311.5	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS
Bolt	X, Y 198.2, 313 233.2, 313	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS
Tension Crack	X, Y 197.95, 311.5 242.95, 311.5 250.795, 311.507	✗	✗	Water level: dry	✗	✗
Block Search Window	X, Y 216.622, 263.268 278.021, 263.268 278.021, 292.433 216.732, 292.433	✗	✗	✓	✗	✓
Block Search Window	X, Y 267.468, 261 323.604, 261 323.604, 289.507 267.578, 289.507	✗	✗	✓	✗	✓

Group: Construction Seismic

Shared Entities

Type	Coordinates X	Coordinates Y
	0	281
	0	280.708
	0	273.939
	0	266.891
	0	225
	955.688	225
	955.688	264.743
	955.688	275.3
	955.688	284.411
	955.688	284.461
	955.688	284.583
	948.65	284.512
	944.8	284.474
	929.465	284.32
	921.703	284.214
	915.325	284.178
	912.11	284.16
	912.098	284.16
	910.833	284.166
	898.456	284.029
	896.643	284.009
	877.063	283.793
	867.823	283.813
	865.575	283.827
	813.708	283.93
	811.444	283.935
	807.14	283.944
	801.376	283.956
	795.262	283.969
	778.517	284.006

Material Boundary

X	Y
619.033	287.015
619.52	287
630.718	286.662
632.557	286.606
641.994	286.33
644.627	286.265
646.34	286.223
646.7	286.217
648.69	286.182
649.594	286.169
649.807	286.167

Material Boundary

X	Y
948.65	284.512
955.688	284.461

X	Y
561.949	277.79
572.269	277.949
641.067	279.011
644.22	279.06
646.186	279.09
652.393	279.186
653.747	279.207
659.538	279.297
660.83	279.316
666.909	279.41
667.378	279.418
669.718	279.454
673.447	279.395
675.357	279.365
679.604	279.298

Material Boundary

X	Y
561.949	270.487
561.949	277.678
561.949	277.79

Material Boundary

X	Y
0	280.708
24.6958	280.409
40.2025	280
48.5504	280
57.9793	280
67.9982	280
74.306	280
74.704	280.013
74.7562	280.015
74.794	280.018
83.7541	280.296
89.8842	280.576
93.9549	281
100.984	281.404
112.746	282
127.83	282.826
131.196	283
144.428	284.864
145.329	285
145.933	284.894
150.488	284
175.313	285.243
190.458	286
195.982	286.081
218.98	286.416
223.63	286.484
231.387	286.584
238.071	286.642
239.273	286.653
240.185	286.652
243.28	286.676
248.857	286.71
251.159	286.724
251.343	286.725
258.37	286.736
258.847	286.737
268.913	286.701
275.004	286.698
286.022	286.717
289.477	286.713
297.242	286.689
303.695	286.678
317.857	286.658
320.139	286.653
325.073	286.642
325.555	286.641
327.113	286.638
330.461	286.627
334.459	286.617
340.464	286.604
342.399	286.534
342.972	286.523
343.523	286.512
352.015	286.485
358.969	286.459
368.353	286.416
368.84	286.423
368.896	286.428

Material Boundary

X	Y
0	273.939
6.29333	274.079
25.8975	275
29.9123	275.111
31.6455	275.123
94.7822	276.378
116.114	276.502
161.458	277.232
185.649	277.524
195.982	277.62
204.894	277.702
211.751	277.723
211.852	277.723
212.526	277.725
226.008	277.761
227.871	277.765
240.504	277.78
242.726	277.782
249.207	277.784
255.378	277.786
302.483	278.011
304.015	278.012
316.187	278.009
321.31	278.006
329.233	278.001
330.25	277.999
341.923	277.989
344.698	277.985
354.694	277.975
396.385	278.061
400.868	278.055
407.627	278.048
408.579	278.047
415.05	278.038
420.957	278.032
429.459	278.021
470.347	278.021
474.364	278.017
477.742	278.013
484.716	278.004
486.93	278.003
499.157	277.991
499.948	277.99
506.702	277.99
512.604	277.988
513.173	277.987
515.882	277.999
524.272	278.025
525.272	278.023
527.27	278.011
532.375	277.989
539.795	277.889
548.888	277.795
557.096	277.703
561.949	277.678
607.196	277.444
624.402	277.269
625.106	277.261
626.307	277.25
644.759	277.072
645.582	277.064
682.72	276.859
696.855	276.743
703.362	276.684
709.126	276.651
713.666	276.619
726.046	276.532
743.571	276.458
749.356	276.434
762.201	276.382
766.73	276.355
781.908	276.291
793.63	276.251
804.92	276.213
805.635	276.21
808.908	276.207
830.39	276.131
847.08	276.017
857.773	275.995

Material Boundary

X	Y
139.918	287
143.096	287.095
143.205	287.102

Material Boundary

X	Y
352.685	287.194
354.933	287.082
356.598	287.007
356.764	287
357.029	287
357.166	286.993
357.435	286.998
357.518	287
357.779	287
364.935	287.439

Material Boundary

X	Y
637.6	287.39
641.293	287.034
649.807	286.167
651.149	286.152
651.473	286.149
652.312	286.144
653.352	286.137
654.038	286.133
654.788	286.131
655.925	286.127
656.676	286.125
657.083	286.125
658.708	286.123
658.827	286.123
660.517	286.115
662.033	286.11
662.232	286.11
664.437	286.114
665.265	286.112
667.015	286.117
667.949	286.12
669.33	286.126
680.153	286.067

Material Boundary

X	Y
813.708	283.93
867.823	283.813

Material Boundary

X	Y
577.803	286.183
623.787	285.113
624.668	285.106
625.499	285.099
626.233	285.092
632.124	285
635.181	285.228
636.746	285.348
653.262	286
669.074	285.448
680.437	285.184
682.049	285.146

Material Boundary

X	Y
729.829	284.111
730.883	284.083
733.562	284
740.975	283.806
753.073	283.445
757.465	283.317
758.709	283.294
762.746	283.229
764.959	283.234
768.236	283.292
769.206	283.334
780.078	283.583
785.167	283.673
785.209	283.674
788.586	283.728
801.376	283.956

Material Boundary

X	Y
877.063	283.793
894.385	283.967
915.325	284.178

Material Boundary

X	Y
867.823	283.813
877.937	283.75
889.736	283.901
889.869	283.902
894.385	283.967
896.643	284.009

X	Y
944.8	284.474

Material Boundary

X	Y
0	281
8.4871	280.995
10.3132	280.995
12.7777	280.994
25.3074	280.985
33.3017	280.984
33.5149	280.984
33.7094	280.984
37.293	280.985
37.803	280.985
48.2248	280.991
49.4209	280.991
51.3305	280.992
56.7029	280.994
72.0436	281
73.7329	281.134
84.6255	282
89.3342	282.374
93.4125	283
99.638	283.955
99.93	284
100.29	284.052
109.448	285
115.628	285.938
116.004	286
116.454	286
116.893	286.074
139.918	287
143.096	287.128
143.205	287.102
143.237	287.102
144.62	287
157.512	286.234
157.528	286.236
161.628	286.694
164.365	287
169.055	287.524
170.207	288
171.308	288.455
172.629	289
176.536	290.613
177.473	291
177.619	291.06
179.894	292
181.676	292.736
182.316	293
186.271	293.973
186.351	294
186.531	294.015
194.951	294.704
195.982	294.789
195.982	299.72

Material Boundary

X	Y
195.982	299.72
198.264	299.72
204	299.72
286.235	299.72

Material Boundary

X	Y
116.004	286
116.454	286.056
116.893	286.074

Material Boundary

X	Y
195.982	294.789
198.264	294.976
198.564	295
201.454	295.544
207.049	295.565
208.002	295.575
221.269	295.851
224.774	295.926
238.208	296
244.382	295.901
255.416	295
273.528	294.503
284.751	294.006
284.887	294
288.791	293.526
290.322	293.34
293.116	293
298.419	292.356
301.418	292
303.444	291.771
309.039	291
312.834	290.47
314.919	290.179

Material Boundary

X	Y
364.935	287.439
371.251	287.826
374.089	288
374.396	288.025
375.154	288.076
383.976	288.695

X	Y

Material Boundary

X	Y
290.322	293.34
303.444	291.771
306.051	291.459
309.942	291
310.305	290.954

Material Boundary

X	Y
318.242	289.997
330.28	288.444

Material Boundary

X	Y
198.264	294.976
198.264	299.72
201.738	299.757
204	299.72
228.278	299.317
236.652	299.204
241.367	299
251.167	298.288
275.39	295
283.422	294.177
284.751	294.006

Material Boundary

X	Y
315.29	290.056
325.555	286.641

Material Boundary

X	Y
0	266.891
42.8393	267.653
83.6564	268.205
108.489	268.757
145.69	269.348
156.537	269.506
200.693	270
236.911	270.244
240.666	270.221
241.514	270.228
265.887	270.217
266.727	270.225
267.722	270.225
292.818	270.266
293.687	270.272
294.703	270.273
295.952	270.285
320.596	270.334
321.247	270.341
322.584	270.343
324.09	270.356
348.11	270.404
348.906	270.41
350.464	270.412
351.709	270.422
372.775	270.46
376.803	270.466
378.244	270.476
401.6	270.51
402.579	270.517
403.824	270.518
405.864	270.529
429.482	270.554
430.152	270.558
430.744	270.558
443.891	270.566
446.425	270.577
457.632	270.583
458.062	270.585
481.192	270.583
483.983	270.592
486.101	270.591
486.409	270.592
507.778	270.575
509.408	270.579
515.185	270.571
516.67	270.575
534.356	270.546
537.057	270.548
544.472	270.532
544.814	270.532
560.895	270.491
561.949	270.487
572.548	270.454
574.68	270.453
586.902	270.408
587.333	270.408
604.556	270.331
605.962	270.329
613.057	270.294
613.561	270.293
638.274	270.149
638.804	270.147
639.669	270.141
659.114	270
664.784	269.957

Scenario-based Entities

Type	Coordinates	Master Scenario	Berm Inward	Berm Inward NC	Berm Outward	Berm Outward NC
Piezoline	X Y 0 283 955.688 283	Assigned to materials: Stiff Clay Gray Clay (Construction) Brown Clay (Construction)	Assigned to materials: Stiff Clay Gray Clay (Construction) Brown Clay (Construction)	Assigned to materials: Stiff Clay Gray Clay (Construction) Brown Clay (Construction)	Assigned to materials: Stiff Clay Gray Clay (Construction) Brown Clay (Construction)	Assigned to materials: Stiff Clay Gray Clay (Construction) Brown Clay (Construction)
Piezoline	X Y 0 295 75 290 955.688 287	Assigned to materials: Sand Silty Sand MSE Berm Compacted Clay	Assigned to materials: Sand Silty Sand MSE Berm Compacted Clay	Assigned to materials: Sand Silty Sand MSE Berm Compacted Clay	Assigned to materials: Sand Silty Sand MSE Berm Compacted Clay	Assigned to materials: Sand Silty Sand MSE Berm Compacted Clay
Piezoline	X Y 0 283 955.7 285	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till
Distributed Load	X Y 205.662 313 203.998 313	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No
Distributed Load	X Y 215.996 313 214.332 313	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No
Bolt	X Y 196.196 301 231.196 301	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS
Bolt	X Y 196.447 302.5 231.447 302.5	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS
Bolt	X Y 196.697 304 231.697 304	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS
Bolt	X Y 196.948 305.5 231.948 305.5	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS
Bolt	X Y 197.198 307 232.198 307	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS
Bolt	X Y 197.449 308.5 232.449 308.5	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS
Bolt	X Y 197.699 310 232.699 310	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS

Bolt	X Y 197.95 311.5 232.95 311.5	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS
Bolt	X Y 198.2 313 233.2 313	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS
Tension Crack	X Y 197.95 311.5 242.95 311.5 250.795 311.507	✗	✗	Water level: dry	✗	✗
Block Search Window	X Y 216.622 263.268 278.021 263.268 278.021 292.433 216.732 292.433	✗	✗	✓	✗	✓
Block Search Window	X Y 267.468 261 323.604 261 323.604 289.507 267.578 289.507	✗	✗	✓	✗	✓

Section II

Slide Analysis Information

2019.10.01 Ph14 II Con

Project Summary

File Name:	2019.10.01 Ph14 II Con.slmd
Last saved with Slide version:	8.028
Project Title:	SLIDE - An Interactive Slope Stability Program
Date Created:	7/16/2019, 9:54:59 AM

Currently Open Scenarios

Group Name	Scenario Name	Compute Time
Construction	Master Scenario	
	Berm Inward	
	Berm Inward NC	
	Berm Outward	
	Berm Outward NC	
Construction Seismic	Master Scenario	
	Berm Inward	
	Berm Inward NC	
	Berm Outward	
	Berm Outward NC	

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard

	Master Scenario	Berm Inward	Berm Inward NC	Berm Outward	Berm Outward NC	Master Scenario	Berm Inward	Berm Inward NC	Berm Outward	Berm Outward NC
Failure Direction:	Right to Left	Left to Right	Left to Right	Right to Left	Right to Left	Right to Left	Left to Right	Left to Right	Right to Left	Right to Left

Analysis Options

All Open Scenarios	
Slices Type:	Vertical
Analysis Methods Used	
	Spencer
Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

All Open Scenarios	
Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

All Open Scenarios	
Pseudo-random Seed:	10116
Random Number Generation Method:	Park and Miller v.3

Surface Options

Construction - Master Scenario	
Surface Type:	Circular
Search Method:	Auto Refine Search
Divisions along slope:	20
Circles per division:	10
Number of iterations:	10
Divisions to use in next iteration:	50%
Composite Surfaces:	Disabled
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Construction - Berm Inward	
Surface Type:	Circular
Search Method:	Grid Search
Radius Increment:	10
Composite Surfaces:	Disabled
Reverse Curvature:	Invalid Surfaces
Minimum Elevation:	Not Defined
Minimum Depth [ft]:	10
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Construction - Berm Inward NC	
Surface Type:	Non-Circular Block Search
Number of Surfaces:	5000
Multiple Groups:	Disabled
Pseudo-Random Surfaces:	Enabled
Convex Surfaces Only:	Disabled
Left Projection Angle (Start Angle) [°]:	105
Left Projection Angle (End Angle) [°]:	165
Right Projection Angle (Start Angle) [°]:	15
Right Projection Angle (End Angle) [°]:	75
Minimum Elevation:	Not Defined
Minimum Depth [ft]:	10
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Construction - Berm Outward	
Surface Type:	Circular
Search Method:	Grid Search
Radius Increment:	10
Composite Surfaces:	Disabled
Reverse Curvature:	Invalid Surfaces
Minimum Elevation:	Not Defined
Minimum Depth [ft]:	10
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Construction - Berm Outward NC	
Surface Type:	Non-Circular Block Search
Number of Surfaces:	5000
Multiple Groups:	Disabled
Pseudo-Random Surfaces:	Enabled
Convex Surfaces Only:	Disabled
Left Projection Angle (Start Angle) [°]:	105
Left Projection Angle (End Angle) [°]:	165
Right Projection Angle (Start Angle) [°]:	15
Right Projection Angle (End Angle) [°]:	75
Minimum Elevation:	Not Defined
Minimum Depth [ft]:	10
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Construction Seismic	
Surface Type:	Circular
Search Method:	Auto Refine Search
Divisions along slope:	20
Circles per division:	10
Number of iterations:	10
Divisions to use in next iteration:	50%
Composite Surfaces:	Disabled
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Construction		Construction Seismic	
Advanced seismic analysis:	No	Advanced seismic analysis:	No
Staged pseudostatic analysis:	No	Staged pseudostatic analysis:	No
		Seismic Load Coefficient (Horizontal):	0.05

Loading

All Open Scenarios	
2 Distributed Loads present	
Distributed Load 1	
Distribution:	Constant
Magnitude [psf]:	2350
Orientation:	Normal to boundary
Distributed Load 2	
Distribution:	Constant
Magnitude [psf]:	2350
Orientation:	Normal to boundary

Tension Crack

Construction - Master Scenario	Construction - Berm Inward	Construction - Berm Inward NC	Construction - Berm Outward	Construction - Berm Outward NC	Construction Seismic - Master Scenario	Construction Seismic - Berm Inward	Construction Seismic - Berm Inward NC	Construction Seismic - Berm Outward	Construction Seismic - Berm Outward NC
		Water level: dry		Water level: dry			Water level: dry		Water level: dry

Materials

Property	Till	Sand	Silty Sand	MSE Berm	Liner Bottom	Gray Clay (Construction)	Brown Clay (Construction)	Compacted Clay
Color								
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	SHANSEP	SHANSEP	Mohr-Coulomb
Unit Weight [lbs/ft3]	150	110	110	120	120	120	125	125
Cohesion [psf]	10000	0	0	100	0			100
Friction Angle [°]	50	36	32	32	18.3			32
A [psf]						0	0	
S						0.19	0.22	
m						0.66	0.76	
Stress History Type						Preconsolidation Pressure	Preconsolidation Pressure	
Definition Method						Constant [7000]	Constant [21000]	
Material Dependent Vertical Stress						Yes	Yes	
Water Surface	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario
Hu Value	1	1	1	1		1	1	1
Ru Value					0			

SHANSEP Material Dependent Vertical Stress

Gray Clay (Construction)

Vertical stress computed using the following factored materials:

MSE Berm   Factor=0

Brown Clay (Construction)

Vertical stress computed using the following factored materials:

MSE Berm   Factor=0

Property	Bedrock
Color	
Strength Type	Infinite strength
Unit Weight [lbs/ft3]	165
Allow Sliding Along Boundary	Yes
Water Surface	Assigned per scenario
Ru Value	0

Materials In Use

Material	Master Scenario	Berm Inward	Berm Inward NC	Berm Outward	Berm Outward NC	Master Scenario	Berm Inward	Berm Inward NC	Berm Outward	Berm Outward NC
Till	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Sand	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Silty Sand	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
MSE Berm	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Liner Bottom	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Gray Clay (Construction)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Brown Clay (Construction)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Compacted Clay	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Bedrock	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Support

Support 1

Support Type: GeoTextile
Force Application: Active
Force Orientation: Parallel to Reinforcement
Anchorage: None
Shear Strength Model: Linear
Use External Loads for Strength: yes
Strip Coverage: 100 percent
Tensile Strength: 1760 lb/ft
Pullout Strength Adhesion: 0 psf
Pullout Strength Friction Angle: 32 degrees

Entity Information

Group: Construction

Shared Entities

Type	Coordinates X	Coordinates Y
External Boundary	133.61	304.958
	133.033	304.766
	124.708	302
	4.22254	302
	0	303.688
	0	295.53
	0	292.466
	0	288.041
	0	285.839
	0	225
	896.857	225
	896.857	261.717
	896.857	271.503
	896.857	275.385
	896.857	282.691
	896.857	283.309
	852.441	283.878
	852.375	283.879
	851.228	283.893
	848.212	283.932
	844.022	283.986
	842.906	284
	839.926	284.038
	836.162	284.086
	810.597	284.414
	801.627	284.528
	784.323	284.747
	718.692	285.592
	718.64	285.593
	718.339	285.597
	717.435	285.608
	716.263	285.624
	715.121	285.638
	714.464	285.647
	714.01	285.653
	713.939	285.653
	713.334	285.661
	712.927	285.666
	711.871	285.68
	710.842	285.693
	709.839	285.706
	676.836	286.131
	668.377	286.296
	608.598	287.458
	606.896	287.491
	600.758	287.61
	600.519	287.615
	599.051	287.644
	596.359	287.696
	593.474	287.752
	590.375	287.812
	587.035	287.877
	583.428	287.947
	579.519	288.023
	575.268	288.106
	573.088	288.148
	570.628	288.196
	566.958	288.268
	565.545	288.295
	563.767	288.33
	483.178	289.897
	478.828	289.981
	471.975	290.114
	464.63	290.257
	456.739	290.411
	448.238	290.576
	445.698	290.625
	439.054	290.755
	429.102	290.948
	418.279	291.159
	416.036	291.202
	406.467	291.388
	402.586	291.464
	396.475	291.582
	393.525	291.64
	389.006	291.728
	365.598	292.183
	358.601	292.319
	355.296	292.383
	352.052	292.446
	347.585	292.533
	346.335	292.557
	335.78	292.763
	335.095	292.776
	332.014	292.836
	323.096	293.009
	317.473	293.119
	313.461	294.238
	311.637	294.748
	310.616	295.032
	308.901	295.511
	306.591	296.156
	301.144	297.676
	300.29	297.686
	298.78	297.704
	296.015	297.736
	294.452	297.754
	291.536	297.008
	286.943	295.832
	283.627	294.984
	282.705	294.748
	282.007	294.749
	275.141	297.037
	258.94	302.436
	252.537	304.569
	242.844	307.799
	227.235	313
	187.301	313
	179.218	313
	178.473	308.532
	178.351	307.799
	165.882	307
	156.828	310
	148.798	310
Material Boundary	676.836	286.131
	707.575	285.735
	707.905	285.731

Material Boundary

X	Y
291.536	297.008
295.8	296.549
300.21	296
311.637	294.748

Material Boundary

X	Y
338.832	292.465
338.909	292.461
339.626	292.463
344.621	292.238
347.016	292.27
352.052	292.446

Material Boundary

X	Y
133.033	304.766
135.147	304.67
136.684	304.564
138.14	304.532
139.675	304.648
140.181	304.699

Material Boundary

X	Y
335.095	292.776
338.832	292.465

Material Boundary

X	Y
810.597	284.414
824.033	284.132
827.165	284.066
830.316	284.005
830.815	284
839.057	284
842.22	284
842.906	284

Material Boundary

X	Y
160.256	306.333
172.467	306.948
172.87	306.962
173.34	306.985
173.382	306.987
173.402	306.987
173.494	306.988
174.628	307

Material Boundary

X	Y
344.621	292.238
345.263	292.209
347.016	292.27

Material Boundary

X	Y
174.628	307
178.351	307

Material Boundary

X	Y
866.601	275.862
866.816	275.859
866.847	275.859
867.041	275.856
867.146	275.855
867.703	275.848
867.986	275.844
869.217	275.828
869.706	275.822
869.86	275.82
870.745	275.808
871.427	275.798
872.061	275.789
872.078	275.789
875.519	275.74
875.622	275.739
875.82	275.736
875.937	275.734
876.357	275.729
876.484	275.727
876.658	275.724
878.378	275.7
886.495	275.573
894.156	275.438
896.857	275.385

Material Boundary

X	Y
866.601	262.783
866.601	273.046
866.601	275.862

Material Boundary

X	Y
0	292.466
5.19276	292.398
42.0522	292.086
98.7743	291.473
155.474	290.76
178.351	290.431
208.25	290
225.08	289.341
227.235	289.269
239.237	288.867
329.556	285.799
352.976	285
402.817	283.84
447.737	282.681
482.974	281.809
548.127	280
629.585	278.413
656.985	277.958
664.794	277.823
709.693	277.056
748.356	276.396
769.711	276.02
827.765	275
866.601	273.046
881.899	272.276
893.958	271.653
896.857	271.503

Material Boundary

X	Y
830.815	284
865.351	283.319
881.622	283
896.031	282.708
896.857	282.691

Material Boundary

X	Y
0	295.53
10.3492	295.452
71.3295	295
86.9141	294.747
92.8738	294.671
137.957	294
146.931	293.861
156.366	293.732
159.944	293.681
162.446	293.645
178.351	293.406
205.334	293
227.137	292.52
227.235	292.517
248.439	292
275.148	291.484
292.783	291.159
301.394	291
330.913	290.132
335.369	290
343.472	289.908
346.459	289.881
355.841	289.791
386.035	289.477
405.276	289.277
436.505	289.027
439.672	289
453.326	288.841
460.005	288.786
480.666	288.573
483.455	288.55
503.504	288.392
510.759	288.32
518.95	288.24
532.536	288.141
551.521	288
554.063	287.98
555.112	287.97
555.274	287.968
585.03	287.71
602.792	287.517
606.896	287.491

Material Boundary

X	Y
668.377	286.296
702.993	285
710.355	285.439

Material Boundary

X	Y
801.627	284.528
824.033	284.132

Material Boundary

X	Y
178.351	307
184.698	307
185.733	307
196.451	306.277
200.622	306
232.73	304.022
233.108	304
234.046	303.949
235.96	303.845
251.224	303
252.273	302.922
258.94	302.436

Material Boundary

X	Y
178.351	307.799
242.844	307.799

Material Boundary

X	Y
133.61	304.958
137.508	304.732
138.307	304.754
140.181	304.699
144.033	305.093
153.638	306
160.256	306.333
165.882	307

Material Boundary

X	Y
282.007	294.749
292.783	291.159

Material Boundary

X	Y
710.355	285.439
713.939	285.653

Material Boundary

X	Y
0	285.839
6.56757	285.722
8.57549	285.679
47.6175	285
47.9148	284.994
60.0972	284.707
62.8373	284.693
84.8982	284.258
86.3156	284.25
97.2622	284.019
112.485	283.703
127.325	283.631
137.16	283.438
149.375	283.201
169.689	283.112
183.416	282.854
187.918	282.77
235.873	282.578
245.953	282.563
257.637	282.521
271.206	282.451
287.055	282.349
305.734	282.21
328.021	282.025
355.041	281.781
388.467	281.459
488.717	280.291
511.528	280
571.575	275.428
577.778	275
630.25	272.265
678.132	270
685.881	269.691
690.599	269.506
691.88	269.457
711.681	268.65
734.865	267.746
[illegible]	[illegible]

Scenario-based Entities

Type	Coordinates	Master Scenario	Berm Inward	Berm Inward NC	Berm Outward	Berm Outward NC
Piezoline	X Y 0 290 897 280	Assigned to materials: Gray Clay (Construction) Brown Clay (Construction)	Assigned to materials: Gray Clay (Construction) Brown Clay (Construction)	Assigned to materials: Gray Clay (Construction) Brown Clay (Construction)	Assigned to materials: Gray Clay (Construction) Brown Clay (Construction)	Assigned to materials: Gray Clay (Construction) Brown Clay (Construction)
Piezoline	X Y -0.0145395 296.37 165.867 294.726 235.827 294.032 268.174 293.74 338.487 293.052 393.073 292.567 633.815 290.031 653.324 290.018 655.207 290.016 677.056 290.001 677.149 290.001 677.204 290.001 678.289 290 737.323 288.553 865.488 285.31 872.165 285.141 875.588 285.055 877.744 285 895.743 284.587	Assigned to materials: Sand Silty Sand MSE Berm Compacted Clay	Assigned to materials: Sand Silty Sand MSE Berm Compacted Clay	Assigned to materials: Sand Silty Sand MSE Berm Compacted Clay	Assigned to materials: Sand Silty Sand MSE Berm Compacted Clay	Assigned to materials: Sand Silty Sand MSE Berm Compacted Clay
Piezoline	X Y 0 295 896.9 285	Assigned to materials: Till	Assigned to materials: Till Liner Bottom	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till
Distributed Load	X Y 186.843 313 185.198 313	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No
Distributed Load	X Y 197.185 313 195.54 313	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No
Bolt	X Y 178.718 310 193.718 310	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 178.968 311.5 193.968 311.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 179.218 313 194.218 313	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 178.467 308.5 193.467 308.5	Support 1	Support 1	Support 1	Support 1	Support 1
Tension Crack	X Y 178.718 310 236.17 310.023	✗	✗	Water level: dry	✗	✗
Block Search Window	X Y 281.779 293.799 243.847 293.799 243.847 269.166 281.779 269.166	✗	✗	✓	✗	✗
Block Search Window	X Y 251.046 304.63 213.114 304.63 213.114 279.997 251.046 279.997	✗	✗	✓	✗	✗
Tension Crack	X Y 197.589 313 197.589 312 217.589 312 217.589 313	✗	✗	✗	✗	Water level: dry
Block Search Window	X Y 225.142 306.2 178.783 306.2 178.783 279.079 225.142 279.079	✗	✗	✗	✗	✓
Block Search Window	X Y 189.649 304.136 143.29 304.136 143.29 277.015 189.649 277.015	✗	✗	✗	✗	✓

Group: Construction Seismic

Shared Entities

Type	Coordinates
	X Y 133.61 304.958 133.033 304.766 124.708 302 4.22254 302 0 303.688 0 295.53 0 292.466 0 288.041 0 285.839 0 225 896.857 225 896.857 261.717 896.857 271.503 896.857 275.385

Material Boundary

X	Y
676.836	286.131
707.575	285.735
707.905	285.731
708.86	285.719
709.839	285.706

Material Boundary

X	Y
291.536	297.008
295.8	296.549
300.21	296
311.637	294.748

Material Boundary

X	Y
338.832	292.465
338.909	292.461
339.626	292.463
344.621	292.238
347.016	292.27
352.052	292.446

Material Boundary

X	Y
133.033	304.766
135.147	304.67
136.684	304.564
138.14	304.532
139.675	304.648
140.181	304.699

Material Boundary

X	Y
335.095	292.776
338.832	292.465

Material Boundary

X	Y
810.597	284.414
824.033	284.132
827.165	284.066
830.316	284.005
830.815	284
839.057	284
842.22	284
842.906	284

Material Boundary

X	Y
160.256	306.333
172.467	306.948
172.87	306.962
173.34	306.985
173.382	306.987
173.402	306.987
173.494	306.988
174.628	307

Material Boundary

X	Y
344.621	292.238
345.263	292.209
347.016	292.27

Material Boundary

X	Y
174.628	307
178.351	307

Material Boundary

X	Y
866.601	275.862
866.816	275.859
866.847	275.859
867.041	275.856
867.146	275.855
867.703	275.848
867.986	275.844
869.217	275.828
869.706	275.822
869.86	275.82
870.745	275.808
871.427	275.798
872.061	275.789
872.078	275.789
875.519	275.74
875.622	275.739
875.82	275.736
875.937	275.734
876.357	275.729
876.484	275.727
876.658	275.724
878.378	275.7
886.495	275.573
894.156	275.438
896.857	275.385

Material Boundary

X	Y
866.601	262.783
866.601	273.046
866.601	275.862

Material Boundary

X	Y
0	292.466
5.19276	292.398
42.0522	292.086
98.7743	291.473
155.474	290.76
178.351	290.431
208.25	290
225.08	289.341
227.235	289.269
239.237	288.867
329.556	285.799
352.976	285
402.817	283.84
447.737	282.681
482.974	281.809
548.127	280
629.585	278.413
656.985	277.958
664.794	277.823
709.693	277.056
748.356	276.396
769.711	276.02
827.765	275
866.601	273.046
881.899	272.276
893.958	271.653
896.857	271.503

Material Boundary

X	Y
830.815	284
865.351	283.319
881.622	283
896.031	282.708
896.857	282.691

Material Boundary

X	Y
0	295.53
10.3492	295.452
71.3295	295
86.9141	294.747
92.8738	294.671
137.957	294
146.931	293.861
156.366	293.732
159.944	293.681
162.446	293.645
178.351	293.406
205.334	293
227.137	292.52
227.235	292.517
248.439	292
275.148	291.484
292.783	291.159
301.394	291
330.913	290.132
335.369	290
343.472	289.908
346.459	289.881
355.841	289.791
386.035	289.477

Type	X	Y
Material Boundary	668.377	286.296
	702.993	285
	710.355	285.439
Material Boundary	801.627	284.528
	824.033	284.132
Material Boundary	178.351	307
	184.698	307
	185.733	307
	196.451	306.277
	200.622	306
	232.73	304.022
	233.108	304
	234.046	303.949
	235.96	303.845
	251.224	303
	252.273	302.922
	258.94	302.436
Material Boundary	178.351	307.799
	242.844	307.799
Material Boundary	133.61	304.958
	137.508	304.732
	138.307	304.754
	140.181	304.699
	144.033	305.093
	153.638	306
	160.256	306.333
	165.882	307
Material Boundary	282.007	294.749
	292.783	291.159
Material Boundary	710.355	285.439
	713.939	285.653
Material Boundary	0	285.839
	6.56757	285.722
	8.57549	285.679
	47.6175	285
	47.9148	284.994
	60.0972	284.707
	62.8373	284.693
	84.8982	284.258
	86.3156	284.25
	97.2622	284.019
	112.485	283.703
	127.325	283.631
	137.16	283.438
	149.375	283.201
	169.689	283.112
	183.416	282.854
	187.918	282.77
	235.873	282.578
	245.953	282.563
	257.637	282.521
	271.206	282.451
	287.055	282.349
	305.734	282.21
	328.021	282.025
	355.041	281.781
	388.467	281.459
	488.717	280.291
	511.528	280
	571.575	275.428
	577.778	275
	630.25	272.265
	678.132	270
	685.881	269.691
	690.599	269.506
	691.88	269.457
	711.681	268.65
	734.865	267.746
	760.58	266.723
	788.075	265.664
	793.846	265.43
	805.096	265
	831.142	264.06
	841.66	263.69
	847.62	263.482
	866.601	262.783
	874.381	262.497
	896.857	261.717

Scenario-based Entities

Type	Coordinates	Master Scenario	Berm Inward	Berm Inward NC	Berm Outward	Berm Outward NC
Piezoline	X: 0, 897; Y: 290, 280	Assigned to materials: Gray Clay (Construction), Brown Clay (Construction)	Assigned to materials: Gray Clay (Construction), Brown Clay (Construction)	Assigned to materials: Gray Clay (Construction), Brown Clay (Construction)	Assigned to materials: Gray Clay (Construction), Brown Clay (Construction)	Assigned to materials: Gray Clay (Construction), Brown Clay (Construction)

Piezoline	X Y -0.0145395 296.37 165.867 294.726 235.827 294.032 268.174 293.74 338.487 293.052 393.073 292.567 633.815 290.031 653.324 290.018 655.207 290.016 677.056 290.001 677.149 290.001 677.204 290.001 678.289 290 737.323 288.553 865.488 285.31 872.165 285.141 875.588 285.055 877.744 285 895.743 284.587	Assigned to materials: Sand Silty Sand MSE Berm Compacted Clay	Assigned to materials: Sand Silty Sand MSE Berm Compacted Clay	Assigned to materials: Sand Silty Sand MSE Berm Compacted Clay	Assigned to materials: Sand Silty Sand MSE Berm Compacted Clay	Assigned to materials: Sand Silty Sand MSE Berm Compacted Clay
Piezoline	X Y 0 295 896.9 285	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till
Distributed Load	X Y 186.843 313 185.198 313	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No
Distributed Load	X Y 197.185 313 195.54 313	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No
Bolt	X Y 178.718 310 193.718 310	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 178.968 311.5 193.968 311.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 179.218 313 194.218 313	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 178.467 308.5 193.467 308.5	Support 1	Support 1	Support 1	Support 1	Support 1
Tension Crack	X Y 178.718 310 236.17 310.023	✗	✗	Water level: dry	✗	✗
Block Search Window	X Y 281.779 293.799 243.847 293.799 243.847 269.166 281.779 269.166	✗	✗	✓	✗	✗
Block Search Window	X Y 251.046 304.63 213.114 304.63 213.114 279.997 251.046 279.997	✗	✗	✓	✗	✗
Tension Crack	X Y 198.243 313 198.243 312 218.243 312 218.243 313	✗	✗	✗	✗	Water level: dry
Block Search Window	X Y 225.142 306.2 178.783 306.2 178.783 279.079 225.142 279.079	✗	✗	✗	✗	✓
Block Search Window	X Y 189.649 304.136 143.29 304.136 143.29 277.015 189.649 277.015	✗	✗	✗	✗	✓

Section III

Slide Analysis Information

2019.10.01 Ph14 III Con ST2

Project Summary

File Name:	2019.10.01 Ph14 III Con ST2.slmd
Last saved with Slide version:	8.028
Project Title:	SLIDE - An Interactive Slope Stability Program
Date Created:	7/16/2019, 9:54:59 AM

Currently Open Scenarios

Group Name	Scenario Name	Compute Time
Construction	Master Scenario	
	Berm Inward	
	Berm Inward NC	
	Berm Outward	
	Berm Outward NC	
Construction Seismic	Master Scenario	
	Berm Inward	
	Berm Inward NC	
	Berm Outward	
	Berm Outward NC	

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard

	Master Scenario	Berm Inward	Berm Inward NC	Berm Outward	Berm Outward NC	Master Scenario	Berm Inward	Berm Inward NC	Berm Outward	Berm Outward NC
Failure Direction:	Right to Left	Left to Right	Left to Right	Right to Left	Right to Left	Right to Left	Left to Right	Left to Right	Right to Left	Right to Left

Analysis Options

All Open Scenarios	
Slices Type:	Vertical
Analysis Methods Used	
	Spencer
Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

All Open Scenarios	
Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

All Open Scenarios	
Pseudo-random Seed:	10116
Random Number Generation Method:	Park and Miller v.3

Surface Options

Construction - Master Scenario	
Surface Type:	Circular
Search Method:	Auto Refine Search
Divisions along slope:	20
Circles per division:	10
Number of iterations:	10
Divisions to use in next iteration:	50%
Composite Surfaces:	Disabled
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Construction - Berm Inward	
Surface Type:	Circular
Search Method:	Grid Search
Radius Increment:	10
Composite Surfaces:	Disabled
Reverse Curvature:	Invalid Surfaces
Minimum Elevation:	Not Defined
Minimum Depth [ft]:	10
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Construction - Berm Inward NC	
Surface Type:	Non-Circular Block Search
Number of Surfaces:	5000
Multiple Groups:	Disabled
Pseudo-Random Surfaces:	Enabled
Convex Surfaces Only:	Disabled
Left Projection Angle (Start Angle) [°]:	105
Left Projection Angle (End Angle) [°]:	165
Right Projection Angle (Start Angle) [°]:	15
Right Projection Angle (End Angle) [°]:	75
Minimum Elevation:	Not Defined
Minimum Depth [ft]:	10
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Construction - Berm Outward	
Surface Type:	Circular
Search Method:	Grid Search
Radius Increment:	10
Composite Surfaces:	Disabled
Reverse Curvature:	Invalid Surfaces
Minimum Elevation:	Not Defined
Minimum Depth [ft]:	10
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Construction - Berm Outward NC	
Surface Type:	Non-Circular Block Search
Number of Surfaces:	5000
Multiple Groups:	Disabled
Pseudo-Random Surfaces:	Enabled
Convex Surfaces Only:	Disabled
Left Projection Angle (Start Angle) [°]:	105
Left Projection Angle (End Angle) [°]:	165
Right Projection Angle (Start Angle) [°]:	15
Right Projection Angle (End Angle) [°]:	65
Minimum Elevation:	Not Defined
Minimum Depth [ft]:	10
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Construction Seismic	
Surface Type:	Circular
Search Method:	Auto Refine Search
Divisions along slope:	20
Circles per division:	10
Number of iterations:	10
Divisions to use in next iteration:	50%
Composite Surfaces:	Disabled
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Construction		Construction Seismic	
Advanced seismic analysis:	No	Advanced seismic analysis:	No
Staged pseudostatic analysis:	No	Staged pseudostatic analysis:	No
		Seismic Load Coefficient (Horizontal):	0.05

Loading

All Open Scenarios	
2 Distributed Loads present	
Distributed Load 1	
Distribution:	Constant
Magnitude [psf]:	2350
Orientation:	Normal to boundary
Distributed Load 2	
Distribution:	Constant
Magnitude [psf]:	2350
Orientation:	Normal to boundary

Tension Crack

Construction - Master Scenario	Construction - Berm Inward	Construction - Berm Inward NC	Construction - Berm Outward	Construction - Berm Outward NC	Construction Seismic - Master Scenario	Construction Seismic - Berm Inward	Construction Seismic - Berm Inward NC	Construction Seismic - Berm Outward	Construction Seismic - Berm Outward NC
				Water level: dry				Water level: dry	Water level: dry

Materials

Property	Till	Sand	Silty Sand	MSE Berm Stage 1	MSE Berm Stage 2	Liner Bottom	Soft Clay (Construction)	Stiff Clay (Construction)
Color								
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	SHANSEP	SHANSEP
Unit Weight [lbs/ft3]	150	110	110	120	120	120	120	125
Cohesion [psf]	10000	0	0	100	100	0		
Friction Angle [°]	50	36	32	32	32	18.3		
A [psf]							0	0
S							0.19	0.22
m							0.66	0.76
Stress History Type							Preconsolidation Pressure	Preconsolidation Pressure
Definition Method							Constant [8775]	Constant [11500]
Material Dependent Vertical Stress							Yes	Yes
Water Surface	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario
Hu Value	1	1	1	1			1	1
Ru Value					0	0		

SHANSEP Material Dependent Vertical Stress

Soft Clay (Construction)

Vertical stress computed using the following factored materials:

Color	Material	Factor
(yellow)	Liner Slope	Factor=0
(grey)	MSW	Factor=0.9

Stiff Clay (Construction)

Vertical stress computed using the following factored materials:

Color	Material	Factor
(yellow)	Liner Slope	Factor=0
(grey)	MSW	Factor=0.9

Property	Compacted Clay	Bedrock
Color		
Strength Type	Mohr-Coulomb	Infinite strength
Unit Weight [lbs/ft3]	125	165
Allow Sliding Along Boundary		Yes
Cohesion [psf]	100	
Friction Angle [°]	32	
Water Surface	Assigned per scenario	Assigned per scenario
Ru Value	0	0

Materials In Use

Material	Master Scenario	Berm Inward	Berm Inward NC	Berm Outward	Berm Outward NC	Master Scenario	Berm Inward	Berm Inward NC	Berm Outward	Berm Outward NC
Till	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Sand	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Silty Sand	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
MSE Berm Stage 1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
MSE Berm Stage 2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Liner Bottom	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Soft Clay (Construction)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Stiff Clay (Construction)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Compacted Clay	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Bedrock	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Support

Support 1

Support Type: GeoTextile
Force Application: Active
Force Orientation: Parallel to Reinforcement
Anchorage: None
Shear Strength Model: Linear
Use External Loads for Strength: yes
Strip Coverage: 100 percent
Tensile Strength: 2860 lb/ft
Pullout Strength Adhesion: 0 psf
Pullout Strength Friction Angle: 32 degrees

Entity Information

Group: Construction

Shared Entities

Type	Coordinates X	Coordinates Y
	152.228	308.5
	152.212	308.403
	149.32	291.131
	149.075	289.673
	148.542	286.487
	148.46	286
	147.704	281.487
	144.276	281.646
	142.939	281.675
	141.961	281.697
	136.308	281.822
	133.58	281.925
	132.582	281.962
	128.929	282.1
	127.069	282.169
	124.278	282.274
	124.192	282.277
	120.492	282.416
	120.311	282.423
	115.862	282.661
	108.573	283.051
	97.597	283.459
	91.5025	283.321
	80.8507	282.787
	69.0791	282
	60.5092	281.578
	39.0313	280
	35.0554	279.641
	28.729	279.267
	24.3778	279
	15.5906	278.462
	14.6953	278.438
	11.8611	278.36
	5.75912	278.433
	0	278.603
	0	272.515
	0	267.71
	0	263.666
	0	225
	740.623	225
	740.623	264.305
	740.623	268.55
	740.623	272.744
	740.623	277.583
	713.257	277.706
	710.047	277.721
	708.461	277.728
	706.957	277.734
	703.361	277.749
	699.634	277.765
	696.17	277.779
	690.807	277.802
	684.647	277.827
	684.188	277.829
	681.846	277.839
	681.348	277.848
	680.938	277.855
	680.877	277.857
	675.587	277.955
	674.595	277.973
	661.048	278.225
	660.974	278.226
	660.169	278.244
	659.037	278.269
	658.097	278.29
	645.25	278.574
	634.208	278.818
External Boundary	633.721	278.828
	511.72	281.523
	509.547	281.571
	487.814	281.555
	427.577	281.51
	379.493	281.474
	378.363	281.496
	378.347	281.496
	378.334	281.496
	378.302	281.497
	378.285	281.497
	378.268	281.498
	378.258	281.498
	378.248	281.498
	378.234	281.498
	378.215	281.499
	378.195	281.499
	378.17	281.5
	378.15	281.5
	378.13	281.5
	378.117	281.501
	378.095	281.501
	378.058	281.502
	378.047	281.502
	378.026	281.502
	378.006	281.503

Material Boundary

X	Y
24.3778	279
25.7169	279
28.8919	279.153
35.8251	279.627
50.0161	280.635
55.3645	281
68.2343	281.852
69.811	281.928
71.8324	282
81.262	282.475
91.6839	283
91.805	283.006
91.8206	283.006
92.324	283
106.54	282.822
110.944	282.74
115.862	282.661

Material Boundary

X	Y
141.961	281.697
147.704	281.427
151.213	281.261
157.688	281.027

X	Y
0	272.515
3.37654	272.518
4.98476	272.52
13.3235	272.534
23.8287	272.554
30.0922	272.573
43.0209	272.614
48.2859	272.64
61.4103	272.701
69.3433	272.756
79.3456	272.821
97.1851	272.986
97.2039	272.986
97.2224	272.986
116.729	273.183
134.08	273.397
137.9	273.44
144.687	273.531
147.704	273.569
162.436	273.756
170.828	273.88
191.38	274.172
195.982	274.249
201.215	274.336
209.056	274.466
226.985	274.783
230.399	274.849
238.23	275
238.424	275.063
238.618	275.065
238.628	275.065
238.98	275.067
239.359	275.07
239.581	275.071

Material Boundary

X	Y
14.6953	278.438
18.0809	278.482
18.4566	278.47
21.4821	278.441
28.4323	278.375
37.1886	278.419
38.8626	278.425
42.104	278.465
46.6479	278.543
63.6068	278.713
69.1321	278.796
69.5684	278.799
84.7209	279
97.648	279.242
106.979	279.33
107.642	279.344
109.762	279.379
112.749	279.408
123.889	279.58
127.032	279.628
131.177	279.689
132.131	279.709
136.099	279.7
137.156	279.692
140.27	279.675
142.218	279.665
147.704	279.703
158.032	279.774
159.343	279.776
164.37	279.802
166.829	279.816
186.648	279.989
186.706	279.99
190.418	279.975
191.56	280
195.982	280.118
201.215	280.257
201.239	280.257
216.165	280.511
225.585	280.694
228.763	280.76

Material Boundary

X	Y
0	267.71
12.8009	267.742
17.6671	267.759
22.9357	267.757
28.7848	267.777
35.9604	267.802
41.2652	267.826
55.0776	267.889
59.3201	267.911
63.6444	267.915
80.1407	268.005
89.2019	268.061
100.523	268.13
103.102	268.146
107.573	268.157
124.708	268.268
132.901	268.322
137.223	268.337
147.704	268.405
150.168	268.421
158.361	268.453
172.723	268.548
180.871	268.599
185.53	268.619
195.982	268.683
201.215	268.716
206.273	268.747
216.086	268.797
220.627	268.814
223.938	268.822
227.526	268.828
231.408	268.831
237.298	268.834
242.135	268.834
244.88	268.832
246.306	268.828
246.644	268.827
248.347	268.819
252.688	268.786
257.972	268.74
265.356	268.673
268.208	268.694
271.31	268.666
274.084	268.636
277.582	268.589
286.892	268.442
303.171	268.604
304.156	268.61
308.441	268.544
327.899	268.688
331.624	268.632
335.584	268.65
339.222	268.599
356.665	268.684
359.928	268.639
363.255	268.599
370.01	268.61
385.214	268.642
389.347	268.594
392.717	268.559
410.036	268.546
413.084	268.521
417.762	268.52
425.037	268.505
427.854	268.489
442.321	268.455
445.674	268.446
448.745	268.444
461.021	268.395
470.015	268.369
472.891	268.376
483.391	268.342
485.975	268.357
496.077	268.307
506.573	268.264
509.059	268.288
518.453	268.259
531.18	268.243
534.09	268.278

Material Boundary

X	Y
157.688	281.027
158.434	281
159.57	280.999
164.637	280.995
169.948	280.992
179.533	280.993
189.303	280.994
190.197	280.994
193.763	280.998
195.643	281
195.982	281.043
196.215	281.073
200.957	281.675
201.215	281.708
203.513	282
204.853	282.17

Material Boundary

X	Y
427.577	281.51
430.667	281.462
442.612	281.268
455.262	281.081
456.35	281.063
456.799	281.056
460.707	281
482.477	280.659
484.483	280.627
489.078	280.555
511.075	280.197
516.298	280.114
523.381	280
532.996	279.848
537.047	279.771
549.849	279.551
572.171	279.137
575.728	279.077
579.558	279
580.977	278.973
581.74	278.96
582.17	278.951
584.477	278.901
613.594	278.327
620.042	278.139
621.376	278.116
626.75	278
636.602	277.775
639.47	277.663
651.837	277.33
653.092	277.304
654.039	277.292
666.491	277
667.613	277
672.52	277
674.383	277
683.915	277.141
684.203	277.146
689.244	277.203
697.326	277.389
700.851	277.445

	X	Y
Material Boundary	147.704	281.487
	184.779	281.93
	195.982	282.064
	201.215	282.127
	204.853	282.17
	246.306	282.666
	291	283.2
	291.052	283.199
	348.987	282.074

	X	Y
Material Boundary	634.208	278.818
	635.043	278.799
	637.846	278.737
	638.638	278.719
	639.183	278.707
	642.234	278.639
	645.25	278.574
	646.672	278.54
	651.318	278.436
	653.021	278.398
	655.499	278.343
	656.293	278.325
	658.097	278.29
	658.639	278.273
	659.037	278.269
	659.3	278.258
	659.315	278.258
	659.357	278.257
	659.571	278.253
	660.169	278.244

	X	Y
Material Boundary	378.302	281.497
	378.321	281.497
	378.334	281.496

	X	Y
Material Boundary	487.814	281.555
	509.494	281.555
	511.72	281.523

	X	Y
Material Boundary	684.647	277.827
	710.047	277.721

	X	Y
Material Boundary	291	283.216
	291.052	283.199
	291.078	283.19
	295.767	281.635

	X	Y
Material Boundary	184.704	281.487
	184.779	281.93
	184.994	283.216

	X	Y
Material Boundary	184.994	283.216
	212.982	283.216
	291	283.216

	X	Y
Material Boundary	147.704	281.487
	184.704	281.487

	X	Y
Material Boundary	204.853	282.17
	210.026	282.828
	212.982	283.216

	X	Y
	0	263.666
	1.95126	263.689
	12.6954	263.77
	15.0957	263.797
	27.3095	263.903
	31.1961	263.945
	33.4881	263.97
	43.0994	264.019
	58.0473	264.162
	68.047	264.296
	70.4651	264.321
	84.9521	264.472
	86.2576	264.485
	99.1835	264.647
	100.372	264.659
	101.199	264.666
	114.451	264.805
	115.106	264.81
	130.011	264.973
	130.074	264.973
	132.383	265
	143.175	265.096
	160.167	265.242
	184.827	265.413
	197.268	265.511
	230.492	265.643

Material Boundary	X, Y: 661.048, 278.225; 663.743, 278.174; 664.326, 278.164; 667.404, 278.106; 669.52, 278.066; 673.153, 277.999; 674.595, 277.973
Material Boundary	X, Y: 152.228, 308.5; 152.396, 308.5; 214.78, 308.5

Scenario-based Entities

Type	Coordinates	Master Scenario	Berm Inward	Berm Inward NC	Berm Outward	Berm Outward NC
Piezoline	X, Y: 0, 275; 543.386, 280.869; 590.645, 279.785; 680.938, 277.855; 740.623, 277.583	Assigned to materials: Soft Clay (Construction)	Assigned to materials: Soft Clay (Construction)	Assigned to materials: Soft Clay (Construction)	✗	Assigned to materials: Soft Clay (Construction)
Piezoline	X, Y: 0, 275; 740.7, 286	Assigned to materials: Sand, Silty Sand, MSE Berm Stage 1, Stiff Clay (Construction)	Assigned to materials: Sand, Silty Sand, MSE Berm Stage 1, Stiff Clay (Construction)	Assigned to materials: Sand, Silty Sand, MSE Berm Stage 1, Stiff Clay (Construction)	✗	Assigned to materials: Sand, Silty Sand, MSE Berm Stage 1, Stiff Clay (Construction)
Piezoline	X, Y: 0, 270; 740.7, 278	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till	✗	Assigned to materials: Till
Distributed Load	X, Y: 160.606, 313; 158.976, 313	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No
Distributed Load	X, Y: 170.975, 313; 169.31, 313	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No
Bolt	X, Y: 152.228, 308.5; 164.228, 308.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X, Y: 152.48, 310; 164.48, 310	Support 1	Support 1	Support 1	Support 1	Support 1

Bolt	X Y 152.731 311.5 164.731 311.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 152.982 313 164.982 313	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 149.465 292 161.465 292	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 149.716 293.5 161.716 293.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 149.967 295 161.967 295	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 150.219 296.5 162.219 296.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 150.47 298 162.47 298	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 150.721 299.5 162.721 299.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 150.972 301 162.972 301	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 151.223 302.5 163.223 302.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 151.475 304 163.475 304	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 151.726 305.5 163.726 305.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 151.977 307 163.977 307	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 149.214 290.5 161.214 290.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 148.711 287.5 160.711 287.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 148.963 289 160.963 289	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 148.46 286 160.46 286	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 147.707 281.5 159.707 281.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 147.958 283 159.958 283	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 148.209 284.5 160.209 284.5	Support 1	Support 1	Support 1	Support 1	Support 1
Block Search Window	X Y 300.732 282.405 248.434 282.691 248.434 252.759 300.732 252.759	✗	✗	✓	✗	✗
Block Search Window	X Y 257.575 281.612 205.277 281.898 205.277 251.966 257.575 251.966	✗	✗	✓	✗	✗
Piezoline	X Y 0 275 543.386 280.869 590.645 279.785 680.938 277.855 740.623 277.583	✗	✗	✗	Assigned to materials: Soft Clay (Construction)	✗

Piezoline	X: 0, 740.7; Y: 275, 286	✗	✗	✗	Assigned to materials: Sand, Silty Sand, MSE Berm Stage 1, Stiff Clay (Construction)	✗
Piezoline	X: 0, 740.7; Y: 270, 278	✗	✗	✗	Assigned to materials: Till	✗
Tension Crack	X: 176.536, 176.536, 230.811; Y: 308.5, 303.182, 303.182	✗	✗	✗	✗	Water level: dry
Block Search Window	X: 173.694, 126.603, 126.603, 173.694; Y: 281.536, 281.358, 251.813, 251.813	✗	✗	✗	✗	✓

Group: Construction Seismic

Shared Entities

Type	Coordinates X	Coordinates Y
External Boundary	152.228	308.5
	148.963	289
	148.542	286.487
	148.46	286
	147.704	281.487
	144.276	281.646
	142.939	281.675
	141.961	281.697
	136.308	281.822
	127.069	282.169
	120.492	282.416
	120.311	282.423
	115.862	282.661
	108.573	283.051
	97.597	283.459
	91.5025	283.321
	80.8507	282.787
	69.0791	282
	60.5092	281.578
	39.0313	280
	35.0554	279.641
	28.729	279.267
	24.3778	279
	15.5906	278.462
	14.6953	278.438
	11.8611	278.36
	5.75912	278.433
	0	278.603
	0	272.515
	0	267.71
	0	263.666
	0	225
	740.623	225
	740.623	264.305
	740.623	268.55
	740.623	272.744
	740.623	277.583
	713.257	277.706
	710.047	277.721
	708.461	277.728
	706.957	277.734
	703.361	277.749
	699.634	277.765
	696.17	277.779
	690.807	277.802
	684.647	277.827
	684.188	277.829
	681.846	277.839
	681.348	277.848
	680.938	277.855
	680.877	277.857
	675.587	277.955
	674.595	277.973
	661.048	278.225
	660.974	278.226
	660.169	278.244
	659.037	278.269
	658.097	278.29
	645.25	278.574
	634.208	278.818
	633.721	278.828
	511.72	281.523
	509.547	281.571
	487.814	281.555
	427.577	281.51
	379.493	281.474
	378.363	281.496
	378.347	281.496
	378.334	281.496
	378.302	281.497
	378.285	281.497

Material Boundary

X	Y
24.3778	279
25.7169	279
28.8919	279.153
35.8251	279.627
50.0161	280.635
55.3645	281
68.2343	281.852
69.811	281.928
71.8324	282
81.262	282.475
91.6839	283
91.805	283.006
91.8206	283.006
92.324	283
106.54	282.822
110.944	282.74
115.862	282.661

Material Boundary

X	Y
141.961	281.697
147.704	281.427
151.213	281.261
157.688	281.027

X	Y
0	272.515
3.37654	272.518
4.98476	272.52
13.3235	272.534
23.8287	272.554
30.0922	272.573
43.0209	272.614
48.2859	272.64
61.4103	272.701
69.3433	272.756
79.3456	272.821
97.1851	272.986
97.2039	272.986
97.2224	272.986
116.729	273.183
134.08	273.397
137.9	273.44
144.687	273.531
147.704	273.569

X	Y
14.6953	278.438
18.0809	278.482
18.4566	278.47
21.4821	278.441
28.4323	278.375
37.1886	278.419
38.8626	278.425
42.104	278.465
46.6479	278.543
63.6068	278.713
69.1321	278.796
69.5684	278.799
84.7209	279
97.648	279.242
106.979	279.33
107.642	279.344
109.762	279.379
112.749	279.408
127.032	279.628
131.177	279.689
132.131	279.709
136.099	279.7
137.156	279.692
140.27	279.675
142.218	279.665
147.704	279.703

Material Boundary

X	Y
0	267.71
12.8009	267.742
17.6671	267.759
22.9357	267.757
28.7848	267.777
35.9604	267.802
41.2652	267.826
55.0776	267.889
59.3201	267.911
63.6444	267.915
80.1407	268.005
89.2019	268.061
100.523	268.13
103.102	268.146
107.573	268.157
124.708	268.268
132.901	268.322
137.223	268.337
147.704	268.405
150.168	268.421
158.361	268.453
172.723	268.548
180.871	268.599
185.53	268.619
195.982	268.683
201.215	268.716
206.273	268.747
216.086	268.797
220.627	268.814
223.938	268.822
227.526	268.828
231.408	268.831
237.298	268.834
242.135	268.834
244.88	268.832
246.306	268.828
246.644	268.827
248.347	268.819
252.688	268.786
257.972	268.74
265.356	268.673
268.208	268.694
271.31	268.666
274.084	268.636
277.582	268.589
286.892	268.442
303.171	268.604
304.156	268.61
308.441	268.544
327.899	268.688
331.624	268.632
335.584	268.65
339.222	268.599
356.665	268.684
359.928	268.639
363.255	268.599
370.01	268.61
385.214	268.642
389.347	268.594
392.717	268.559
410.036	268.546
413.084	268.521
417.762	268.52
425.037	268.505
427.854	268.489
442.321	268.455

Material Boundary

X	Y
157.688	281.027
158.434	281
159.57	280.999
164.637	280.995
169.948	280.992
179.533	280.993
189.303	280.994
190.197	280.994
193.763	280.998
195.643	281
195.982	281.043
196.215	281.073
200.957	281.675
201.215	281.708
203.513	282
204.853	282.17

Material Boundary

X	Y
427.577	281.51
430.667	281.462
442.612	281.268
455.262	281.081
456.35	281.063
456.799	281.056
460.707	281
482.477	280.659
484.483	280.627
489.078	280.555
511.075	280.197
516.298	280.114
523.381	280
532.996	279.848
537.047	279.771
549.849	279.551
572.171	279.137
575.728	279.077
579.558	279
580.977	278.973
581.74	278.96
582.17	278.951
584.477	278.901
613.594	278.327
620.042	278.139
621.376	278.116
626.75	278
636.602	277.775

Material Boundary

X	Y
147.704	281.487
184.779	281.93
195.982	282.064
201.215	282.127
204.853	282.17
246.306	282.666
291	283.2
291.052	283.199
348.987	282.074

Material Boundary

X	Y
634.208	278.818
635.043	278.799
637.846	278.737
638.638	278.719
639.183	278.707
642.234	278.639
645.25	278.574
646.672	278.54
651.318	278.436
653.021	278.398
655.499	278.343
656.293	278.325
658.097	278.29
658.639	278.273
659.037	278.269
659.3	278.258
659.315	278.258
659.357	278.257
659.571	278.253
660.169	278.244

Material Boundary

X	Y
378.302	281.497
378.321	281.497
378.334	281.496

Material Boundary

X	Y
487.814	281.555
509.494	281.555
511.72	281.523

Material Boundary

X	Y
684.647	277.827
710.047	277.721

Material Boundary

X	Y
291	283.216
291.052	283.199
291.078	283.19
295.767	281.635

Material Boundary

X	Y
184.704	281.487
184.779	281.93
184.994	283.216

Material Boundary

X	Y
184.994	283.216
212.982	283.216
291	283.216

Material Boundary

X	Y
147.704	281.487
184.704	281.487

Material Boundary

X	Y
204.853	282.17
210.026	282.828
212.982	283.216

X	Y
0	263.666
1.95126	263.689
12.6954	263.77
15.0957	263.797
27.3095	263.903
31.1961	263.945
33.4881	263.97
43.0994	264.019
58.0473	264.162
68.047	264.296
70.4651	264.321
84.9521	264.472
86.2576	264.485

Type	Coordinates
Material Boundary	X / Y: 661.048 278.225; 663.743 278.174; 664.326 278.164; 667.404 278.106; 669.52 278.066; 673.153 277.999; 674.595 277.973
Material Boundary	X / Y: 152.228 308.5; 152.982 308.5; 214.78 308.5

Scenario-based Entities

Type	Coordinates	Master Scenario	Berm Inward	Berm Inward NC	Berm Outward	Berm Outward NC
Piezoline	X / Y: 0 275; 543.386 280.869; 590.645 279.785; 680.938 277.855; 740.623 277.583	Assigned to materials: Soft Clay (Construction)	Assigned to materials: Soft Clay (Construction)	Assigned to materials: Soft Clay (Construction)	✗	Assigned to materials: Soft Clay (Construction), Stiff Clay (Construction)
Piezoline	X / Y: 0 275; 740.7 286	Assigned to materials: Sand, Silty Sand, MSE Berm Stage 1, Stiff Clay (Construction)	Assigned to materials: Sand, Silty Sand, MSE Berm Stage 1, Stiff Clay (Construction)	Assigned to materials: Sand, Silty Sand, MSE Berm Stage 1, Stiff Clay (Construction)	✗	Assigned to materials: Sand, Silty Sand, MSE Berm Stage 2, Compacted Clay
Piezoline	X / Y: 0 270; 740.7 278	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till	✗	Assigned to materials: Till
Distributed Load	X / Y: 160.643 313; 158.953 313	Constant Distribution; Orientation: Normal to boundary; Magnitude: 2350 lbs/ft2; Creates Excess Pore Pressure: No	Constant Distribution; Orientation: Normal to boundary; Magnitude: 2350 lbs/ft2; Creates Excess Pore Pressure: No	Constant Distribution; Orientation: Normal to boundary; Magnitude: 2350 lbs/ft2; Creates Excess Pore Pressure: No	Constant Distribution; Orientation: Normal to boundary; Magnitude: 2350 lbs/ft2; Creates Excess Pore Pressure: No	Constant Distribution; Orientation: Normal to boundary; Magnitude: 2350 lbs/ft2; Creates Excess Pore Pressure: No

Distributed Load	X Y 170.978 313 169.309 313	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No
Bolt	X Y 152.228 308.5 164.228 308.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 152.48 310 164.48 310	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 152.731 311.5 164.731 311.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 152.982 313 164.982 313	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 148.963 289 160.963 289	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 149.214 290.5 161.214 290.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 149.465 292 161.465 292	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 149.716 293.5 161.716 293.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 149.967 295 161.967 295	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 150.219 296.5 162.219 296.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 150.47 298 162.47 298	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 150.721 299.5 162.721 299.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 150.972 301 162.972 301	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 151.223 302.5 163.223 302.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 151.475 304 163.475 304	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 151.726 305.5 163.726 305.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 151.977 307 163.977 307	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 148.711 287.5 160.711 287.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 148.46 286 160.46 286	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 147.707 281.5 159.707 281.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 147.958 283 159.958 283	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 148.209 284.5 160.209 284.5	Support 1	Support 1	Support 1	Support 1	Support 1
Block Search Window	X Y 300.732 282.405 248.434 282.691 248.434 252.759 300.732 252.759	✗	✗	✓	✗	✗

Block Search Window	X Y 257.575 281.612 205.277 281.898 205.277 251.966 257.575 251.966	✗	✗	✓	✗	✗
Piezoline	X Y 0 275 543.386 280.869 590.645 279.785 680.938 277.855 740.623 277.583	✗	✗	✗	Assigned to materials: Soft Clay (Construction)	✗
Piezoline	X Y 0 275 740.7 286	✗	✗	✗	Assigned to materials: Sand Silty Sand MSE Berm Stage 1 Stiff Clay (Construction)	✗
Piezoline	X Y 0 270 740.7 278	✗	✗	✗	Assigned to materials: Till	✗
Tension Crack	X Y 165.622 313 165.622 310.77 207.937 310.77	✗	✗	✗	Water level: dry	✗
Tension Crack	X Y 152.049 306.685 218.003 306.685	✗	✗	✗	✗	Water level: dry
Block Search Window	X Y 184.552 280.998 137.461 280.82 137.461 251.275 184.552 251.275	✗	✗	✗	✗	✓

Section IV

Slide Analysis Information

2019.10.01 Ph14 IV Con

Project Summary

File Name:	2019.10.01 Ph14 IV Con.slmd
Last saved with Slide version:	8.028
Project Title:	SLIDE - An Interactive Slope Stability Program
Date Created:	7/16/2019, 9:54:59 AM

Currently Open Scenarios

Group Name	Scenario Name	Compute Time
Construction	Master Scenario	
	Berm Inward	
	Berm Inward NC	
	Berm Outward	
	Berm Outward NC	
Construction Seismic	Master Scenario	
	Berm Inward	
	Berm Inward NC	
	Berm Outward	
	Berm Outward NC	

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard

	Master Scenario	Berm Inward	Berm Inward NC	Berm Outward	Berm Outward NC	Master Scenario	Berm Inward	Berm Inward NC	Berm Outward	Berm Outward NC
Failure Direction:	Right to Left	Left to Right	Left to Right	Right to Left	Right to Left	Right to Left	Left to Right	Left to Right	Right to Left	Right to Left

Analysis Options

All Open Scenarios	
Slices Type:	Vertical
Analysis Methods Used	
	Spencer
Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

All Open Scenarios	
Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

All Open Scenarios	
Pseudo-random Seed:	10116
Random Number Generation Method:	Park and Miller v.3

Surface Options

Construction - Master Scenario	Construction - Berm Inward	Construction - Berm Inward NC	Construction - Berm Outward	Construction - Berm Outward NC	Construction Seismic
Surface Type: Circular Search Method: Auto Refine Search Divisions along slope: 20 Circles per division: 10 Number of iterations: 10 Divisions to use in next iteration: 50% Composite Surfaces: Disabled Minimum Elevation: Not Defined Minimum Depth: Not Defined Minimum Area: Not Defined Minimum Weight: Not Defined	Surface Type: Circular Search Method: Grid Search Radius Increment: 10 Composite Surfaces: Disabled Reverse Curvature: Invalid Surfaces Minimum Elevation: Not Defined Minimum Depth [ft]: 10 Minimum Area: Not Defined Minimum Weight: Not Defined	Surface Type: Non-Circular Block Search Number of Surfaces: 5000 Multiple Groups: Disabled Pseudo-Random Surfaces: Enabled Convex Surfaces Only: Disabled Left Projection Angle (Start Angle) [°]: 105 Left Projection Angle (End Angle) [°]: 165 Right Projection Angle (Start Angle) [°]: 15 Right Projection Angle (End Angle) [°]: 75 Minimum Elevation: Not Defined Minimum Depth [ft]: 10 Minimum Area: Not Defined Minimum Weight: Not Defined	Surface Type: Circular Search Method: Grid Search Radius Increment: 10 Composite Surfaces: Disabled Reverse Curvature: Invalid Surfaces Minimum Elevation: Not Defined Minimum Depth [ft]: 10 Minimum Area: Not Defined Minimum Weight: Not Defined	Surface Type: Non-Circular Block Search Number of Surfaces: 5000 Multiple Groups: Disabled Pseudo-Random Surfaces: Enabled Convex Surfaces Only: Disabled Left Projection Angle (Start Angle) [°]: 105 Left Projection Angle (End Angle) [°]: 165 Right Projection Angle (Start Angle) [°]: 15 Right Projection Angle (End Angle) [°]: 75 Minimum Elevation: Not Defined Minimum Depth [ft]: 10 Minimum Area: Not Defined Minimum Weight: Not Defined	Surface Type: Circular Search Method: Auto Refine Search Divisions along slope: 20 Circles per division: 10 Number of iterations: 10 Divisions to use in next iteration: 50% Composite Surfaces: Disabled Minimum Elevation: Not Defined Minimum Depth: Not Defined Minimum Area: Not Defined Minimum Weight: Not Defined

Seismic Loading

Construction	Construction Seismic
Advanced seismic analysis: No	Advanced seismic analysis: No
Staged pseudostatic analysis: No	Staged pseudostatic analysis: No
	Seismic Load Coefficient (Horizontal): 0.05

Loading

All Open Scenarios	
2 Distributed Loads present	
Distributed Load 1	
Distribution:	Constant
Magnitude [psf]:	2350
Orientation:	Normal to boundary
Distributed Load 2	
Distribution:	Constant
Magnitude [psf]:	2350
Orientation:	Normal to boundary

Tension Crack

Construction - Master Scenario	Construction - Berm Inward	Construction - Berm Inward NC	Construction - Berm Outward	Construction - Berm Outward NC	Construction Seismic - Master Scenario	Construction Seismic - Berm Inward	Construction Seismic - Berm Inward NC	Construction Seismic - Berm Outward	Construction Seismic - Berm Outward NC
			Water level: dry					Water level: dry	

Materials

Property	Till	Stiff Clay	Sand	Silty Sand	MSE Berm	Liner Bottom	Soft Clay (Construction)	Stiff Clay (Construction)
Color								
Strength Type	Mohr-Coulomb	SHANSEP	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	SHANSEP	SHANSEP
Unit Weight [lbs/ft3]	150	125	110	110	120	120	120	125
Cohesion [psf]	10000		0	0	100	0		
Friction Angle [°]	50		36	32	32	18.3		
A [psf]		0					0	0
S		0.22					0.19	0.22
m		0.76					0.66	0.76
Stress History Type		Preconsolidation Pressure					Preconsolidation Pressure	Preconsolidation Pressure
Definition Method		Constant [12250]					Constant [4600]	Constant [12250]
Material Dependent Vertical Stress		No					Yes	Yes
Water Surface	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario
Hu Value	1	1	1	1	1		1	1
Ru Value						0		

SHANSEP Material Dependent Vertical Stress

Soft Clay (Construction)

Vertical stress computed using the following factored materials:

MSE Berm Factor=0

Stiff Clay (Construction)

Vertical stress computed using the following factored materials:

MSE Berm Factor=0

Property	Bedrock
Color	
Strength Type	Infinite strength
Unit Weight [lbs/ft3]	165
Allow Sliding Along Boundary	Yes
Water Surface	Assigned per scenario
Ru Value	0

Materials In Use

Material	Master Scenario	Berm Inward	Berm Inward NC	Berm Outward	Berm Outward NC	Master Scenario	Berm Inward	Berm Inward NC	Berm Outward	Berm Outward NC
Till	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Stiff Clay	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Sand	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Silty Sand	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
MSE Berm	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Liner Bottom	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Soft Clay (Construction)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Stiff Clay (Construction)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Bedrock	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Support

Support 1

Support Type: GeoTextile
Force Application: Active
Force Orientation: Parallel to Reinforcement
Anchorage: None
Shear Strength Model: Linear
Use External Loads for Strength: yes
Strip Coverage: 100 percent
Tensile Strength: 1760 lb/ft
Pullout Strength Adhesion: 0 psf
Pullout Strength Friction Angle: 32 degrees

Entity Information

Group: Construction

Shared Entities

Type	X	Y
External Boundary	240.434	289.958
	231.416	289.556
	225.769	289.042
	225.141	289.038
	202.533	288.101
	194.135	287.472
	183.742	286
	161.104	284.602
	156.665	284.328
	126.897	284.133
	119.588	284.016
	111.032	284.031
	73.1206	284.044
	58.9292	284
	53.3255	282.785
	38.4942	282.447
	30.8178	282
	26.1313	280.9
	13.1043	280.032
	12.6189	280
	11.3347	279.8
	5.14036	278.32
	3.58069	278
	0.948341	277.525
	0	277.362
	0	276.126
	0	270.244
	0	264.464
	0	249.186
	0	245.606
	0	225
	1156.29	225
	1156.29	263.748
	1156.29	272.267
	1156.29	277.235
	1156.29	280.328
	1151.41	280.475
	1141.68	280.77
	1138.18	280.875
	1126.39	281.232
	1124.96	281.275
	1115.76	281.553
	1111.74	281.675
	1111.11	281.694
	1029.88	284.15
	1026.44	284.071
	1025.36	284.044
	881.121	280.524
	880.983	280.521
	879.177	280.477
	874.371	280.36
	839.639	279.512
	795.119	278.425
	795.029	278.423
	794.457	278.409
	788.418	278.262
	787.477	278.239
	771.981	277.861
	771.848	277.859
	769.817	277.827
	769.673	277.825
	768.582	277.844
	768.313	277.848
	761.971	277.959
	735.89	278.396
	730.043	278.494
	728.912	278.513
	726.344	278.556
	722.3	278.624
	718.703	278.684
	715.688	278.735
	665.211	279.581
	661.624	279.581
	661.316	279.581
	661.189	279.581
	661.084	279.581
	570.837	277.571
	532.908	276.726
	498.516	277.316
	498.109	277.323
	461.723	277.947
	452.093	278.112
	451.754	278.118
	444.894	278.235
	441.412	278.295
	441.041	278.301
	431.974	278.457
	428.389	278.518
	427.153	278.54
	422.868	278.613
	416.129	278.729
	408.163	278.865
	406.234	278.898
	398.086	279.038
	394.839	279.094
	388.69	281.132
	380.812	283.744
	380.59	283.818
	362.068	289.958
	356.488	291.807
	338.34	297.823
	329.822	300.647
	292.952	312.87
	292.56	313
	244.299	313
	240.661	291.313
Material Boundary	0	276.126
	8.53186	276.311
	12.9767	276.401
	27.3698	277
	44.4629	277.473
	62.8683	278
	68.4389	278.15
	99.1303	279
	133.897	279.924
	145.674	280.233
	145.968	280.235
	153.309	280.293
	159.638	280.365
	176.276	281
	185.382	281.224
	199.63	281.574
	210.619	281.843
	217.005	282
	240.434	282.375
Material Boundary	0	264.464
	36.9453	264.988
	37.0786	264.99
	37.1972	264.992
	37.2089	264.992
	37.816	265
	79.617	265.347
	116.811	265.634
	149.95	265.869
	179.827	266.06
	207.053	266.216
	232.107	266.34
	240.434	266.402
	244.299	266.431
	258.169	266.54
	292.56	266.689
	323.614	266.822
	339.51	266.968
	365.884	267.205
	375.98	267.305
	386.395	267.434
	400.203	267.703
	412.309	267.918
	428.156	268.173
	448.598	268.477
	480.528	268.67
	499.818	269
	524.231	269.383
	536.18	269.459
	558.221	269.848
	567.708	270
	771.104	273.009
	834.718	273.941
	856.655	274.257
	898.561	275
	958.946	278.612
	980.034	280
	987.616	280
	997.6	280
	1006.78	280
	1014.49	280
	1021.14	280
	1033.83	280
	1035.88	280
	1037.2	280
	1041.74	280
	1045.34	279.769
	1045.95	279.766
	1047.43	279.751
	1058.57	279.22
	1066.23	279.13
	1077.28	278.695
	1084.34	278.604
	1094.61	278.453
	1100.63	278.264
	1106.03	278.095
	1113.56	277.854
	1156.29	277.235
Material Boundary	0	270.244
	14.0784	270.522
	35.0451	271
	35.2441	271.003
	51.5834	271.19
	58.497	271.305
	70.2647	271.475
	83.1457	271.695
	91.56	271.817
	101.632	272
	105.068	272.066
	147.978	273
	151.677	273.095
	171.368	273.654
	179.215	273.873
	181.099	273.923
	183.949	274
	197.048	274.351
	218.376	275
	227.201	275.546
	237.178	275.746
	239.576	275.814
	240.434	275.838
	241.732	275.874
	249.347	276
	256.986	276.031
	259.505	276.019
	276.049	276.048
	288.959	276.071
	292.56	276.084
	303.974	276.125
	317.688	276.16
	318.427	276.166
	324.238	276.217
	335.069	276.274
	350.197	276.348
	355.394	276.394
	365.618	276.489
	378.057	276.573
	398.12	276.762
	401.547	276.787
	405.212	276.825
	410.47	276.88
	413.73	276.907
	422.464	277
	444.899	277.095
	457.16	277.145
	458.431	277.15
	478.715	277.234
	489.283	277.278
	498.109	277.323
	0	249.186
	50.5069	250
	52.345	250.063
	53.3196	250.1
	96.5149	251.651

Material Boundary

X	Y
570.837	277.571
573.812	277.584
579.273	277.613
583.197	277.633
584.452	277.643
589.928	277.673
590.673	277.679
592.34	277.693
594.683	277.705
597.28	277.716
599.913	277.73
605.849	277.742
612.345	277.744
612.641	277.743
618.138	277.74
619.283	277.739
619.418	277.739
626.143	277.735
626.814	277.735
633.148	277.732
655.935	277.729
726.278	277.172
727.082	277
741.983	277
758.88	277
760.686	277
762.957	277
765.414	277
767.433	277.028
769.28	277.09
769.865	277.109
787.177	277.666
795.111	278
805.18	278.358
817.081	278.753
824.366	279
836.788	279.416
839.639	279.512

Material Boundary

X	Y
661.084	279.581
661.172	279.579
661.189	279.581

Material Boundary

X	Y
735.89	278.396
768.313	277.848

Material Boundary

X	Y
769.817	277.827
770.301	277.82
771.848	277.859

Material Boundary

X	Y
1025.36	284.044
1029.88	284.15

Material Boundary

X	Y
769.673	277.825
769.904	277.821
769.967	277.82
770.144	277.817
770.301	277.82
770.917	277.835
771.301	277.844
771.981	277.861
773.802	277.904
775.194	277.938
779.836	278.05
781.806	278.097
787.477	278.239

Material Boundary

X	Y
1026.44	284.071
1029.02	284.131
1029.88	284.15
1032.53	284.07
1033.04	284.048
1033.46	284.036
1034.69	283.999
1045.62	283.666
1049.98	283.535
1058.84	283.265
1065.26	283.072
1072.07	282.865
1080.54	282.609
1085.29	282.465
1095.83	282.147
1098.51	282.066
1111.11	281.694

Material Boundary

X	Y
240.434	289.958
292.56	289.958
362.068	289.958

Material Boundary

X	Y
240.434	282.375
248.931	282.511
279.041	283
282.264	283.046
283.145	283.054
292.56	283.157
301.241	283.252
310.11	283.348
316.32	283.396
327.367	283.515
343.548	283.61
350.04	283.671
352.632	283.684
359.007	283.746
380.59	283.818

Material Boundary

X	Y
0	245.606
19.8454	245.847
27.1339	245.925
55.2924	246.198
61.0906	246.25
61.2614	246.251
82.0509	246.397
87.4027	246.435
89.7722	246.446
109.099	246.539
123.654	246.582
127.489	246.588
138.803	246.6
142.236	246.644
148.97	246.74
157.973	246.757
173.101	246.76
179.633	246.858
183.989	246.929
196.367	246.968
200.755	246.969
212.062	247.166
214.05	247.204
226.824	247.442
233.862	247.578
240.191	247.621
244.759	247.715
250.231	247.828
257.784	247.883
274.175	248.252
281.049	248.41
304.951	248.973
312.268	249.079
341.129	249.83
341.232	249.832
347.548	250
349.94	250.094
351.302	250.145
402.944	252.143
432.981	253.272
449.918	253.917
470.442	254.681
471.59	254.725
479.047	255
513.394	256.283
524.207	256.685
533.123	257.017
561.655	258.076
578.513	258.695
579.847	258.744
610.366	259.864
611.635	259.911
614.106	260
631.329	260.588
640.925	260.943
672.226	262.04
679.096	262.277
710.071	263.474
722.958	263.934
725.603	264.027
733.014	264.315
737.935	264.488
742.418	264.641
743.374	264.674
744.672	264.717
753.944	265
797.804	266.183
810.018	266.516
835.893	267.203
859.232	268.076
867.017	268.298
869.678	268.397
879.687	268.681
884.105	268.798
885.878	268.86
915.881	270
919.523	270.029
935.822	270.124
950.728	270.224
969.989	270.317

Type	Coordinates	
Material Boundary	X	Y
	661.624	279.581
	662.794	279.555
	665.211	279.518
	669.406	279.454
	672.853	279.401
	676.018	279.352
	680.494	279.283
	682.629	279.249
	688.136	279.163
	689.241	279.146
	695.778	279.044
	695.853	279.042
	696.335	279.035
	702.465	278.938
	703.419	278.923
	709.076	278.833
	711.061	278.801
	715.688	278.735
Material Boundary	X	Y
	795.119	278.425
	801.641	278.573
	802.76	278.599
	808.253	278.731
	809.25	278.755
	810.402	278.783
	812.795	278.841
	814.865	278.89
	816.339	278.926
	818.044	278.967
	822.395	279.072
	824.179	279.115
	825.533	279.148
	826.34	279.167
	826.482	279.169
	826.583	279.17
	826.714	279.177
	826.885	279.181
	827.346	279.192
	827.538	279.196
	828.323	279.214
	831.447	279.289
	833.327	279.333
	834.7	279.366
	836.788	279.416
	840.969	279.517
	841.312	279.525
	843.518	279.579
	847.924	279.686
	848.61	279.703
	854.536	279.849
	856.252	279.892
	861.147	280.014
	863.893	280.083
	867.759	280.181
	871.535	280.277
	874.371	280.36

Scenario-based Entities

Type	Coordinates	Master Scenario	Berm Inward	Berm Inward NC	Berm Outward	Berm Outward NC
Piezoline	X Y 0 267 696.778 279.052 769.673 277.825 770.301 277.82 775.194 277.938 842.556 279.61 980.16 283.008 1029.88 284.15 1156.29 280.328	Assigned to materials: Stiff Clay Soft Clay (Construction) Stiff Clay (Construction)	Assigned to materials: Stiff Clay Soft Clay (Construction) Stiff Clay (Construction)	Assigned to materials: Stiff Clay Soft Clay (Construction) Stiff Clay (Construction)	Assigned to materials: Stiff Clay Soft Clay (Construction) Stiff Clay (Construction)	Assigned to materials: Stiff Clay Soft Clay (Construction) Stiff Clay (Construction)
Piezoline	X Y 0 275 1156.3 288	Assigned to materials: Sand Silty Sand MSE Berm	Assigned to materials: Sand Silty Sand MSE Berm	Assigned to materials: Sand Silty Sand MSE Berm	Assigned to materials: Sand Silty Sand MSE Berm	Assigned to materials: Sand Silty Sand MSE Berm
Piezoline	X Y 0 258 1156.3 287	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till
Piezoline	X Y 395.359 282.085 406.279 281.897 407.555 281.876 415.716 281.736 425.264 281.572 427.429 281.535 435.721 281.393 441.78 281.289 448.342 281.176 452.093 281.112 532.908 279.726 588.385 281.072 590.889 281.124 661.084 282.581 661.109 282.58 661.366 282.576 661.624 282.572 662.794 282.555 665.211 282.518 669.406 282.454 672.853 282.401 676.018 282.352 680.494 282.283 682.629 282.249 688.136 282.163 689.241 282.146 695.778 282.044 695.853 282.042 696.335 282.035 702.465 281.938 703.419 281.923 709.076 281.833 711.061 281.801 715.688 281.727 718.703 281.678 722.3 281.62 726.344 281.554 728.912 281.512 731.265 281.474 733.986 281.429 734.81 281.416 735.524 281.404 741.627 281.303 742.135 281.294 745.396 281.24 748.747 281.184 749.269 281.175 755.359 281.072 756.911 281.046 761.971 280.959 764.552 280.914 768.582 280.844 769.673 280.825 769.904 280.821 769.962 280.82 769.972 280.82 770.144 280.817 770.301 280.82 770.917 280.835 771.301 280.844 771.981 280.861 773.802 280.904 775.194 280.938 779.836 281.05 781.806 281.097 787.477 281.233 788.418 281.255 794.457 281.4 795.03 281.414 795.119 281.416 801.641 281.573 802.76 281.599 808.253 281.731 809.25 281.755 810.402 281.783 812.795 281.841 814.865 281.89 816.339 281.926 818.044 281.967 822.395 282.072 824.179 282.115 825.533 282.148 826.34 282.167 826.57 282.173 826.714 282.177 826.885 282.181 827.346 282.192 827.538 282.196 828.323 282.214 831.447 282.289 833.327 282.333 834.7 282.366 840.969 282.517 841.312 282.525 843.518 282.579 847.924 282.686 848.61 282.703 854.536 282.849 856.252 282.892 861.147 283.014 863.893 283.083 867.759 283.181 871.535 283.277 874.371 283.35 879.177 283.474 880.983 283.521 886.818 283.673 887.595 283.693 892.579 283.825 894.206 283.868 894.46 283.875 900.818 284.045 902.102 284.079 907.43 284.224 909.743 284.287 914.042 284.404 917.385 284.496 920.654 284.587 925.026 284.709 927.767 284.786 928.197 284.798 928.239 284.799 928.488 284.806 928.523 284.807 928.609 284.809 929.126 284.821 929.395 284.828 930.057 284.843 931.628 284.88 931.91 284.887 932.668 284.904 933.877 284.933 940.31 285.083 940.489 285.087 941.64 285.114 947.101 285.241 947.951 285.261 953.712 285.395 955.593 285.439 960.324 285.549 963.235 285.617 966.936 285.702 970.876 285.794 973.548 285.855 975.853 285.909 978.518 285.97 979.398 285.991 980.16 286.008	Assigned to materials: Liner Bottom	Assigned to materials: Liner Bottom	Assigned to materials: Liner Bottom	Assigned to materials: Liner Bottom	Assigned to materials: Liner Bottom

Distributed Load	X Y 251.889 313 250.276 313	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No
Distributed Load	X Y 262.243 313 260.552 313	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No
Bolt	X Y 240.776 292 275.776 292	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 241.028 293.5 276.028 293.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 241.279 295 276.279 295	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 241.531 296.5 276.531 296.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 241.783 298 276.783 298	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 242.034 299.5 277.034 299.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 242.286 301 277.286 301	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 242.538 302.5 277.538 302.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 242.789 304 277.789 304	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 243.041 305.5 278.041 305.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 243.292 307 278.292 307	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 243.544 308.5 278.544 308.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 243.796 310 278.796 310	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 244.047 311.5 279.047 311.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 244.299 313 279.299 313	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 240.525 290.5 275.525 290.5	Support 1	Support 1	Support 1	Support 1	Support 1
Block Search Window	X Y 261.613 232.07 352.915 232.07 352.915 282.868 261.613 282.868	✗	✗	✓	✗	✗
Block Search Window	X Y 337.029 227.218 428.331 227.218 428.331 278.016 337.029 278.016	✗	✗	✓	✗	✗
Tension Crack	X Y 243.544 308.5 306.134 308.5	✗	✗	✗	Water level: dry	✗
Block Search Window	X Y 191.104 245.049 258.797 245.049 258.797 284.151 191.104 284.151	✗	✗	✗	✗	✓
Block Search Window	X Y 241.876 247.294 309.569 247.294 309.569 286.396 241.876 286.396	✗	✗	✗	✗	✓

Group: Construction Seismic

Shared Entities

Type	Coordinates
External Boundary	X Y 240.434 289.958 231.416 289.556 225.769 289.042 225.141 289.038 202.533 288.101 194.135 287.472 183.742 286 161.104 284.602 156.665 284.328 126.897 284.133 119.588 284.016 111.032 284.031 73.1206 284.044 58.9292 284 53.3255 282.785 38.4942 282.447 30.8178 282 26.1313 280.9 13.1043 280.032 12.6189 280 11.3347 279.8 5.14036 278.32 3.58069 278 0.948341 277.525 0 277.362 0 276.126 0 270.244 0 264.464 0 249.186 0 245.606 0 225 1156.29 225 1156.29 263.748 1156.29 272.267 1156.29 277.235 1156.29 280.328 1151.41 280.475 1141.68 280.77 1138.18 280.875 1126.39 281.232 1124.96 281.275 1115.76 281.553 1111.74 281.675 1111.11 281.694 1029.88 284.15 1026.44 284.071 1025.36 284.044 881.121 280.524 880.983 280.521 879.177 280.477 874.371 280.36 839.639 279.512 795.119 278.425 795.029 278.423 794.457 278.409 788.418 278.262 787.477 278.239 771.981 277.861 771.848 277.859 769.817 277.827 769.673 277.825 768.582 277.844 768.313 277.848 761.971 277.959 735.89 278.396 730.043 278.494 728.912 278.513 726.344 278.556 722.3 278.624 718.703 278.684 715.688 278.735 665.211 279.581 661.624 279.581 661.316 279.581 661.189 279.581 661.084 279.581 570.837 277.571 532.908 276.726 498.516 277.316 498.109 277.323 461.723 277.947 452.093 278.112 451.754 278.118 444.894 278.235 441.412 278.295 441.041 278.301 431.974 278.457 428.389 278.518 427.153 278.54 422.868 278.613 416.129 278.729 408.163 278.865 406.234 278.898 398.086 279.038 394.839 279.094 388.69 281.132 380.812 283.744 380.59 283.818 362.068 289.958 356.488 291.807 338.34 297.823 329.822 300.647 292.952 312.87 292.56 313 244.299 313

Material Boundary

X	Y
0	276.126
8.53186	276.311
12.9767	276.401
27.3698	277
44.4629	277.473
62.8683	278
68.4389	278.15
99.1303	279
133.897	279.924
145.674	280.233
145.968	280.235
153.309	280.293
159.638	280.365
176.276	281
185.382	281.224
199.63	281.574
210.619	281.843
217.005	282
240.434	282.375

Material Boundary

X	Y
0	264.464
36.9453	264.988
37.0786	264.99
37.1972	264.992
37.2089	264.992
37.816	265
79.617	265.347
116.811	265.634
149.95	265.869
179.827	266.06
207.053	266.216
232.107	266.34
240.434	266.402
244.299	266.431
258.169	266.54
292.56	266.689
323.614	266.822
339.51	266.968
365.884	267.205
375.98	267.305
386.395	267.434
400.203	267.703
412.309	267.918
428.156	268.173
448.598	268.477
480.528	268.67
499.818	269
524.231	269.383
536.18	269.459
558.221	269.848
567.708	270
771.104	273.009
834.718	273.941
856.655	274.257
898.561	275
958.946	278.612
980.034	280
987.616	280
997.6	280
1006.78	280
1014.49	280
1021.14	280
1033.83	280
1035.88	280
1037.2	280
1041.74	280
1045.34	279.769
1045.95	279.766
1047.43	279.751
1058.57	279.22
1066.23	279.13
1077.28	278.695
1084.34	278.604
1094.61	278.453
1100.63	278.264
1106.03	278.095
1113.56	277.854
1156.29	277.235

Material Boundary

X	Y
0	270.244
14.0784	270.522
35.0451	271
35.2441	271.003
51.5834	271.19
58.497	271.305
70.2647	271.475
83.1457	271.695
91.56	271.817
101.632	272
105.068	272.066
147.978	273
151.677	273.095
171.368	273.654
179.215	273.873
181.099	273.923
183.949	274
197.048	274.351
218.376	275
227.201	275.546
237.178	275.746
239.576	275.814
240.434	275.838
241.732	275.874
249.347	276
256.986	276.031
259.505	276.019
276.049	276.048
288.959	276.071
292.56	276.084
303.974	276.125
317.688	276.16
318.427	276.166
324.238	276.217
335.069	276.274
350.197	276.348
355.394	276.394
365.618	276.489
378.057	276.573
398.12	276.762
401.547	276.787
405.212	276.825
410.47	276.88
413.73	276.907
422.464	277
444.899	277.095
457.16	277.145
458.431	277.15
478.715	277.234
489.283	277.278
498.109	277.323

Material Boundary

X	Y
0	249.186
50.5069	250
52.345	250.063
53.3196	250.1
96.5149	251.651
120.444	252.577
181.204	254.936
182.856	255
240.434	257.328
258.78	258.07
292.56	259.39
298.02	259.603
303.257	259.812
304.303	259.853
308.265	260
458.713	264.407
477.562	265
590.671	266.572
731.03	268.508
765.562	268.982
781.963	269.203
791.519	269.329
797.362	269.405
801.591	269.458
804.823	269.497
807.228	269.524
809.585	269.55
811.923	269.574
814.595	269.601
817.11	269.625
818.781	269.641
820.122	269.653
821.215	269.661
821.905	269.665
822.626	269.669
824.751	269.678
826.138	269.684
827.505	269.689
830.235	269.697
845.775	270
876.508	271.082
890.984	271.643
916.725	272.575
929.067	272.998
951.674	273.785
971.626	274.638
974.258	274.719
975.556	274.758
980.817	275
1009.08	275
1036.31	275
1037.89	275
1039.52	275
1043.98	275
1050.62	274.635
1051.24	274.637
1059.23	274.21
1061.61	274.225
1068.61	273.871
1073.81	273.568
1077.61	273.306
1078.27	273.268
1119.86	272.476
1146.15	272.067
1153.32	272.215
1156.29	272.267

Material Boundary

X	Y
570.837	277.571
573.812	277.584
579.273	277.613
583.197	277.633
584.452	277.643
588.928	277.673
590.671	277.679
592.34	277.693
594.683	277.705
597.28	277.716
599.913	277.73
605.849	277.742
612.345	277.744
612.641	277.743
618.138	277.74
619.283	277.739
619.418	277.739
626.143	277.735
626.814	277.735
633.148	277.732
655.935	277.729
726.278	277.172
727.082	277
741.983	277
758.88	277
760.686	277
762.957	277
765.414	277
767.433	277.028
769.28	277.09
769.865	277.109
787.177	277.666
795.111	278
805.18	278.358
817.081	278.753
824.366	279
836.788	279.416
839.639	279.512

Material Boundary

X	Y
661.084	279.581
661.172	279.579
661.189	279.581

Material Boundary

X	Y
775.89	278.396
768.313	277.848

Material Boundary

X	Y
769.817	277.827
770.301	277.82
771.848	277.859

Material Boundary

X	Y
1025.36	284.044
1029.88	284.15

Material Boundary

X	Y
769.673	277.825
769.904	277.821
769.967	277.82
770.144	277.817
770.301	277.82
770.917	277.835
771.301	277.844
771.981	277.861
773.802	277.904
775.194	277.938
779.836	278.05
781.806	278.097
787.477	278.239

Material Boundary

X	Y
1026.44	284.071
1029.02	284.131
1029.88	284.15
1032.53	284.07
1033.04	284.048
1033.46	284.036
1034.69	283.999
1045.62	283.666
1049.98	283.535
1058.84	283.265
1065.26	283.072
1072.07	282.865
1080.54	282.609
1085.29	282.465
1095.83	282.147
1098.51	282.066
1111.11	281.694

Material Boundary

X	Y
240.434	289.958
292.56	289.958
362.068	289.958

Material Boundary

X	Y
240.434	282.375
248.931	282.511
279.041	283
282.264	283.046
283.145	283.054
292.56	283.157
301.241	283.252
310.11	283.348
316.32	283.396
327.367	283.515
343.548	283.61
350.04	283.671
352.632	283.684
359.007	283.746
380.59	283.818

Material Boundary

X	Y
0	245.606
19.8454	245.847
27.1339	245.925
55.2924	246.198
61.0906	246.25
61.2614	246.251
82.0509	246.397
87.4027	246.435
89.7722	246.446
109.099	246.539
123.654	246.582
127.489	246.588
138.803	246.6
142.236	246.644
148.97	246.74
157.973	246.757
173.101	246.76
179.633	246.858
183.989	246.929
196.367	246.968
200.755	246.969
212.062	247.166
214.05	247.204
226.824	247.442
233.862	247.578
240.191	247.621
244.759	247.715
250.231	247.828
257.784	247.883
274.175	248.252
281.049	248.41
304.951	248.973
312.268	249.079
341.129	249.83
341.232	249.832
347.548	250
349.94	250.094
351.302	250.145
402.944	252.143
432.981	253.272
449.918	253.917
470.442	254.681
471.59	254.725
479.047	255
513.394	256.283
524.207	256.685
533.123	257.017
561.655	258.076
578.513	258.695
579.847	258.744
610.366	259.864
611.635	259.911
614.106	260
631.329	260.588
640.925	260.943
672.226	262.04
679.096	262.277
710.071	263.474
722.958	263.934
725.603	264.027
733.014	264.315
737.935	264.488
742.418	264.641
743.374	264.674
744.672	264.717
753.944	265
797.804	266.183
810.018	266.516
835.893	267.203
859.232	268.076
867.017	268.298
869.678	268.397
879.687	268.681
884.105	268.798
885.878	268.86
915.881	270
919.523	270.029
935.822	270.124
950.728	270.224
969.989	270.317
987.444	270.385
998.09	270.411
1004.27	270.408
1022.34	270.427
1031.19	270.389
1043.01	270.323
1045.76	270.288
1045.98	270.244
1049.53	270.115
1050.32	270
1071.07	266.597
1083.11	265
1087.23	264.877
1097.36	264.778
1120.18	264.275
1121.12	264.255
1122.27	264.226
1141.57	263.95
1142.85	263.937
1144.94	263.907
1149.57	263.818
1156.29	263.748

Material Boundary

X	Y
661.624	279.581
662.794	279.555
665.211	279.518
669.406	279.454
672.853	279.401
676.018	279.352
680.494	279.283
682.629	279.249
688.136	279.163
689.241	279.146
695.778	279.044
695.853	279.042
696.335	279.035
702.465	278.938
703.419	278.923
709.076	278.833
711.061	278.801
715.688	278.735

Material Boundary

X	Y
795.119	278.425
801.641	278.573
802.76	278.599
808.253	278.731
809.25	278.755
810.402	278.783
812.795	278.841
814.865	278.89
816.339	278.926
818.044	278.967
822.395	279.072
824.179	279.115
825.533	279.148
826.34	279.167
826.482	279.169
826.583	279.17
826.714	279.177
826.885	279.181
827.346	279.192
827.538	279.196
828.323	279.214
831.447	279.289
833.327	279.333
834.7	279.366
836.788	279.416
840.969	279.517
841.312	279.525
843.518	279.579
847.924	279.686
848.61	279.703
854.536	279.849
856.252	279.892
861.147	280.014
863.893	280.083
867.759	280.181
871.535	280.277
874.371	280.36

Scenario-based Entities

Type	Coordinates	Master Scenario	Berm Inward	Berm Inward NC	Berm Outward	Berm Outward NC
Piezoline	X, Y: 0, 267 696.778, 279.052 769.673, 277.825 770.301, 277.82 775.194, 277.938 842.556, 279.61 980.16, 283.008 1029.88, 284.15 1156.29, 280.328	Assigned to materials: Stiff Clay Soft Clay (Construction) Stiff Clay (Construction)	Assigned to materials: Stiff Clay Soft Clay (Construction) Stiff Clay (Construction)	Assigned to materials: Stiff Clay Soft Clay (Construction) Stiff Clay (Construction)	Assigned to materials: Stiff Clay Soft Clay (Construction) Stiff Clay (Construction)	Assigned to materials: Stiff Clay Soft Clay (Construction) Stiff Clay (Construction)
Piezoline	X, Y: 0, 275 1156.3, 288	Assigned to materials: Sand Silty Sand MSE Berm	Assigned to materials: Sand Silty Sand MSE Berm	Assigned to materials: Sand Silty Sand MSE Berm	Assigned to materials: Sand Silty Sand MSE Berm	Assigned to materials: Sand Silty Sand MSE Berm
Piezoline	X, Y: 0, 258 1156.3, 287	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till
	X, Y: 395.359, 282.085 406.279, 281.897 407.555, 281.876 415.716, 281.736 425.264, 281.572					

Distributed Load	X Y 251.889 313 250.276 313	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No
Distributed Load	X Y 262.243 313 260.552 313	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No
Bolt	X Y 240.776 292 275.776 292	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 241.028 293.5 276.028 293.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 241.279 295 276.279 295	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 241.531 296.5 276.531 296.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 241.783 298 276.783 298	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 242.034 299.5 277.034 299.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 242.286 301 277.286 301	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 242.538 302.5 277.538 302.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 242.789 304 277.789 304	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 243.041 305.5 278.041 305.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 243.292 307 278.292 307	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 243.544 308.5 278.544 308.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 243.796 310 278.796 310	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 244.047 311.5 279.047 311.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 244.299 313 279.299 313	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 240.525 290.5 275.525 290.5	Support 1	Support 1	Support 1	Support 1	Support 1

Block Search Window	X Y 261.613 232.07 352.915 232.07 352.915 282.868 261.613 282.868	✗	✗	✓	✗	✗
Block Search Window	X Y 337.029 227.218 428.331 227.218 428.331 278.016 337.029 278.016	✗	✗	✓	✗	✗
Tension Crack	X Y 243.544 308.5 306.134 308.5	✗	✗	✗	Water level: dry	✗
Block Search Window	X Y 191.104 245.049 258.797 245.049 258.797 284.151 191.104 284.151	✗	✗	✗	✗	✓
Block Search Window	X Y 241.876 247.294 309.569 247.294 309.569 286.396 241.876 286.396	✗	✗	✗	✗	✓

Section V

Slide Analysis Information
2019.10.01 Ph14 V Con

Project Summary

File Name:	2019.10.01 Ph14 V Con.slmd
Last saved with Slide version:	8.028
Project Title:	SLIDE - An Interactive Slope Stability Program
Date Created:	7/16/2019, 9:54:59 AM

Currently Open Scenarios

Group Name	Scenario Name	Compute Time
Construction	Master Scenario	
	Berm Inward	
	Berm Inward NC	
	Berm Outward	
	Berm Outward NC	
Construction Seismic	Master Scenario	
	Berm Inward	
	Berm Inward NC	
	Berm Outward	
	Berm Outward NC	

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard

	Master Scenario	Berm Inward	Berm Inward NC	Berm Outward	Berm Outward NC	Master Scenario	Berm Inward	Berm Inward NC	Berm Outward	Berm Outward NC
Failure Direction:	Right to Left	Left to Right	Left to Right	Right to Left	Right to Left	Right to Left	Left to Right	Left to Right	Right to Left	Right to Left

Analysis Options

All Open Scenarios	
Slices Type:	Vertical
Analysis Methods Used	
	Spencer
Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

All Open Scenarios	
Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

All Open Scenarios	
Pseudo-random Seed:	10116
Random Number Generation Method:	Park and Miller v.3

Surface Options

Construction - Master Scenario

Surface Type:	Circular
Search Method:	Auto Refine Search
Divisions along slope:	20
Circles per division:	10
Number of iterations:	10
Divisions to use in next iteration:	50%
Composite Surfaces:	Disabled
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Construction - Berm Inward

Surface Type:	Circular
Search Method:	Grid Search
Radius Increment:	10
Composite Surfaces:	Disabled
Reverse Curvature:	Invalid Surfaces
Minimum Elevation:	Not Defined
Minimum Depth [ft]:	10
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Construction - Berm Inward NC

Surface Type:	Non-Circular Block Search
Number of Surfaces:	5000
Multiple Groups:	Disabled
Pseudo-Random Surfaces:	Enabled
Convex Surfaces Only:	Disabled
Left Projection Angle (Start Angle) [°]:	105
Left Projection Angle (End Angle) [°]:	165
Right Projection Angle (Start Angle) [°]:	15
Right Projection Angle (End Angle) [°]:	75
Minimum Elevation:	Not Defined
Minimum Depth [ft]:	10
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Construction - Berm Outward

Surface Type:	Circular
Search Method:	Grid Search
Radius Increment:	10
Composite Surfaces:	Disabled
Reverse Curvature:	Invalid Surfaces
Minimum Elevation:	Not Defined
Minimum Depth [ft]:	10
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Construction - Berm Outward NC

Surface Type:	Non-Circular Block Search
Number of Surfaces:	5000
Multiple Groups:	Disabled
Pseudo-Random Surfaces:	Enabled
Convex Surfaces Only:	Disabled
Left Projection Angle (Start Angle) [°]:	105
Left Projection Angle (End Angle) [°]:	165
Right Projection Angle (Start Angle) [°]:	15
Right Projection Angle (End Angle) [°]:	75
Minimum Elevation:	Not Defined
Minimum Depth [ft]:	10
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Construction Seismic

Surface Type:	Circular
Search Method:	Auto Refine Search
Divisions along slope:	20
Circles per division:	10
Number of iterations:	10
Divisions to use in next iteration:	50%
Composite Surfaces:	Disabled
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Construction		Construction Seismic	
Advanced seismic analysis:	No	Advanced seismic analysis:	No
Staged pseudostatic analysis:	No	Staged pseudostatic analysis:	No
		Seismic Load Coefficient (Horizontal):	0.05

Loading

All Open Scenarios	
2 Distributed Loads present	
Distributed Load 1	
Distribution:	Constant
Magnitude [psf]:	2350
Orientation:	Vertical
Distributed Load 2	
Distribution:	Constant
Magnitude [psf]:	2350
Orientation:	Vertical

Tension Crack

Construction - Master Scenario	Construction - Berm Inward	Construction - Berm Inward NC	Construction - Berm Outward	Construction - Berm Outward NC	Construction Seismic - Master Scenario	Construction Seismic - Berm Inward	Construction Seismic - Berm Inward NC	Construction Seismic - Berm Outward	Construction Seismic - Berm Outward NC
	Water level: dry		Water level: dry			Water level: dry			

Materials

Property	Till	Stiff Clay	Sand	Silty Sand	MSE Berm	Liner Bottom	Soft Clay (Construction)	Stiff Clay (Construction)
Color								
Strength Type	Mohr-Coulomb	SHANSEP	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	SHANSEP	SHANSEP
Unit Weight [lbs/ft3]	150	125	110	110	120	120	120	125
Cohesion [psf]	10000		0	0	100	0		
Friction Angle [°]	50		36	32	32	18.3		
A [psf]		0					0	0
S		0.22					0.19	0.22
m		0.76					0.66	0.76
Stress History Type		Preconsolidation Pressure					Preconsolidation Pressure	Preconsolidation Pressure
Definition Method		Constant [12250]					Constant [4750]	Constant [12250]
Material Dependent Vertical Stress		No					Yes	Yes
Water Surface	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario
Hu Value	1	1	1	1	1		1	1
Ru Value						0		

SHANSEP Material Dependent Vertical Stress

Soft Clay (Construction)

Vertical stress computed using the following factored materials:

MSE Berm Factor=0

Stiff Clay (Construction)

Vertical stress computed using the following factored materials:

MSE Berm Factor=0

Property	Bedrock
Color	
Strength Type	Infinite strength
Unit Weight [lbs/ft3]	165
Allow Sliding Along Boundary	Yes
Water Surface	Assigned per scenario
Ru Value	0

Materials In Use

Material	Master Scenario	Berm Inward	Berm Inward NC	Berm Outward	Berm Outward NC	Master Scenario	Berm Inward	Berm Inward NC	Berm Outward	Berm Outward NC
Till	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Stiff Clay	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Sand	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Silty Sand	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
MSE Berm	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Liner Bottom	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Soft Clay (Construction)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Stiff Clay (Construction)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Bedrock	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Support

Support 1

Support Type: GeoTextile
Force Application: Active
Force Orientation: Parallel to Reinforcement
Anchorage: None
Shear Strength Model: Linear
Use External Loads for Strength: yes
Strip Coverage: 100 percent
Tensile Strength: 1760 lb/ft
Pullout Strength Adhesion: 0 psf
Pullout Strength Friction Angle: 32 degrees

Entity Information

Group: Construction

Shared Entities

Type	Coordinates

Type	Coordinates	
External Boundary	X	Y
	163.622	283.33
	160.95	283.38
	148.622	282.854
	129.024	282.018
	124.95	282
	110.623	282
	101.217	281.355
	69.4213	281.344
	50.662	281.582
	35.7052	281.667
	28.3911	281.577
	15.6462	280.987
	3.70482	280
	0	279.738
	0	279.057
	0	271.547
	0	261.456
	0	260
	0	245.912
	0	225
	889.809	225
	889.809	270.193
	889.809	274.403
	889.809	279.041
	889.809	283.305
	807.355	283.485
	801.667	283.482
	788.547	283.476
	787.719	283.475
	786.83	283.475
	786.417	283.475
	786.178	283.474
	785.197	283.474
	775.975	283.32
	760.649	283.041
	759.447	283.019
	756.161	282.954
	755.874	282.948
	755.767	282.946
	755.733	282.945
	755.673	282.944
	755.511	282.941
	755.45	282.94
	754.733	282.925
	746.201	282.706
	743.257	282.605
	743.242	282.605
	743.007	282.597
	742.885	282.593
	742.826	282.591
	684.597	280.594
	683.989	280.578
	682.255	280.532
	680.066	280.474
	610.413	278.618
	609.461	278.593
	607.612	278.544
	606.225	278.516
	605.71	278.506
	605.656	278.505
	605.458	278.501
	605.424	278.5
	605.358	278.499
	605.114	278.494
	601.616	278.425
	599.815	278.389
	597.694	278.347
	594.516	278.283
	593.771	278.268
	557.424	277.545
	554.547	277.489
	552.125	277.442
	550.624	277.413
	548.108	277.364
	546.826	277.34
	546.726	277.338
	546.684	277.343
	546.525	277.347
	546.051	277.332
	545.791	277.323
	545.678	277.318
	545.304	277.312
	544.501	277.297
	542.779	277.266
	542.342	277.258
	541.527	277.243
	538.857	277.195

Type	Coordinates	
	X	Y
	536.228	277.148
	534.934	277.124
	533.231	277.094
	532.421	277.079
	532.321	277.077
	532.044	277.072
	532.001	277.072
	531.845	277.069
	531.7	277.066
	531.224	277.058
	530.929	277.052
	525.631	276.957
	519.244	276.841
	507.477	276.63
	504.435	276.58
	503.554	276.565
	501.044	276.524
	493.837	276.405
	485.943	276.254
	483.942	276.215
	483.239	276.202
	481.389	276.166
	480.889	276.156
	480.657	276.152
	480.604	276.151
	479.737	276.135
	479.608	276.133
	479.412	276.129
	462.044	275.782
	456.745	275.677
	440.64	275.361
	431.041	275.175
	427.068	275.098
	426.302	275.082
	426.287	275.082
	426.275	275.082
	419.653	274.949
	417.259	274.901
	414.354	274.843
	413.337	274.823
	410.438	274.765
	409.414	274.745
	409.055	274.737
	405.492	274.666
	403.756	274.632
	401.569	274.589
	398.457	274.527
	397.647	274.511
	395.337	274.466
	382.561	274.215
	381.81	274.201
	370.189	273.976
	354.499	273.677
	352.491	273.653
	352.367	273.651
	346.654	273.581
	345.468	273.566
	342.732	273.533
	340.169	273.501
	338.809	273.485
	335.317	273.442
	335.283	273.442
	319.424	278.727
	311.09	281.504
	305.611	283.33
	299.337	285.421
	216.58	313
	205.996	313
	168.568	313
	165.567	295
Material Boundary	X	Y
	0	279.057
	58.1929	279.417
	71.1579	279.497
	73.3773	279.509
	74.9248	279.518
	124.757	279.796
	135.264	279.847
	144.219	279.855
	158.113	279.882
	160.076	279.881
	161.607	279.886
	163.506	279.81
	163.622	279.808

Type	Coordinates	
	X	Y
Material Boundary	0	261.456
	163.622	263.057
	216.58	263.576
	265.369	264.053
	324.488	264.63
	325.796	264.643
	325.862	264.643
	339.74	264.777
	344.697	264.824
	346.026	264.837
	348.413	264.859
	362.483	265
	383.024	265.925
	475.957	270
	569.642	271.721
	630.531	272.766
	700.718	274.014
	761.565	275
	797.109	279.451
	800.017	279.672
	803.891	279.794
	809.662	279.797
	814.956	279.67
	816.767	279.829
	824.303	279.635
	824.949	279.679
	831.558	279.489
	832.412	279.536
	833.881	279.607
	839.763	279.446
	842.005	279.532
	847.397	279.379
	848.704	279.419
	850.107	279.456
	852.768	279.391
	855.353	279.329
	859.32	279.226
	865.142	279.344
	869.093	279.253
	870.89	279.291
	872.87	279.326
	889.809	279.041
	X	Y
Material Boundary	0	271.547
	4.17383	271.613
	14.1023	271.741
	19.5494	271.804
	22.6138	271.841
	25.9587	271.872
	38.7745	271.945
	39.0866	271.947
	39.2107	271.948
	40.3655	271.956
	40.6328	271.957
	41.3984	271.961
	60.2217	271.859
	66.0738	271.851
	67.0426	271.854
	69.8866	271.861
	84.0427	271.786
	95.0821	271.807
	95.9776	271.808
	105.003	271.816
	119.79	271.854
	123.206	271.861
	123.535	271.861
	131.387	271.875
	150.131	271.878
	153.41	271.894
	162.21	271.924
	163.622	271.929
	171.66	271.96
	173.441	272
	209.781	272.476
	216.58	272.567
	248.997	273
	280.62	273.441

Type	Coordinates X	Coordinates Y
Material Boundary	0	260
	38.4717	260
	86.5533	260
	92.4441	260
	99.9065	260
	100.949	259.947
	105.01	259.631
	106.348	259.543
	109.193	259.361
	110.722	259.199
	111.618	259.097
	115.147	258.906
	118.414	258.721
	118.43	258.72
	120.284	258.657
	125.945	258.455
	126.42	258.442
	132.016	258.297
	133.477	258.257
	133.652	258.254
	163.622	258.243
	216.58	258.225
	260.46	258.21
	443.788	259.943
	450.937	259.908
	451.294	259.906
	455.216	260
	558.971	263.567
	595.932	265
	623.29	265.951
	633.66	266.333
	634.808	266.375
	660.887	267.328
	712.038	269.178
	734.412	270
	768.981	272.36
	776.623	272.807
	779.525	272.995
	788.226	273.449
	799.911	274.181
	806.266	274.404
	807.68	274.492
	812.605	274.578
	814.388	274.68
	819.475	274.682
	820.589	274.747
	834.952	274.588
	835.6	274.619
	843.564	274.509
	844.885	274.57
	852.058	274.442
	857.995	274.29
	862.69	274.117
	863.546	274.096
	889.809	274.403
Material Boundary	724.667	281.936
	724.846	281.942
	801.667	283.482

Type	Coordinates	
	X	Y
Material Boundary	352.491	273.653
	352.504	273.64
	352.573	273.641
	352.664	273.642
	352.794	273.645
	352.996	273.648
	353.352	273.655
	353.491	273.658
	354.499	273.677
	356.066	273.707
	358.422	273.752
	361.365	273.807
	362.344	273.826
	365.135	273.879
	366.267	273.901
	366.664	273.909
	370.189	273.976
	371.963	274.01
	374.112	274.052
	377.262	274.113
	378.034	274.128
	380.236	274.17
	381.81	274.201
	381.957	274.204
	382.561	274.215
	385.879	274.28
	387.859	274.319
	389.802	274.357
	393.158	274.423
	393.724	274.434
	395.337	274.466
	X	Y
Material Boundary	430.251	275.159
	431.041	275.175
	432.949	275.212
	435.549	275.262
	436.872	275.288
	440.64	275.361
	440.794	275.364
	440.848	275.365
	444.717	275.441
	446.147	275.468
	448.639	275.517
	451.446	275.572
	452.562	275.594
	455.741	275.657
	456.484	275.672
	456.745	275.677
	460.407	275.749
	462.044	275.782
	464.329	275.827
	467.343	275.887
	468.252	275.905
	470.842	275.957
	472.642	275.993
	473.615	276.012
	477.941	276.099
	479.135	276.123
	479.412	276.129
	479.458	276.13
	479.608	276.133
	479.68	276.134
	479.715	276.134
	479.737	276.135
	X	Y
Material Boundary	546.726	277.338
	546.755	277.338
	546.826	277.34

Type	Coordinates	
	X	Y
Material Boundary	557.424	277.545
	558.469	277.566
	561.448	277.624
	562.392	277.642
	562.723	277.649
	566.314	277.719
	568.022	277.752
	570.237	277.796
	573.321	277.856
	574.159	277.873
	576.549	277.92
	578.082	277.95
	578.619	277.961
	582.004	278.028
	583.918	278.065
	585.927	278.105
	589.217	278.17
	589.849	278.183
	591.65	278.219
	593.771	278.268
	X	Y
Material Boundary	606.225	278.516
	606.288	278.517
	606.504	278.517
	606.856	278.526
	607.612	278.544
	X	Y
Material Boundary	163.622	279.808
	166.459	279.765
	169.492	279.748
	190.858	279.845
	193.985	279.857
	218.25	280.027
	224.476	280.066
	236.344	280.273
	248.265	280.364
	252.424	280.399
	283.152	281
	309.042	281.472
	311.09	281.504
	X	Y
Material Boundary	485.943	276.254
	487.864	276.28
	488.538	276.292
	491.787	276.35
	493.837	276.386
	495.709	276.42
	499.136	276.481
	499.632	276.49
	501.044	276.524
	X	Y
Material Boundary	724.846	281.942
	726.68	282.006
	726.988	282.017
	727.558	282.037
	731.059	282.161
	732.287	282.204
	734.844	282.294
	740.052	282.479
	741.043	282.514
	741.066	282.514
	741.081	282.515
	741.096	282.515
	741.181	282.519
	742.826	282.591
	X	Y
Material Boundary	755.673	282.944
	755.711	282.945
	755.733	282.945
	X	Y
Material Boundary	163.622	283.33
	305.611	283.33
	X	Y
Material Boundary	280.62	273.441
	335.283	273.442

Type	Coordinates	
	X	Y
Material Boundary	0	245.912
	6.36475	246.126
	13.3403	246.341
	36.3284	247.103
	54.3369	247.652
	55.2772	247.682
	79.2611	248.444
	110.272	249.344
	111.035	249.367
	127.411	249.843
	128.882	249.888
	132.876	250
	148.142	250.327
	154.566	250.461
	155.103	250.439
	174.679	250.477
	214.244	250.887
	223.04	251.046
	223.923	251.063
	234.446	251.24
	240.347	251.34
	241.61	251.359
	271.29	251.838
	338.025	252.82
	359.196	253.144
	468.669	255
	504.884	256.001
	512.811	256.301
	518.723	256.525
	525.676	256.781
	533.762	257.101
	570.283	258.441
	584.807	258.964
	597.519	259.475
	602.609	259.649
	602.782	259.656
	603.792	259.688
	613.635	260
	644.906	261.528
	652.572	261.886
	675.227	262.978
	689.592	263.645
	694.125	263.874
	696.449	263.978
	702.144	264.222
	720.045	265
	733.785	265.893
	740.862	266.335
	755.735	267.14
	763.008	267.621
	772.725	268.001
	787.18	268.982
	788.074	269.024
	788.743	269.034
	792.383	269.156
	797.821	269.423
	799.666	269.372
	804.53	269.382
	805.662	269.392
	821.433	269.77
	822.214	269.723
	822.878	269.719
	853.823	269.853
	854.209	269.868
	862.107	270
	889.809	270.193

Type	Coordinates	
	X	Y
Material Boundary	610.413	278.618
	613.384	278.683
	615.712	278.74
	617.307	278.779
	621.011	278.869
	621.229	278.874
	621.852	278.89
	625.152	278.97
	626.309	278.999
	629.074	279.067
	631.608	279.129
	632.997	279.163
	634.66	279.204
	635.484	279.225
	635.868	279.235
	635.933	279.236
	636.043	279.239
	636.086	279.24
	636.109	279.241
	636.128	279.241
	636.143	279.241
	636.372	279.247
	636.434	279.249
	636.556	279.252
	636.918	279.262
	636.953	279.263
	640.842	279.369
	642.206	279.406
	644.764	279.476
	647.505	279.551
	648.687	279.584
	652.054	279.677
	652.609	279.692
	652.804	279.698
	656.531	279.801
	658.103	279.845
	660.454	279.911
	663.402	279.993
	664.376	280.021
	667.155	280.099
	668.299	280.131
	668.701	280.142
	672.221	280.242
	673.999	280.292
	676.144	280.353
	679.298	280.443
	680.066	280.474
	X	Y
Material Boundary	684.597	280.594
	687.911	280.69
	688.448	280.705
	689.353	280.731
	689.806	280.745
	689.981	280.75
	690.044	280.752
	690.078	280.753
	690.098	280.753
	690.112	280.754
	690.16	280.755
	690.212	280.756
	690.222	280.756
	690.243	280.757
	690.312	280.76
	691.251	280.791
	691.834	280.811
	695.195	280.923
	695.756	280.942
	697.356	280.996
	699.679	281.075
	700.494	281.102
	703.601	281.208
	705.793	281.282
	707.524	281.342
	711.092	281.464
	711.446	281.477
	712.457	281.512
	715.369	281.612
	716.391	281.647
	719.291	281.749
	721.689	281.832
	724.667	281.936

Scenario-based Entities

Type	Coordinates	Master Scenario	Berm Inward	Berm Inward NC	Berm Outward	Berm Outward NC

Type	Coordinates		Master Scenario	Berm Inward	Berm Inward NC	Berm Outward	Berm Outward NC
Piezoline	X	Y	Assigned to materials: Stiff Clay, Soft Clay (Construction), Stiff Clay (Construction)	Assigned to materials: Stiff Clay, Soft Clay (Construction), Stiff Clay (Construction)	Assigned to materials: Stiff Clay, Soft Clay (Construction), Stiff Clay (Construction)	Assigned to materials: Stiff Clay, Soft Clay (Construction), Stiff Clay (Construction)	Assigned to materials: Stiff Clay, Soft Clay (Construction), Stiff Clay (Construction)
	0	269					
	328.689	275.639					
	335.285	273.441					
	335.317	273.442					
	338.809	273.482					
	340.169	273.497					
	342.732	273.527					
	345.468	273.558					
	346.654	273.572					
	350.034	273.611					
	350.577	273.617					
	350.658	273.618					
	352.06	273.634					
	352.134	273.635					
	352.141	273.635					
	352.302	273.637					
	352.318	273.637					
	352.349	273.637					
	352.418	273.637					
	352.441	273.638					
	352.456	273.638					
	352.474	273.639					
	352.501	273.639					
	352.504	273.64					
	352.506	273.64					
	352.573	273.641					
	352.664	273.642					
	352.794	273.645					
	352.996	273.648					
	353.352	273.655					
	353.491	273.658					
	354.499	273.677					
	356.066	273.707					
	358.422	273.752					
	361.365	273.807					
	362.344	273.826					
	365.135	273.879					
	366.267	273.901					
	366.664	273.909					
	370.189	273.976					
	371.963	274.01					
	374.112	274.052					
	377.262	274.113					
	378.034	274.128					
	380.236	274.17					
	381.957	274.204					
	382.561	274.215					
	385.879	274.28					
	387.859	274.319					
	389.802	274.357					
	393.158	274.423					
	393.724	274.434					
	395.337	274.466					
	397.647	274.511					
	398.457	274.527					
	401.569	274.588					
	403.756	274.632					
	405.492	274.666					
	409.055	274.737					
	409.414	274.744					
	410.438	274.765					
	413.337	274.823					
	414.354	274.843					
	417.259	274.901					
	419.653	274.949					
	421.182	274.98					
	424.952	275.056					
	425.104	275.059					
	426.123	275.08					
	426.181	275.081					
	426.23	275.081					
	426.263	275.082					
	426.285	275.082					
	426.288	275.082					
	426.302	275.082					
	427.068	275.098					
	427.172	275.1					
	427.926	275.115					
	429.027	275.136					
	430.251	275.159					
	432.949	275.212					
	435.549	275.262					
	436.872	275.288					
	440.64	275.361					
	440.794	275.364					
	440.848	275.365					
	444.717	275.441					

Type	Coordinates		Master Scenario	Berm Inward	Berm Inward NC	Berm Outward	Berm Outward NC
	X	Y					
	446.147	275.468					
	448.639	275.517					
	451.446	275.572					
	452.562	275.594					
	455.741	275.657					
	456.484	275.672					
	456.745	275.677					
	460.407	275.749					
	462.044	275.782					
	464.329	275.827					
	467.343	275.887					
	468.252	275.905					
	470.842	275.957					
	472.642	275.993					
	473.615	276.012					
	477.941	276.099					
	479.135	276.123					
	479.458	276.13					
	479.608	276.133					
	479.617	276.133					
	479.68	276.134					
	479.715	276.134					
	479.736	276.134					
	479.738	276.134					
	480.604	276.151					
	480.657	276.152					
	480.889	276.156					
	481.389	276.165					
	483.239	276.198					
	483.942	276.21					
	485.943	276.246					
	487.864	276.28					
	488.538	276.292					
	491.787	276.35					
	493.837	276.386					
	495.709	276.42					
	499.136	276.481					
	499.632	276.49					
	501.044	276.515					
	503.554	276.56					
	504.435	276.576					
	507.477	276.63					
	509.734	276.671					
	511.399	276.7					
	515.033	276.766					
	515.322	276.771					
	516.145	276.786					
	519.244	276.841					
	520.332	276.861					
	523.167	276.912					
	525.631	276.957					
	527.089	276.983					
	530.929	277.052					
	530.977	277.053					
	530.989	277.053					
	530.995	277.053					
	530.996	277.053					
	531.097	277.055					
	531.148	277.056					
	531.178	277.057					
	531.198	277.057					
	531.213	277.057					
	531.215	277.057					
	531.224	277.058					
	531.7	277.066					
	531.845	277.069					
	532.044	277.072					
	532.421	277.079					
	533.231	277.094					
	534.934	277.124					
	536.228	277.148					
	538.857	277.195					
	541.527	277.243					
	542.779	277.266					
	544.501	277.297					
	545.304	277.312					
	545.678	277.318					
	545.791	277.323					
	546.051	277.332					
	546.185	277.337					
	546.267	277.34					
	546.525	277.347					
	546.684	277.343					
	546.726	277.338					
	546.735	277.338					
	546.755	277.338					
	546.826	277.34					

Type	Coordinates		Master Scenario	Berm Inward	Berm Inward NC	Berm Outward	Berm Outward NC
	X	Y					
	550.624	277.413					
	552.125	277.442					
	554.547	277.489					
	557.424	277.545					
	558.469	277.566					
	561.448	277.624					
	562.392	277.642					
	562.723	277.649					
	566.314	277.719					
	568.022	277.752					
	570.237	277.796					
	573.321	277.856					
	574.159	277.873					
	576.549	277.92					
	578.082	277.95					
	578.619	277.961					
	582.004	278.028					
	583.918	278.065					
	585.927	278.105					
	589.217	278.17					
	589.849	278.183					
	591.65	278.219					
	593.772	278.261					
	594.516	278.276					
	597.694	278.339					
	599.815	278.381					
	601.617	278.417					
	605.114	278.487					
	605.358	278.492					
	605.424	278.493					
	605.455	278.494					
	605.462	278.494					
	605.656	278.503					
	605.733	278.507					
	605.775	278.509					
	605.801	278.51					
	605.818	278.511					
	605.831	278.512					
	605.858	278.513					
	606.104	278.516					
	606.166	278.516					
	606.288	278.517					
	606.504	278.517					
	606.856	278.526					
	607.612	278.544					
	609.462	278.589					
	610.413	278.612					
	613.384	278.683					
	615.712	278.74					
	617.307	278.779					
	621.011	278.869					
	621.229	278.874					
	621.852	278.89					
	625.152	278.97					
	626.309	278.999					
	629.074	279.067					
	631.608	279.129					
	632.997	279.163					
	634.66	279.204					
	635.484	279.225					
	635.868	279.235					
	635.933	279.236					
	636.043	279.239					
	636.086	279.24					
	636.109	279.241					
	636.124	279.241					
	636.133	279.241					
	636.14	279.241					
	636.141	279.241					
	636.146	279.241					
	636.372	279.247					
	636.434	279.249					
	636.556	279.252					
	636.916	279.262					
	636.919	279.262					
	636.953	279.263					
	640.842	279.369					
	642.206	279.406					
	644.764	279.476					
	647.505	279.551					
	648.687	279.584					
	652.054	279.677					
	652.609	279.692					
	652.804	279.698					
	656.531	279.801					
	658.103	279.845					
	660.454	279.911					

Type	Coordinates		Master Scenario	Berm Inward	Berm Inward NC	Berm Outward	Berm Outward NC
	X	Y					
	663.402	279.993					
	664.376	280.021					
	667.155	280.099					
	668.299	280.131					
	668.701	280.142					
	672.221	280.242					
	673.999	280.292					
	676.144	280.353					
	679.298	280.443					
	680.066	280.465					
	682.256	280.527					
	683.989	280.577					
	684.597	280.594					
	687.911	280.69					
	688.448	280.705					
	689.353	280.731					
	689.806	280.745					
	689.981	280.75					
	690.044	280.752					
	690.078	280.753					
	690.098	280.753					
	690.112	280.754					
	690.16	280.755					
	690.212	280.756					
	690.222	280.756					
	690.243	280.757					
	690.312	280.76					
	691.251	280.791					
	691.834	280.811					
	695.195	280.923					
	695.756	280.942					
	697.356	280.996					
	699.679	281.075					
	700.494	281.102					
	703.601	281.208					
	705.793	281.282					
	707.524	281.342					
	711.092	281.464					
	711.446	281.477					
	712.457	281.512					
	715.369	281.612					
	716.391	281.647					
	719.291	281.749					
	721.689	281.832					
	724.846	281.942					
	726.68	282.006					
	726.988	282.017					
	727.558	282.037					
	731.059	282.161					
	732.287	282.204					
	734.844	282.294					
	740.052	282.479					
	741.043	282.514					
	741.06	282.514					
	741.064	282.514					
	741.066	282.514					
	741.066	282.515					
	741.067	282.515					
	741.068	282.515					
	741.068	282.515					
	741.068	282.515					
	741.068	282.515					
	741.078	282.515					
	741.08	282.515					
	741.085	282.515					
	741.096	282.515					
	741.181	282.519					
	742.826	282.581					
	742.885	282.583					
	743.007	282.587					
	743.242	282.596					
	743.257	282.597					
	746.201	282.706					
	748.35	282.763					
	752.967	282.883					
	755.009	282.932					
	755.28	282.938					
	755.366	282.94					
	755.408	282.941					
	755.433	282.942					
	755.45	282.942					
	755.511	282.943					
	755.677	282.944					
	755.711	282.945					
	755.767	282.946					
	755.874	282.948					
	756.161	282.954					

Type	Coordinates X	Coordinates Y	Master Scenario	Berm Inward	Berm Inward NC	Berm Outward	Berm Outward NC
	759.447	283.018					
	761.388	283.055					
	771.241	283.24					
	775.975	283.32					
	781.839	283.422					
	783.82	283.453					
	784.63	283.466					
	784.896	283.47					
	785.009	283.472					
	785.071	283.473					
	785.111	283.473					
	785.138	283.474					
	785.158	283.474					
	785.174	283.474					
	785.186	283.474					
	785.197	283.474					
	786.178	283.473					
	786.417	283.474					
	786.83	283.474					
	787.719	283.475					
	791.033	283.478					
	791.759	283.478					
	792.437	283.479					
	799.51	283.482					
	803.034	283.484					
	807.355	283.485					
	813.632	283.487					
	815.2	283.487					
	819.67	283.487					
	823.045	283.487					
	824.23	283.487					
	830.89	283.485					
	834.828	283.484					
	838.735	283.481					
	839.771	283.481					
	840.59	283.481					
	841.025	283.48					
	841.294	283.48					
	842.215	283.478					
	843.93	283.472					
	844.354	283.47					
	845.114	283.468					
	846.58	283.462					
	849.872	283.45					
	854.425	283.434					
	856.023	283.428					
	862.27	283.405					
	866.621	283.389					
	870.115	283.376					
	877.219	283.351					
	877.96	283.348					
	880.074	283.34					
	885.805	283.319					
	887.817	283.312					
	889.809	283.305					
Piezoline	-1.77636e-15	275	Assigned to materials: Sand, Silty Sand, MSE Berm	Assigned to materials: Sand, Silty Sand, MSE Berm	Assigned to materials: Sand, Silty Sand, MSE Berm	Assigned to materials: Sand, Silty Sand, MSE Berm	Assigned to materials: Sand, Silty Sand, MSE Berm
	889.809	287					
Piezoline	0	265	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till
	889.9	285					
Distributed Load	176.217	313	Constant Distribution Orientation: Vertical Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Vertical Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Vertical Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Vertical Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Vertical Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No
	174.605	313					
Distributed Load	186.569	313	Constant Distribution Orientation: Vertical Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Vertical Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Vertical Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Vertical Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Vertical Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No
	184.885	313					
Bolt	165.567	295	Support 1	Support 1	Support 1	Support 1	Support 1
	180.567	295					
Bolt	165.817	296.5	Support 1	Support 1	Support 1	Support 1	Support 1
	180.817	296.5					

Type	Coordinates	Master Scenario	Berm Inward	Berm Inward NC	Berm Outward	Berm Outward NC
Bolt	X Y 166.067 298 181.067 298	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 166.317 299.5 181.317 299.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 166.567 301 181.567 301	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 166.818 302.5 181.818 302.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 167.068 304 182.068 304	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 167.318 305.5 182.318 305.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 167.568 307 182.568 307	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 167.818 308.5 182.818 308.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 168.068 310 183.068 310	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 168.318 311.5 183.318 311.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 168.568 313 183.568 313	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 163.817 284.5 178.817 284.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 164.067 286 179.067 286	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 164.317 287.5 179.317 287.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 164.567 289 179.567 289	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 164.817 290.5 179.817 290.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 165.067 292 180.067 292	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 165.317 293.5 180.317 293.5	Support 1	Support 1	Support 1	Support 1	Support 1
Tension Crack	X Y 167.818 308.5 230.083 308.5		Water level: dry			
Block Search Window	X Y 284.201 272.859 284.201 237.518 345.698 237.518 345.698 272.859					

Type	Coordinates	Master Scenario	Berm Inward	Berm Inward NC	Berm Outward	Berm Outward NC
Block Search Window	X Y 231.992 279.601 231.992 244.26 293.489 244.26 293.489 279.601					
Tension Crack	X Y 186.57 313 186.57 311.409 221.354 311.409				Water level: dry	
Block Search Window	X Y 184.718 280.948 98.5926 280.948 98.5926 245.63 184.718 245.63					
Block Search Window	X Y 245.672 282.767 159.547 282.767 159.547 247.449 245.672 247.449					
Block Search Window	X Y 216.476 281.746 130.351 281.746 130.351 246.428 216.476 246.428					

Group: Construction Seismic

Shared Entities

Type	Coordinates

Type	Coordinates	
External Boundary	X	Y
	163.622	283.33
	160.95	283.38
	148.622	282.854
	129.024	282.018
	124.95	282
	110.623	282
	101.217	281.355
	69.4213	281.344
	50.662	281.582
	35.7052	281.667
	28.3911	281.577
	15.6462	280.987
	3.70482	280
	0	279.738
	0	279.057
	0	271.547
	0	261.456
	0	260
	0	245.912
	0	225
	889.809	225
	889.809	270.193
	889.809	274.403
	889.809	279.041
	889.809	283.305
	807.355	283.485
	801.667	283.482
	788.547	283.476
	787.719	283.475
	786.83	283.475
	786.417	283.475
	786.178	283.474
	785.197	283.474
	775.975	283.32
	760.649	283.041
	759.447	283.019
	756.161	282.954
	755.874	282.948
	755.767	282.946
	755.733	282.945
	755.673	282.944
	755.511	282.941
	755.45	282.94
	754.733	282.925
	746.201	282.706
	743.257	282.605
	743.242	282.605
	743.007	282.597
	742.885	282.593
	742.826	282.591
	684.597	280.594
	683.989	280.578
	682.255	280.532
	680.066	280.474
	610.413	278.618
	609.461	278.593
	607.612	278.544
	606.225	278.516
	605.71	278.506
	605.656	278.505
	605.458	278.501
	605.424	278.5
	605.358	278.499
	605.114	278.494
	601.616	278.425
	599.815	278.389
	597.694	278.347
	594.516	278.283
	593.771	278.268
	557.424	277.545
	554.547	277.489
	552.125	277.442
	550.624	277.413
	548.108	277.364
	546.826	277.34
	546.726	277.338
	546.684	277.343
	546.525	277.347
	546.051	277.332
	545.791	277.323
	545.678	277.318
	545.304	277.312
	544.501	277.297
	542.779	277.266
	542.342	277.258
	541.527	277.243
	538.857	277.195

Type	Coordinates	
	X	Y
	536.228	277.148
	534.934	277.124
	533.231	277.094
	532.421	277.079
	532.321	277.077
	532.044	277.072
	532.001	277.072
	531.845	277.069
	531.7	277.066
	531.224	277.058
	530.929	277.052
	525.631	276.957
	519.244	276.841
	507.477	276.63
	504.435	276.58
	503.554	276.565
	501.044	276.524
	493.837	276.405
	485.943	276.254
	483.942	276.215
	483.239	276.202
	481.389	276.166
	480.889	276.156
	480.657	276.152
	480.604	276.151
	479.737	276.135
	479.608	276.133
	479.412	276.129
	462.044	275.782
	456.745	275.677
	440.64	275.361
	431.041	275.175
	427.068	275.098
	426.302	275.082
	426.287	275.082
	426.275	275.082
	419.653	274.949
	417.259	274.901
	414.354	274.843
	413.337	274.823
	410.438	274.765
	409.414	274.745
	409.055	274.737
	405.492	274.666
	403.756	274.632
	401.569	274.589
	398.457	274.527
	397.647	274.511
	395.337	274.466
	382.561	274.215
	381.81	274.201
	370.189	273.976
	354.499	273.677
	352.491	273.653
	352.367	273.651
	346.654	273.581
	345.468	273.566
	342.732	273.533
	340.169	273.501
	338.809	273.485
	335.317	273.442
	335.283	273.442
	319.424	278.727
	311.09	281.504
	305.611	283.33
	299.337	285.421
	216.58	313
	205.996	313
	168.568	313
	165.567	295
Material Boundary	X	Y
	0	279.057
	58.1929	279.417
	71.1579	279.497
	73.3773	279.509
	74.9248	279.518
	124.757	279.796
	135.264	279.847
	144.219	279.855
	158.113	279.882
	160.076	279.881
	161.607	279.886
	163.506	279.81
	163.622	279.808

Type	Coordinates	
	X	Y
Material Boundary	0	261.456
	163.622	263.057
	216.58	263.576
	265.369	264.053
	324.488	264.63
	325.796	264.643
	325.862	264.643
	339.74	264.777
	344.697	264.824
	346.026	264.837
	348.413	264.859
	362.483	265
	383.024	265.925
	475.957	270
	569.642	271.721
	630.531	272.766
	700.718	274.014
	761.565	275
	797.109	279.451
	800.017	279.672
	803.891	279.794
	809.662	279.797
	814.956	279.67
	816.767	279.829
	824.303	279.635
	824.949	279.679
	831.558	279.489
	832.412	279.536
	833.881	279.607
	839.763	279.446
	842.005	279.532
	847.397	279.379
	848.704	279.419
	850.107	279.456
	852.768	279.391
	855.353	279.329
	859.32	279.226
	865.142	279.344
	869.093	279.253
	870.89	279.291
	872.87	279.326
	889.809	279.041
	X	Y
Material Boundary	0	271.547
	4.17383	271.613
	14.1023	271.741
	19.5494	271.804
	22.6138	271.841
	25.9587	271.872
	38.7745	271.945
	39.0866	271.947
	39.2107	271.948
	40.3655	271.956
	40.6328	271.957
	41.3984	271.961
	60.2217	271.859
	66.0738	271.851
	67.0426	271.854
	69.8866	271.861
	84.0427	271.786
	95.0821	271.807
	95.9776	271.808
	105.003	271.816
	119.79	271.854
	123.206	271.861
	123.535	271.861
	131.387	271.875
	150.131	271.878
	153.41	271.894
	162.21	271.924
	163.622	271.929
	171.66	271.96
	173.441	272
	209.781	272.476
	216.58	272.567
	248.997	273
	280.62	273.441

Type	Coordinates	
	X	Y
Material Boundary	0	260
	38.4717	260
	86.5533	260
	92.4441	260
	99.9065	260
	100.949	259.947
	105.01	259.631
	106.348	259.543
	109.193	259.361
	110.722	259.199
	111.618	259.097
	115.147	258.906
	118.414	258.721
	118.43	258.72
	120.284	258.657
	125.945	258.455
	126.42	258.442
	132.016	258.297
	133.477	258.257
	133.652	258.254
	163.622	258.243
	216.58	258.225
	260.46	258.21
	443.788	259.943
	450.937	259.908
	451.294	259.906
	455.216	260
	558.971	263.567
	595.932	265
	623.29	265.951
	633.66	266.333
	634.808	266.375
	660.887	267.328
	712.038	269.178
	734.412	270
	768.981	272.36
	776.623	272.807
	779.525	272.995
	788.226	273.449
	799.911	274.181
	806.266	274.404
	807.68	274.492
	812.605	274.578
	814.388	274.68
	819.475	274.682
	820.589	274.747
	834.952	274.588
	835.6	274.619
	843.564	274.509
	844.885	274.57
	852.058	274.442
	857.995	274.29
	862.69	274.117
	863.546	274.096
	889.809	274.403
	X	Y
Material Boundary	724.667	281.936
	724.846	281.942
	801.667	283.482

Type	Coordinates	
	X	Y
Material Boundary	352.491	273.653
	352.504	273.64
	352.573	273.641
	352.664	273.642
	352.794	273.645
	352.996	273.648
	353.352	273.655
	353.491	273.658
	354.499	273.677
	356.066	273.707
	358.422	273.752
	361.365	273.807
	362.344	273.826
	365.135	273.879
	366.267	273.901
	366.664	273.909
	370.189	273.976
	371.963	274.01
	374.112	274.052
	377.262	274.113
	378.034	274.128
	380.236	274.17
	381.81	274.201
	381.957	274.204
	382.561	274.215
	385.879	274.28
	387.859	274.319
	389.802	274.357
	393.158	274.423
	393.724	274.434
	395.337	274.466
	X	Y
Material Boundary	430.251	275.159
	431.041	275.175
	432.949	275.212
	435.549	275.262
	436.872	275.288
	440.64	275.361
	440.794	275.364
	440.848	275.365
	444.717	275.441
	446.147	275.468
	448.639	275.517
	451.446	275.572
	452.562	275.594
	455.741	275.657
	456.484	275.672
	456.745	275.677
	460.407	275.749
	462.044	275.782
	464.329	275.827
	467.343	275.887
	468.252	275.905
	470.842	275.957
	472.642	275.993
	473.615	276.012
	477.941	276.099
	479.135	276.123
	479.412	276.129
	479.458	276.13
	479.608	276.133
	479.68	276.134
	479.715	276.134
	479.737	276.135
	X	Y
Material Boundary	546.726	277.338
	546.755	277.338
	546.826	277.34

Type	Coordinates	
	X	Y
Material Boundary	557.424	277.545
	558.469	277.566
	561.448	277.624
	562.392	277.642
	562.723	277.649
	566.314	277.719
	568.022	277.752
	570.237	277.796
	573.321	277.856
	574.159	277.873
	576.549	277.92
	578.082	277.95
	578.619	277.961
	582.004	278.028
	583.918	278.065
	585.927	278.105
	589.217	278.17
	589.849	278.183
	591.65	278.219
	593.771	278.268
	X	Y
Material Boundary	606.225	278.516
	606.288	278.517
	606.504	278.517
	606.856	278.526
	607.612	278.544
	X	Y
Material Boundary	163.622	279.808
	166.459	279.765
	169.492	279.748
	190.858	279.845
	193.985	279.857
	218.25	280.027
	224.476	280.066
	236.344	280.273
	248.265	280.364
	252.424	280.399
	283.152	281
	309.042	281.472
	311.09	281.504
	X	Y
Material Boundary	346.654	273.581
	350.034	273.611
	350.577	273.617
	350.658	273.618
	352.06	273.634
	352.137	273.635
	352.302	273.637
	352.318	273.637
	352.349	273.637
	352.367	273.651
	X	Y
Material Boundary	485.943	276.254
	487.864	276.28
	488.538	276.292
	491.787	276.35
	493.837	276.386
	495.709	276.42
	499.136	276.481
	499.632	276.49
	501.044	276.524
	X	Y
Material Boundary	724.846	281.942
	726.68	282.006
	726.988	282.017
	727.558	282.037
	731.059	282.161
	732.287	282.204
	734.844	282.294
	740.052	282.479
	741.043	282.514
	741.066	282.514
	741.081	282.515
	741.096	282.515
	741.181	282.519
	742.826	282.591

Type	Coordinates	
	X	Y
Material Boundary	755.673	282.944
	755.711	282.945
	755.733	282.945
	X	Y
Material Boundary	163.622	283.33
	305.611	283.33
	X	Y
Material Boundary	280.62	273.441
	335.283	273.442
	X	Y
Material Boundary	0	245.912
	6.36475	246.126
	13.3403	246.341
	36.3284	247.103
	54.3369	247.652
	55.2772	247.682
	79.2611	248.444
	110.272	249.344
	111.035	249.367
	127.411	249.843
	128.882	249.888
	132.876	250
	148.142	250.327
	154.566	250.461
	155.103	250.439
	174.679	250.477
	214.244	250.887
	223.04	251.046
	223.923	251.063
	234.446	251.24
	240.347	251.34
	241.61	251.359
	271.29	251.838
	338.025	252.82
	359.196	253.144
	468.669	255
	504.884	256.001
	512.811	256.301
	518.723	256.525
	525.676	256.781
	533.762	257.101
	570.283	258.441
	584.807	258.964
	597.519	259.475
	602.609	259.649
	602.782	259.656
	603.792	259.688
	613.635	260
	644.906	261.528
	652.572	261.886
	675.227	262.978
	689.592	263.645
	694.125	263.874
	696.449	263.978
	702.144	264.222
	720.045	265
	733.785	265.893
	740.862	266.335
	755.735	267.14
	763.008	267.621
	772.725	268.001
	787.18	268.982
	788.074	269.024
	788.743	269.034
	792.383	269.156
	797.821	269.423
	799.666	269.372
	804.53	269.382
	805.662	269.392
	821.433	269.77
	822.214	269.723
	822.878	269.719
	853.823	269.853
	854.209	269.868
	862.107	270
	889.809	270.193

Type	Coordinates	
	X	Y
Material Boundary	610.413	278.618
	613.384	278.683
	615.712	278.74
	617.307	278.779
	621.011	278.869
	621.229	278.874
	621.852	278.89
	625.152	278.97
	626.309	278.999
	629.074	279.067
	631.608	279.129
	632.997	279.163
	634.66	279.204
	635.484	279.225
	635.868	279.235
	635.933	279.236
	636.043	279.239
	636.086	279.24
	636.109	279.241
	636.128	279.241
	636.143	279.241
	636.372	279.247
	636.434	279.249
	636.556	279.252
	636.918	279.262
	636.953	279.263
	640.842	279.369
	642.206	279.406
	644.764	279.476
	647.505	279.551
	648.687	279.584
	652.054	279.677
	652.609	279.692
	652.804	279.698
	656.531	279.801
	658.103	279.845
	660.454	279.911
	663.402	279.993
	664.376	280.021
	667.155	280.099
	668.299	280.131
	668.701	280.142
	672.221	280.242
	673.999	280.292
	676.144	280.353
	679.298	280.443
	680.066	280.474
	X	Y
Material Boundary	684.597	280.594
	687.911	280.69
	688.448	280.705
	689.353	280.731
	689.806	280.745
	689.981	280.75
	690.044	280.752
	690.078	280.753
	690.098	280.753
	690.112	280.754
	690.16	280.755
	690.212	280.756
	690.222	280.756
	690.243	280.757
	690.312	280.76
	691.251	280.791
	691.834	280.811
	695.195	280.923
	695.756	280.942
	697.356	280.996
	699.679	281.075
	700.494	281.102
	703.601	281.208
	705.793	281.282
	707.524	281.342
	711.092	281.464
	711.446	281.477
	712.457	281.512
	715.369	281.612
	716.391	281.647
	719.291	281.749
	721.689	281.832
	724.667	281.936

Scenario-based Entities

Type	Coordinates	Master Scenario	Berm Inward	Berm Inward NC	Berm Outward	Berm Outward NC

Type	Coordinates X	Coordinates Y	Master Scenario	Berm Inward	Berm Inward NC	Berm Outward	Berm Outward NC
Piezoline	0	269	Assigned to materials: Stiff Clay Soft Clay (Construction) Stiff Clay (Construction)	Assigned to materials: Stiff Clay Soft Clay (Construction) Stiff Clay (Construction)	Assigned to materials: Stiff Clay Soft Clay (Construction) Stiff Clay (Construction)	Assigned to materials: Stiff Clay Soft Clay (Construction) Stiff Clay (Construction)	Assigned to materials: Stiff Clay Soft Clay (Construction) Stiff Clay (Construction)
	328.689	275.639					
	335.285	273.441					
	335.317	273.442					
	338.809	273.482					
	340.169	273.497					
	342.732	273.527					
	345.468	273.558					
	346.654	273.572					
	350.034	273.611					
	350.577	273.617					
	350.658	273.618					
	352.06	273.634					
	352.134	273.635					
	352.141	273.635					
	352.302	273.637					
	352.318	273.637					
	352.349	273.637					
	352.426	273.699					
	352.454	273.699					
	352.455	273.699					
	352.456	273.699					
	352.501	273.639					
	352.504	273.64					
	352.506	273.64					
	352.573	273.641					
	352.664	273.642					
	352.794	273.645					
	352.996	273.648					
	353.352	273.655					
	353.491	273.658					
	354.499	273.677					
	356.066	273.707					
	358.422	273.752					
	361.365	273.807					
	362.344	273.826					
	365.135	273.879					
	366.267	273.901					
	366.664	273.909					
	370.189	273.976					
	371.963	274.01					
	374.112	274.052					
	377.262	274.113					
	378.034	274.128					
	380.236	274.17					
	381.957	274.204					
	382.561	274.215					
	385.879	274.28					
	387.859	274.319					
	389.802	274.357					
	393.158	274.423					
	393.724	274.434					
	395.337	274.466					
	397.647	274.511					
	398.457	274.527					
	401.569	274.588					
	403.756	274.632					
	405.492	274.666					
	409.055	274.737					
	409.414	274.744					
	410.438	274.765					
	413.337	274.823					
	414.354	274.843					
	417.259	274.901					
	419.653	274.949					
	421.182	274.98					
	424.952	275.056					
	425.104	275.059					
	426.123	275.08					
	426.181	275.081					
	426.23	275.081					
	426.263	275.082					
	426.285	275.082					
	426.288	275.082					
	426.302	275.082					
	427.068	275.098					
	427.172	275.1					
	427.926	275.115					
	429.027	275.136					
	430.251	275.159					
	432.949	275.212					
	435.549	275.262					
	436.872	275.288					
	440.64	275.361					
	440.794	275.364					
	440.848	275.365					
	444.717	275.441					

Type	Coordinates		Master Scenario	Berm Inward	Berm Inward NC	Berm Outward	Berm Outward NC
	X	Y					
	446.147	275.468					
	448.639	275.517					
	451.446	275.572					
	452.562	275.594					
	455.741	275.657					
	456.484	275.672					
	456.745	275.677					
	460.407	275.749					
	462.044	275.782					
	464.329	275.827					
	467.343	275.887					
	468.252	275.905					
	470.842	275.957					
	472.642	275.993					
	473.615	276.012					
	477.941	276.099					
	479.135	276.123					
	479.458	276.13					
	479.608	276.133					
	479.617	276.133					
	479.68	276.134					
	479.715	276.134					
	479.736	276.134					
	479.738	276.134					
	480.604	276.151					
	480.657	276.152					
	480.889	276.156					
	481.389	276.165					
	483.239	276.198					
	483.942	276.21					
	485.943	276.246					
	487.864	276.28					
	488.538	276.292					
	491.787	276.35					
	493.837	276.386					
	495.709	276.42					
	499.136	276.481					
	499.632	276.49					
	501.044	276.515					
	503.554	276.56					
	504.435	276.576					
	507.477	276.63					
	509.734	276.671					
	511.399	276.7					
	515.033	276.766					
	515.322	276.771					
	516.145	276.786					
	519.244	276.841					
	520.332	276.861					
	523.167	276.912					
	525.631	276.957					
	527.089	276.983					
	530.929	277.052					
	530.977	277.053					
	530.989	277.053					
	530.995	277.053					
	530.996	277.053					
	531.097	277.055					
	531.148	277.056					
	531.178	277.057					
	531.198	277.057					
	531.213	277.057					
	531.215	277.057					
	531.224	277.058					
	531.7	277.066					
	531.845	277.069					
	532.044	277.072					
	532.421	277.079					
	533.231	277.094					
	534.934	277.124					
	536.228	277.148					
	538.857	277.195					
	541.527	277.243					
	542.779	277.266					
	544.501	277.297					
	545.304	277.312					
	545.678	277.318					
	545.791	277.323					
	546.051	277.332					
	546.185	277.337					
	546.267	277.34					
	546.525	277.347					
	546.684	277.343					
	546.726	277.338					
	546.735	277.338					
	546.755	277.338					
	546.826	277.34					

Type	Coordinates		Master Scenario	Berm Inward	Berm Inward NC	Berm Outward	Berm Outward NC
	X	Y					
	550.624	277.413					
	552.125	277.442					
	554.547	277.489					
	557.424	277.545					
	558.469	277.566					
	561.448	277.624					
	562.392	277.642					
	562.723	277.649					
	566.314	277.719					
	568.022	277.752					
	570.237	277.796					
	573.321	277.856					
	574.159	277.873					
	576.549	277.92					
	578.082	277.95					
	578.619	277.961					
	582.004	278.028					
	583.918	278.065					
	585.927	278.105					
	589.217	278.17					
	589.849	278.183					
	591.65	278.219					
	593.772	278.261					
	594.516	278.276					
	597.694	278.339					
	599.815	278.381					
	601.617	278.417					
	605.114	278.487					
	605.358	278.492					
	605.424	278.493					
	605.455	278.494					
	605.462	278.494					
	605.656	278.503					
	605.733	278.507					
	605.775	278.509					
	605.801	278.51					
	605.818	278.511					
	605.831	278.512					
	605.858	278.513					
	606.104	278.516					
	606.166	278.516					
	606.288	278.517					
	606.504	278.517					
	606.856	278.526					
	607.612	278.544					
	609.462	278.589					
	610.413	278.612					
	613.384	278.683					
	615.712	278.74					
	617.307	278.779					
	621.011	278.869					
	621.229	278.874					
	621.852	278.89					
	625.152	278.97					
	626.309	278.999					
	629.074	279.067					
	631.608	279.129					
	632.997	279.163					
	634.66	279.204					
	635.484	279.225					
	635.868	279.235					
	635.933	279.236					
	636.043	279.239					
	636.086	279.24					
	636.109	279.241					
	636.124	279.241					
	636.133	279.241					
	636.14	279.241					
	636.141	279.241					
	636.146	279.241					
	636.372	279.247					
	636.434	279.249					
	636.556	279.252					
	636.916	279.262					
	636.919	279.262					
	636.953	279.263					
	640.842	279.369					
	642.206	279.406					
	644.764	279.476					
	647.505	279.551					
	648.687	279.584					
	652.054	279.677					
	652.609	279.692					
	652.804	279.698					
	656.531	279.801					
	658.103	279.845					
	660.454	279.911					

Type	Coordinates		Master Scenario	Berm Inward	Berm Inward NC	Berm Outward	Berm Outward NC
	X	Y					
	663.402	279.993					
	664.376	280.021					
	667.155	280.099					
	668.299	280.131					
	668.701	280.142					
	672.221	280.242					
	673.999	280.292					
	676.144	280.353					
	679.298	280.443					
	680.066	280.465					
	682.256	280.527					
	683.989	280.577					
	684.597	280.594					
	687.911	280.69					
	688.448	280.705					
	689.353	280.731					
	689.806	280.745					
	689.981	280.75					
	690.044	280.752					
	690.078	280.753					
	690.098	280.753					
	690.112	280.754					
	690.16	280.755					
	690.212	280.756					
	690.222	280.756					
	690.243	280.757					
	690.312	280.76					
	691.251	280.791					
	691.834	280.811					
	695.195	280.923					
	695.756	280.942					
	697.356	280.996					
	699.679	281.075					
	700.494	281.102					
	703.601	281.208					
	705.793	281.282					
	707.524	281.342					
	711.092	281.464					
	711.446	281.477					
	712.457	281.512					
	715.369	281.612					
	716.391	281.647					
	719.291	281.749					
	721.689	281.832					
	724.846	281.942					
	726.68	282.006					
	726.988	282.017					
	727.558	282.037					
	731.059	282.161					
	732.287	282.204					
	734.844	282.294					
	740.052	282.479					
	741.043	282.514					
	741.06	282.514					
	741.064	282.514					
	741.066	282.514					
	741.066	282.515					
	741.067	282.515					
	741.068	282.515					
	741.068	282.515					
	741.068	282.515					
	741.068	282.515					
	741.078	282.515					
	741.08	282.515					
	741.085	282.515					
	741.096	282.515					
	741.181	282.519					
	742.826	282.581					
	742.885	282.583					
	743.007	282.587					
	743.242	282.596					
	743.257	282.597					
	746.201	282.706					
	748.35	282.763					
	752.967	282.883					
	755.009	282.932					
	755.28	282.938					
	755.366	282.94					
	755.408	282.941					
	755.433	282.942					
	755.45	282.942					
	755.511	282.943					
	755.677	282.944					
	755.711	282.945					
	755.767	282.946					
	755.874	282.948					
	756.161	282.954					

Type	Coordinates	Master Scenario	Berm Inward	Berm Inward NC	Berm Outward	Berm Outward NC
	X Y 759.447 283.018 761.388 283.055 771.241 283.24 775.975 283.32 781.839 283.422 783.82 283.453 784.63 283.466 784.896 283.47 785.009 283.472 785.071 283.473 785.111 283.473 785.138 283.474 785.158 283.474 785.174 283.474 785.186 283.474 785.197 283.474 786.178 283.473 786.417 283.474 786.83 283.474 787.719 283.475 791.033 283.478 791.759 283.478 792.437 283.479 799.51 283.482 803.034 283.484 807.355 283.485 813.632 283.487 815.2 283.487 819.67 283.487 823.045 283.487 824.23 283.487 830.89 283.485 834.828 283.484 838.735 283.481 839.771 283.481 840.59 283.481 841.025 283.48 841.294 283.48 842.215 283.478 843.93 283.472 844.354 283.47 845.114 283.468 846.58 283.462 849.872 283.45 854.425 283.434 856.023 283.428 862.27 283.405 866.621 283.389 870.115 283.376 877.219 283.351 877.96 283.348 880.074 283.34 885.805 283.319 887.817 283.312 889.809 283.305					
Piezoline	X Y -1.77636e-15 275 889.809 287	Assigned to materials: Sand Silty Sand MSE Berm	Assigned to materials: Sand Silty Sand MSE Berm	Assigned to materials: Sand Silty Sand MSE Berm	Assigned to materials: Sand Silty Sand MSE Berm	Assigned to materials: Sand Silty Sand MSE Berm
Piezoline	X Y 0 265 889.9 285	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till
Distributed Load	X Y 176.217 313 174.605 313	Constant Distribution Orientation: Vertical Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Vertical Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Vertical Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Vertical Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Vertical Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No
Distributed Load	X Y 186.569 313 184.885 313	Constant Distribution Orientation: Vertical Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Vertical Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Vertical Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Vertical Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Vertical Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No
Bolt	X Y 165.567 295 180.567 295	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 165.817 296.5 180.817 296.5	Support 1	Support 1	Support 1	Support 1	Support 1

Type	Coordinates	Master Scenario	Berm Inward	Berm Inward NC	Berm Outward	Berm Outward NC
Bolt	X Y 166.067 298 181.067 298	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 166.317 299.5 181.317 299.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 166.567 301 181.567 301	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 166.818 302.5 181.818 302.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 167.068 304 182.068 304	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 167.318 305.5 182.318 305.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 167.568 307 182.568 307	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 167.818 308.5 182.818 308.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 168.068 310 183.068 310	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 168.318 311.5 183.318 311.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 168.568 313 183.568 313	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 163.817 284.5 178.817 284.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 164.067 286 179.067 286	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 164.317 287.5 179.317 287.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 164.567 289 179.567 289	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 164.817 290.5 179.817 290.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 165.067 292 180.067 292	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 165.317 293.5 180.317 293.5	Support 1	Support 1	Support 1	Support 1	Support 1
Tension Crack	X Y 167.818 308.5 230.083 308.5		Water level: dry			
Block Search Window	X Y 284.201 272.859 284.201 237.518 345.698 237.518 345.698 272.859					

Type	Coordinates	Master Scenario	Berm Inward	Berm Inward NC	Berm Outward	Berm Outward NC
Block Search Window	X Y 231.992 279.601 231.992 244.26 293.489 244.26 293.489 279.601					
Block Search Window	X Y 184.718 280.948 98.5926 280.948 98.5926 245.63 184.718 245.63					
Block Search Window	X Y 245.672 282.767 159.547 282.767 159.547 247.449 245.672 247.449					
Block Search Window	X Y 216.476 281.746 130.351 281.746 130.351 246.428 216.476 246.428					

Section VI

Slide Analysis Information

2019.10.01 Ph14 VI Con

Project Summary

File Name:	2019.10.01 Ph14 VI Con.slmd
Last saved with Slide version:	8.028
Project Title:	SLIDE - An Interactive Slope Stability Program
Date Created:	7/16/2019, 9:54:59 AM

Currently Open Scenarios

Group Name	Scenario Name	Compute Time
Construction	Master Scenario	
	Berm Inward	
	Berm Inward NC	
	Berm Outward	
	Berm Outward NC	
Construction Seismic	Master Scenario	
	Berm Inward	
	Berm Inward NC	
	Berm Outward	
	Berm Outward NC	

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard

	Master Scenario	Berm Inward	Berm Inward NC	Berm Outward	Berm Outward NC	Master Scenario	Berm Inward	Berm Inward NC	Berm Outward	Berm Outward NC
Failure Direction:	Right to Left	Left to Right	Left to Right	Right to Left	Right to Left	Right to Left	Left to Right	Left to Right	Right to Left	Right to Left

Analysis Options

All Open Scenarios	
Slices Type:	Vertical
Analysis Methods Used	
	Spencer
Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

All Open Scenarios	
Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

All Open Scenarios	
Pseudo-random Seed:	10116
Random Number Generation Method:	Park and Miller v.3

Surface Options

Construction - Master Scenario	
Surface Type:	Circular
Search Method:	Auto Refine Search
Divisions along slope:	20
Circles per division:	10
Number of iterations:	10
Divisions to use in next iteration:	50%
Composite Surfaces:	Disabled
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Construction - Berm Inward	
Surface Type:	Circular
Search Method:	Grid Search
Radius Increment:	10
Composite Surfaces:	Disabled
Reverse Curvature:	Invalid Surfaces
Minimum Elevation:	Not Defined
Minimum Depth [ft]:	10
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Construction - Berm Inward NC	
Surface Type:	Non-Circular Block Search
Number of Surfaces:	5000
Multiple Groups:	Disabled
Pseudo-Random Surfaces:	Enabled
Convex Surfaces Only:	Disabled
Left Projection Angle (Start Angle) [°]:	105
Left Projection Angle (End Angle) [°]:	165
Right Projection Angle (Start Angle) [°]:	15
Right Projection Angle (End Angle) [°]:	75
Minimum Elevation:	Not Defined
Minimum Depth [ft]:	10
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Construction - Berm Outward	
Surface Type:	Circular
Search Method:	Grid Search
Radius Increment:	10
Composite Surfaces:	Disabled
Reverse Curvature:	Invalid Surfaces
Minimum Elevation:	Not Defined
Minimum Depth [ft]:	10
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Construction - Berm Outward NC	
Surface Type:	Non-Circular Block Search
Number of Surfaces:	5000
Multiple Groups:	Disabled
Pseudo-Random Surfaces:	Enabled
Convex Surfaces Only:	Disabled
Left Projection Angle (Start Angle) [°]:	105
Left Projection Angle (End Angle) [°]:	165
Right Projection Angle (Start Angle) [°]:	15
Right Projection Angle (End Angle) [°]:	75
Minimum Elevation:	Not Defined
Minimum Depth [ft]:	10
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Construction Seismic	
Surface Type:	Circular
Search Method:	Auto Refine Search
Divisions along slope:	20
Circles per division:	10
Number of iterations:	10
Divisions to use in next iteration:	50%
Composite Surfaces:	Disabled
Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined
Minimum Area:	Not Defined
Minimum Weight:	Not Defined

Seismic Loading

Construction	Construction Seismic
Advanced seismic analysis: No	Advanced seismic analysis: No
Staged pseudostatic analysis: No	Staged pseudostatic analysis: No
	Seismic Load Coefficient (Horizontal): 0.05

Loading

All Open Scenarios	
2 Distributed Loads present	
Distributed Load 1	
Distribution:	Constant
Magnitude [psf]:	2350
Orientation:	Normal to boundary
Distributed Load 2	
Distribution:	Constant
Magnitude [psf]:	2350
Orientation:	Normal to boundary

Tension Crack

Construction - Master Scenario	Construction - Berm Inward	Construction - Berm Inward NC	Construction - Berm Outward	Construction - Berm Outward NC	Construction Seismic - Master Scenario	Construction Seismic - Berm Inward	Construction Seismic - Berm Inward NC	Construction Seismic - Berm Outward	Construction Seismic - Berm Outward NC
	Water level: dry		Water level: dry			Water level: dry		Water level: dry	

Materials

Property	Till	Sand	Silty Sand	MSE Berm	MSW	Liner Bottom	Soft Clay (Construction)	Stiff Clay (Construction)
Color								
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	SHANSEP	SHANSEP
Unit Weight [lbs/ft3]	150	110	110	120	75	120	120	125
Cohesion [psf]	10000	0	0	100	30	0		
Friction Angle [°]	50	36	32	32	30	18.3		
A [psf]							0	0
S							0.19	0.22
m							0.66	0.76
Stress History Type							Preconsolidation Pressure	Preconsolidation Pressure
Definition Method							Constant [6500]	Constant [21000]
Material Dependent Vertical Stress							Yes	Yes
Water Surface	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario
Hu Value	1	1	1	1			1	1
Ru Value					0	0		

SHANSEP Material Dependent Vertical Stress

Soft Clay (Construction)

Vertical stress computed using the following factored materials:

MSE Berm Factor=0

Stiff Clay (Construction)

Vertical stress computed using the following factored materials:

MSE Berm Factor=0

Property	Compacted Clay	Bedrock
Color		
Strength Type	Mohr-Coulomb	Infinite strength
Unit Weight [lbs/ft3]	125	165
Allow Sliding Along Boundary		Yes
Cohesion [psf]	100	
Friction Angle [°]	32	
Water Surface	Assigned per scenario	Assigned per scenario
Hu Value	1	
Ru Value		0

Materials In Use

Material	Master Scenario	Berm Inward	Berm Inward NC	Berm Outward	Berm Outward NC	Master Scenario	Berm Inward	Berm Inward NC	Berm Outward	Berm Outward NC
Till	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Sand	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Silty Sand	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
MSE Berm	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
MSW	✓	✓	✓	✓	✓	✗	✗	✗	✗	✗
Liner Bottom	✗	✗	✗	✗	✗	✓	✓	✓	✓	✓
Soft Clay (Construction)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Stiff Clay (Construction)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Compacted Clay	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Bedrock	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Support

Support 1

Support Type: GeoTextile
Force Application: Active
Force Orientation: Parallel to Reinforcement
Anchorage: None
Shear Strength Model: Linear
Use External Loads for Strength: yes
Strip Coverage: 100 percent
Tensile Strength: 1760 lb/ft
Pullout Strength Adhesion: 0 psf
Pullout Strength Friction Angle: 32 degrees

Entity Information

Group: Construction

Shared Entities

Type	Coordinates X	Coordinates Y
	161.478	287
	147.73	282.413
	140.499	280
	128.946	280
	90.0679	280
	14.6142	280
	13.9002	280.284
	0	285.816
	0	279.903
	0	275.814
	0	269.452
	0	261.075
	0	251.139
	0	239.626
	0	225
	944.434	225
	944.434	264.516
	944.434	274.422
	944.434	275.247
	944.434	283.909
	944.434	285.236
	944.434	286.008
	944.434	287.004
	941.12	286.945
	937.87	286.886
	933.272	286.804
	925.577	286.665
	918.028	286.53
	912.444	286.429
	910.622	286.397
	910.314	286.391
	893.091	286.082
	885.514	285.945
	877.742	285.806
	870.107	285.669
	865.521	285.586
	862.606	285.534
	855.234	285.401
	853.956	285.378
	853.206	285.365
	796.421	284.344
	796.318	284.342
	795.735	284.332
	785.074	284.14
	771.753	283.901
	771.652	283.899
	764.335	283.768
	757.127	283.638
	750.027	283.51
	743.032	283.385
	736.14	283.261
External Boundary	729.348	283.139
	726.029	283.079
	722.655	283.018
	716.058	282.9
	710.148	282.794
	709.555	282.783
	708.299	282.76
	677.306	282.203
	677.282	282.203
	676.923	282.197
	676.704	282.193
	676.693	282.192
	676.682	282.192
	671.272	282.095
	664.339	281.97
	657.498	281.847
	650.748	281.726
	644.086	281.606
	637.512	281.488
	631.023	281.372
	627.707	281.312
	624.618	281.257
	618.296	281.143
	350.172	276.324
	343.452	276.203
	330.435	280.452
	327.173	281.517
	322.665	282.988
	305.073	288.731
	304.479	288.925
	285.928	294.98
	280.624	296.711
	280.273	296.826
	230.723	313
	230.387	313
	230.152	313
	230.11	313
	227.05	313
	226.85	313
	226.51	313
	223.91	313
	221.897	313

Material Boundary

X	Y
163.192	283.092
164.367	283.299
173.402	284.426
175.374	284.702
175.934	284.781
176.556	284.85
177.274	284.837

Material Boundary

X	Y
742.19	281.956
743.315	281.982
743.586	281.986
743.998	281.992
744.582	282
744.71	282.006
745.941	282.066

Material Boundary

X	Y
0	261.075
20.2242	261.333
49.0772	261.677
68.7601	261.912
89.1595	262.135
102.088	262.274
105.203	262.308
134.725	262.59
136.122	262.601
160.48	262.798
165.143	262.856
174.815	262.98
177.274	263.014
180.788	263.062
181.79	263.071
190.412	263.134
200.629	263.208
202.01	263.214
224.213	263.526
230.723	263.626
247.533	263.886
258.569	264.048
303.199	264.773
303.761	264.782
303.877	264.784
316.472	265
427.452	268.053
442.287	268.461
497.709	270
538.677	270.91
555.482	271.188
560.526	271.294
606.259	272.249
620.354	272.45
636.467	272.671
639.3	272.732
666.41	273.251
667.887	273.284
675.802	273.42
683.177	273.546
686.158	273.596
706.253	273.892
721.704	274.052
738.104	274.21
753.711	274.423
767.502	274.531
782.548	274.638
798.841	274.741
816.342	274.841
819.212	274.878
838.607	274.961
849.651	275
854.351	275.019
854.37	275.019
854.568	275.02
854.599	275.02
854.725	275.021
854.77	275.021
854.783	275.021
866.357	275.054
866.624	275.054
866.646	275.054
867.552	275.057
867.568	275.057
867.614	275.057
867.66	275.057
867.712	275.057
878.254	275.072
879.315	275.074
879.571	275.074
880.075	275.075
880.149	275.075
880.186	275.075

Material Boundary

X	Y
0	251.139
11.1527	251.416
26.4465	251.783
64.1069	252.692
81.0029	253.091
90.1714	253.309
101.077	253.566
113.608	253.861
157.216	254.879
162.122	255
177.274	255.346
181.905	255.452
192.409	255.664
208.664	255.998
217.716	256.193
221.366	256.22
230.723	256.287
245.393	256.393
269.063	256.472
291.423	256.518
291.764	256.523
313.338	256.537
324.39	256.708
344.544	256.691
345.57	256.707
357.779	256.906
376.347	256.852
378.057	256.881
391.439	257.126
402.037	257.125
404.75	257.174
415.45	257.217
430.363	257.543
435.507	257.652
444.803	257.735
462.411	258.175
469.881	258.28
481.193	258.584
499.661	259.117
499.985	259.126
503.208	259.198
529.072	260
534.978	260.21
535.955	260.252
547.561	260.689
551.582	260.872
570.692	261.637
586.762	262.279
640.401	265
662.019	265.925
663.77	265.991
672.979	266.337
676.005	266.45
712.54	267.905
745.647	269.071
772.2	270
787.59	270.622
792.852	270.797
801.969	271.141
813.866	271.591
816.852	271.69
834.417	272.354
857.027	272.998
865.221	273.29
877.07	273.64
883.702	273.865
914.968	274.691
917.256	274.767
918.83	274.81
925.869	275
939.222	275.18
944.434	275.247

X	Y
677.306	282.203
678.564	282.053
679.463	282.039
680.999	282
683.536	281.743
685.801	281.514
693.062	281.499
702.522	281.161

Material Boundary

X	Y
0	275.814
10.7043	276
24.4375	276.392
44.9968	277
46.75	277.072
51.7986	277.324
64.1345	277.912
65.8064	278
82.5637	278.929
83.8774	279
84.0913	279.033
90.0679	280

Material Boundary

X	Y
676.704	282.193
677.133	282.064
677.812	282.065
678.564	282.053

Material Boundary

X	Y
343.452	276.203
344.783	276.226
346.405	276.254
348.65	276.292
350.104	276.316
352.207	276.352
353.508	276.374
353.798	276.379
354.286	276.388
356.242	276.421
356.65	276.428
357.377	276.44
359.242	276.472
359.559	276.477
361.372	276.508
362.261	276.523
362.901	276.534
364.648	276.564
364.776	276.566
366.5	276.595
367.124	276.606
367.594	276.614
389.286	277.005
391.242	277.04
407.064	277.325
407.582	277.335
410.587	277.389
416.382	277.493
418.662	277.534
422.239	277.599
428.158	277.706
433.549	277.803
434.14	277.813
440.186	277.922
446.297	278.033
452.474	278.144
458.718	278.256
465.031	278.37
470.001	278.46
507.04	279.128
508.345	279.151
508.437	279.153
514.308	279.259
520.339	279.367
526.44	279.477
532.613	279.589
533.321	279.601
538.859	279.701
545.178	279.815
551.573	279.93
558.045	280.047
564.594	280.165
571.223	280.285
573.193	280.32

	X	Y
Material Boundary	177.274	284.837
	185.477	284.69
	187.842	284.786
	204.021	284.949
	204.286	284.958
	207.695	284.988
	207.838	284.988
	207.85	284.988
	207.865	284.988
	223.804	284.404
	237.755	283.936
	239.646	283.859
	241.815	283.742
	246.906	283.234
	256.238	283
	300.585	282.033
	302.038	282
	307.475	281.899

	X	Y
Material Boundary	817.37	284.002
	817.932	283.979
	818.767	283.956
	818.915	283.947
	825.365	283.557
	827.172	283.555
	831.828	283.551

	X	Y
Material Boundary	764.441	282.964
	765.173	283
	767.684	283.063
	775.757	283.371
	790.046	283.877
	791.527	283.924
	791.877	283.929
	804.211	284
	810.176	284
	812.449	284
	814.589	284
	815.663	284.009

	X	Y
Material Boundary	676.682	282.192
	677.133	282.064

	X	Y
Material Boundary	307.475	281.899
	327.173	281.517

	X	Y
Material Boundary	177.274	288.925
	304.479	288.925

	X	Y
Material Boundary	147.73	282.413
	162.668	283
	163.192	283.092

	X	Y
	0	269.452
	12.8396	269.703
	28.8795	270
	62.5163	270.325
	91.7476	270.603
	116.753	270.844
	120.765	270.879
	124.324	270.905
	126.737	270.918
	132.869	270.969
	133.683	270.974
	134.093	270.977
	136.553	271
	174.726	271.432
	183.221	271.537
	198.675	271.688
	201.154	271.708
	204.789	271.72
	218.901	271.959
	219.46	271.961
	221.504	272
	253.929	272.489
	266.858	272.7
	285.521	273
	324.447	273.669
	342.95	274
	345.591	274.029
	349.956	274.08
	428.072	275
	428.628	275.046
	430.653	275.23
	435.969	275.705
	439.116	276
	496.948	276.947
	498.331	276.968

Material Boundary

X	Y
343.452	276.203
349.956	274.08

Material Boundary

X	Y
161.478	287
163.289	287.265
168.24	288
170.513	288.25
176.044	288.802
177.274	288.925

X	Y
0	239.626
6.78362	240
75.2254	244.367
85.1441	245
87.2034	245.144
125.218	247.784
142.14	248.928
160.581	250
195.223	250.675
256.01	251.757
264.309	251.904
277.531	252.118
300.754	252.494
303.294	252.535
314.586	252.684
329.058	252.875
333.419	252.935
335.645	252.962
348.795	253.089
355.786	253.158
356.93	253.163
369.473	253.253
377.705	253.302
381.407	253.329
388.256	253.379
392.578	253.405
395.332	253.425
403.246	253.49
422.069	253.861
426.939	253.908
432.925	254.032
435.701	254.063
446.654	254.264
466.758	254.643
468.774	254.668
469.432	254.677
478.569	254.829
488.417	255

Scenario-based Entities

Type	Coordinates	Master Scenario	Berm Inward	Berm Inward NC	Berm Outward	Berm Outward NC
Piezoline	X Y 0 270 944.5 285	Assigned to materials: Soft Clay (Construction) Stiff Clay (Construction)	Assigned to materials: Soft Clay (Construction) Stiff Clay (Construction)	Assigned to materials: Soft Clay (Construction) Stiff Clay (Construction)	Assigned to materials: Soft Clay (Construction) Stiff Clay (Construction)	Assigned to materials: Soft Clay (Construction) Stiff Clay (Construction)
Piezoline	X Y 0 272.332 202.501 275 460.387 278.456 484.606 278.78 576.751 280 679.869 282.328 803.524 285 811.859 285.206 814.148 285.262 891.554 287.165 927.896 288.013 944.434 288.387	Assigned to materials: Sand Silty Sand MSE Berm Compacted Clay	Assigned to materials: Sand Silty Sand MSE Berm Compacted Clay	Assigned to materials: Sand Silty Sand MSE Berm Compacted Clay	Assigned to materials: Sand Silty Sand MSE Berm Compacted Clay	Assigned to materials: Sand Silty Sand MSE Berm Compacted Clay
Piezoline	X Y 0 260 944.5 286	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till
Distributed Load	X Y 189.051 313 187.39 313	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No
Distributed Load	X Y 199.382 313 197.71 313	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No
Bolt	X Y 180.114 305.5 200.114 305.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 180.371 307 200.371 307	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 180.628 308.5 200.628 308.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 180.885 310 200.885 310	Support 1	Support 1	Support 1	Support 1	Support 1
	X Y 181.142 311.5					

Bolt	X Y 181.399 313 201.399 313	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 177.544 290.5 197.544 290.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 177.801 292 197.801 292	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 178.058 293.5 198.058 293.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 178.315 295 198.315 295	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 178.572 296.5 198.572 296.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 178.829 298 198.829 298	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 179.086 299.5 199.086 299.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 179.343 301 199.343 301	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 179.6 302.5 199.6 302.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 179.857 304 199.857 304	Support 1	Support 1	Support 1	Support 1	Support 1
Tension Crack	X Y 180.885 310 239.913 310	✗	Water level: dry	✗	✗	✗
Block Search Window	X Y 285.738 204.743 389.783 204.743 389.783 275.885 285.738 275.885	✗	✗	✓	✗	✗
Block Search Window	X Y 201.557 215.65 305.602 215.65 305.602 286.792 201.557 286.792	✗	✗	✓	✗	✗
Tension Crack	X Y 180.628 308.5 244.509 308.5	✗	✗	✗	Water level: dry	✗
Block Search Window	X Y 243.169 287.981 174.06 287.981 174.06 235.859 243.169 235.859	✗	✗	✗	✗	✓

Group: Construction Seismic

Shared Entities

Type	Coordinates	
	X	Y
	161.478	287
	147.73	282.413
	140.499	280
	128.946	280
	90.0679	280
	14.6142	280
	13.9002	280.284
	0	285.816
	0	279.903
	0	275.814
	0	269.452
	0	261.075
	0	251.139
	0	239.626
	0	225
	944.434	225
	944.434	264.516
	944.434	274.422
	944.434	275.247
	944.434	283.909

	X	Y
Material Boundary	163.192	283.092
	164.367	283.299
	173.402	284.426
	175.374	284.702
	175.934	284.781
	176.556	284.85
	177.274	284.837

	X	Y
Material Boundary	742.19	281.956
	743.315	281.982
	743.586	281.986
	743.998	281.992
	744.582	282
	744.71	282.006
	745.941	282.066

X	Y

X	Y
0	251.139
11.1527	251.416
26.4465	251.783
64.1069	252.692
81.0029	253.091
90.1714	253.309
101.077	253.566
113.608	253.861
157.216	254.879
[illegible]	[illegible]

	X	Y
Material Boundary	677.306	282.203
	678.564	282.053
	679.463	282.039
	680.999	282
	683.536	281.743
	685.801	281.514
	693.062	281.499
	702.522	281.161
	702.729	281.154
	706.787	281.209
	721.111	281.494
	722.15	281.515
	739.373	281.89
	742.064	281.953
	742.19	281.956
	743.544	282
	745.941	282.066
	758.439	282.67
	764.441	282.964
	770.349	283.354
	780.303	283.957
	781.257	284
	781.576	284.004
	798.929	284.062
	802.612	284.06
	815.663	284.009
	817.37	284.002
	818.392	284
	826.647	283.737
	828.247	283.68
	831.828	283.551
	835.454	283.548
	841.086	283.518
	930.714	284.963
	944.434	285.236

X	Y
0	275.814

Material Boundary

X	Y
676.704	282.193
677.133	282.064
677.812	282.065
678.564	282.053

Material Boundary

X	Y
343.452	276.203
344.783	276.226
346.405	276.254
348.65	276.292
350.104	276.316
352.207	276.352
353.508	276.374
353.798	276.379
354.286	276.388
356.242	276.421
356.65	276.428
357.377	276.44
359.242	276.472
359.559	276.477
361.372	276.508
362.261	276.523
362.901	276.534
364.648	276.564
364.776	276.566
366.5	276.595
367.124	276.606
367.594	276.614
389.286	277.005
391.242	277.04
407.064	277.325
407.582	277.335
410.587	277.389
416.382	277.493
418.662	277.534
422.239	277.599
428.158	277.706
433.549	277.803
434.14	277.813
440.186	277.922
446.297	278.033
452.474	278.144
458.718	278.256
465.031	278.37
470.001	278.46
507.04	279.128
508.345	279.151
508.437	279.153
514.308	279.259
520.339	279.367
526.44	279.477
532.613	279.589
533.321	279.601
538.859	279.701
545.178	279.815
551.573	279.93
558.045	280.047
564.594	280.165
571.223	280.285
573.193	280.32
607.699	280.942
609.293	280.971
612.053	281.021
618.296	281.143

Material Boundary

X	Y
177.274	284.837
185.477	284.69
187.842	284.786
204.021	284.949
204.286	284.958
207.695	284.988
207.838	284.988
207.85	284.988
207.865	284.988
223.804	284.404
237.755	283.936
239.646	283.859
241.815	283.742
246.906	283.234
256.238	283
300.585	282.033
302.038	282
307.475	281.899

Material Boundary

X	Y
817.37	284.002
817.932	283.979
818.767	283.956
818.915	283.947

X	Y
764.441	282.964
765.173	283
767.684	283.063
775.757	283.371
790.046	283.877
791.527	283.924
791.877	283.929
804.211	284
810.176	284
812.449	284
814.589	284
815.663	284.009

Material Boundary

X	Y
676.682	282.192
677.133	282.064

Material Boundary

X	Y
307.475	281.899
327.173	281.517

Material Boundary

X	Y
177.274	288.925
304.479	288.925

Material Boundary

X	Y
147.73	282.413
162.668	283
163.192	283.092

Material Boundary

X	Y
0	269.452
12.8396	269.703
28.8795	270
62.5163	270.325
91.7476	270.603
116.753	270.844
120.765	270.879
124.324	270.905
126.737	270.918
132.869	270.969
133.683	270.974
134.093	270.977
136.553	271
174.726	271.432
183.221	271.537
198.675	271.688
201.154	271.708
204.789	271.72
218.901	271.959
219.46	271.961
221.504	272
253.929	272.489
266.858	272.7
285.521	273
324.447	273.669
342.95	274
345.591	274.029
349.956	274.08
428.072	275
428.628	275.046
430.653	275.23
435.969	275.705
439.116	276
496.948	276.947
498.331	276.968
498.697	276.974
499.332	276.983
499.615	276.985
500.475	277
513.785	277.25
553.889	278
557.577	278.075
559.454	278.113
573.783	278.402
595.635	278.841
599.215	278.913
603.558	279
640.223	279.755
652.063	280
668.747	280.341
701.44	281
705.174	281.073
710.495	281.177
713.243	281.175
718.686	281.147
726.22	281.259
741.866	281.682
742.231	281.692
750.544	281.863
753.795	282
773.727	282.36
781.603	282.458
793.364	282.681
797.096	282.731
810.175	283
813.169	283.052

Material Boundary

Material Boundary

X	Y
343.452	276.203
349.956	274.08

Material Boundary

X	Y
161.478	287
163.289	287.265
168.24	288
170.513	288.25
176.044	288.802
177.274	288.925

Material Boundary

X	Y
0	239.626
6.78362	240
75.2254	244.367
85.1441	245
87.2034	245.144
125.218	247.784
142.14	248.928
160.581	250
195.223	250.675
256.01	251.757
264.309	251.904
277.531	252.118
300.754	252.494
303.294	252.535
314.586	252.684
329.058	252.875
333.419	252.935
335.645	252.962
348.795	253.089
355.786	253.158
356.93	253.163
369.473	253.253
377.705	253.302
381.407	253.329
388.256	253.379
392.578	253.405
395.332	253.425
403.246	253.49
422.069	253.861
426.939	253.908
432.925	254.032
435.701	254.063
446.654	254.264
466.758	254.643
468.774	254.668
469.432	254.677
478.569	254.829
488.417	255
506.288	255.316
508.463	255.361
526.911	255.663
527.672	255.679
545.39	255.98
548.819	256.05
567.278	256.349
572.8	256.464
584.11	256.652
588.519	256.723
595.674	256.865
607.784	257.061
614.885	257.206
622.499	257.331
635.926	257.545
652.157	257.867
657.536	257.954
661.681	258.038
671.48	258.194
684.478	258.45
688.402	258.513
700.544	258.753
706.491	258.848
733.558	259.384
735.361	259.413
744.062	259.581
745.923	259.611
765.308	260
771.564	260.157
772.378	260.179
786.99	260.541

Scenario-based Entities

Type	Coordinates	Master Scenario	Berm Inward	Berm Inward NC	Berm Outward	Berm Outward NC
Piezoline	X Y 0 270 944.5 285	Assigned to materials: Soft Clay (Construction) Stiff Clay (Construction)	Assigned to materials: Soft Clay (Construction) Stiff Clay (Construction)	Assigned to materials: Soft Clay (Construction) Stiff Clay (Construction)	Assigned to materials: Soft Clay (Construction) Stiff Clay (Construction)	Assigned to materials: Soft Clay (Construction) Stiff Clay (Construction)
Piezoline	X Y 0 272.332 202.501 275 460.387 278.456 484.606 278.78 576.751 280 679.869 282.328 803.524 285 811.859 285.206 814.148 285.262 891.554 287.165 927.896 288.013 944.434 288.387	Assigned to materials: Sand Silty Sand MSE Berm Compacted Clay	Assigned to materials: Sand Silty Sand MSE Berm Compacted Clay	Assigned to materials: Sand Silty Sand MSE Berm Compacted Clay	Assigned to materials: Sand Silty Sand MSE Berm Compacted Clay	Assigned to materials: Sand Silty Sand MSE Berm Compacted Clay
Piezoline	X Y 0 260 944.5 286	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till
Distributed Load	X Y 189.051 313 187.39 313	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No
Distributed Load	X Y 199.382 313 197.71 313	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Normal to boundary Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No
Bolt	X Y 180.114 305.5 200.114 305.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 180.371 307 200.371 307	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 180.628 308.5 200.628 308.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 180.885 310 200.885 310	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 181.142 311.5 201.142 311.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 181.399 313 201.399 313	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 177.544 290.5 197.544 290.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 177.801 292 197.801 292	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 178.058 293.5 198.058 293.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 178.315 295 198.315 295	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 178.572 296.5 198.572 296.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 178.829 298 198.829 298	Support 1	Support 1	Support 1	Support 1	Support 1

Bolt	X Y 179.086 299.5 199.086 299.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 179.343 301 199.343 301	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 179.6 302.5 199.6 302.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 179.857 304 199.857 304	Support 1	Support 1	Support 1	Support 1	Support 1
Tension Crack	X Y 180.885 310 239.913 310	✗	Water level: dry	✗	✗	✗
Block Search Window	X Y 285.738 204.743 389.783 204.743 389.783 275.885 285.738 275.885	✗	✗	✓	✗	✗
Block Search Window	X Y 201.557 215.65 305.602 215.65 305.602 286.792 201.557 286.792	✗	✗	✓	✗	✗
Tension Crack	X Y 180.628 308.5 244.509 308.5	✗	✗	✗	Water level: dry	✗
Block Search Window	X Y 243.169 287.981 174.06 287.981 174.06 235.859 243.169 235.859	✗	✗	✗	✗	✓

Section VII

Slide Analysis Information

2019.10.10 Ph14 VII Con ST2

Project Summary

File Name:	2019.10.10 Ph14 VII Con ST2.slmd
Last saved with Slide version:	8.028
Project Title:	SLIDE - An Interactive Slope Stability Program
Date Created:	7/16/2019, 9:54:59 AM

Currently Open Scenarios

Group Name	Scenario Name	Compute Time
Construction	Master Scenario	
	Berm Inward	
	Berm Inward NC	
	Berm Outward	
	Berm Outward NC	
Construction Seimic	Master Scenario	
	Berm Inward	
	Berm Inward NC	
	Berm Outward	
	Berm Outward NC	

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard

	Master Scenario	Berm Inward	Berm Inward NC	Berm Outward	Berm Outward NC	Master Scenario	Berm Inward	Berm Inward NC	Berm Outward	Berm Outward NC
Failure Direction:	Right to Left	Left to Right	Left to Right	Right to Left	Right to Left	Right to Left	Left to Right	Left to Right	Right to Left	Right to Left

Analysis Options

All Open Scenarios	
Slices Type:	Vertical
Analysis Methods Used	
	Spencer
Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

All Open Scenarios	
Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

All Open Scenarios	
Pseudo-random Seed:	10116
Random Number Generation Method:	Park and Miller v.3

Surface Options

Construction - Master Scenario	Construction - Berm Inward	Construction - Berm Inward NC	Construction - Berm Outward	Construction - Berm Outward NC	Construction Seimic
Surface Type: Circular Search Method: Auto Refine Search Divisions along slope: 20 Circles per division: 10 Number of iterations: 10 Divisions to use in next iteration: 50% Composite Surfaces: Disabled Minimum Elevation: Not Defined Minimum Depth: Not Defined Minimum Area: Not Defined Minimum Weight: Not Defined	Surface Type: Circular Search Method: Grid Search Radius Increment: 10 Composite Surfaces: Disabled Reverse Curvature: Invalid Surfaces Minimum Elevation: Not Defined Minimum Depth [ft]: 10 Minimum Area: Not Defined Minimum Weight: Not Defined	Surface Type: Non-Circular Block Search Number of Surfaces: 5000 Multiple Groups: Disabled Pseudo-Random Surfaces: Enabled Convex Surfaces Only: Disabled Left Projection Angle (Start Angle) [°]: 105 Left Projection Angle (End Angle) [°]: 165 Right Projection Angle (Start Angle) [°]: 15 Right Projection Angle (End Angle) [°]: 75 Minimum Elevation: Not Defined Minimum Depth [ft]: 10 Minimum Area: Not Defined Minimum Weight: Not Defined	Surface Type: Circular Search Method: Grid Search Radius Increment: 10 Composite Surfaces: Disabled Reverse Curvature: Invalid Surfaces Minimum Elevation: Not Defined Minimum Depth [ft]: 10 Minimum Area: Not Defined Minimum Weight: Not Defined	Surface Type: Non-Circular Block Search Number of Surfaces: 5000 Multiple Groups: Disabled Pseudo-Random Surfaces: Enabled Convex Surfaces Only: Disabled Left Projection Angle (Start Angle) [°]: 105 Left Projection Angle (End Angle) [°]: 165 Right Projection Angle (Start Angle) [°]: 15 Right Projection Angle (End Angle) [°]: 75 Minimum Elevation: Not Defined Minimum Depth [ft]: 10 Minimum Area: Not Defined Minimum Weight: Not Defined	Surface Type: Circular Search Method: Auto Refine Search Divisions along slope: 20 Circles per division: 10 Number of iterations: 10 Divisions to use in next iteration: 50% Composite Surfaces: Disabled Minimum Elevation: Not Defined Minimum Depth: Not Defined Minimum Area: Not Defined Minimum Weight: Not Defined

Seismic Loading

Construction		Construction Seimic	
Advanced seismic analysis:	No	Advanced seismic analysis:	No
Staged pseudostatic analysis:	No	Staged pseudostatic analysis:	No
		Seismic Load Coefficient (Horizontal):	0.05

Loading

All Open Scenarios	
2 Distributed Loads present	
Distributed Load 1	
Distribution:	Constant
Magnitude [psf]:	2350
Orientation:	Vertical
Distributed Load 2	
Distribution:	Constant
Magnitude [psf]:	2350
Orientation:	Vertical

Tension Crack

Construction - Master Scenario	Construction - Berm Inward	Construction - Berm Inward NC	Construction - Berm Outward	Construction - Berm Outward NC	Construction Seimic - Master Scenario	Construction Seimic - Berm Inward	Construction Seimic - Berm Inward NC	Construction Seimic - Berm Outward	Construction Seimic - Berm Outward NC
	Water level: dry	Water level: dry		Water level: dry		Water level: dry	Water level: dry		

Materials

Property	Till	Sand	Silty Sand	MSE Berm Stage 1	MSE Berm Stage 2	Soft Clay (Construction)	Stiff Clay (Construction)	Compacted Clay
Color								
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	SHANSEP	SHANSEP	Mohr-Coulomb
Unit Weight [lbs/ft3]	150	110	110	120	120	120	125	125
Cohesion [psf]	10000	0	0	100	100			100
Friction Angle [°]	50	36	32	32	32			32
A [psf]						0	0	
S						0.19	0.22	
m						0.66	0.76	
Stress History Type						Preconsolidation Pressure	Preconsolidation Pressure	
Definition Method						Constant [6500]	Constant [21000]	
Material Dependent Vertical Stress						Yes	Yes	
Water Surface	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario
Hu Value	1	1	1	1		1	1	
Ru Value					0			0

SHANSEP Material Dependent Vertical Stress

Soft Clay (Construction)

Vertical stress computed using the following factored materials:

Liner Slope Factor=0

MSW Factor=0.9

Stiff Clay (Construction)

Vertical stress computed using the following factored materials:

Liner Slope Factor=0

MSW Factor=0.9

Property	Bedrock
Color	
Strength Type	Infinite strength
Unit Weight [lbs/ft3]	165
Allow Sliding Along Boundary	Yes
Water Surface	Assigned per scenario
Ru Value	0

Materials In Use

Material	Master Scenario	Berm Inward	Berm Inward NC	Berm Outward	Berm Outward NC	Master Scenario	Berm Inward	Berm Inward NC	Berm Outward	Berm Outward NC
Till	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Sand	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Silty Sand	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
MSE Berm Stage 1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
MSE Berm Stage 2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Soft Clay (Construction)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Stiff Clay (Construction)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Compacted Clay	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Bedrock	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Support

Support 1

Support Type: GeoTextile
Force Application: Active
Force Orientation: Parallel to Reinforcement
Anchorage: None
Shear Strength Model: Linear
Use External Loads for Strength: yes
Strip Coverage: 100 percent
Tensile Strength: 3620 lb/ft
Pullout Strength Adhesion: 0 psf
Pullout Strength Friction Angle: 32 degrees

Entity Information

Group: Construction

Shared Entities

Type	X	Y
External Boundary	0	267.394
	0	263.993
	0	263.907
	0	255
	0	251
	0	237.545
	0	225
	918.306	225
	918.306	247.055
	918.306	265.56
	918.306	275.657
	918.306	284.709
	891.792	284.185
	888.393	284.118
	858.604	283.529
	762.31	281.721
	711.835	281
	655.355	280.193
	580.638	279.104
	580.083	279.096
	538.794	278.494
	356.411	275.835
	354.153	276.581
	344.019	279.928
	252.974	310
	243.891	313
	225.45	313
	215.45	313
	210.45	313
	195.45	313
	194.946	310
	190.766	285.15
	189.325	276.581
	187.806	276.569
	186.012	276.56
	174.887	276.472
	173.397	276.465
	0	276.465
Material Boundary	14.8525	263.899
	20.6166	263.928
	111.168	264.493
	118.325	264.638
	135.935	265
	142.846	265.295
	148.804	265.656
	155.294	266.005
	155.579	266
	155.69	266
	155.801	266
	156.036	266
	156.269	266
	161.142	266
	176.98	266
	183.967	266
	190.847	266
	200.76	266
	202.096	266
	208.706	266.195
	209.204	266.166
	212.249	266.126
	213.206	266.068
	214.732	266.057
	223.243	266.548
	228.597	266.624
	235.803	266.726
	238.166	267
	240.407	267.259
	243.891	267.561
	245.3	267.683
	248.968	268
	275.25	268.984
	275.367	268.992
	275.49	269
	275.548	269
	275.606	268.999
	275.618	268.996
	275.628	268.992
	275.659	268.991
	275.775	268.996
	277.995	268.92
	277.997	268.92
	279.163	268.902
	299.798	268.571
	302.724	268.631
	304.496	268.667
	310.459	268.898
	311.919	268.932
	313.088	269
	321.978	269.517

Material Boundary

X	Y
711.835	281
746.351	281
756.165	281
756.822	281
785.494	281.721
795.704	282
811.202	282.321
837.772	282.871
843.78	283
864.53	283.526
883.771	284
888.393	284.118

X	Y
0	251
3.62511	251.092
6.31227	251.156
8.39158	251.21
17.1637	251.434
22.4605	251.584
39.2699	252.053
47.7657	252.295
54.8174	252.496
61.3129	252.692
98.6088	253.877
106.379	254.117
111.491	254.278
113.005	254.331
132.977	255
173.723	257.312
195.434	258.441
205.742	259.027
224.891	260
243.891	260.746
248.393	260.923
287.879	262.478
294.598	262.743
333.549	264.147
341.085	264.442
342.714	264.505
357.452	265
396.135	266.247
400.871	266.361
412.871	266.72
422.038	266.936
431.676	267.202
445.804	267.569
458.899	267.833
467.913	268.04
474.48	268.169

Material Boundary

X	Y
0	255
0.396516	255
1.21979	255
2.14325	255
3.05308	255
4.81628	255
6.56946	255
8.86921	255
9.81812	255
26.9591	255.498
33.0127	255.685
43.0858	256.003
82.6735	257.229
141.034	259.1
169.16	260
189.114	260.638
204.947	261.091
205.508	261.107
243.891	262.258
264.498	262.876
295.658	263.824
315.812	264.428
335.946	265
355.135	266.235
372.867	267.584
379.845	268.081
420.488	270
427.551	270.253
427.578	270.254
427.606	270.255
427.862	270.264
428.949	270.303
429.337	270.316
491.911	272.173
492.253	272.183
492.757	272.196
494.37	272.239
494.47	272.242
494.953	272.254
495.345	272.265
495.758	272.276
495.969	272.281
539.986	273.452
589.053	274.377
624.053	275
643.807	275.775
644.538	275.746

Material Boundary

X	Y
577.335	279
580.083	279.096

Material Boundary

X	Y
173.23	267.025
173.397	267.021
173.887	267.008
177.276	267.011
179.242	267.01
184.101	267.005
188.465	267.005
193.417	267.124
196.897	267.337
202.33	267.469
204.119	267.472
205.906	267.47
206.945	267
209.1	267
219.714	267
225.275	267
234.775	267.359
235.704	267.409
248.317	268
257.563	268.612
263.421	269
265.56	269.214
275.367	268.992

Material Boundary

X	Y
356.411	275.835
369.381	271.551
370.38	271.221

X	Y
0	237.545
8.90245	237.853
18.3492	238.131
27.9507	238.462
31.8699	238.583
53.5555	239.368
56.9073	239.473
62.3526	239.67
71.0864	240
88.7106	240.692
90.1928	240.757
97.2828	241.042
103.85	241.33
109.711	241.593
133.251	242.575
145.512	243.136
149.002	243.29
154.345	243.52
171.928	244.363
173.449	244.429
185.35	245
188.144	245.126
188.211	245.129
211.117	246.194
222.728	246.752
232.704	247.218
234.335	247.297
266.106	248.853
273.886	249.23
279.689	249.518
281.259	249.594
289.344	250
316.255	251.184
325.287	251.573
336.34	252.059
348.245	252.576
365.496	253.339
[illegible]	[illegible]

Material Boundary

X	Y
275.775	268.996
295.347	269.729
323.877	270.647
328.199	270.706
341.12	270.858
345.588	271
365.954	271.43
369.381	271.551

Material Boundary

X	Y
171.097	267.08
173.23	267.025

Material Boundary

X	Y
173.397	267.021
173.397	267.109
173.397	276.465

Material Boundary

X	Y
117.678	267.179
124.017	267.159
159.007	267.099
161.556	267.027
167.567	267
170.387	267.073
171.097	267.08

Material Boundary

X	Y
189.325	276.581
219.325	276.581
354.153	276.581

X	Y
0	263.993
14.8525	263.899
[illegible]	[illegible]

Type	X	Y
Material Boundary	148.804	265.656
	155.294	266
	155.579	266

Type	X	Y
Material Boundary	275.25	268.984
	275.49	268.993
	275.548	268.993
	275.606	268.993
	275.617	268.992
	275.628	268.992

Type	X	Y
Material Boundary	275.659	268.991
	275.775	268.988
	277.993	268.921
	277.995	268.92

Type	X	Y
Material Boundary	402.888	271.985
	402.926	271.985
	402.926	271.985
	402.926	271.985
	403.22	272

Type	X	Y
Material Boundary	577.335	279
	580.638	279.104

Type	X	Y
Material Boundary	883.771	284
	888.389	284.104
	891.792	284.185

Type	X	Y
Material Boundary	189.325	276.581
	198.627	276.653
	205.453	276.733
	208.538	276.804
	219.378	276.897
	219.48	276.898
	223.326	276.992
	233.668	277.087
	252.03	277.56
	264.107	277.845
	274.507	278.117
	283.822	278.339
	297.016	278.688
	303.498	278.845
	319.556	279.275
	323.136	279.362
	342.13	279.877
	342.734	279.892
	344.019	279.928

Type	X	Y
Material Boundary	0	267.394
	1.32741	267.392
	5.81444	267.386
	13.2249	267.379
	27.7457	267.364
	33.2027	267.358
	38.7829	267.373
	44.1863	267.381
	47.2647	267.375
	48.1904	267.374
	53.1121	267.36
	66.6587	267.302
	80.1789	267.278
	107.481	267.21
	117.678	267.179
	173.397	276.465

Type	X	Y
Material Boundary	194.946	310
	252.974	310

Scenario-based Entities

Type	Coordinates	Master Scenario	Berm Inward	Berm Inward NC	Berm Outward	Berm Outward NC
Piezoline	X: 0, 918.35; Y: 265, 283	Assigned to materials:	Assigned to materials:	Assigned to materials:	Assigned to materials:	Assigned to materials:

		Soft Clay (Construction)	Soft Clay (Construction)	Soft Clay (Construction)	Soft Clay (Construction)	Soft Clay (Construction)
Piezoline	X Y 0 275 918.4 288	Assigned to materials: Sand Silty Sand MSE Berm Stage 1 Stiff Clay (Construction)	Assigned to materials: Sand Silty Sand MSE Berm Stage 1 Stiff Clay (Construction)	Assigned to materials: Sand Silty Sand MSE Berm Stage 1 Stiff Clay (Construction)	Assigned to materials: Sand Silty Sand MSE Berm Stage 1 Stiff Clay (Construction)	Assigned to materials: Sand Silty Sand MSE Berm Stage 1 Stiff Clay (Construction)
Piezoline	X Y 0 265 918.306 285	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till
Distributed Load	X Y 201.442 313 203.121 313	Constant Distribution Orientation: Vertical Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Vertical Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Vertical Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Vertical Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Vertical Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No
Distributed Load	X Y 211.785 313 213.464 313	Constant Distribution Orientation: Vertical Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Vertical Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Vertical Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Vertical Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Vertical Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No
Bolt	X Y 194.946 310 216.946 310	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 195.198 311.5 217.198 311.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 195.45 313 217.45 313	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 190.909 286 212.909 286	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 191.161 287.5 213.161 287.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 191.414 289 213.414 289	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 191.666 290.5 213.666 290.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 191.918 292 213.918 292	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 192.17 293.5 214.17 293.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 192.423 295 214.423 295	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 192.675 296.5 214.675 296.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 192.927 298 214.927 298	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 193.18 299.5 215.18 299.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 193.432 301 215.432 301	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 193.684 302.5 215.684 302.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 193.937 304 215.937 304	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 194.189 305.5 216.189 305.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 194.441 307 216.441 307	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 194.693 308.5 216.693 308.5	Support 1	Support 1	Support 1	Support 1	Support 1

Bolt	X Y 189.395 277 211.395 277	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 189.648 278.5 211.648 278.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 189.9 280 211.9 280	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 190.152 281.5 212.152 281.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 190.404 283 212.404 283	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 190.657 284.5 212.657 284.5	Support 1	Support 1	Support 1	Support 1	Support 1
Tension Crack	X Y 267.716 299.507 284.742 299.507 267.716 305.131 267.716 299.507	✗	Water level: dry	✗	✗	✗
Block Search Window	X Y 360.039 271.259 275.01 271.244 274.951 232.089 359.941 231.828	✗	✓	✓	✓	✗
Block Search Window	X Y 430.925 274.526 345.896 274.511 345.837 235.356 430.827 235.095	✗	✓	✓	✓	✓
Tension Crack	X Y 243.891 305.502 266.592 305.502 243.891 313 243.891 305.502	✗	✗	Water level: dry	✗	✗
Tension Crack	X Y 251.89 305.487 266.637 305.487 243.891 313 251.89 305.487	✗	✗	✗	✗	Water level: dry

Group: Construction Seimic

Shared Entities

Type	Coordinates
External Boundary	X Y 0 267.394 0 263.993 0 263.907 0 255 0 251 0 237.545 0 225 918.306 225 918.306 247.055 918.306 265.56 918.306 275.657 918.306 284.709 891.792 284.185 888.393 284.118 858.604 283.529 762.31 281.721 711.835 281 655.355 280.193 580.638 279.104 580.083 279.096 538.794 278.494 356.411 275.835 354.153 276.581 344.019 279.928 252.974 310 243.891 313 225.45 313 215.45 313 210.45 313 195.45 313 194.946 310 191.414 289 190.766 285.15 189.325 276.581 187.806 276.569 186.012 276.56 174.887 276.472 173.397 276.465 0 276.465

Material Boundary

X	Y
14.8525	263.899
20.6166	263.928

Material Boundary

X	Y
111.168	264.493
118.325	264.638
135.935	265
142.846	265.295
148.804	265.656
155.294	266.005
155.579	266
155.69	266
155.801	266
156.036	266
156.269	266
161.142	266
176.98	266
183.967	266
190.847	266
200.76	266
202.096	266
208.706	266.195
209.204	266.166
212.249	266.126
213.206	266.068
214.732	266.057
223.243	266.548
228.597	266.624
235.803	266.726
238.166	267
240.407	267.259
243.891	267.561
245.3	267.683
248.968	268
275.25	268.984
275.367	268.992
275.49	269
275.548	269
275.606	268.999
275.618	268.996
275.628	268.992
275.659	268.991
275.775	268.996
277.995	268.92
277.997	268.92
279.163	268.902
299.798	268.571
302.724	268.631
304.496	268.667
310.459	268.898
311.919	268.932
313.088	269
321.978	269.517
330.268	270
331.391	270.035
332.095	270.071
333.251	270.144
340.155	270.465
346.433	270.757
346.659	270.767
353.205	271
362.863	271.103
363.105	271.109
363.122	271.109
365.124	271.148
370.38	271.221
383.995	271.41
392.481	271.597
400.38	271.687
402.815	271.983
402.888	271.985
402.926	271.985
403.22	272
403.368	272
406.994	272.006
407.751	272.006
408.483	272.098
424.848	272.057
425.698	272.061
426.274	272.068
426.567	272.074
427.715	272.108
430.249	272.181
432.657	272.284
440.527	272.505
451.703	273
454.545	273.146
462.528	273.431
472.451	274
481.185	274.4
499.949	275
505.308	275.598
508.092	276
525.688	276.879
526.197	276.902
528.413	277
549.217	277.903
551.426	278
552.028	278.024
554.959	278.148
556.131	278.193
557.188	278.231

Material Boundary

X	Y
711.835	281
746.351	281
756.165	281
756.822	281
785.494	281.721
795.704	282
811.202	282.321
837.772	282.871
843.78	283
864.53	283.526
883.771	284
888.393	284.118

Material Boundary

X	Y
0	251
3.62511	251.092
6.31227	251.156
8.39158	251.21
17.1637	251.434
22.4605	251.584
39.2699	252.053
47.7657	252.295
54.8174	252.496
61.3129	252.692
98.6088	253.877
106.379	254.117
111.491	254.278
113.005	254.331
132.977	255
173.723	257.312
195.434	258.441
205.742	259.027
224.891	260
243.891	260.746
248.393	260.923
287.879	262.478
294.598	262.743
333.549	264.147
341.085	264.442
342.714	264.505
357.452	265
396.135	266.247
400.871	266.361
412.871	266.72
422.038	266.936
431.676	267.202
445.804	267.569
458.899	267.833
467.913	268.04
474.48	268.169
483.813	268.359
491.395	268.492
507.659	268.78
511.175	268.837
514.517	268.885
525.005	269.074
527.794	269.11
530.569	269.141
539.191	269.281
560.511	269.632
562.409	269.651
585.047	269.997
585.085	269.997
585.268	270
596.125	270.157
608.216	270.325
608.298	270.326
608.437	270.328
616.677	270.44
619.516	270.471
630.476	270.618
630.639	270.62
644.948	270.809
648.868	270.868
662.854	271.059
665.066	271.089
667.032	271.128
668.655	271.156
684.161	271.379
689.339	271.471
692.028	271.533
701.875	271.672
708.684	271.835
716.166	271.947
718.84	272.003
726.703	272.204
740.11	272.424
749.331	272.672
752.152	272.761
763.334	272.96
784.091	273.543
787.321	273.601
789.987	273.65
802.263	274.046
807.198	274.144
812.365	274.294
825.302	274.669
827.001	274.704
837.005	275

Material Boundary

X	Y
0	255
0.396516	255
1.21979	255
2.14325	255
3.05308	255
4.81628	255
6.56946	255
8.86921	255
9.81812	255
26.9591	255.498
33.0127	255.685
43.0858	256.003
82.6735	257.229
141.034	259.1
169.16	260
189.114	260.638
204.947	261.091
205.508	261.107
243.891	262.258
264.498	262.876
295.658	263.824
315.812	264.428
335.946	265
355.135	266.235
372.867	267.584
379.845	268.081
420.488	270
427.551	270.253
427.578	270.254
427.606	270.255
427.862	270.264
428.949	270.303
429.337	270.316
491.911	272.173
492.253	272.183
492.757	272.196
494.37	272.239
494.47	272.242
494.953	272.254
495.345	272.265
495.758	272.276
495.969	272.281
539.986	273.452
589.053	274.377
624.053	275
643.807	275.775
644.538	275.746
645.236	275.713
645.83	275.678
676.562	276.545
678.233	276.477
679.61	276.402
703.84	276.923
706.082	276.831
726.704	277.188
738.68	277.324
744.234	277.358
750.093	277.382
756.318	277.395
762.975	277.399
769.672	277.392
777.266	277.375
781.168	277.363
782.471	277.358
784.645	277.351
785.427	277.349
785.852	277.348
787.774	277.34
791.959	277.323
795.122	277.311
795.542	277.309
797.444	277.3
805.603	277.262
808.082	277.25
812.365	277.227
812.365	274.294

Material Boundary

X	Y
577.335	279
580.083	279.096

Material Boundary

X	Y
173.23	267.025
173.397	267.021
173.887	267.008
177.276	267.011
179.242	267.01
184.101	267.005
188.465	267.005
193.417	267.124
196.897	267.337
202.33	267.469
204.119	267.472
205.906	267.47
206.945	267
209.1	267

	X	Y
Material Boundary	356.411	275.835
	369.381	271.551
	370.38	271.221

	X	Y
Material Boundary	0	237.545
	8.90245	237.853
	18.3492	238.131
	27.9507	238.462
	31.8699	238.583
	53.5555	239.368
	56.9073	239.473
	62.3526	239.67
	71.0864	240
	88.7106	240.692
	90.1928	240.757
	97.2828	241.042
	103.85	241.33
	109.711	241.593
	133.251	242.575
	145.512	243.136
	149.002	243.29
	154.345	243.52
	171.928	244.363
	173.449	244.429
	185.35	245
	188.144	245.126
	188.211	245.129
	211.117	246.194
	222.728	246.752
	232.704	247.218
	234.335	247.297
	266.106	248.853
	273.886	249.23
	279.689	249.518
	281.259	249.594
	289.344	250
	316.255	251.184
	325.287	251.573
	336.34	252.059
	348.245	252.576
	365.496	253.339
	387.967	254.298
	390.146	254.394
	404.179	255
	414.017	255.359
	432.442	256.022
	438.923	256.23
	443.45	256.377
	461.426	257.017
	471.842	257.381
	490.061	257.935
	500.617	258.302
	507.173	258.5
	511.405	258.642
	545.99	259.631
	548.21	259.705
	548.824	259.725
	559.078	260
	564.854	260.149
	584.743	260.654
	586.58	260.693
	590.912	260.794
	594.208	260.864
	616.141	261.386
	616.405	261.392
	626.483	261.611
	636.657	261.808
	647.29	262.043
	649.291	262.08
	664.601	262.384
	678.43	262.629
	679.729	262.655
	681.96	262.695
	693.062	262.895
	704.998	263.085
	711.996	263.193
	718.211	263.294
	721.828	263.352
	725.349	263.399
	732.375	263.501
	737.555	263.572
	750.85	263.768
	756.695	263.835
	772.306	264.043
	773.143	264.052
	775.613	264.076
	787.821	264.233
	790.201	264.256
	792.494	264.274
	811.164	264.509
	812.453	264.52

	X	Y
Material Boundary	275.775	268.996
	295.347	269.729
	323.877	270.647
	328.199	270.706
	341.12	270.858
	345.588	271
	365.954	271.43
	369.381	271.551

	X	Y
Material Boundary	171.097	267.08
	173.23	267.025

	X	Y
Material Boundary	173.397	267.021
	173.397	267.109
	173.397	276.465

	X	Y
Material Boundary	117.678	267.179
	124.017	267.159
	159.007	267.099
	161.556	267.027
	167.567	267
	170.387	267.073
	171.097	267.08

	X	Y
Material Boundary	189.325	276.581
	219.325	276.581
	354.153	276.581

	X	Y
Material Boundary	0	263.993
	14.8525	263.899
	20.6166	263.924
	45.3146	263.962
	53.3627	264
	60.9536	264.075
	61.3362	264.076
	62.53	264.084
	74.9056	264.205
	78.1642	264.226
	96.8602	264.261
	98.8551	264.285
	103.183	264.351
	105.965	264.393
	109.824	264.471
	110.885	264.487
	111.168	264.493

	X	Y
Material Boundary	148.804	265.656
	155.294	266
	155.579	266

	X	Y
Material Boundary	275.25	268.984
	275.49	268.993
	275.548	268.993
	275.606	268.993
	275.617	268.992
	275.628	268.992

	X	Y
Material Boundary	275.659	268.991
	275.775	268.988
	277.993	268.921
	277.995	268.92

	X	Y
Material Boundary	402.888	271.985
	402.926	271.985
	402.926	271.985
	402.926	271.985
	403.22	272

	X	Y
Material Boundary	577.335	279
	580.638	279.104

	X	Y
Material Boundary	883.771	284
	888.389	284.104

Type	Coordinates
Material Boundary	X / Y: 189.325 276.581; 198.627 276.653; 205.453 276.733; 208.538 276.804; 219.378 276.897; 219.48 276.898; 223.326 276.992; 233.668 277.087; 252.03 277.56; 264.107 277.845; 274.507 278.117; 283.822 278.339; 297.016 278.688; 303.498 278.845; 319.556 279.275; 323.136 279.362; 342.13 279.877; 342.734 279.892; 344.019 279.928
Material Boundary	X / Y: 0 267.394; 1.32741 267.392; 5.81444 267.386; 13.2249 267.379; 27.7457 267.364; 33.2027 267.358; 38.7829 267.373; 44.1863 267.381; 47.2647 267.375; 48.1904 267.374; 53.1121 267.36; 66.6587 267.302; 80.1789 267.278; 107.481 267.21; 117.678 267.179; 173.397 276.465
Material Boundary	X / Y: 194.946 310; 252.974 310

Scenario-based Entities

Type	Coordinates	Master Scenario	Berm Inward	Berm Inward NC	Berm Outward	Berm Outward NC
Piezoline	X / Y: 0 265; 918.35 283	Assigned to materials: Soft Clay (Construction)	Assigned to materials: Soft Clay (Construction)	Assigned to materials: Soft Clay (Construction)	Assigned to materials: Soft Clay (Construction)	Assigned to materials: Soft Clay (Construction), Stiff Clay (Construction)
Piezoline	X / Y: 0 275; 918.4 288	Assigned to materials: Sand, Silty Sand, MSE Berm Stage 1, Stiff Clay (Construction)	Assigned to materials: Sand, Silty Sand, MSE Berm Stage 1, Stiff Clay (Construction)	Assigned to materials: Sand, Silty Sand, MSE Berm Stage 1, Stiff Clay (Construction)	Assigned to materials: Sand, Silty Sand, MSE Berm Stage 1, Stiff Clay (Construction)	Assigned to materials: Sand, Silty Sand, MSE Berm Stage 2, Compacted Clay
Piezoline	X / Y: 0 265; 918.306 285	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till
Distributed Load	X / Y: 201.442 313; 203.121 313	Constant Distribution, Orientation: Vertical, Magnitude: 2350 lbs/ft2, Creates Excess Pore Pressure: No	Constant Distribution, Orientation: Vertical, Magnitude: 2350 lbs/ft2, Creates Excess Pore Pressure: No	Constant Distribution, Orientation: Vertical, Magnitude: 2350 lbs/ft2, Creates Excess Pore Pressure: No	Constant Distribution, Orientation: Vertical, Magnitude: 2350 lbs/ft2, Creates Excess Pore Pressure: No	Constant Distribution, Orientation: Vertical, Magnitude: 2350 lbs/ft2, Creates Excess Pore Pressure: No
Distributed Load	X / Y: 211.785 313; 213.464 313	Constant Distribution, Orientation: Vertical, Magnitude: 2350 lbs/ft2, Creates Excess Pore Pressure: No	Constant Distribution, Orientation: Vertical, Magnitude: 2350 lbs/ft2, Creates Excess Pore Pressure: No	Constant Distribution, Orientation: Vertical, Magnitude: 2350 lbs/ft2, Creates Excess Pore Pressure: No	Constant Distribution, Orientation: Vertical, Magnitude: 2350 lbs/ft2, Creates Excess Pore Pressure: No	Constant Distribution, Orientation: Vertical, Magnitude: 2350 lbs/ft2, Creates Excess Pore Pressure: No
Bolt	X / Y: 194.946 310; 216.946 310	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X / Y: 195.198 311.5; 217.198 311.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X / Y: 195.45 313; 217.45 313	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X / Y: 191.414 289; 213.414 289	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X / Y: 191.666 290.5; 213.666 290.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X / Y: 191.918 292; 213.918 292	Support 1	Support 1	Support 1	Support 1	Support 1

Bolt	X Y 192.17 293.5 214.17 293.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 192.423 295 214.423 295	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 192.675 296.5 214.675 296.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 192.927 298 214.927 298	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 193.18 299.5 215.18 299.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 193.432 301 215.432 301	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 193.684 302.5 215.684 302.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 193.937 304 215.937 304	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 194.189 305.5 216.189 305.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 194.441 307 216.441 307	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 194.693 308.5 216.693 308.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 190.909 286 212.909 286	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 191.161 287.5 213.161 287.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 189.395 277 211.395 277	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 189.648 278.5 211.648 278.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 189.9 280 211.9 280	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 190.152 281.5 212.152 281.5	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 190.404 283 212.404 283	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 190.657 284.5 212.657 284.5	Support 1	Support 1	Support 1	Support 1	Support 1
Tension Crack	X Y 243.891 300.984 280.27 300.984 243.891 313 243.891 300.984	✗	Water level: dry	✗	✗	✗
Block Search Window	X Y 360.039 271.259 275.01 271.244 274.951 232.089 359.941 231.828	✗	✓	✓	✓	✗
Block Search Window	X Y 430.925 274.526 345.896 274.511 345.837 235.356 430.827 235.095	✗	✓	✓	✓	✓
Tension Crack	X Y 243.891 304.007 271.118 304.007 243.891 313 [illegible]	✗	✗	Water level: dry	✗	✗

Section VIII

Slide Analysis Information

2019.10.01 Ph14 VIII Con

Project Summary

File Name:	2019.10.01 Ph14 VIII Con.slmd
Last saved with Slide version:	8.028
Project Title:	SLIDE - An Interactive Slope Stability Program
Date Created:	7/16/2019, 9:54:59 AM

Currently Open Scenarios

Group Name	Scenario Name	Compute Time
Construction	Master Scenario	
	Inward	
	Inward NC	
	Outward	
	Outward NC	
Construction Seismic	Master Scenario	
	Inward	
	Inward NC	
	Outward	
	Outward NC	

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard

	Master Scenario	Inward	Inward NC	Outward	Outward NC	Master Scenario	Inward	Inward NC	Outward	Outward NC
Failure Direction:	Right to Left	Left to Right	Left to Right	Right to Left	Right to Left	Right to Left	Left to Right	Left to Right	Right to Left	Right to Left

Analysis Options

All Open Scenarios	
Slices Type:	Vertical
Analysis Methods Used	
	Spencer
Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

All Open Scenarios	
Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

All Open Scenarios	
Pseudo-random Seed:	10116
Random Number Generation Method:	Park and Miller v.3

Surface Options

Construction - Master Scenario		Construction - Inward		Construction - Inward NC		Construction - Outward		Construction - Outward NC		Construction Seismic	
Surface Type:	Circular	Surface Type:	Circular	Surface Type:	Non-Circular Block Search	Surface Type:	Circular	Surface Type:	Non-Circular Block Search	Surface Type:	Circular
Search Method:	Auto Refine Search	Search Method:	Grid Search	Number of Surfaces:	5000	Search Method:	Grid Search	Number of Surfaces:	5000	Search Method:	Auto Refine Search
Divisions along slope:	20	Radius Increment:	10	Multiple Groups:	Disabled	Radius Increment:	10	Multiple Groups:	Disabled	Divisions along slope:	20
Circles per division:	10	Composite Surfaces:	Disabled	Pseudo-Random Surfaces:	Enabled	Composite Surfaces:	Disabled	Pseudo-Random Surfaces:	Enabled	Circles per division:	10
Number of iterations:	10	Reverse Curvature:	Invalid Surfaces	Convex Surfaces Only:	Disabled	Reverse Curvature:	Invalid Surfaces	Convex Surfaces Only:	Disabled	Number of iterations:	10
Divisions to use in next iteration:	50%	Minimum Elevation:	Not Defined	Left Projection Angle (Start Angle) [°]:	105	Minimum Elevation:	Not Defined	Left Projection Angle (Start Angle) [°]:	105	Divisions to use in next iteration:	50%
Composite Surfaces:	Disabled	Minimum Depth [ft]:	10	Left Projection Angle (End Angle) [°]:	165	Minimum Depth [ft]:	10	Left Projection Angle (End Angle) [°]:	165	Composite Surfaces:	Disabled
Minimum Elevation:	Not Defined	Minimum Area:	Not Defined	Right Projection Angle (Start Angle) [°]:	15	Minimum Area:	Not Defined	Right Projection Angle (Start Angle) [°]:	15	Minimum Elevation:	Not Defined
Minimum Depth:	Not Defined	Minimum Weight:	Not Defined	Right Projection Angle (End Angle) [°]:	75	Minimum Weight:	Not Defined	Right Projection Angle (End Angle) [°]:	75	Minimum Depth:	Not Defined
Minimum Area:	Not Defined			Minimum Elevation:	Not Defined			Minimum Elevation:	Not Defined	Minimum Area:	Not Defined
Minimum Weight:	Not Defined			Minimum Depth [ft]:	10			Minimum Depth [ft]:	10	Minimum Weight:	Not Defined
				Minimum Area:	Not Defined			Minimum Area:	Not Defined		
				Minimum Weight:	Not Defined			Minimum Weight:	Not Defined		

Seismic Loading

Construction		Construction Seismic	
Advanced seismic analysis:	No	Advanced seismic analysis:	No
Staged pseudostatic analysis:	No	Staged pseudostatic analysis:	No
		Seismic Load Coefficient (Horizontal):	0.05

Loading

All Open Scenarios	
2 Distributed Loads present	
Distributed Load 1	
Distribution:	Constant
Magnitude [psf]:	2350
Orientation:	Vertical
Distributed Load 2	
Distribution:	Constant
Magnitude [psf]:	2350
Orientation:	Vertical

Materials

Property	Till	Sand	Silty Sand	MSE Berm	Soft Clay (Construction)	Stiff Clay (Construction)	Bedrock
Color							
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	SHANSEP	SHANSEP	Infinite strength
Unit Weight [lbs/ft3]	150	110	110	120	120	125	165
Allow Sliding Along Boundary							Yes
Cohesion [psf]	10000	0	0	100			
Friction Angle [°]	50	36	32	32			
A [psf]					0	0	
S					0.19	0.22	
m					0.66	0.76	
Stress History Type					Preconsolidation Pressure	Preconsolidation Pressure	
Definition Method					Constant [4600]	Constant [15500]	
Material Dependent Vertical Stress					Yes	Yes	
Water Surface	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario
Hu Value	1	1	1	1	1	1	
Ru Value							0

SHANSEP Material Dependent Vertical Stress

Soft Clay (Construction)

Vertical stress computed using the following factored materials:

MSE Berm Factor=0

Stiff Clay (Construction)

Vertical stress computed using the following factored materials:

MSE Berm Factor=0

Materials In Use

Material	Master Scenario ◆ (green)	Inward ◆ (green)	Inward NC ◆ (green)	Outward ◆ (green)	Outward NC ◆ (green)	Master Scenario ◆ (red)	Inward ◆ (red)	Inward NC ◆ (red)	Outward ◆ (red)	Outward NC ◆ (red)
Till	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Sand	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Silty Sand	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
MSE Berm	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Soft Clay (Construction)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Stiff Clay (Construction)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Bedrock	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Support

Support 1

Support Type: GeoTextile
Force Application: Active
Force Orientation: Parallel to Reinforcement
Anchorage: None
Shear Strength Model: Linear
Use External Loads for Strength: yes
Strip Coverage: 100 percent
Tensile Strength: 1760 lb/ft
Pullout Strength Adhesion: 0 psf
Pullout Strength Friction Angle: 32 degrees

Entity Information

Group: Construction

Shared Entities

Type	Coordinates	
	X	Y
External Boundary	101.075	285.006
	57.0916	277.675
	44.2224	277.309
	33.3807	277
	25.5115	276.562
	19.0587	276.202
	12.7313	276
	1.78344	274.807
	0	274.581
	0	274.25
	0	267.695
	0	260.893
	0	244.771
	0	234.923
	0	225
	238.498	225
	238.498	242.288
	238.498	253.203
	238.498	263.829
	238.498	270.312
	238.498	281.961
	238.498	285.71
	217.531	285.805
	210.588	285.727
	198.476	285.696
	195.635	285.625
	192.756	285.536
	179.885	285.49
	179.092	285.496
	166.59	285.587
	162.327	285.465
	153.878	285.18
	146.69	285.012
	140.978	284.938
	138.611	285.006
	138.611	285.018
	134.844	307.62
	104.844	307.62
	X	Y
Material Boundary	0	244.771
	0.899061	244.785
	14.5378	245
	28.7866	245.781
	36.4443	246.123
	56.4833	247.133
	69.5486	247.698
	122.682	250
	130.658	250.269
	132.54	250.315
	133.159	250.331
	144.162	250.692
	167.954	251.44
	174.708	251.588
	180.557	251.717
	193.682	252.119
	197.136	252.186
	208.477	252.511
	225.609	252.84
	237.589	253.179
	238.498	253.203
	X	Y
	0	260.893

Material Boundary

X	Y
0	267.695
6.30825	267.753
27.4273	267.956
28.7058	267.968
32.0029	268
42.0986	268.102
44.588	268.129
70.1916	268.394
77.6249	268.474
79.8479	268.497
92.8654	268.633
112.442	268.845
114.461	268.867
126.828	269
130.118	269.038
130.819	269.046
149.593	269.264
155.211	269.33
160.511	269.392
177.256	269.585
188.788	269.719
193.967	269.779
197.889	269.825
213.053	270
213.984	270.012
214.056	270.013
227.545	270.182
233.276	270.248
237.951	270.305
238.498	270.312

Material Boundary

X	Y
0	274.25
15.4262	276
19.0587	276.202

Material Boundary

X	Y
81.7086	278.439
84.0627	278.545
95.3148	279
99.7637	279.365
100.142	279.406
100.782	279.476
114.748	281
118.071	281.235
120.451	281.262
121.224	281.271
126.073	281.461
129.2	281.488
132.959	281.521
138.414	281.557
139.188	281.562
144.519	281.599
149.76	281.634
159.718	281.701
165.15	281.728
178.672	281.794
180.014	281.801
186.477	281.829
190.474	281.843
210.448	281.906
211.258	281.908
213.891	281.914
215.423	281.918
235.554	281.955
235.682	281.956

Material Boundary

X	Y
119.85	307.585
123.613	285.006

Material Boundary

X	Y
101.075	285.006
116.087	285.006
123.613	285.006
138.611	285.006

Material Boundary

X	Y
0	234.923
3.09256	235
27.7051	235.902
33.1217	236.072
58.369	236.965
87.6206	237.884
95.8569	238.164
105.969	238.483
119.082	238.923
153.916	240
159.266	240.161
160.515	240.191
164.988	240.324
166.258	240.353
198.842	241.296
204.903	241.435
213.489	241.684
225.432	241.947
229.913	242.052
238.498	242.288

Material Boundary

X	Y
57.0916	277.675
60.0681	277.76
63.5596	277.839
64.957	277.863
71.99	278
81.7086	278.439
100.153	279.476
101.075	285.006

Material Boundary

X	Y
116.087	285.006
119.85	307.585

Scenario-based Entities

Type	Coordinates	Master Scenario	Inward	Inward NC	Outward	Outward NC
Piezoline	X, Y: 0, 270; 238.5, 275	Assigned to materials: Soft Clay (Construction), Stiff Clay (Construction)	Assigned to materials: Soft Clay (Construction), Stiff Clay (Construction)	Assigned to materials: Soft Clay (Construction), Stiff Clay (Construction)	Assigned to materials: Soft Clay (Construction), Stiff Clay (Construction)	Assigned to materials: Soft Clay (Construction), Stiff Clay (Construction)
Piezoline	X, Y: 0, 273; 238.5, 275	Assigned to materials: Sand, Silty Sand, MSE Berm	Assigned to materials: Sand, Silty Sand, MSE Berm	Assigned to materials: Sand, Silty Sand, MSE Berm	Assigned to materials: Sand, Silty Sand, MSE Berm	Assigned to materials: Sand, Silty Sand, MSE Berm
Piezoline	X, Y: 0, 260; 238.5, 265	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till
Distributed	X, Y: 113.836, 307.62	Constant Distribution Orientation: Vertical	Constant Distribution Orientation: Vertical	Constant Distribution Orientation: Vertical	Constant Distribution Orientation: Vertical	Constant Distribution Orientation: Vertical

		Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No
Distributed Load	X Y 124.174 307.62 125.813 307.62	Constant Distribution Orientation: Vertical Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Vertical Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Vertical Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Vertical Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Vertical Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No
Bolt	X Y 123.6 285.085 138.6 285.085	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 123.35 286.585 138.35 286.585	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 123.1 288.085 138.1 288.085	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 122.85 289.585 137.85 289.585	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 122.6 291.085 137.6 291.085	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 122.35 292.585 137.35 292.585	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 122.1 294.085 137.1 294.085	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 121.85 295.585 136.85 295.585	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 121.6 297.085 136.6 297.085	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 121.35 298.585 136.35 298.585	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 121.1 300.085 136.1 300.085	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 120.85 301.585 135.85 301.585	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 120.6 303.085 135.6 303.085	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 120.35 304.585 135.35 304.585	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 120.1 306.085 135.1 306.085	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 119.85 307.585 134.85 307.585	Support 1	Support 1	Support 1	Support 1	Support 1

	X	Y					
Bolt	101.094 116.094	285.12 285.12	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	101.344 116.344	286.62 286.62	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	101.594 116.594	288.12 288.12	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	101.844 116.844	289.62 289.62	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	102.094 117.094	291.12 291.12	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	102.344 117.344	292.62 292.62	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	102.594 117.594	294.12 294.12	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	102.844 117.844	295.62 295.62	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	103.094 118.094	297.12 297.12	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	103.344 118.344	298.62 298.62	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	103.594 118.594	300.12 300.12	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	103.844 118.844	301.62 301.62	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	104.094 119.094	303.12 303.12	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	104.344 119.344	304.62 304.62	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	104.594 119.594	306.12 306.12	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	104.844 119.844	307.62 307.62	Support 1	Support 1	Support 1	Support 1	Support 1
Block Search Window	184.755 157.13 157.13 184.755	284.031 284.031 247.29 247.29	✗	✗	✓	✗	✗

Type	X	Y					
Block Search Window	169.166	284.031	✗	✗	✓	✗	✗
	141.541	284.031					
	141.541	247.29					
	169.166	247.29					
Block Search Window	151.403	279.202	✗	✗	✓	✗	✗
	123.778	279.202					
	123.778	249.728					
	151.308	249.728					
Block Search Window	99.6364	239.526	✗	✗	✗	✗	✓
	138.571	239.526					
	138.571	285.006					
	99.6364	285.006					
Block Search Window	62.4394	239.526	✗	✗	✗	✗	✓
	101.374	239.526					
	101.374	285.006					
	62.4394	285.006					

Group: Construction Seismic

Shared Entities

Type	Coordinates X	Coordinates Y
External Boundary	101.075	285.006
	57.0916	277.675
	44.2224	277.309
	33.3807	277
	25.5115	276.562
	19.0587	276.202
	12.7313	276
	1.78344	274.807
	0	274.581
	0	274.25
	0	267.695
	0	260.893
	0	244.771
	0	234.923
	0	225
	238.498	225
	238.498	242.288
	238.498	253.203
	238.498	263.829
	238.498	270.312
	238.498	281.961
	238.498	285.71
	217.531	285.805
	210.588	285.727
	198.476	285.696
	195.635	285.625
	192.756	285.536
	179.885	285.49
	179.092	285.496
	166.59	285.587
	162.327	285.465
	153.878	285.18
	146.69	285.012
	140.978	284.938
	138.611	285.006
	138.611	285.018
	134.844	307.62
	104.844	307.62
	X	Y
	0	244.771
	[illegible]	[illegible]

Material Boundary

X	Y
0	260.893
20.0626	261.128
59.5799	261.593
81.4608	261.849
117.766	262.274
123.649	262.343
238.498	263.829

Material Boundary

X	Y
0	267.695
6.30825	267.753
27.4273	267.956
28.7058	267.968
32.0029	268
42.0986	268.102
44.588	268.129
70.1916	268.394
77.6249	268.474
79.8479	268.497
92.8654	268.633
112.442	268.845
114.461	268.867
126.828	269
130.118	269.038
130.819	269.046
149.593	269.264
155.211	269.33
160.511	269.392
177.256	269.585
188.788	269.719
193.967	269.779
197.889	269.825
213.053	270
213.984	270.012
214.056	270.013
227.545	270.182
233.276	270.248
237.951	270.305
238.498	270.312

Material Boundary

X	Y
0	274.25
15.4262	276
19.0587	276.202

X	Y
81.7086	278.439
84.0627	278.545
95.3148	279
99.7637	279.365
100.142	279.406
100.782	279.476

Material Boundary

X	Y
119.85	307.585
123.613	285.006

Material Boundary

X	Y
101.075	285.006
116.087	285.006
123.613	285.006
138.611	285.006

Material Boundary

X	Y
0	234.923
3.09256	235
27.7051	235.902
33.1217	236.072
58.369	236.965
87.6206	237.884
95.8569	238.164
105.969	238.483
119.082	238.923
153.916	240
159.266	240.161
160.515	240.191
164.988	240.324
166.258	240.353
198.842	241.296
204.903	241.435
213.489	241.684
225.432	241.947
229.913	242.052
238.498	242.288

Material Boundary

X	Y
57.0916	277.675
60.0681	277.76
63.5596	277.839
64.957	277.863
71.99	278
81.7086	278.439
100.153	279.476
101.075	285.006

Material Boundary

X	Y
116.087	285.006
119.85	307.585

Scenario-based Entities

Type	Coordinates	Master Scenario	Inward	Inward NC	Outward	Outward NC
Piezoline	X Y 0 270 238.5 275	Assigned to materials: Soft Clay (Construction) Stiff Clay (Construction)	Assigned to materials: Soft Clay (Construction) Stiff Clay (Construction)	Assigned to materials: Soft Clay (Construction) Stiff Clay (Construction)	Assigned to materials: Soft Clay (Construction) Stiff Clay (Construction)	Assigned to materials: Soft Clay (Construction) Stiff Clay (Construction)
Piezoline	X Y 0 273 238.5 275	Assigned to materials: Sand Silty Sand MSE Berm	Assigned to materials: Sand Silty Sand MSE Berm	Assigned to materials: Sand Silty Sand MSE Berm	Assigned to materials: Sand Silty Sand MSE Berm	Assigned to materials: Sand Silty Sand MSE Berm
Piezoline	X Y 0 260 238.5 265	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till
Distributed Load	X Y 113.836 307.62 115.514 307.62	Constant Distribution Orientation: Vertical Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Vertical Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Vertical Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Vertical Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Vertical Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No
Distributed Load	X Y 124.174 307.62 125.813 307.62	Constant Distribution Orientation: Vertical Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Vertical Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Vertical Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Vertical Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Vertical Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No
Bolt	X Y 101.094 285.12 116.094 285.12	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 101.344 286.62 116.344 286.62	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 101.594 288.12 116.594 288.12	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 101.844 289.62 116.844 289.62	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 102.094 291.12 117.094 291.12	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 102.344 292.62 117.344 292.62	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 102.594 294.12 117.594 294.12	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 102.844 295.62 117.844 295.62	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 103.094 297.12 118.094 297.12	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 103.344 298.62 118.344 298.62	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 103.594 300.12	Support 1	Support 1	Support 1	Support 1	Support 1

Bolt	X Y 103.844 301.62 118.844 301.62	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 104.094 303.12 119.094 303.12	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 104.344 304.62 119.344 304.62	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 104.594 306.12 119.594 306.12	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 104.844 307.62 119.844 307.62	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 123.6 285.085 138.6 285.085	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 123.35 286.585 138.35 286.585	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 123.1 288.085 138.1 288.085	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 122.85 289.585 137.85 289.585	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 122.6 291.085 137.6 291.085	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 122.35 292.585 137.35 292.585	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 122.1 294.085 137.1 294.085	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 121.85 295.585 136.85 295.585	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 121.6 297.085 136.6 297.085	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 121.35 298.585 136.35 298.585	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 121.1 300.085 136.1 300.085	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 120.85 301.585 135.85 301.585	Support 1	Support 1	Support 1	Support 1	Support 1

Bolt	X / Y 120.6 / 303.085 135.6 / 303.085	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X / Y 120.35 / 304.585 135.35 / 304.585	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X / Y 120.1 / 306.085 135.1 / 306.085	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X / Y 119.85 / 307.585 134.85 / 307.585	Support 1	Support 1	Support 1	Support 1	Support 1
Block Search Window	X / Y 184.755 / 284.031 157.13 / 284.031 157.13 / 247.29 184.755 / 247.29	✗	✗	✓	✗	✗
Block Search Window	X / Y 169.166 / 284.031 141.541 / 284.031 141.541 / 247.29 169.166 / 247.29	✗	✗	✓	✗	✗
Block Search Window	X / Y 151.403 / 279.202 123.778 / 279.202 123.778 / 249.728 151.308 / 249.728	✗	✗	✓	✗	✗
Block Search Window	X / Y 100.822 / 284.571 100.779 / 246.516 138.818 / 246.516 138.818 / 284.605	✗	✗	✗	✗	✓
Block Search Window	X / Y 61.495 / 278.16 68.095 / 246.27 106.134 / 246.27 106.134 / 284.359	✗	✗	✗	✗	✓

Post-Closure Condition

Section I

Slide Analysis Information

2019.10.01 Ph14 I PC

Project Summary

File Name:	2019.10.01 Ph14 I PC.slmd
Last saved with Slide version:	8.028
Project Title:	SLIDE - An Interactive Slope Stability Program
Date Created:	7/16/2019, 9:54:59 AM

Currently Open Scenarios

Group Name	Scenario Name	Compute Time
Post-Closure	Master Scenario	
	Global Static	
	Global Seismic	
	Global NC Static	
	Global NC Seismic	
	LWB Static	
	LWB Seismic	
	Horizontal Sliding	
	Horizontal Sliding Seismic	

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Right to Left

Analysis Options

All Open Scenarios	
Slices Type:	Vertical
Analysis Methods Used	
	Spencer
Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

All Open Scenarios	
Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

All Open Scenarios	
Pseudo-random Seed:	10116
Random Number Generation Method:	Park and Miller v.3

Surface Options

Post-Closure - Global NC Static		All other Scenarios	
Surface Type:	Non-Circular Block Search	Surface Type:	Circular
Number of Surfaces:	5000	Search Method:	Grid Search
Multiple Groups:	Disabled	Radius Increment:	10

Seismic Loading

Post-Closure - Master Scenario	Post-Closure - Global Static	Post-Closure - Global Seismic	Post-Closure - Global NC Static	Post-Closure - Global NC Seismic	Post-Closure - LWB Static	Post-Closure - LWB Seismic	Post-Closure - Horizontal Sliding	Post-Closure - Horizontal Sliding Seismic
Advanced seismic analysis: No Staged pseudostatic analysis: No Seismic Load Coefficient (Horizontal): 0.106	Advanced seismic analysis: No Staged pseudostatic analysis: No	Advanced seismic analysis: No Staged pseudostatic analysis: No Seismic Load Coefficient (Horizontal): 0.106	Advanced seismic analysis: No Staged pseudostatic analysis: No	Advanced seismic analysis: No Staged pseudostatic analysis: No Seismic Load Coefficient (Horizontal): 0.106	Advanced seismic analysis: No Staged pseudostatic analysis: No	Advanced seismic analysis: No Staged pseudostatic analysis: No Seismic Load Coefficient (Horizontal): 0.106	Advanced seismic analysis: No Staged pseudostatic analysis: No	Advanced seismic analysis: No Staged pseudostatic analysis: No Seismic Load Coefficient (Horizontal): 0.106

Tension Crack

Post-Closure - LWB Seismic	All other Scenarios
Water level: dry	

Materials

Property	Till	Soft Clay	Stiff Clay	Sand	Silty Sand	MSE Berm	MSW	Liner Slope
Color								
Strength Type	Mohr-Coulomb	SHANSEP	SHANSEP	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	150	120	125	110	110	120	75	120
Cohesion [psf]	10000			0	0	100	30	0
Friction Angle [°]	50			36	32	32	30	8.2
A [psf]		0	0					
S		0.19	0.22					
m		0.66	0.76					
Stress History Type		Preconsolidation Pressure	Preconsolidation Pressure					
Definition Method		Constant [6500]	Constant [16500]					
Material Dependent Vertical Stress		No	No					
Water Surface	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario
Hu Value	1	1	1	1	1	1		
Ru Value							0	0

Property	Liner Bottom	Cover System	MSWLWB	Compacted Clay	Bedrock
Color					
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Shear Normal function	Mohr-Coulomb	Infinite strength
Unit Weight [lbs/ft3]	110	120	75	125	165
Allow Sliding Along Boundary					Yes
Cohesion [psf]	0	0		100	
Friction Angle [°]	18.3	30		32	
Water Surface	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario
Hu Value	1			1	
Ru Value		0	0		0

Shear Normal Functions

Materials In Use

Material	Master Scenario	Global Static	Global Seismic	Global NC Static	Global NC Seismic	LWB Static	LWB Seismic	Horizontal Sliding	Horizontal Sliding Seismic
Till	✓	✓	✓	✓	✓	✓	✓	✓	✓
Soft Clay	✓	✓	✓	✓	✓	✓	✓	✓	✓
Stiff Clay	✓	✓	✓	✓	✓	✓	✓	✓	✓
Sand	✓	✓	✓	✓	✓	✓	✓	✓	✓
Silty Sand	✓	✓	✓	✓	✓	✓	✓	✓	✓

MSE Berm	✓	✓	✓	✓	✓	✓	✓	✓	✓
MSW	✓	✓	✓	✓	✓	✓	✓	✓	✓
Liner Slope	✓	✓	✓	✓	✓	✓	✓	✓	✓
Liner Bottom	✓	✓	✓	✓	✓	✓	✓	✓	✓
Cover System	✓	✓	✓	✓	✓	✓	✓	✓	✓
MSWLWB	✗	✗	✗	✗	✗	✓	✓	✗	✗
Compacted Clay	✓	✓	✓	✓	✓	✓	✓	✓	✓
Bedrock	✓	✓	✓	✓	✓	✓	✓	✓	✓

Support

Tensar UX 1400HS

Support Type: GeoTextile
Force Application: Passive
Force Orientation: Tangent to Slip Surface
Anchorage: None
Shear Strength Model: Linear
Use External Loads for Strength: yes
Strip Coverage: 100 percent
Tensile Strength: 1760 lb/ft
Pullout Strength Adhesion: 0 psf
Pullout Strength Friction Angle: 32 degrees

Entity Information

Group: Post-Closure

Shared Entities

Type	X	Y
External Boundary	654.875	448.891
	260.256	317.64
	246.306	313
	218.957	313
	198.2	313
	197.286	307.525
	195.982	299.72
	175.208	299.563
	77.7063	287.624
	0	288.041
	0	281
	0	280.708
	0	273.939
	0	266.891
	0	225
	955.688	225
	955.688	264.743
	955.688	275.3
	955.688	284.296
	955.688	284.587
	955.688	287.583
	955.688	463.98
	955.688	466.98
	787.68	464.328
	779.016	462.304
	738.891	449.855
	738.394	449.855
	718.147	449.385
	700.47	449.279

Type	X	Y
Material Boundary	619.033	287.015
	619.52	287
	630.718	286.662
	632.557	286.606
	641.994	286.33
	644.627	286.265
	646.34	286.223
	646.7	286.217
	648.69	286.182
	649.594	286.169
	649.807	286.167

Type	X	Y
Material Boundary	0	280.708
	24.6958	280.409
	40.2025	280
	48.5504	280
	57.9793	280
	67.9982	280
	74.306	280
	74.704	280.013
	74.7562	280.015
	74.794	280.018
	83.7541	280.296
	89.8842	280.576
	93.9549	281
	100.984	281.404
	112.746	282
	127.83	282.826
	131.196	283
	144.428	284.864
	145.329	285
	145.933	284.894
	150.488	284
	175.313	285.243
	190.458	286
	195.982	286.081
	218.98	286.416
	223.63	286.484
	231.387	286.584
	238.071	286.642
	239.273	286.653
	240.185	286.652
	243.28	286.676
	246.306	286.694
	248.857	286.71
	251.159	286.724
	251.343	286.725
	258.37	286.736
	258.847	286.737
	268.913	286.701
	275.004	286.698
	286.022	286.717
	289.477	286.713
	297.242	286.689
	303.695	286.678
	317.857	286.658
	320.139	286.653
	325.073	286.642
	325.555	286.641
	327.113	286.638
	330.461	286.627
	334.459	286.617
	340.464	286.604
	342.399	286.534
	[illegible]	[illegible]

Material Boundary

X	Y
0	273.939
6.29333	274.079
25.8975	275
29.9123	275.111
31.6455	275.123
94.7822	276.378
116.114	276.502
161.458	277.232
185.649	277.524
195.982	277.62
204.894	277.702
211.751	277.723
211.852	277.723
212.526	277.725
226.008	277.761
227.871	277.765
240.504	277.78
242.726	277.782
246.306	277.783
249.207	277.784
255.378	277.786
302.483	278.011
304.015	278.012
316.187	278.009
321.31	278.006
329.233	278.001
330.25	277.999
341.923	277.989
344.698	277.985
354.694	277.975
396.385	278.061
400.868	278.055
407.627	278.048
408.579	278.047
415.05	278.038
420.957	278.032
429.459	278.021
470.347	278.021
474.364	278.017
477.742	278.013
484.716	278.004
486.93	278.003
499.157	277.991
499.948	277.99
506.702	277.99
512.604	277.988
513.173	277.987
515.882	277.999
524.272	278.025
525.272	278.023
527.27	278.011
532.375	277.989
539.795	277.889
548.888	277.795
557.096	277.703
561.949	277.678
607.196	277.444
624.402	277.269
625.106	277.261
626.307	277.25
644.759	277.072
645.582	277.064
682.72	276.859
696.855	276.743
703.362	276.684
709.126	276.651
713.666	276.619
726.046	276.532
743.571	276.458
749.356	276.434
762.201	276.382
766.73	276.355
781.908	276.291
793.63	276.251
804.92	276.213
[illegible]	[illegible]

Material Boundary

X	Y
315.888	290.044
323.365	289
328.155	288.615
330.28	288.444

Material Boundary

X	Y
318.242	289.997
327.649	288.784
330.28	288.444
334.205	288.129
336.463	288
349.296	287.362
352.685	287.194
354.933	287.082
356.598	287.007
356.764	287
357.029	287
357.166	286.993
357.435	286.998
357.518	287
357.779	287
364.935	287.439
371.251	287.826
374.089	288
374.396	288.025
375.154	288.076
383.976	288.695

Material Boundary

X	Y
637.6	287.39
641.293	287.034
649.807	286.167
651.149	286.152
651.473	286.149
652.312	286.144
653.352	286.137
654.038	286.133
654.788	286.131
655.925	286.127
656.676	286.125
657.083	286.125
658.708	286.123
658.827	286.123
660.517	286.115
662.033	286.11
662.232	286.11
664.437	286.114
665.265	286.112
667.015	286.117
667.949	286.12
669.33	286.126
680.153	286.067

Material Boundary

X	Y
577.803	286.183
623.787	285.113
624.668	285.106
625.499	285.099
626.233	285.092
632.124	285
635.181	285.228
636.746	285.348
653.262	286
669.074	285.448
680.437	285.184
682.049	285.146

Material Boundary

X	Y
729.829	284.111
730.883	284.083
733.562	284
740.975	283.806
753.073	283.445
757.465	283.317
758.709	283.294
762.746	283.229
764.959	283.234
768.236	283.292
769.206	283.334
780.078	283.583
785.167	283.673
785.209	283.674
788.586	283.728
801.376	283.956

Material Boundary

X	Y
894.385	283.967
919.778	284.223
919.856	284.223
925.679	284.282
926.018	284.285
926.166	284.287

Material Boundary

X	Y
926.166	284.287
926.507	284.29
927.023	284.296
928.174	284.296
955.688	284.296

Material Boundary

X	Y
867.823	283.813
877.937	283.75
889.736	283.901
889.869	283.902
894.385	283.967

Material Boundary

X	Y
919.856	284.223
921.703	284.214
925.679	284.282

Material Boundary

X	Y
683.979	284.21
690.457	284.196
697.819	284.18
705.228	284.164
707.026	284.16
729.829	284.111
757.261	284.051
763.325	284.038
778.517	284.006
795.262	283.969
801.376	283.956
807.14	283.944
811.444	283.935
813.708	283.93
867.823	283.813
877.063	283.793
894.385	283.967

Material Boundary

X	Y
246.306	313
286.235	299.72
295.49	296.641
315.29	290.056

Material Boundary

X	Y
502.138	286.353
544.553	285.513
577.803	286.183
617.585	286.986
619.033	287.015
620.376	287.042
623.011	287.096
630.214	287.241
637.6	287.39
642.479	287.488
658.192	287.805
659.866	287.839
660.554	288.177
666.301	291.001
667.217	291.003
669.966	291.011
676.133	288.018
680.153	286.067
682.049	285.146
683.979	284.21

Material Boundary

X	Y
928.174	284.296
928.778	284.311
929.465	284.318
941.447	284.44
943.719	284.463
955.688	284.587

Material Boundary

X	Y
246.306	313
249.437	313
255.339	313
255.817	313
303.59	297.11
315.812	293.045
326.702	292.83
359.867	292.172
377.969	291.814
396.619	291.444
398.229	291.412
412.582	291.128
420.957	290.962
424.293	290.896
432.234	290.738
438.262	290.619
443.631	290.512
449.771	290.391
451.198	290.363
455.113	290.285
455.299	290.281
461.234	290.164
466.421	290.061
469.247	290.005
472.961	289.931
544.553	288.513
617.089	289.976
619.995	290.035
623.011	290.096
629.81	290.233

	X	Y
Material Boundary	315.29	290.056
	315.888	290.044
	318.242	289.997
	324.277	289.878
	354.023	289.288
	374.768	288.877
	383.976	288.695
	392.013	288.535
	406.158	288.255
	417.173	288.037
	419.771	287.985
	427.563	287.831
	435.399	287.676
	439.515	287.594
	443.093	287.523
	447.777	287.43
	449.759	287.391
	454.875	287.29
	455.113	287.285
	460.096	287.186
	462.218	287.144
	464.119	287.106
	466.153	287.066
	469.326	287.003
	471.567	286.959
	472.81	286.934
	501.844	286.359

	X	Y
Material Boundary	927.023	284.296
	928.174	284.307
	928.778	284.311

	X	Y
Material Boundary	255.339	313
	264.773	316.138
	654.887	445.891
	700.482	446.279
	718.158	446.384
	738.406	446.855
	738.903	446.855
	779.027	459.303
	787.692	461.328
	955.688	463.98

	X	Y
Material Boundary	195.982	299.72
	198.264	299.72
	204.108	299.72
	286.235	299.72

	X	Y
Material Boundary	238.208	296
	244.382	295.901
	255.416	295
	273.528	294.503
	284.751	294.006
	283.422	294.177
	275.39	295
	251.167	298.288
	241.367	299
	236.652	299.204
	204.108	299.72
	201.738	299.757
	198.264	299.72
	198.264	294.976
	198.564	295
	201.454	295.544
	207.049	295.565
	208.002	295.575
	224.774	295.926
	238.208	296

	X	Y
Material Boundary	315.29	290.056
	315.812	293.045

Material Boundary

X	Y
315.29	290.056
325.555	286.641

Material Boundary

X	Y
0	266.891
42.8393	267.653
83.6564	268.205
108.489	268.757
145.69	269.348
156.537	269.506
200.693	270
236.911	270.244
240.666	270.221
241.514	270.228
265.887	270.217
266.727	270.225
267.722	270.225
292.818	270.266
293.687	270.272
294.703	270.273
295.952	270.285
320.596	270.334
321.247	270.341
322.584	270.343
324.09	270.356
348.11	270.404
348.906	270.41
350.464	270.412
351.709	270.422
372.775	270.46
376.803	270.466
378.244	270.476
401.6	270.51
402.579	270.517
403.824	270.518
405.864	270.529
429.482	270.554
430.152	270.558
430.744	270.558
443.891	270.566
446.425	270.577
457.632	270.583
458.062	270.585
481.192	270.583
483.983	270.592
486.101	270.591
486.409	270.592
507.778	270.575
509.408	270.579
515.185	270.571
516.67	270.575
534.356	270.546
537.057	270.548
544.472	270.532
544.814	270.532
560.895	270.491
561.949	270.487
572.548	270.454
574.68	270.453
586.902	270.408
587.333	270.408
604.556	270.331
605.962	270.329
613.057	270.294
613.561	270.293
638.274	270.149
638.804	270.147
639.669	270.141
659.114	270
664.784	269.957
665.009	269.955
674.446	269.874
674.73	269.871
690.916	269.724
691.774	269.716
693.289	269.699
714.419	269.479
714.853	269.474
725.465	269.351
728.781	269.308
741.613	269.155
744.876	269.106
748.69	269.06
758.812	268.923
760.783	268.894
763.082	268.855
774.562	268.696
779.49	268.614
792.936	268.405
799.646	268.28
804.92	268.199
805.68	268.187
811.47	268.074
816.794	267.982
827.048	267.776
838.601	267.573
853.027	267.254
861.709	267.082
869.035	266.917
873.457	266.83
890.603	266.43
895.602	266.32
904.813	266.082
907.977	266.013
926.967	265.535
927.953	265.51

Type	X	Y
Material Boundary	561.949	277.79
	572.269	277.949
	641.067	279.011
	644.22	279.06
	646.186	279.09
	652.393	279.186
	653.747	279.207
	659.538	279.297
	660.83	279.316
	666.909	279.41
	667.378	279.418
	669.718	279.454
	673.447	279.395
	675.357	279.365
	679.604	279.298
	684.364	279.223
	686.311	279.192
	693.346	279.082
	693.657	279.077
	700.598	278.967
	701.752	278.949
	708.374	278.845
	712.489	278.78
	712.693	278.777
	712.863	278.774
	713.785	278.76
	715.445	278.734
	716.164	278.722
	717.896	278.695
	721.891	278.632
	723.528	278.606
	727.723	278.54
	735.435	278.419
	739.571	278.354
	744.463	278.277
	755.326	278.106
	755.732	278.099
	771.022	277.859
	771.637	277.849
	772.652	277.851
	776.697	277.858
	778.213	277.862
	779.795	277.866
	785.351	277.88
	786.249	277.881
	790.806	277.885
	792.366	277.886
	794.888	277.844
	795.384	277.844
	802.016	277.837
	804.92	277.792
	804.92	276.213
	804.92	268.199
Material Boundary	561.949	270.487
	561.949	277.678
	561.949	277.79

Scenario-based Entities

Type	Coordinates	Master Scenario	Global Static	Global Seismic	Global NC Static	Global NC Seismic	LWB Static	LWB Seismic	Horizontal Sliding	Horizontal Sliding Seismic
Piezoline	X, Y 0, 283 955.688, 283	Assigned to materials: Soft Clay Stiff Clay	Assigned to materials: Soft Clay Stiff Clay	Assigned to materials: Soft Clay Stiff Clay	Assigned to materials: Soft Clay Stiff Clay	Assigned to materials: Soft Clay Stiff Clay	Assigned to materials: Soft Clay Stiff Clay	Assigned to materials: Soft Clay Stiff Clay	Assigned to materials: Soft Clay Stiff Clay	Assigned to materials: Soft Clay Stiff Clay
Piezoline	X, Y 5.55112e-17, 290 75, 290 955.688, 287	Assigned to materials: Sand Silty Sand MSE Berm Compacted Clay	Assigned to materials: Sand Silty Sand MSE Berm Compacted Clay	Assigned to materials: Sand Silty Sand MSE Berm Compacted Clay	Assigned to materials: Sand Silty Sand MSE Berm Compacted Clay	Assigned to materials: Sand Silty Sand MSE Berm Compacted Clay	Assigned to materials: Sand Silty Sand MSE Berm Compacted Clay	Assigned to materials: Sand Silty Sand MSE Berm Compacted Clay	Assigned to materials: Sand Silty Sand MSE Berm Compacted Clay	Assigned to materials: Sand Silty Sand MSE Berm Compacted Clay
Piezoline	X, Y 0, 283 955.7, 285	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till
	X, Y 315.812, 293.045 326.702, 292.83 359.867, 292.172 377.969, 291.814 396.619, 291.444 398.229, 291.412 412.582, 291.128 420.957, 290.962 424.293, 290.896 432.234, 290.738 438.262, 290.619 443.631, 290.512 449.771, 290.391 451.198, 290.363 455.113, 290.285 455.299, 290.281 461.234, 290.164									

Bolt	X Y 197.449 308.5 232.449 308.5	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS
Bolt	X Y 197.699 310 232.699 310	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS
Bolt	X Y 197.95 311.5 232.95 311.5	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS
Bolt	X Y 198.2 313 233.2 313	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS
Bolt	X Y 196.196 301 231.196 301	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS
Bolt	X Y 196.447 302.5 231.447 302.5	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS
Bolt	X Y 196.697 304 231.697 304	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS
Bolt	X Y 196.948 305.5 231.948 305.5	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS
Bolt	X Y 197.198 307 232.198 307	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS	Tensar UX 1400HS
Block Search Polyline	X Y 246 313 325.073 286.642 657.616 293.285	✗	✓	✓	✗	✗	✗	✗	✗	✗
Block Search Window	X Y 150.915 260.144 205.279 260.144 205.279 295.975 150.915 295.975	✗	✗	✗	✓	✓	✗	✗	✗	✗
Block Search Window	X Y 196.937 257.255 251.301 257.255 251.301 293.086 196.937 293.086	✗	✗	✗	✓	✓	✗	✗	✗	✗
Block Search Window	X Y 240.482 254.366 294.846 254.366 294.846 290.197 240.482 290.197	✗	✗	✗	✓	✓	✗	✗	✗	✗
Block Search Window	X Y 288.155 253.128 342.519 253.128 342.519 288.959 288.155 288.959	✗	✗	✗	✓	✓	✗	✗	✗	✗
Block Search	X Y 251.531 313 315.535 291.456 [illegible]	✗	✗	✗	✗	✗	✓	✓	✓	✓

Tension Crack	X / Y 595.516 / 429.148 700.47 / 429.148 700.47 / 449.279	✗	✗	✗	✗	✗	✗	Water level: dry	✗	✗
Block Search Window	X / Y 738.394 / 449.855 654.875 / 448.891 246.306 / 313 738.784 / 313	✗	✗	✗	✗	✗	✗	✗	✓	✓

Section II

Slide Analysis Information
2019.10.01 Ph14 II PC

Project Summary

File Name:	2019.10.01 Ph14 II PC.slmd
Last saved with Slide version:	8.028
Project Title:	SLIDE - An Interactive Slope Stability Program
Date Created:	7/16/2019, 9:54:59 AM

Currently Open Scenarios

Group Name	Scenario Name	Compute Time
Post-Closure	Master Scenario	
	Global Static	
	Global Seismic	
	Global Static NC	
	Global Seismic NC	
	LWB Static	
	LWB Seismic	
	Horizontal Sliding	
	Horizontal Sliding Seismic	

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Right to Left

Analysis Options

All Open Scenarios	
Slices Type:	Vertical
Analysis Methods Used	
	Spencer
Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

All Open Scenarios	
Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

All Open Scenarios	
Pseudo-random Seed:	10116
Random Number Generation Method:	Park and Miller v.3

Surface Options

Post-Closure - Master Scenario	Post-Closure - Global Static	Post-Closure - Global Seismic	Post-Closure - Global Static NC	Post-Closure - Global Seismic NC	Post-Closure - LWB Static	Post-Closure - LWB Seismic	Post-Closure - Horizontal Sliding	Post-Closure - Horizontal Sliding Seismic
Surface Type: Circular	Surface Type: Circular	Surface Type: Circular	Surface Type: Non-Circular Block Search	Surface Type: Non-Circular Block Search	Surface Type: Non-Circular Block Search	Surface Type: Non-Circular Block Search	Surface Type: Non-Circular Block Search	Surface Type: Non-Circular Block Search
Search Method: Auto Refine Search	Search Method: Grid Search	Search Method: Grid Search	Number of Surfaces: 5000	Number of Surfaces: 5000	Number of Surfaces: 5000	Number of Surfaces: 5000	Number of Surfaces: 5000	Number of Surfaces: 5000
Divisions along slope: 20	Radius Increment: 10	Radius Increment: 10	Multiple Groups: Disabled	Multiple Groups: Disabled	Multiple Groups: Disabled	Multiple Groups: Disabled	Multiple Groups: Disabled	Multiple Groups: Disabled
Circles per division: 10	Composite Surfaces: Disabled	Composite Surfaces: Disabled	Pseudo-Random Surfaces: Enabled	Pseudo-Random Surfaces: Enabled	Pseudo-Random Surfaces: Enabled	Pseudo-Random Surfaces: Enabled	Pseudo-Random Surfaces: Enabled	Pseudo-Random Surfaces: Enabled
Number of iterations: 10	Reverse Curvature: Invalid Surfaces	Reverse Curvature: Invalid Surfaces	Convex Surfaces Only: Disabled	Convex Surfaces Only: Disabled	Convex Surfaces Only: Disabled	Convex Surfaces Only: Disabled	Convex Surfaces Only: Disabled	Convex Surfaces Only: Disabled
Divisions 50%	Minimum Elevation: Not Defined	Minimum Elevation: Not Defined						
	Minimum 10	Minimum 10						

Seismic Loading

Scenario	Advanced seismic analysis:	Staged pseudostatic analysis:	Seismic Load Coefficient (Horizontal):
Post-Closure - Master Scenario	No	No	
Post-Closure - Global Static	No	No	
Post-Closure - Global Seismic	No	No	0.106
Post-Closure - Global Static NC	No	No	
Post-Closure - Global Seismic NC	No	No	0.106
Post-Closure - LWB Static	No	No	
Post-Closure - LWB Seismic	No	No	0.106
Post-Closure - Horizontal Sliding	No	No	
Post-Closure - Horizontal Sliding Seismic	No	No	0.106

Tension Crack

Post-Closure - LWB Seismic	All other Scenarios
Water level: dry	

Materials

Property	Till	Soft Clay	Stiff Clay	Sand	Silty Sand	MSE Berm	MSW	Liner Slope
Color								
Strength Type	Mohr-Coulomb	SHANSEP	SHANSEP	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	150	120	125	110	110	120	75	120
Cohesion [psf]	10000			0	0	100	30	0
Friction Angle [°]	50			36	32	32	30	8.2
A [psf]		0	0					
S		0.19	0.22					
m		0.66	0.76					
Stress History Type		Preconsolidation Pressure	Preconsolidation Pressure					
Definition Method		Constant [7000]	Constant [21000]					
Material Dependent Vertical Stress		No	No					
Water Surface	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario
Hu Value	1	1	1	1	1	1		
Ru Value							0	0

Property	Liner Bottom	Cover System	Compacted Clay	MSWLWB	Bedrock
Color					
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Shear Normal function	Infinite strength
Unit Weight [lbs/ft3]	120	120	125	75	165
Allow Sliding Along Boundary					Yes
Cohesion [psf]	0	0	100		
Friction Angle [°]	18.3	30	32		
Water Surface	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario
Hu Value	1		1		
Ru Value		0		0	0

Shear Normal Functions

Materials In Use

Material	Master Scenario	Global Static	Global Seismic	Global Static NC	Global Seismic NC	LWB Static	LWB Seismic	Horizontal Sliding	Horizontal Sliding Seismic
Till	✓	✓	✓	✓	✓	✓	✓	✓	✓
Soft Clay	✓	✓	✓	✓	✓	✓	✓	✓	✓
Stiff Clay	✓	✓	✓	✓	✓	✓	✓	✓	✓
Sand	✓	✓	✓	✓	✓	✓	✓	✓	✓
Silty Sand	✓	✓	✓	✓	✓	✓	✓	✓	✓
MSE Berm	✓	✓	✓	✓	✓	✓	✓	✓	✓
MSW	✓	✓	✓	✓	✓	✗	✗	✓	✓

Liner Slope	✓	✓	✓	✓	✓	✓	✓	✓	✓
Liner Bottom	✓	✓	✓	✓	✓	✓	✓	✓	✓
Cover System	✓	✓	✓	✓	✓	✓	✓	✓	✓
Compacted Clay	✓	✓	✓	✓	✓	✓	✓	✓	✓
MSWLWB	✗	✗	✗	✗	✗	✓	✓	✗	✗
Bedrock	✓	✓	✓	✓	✓	✓	✓	✓	✓

Support

Support 1

Support Type: GeoTextile
Force Application: Active
Force Orientation: Parallel to Reinforcement
Anchorage: None
Shear Strength Model: Linear
Use External Loads for Strength: yes
Strip Coverage: 100 percent
Tensile Strength: 1760 lb/ft
Pullout Strength Adhesion: 0 psf
Pullout Strength Friction Angle: 32 degrees

Entity Information

Group: Post-Closure

Shared Entities

Type	Coordinates X	Coordinates Y
External Boundary	133.614	304.958
	133.036	304.766
	124.698	301.999
	4.22254	302
	0	303.688
	0	295.53
	0	292.466
	0	288.041
	0	285.839
	0	225
	896.857	225
	896.857	261.717
	896.857	271.503
	896.857	275.385
	896.857	282.691
	896.857	283.309
	896.857	286.309
	896.857	461.781
	896.857	464.781
	841.1	467.5
	818.45	467.5
	668.395	460
	243.651	318.47
	227.235	313
	187.301	313
	179.218	313
	178.473	308.532
	178.351	307.799
	165.882	307
	156.828	310
	148.798	310
Material Boundary	317.473	293.119
	323.096	293.009
	332.014	292.836
	335.095	292.776
	335.78	292.763
	346.335	292.557
	347.585	292.533
	352.052	292.446
	355.296	292.383
	358.601	292.319
	365.598	292.183
	389.006	291.728
	393.525	291.64
	396.475	291.582
	402.586	291.464
	406.467	291.388
	416.036	291.202
	418.279	291.159
	429.102	290.948
	439.054	290.755
	445.698	290.625
	448.238	290.576
	456.739	290.411
	464.63	290.257
	471.975	290.114
	478.828	289.981
	483.178	289.897
	563.767	288.33
	565.545	288.295
	566.958	288.268
	570.628	288.196
	573.088	288.148
	575.268	288.106
	579.519	288.023
	583.428	287.947
	587.035	287.877
	590.375	287.812
	593.474	287.752
	596.359	287.696
	599.051	287.644
	600.519	287.615
	600.758	287.61
	608.598	287.458
	668.377	286.296
	676.836	286.131
	707.575	285.735
	707.905	285.731
	708.86	285.719
	709.839	285.706
	710.842	285.693
	711.871	285.68
	712.927	285.666
	713.334	285.661
	714.01	285.653
	714.464	285.647
	715.121	285.638
	716.263	285.624
	717.435	285.608
	718.339	285.597
	718.64	285.593
	718.692	285.592
	784.323	284.747
	787.089	284.712
	790.04	284.675
	793.059	284.637

Material Boundary

X	Y
291.536	297.008
295.8	296.549
300.21	296
311.637	294.748

Material Boundary

X	Y
338.832	292.465
338.909	292.461
339.626	292.463
344.621	292.238
347.016	292.27
352.052	292.446
353.394	292.493

Material Boundary

X	Y
133.036	304.766
135.147	304.67
136.684	304.564
138.14	304.532
139.675	304.648
140.181	304.699

Material Boundary

X	Y
334.551	292.821
335.095	292.776
338.832	292.465

Material Boundary

X	Y
808.284	284.463
810.597	284.414
824.033	284.127
827.165	284.066
830.316	284.009
830.815	284
839.057	284
842.22	284
842.906	284

Material Boundary

X	Y
160.256	306.333
172.467	306.948
172.87	306.962
173.34	306.985
173.382	306.987
173.402	306.987
173.494	306.988
174.628	307

Material Boundary

X	Y
344.621	292.238
345.263	292.209
347.016	292.27

Material Boundary

X	Y
174.628	307
178.351	307

Material Boundary

X	Y
866.601	275.862
866.816	275.859
866.847	275.859
867.041	275.856
867.146	275.855
867.703	275.848
867.986	275.844
869.217	275.828
869.706	275.822
869.86	275.82
870.745	275.808
871.427	275.798
872.061	275.789
872.078	275.789
875.519	275.74
875.622	275.739
875.82	275.736
875.937	275.734
876.357	275.729
876.484	275.727
876.658	275.724
878.378	275.7
886.495	275.573
894.156	275.438
896.857	275.385

Material Boundary

X	Y
866.601	262.783
866.601	273.046
866.601	275.862

X	Y
0	292.466
5.19276	292.398

	X	Y
Material Boundary	830.815	284
	865.351	283.319
	881.622	283
	896.031	282.708
	896.857	282.691

	X	Y
Material Boundary	227.235	313
	242.844	307.799
	252.537	304.569
	258.94	302.435
	275.141	297.037
	282.007	294.749
	282.705	294.748
	283.627	294.984
	286.943	295.832
	291.536	297.008
	294.452	297.754
	296.015	297.736
	298.78	297.704
	300.29	297.686
	301.144	297.676
	306.591	296.156
	308.901	295.511
	310.616	295.032
	311.637	294.748
	313.461	294.238
	317.473	293.119

	X	Y
Material Boundary	836.162	284.086
	839.926	284.038
	842.906	284
	844.022	283.986
	848.212	283.932
	851.228	283.893
	852.375	283.879
	852.441	283.878
	896.857	283.309

X	Y
227.235	313
230.672	313
236.243	313
236.729	313
274.342	300.467
281.987	297.919
282.72	298.107
282.747	298.114
282.795	298.126
286.943	299.187
293.125	300.769
295.62	300.74
298.78	300.704
300.842	300.68
302.471	300.661
307.157	299.353
310.616	298.387
314.027	297.435
316.693	296.691
318.84	296.092
322.922	296.013
335.664	295.765
341.046	295.66
346.266	295.559
347.521	295.534
358.582	295.319
363.305	295.227
365.598	295.183
388.47	294.738
393.033	294.649
396.475	294.582
406.067	294.396
411.574	294.289
417.956	294.165
428.845	293.953
433.507	293.862
437.231	293.79
438.855	293.758
445.534	293.629
448.088	293.579

Material Boundary

X	Y
281.987	297.919
282.007	294.749

Material Boundary

X	Y
236.243	313
248.155	316.969
668.399	457
818.453	464.5
841.103	464.5
896.857	461.781

Material Boundary

X	Y
178.351	307.799
242.844	307.799

Material Boundary

X	Y
0	295.53
10.3492	295.452
71.3295	295
86.9141	294.747
92.8738	294.671
137.957	294
146.931	293.861
156.366	293.732
159.944	293.681
162.446	293.645
178.351	293.406
205.334	293
227.137	292.52
227.235	292.517
248.439	292
275.148	291.484
292.783	291.159
301.394	291
330.913	290.132
335.369	290
343.472	289.908
346.459	289.881
355.841	289.791
386.035	289.477
405.276	289.277
436.505	289.027
439.672	289
453.326	288.841
460.005	288.786
480.666	288.573
483.455	288.55
503.504	288.392
510.759	288.32

Material Boundary	X: 178.351, 185.733, 200.622, 232.73, 251.224, 258.94 Y: 307, 307, 306, 304.022, 303, 302.435

Type	X	Y
Material Boundary	178.351	307
	185.733	307
	200.622	306
	232.73	304.022
	251.224	303
	258.94	302.435

Type	X	Y
Material Boundary	133.614	304.958
	137.508	304.732
	138.307	304.754
	140.181	304.699
	144.033	305.093
	153.638	306
	160.256	306.333
	165.882	307

Type	X	Y
Material Boundary	282.007	294.749
	292.783	291.159

Type	X	Y
Material Boundary	0	285.839
	6.56757	285.722
	8.57549	285.679
	47.6175	285
	47.9148	284.994
	60.0972	284.707
	62.8373	284.693
	84.8982	284.258
	86.3156	284.25
	97.2622	284.019
	112.485	283.703
	127.325	283.631
	137.16	283.438
	149.375	283.201
	169.689	283.112
	183.416	282.854
	187.918	282.77
	235.873	282.578
	245.953	282.563
	257.637	282.521
	271.206	282.451
	287.055	282.349
	305.734	282.21
	328.021	282.025
	355.041	281.781
	388.467	281.459
	488.717	280.291
	511.528	280
	571.575	275.428
	577.778	275
	630.25	272.265
	678.132	270
	685.881	269.691
	690.599	269.506
	691.88	269.457
	711.681	268.65
	734.865	267.746
	760.58	266.723
	788.075	265.664
	793.846	265.43
	805.096	265
	831.142	264.06
	841.66	263.69
	847.62	263.482
	866.601	262.783
	874.381	262.497
	896.857	261.717

Scenario-based Entities

Type	Coordinates	Master Scenario	Global Static	Global Seismic	Global Static NC	Global Seismic NC	LWB Static	LWB Seismic	Horizontal Sliding	Horizontal Sliding Seismic

Piezoline

X	Y
0	290
897	280

Assigned to materials: Soft Clay, Stiff Clay (the box is printed nine times, with the same contents each time)

Piezoline

X	Y
-0.0145395	296.37
165.867	294.726
235.827	294.032
268.174	293.74
338.487	293.052
393.073	292.567
633.815	290.031
653.324	290.018
655.207	290.016
677.056	290.001
677.149	290.001
677.204	290.001
678.289	290
737.323	288.553
865.488	285.31
872.165	285.141
875.588	285.055
877.744	285
895.743	284.587

Assigned to materials: Sand, Silty Sand, MSE Berm, Compacted Clay (the box is printed nine times, with the same contents each time)

Piezoline

X	Y
0	295
896.9	285

Assigned to materials: Till (the box is printed nine times, with the same contents each time)

Piezoline

X	Y
281.987	297.919
282.72	298.107
282.747	298.114
282.795	298.126
286.943	299.187
293.125	300.769
295.62	300.74
298.78	300.704
300.842	300.68
302.471	300.661
307.157	299.353
310.616	298.387
314.027	297.435
316.693	296.691
318.84	296.092
322.922	296.013
335.664	295.765
341.046	295.66
346.266	295.559
347.521	295.534
358.582	295.319
363.305	295.227
365.598	295.183
388.47	294.738
393.033	294.649
396.475	294.582
406.067	294.396
411.574	294.289
417.956	294.165
428.845	293.953
433.507	293.862
437.231	293.79
438.855	293.758
445.534	293.629
448.088	293.579
456.631	293.413
464.559	293.259
471.935	293.115
478.816	292.981
483.178	292.897
563.556	291.334
565.352	291.299
566.958	291.268
570.471	291.199
572.948	291.151
575.141	291.108
579.418	291.025
583.35	290.949
586.976	290.878
590.332	290.813
593.446	290.753
596.344	290.696
599.046	290.644
600.52	290.615
600.758	290.61
676.836	289.131
707.575	288.735
707.892	288.731
708.851	288.719
709.833	288.706
710.841	288.693
711.873	288.68
712.933	288.666
714.02	288.652
714.476	288.647
715.137	288.638
716.283	288.623
717.461	288.608
718.339	288.597
718.671	288.593
718.725	288.592
784.323	287.747
787.091	287.712
790.052	287.675
793.082	287.636

Assigned to materials: Liner Bottom (the box is printed nine times, with the same contents each time)

Bolt	X Y 178.718 310 193.718 310	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 178.968 311.5 193.968 311.5	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 179.218 313 194.218 313	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 178.467 308.5 193.467 308.5	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Block Search Window	X Y 142.424 274.683 188.899 274.683 188.899 302.408 142.424 302.408	✗	✗	✗	✓	✓	✗	✗	✗	✗
Block Search Window	X Y 170.382 278.275 216.857 278.275 216.857 306 170.382 306	✗	✗	✗	✓	✓	✗	✗	✗	✗
Block Search Window	X Y 207.372 274.071 253.847 274.071 253.847 301.796 207.372 301.796	✗	✗	✗	✓	✓	✗	✗	✗	✗
Block Search Window	X Y 246.248 266.394 292.723 266.394 292.723 294.119 246.248 294.119	✗	✗	✗	✓	✓	✗	✗	✗	✗
Block Search Window	X Y 285.785 264.154 332.26 264.154 332.26 291.879 285.785 291.879	✗	✗	✗	✓	✓	✗	✗	✗	✗
Block Search Polyline	X Y 232.418 313 281.997 296.331 293.93 299.256 301.813 299.256 318.052 294.63 637.635 288.471	✗	✗	✗	✗	✗	✓	✗	✓	✓
Tension Crack	X Y 630.651 447.423 896.857 447.249 896.803 464.784	✗	✗	✗	✗	✗	✗	Water level: dry	✗	✗
Block Search Polyline	X Y 232.597 313 281.997 296.377 293.9 299.253 301.527 299.253 317.932 294.217 707.219 287.343	✗	✗	✗	✗	✗	✗	✓	✗	✗
Block Search Window	X Y 818.45 467.5 668.395 460 227.235 313 818.136 303.009	✗	✗	✗	✗	✗	✗	✗	✓	✓

Section III

Slide Analysis Information
2019.10.01 Ph14 III PC

Project Summary

File Name:	2019.10.01 Ph14 III PC.slmd
Last saved with Slide version:	8.028
Project Title:	SLIDE - An Interactive Slope Stability Program
Date Created:	7/16/2019, 9:54:59 AM

Currently Open Scenarios

Group Name	Scenario Name	Compute Time
Post-Closure	Master Scenario	
	Global Static	
	Global Seismic	
	Global Static NC	
	Global Seismic NC	
	LWB Static	
	LWB Seismic	
	Horizontal Sliding	
	Horizontal Sliding Seismic	

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Right to Left

Analysis Options

All Open Scenarios	
Slices Type:	Vertical
Analysis Methods Used	
	Spencer
Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

All Open Scenarios	
Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

All Open Scenarios	
Pseudo-random Seed:	10116
Random Number Generation Method:	Park and Miller v.3

Surface Options

Post-Closure - Master Scenario	Post-Closure - Global Static	Post-Closure - Global Seismic	Post-Closure - Global Static NC	Post-Closure - Global Seismic NC	Post-Closure - LWB Static	Post-Closure - LWB Seismic	Post-Closure - Horizontal Sliding	Post-Closure - Horizontal Sliding Seismic
Surface Type: Circular	Surface Type: Circular	Surface Type: Circular	Surface Type: Non-Circular Block Search	Surface Type: Non-Circular Block Search	Surface Type: Non-Circular Block Search	Surface Type: Non-Circular Block Search	Surface Type: Non-Circular Block Search	Surface Type: Non-Circular Block Search
Search Method: Auto Refine Search	Search Method: Grid Search	Search Method: Grid Search	Number of Surfaces: 5000	Number of Surfaces: 5000	Number of Surfaces: 5000	Number of Surfaces: 5000	Number of Surfaces: 5000	Number of Surfaces: 5000
Divisions along slope: 20	Radius Increment: 10	Radius Increment: 10	Multiple Groups: Disabled	Multiple Groups: Disabled	Multiple Groups: Disabled	Multiple Groups: Disabled	Multiple Groups: Disabled	Multiple Groups: Disabled
Circles per division: 10	Composite Surfaces: Disabled	Composite Surfaces: Disabled	Pseudo-Random Surfaces: Enabled	Pseudo-Random Surfaces: Enabled	Pseudo-Random Surfaces: Enabled	Pseudo-Random Surfaces: Enabled	Pseudo-Random Surfaces: Enabled	Pseudo-Random Surfaces: Enabled
Number of iterations: 10	Reverse Curvature: Invalid Surfaces	Reverse Curvature: Invalid Surfaces	Convex Surfaces Only: Disabled	Convex Surfaces Only: Disabled	Convex Surfaces Only: Disabled	Convex Surfaces Only: Disabled	Convex Surfaces Only: Disabled	Convex Surfaces Only: Disabled
Divisions 50%	Minimum Elevation: Not Defined	Minimum Elevation: Not Defined						
	Minimum 10	Minimum 10						

Seismic Loading

	Post-Closure - Master Scenario	Post-Closure - Global Static	Post-Closure - Global Seismic	Post-Closure - Global Static NC	Post-Closure - Global Seismic NC	Post-Closure - LWB Static	Post-Closure - LWB Seismic	Post-Closure - Horizontal Sliding	Post-Closure - Horizontal Sliding Seismic
Advanced seismic analysis:	No	No	No	No	No	No	No	No	No
Staged pseudostatic analysis:	No	No	No	No	No	No	No	No	No
Seismic Load Coefficient (Horizontal):			0.106		0.106		0.106		0.106

Materials

Property	Till	Soft Clay	Stiff Clay	Sand	Silty Sand	MSE Berm	MSW	Liner Slope
Color								
Strength Type	Mohr-Coulomb	SHANSEP	SHANSEP	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	150	120	125	110	110	120	75	120
Cohesion [psf]	10000			0	0	100	30	0
Friction Angle [°]	50			36	32	32	30	8.2
A [psf]		0	0					
S		0.19	0.22					
m		0.66	0.76					
Stress History Type		Preconsolidation Pressure	Preconsolidation Pressure					
Definition Method		Constant [8775]	Constant [11500]					
Material Dependent Vertical Stress		No	No					
Water Surface	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario
Hu Value	1	1	1	1	1	1		
Ru Value							0	0

Property	Liner Bottom	Cover System	Compacted Clay	MSWLWB	Bedrock
Color					
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Shear Normal function	Infinite strength
Unit Weight [lbs/ft3]	120	120	125	75	165
Allow Sliding Along Boundary					Yes
Cohesion [psf]	0	0	100		
Friction Angle [°]	18.3	30	32		
Water Surface	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario
Hu Value	1		1		
Ru Value		0		0	0

Shear Normal Functions

Materials In Use

Material	Master Scenario	Global Static	Global Seismic	Global Static NC	Global Seismic NC	LWB Static	LWB Seismic	Horizontal Sliding	Horizontal Sliding Seismic
Till	✓	✓	✓	✓	✓	✓	✓	✓	✓
Soft Clay	✓	✓	✓	✓	✓	✓	✓	✓	✓
Stiff Clay	✓	✓	✓	✓	✓	✓	✓	✓	✓
Sand	✓	✓	✓	✓	✓	✓	✓	✓	✓
Silty Sand	✓	✓	✓	✓	✓	✓	✓	✓	✓
MSE Berm	✓	✓	✓	✓	✓	✓	✓	✓	✓
MSW	✓	✓	✓	✓	✓	✗	✗	✓	✓
Liner Slope	✓	✓	✓	✓	✓	✓	✓	✓	✓
Liner Bottom	✓	✓	✓	✓	✓	✓	✓	✓	✓
Cover System	✓	✓	✓	✓	✓	✓	✓	✓	✓
Compacted Clay	✓	✓	✓	✓	✓	✓	✓	✓	✓
MSWLWB	✗	✗	✗	✗	✗	✓	✓	✗	✗

Bedrock	✓	✓	✓	✓	✓	✓	✓	✓	✓

Support

Support 1

Support Type: GeoTextile
Force Application: Active
Force Orientation: Parallel to Reinforcement
Anchorage: None
Shear Strength Model: Linear
Use External Loads for Strength: yes
Strip Coverage: 100 percent
Tensile Strength: 2860 lb/ft
Pullout Strength Adhesion: 0 psf
Pullout Strength Friction Angle: 32 degrees

Entity Information

Group: Post-Closure

Shared Entities

Type	X	Y
External Boundary	148.542	286.487
	147.704	281.487
	144.276	281.646
	142.939	281.675
	141.961	281.697
	136.308	281.822
	127.069	282.169
	120.311	282.423
	115.862	282.661
	108.573	283.051
	97.597	283.459
	91.5025	283.321
	80.8507	282.787
	69.0791	282
	60.5092	281.578
	39.0313	280
	35.0554	279.641
	28.729	279.267
	24.3778	279
	15.5906	278.462
	14.6953	278.438
	11.8611	278.36
	5.75912	278.433
	0	278.603
	0	272.515
	0	267.71
	0	263.666
	0	225
	740.623	225
	740.623	264.305
	740.623	268.55
	740.623	272.744
	740.623	277.583
	740.623	280.583
	740.623	454.965
	740.623	457.963
	725.955	461.955
	678.282	461.688
	644.351	460
	201.215	313
	187.982	313
	180.188	313
	152.982	313
	152.212	308.403
	148.963	289

Type	X	Y
Material Boundary	24.3778	279
	25.7169	279
	28.8919	279.153
	35.8251	279.627
	50.0161	280.635
	55.3645	281
	68.2343	281.852
	69.811	281.928
	71.8324	282
	81.262	282.475
	91.6839	283
	91.805	283.006
	91.8206	283.006
	92.324	283
	106.54	282.822
	110.944	282.74
	115.862	282.661

Type	X	Y
Material Boundary	141.961	281.697
	147.704	281.427
	151.213	281.261
	157.688	281.027

Type	X	Y
Material Boundary	0	272.515
	3.37654	272.518
	4.98476	272.52
	13.3235	272.534
	23.8287	272.554
	30.0922	272.573
	43.0209	272.614
	48.2859	272.64
	61.4103	272.701
	69.3433	272.756
	79.3456	272.821
	97.1851	272.986
	97.2039	272.986
	97.2224	272.986
	116.729	273.183
	134.08	273.397
	137.9	273.44
	144.687	273.531
	147.704	273.569
	162.436	273.756
	170.828	273.88
	191.38	274.172
	195.982	274.249
	201.215	274.336
	209.056	274.466
	226.985	274.783
	230.399	274.849
	238.23	275
	238.424	275.063
	238.618	275.065
	238.628	275.065
	238.98	275.067
	239.359	275.07
	239.581	275.071
	246.306	275.117
	282.866	275.363
	283.76	275.369
	285.731	275.38
	287.746	275.393
	288.487	275.397
	322.462	275.602
	324.638	275.558
	326.914	275.512
	342.12	275.207
	342.301	275.203
	342.982	275.19
	344.173	275.166
	352.625	275
	375.663	274.364
	377.795	274.365
	391.36	274.039
	402.27	273.789
	416.563	273.487
	430.685	273.212
	443.782	272.973
	464.15	272.615
	480.191	272.322
	486.413	272.215
	492.572	272.121
	498.188	272.048
	504.314	271.97
	506.239	271.954
	508.145	271.945
	509.985	271.941
	512.155	271.94
	517.618	271.948
	520.51	271.957
	523.761	271.972
	534.138	272.037
	542.554	272.089
	547.78	272.125
	552.553	272.162
	556.722	272.202
	561.118	272.256
	569.5	272.379
	573.354	272.431
	586.992	272.592
	594.072	272.668
	601.308	272.741
	612.271	272.844
	627.635	272.944
	636.932	272.995
	645.672	273.031
	653.943	273.053
	661.82	273.061
	669.365	273.055
	676.632	273.036
	683.665	273.003
	690.503	272.955

Material Boundary

X	Y
14.6953	278.438
18.0809	278.482
18.4566	278.47
21.4821	278.441
28.4323	278.375
37.1886	278.419
38.8626	278.425
42.104	278.465
46.6479	278.543
63.6068	278.713
69.1321	278.796
69.5684	278.799
84.7209	279
97.648	279.242
106.979	279.33
107.642	279.344
109.762	279.379
112.749	279.408
127.032	279.628
131.177	279.689
132.131	279.709
136.099	279.7
137.156	279.692
140.27	279.675
142.218	279.665
147.704	279.703
158.032	279.774
159.343	279.776
164.37	279.802
166.829	279.816
186.648	279.989
186.706	279.99
190.418	279.975
191.56	280
195.982	280.118
201.215	280.257
201.239	280.257
216.165	280.511
225.585	280.694
228.763	280.76
242.978	281
246.306	281.049
249.282	281.093
249.576	281.096
257.841	281.2
263.868	281.267
276.492	281.423
277.876	281.435
283.138	281.489
289.433	281.569
292.623	281.605
295.687	281.634
295.767	281.635
300.128	281.675
306.994	281.739
312.391	281.793
316.884	281.832
319.469	281.853
335.405	282
339.86	282.031
340.054	282.031
348.987	282.074

Material Boundary

X	Y
0	267.71
12.8009	267.742
17.6671	267.759
22.9357	267.757
28.7848	267.777
35.9604	267.802
41.2652	267.826
55.0776	267.889
59.3201	267.911
63.6444	267.915
80.1407	268.005
89.2019	268.061
100.523	268.13
103.102	268.146
107.573	268.157
124.708	268.268
132.901	268.322
137.223	268.337
147.704	268.405
150.168	268.421
158.361	268.453
172.723	268.548
180.871	268.599
185.53	268.619
195.982	268.683
201.215	268.716
206.273	268.747
216.086	268.797
220.627	268.814
223.938	268.822
227.526	268.828
231.408	268.831
237.298	268.834
242.135	268.834
244.88	268.832
246.306	268.828
246.644	268.827
248.347	268.819
252.688	268.786
257.972	268.74
265.356	268.673
268.208	268.694
271.31	268.666
274.084	268.636
277.582	268.589
286.892	268.442
303.171	268.604
304.156	268.61
308.441	268.544
327.899	268.688
331.624	268.632
335.584	268.65
339.222	268.599
356.665	268.684
359.928	268.639
363.255	268.599
370.01	268.61
385.214	268.642
389.347	268.594
392.717	268.559
410.036	268.546
413.084	268.521
417.762	268.52
425.037	268.505
427.854	268.489
442.321	268.455
445.674	268.446
448.745	268.444
461.021	268.395
470.015	268.369
472.891	268.376
483.391	268.342
485.975	268.357
496.077	268.307
506.573	268.264
509.059	268.288
518.453	268.259
531.18	268.243
534.09	268.278
541.079	268.257
546.06	268.26
549.294	268.305
564.642	268.302
579.346	268.331
584.24	268.398
590.8	268.402
595.009	268.466
611.222	268.487
619.45	268.498
623.82	268.572
643.566	268.571
647.731	268.644
656.816	268.813
659.24	268.853
661.405	268.884
666.26	268.95
667.774	268.968
669.147	268.981
670.827	268.995
672.737	269.006
678.256	269.032

Material Boundary

X	Y
157.688	281.027
158.434	281
159.57	280.999
164.637	280.995
169.948	280.992
179.533	280.993
189.303	280.994
190.197	280.994
193.763	280.998
195.643	281
195.982	281.043
196.215	281.073
200.957	281.675
201.215	281.708
203.513	282
204.853	282.17

Material Boundary

X	Y
427.465	281.511
430.667	281.462
442.612	281.268
455.262	281.081
456.35	281.063
456.799	281.056
460.707	281
482.477	280.659
484.483	280.627
489.078	280.555
511.075	280.197
516.298	280.114
523.381	280
532.996	279.848
537.047	279.771
549.849	279.551
572.171	279.137
575.728	279.077
579.558	279
580.977	278.973
581.74	278.96
582.17	278.951
584.477	278.901
613.594	278.327
620.042	278.139
621.376	278.116
626.75	278
636.602	277.775
639.47	277.663
651.837	277.33
653.092	277.304
654.039	277.292
666.491	277
667.613	277
672.52	277
674.383	277
683.915	277.141
684.203	277.146
689.244	277.203
697.326	277.389
700.851	277.445
713.299	277.707
713.482	277.706

Material Boundary

X	Y
147.704	281.487
182.775	281.906
184.779	281.93
195.982	282.064
201.215	282.127
204.853	282.17
246.306	282.666
293.478	282.394
348.987	282.074
349.331	282.067
350.535	282.044
351.177	282.031
351.841	282.018
352.371	282.008
352.533	282.004
352.946	281.996
377.676	281.509
377.696	281.509
377.78	281.507
377.831	281.506
377.845	281.506
377.896	281.505
377.924	281.504
377.954	281.504
377.985	281.503
378.006	281.503
378.026	281.502
378.047	281.502
378.058	281.502
378.095	281.501
378.117	281.501
378.13	281.5
378.15	281.5
378.17	281.5
378.195	281.499
378.215	281.499
378.234	281.498
378.248	281.498
378.258	281.498
378.268	281.498
378.285	281.497
378.302	281.497
378.321	281.497
378.334	281.496
378.347	281.496
378.363	281.496
379.493	281.474
427.465	281.511
485.806	281.555
509.494	281.555
511.771	281.522
530.767	281.106
533.083	281.106
591.894	279.757
591.917	279.757
595.49	279.678
596.712	279.65
599.086	279.598
602.538	279.521
602.672	279.518
602.78	279.516
603.772	279.494
616.018	279.222
616.824	279.204
629.019	278.933
645.25	278.571
658.097	278.282
659.037	278.264
660.169	278.241
680.938	277.855
684.188	277.829
713.299	277.707

Material Boundary

X	Y
201.215	313
228.477	303.956
240.256	300.049
267.297	291.079
284.028	285.529
291	283.216
291.821	283.2
294.275	283.151
296.436	283.109
298.708	283.064
299.469	283.049
301.611	283.007
303.365	282.972

Material Boundary

X	Y
603.772	279.494
606.277	279.438
608.847	279.381
609.873	279.359
611.365	279.326
612.86	279.292
614.505	279.256
614.692	279.252
614.718	279.251
614.891	279.247
615.013	279.245
615.217	279.24
615.473	279.234
616.018	279.222
616.487	279.212
616.824	279.204
617.969	279.179
620.192	279.129
620.66	279.119
620.981	279.112
624.255	279.039
627.049	278.977
627.851	278.959
629.019	278.933
631.447	278.879
633.116	278.842
635.043	278.799
637.846	278.737
638.638	278.719
639.183	278.707
642.234	278.639
645.25	278.571
646.672	278.54
651.318	278.436
653.021	278.398
655.499	278.343
656.293	278.325
658.097	278.282
658.639	278.273
659.037	278.264
659.3	278.258
659.315	278.258
659.357	278.257
659.571	278.253
660.169	278.241
661.048	278.225
663.743	278.174
664.326	278.164
667.404	278.106
669.52	278.066
673.153	277.999
674.595	277.972
675.587	277.954
680.938	277.855
681.348	277.848
681.855	277.839
682.288	277.837
684.188	277.829
685.111	277.825
686.106	277.821
687.721	277.814
688.978	277.809
690.807	277.802
693.789	277.789
696.17	277.779
699.634	277.765
699.856	277.764
703.361	277.749
705.923	277.739
706.957	277.734
708.461	277.728
710.552	277.719
711.99	277.713
713.299	277.707

X	Y
201.215	313
202.327	313
210.264	313
210.75	313
247.018	300.969
260.056	296.644
270.696	293.115
291.524	286.205
293.415	286.168
294.864	286.14
297.479	286.088
299.413	286.05
299.983	286.039
301.922	286.001
303.629	285.967
305.27	285.935
305.315	285.934
306.256	285.915
343.492	285.182
344.424	285.164
346.331	285.126
347.65	285.1
348.112	285.091
349.331	285.067
349.452	285.065
350.61	285.042
351.157	285.031
351.736	285.02
352.424	285.006
352.972	284.996
377.676	284.509
377.724	284.508
377.777	284.507
377.795	284.507
377.851	284.506
377.869	284.506
377.907	284.505
377.95	284.504
377.99	284.503
378.025	284.502
378.064	284.502
378.095	284.501
378.127	284.5
378.149	284.5
378.174	284.499
378.198	284.499
378.217	284.499
378.239	284.498
378.254	284.498
378.269	284.498
378.284	284.497
378.297	284.497
378.312	284.497
378.324	284.497
378.338	284.496
378.349	284.496
378.362	284.496
379.493	284.474
443.562	284.524
509.496	284.572
509.548	284.571
510.788	284.544
511.771	284.522
512.789	284.5
514.269	284.467
517.838	284.389
519.98	284.342
523.096	284.274
523.576	284.263
525.992	284.21
526.742	284.194
526.853	284.191
527.13	284.185
527.267	284.182
527.292	284.182
527.465	284.178
528.547	284.154
530.767	284.106
531.923	284.08
534.363	284.027
536.04	283.99
537.958	283.947
540.75	283.886
541.554	283.868

Material Boundary

X	Y
713.482	277.706
734.941	277.609
735.722	277.605
736.259	277.603
739.318	277.589
740.623	277.583

Material Boundary

X	Y
427.465	281.511
435.958	281.518
485.806	281.555
509.495	281.572
509.547	281.571
510.796	281.544
511.771	281.522
512.789	281.5
514.269	281.467
517.838	281.389
519.98	281.342
523.096	281.274
523.576	281.263
525.992	281.21
526.742	281.194
526.853	281.191
527.13	281.185
527.267	281.182
527.292	281.182
527.465	281.178
528.547	281.154
530.767	281.106
531.923	281.08
534.363	281.027
536.04	280.99
537.958	280.947
540.75	280.886
541.554	280.868
542.107	280.856
545.15	280.789
548.174	280.723
548.746	280.71
549.577	280.692
552.341	280.631
554.241	280.589
555.937	280.552
558.404	280.497
559.533	280.472
560.309	280.455
563.128	280.393
566.376	280.321
566.724	280.314
567.231	280.303
570.32	280.234

Type	X	Y
Material Boundary	591.917	279.757
	593.711	279.717
	595.49	279.678

Type	X	Y
Material Boundary	713.482	277.706
	714.148	277.703
	717.287	277.69
	717.744	277.688
	718.058	277.686
	719.751	277.679
	724.125	277.659
	726.114	277.65
	730.192	277.632
	732.127	277.623
	734.941	277.609

Type	X	Y
Material Boundary	291	283.216
	291.524	286.205

Type	X	Y
Material Boundary	210.264	313
	644.358	457
	678.289	458.689
	725.961	458.955
	740.623	454.965

Type	X	Y
Material Boundary	291	283.216
	293.478	282.394
	295.767	281.635

Type	X	Y
Material Boundary	184.704	281.487
	184.779	281.93
	184.994	283.216

Type	X	Y
Material Boundary	147.704	281.487
	184.704	281.487

Type	X	Y
Material Boundary	184.994	283.216
	212.982	283.216
	291	283.216

Type	X	Y
Material Boundary	204.853	282.17
	210.026	282.828
	212.982	283.216

Type	X	Y
Material Boundary	0	263.666
	1.95126	263.689
	12.6954	263.77
	15.0957	263.797
	27.3095	263.903
	31.1961	263.945
	33.4881	263.97
	43.0994	264.019
	58.0473	264.162
	68.047	264.296
	70.4651	264.321
	84.9521	264.472
	86.2576	264.485
	99.1835	264.647
	100.372	264.659
	101.199	264.666
	114.451	264.805
	115.106	264.81
	130.011	264.973
	130.074	264.973
	132.383	265
	143.175	265.096
	147.704	265.135
	160.167	265.242
	184.827	265.413
	197.268	265.511
	230.492	265.643
	255.033	265.692
	265.037	265.738
	272.334	265.764
	288.73	265.82
	292.71	265.834
	310.222	265.884
	323.757	265.946
	333.764	265.978
	345.127	266.004
	361.736	266.041
	365.85	266.046
	374.633	266.05
	386.171	266.06
	392.302	266.05
	406.583	266.038
	422.039	266.103
	440.777	266.079
	443.837	266.075
	462.272	266.042
	475.058	266.025
	482.88	266.009
	497.873	266.068
	508.39	266.047
	518.028	266.027
	524.925	266.015
	538.625	265.979
	556.699	265.934
	570.567	265.982
	575.731	265.967
	594.124	265.899
	597.046	265.888
	615.225	265.819
	615.912	265.816
	637.909	265.73
	648.692	265.762
	666.76	265.703
	670.497	265.681
	672.99	265.648
	694.95	265.247
	702.097	265.122
	708.514	265
	725.7	264.635
	727.534	264.595
	738.912	264.344
	740.469	264.308
	740.623	264.305

Scenario-based Entities

Type	Coordinates	Master Scenario	Global Static	Global Seismic	Global Static NC	Global Seismic NC	LWB Static	LWB Seismic	Horizontal Sliding	Horizontal Sliding Seismic
Piezoline	X Y 0 275 543.386 280.869 590.645 279.785 680.938 277.855 740.623 277.583	Assigned to materials: Soft Clay Stiff Clay	Assigned to materials: Soft Clay Stiff Clay	Assigned to materials: Soft Clay Stiff Clay	Assigned to materials: Soft Clay Stiff Clay	Assigned to materials: Soft Clay Stiff Clay	Assigned to materials: Soft Clay Stiff Clay	Assigned to materials: Soft Clay Stiff Clay	Assigned to materials: Soft Clay Stiff Clay	Assigned to materials: Soft Clay Stiff Clay
Piezoline	X Y 0 275 740.7 286	Assigned to materials: Sand Silty Sand MSE Berm Compacted Clay	Assigned to materials: Sand Silty Sand MSE Berm Compacted Clay	Assigned to materials: Sand Silty Sand MSE Berm Compacted Clay	Assigned to materials: Sand Silty Sand MSE Berm Compacted Clay	Assigned to materials: Sand Silty Sand MSE Berm Compacted Clay	Assigned to materials: Sand Silty Sand MSE Berm Compacted Clay	Assigned to materials: Sand Silty Sand MSE Berm Compacted Clay	Assigned to materials: Sand Silty Sand MSE Berm Compacted Clay	Assigned to materials: Sand Silty Sand MSE Berm Compacted Clay
Piezoline	X Y 0 270 740.7 278	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till
Piezoline	X Y 291.524 286.205 377.676 284.509 509.496 284.572 663.743 281.174	Assigned to materials:	Assigned to materials:	Assigned to materials:	Assigned to materials:	Assigned to materials:	Assigned to materials:	Assigned to materials:	Assigned to materials:	Assigned to materials:

Bolt	X Y 152.228 308.5 164.228 308.5	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 152.48 310 164.48 310	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 152.731 311.5 164.731 311.5	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 152.982 313 164.982 313	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 148.963 289 160.963 289	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 149.214 290.5 161.214 290.5	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 149.465 292 161.465 292	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 149.716 293.5 161.716 293.5	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 149.967 295 161.967 295	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 150.219 296.5 162.219 296.5	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 150.47 298 162.47 298	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 150.721 299.5 162.721 299.5	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 150.972 301 162.972 301	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 151.223 302.5 163.223 302.5	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 151.475 304 163.475 304	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 151.726 305.5 163.726 305.5	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 151.977 307 163.977 307	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 148.711 287.5 160.711 287.5	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 147.707 281.5 159.707 281.5	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 147.958 283 159.958 283	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 148.209 284.5 160.209 284.5	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 148.46 286 160.46 286	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Block Search Window	X Y 114.993 251.77 167.714 251.77 167.714 281.402 114.993 281.402	✗	✗	✗	✓	✓	✗	✗	✗	✗
Block Search Window	X Y 156.812 251.278 209.533 251.278 209.533 280.91 156.812 280.91	✗	✗	✗	✓	✓	✗	✗	✗	✗
Block Search Window	X Y 201.583 251.278 254.304 251.278 254.304 280.91 201.583 280.91	✗	✗	✗	✓	✓	✗	✗	✗	✗
Block Search Window	X Y 246.845 251.032 299.566 251.032 299.566 280.664 246.845 280.664	✗	✗	✗	✓	✓	✗	✗	✗	✗
Block Search Window	X Y 288.909 251.032 341.63 251.032 341.63 280.664 288.909 280.664	✗	✗	✗	✓	✓	✗	✗	✗	✗
Block Search Polyline	X Y 207.675 312.81 291.242 284.599 618.604 280.925	✗	✗	✗	✗	✗	✓	✓	✓	✓
Block Search Window	X Y 678.282 461.688 644.351 460 201.215 313 678.421 296.426	✗	✗	✗	✗	✗	✗	✗	✓	✓
Block Search Polyline	X Y 147.704 281.487 183.704 281.487 184.704 281.487	✗	✗	✗	✗	✗	✗	✗	✓	✗
Block Search Polyline	X Y 147.704 281.487 184.704 281.487	✗	✗	✗	✗	✗	✗	✗	✗	✓

Section IV

Slide Analysis Information

2019.10.01 Ph14 IV PC

Project Summary

File Name:	2019.10.01 Ph14 IV PC.slmd
Last saved with Slide version:	8.028
Project Title:	SLIDE - An Interactive Slope Stability Program
Date Created:	7/16/2019, 9:54:59 AM

Currently Open Scenarios

Group Name	Scenario Name	Compute Time
Post-Closure	Master Scenario	
	Global Static	
	Global Seismic	
	Global Static NC	
	Global Seismic NC	
	LWB Static	
	LWB Seismic	
	Horizontal Sliding	
	Horizontal Sliding Seismic	

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Right to Left

Analysis Options

All Open Scenarios	
Slices Type:	Vertical
Analysis Methods Used	
	Spencer
Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

All Open Scenarios	
Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

All Open Scenarios	
Pseudo-random Seed:	10116
Random Number Generation Method:	Park and Miller v.3

Surface Options

Post-Closure - Master Scenario	Post-Closure - Global Static	Post-Closure - Global Seismic	Post-Closure - Global Static NC	Post-Closure - Global Seismic NC	Post-Closure - LWB Static	Post-Closure - LWB Seismic	Post-Closure - Horizontal Sliding	Post-Closure - Horizontal Sliding Seismic
Surface Type: Circular	Surface Type: Circular	Surface Type: Circular	Surface Type: Non-Circular Block Search	Surface Type: Non-Circular Block Search	Surface Type: Non-Circular Block Search	Surface Type: Non-Circular Block Search	Surface Type: Non-Circular Block Search	Surface Type: Non-Circular Block Search
Search Method: Auto Refine Search	Search Method: Grid Search	Search Method: Grid Search	Number of Surfaces: 5000	Number of Surfaces: 5000	Number of Surfaces: 5000	Number of Surfaces: 5000	Number of Surfaces: 5000	Number of Surfaces: 5000
Divisions along slope: 20	Radius Increment: 10	Radius Increment: 10	Multiple Groups: Disabled	Multiple Groups: Disabled	Multiple Groups: Disabled	Multiple Groups: Disabled	Multiple Groups: Disabled	Multiple Groups: Disabled
Circles per division: 10	Composite Surfaces: Disabled	Composite Surfaces: Disabled	Pseudo-Random Surfaces: Enabled	Pseudo-Random Surfaces: Enabled	Pseudo-Random Surfaces: Enabled	Pseudo-Random Surfaces: Enabled	Pseudo-Random Surfaces: Enabled	Pseudo-Random Surfaces: Enabled
Number of iterations: 10	Reverse Curvature: Invalid Surfaces	Reverse Curvature: Invalid Surfaces	Convex Surfaces Only: Disabled	Convex Surfaces Only: Disabled	Convex Surfaces Only: Disabled	Convex Surfaces Only: Disabled	Convex Surfaces Only: Disabled	Convex Surfaces Only: Disabled
Divisions 50%	Minimum Elevation: Not Defined	Minimum Elevation: Not Defined						
	Minimum 10	Minimum 10						

Seismic Loading

	Post-Closure - Master Scenario	Post-Closure - Global Static	Post-Closure - Global Seismic	Post-Closure - Global Static NC	Post-Closure - Global Seismic NC	Post-Closure - LWB Static	Post-Closure - LWB Seismic	Post-Closure - Horizontal Sliding	Post-Closure - Horizontal Sliding Seismic
Advanced seismic analysis:	No	No	No	No	No	No	No	No	No
Staged pseudostatic analysis:	No	No	No	No	No	No	No	No	No
Seismic Load Coefficient (Horizontal):			0.106		0.106		0.106		0.106

Materials

Property	Till	Soft Clay	Stiff Clay	Sand	Silty Sand	MSE Berm	MSW	Liner Slope
Color								
Strength Type	Mohr-Coulomb	SHANSEP	SHANSEP	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	150	120	125	110	110	120	75	120
Cohesion [psf]	10000			0	0	100	30	0
Friction Angle [°]	50			36	32	32	30	8.2
A [psf]		0	0					
S		0.19	0.22					
m		0.66	0.76					
Stress History Type		Preconsolidation Pressure	Preconsolidation Pressure					
Definition Method		Constant [4600]	Constant [12250]					
Material Dependent Vertical Stress		No	No					
Water Surface	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario
Hu Value	1	1	1	1	1	1		
Ru Value							0	0

Property	Liner Bottom	Cover System	Compacted Clay	MSW-LWB	Bedrock
Color					
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Shear Normal function	Infinite strength
Unit Weight [lbs/ft3]	120	120	125	75	165
Allow Sliding Along Boundary					Yes
Cohesion [psf]	0	0	100		
Friction Angle [°]	18.3	30	32		
Water Surface	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario
Hu Value	1		1		
Ru Value		0		0	0

Shear Normal Functions

Materials In Use

Material	Master Scenario	Global Static	Global Seismic	Global Static NC	Global Seismic NC	LWB Static	LWB Seismic	Horizontal Sliding	Horizontal Sliding Seismic
Till	✓	✓	✓	✓	✓	✓	✓	✓	✓
Soft Clay	✓	✓	✓	✓	✓	✓	✓	✓	✓
Stiff Clay	✓	✓	✓	✓	✓	✓	✓	✓	✓
Sand	✓	✓	✓	✓	✓	✓	✓	✓	✓
Silty Sand	✓	✓	✓	✓	✓	✓	✓	✓	✓
MSE Berm	✓	✓	✓	✓	✓	✓	✓	✓	✓
MSW	✓	✓	✓	✓	✓	✗	✗	✓	✓
Liner Slope	✓	✓	✓	✓	✓	✓	✓	✓	✓
Liner Bottom	✓	✓	✓	✓	✓	✓	✓	✓	✓
Cover System	✓	✓	✓	✓	✓	✓	✓	✓	✓
Compacted Clay	✓	✓	✓	✓	✓	✓	✓	✓	✓
MSW-LWB	✗	✗	✗	✗	✗	✓	✓	✗	✗

Bedrock	✓	✓	✓	✓	✓	✓	✓	✓	✓

Support

Support 1

Support Type: GeoTextile
Force Application: Active
Force Orientation: Parallel to Reinforcement
Anchorage: None
Shear Strength Model: Linear
Use External Loads for Strength: yes
Strip Coverage: 100 percent
Tensile Strength: 1760 lb/ft
Pullout Strength Adhesion: 0 psf
Pullout Strength Friction Angle: 32 degrees

Entity Information

Group: Post-Closure

Shared Entities

Type	X	Y
External Boundary	240.434	289.958
	231.416	289.556
	225.769	289.042
	225.141	289.038
	202.533	288.101
	194.135	287.472
	183.742	286
	161.104	284.602
	156.665	284.328
	126.897	284.133
	119.588	284.016
	111.032	284.031
	73.1206	284.044
	58.9292	284
	53.3255	282.785
	38.4942	282.447
	30.8178	282
	26.1313	280.9
	13.1043	280.032
	12.6189	280
	11.3347	279.8
	5.14036	278.32
	3.58069	278
	0.948341	277.525
	0	277.362
	0	276.126
	0	270.244
	0	264.464
	0	249.186
	0	245.606
	0	225
	1156.29	225
	1156.29	263.748
	1156.29	272.267
	1156.29	277.235
	1156.29	280.328
	1156.29	283.328
	1156.29	461.346
	1156.29	464.346
	1113.8	464.639
	776.16	461.998
	735.989	460
	292.56	313
	244.295	313
	240.661	291.313
Material Boundary	X	Y
	0	276.126
	8.53186	276.311
	12.9767	276.401
	27.3698	277
	44.4629	277.473
	62.8683	278
	68.4389	278.15
	99.1303	279
	133.897	279.924
	145.674	280.233
	145.968	280.235
	153.309	280.293
	159.638	280.365
	176.276	281
	185.382	281.224
	199.63	281.574
	210.619	281.843
	217.005	282
	240.434	282.375
Material Boundary	X	Y
	0	264.464
	36.9453	264.988
	37.0786	264.99
	37.1972	264.992
	37.2089	264.992
	37.816	265
	79.617	265.347
	116.811	265.634
	149.95	265.869
	179.827	266.06
	207.053	266.216
	232.107	266.34
	240.434	266.402
	244.299	266.431
	258.169	266.54
	292.56	266.689
	323.614	266.822
	339.51	266.968
	365.884	267.205
	375.98	267.305
	386.395	267.434
	400.203	267.703
	412.309	267.918
	428.156	268.173
	448.598	268.477
	480.528	268.67
	499.818	269
	524.231	269.383
	536.18	269.459
	558.221	269.848
	567.708	270
	771.104	273.009
	834.718	273.941
	856.655	274.257
	898.561	275
	958.946	278.612
	980.034	280
	987.616	280
	997.6	280
	1006.78	280
	1014.49	280
	1021.14	280
	1033.83	280
	1035.88	280
	1037.2	280
	1041.74	280
	1045.34	279.769
	1045.95	279.766
	1047.43	279.751
	1058.57	279.22
	1066.23	279.13
	1077.28	278.695
	1084.34	278.604
	1094.61	278.453
	1100.63	278.264
	1106.03	278.095
	1113.56	277.854
	1156.29	277.235
Material Boundary	X	Y
	0	270.244
	14.0784	270.522
	35.0451	271
	35.2441	271.003
	51.5834	271.19
	58.497	271.305
	70.2647	271.475
	83.1457	271.695
	91.56	271.817
	101.632	272
	105.068	272.066
	147.978	273
	151.677	273.095
	171.368	273.654
	179.215	273.873
	181.099	273.923
	183.949	274
	197.048	274.351
	218.376	275
	227.201	275.546
	237.178	275.746
	239.576	275.814
	240.434	275.838
	241.732	275.874
	249.347	276
	256.986	276.031
	259.505	276.019
	276.049	276.048
	288.959	276.071
	292.56	276.084
	303.974	276.125
	317.688	276.16
	318.427	276.166
	324.238	276.217
	335.069	276.274
	350.197	276.348
	355.394	276.394
	365.618	276.489
	378.057	276.573
	398.12	276.762
	401.547	276.787
	401.79	276.789
	405.212	276.825
	410.47	276.88
	413.73	276.907
	422.464	277
	444.899	277.095
	457.16	277.145
	458.431	277.15
	478.715	277.234
	489.283	277.278
	498.109	277.323
	498.516	277.316
Material Boundary	X	Y
	0	249.186
	50.5069	250
	52.345	250.063
	53.3196	250.1
	96.5149	251.651
	120.444	252.577
	181.204	254.936
	182.856	255
	240.434	257.328
	258.78	258.07
	292.56	259.39
	298.02	259.603
	303.257	259.812
	304.303	259.853
	308.265	260
	458.713	264.407
	477.562	265
	590.671	266.572
	731.03	268.508
	765.562	268.982
	781.963	269.203
	791.519	269.329
	797.362	269.405
	801.591	269.458
	804.823	269.497
	807.228	269.524
	809.585	269.55
	811.923	269.574
	814.595	269.601
	817.11	269.625
	818.781	269.641
	820.122	269.653
	821.215	269.661
	821.905	269.665
	822.626	269.669
	824.751	269.678
	826.138	269.684
	827.505	269.689
	830.235	269.697
	845.775	270
	876.508	271.082
	890.984	271.643
	916.725	272.575
	929.067	272.998
	951.674	273.785
	971.626	274.638
	974.258	274.719
	975.556	274.758
	980.817	275
	1009.08	275
	1036.31	275
	1037.89	275
	1039.52	275
	1043.98	275
	1050.62	274.635
	1051.24	274.637
	1059.23	274.21
	1061.61	274.225
	1068.61	273.871
	1073.81	273.568
	1077.61	273.306
	1078.27	273.268
	1119.86	272.476
	1146.15	272.067

Material Boundary

X	Y
570.837	277.571
573.812	277.584
579.273	277.613
583.197	277.633
584.452	277.643
589.928	277.673
590.673	277.679
592.34	277.693
594.683	277.705
597.28	277.716
599.913	277.73
605.849	277.742
612.345	277.744
612.641	277.743
618.138	277.74
619.283	277.739
619.418	277.739
626.143	277.735
626.814	277.735
633.148	277.732
655.935	277.729
726.278	277.172
727.082	277
741.983	277
758.88	277
760.686	277
762.957	277
765.414	277
767.433	277.028
769.28	277.09
769.865	277.109
787.177	277.666
795.111	278
805.18	278.358
817.081	278.753
824.366	279
836.788	279.416
842.556	279.61

Material Boundary

X	Y
240.434	289.958
240.434	282.375
240.434	279.094
240.594	279.094
292.56	279.094
394.839	279.094
398.086	279.038
406.234	278.898
408.163	278.865
416.129	278.729
422.868	278.613
427.153	278.54
428.389	278.518
431.974	278.457
441.041	278.301
441.412	278.295
444.894	278.235
451.754	278.118
452.093	278.112
461.723	277.947
498.109	277.323

Material Boundary

X	Y
292.56	313
297.084	311.5
329.822	300.647
338.34	297.823
356.488	291.807
362.068	289.958
380.59	283.817
380.812	283.744
388.69	281.132
394.839	279.094

Material Boundary

X	Y
532.908	276.726
588.385	278.072
590.889	278.124
661.084	279.581
661.172	279.579
661.189	279.579
661.316	279.577
661.624	279.572
662.794	279.555
665.211	279.518
669.406	279.454
672.853	279.401
676.018	279.352
680.494	279.283
682.629	279.249
688.136	279.163
689.241	279.146
695.778	279.044
695.853	279.042
696.335	279.035
702.465	278.938
703.419	278.923
709.076	278.833
711.061	278.801
715.688	278.727
718.703	278.678
722.3	278.62
726.344	278.554
728.912	278.512
731.265	278.474
733.986	278.429
734.81	278.416
735.524	278.404
741.627	278.303
742.135	278.294
745.396	278.24
748.747	278.184
749.269	278.175
755.359	278.072
756.911	278.046
761.971	277.959
764.552	277.914
768.582	277.844
769.673	277.825
769.904	277.821
769.967	277.82
770.144	277.817
770.301	277.82
770.917	277.835
771.301	277.844
771.981	277.861
773.802	277.904
775.194	277.938
779.836	278.05
781.806	278.097
787.477	278.233
788.418	278.255
794.457	278.4
795.03	278.414
795.119	278.416
801.641	278.573
802.76	278.599
808.253	278.731
809.25	278.755
810.402	278.783
812.795	278.841
814.865	278.89
816.339	278.926
818.044	278.967
822.395	279.072
824.179	279.115
825.533	279.148
826.34	279.167
826.482	279.169
826.583	279.17
826.714	279.177
826.885	279.181
827.346	279.192
827.538	279.196
828.323	279.214
831.447	279.289
833.327	279.333
834.7	279.366
836.788	279.416
840.969	279.517
841.312	279.525
843.518	279.579
847.924	279.686
848.61	279.703
854.536	279.849
856.252	279.892
861.147	280.014
863.893	280.083
867.759	280.181
871.535	280.277
874.371	280.35
879.177	280.474
880.983	280.521
886.818	280.673
887.595	280.693
892.579	280.825
894.206	280.868
894.46	280.875
900.818	281.045
902.102	281.079
904.23	281.137
907.43	281.224
909.743	281.287
914.042	281.404
917.385	281.496
920.654	281.587
925.026	281.709
927.767	281.786
928.197	281.798
928.239	281.799
928.488	281.806
928.523	281.807
928.609	281.809
929.126	281.823
929.395	281.828
930.057	281.843
931.628	281.88
931.91	281.887
932.668	281.904
933.877	281.933
940.31	282.083
940.489	282.087
941.64	282.114
947.101	282.241
947.951	282.261
953.712	282.395
955.593	282.439
960.324	282.549
963.235	282.617
966.936	282.702
970.876	282.794
973.548	282.855
975.853	282.909
978.518	282.97
979.398	282.991
980.16	283.008
986.159	283.146
986.771	283.16
990.701	283.251
993.383	283.313
993.801	283.322
999.995	283.464
1001.44	283.498
1006.61	283.616
1009.08	283.673
1013.22	283.767
1016.73	283.848
1019.83	283.919
1024.37	284.023
1026.44	284.071
1029.02	284.131
1029.88	284.15
1032.53	284.07
1033.04	284.048
1033.46	284.036
1034.69	283.999
1045.62	283.666
1049.98	283.535
1058.84	283.265
1065.26	283.072
1072.07	282.865
1080.54	282.609
1085.29	282.465
1095.83	282.147
1098.51	282.066
1111.11	281.686
1111.74	281.667
1115.76	281.546
1124.96	281.269
1126.39	281.232

X	Y
292.56	313
298.485	313

Material Boundary

X	Y
394.839	279.094
395.359	282.085

Material Boundary

X	Y
301.623	313
736.004	457
776.175	458.998
1113.82	461.639
1156.29	461.346

Material Boundary

X	Y
240.434	289.958
292.56	289.958
362.068	289.958

Material Boundary

X	Y
240.434	282.375
279.041	283
292.56	283.126
359.007	283.746
380.59	283.817

Material Boundary

X	Y
394.839	279.094
401.79	276.789

X	Y
0	245.606
19.8454	245.847
27.1339	245.925
55.2924	246.198
61.0906	246.25
61.2614	246.251
82.0509	246.397
87.4027	246.435
89.7722	246.446
109.099	246.539
123.654	246.582
127.489	246.588
138.803	246.6
142.236	246.644
148.97	246.74
157.973	246.757
173.101	246.76
179.633	246.858
183.989	246.929
196.367	246.968
200.755	246.969
212.062	247.166
214.05	247.204
226.824	247.442
233.862	247.578
240.191	247.621
244.759	247.715
250.231	247.828
257.784	247.883
274.175	248.252
281.049	248.41
304.951	248.973
312.268	249.079
341.129	249.83
341.232	249.832
347.548	250

Type	X	Y
Material Boundary	498.516	277.316
	532.908	276.726
	570.837	277.571
	661.084	279.581
	665.211	279.581
	731.265	278.474
	768.582	277.844
	770.301	277.82
	842.556	279.61
	904.23	281.137
	956.811	282.439
	1029.88	284.15
	1126.39	281.232
	1138.18	280.875
	1141.68	280.77
	1151.41	280.475
	1156.29	280.328

Scenario-based Entities

Type	Coordinates	Master Scenario	Global Static	Global Seismic	Global Static NC	Global Seismic NC	LWB Static	LWB Seismic	Horizontal Sliding	Horizontal Sliding Seismic
Piezoline	X Y 0 267 696.778 279.052 769.673 277.825 770.301 277.82 775.194 277.938 842.556 279.61 980.16 283.008 1029.88 284.15 1156.29 280.328	Assigned to materials: Soft Clay Stiff Clay	Assigned to materials: Soft Clay Stiff Clay	Assigned to materials: Soft Clay Stiff Clay	Assigned to materials: Soft Clay Stiff Clay	Assigned to materials: Soft Clay Stiff Clay	Assigned to materials: Soft Clay Stiff Clay	Assigned to materials: Soft Clay Stiff Clay	Assigned to materials: Soft Clay Stiff Clay	Assigned to materials: Soft Clay Stiff Clay
Piezoline	X Y 0 275 1156.3 288	Assigned to materials: Sand Silty Sand MSE Berm Compacted Clay	Assigned to materials: Sand Silty Sand MSE Berm Compacted Clay	Assigned to materials: Sand Silty Sand MSE Berm Compacted Clay	Assigned to materials: Sand Silty Sand MSE Berm Compacted Clay	Assigned to materials: Sand Silty Sand MSE Berm Compacted Clay	Assigned to materials: Sand Silty Sand MSE Berm Compacted Clay	Assigned to materials: Sand Silty Sand MSE Berm Compacted Clay	Assigned to materials: Sand Silty Sand MSE Berm Compacted Clay	Assigned to materials: Sand Silty Sand MSE Berm Compacted Clay
Piezoline	X Y 0 258 1156.3 287	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till
Piezoline	X Y 395.359 282.085 406.279 281.897 407.555 281.876 415.716 281.736 425.264 281.572 427.429 281.535 435.721 281.393 441.78 281.289 448.342 281.176 452.093 281.112 532.908 279.726 588.385 281.072 590.889 281.124 661.084 282.581 661.109 282.58 661.366 282.576 661.624 282.572 662.794 282.555 665.211 282.518 669.406 282.454 672.853 282.401 676.018 282.352 680.494 282.283 682.629 282.249 688.136 282.163 689.241 282.146 695.778 282.044 695.853 282.042 696.335 282.035 702.465 281.938 703.419 281.923 709.076 281.833 711.061 281.801 715.688 281.727 718.703 281.678 722.3 281.62 726.344 281.554 728.912 281.512 731.265 281.474 733.986 281.429 734.81 281.416 735.524 281.404 741.627 281.303 742.135 281.294 745.396 281.24 748.747 281.184 749.269 281.175 755.359 281.072 756.911 281.046 761.971 280.959 764.552 280.914 768.582 280.844 769.673 280.825 769.904 280.821 769.962 280.82 769.972 280.82 770.144 280.817 770.301 280.82 770.917 280.835 771.301 280.844 771.981 280.861 773.802 280.904 775.194 280.938 779.836 281.05 781.806 281.097 787.477 281.233 788.418 281.255 794.457 281.4 795.03 281.414 795.119 281.416 801.641 281.573 802.76 281.599 808.253 281.731 809.25 281.755 810.402 281.783 812.795 281.841 814.865 281.89 816.339 281.926 818.044 281.967 822.395 282.072 824.179 282.115 825.533 282.148 826.34 282.167 826.57 282.173 826.714 282.177 826.885 282.181 827.346 282.192 827.538 282.196 828.323 282.214 831.447 282.289 833.327 282.333 834.7 282.366 840.969 282.517 841.312 282.525 843.518 282.579 847.924 282.686 848.61 282.703 854.536 282.849 856.252 282.892 861.147 283.014 863.893 283.083 867.759 283.181 871.535 283.277 874.371 283.35 879.177 283.474 880.983 283.521 886.818 283.673 887.595 283.693 892.579 283.825 894.206 283.868 894.46 283.875 900.818 284.045 902.102 284.079 907.43 284.224 909.743 284.287 914.042 284.404 917.385 284.496 920.654 284.587 925.026 284.709 927.767 284.786 928.197 284.798 928.239 284.799 928.488 284.806 928.523 284.807 928.609 284.809 929.126 284.821 929.395 284.828 930.057 284.843 931.628 284.88 931.91 284.887 932.668 284.904 933.877 284.933 940.31 285.083 940.489 285.087 941.64 285.114 947.101 285.241 947.951 285.261 953.712 285.395 955.593 285.439 960.324 285.549 963.235 285.617 966.936 285.702 970.876 285.794	Assigned to materials: Liner Bottom	Assigned to materials: Liner Bottom	Assigned to materials: Liner Bottom	Assigned to materials: Liner Bottom	Assigned to materials: Liner Bottom	Assigned to materials: Liner Bottom	Assigned to materials: Liner Bottom	Assigned to materials: Liner Bottom	Assigned to materials: Liner Bottom

Bolt	X Y 240.776 292 275.776 292	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 241.028 293.5 276.028 293.5	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 241.279 295 276.279 295	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 241.53 296.5 276.53 296.5	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 241.782 298 276.782 298	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 242.033 299.5 277.033 299.5	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 242.284 301 277.284 301	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 242.536 302.5 277.536 302.5	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 242.787 304 277.787 304	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 243.039 305.5 278.039 305.5	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 243.29 307 278.29 307	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 243.541 308.5 278.541 308.5	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 243.793 310 278.793 310	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 244.044 311.5 279.044 311.5	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 244.295 313 279.295 313	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 240.525 290.5 275.525 290.5	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Block Search Window	X Y 261.815 287.063 194.527 287.063 194.527 247.697 261.815 247.697	✗	✗	✗	✓	✓	✗	✗	✗	✗
Block Search Window	X Y 323.145 286.389 255.857 286.389 255.857 247.023 323.145 247.023	✗	✗	✗	✓	✓	✗	✗	✗	✗
Block Search Window	X Y 377.96 282.345 310.672 282.345 310.672 242.979 377.96 242.979	✗	✗	✗	✓	✓	✗	✗	✗	✗
Block Search Window	X Y 438.166 277.852 370.878 277.852 370.878 238.486 438.166 238.486	✗	✗	✗	✓	✓	✗	✗	✗	✗
Block Search Polyline	X Y 298.485 313 395.103 280.61 533.009 277.935 662.751 281.149 770.868 279.189 1029.96 285.79	✗	✗	✗	✗	✗	✓	✗	✓	✓
Block Search Polyline	X Y 298.485 313 395.085 280.508 532.779 278.153 663.116 280.929 768.944 279.277 1028.62 285.644	✗	✗	✗	✗	✗	✗	✓	✗	✗
Block Search Window	X Y 735.989 460 292.56 313 395.359 282.085 734.236 283.255	✗	✗	✗	✗	✗	✗	✗	✓	✓

Section V

Slide Analysis Information
2019.10.01 Ph14 V PC

Project Summary

File Name:	2019.10.01 Ph14 V PC.slmd
Last saved with Slide version:	8.028
Project Title:	SLIDE - An Interactive Slope Stability Program
Date Created:	7/16/2019, 9:54:59 AM

Currently Open Scenarios

Group Name	Scenario Name	Compute Time
Post-Closure	Master Scenario	
	Global Static	
	Global Seismic	
	Global Static NC	
	Global Seismic NC	
	LWB Static	
	LWB Seismic	
	Horizontal Sliding	
	Horizontal Sliding Seismic	

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Right to Left

Analysis Options

All Open Scenarios	
Slices Type:	Vertical
Analysis Methods Used	
	Spencer
Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

All Open Scenarios	
Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

All Open Scenarios	
Pseudo-random Seed:	10116
Random Number Generation Method:	Park and Miller v.3

Surface Options

Post-Closure - Master Scenario		Post-Closure - Global Static		Post-Closure - Global Seismic	
Surface Type:	Circular	Surface Type:	Circular	Surface Type:	Circular
Search Method:	Auto Refine Search	Search Method:	Grid Search	Search Method:	Grid Search
Divisions along slope:	20	Radius Increment:	10	Radius Increment:	10
Circles per division:	10	Composite Surfaces:	Disabled	Composite Surfaces:	Disabled
Number of iterations:	10	Reverse Curvature:	Invalid Surfaces	Reverse Curvature:	Invalid Surfaces
Divisions	50%	Minimum Elevation:	Not Defined	Minimum Elevation:	Not Defined
		Minimum	10	Minimum	10

Post-Closure - Global Static NC		Post-Closure - Global Seismic NC		Post-Closure - LWB Static		Post-Closure - LWB Seismic		Post-Closure - Horizontal Sliding		Post-Closure - Horizontal Sliding Seismic	
Surface Type:	Non-Circular Block Search	Surface Type:	Non-Circular Block Search	Surface Type:	Non-Circular Block Search	Surface Type:	Non-Circular Block Search	Surface Type:	Non-Circular Block Search	Surface Type:	Non-Circular Block Search
Number of Surfaces:	5000	Number of Surfaces:	5000	Number of Surfaces:	5000	Number of Surfaces:	5000	Number of Surfaces:	5000	Number of Surfaces:	5000
Multiple Groups:	Disabled	Multiple Groups:	Disabled	Multiple Groups:	Disabled	Multiple Groups:	Disabled	Multiple Groups:	Disabled	Multiple Groups:	Disabled
Pseudo-Random Surfaces:	Enabled	Pseudo-Random Surfaces:	Enabled	Pseudo-Random Surfaces:	Enabled	Pseudo-Random Surfaces:	Enabled	Pseudo-Random Surfaces:	Enabled	Pseudo-Random Surfaces:	Enabled
Convex Surfaces Only:	Disabled	Convex Surfaces Only:	Disabled	Convex Surfaces Only:	Disabled	Convex Surfaces Only:	Disabled	Convex Surfaces Only:	Disabled	Convex Surfaces Only:	Disabled

Seismic Loading

Post-Closure - Master Scenario	Post-Closure - Global Static	Post-Closure - Global Seismic	Post-Closure - Global Static NC	Post-Closure - Global Seismic NC	Post-Closure - LWB Static	Post-Closure - LWB Seismic	Post-Closure - Horizontal Sliding	Post-Closure - Horizontal Sliding Seismic
Advanced seismic analysis: No	Advanced seismic analysis: No	Advanced seismic analysis: No	Advanced seismic analysis: No	Advanced seismic analysis: No	Advanced seismic analysis: No	Advanced seismic analysis: No	Advanced seismic analysis: No	Advanced seismic analysis: No
Staged pseudostatic analysis: No	Staged pseudostatic analysis: No	Staged pseudostatic analysis: No	Staged pseudostatic analysis: No	Staged pseudostatic analysis: No	Staged pseudostatic analysis: No	Staged pseudostatic analysis: No	Staged pseudostatic analysis: No	Staged pseudostatic analysis: No
		Seismic Load Coefficient (Horizontal): 0.106		Seismic Load Coefficient (Horizontal): 0.106		Seismic Load Coefficient (Horizontal): 0.106		Seismic Load Coefficient (Horizontal): 0.106

Tension Crack

Post-Closure - Global Static NC	All other Scenarios
Water level: dry	

Materials

Property	Till	Soft Clay	Stiff Clay	Sand	Silty Sand	MSE Berm	MSW	Liner Slope
Color								
Strength Type	Mohr-Coulomb	SHANSEP	SHANSEP	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	150	120	125	110	110	120	75	120
Cohesion [psf]	10000			0	0	100	30	0
Friction Angle [°]	50			36	32	32	30	8.2
A [psf]		0	0					
S		0.19	0.22					
m		0.66	0.76					
Stress History Type		Preconsolidation Pressure	Preconsolidation Pressure					
Definition Method		Constant [4750]	Constant [12250]					
Material Dependent Vertical Stress		No	No					
Water Surface	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario
Hu Value	1	1	1	1	1	1		
Ru Value							0	0

Property	Liner Bottom	Cover System	MSWLWB	Bedrock
Color				
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Shear Normal function	Infinite strength
Unit Weight [lbs/ft3]	120	120	75	165
Allow Sliding Along Boundary				Yes
Cohesion [psf]	0	0		
Friction Angle [°]	18.3	30		
Water Surface	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario
Hu Value	1			
Ru Value		0	0	0

Shear Normal Functions

Materials In Use

Material	Master Scenario	Global Static	Global Seismic	Global Static NC	Global Seismic NC	LWB Static	LWB Seismic	Horizontal Sliding	Horizontal Sliding Seismic
Till	✓	✓	✓	✓	✓	✓	✓	✓	✓
Soft Clay	✓	✓	✓	✓	✓	✓	✓	✓	✓
Stiff Clay	✓	✓	✓	✓	✓	✓	✓	✓	✓
Sand	✓	✓	✓	✓	✓	✓	✓	✓	✓
Silty Sand	✓	✓	✓	✓	✓	✓	✓	✓	✓
MSE Berm	✓	✓	✓	✓	✓	✓	✓	✓	✓
MSW	✓	✓	✓	✓	✓	✗	✗	✓	✓

Liner Slope	✓	✓	✓	✓	✓	✓	✓	✓	✓
Liner Bottom	✓	✓	✓	✓	✓	✓	✓	✓	✓
Cover System	✓	✓	✓	✓	✓	✓	✓	✓	✓
MSWLWB	✗	✗	✗	✗	✗	✓	✓	✗	✗
Bedrock	✓	✓	✓	✓	✓	✓	✓	✓	✓

Support

Support 1

Support Type: GeoTextile
Force Application: Active
Force Orientation: Parallel to Reinforcement
Anchorage: None
Shear Strength Model: Linear
Use External Loads for Strength: yes
Strip Coverage: 100 percent
Tensile Strength: 1760 lb/ft
Pullout Strength Adhesion: 0 psf
Pullout Strength Friction Angle: 32 degrees

Entity Information

Group: Post-Closure

Shared Entities

Type	Coordinates	
	X	Y
External Boundary	129.024	282.018
	124.95	282
	110.623	282
	101.217	281.355
	69.4213	281.344
	50.662	281.582
	35.7052	281.667
	28.3911	281.577
	15.6462	280.987
	3.70482	280
	0	279.738
	0	279.057
	0	271.547
	0	261.456
	0	260
	0	245.912
	0	225
	889.809	225
	889.809	270.193
	889.809	274.403
	889.809	279.041
	889.809	283.171
	889.809	283.305
	889.809	286.305
	889.809	287.596
	889.809	458.84
	889.809	461.836
	784.846	466.356
	705.213	462.376
	388.473	356.844
	346.73	356.373
	220.447	314.289
	216.58	313
	205.996	313
	168.568	313
	163.622	283.33
	160.95	283.38
	159.791	283.33
	148.622	282.854
	X	Y
Material Boundary	0	279.057
	58.1929	279.417
	71.1579	279.497
	73.3773	279.509
	74.9248	279.518
	124.757	279.796
	135.264	279.847
	144.219	279.855
	158.113	279.882
	160.076	279.881
	161.607	279.886
	163.506	279.81
	163.622	279.808

Type	Coordinates	
	X	Y
Material Boundary	0	261.456
	163.622	263.057
	216.58	263.576
	265.369	264.053
	324.488	264.63
	325.796	264.643
	325.862	264.643
	339.74	264.777
	344.697	264.824
	346.026	264.837
	348.413	264.859
	362.483	265
	383.024	265.925
	475.957	270
	569.642	271.721
	630.531	272.766
	700.718	274.014
	761.565	275
	797.109	279.451
	800.017	279.672
	803.891	279.794
	809.662	279.797
	814.956	279.67
	816.767	279.829
	824.303	279.635
	824.949	279.679
	831.558	279.489
	832.412	279.536
	833.881	279.607
	839.763	279.446
	842.005	279.532
	847.397	279.379
	848.704	279.419
	850.107	279.456
	852.768	279.391
	855.353	279.329
	859.32	279.226
	865.142	279.344
	869.093	279.253
	870.89	279.291
	872.87	279.326
	889.809	279.041
	X	Y
Material Boundary	0	271.547
	4.17383	271.613
	14.1023	271.741
	19.5494	271.804
	22.6138	271.841
	25.9587	271.872
	38.7745	271.945
	39.0866	271.947
	39.2107	271.948
	40.3655	271.956
	40.6328	271.957
	41.3984	271.961
	60.2217	271.859
	66.0738	271.851
	67.0426	271.854
	69.8866	271.861
	84.0427	271.786
	95.0821	271.807
	95.9776	271.808
	105.003	271.816
	119.79	271.854
	123.206	271.861
	123.535	271.861
	131.387	271.875
	150.131	271.878
	153.41	271.894
	162.21	271.924
	163.622	271.929
	171.66	271.96
	173.441	272
	209.781	272.476
	216.58	272.567
	248.997	273
	280.62	273.441

Type	Coordinates X	Coordinates Y
Material Boundary	0	260
	38.4717	260
	86.5533	260
	92.4441	260
	99.9065	260
	100.949	259.947
	105.01	259.631
	106.348	259.543
	109.193	259.361
	110.722	259.199
	111.618	259.097
	115.147	258.906
	118.414	258.721
	118.43	258.72
	120.284	258.657
	125.945	258.455
	126.42	258.442
	132.016	258.297
	133.477	258.257
	133.652	258.254
	163.622	258.243
	216.58	258.225
	260.46	258.21
	443.788	259.943
	450.937	259.908
	451.294	259.906
	455.216	260
	558.971	263.567
	595.932	265
	623.29	265.951
	633.66	266.333
	634.808	266.375
	660.887	267.328
	712.038	269.178
	734.412	270
	768.981	272.36
	776.623	272.807
	779.525	272.995
	788.226	273.449
	799.911	274.181
	806.266	274.404
	807.68	274.492
	812.605	274.578
	814.388	274.68
	819.475	274.682
	820.589	274.747
	834.952	274.588
	835.6	274.619
	843.564	274.509
	844.885	274.57
	852.058	274.442
	857.995	274.29
	862.69	274.117
	863.546	274.096
	889.809	274.403
Material Boundary	724.667	281.936
	724.846	281.942
	733.722	282.119
	795.136	283.346
	801.667	283.483

Type	Coordinates	
Material Boundary	X	Y
	216.58	313
	221.08	311.5
	305.611	283.33
	311.09	281.504
	319.424	278.727
	335.285	273.441
	335.317	273.442
	338.809	273.482
	340.169	273.497
	342.732	273.527
	345.468	273.558
	346.654	273.572
	350.034	273.611
	350.577	273.617
	350.658	273.618
	352.06	273.634
	352.137	273.635
	352.302	273.637
	352.318	273.637
	352.349	273.637
	352.426	273.699
	352.455	273.699
	352.504	273.64
	352.573	273.641
	352.664	273.642
	352.794	273.645
	352.996	273.648
	353.352	273.655
	353.491	273.658
	354.499	273.677
	356.066	273.707
	358.422	273.752
	361.365	273.807
	362.344	273.826
	365.135	273.879
	366.267	273.901
	366.664	273.909
	370.189	273.976
	371.963	274.01
	374.112	274.052
	377.262	274.113
	378.034	274.128
	380.236	274.17
	381.957	274.204
	382.561	274.215
	385.879	274.28
	387.859	274.319
	389.802	274.357
	393.158	274.423
	393.724	274.434
	395.337	274.466
	397.647	274.511
	398.457	274.527
	401.569	274.588
	403.756	274.632
	405.492	274.666
	409.055	274.737
	409.414	274.744
	410.438	274.765
	413.337	274.823
	414.354	274.843
	417.259	274.901
	419.653	274.949
	421.182	274.98
	424.952	275.056
	425.104	275.059
	426.123	275.08
	426.181	275.081
	426.23	275.081
	426.263	275.082
	426.287	275.082
	426.302	275.082
	427.068	275.098
	427.172	275.1
	427.926	275.115
	429.027	275.136
	430.251	275.159
	432.949	275.212
	435.549	275.262
	436.872	275.288
	440.64	275.361
	440.794	275.364
	440.848	275.365
	444.717	275.441
	446.147	275.468
	448.639	275.517
	451.446	275.572

Type	Coordinates	
	X	Y
	452.562	275.594
	455.741	275.657
	456.484	275.672
	456.745	275.677
	460.407	275.749
	462.044	275.782
	464.329	275.827
	467.343	275.887
	468.252	275.905
	470.842	275.957
	472.642	275.993
	473.615	276.012
	477.941	276.099
	479.135	276.123
	479.458	276.13
	479.613	276.133
	479.68	276.134
	479.715	276.134
	479.737	276.134
	480.604	276.151
	480.657	276.152
	480.889	276.156
	481.389	276.165
	483.239	276.198
	483.942	276.21
	485.943	276.246
	487.864	276.28
	488.538	276.292
	491.787	276.35
	493.837	276.386
	495.709	276.42
	499.136	276.481
	499.632	276.49
	501.044	276.515
	503.554	276.56
	504.435	276.576
	507.477	276.63
	509.734	276.671
	511.399	276.7
	515.033	276.766
	515.322	276.771
	516.145	276.786
	519.244	276.841
	520.332	276.861
	523.167	276.912
	525.631	276.957
	527.089	276.983
	530.929	277.052
	530.977	277.053
	530.994	277.053
	531.097	277.055
	531.148	277.056
	531.178	277.057
	531.198	277.057
	531.214	277.057
	531.224	277.058
	531.7	277.066
	531.845	277.069
	532.044	277.072
	532.421	277.079
	533.231	277.094
	534.934	277.124
	536.228	277.148
	538.857	277.195
	541.527	277.243
	542.779	277.266
	544.501	277.297
	545.304	277.312
	545.678	277.318
	545.791	277.323
	546.051	277.332
	546.185	277.337
	546.267	277.34
	546.525	277.347
	546.684	277.343
	546.731	277.338
	546.755	277.338
	546.826	277.34
	550.624	277.413
	552.125	277.442
	554.547	277.489
	557.424	277.545
	558.469	277.566
	561.448	277.624
	562.392	277.642
	562.723	277.649
	566.314	277.719

Type	Coordinates	
	X	Y
	568.022	277.752
	570.237	277.796
	573.321	277.856
	574.159	277.873
	576.549	277.92
	578.082	277.95
	578.619	277.961
	582.004	278.028
	583.918	278.065
	585.927	278.105
	589.217	278.17
	589.849	278.183
	591.65	278.219
	593.772	278.261
	594.516	278.276
	597.694	278.339
	599.815	278.381
	601.617	278.417
	605.114	278.487
	605.358	278.492
	605.424	278.493
	605.459	278.494
	605.656	278.503
	605.733	278.507
	605.775	278.509
	605.801	278.51
	605.818	278.511
	605.831	278.512
	605.858	278.513
	606.104	278.516
	606.166	278.516
	606.288	278.517
	606.504	278.517
	606.856	278.526
	607.612	278.544
	609.462	278.589
	610.413	278.612
	613.384	278.683
	615.712	278.74
	617.307	278.779
	621.011	278.869
	621.229	278.874
	621.852	278.89
	625.152	278.97
	626.309	278.999
	629.074	279.067
	631.608	279.129
	632.997	279.163
	634.66	279.204
	635.484	279.225
	635.868	279.235
	635.933	279.236
	636.043	279.239
	636.086	279.24
	636.109	279.241
	636.128	279.241
	636.143	279.241
	636.372	279.247
	636.434	279.249
	636.556	279.252
	636.918	279.262
	636.953	279.263
	640.842	279.369
	642.206	279.406
	644.764	279.476
	647.505	279.551
	648.687	279.584
	652.054	279.677
	652.609	279.692
	652.804	279.698
	656.531	279.801
	658.103	279.845
	660.454	279.911
	663.402	279.993
	664.376	280.021
	667.155	280.099
	668.299	280.131
	668.701	280.142
	672.221	280.242
	673.999	280.292
	676.144	280.353
	679.298	280.443
	680.066	280.465
	682.256	280.527
	683.989	280.577
	684.597	280.594
	687.911	280.69

Type	Coordinates	
	X	Y
	688.448	280.705
	689.353	280.731
	689.806	280.745
	689.981	280.75
	690.044	280.752
	690.078	280.753
	690.098	280.753
	690.112	280.754
	690.16	280.755
	690.212	280.756
	690.222	280.756
	690.243	280.757
	690.312	280.76
	691.251	280.791
	691.834	280.811
	695.195	280.923
	695.756	280.942
	697.356	280.996
	699.679	281.075
	700.494	281.102
	703.601	281.208
	705.793	281.282
	707.524	281.342
	711.092	281.464
	711.446	281.477
	712.457	281.512
	715.369	281.612
	716.391	281.647
	719.291	281.749
	721.689	281.832
	724.667	281.936

Type	Coordinates	
Material Boundary	X	Y
	216.58	313
	225.434	313
	225.581	313
	225.672	313
	226.072	313
	249.079	305.333
	256.336	302.914
	320.479	281.539
	335.758	276.447
	335.804	276.447
	338.809	276.482
	340.169	276.497
	342.732	276.527
	345.468	276.558
	346.654	276.572
	350.034	276.611
	350.577	276.617
	350.658	276.618
	352.06	276.634
	352.137	276.635
	352.301	276.637
	352.318	276.637
	352.349	276.637
	352.425	276.698
	352.455	276.698
	352.503	276.64
	352.573	276.641
	352.664	276.642
	352.794	276.645
	352.996	276.648
	353.352	276.655
	353.491	276.658
	354.499	276.677
	356.066	276.707
	358.422	276.752
	361.365	276.807
	362.344	276.826
	365.135	276.879
	366.267	276.901
	366.664	276.909
	370.189	276.976
	371.963	277.01
	374.112	277.052
	377.262	277.113
	378.034	277.128
	380.236	277.17
	381.957	277.204
	382.561	277.215
	385.879	277.28
	387.859	277.319
	389.802	277.357
	393.158	277.423
	393.724	277.434
	395.337	277.466
	397.647	277.511
	398.457	277.527
	401.569	277.588
	403.756	277.632
	405.492	277.666
	409.055	277.737
	409.414	277.744
	410.438	277.765
	413.337	277.823
	414.354	277.843
	417.259	277.901
	419.653	277.949
	421.182	277.98
	424.952	278.056
	425.104	278.059
	426.123	278.08
	426.181	278.081
	426.23	278.081
	426.263	278.082
	426.287	278.082
	426.302	278.082
	427.068	278.098
	427.172	278.1
	427.926	278.115
	429.027	278.136
	430.251	278.159
	432.949	278.212
	435.549	278.262
	436.872	278.288
	440.64	278.361
	440.794	278.364
	440.848	278.365
	444.717	278.441

Type	Coordinates	
	X	Y
	446.147	278.468
	448.639	278.517
	451.446	278.572
	452.562	278.594
	455.741	278.657
	456.484	278.672
	456.745	278.677
	460.407	278.749
	462.044	278.782
	464.329	278.827
	467.343	278.887
	468.252	278.905
	470.842	278.957
	472.642	278.993
	473.615	279.012
	477.941	279.099
	479.135	279.123
	479.458	279.13
	479.613	279.133
	479.68	279.134
	479.715	279.134
	479.737	279.134
	480.604	279.151
	480.657	279.152
	480.889	279.156
	481.389	279.165
	483.239	279.198
	483.942	279.21
	485.943	279.246
	487.864	279.28
	488.538	279.292
	491.787	279.35
	493.837	279.386
	495.709	279.42
	499.136	279.481
	499.632	279.49
	501.044	279.515
	503.554	279.56
	504.435	279.576
	507.477	279.63
	509.734	279.671
	511.399	279.7
	515.033	279.766
	515.322	279.771
	516.145	279.786
	519.244	279.841
	520.332	279.861
	523.167	279.912
	525.631	279.957
	527.089	279.983
	530.929	280.052
	530.977	280.053
	530.994	280.053
	531.097	280.055
	531.148	280.056
	531.178	280.057
	531.198	280.057
	531.214	280.057
	531.224	280.058
	531.7	280.066
	531.845	280.069
	532.044	280.072
	532.421	280.079
	533.231	280.094
	534.934	280.124
	536.228	280.148
	538.857	280.195
	541.527	280.243
	542.779	280.266
	544.501	280.297
	545.304	280.312
	545.678	280.318
	545.791	280.323
	546.051	280.332
	546.185	280.337
	546.267	280.34
	546.525	280.347
	546.684	280.343
	546.731	280.338
	546.755	280.338
	546.826	280.34
	550.624	280.413
	552.125	280.442
	554.547	280.489
	557.424	280.545
	558.469	280.566
	561.448	280.624

Type	Coordinates	
	X	Y
	562.392	280.642
	562.723	280.649
	566.314	280.719
	568.022	280.752
	570.237	280.796
	573.321	280.856
	574.159	280.873
	576.549	280.92
	578.082	280.95
	578.619	280.961
	582.004	281.028
	583.918	281.065
	585.927	281.105
	589.217	281.17
	589.849	281.183
	591.65	281.219
	593.772	281.261
	594.516	281.276
	597.694	281.339
	599.815	281.381
	601.617	281.417
	605.114	281.487
	605.358	281.492
	605.424	281.493
	605.459	281.494
	605.656	281.503
	605.733	281.507
	605.775	281.509
	605.801	281.51
	605.818	281.511
	605.831	281.512
	605.858	281.513
	606.104	281.516
	606.166	281.516
	606.288	281.517
	606.504	281.517
	606.856	281.526
	607.612	281.544
	609.462	281.589
	610.413	281.612
	613.384	281.683
	615.712	281.74
	617.307	281.779
	621.011	281.869
	621.229	281.874
	621.852	281.89
	625.152	281.97
	626.309	281.999
	629.074	282.067
	631.608	282.129
	632.997	282.163
	634.66	282.204
	635.484	282.225
	635.868	282.235
	635.933	282.236
	636.043	282.239
	636.086	282.24
	636.109	282.241
	636.128	282.241
	636.143	282.241
	636.372	282.247
	636.434	282.249
	636.556	282.252
	636.918	282.262
	636.953	282.263
	640.842	282.369
	642.206	282.406
	644.764	282.476
	647.505	282.551
	648.687	282.584
	652.054	282.677
	652.609	282.692
	652.804	282.698
	656.531	282.801
	658.103	282.845
	660.454	282.911
	663.402	282.993
	664.376	283.021
	667.155	283.099
	668.299	283.131
	668.701	283.142
	672.221	283.242
	673.999	283.292
	676.144	283.353
	679.298	283.443
	680.066	283.465
	682.256	283.527

Type	Coordinates	
	X	Y
	683.989	283.577
	684.597	283.594
	687.911	283.69
	688.448	283.705
	689.353	283.731
	689.806	283.745
	689.981	283.75
	690.044	283.752
	690.078	283.753
	690.098	283.753
	690.112	283.754
	690.16	283.755
	690.212	283.756
	690.222	283.756
	690.243	283.757
	690.312	283.76
	691.251	283.791
	691.834	283.811
	695.195	283.923
	695.756	283.942
	697.356	283.996
	699.679	284.075
	700.494	284.102
	703.601	284.208
	705.793	284.282
	707.524	284.342
	711.092	284.464
	711.446	284.477
	712.457	284.512
	715.369	284.612
	716.391	284.647
	719.291	284.749
	721.689	284.832
	726.68	285.006
	726.988	285.017
	727.558	285.037
	731.059	285.161
	732.287	285.204
	734.844	285.294
	740.052	285.479
	741.043	285.514
	741.066	285.514
	741.081	285.515
	741.096	285.515
	741.181	285.519
	742.826	285.581
	742.885	285.583
	743.007	285.587
	743.257	285.597
	746.201	285.706
	748.35	285.763
	752.967	285.883
	755.009	285.932
	755.28	285.938
	755.366	285.94
	755.408	285.941
	755.433	285.942
	755.45	285.942
	755.511	285.943
	755.677	285.944
	755.711	285.945
	755.767	285.946
	755.874	285.948
	756.161	285.954
	759.447	286.018
	761.388	286.055
	771.241	286.24
	775.975	286.32
	781.839	286.422
	783.82	286.453
	784.63	286.466
	784.896	286.47
	785.009	286.472
	785.071	286.473
	785.111	286.473
	785.138	286.474
	785.158	286.474
	785.174	286.474
	785.186	286.474
	785.197	286.474
	786.178	286.473
	786.417	286.474
	786.83	286.474
	787.719	286.475
	791.033	286.478
	792.437	286.479
	799.51	286.482

Type	Coordinates	
	X	Y
	803.034	286.484
	807.355	286.485
	813.632	286.487
	815.2	286.487
	819.67	286.487
	823.045	286.487
	824.23	286.487
	830.89	286.485
	834.828	286.484
	838.735	286.481
	839.771	286.481
	840.59	286.481
	841.025	286.48
	841.294	286.48
	842.215	286.478
	843.93	286.472
	844.354	286.47
	845.114	286.468
	846.58	286.462
	849.872	286.45
	854.425	286.434
	856.023	286.428
	862.27	286.405
	866.621	286.389
	870.115	286.376
	877.219	286.351
	877.96	286.348
	880.074	286.34
	885.805	286.319
	887.817	286.312
	889.809	286.305
Material Boundary	X	Y
	335.317	273.442
	335.758	276.447
Material Boundary	X	Y
	225.672	313
	228.176	313.834
	346.821	353.373
	388.563	353.844
	705.303	459.376
	784.936	463.356
	889.809	458.84
Material Boundary	X	Y
	163.622	283.33
	198.622	283.33
	305.611	283.33
Material Boundary	X	Y
	163.622	279.808
	166.459	279.765
	169.492	279.748
	190.858	279.845
	236.344	280.273
	252.171	280.394
	252.424	280.399
	266.6	280.676
	280.191	280.942
	311.09	281.504
Material Boundary	X	Y
	280.62	273.441
	334.915	273.441
	335.285	273.441

Type	Coordinates X	Coordinates Y
Material Boundary	0	245.912
	6.36475	246.126
	13.3403	246.341
	36.3284	247.103
	54.3369	247.652
	55.2772	247.682
	79.2611	248.444
	110.272	249.344
	111.035	249.367
	127.411	249.843
	128.882	249.888
	132.876	250
	148.142	250.327
	154.566	250.461
	155.103	250.439
	174.679	250.477
	214.244	250.887
	223.04	251.046
	223.923	251.063
	234.446	251.24
	240.347	251.34
	241.61	251.359
	271.29	251.838
	338.025	252.82
	359.196	253.144
	468.669	255
	504.884	256.001
	512.811	256.301
	518.723	256.525
	525.676	256.781
	533.762	257.101
	570.283	258.441
	584.807	258.964
	597.519	259.475
	602.609	259.649
	602.782	259.656
	603.792	259.688
	613.635	260
	644.906	261.528
	652.572	261.886
	675.227	262.978
	689.592	263.645
	694.125	263.874
	696.449	263.978
	702.144	264.222
	720.045	265
	733.785	265.893
	740.862	266.335
	755.735	267.14
	763.008	267.621
	772.725	268.001
	787.18	268.982
	788.074	269.024
	788.743	269.034
	792.383	269.156
	797.821	269.423
	799.666	269.372
	804.53	269.382
	805.662	269.392
	821.433	269.77
	822.214	269.723
	822.878	269.719
	853.823	269.853
	854.209	269.868
	862.107	270
	889.809	270.193

Type	Coordinates	
Material Boundary	X	Y
	724.846	281.942
	726.68	282.006
	726.988	282.017
	727.558	282.037
	731.059	282.161
	732.287	282.204
	734.844	282.294
	740.052	282.479
	741.043	282.514
	741.066	282.514
	741.081	282.515
	741.096	282.515
	741.181	282.519
	742.826	282.581
	742.885	282.583
	743.007	282.587
	743.242	282.596
	743.257	282.597
	746.201	282.706
	748.35	282.763
	752.967	282.883
	755.009	282.932
	755.28	282.938
	755.366	282.94
	755.408	282.941
	755.433	282.942
	755.45	282.942
	755.511	282.943
	755.677	282.944
	755.711	282.945
	755.767	282.946
	755.874	282.948
	756.161	282.954
	759.447	283.018
	761.388	283.055
	771.241	283.24
	775.975	283.32
	781.839	283.422
	783.82	283.453
	784.63	283.466
	784.896	283.47
	785.009	283.472
	785.071	283.473
	785.111	283.473
	785.138	283.474
	785.158	283.474
	785.174	283.474
	785.186	283.474
	785.197	283.474
	786.178	283.473
	786.417	283.474
	786.83	283.474
	787.719	283.475
	791.033	283.478
	791.759	283.478
	792.437	283.479
	799.51	283.482
	801.667	283.483
	803.034	283.484
	807.355	283.485
	813.632	283.487
	815.2	283.487
	819.67	283.487
	823.045	283.487
	824.23	283.487
	830.89	283.485
	834.828	283.484
	838.735	283.481
	839.771	283.481
	840.59	283.481
	841.025	283.48
	841.294	283.48
	842.215	283.478
	843.93	283.472
	844.354	283.47
	845.114	283.468
	846.58	283.462
	849.872	283.45
	854.425	283.434
	856.023	283.428
	862.27	283.405
	866.621	283.389
	870.115	283.376
	877.219	283.351
	877.96	283.348
	880.074	283.34
	885.805	283.319

Type	Coordinates	
	X	Y
	887.817	283.312
	889.809	283.305

Scenario-based Entities

Type	Coordinates	Master Scenario	Global Static	Global Seismic	Global Static NC	Global Seismic NC	LWB Static	LWB Seismic	Horizontal Sliding	Horizont Sei

Type	Coordinates X	Coordinates Y	Master Scenario	Global Static	Global Seismic	Global Static NC	Global Seismic NC	LWB Static	LWB Seismic	Horizontal Sliding	Horizont Seis
Piezoline	0	269	Assigned to materials: Soft Clay Stiff Clay	Assigned to materials: Soft Clay Stiff Clay	Assigned to materials: Soft Clay Stiff Clay	Assigned to materials: Soft Clay Stiff Clay	Assigned to materials: Soft Clay Stiff Clay	Assigned to materials: Soft Clay Stiff Clay	Assigned to materials: Soft Clay Stiff Clay	Assigned to materials: Soft Clay Stiff Clay	Assig mate
	328.689	275.639									
	335.285	273.441									
	335.317	273.442									
	338.809	273.482									
	340.169	273.497									
	342.732	273.527									
	345.468	273.558									
	346.654	273.572									
	350.034	273.611									
	350.577	273.617									
	350.658	273.618									
	352.06	273.634									
	352.134	273.635									
	352.141	273.635									
	352.302	273.637									
	352.318	273.637									
	352.349	273.637									
	352.426	273.699									
	352.454	273.699									
	352.455	273.699									
	352.456	273.699									
	352.501	273.639									
	352.504	273.64									
	352.506	273.64									
	352.573	273.641									
	352.664	273.642									
	352.794	273.645									
	352.996	273.648									
	353.352	273.655									
	353.491	273.658									
	354.499	273.677									
	356.066	273.707									
	358.422	273.752									
	361.365	273.807									
	362.344	273.826									
	365.135	273.879									
	366.267	273.901									
	366.664	273.909									
	370.189	273.976									
	371.963	274.01									
	374.112	274.052									
	377.262	274.113									
	378.034	274.128									
	380.236	274.17									
	381.957	274.204									
	382.561	274.215									
	385.879	274.28									
	387.859	274.319									
	389.802	274.357									
	393.158	274.423									
	393.724	274.434									
	395.337	274.466									
	397.647	274.511									
	398.457	274.527									
	401.569	274.588									
	403.756	274.632									
	405.492	274.666									
	409.055	274.737									
	409.414	274.744									
	410.438	274.765									
	413.337	274.823									
	414.354	274.843									
	417.259	274.901									
	419.653	274.949									
	421.182	274.98									
	424.952	275.056									
	425.104	275.059									
	426.123	275.08									
	426.181	275.081									
	426.23	275.081									
	426.263	275.082									
	426.285	275.082									
	426.288	275.082									
	426.302	275.082									
	427.068	275.098									
	427.172	275.1									
	427.926	275.115									
	429.027	275.136									
	430.251	275.159									
	432.949	275.212									
	435.549	275.262									
	436.872	275.288									
	440.64	275.361									
	440.794	275.364									
	440.848	275.365									

Type	Coordinates		Master Scenario	Global Static	Global Seismic	Global Static NC	Global Seismic NC	LWB Static	LWB Seismic	Horizontal Sliding	Horizont Sei
	X	Y									
	444.717	275.441									
	446.147	275.468									
	448.639	275.517									
	451.446	275.572									
	452.562	275.594									
	455.741	275.657									
	456.484	275.672									
	456.745	275.677									
	460.407	275.749									
	462.044	275.782									
	464.329	275.827									
	467.343	275.887									
	468.252	275.905									
	470.842	275.957									
	472.642	275.993									
	473.615	276.012									
	477.941	276.099									
	479.135	276.123									
	479.458	276.13									
	479.608	276.133									
	479.617	276.133									
	479.68	276.134									
	479.715	276.134									
	479.736	276.134									
	479.738	276.134									
	480.604	276.151									
	480.657	276.152									
	480.889	276.156									
	481.389	276.165									
	483.239	276.198									
	483.942	276.21									
	485.943	276.246									
	487.864	276.28									
	488.538	276.292									
	491.787	276.35									
	493.837	276.386									
	495.709	276.42									
	499.136	276.481									
	499.632	276.49									
	501.044	276.515									
	503.554	276.56									
	504.435	276.576									
	507.477	276.63									
	509.734	276.671									
	511.399	276.7									
	515.033	276.766									
	515.322	276.771									
	516.145	276.786									
	519.244	276.841									
	520.332	276.861									
	523.167	276.912									
	525.631	276.957									
	527.089	276.983									
	530.929	277.052									
	530.977	277.053									
	530.989	277.053									
	530.995	277.053									
	530.996	277.053									
	531.097	277.055									
	531.148	277.056									
	531.178	277.057									
	531.198	277.057									
	531.213	277.057									
	531.215	277.057									
	531.224	277.058									
	531.7	277.066									
	531.845	277.069									
	532.044	277.072									
	532.421	277.079									
	533.231	277.094									
	534.934	277.124									
	536.228	277.148									
	538.857	277.195									
	541.527	277.243									
	542.779	277.266									
	544.501	277.297									
	545.304	277.312									
	545.678	277.318									
	545.791	277.323									
	546.051	277.332									
	546.185	277.337									
	546.267	277.34									
	546.525	277.347									
	546.684	277.343									
	546.726	277.338									
	546.735	277.338									
	546.755	277.338									

Type	Coordinates		Master Scenario	Global Static	Global Seismic	Global Static NC	Global Seismic NC	LWB Static	LWB Seismic	Horizontal Sliding	Horizont Sei
	X	Y									
	546.826	277.34									
	550.624	277.413									
	552.125	277.442									
	554.547	277.489									
	557.424	277.545									
	558.469	277.566									
	561.448	277.624									
	562.392	277.642									
	562.723	277.649									
	566.314	277.719									
	568.022	277.752									
	570.237	277.796									
	573.321	277.856									
	574.159	277.873									
	576.549	277.92									
	578.082	277.95									
	578.619	277.961									
	582.004	278.028									
	583.918	278.065									
	585.927	278.105									
	589.217	278.17									
	589.849	278.183									
	591.65	278.219									
	593.772	278.261									
	594.516	278.276									
	597.694	278.339									
	599.815	278.381									
	601.617	278.417									
	605.114	278.487									
	605.358	278.492									
	605.424	278.493									
	605.455	278.494									
	605.462	278.494									
	605.656	278.503									
	605.733	278.507									
	605.775	278.509									
	605.801	278.51									
	605.818	278.511									
	605.831	278.512									
	605.858	278.513									
	606.104	278.516									
	606.166	278.516									
	606.288	278.517									
	606.504	278.517									
	606.856	278.526									
	607.612	278.544									
	609.462	278.589									
	610.413	278.612									
	613.384	278.683									
	615.712	278.74									
	617.307	278.779									
	621.011	278.869									
	621.229	278.874									
	621.852	278.89									
	625.152	278.97									
	626.309	278.999									
	629.074	279.067									
	631.608	279.129									
	632.997	279.163									
	634.66	279.204									
	635.484	279.225									
	635.868	279.235									
	635.933	279.236									
	636.043	279.239									
	636.086	279.24									
	636.109	279.241									
	636.124	279.241									
	636.133	279.241									
	636.14	279.241									
	636.141	279.241									
	636.146	279.241									
	636.372	279.247									
	636.434	279.249									
	636.556	279.252									
	636.916	279.262									
	636.919	279.262									
	636.953	279.263									
	640.842	279.369									
	642.206	279.406									
	644.764	279.476									
	647.505	279.551									
	648.687	279.584									
	652.054	279.677									
	652.609	279.692									
	652.804	279.698									
	656.531	279.801									
	658.103	279.845									

Type	Coordinates		Master Scenario	Global Static	Global Seismic	Global Static NC	Global Seismic NC	LWB Static	LWB Seismic	Horizontal Sliding	Horizont Sei
	X	Y									
	660.454	279.911									
	663.402	279.993									
	664.376	280.021									
	667.155	280.099									
	668.299	280.131									
	668.701	280.142									
	672.221	280.242									
	673.999	280.292									
	676.144	280.353									
	679.298	280.443									
	680.066	280.465									
	682.256	280.527									
	683.989	280.577									
	684.597	280.594									
	687.911	280.69									
	688.448	280.705									
	689.353	280.731									
	689.806	280.745									
	689.981	280.75									
	690.044	280.752									
	690.078	280.753									
	690.098	280.753									
	690.112	280.754									
	690.16	280.755									
	690.212	280.756									
	690.222	280.756									
	690.243	280.757									
	690.312	280.76									
	691.251	280.791									
	691.834	280.811									
	695.195	280.923									
	695.756	280.942									
	697.356	280.996									
	699.679	281.075									
	700.494	281.102									
	703.601	281.208									
	705.793	281.282									
	707.524	281.342									
	711.092	281.464									
	711.446	281.477									
	712.457	281.512									
	715.369	281.612									
	716.391	281.647									
	719.291	281.749									
	721.689	281.832									
	724.846	281.942									
	726.68	282.006									
	726.988	282.017									
	727.558	282.037									
	731.059	282.161									
	732.287	282.204									
	734.844	282.294									
	740.052	282.479									
	741.043	282.514									
	741.06	282.514									
	741.064	282.514									
	741.066	282.514									
	741.066	282.515									
	741.067	282.515									
	741.068	282.515									
	741.068	282.515									
	741.068	282.515									
	741.068	282.515									
	741.078	282.515									
	741.08	282.515									
	741.085	282.515									
	741.096	282.515									
	741.181	282.519									
	742.826	282.581									
	742.885	282.583									
	743.007	282.587									
	743.242	282.596									
	743.257	282.597									
	746.201	282.706									
	748.35	282.763									
	752.967	282.883									
	755.009	282.932									
	755.28	282.938									
	755.366	282.94									
	755.408	282.941									
	755.433	282.942									
	755.45	282.942									
	755.511	282.943									
	755.677	282.944									
	755.711	282.945									
	755.767	282.946									
	755.874	282.948									

Type	Coordinates	Master Scenario	Global Static	Global Seismic	Global Static NC	Global Seismic NC	LWB Static	LWB Seismic	Horizontal Sliding	Horizont Sei
	(see coordinate list below)									
Piezoline	(see coordinates below)	Assigned to materials: Sand, Silty Sand, MSE Berm	Assigned to materials: Sand, Silty Sand, MSE Berm	Assigned to materials: Sand, Silty Sand, MSE Berm	Assigned to materials: Sand, Silty Sand, MSE Berm	Assigned to materials: Sand, Silty Sand, MSE Berm	Assigned to materials: Sand, Silty Sand, MSE Berm	Assigned to materials: Sand, Silty Sand, MSE Berm	Assigned to materials: Sand, Silty Sand, MSE Berm	Assig mate
Piezoline	X / Y: 0, 265; 889.9, 285	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till	Assig mate

Coordinates (first row):

X	Y
756.161	282.954
759.447	283.018
761.388	283.055
771.241	283.24
775.975	283.32
781.839	283.422
783.82	283.453
784.63	283.466
784.896	283.47
785.009	283.472
785.071	283.473
785.111	283.473
785.138	283.474
785.158	283.474
785.174	283.474
785.186	283.474
785.197	283.474
786.178	283.473
786.417	283.474
786.83	283.474
787.719	283.475
791.033	283.478
791.759	283.478
792.437	283.479
799.51	283.482
803.034	283.484
807.355	283.485
813.632	283.487
815.2	283.487
819.67	283.487
823.045	283.487
824.23	283.487
830.89	283.485
834.828	283.484
838.735	283.481
839.771	283.481
840.59	283.481
841.025	283.48
841.294	283.48
842.215	283.478
843.93	283.472
844.354	283.47
845.114	283.468
846.58	283.462
849.872	283.45
854.425	283.434
856.023	283.428
862.27	283.405
866.621	283.389
870.115	283.376
877.219	283.351
877.96	283.348
880.074	283.34
885.805	283.319
887.817	283.312
889.809	283.305

Piezoline coordinates (first piezoline):

X	Y
-1.77636e-15	275
889.809	287

Type	Coordinates		Master Scenario	Global Static	Global Seismic	Global Static NC	Global Seismic NC	LWB Static	LWB Seismic	Horizontal Sliding	Horizont Sei
Piezoline	X	Y	Assigned to materials: Liner Bottom	Assigned to materials: Liner Bottom	Assigned to materials: Liner Bottom	Assigned to materials: Liner Bottom	Assigned to materials: Liner Bottom	Assigned to materials: Liner Bottom	Assigned to materials: Liner Bottom	Assigned to materials: Liner Bottom	Assig mate
	335.758	276.447									
	335.804	276.447									
	338.809	276.482									
	340.169	276.497									
	342.732	276.527									
	345.468	276.558									
	346.654	276.572									
	350.034	276.611									
	350.577	276.617									
	350.658	276.618									
	352.06	276.634									
	352.133	276.635									
	352.141	276.635									
	352.301	276.637									
	352.318	276.637									
	352.349	276.637									
	352.425	276.698									
	352.454	276.698									
	352.454	276.698									
	352.456	276.698									
	352.501	276.639									
	352.506	276.64									
	352.573	276.641									
	352.664	276.642									
	352.794	276.645									
	352.996	276.648									
	353.352	276.655									
	353.491	276.658									
	354.499	276.677									
	356.066	276.707									
	358.422	276.752									
	361.365	276.807									
	362.344	276.826									
	365.135	276.879									
	366.267	276.901									
	366.664	276.909									
	370.189	276.976									
	371.963	277.01									
	374.112	277.052									
	377.262	277.113									
	378.034	277.128									
	380.236	277.17									
	381.957	277.204									
	382.561	277.215									
	385.879	277.28									
	387.859	277.319									
	389.802	277.357									
	393.158	277.423									
	393.724	277.434									
	395.337	277.466									
	397.647	277.511									
	398.457	277.527									
	401.569	277.588									
	403.756	277.632									
	405.492	277.666									
	409.055	277.737									
	409.414	277.744									
	410.438	277.765									
	413.337	277.823									
	414.354	277.843									
	417.259	277.901									
	419.653	277.949									
	421.182	277.98									
	424.952	278.056									
	425.104	278.059									
	426.123	278.08									
	426.181	278.081									
	426.23	278.081									
	426.263	278.082									
	426.285	278.082									
	426.288	278.082									
	426.302	278.082									
	427.068	278.098									
	427.172	278.1									
	427.926	278.115									
	429.027	278.136									
	430.251	278.159									
	432.949	278.212									
	435.549	278.262									
	436.872	278.288									
	440.64	278.361									
	440.794	278.364									
	440.848	278.365									
	444.717	278.441									
	446.147	278.468									
	448.639	278.517									

Type	Coordinates		Master Scenario	Global Static	Global Seismic	Global Static NC	Global Seismic NC	LWB Static	LWB Seismic	Horizontal Sliding	Horizont Sei
	X	Y									
	451.446	278.572									
	452.562	278.594									
	455.741	278.657									
	456.484	278.672									
	456.745	278.677									
	460.407	278.749									
	462.044	278.782									
	464.329	278.827									
	467.343	278.887									
	468.252	278.905									
	470.842	278.957									
	472.642	278.993									
	473.615	279.012									
	477.941	279.099									
	479.135	279.123									
	479.458	279.13									
	479.608	279.133									
	479.617	279.133									
	479.68	279.134									
	479.715	279.134									
	479.736	279.134									
	479.738	279.134									
	480.604	279.151									
	480.657	279.152									
	480.889	279.156									
	481.389	279.165									
	483.239	279.198									
	483.942	279.21									
	485.943	279.246									
	487.864	279.28									
	488.538	279.292									
	491.787	279.35									
	493.837	279.386									
	495.709	279.42									
	499.136	279.481									
	499.632	279.49									
	501.044	279.515									
	503.554	279.56									
	504.435	279.576									
	507.477	279.63									
	509.734	279.671									
	511.399	279.7									
	515.033	279.766									
	515.322	279.771									
	516.145	279.786									
	519.244	279.841									
	520.332	279.861									
	523.167	279.912									
	525.631	279.957									
	527.089	279.983									
	530.929	280.052									
	530.977	280.053									
	530.989	280.053									
	530.995	280.053									
	530.996	280.053									
	531.097	280.055									
	531.148	280.056									
	531.178	280.057									
	531.198	280.057									
	531.213	280.057									
	531.215	280.057									
	531.224	280.058									
	531.7	280.066									
	531.845	280.069									
	532.044	280.072									
	532.421	280.079									
	533.231	280.094									
	534.934	280.124									
	536.228	280.148									
	538.857	280.195									
	541.527	280.243									
	542.779	280.266									
	544.501	280.297									
	545.304	280.312									
	545.678	280.318									
	545.791	280.323									
	546.051	280.332									
	546.185	280.337									
	546.267	280.34									
	546.525	280.347									
	546.684	280.343									
	546.726	280.338									
	546.735	280.338									
	546.755	280.338									
	546.826	280.34									
	550.624	280.413									
	552.125	280.442									

Type	Coordinates		Master Scenario	Global Static	Global Seismic	Global Static NC	Global Seismic NC	LWB Static	LWB Seismic	Horizontal Sliding	Horizont Sei
	X	Y									
	554.547	280.489									
	557.424	280.545									
	558.469	280.566									
	561.448	280.624									
	562.392	280.642									
	562.723	280.649									
	566.314	280.719									
	568.022	280.752									
	570.237	280.796									
	573.321	280.856									
	574.159	280.873									
	576.549	280.92									
	578.082	280.95									
	578.619	280.961									
	582.004	281.028									
	583.918	281.065									
	585.927	281.105									
	589.217	281.17									
	589.849	281.183									
	591.65	281.219									
	593.772	281.261									
	594.516	281.276									
	597.694	281.339									
	599.815	281.381									
	601.617	281.417									
	605.114	281.487									
	605.358	281.492									
	605.424	281.493									
	605.455	281.494									
	605.462	281.494									
	605.656	281.503									
	605.733	281.507									
	605.775	281.509									
	605.801	281.51									
	605.818	281.511									
	605.831	281.512									
	605.858	281.513									
	606.104	281.516									
	606.166	281.516									
	606.288	281.517									
	606.504	281.517									
	606.856	281.526									
	607.612	281.544									
	609.462	281.589									
	610.413	281.612									
	613.384	281.683									
	615.712	281.74									
	617.307	281.779									
	621.011	281.869									
	621.229	281.874									
	621.852	281.89									
	625.152	281.97									
	626.309	281.999									
	629.074	282.067									
	631.608	282.129									
	632.997	282.163									
	634.66	282.204									
	635.484	282.225									
	635.868	282.235									
	635.933	282.236									
	636.043	282.239									
	636.086	282.24									
	636.109	282.241									
	636.124	282.241									
	636.133	282.241									
	636.14	282.241									
	636.141	282.241									
	636.146	282.241									
	636.372	282.247									
	636.434	282.249									
	636.556	282.252									
	636.916	282.262									
	636.919	282.262									
	636.953	282.263									
	640.842	282.369									
	642.206	282.406									
	644.764	282.476									
	647.505	282.551									
	648.687	282.584									
	652.054	282.677									
	652.609	282.692									
	652.804	282.698									
	656.531	282.801									
	658.103	282.845									
	660.454	282.911									
	663.402	282.993									
	664.376	283.021									

Type	Coordinates X	Coordinates Y	Master Scenario	Global Static	Global Seismic	Global Static NC	Global Seismic NC	LWB Static	LWB Seismic	Horizontal Sliding	Horizont Sei
	667.155	283.099									
	668.299	283.131									
	668.701	283.142									
	672.221	283.242									
	673.999	283.292									
	676.144	283.353									
	679.298	283.443									
	680.066	283.465									
	682.256	283.527									
	683.989	283.577									
	684.597	283.594									
	687.911	283.69									
	688.448	283.705									
	689.353	283.731									
	689.806	283.745									
	689.981	283.75									
	690.044	283.752									
	690.078	283.753									
	690.098	283.753									
	690.112	283.754									
	690.16	283.755									
	690.212	283.756									
	690.222	283.756									
	690.243	283.757									
	690.312	283.76									
	691.251	283.791									
	691.834	283.811									
	695.195	283.923									
	695.756	283.942									
	697.356	283.996									
	699.679	284.075									
	700.494	284.102									
	703.601	284.208									
	705.793	284.282									
	707.524	284.342									
	711.092	284.464									
	711.446	284.477									
	712.457	284.512									
	715.369	284.612									
	716.391	284.647									
	719.291	284.749									
	721.689	284.832									
	726.68	285.006									
	726.988	285.017									
	727.558	285.037									
	731.059	285.161									
	732.287	285.204									
	734.844	285.294									
	740.052	285.479									
	741.043	285.514									
	741.06	285.514									
	741.064	285.514									
	741.066	285.514									
	741.066	285.515									
	741.067	285.515									
	741.068	285.515									
	741.068	285.515									
	741.068	285.515									
	741.068	285.515									
	741.078	285.515									
	741.08	285.515									
	741.085	285.515									
	741.096	285.515									
	741.181	285.519									
	742.826	285.581									
	742.885	285.583									
	743.007	285.587									
	743.257	285.597									
	746.201	285.706									
	748.35	285.763									
	752.967	285.883									
	755.009	285.932									
	755.28	285.938									
	755.366	285.94									
	755.408	285.941									
	755.433	285.942									
	755.45	285.942									
	755.511	285.943									
	755.677	285.944									
	755.711	285.945									
	755.767	285.946									
	755.874	285.948									
	756.161	285.954									
	759.447	286.018									
	761.388	286.055									
	771.241	286.24									
	775.975	286.32									

Type	Coordinates X	Coordinates Y	Master Scenario	Global Static	Global Seismic	Global Static NC	Global Seismic NC	LWB Static	LWB Seismic	Horizontal Sliding	Horizont Sei
	X	Y									
	781.839	286.422									
	783.82	286.453									
	784.63	286.466									
	784.896	286.47									
	785.009	286.472									
	785.071	286.473									
	785.111	286.473									
	785.138	286.474									
	785.158	286.474									
	785.174	286.474									
	785.186	286.474									
	785.197	286.474									
	786.178	286.473									
	786.417	286.474									
	786.83	286.474									
	787.719	286.475									
	791.033	286.478									
	792.437	286.479									
	799.51	286.482									
	803.034	286.484									
	807.355	286.485									
	813.632	286.487									
	815.2	286.487									
	819.67	286.487									
	823.045	286.487									
	824.23	286.487									
	830.89	286.485									
	834.828	286.484									
	838.735	286.481									
	839.771	286.481									
	840.59	286.481									
	841.025	286.48									
	841.294	286.48									
	842.215	286.478									
	843.93	286.472									
	844.354	286.47									
	845.114	286.468									
	846.58	286.462									
	849.872	286.45									
	854.425	286.434									
	856.023	286.428									
	862.27	286.405									
	866.621	286.389									
	870.115	286.376									
	877.219	286.351									
	877.96	286.348									
	880.074	286.34									
	885.805	286.319									
	887.817	286.312									
	889.07	286.307									
Bolt	X / 163.817 / 178.817	Y / 284.5 / 284.5	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	
Bolt	X / 164.067 / 179.067	Y / 286 / 286	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	
Bolt	X / 164.317 / 179.317	Y / 287.5 / 287.5	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	
Bolt	X / 164.567 / 179.567	Y / 289 / 289	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	
Bolt	X / 164.817 / 179.817	Y / 290.5 / 290.5	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	
Bolt	X / 165.067 / 180.067	Y / 292 / 292	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	
Bolt	X / 165.317 / 180.317	Y / 293.5 / 293.5	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	
Bolt	X / 165.567 / 180.567	Y / 295 / 295	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	

Type	Coordinates	Master Scenario	Global Static	Global Seismic	Global Static NC	Global Seismic NC	LWB Static	LWB Seismic	Horizontal Sliding	Horizont Sei
Bolt	X Y 165.817 296.5 180.817 296.5	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	
Bolt	X Y 166.067 298 181.067 298	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	
Bolt	X Y 166.317 299.5 181.317 299.5	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	
Bolt	X Y 166.567 301 181.567 301	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	
Bolt	X Y 166.818 302.5 181.818 302.5	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	
Bolt	X Y 167.068 304 182.068 304	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	
Bolt	X Y 167.318 305.5 182.318 305.5	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	
Bolt	X Y 167.568 307 182.568 307	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	
Bolt	X Y 167.818 308.5 182.818 308.5	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	
Bolt	X Y 168.068 310 183.068 310	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	
Bolt	X Y 168.318 311.5 183.318 311.5	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	
Bolt	X Y 168.568 313 183.568 313	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	
Tension Crack	X Y 577.831 419.934 889.809 420				Water level: dry					
Block Search Window	X Y 184.822 281.5 123.571 281.5 123.571 245.065 184.822 245.065									
Block Search Window	X Y 237.926 281.5 176.675 281.5 176.675 245.065 237.926 245.065									
Block Search Window	X Y 291.231 282.707 229.98 282.707 229.98 246.272 291.231 246.272									
Block Search Window	X Y 347.956 281.097 286.705 281.097 286.705 244.662 347.956 244.662									
Block Search Window	X Y 394.623 272.448 333.372 272.448 333.372 236.013 394.623 236.013									

Type	Coordinates	Master Scenario	Global Static	Global Seismic	Global Static NC	Global Seismic NC	LWB Static	LWB Seismic	Horizontal Sliding	Horizont Sei
Tension Crack	X Y 554.103 412.029 889.809 412					Water level: dry				
Block Search Polyline	X Y 222.709 312.84 335.516 274.794 724.779 283.514									
Block Search Window	X Y 388.473 356.844 346.73 356.373 216.58 313 784.18 297.161									
Block Search Window	X Y 784.846 466.356 705.213 462.376 388.473 356.844 784.18 297.161									
Block Search Polyline	X Y 163.622 283.33 305.611 283.33									
Block Search Polyline	X Y 305.611 283.33 163.622 283.33									

Section VI

Slide Analysis Information
2019.10.01 Ph14 VI PC

Project Summary

File Name:	2019.10.01 Ph14 VI PC.slmd
Last saved with Slide version:	8.028
Project Title:	SLIDE - An Interactive Slope Stability Program
Date Created:	7/16/2019, 9:54:59 AM

Currently Open Scenarios

Group Name	Scenario Name	Compute Time
Post-Closure	Master Scenario	
	Global Static	
	Global Seismic	
	Global Static NC	
	Global Seismic NC	
	LWB Static	
	LWB Seismic	
	Sliding	
	Sliding Seismic	

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Right to Left

Analysis Options

All Open Scenarios	
Slices Type:	Vertical
Analysis Methods Used	
	Spencer
Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

All Open Scenarios	
Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

All Open Scenarios	
Pseudo-random Seed:	10116
Random Number Generation Method:	Park and Miller v.3

Surface Options

Post-Closure - Master Scenario	Post-Closure - Global Static	Post-Closure - Global Seismic	Post-Closure - Global Static NC	Post-Closure - Global Seismic NC	Post-Closure - LWB Static	Post-Closure - LWB Seismic	Post-Closure - Sliding	Post-Closure - Sliding Seismic
Surface Type: Circular	Surface Type: Circular	Surface Type: Circular	Surface Type: Non-Circular Block Search	Surface Type: Non-Circular Block Search	Surface Type: Non-Circular Block Search	Surface Type: Non-Circular Block Search	Surface Type: Non-Circular Block Search	Surface Type: Non-Circular Block Search
Search Method: Auto Refine Search	Search Method: Grid Search	Search Method: Grid Search	Number of Surfaces: 5000	Number of Surfaces: 5000	Number of Surfaces: 5000	Number of Surfaces: 5000	Number of Surfaces: 5000	Number of Surfaces: 5000
Divisions along slope: 20	Radius Increment: 10	Radius Increment: 10	Multiple Groups: Disabled	Multiple Groups: Disabled	Multiple Groups: Disabled	Multiple Groups: Disabled	Multiple Groups: Disabled	Multiple Groups: Disabled
Circles per division: 10	Composite Surfaces: Disabled	Composite Surfaces: Disabled	Pseudo-Random Surfaces: Enabled	Pseudo-Random Surfaces: Enabled	Pseudo-Random Surfaces: Enabled	Pseudo-Random Surfaces: Enabled	Pseudo-Random Surfaces: Enabled	Pseudo-Random Surfaces: Enabled
Number of iterations: 10	Reverse Curvature: Invalid Surfaces	Reverse Curvature: Invalid Surfaces	Convex Surfaces Only: Disabled	Convex Surfaces Only: Disabled	Convex Surfaces Only: Disabled	Convex Surfaces Only: Disabled	Convex Surfaces Only: Disabled	Convex Surfaces Only: Disabled
Divisions 50%	Minimum Elevation: Not Defined	Minimum Elevation: Not Defined						
	Minimum 10	Minimum 10						

Seismic Loading

Post-Closure - Master Scenario	Post-Closure - Global Static	Post-Closure - Global Seismic	Post-Closure - Global Static NC	Post-Closure - Global Seismic NC	Post-Closure - LWB Static	Post-Closure - LWB Seismic	Post-Closure - Sliding	Post-Closure - Sliding Seismic
Advanced seismic analysis: No Staged pseudostatic analysis: No	Advanced seismic analysis: No Staged pseudostatic analysis: No	Advanced seismic analysis: No Staged pseudostatic analysis: No Seismic Load Coefficient (Horizontal): 0.106	Advanced seismic analysis: No Staged pseudostatic analysis: No	Advanced seismic analysis: No Staged pseudostatic analysis: No Seismic Load Coefficient (Horizontal): 0.106	Advanced seismic analysis: No Staged pseudostatic analysis: No	Advanced seismic analysis: No Staged pseudostatic analysis: No Seismic Load Coefficient (Horizontal): 0.106	Advanced seismic analysis: No Staged pseudostatic analysis: No	Advanced seismic analysis: No Staged pseudostatic analysis: No Seismic Load Coefficient (Horizontal): 0.106

Tension Crack

Post-Closure - Master Scenario	Post-Closure - Global Static	Post-Closure - Global Seismic	Post-Closure - Global Static NC	Post-Closure - Global Seismic NC	Post-Closure - LWB Static	Post-Closure - LWB Seismic	Post-Closure - Sliding	Post-Closure - Sliding Seismic
Water level: dry				Water level: dry				

Materials

Property	Till	Soft Clay	Stiff Clay	Sand	Silty Sand	MSE Berm	MSW	Liner Slope
Color								
Strength Type	Mohr-Coulomb	SHANSEP	SHANSEP	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	150	120	125	110	110	120	75	120
Cohesion [psf]	10000			0	0	100	30	0
Friction Angle [°]	50			36	32	32	30	8.2
A [psf]		0	0					
S		0.19	0.22					
m		0.66	0.76					
Stress History Type		Preconsolidation Pressure	Preconsolidation Pressure					
Definition Method		Constant [6500]	Constant [21000]					
Material Dependent Vertical Stress		No	No					
Water Surface	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario
Hu Value	1	1	1	1	1	1		
Ru Value							0	0

Property	Liner Bottom	Cover System	MSWLWB	Compacted Clay	Bedrock
Color					
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Shear Normal function	Mohr-Coulomb	Infinite strength
Unit Weight [lbs/ft3]	120	120	75	125	165
Allow Sliding Along Boundary					Yes
Cohesion [psf]	0	0		100	
Friction Angle [°]	18.3	30		32	
Water Surface	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario
Hu Value	1			1	
Ru Value		0	0		0

Shear Normal Functions

Materials In Use

Material	Master Scenario	Global Static	Global Seismic	Global Static NC	Global Seismic NC	LWB Static	LWB Seismic	Sliding	Sliding Seismic
Till	✓	✓	✓	✓	✓	✓	✓	✓	✓
Soft Clay	✓	✓	✓	✓	✓	✓	✓	✓	✓
Stiff Clay	✓	✓	✓	✓	✓	✓	✓	✓	✓
Sand	✓	✓	✓	✓	✓	✓	✓	✓	✓
Silty Sand	✓	✓	✓	✓	✓	✓	✓	✓	✓
MSE Berm	✓	✓	✓	✓	✓	✓	✓	✓	✓
MSW	✓	✓	✓	✓	✓	✗	✗	✓	✓

Liner Slope	✓	✓	✓	✓	✓	✓	✓	✓	✓
Liner Bottom	✓	✓	✓	✓	✓	✓	✓	✓	✓
Cover System	✓	✓	✓	✓	✓	✓	✓	✓	✓
MSWLWB	✗	✗	✗	✗	✗	✓	✓	✗	✗
Compacted Clay	✓	✓	✓	✓	✓	✓	✓	✓	✓
Bedrock	✓	✓	✓	✓	✓	✓	✓	✓	✓

Support

Support 1

Support Type: GeoTextile
Force Application: Active
Force Orientation: Parallel to Reinforcement
Anchorage: None
Shear Strength Model: Linear
Use External Loads for Strength: yes
Strip Coverage: 100 percent
Tensile Strength: 1760 lb/ft
Pullout Strength Adhesion: 0 psf
Pullout Strength Friction Angle: 32 degrees

Entity Information

Group: Post-Closure

Shared Entities

Type	X	Y
External Boundary	161.484	286.998
	147.735	282.413
	140.499	280
	128.946	280
	90.0679	280
	14.6142	280
	13.9002	280.284
	0	285.816
	0	279.903
	0	275.814
	0	269.452
	0	261.075
	0	251.139
	0	239.626
	0	225
	944.434	225
	944.434	264.516
	944.434	274.422
	944.434	275.247
	944.434	283.909
	944.434	285.236
	944.434	286.008
	944.434	287.004
	944.434	290.004
	944.434	450.172
	944.434	461.364
	944.434	464.364
	876.335	467.5
	834.246	467.5
	734.334	462.608
	696.684	450.324
	577.153	411.325
	532.892	411.633
	252.653	320.158
	230.723	313
	230.387	313
	230.152	313
	230.11	313
	227.05	313
	226.85	313
	226.51	313
	223.91	313
	221.897	313
	220.771	313
	211.336	313
	192.396	313
	190.703	313
	189.128	313
	184.206	313
	181.399	313
	179.878	304.121
	177.274	288.925
	167.274	288.925
Material Boundary	163.192	283.092
	164.367	283.299
	173.402	284.426
	175.374	284.702
	175.934	284.781
	176.556	284.85
	177.274	284.837
Material Boundary	742.19	281.956
	743.315	281.982
	743.586	281.986
	743.998	281.992
	744.582	282
	744.71	282.006
	745.941	282.066
	0	261.075
	20.2242	261.333
	49.0772	261.677
	68.7601	261.912
	89.1595	262.135
	102.088	262.274
	105.203	262.308
	134.725	262.59
	136.122	262.601
	160.48	262.798
	165.143	262.856
	174.815	262.98
	177.274	263.014
	180.788	263.062
	181.79	263.071
	190.412	263.134
	200.629	263.208
	202.01	263.214
	224.213	263.526
	230.723	263.626
	247.533	263.886
	258.569	264.048
	303.199	264.773

X	Y
0	251.139
11.1527	251.416
26.4465	251.783
64.1069	252.692
81.0029	253.091
90.1714	253.309
101.077	253.566
113.608	253.861
157.216	254.879
162.122	255
177.274	255.346
181.905	255.452
192.409	255.664
208.664	255.998
217.716	256.193
221.366	256.22
230.723	256.287
245.393	256.393
269.063	256.472
291.423	256.518
291.764	256.523
313.338	256.537
324.39	256.708
344.544	256.691
345.57	256.707
357.779	256.906
376.347	256.852
378.057	256.881
391.439	257.126
402.037	257.125
404.75	257.174
415.45	257.217
430.363	257.543
435.507	257.652
444.803	257.735
462.411	258.175

Material Boundary

Material Boundary

X	Y
0	275.814
10.7043	276
24.4375	276.392
44.9968	277
46.75	277.072
51.7986	277.324
64.1345	277.912
65.8064	278
82.5637	278.929
83.8774	279
84.0913	279.033
90.0679	280

Material Boundary

X	Y
676.704	282.186
677.133	282.064
677.812	282.065
678.564	282.053

Material Boundary

X	Y
230.723	313
280.273	296.826
280.624	296.711
285.928	294.98
304.479	288.925
305.073	288.731
322.665	282.988
327.174	281.517
330.435	280.452
343.452	276.203
344.783	276.226
346.405	276.254
348.65	276.292
350.104	276.316
352.207	276.352
353.508	276.374
353.798	276.379
354.286	276.388
356.242	276.421
356.65	276.428
357.377	276.44
359.242	276.472
359.559	276.477
361.372	276.508
362.261	276.523
362.901	276.534
364.648	276.564
364.776	276.566
366.5	276.595
367.124	276.606
367.594	276.614
389.286	277.005
391.242	277.04
407.064	277.325
407.582	277.335
410.587	277.389
416.382	277.493
418.662	277.534
422.239	277.599
428.158	277.706
433.549	277.803
434.14	277.813
440.186	277.922
446.297	278.033
452.474	278.144
458.718	278.256
465.031	278.37
470.001	278.46
507.04	279.128

Material Boundary

X	Y
726.029	283.075
729.348	283.135
736.14	283.258
743.032	283.382
750.027	283.508
757.127	283.636
764.335	283.766
771.652	283.898
771.753	283.9
796.318	284.342
796.421	284.344
798.219	284.377
803.041	284.464
809.967	284.588
817.007	284.715
823.723	284.836
833.442	285.012
833.865	285.019
834.243	285.026
834.334	285.028
840.867	285.144
847.989	285.272
852.833	285.358
855.234	285.401
862.606	285.533
865.521	285.585
870.107	285.667
877.742	285.803
885.514	285.942
893.091	286.077
910.314	286.388
910.622	286.397
912.444	286.43
918.028	286.53
925.577	286.666
933.272	286.803
937.87	286.886
941.12	286.944
944.434	287.004

X	Y
230.723	313
231.743	313
239.915	313
240.414	313
267.557	304.14
273.675	302.143
276.228	301.31
283.009	299.096
305.238	291.84
320.079	286.996
325.945	285.081
342.337	279.731
342.919	279.54
343.927	279.211
345.888	279.245
346.449	279.254
347.726	279.276
349.652	279.309
350.132	279.317
351.98	279.348
353.521	279.375
355.261	279.404
356.651	279.428
357.672	279.445
359.294	279.473
359.55	279.477
361.128	279.504
362.242	279.523

	X	Y
Material Boundary	343.452	276.203
	343.927	279.211

	X	Y
Material Boundary	239.915	313
	257.249	318.658
	532.892	408.633
	577.154	408.325
	734.334	459.608
	834.246	464.5
	876.335	464.5

Material Boundary

X	Y
177.274	288.925
304.479	288.925

Material Boundary

X	Y
177.274	284.837
185.477	284.69
187.842	284.786
207.695	284.988
237.755	283.936
241.815	283.742
246.906	283.234
256.238	283
307.475	281.899
327.174	281.517

Material Boundary

X	Y
147.735	282.413
162.668	283
163.192	283.092

Material Boundary

X	Y
0	269.452
12.8396	269.703
28.8795	270
62.5163	270.325
91.7476	270.603
116.753	270.844
120.765	270.879
124.324	270.905
126.737	270.918
132.869	270.969
133.683	270.974
134.093	270.977
136.553	271
174.726	271.432
183.221	271.537
198.675	271.688
201.154	271.708
204.789	271.72
218.901	271.959
219.46	271.961
221.504	272
253.929	272.489
266.858	272.7
285.521	273
324.447	273.669
342.95	274
345.591	274.029
349.956	274.08
428.072	275
428.628	275.046
430.653	275.23
435.969	275.705
439.116	276
496.948	276.947
498.331	276.968
498.697	276.974
499.332	276.983
499.615	276.985
500.475	277
513.785	277.25
553.889	278
557.577	278.075
559.454	278.113
573.783	278.402
595.635	278.841
599.215	278.913
603.558	279
640.223	279.755
652.063	280
668.747	280.341
701.44	281
705.174	281.073
710.495	281.177
713.243	281.175
718.686	281.147
726.22	281.259
741.866	281.682
742.231	281.692
750.544	281.863
753.795	282
773.727	282.36
781.603	282.458
793.364	282.681
797.096	282.731
810.175	283
813.169	283.052
829.643	283.329
838.174	283.472
841.086	283.518
841.552	283.44
842.328	283.314
845.063	283.169
854.428	283
857.011	282.969
868.744	282.887
868.961	282.89
885.411	282.836
889.982	282.813
897.312	282.872
902.941	283
906.666	283.136
910.969	283.164
911.394	283.166

Material Boundary

X	Y
678.564	282.053
679.463	282.039
680.999	282
683.536	281.743
685.801	281.514
693.062	281.499
702.729	281.154
706.787	281.209
721.111	281.494
722.15	281.515
739.373	281.89
742.19	281.956

Material Boundary

X	Y
745.941	282.066
758.439	282.67
765.173	283
767.684	283.063
775.757	283.371
790.046	283.877
791.527	283.924
791.877	283.929
804.211	284
810.176	284
812.449	284
814.589	284
815.663	284
817.37	284
817.932	283.979
818.767	283.956
818.915	283.947
825.365	283.557
827.172	283.555
835.454	283.548
841.086	283.518
930.714	284.963
944.434	285.236

Material Boundary

X	Y
833.442	285.012
834.243	285.026
910.622	286.397

Material Boundary

X	Y
343.452	276.203
349.956	274.08

Material Boundary

X	Y
161.484	286.998
163.289	287.265
168.24	288
170.513	288.25
176.044	288.802
177.274	288.925

Material Boundary

X	Y
0	239.626
6.78362	240
75.2254	244.367
85.1441	245
87.2034	245.144
125.218	247.784
142.14	248.928
160.581	250
195.223	250.675
256.01	251.757
264.309	251.904
277.531	252.118
300.754	252.494
303.294	252.535
314.586	252.684
329.058	252.875
333.419	252.935
335.645	252.962
348.795	253.089
355.786	253.158
356.93	253.163
369.473	253.253
377.705	253.302
381.407	253.329
388.256	253.379
392.578	253.405
395.332	253.425
403.246	253.49
422.069	253.861
426.939	253.908
432.925	254.032
435.701	254.063
446.654	254.264
466.758	254.643
468.774	254.668
469.432	254.677
478.569	254.829
488.417	255
506.288	255.316
508.463	255.361
526.911	255.663
527.672	255.679
545.39	255.98
548.819	256.05
567.278	256.349

Material Boundary	X Y 925.577 286.666 944.434 287.004

Scenario-based Entities

Type	Coordinates	Master Scenario	Global Static	Global Seismic	Global Static NC	Global Seismic NC	LWB Static	LWB Seismic	Sliding	Sliding Seismic
Piezoline	X Y 0 270 944.5 285	Assigned to materials: Soft Clay Stiff Clay	Assigned to materials: Soft Clay Stiff Clay	Assigned to materials: Soft Clay Stiff Clay	Assigned to materials: Soft Clay Stiff Clay	Assigned to materials: Soft Clay Stiff Clay	Assigned to materials: Soft Clay Stiff Clay	Assigned to materials: Soft Clay Stiff Clay	Assigned to materials: Soft Clay Stiff Clay	Assigned to materials: Soft Clay Stiff Clay
Piezoline	X Y 0 272.332 202.501 275 460.387 278.456 484.606 278.78 576.751 280 679.869 282.328 803.524 285 811.859 285.206 814.148 285.262 891.554 287.165 927.896 288.013 944.434 288.387	Assigned to materials: Sand Silty Sand MSE Berm Compacted Clay	Assigned to materials: Sand Silty Sand MSE Berm Compacted Clay	Assigned to materials: Sand Silty Sand MSE Berm Compacted Clay	Assigned to materials: Sand Silty Sand MSE Berm Compacted Clay	Assigned to materials: Sand Silty Sand MSE Berm Compacted Clay	Assigned to materials: Sand Silty Sand MSE Berm Compacted Clay	Assigned to materials: Sand Silty Sand MSE Berm Compacted Clay	Assigned to materials: Sand Silty Sand MSE Berm Compacted Clay	Assigned to materials: Sand Silty Sand MSE Berm Compacted Clay
Piezoline	X Y 0 260 944.5 286	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till
	X Y 343.927 279.211 345.888 279.245 346.449 279.254 347.726 279.276 349.652 279.309 350.132 279.317 351.98 279.348 353.521 279.375 355.261 279.404 356.651 279.428 357.672 279.445 359.294 279.473 359.55 279.477 361.128 279.504 362.242 279.523 363.766 279.549 364.75 279.565 365.589 279.58 367.091 279.605 367.594 279.614 389.154 280.002 391.242 280.04 407.015 280.324 407.582 280.335 410.453 280.386 416.26 280.491 422.127 280.597 428.057 280.704 429.133 280.723 433.459 280.801 434.051 280.812 440.108 280.921									

Tension Crack	X Y 696.684 450.324 944.434 450.172	Water level: dry	✗	✗	✗	✗	✗	✗	✗	✗
Bolt	X Y 180.114 305.5 200.114 305.5	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 180.371 307 200.371 307	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 180.628 308.5 200.628 308.5	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 180.885 310 200.885 310	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 181.142 311.5 201.142 311.5	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 181.399 313 201.399 313	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1

Bolt	X Y 177.544 290.5 197.544 290.5	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 177.801 292 197.801 292	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 178.058 293.5 198.058 293.5	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 178.315 295 198.315 295	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 178.572 296.5 198.572 296.5	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 178.829 298 198.829 298	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 179.086 299.5 199.086 299.5	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 179.343 301 199.343 301	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 179.6 302.5 199.6 302.5	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 179.857 304 199.857 304	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Block Search Window	X Y 251.911 287.62 177.498 287.62 177.498 240.916 251.911 240.916	✗	✗	✗	✓	✓	✗	✗	✗	✗
Block Search Window	X Y 310.629 284.685 236.216 284.685 236.216 237.981 310.629 237.981	✗	✗	✗	✓	✓	✗	✗	✗	✗
Block Search Window	X Y 377.603 275.144 303.19 275.144 303.19 228.44 377.603 228.44	✗	✗	✗	✓	✓	✗	✗	✗	✗
Tension Crack	X Y 471.496 391.592 944.434 391.403	✗	✗	✗	✗	Water level: dry	✗	✗	✗	✗
Block Search Polyline	X Y 236.15 313 343.669 277.58 823.144 286.139	✗	✗	✗	✗	✗	✓	✓	✓	✓
Block Search Window	X Y 577.153 411.325 532.892 411.633 231.743 313 829.502 313	✗	✗	✗	✗	✗	✗	✗	✓	✓
Block Search Window	X Y 834.246 467.5 734.334 462.608 577.153 411.325 829.502 313	✗	✗	✗	✗	✗	✗	✗	✓	✓

Section VII

Slide Analysis Information
2019.10.10 Ph14 VII PC

Project Summary

File Name:	2019.10.10 Ph14 VII PC.slmd
Last saved with Slide version:	8.028
Project Title:	SLIDE - An Interactive Slope Stability Program
Date Created:	7/16/2019, 9:54:59 AM

Currently Open Scenarios

Group Name	Scenario Name	Compute Time
Post-Closure	Master Scenario	
	Global Static	
	Global Seismic	
	Global Static NC	
	Global Seismic NC	
	LWB Static	
	LWB Seismic	
	Horizontal Sliding	
	Horizontal Sliding Seismic	

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard
Failure Direction:	Right to Left

Analysis Options

All Open Scenarios	
Slices Type:	Vertical
Analysis Methods Used	
	Spencer
Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

All Open Scenarios	
Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

All Open Scenarios	
Pseudo-random Seed:	10116
Random Number Generation Method:	Park and Miller v.3

Surface Options

Post-Closure - Master Scenario	Post-Closure - Global Static	Post-Closure - Global Seismic	Post-Closure - Global Static NC	Post-Closure - Global Seismic NC	Post-Closure - LWB Static	Post-Closure - LWB Seismic	Post-Closure - Horizontal Sliding	Post-Closure - Horizontal Sliding Seismic
Surface Type: Circular	Surface Type: Circular	Surface Type: Circular	Surface Type: Non-Circular Block Search	Surface Type: Non-Circular Block Search	Surface Type: Non-Circular Block Search	Surface Type: Non-Circular Block Search	Surface Type: Non-Circular Block Search	Surface Type: Non-Circular Block Search
Search Method: Auto Refine Search	Search Method: Grid Search	Search Method: Grid Search	Number of Surfaces: 5000	Number of Surfaces: 5000	Number of Surfaces: 5000	Number of Surfaces: 5000	Number of Surfaces: 5000	Number of Surfaces: 5000
Divisions along slope: 20	Radius Increment: 10	Radius Increment: 10	Multiple Groups: Disabled	Multiple Groups: Disabled	Multiple Groups: Disabled	Multiple Groups: Disabled	Multiple Groups: Disabled	Multiple Groups: Disabled
Circles per division: 10	Composite Surfaces: Disabled	Composite Surfaces: Disabled	Pseudo-Random Surfaces: Enabled	Pseudo-Random Surfaces: Enabled	Pseudo-Random Surfaces: Enabled	Pseudo-Random Surfaces: Enabled	Pseudo-Random Surfaces: Enabled	Pseudo-Random Surfaces: Enabled
Number of iterations: 10	Reverse Curvature: Invalid Surfaces	Reverse Curvature: Invalid Surfaces	Convex Surfaces Only: Disabled	Convex Surfaces Only: Disabled	Convex Surfaces Only: Disabled	Convex Surfaces Only: Disabled	Convex Surfaces Only: Disabled	Convex Surfaces Only: Disabled
Divisions 50%	Minimum Elevation: Not Defined	Minimum Elevation: Not Defined						
	Minimum 10	Minimum 10						

Seismic Loading

Post-Closure - Master Scenario	Post-Closure - Global Static	Post-Closure - Global Seismic	Post-Closure - Global Static NC	Post-Closure - Global Seismic NC	Post-Closure - LWB Static	Post-Closure - LWB Seismic	Post-Closure - Horizontal Sliding	Post-Closure - Horizontal Sliding Seismic
Advanced seismic analysis: No Staged pseudostatic analysis: No	Advanced seismic analysis: No Staged pseudostatic analysis: No	Advanced seismic analysis: No Staged pseudostatic analysis: No Seismic Load Coefficient (Horizontal): 0.106	Advanced seismic analysis: No Staged pseudostatic analysis: No	Advanced seismic analysis: No Staged pseudostatic analysis: No Seismic Load Coefficient (Horizontal): 0.106	Advanced seismic analysis: No Staged pseudostatic analysis: No	Advanced seismic analysis: No Staged pseudostatic analysis: No Seismic Load Coefficient (Horizontal): 0.106	Advanced seismic analysis: No Staged pseudostatic analysis: No	Advanced seismic analysis: No Staged pseudostatic analysis: No Seismic Load Coefficient (Horizontal): 0.106

Tension Crack

Post-Closure - Master Scenario	Post-Closure - Global Static	Post-Closure - Global Seismic	Post-Closure - Global Static NC	Post-Closure - Global Seismic NC	Post-Closure - LWB Static	Post-Closure - LWB Seismic	Post-Closure - Horizontal Sliding	Post-Closure - Horizontal Sliding Seismic
	Water level: dry		Water level: dry	Water level: dry				

Materials

Property	Till	Soft Clay	Stiff Clay	Sand	Silty Sand	MSE Berm	MSW	Liner Slope
Color								
Strength Type	Mohr-Coulomb	SHANSEP	SHANSEP	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb
Unit Weight [lbs/ft3]	150	120	125	110	110	120	75	120
Cohesion [psf]	10000			0	0	100	30	0
Friction Angle [°]	50			36	32	32	30	8.2
A [psf]		0	0					
s		0.19	0.22					
m		0.66	0.76					
Stress History Type		Preconsolidation Pressure	Preconsolidation Pressure					
Definition Method		Constant [6500]	Constant [21000]					
Material Dependent Vertical Stress		No	No					
Water Surface	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario
Hu Value	1	1	1	1	1	1		
Ru Value							0	0

Property	Liner Bottom	Cover System	Compacted Clay	MSW-LWB	Bedrock
Color					
Strength Type	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Shear Normal function	Infinite strength
Unit Weight [lbs/ft3]	120	120	125	75	165
Allow Sliding Along Boundary					Yes
Cohesion [psf]	0	0	100		
Friction Angle [°]	18.3	30	32		
Water Surface	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario
Hu Value	1		1		
Ru Value		0		0	0

Shear Normal Functions

Materials In Use

Material	Master Scenario	Global Static	Global Seismic	Global Static NC	Global Seismic NC	LWB Static	LWB Seismic	Horizontal Sliding	Horizontal Sliding Seismic
Till	✓	✓	✓	✓	✓	✓	✓	✓	✓
Soft Clay	✓	✓	✓	✓	✓	✓	✓	✓	✓
Stiff Clay	✓	✓	✓	✓	✓	✓	✓	✓	✓
Sand	✓	✓	✓	✓	✓	✓	✓	✓	✓
Silty Sand	✓	✓	✓	✓	✓	✓	✓	✓	✓
MSE Berm	✓	✓	✓	✓	✓	✓	✓	✓	✓
MSW	✓	✓	✓	✓	✓	✗	✗	✓	✓

Liner Slope	✓	✓	✓	✓	✓	✓	✓	✓	✓
Liner Bottom	✓	✓	✓	✓	✓	✓	✓	✓	✓
Cover System	✓	✓	✓	✓	✓	✓	✓	✓	✓
Compacted Clay	✓	✓	✓	✓	✓	✓	✓	✓	✓
MSW-LWB	✗	✗	✗	✗	✗	✓	✓	✗	✗
Bedrock	✓	✓	✓	✓	✓	✓	✓	✓	✓

Support

Support 1

Support Type: GeoTextile
Force Application: Active
Force Orientation: Parallel to Reinforcement
Anchorage: None
Shear Strength Model: Linear
Use External Loads for Strength: yes
Strip Coverage: 100 percent
Tensile Strength: 3620 lb/ft
Pullout Strength Adhesion: 0 psf
Pullout Strength Friction Angle: 32 degrees

Entity Information

Group: Post-Closure

Shared Entities

Type	Coordinates X	Coordinates Y
External Boundary	0	267.394
	0	263.993
	0	255
	0	251
	0	237.545
	0	237.124
	0	225
	918.306	225
	918.306	265.56
	918.306	275.657
	918.306	284.709
	918.306	284.837
	918.306	287.709
	918.306	463.067
	918.306	466.067
	866.159	467.5
	845.952	467.5
	752.307	463.139
	662.571	433.505
	605.365	432.395
	243.891	313
	225.45	313
	215.45	313
	210.45	313
	195.45	313
	190.682	284.65
	189.325	276.581
	174.325	276.472
	174.325	276.472
	173.397	276.465
	0	276.465
Material Boundary	14.8525	263.899
	20.6166	263.928
Material Boundary	111.168	264.493
	118.325	264.638
	135.935	265
	142.846	265.295
	148.804	265.656
	155.294	266.005
	155.579	266
	155.69	266
	155.801	266
	156.036	266
	156.269	266
	161.142	266
	163.963	266
	176.98	266
	183.967	266
	187.828	266
	190.847	266
	200.76	266
	202.096	266
	208.706	266.195
	209.204	266.166
	212.249	266.126
	213.206	266.068
	214.732	266.057
	221.675	266.458
	223.243	266.548
	228.597	266.624
	234.664	266.71
	235.803	266.726
	238.166	267
	240.407	267.259
	243.891	267.561
	245.3	267.683
	248.968	268
	275.25	268.984
	275.367	268.992
	275.49	269
	275.548	269
	275.606	268.999
	275.618	268.996
	275.628	268.992
	275.659	268.991
	275.775	268.996
	277.995	268.92
	279.163	268.902
	299.798	268.571
	302.724	268.631
	304.496	268.667
	310.459	268.898
	311.919	268.932
	313.088	269
	321.978	269.517
	330.268	270
	331.391	270.035
	332.095	270.071
	333.251	270.144

Material Boundary

X	Y
711.835	281
746.351	281
756.165	281
756.822	281
785.494	281.721
795.704	282
811.202	282.321
837.772	282.871
843.78	283
864.53	283.526
883.771	284
888.393	284.118

X	Y
0	251
3.62511	251.092
6.31227	251.156
8.39158	251.21
17.1637	251.434
22.4605	251.584
39.2699	252.053
47.7657	252.295
54.8174	252.496
61.3129	252.692
98.6088	253.877
106.379	254.117
111.491	254.278
113.005	254.331
132.977	255
173.723	257.312
187.828	258.045
195.434	258.441
205.742	259.027
224.891	260
243.891	260.746
248.393	260.923
287.879	262.478
294.598	262.743
319.494	263.641
333.549	264.147
341.085	264.442
342.714	264.505
357.452	265
396.135	266.247
400.871	266.361
412.871	266.72
422.038	266.936
431.676	267.202
445.804	267.569
458.899	267.833
467.913	268.04
474.48	268.169
483.813	268.359
491.395	268.492

Material Boundary

X	Y
0	255
0.396516	255
1.21979	255
2.14325	255
3.05308	255
4.81628	255
6.56946	255
8.86921	255
9.81812	255
26.9591	255.498
33.0127	255.685
43.0858	256.003
82.6735	257.229
141.034	259.1
169.16	260
180.844	260.373
187.828	260.597
189.114	260.638
204.947	261.091
205.508	261.107
243.891	262.258
264.498	262.876
295.658	263.824
315.812	264.428
322.449	264.617
335.946	265
355.135	266.235
372.867	267.584
379.845	268.081
420.488	270
427.551	270.253
427.578	270.254
427.606	270.255
427.862	270.264
428.949	270.303
429.337	270.316
491.911	272.173
492.253	272.183
492.757	272.196
494.37	272.239
494.47	272.242
494.953	272.254
495.345	272.265
495.758	272.276
495.969	272.281
539.986	273.452
589.053	274.377
624.053	275
643.807	275.775

Material Boundary

X	Y
577.335	279
581.18	279.134

Material Boundary

X	Y
243.891	313
354.152	276.581
356.411	275.835
456.144	277.349
463.366	277.452
470.278	277.55
476.899	277.645
540.13	278.548
563.964	278.888
581.18	279.134
655.355	280.193
711.835	281
762.31	281.721
858.604	283.529
888.393	284.118
918.306	284.709

X	Y
243.891	313
244.884	313
252.972	313
253.468	313
310.043	294.313
312.496	293.503
320.381	290.899
337.537	285.232
356.881	278.843
357.805	278.859
358.032	278.863
359.338	278.886
360.062	278.899
360.311	278.903
360.34	278.904
382.977	279.304
386.38	279.352
388.512	279.383
397.875	279.517
403.413	279.596
406.808	279.644
415.338	279.766
417.254	279.793
418.609	279.813
427.181	279.935
427.657	279.942
431.233	279.993
432.405	280.01
440.724	280.128
448.659	280.242
456.237	280.35
463.481	280.453
470.412	280.552
477.051	280.647
483.416	280.738
483.83	280.744
489.667	280.827
495.272	280.907
495.708	280.914
498.047	280.947
538.672	281.527
542.281	281.579
548.065	281.661
553.611	281.74
558.933	281.816
564.046	281.889
568.96	281.96
573.688	282.027

Material Boundary

X	Y
356.411	275.835
356.881	278.843

Material Boundary

X	Y
252.972	313
605.365	429.395
662.571	430.505
752.307	460.14
845.953	464.5
866.159	464.5
918.306	463.067

Material Boundary

X	Y
173.397	267.021
173.887	267.008
176.062	267.01
177.276	267.011
179.242	267.01
184.101	267.005
188.465	267.005
193.417	267.124
196.897	267.337
202.33	267.469
204.119	267.472
205.906	267.47
205.907	267.469
206.945	267
209.1	267
217.713	267
219.714	267
225.275	267
234.774	267.359
235.704	267.409
248.317	268
257.563	268.612
263.421	269
265.56	269.214
275.367	268.992

Material Boundary

X	Y
356.411	275.835
369.381	271.551
370.38	271.221

X	Y
0	237.545
8.90245	237.853
18.3492	238.131

X	Y
275.775	268.996

Material Boundary

X	Y
0	263.993
20.6166	263.928
74.9056	264.205
98.8551	264.285
110.885	264.487
111.168	264.493
155.131	266
155.294	266.005
173.397	267.021
173.397	267.109
173.397	276.465

Material Boundary

X	Y
167.567	267
170.387	267.073
171.097	267.08
173.397	267.021

Material Boundary

X	Y
189.325	276.581
219.325	276.581
354.152	276.581

Material Boundary

X	Y
117.644	267.173
123.505	267.16
125.241	267.157
158.997	267.099
159.007	267.099
161.462	267.03
167.567	267

Material Boundary

X	Y
161.462	267.03
161.556	267.027
167.567	267

Material Boundary

X	Y
204.119	267.472
205.905	267.47
205.906	267.47

Material Boundary

X	Y
234.774	267.359
234.775	267.359
235.704	267.409

Material Boundary

X	Y
265.56	269.214
275.366	269
275.49	269

Material Boundary

X	Y
275.606	268.999
275.629	268.999
275.659	269
295.347	269.729

X	Y

Material Boundary	X / Y	0 267.394 27.7457 267.364 117.644 267.173 173.397 276.465

Scenario-based Entities

Type	Coordinates	Master Scenario	Global Static	Global Seismic	Global Static NC	Global Seismic NC	LWB Static	LWB Seismic	Horizontal Sliding	Horizontal Sliding Seismic
Piezoline	X Y 0 265 918.35 283	Assigned to materials: Soft Clay Stiff Clay	Assigned to materials: Soft Clay Stiff Clay	Assigned to materials: Soft Clay Stiff Clay	Assigned to materials: Soft Clay Stiff Clay	Assigned to materials: Soft Clay Stiff Clay	Assigned to materials: Soft Clay Stiff Clay	Assigned to materials: Soft Clay Stiff Clay	Assigned to materials: Soft Clay Stiff Clay	Assigned to materials: Soft Clay Stiff Clay
Piezoline	X Y 0 275 918.4 288	Assigned to materials: Sand Silty Sand MSE Berm Compacted Clay	Assigned to materials: Sand Silty Sand MSE Berm Compacted Clay	Assigned to materials: Sand Silty Sand MSE Berm Compacted Clay	Assigned to materials: Sand Silty Sand MSE Berm Compacted Clay	Assigned to materials: Sand Silty Sand MSE Berm Compacted Clay	Assigned to materials: Sand Silty Sand MSE Berm Compacted Clay	Assigned to materials: Sand Silty Sand MSE Berm Compacted Clay	Assigned to materials: Sand Silty Sand MSE Berm Compacted Clay	Assigned to materials: Sand Silty Sand MSE Berm Compacted Clay
Piezoline	X Y 0 265 918.306 285	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till
Piezoline	X Y 356.881 278.843 357.805 278.859 358.032 278.863 359.338 278.886 360.062 278.899 360.306 278.903 360.315 278.903 360.34 278.904 382.977 279.304 386.38 279.352 388.512 279.383 397.875 279.517 403.413 279.596 406.808 279.644 415.338 279.766 417.254 279.793 418.609 279.813 427.181 279.935 427.657 279.942 431.233 279.993 432.405 280.01 440.724 280.128 448.659 280.242 456.237 280.35 463.481 280.453 470.412 280.552 477.051 280.647 483.416 280.738 483.83 280.744 489.667 280.827 495.272 280.907 495.708 280.914 498.047 280.947 538.672 281.527 542.281 281.579 548.065 281.661 553.611 281.74 558.933 281.816 564.046 281.889 568.96 281.96 573.688 282.027 578.24 282.092 582.626 282.155 585.378 282.194 586.259 282.207 586.851 282.215 588.499 282.239 650.162 283.119 652.157 283.148 655.372 283.194 658.448 283.238 660.341 283.265 661.383 283.28 664.163 283.319 666.815 283.357 669.348 283.393 671.769 283.428 674.085 283.461 675.368 283.479 676.304 283.493 677.17 283.505 761.653 284.711 761.938 284.715 762.312 284.721 762.395 284.722 762.83 284.728 763.243 284.734 763.637 284.74 764.013 284.745 [illegible]	Assigned to materials: Liner Bottom	Assigned to materials: Liner Bottom	Assigned to materials: Liner Bottom	Assigned to materials: Liner Bottom	Assigned to materials: Liner Bottom	Assigned to materials: Liner Bottom	Assigned to materials: Liner Bottom	Assigned to materials: Liner Bottom	Assigned to materials: Liner Bottom

Bolt	X Y 190.909 286 212.909 286	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 191.161 287.5 213.161 287.5	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 191.414 289 213.414 289	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 191.666 290.5 213.666 290.5	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 191.918 292 213.918 292	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 192.17 293.5 214.17 293.5	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 192.423 295 214.423 295	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 192.675 296.5 214.675 296.5	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 192.927 298 214.927 298	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 193.18 299.5 215.18 299.5	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 193.432 301 215.432 301	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 193.684 302.5 215.684 302.5	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 193.937 304 215.937 304	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 194.189 305.5 216.189 305.5	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 194.441 307 216.441 307	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 194.693 308.5 216.693 308.5	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 194.946 310 216.946 310	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 195.198 311.5 217.198 311.5	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 195.45 313 217.45 313	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1

Bolt	X Y 189.395 277 211.395 277	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 189.648 278.5 211.648 278.5	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 189.9 280 211.9 280	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 190.152 281.5 212.152 281.5	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 190.404 283 212.404 283	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 190.657 284.5 212.657 284.5	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Tension Crack	X Y 243.996 306.27 356.848 331 356.848 350.31	✗	Water level: dry	✗	✗	✗	✗	✗	✗	✗
Tension Crack	X Y 918.306 457.487 735.175 457.482	✗	✗	✗	Water level: dry	✗	✗	✗	✗	✗
Block Search Window	X Y 222.012 264.281 136.983 264.266 136.924 225.111 221.914 224.85	✗	✗	✗	✓	✓	✗	✗	✗	✗
Block Search Window	X Y 290.178 267.889 205.149 267.874 205.09 228.719 290.08 228.458	✗	✗	✗	✓	✓	✗	✗	✗	✗
Block Search Window	X Y 360.039 271.259 275.01 271.244 274.951 232.089 359.941 231.828	✗	✗	✗	✓	✓	✗	✗	✗	✗
Block Search Window	X Y 430.925 274.526 345.896 274.511 345.837 235.356 430.827 235.095	✗	✗	✗	✓	✓	✗	✗	✗	✗
Tension Crack	X Y 918.306 449.628 710.492 449.33	✗	✗	✗	✗	Water level: dry	✗	✗	✗	✗
Block Search Polyline	X Y 248.485 312.781 356.634 277.259 759.091 283.086	✗	✗	✗	✗	✗	✓	✓	✓	✓
Block Search Window	X Y 662.571 433.505 605.365 432.395 243.891 313 662.74 294.114	✗	✗	✗	✗	✗	✗	✗	✓	✓

Section VIII

Slide Analysis Information
2019.10.01 Ph14 VIII PC

Project Summary

File Name:	2019.10.01 Ph14 VIII PC.slmd
Last saved with Slide version:	8.028
Project Title:	SLIDE - An Interactive Slope Stability Program
Date Created:	7/16/2019, 9:54:59 AM

Currently Open Scenarios

Group Name	Scenario Name	Compute Time
Post-Closure	Master Scenario	
	Inward	
	Inward Seismic	
	Inward NC	
	Inward NC Seismic	
	Outward	
	Outward Seismic	
	Outward NC	
	Outward NC Seismic	

General Settings

Units of Measurement:	Imperial Units
Time Units:	days
Permeability Units:	feet/second
Data Output:	Standard

	Master Scenario	Inward	Inward Seismic	Inward NC	Inward NC Seismic	Outward	Outward Seismic	Outward NC	Outward NC Seismic
Failure Direction:	Right to Left	Left to Right	Left to Right	Left to Right	Left to Right	Right to Left	Right to Left	Right to Left	Right to Left

Analysis Options

All Open Scenarios	
Slices Type:	Vertical
Analysis Methods Used	
	Spencer
Number of slices:	50
Tolerance:	0.005
Maximum number of iterations:	75
Check malpha < 0.2:	Yes
Create Interslice boundaries at intersections with water tables and piezos:	Yes
Initial trial value of FS:	1
Steffensen Iteration:	Yes

Groundwater Analysis

All Open Scenarios	
Groundwater Method:	Water Surfaces
Pore Fluid Unit Weight [lbs/ft3]:	62.4
Use negative pore pressure cutoff:	Yes
Maximum negative pore pressure [psf]:	0
Advanced Groundwater Method:	None

Random Numbers

All Open Scenarios	
Pseudo-random Seed:	10116
Random Number Generation Method:	Park and Miller v.3

Surface Options

Post-Closure - Master Scenario	Post-Closure - Inward	Post-Closure - Inward Seismic	Post-Closure - Inward NC	Post-Closure - Inward NC Seismic	Post-Closure - Outward	Post-Closure - Outward Seismic	Post-Closure - Outward NC	Post-Closure - Outward NC Seismic
Surface Type: Circular	Surface Type: Circular	Surface Type: Circular	Surface Type: Non-Circular Block Search	Surface Type: Non-Circular Block Search	Surface Type: Circular	Surface Type: Circular	Surface Type: Non-Circular Block Search	Surface Type: Non-Circular Block Search
Search Method: Auto Refine Search	Search Method: Grid Search	Search Method: Grid Search	Number of Surfaces: 5000	Number of Surfaces: 5000	Search Method: Grid Search	Search Method: Grid Search	Number of Surfaces: 5000	Number of Surfaces: 5000
Divisions along slope: 20	Radius Increment: 10	Radius Increment: 10	Multiple Groups: Disabled	Multiple Groups: Disabled	Radius Increment: 10	Radius Increment: 10	Multiple Groups: Disabled	Multiple Groups: Disabled
Circles per division: 10	Composite Surfaces: Disabled	Composite Surfaces: Disabled	Pseudo-Random Surfaces: Enabled	Pseudo-Random Surfaces: Enabled	Composite Surfaces: Disabled	Composite Surfaces: Disabled	Pseudo-Random Surfaces: Enabled	Pseudo-Random Surfaces: Enabled
Number of 10	Reverse Curvature: Invalid Surfaces	Reverse Curvature: Invalid Surfaces			Reverse Curvature: Invalid Surfaces	Reverse Curvature: Invalid Surfaces		
	Minimum Not	Minimum Not			Minimum Not	Minimum Not		

Seismic Loading

	Post-Closure - Master Scenario	Post-Closure - Inward	Post-Closure - Inward Seismic	Post-Closure - Inward NC	Post-Closure - Inward NC Seismic	Post-Closure - Outward	Post-Closure - Outward Seismic	Post-Closure - Outward NC	Post-Closure - Outward NC Seismic
Advanced seismic analysis:	No	No	No	No	No	No	No	No	No
Staged pseudostatic analysis:	No	No	No	No	No	No	No	No	No
Seismic Load Coefficient (Horizontal):			0.106		0.106		0.106		0.106

Loading

All Open Scenarios	
2 Distributed Loads present	
Distributed Load 1	
Distribution:	Constant
Magnitude [psf]:	2350
Orientation:	Vertical
Distributed Load 2	
Distribution:	Constant
Magnitude [psf]:	2350
Orientation:	Vertical

Materials

Property	Till	Soft Clay	Stiff Clay	Sand	Silty Sand	MSE Berm	Bedrock
Color							
Strength Type	Mohr-Coulomb	SHANSEP	SHANSEP	Mohr-Coulomb	Mohr-Coulomb	Mohr-Coulomb	Infinite strength
Unit Weight [lbs/ft3]	150	120	125	110	110	120	165
Allow Sliding Along Boundary							Yes
Cohesion [psf]	10000			0	0	100	
Friction Angle [°]	50			36	32	32	
A [psf]		0	0				
S		0.19	0.22				
m		0.66	0.76				
Stress History Type		Preconsolidation Pressure	Preconsolidation Pressure				
Definition Method		Constant [4600]	Constant [15500]				
Material Dependent Vertical Stress		No	No				
Water Surface	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario	Assigned per scenario
Hu Value	1	1	1	1	1	1	
Ru Value							0

Materials In Use

Material	Master Scenario	Inward	Inward Seismic	Inward NC	Inward NC Seismic	Outward	Outward Seismic	Outward NC	Outward NC Seismic
Till	✓	✓	✓	✓	✓	✓	✓	✓	✓
Soft Clay	✓	✓	✓	✓	✓	✓	✓	✓	✓
Stiff Clay	✓	✓	✓	✓	✓	✓	✓	✓	✓
Sand	✓	✓	✓	✓	✓	✓	✓	✓	✓
Silty Sand	✓	✓	✓	✓	✓	✓	✓	✓	✓
MSE Berm	✓	✓	✓	✓	✓	✓	✓	✓	✓
Bedrock	✓	✓	✓	✓	✓	✓	✓	✓	✓

Support

Support 1

Support Type: GeoTextile
Force Application: Active
Force Orientation: Parallel to Reinforcement
Anchorage: None
Shear Strength Model: Linear
Use External Loads for Strength: yes
Strip Coverage: 100 percent
Tensile Strength: 1760 lb/ft
Pullout Strength Adhesion: 0 psf
Pullout Strength Friction Angle: 32 degrees

Entity Information

Group: Post-Closure

Shared Entities

Type	X	Y
External Boundary	57.0909	277.675
	44.2224	277.309
	33.3807	277
	25.5115	276.562
	19.0587	276.202
	12.7313	276
	1.78344	274.807
	0	274.581
	0	274.25
	0	267.695
	0	260.893
	0	244.771
	0	234.923
	0	225
	238.498	225
	238.498	242.288
	238.498	253.203
	238.498	263.829
	238.498	270.312
	238.498	281.961
	238.498	285.71
	217.531	285.805
	210.588	285.727
	198.476	285.696
	195.635	285.625
	192.756	285.536
	179.885	285.49
	179.092	285.496
	166.59	285.587
	164.055	285.514
	162.327	285.465
	157.172	285.292
	153.878	285.18
	146.69	285.012
	142.506	284.958
	140.978	284.938
	138.613	285.007
	136.662	296.711
	134.844	307.62
	119.844	307.62
	104.844	307.62
	104.844	307.62
	101.075	285.006
	101.075	285.006
	78.4615	281.237
Material Boundary	0	244.771
	0.899061	244.785
	14.5378	245
	28.7866	245.781
	36.4443	246.123
	56.4833	247.133
	69.5486	247.698
	122.682	250
	130.658	250.269
	132.54	250.315
	133.159	250.331
	144.162	250.692
	167.954	251.44
	174.708	251.588
	180.557	251.717
	193.682	252.119
	197.136	252.186
	208.477	252.511
	225.609	252.84
	237.589	253.179
	238.498	253.203
Material Boundary	0	260.893
	20.0626	261.128
	59.5799	261.593
	81.4608	261.849
	117.766	262.274
	123.649	262.343
	238.498	263.829
	0	267.695
	6.30825	267.753
	27.4273	267.956
	28.7058	267.968
	32.0029	268
	42.0986	268.102

	X	Y
Material Boundary	0	274.25
	15.4262	276
	19.0587	276.202

	X	Y
Material Boundary	81.7086	278.439
	84.0627	278.545
	95.3148	279
	99.7637	279.365
	100.142	279.406
	100.782	279.476
	114.748	281
	118.071	281.235
	120.45	281.262
	121.224	281.271
	126.073	281.461
	129.2	281.488
	130.96	281.504
	132.959	281.521
	138.414	281.557
	139.188	281.562
	144.519	281.599
	149.76	281.634
	159.718	281.701
	165.15	281.728
	178.672	281.794
	180.014	281.801
	186.477	281.829
	190.474	281.843
	210.448	281.906
	211.258	281.908
	213.891	281.914
	215.423	281.918
	235.554	281.955
	235.682	281.956
	238.498	281.961

	X	Y
Material Boundary	100.154	279.476
	100.782	279.476

	X	Y
Material Boundary	101.075	285.006
	101.172	285.006
	123.613	285.006
	127.458	285.006
	138.615	285.006

	X	Y
Material Boundary	0	234.923
	3.09256	235
	27.7051	235.902
	33.1217	236.072
	58.369	236.965
	87.6206	237.884
	95.8569	238.164
	105.969	238.483
	119.082	238.923
	153.916	240
	159.266	240.161
	160.515	240.191
	164.988	240.324
	166.258	240.353
	198.842	241.296
	204.903	241.435
	213.489	241.684
	225.432	241.947
	229.913	242.052
	238.498	242.288

Material Boundary	X Y 57.0909 277.675 60.0681 277.76 63.5596 277.839 64.957 277.863 71.99 278 78.0037 278.271 79.9674 278.36 81.7086 278.439 100.154 279.476 101.075 285.006 101.075 285.006
Material Boundary	X Y 138.615 285.006 140.978 284.938
Material Boundary	X Y 119.844 307.62 119.844 307.619 120.299 304.893 123.613 285.007
Material Boundary	X Y 101.075 285.006 104.844 307.62
Material Boundary	X Y 116.075 285.007 119.46 305.312 119.844 307.619 119.844 307.62
Material Boundary	X Y 101.075 285.006 101.075 285.006 101.172 285.006

Scenario-based Entities

Type	Coordinates	Master Scenario	Inward	Inward Seismic	Inward NC	Inward NC Seismic	Outward	Outward Seismic	Outward NC	Outward NC Seismic
Piezoline	X Y 0 270 238.5 275	Assigned to materials: Soft Clay Stiff Clay	Assigned to materials: Soft Clay Stiff Clay	Assigned to materials: Soft Clay Stiff Clay	Assigned to materials: Soft Clay Stiff Clay	Assigned to materials: Soft Clay Stiff Clay	Assigned to materials: Soft Clay Stiff Clay	Assigned to materials: Soft Clay Stiff Clay	Assigned to materials: Soft Clay Stiff Clay	Assigned to materials: Soft Clay Stiff Clay
Piezoline	X Y 0 273 238.5 275	Assigned to materials: Sand Silty Sand MSE Berm	Assigned to materials: Sand Silty Sand MSE Berm	Assigned to materials: Sand Silty Sand MSE Berm	Assigned to materials: Sand Silty Sand MSE Berm	Assigned to materials: Sand Silty Sand MSE Berm	Assigned to materials: Sand Silty Sand MSE Berm	Assigned to materials: Sand Silty Sand MSE Berm	Assigned to materials: Sand Silty Sand MSE Berm	Assigned to materials: Sand Silty Sand MSE Berm
Piezoline	X Y 0 260 238.5 265	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till	Assigned to materials: Till
Distributed Load	X Y 113.836 307.62 115.514 307.62	Constant Distribution Orientation: Vertical Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Vertical Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Vertical Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Vertical Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Vertical Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Vertical Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Vertical Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Vertical Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Vertical Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No
Distributed Load	X Y 124.174 307.62 125.813 307.62	Constant Distribution Orientation: Vertical Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Vertical Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Vertical Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Vertical Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Vertical Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Vertical Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Vertical Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Vertical Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No	Constant Distribution Orientation: Vertical Magnitude: 2350 lbs/ft2 Creates Excess Pore Pressure: No
Bolt	X Y 120.095 306.115 135.095 306.115	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 119.845 307.615 134.845 307.615	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 123.595 285.115 138.595 285.115	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 123.345 286.615 138.345 286.615	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1

Bolt	X Y 123.095 288.115 138.095 288.115	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 122.845 289.615 137.845 289.615	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 122.595 291.115 137.595 291.115	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 122.345 292.615 137.345 292.615	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 122.095 294.115 137.095 294.115	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 121.845 295.615 136.845 295.615	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 121.595 297.115 136.595 297.115	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 121.345 298.615 136.345 298.615	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 121.095 300.115 136.095 300.115	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 120.845 301.615 135.845 301.615	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 120.595 303.115 135.595 303.115	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 120.345 304.615 135.345 304.615	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 101.094 285.12 116.094 285.12	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 101.344 286.62 116.344 286.62	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 101.594 288.12 116.594 288.12	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 101.844 289.62 116.844 289.62	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 102.094 291.12 117.094 291.12	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 102.344 292.62 117.344 292.62	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 102.594 294.12 117.594 294.12	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 102.844 295.62 117.844 295.62	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 103.094 297.12 118.094 297.12	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 103.344 298.62 118.344 298.62	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 103.594 300.12	Support	Support	Support	Support	Support	Support	Support 1	Support 1	Support 1

Bolt	X Y 103.844 301.62 118.844 301.62	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 104.094 303.12 119.094 303.12	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 104.344 304.62 119.344 304.62	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 104.594 306.12 119.594 306.12	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Bolt	X Y 104.844 307.62 119.844 307.62	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1	Support 1
Block Search Window	X Y 184.755 284.031 157.13 284.031 157.13 247.29 184.755 247.29	✗	✗	✗	✓	✓	✗	✗	✗	✗
Block Search Window	X Y 169.166 284.031 141.541 284.031 141.541 247.29 169.166 247.29	✗	✗	✗	✓	✓	✗	✗	✗	✗
Block Search Window	X Y 151.403 279.202 123.778 279.202 123.778 249.728 151.308 249.728	✗	✗	✗	✓	✓	✗	✗	✗	✗
Block Search Window	X Y 101.212 243.87 140.131 243.91 140.131 284.66 101.212 284.66	✗	✗	✗	✗	✗	✗	✗	✓	✓
Block Search Window	X Y 64.5828 237.457 103.502 237.496 103.502 284.66 64.5828 278.246	✗	✗	✗	✗	✗	✗	✗	✓	✓

ATTACHMENT 6

Technical References for Evaluating Seismic Parameters

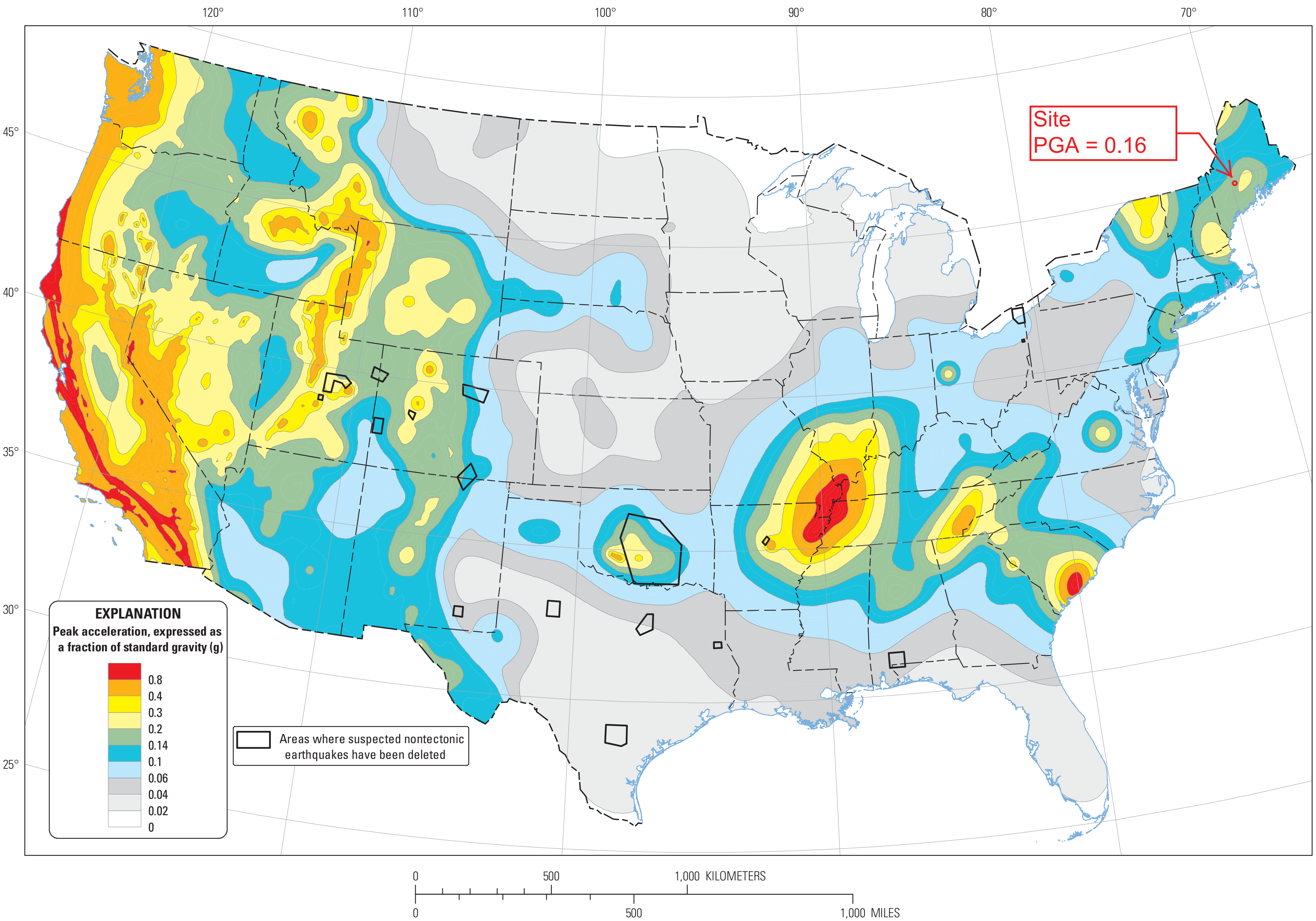


Figure A6-1a. Seismic hazard map for two percent probability of exceedance in 50 years of peak ground acceleration (after USGS, 2014).

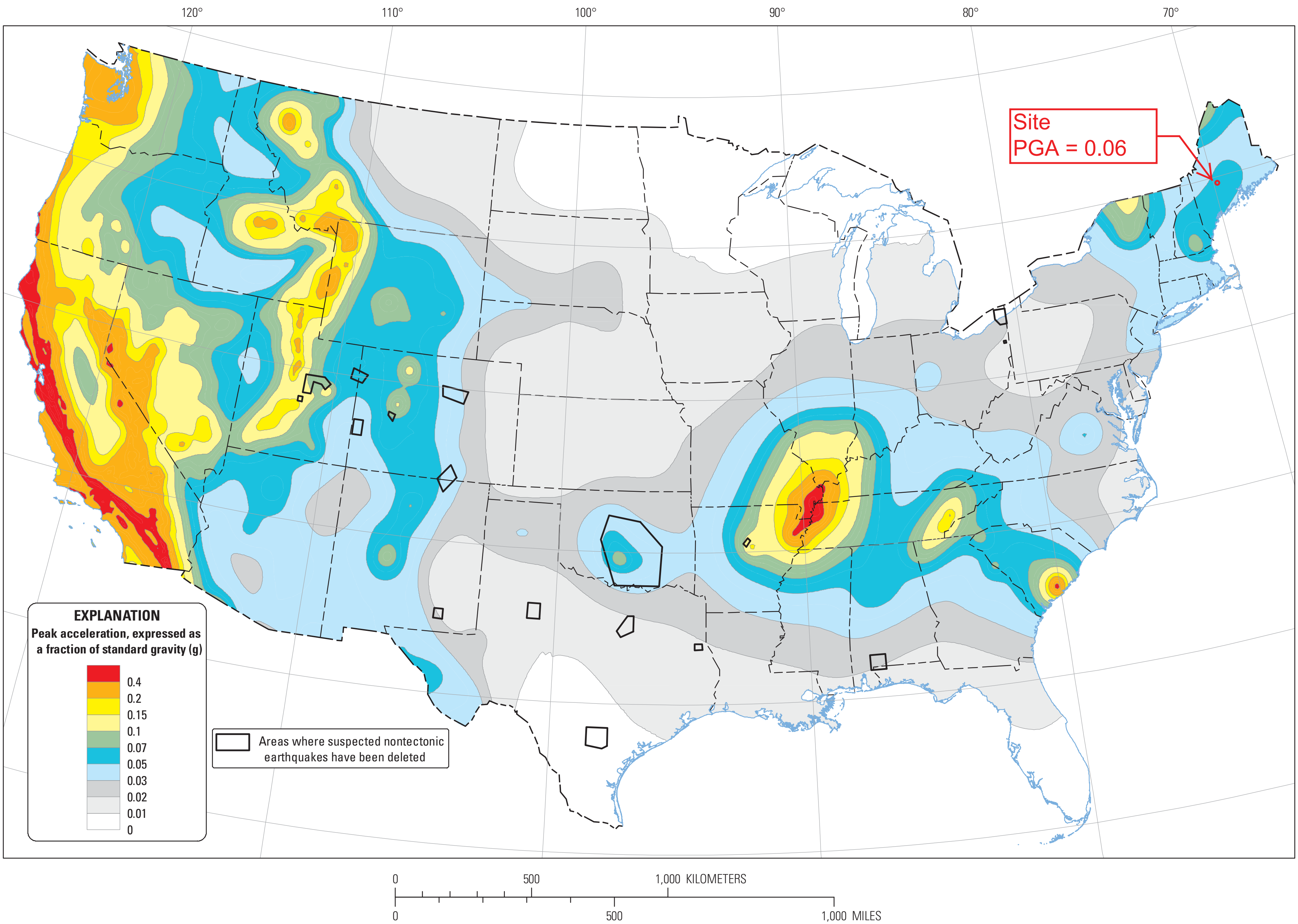


Figure A6-1b. Seismic hazard map for ten percent probability of exceedance in 50 years of peak ground acceleration (after USGS, 2014).

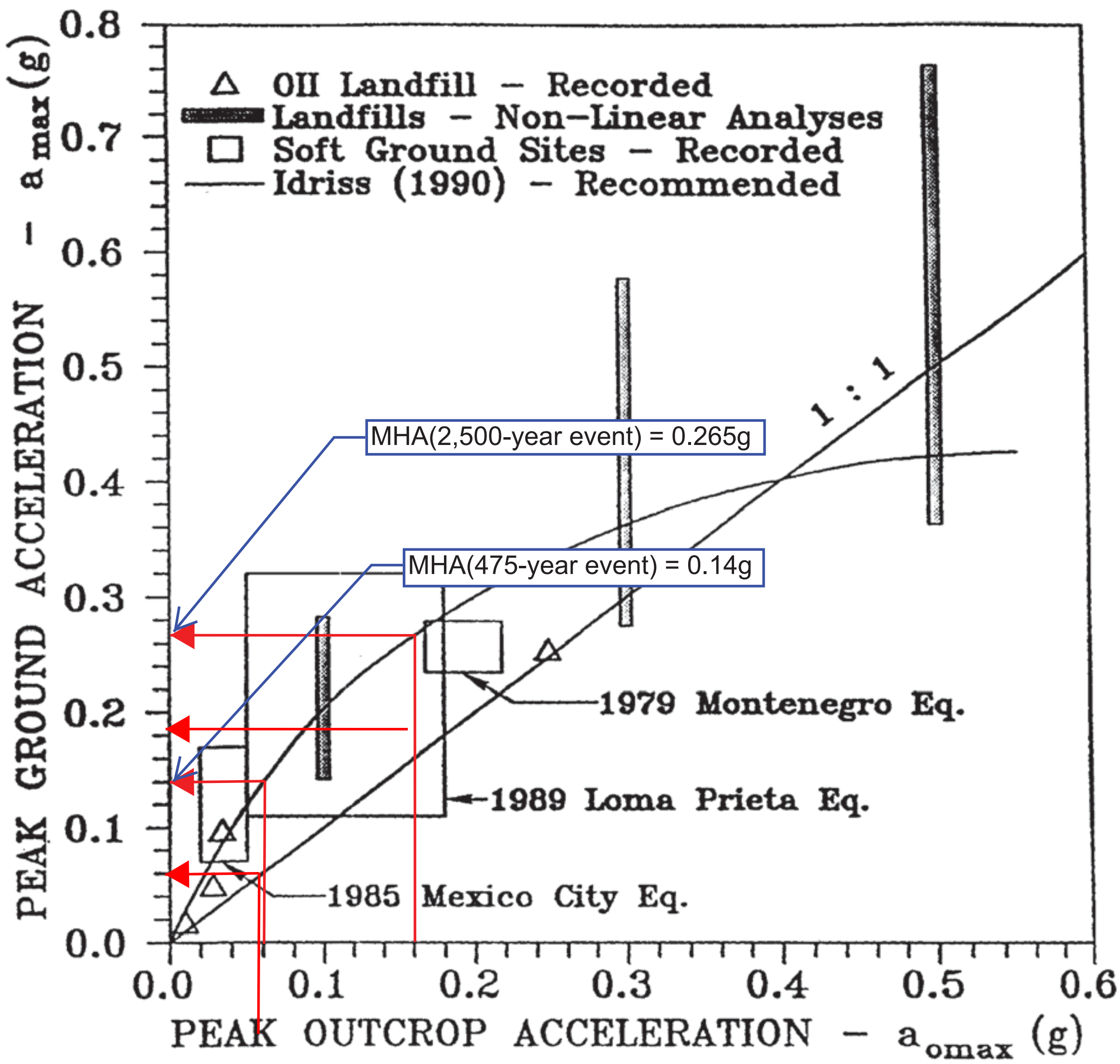
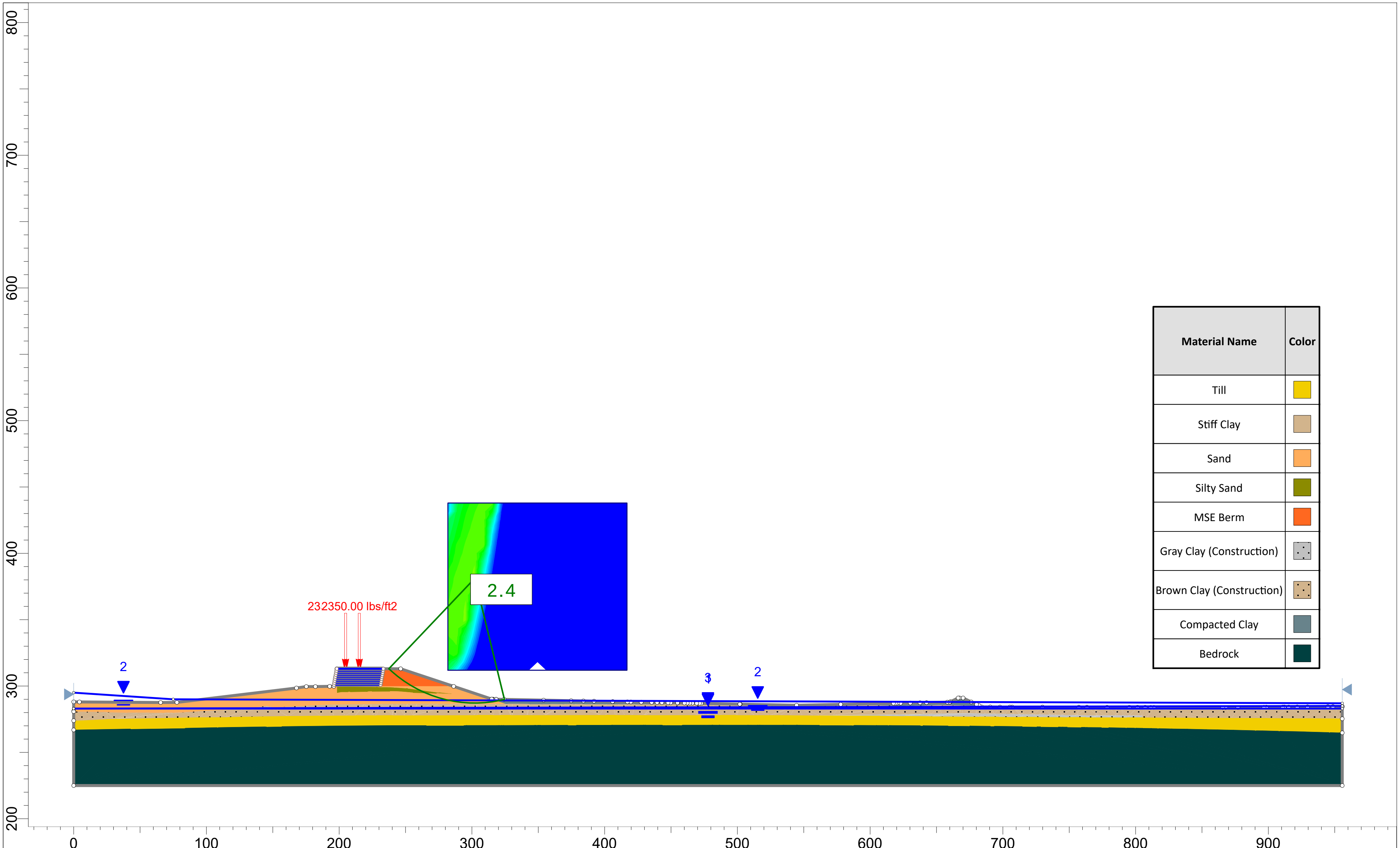


Figure A6-2. Observed Variations of Peak Horizontal Accelerations on Soft Soil and MSW sites in Comparison to Rock Sites (after Kavazanjian and Matasovic, 1994).

ATTACHMENT 7
Slope Stability Outputs for Static Construction Condition

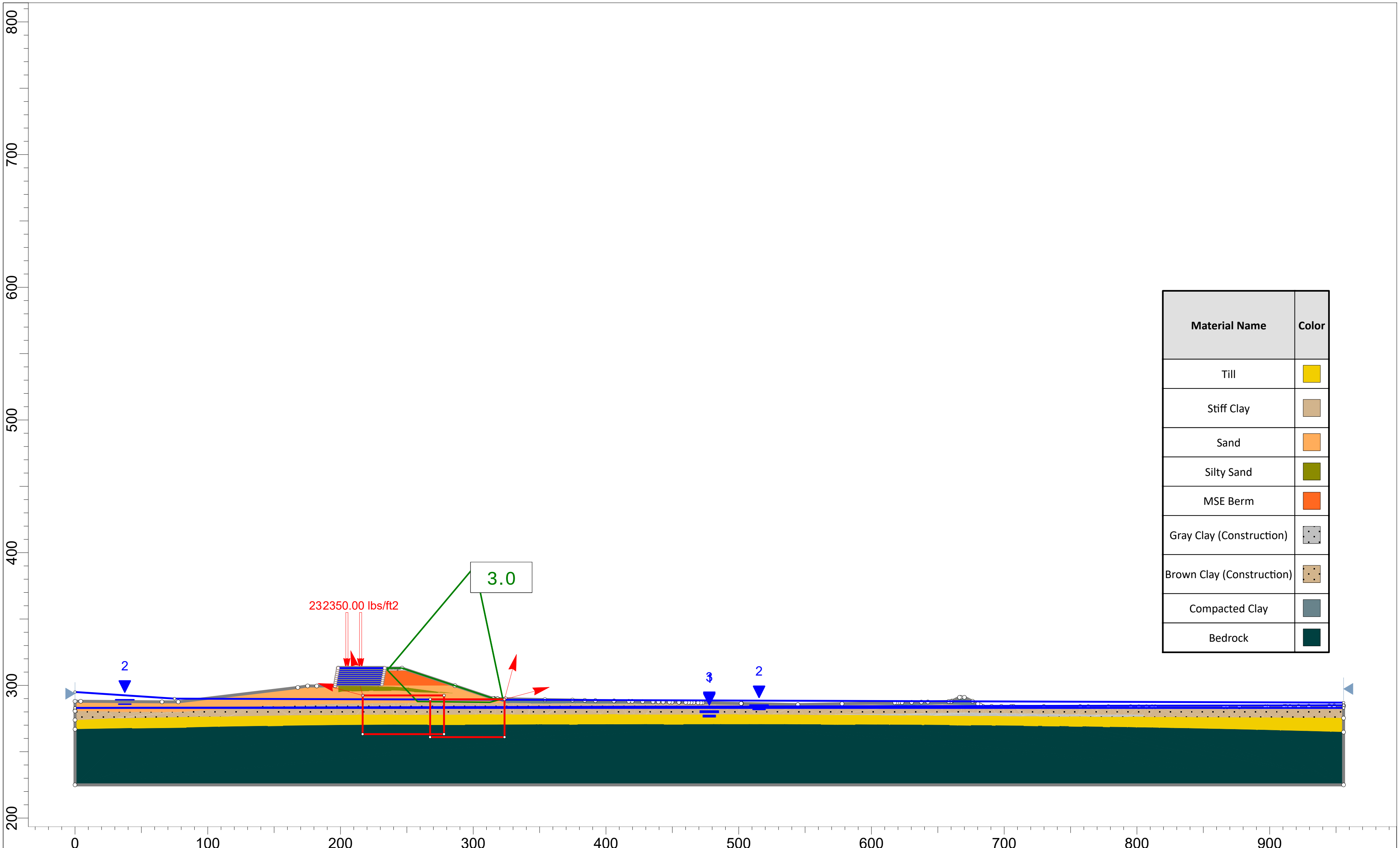
Section I



Geosyntec consultants

Project Crossroads Phase 14 Stability Section I			
Analysis Description Construction, Static, Inward Circular			
Drawn By A. Rohrman	*Scale* 1:1200	*Company* Geosyntec Consultants	
Date 10/1/2019		*File Name* 2019.10.01 Ph14 I.slmd	

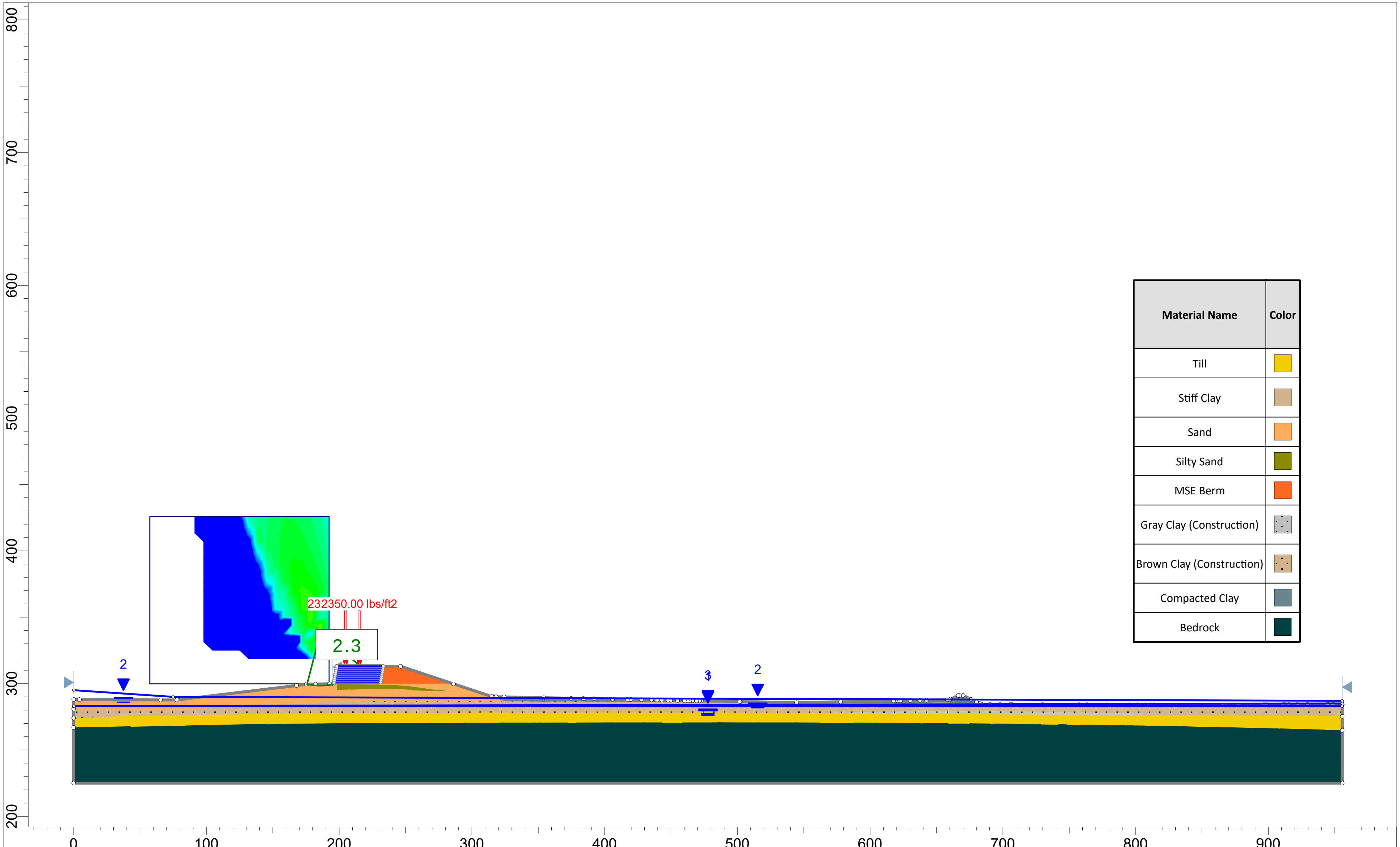
SLIDEINTERPRET 8.028



Geosyntec consultants

Project	Crossroads Phase 14 Stability Section I
Analysis Description	Construction, Static, Inward Non-Circular
Drawn By	A. Rohrman
Scale	1:1200
Company	Geosyntec Consultants
Date	10/1/2019
File Name	2019.10.01 Ph14 I.slmd

SLIDEINTERPRET 8.028

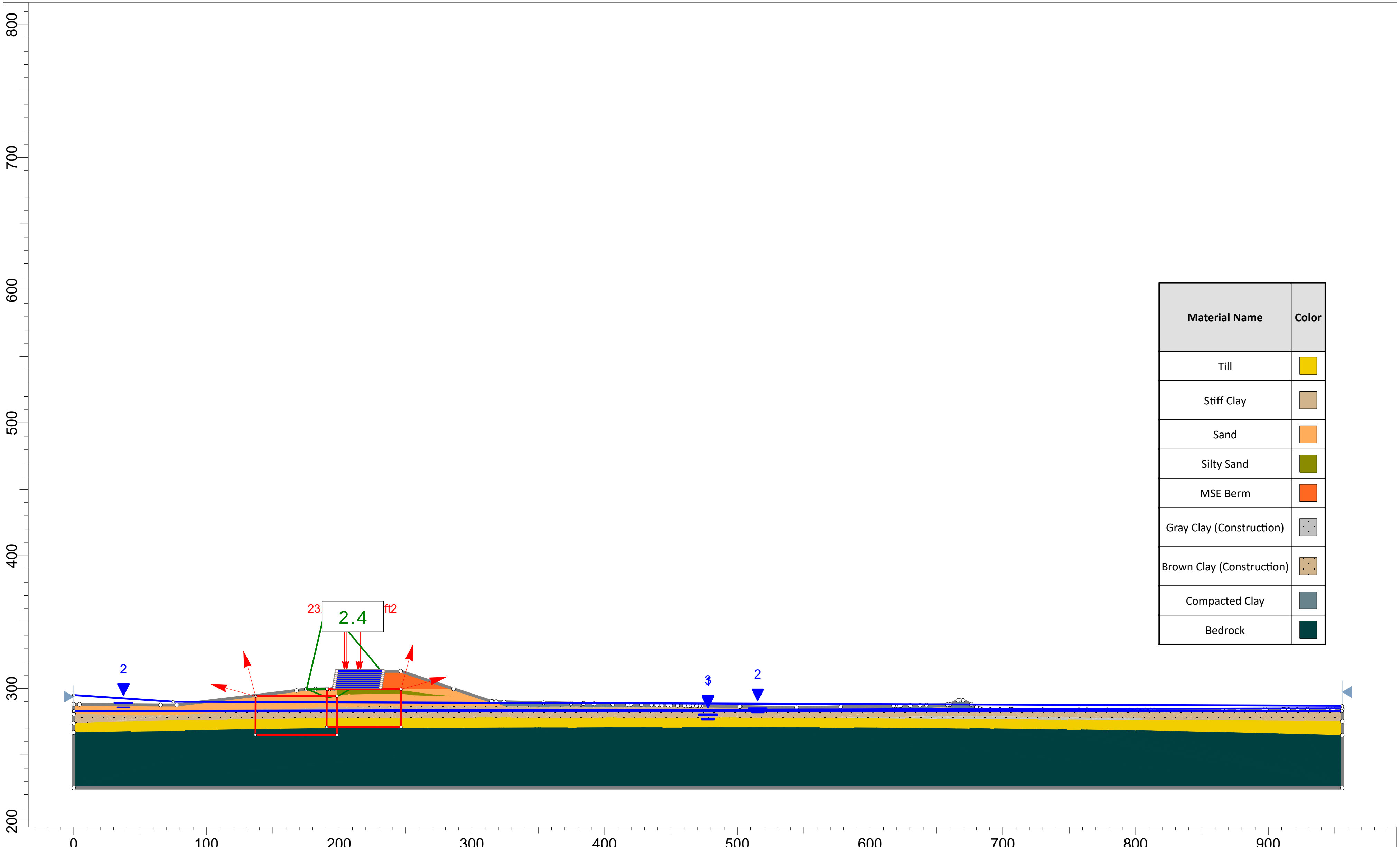


Material Name	Color
Till	
Stiff Clay	
Sand	
Silty Sand	
MSE Berm	
Gray Clay (Construction)	
Brown Clay (Construction)	
Compacted Clay	
Bedrock	

Geosyntec consultants

SLIDEINTERPRET 8.028

Project	Crossroads Phase 14 Stability Section I		
Analysis Description	Construction, Static, Outward Circular		
Drawn By A. Rohrman	*Scale* 1:1200	*Company*	Geosyntec Consultants
Date	10/1/2019	*File Name*	2019.10.01 Ph14 I.slmd



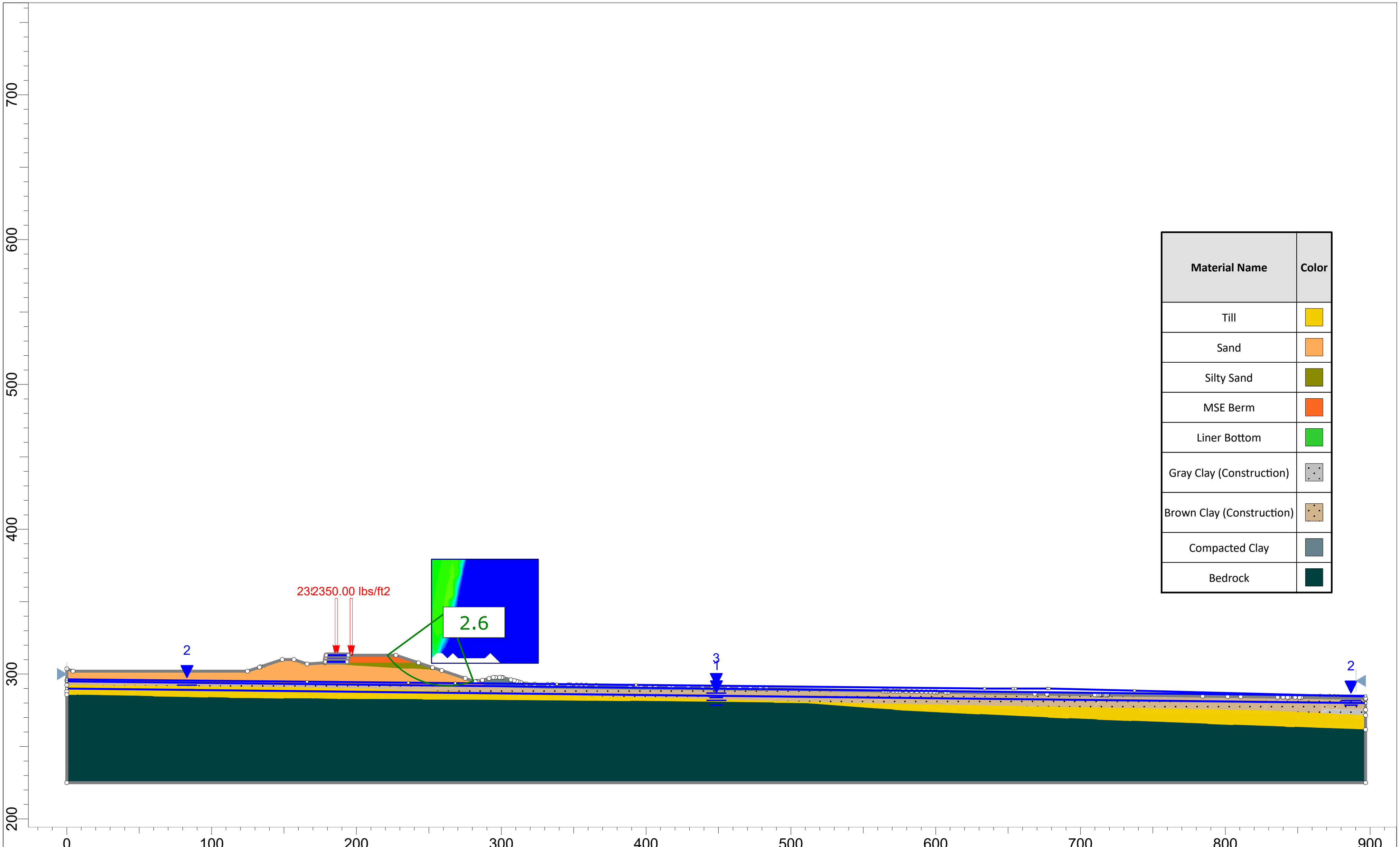
Material Name	Color
Till	
Stiff Clay	
Sand	
Silty Sand	
MSE Berm	
Gray Clay (Construction)	
Brown Clay (Construction)	
Compacted Clay	
Bedrock	

Geosyntec consultants

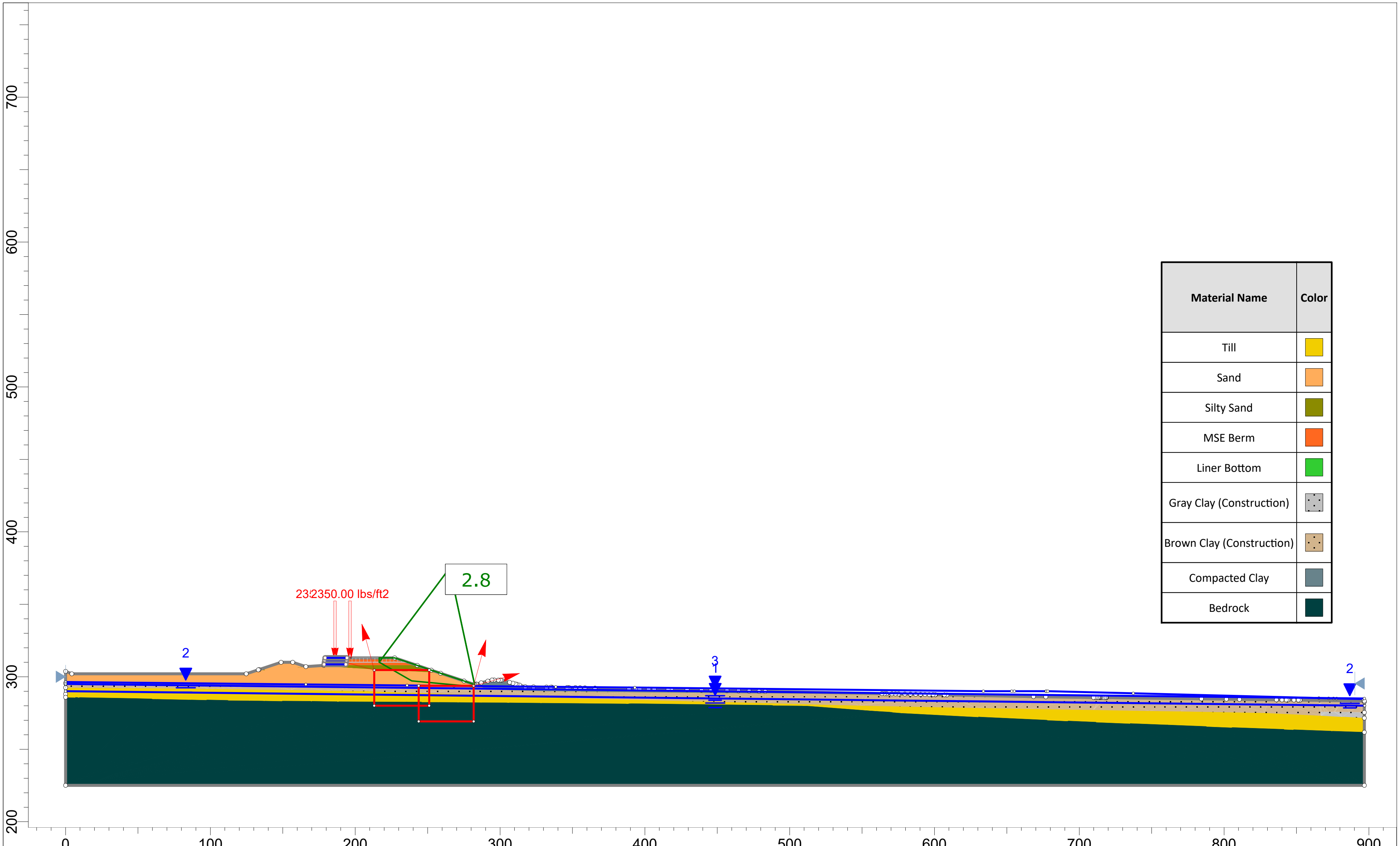
Project	Crossroads Phase 14 Stability Section I		
Analysis Description	Construction, Static, Outward Non-Circular		
Drawn By A. Rohrman	*Scale* 1:1200	*Company*	Geosyntec Consultants
Date	10/1/2019	*File Name*	2019.10.01 Ph14 I.slmd

SLIDEINTERPRET 8.028

Section II



Geosyntec consultants	*Project* Crossroads Phase 14 Stability Section II		
	Analysis Description Construction, Static, Inward Circular		
	Drawn By A. Rohrman	*Scale* 1:1100	*Company* Geosyntec Consultants
SLIDEINTERPRET 8.028	*Date* 10/1/2019		*File Name* 2019.10.01 Ph14 II.slmd

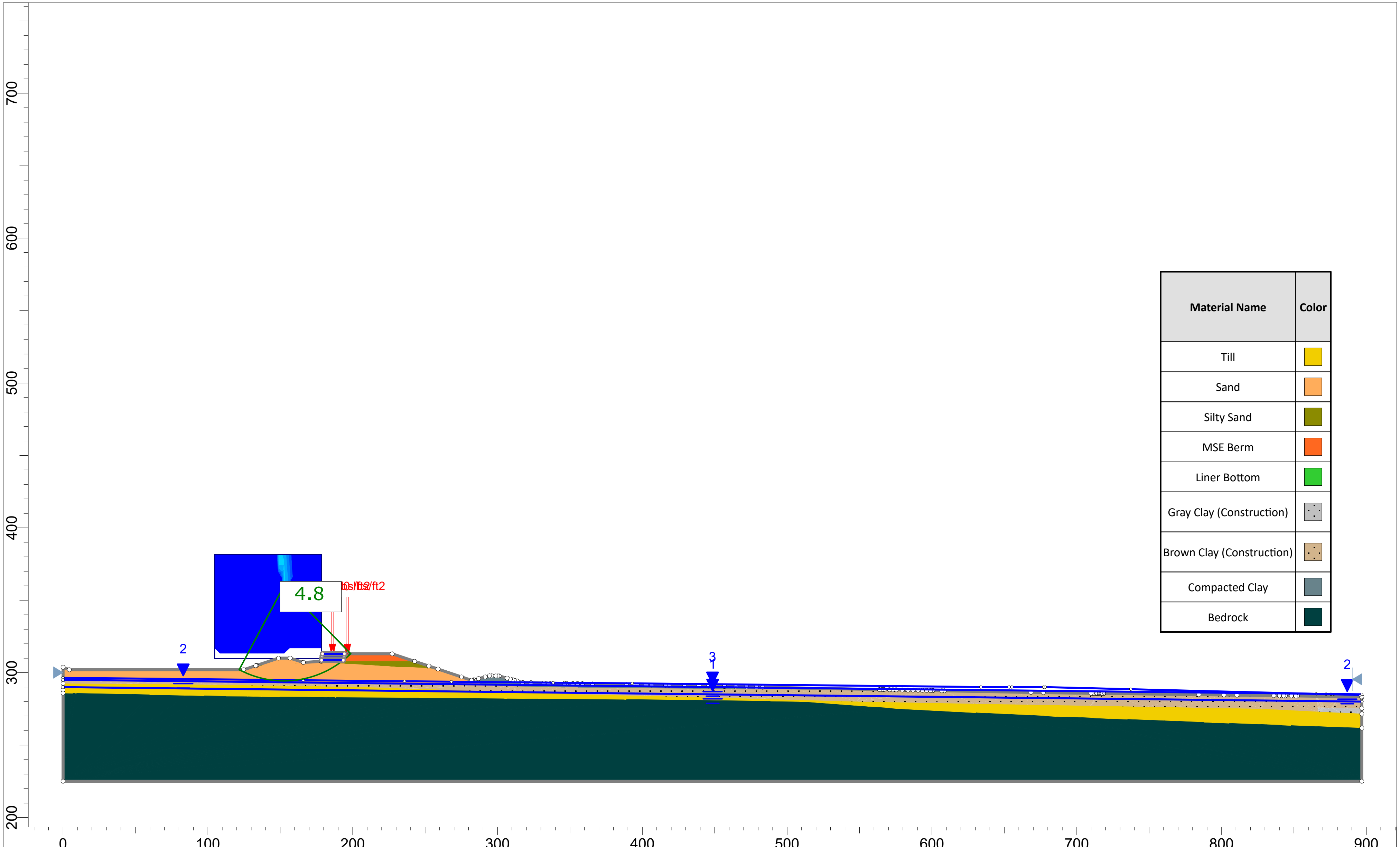


Material Name	Color
Till	
Sand	
Silty Sand	
MSE Berm	
Liner Bottom	
Gray Clay (Construction)	
Brown Clay (Construction)	
Compacted Clay	
Bedrock	

Geosyntec consultants

SLIDEINTERPRET 8.028

Project	Crossroads Phase 14 Stability Section II		
Analysis Description	Construction, Static, Inward Non-Circular		
Drawn By A. Rohrman	*Scale* 1:1100	*Company*	Geosyntec Consultants
Date	10/1/2019	*File Name*	2019.10.01 Ph14 II.slmd

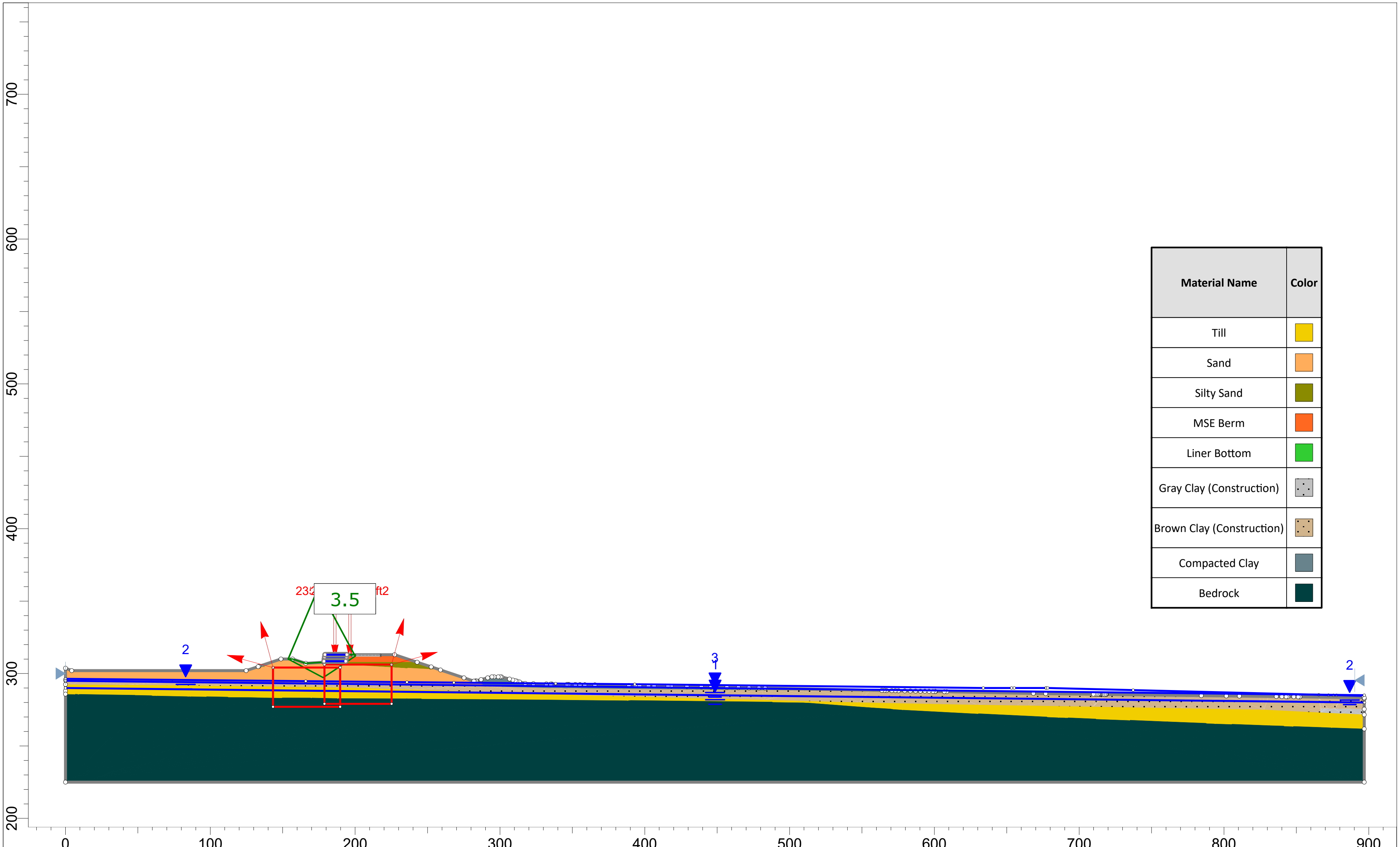


Material Name	Color
Till	
Sand	
Silty Sand	
MSE Berm	
Liner Bottom	
Gray Clay (Construction)	
Brown Clay (Construction)	
Compacted Clay	
Bedrock	

Geosyntec consultants

SLIDEINTERPRET 8.028

Project	Crossroads Phase 14 Stability Section II
Analysis Description	Construction, Static, Outward Circular
Drawn By	A. Rohrman
Scale	1:1100
Company	Geosyntec Consultants
Date	10/1/2019
File Name	2019.10.01 Ph14 II.slmd



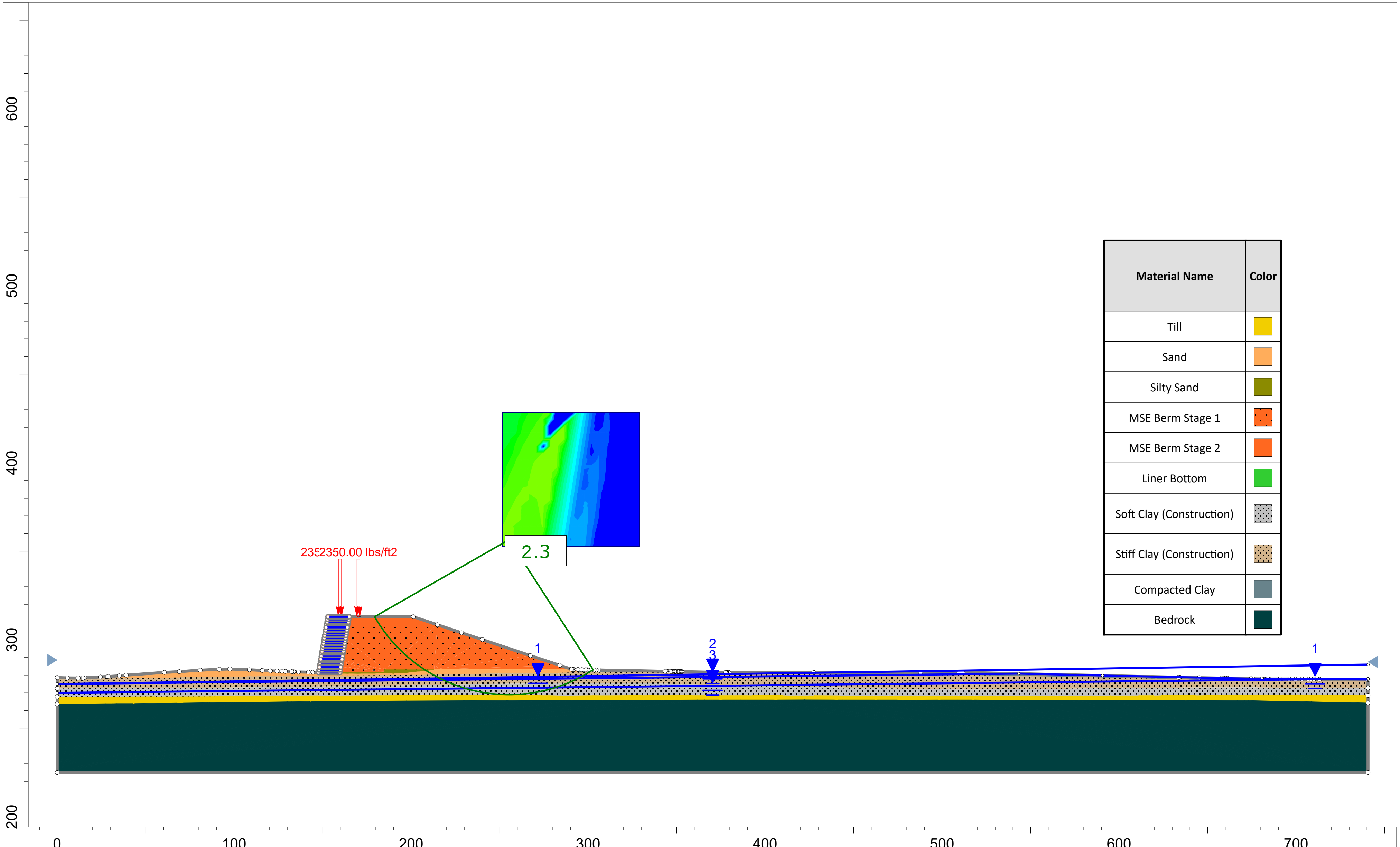
Material Name	Color
Till	
Sand	
Silty Sand	
MSE Berm	
Liner Bottom	
Gray Clay (Construction)	
Brown Clay (Construction)	
Compacted Clay	
Bedrock	

Geosyntec consultants

SLIDEINTERPRET 8.028

Project	Crossroads Phase 14 Stability Section II
Analysis Description	Construction, Static, Outward Non-Circular
Drawn By	A. Rohrman
Scale	1:1100
Company	Geosyntec Consultants
Date	10/1/2019
File Name	2019.10.01 Ph14 II.slmd

Section III

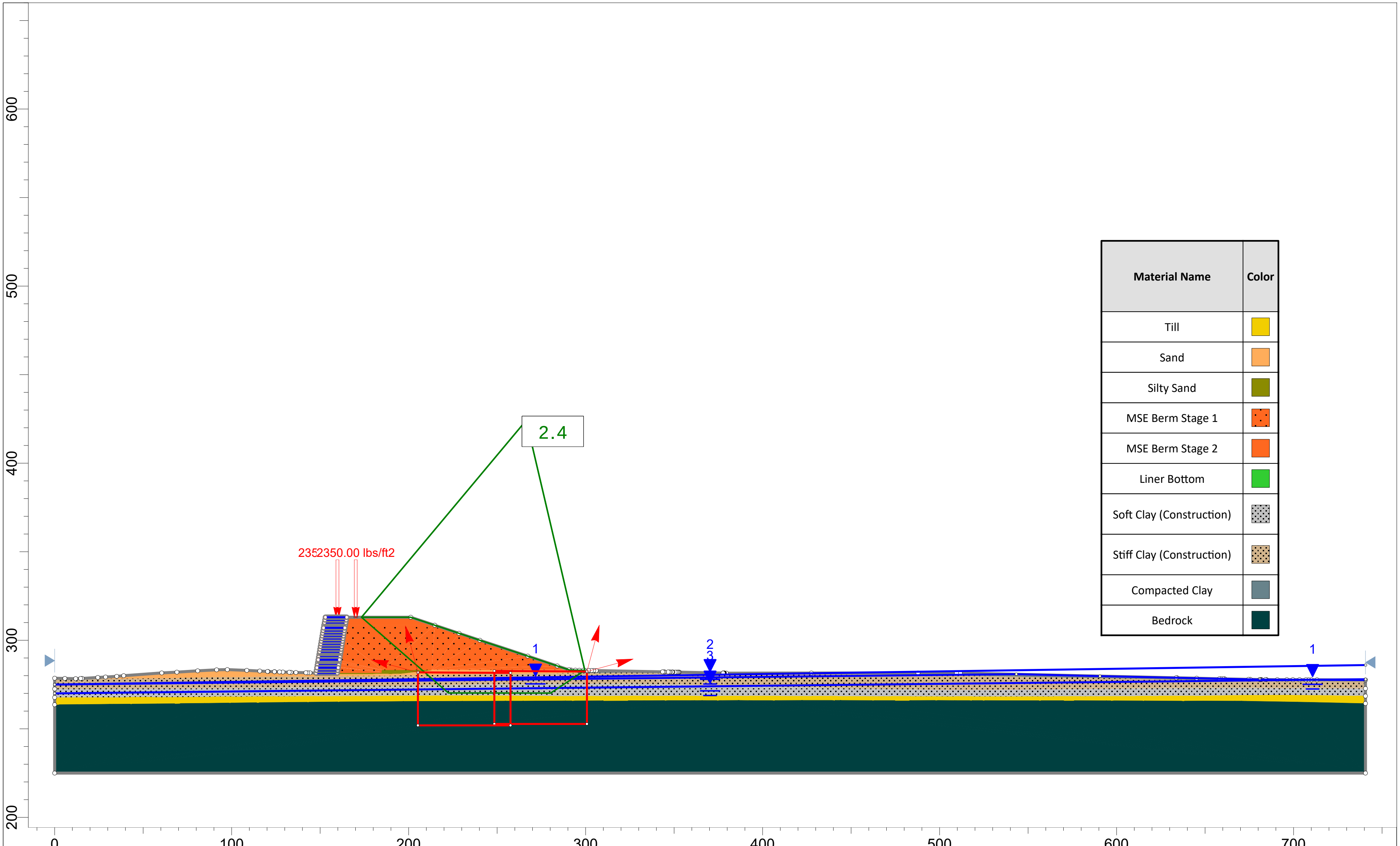


Material Name	Color
Till	
Sand	
Silty Sand	
MSE Berm Stage 1	
MSE Berm Stage 2	
Liner Bottom	
Soft Clay (Construction)	
Stiff Clay (Construction)	
Compacted Clay	
Bedrock	

Geosyntec consultants

SLIDEINTERPRET 8.028

Project	Crossroads Phase 14 Stability Section III
Analysis Description	Construction, Static, Inward Circular
Drawn By	A. Rohrman
Scale	1:900
Company	Geosyntec Consultants
Date	10/1/2019
File Name	2019.10.01 Ph14 III.slmd

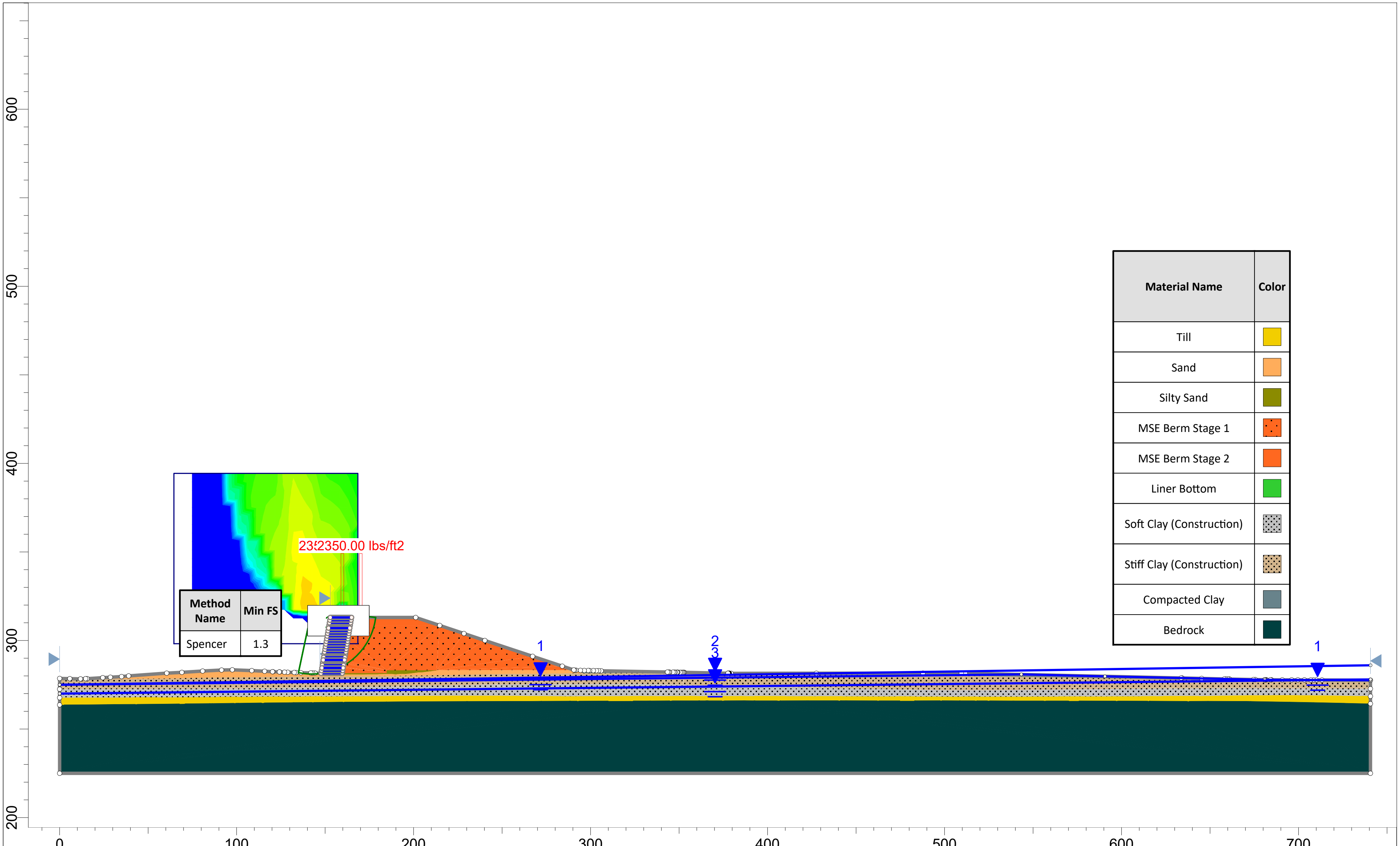


Material Name	Color
Till	
Sand	
Silty Sand	
MSE Berm Stage 1	
MSE Berm Stage 2	
Liner Bottom	
Soft Clay (Construction)	
Stiff Clay (Construction)	
Compacted Clay	
Bedrock	

Geosyntec consultants

SLIDEINTERPRET 8.028

Project	Crossroads Phase 14 Stability Section III
Analysis Description	Construction, Static, Inward Non-Circular
Drawn By	A. Rohrman
Scale	1:900
Company	Geosyntec Consultants
Date	10/1/2019
File Name	2019.10.01 Ph14 III.slmd



Geosyntec consultants	*Project*	Crossroads Phase 14 Stability Section III		
	Analysis Description	Construction, Static, Outward Circular		
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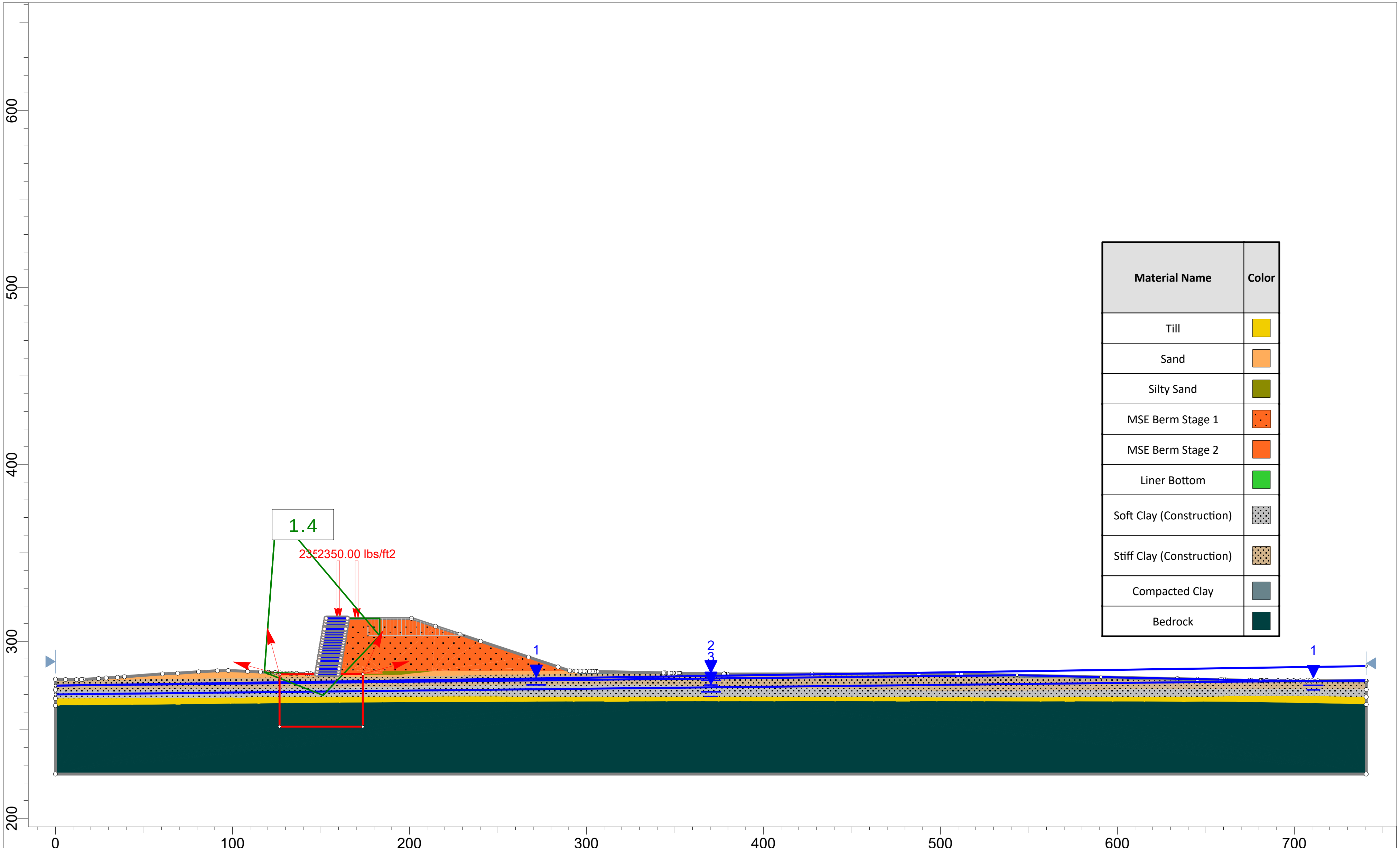
SLIDEINTERPRET 8.028	*Date* 10/1/2019		*File Name*	2019.10.01 Ph14 III.slmd



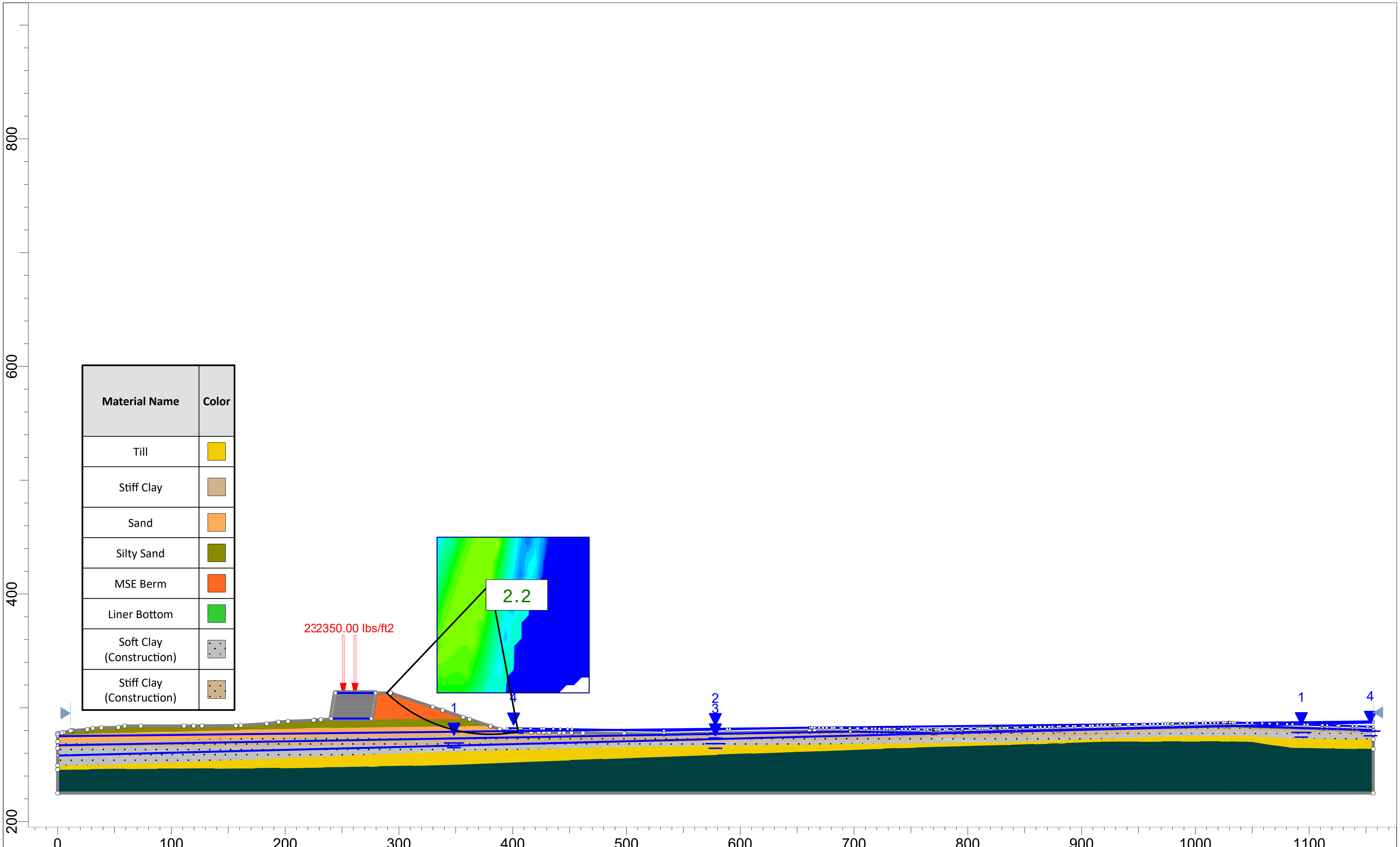
Material Name	Color
Till	
Sand	
Silty Sand	
MSE Berm Stage 1	
MSE Berm Stage 2	
Liner Bottom	
Soft Clay (Construction)	
Stiff Clay (Construction)	
Compacted Clay	
Bedrock	

Geosyntec consultants

SLIDEINTERPRET 8.028

Project	Crossroads Phase 14 Stability Section III
Analysis Description	Construction, Static, Outward Non-Circular
Drawn By	A. Rohrman
Scale	1:900
Company	Geosyntec Consultants
Date	10/1/2019
File Name	2019.10.01 Ph14 III.slmd

Section IV



Geosyntec consultants	*Project* Crossroads Phase 14 Stability Section IV		
	Analysis Description Construction, Static, Inward Circular		
	Drawn By A. Rohrman	*Scale* 1:1400	*Company* Geosyntec Consultants
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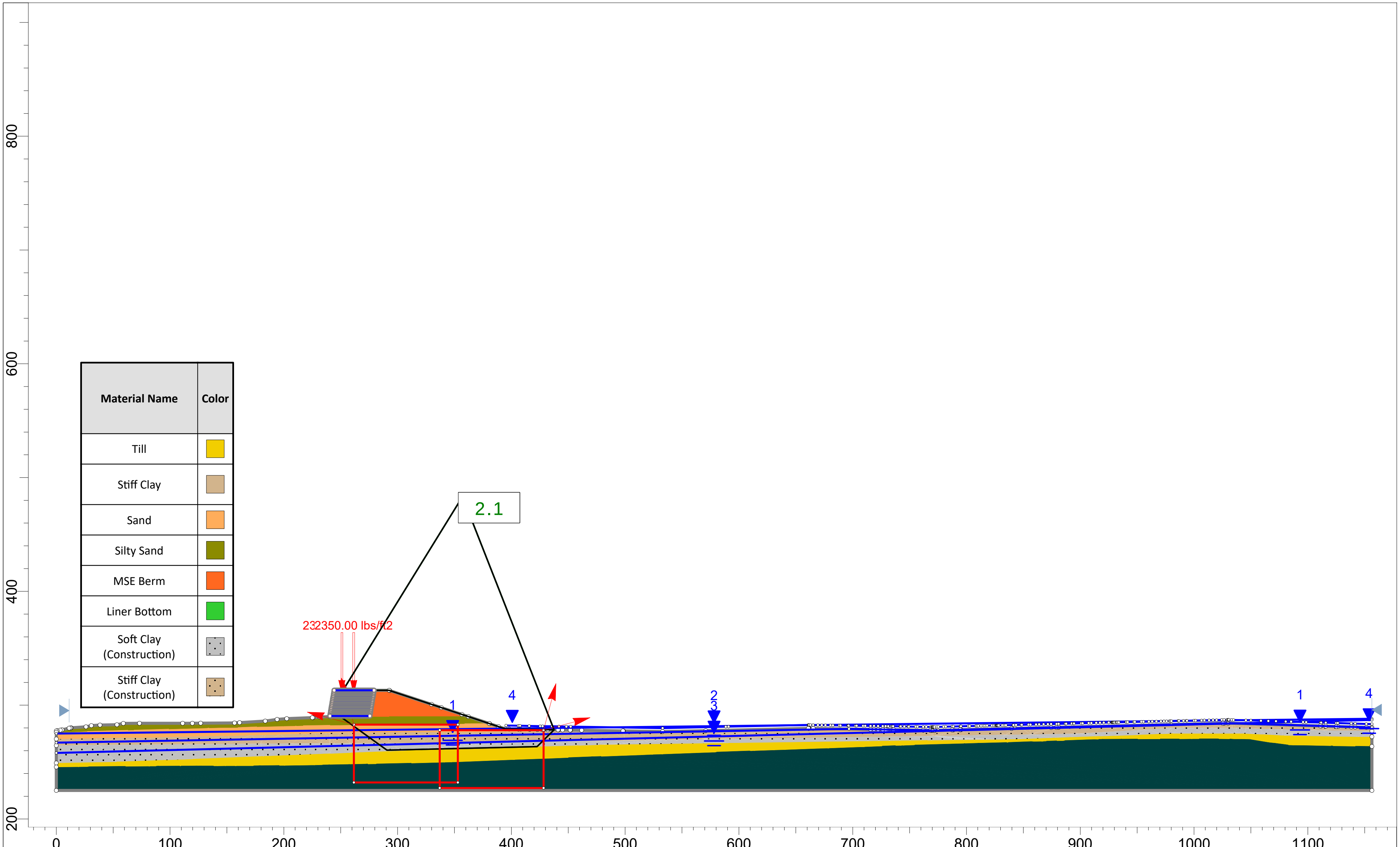
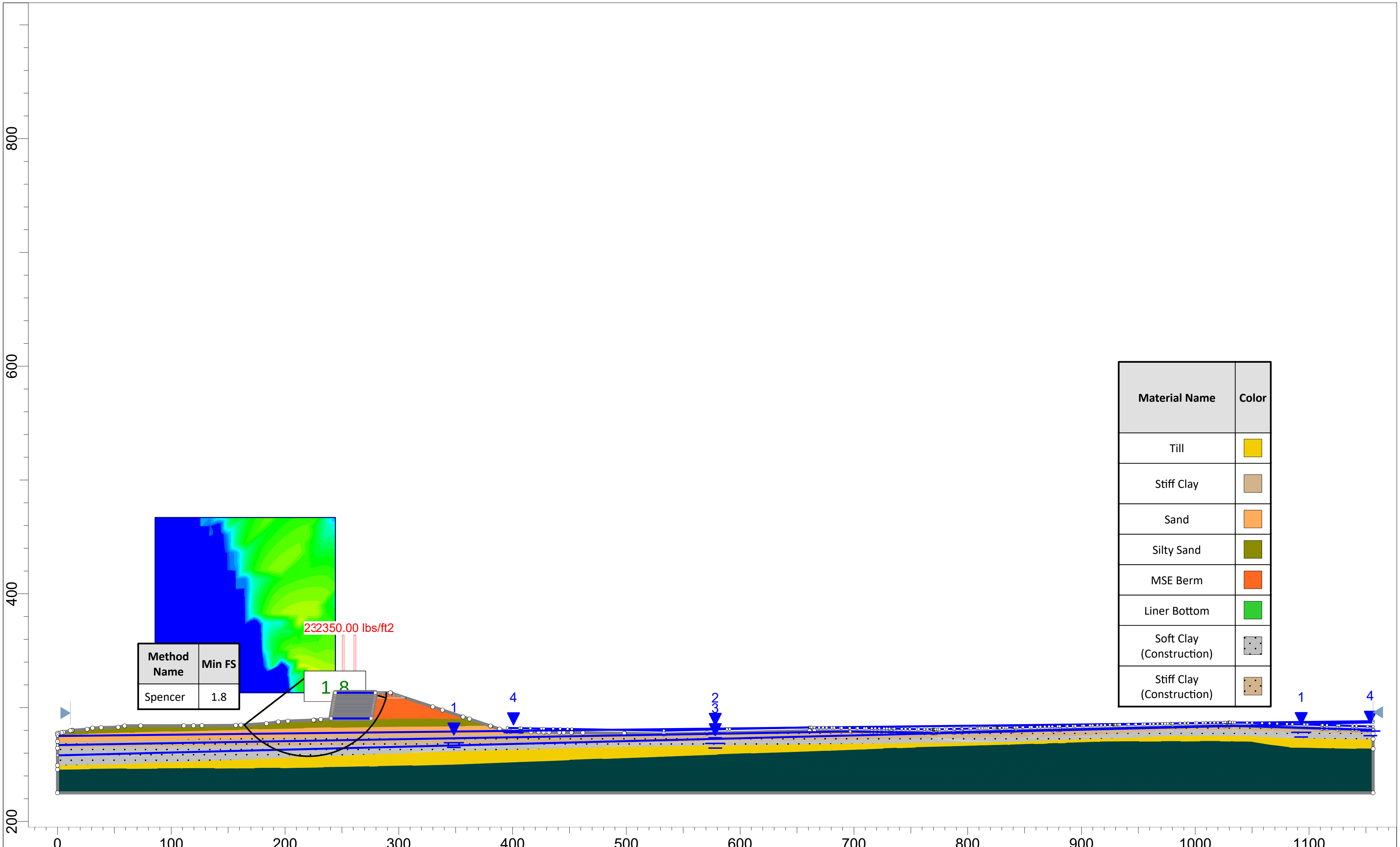


Geosyntec consultants

SLIDEINTERPRET 8.028

Project	Crossroads Phase 14 Stability Section IV		
Analysis Description	Construction, Static, Inward Non-Circular		
Drawn By A. Rohrman	*Scale* 1:1400	*Company*	Geosyntec Consultants
Date	10/1/2019	*File Name*	2019.10.01 Ph14 IV.slmd



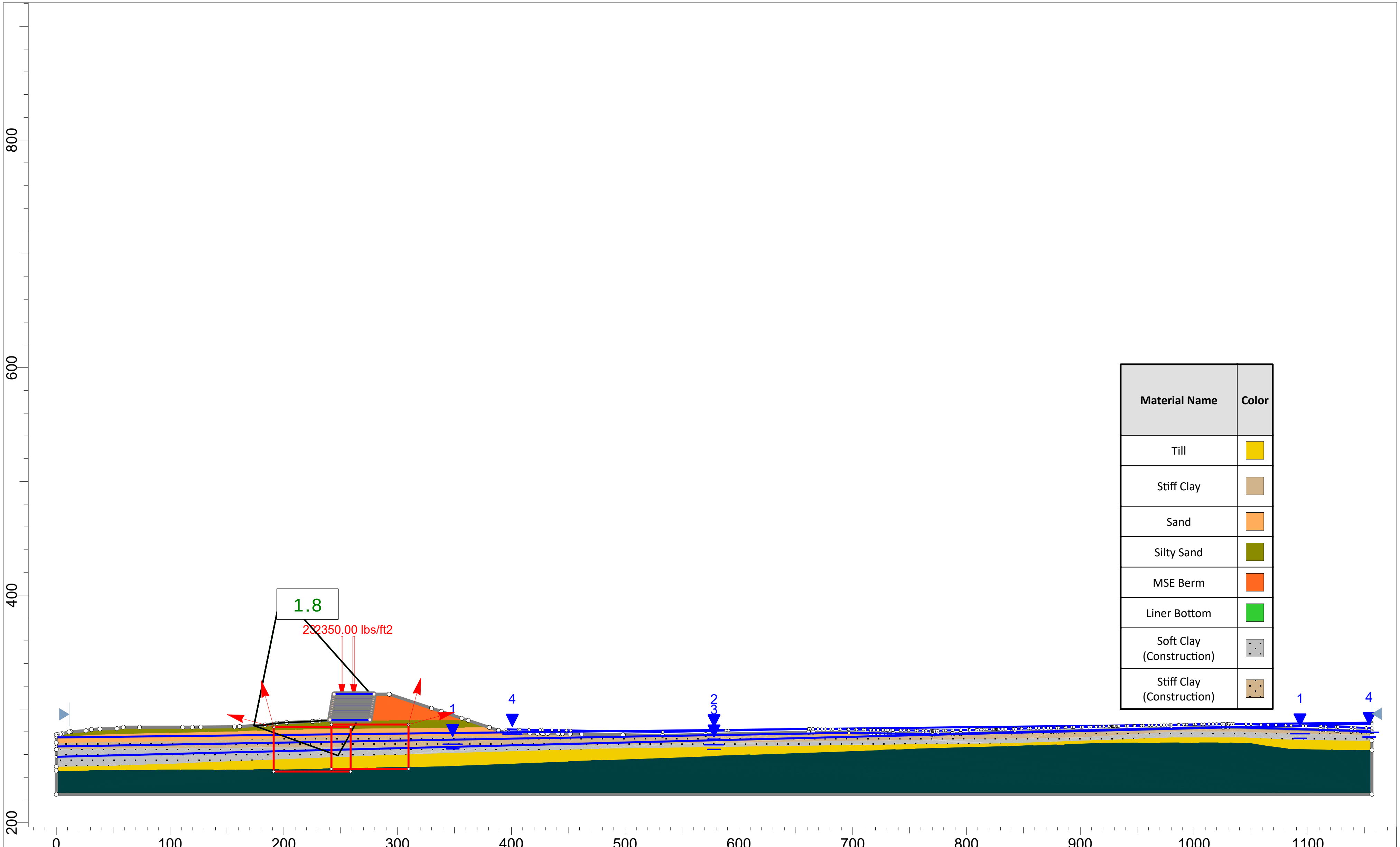
Method Name	Min FS
Spencer	1.8

Material Name	Color
Till	
Stiff Clay	
Sand	
Silty Sand	
MSE Berm	
Liner Bottom	
Soft Clay (Construction)	
Stiff Clay (Construction)	

Geosyntec consultants

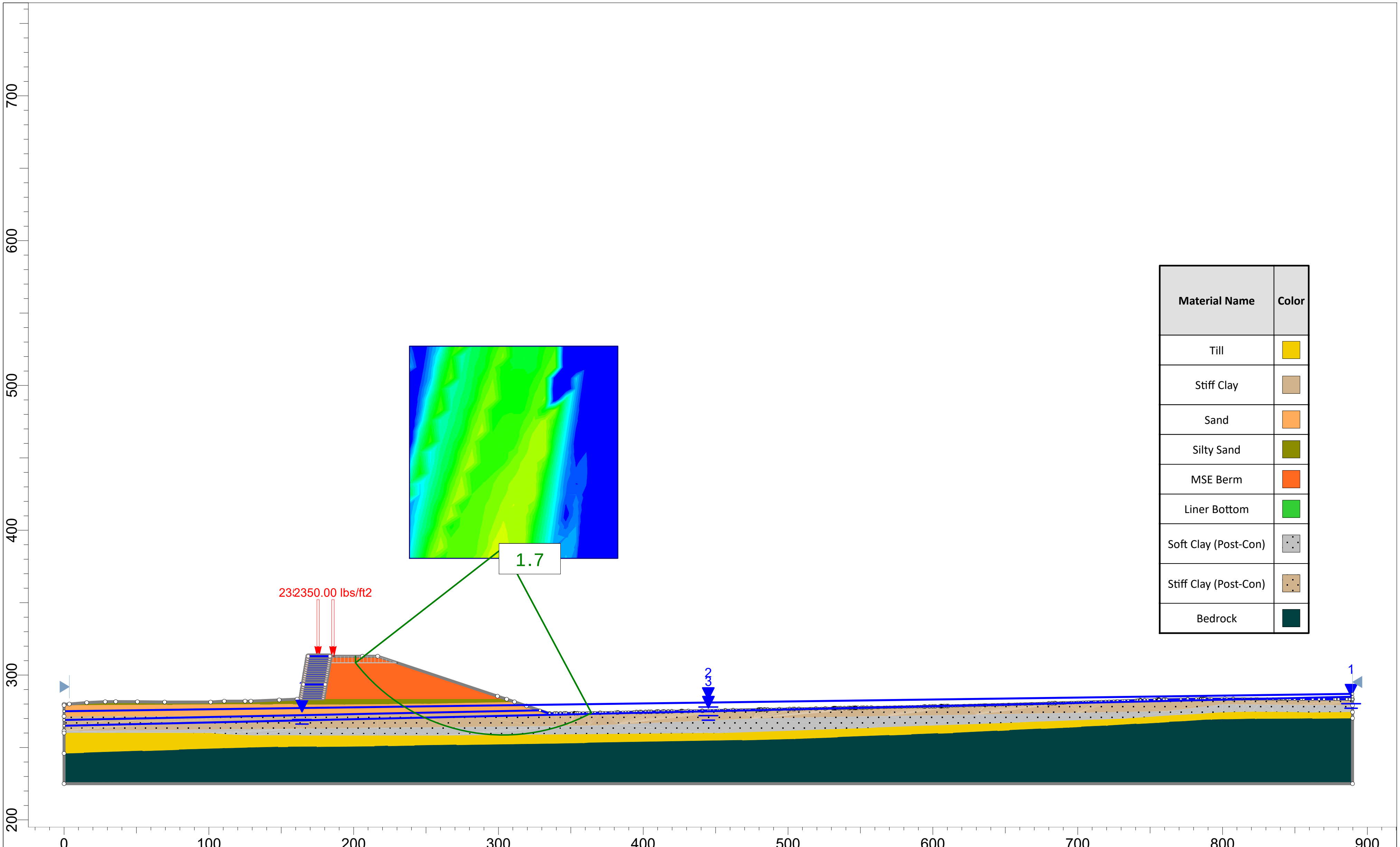
SLIDEINTERPRET 8.028

Project	Crossroads Phase 14 Stability Section IV
Analysis Description	Construction, Static, Outward Circular
Drawn By	A. Rohrman
Scale	1:1400
Company	Geosyntec Consultants
Date	10/1/2019
File Name	2019.10.01 Ph14 IV.slmd



Geosyntec consultants	Project	Crossroads Phase 14 Stability Section IV	
	Analysis Description	Construction, Static, Outward Non-Circular	
	Drawn By: A. Rohrman	Scale: 1:1400	Company: Geosyntec Consultants
SLIDEINTERPRET 8.028	Date: 10/1/2019		File Name: 2019.10.01 Ph14 IV.slmd

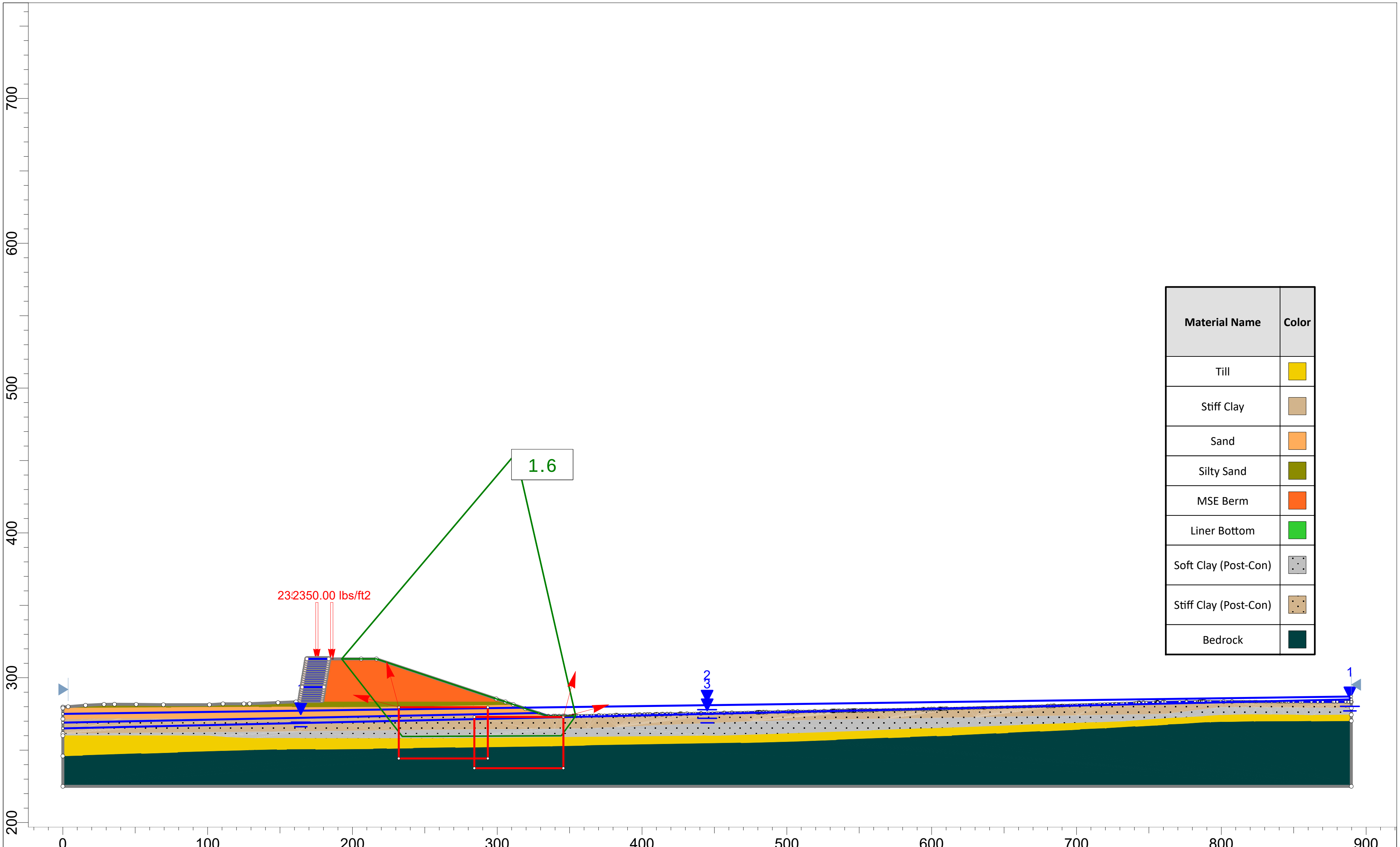
Section V



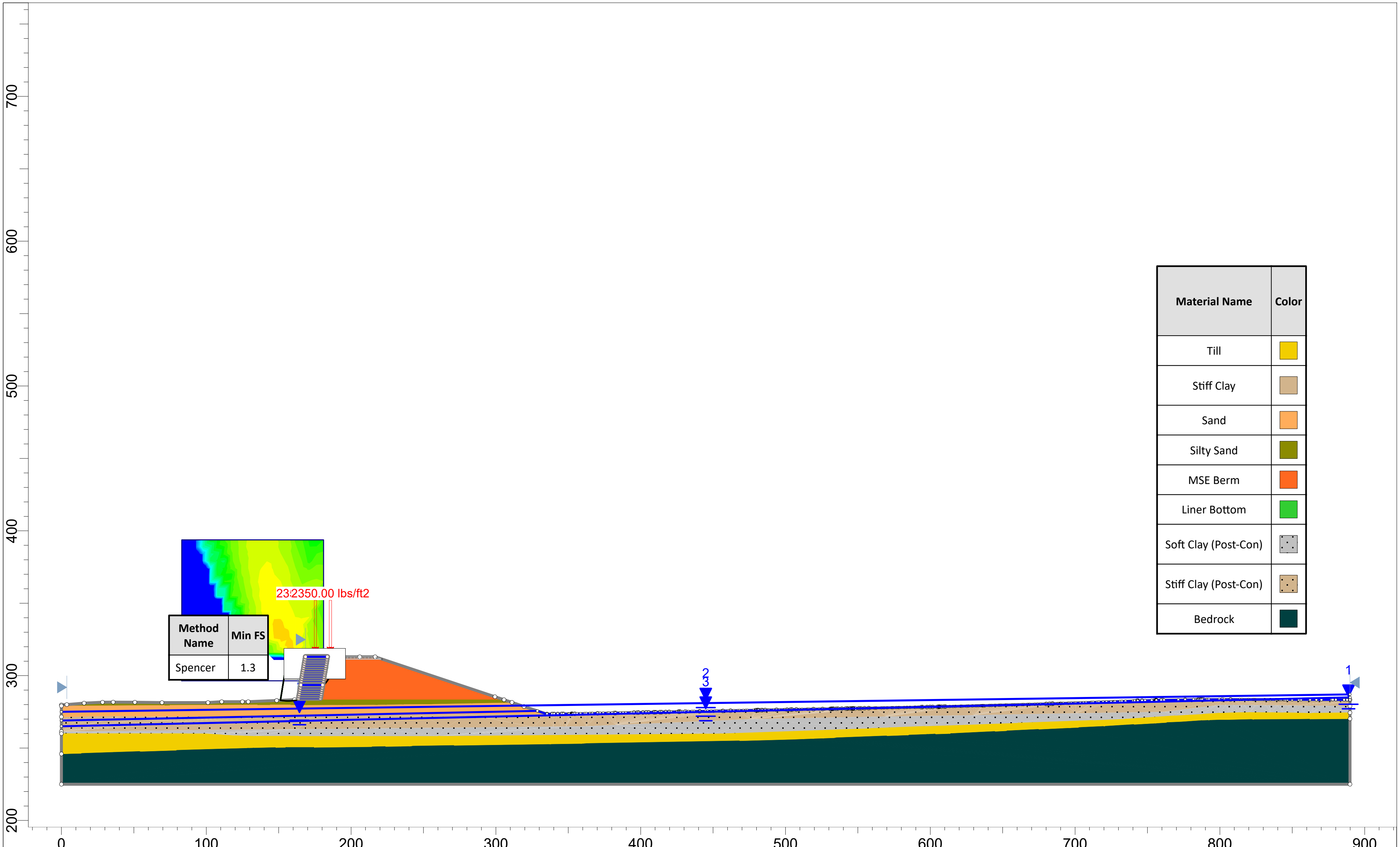
Geosyntec consultants

SLIDEINTERPRET 8.014

Project	Crossroads Phase 14 Stability Section V		
Analysis Description	Construction, Static, Inward Circular		
Drawn By A. Rohrman	*Scale* 1:1100	*Company*	Geosyntec Consultants
Date	10/1/2019	*File Name*	2019.10.01 Ph14 V.slmd



Geosyntec consultants	*Project* Crossroads Phase 14 Stability Section V		
	Analysis Description Construction, Static, Inward Non-Circular		
	Drawn By A. Rohrman	*Scale* 1:1100	*Company* Geosyntec Consultants
SLIDEINTERPRET 8.014	*Date* 10/1/2019		*File Name* 2019.10.01 Ph14 V.slmd



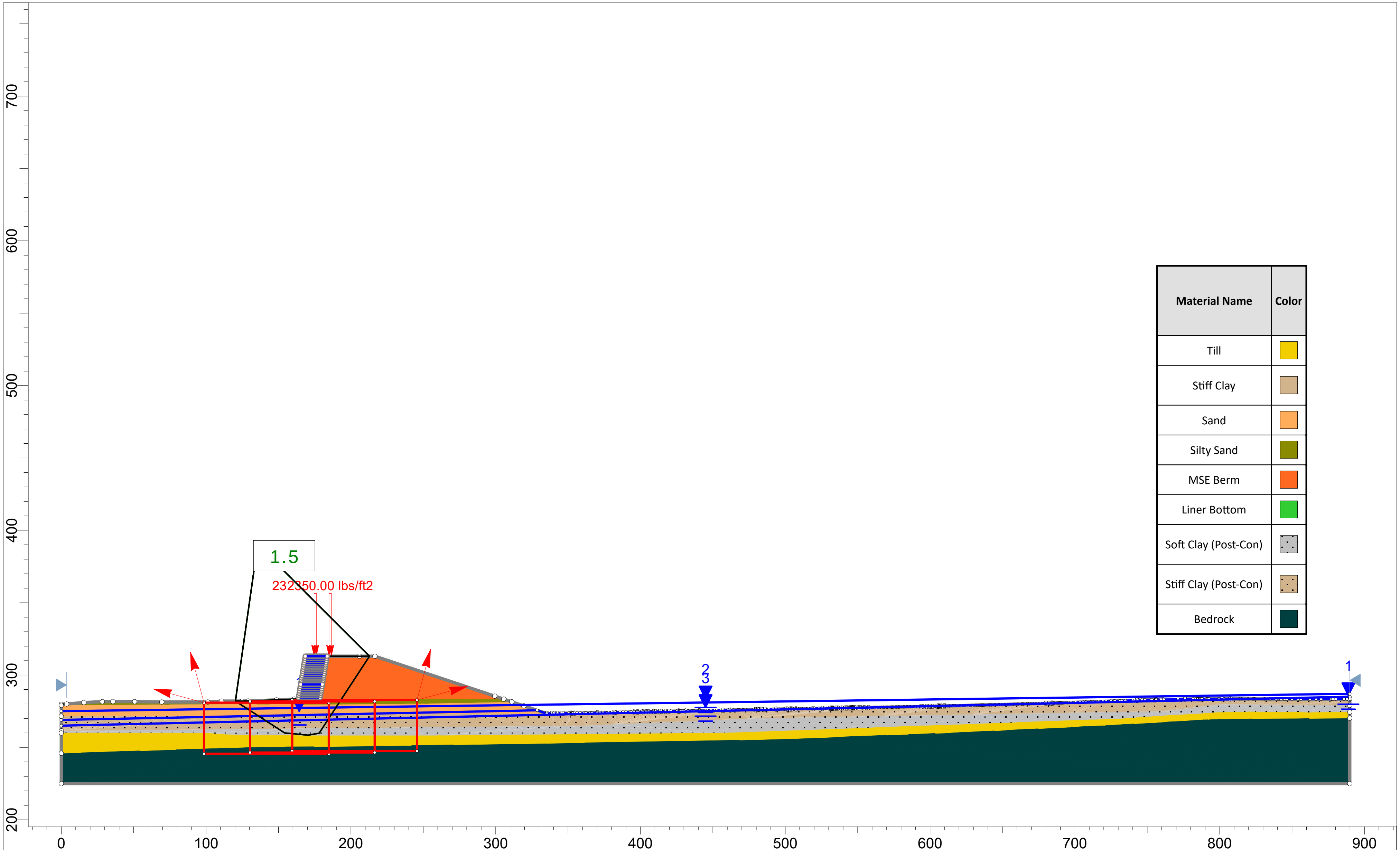
Method Name	Min FS
Spencer	1.3

Material Name	Color
Till	
Stiff Clay	
Sand	
Silty Sand	
MSE Berm	
Liner Bottom	
Soft Clay (Post-Con)	
Stiff Clay (Post-Con)	
Bedrock	

Geosyntec consultants

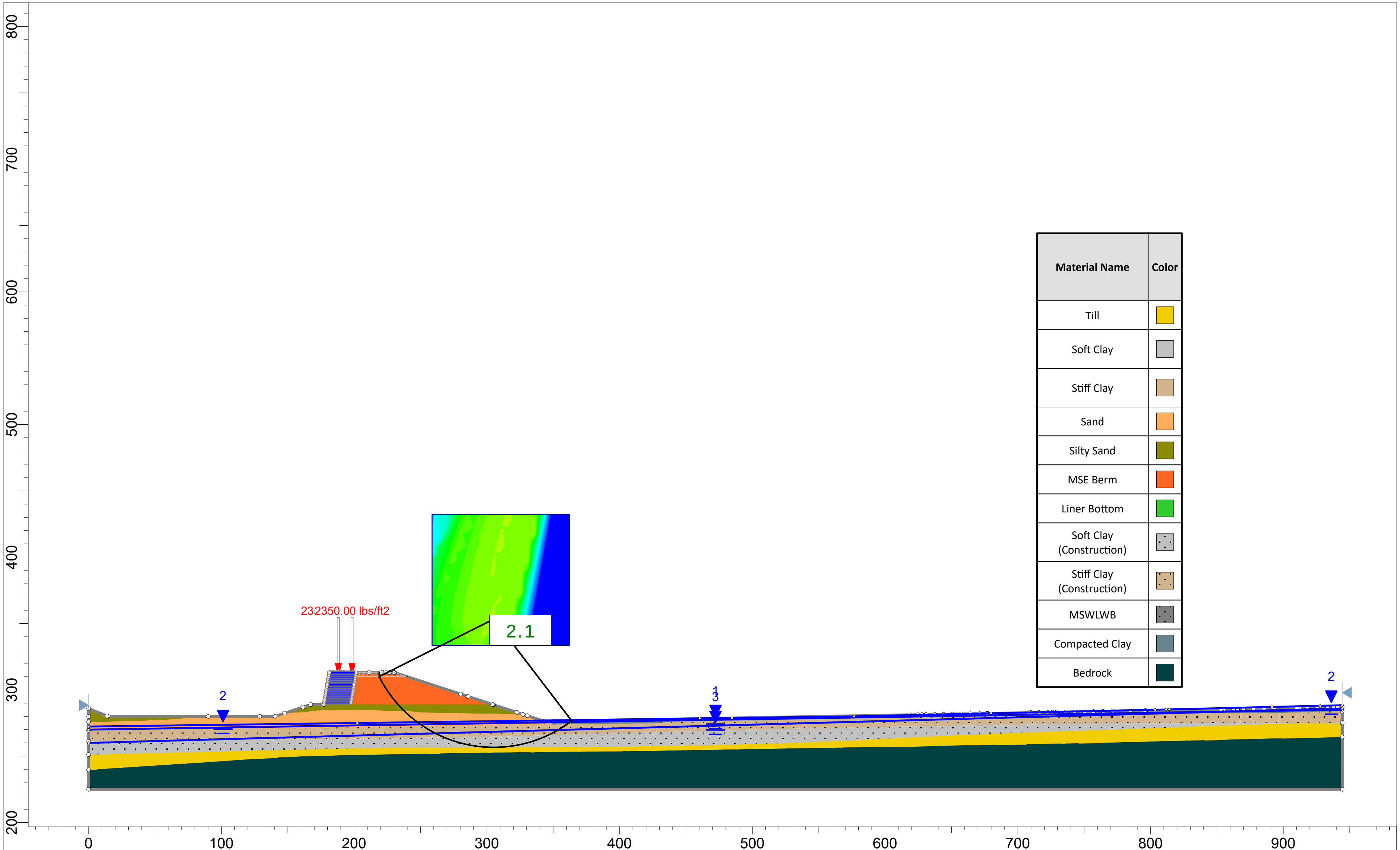
SLIDEINTERPRET 8.014

Project	Crossroads Phase 14 Stability Section V		
Analysis Description	Construction, Static, Outward Circular		
Drawn By A. Rohrman	*Scale* 1:1100	*Company*	Geosyntec Consultants
Date	10/1/2019	*File Name*	2019.10.01 Ph14 V.slmd



Geosyntec consultants	*Project* Crossroads Phase 14 Stability Section V			
	Analysis Description Construction, Static, Outward Non-Circular			
	Drawn By A. Rohrman	*Scale* 1:1100	*Company* Geosyntec Consultants	
SLIDEINTERPRET 8.014	*Date* 10/1/2019		*File Name* 2019.10.01 Ph14 V.slmd	

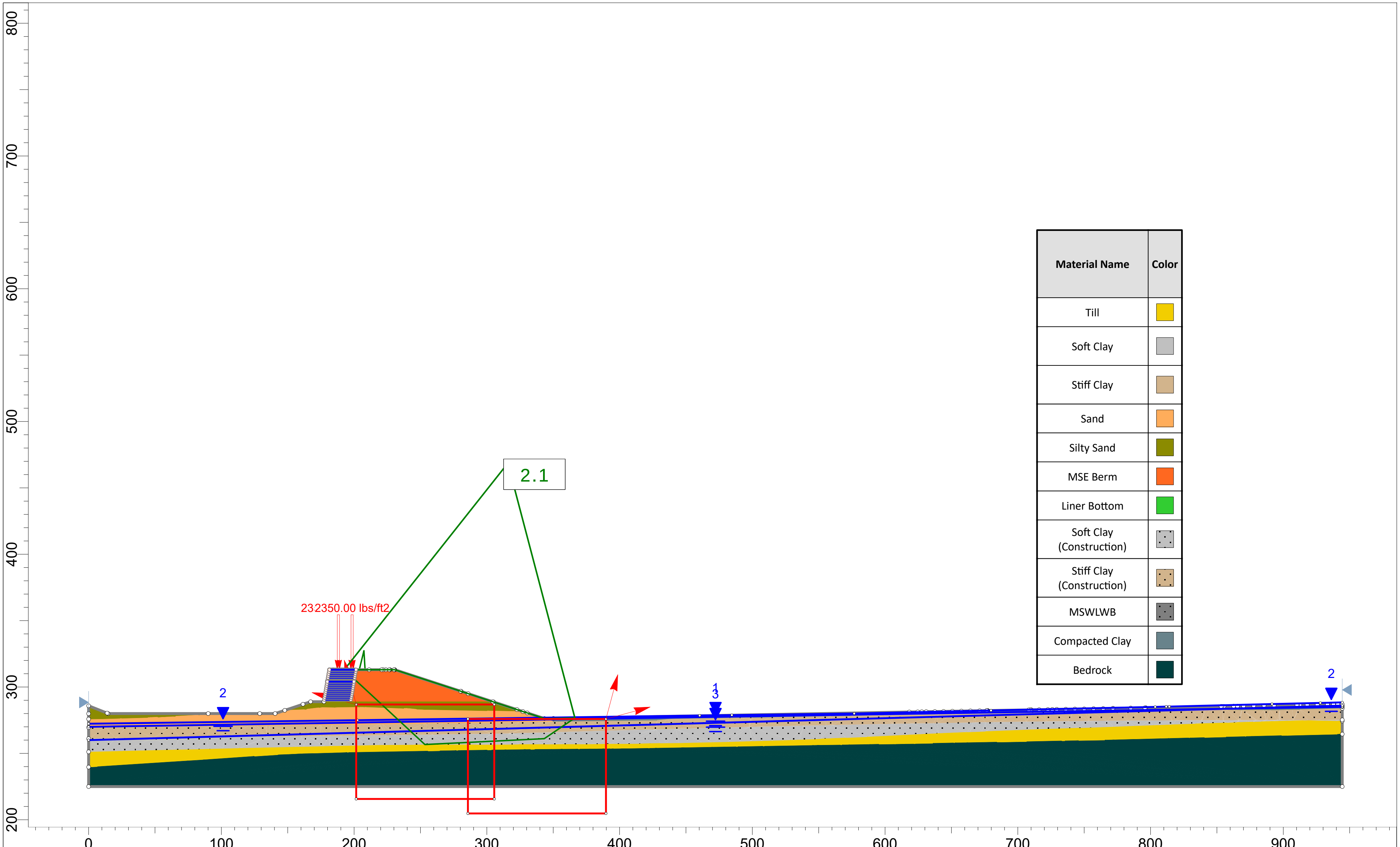
Section VI



Geosyntec consultants

SLIDEINTERPRET 8.028

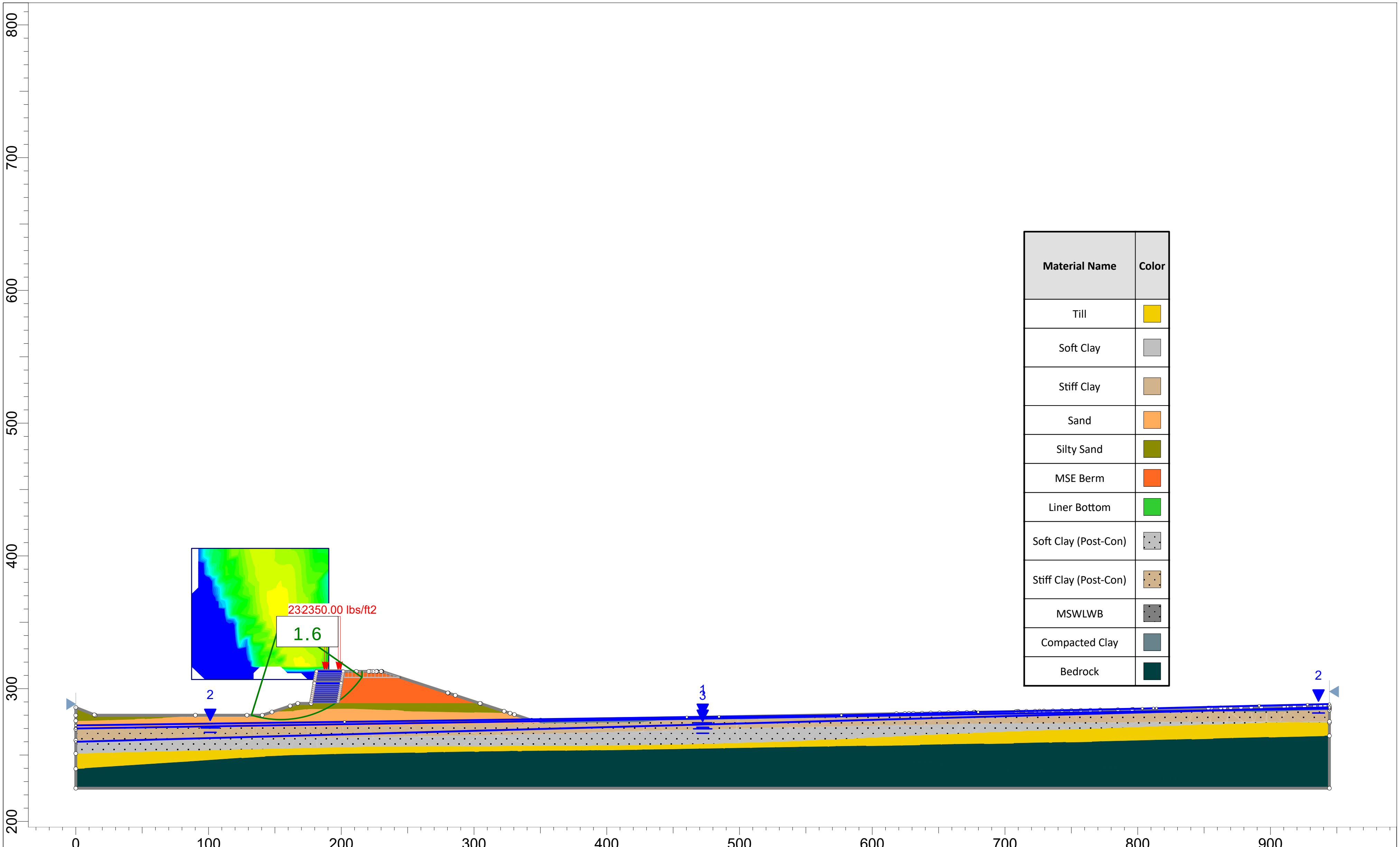
Project	Crossroads Phase 14 Stability Section VI		
Analysis Description	Construction, Static, Inward Circular		
Drawn By A. Rohrman	*Scale* 1:1200	*Company*	Geosyntec Consultants
Date	10/1/2019	*File Name*	2019.10.01 Ph14 VI.slmd



Project	Crossroads Phase 14 Stability Section VI
Analysis Description	Construction, Static, Inward Non-Circular
Drawn By	A. Rohrman
Scale	1:1200
Company	Geosyntec Consultants
Date	10/1/2019
File Name	2019.10.01 Ph14 VI.slmd

Geosyntec consultants

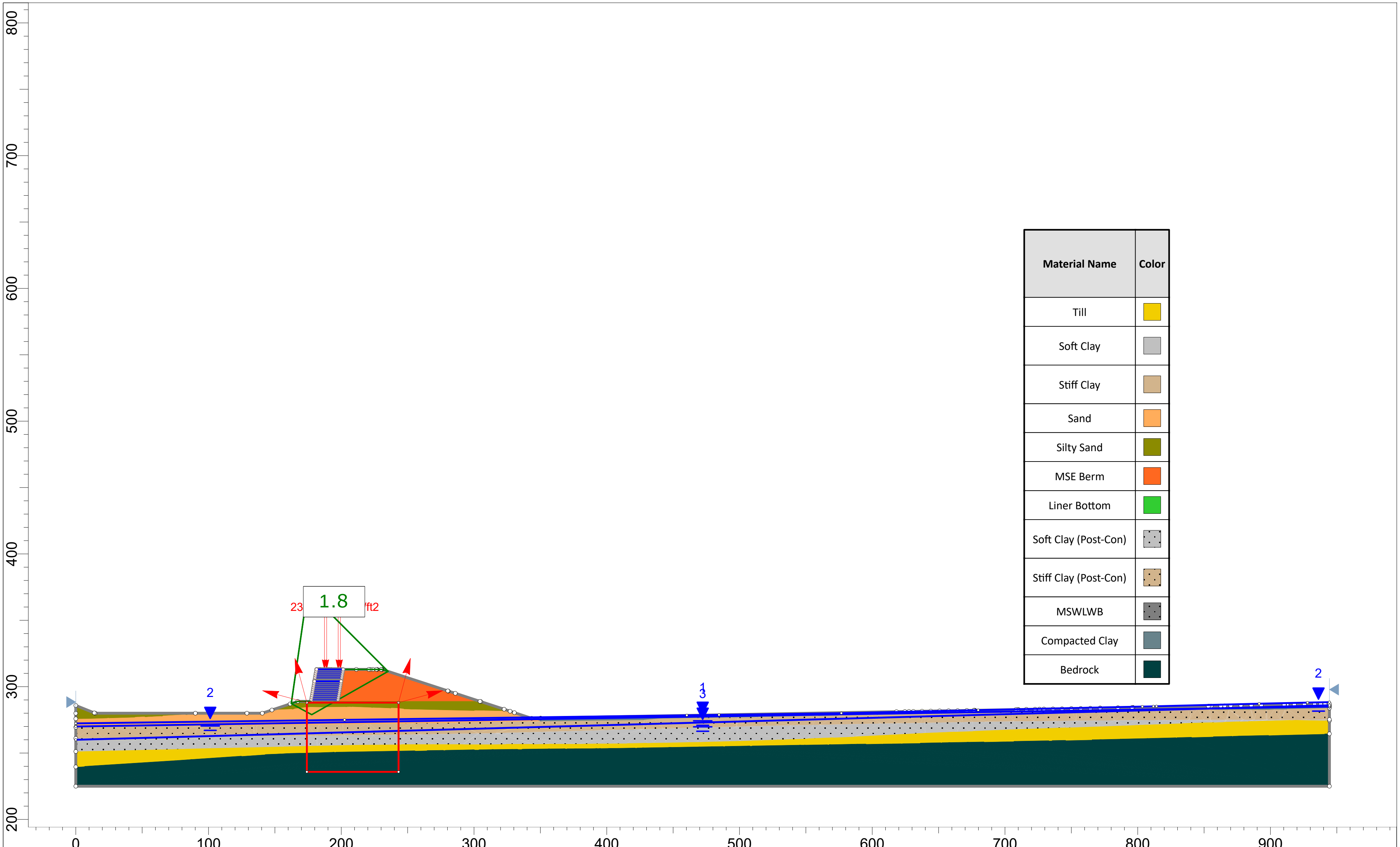
SLIDEINTERPRET 8.028



Geosyntec consultants

SLIDEINTERPRET 8.014

Project	Crossroads Phase 14 Stability Section VI		
Analysis Description	Construction, Static, Outward Circular		
Drawn By A. Rohrman	*Scale* 1:1200	*Company*	Geosyntec Consultants
Date	10/1/2019	*File Name*	2019.10.01 Ph14 VI.slmd



Material Name	Color
Till	
Soft Clay	
Stiff Clay	
Sand	
Silty Sand	
MSE Berm	
Liner Bottom	
Soft Clay (Post-Con)	
Stiff Clay (Post-Con)	
MSWLWB	
Compacted Clay	
Bedrock	

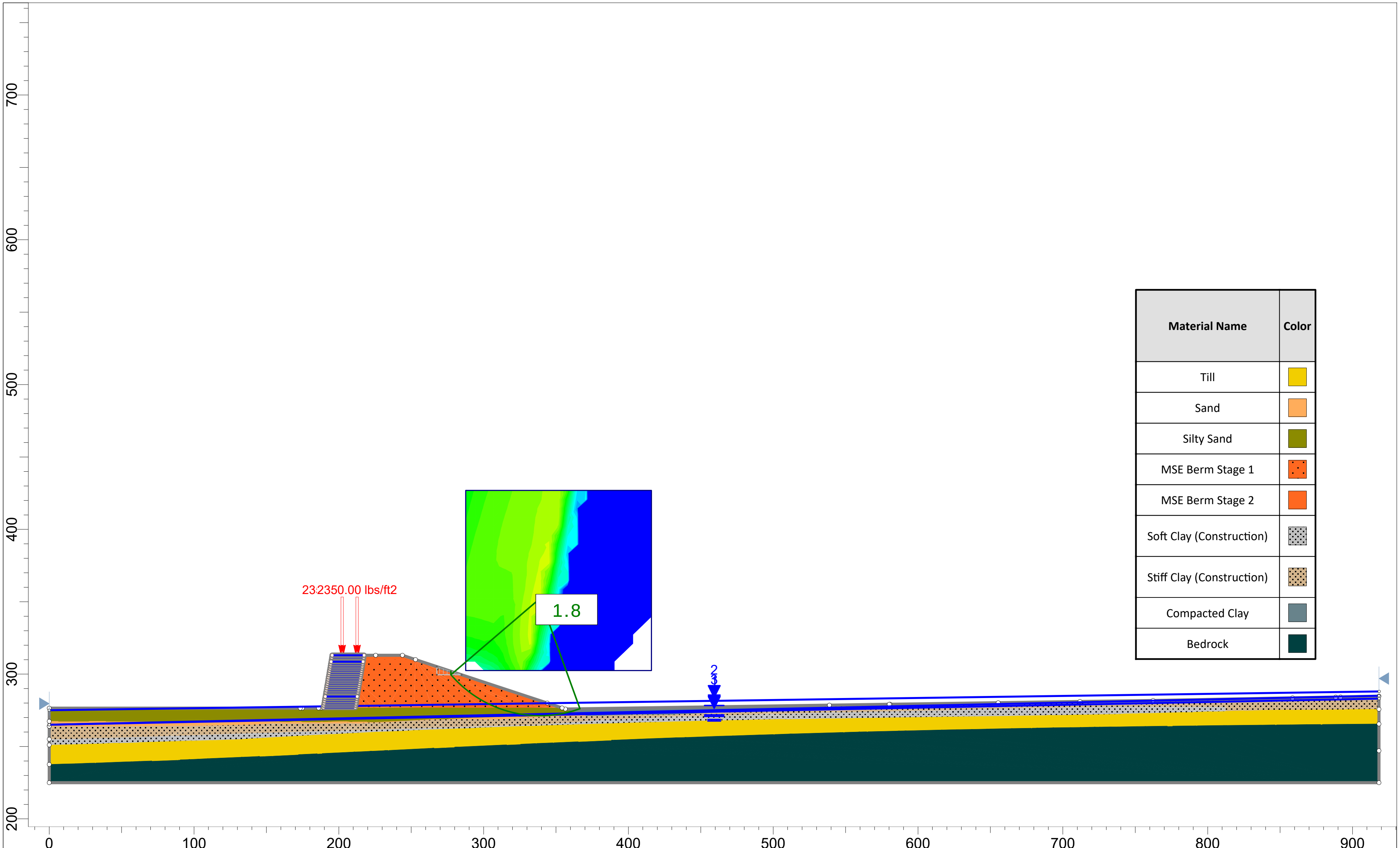
Geosyntec consultants

SLIDEINTERPRET 8.014

Project	Crossroads Phase 14 Stability Section VI
Analysis Description	Construction, Static, Outward Non-Circular

Drawn By	A. Rohrman	*Scale*	1:1200	*Company*	Geosyntec Consultants
Date	10/1/2019			*File Name*	2019.10.01 Ph14 VI.slmd

Section VII

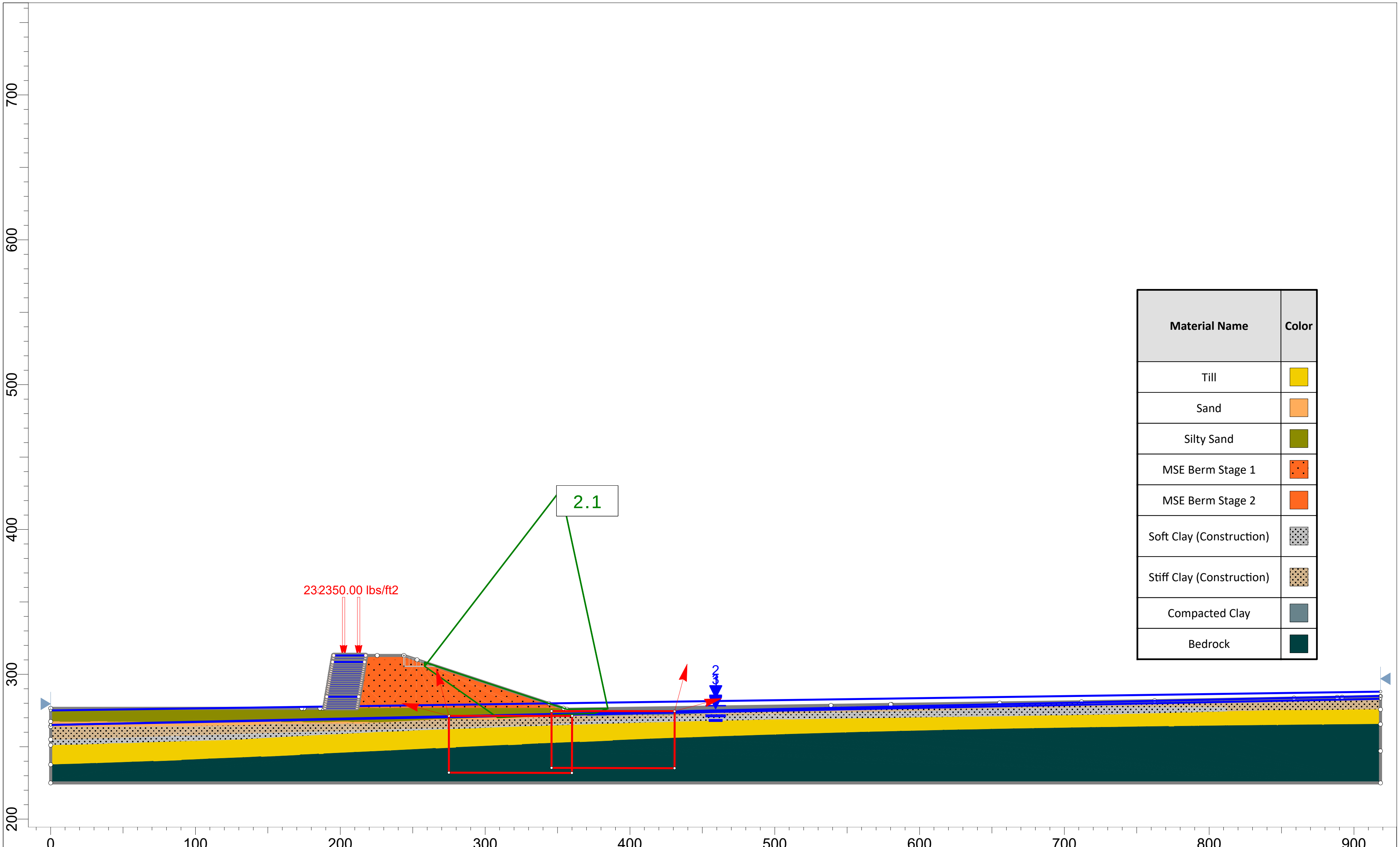


Material Name	Color
Till	
Sand	
Silty Sand	
MSE Berm Stage 1	
MSE Berm Stage 2	
Soft Clay (Construction)	
Stiff Clay (Construction)	
Compacted Clay	
Bedrock	

Geosyntec consultants

SLIDEINTERPRET 8.028

Project	Crossroads Phase 14 Stability Section VII
Analysis Description	Construction, Static, Inward Circular
Drawn By	A. Rohrman
Scale	1:1100
Company	Geosyntec Consultants
Date	10/1/2019
File Name	2019.10.01 Ph14 VII.slmd

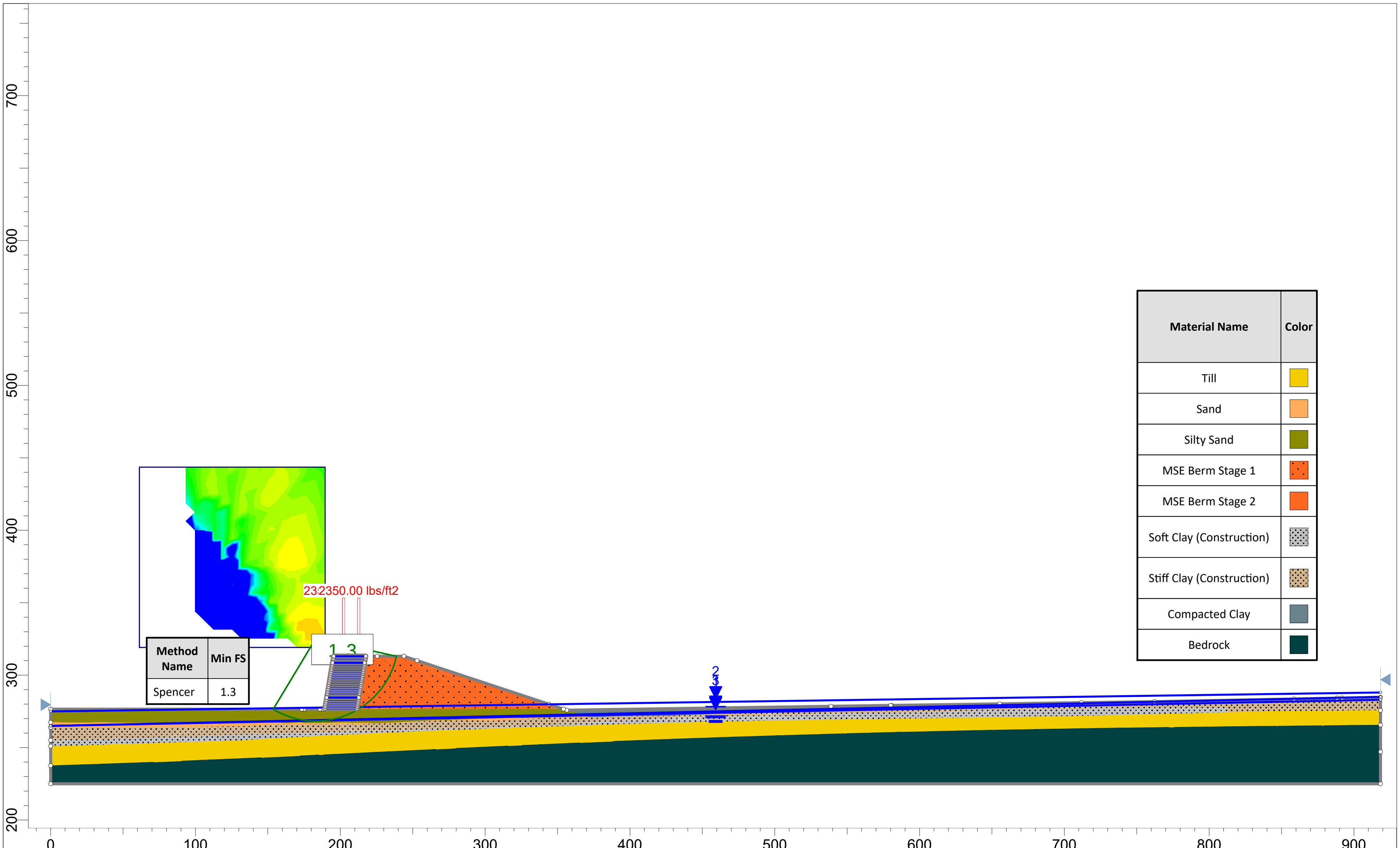


Material Name	Color
Till	
Sand	
Silty Sand	
MSE Berm Stage 1	
MSE Berm Stage 2	
Soft Clay (Construction)	
Stiff Clay (Construction)	
Compacted Clay	
Bedrock	

Geosyntec consultants

SLIDEINTERPRET 8.028

Project	Crossroads Phase 14 Stability Section VII		
Analysis Description	Construction, Static, Inward Non-Circular		
Drawn By A. Rohrman	*Scale* 1:1100	*Company*	Geosyntec Consultants
Date	10/1/2019	*File Name*	2019.10.01 Ph14 VII.slmd



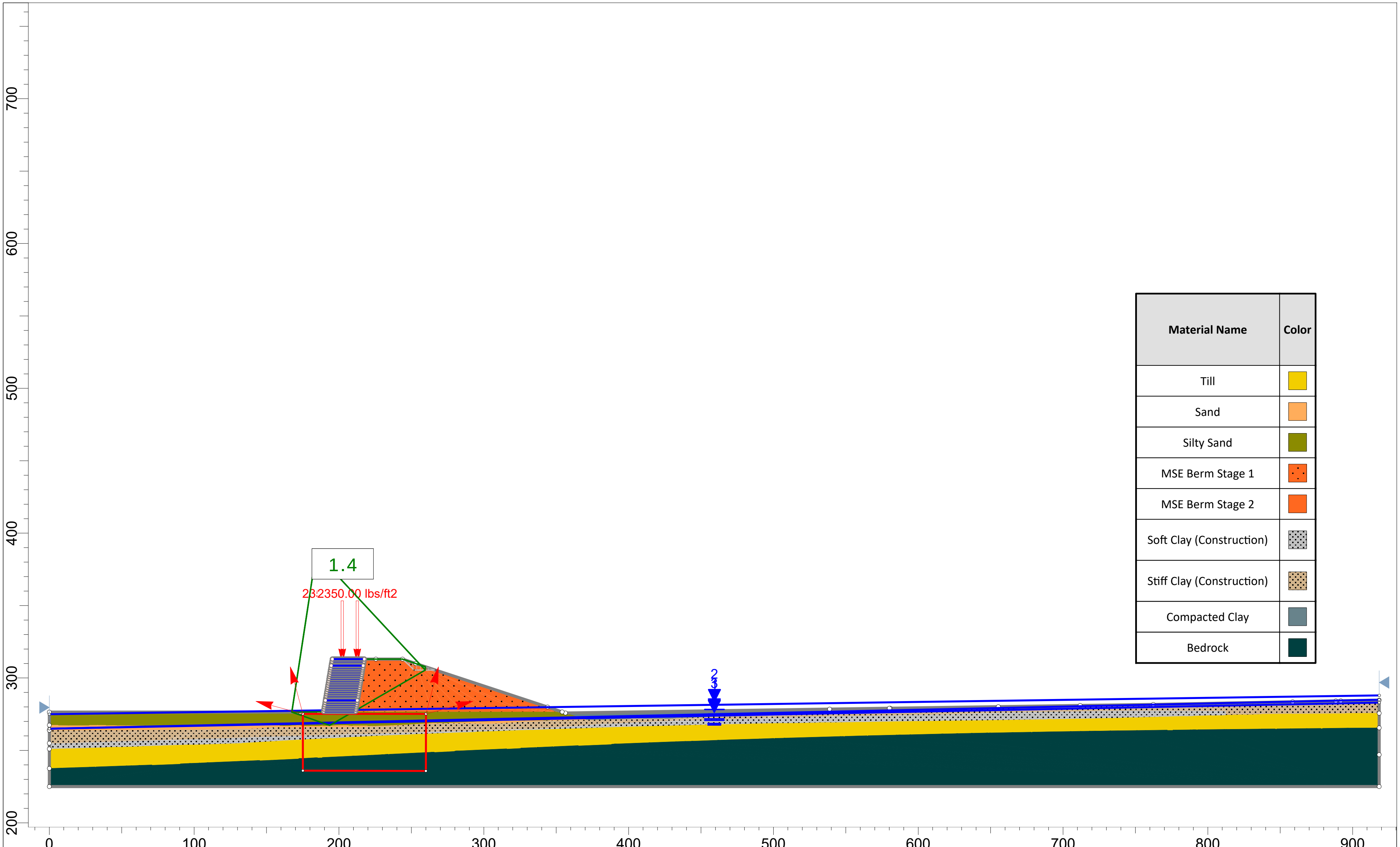
Method Name	Min FS
Spencer	1.3

Material Name	Color
Till	
Sand	
Silty Sand	
MSE Berm Stage 1	
MSE Berm Stage 2	
Soft Clay (Construction)	
Stiff Clay (Construction)	
Compacted Clay	
Bedrock	

Geosyntec consultants

SLIDEINTERPRET 8.028

Project	Crossroads Phase 14 Stability Section VII		
Analysis Description	Construction, Static, Outward Circular		
Drawn By A. Rohrman	*Scale* 1:1100	*Company*	Geosyntec Consultants
Date	10/1/2019	*File Name*	2019.10.01 Ph14 VII.slmd

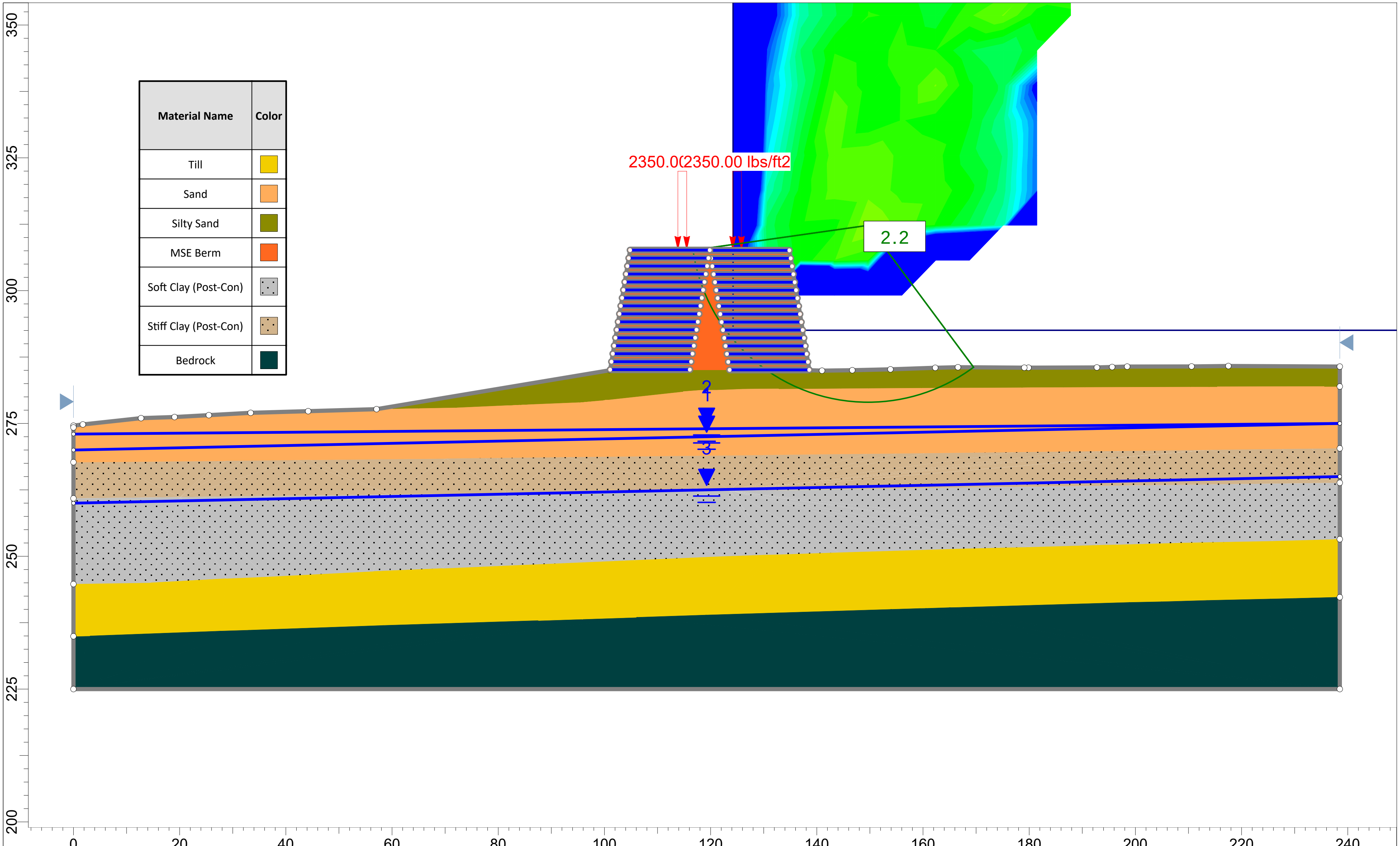


Project	Crossroads Phase 14 Stability Section VII
Analysis Description	Construction, Static, Outward Non-Circular
Drawn By	A. Rohrman
Scale	1:1100
Company	Geosyntec Consultants
Date	10/1/2019
File Name	2019.10.01 Ph14 VII.slmd

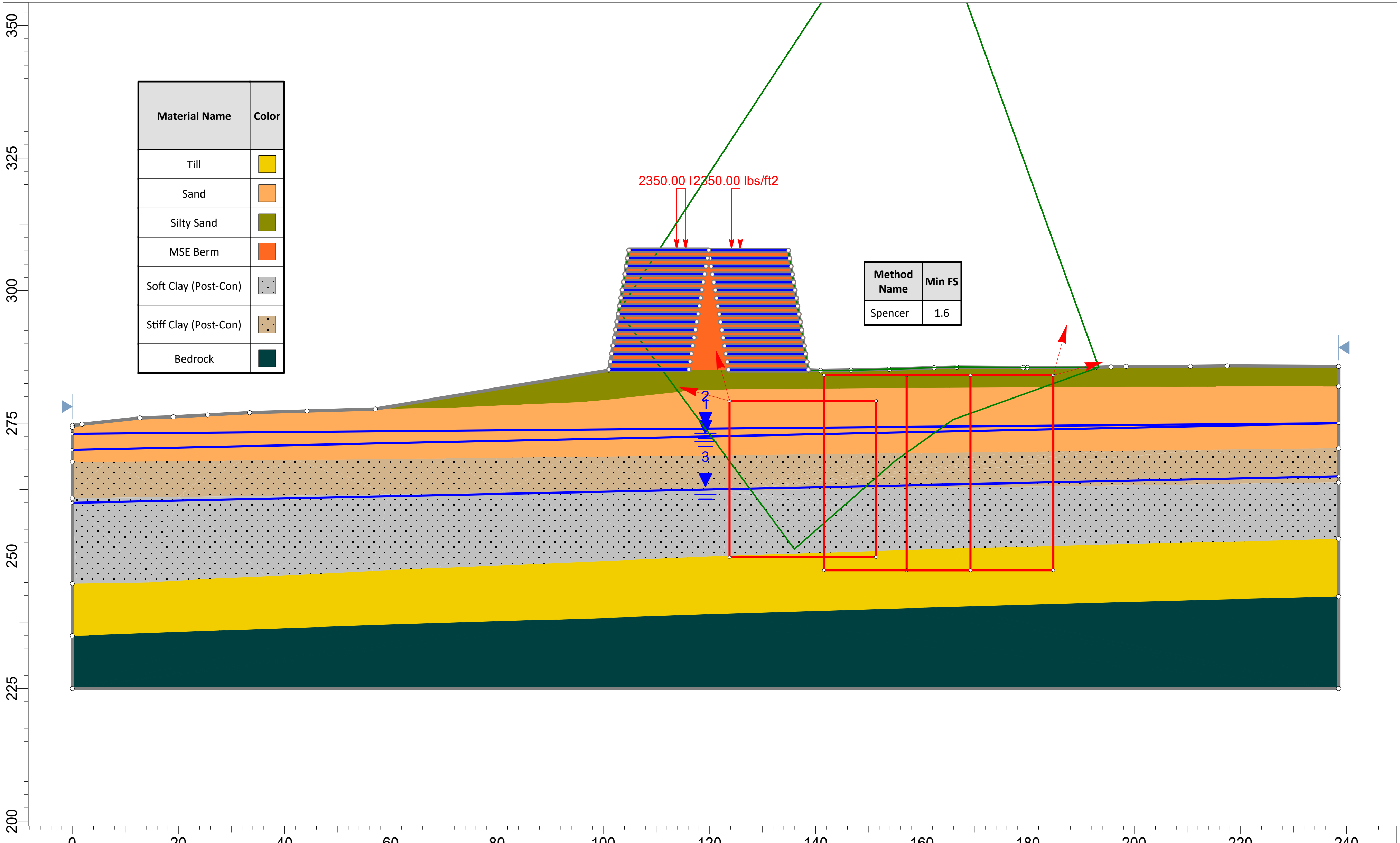
Geosyntec consultants

SLIDEINTERPRET 8.028

Section VIII



Geosyntec consultants	*Project*	Crossroads Phase 14 Stability Section VIII	
	Analysis Description	Construction, Static, Inward Circular	
	Drawn By A. Rohrman	*Scale* 1:300	*Company* Geosyntec Consultants
SLIDEINTERPRET 8.014	*Date* 10/1/2019		*File Name* 2019.10.01 Ph14 VIII.slmd

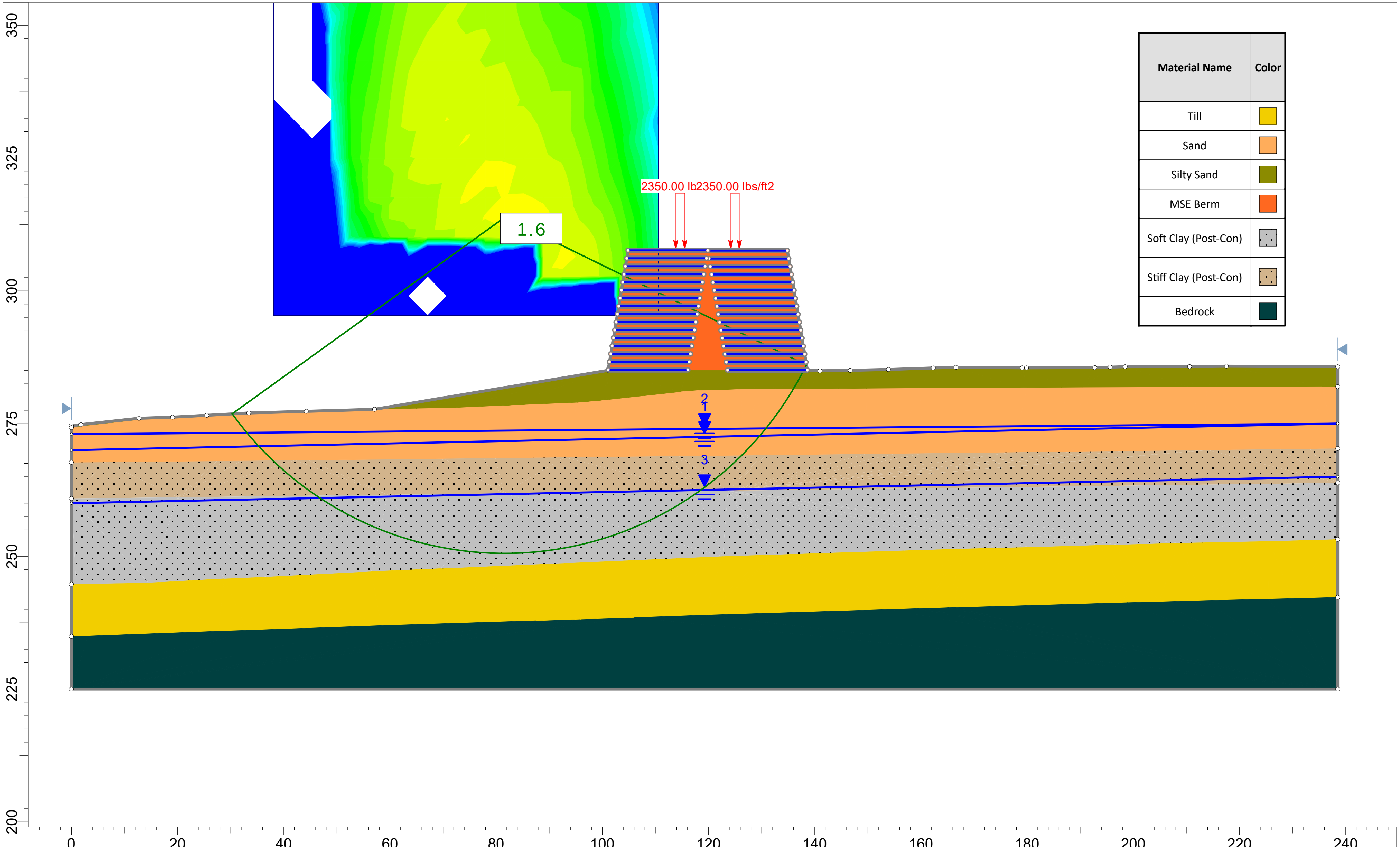


Method Name	Min FS
Spencer	1.6

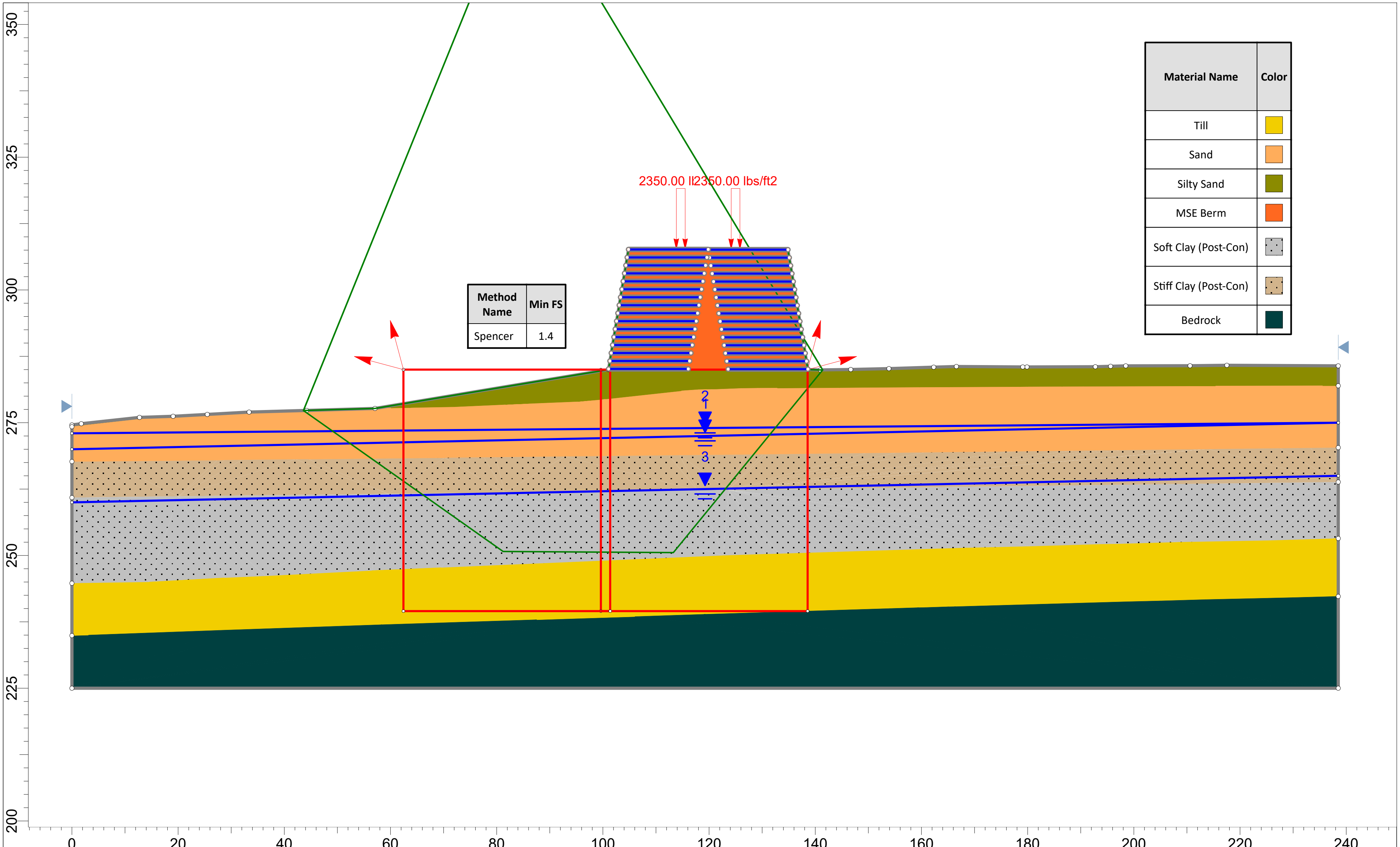
Geosyntec consultants

SLIDEINTERPRET 8.014

Project	Crossroads Phase 14 Stability Section VIII		
Analysis Description	Construction, Static, Inward Non-Circular		
Drawn By A. Rohrman	*Scale* 1:300	*Company*	Geosyntec Consultants
Date	10/1/2019	*File Name*	2019.10.01 Ph14 VIII.slmd



Geosyntec consultants	*Project* Crossroads Phase 14 Stability Section VIII		
	Analysis Description Construction, Static, Outward Circular		
	Drawn By A. Rohrman	*Scale* 1:300	*Company* Geosyntec Consultants
SLIDEINTERPRET 8.014	*Date* 10/1/2019		*File Name* 2019.10.01 Ph14 VIII.slmd



Geosyntec consultants

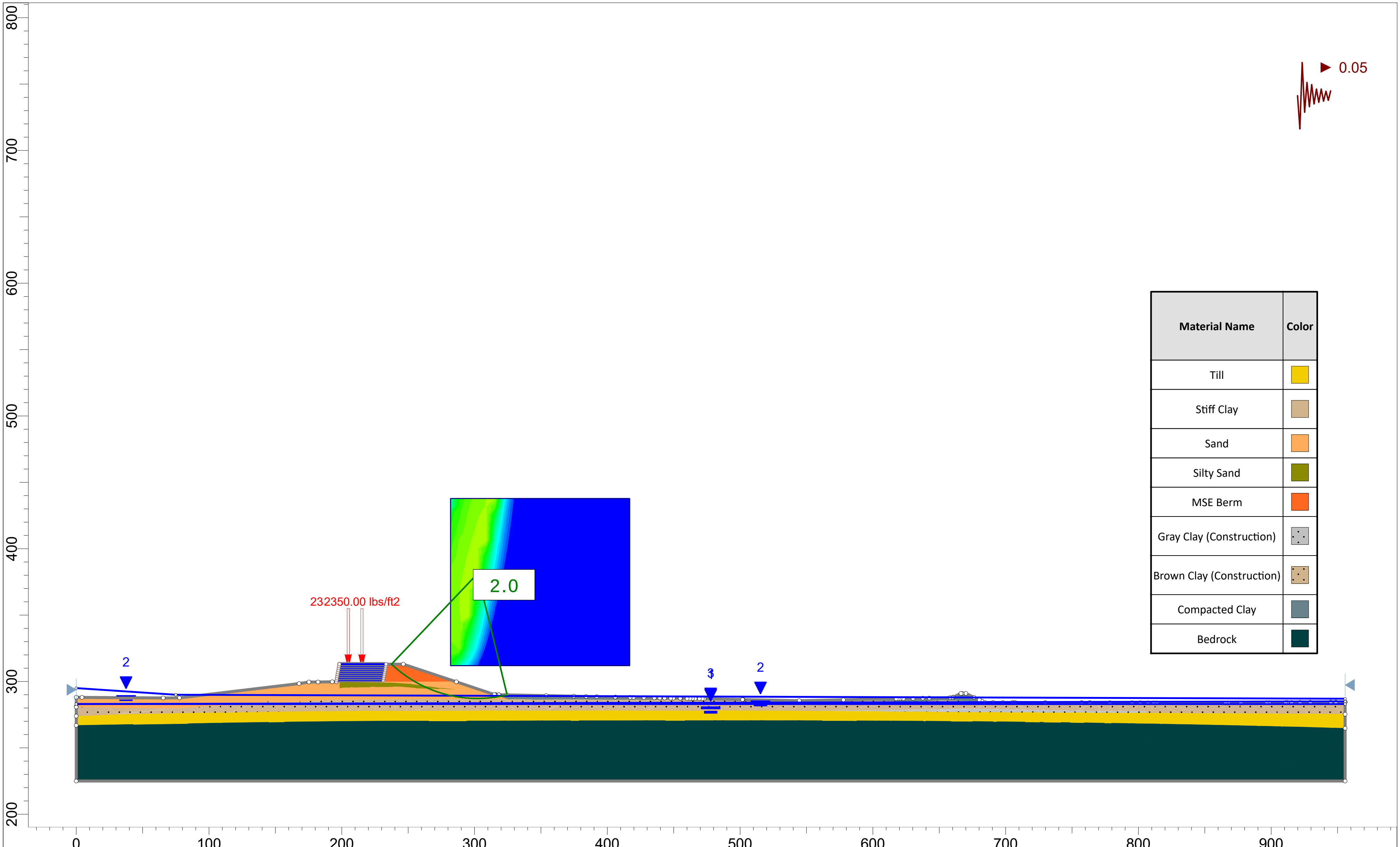
Project	Crossroads Phase 14 Stability Section VIII
Analysis Description	Construction, Static, Outward Non-Circular
Drawn By	A. Rohrman
Scale	1:300
Company	Geosyntec Consultants
Date	10/1/2019
File Name	2019.10.01 Ph14 VIII.slmd

SLIDEINTERPRET 8.014

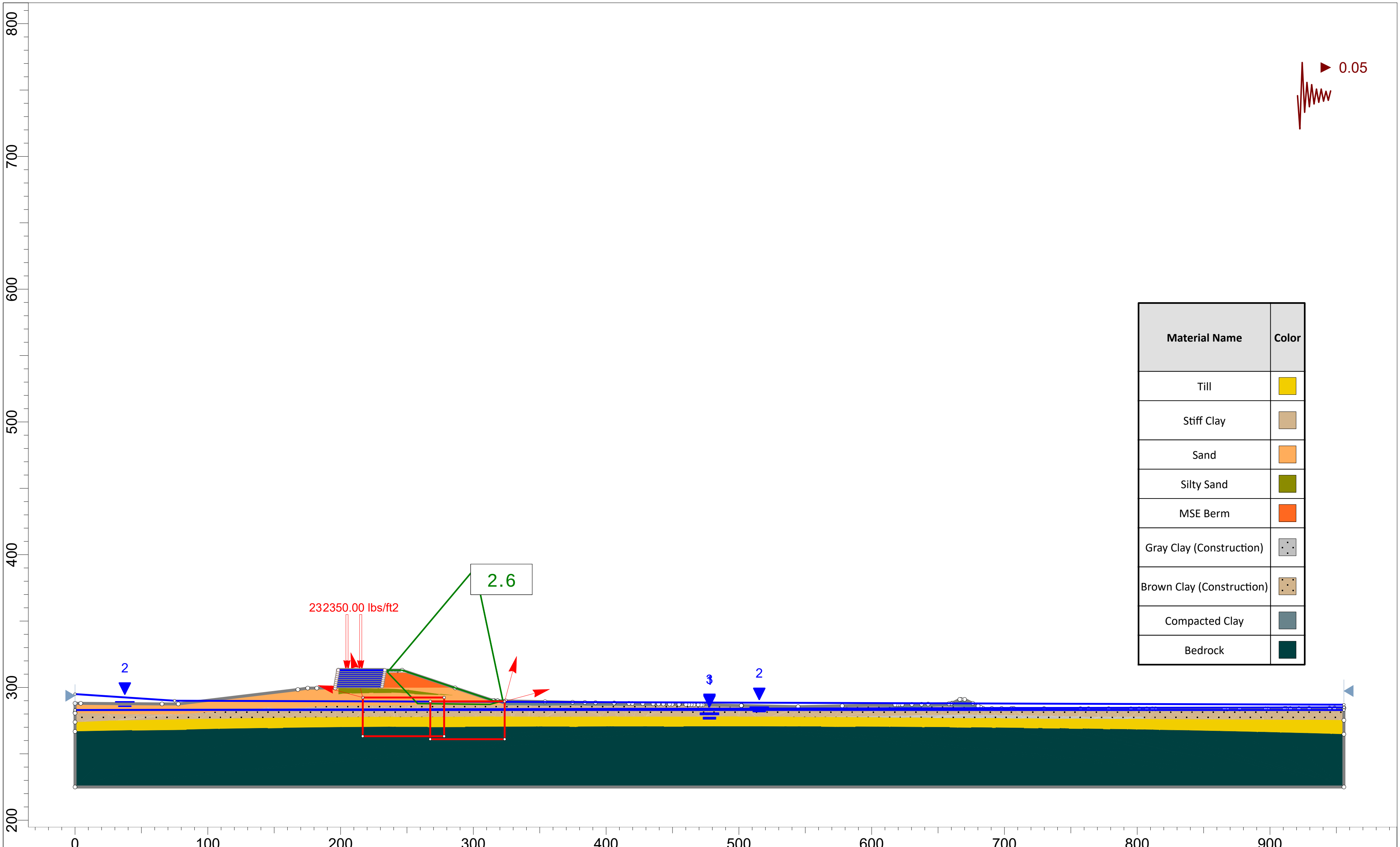
ATTACHMENT 8

Slope Stability Outputs for Seismic Construction Condition

Section I



Geosyntec consultants	*Project*	Crossroads Phase 14 Stability Section I		
	Analysis Description	Construction, Seismic, Inward Circular		
	Drawn By A. Rohrman	*Scale* 1:1200	*Company*	Geosyntec Consultants
SLIDEINTERPRET 8.028	*Date* 10/1/2019		*File Name*	2019.10.01 Ph14 I.slmd



Material Name	Color
Till	
Stiff Clay	
Sand	
Silty Sand	
MSE Berm	
Gray Clay (Construction)	
Brown Clay (Construction)	
Compacted Clay	
Bedrock	

Geosyntec consultants

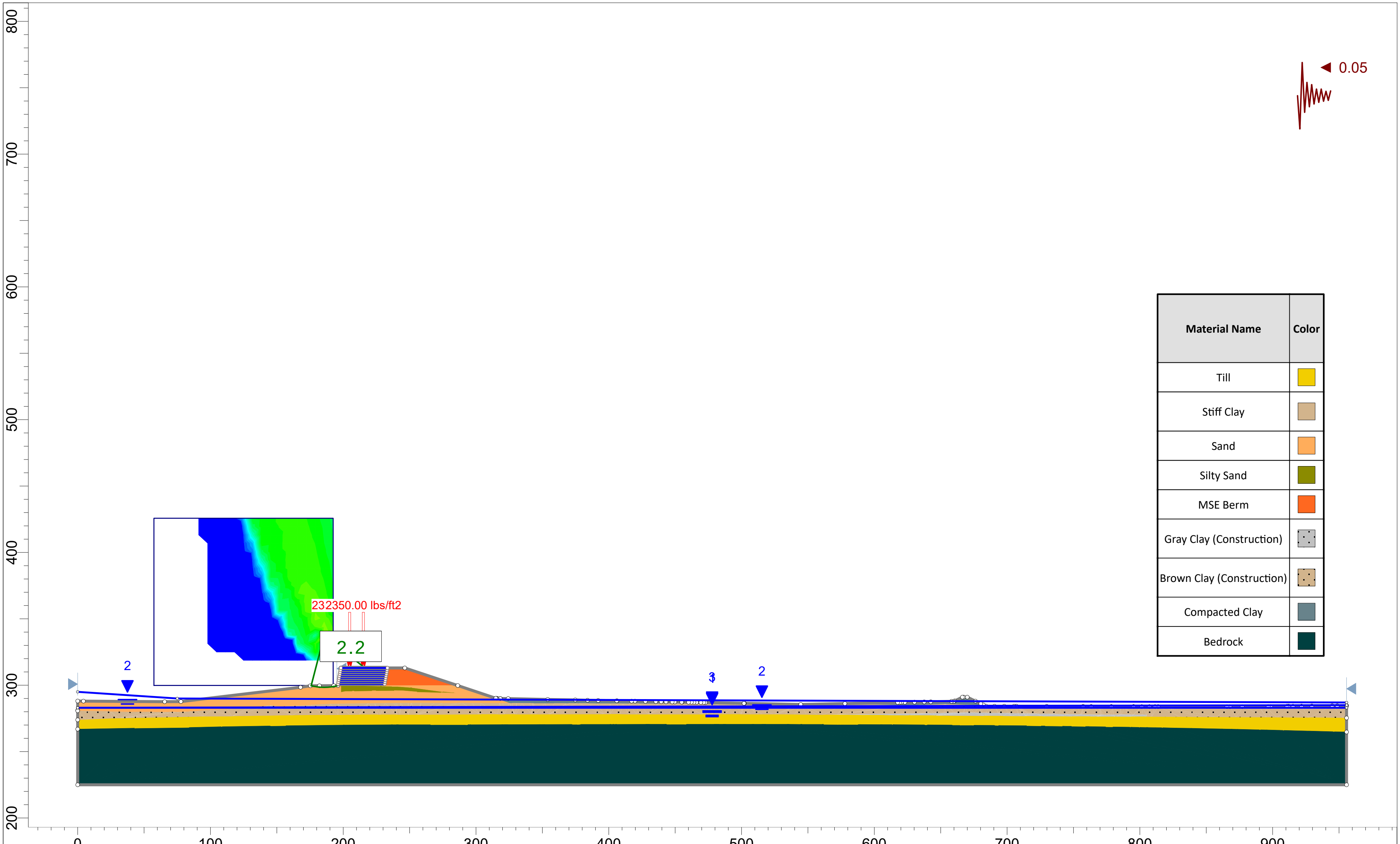
SLIDEINTERPRET 8.028

Project Crossroads Phase 14 Stability Section I

Analysis Description Construction, Seismic, Inward Non-Circular

Drawn By A. Rohrman | *Scale* 1:1200 | *Company* Geosyntec Consultants

Date 10/1/2019 | *File Name* 2019.10.01 Ph14 I.slmd

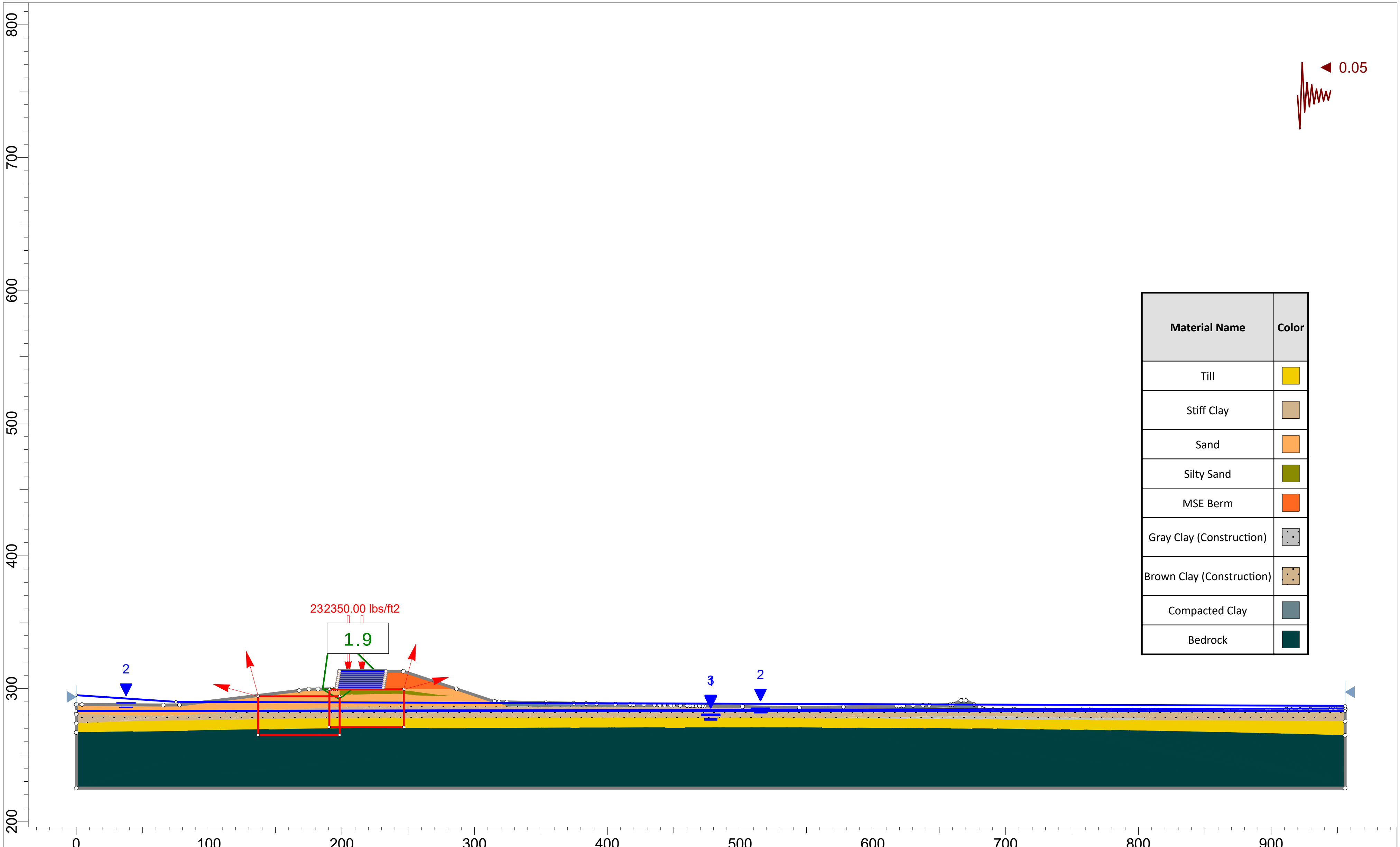


Material Name	Color
Till	
Stiff Clay	
Sand	
Silty Sand	
MSE Berm	
Gray Clay (Construction)	
Brown Clay (Construction)	
Compacted Clay	
Bedrock	

Geosyntec consultants

Project	Crossroads Phase 14 Stability Section I		
Analysis Description	Construction, Seismic, Outward Circular		
Drawn By A. Rohrman	*Scale* 1:1200	*Company*	Geosyntec Consultants
Date	10/1/2019	*File Name*	2019.10.01 Ph14 I.slmd

SLIDEINTERPRET 8.028

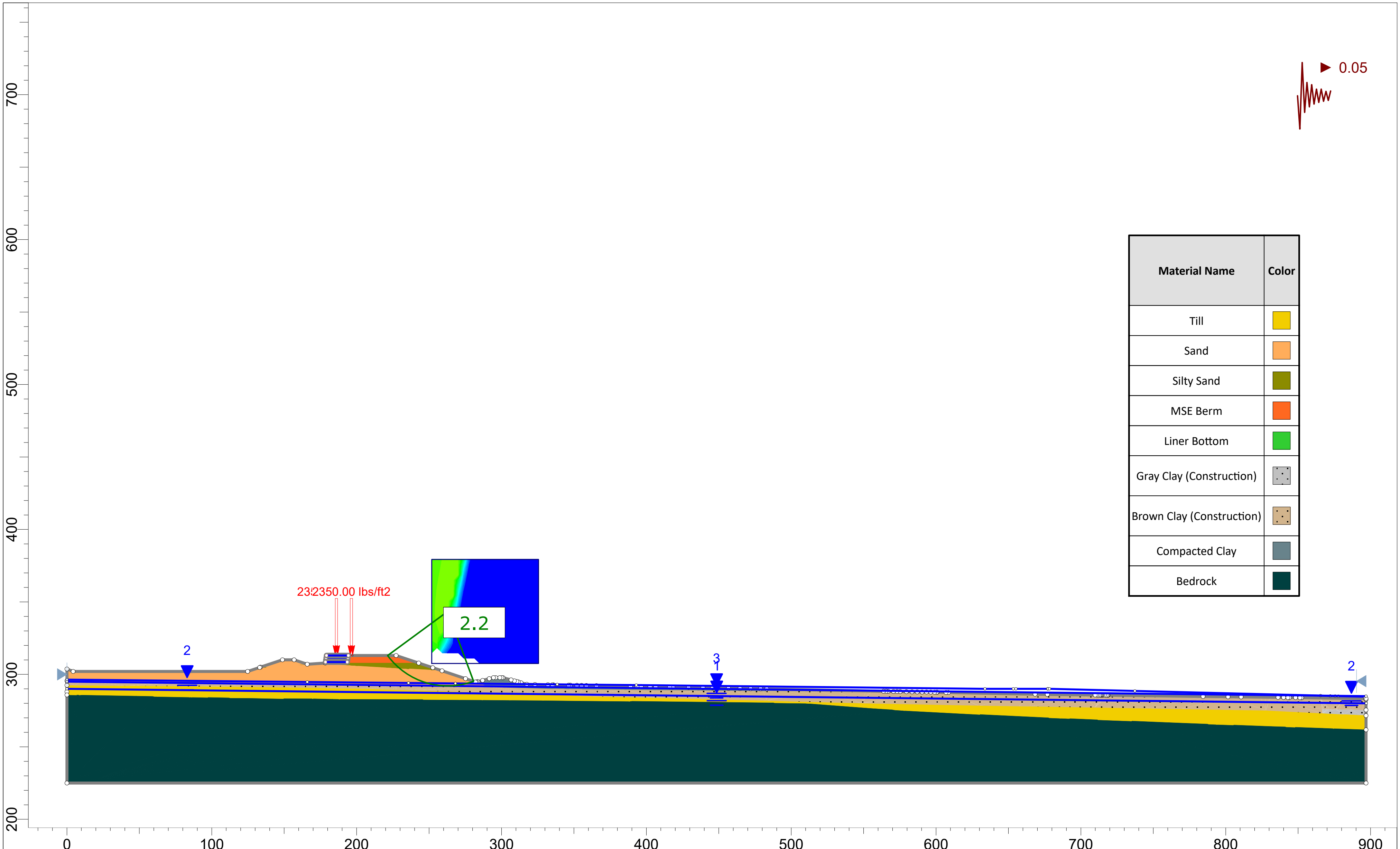


Geosyntec consultants

SLIDEINTERPRET 8.028

Project	Crossroads Phase 14 Stability Section I		
Analysis Description	Construction, Seismic, Outward Non-Circular		
Drawn By A. Rohrman	*Scale* 1:1200	*Company*	Geosyntec Consultants
Date	10/1/2019	*File Name*	2019.10.01 Ph14 I.slmd

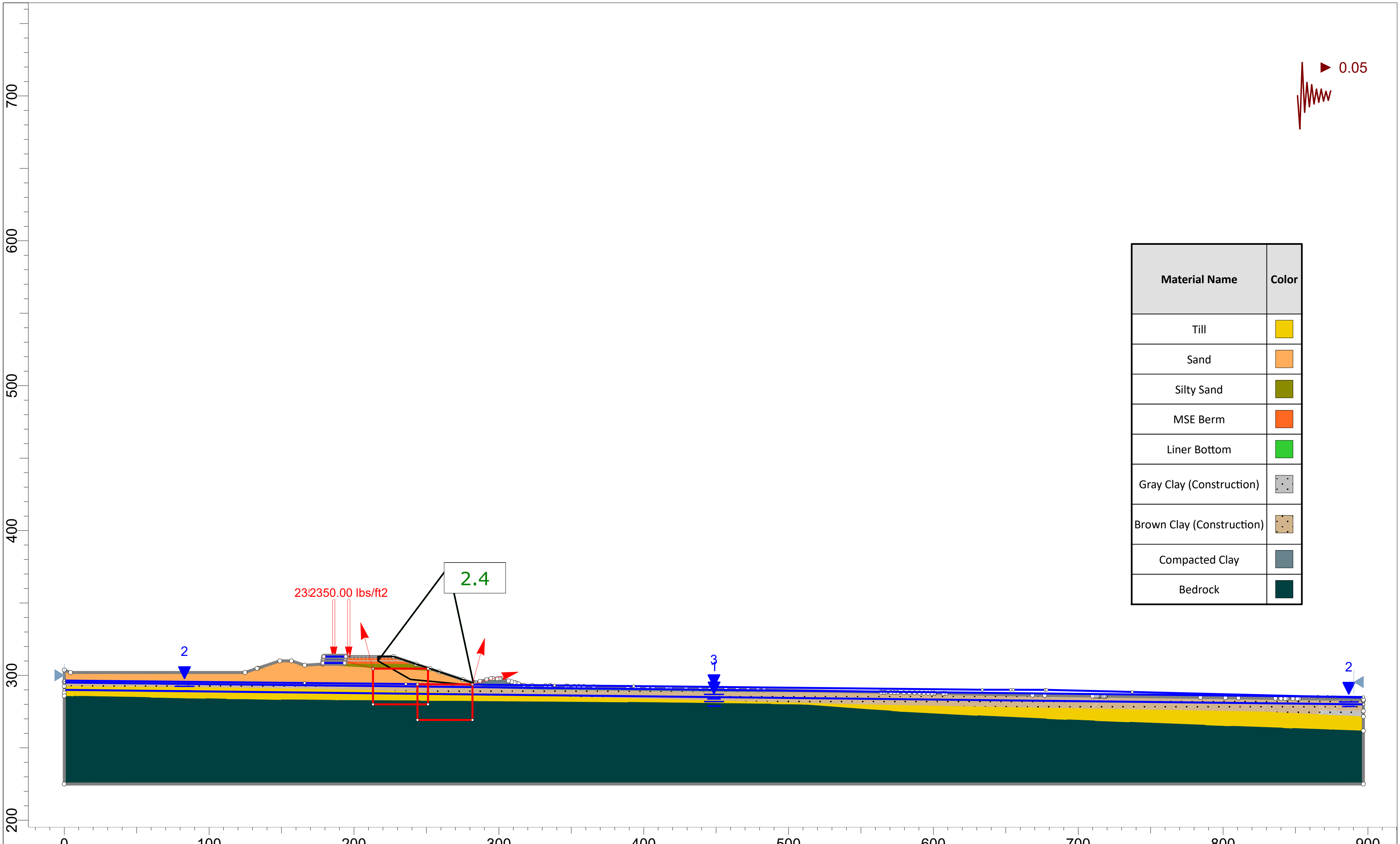
Section II



Geosyntec consultants

SLIDEINTERPRET 8.028

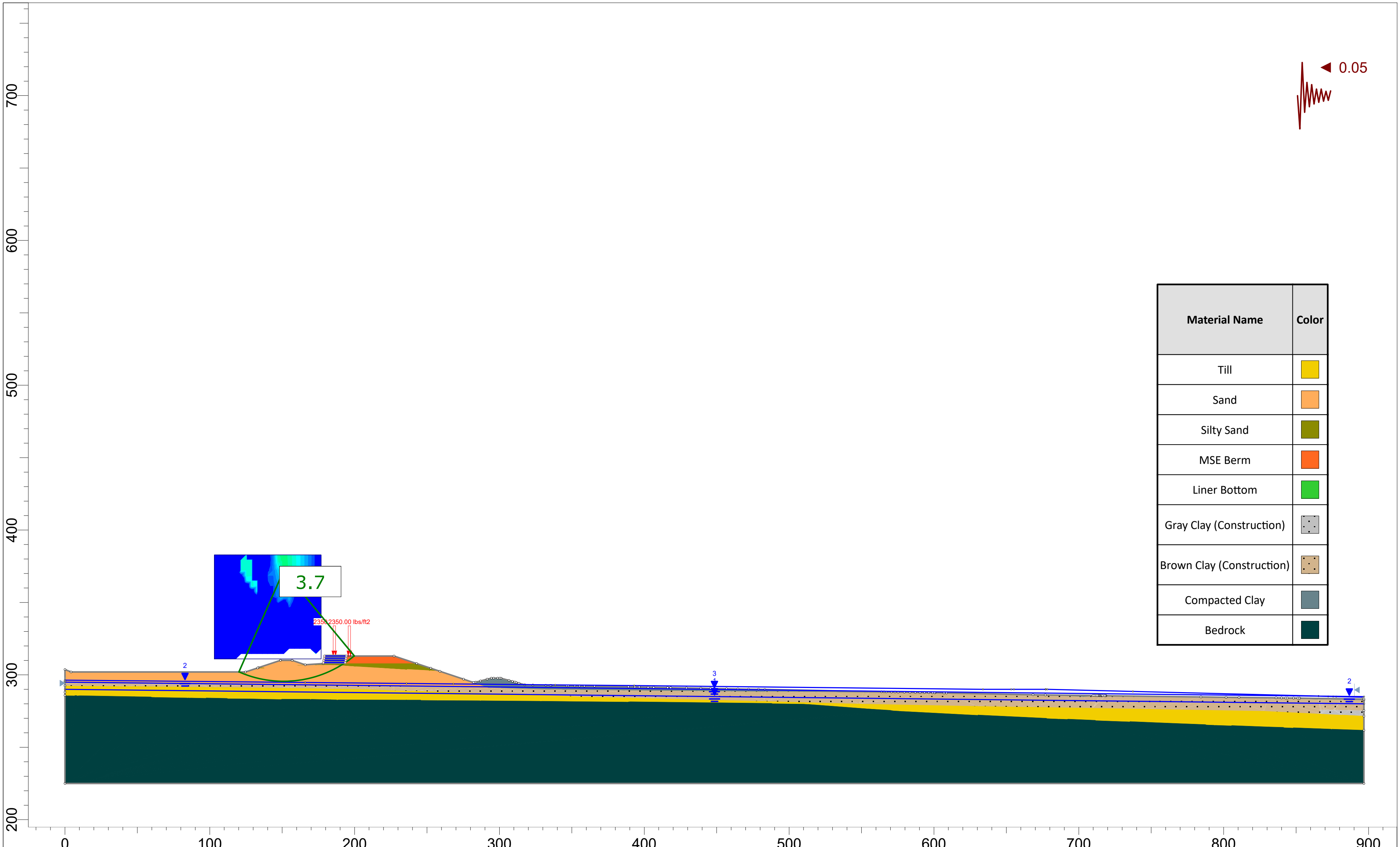
Project	Crossroads Phase 14 Stability Section II		
Analysis Description	Construction, Seismic, Inward Circular		
Drawn By A. Rohrman	*Scale* 1:1100	*Company*	Geosyntec Consultants
Date	10/1/2019	*File Name*	2019.10.01 Ph14 II.slmd



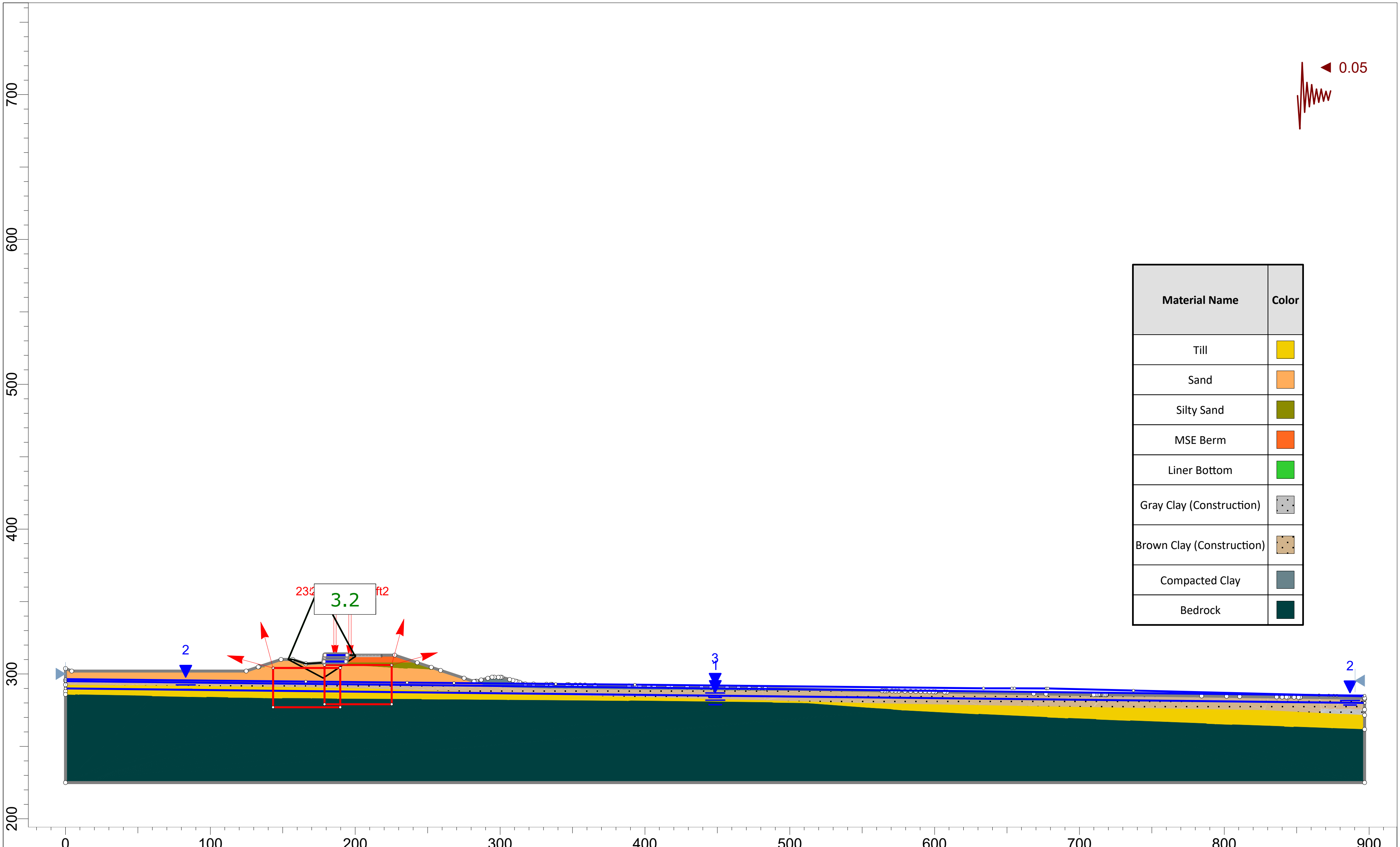
Project	Crossroads Phase 14 Stability Section II		
Analysis Description	Construction, Seismic, Inward Non-Circular		
Drawn By	A. Rohrman	Scale	1:1100
Company	Geosyntec Consultants		
Date	10/1/2019	File Name	2019.10.01 Ph14 II.slmd

Geosyntec consultants

SLIDEINTERPRET 8.028

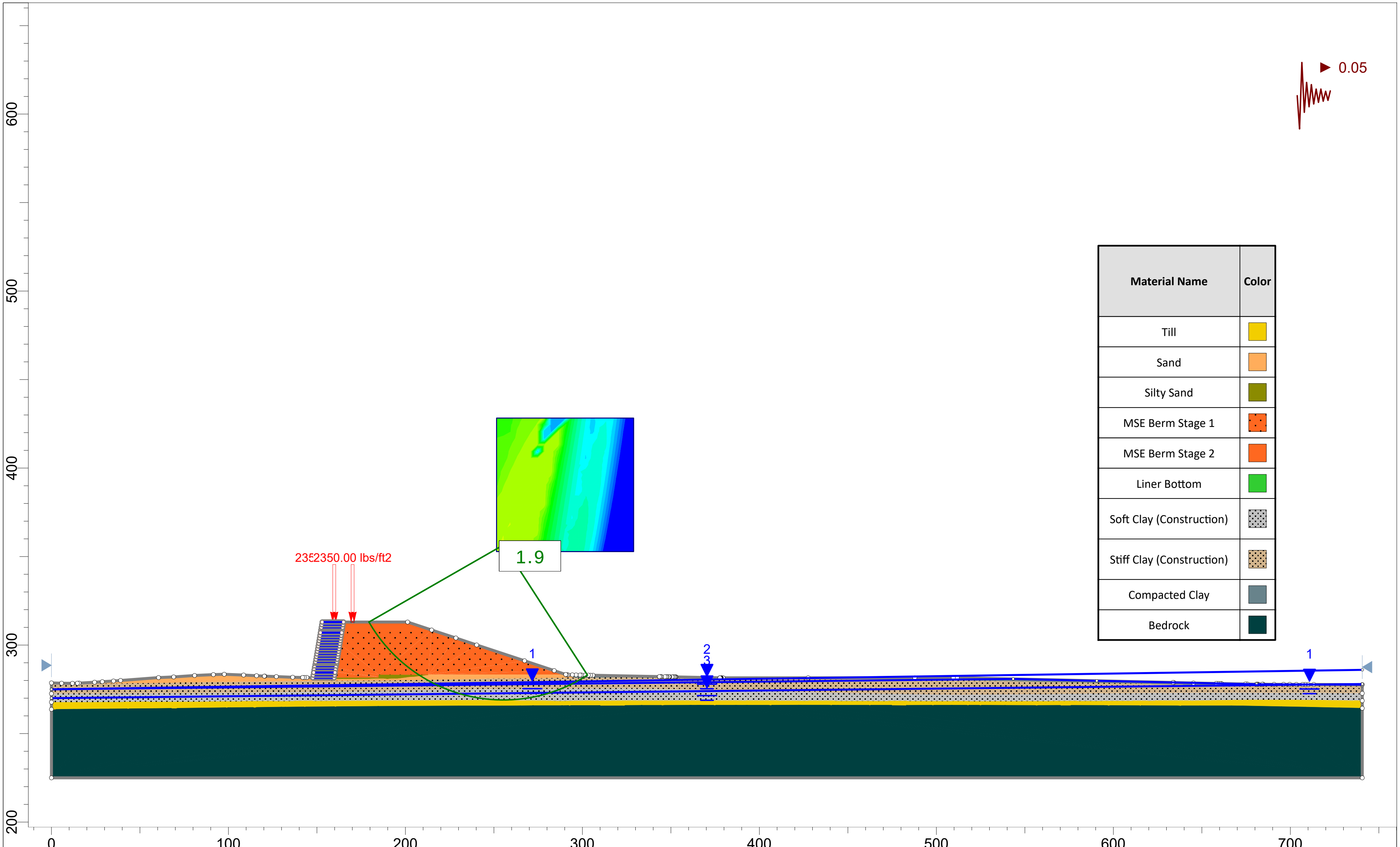


Geosyntec consultants	*Project* Crossroads Phase 14 Stability Section II		
	Analysis Description Construction, Seismic, Outward Circular		
	Drawn By A. Rohrman	*Scale* 1:1100	*Company* Geosyntec Consultants
SLIDEINTERPRET 8.028	*Date* 10/1/2019		*File Name* 2019.10.01 Ph14 II.slmd

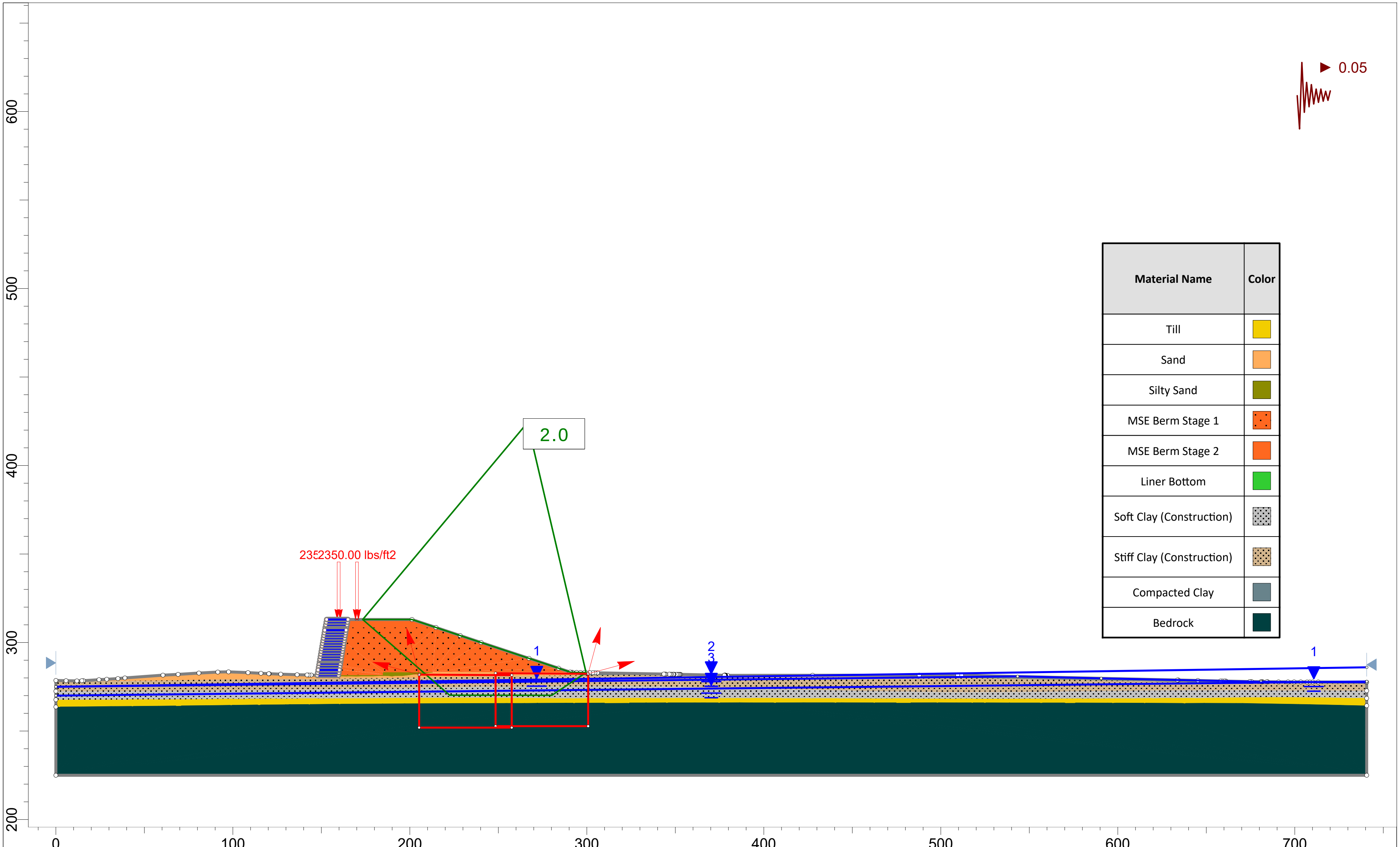


Geosyntec consultants	*Project* Crossroads Phase 14 Stability Section II		
	Analysis Description Construction, Seismic, Outward Non-Circular		
	Drawn By A. Rohrman	*Scale* 1:1100	*Company* Geosyntec Consultants
SLIDEINTERPRET 8.028	*Date* 10/1/2019		*File Name* 2019.10.01 Ph14 II.slmd

Section III



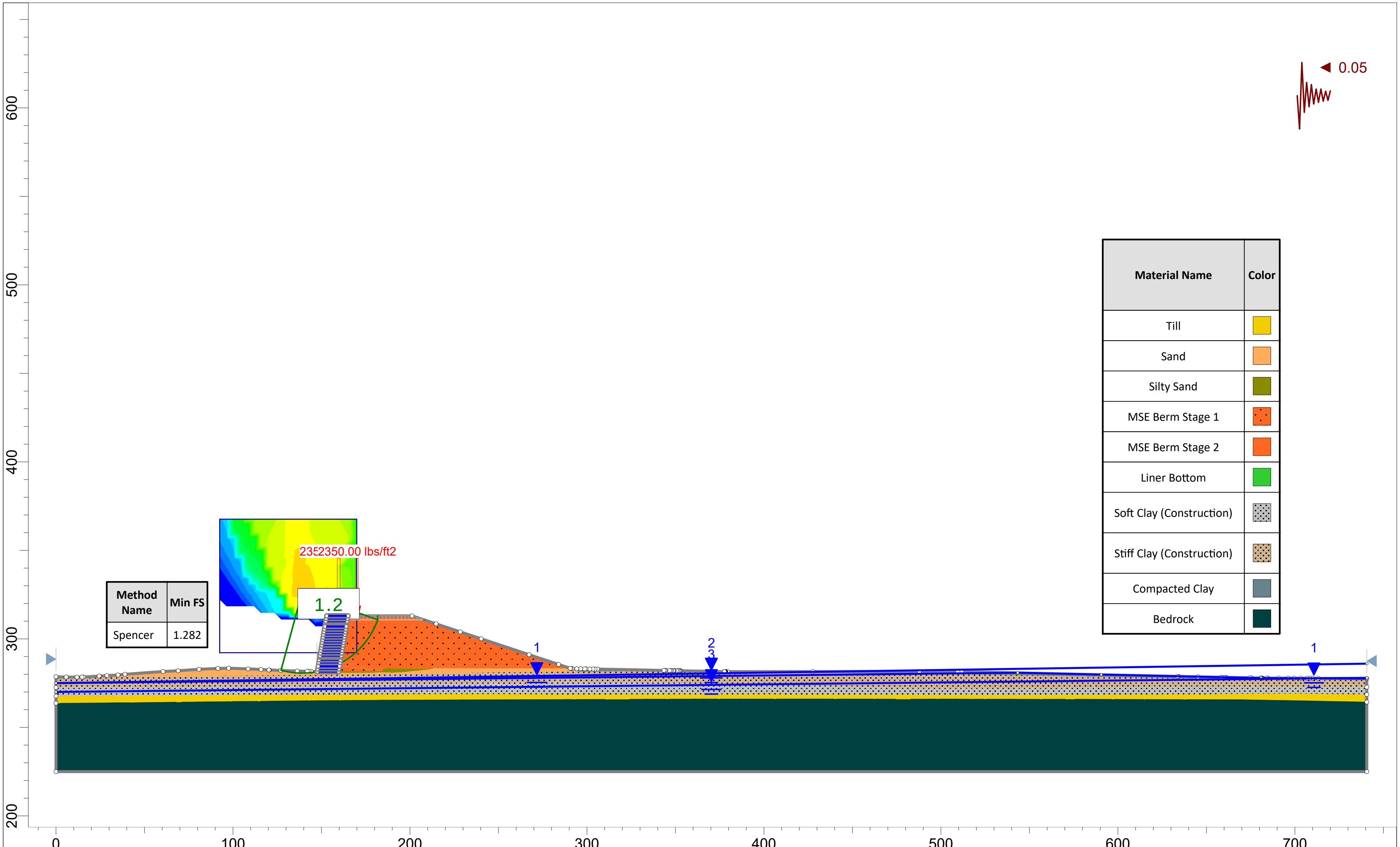
Geosyntec consultants	*Project*	Crossroads Phase 14 Stability Section III	
	Analysis Description	Construction, Seismic, Inward Circular	
	Drawn By A. Rohrman	*Scale* 1:900	*Company* Geosyntec Consultants
SLIDEINTERPRET 8.028	*Date* 10/1/2019		*File Name* 2019.10.01 Ph14 III.slmd



Geosyntec consultants

Project	Crossroads Phase 14 Stability Section III		
Analysis Description	Construction, Seismic, Inward Non-Circular		
Drawn By A. Rohrman	*Scale* 1:900	*Company*	Geosyntec Consultants
Date	10/1/2019	*File Name*	2019.10.01 Ph14 III.slmd

SLIDEINTERPRET 8.028



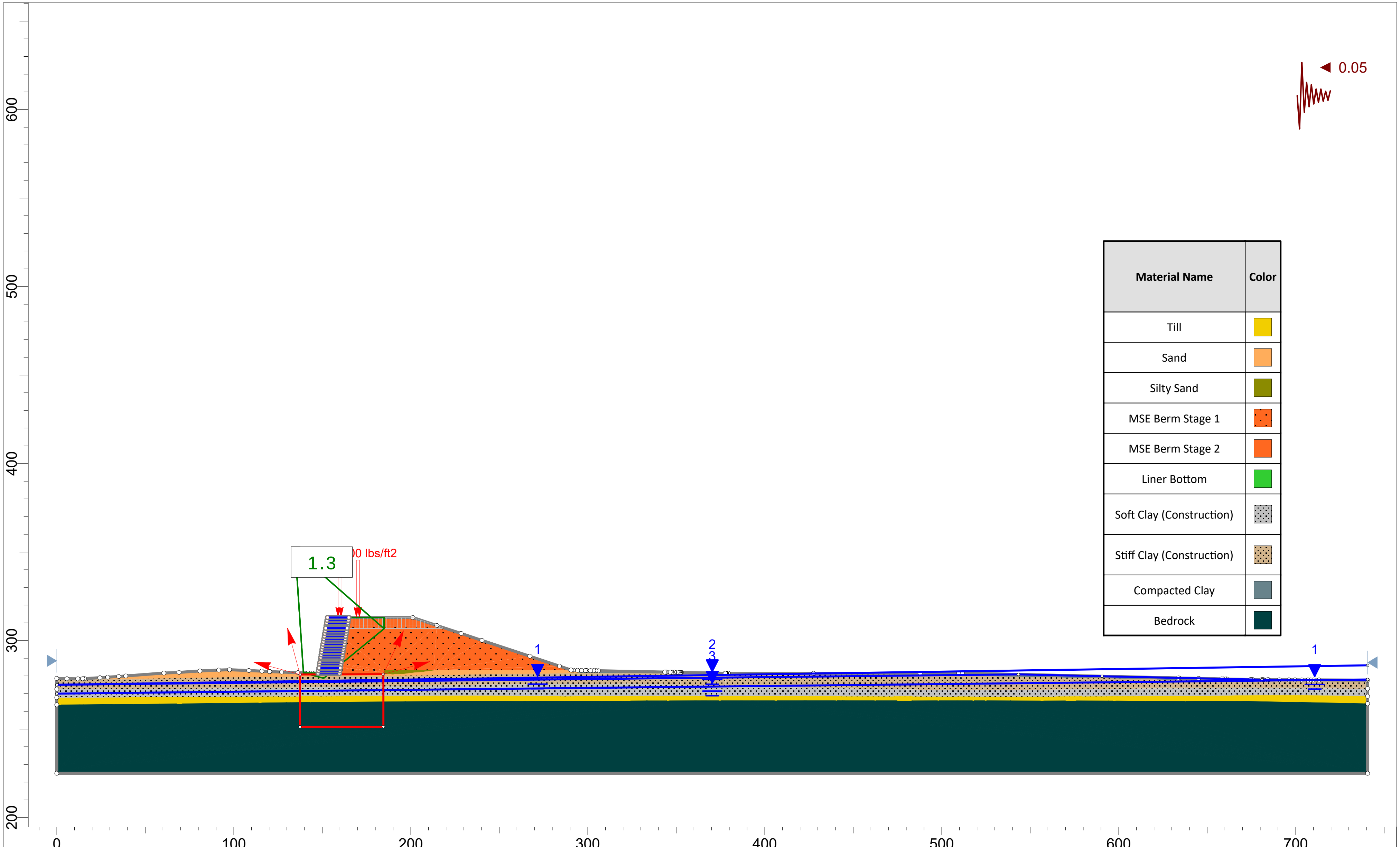
Method Name	Min FS
Spencer	1.282

Material Name	Color
Till	
Sand	
Silty Sand	
MSE Berm Stage 1	
MSE Berm Stage 2	
Liner Bottom	
Soft Clay (Construction)	
Stiff Clay (Construction)	
Compacted Clay	
Bedrock	

Geosyntec consultants

SLIDEINTERPRET 8.028

Project	Crossroads Phase 14 Stability Section III		
Analysis Description	Construction, Seismic, Outward Circular		
Drawn By A. Rohrman	*Scale* 1:900	*Company*	Geosyntec Consultants
Date	10/1/2019	*File Name*	2019.10.01 Ph14 III.slmd



Geosyntec consultants

SLIDEINTERPRET 8.028

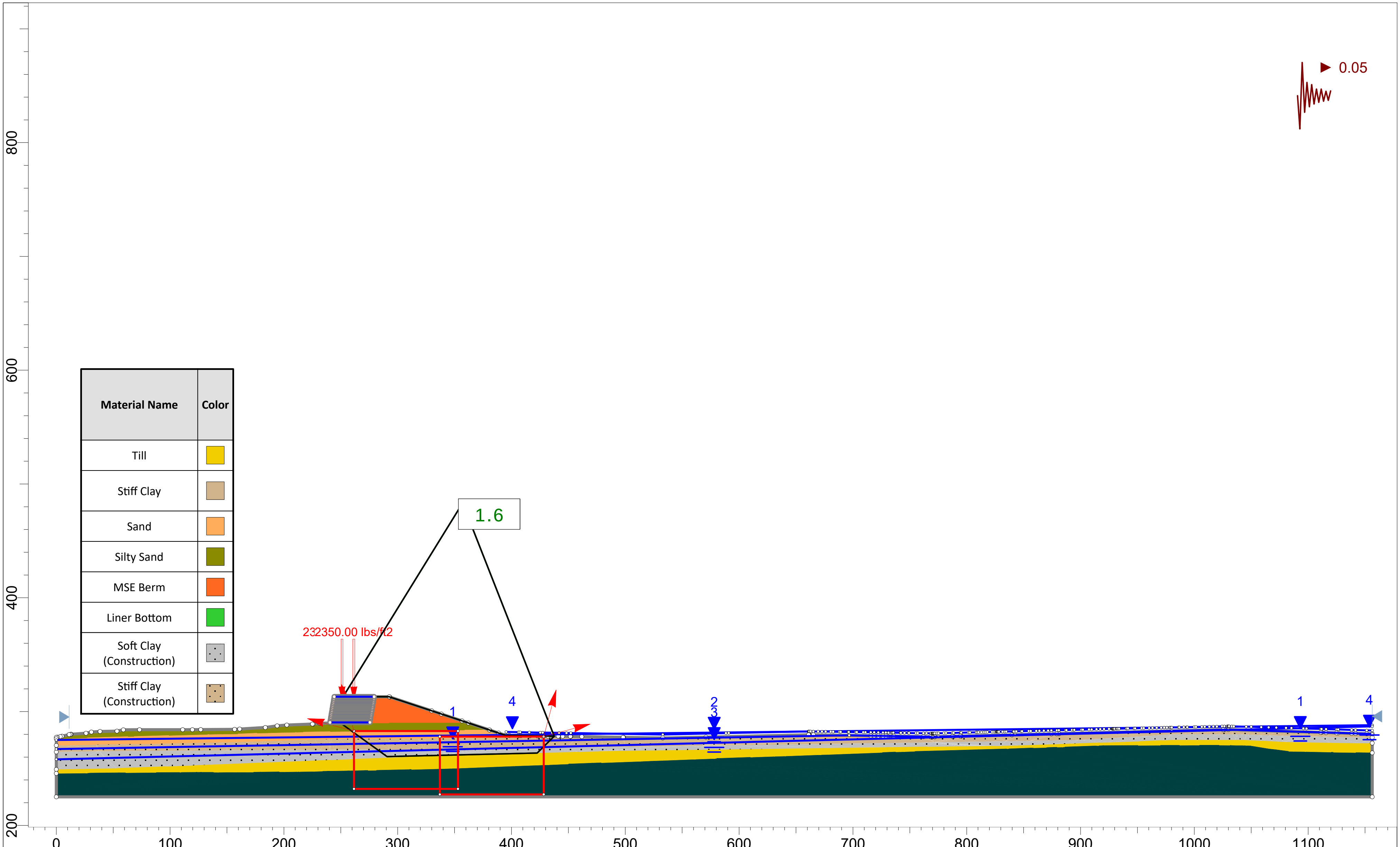
Project	Crossroads Phase 14 Stability Section III		
Analysis Description	Construction, Seismic, Outward Non-Circular		
Drawn By A. Rohrman	*Scale* 1:900	*Company*	Geosyntec Consultants
Date	10/1/2019	*File Name*	2019.10.01 Ph14 III.slmd

Section IV

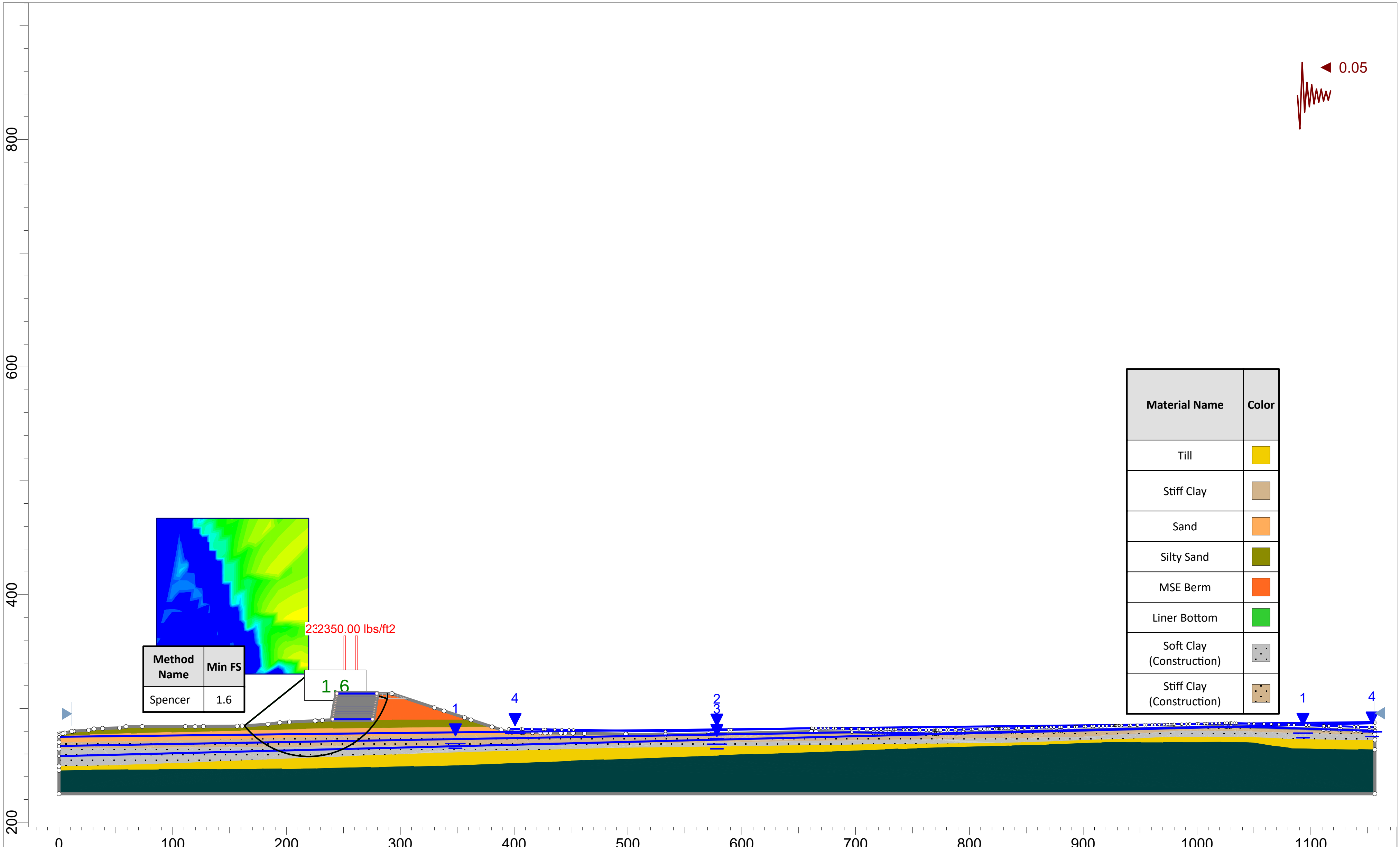
Geosyntec consultants

SLIDEINTERPRET 8.028

Project	Crossroads Phase 14 Stability Section IV		
Analysis Description	Construction, Seismic, Inward Circular		
Drawn By A. Rohrman	*Scale* 1:1400	*Company*	Geosyntec Consultants
Date	10/1/2019	*File Name*	2019.10.01 Ph14 IV.slmd



Geosyntec consultants	*Project* Crossroads Phase 14 Stability Section IV		
	Analysis Description Construction, Seismic, Inward Non-Circular		
	Drawn By A. Rohrman	*Scale* 1:1400	*Company* Geosyntec Consultants
SLIDEINTERPRET 8.028	*Date* 10/1/2019		*File Name* 2019.10.01 Ph14 IV.slmd



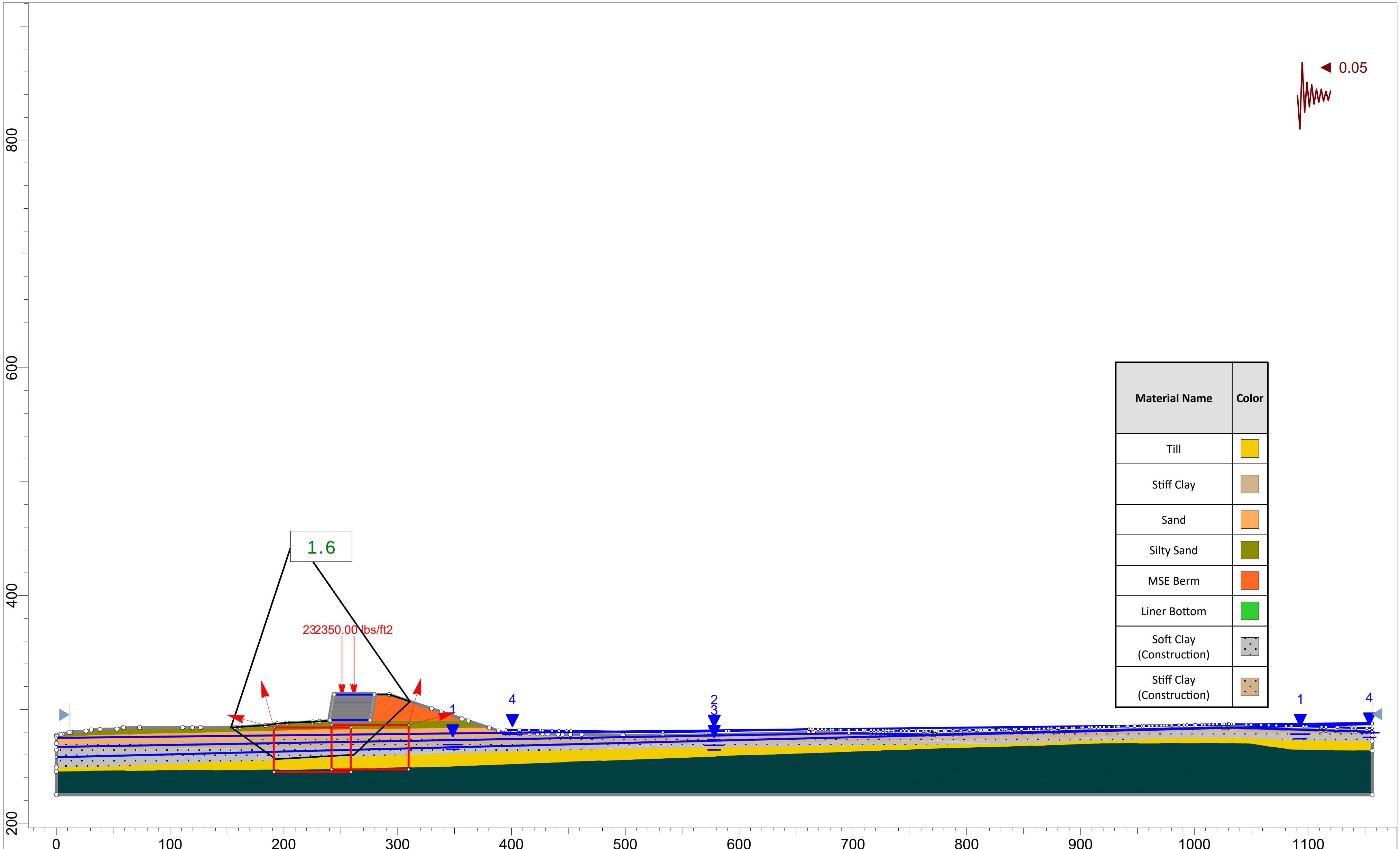
Method Name	Min FS
Spencer	1.6

Material Name	Color
Till	
Stiff Clay	
Sand	
Silty Sand	
MSE Berm	
Liner Bottom	
Soft Clay (Construction)	
Stiff Clay (Construction)	

Geosyntec consultants

SLIDEINTERPRET 8.028

Project	Crossroads Phase 14 Stability Section IV
Analysis Description	Construction, Seismic, Outward Circular
Drawn By	A. Rohrman
Scale	1:1400
Company	Geosyntec Consultants
Date	10/1/2019
File Name	2019.10.01 Ph14 IV.slmd

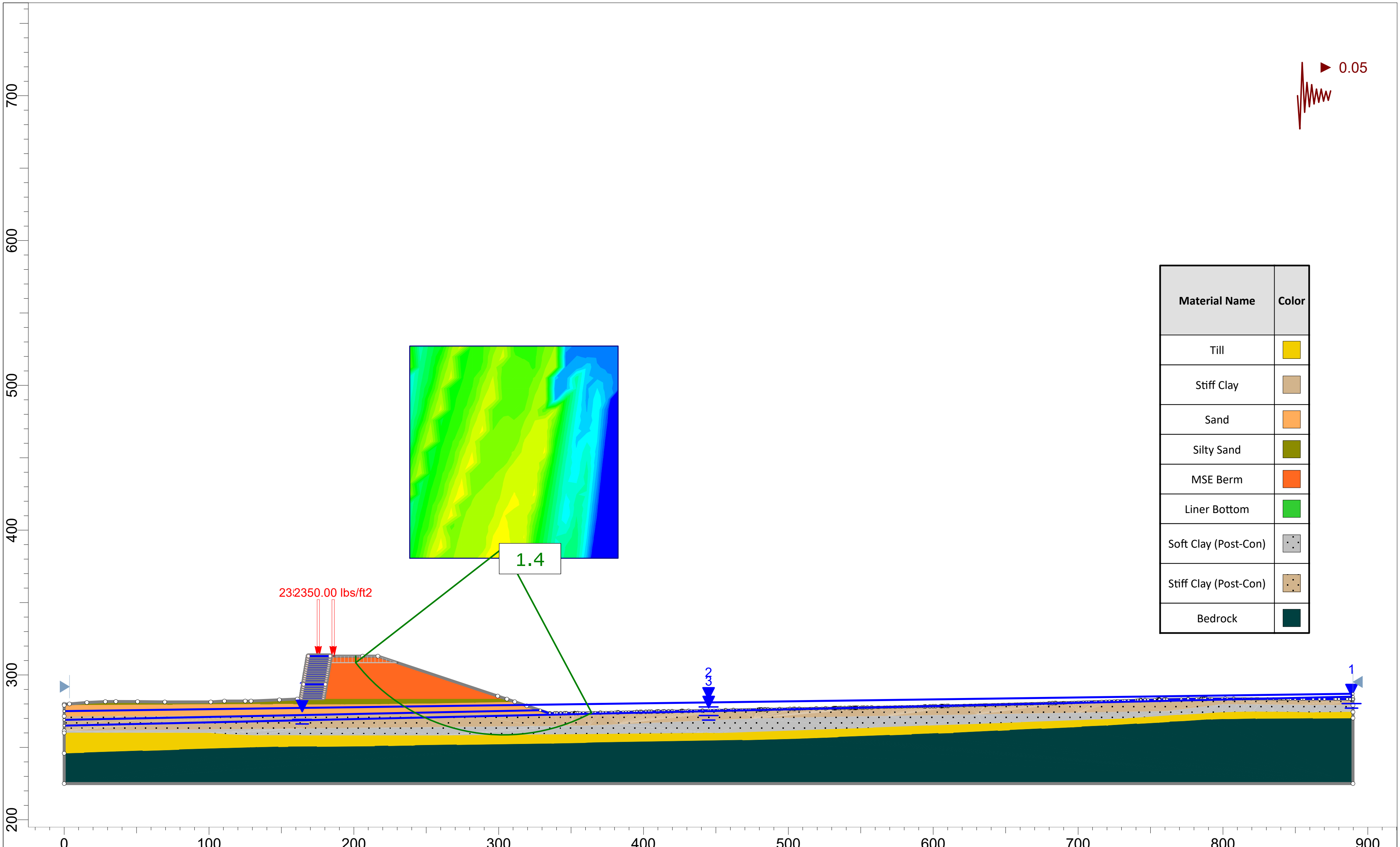


Geosyntec consultants

SLIDEINTERPRET 8.028

Project	Crossroads Phase 14 Stability Section IV		
Analysis Description	Construction, Seismic, Outward Non-Circular		
Drawn By A. Rohrman	*Scale* 1:1400	*Company*	Geosyntec Consultants
Date	10/1/2019	*File Name*	2019.10.01 Ph14 IV.slmd

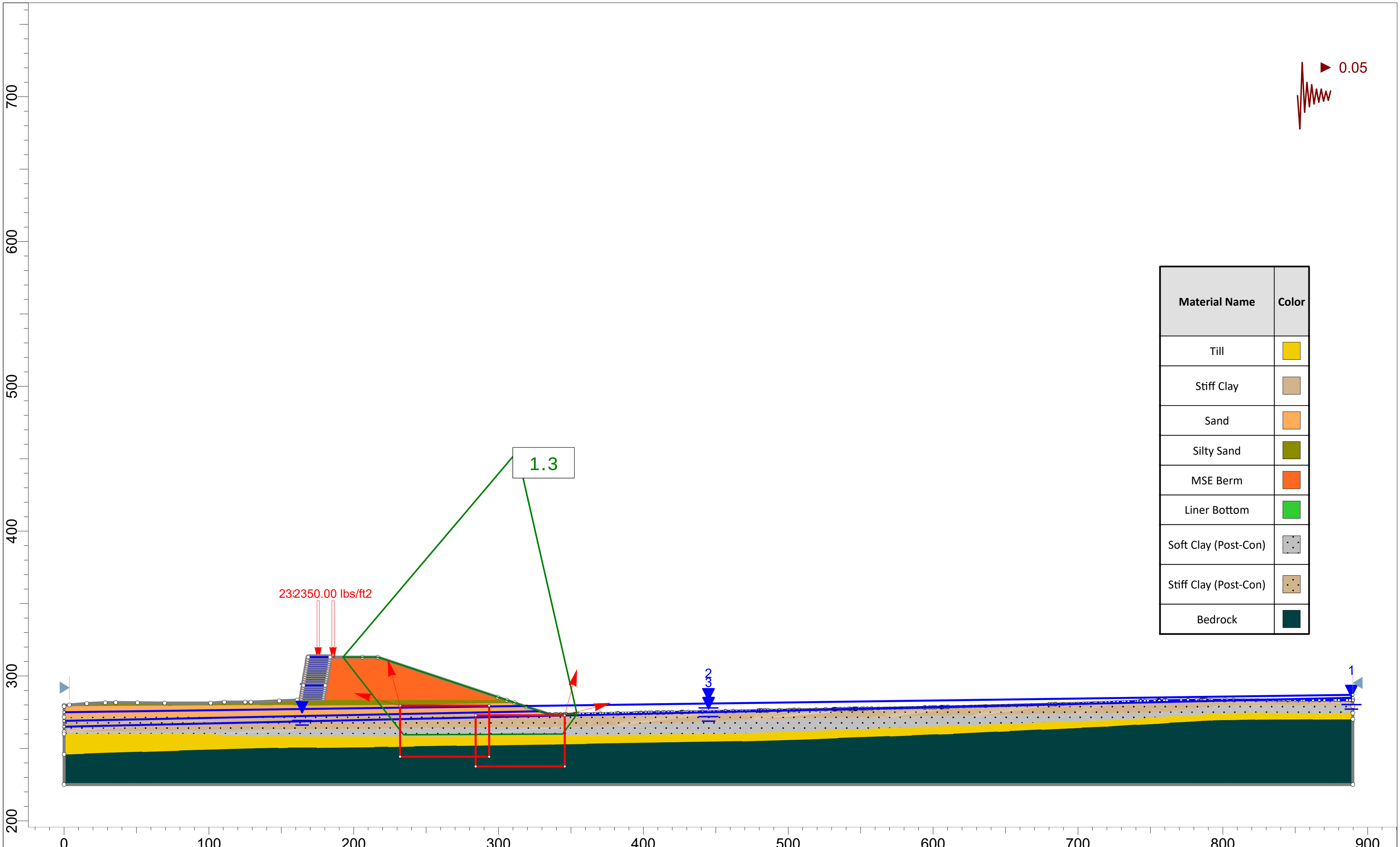
Section V



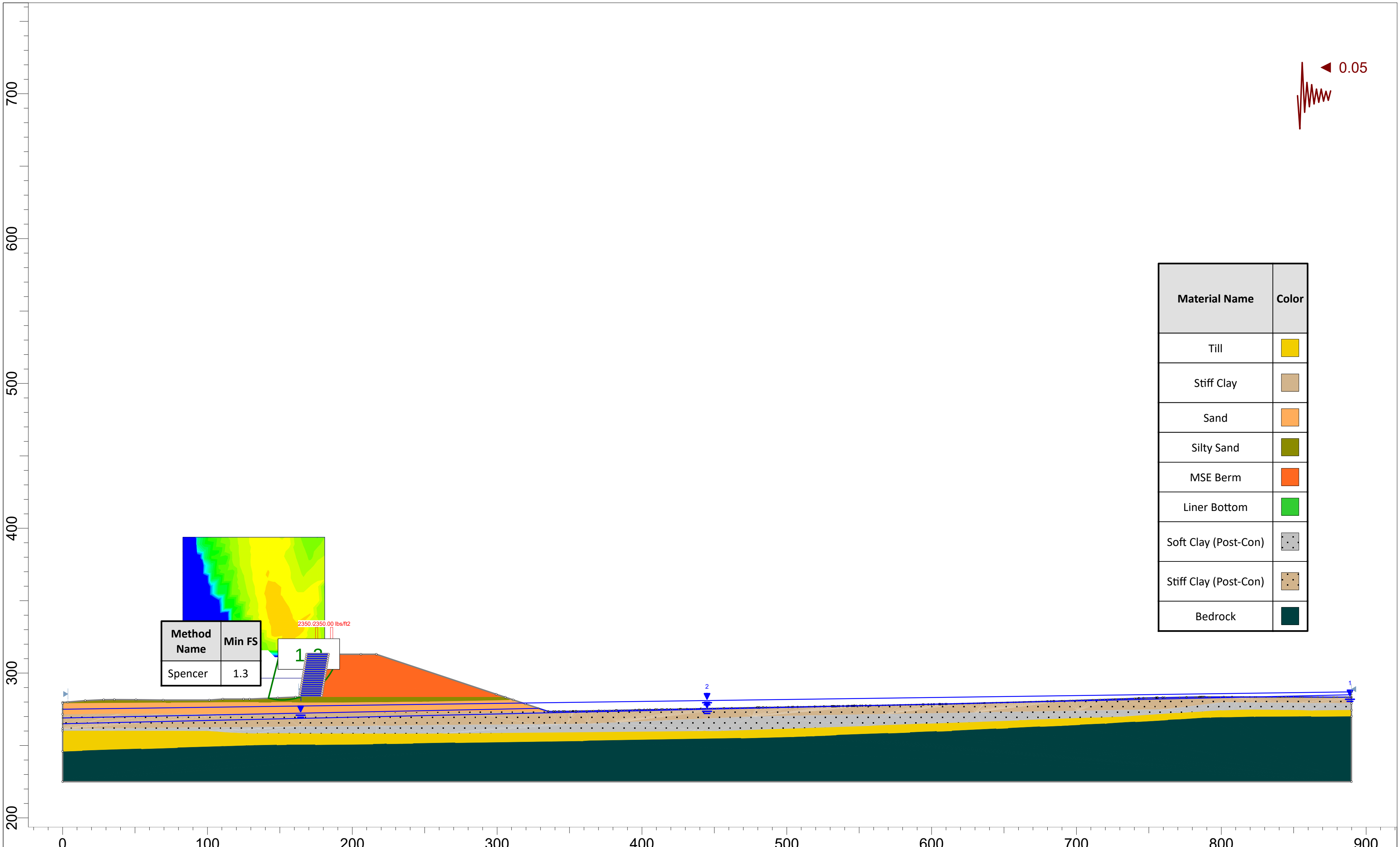
Geosyntec consultants

SLIDEINTERPRET 8.014

Project	Crossroads Phase 14 Stability Section V
Analysis Description	Construction, Seismic, Inward Circular
Drawn By	A. Rohrman
Scale	1:1100
Company	Geosyntec Consultants
Date	10/1/2019
File Name	2019.10.01 Ph14 V.slmd



Geosyntec consultants	*Project*	Crossroads Phase 14 Stability Section V	
	Analysis Description	Construction, Seismic, Inward Non-Circular	
	Drawn By A. Rohrman	*Scale* 1:1100	*Company* Geosyntec Consultants
SLIDEINTERPRET 8.014	*Date* 10/1/2019		*File Name* 2019.10.01 Ph14 V.slmd



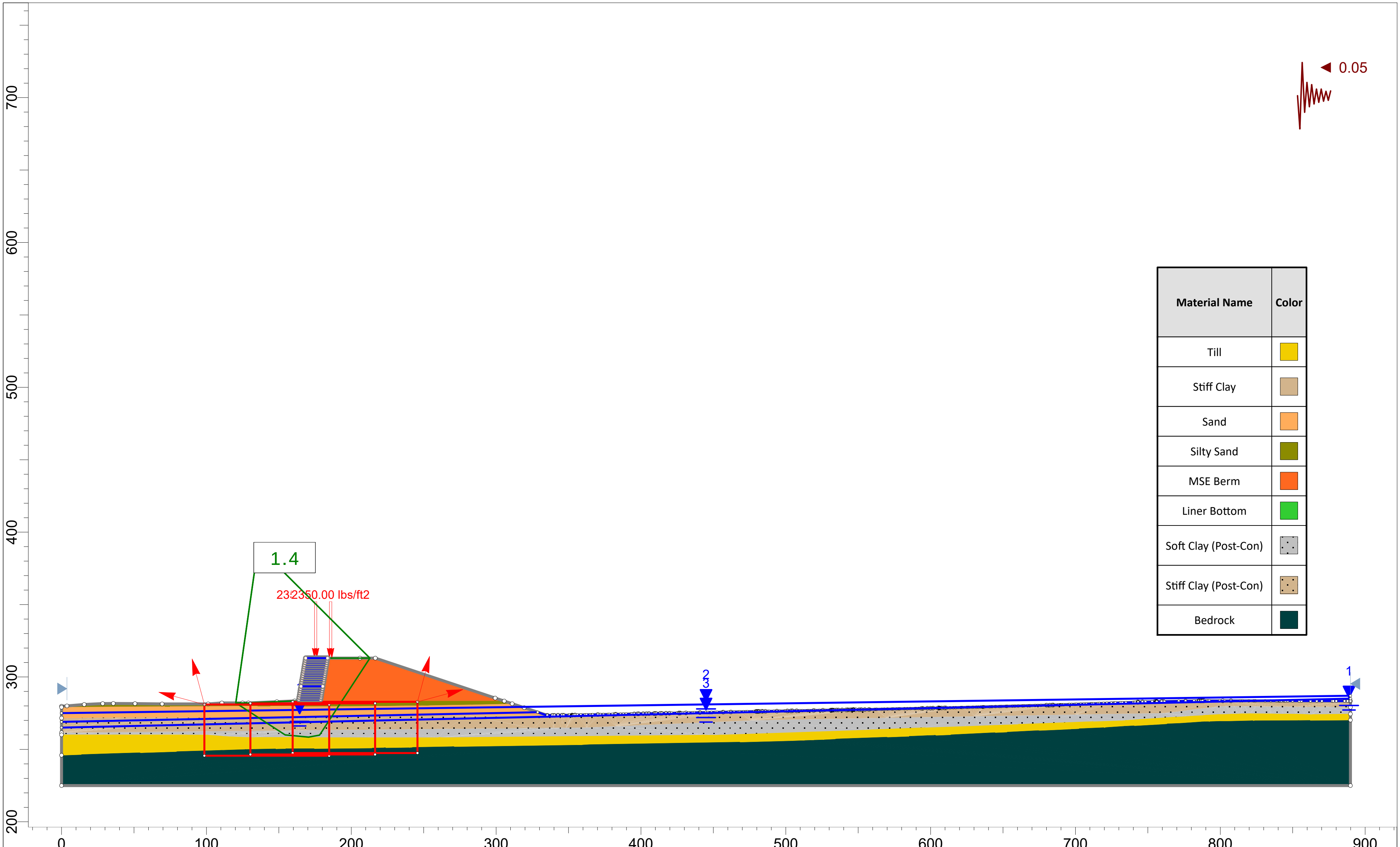
Method Name	Min FS
Spencer	1.3

Material Name	Color
Till	
Stiff Clay	
Sand	
Silty Sand	
MSE Berm	
Liner Bottom	
Soft Clay (Post-Con)	
Stiff Clay (Post-Con)	
Bedrock	

Geosyntec consultants

SLIDEINTERPRET 8.014

Project	Crossroads Phase 14 Stability Section V
Analysis Description	Construction, Seismic, Outward Circular
Drawn By	A. Rohrman
Scale	1:1100
Company	Geosyntec Consultants
Date	10/1/2019
File Name	2019.10.01 Ph14 V.slmd

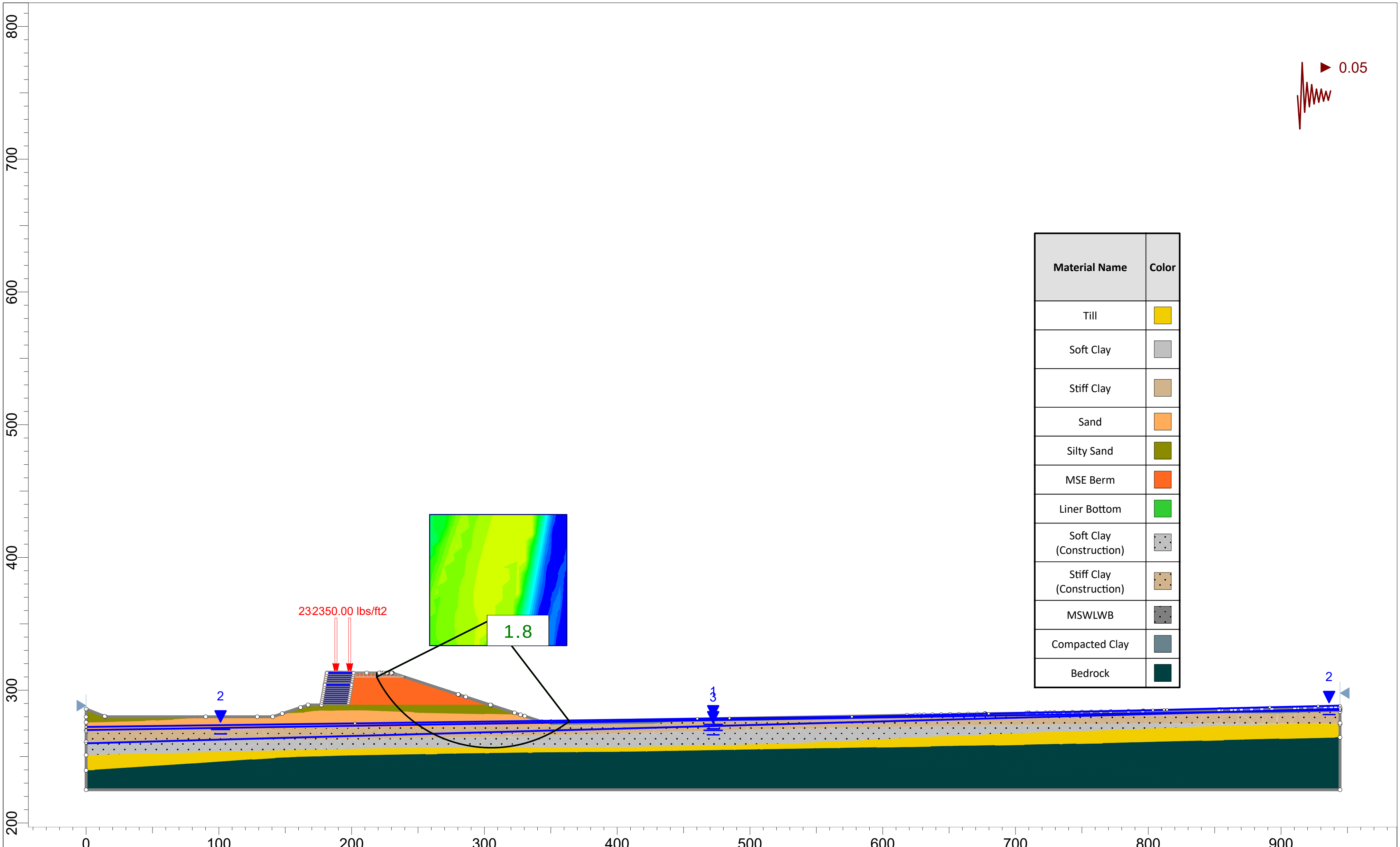


Geosyntec consultants

Project	Crossroads Phase 14 Stability Section V		
Analysis Description	Construction, Seismic, Outward Non-Circular		
Drawn By A. Rohrman	*Scale* 1:1100	*Company*	Geosyntec Consultants
Date 10/1/2019		*File Name*	2019.10.01 Ph14 V.slmd

SLIDEINTERPRET 8.014

Section VI

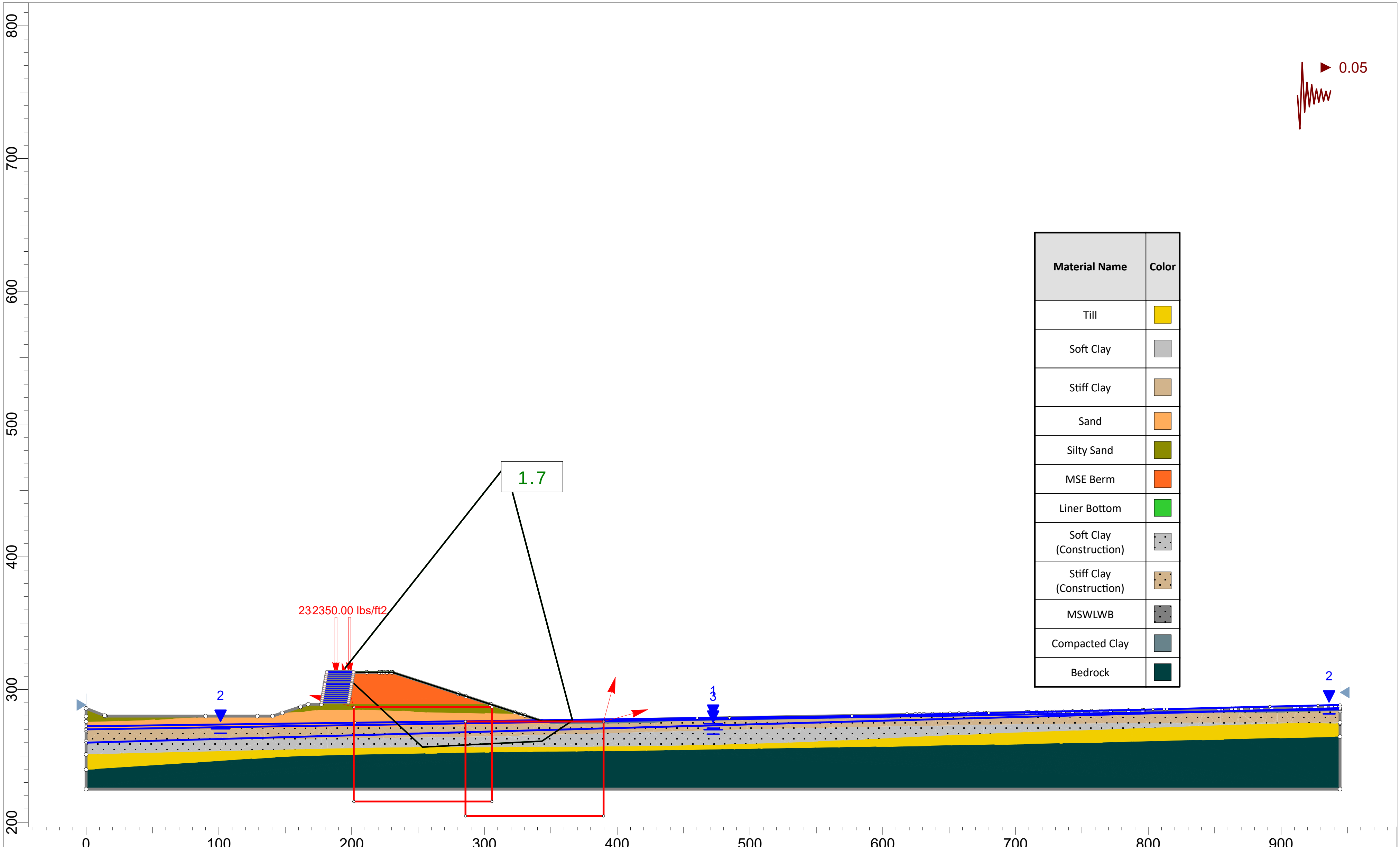


Material Name	Color
Till	
Soft Clay	
Stiff Clay	
Sand	
Silty Sand	
MSE Berm	
Liner Bottom	
Soft Clay (Construction)	
Stiff Clay (Construction)	
MSWLWB	
Compacted Clay	
Bedrock	

Geosyntec consultants

Project	Crossroads Phase 14 Stability Section VI		
Analysis Description	Construction, Seismic, Inward Circular		
Drawn By A. Rohrman	*Scale* 1:1200	*Company*	Geosyntec Consultants
Date	10/1/2019	*File Name*	2019.10.01 Ph14 VI.slmd

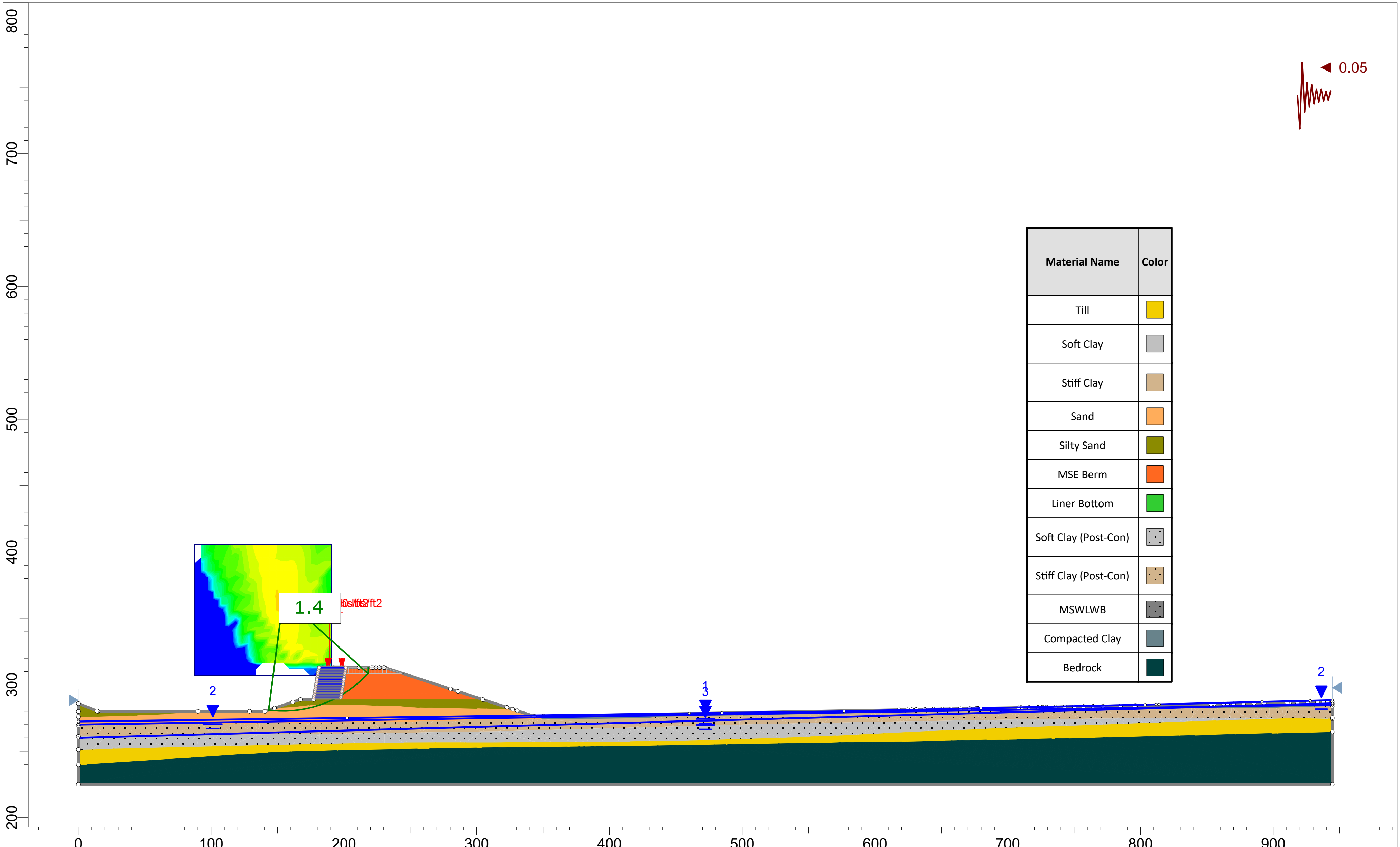
SLIDEINTERPRET 8.028



Geosyntec consultants

Project	Crossroads Phase 14 Stability Section VI
Analysis Description	Construction, Seismic, Inward Non-Circular
Drawn By	A. Rohrman
Scale	1:1200
Company	Geosyntec Consultants
Date	10/1/2019
File Name	2019.10.01 Ph14 VI.slmd

SLIDEINTERPRET 8.028

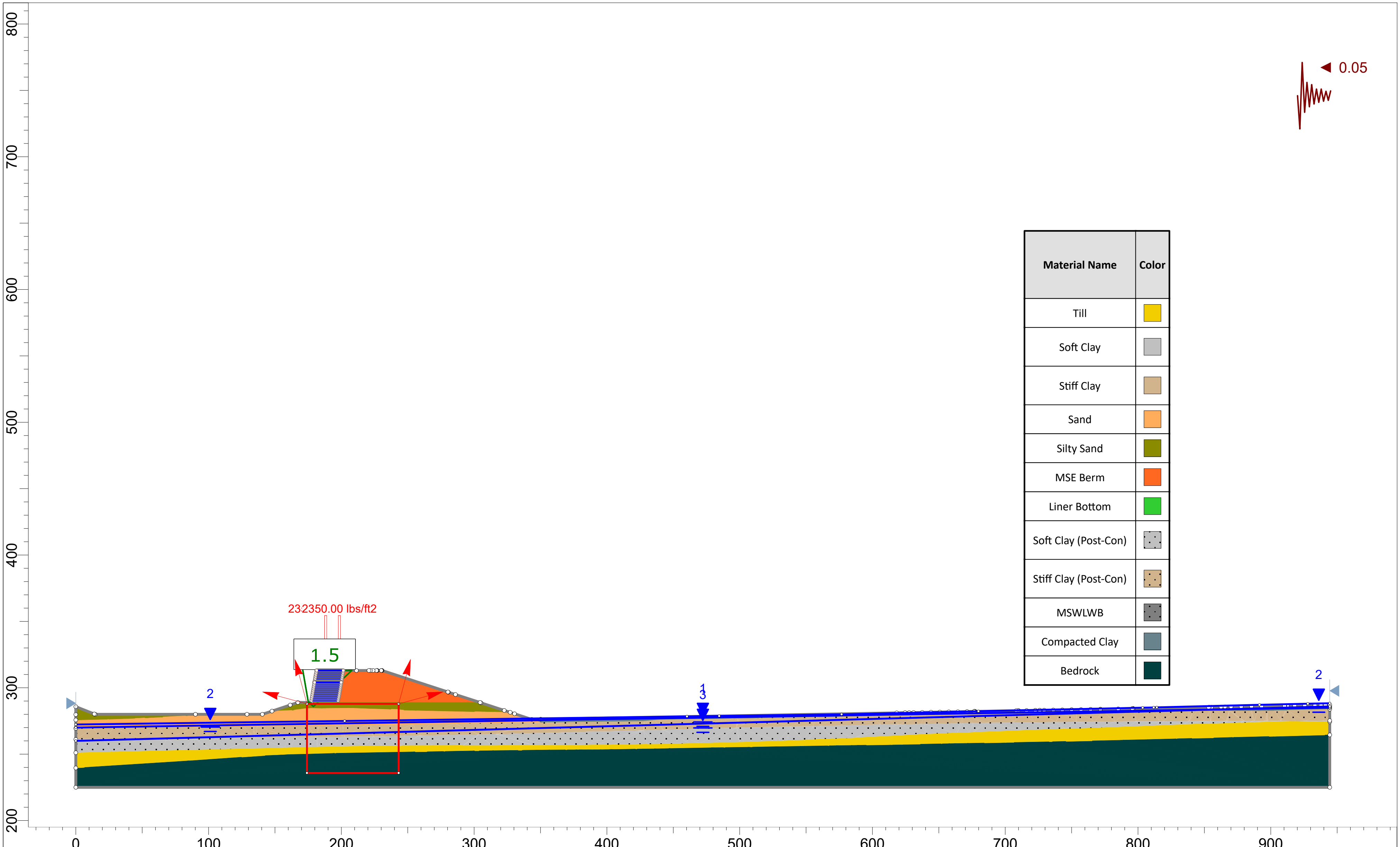


Material Name	Color
Till	
Soft Clay	
Stiff Clay	
Sand	
Silty Sand	
MSE Berm	
Liner Bottom	
Soft Clay (Post-Con)	
Stiff Clay (Post-Con)	
MSWLWB	
Compacted Clay	
Bedrock	

Geosyntec consultants

SLIDEINTERPRET 8.014

Project	Crossroads Phase 14 Stability Section VI		
Analysis Description	Construction, Seismic, Outward Circular		
Drawn By	A. Rohrman	*Scale* 1:1200	*Company* Geosyntec Consultants
Date	10/1/2019	*File Name*	2019.10.01 Ph14 VI.slmd



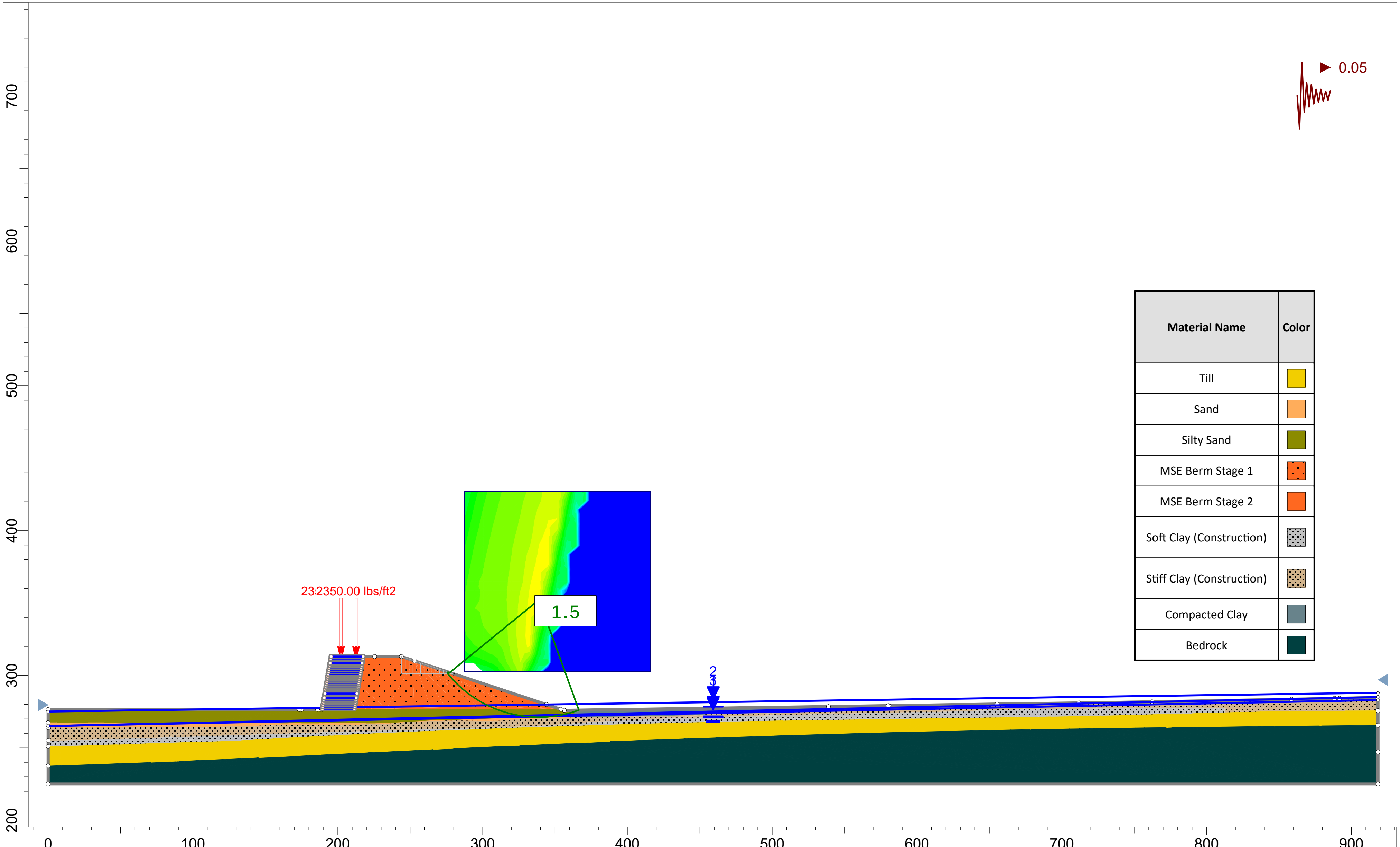
Material Name	Color
Till	
Soft Clay	
Stiff Clay	
Sand	
Silty Sand	
MSE Berm	
Liner Bottom	
Soft Clay (Post-Con)	
Stiff Clay (Post-Con)	
MSWLWB	
Compacted Clay	
Bedrock	

Geosyntec consultants

SLIDEINTERPRET 8.014

Project	Crossroads Phase 14 Stability Section VI
Analysis Description	Construction, Seismic, Outward Non-Circular
Drawn By	A. Rohrman
Scale	1:1200
Company	Geosyntec Consultants
Date	10/1/2019
File Name	2019.10.01 Ph14 VI.slmd

Section VII

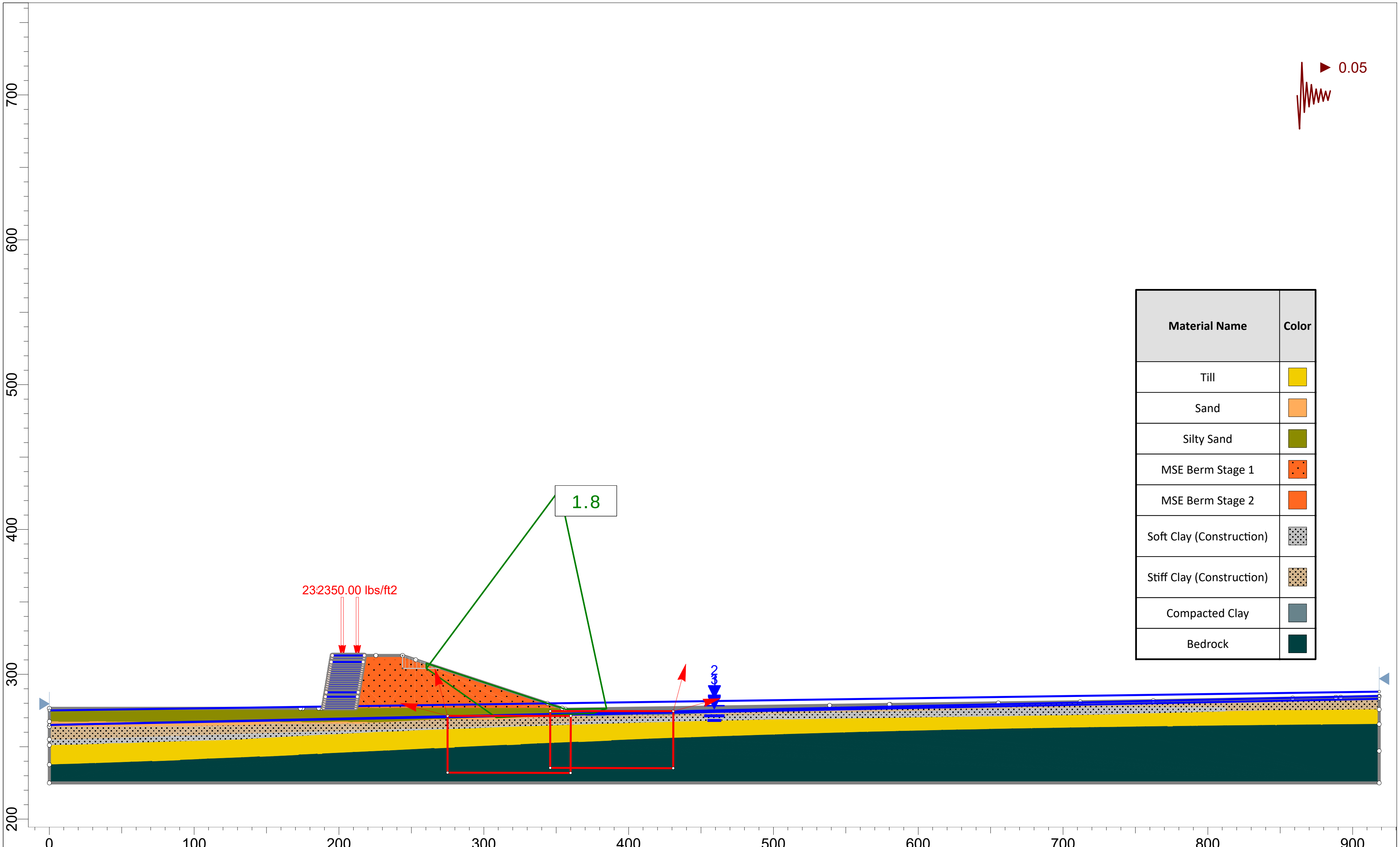


Material Name	Color
Till	
Sand	
Silty Sand	
MSE Berm Stage 1	
MSE Berm Stage 2	
Soft Clay (Construction)	
Stiff Clay (Construction)	
Compacted Clay	
Bedrock	

Geosyntec consultants

Project	Crossroads Phase 14 Stability Section VII
Analysis Description	Construction, Seismic, Inward Circular
Drawn By A. Rohrman	*Scale* 1:1100
Company	Geosyntec Consultants
Date	10/1/2019
File Name	2019.10.01 Ph14 VII.slmd

SLIDEINTERPRET 8.028

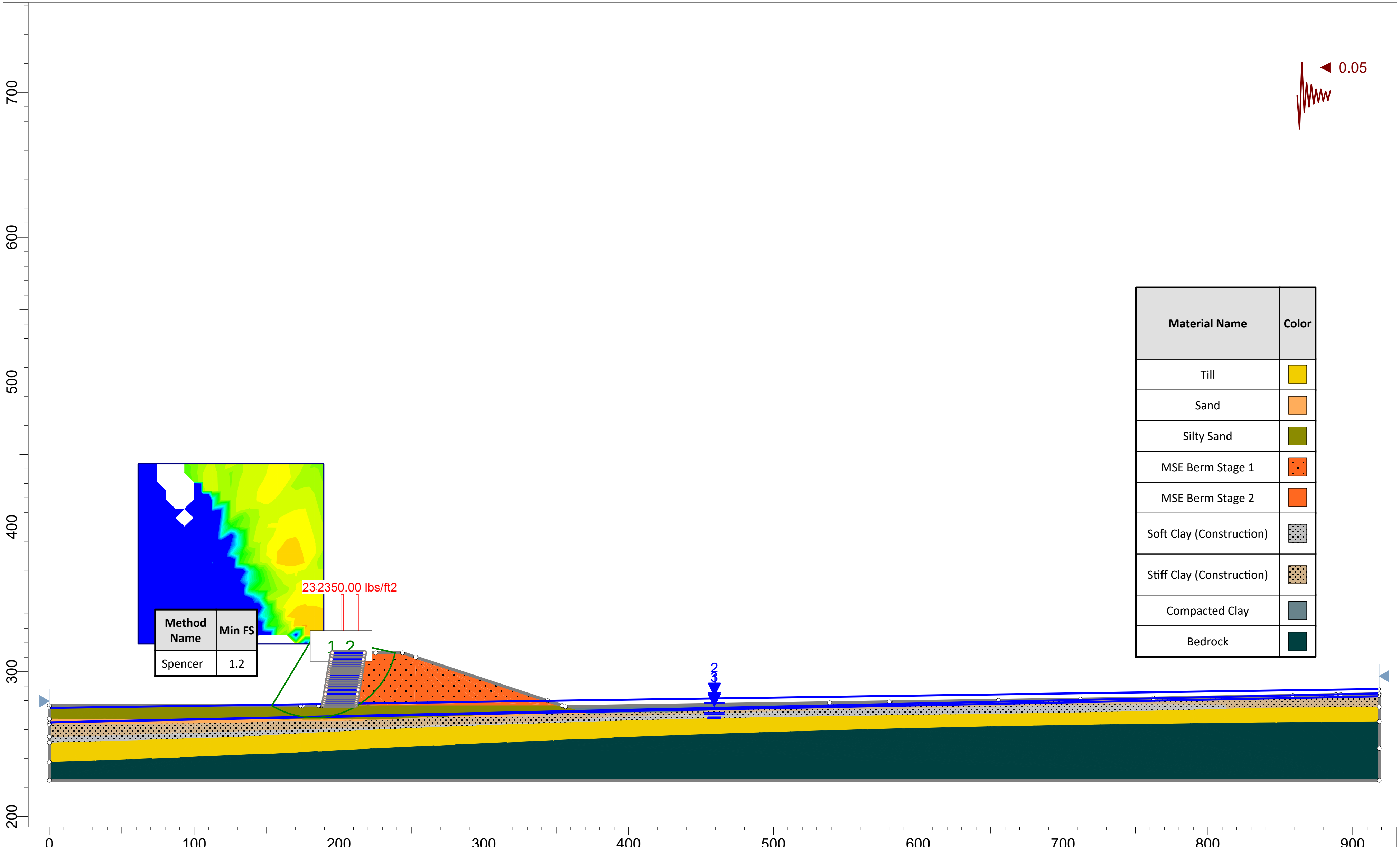


Material Name	Color
Till	
Sand	
Silty Sand	
MSE Berm Stage 1	
MSE Berm Stage 2	
Soft Clay (Construction)	
Stiff Clay (Construction)	
Compacted Clay	
Bedrock	

Geosyntec consultants

SLIDEINTERPRET 8.028

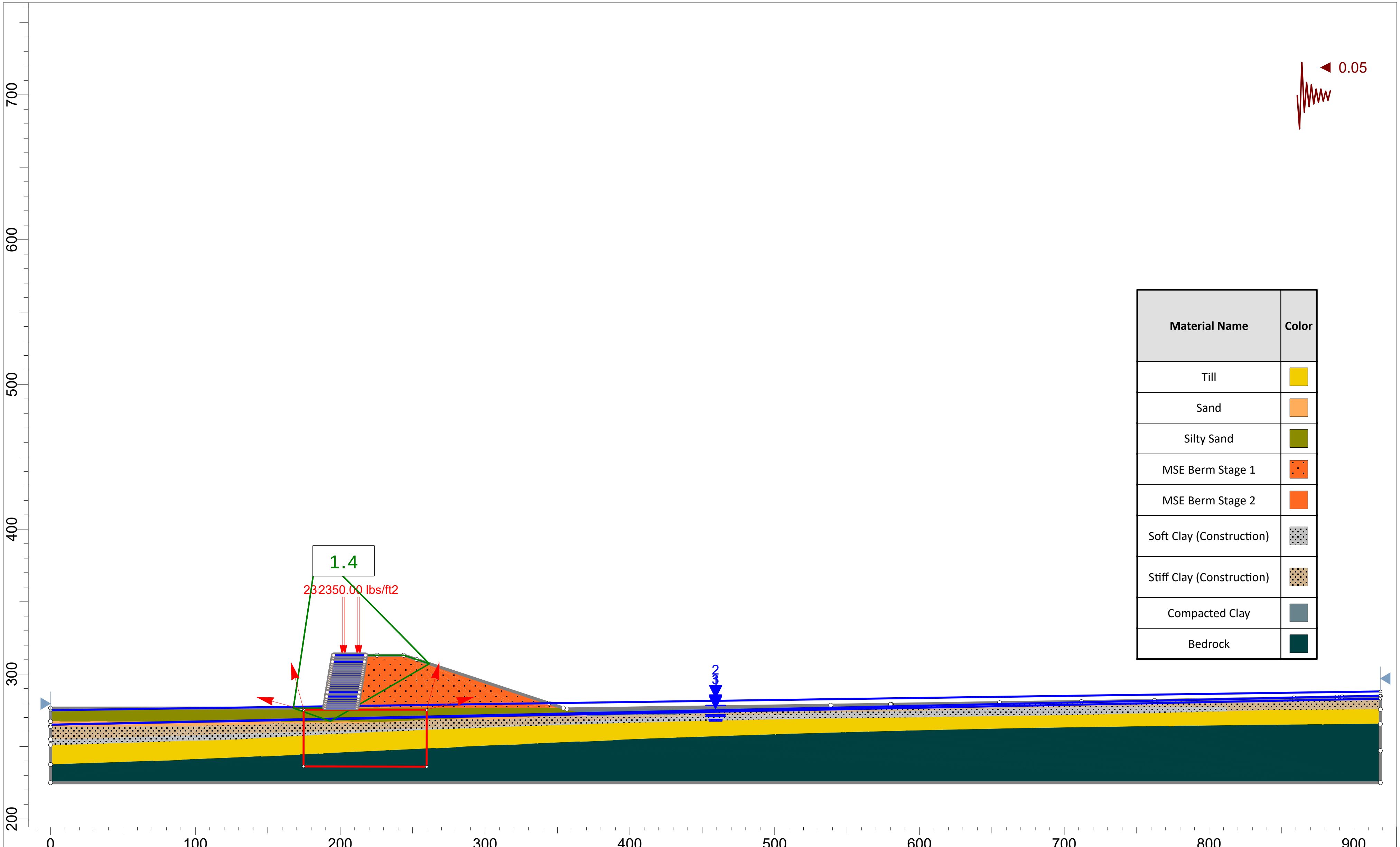
Project	Crossroads Phase 14 Stability Section VII		
Analysis Description	Construction, Seismic, Inward Non-Circular		
Drawn By A. Rohrman	*Scale* 1:1100	*Company*	Geosyntec Consultants
Date	10/1/2019	*File Name*	2019.10.01 Ph14 VII.slmd



Geosyntec consultants

SLIDEINTERPRET 8.028

Project	Crossroads Phase 14 Stability Section VII		
Analysis Description	Construction, Seismic, Outward Circular		
Drawn By A. Rohrman	*Scale* 1:1100	*Company*	Geosyntec Consultants
Date	10/1/2019	*File Name*	2019.10.01 Ph14 VII.slmd



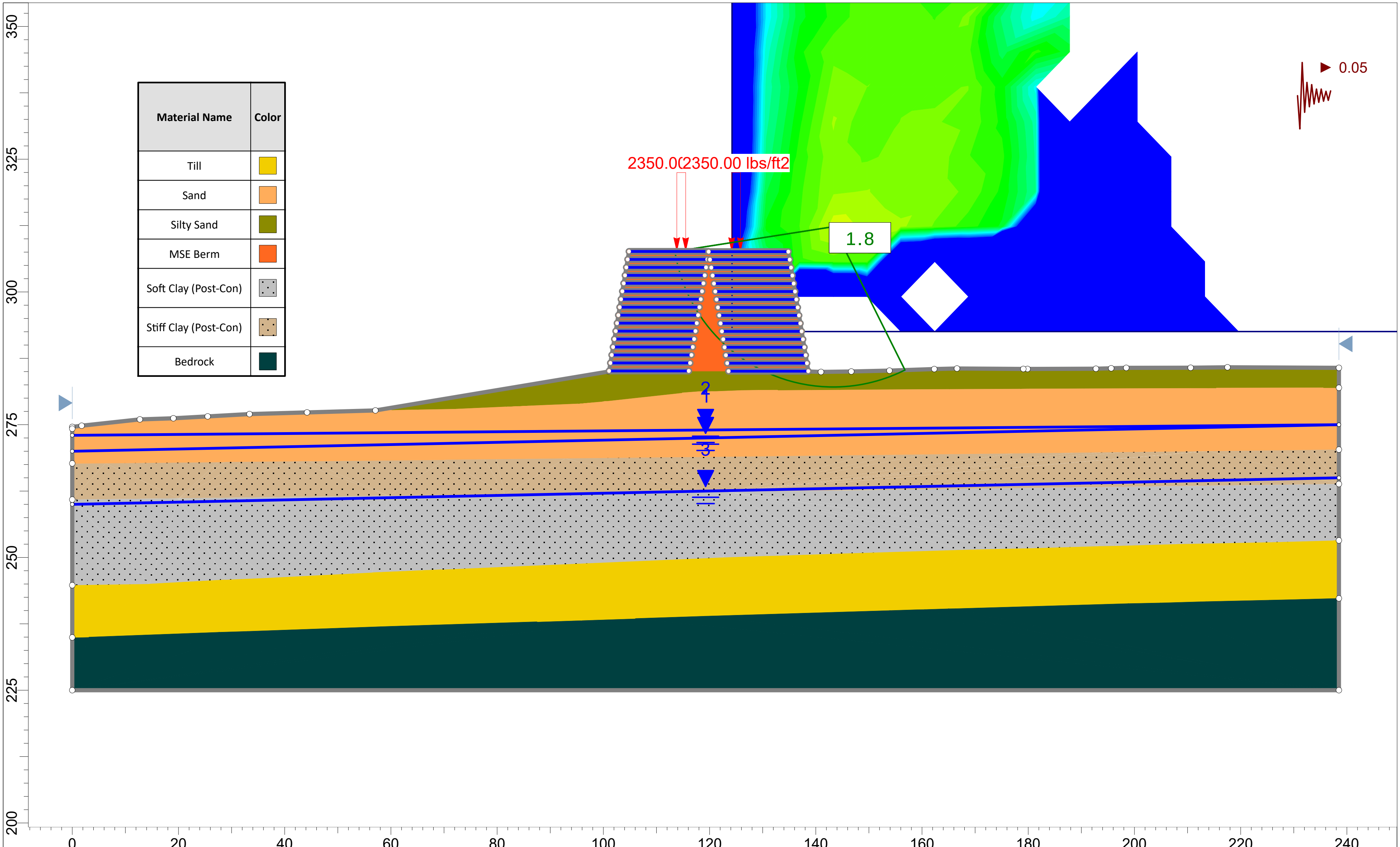
Material Name	Color
Till	
Sand	
Silty Sand	
MSE Berm Stage 1	
MSE Berm Stage 2	
Soft Clay (Construction)	
Stiff Clay (Construction)	
Compacted Clay	
Bedrock	

Geosyntec consultants

SLIDEINTERPRET 8.028

Project	Crossroads Phase 14 Stability Section VII
Analysis Description	Construction, Seismic, Outward Non-Circular
Drawn By	A. Rohrman
Scale	1:1100
Company	Geosyntec Consultants
Date	10/1/2019
File Name	2019.10.01 Ph14 VII.slmd

Section VIII



Geosyntec consultants

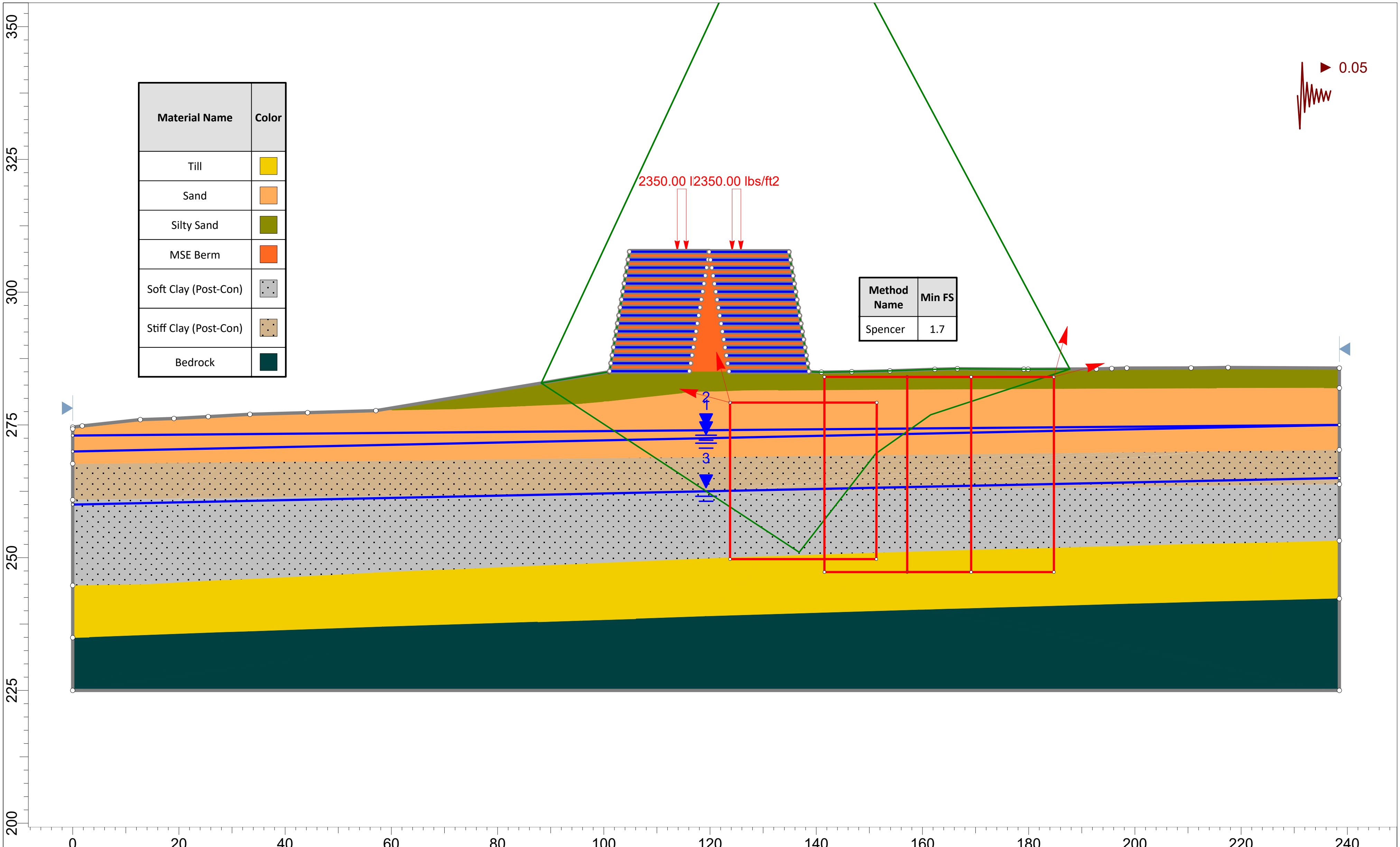
Project Crossroads Phase 14 Stability Section VIII

Analysis Description Construction, Seismic, Inward Circular

Drawn By A. Rohrman | *Scale* 1:300 | *Company* Geosyntec Consultants

Date 10/1/2019 | *File Name* 2019.10.01 Ph14 VIII.slmd

SLIDEINTERPRET 8.014



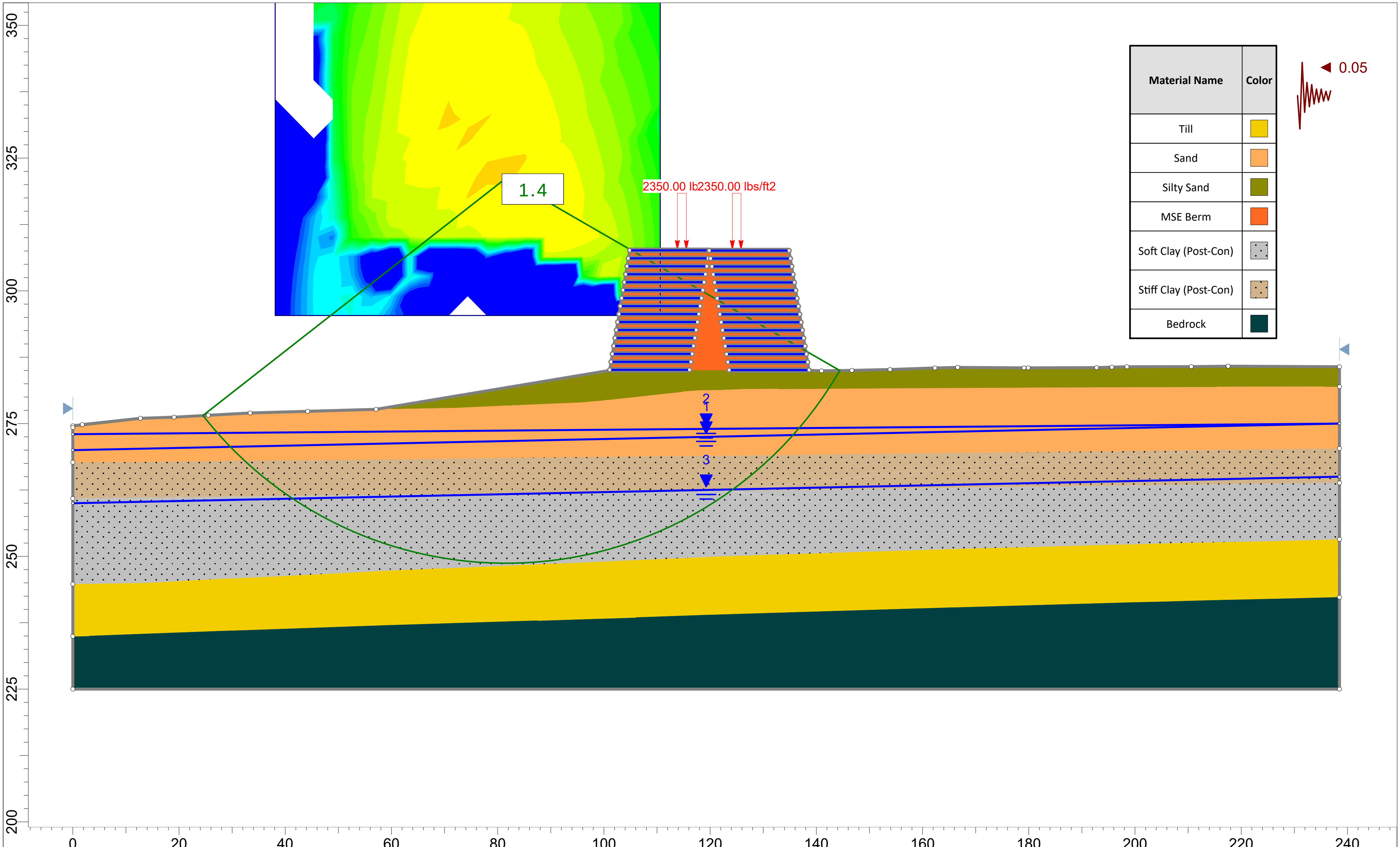
Material Name	Color
Till	
Sand	
Silty Sand	
MSE Berm	
Soft Clay (Post-Con)	
Stiff Clay (Post-Con)	
Bedrock	

Method Name	Min FS
Spencer	1.7

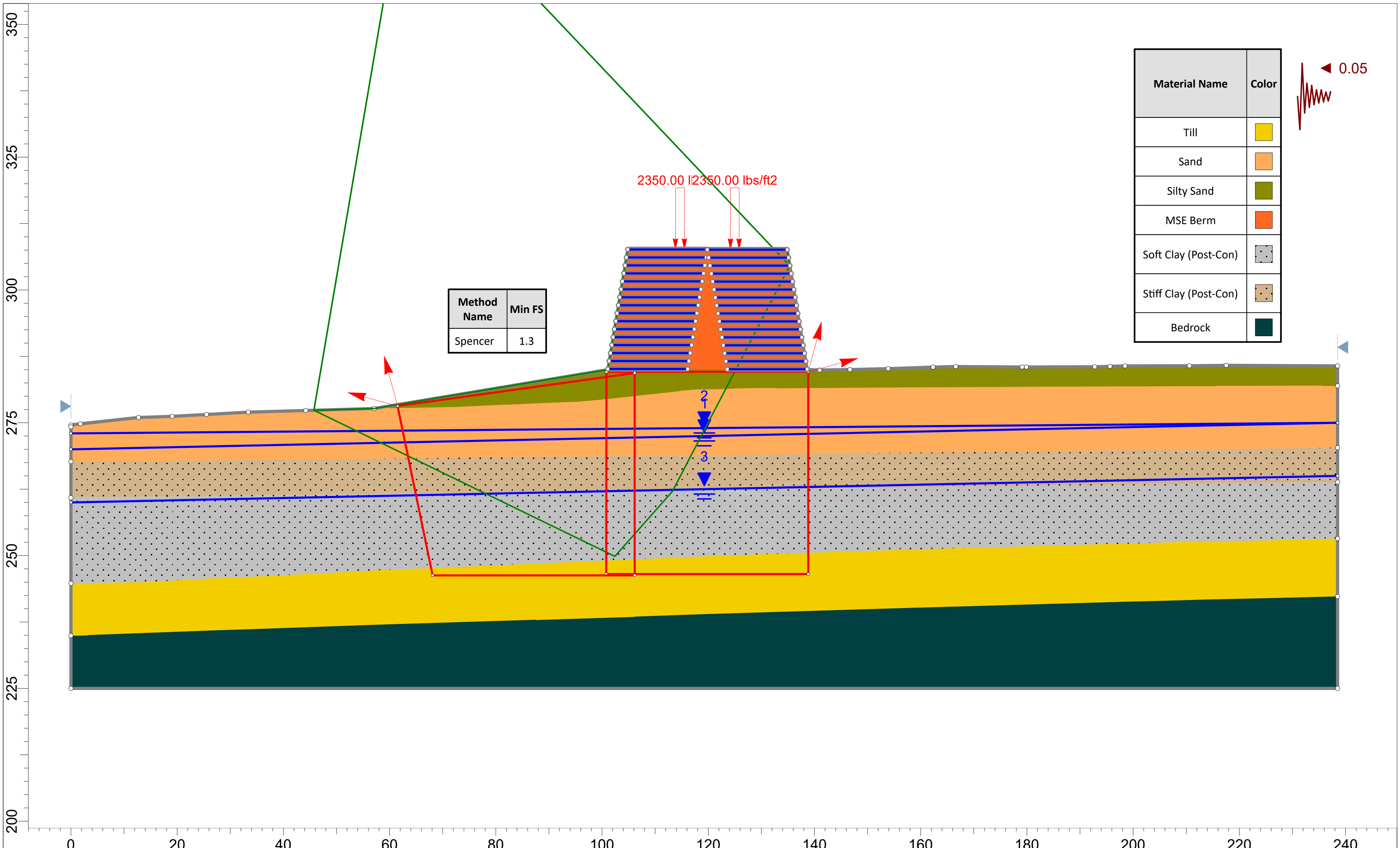
Geosyntec consultants

SLIDEINTERPRET 8.014

Project	Crossroads Phase 14 Stability Section VIII
Analysis Description	Construction, Seismic, Inward Non-Circular
Drawn By	A. Rohrman
Scale	1:300
Company	Geosyntec Consultants
Date	10/1/2019
File Name	2019.10.01 Ph14 VIII.slmd



Geosyntec consultants	Project: Crossroads Phase 14 Stability Section VIII		
	Analysis Description: Construction, Seismic, Outward Circular		
	Drawn By: A. Rohrman	Scale: 1:300	Company: Geosyntec Consultants
SLIDEINTERPRET 8.014	Date: 10/1/2019		File Name: 2019.10.01 Ph14 VIII.slmd



Geosyntec consultants

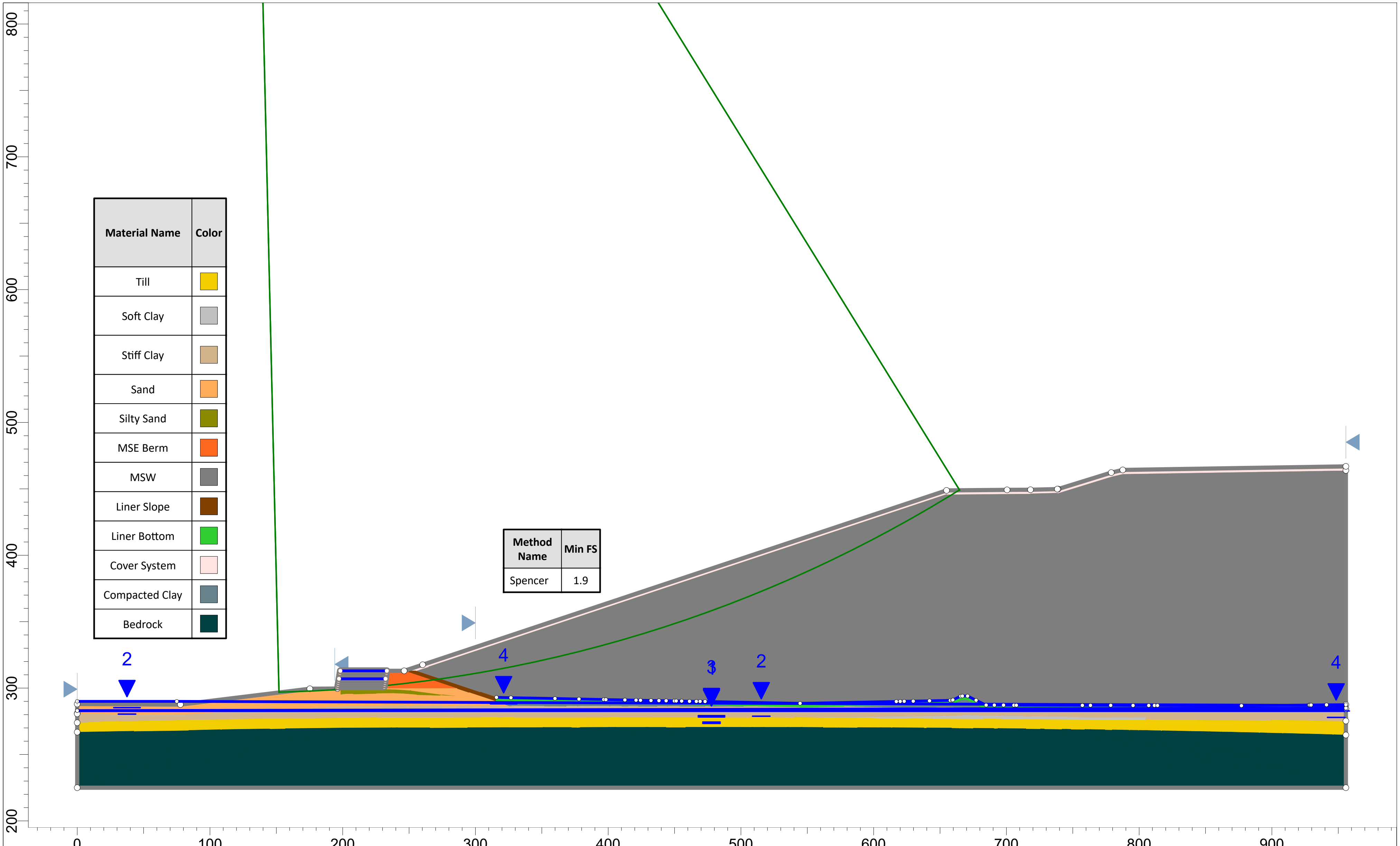
SLIDEINTERPRET 8.014

Project	Crossroads Phase 14 Stability Section VIII
Analysis Description	Construction, Seismic, Outward Non-Circular
Drawn By	A. Rohrman
Scale	1:300
Company	Geosyntec Consultants
Date	10/1/2019
File Name	2019.10.01 Ph14 VIII.slmd

ATTACHMENT 9

Slope Stability Outputs for Static Post-Closure Condition

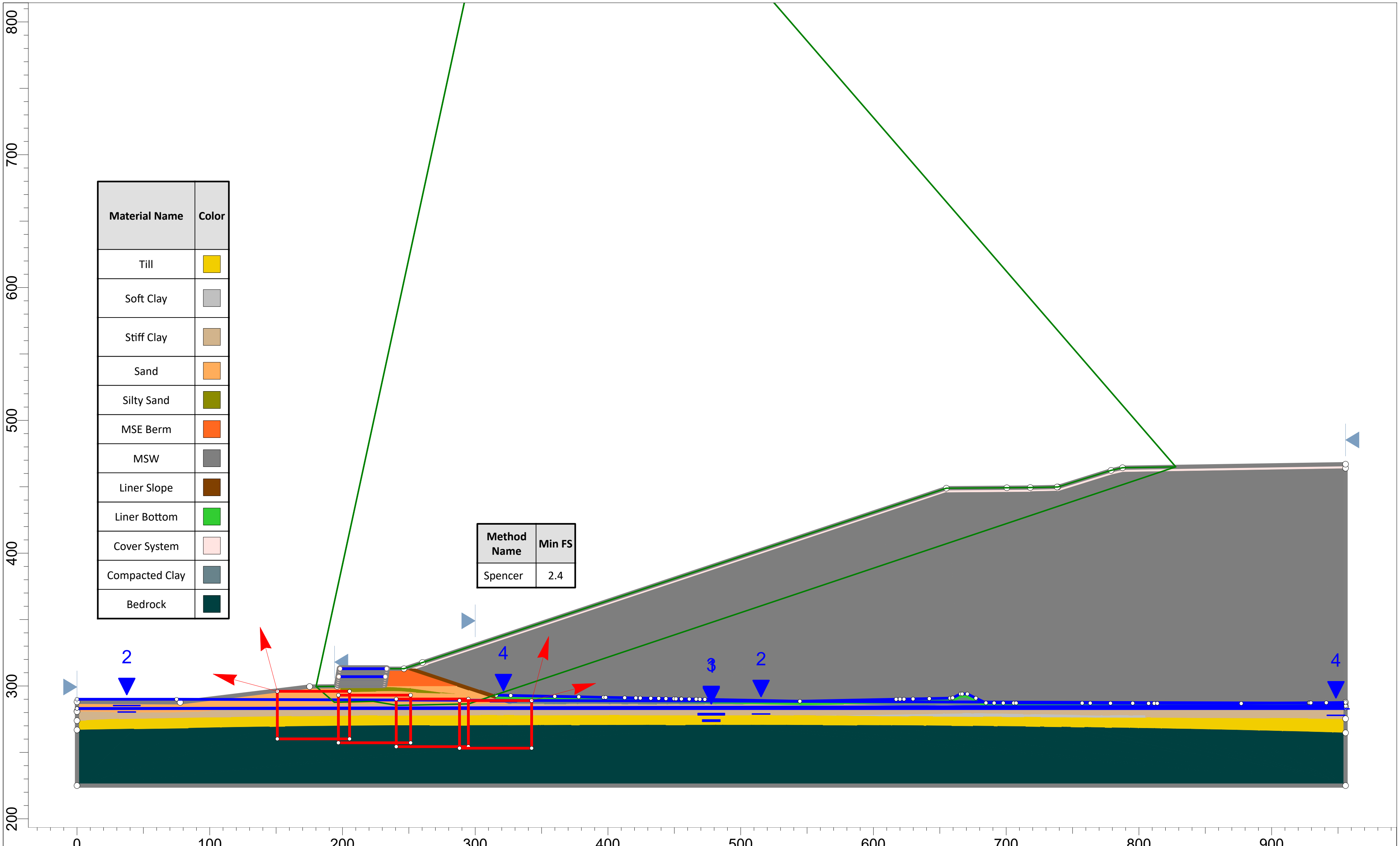
Section I



Geosyntec consultants

Project	Crossroads Phase 14 Stability Section I		
Analysis Description	Post-Closure, Static, Circular		
Drawn By A. Rohrman	*Scale* 1:1200	*Company*	Geosyntec Consultants
Date	10/1/2019	*File Name*	2019.10.01 Ph14 I.slmd

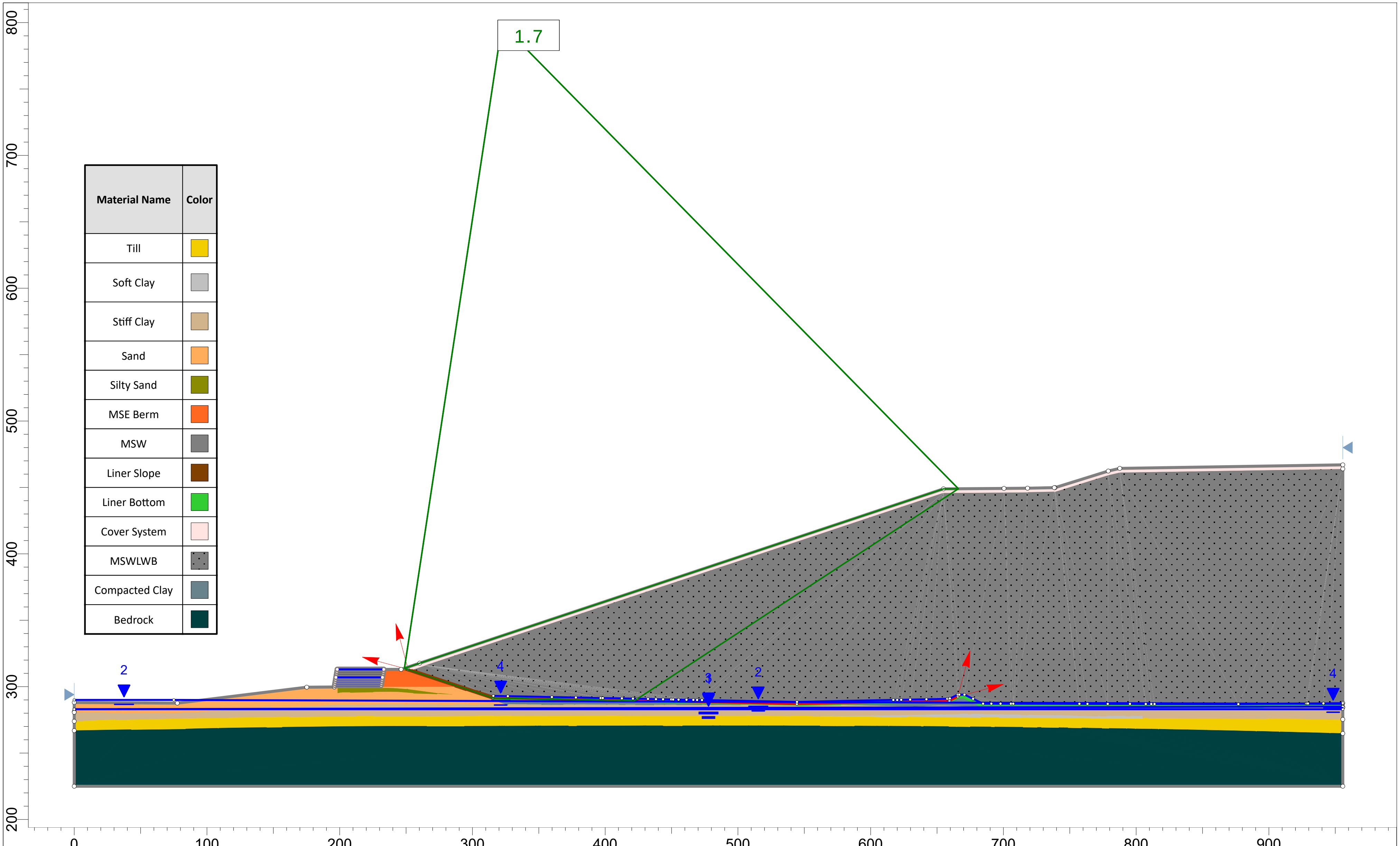
SLIDEINTERPRET 8.028



Geosyntec consultants

SLIDEINTERPRET 8.028

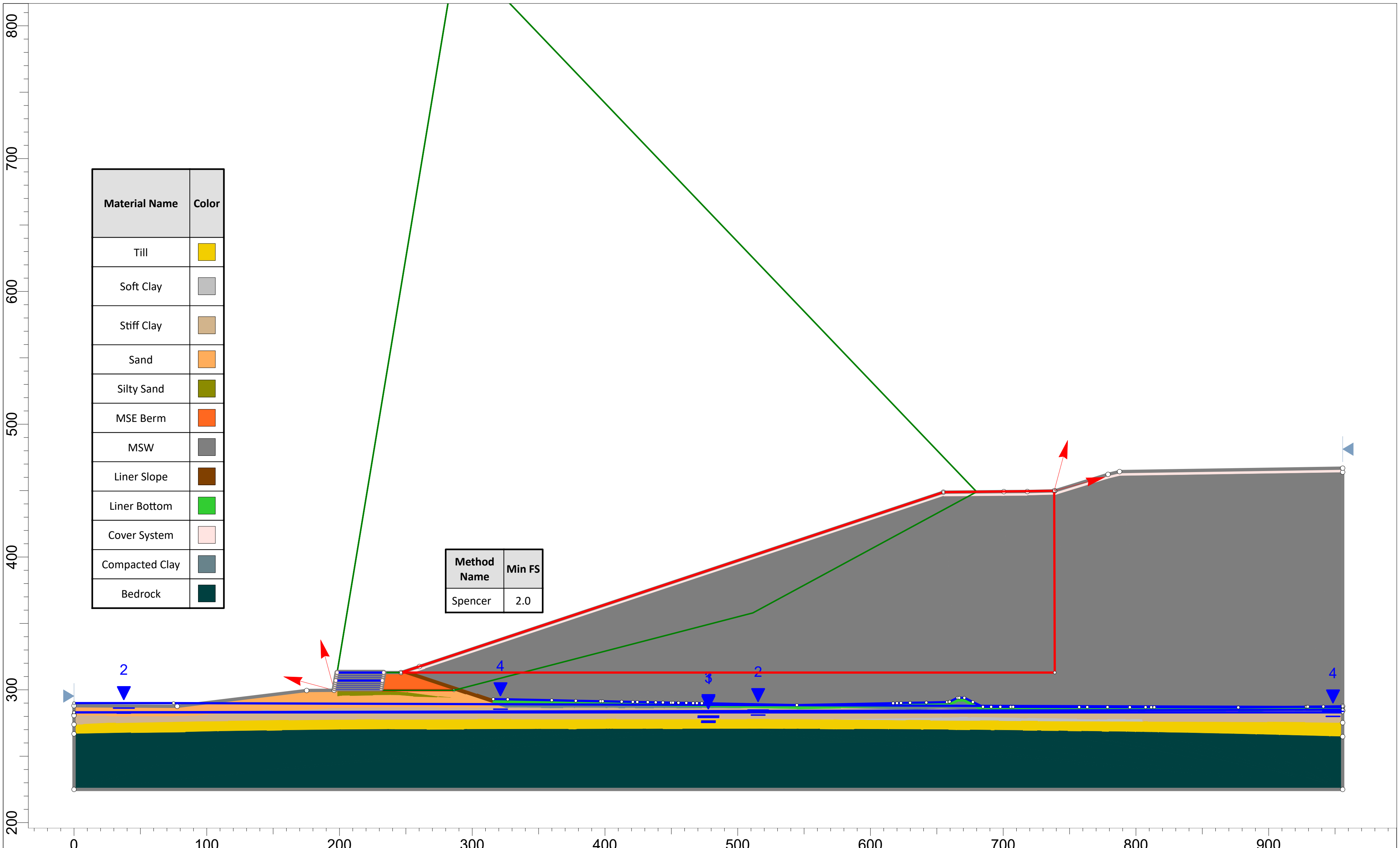
Project	Crossroads Phase 14 Stability Section I
Analysis Description	Post-Closure, Static, Non-Circular
Drawn By	A. Rohrman
Scale	1:1200
Company	Geosyntec Consultants
Date	10/1/2019
File Name	2019.10.01 Ph14 I.slmd



Geosyntec consultants

SLIDEINTERPRET 8.028

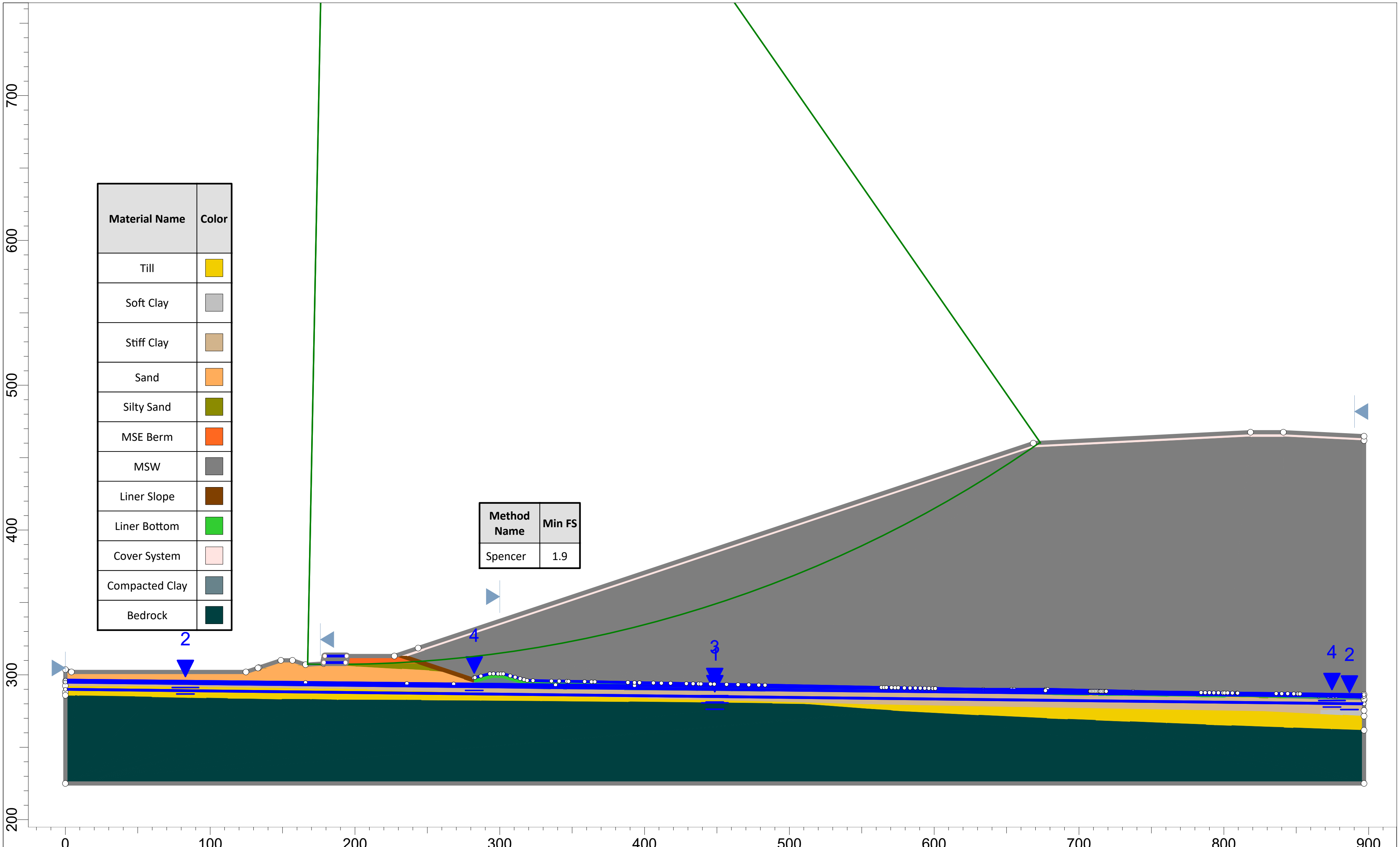
Project	Crossroads Phase 14 Stability Section I		
Analysis Description	Post-Closure, Static, Liner Waste Block		
Drawn By A. Rohrman	*Scale* 1:1200	*Company*	Geosyntec Consultants
Date	10/1/2019	*File Name*	2019.10.01 Ph14 I.slmd



Project	Crossroads Phase 14 Stability Section I
Analysis Description	Post-Closure, Static, Horizontal Berm Sliding
Drawn By A. Rohrman	*Scale* 1:1200
Company	Geosyntec Consultants
Date	10/1/2019
File Name	2019.10.01 Ph14 I.slmd

SLIDEINTERPRET 8.028

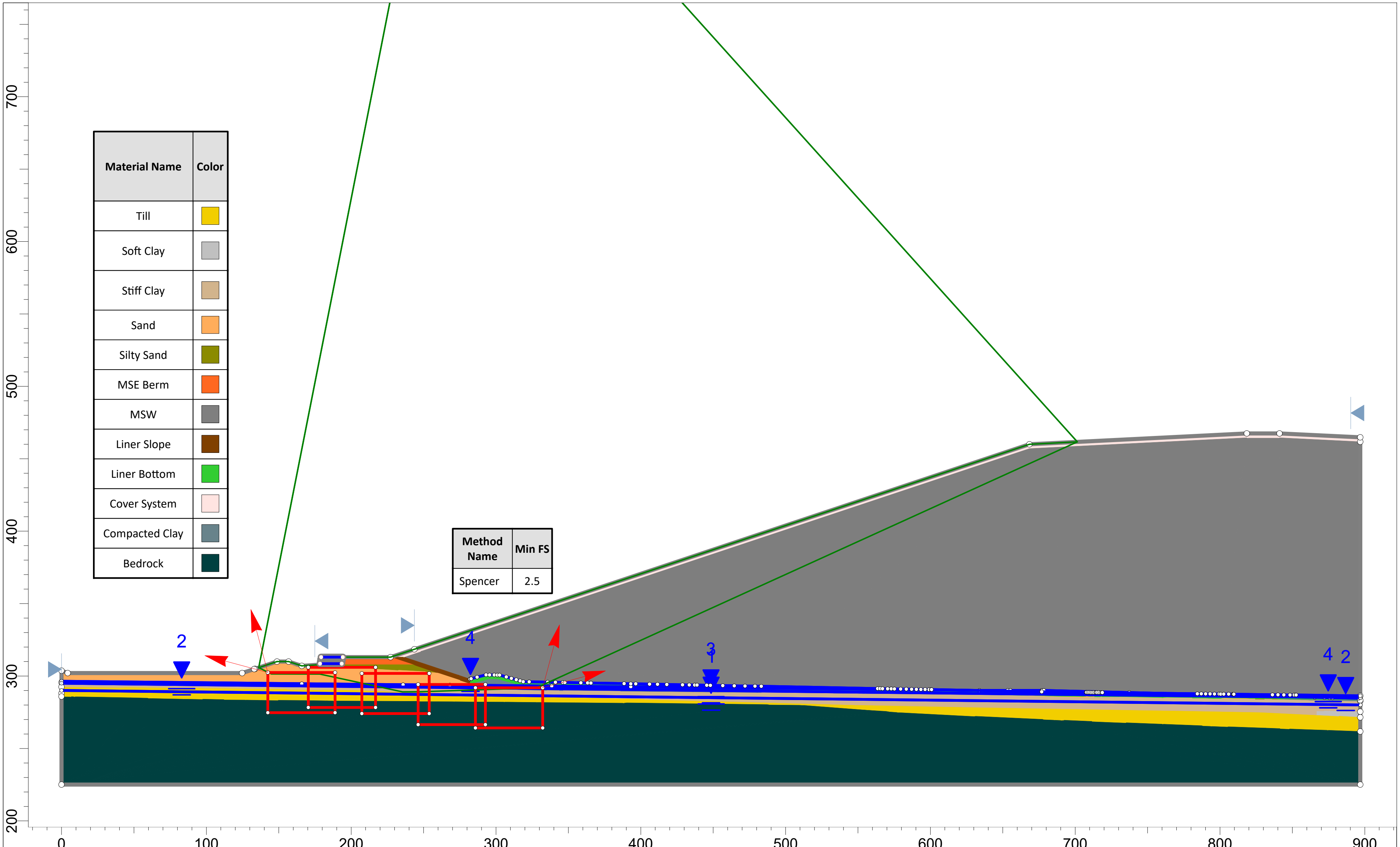
Section II



Project	Crossroads Phase 14 Stability Section II		
Analysis Description	Post-Closure, Static, Circular		
Drawn By A. Rohrman	*Scale* 1:1100	*Company*	Geosyntec Consultants
Date	10/1/2019	*File Name*	2019.10.01 Ph14 II.slmd

Geosyntec consultants

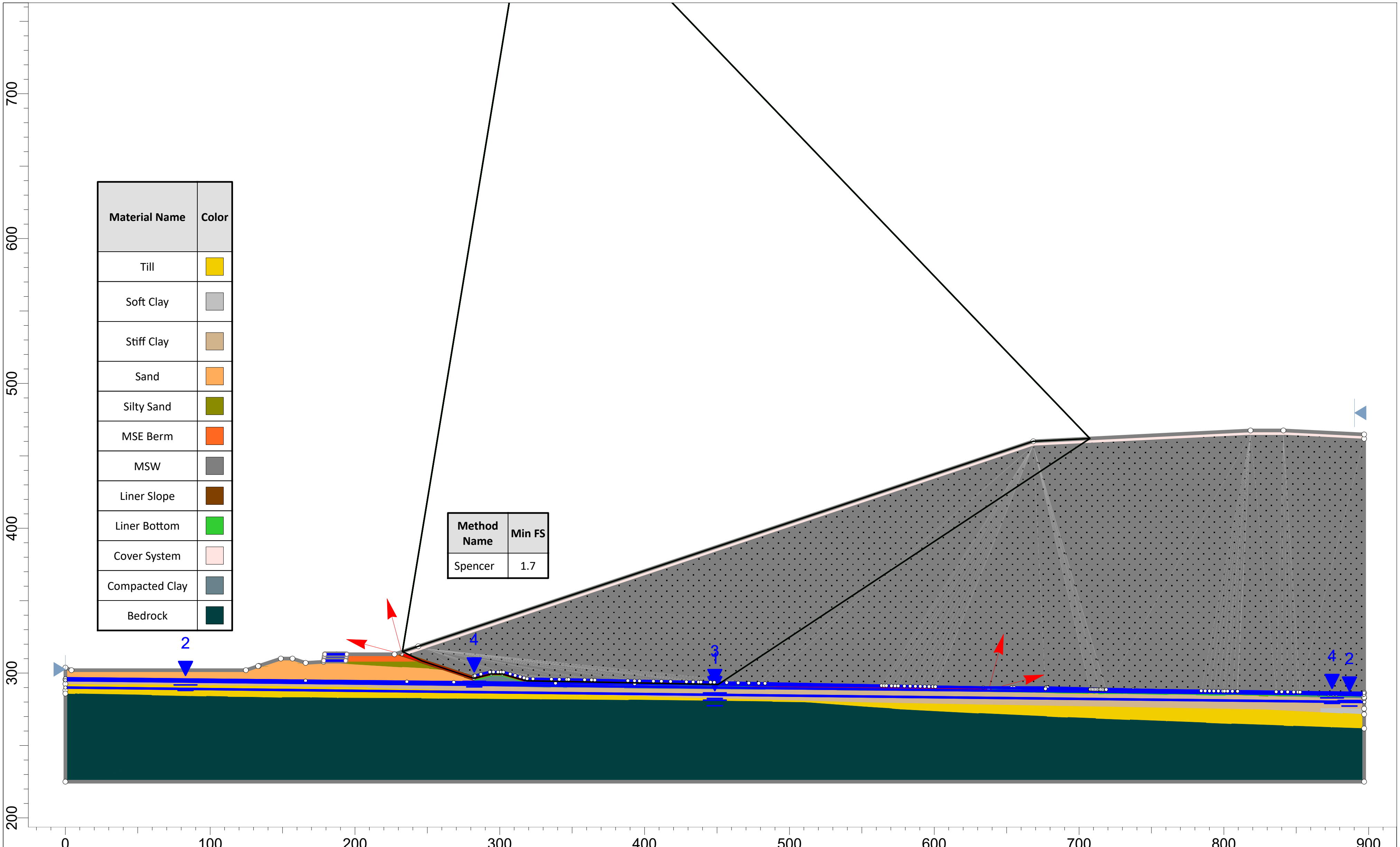
SLIDEINTERPRET 8.028



Project	Crossroads Phase 14 Stability Section II
Analysis Description	Post-Closure, Static, Non-Circular
Drawn By	A. Rohrman
Scale	1:1100
Company	Geosyntec Consultants
Date	10/1/2019
File Name	2019.10.01 Ph14 II.slmd

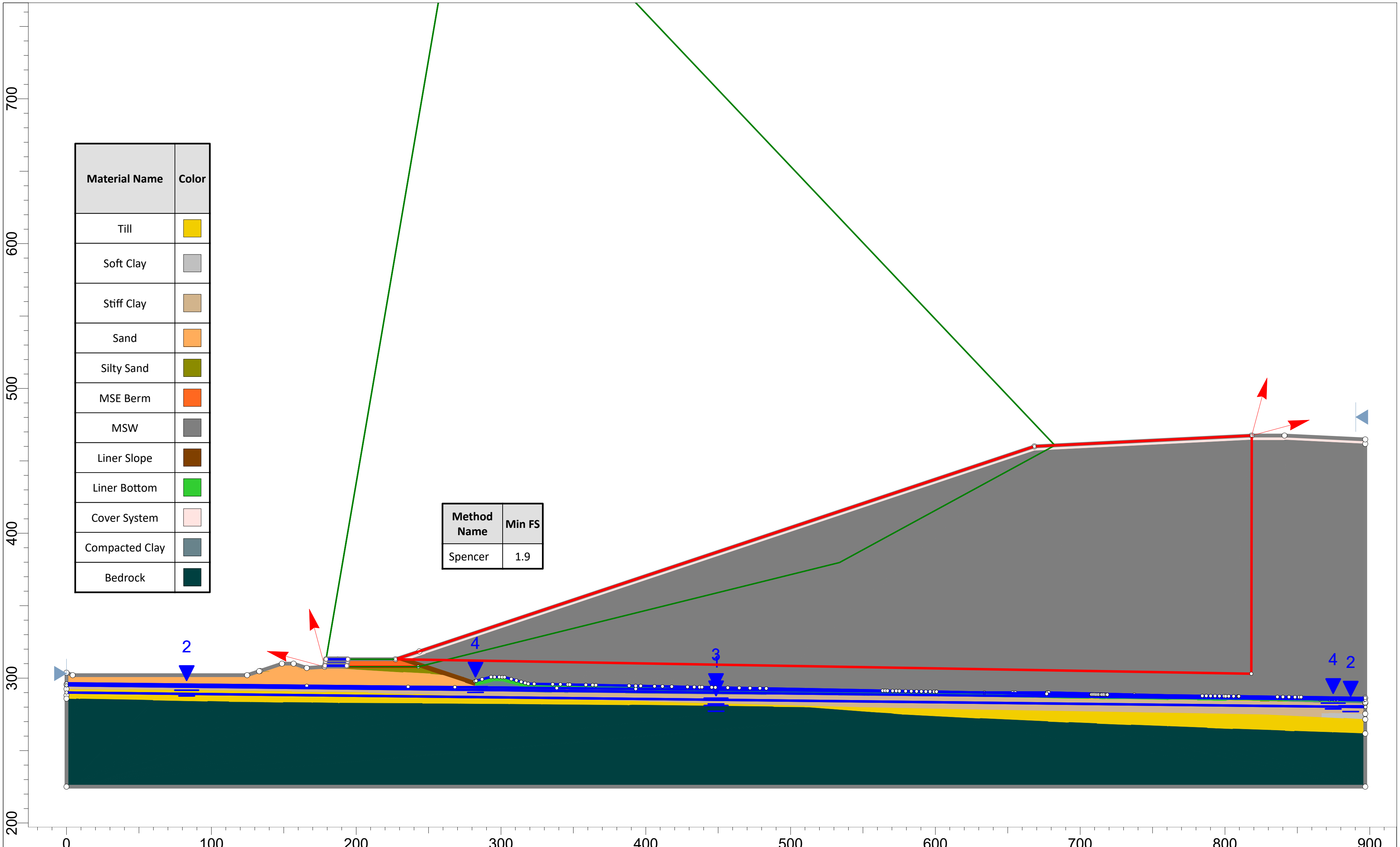
Geosyntec consultants

SLIDEINTERPRET 8.028



Geosyntec consultants				
Project	Crossroads Phase 14 Stability Section II			
Analysis Description	Post-Closure, Static, Liner Waste Block			
Drawn By	A. Rohrman	*Scale* 1:1100	*Company*	Geosyntec Consultants
Date	10/1/2019		*File Name*	2019.10.01 Ph14 II.slmd

SLIDEINTERPRET 8.028



Material Name	Color
Till	
Soft Clay	
Stiff Clay	
Sand	
Silty Sand	
MSE Berm	
MSW	
Liner Slope	
Liner Bottom	
Cover System	
Compacted Clay	
Bedrock	

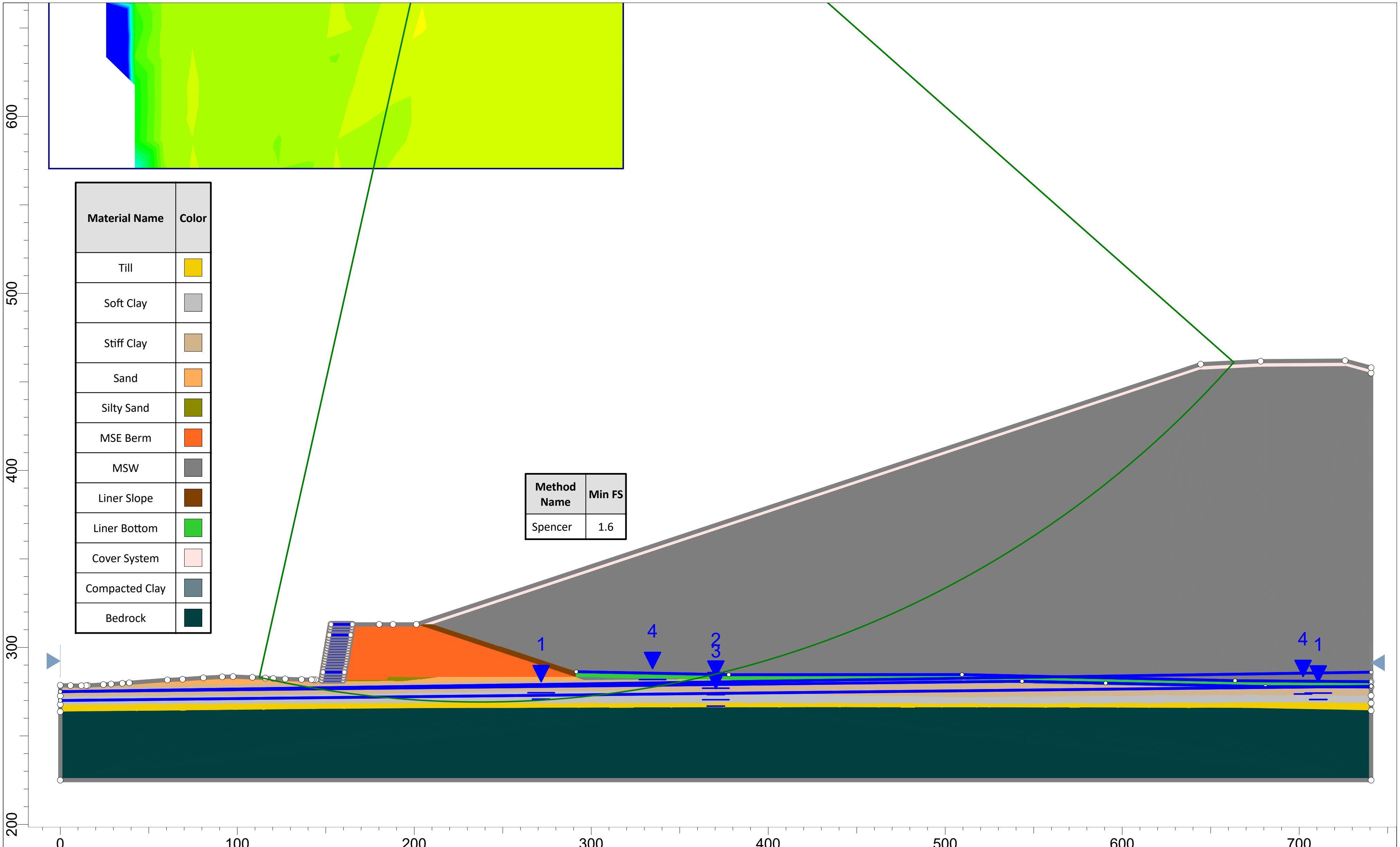
Method Name	Min FS
Spencer	1.9

Geosyntec consultants

SLIDEINTERPRET 8.028

Project	Crossroads Phase 14 Stability Section II
Analysis Description	Post-Closure, Static, Horizontal Berm Sliding
Drawn By A. Rohrman	*Scale* 1:1100
Company	Geosyntec Consultants
Date	10/1/2019
File Name	2019.10.01 Ph14 II.slmd

Section III



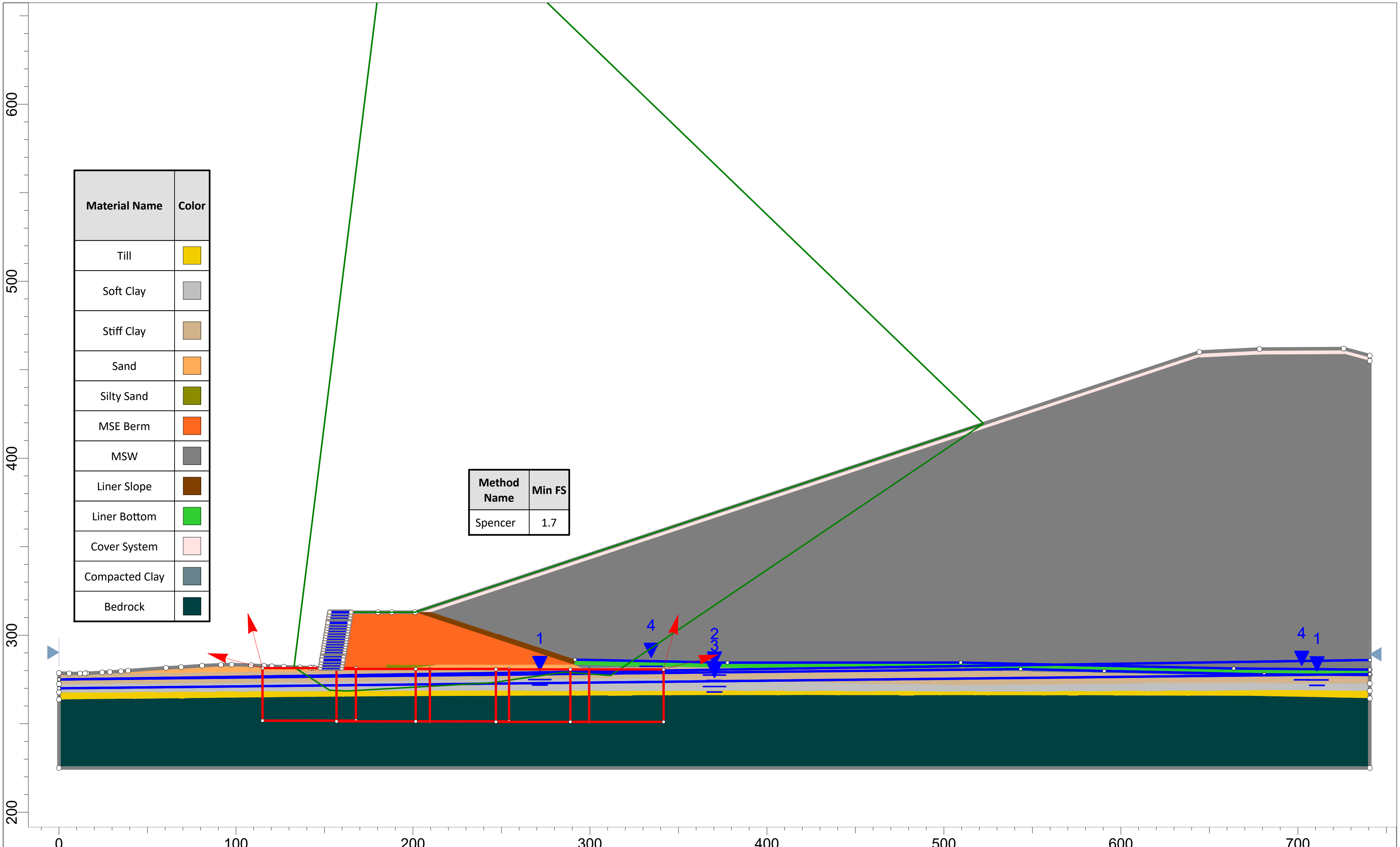
Material Name	Color
Till	
Soft Clay	
Stiff Clay	
Sand	
Silty Sand	
MSE Berm	
MSW	
Liner Slope	
Liner Bottom	
Cover System	
Compacted Clay	
Bedrock	

Method Name	Min FS
Spencer	1.6

Geosyntec consultants

SLIDEINTERPRET 8.028

Project	Crossroads Phase 14 Stability Section III		
Analysis Description	Post-Closure, Static, Circular		
Drawn By A. Rohrman	*Scale* 1:900	*Company*	Geosyntec Consultants
Date	10/1/2019	*File Name*	2019.10.01 Ph14 III.slmd



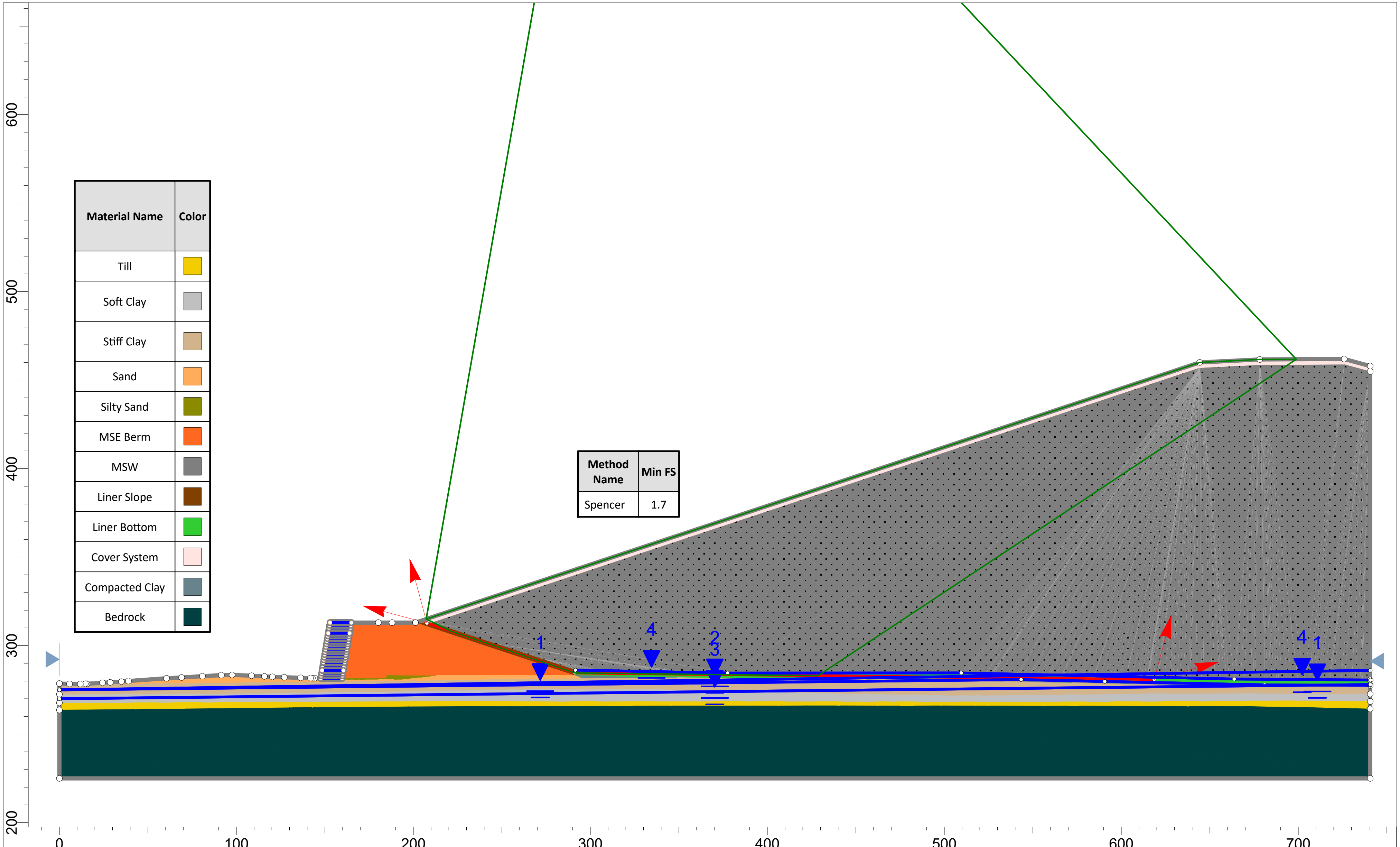
Material Name	Color
Till	
Soft Clay	
Stiff Clay	
Sand	
Silty Sand	
MSE Berm	
MSW	
Liner Slope	
Liner Bottom	
Cover System	
Compacted Clay	
Bedrock	

Method Name	Min FS
Spencer	1.7

Geosyntec consultants

SLIDEINTERPRET 8.028

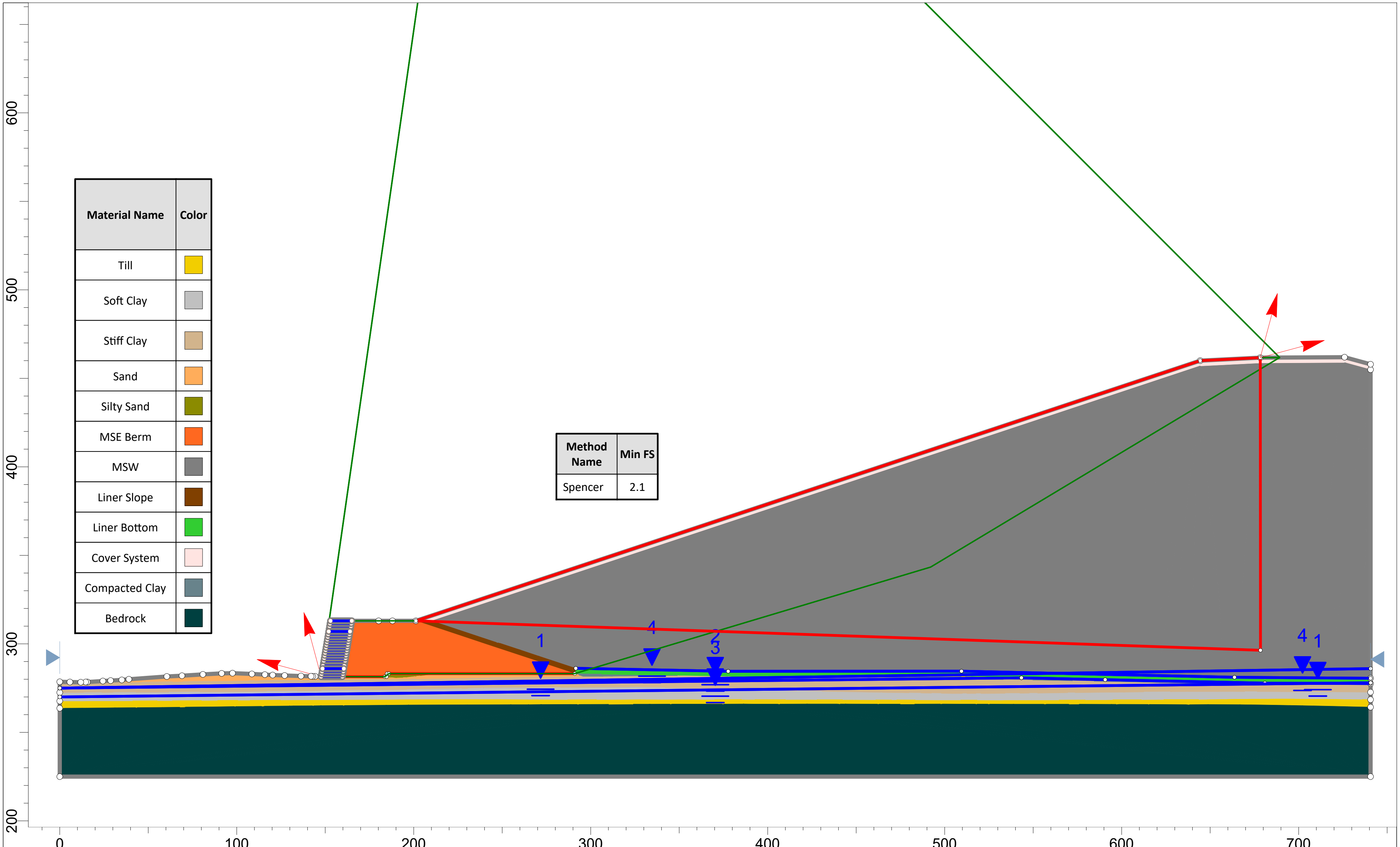
Project	Crossroads Phase 14 Stability Section III
Analysis Description	Post-Closure, Static, Non- Circular
Drawn By	A. Rohrman
Scale	1:900
Company	Geosyntec Consultants
Date	10/1/2019
File Name	2019.10.01 Ph14 III.slmd



Project	Crossroads Phase 14 Stability Section III		
Analysis Description	Post-Closure, Static, Liner Waste Block		
Drawn By: A. Rohrman	Scale: 1:900	Company	Geosyntec Consultants
Date: 10/1/2019		File Name	2019.10.01 Ph14 III.slmd

Geosyntec consultants

SLIDEINTERPRET 8.028

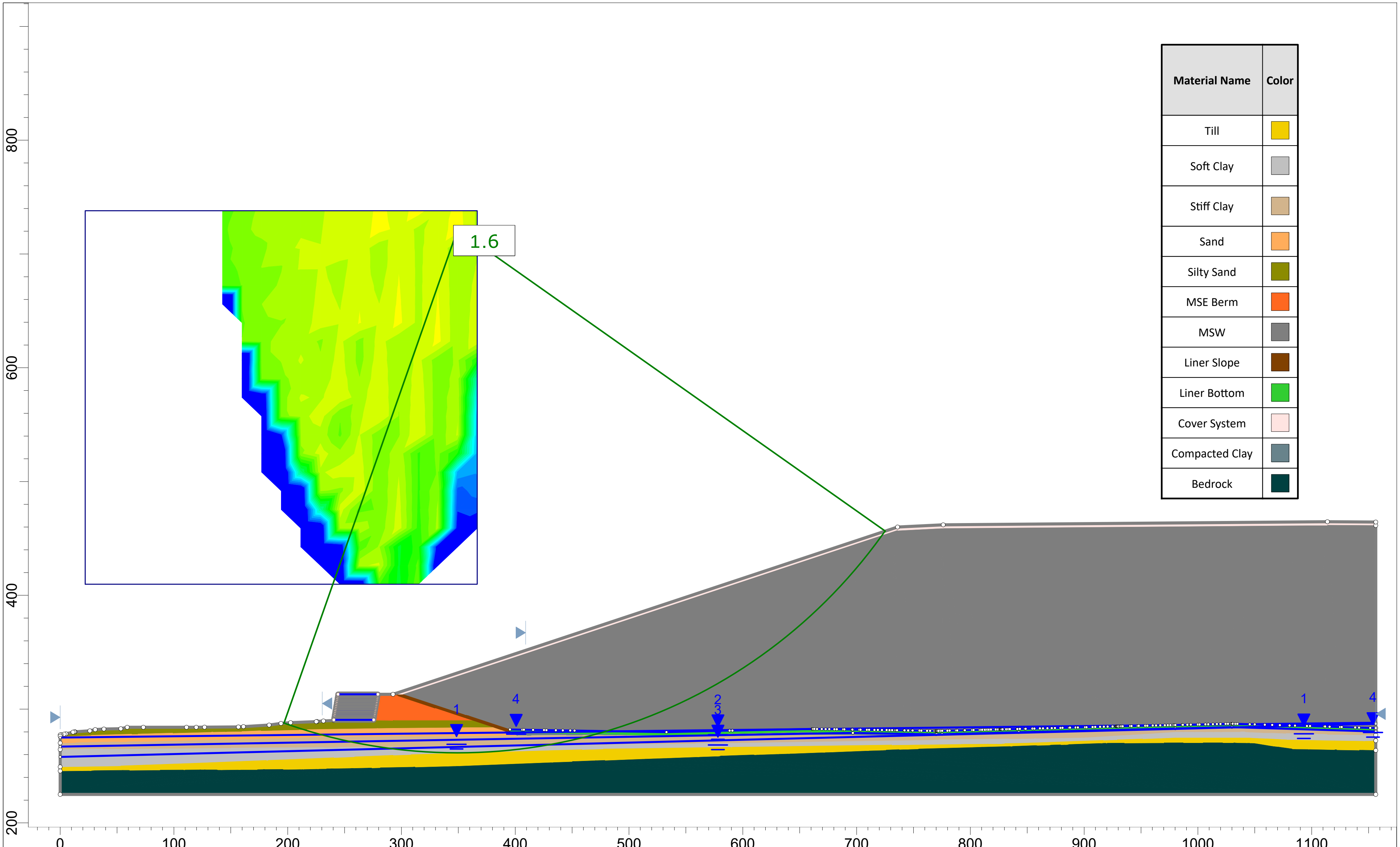


Geosyntec consultants

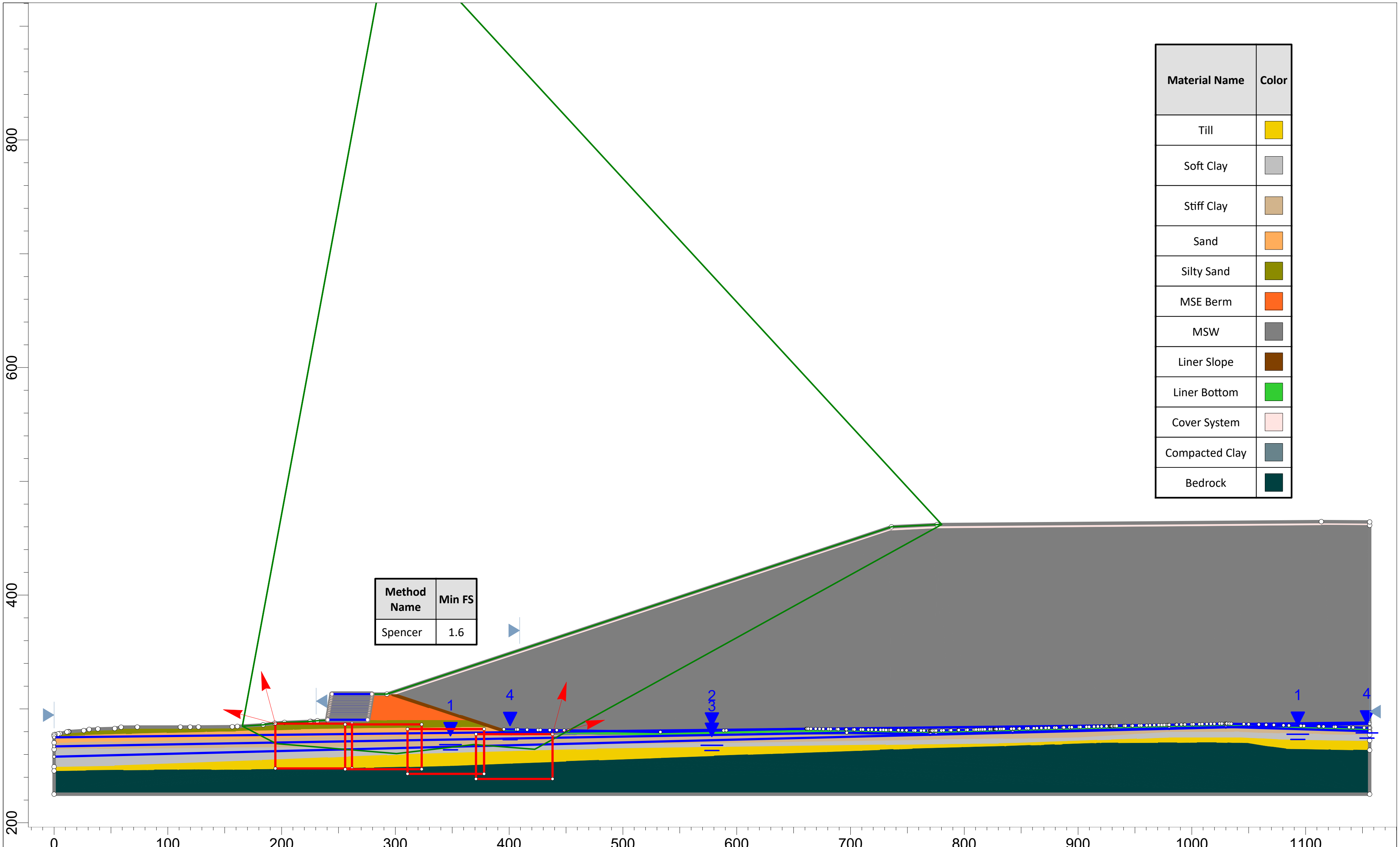
SLIDEINTERPRET 8.028

Project	Crossroads Phase 14 Stability Section III		
Analysis Description	Post-Closure, Static, Horizontal Berm Sliding		
Drawn By A. Rohrman	*Scale* 1:900	*Company*	Geosyntec Consultants
Date	10/1/2019	*File Name*	2019.10.01 Ph14 III.slmd

Section IV



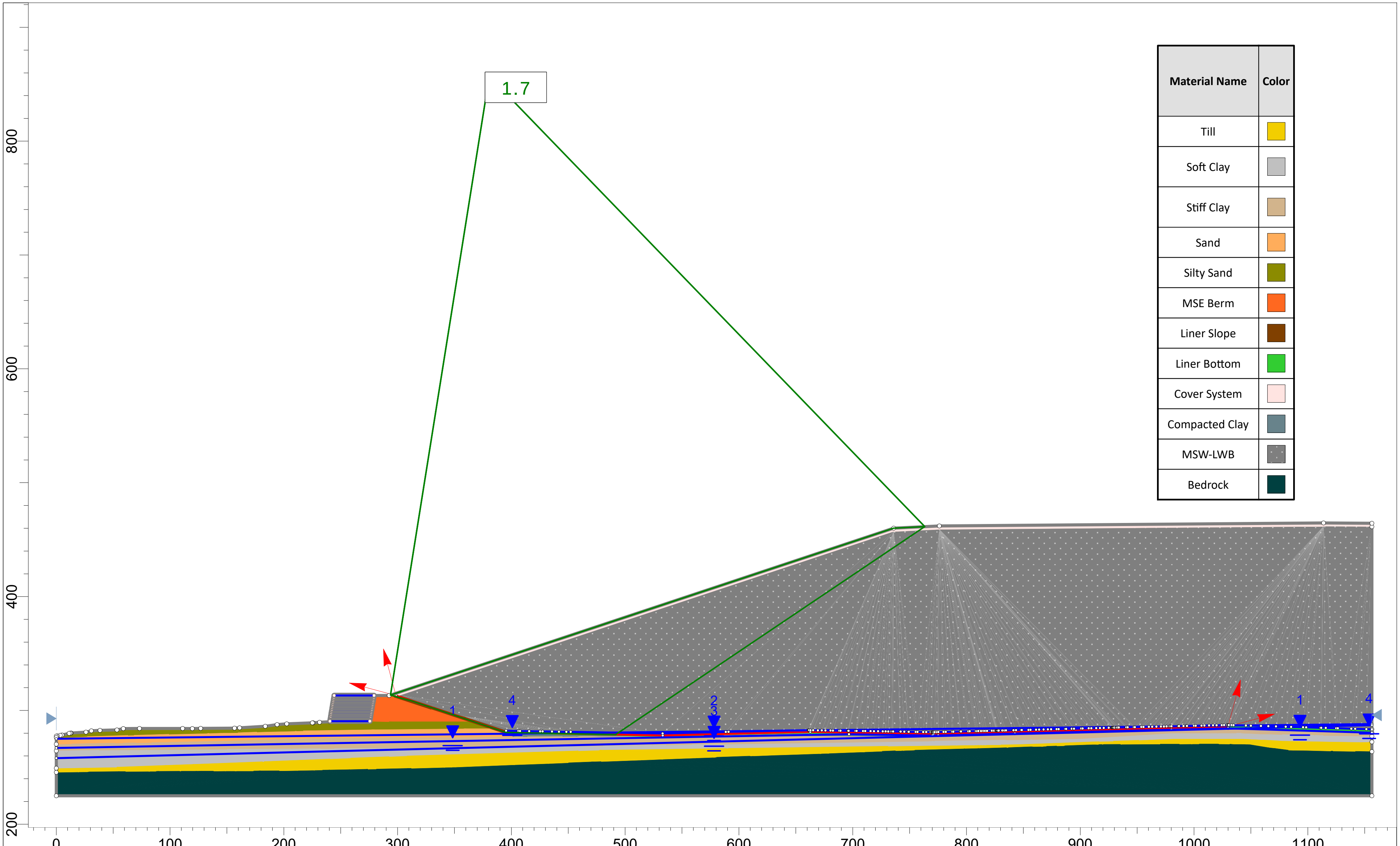
Geosyntec consultants	*Project* Crossroads Phase 14 Stability Section IV		
	Analysis Description Post-Closure, Static, Circular		
	Drawn By A. Rohrman	*Scale* 1:1400	*Company* Geosyntec Consultants
SLIDEINTERPRET 8.028	*Date* 10/1/2019		*File Name* 2019.10.01 Ph14 IV.slmd



Geosyntec consultants

SLIDEINTERPRET 8.028

Project	Crossroads Phase 14 Stability Section IV
Analysis Description	Post-Closure, Static, Non-Circular
Drawn By	A. Rohrman
Scale	1:1400
Company	Geosyntec Consultants
Date	10/1/2019
File Name	2019.10.01 Ph14 IV.slmd

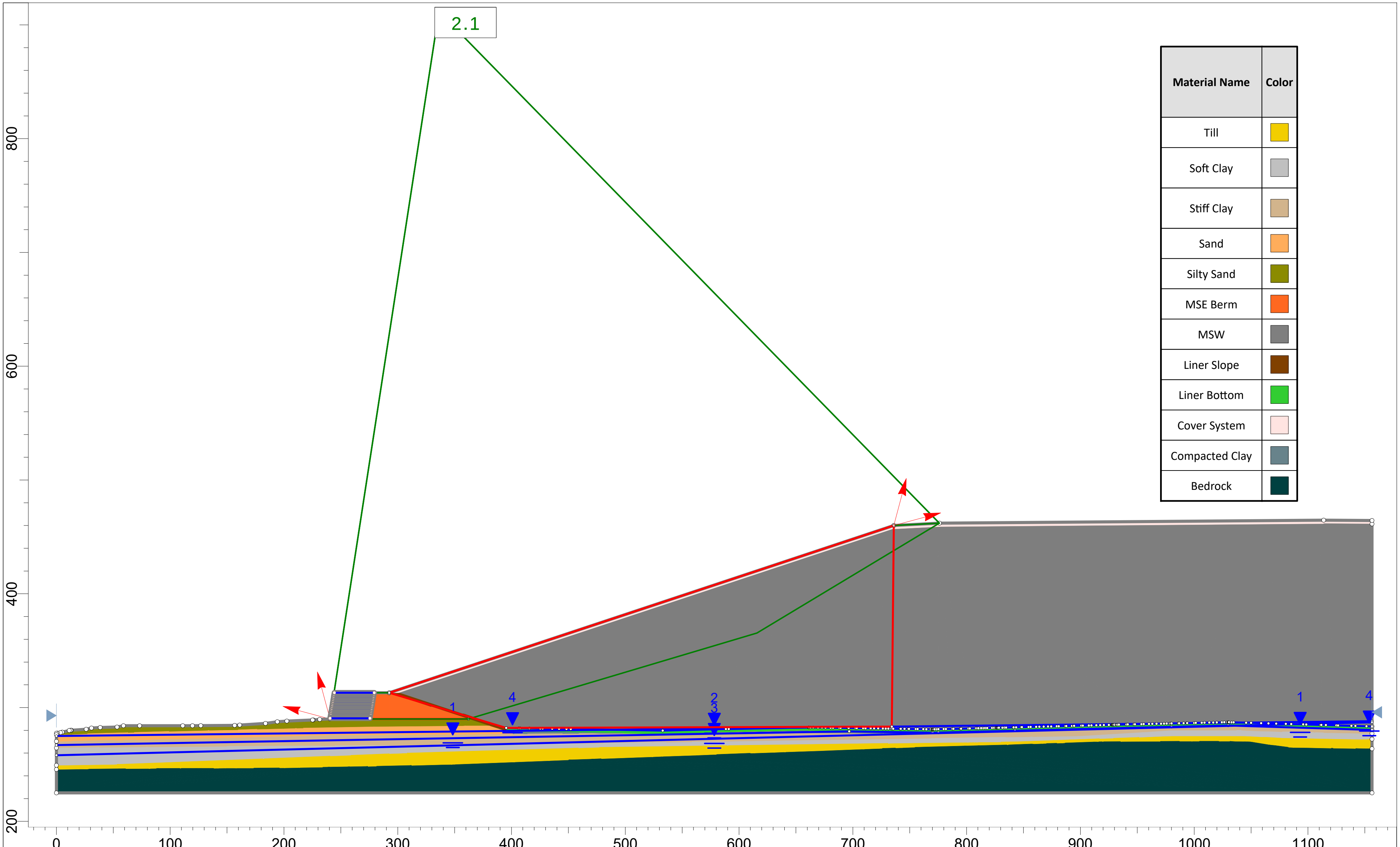


Material Name	Color
Till	
Soft Clay	
Stiff Clay	
Sand	
Silty Sand	
MSE Berm	
Liner Slope	
Liner Bottom	
Cover System	
Compacted Clay	
MSW-LWB	
Bedrock	

Geosyntec consultants

SLIDEINTERPRET 8.028

Project	Crossroads Phase 14 Stability Section IV		
Analysis Description	Post-Closure, Static, Liner Waste Block		
Drawn By A. Rohrman	*Scale* 1:1400	*Company*	Geosyntec Consultants
Date	10/1/2019	*File Name*	2019.10.01 Ph14 IV.slmd

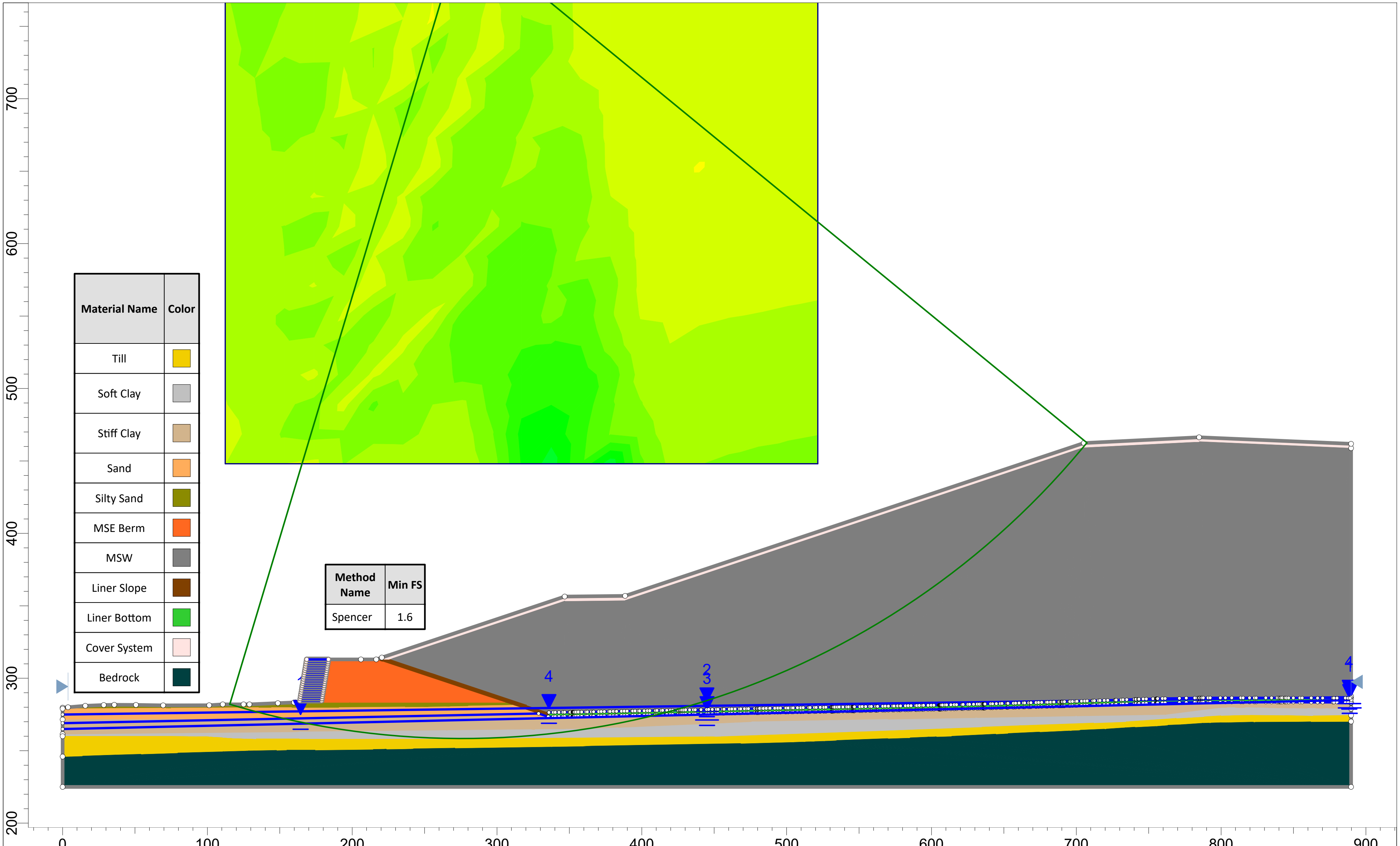


Geosyntec consultants

SLIDEINTERPRET 8.028

Project	Crossroads Phase 14 Stability Section IV		
Analysis Description	Post-Closure, Static, Horizontal Berm Sliding		
Drawn By A. Rohrman	*Scale* 1:1400	*Company*	Geosyntec Consultants
Date	10/1/2019	*File Name*	2019.10.01 Ph14 IV.slmd

Section V

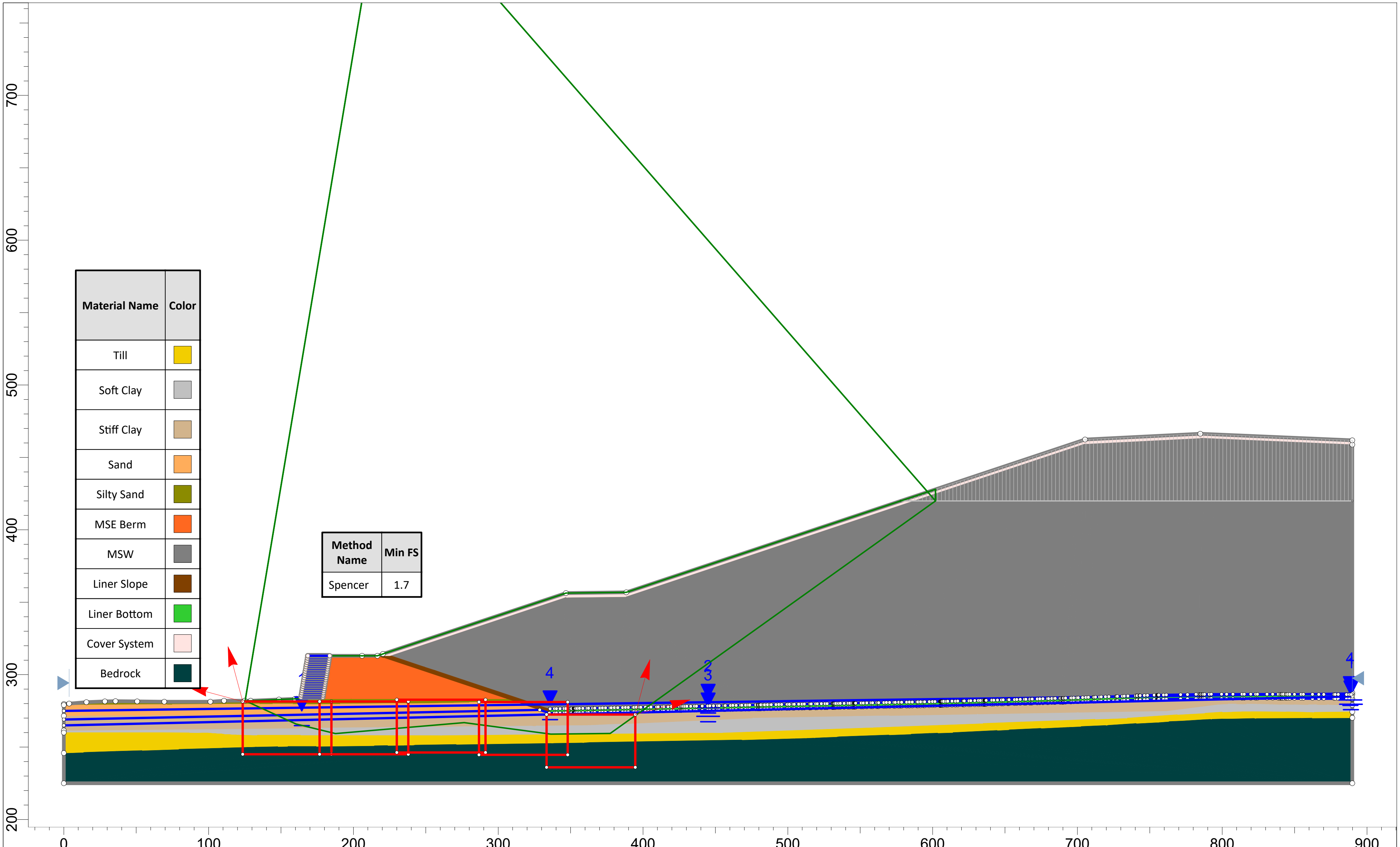


Geosyntec consultants

SLIDEINTERPRET 8.014

Project	Crossroads Phase 14 Stability Section V
Analysis Description	Post-Closure, Static, Circular

Drawn By	A. Rohrman	*Scale*	1:1100	*Company*	Geosyntec Consultants
Date	10/1/2019			*File Name*	2019.10.01 Ph14 V.slmd



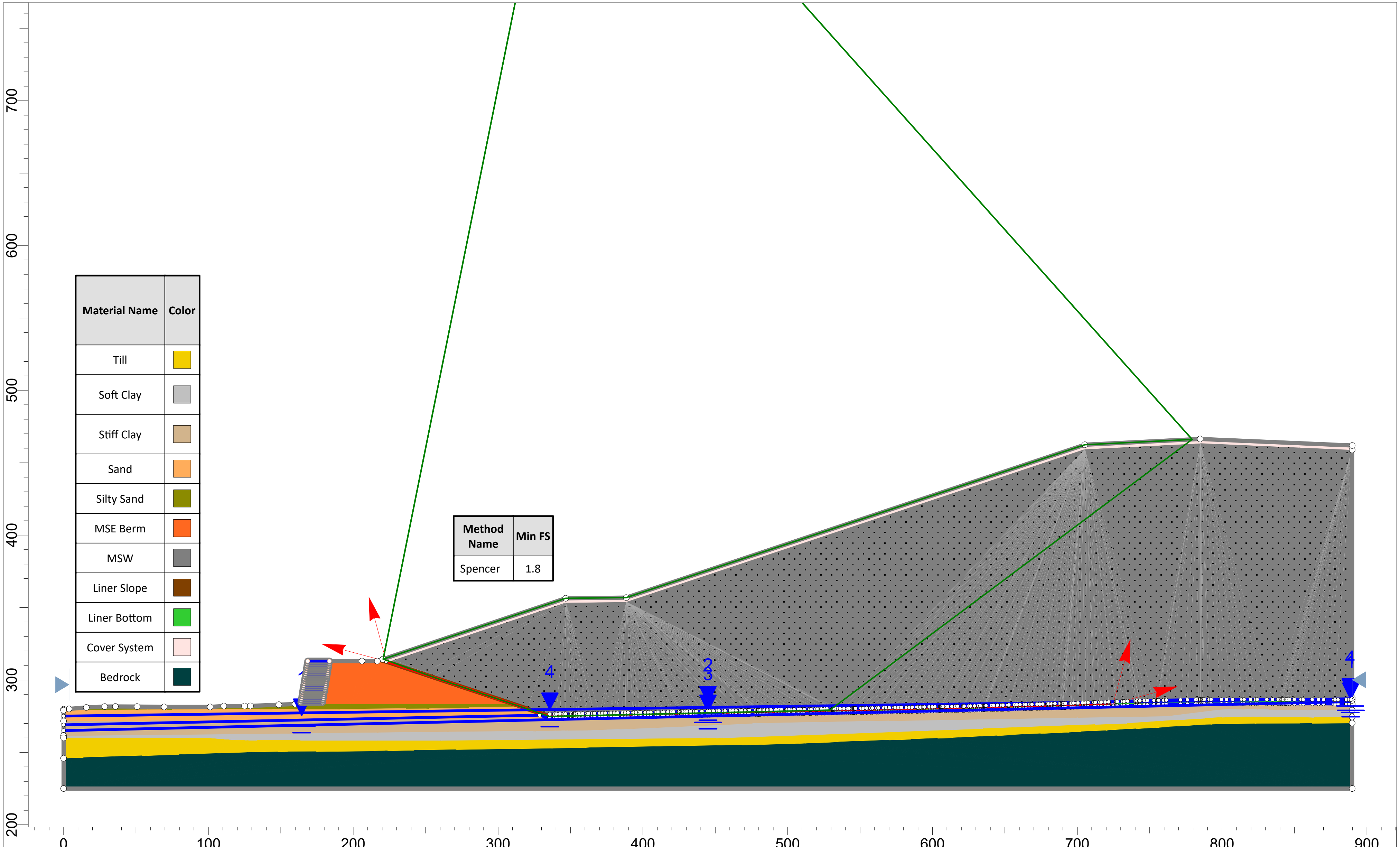
Material Name	Color
Till	
Soft Clay	
Stiff Clay	
Sand	
Silty Sand	
MSE Berm	
MSW	
Liner Slope	
Liner Bottom	
Cover System	
Bedrock	

Method Name	Min FS
Spencer	1.7

Geosyntec consultants

SLIDEINTERPRET 8.014

Project	Crossroads Phase 14 Stability Section V		
Analysis Description	Post-Closure, Static, Non-Circular		
Drawn By A. Rohrman	*Scale* 1:1100	*Company*	Geosyntec Consultants
Date	10/1/2019	*File Name*	2019.10.01 Ph14 V.slmd



Material Name	Color
Till	
Soft Clay	
Stiff Clay	
Sand	
Silty Sand	
MSE Berm	
MSW	
Liner Slope	
Liner Bottom	
Cover System	
Bedrock	

Method Name	Min FS
Spencer	1.8

Geosyntec consultants

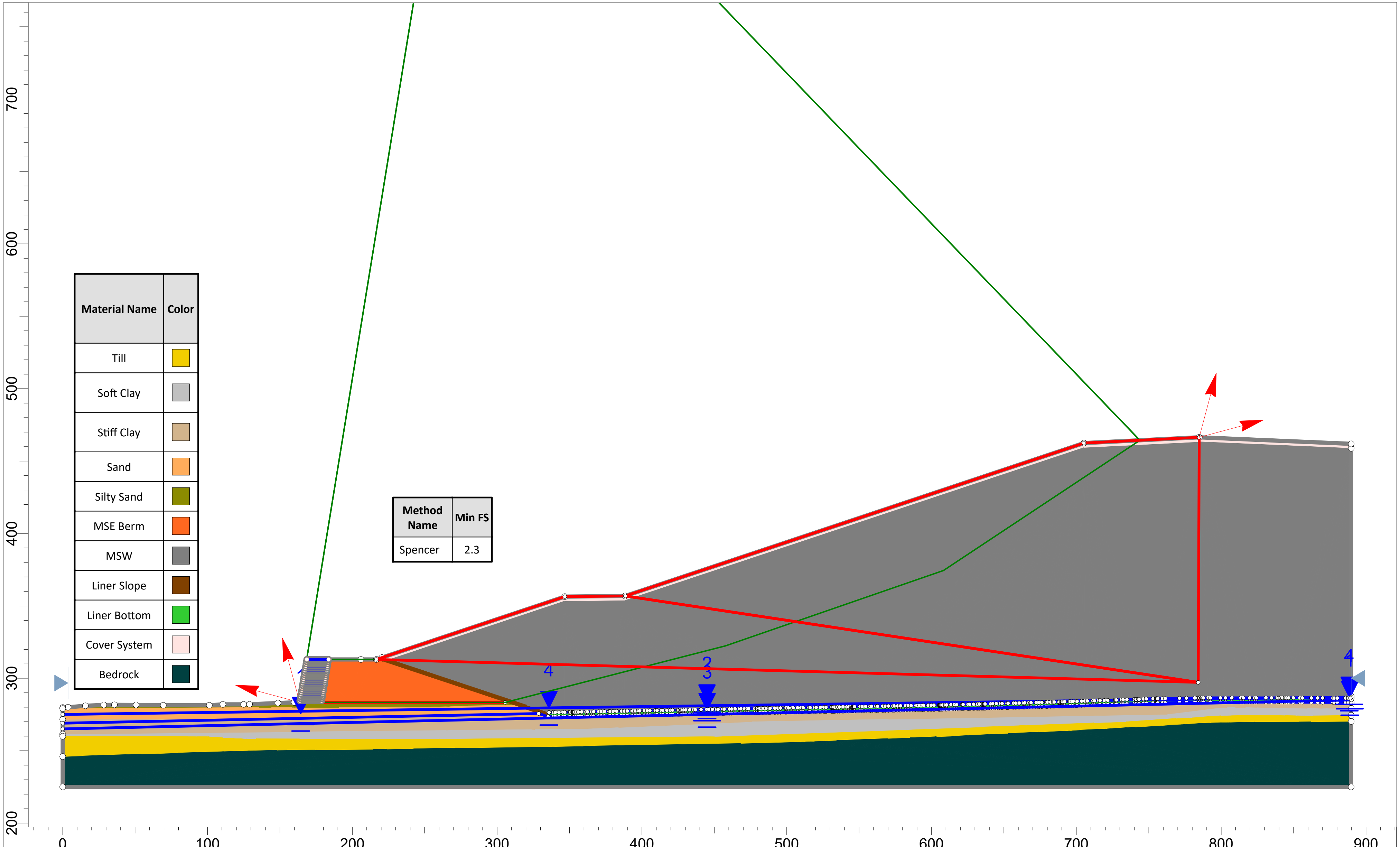
SLIDEINTERPRET 8.028

Project
Crossroads Phase 14 Stability Section V

Analysis Description
Post-Closure, Static, Liner Waste Block

Drawn By A. Rohrman
Scale 1:1100
Company Geosyntec Consultants

Date 10/1/2019
File Name 2019.10.01 Ph14 V.slmd



Material Name	Color
Till	
Soft Clay	
Stiff Clay	
Sand	
Silty Sand	
MSE Berm	
MSW	
Liner Slope	
Liner Bottom	
Cover System	
Bedrock	

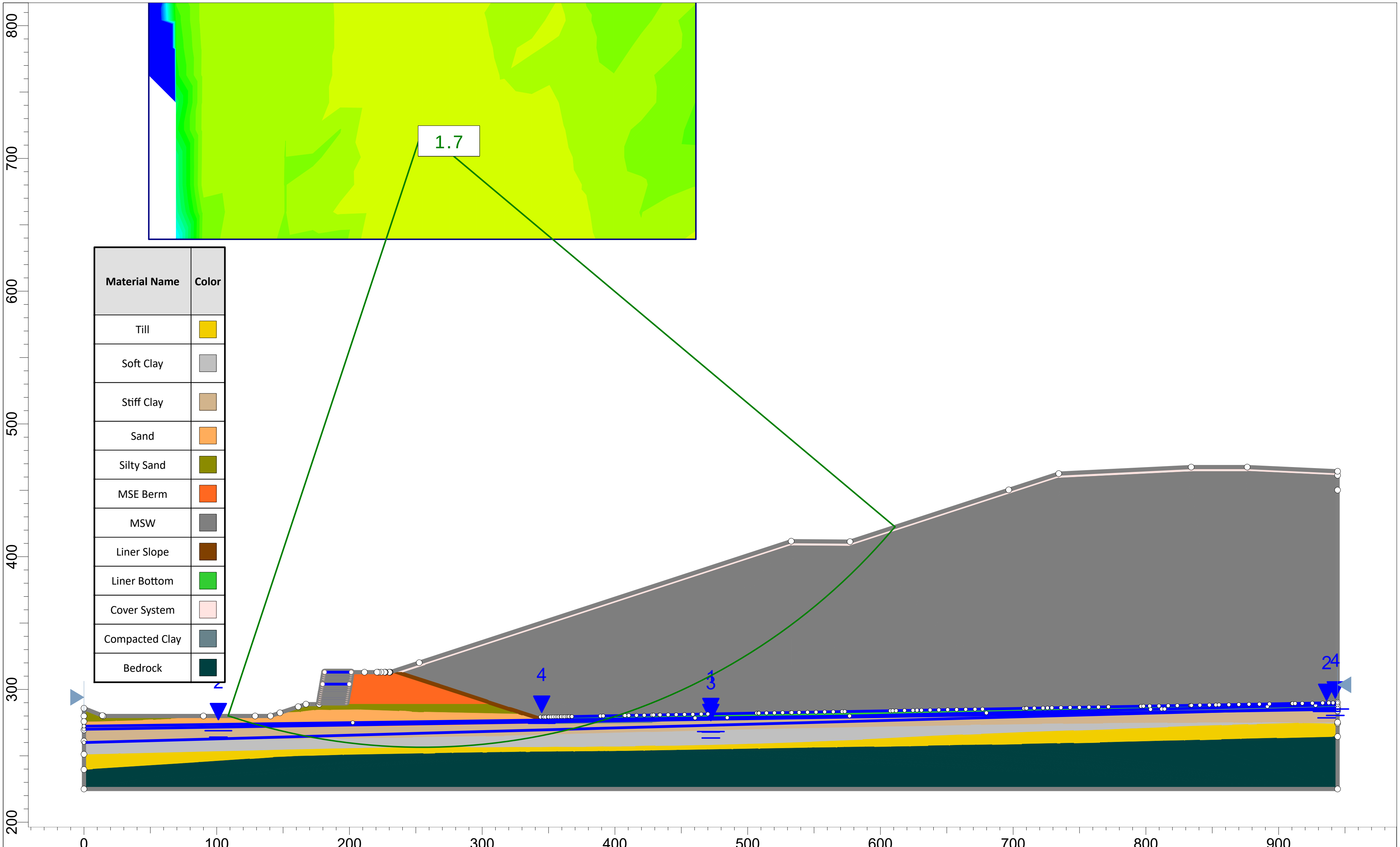
Method Name	Min FS
Spencer	2.3

Geosyntec consultants

SLIDEINTERPRET 8.014

Project	Crossroads Phase 14 Stability Section V
Analysis Description	Post-Closure, Static, Horizontal Berm Sliding
Drawn By	A. Rohrman
Scale	1:1100
Company	Geosyntec Consultants
Date	10/1/2019
File Name	2019.10.01 Ph14 V.slmd

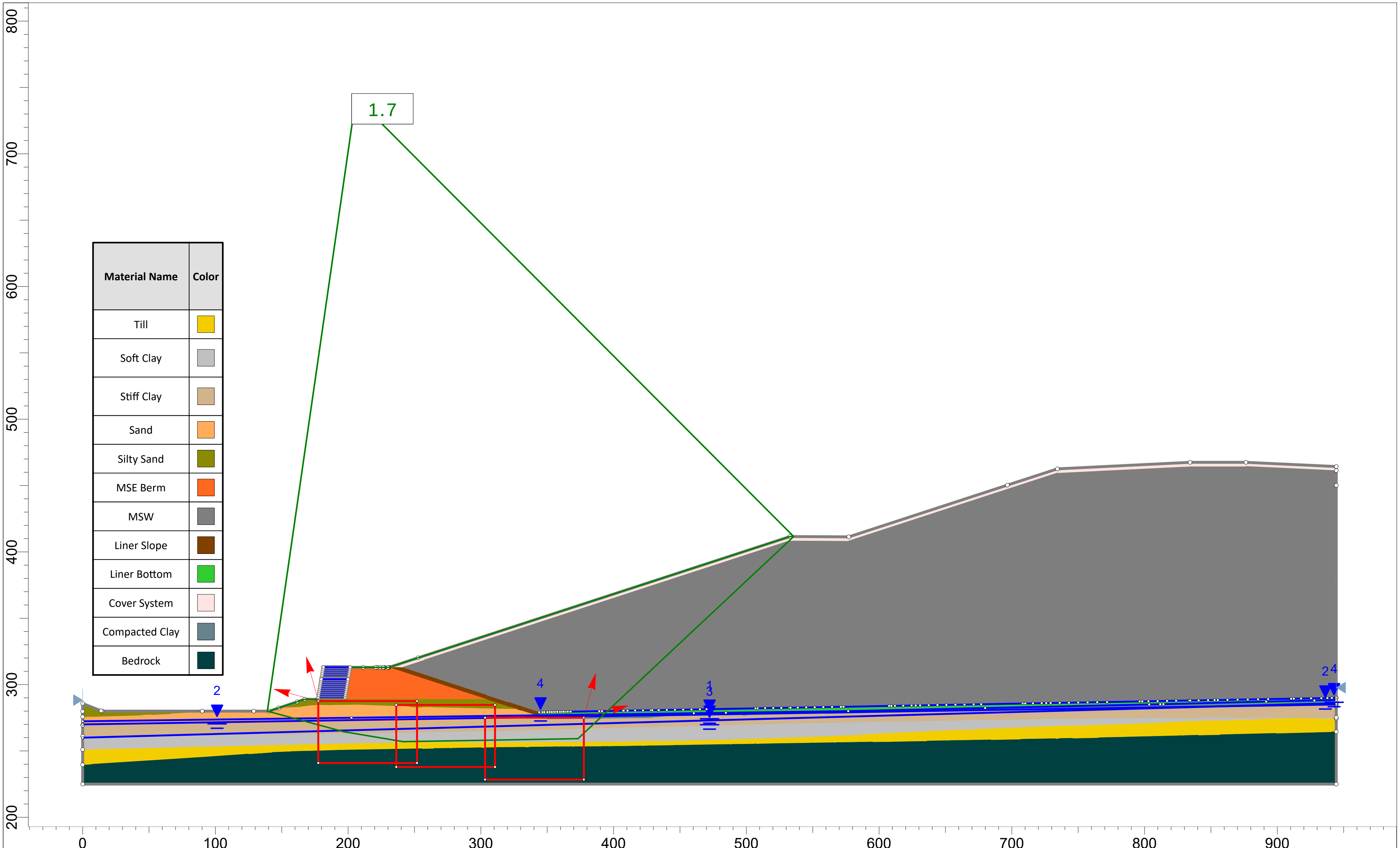
Section VI



Geosyntec consultants

SLIDEINTERPRET 8.028

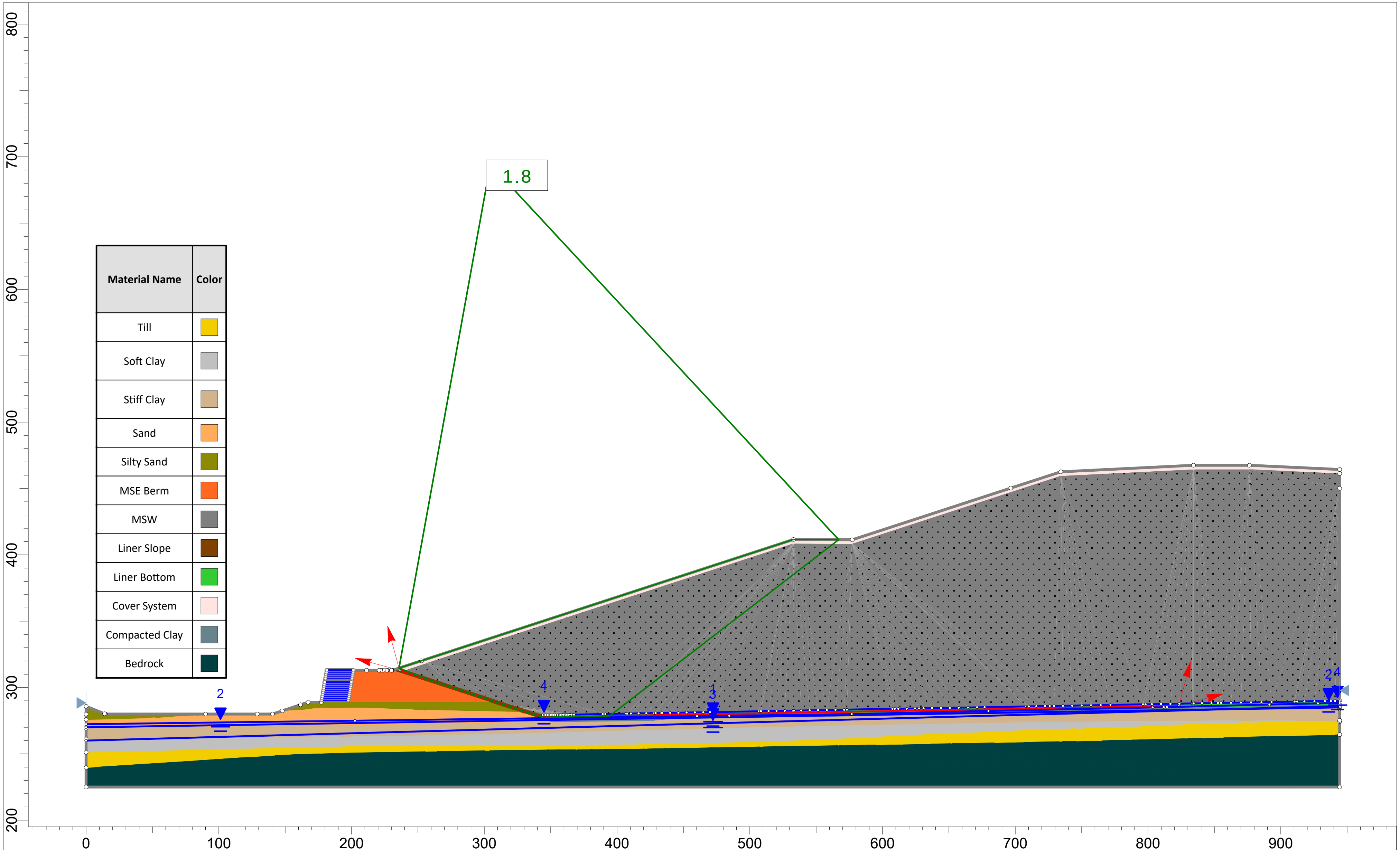
Project	Crossroads Phase 14 Stability Section VI		
Analysis Description	Post-Closure, Static, Circular		
Drawn By A. Rohrman	*Scale* 1:1200	*Company*	Geosyntec Consultants
Date	10/1/2019	*File Name*	2019.10.01 Ph14 VI.slmd



Geosyntec consultants

Project	Crossroads Phase 14 Stability Section VI
Analysis Description	Post-Closure, Static, Non-Circular
Drawn By A. Rohrman	*Scale* 1:1200
Company	Geosyntec Consultants
Date	10/1/2019
File Name	2019.10.01 Ph14 VI.slmd

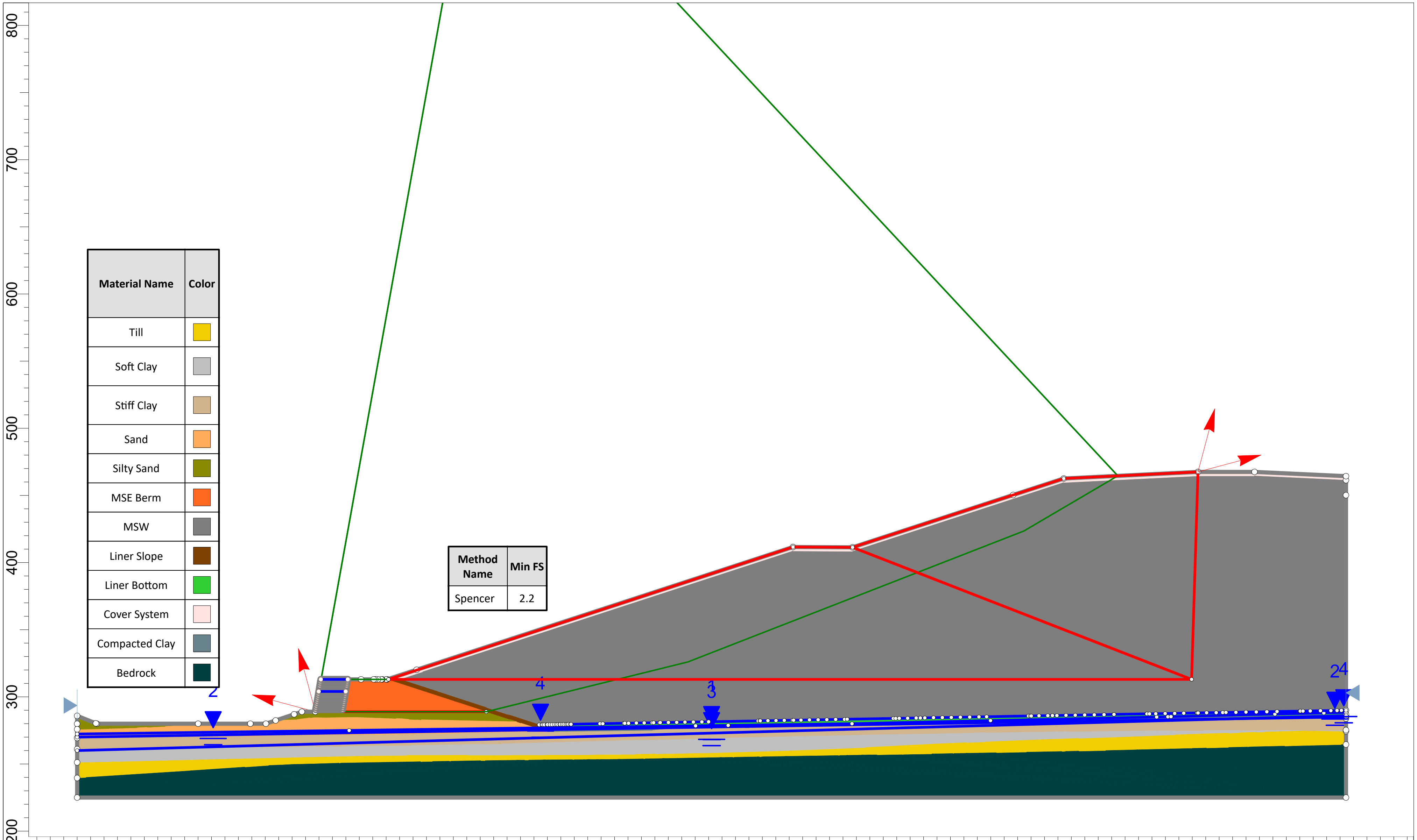
SLIDEINTERPRET 8.014



Geosyntec consultants

SLIDEINTERPRET 8.028

Project	Crossroads Phase 14 Stability Section VI		
Analysis Description	Post-Closure, Static, Liner Waste Block		
Drawn By A. Rohrman	*Scale* 1:1200	*Company*	Geosyntec Consultants
Date	10/1/2019	*File Name*	2019.10.01 Ph14 VI.slmd

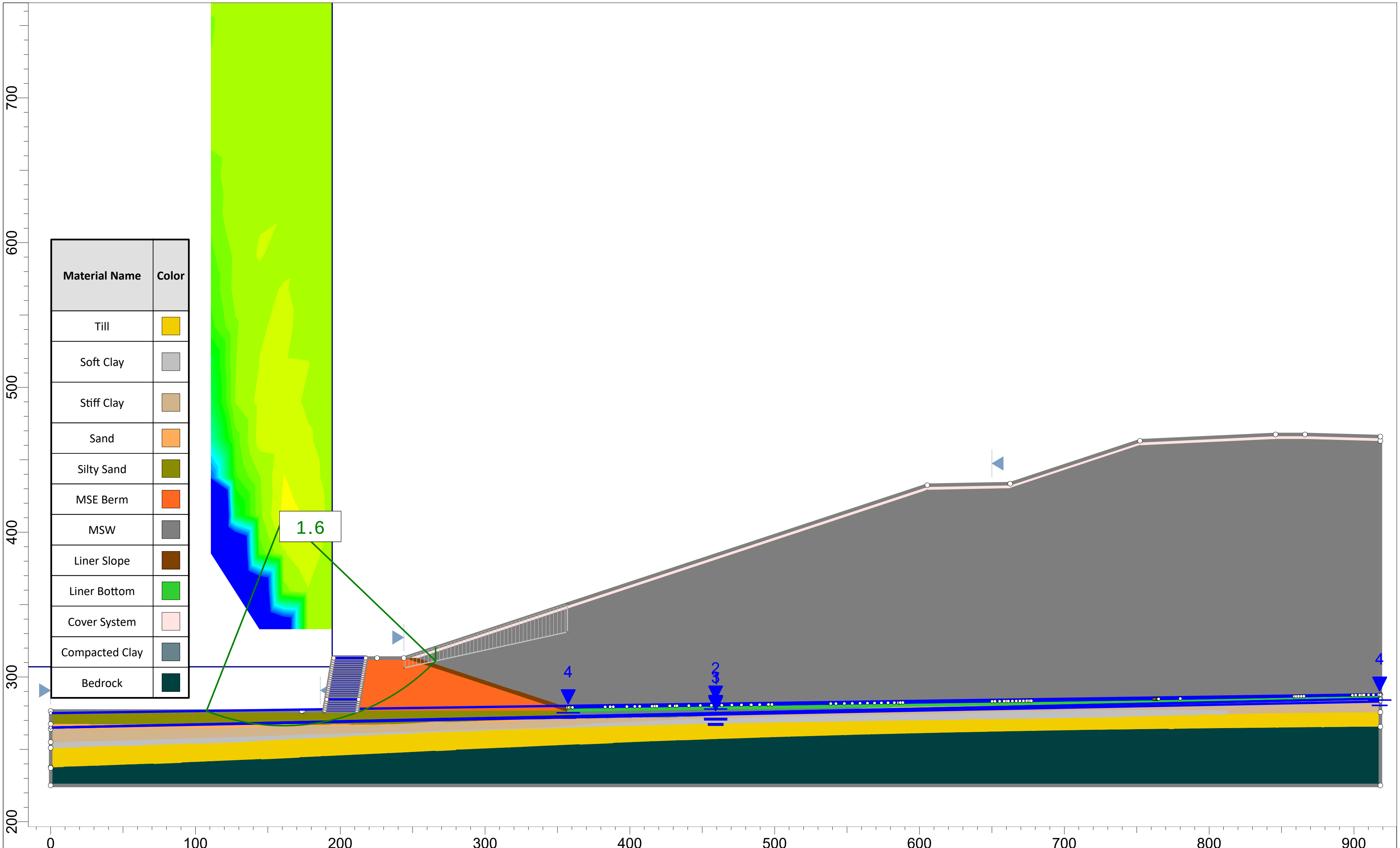


Material Name	Color
Till	
Soft Clay	
Stiff Clay	
Sand	
Silty Sand	
MSE Berm	
MSW	
Liner Slope	
Liner Bottom	
Cover System	
Compacted Clay	
Bedrock	

Method Name	Min FS
Spencer	2.2

Geosyntec consultants	*Project* Crossroads Phase 14 Stability Section VI		
	Analysis Description Post-Closure, Static, Horizontal Berm Sliding		
	Drawn By A. Rohrman	*Scale* 1:1200	*Company* Geosyntec Consultants
SLIDEINTERPRET 8.014	*Date* 10/1/2019		*File Name* 2019.10.01 Ph14 VI.slmd

Section VII

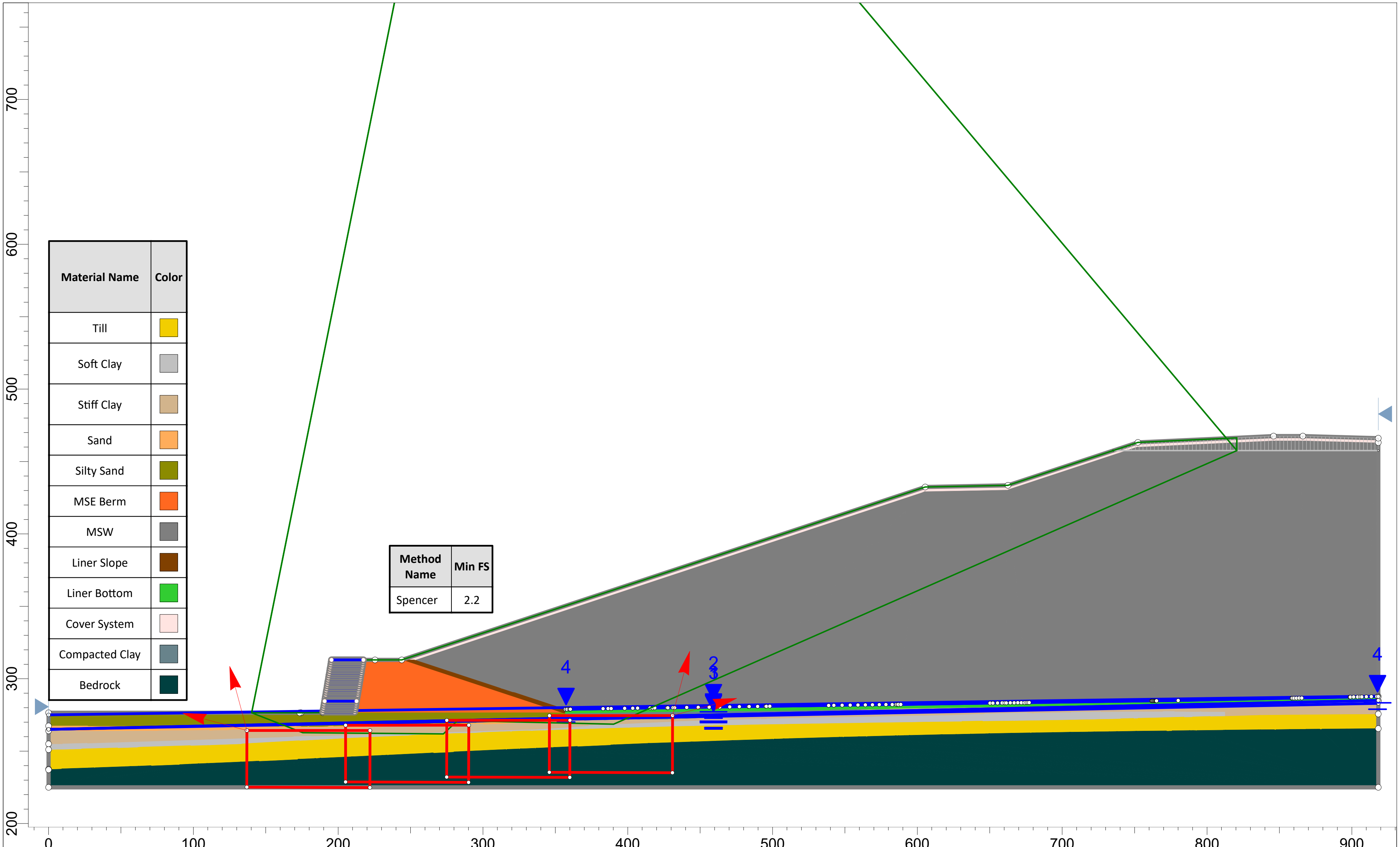


Material Name	Color
Till	
Soft Clay	
Stiff Clay	
Sand	
Silty Sand	
MSE Berm	
MSW	
Liner Slope	
Liner Bottom	
Cover System	
Compacted Clay	
Bedrock	

Geosyntec consultants

SLIDEINTERPRET 8.028

Project	Crossroads Phase 14 Stability Section VII		
Analysis Description	Post-Closure, Static, Circular		
Drawn By A. Rohrman	*Scale* 1:1100	*Company*	Geosyntec Consultants
Date 10/1/2019		*File Name*	2019.10.01 Ph14 VII.slmd



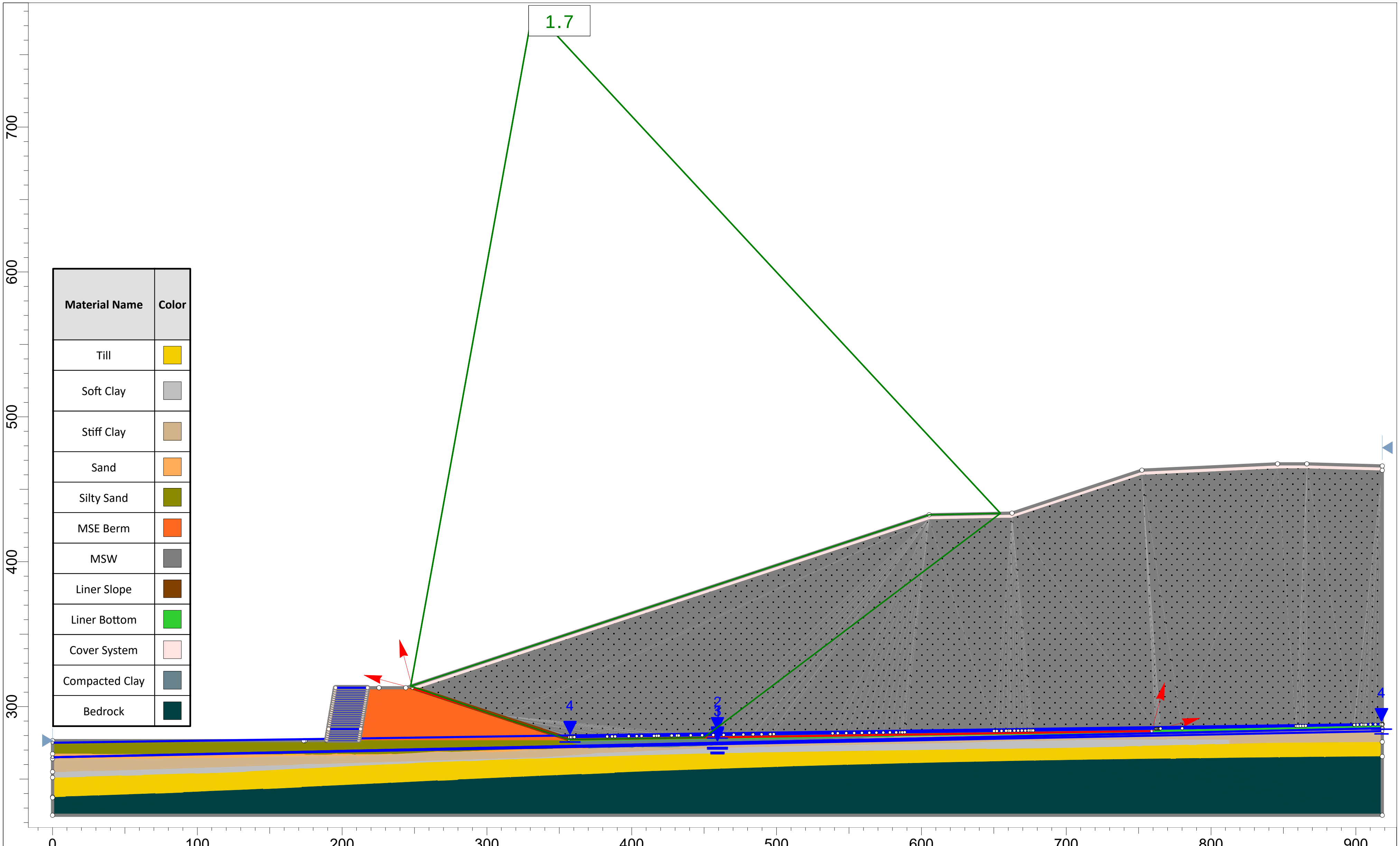
Material Name	Color
Till	
Soft Clay	
Stiff Clay	
Sand	
Silty Sand	
MSE Berm	
MSW	
Liner Slope	
Liner Bottom	
Cover System	
Compacted Clay	
Bedrock	

Method Name	Min FS
Spencer	2.2

Geosyntec consultants

SLIDEINTERPRET 8.028

Project	Crossroads Phase 14 Stability Section VII		
Analysis Description	Post-Closure, Static, Non-Circular		
Drawn By A. Rohrman	*Scale* 1:1100	*Company*	Geosyntec Consultants
Date 10/1/2019		*File Name*	2019.10.01 Ph14 VII.slmd

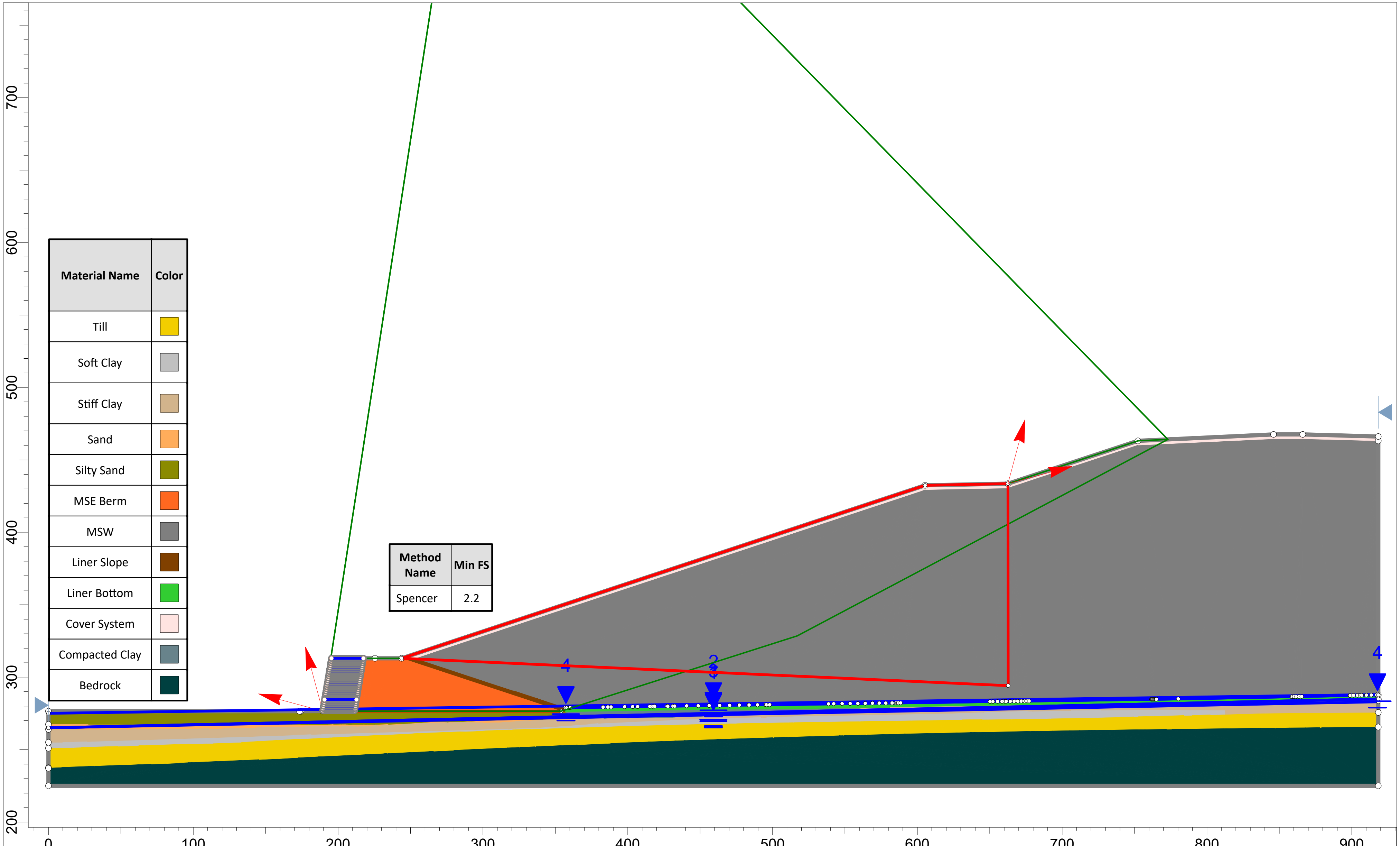


Material Name	Color
Till	
Soft Clay	
Stiff Clay	
Sand	
Silty Sand	
MSE Berm	
MSW	
Liner Slope	
Liner Bottom	
Cover System	
Compacted Clay	
Bedrock	

Geosyntec consultants

SLIDEINTERPRET 8.028

Project	Crossroads Phase 14 Stability Section VII		
Analysis Description	Post-Closure, Static, Liner Waste Block		
Drawn By	A. Rohrman	*Scale* 1:1100	*Company* Geosyntec Consultants
Date	10/1/2019	*File Name*	2019.10.01 Ph14 VII.slmd



Material Name	Color
Till	
Soft Clay	
Stiff Clay	
Sand	
Silty Sand	
MSE Berm	
MSW	
Liner Slope	
Liner Bottom	
Cover System	
Compacted Clay	
Bedrock	

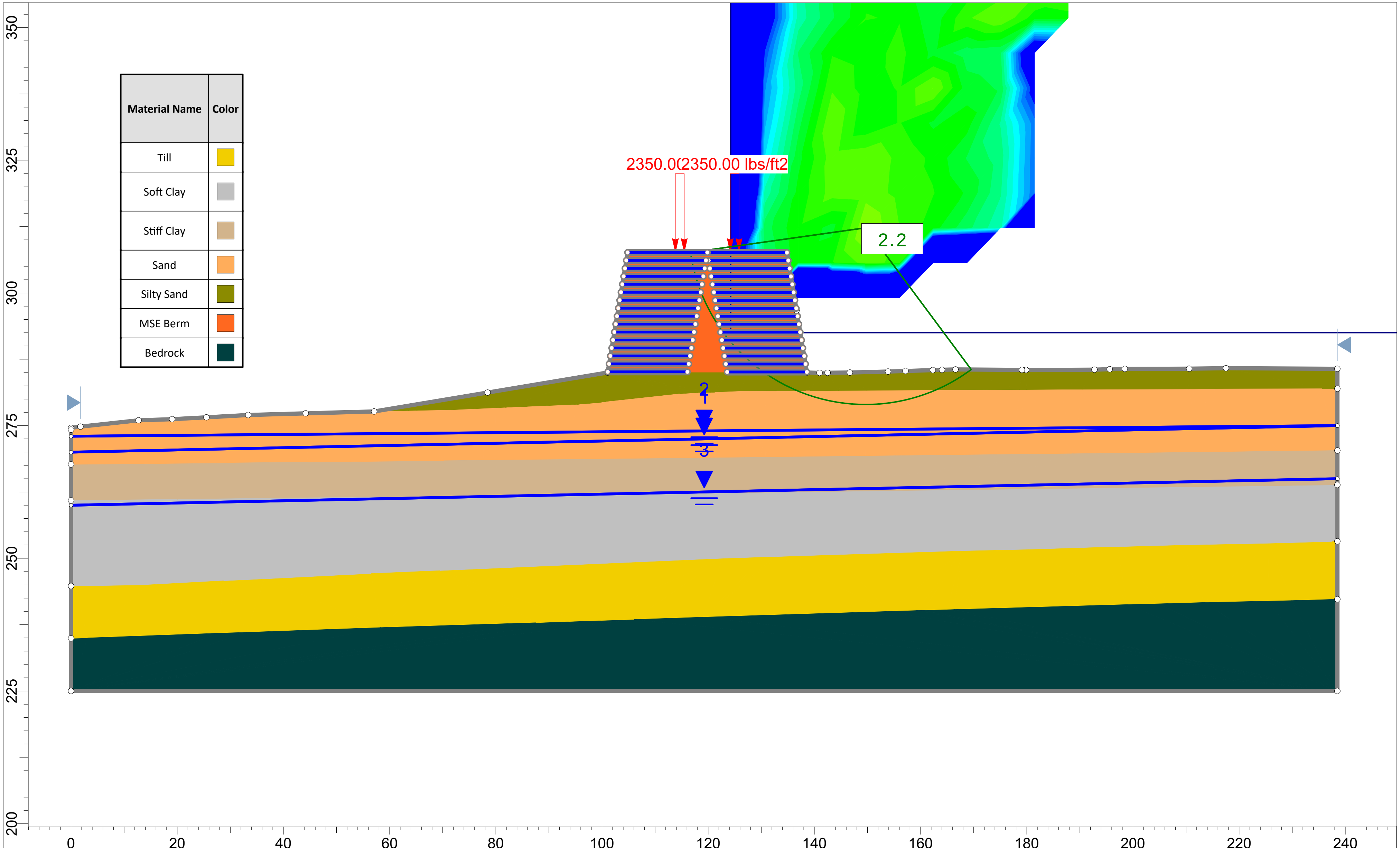
Method Name	Min FS
Spencer	2.2

Geosyntec consultants

Project	Crossroads Phase 14 Stability Section VII		
Analysis Description	Post-Closure, Static, Horizontal Berm Sliding		
Drawn By A. Rohrman	*Scale* 1:1100	*Company*	Geosyntec Consultants
Date	10/1/2019	*File Name*	2019.10.01 Ph14 VII.slmd

SLIDEINTERPRET 8.028

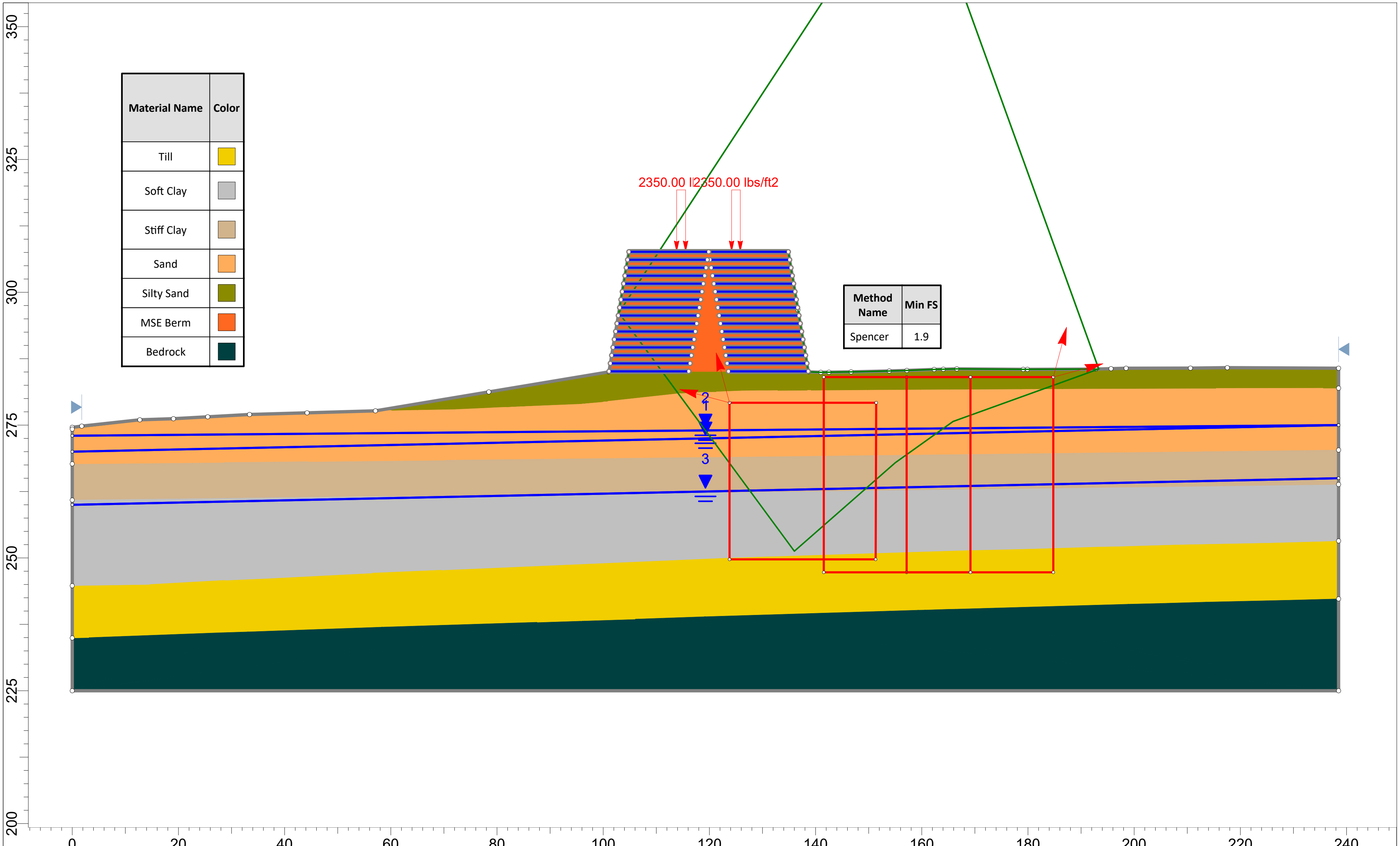
Section VIII



Geosyntec consultants

SLIDEINTERPRET 8.014

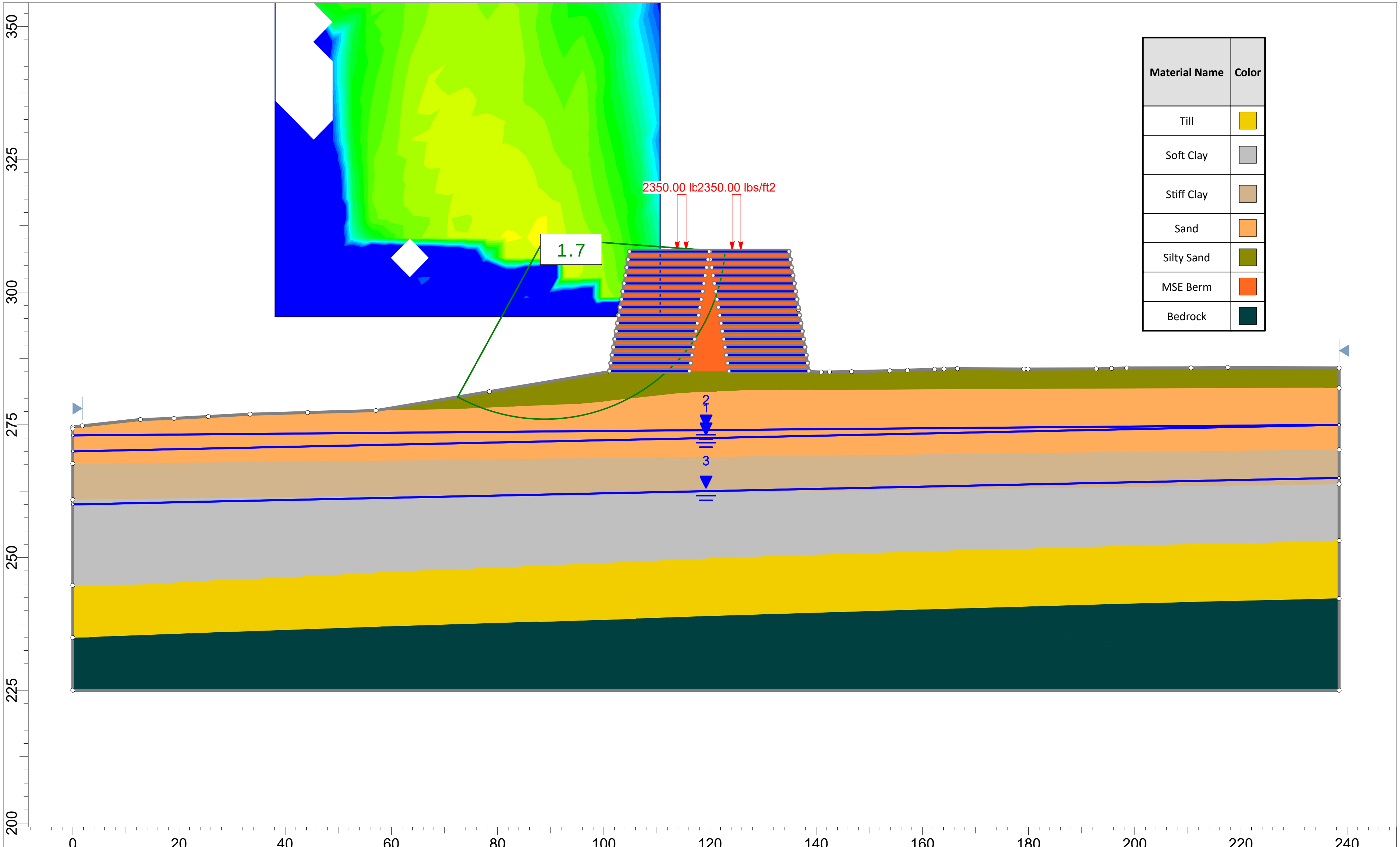
Project	Crossroads Phase 14 Stability Section VIII
Analysis Description	Post-Closure, Static, Inward Circular
Drawn By	A. Rohrman
Scale	1:300
Company	Geosyntec Consultants
Date	10/1/2019
File Name	2019.10.01 Ph14 VIII.slmd



Project	Crossroads Phase 14 Stability Section VIII		
Analysis Description	Post-Closure, Static, Inward Non-Circular		
Drawn By	A. Rohrman	Scale	1:300
Company	Geosyntec Consultants		
Date	10/1/2019	File Name	2019.10.01 Ph14 VIII.slmd

Geosyntec consultants

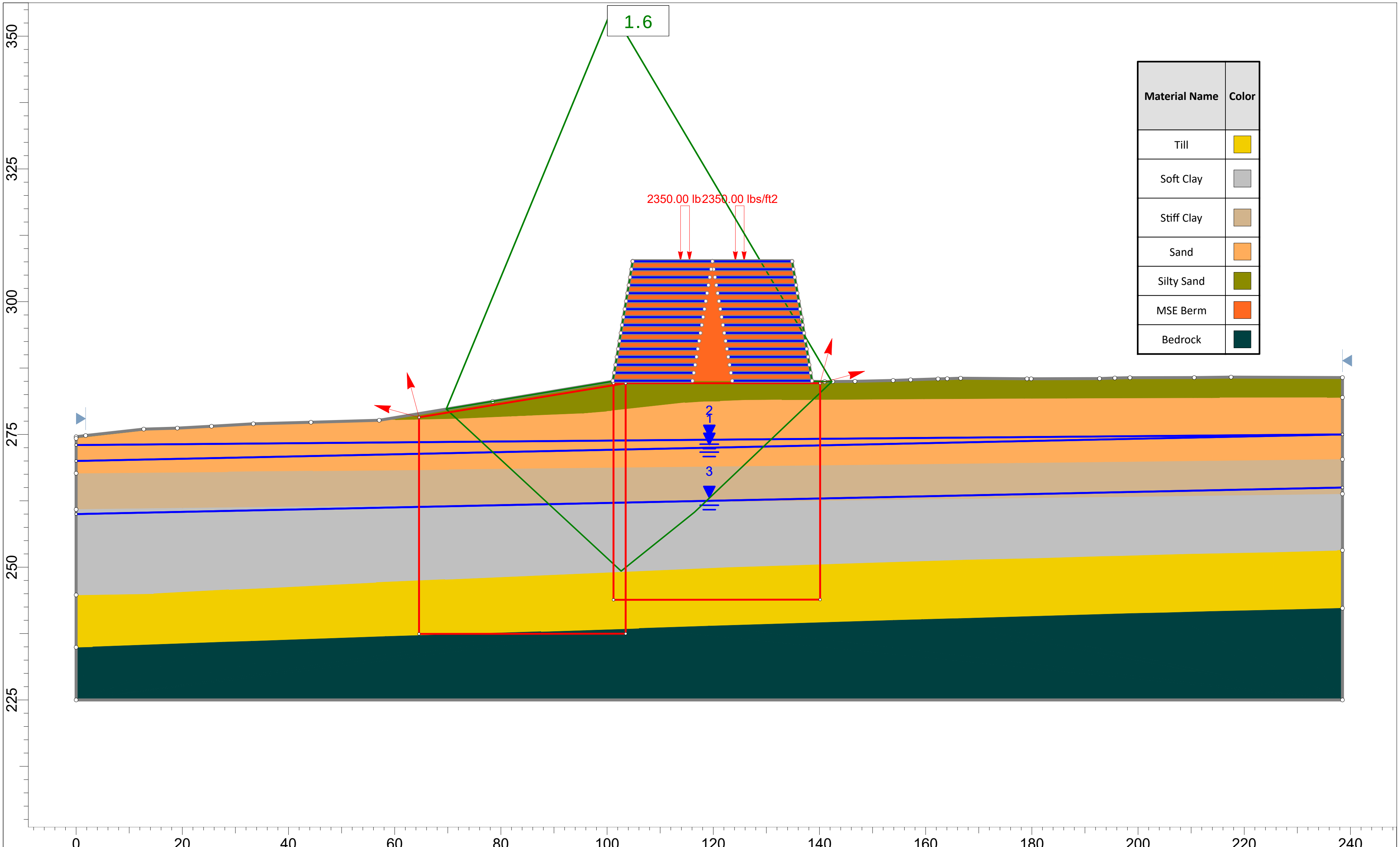
SLIDEINTERPRET 8.014



Project	Crossroads Phase 14 Stability Section VIII
Analysis Description	Post-Closure, Static, Outward Circular
Drawn By	A. Rohrman
Scale	1:300
Company	Geosyntec Consultants
Date	10/1/2019
File Name	2019.10.01 Ph14 VIII.slmd

Geosyntec consultants

SLIDEINTERPRET 8.014



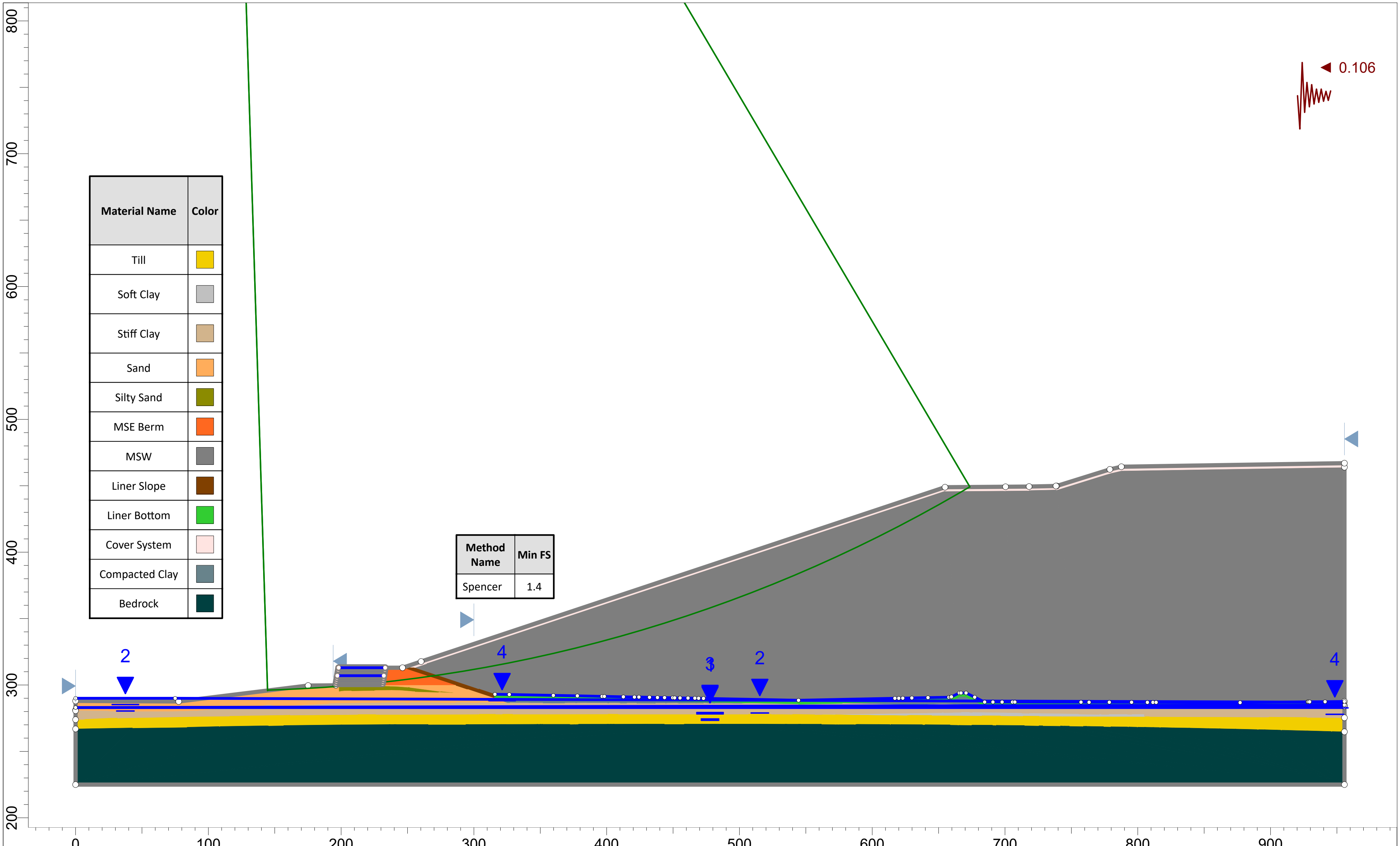
Geosyntec consultants

Project	Crossroads Phase 14 Stability Section VIII
Analysis Description	Post-Closure, Static, Outward Non-Circular
Drawn By	A. Rohrman
Scale	1:300
Company	Geosyntec Consultants
Date	10/1/2019
File Name	2019.10.01 Ph14 VIII.slmd

SLIDEINTERPRET 8.014

ATTACHMENT 10
Slope Stability Outputs for Seismic Post-Closure Condition

Section I



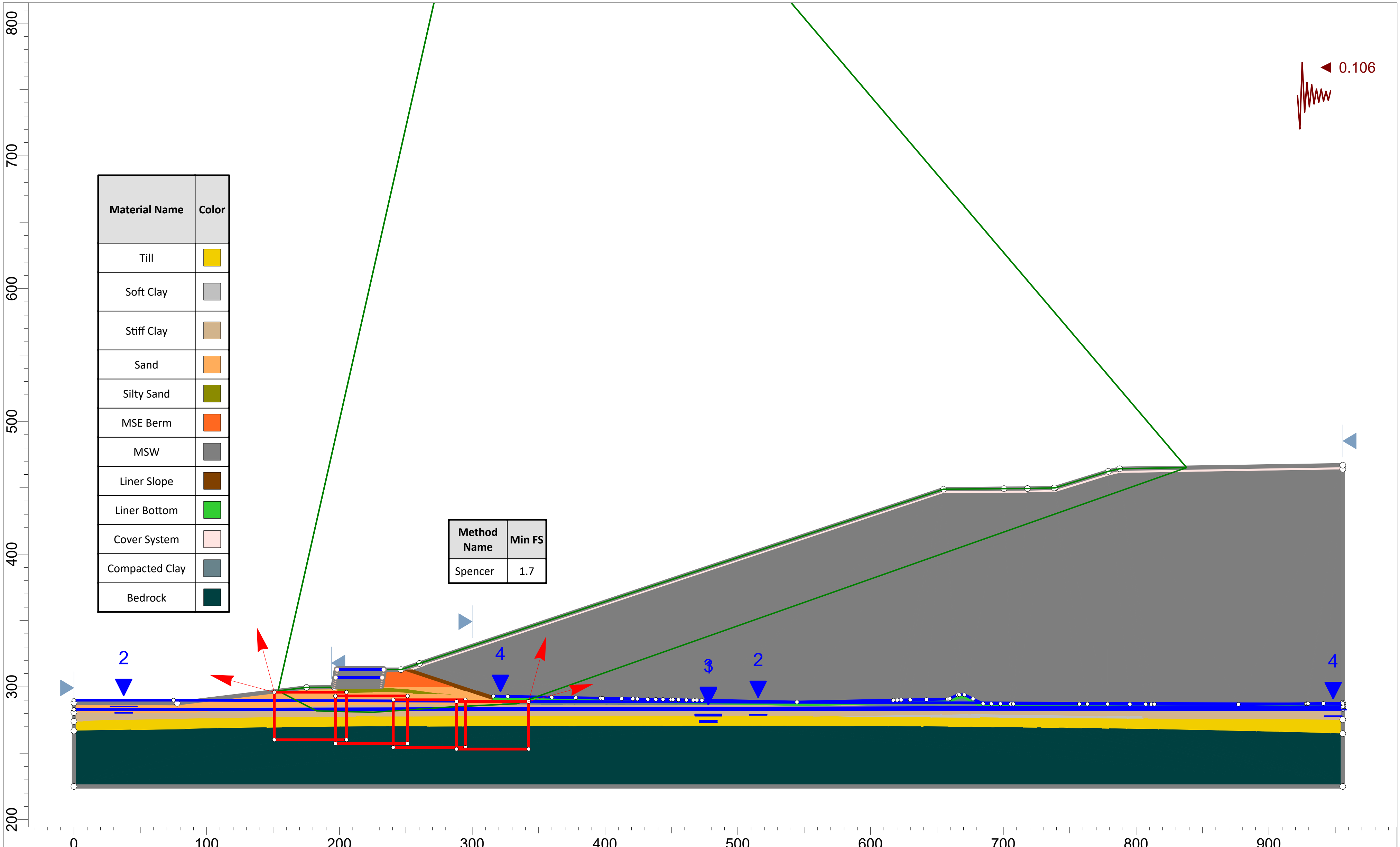
Material Name	Color
Till	
Soft Clay	
Stiff Clay	
Sand	
Silty Sand	
MSE Berm	
MSW	
Liner Slope	
Liner Bottom	
Cover System	
Compacted Clay	
Bedrock	

Method Name	Min FS
Spencer	1.4

Geosyntec consultants

SLIDEINTERPRET 8.028

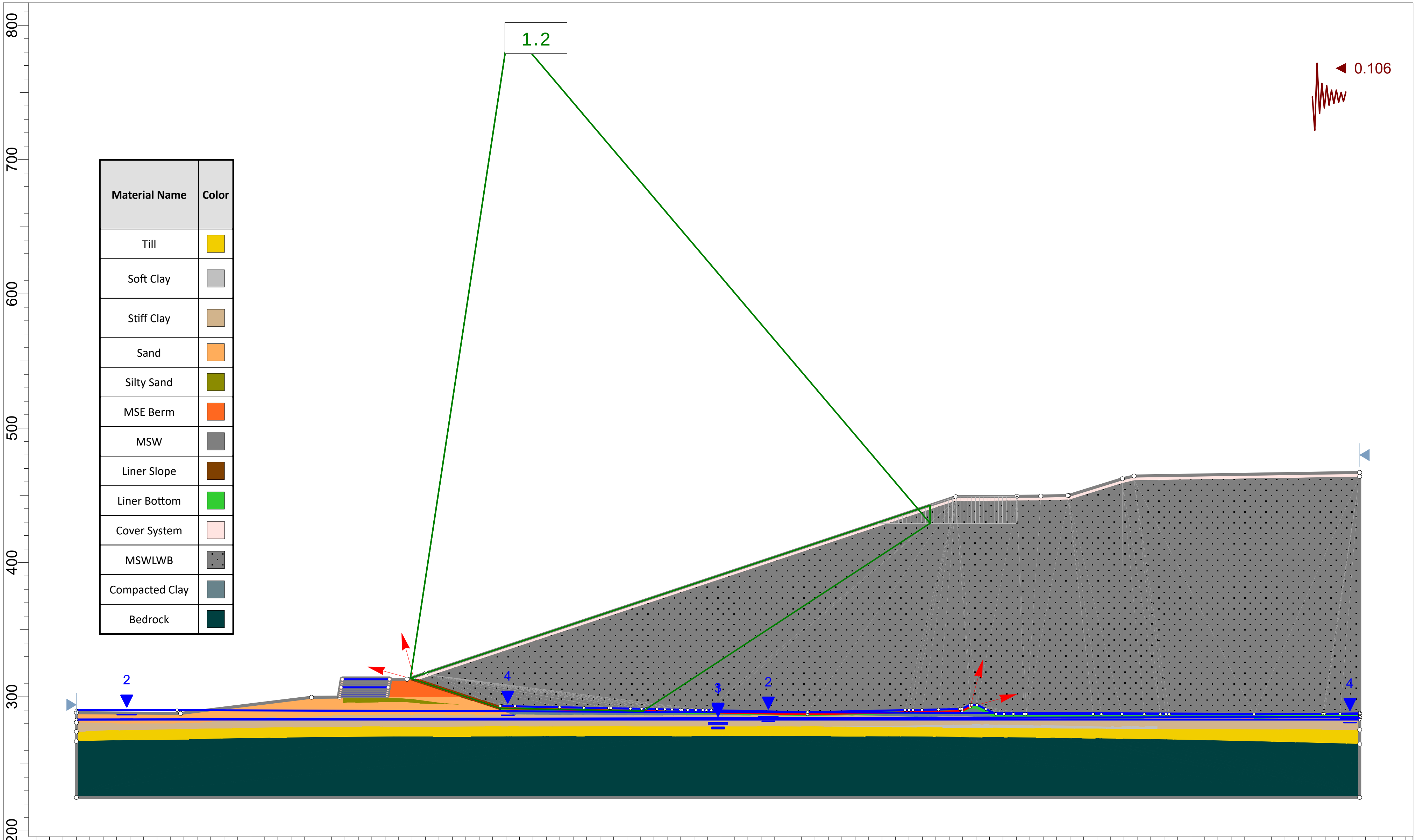
Project	Crossroads Phase 14 Stability Section I		
Analysis Description	Post-Closure, Seismic, Circular		
Drawn By A. Rohrman	*Scale* 1:1200	*Company*	Geosyntec Consultants
Date	10/1/2019	*File Name*	2019.10.01 Ph14 I.slmd



Geosyntec consultants

SLIDEINTERPRET 8.028

Project	Crossroads Phase 14 Stability Section I		
Analysis Description	Post-Closure, Seismic, Non-Circular		
Drawn By A. Rohrman	*Scale* 1:1200	*Company*	Geosyntec Consultants
Date	10/1/2019	*File Name*	2019.10.01 Ph14 I.slmd

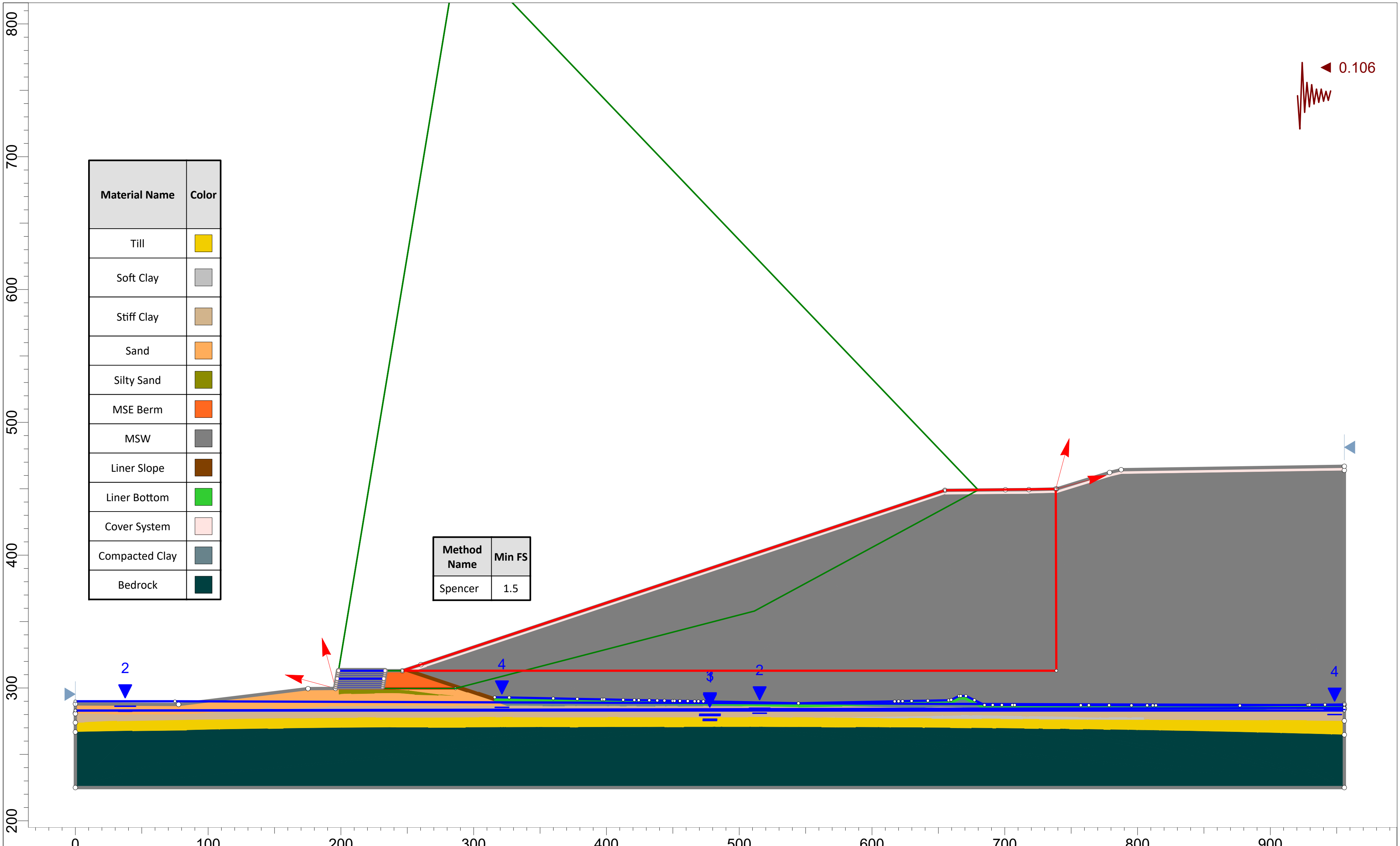


Material Name	Color
Till	
Soft Clay	
Stiff Clay	
Sand	
Silty Sand	
MSE Berm	
MSW	
Liner Slope	
Liner Bottom	
Cover System	
MSWLWB	
Compacted Clay	
Bedrock	

Geosyntec consultants

SLIDEINTERPRET 8.028

Project	Crossroads Phase 14 Stability Section I
Analysis Description	Post-Closure, Seismic, Liner Waste Block
Drawn By	A. Rohrman
Scale	1:1200
Company	Geosyntec Consultants
Date	10/1/2019
File Name	2019.10.01 Ph14 I.slmd

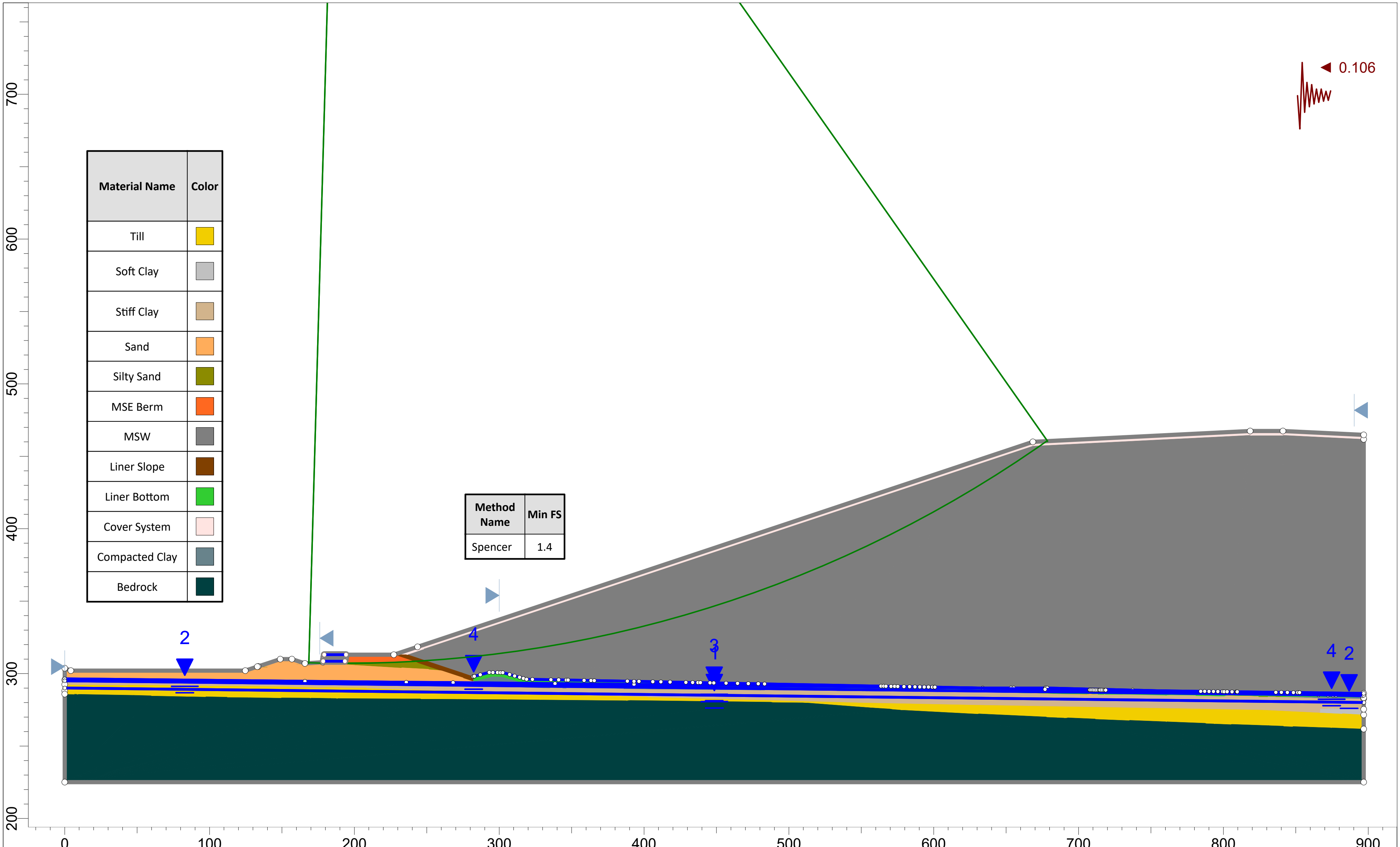


Geosyntec consultants

SLIDEINTERPRET 8.028

Project	Crossroads Phase 14 Stability Section I
Analysis Description	Post-Closure, Seismic, Horizontal Berm Sliding
Drawn By	A. Rohrman
Scale	1:1200
Company	Geosyntec Consultants
Date	10/1/2019
File Name	2019.10.01 Ph14 I.slmd

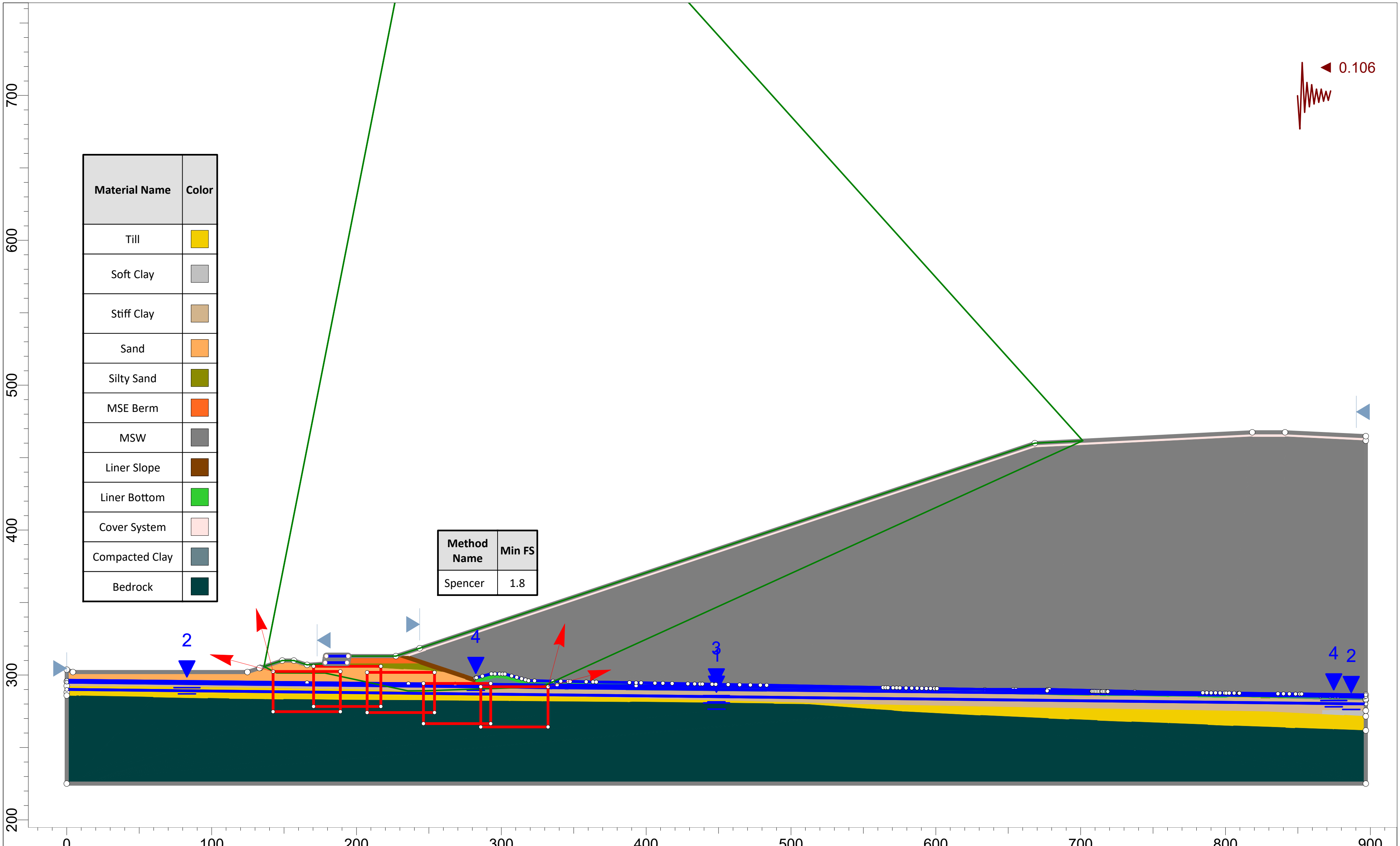
Section II



Project	Crossroads Phase 14 Stability Section II		
Analysis Description	Post-Closure, Seismic, Circular		
Drawn By: A. Rohrman	Scale: 1:1100	Company	Geosyntec Consultants
Date	10/1/2019	File Name	2019.10.01 Ph14 II.slmd

Geosyntec consultants

SLIDEINTERPRET 8.028



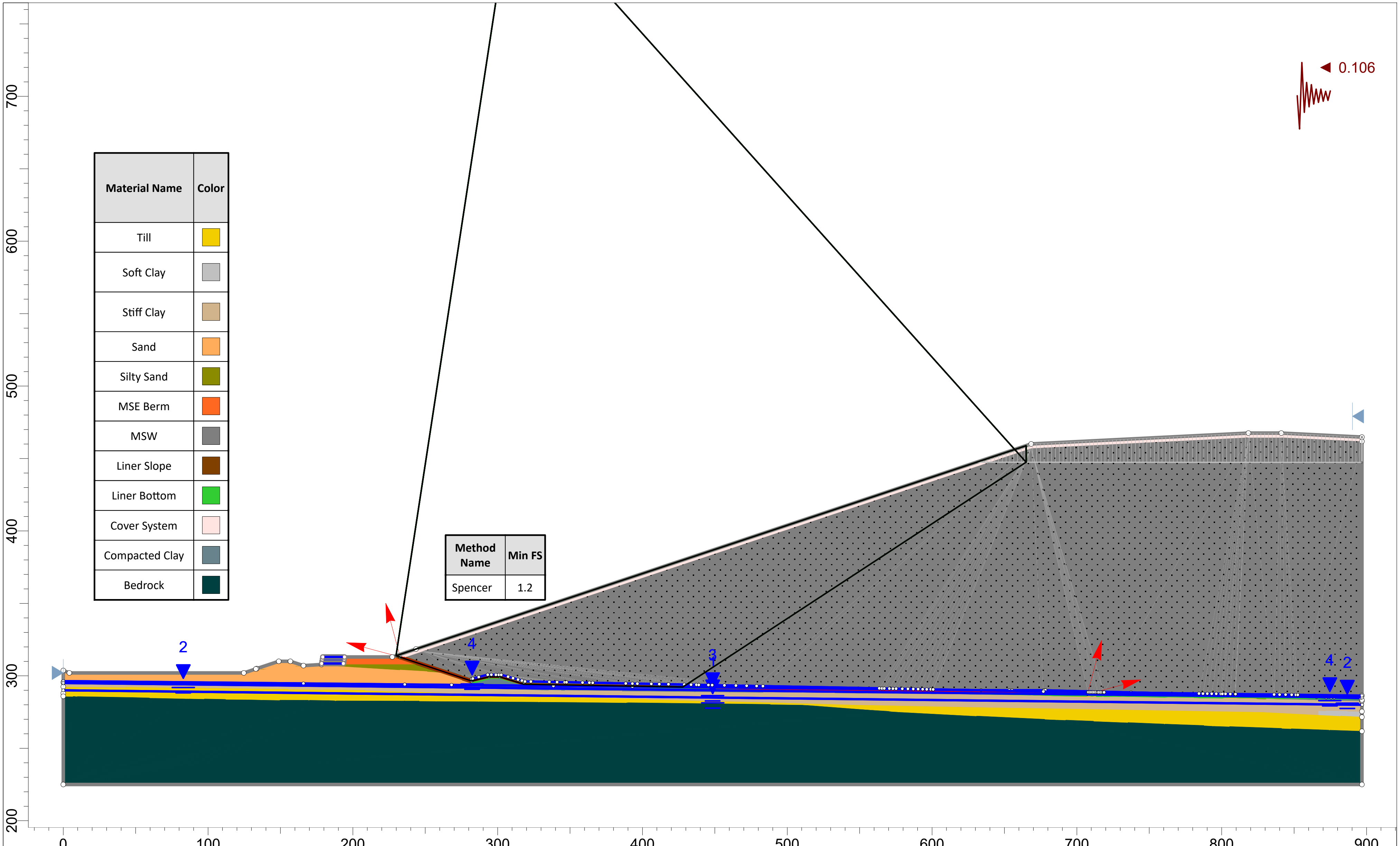
Material Name	Color
Till	
Soft Clay	
Stiff Clay	
Sand	
Silty Sand	
MSE Berm	
MSW	
Liner Slope	
Liner Bottom	
Cover System	
Compacted Clay	
Bedrock	

Method Name	Min FS
Spencer	1.8

Geosyntec consultants

Project	Crossroads Phase 14 Stability Section II
Analysis Description	Post-Closure, Seismic, Non-Circular
Drawn By	A. Rohrman
Scale	1:1100
Company	Geosyntec Consultants
Date	10/1/2019
File Name	2019.10.01 Ph14 II.slmd

SLIDEINTERPRET 8.028

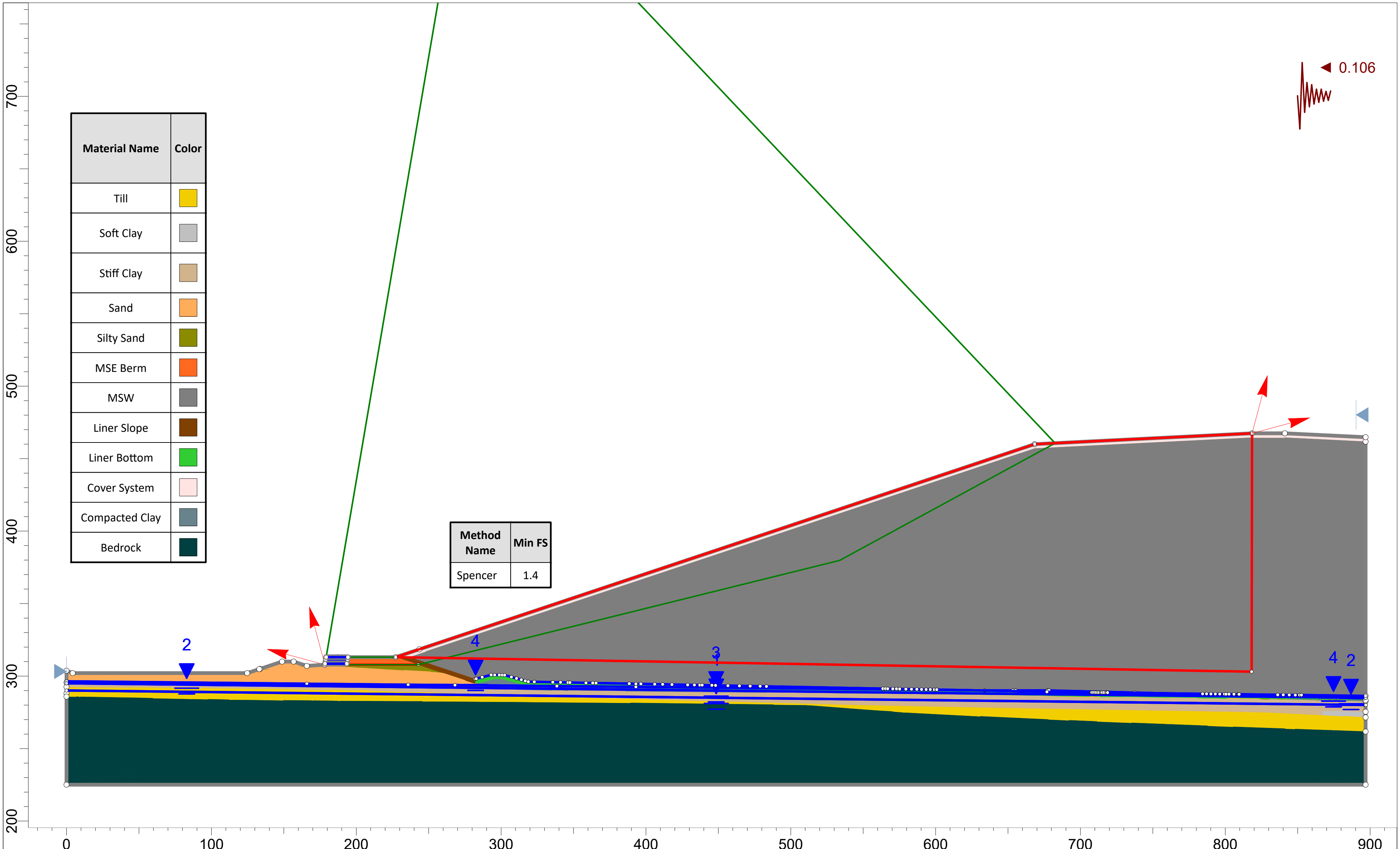


Project	Crossroads Phase 14 Stability Section II
Analysis Description	Post-Closure, Seismic, Liner Waste Block

Drawn By	A. Rohrman	Scale	1:1100	Company	Geosyntec Consultants
Date	10/1/2019			File Name	2019.10.01 Ph14 II.slmd

Geosyntec consultants

SLIDEINTERPRET 8.028

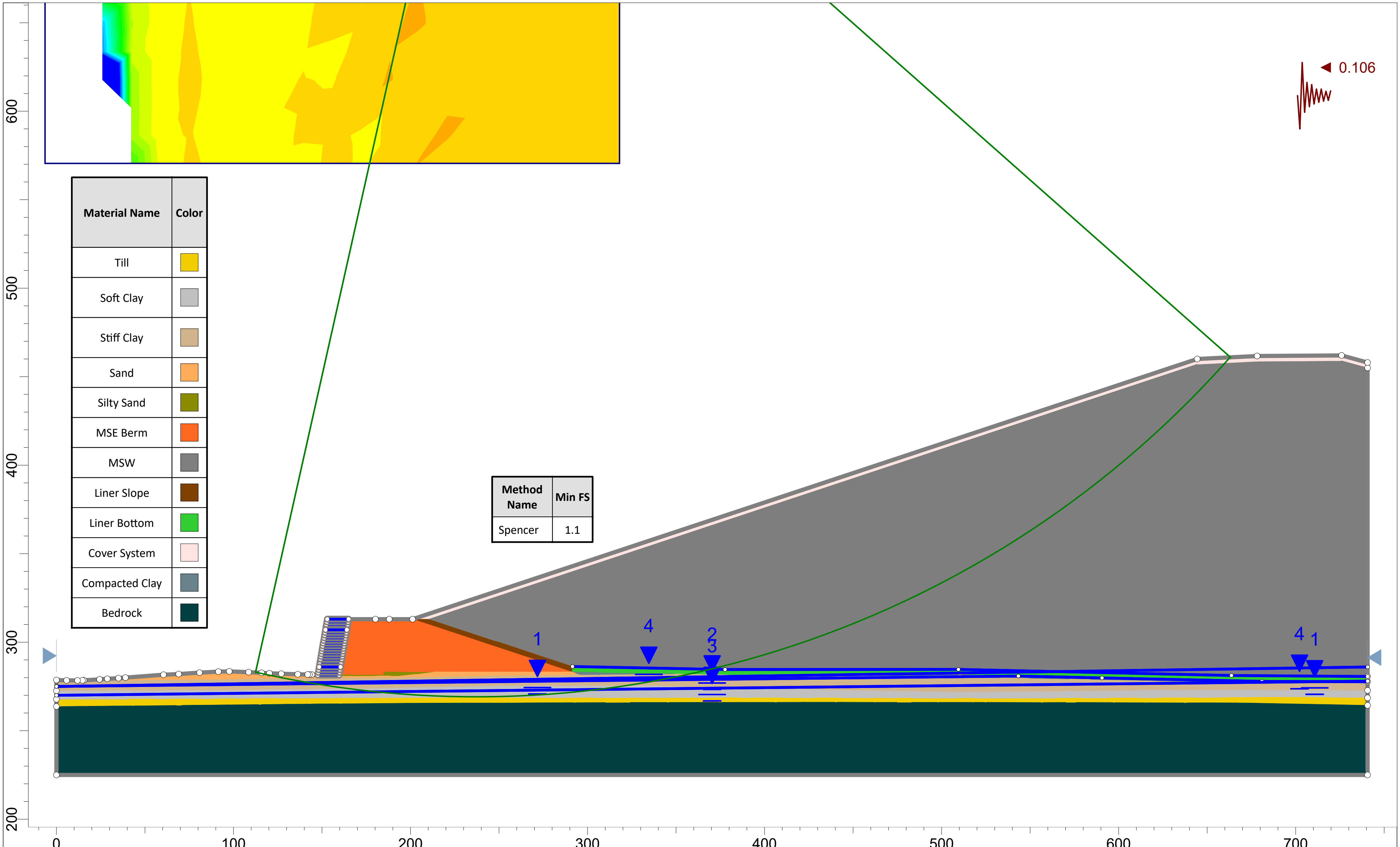


Geosyntec consultants

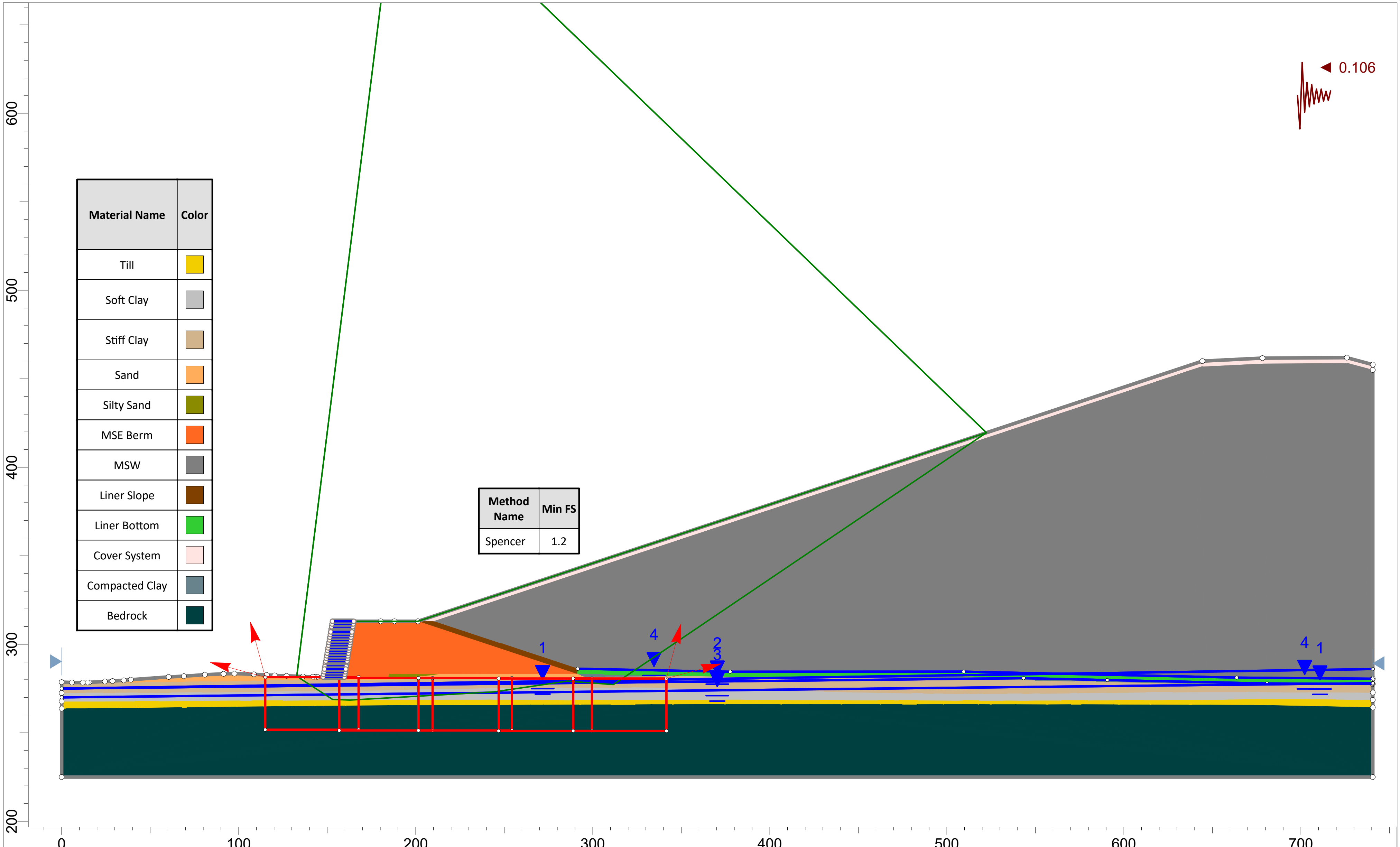
SLIDEINTERPRET 8.028

Project	Crossroads Phase 14 Stability Section II		
Analysis Description	Post-Closure, Seismic, Horizontal Berm Sliding		
Drawn By A. Rohrman	*Scale* 1:1100	*Company*	Geosyntec Consultants
Date	10/1/2019	*File Name*	2019.10.01 Ph14 II.slmd

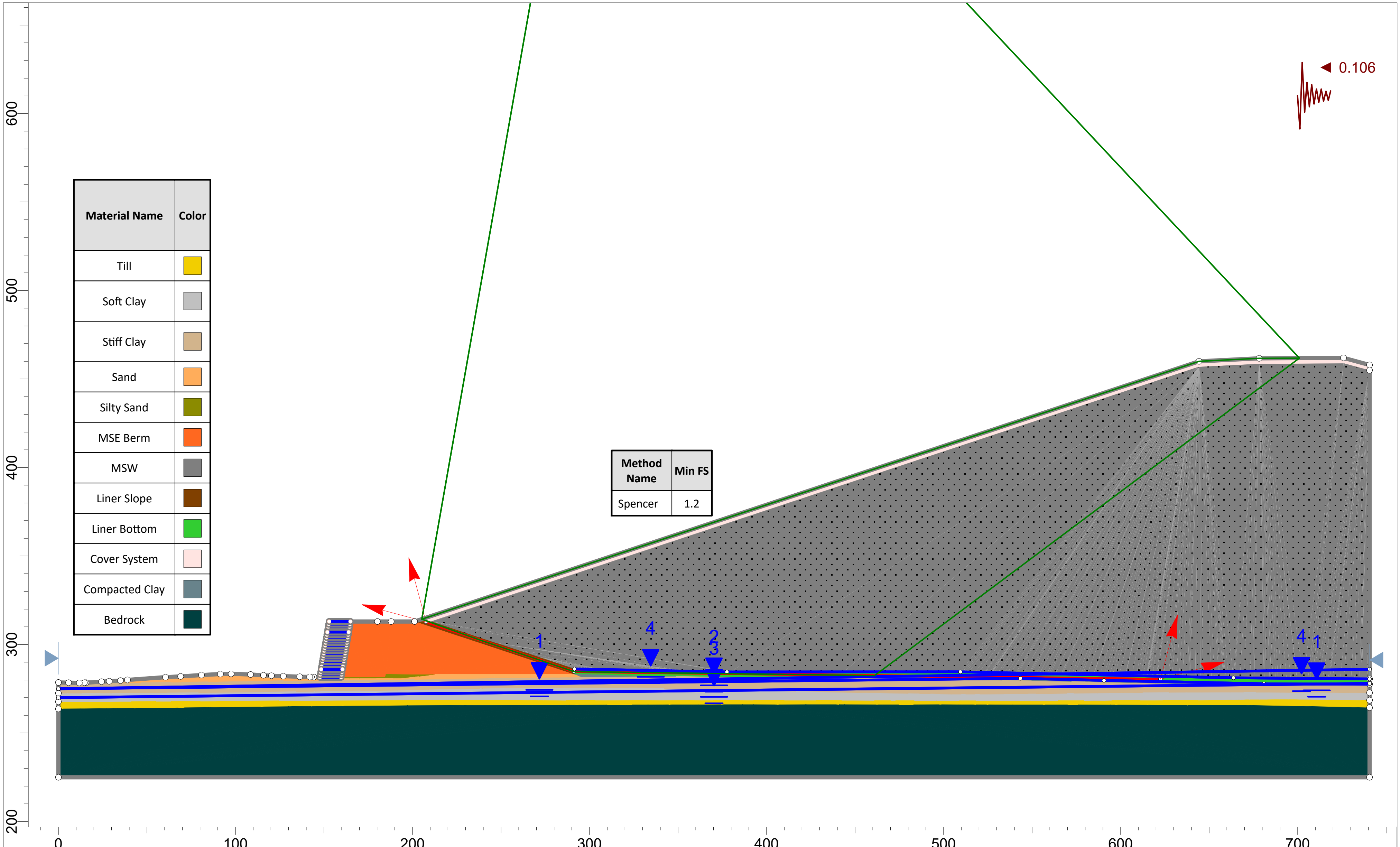
Section III



Geosyntec consultants	*Project* Crossroads Phase 14 Stability Section III		
	Analysis Description Post-Closure, Seismic, Circular		
	Drawn By A. Rohrman	*Scale* 1:900	*Company* Geosyntec Consultants
SLIDEINTERPRET 8.028	*Date* 10/1/2019		*File Name* 2019.10.01 Ph14 III.slmd



Geosyntec consultants	*Project*	Crossroads Phase 14 Stability Section III	
	Analysis Description	Post-Closure, Seismic, Non- Circular	
	Drawn By A. Rohrman	*Scale* 1:900	*Company* Geosyntec Consultants
SLIDEINTERPRET 8.028	*Date* 10/1/2019		*File Name* 2019.10.01 Ph14 III.slmd

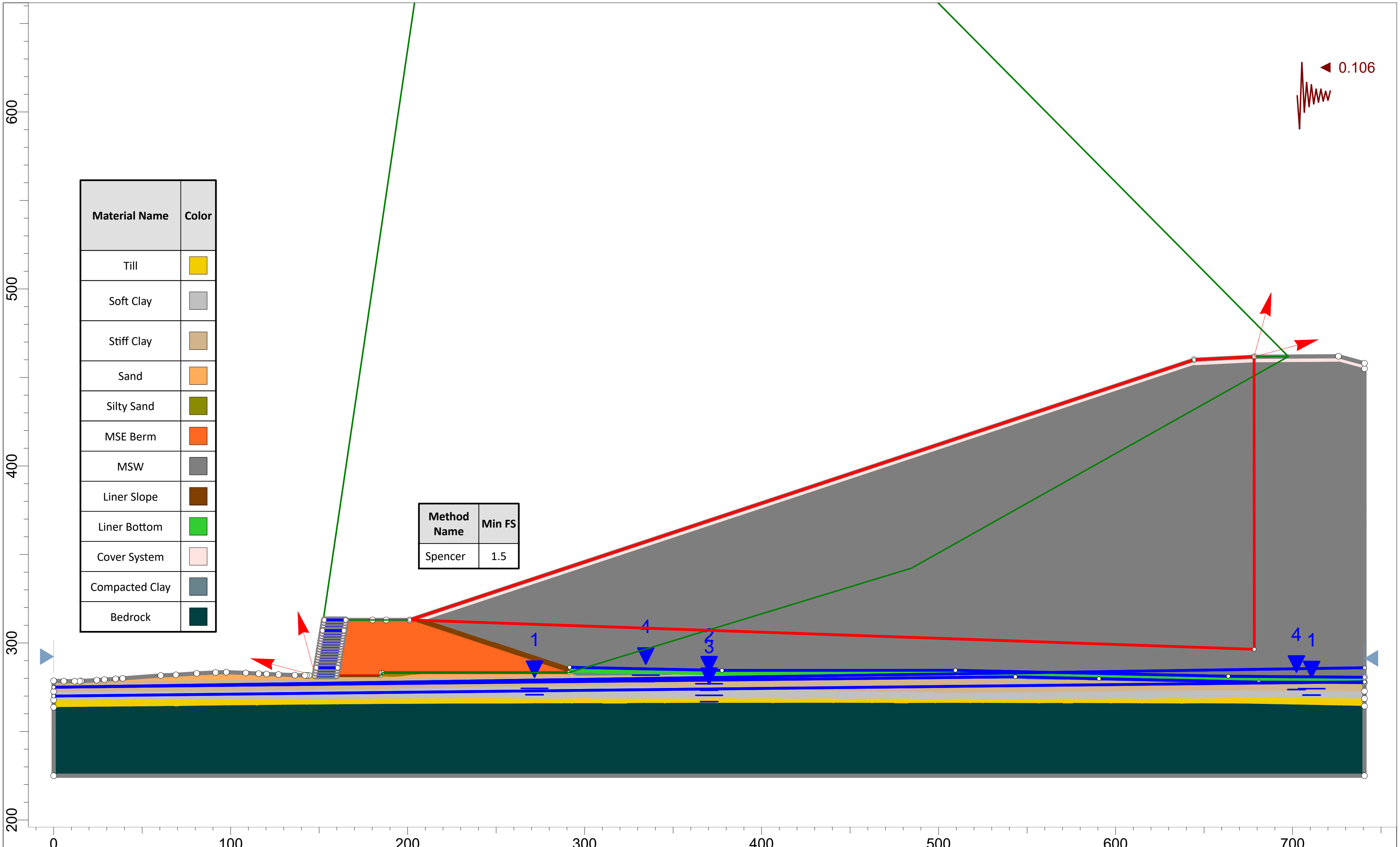


Material Name	Color
Till	
Soft Clay	
Stiff Clay	
Sand	
Silty Sand	
MSE Berm	
MSW	
Liner Slope	
Liner Bottom	
Cover System	
Compacted Clay	
Bedrock	

Geosyntec consultants

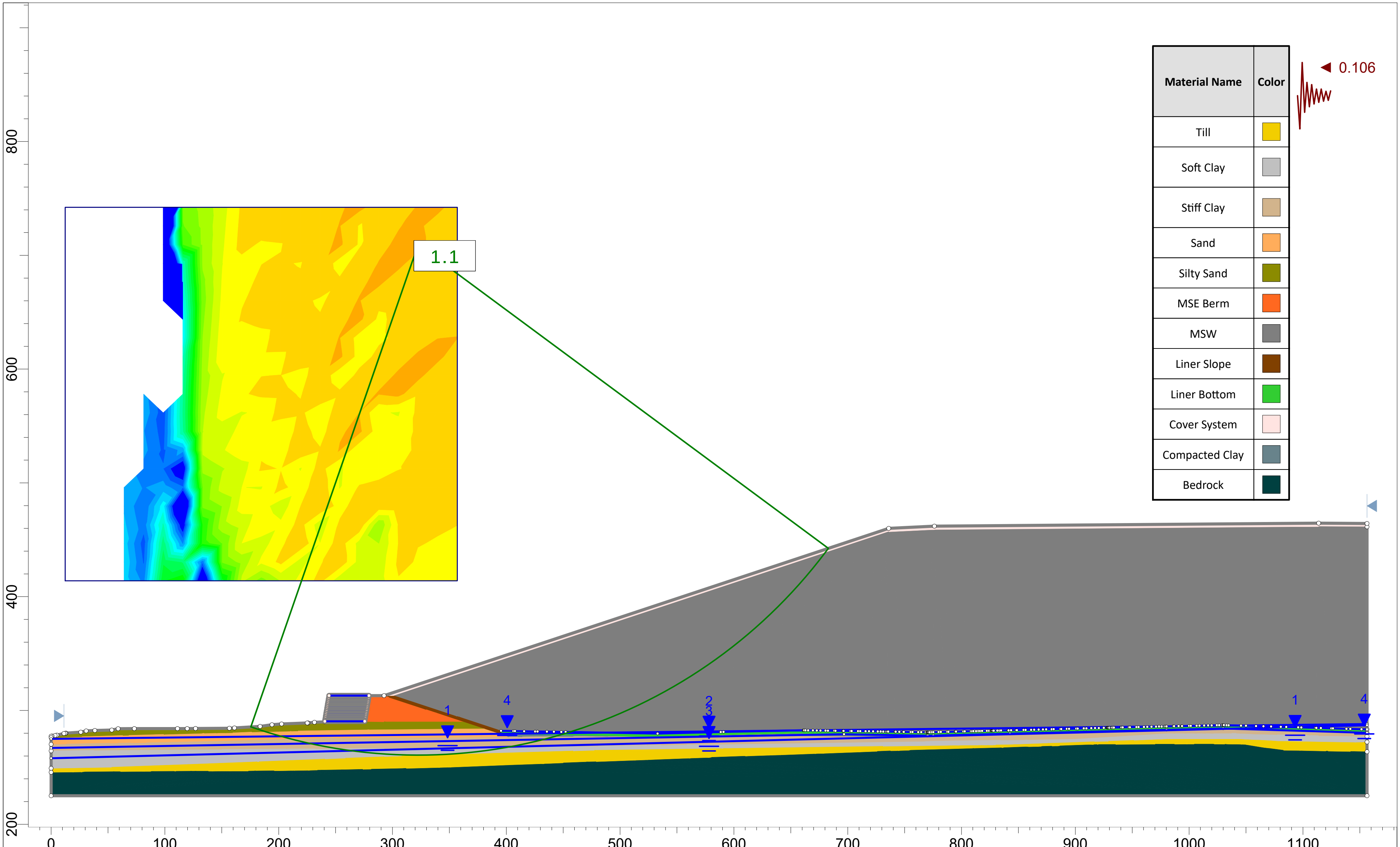
SLIDEINTERPRET 8.028

Project	Crossroads Phase 14 Stability Section III
Analysis Description	Post-Closure, Seismic, Liner Waste Block
Drawn By	A. Rohrman
Scale	1:900
Company	Geosyntec Consultants
Date	10/1/2019
File Name	2019.10.01 Ph14 III.slmd



Geosyntec consultants	Project: Crossroads Phase 14 Stability Section III		
	Analysis Description: Post-Closure, Seismic, Horizontal Berm Sliding		
	Drawn By: A. Rohrman	Scale: 1:900	Company: Geosyntec Consultants
SLIDEINTERPRET 8.028	Date: 10/1/2019		File Name: 2019.10.01 Ph14 III.slmd

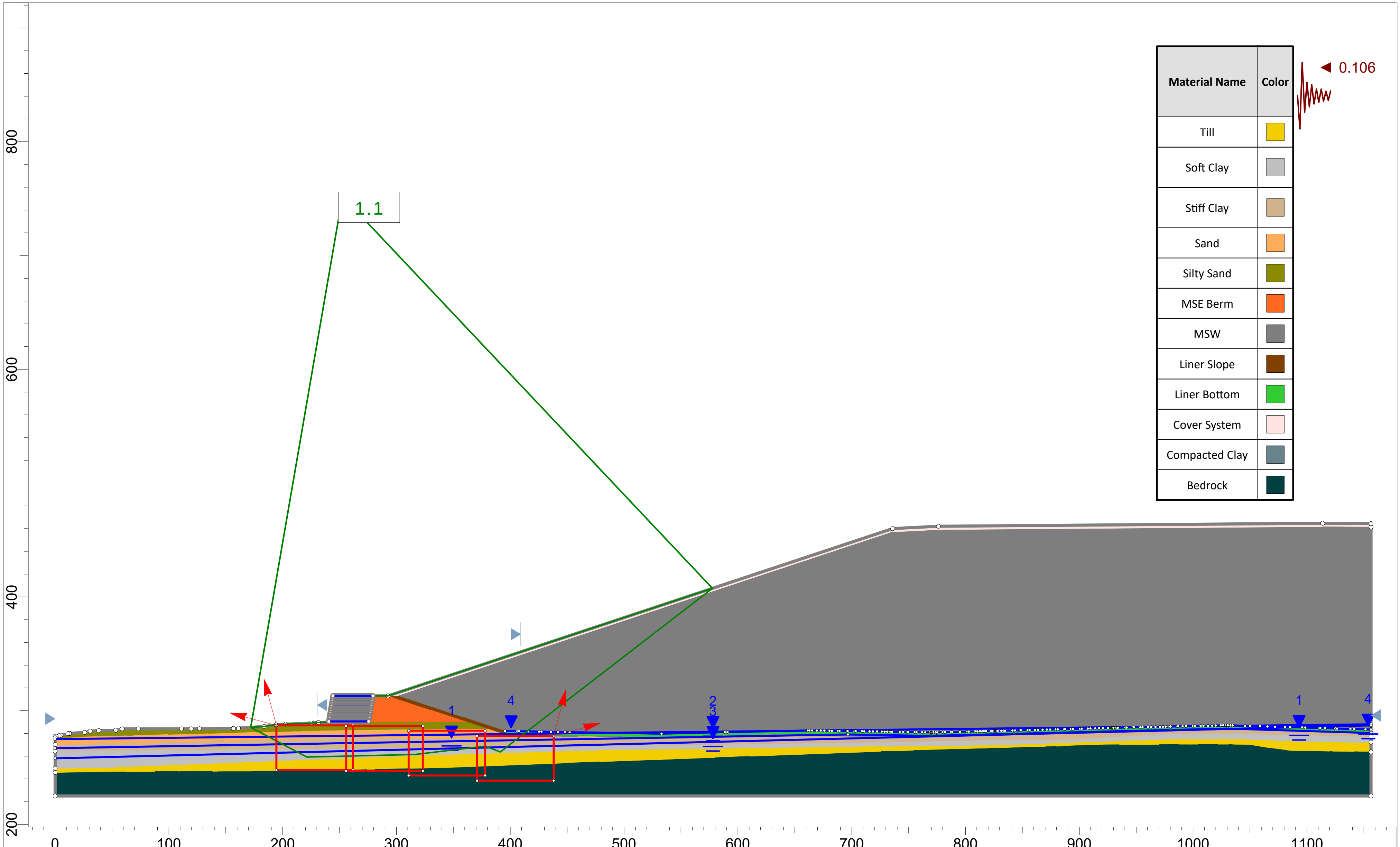
Section IV



Geosyntec consultants

SLIDEINTERPRET 8.028

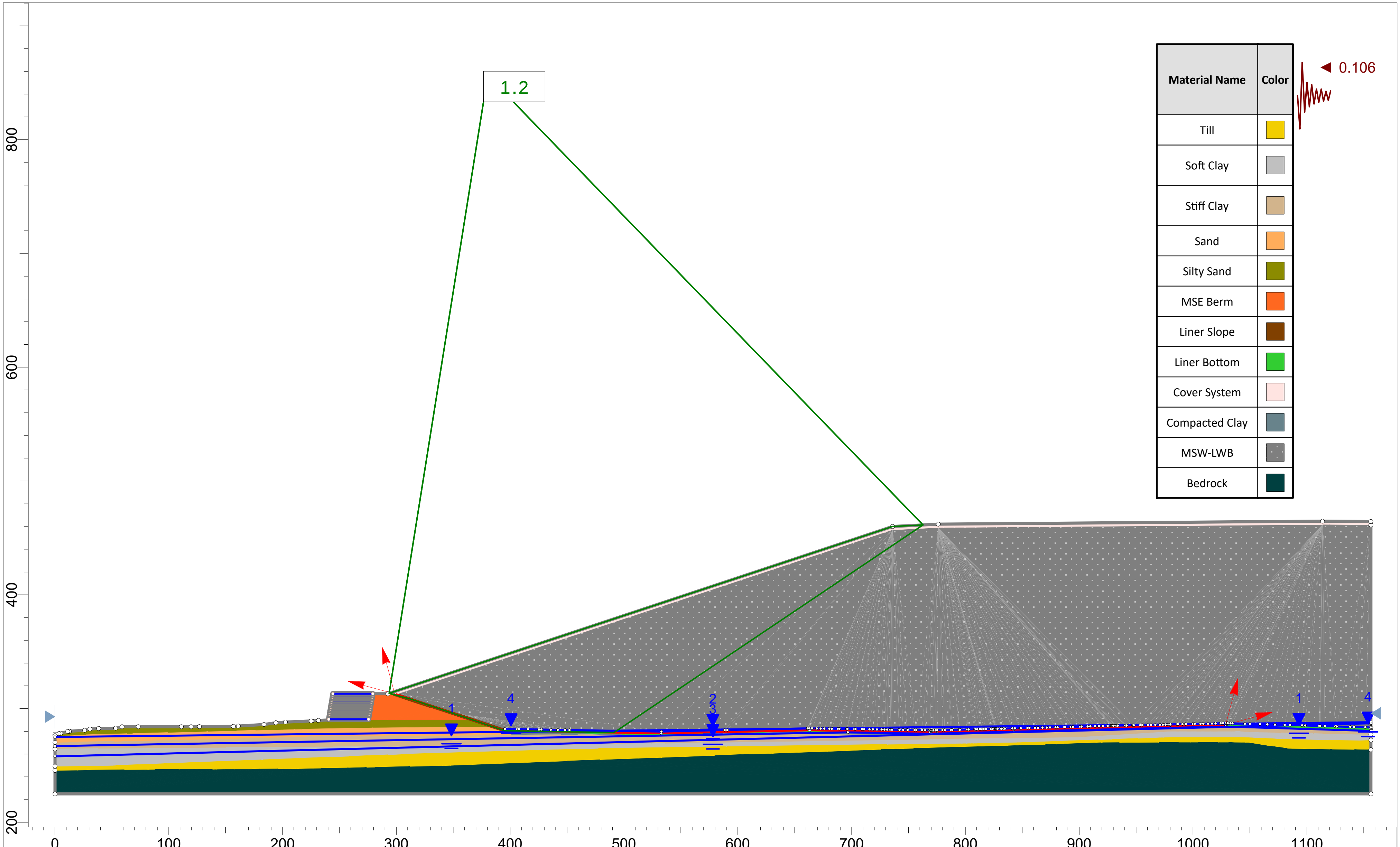
Project	Crossroads Phase 14 Stability Section IV
Analysis Description	Post-Closure, Seismic, Circular
Drawn By A. Rohrman	*Scale* 1:1400
Company	Geosyntec Consultants
Date 10/1/2019	*File Name* 2019.10.01 Ph14 IV.slmd



Geosyntec consultants

Project	Crossroads Phase 14 Stability Section IV		
Analysis Description	Post-Closure, Seismic, Non-Circular		
Drawn By: A. Rohrman	Scale: 1:1400	Company	Geosyntec Consultants
Date: 10/1/2019		File Name	2019.10.01 Ph14 IV.slmd

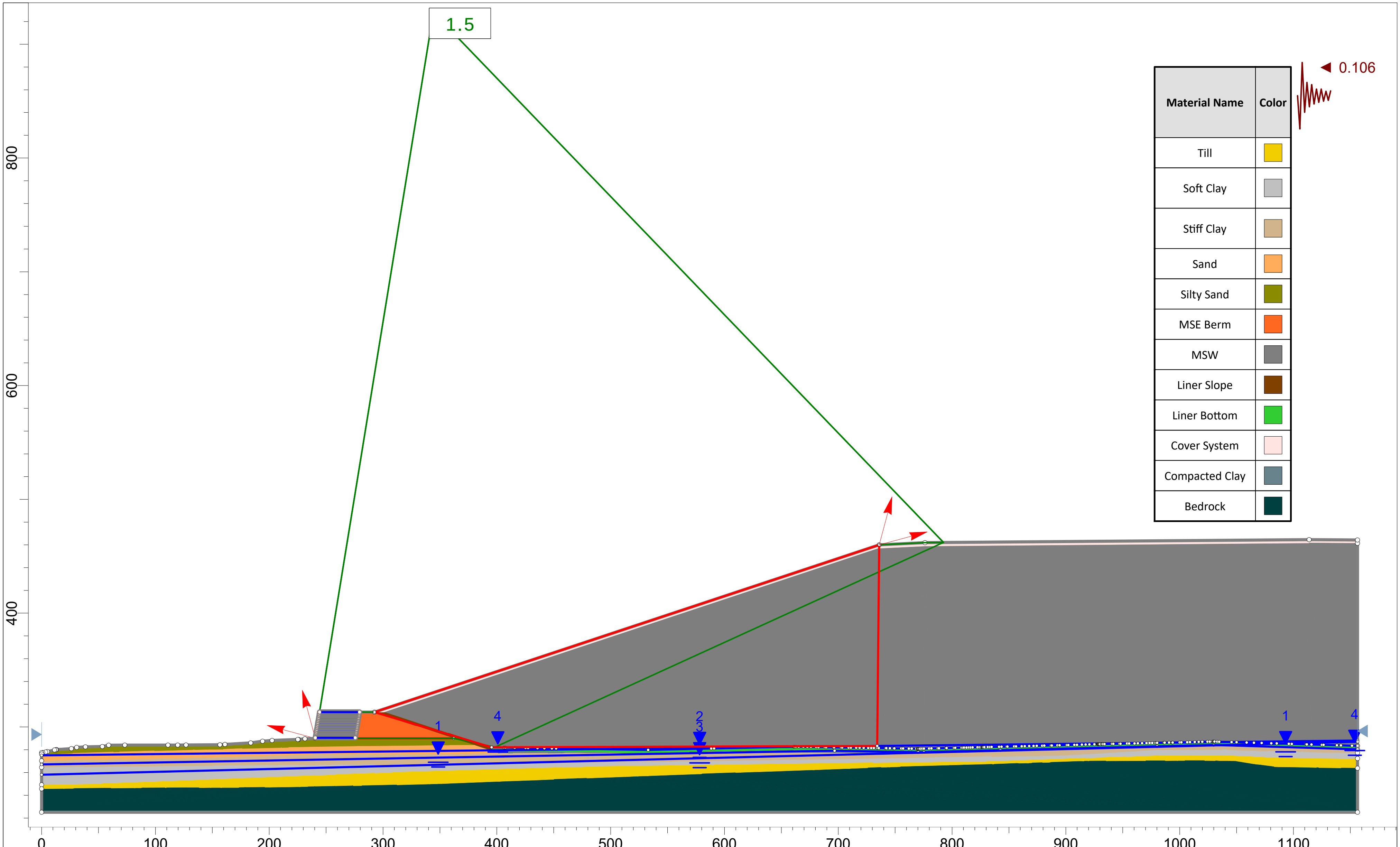
SLIDEINTERPRET 8.028



Geosyntec consultants

SLIDEINTERPRET 8.028

Project	Crossroads Phase 14 Stability Section IV
Analysis Description	Post-Closure, Seismic, Liner Waste Block
Drawn By	A. Rohrman
Scale	1:1400
Company	Geosyntec Consultants
Date	10/1/2019
File Name	2019.10.01 Ph14 IV.slmd

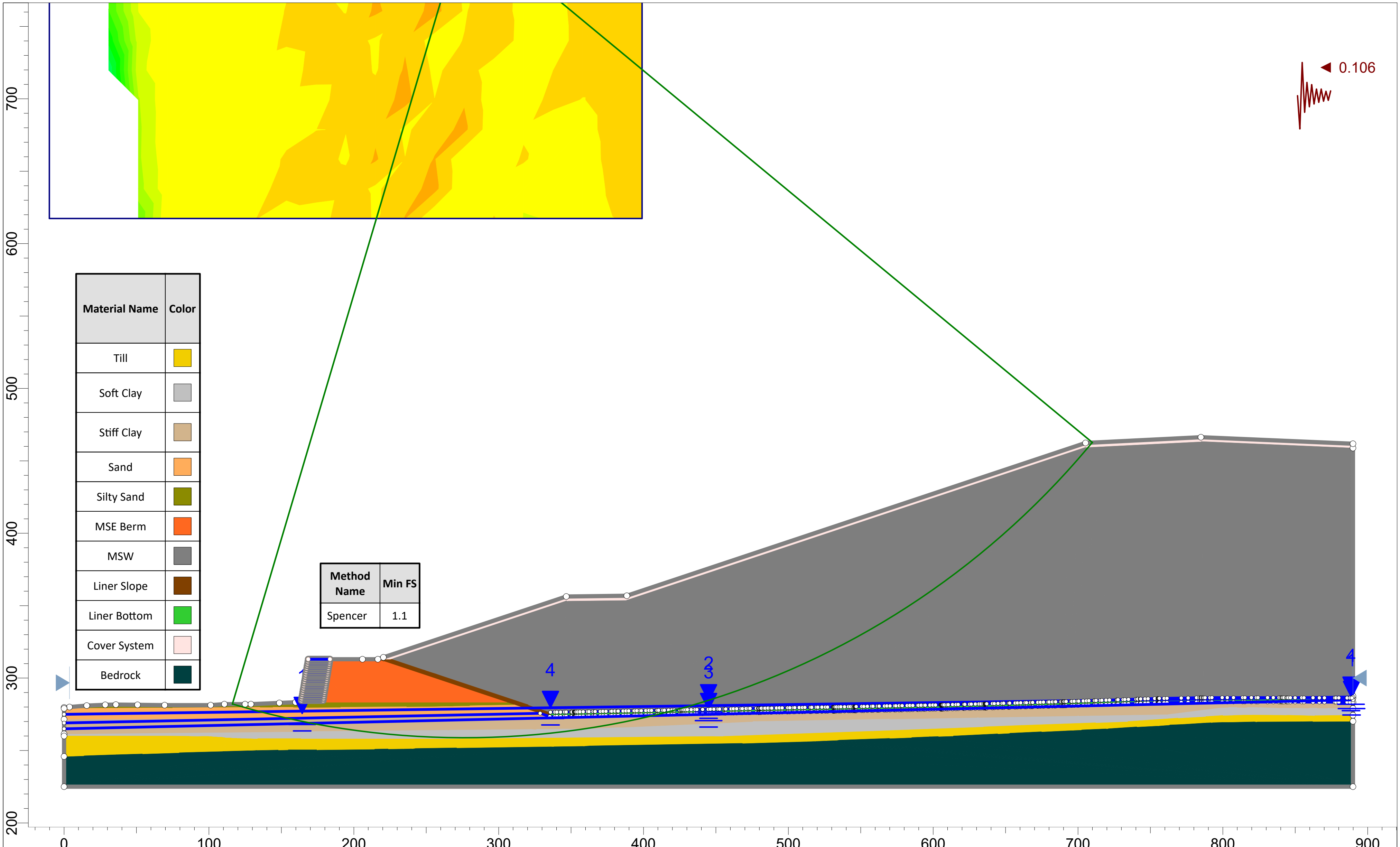


Geosyntec consultants

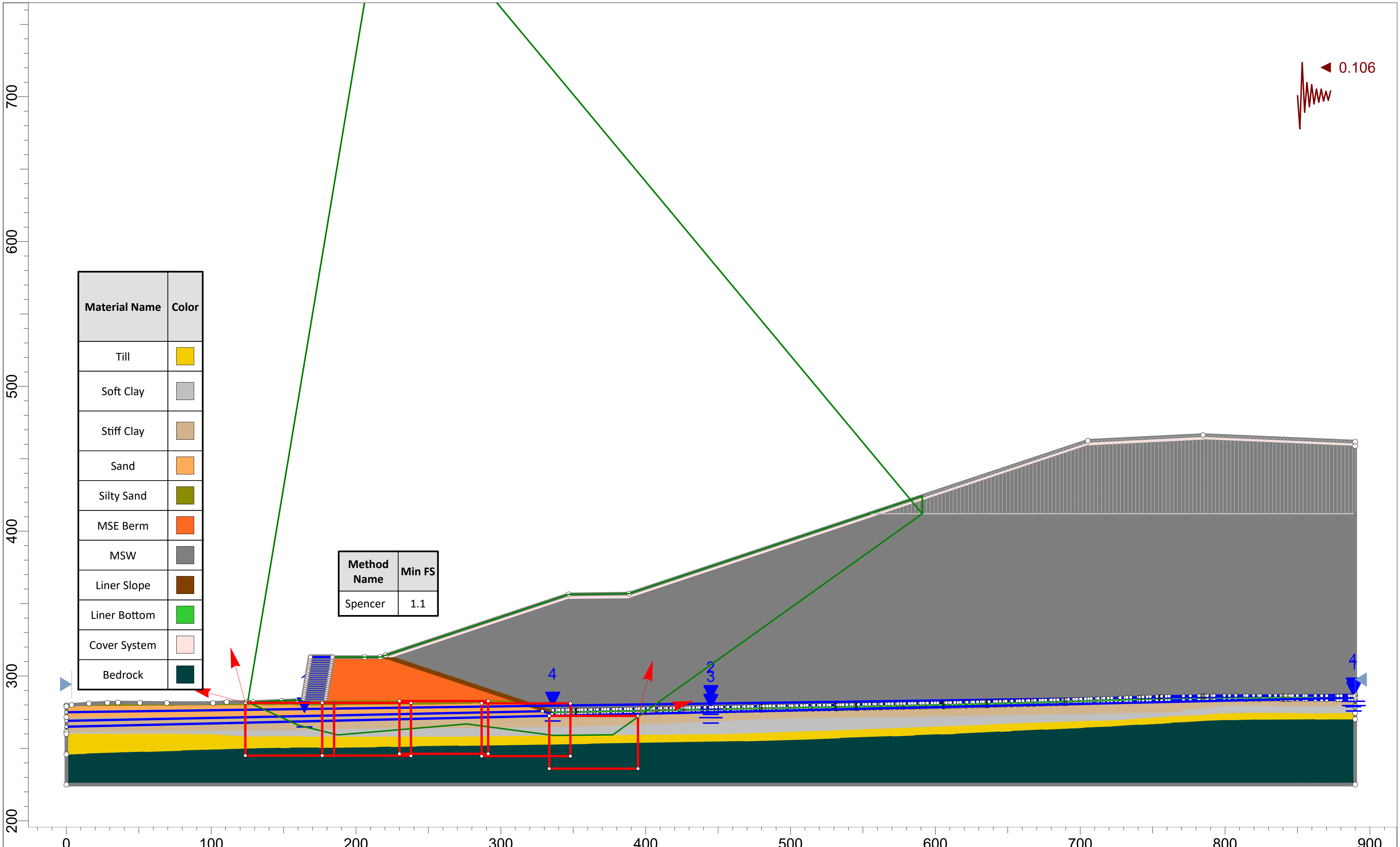
SLIDEINTERPRET 8.028

Project	Crossroads Phase 14 Stability Section IV
Analysis Description	Post-Closure, Seismic, Horizontal Berm Sliding
Drawn By	A. Rohrman
Scale	1:1400
Company	Geosyntec Consultants
Date	10/1/2019
File Name	2019.10.01 Ph14 IV.slmd

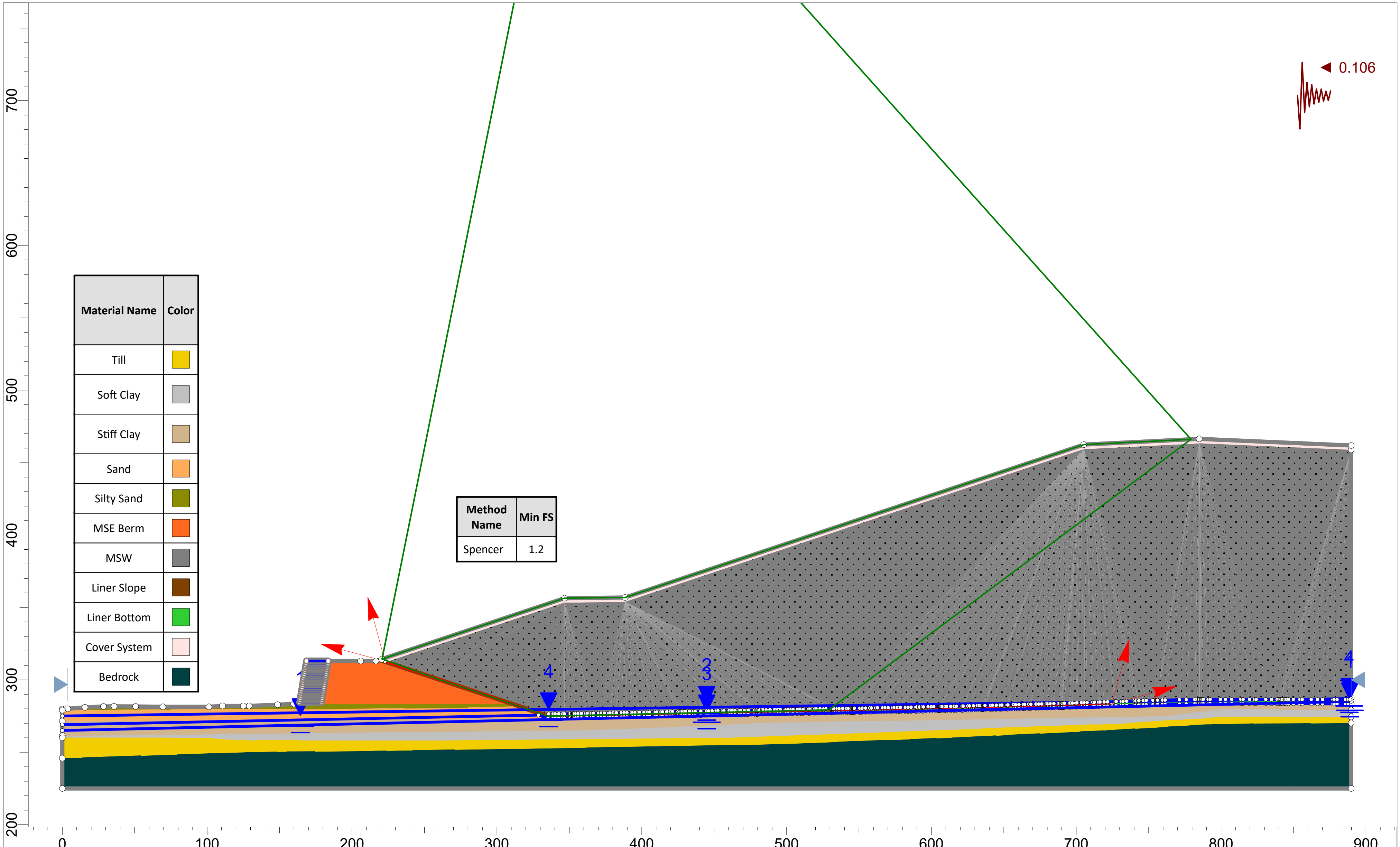
Section V



Geosyntec consultants	Project: Crossroads Phase 14 Stability Section V		
	Analysis Description: Post-Closure, Seismic, Circular		
	Drawn By: A. Rohrman	Scale: 1:1100	Company: Geosyntec Consultants
SLIDEINTERPRET 8.014	Date: 10/1/2019		File Name: 2019.10.01 Ph14 V.slmd



Geosyntec consultants	*Project* Crossroads Phase 14 Stability Section V		
	Analysis Description Post-Closure, Seismic, Non-Circular		
	Drawn By A. Rohrman	*Scale* 1:1100	*Company* Geosyntec Consultants
SLIDEINTERPRET 8.014	*Date* 10/1/2019		*File Name* 2019.10.01 Ph14 V.slmd



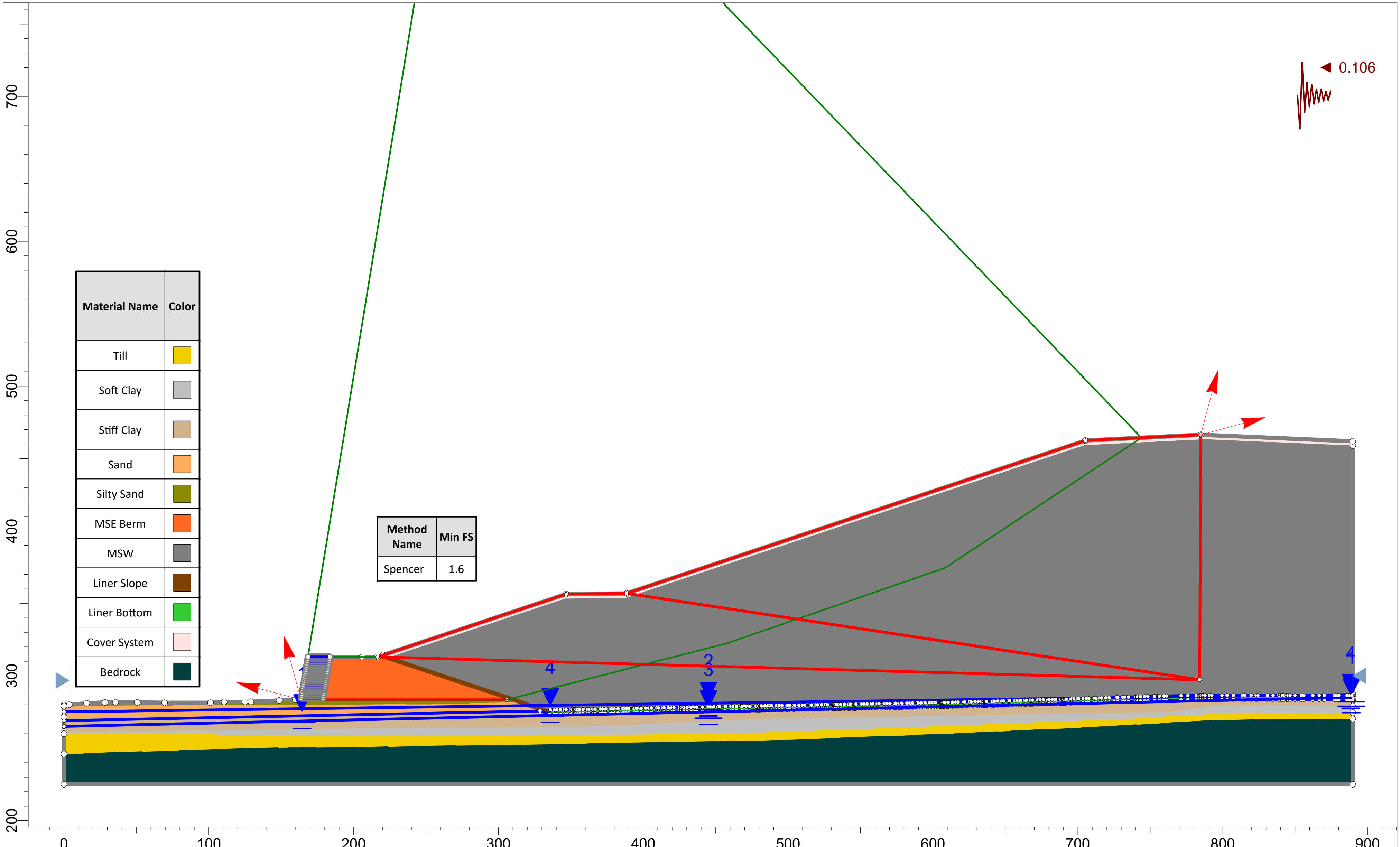
Material Name	Color
Till	
Soft Clay	
Stiff Clay	
Sand	
Silty Sand	
MSE Berm	
MSW	
Liner Slope	
Liner Bottom	
Cover System	
Bedrock	

Method Name	Min FS
Spencer	1.2

Geosyntec consultants

SLIDEINTERPRET 8.028

Project	Crossroads Phase 14 Stability Section V
Analysis Description	Post-Closure, Seismic, Liner Waste Block
Drawn By	A. Rohrman
Scale	1:1100
Company	Geosyntec Consultants
Date	10/1/2019
File Name	2019.10.01 Ph14 V.slmd

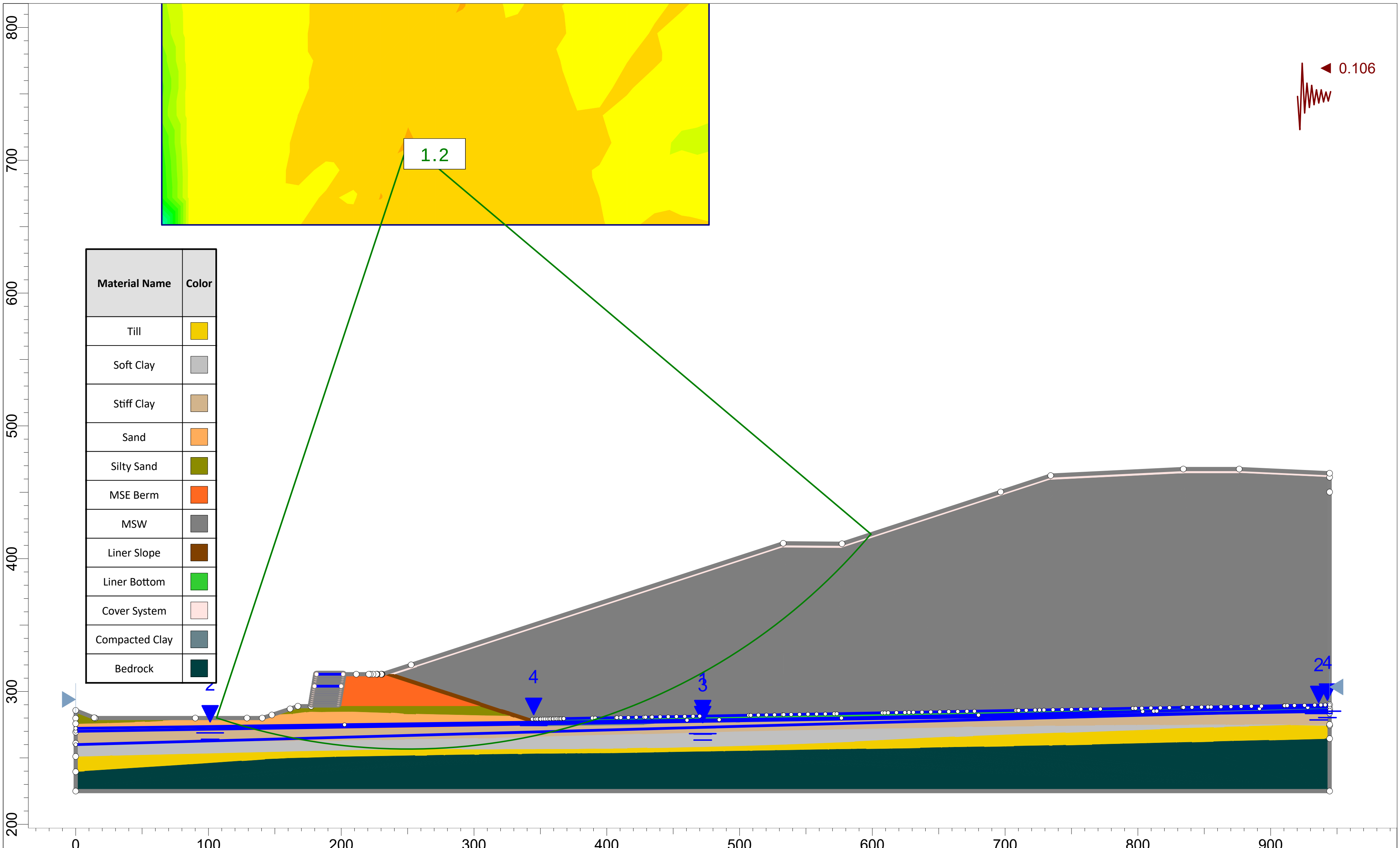


Geosyntec consultants

SLIDEINTERPRET 8.014

Project	Crossroads Phase 14 Stability Section V
Analysis Description	Post-Closure, Seismic, Horizontal Berm Sliding
Drawn By	A. Rohrman
Scale	1:1100
Company	Geosyntec Consultants
Date	10/1/2019
File Name	2019.10.01 Ph14 V.slmd

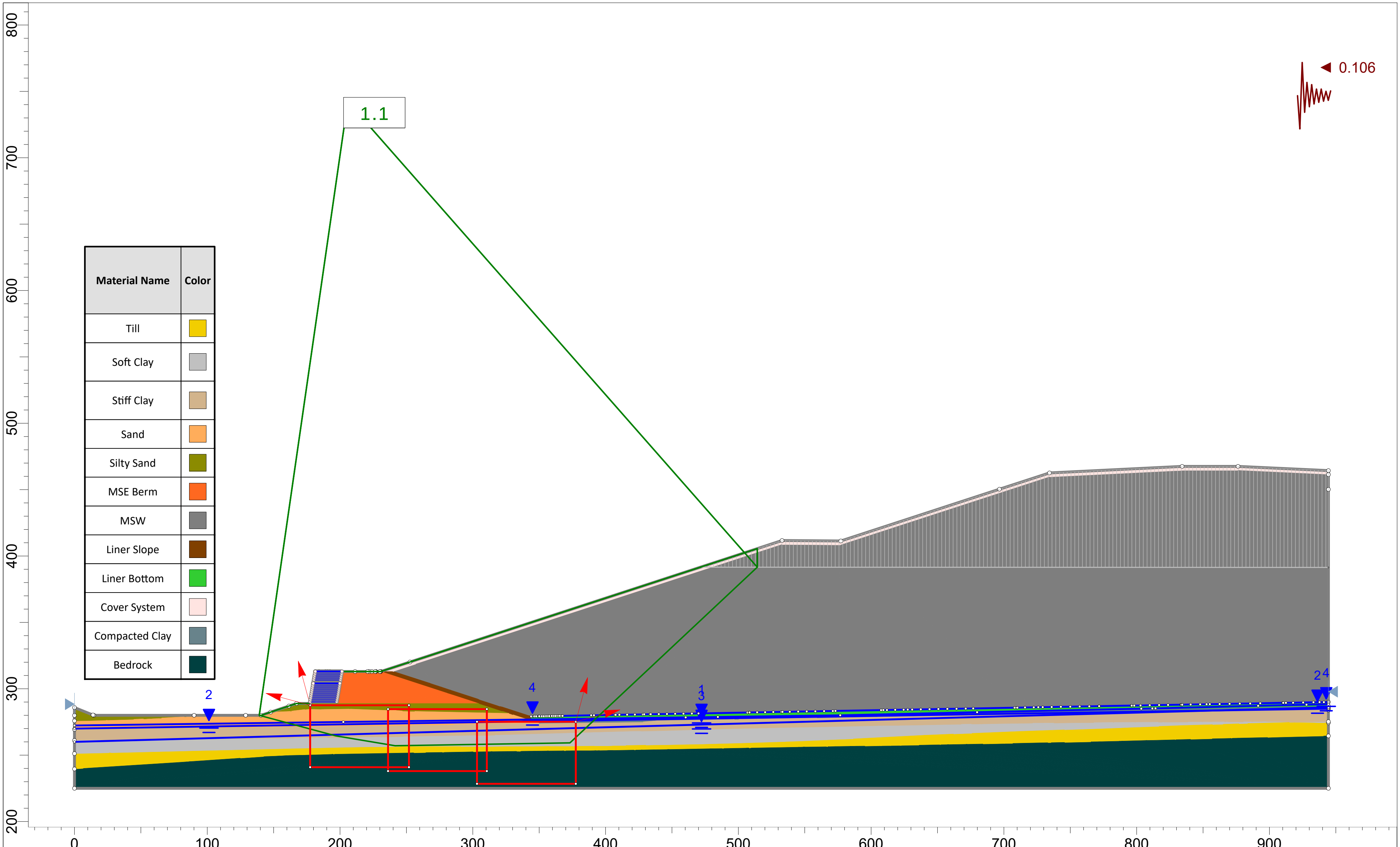
Section VI



Geosyntec consultants

SLIDEINTERPRET 8.014

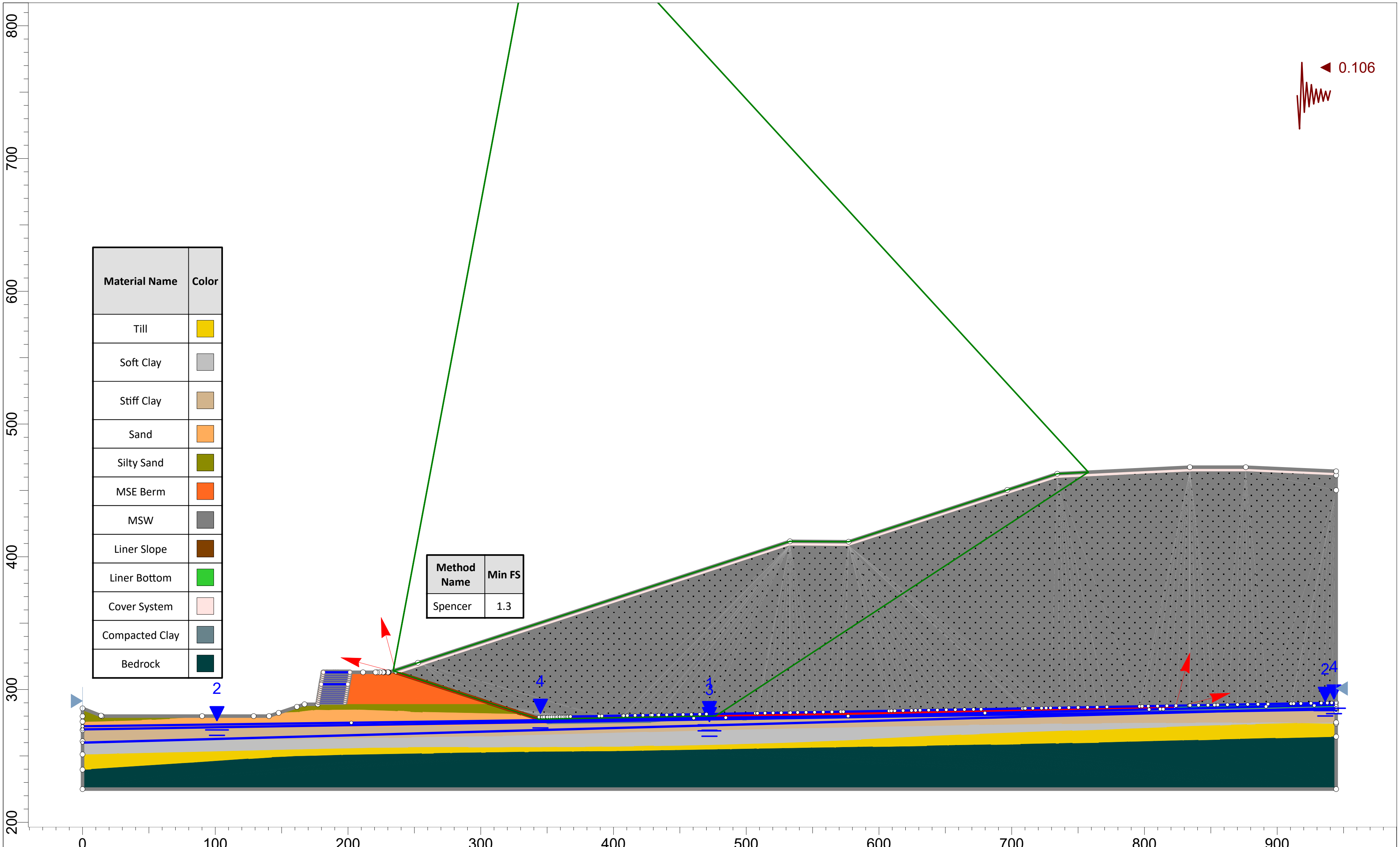
Project	Crossroads Phase 14 Stability Section VI		
Analysis Description	Post-Closure, Seismic, Circular		
Drawn By A. Rohrman	*Scale* 1:1200	*Company*	Geosyntec Consultants
Date	10/1/2019	*File Name*	2019.10.01 Ph14 VI.slmd



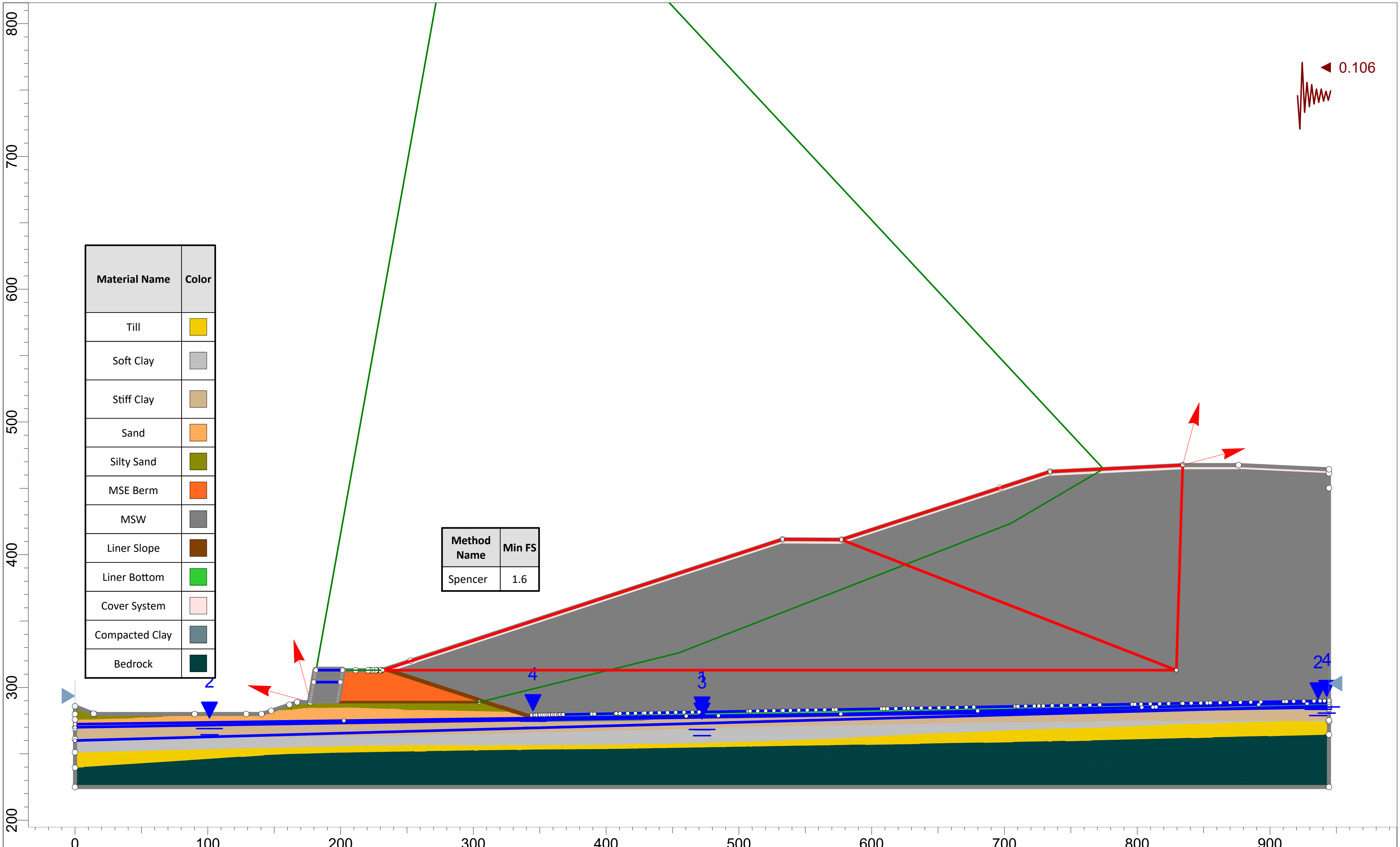
Geosyntec consultants

SLIDEINTERPRET 8.014

Project	Crossroads Phase 14 Stability Section VI		
Analysis Description	Post-Closure, Seismic, Non-Circular		
Drawn By A. Rohrman	*Scale* 1:1200	*Company*	Geosyntec Consultants
Date	10/1/2019	*File Name*	2019.10.01 Ph14 VI.slmd



Geosyntec consultants	*Project* Crossroads Phase 14 Stability Section VI		
	Analysis Description Post-Closure, Seismic, Liner Waste Block		
	Drawn By A. Rohrman	*Scale* 1:1200	*Company* Geosyntec Consultants
SLIDEINTERPRET 8.028	*Date* 10/1/2019		*File Name* 2019.10.01 Ph14 VI.slmd



Material Name	Color
Till	
Soft Clay	
Stiff Clay	
Sand	
Silty Sand	
MSE Berm	
MSW	
Liner Slope	
Liner Bottom	
Cover System	
Compacted Clay	
Bedrock	

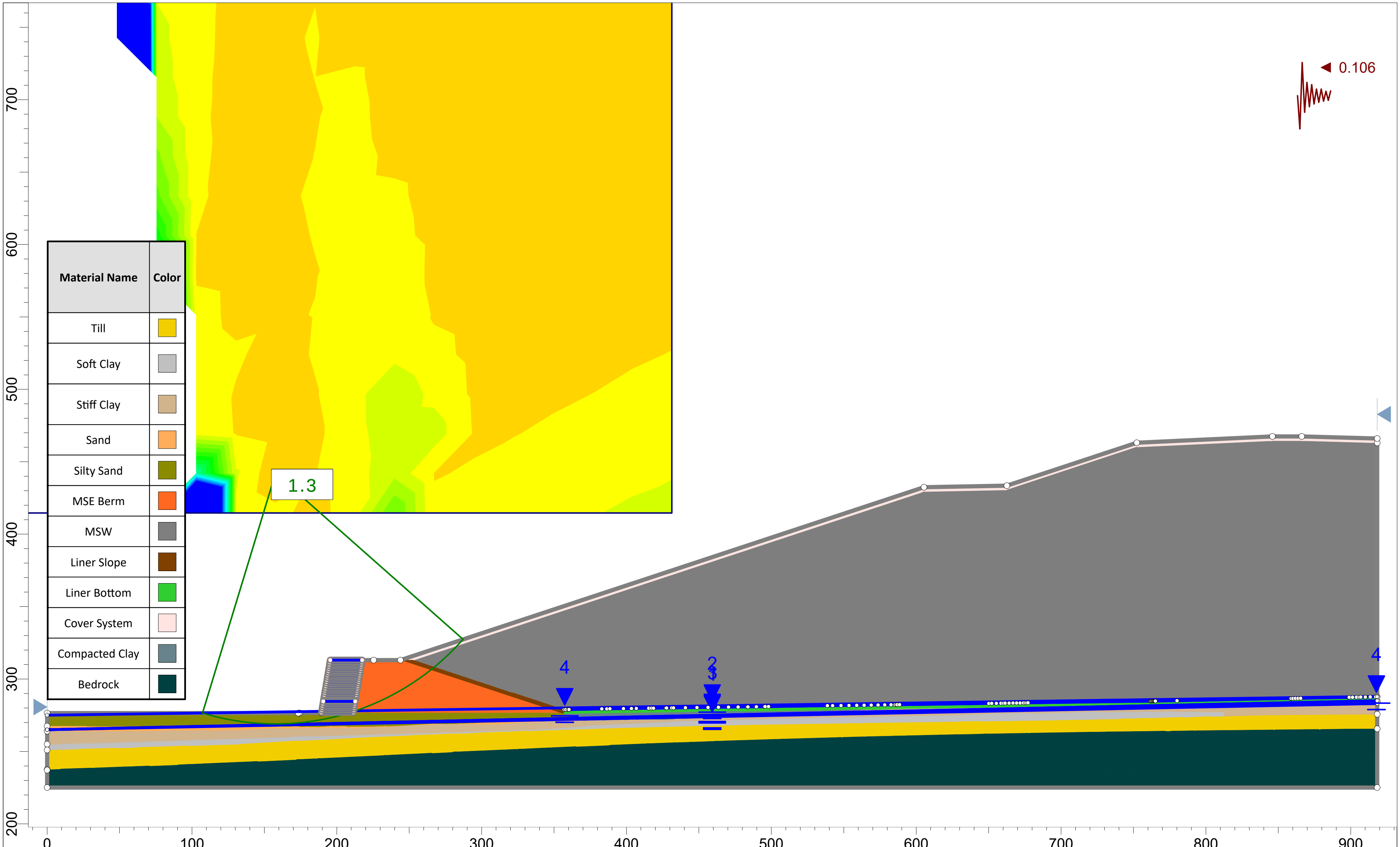
Method Name	Min FS
Spencer	1.6

Geosyntec consultants

SLIDEINTERPRET 8.014

Project	Crossroads Phase 14 Stability Section VI
Analysis Description	Post-Closure, Seismic, Horizontal Berm Sliding
Drawn By	A. Rohrman
Scale	1:1200
Company	Geosyntec Consultants
Date	10/1/2019
File Name	2019.10.01 Ph14 VI.slmd

Section VII

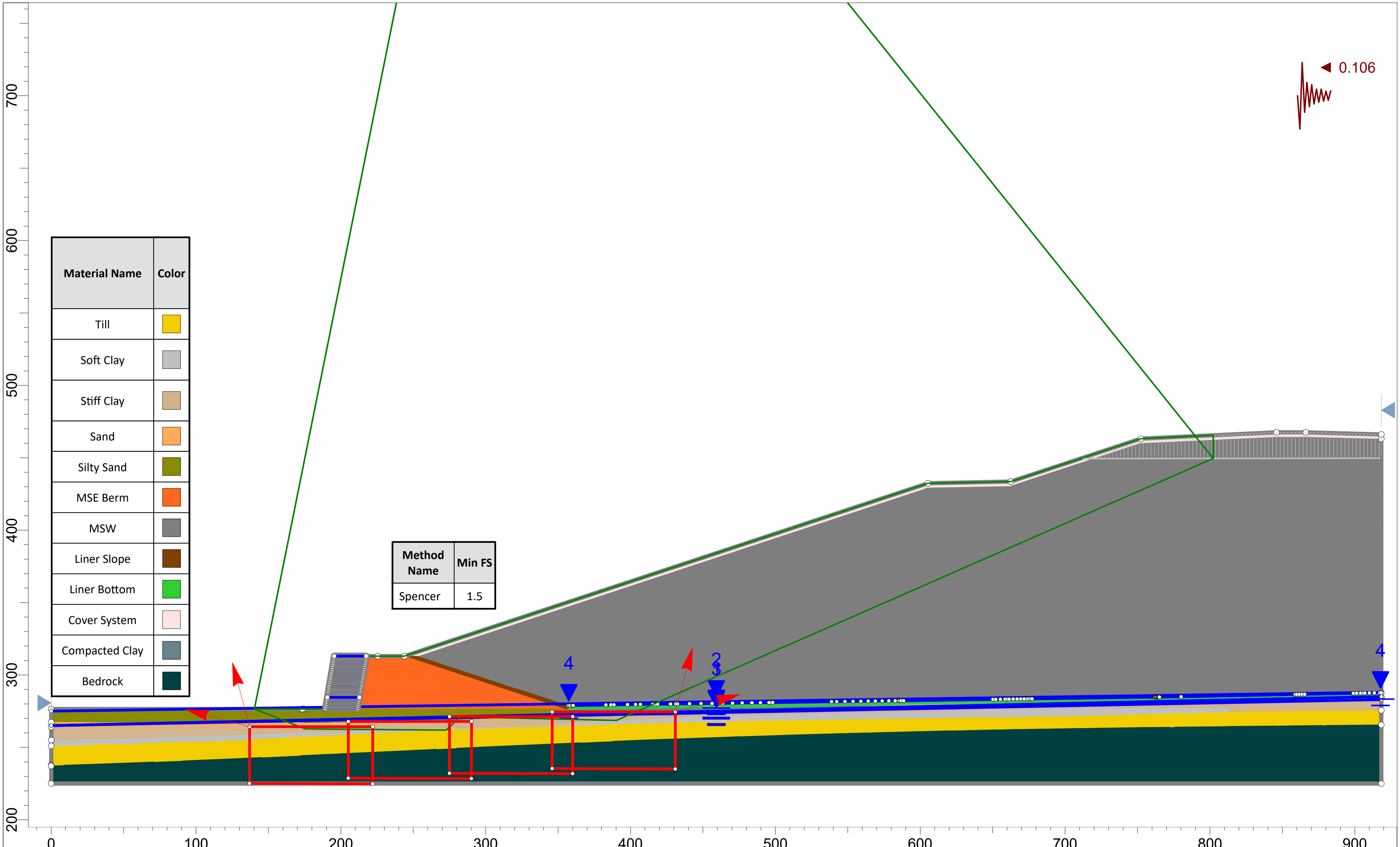


Material Name	Color
Till	
Soft Clay	
Stiff Clay	
Sand	
Silty Sand	
MSE Berm	
MSW	
Liner Slope	
Liner Bottom	
Cover System	
Compacted Clay	
Bedrock	

Geosyntec consultants

SLIDEINTERPRET 8.028

Project	Crossroads Phase 14 Stability Section VII		
Analysis Description	Post-Closure, Seismic, Circular		
Drawn By A. Rohrman	*Scale* 1:1100	*Company*	Geosyntec Consultants
Date	10/1/2019	*File Name*	2019.10.01 Ph14 VII.slmd



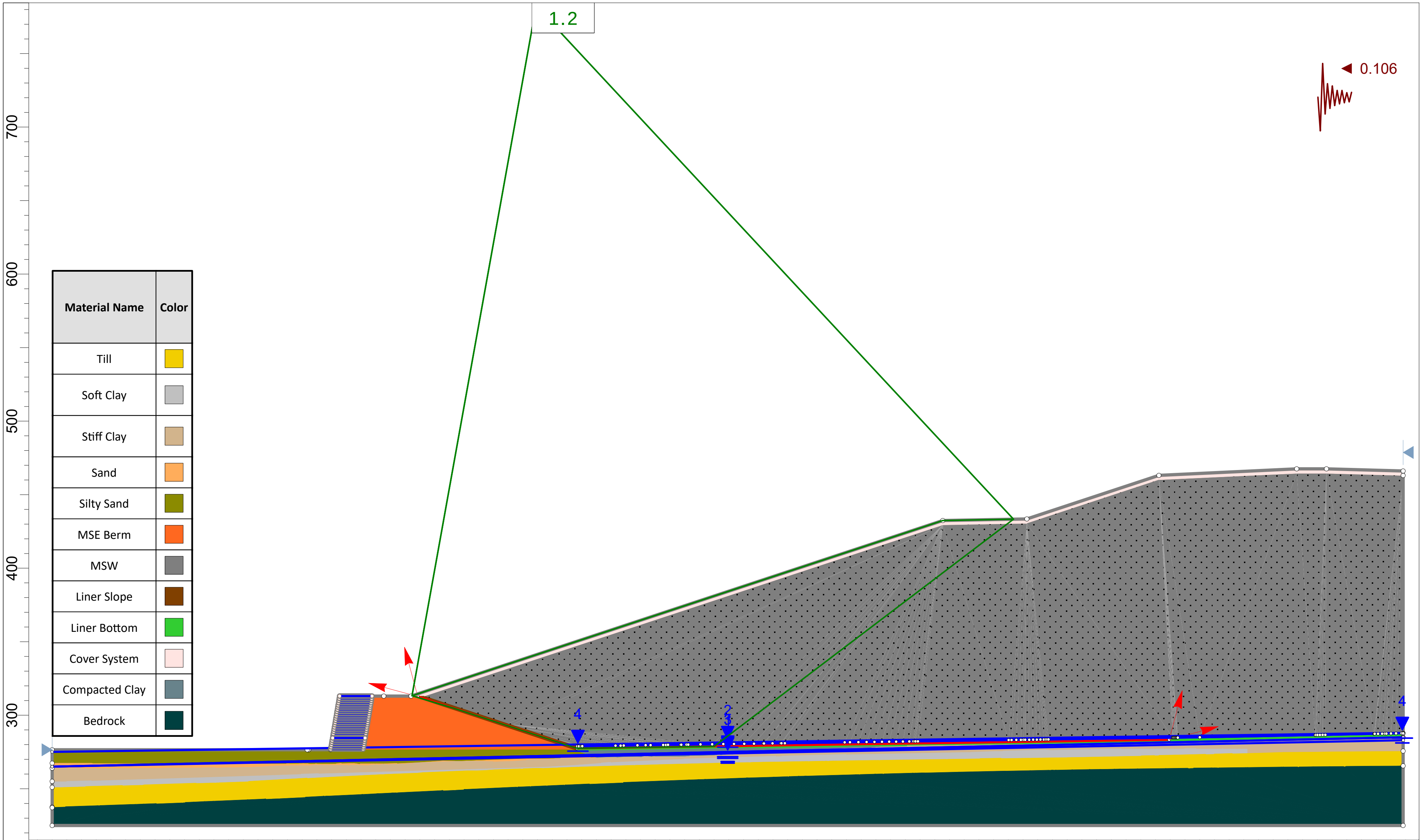
Material Name	Color
Till	
Soft Clay	
Stiff Clay	
Sand	
Silty Sand	
MSE Berm	
MSW	
Liner Slope	
Liner Bottom	
Cover System	
Compacted Clay	
Bedrock	

Method Name	Min FS
Spencer	1.5

Geosyntec consultants

SLIDEINTERPRET 8.028

Project	Crossroads Phase 14 Stability Section VII
Analysis Description	Post-Closure, Seismic, Non-Circular
Drawn By	A. Rohrman
Scale	1:1100
Company	Geosyntec Consultants
Date	10/1/2019
File Name	2019.10.01 Ph14 VII.slmd

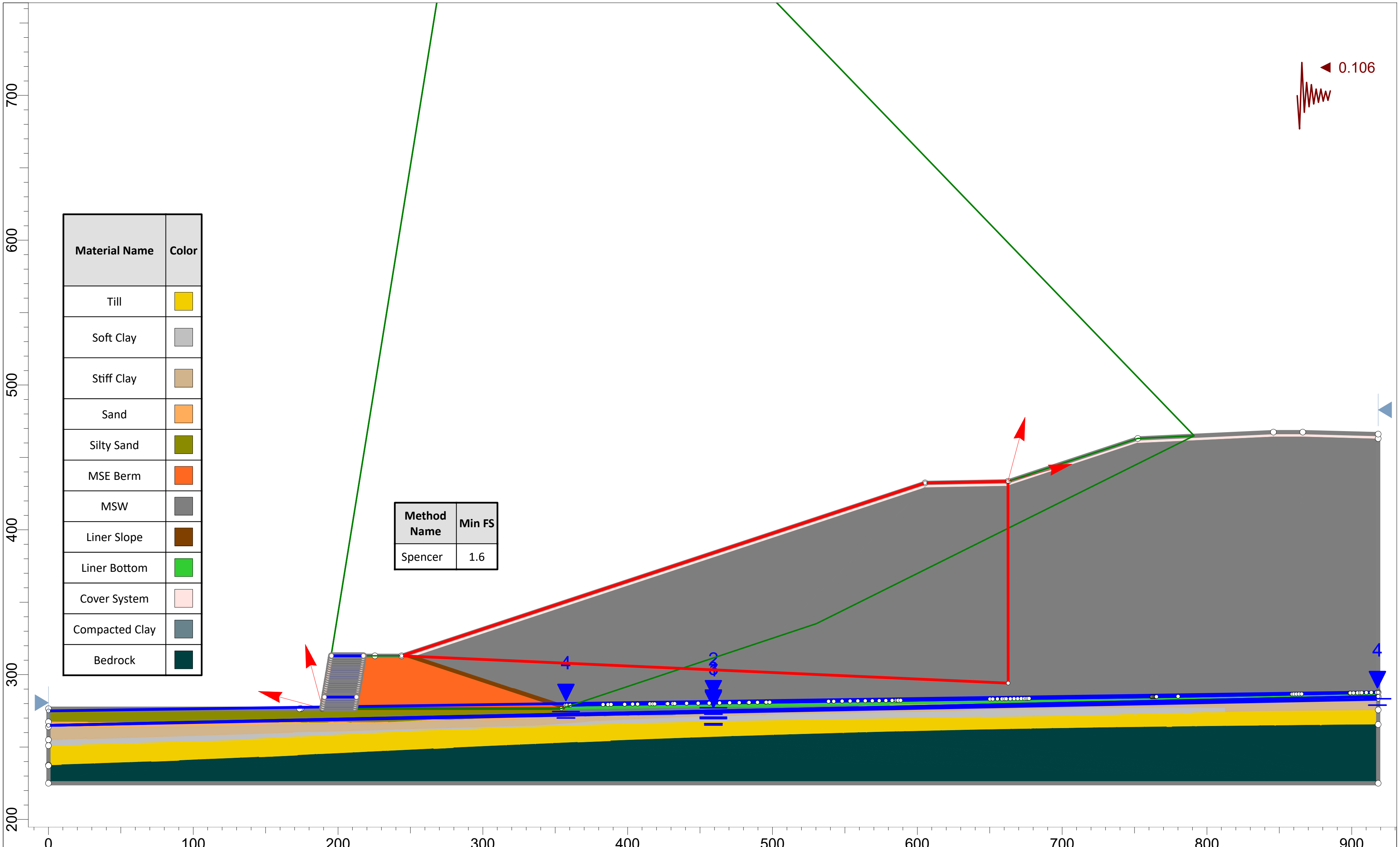


Material Name	Color
Till	
Soft Clay	
Stiff Clay	
Sand	
Silty Sand	
MSE Berm	
MSW	
Liner Slope	
Liner Bottom	
Cover System	
Compacted Clay	
Bedrock	

Geosyntec consultants

Project	Crossroads Phase 14 Stability Section VII		
Analysis Description	Post-Closure, Seismic, Liner Waste Block		
Drawn By A. Rohrman	*Scale* 1:1100	*Company*	Geosyntec Consultants
Date	10/1/2019	*File Name*	2019.10.01 Ph14 VII.slmd

SLIDEINTERPRET 8.028



Material Name	Color
Till	
Soft Clay	
Stiff Clay	
Sand	
Silty Sand	
MSE Berm	
MSW	
Liner Slope	
Liner Bottom	
Cover System	
Compacted Clay	
Bedrock	

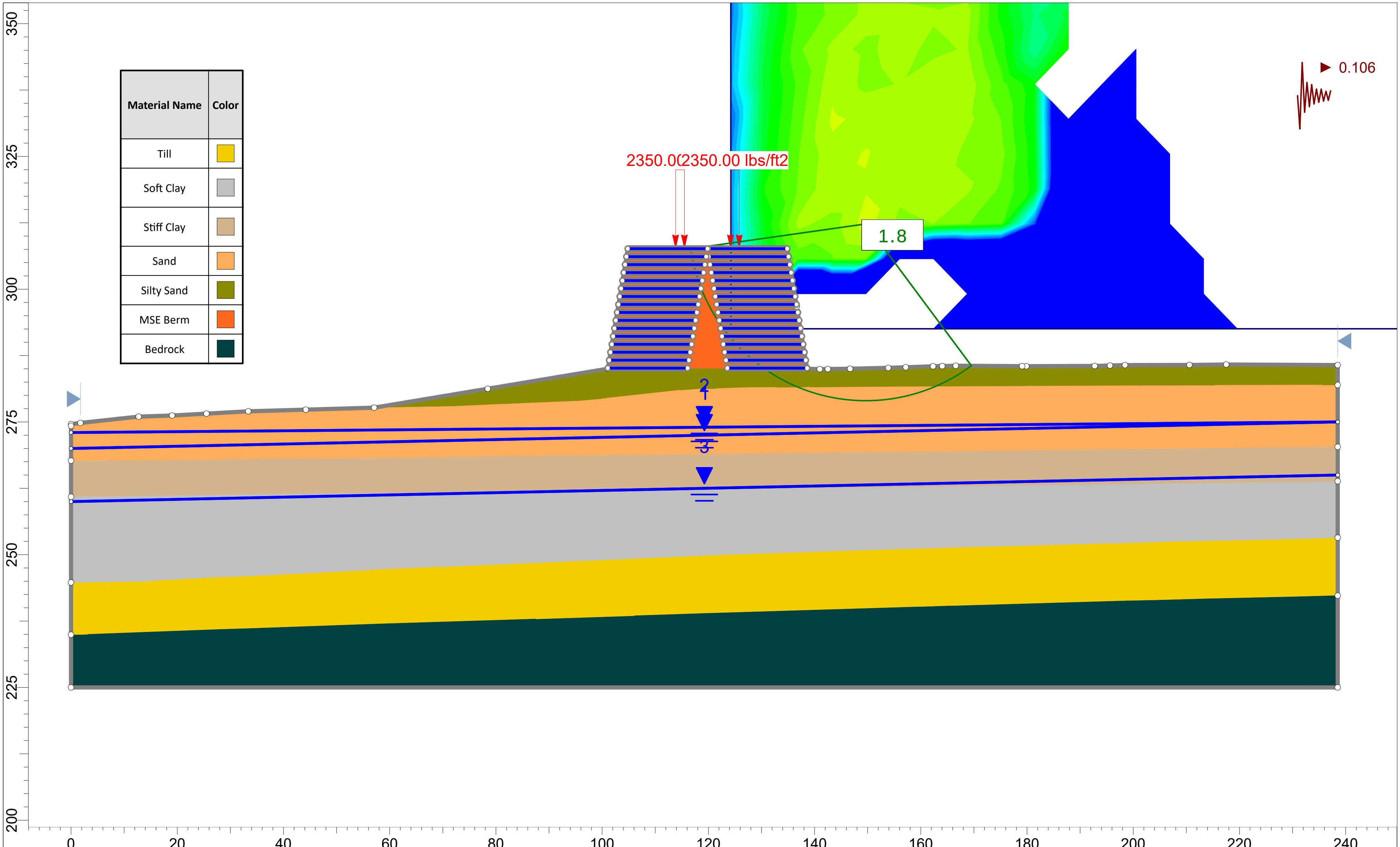
Method Name	Min FS
Spencer	1.6

Geosyntec consultants

SLIDEINTERPRET 8.028

Project	Crossroads Phase 14 Stability Section VII		
Analysis Description	Post-Closure, Seismic, Horizontal Berm Sliding		
Drawn By A. Rohrman	*Scale* 1:1100	*Company*	Geosyntec Consultants
Date	10/1/2019	*File Name*	2019.10.01 Ph14 VII.slmd

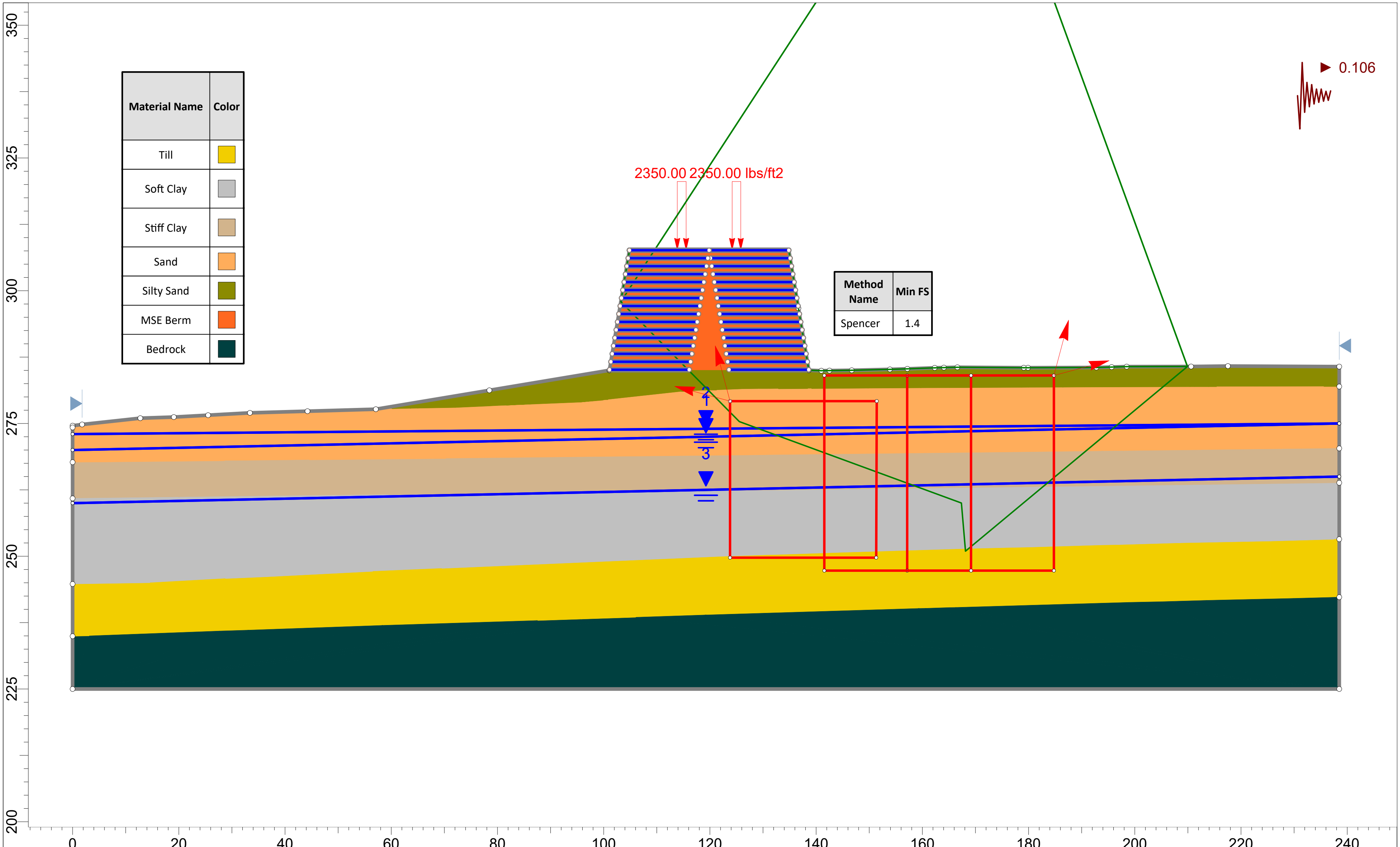
Section VIII



Geosyntec consultants

SLIDEINTERPRET 8.014

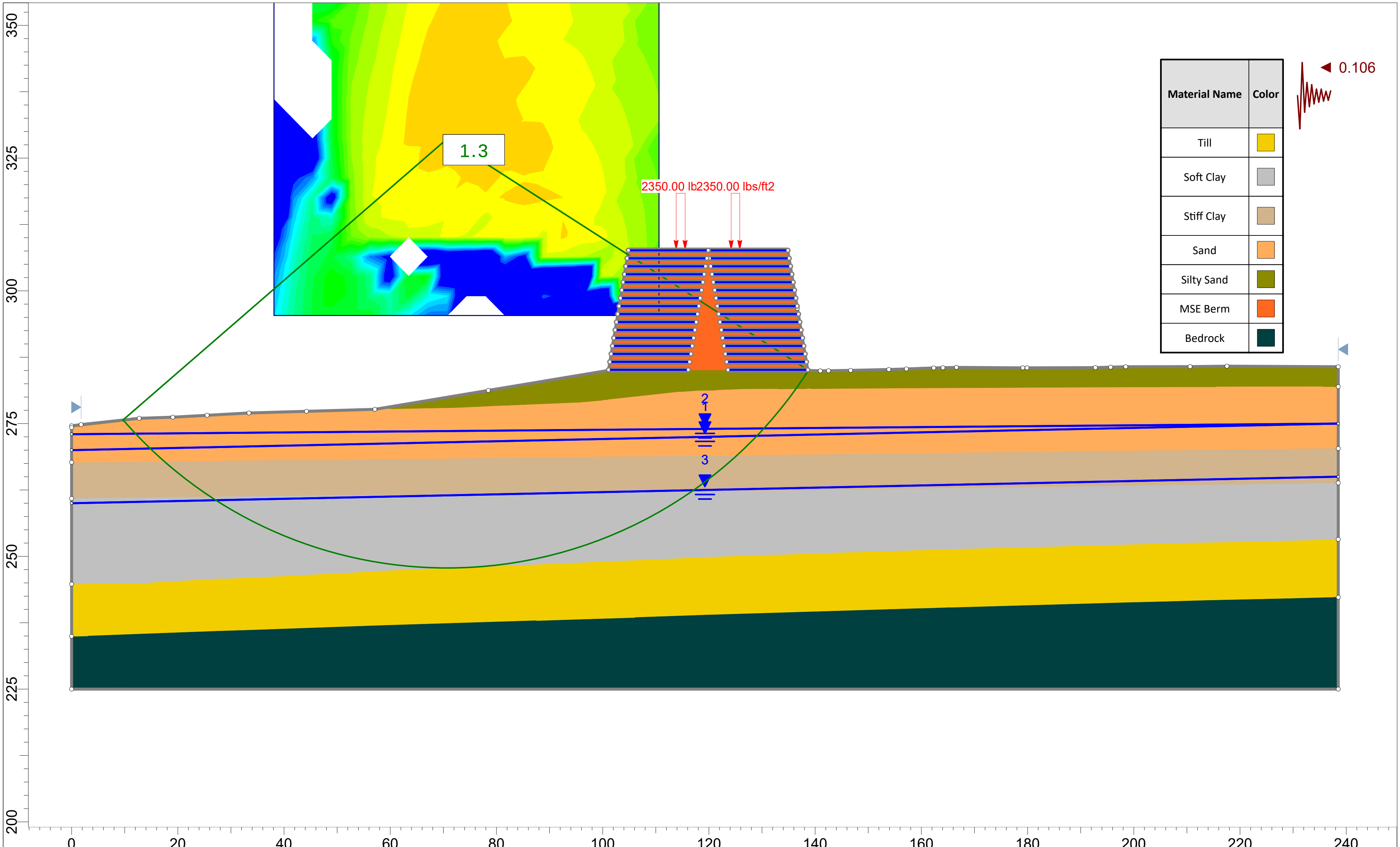
Project	Crossroads Phase 14 Stability Section VIII		
Analysis Description	Post-Closure, Seismic, Inward Circular		
Drawn By A. Rohrman	*Scale* 1:300	*Company*	Geosyntec Consultants
Date	10/1/2019	*File Name*	2019.10.01 Ph14 VIII.slmd



Geosyntec consultants

Project	Crossroads Phase 14 Stability Section VIII
Analysis Description	Post-Closure, Seismic, Inward Non-Circular
Drawn By A. Rohrman	*Scale* 1:300
Company	Geosyntec Consultants
Date	10/1/2019
File Name	2019.10.01 Ph14 VIII.slmd

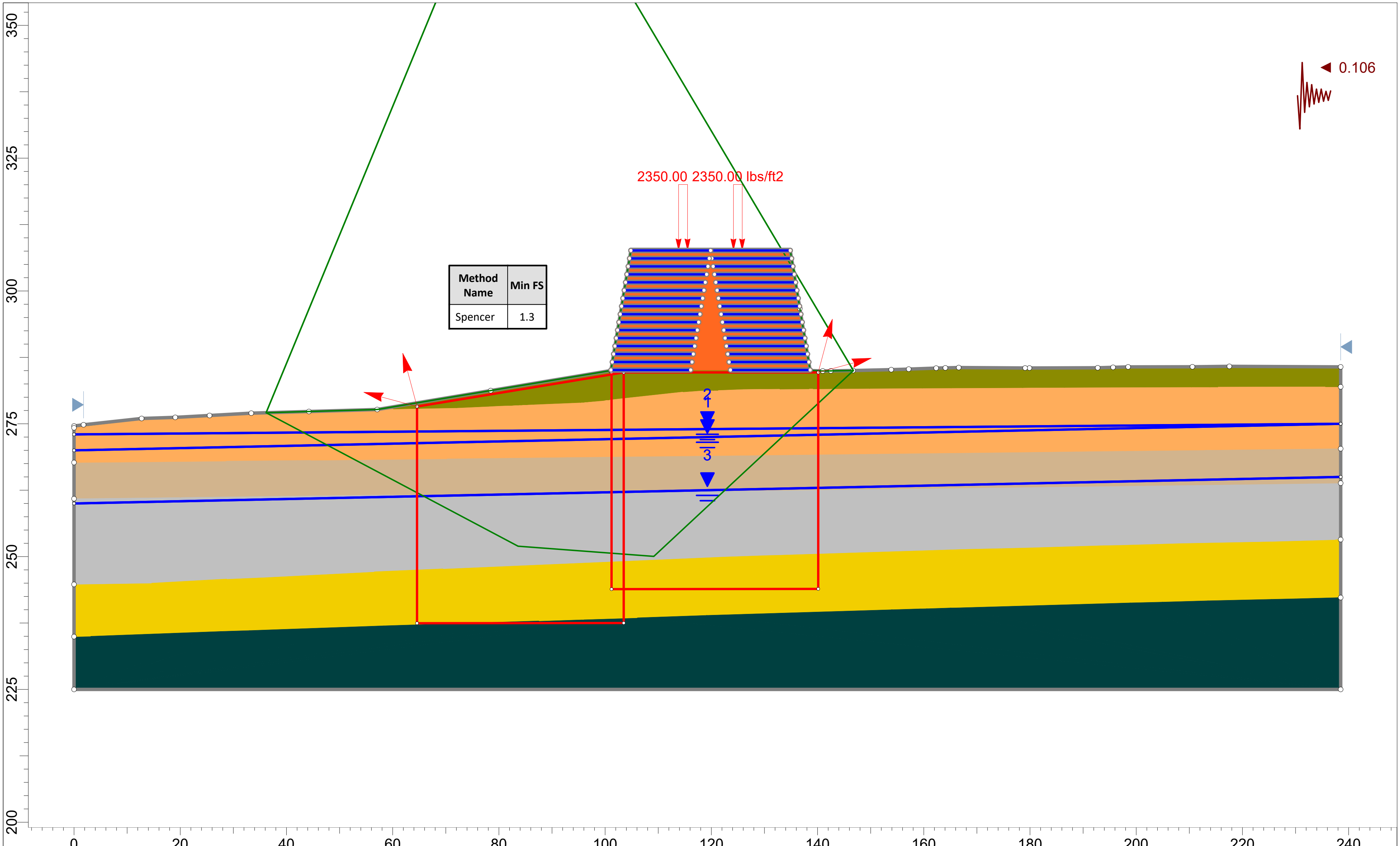
SLIDEINTERPRET 8.014



Geosyntec consultants

Project	Crossroads Phase 14 Stability Section VIII		
Analysis Description	Post-Closure, Seismic, Outward Circular		
Drawn By A. Rohrman	*Scale* 1:300	*Company*	Geosyntec Consultants
Date	10/1/2019	*File Name*	2019.10.01 Ph14 VIII.slmd

SLIDEINTERPRET 8.014



Method Name	Min FS
Spencer	1.3

Project	Crossroads Phase 14 Stability Section VIII		
Analysis Description	Post-Closure, Seismic, Outward Non-Circular		
Drawn By A. Rohrman	*Scale* 1:300	*Company*	Geosyntec Consultants
Date	10/1/2019	*File Name*	2019.10.01 Ph14 VIII.slmd

Geosyntec consultants

SLIDEINTERPRET 8.014

APPENDIX IV(c)(ii)

Punching Shear

Written by: A. Rohrman Date: 13 Sept 2019 Reviewed by: M. Nolden/N. Yafrate Date: 27 Sept 2019

Client: WMDSM Project: Phase 14 Permit Project/Proposal No.: BE0232C Phase No.: 02

MSE BERM PUNCHING SHEAR CALCULATION
WMDSM - CROSSROADS LANDFILL PHASE 14
NORRIDGEWOCK, MAINE

OVERVIEW

The purpose of this calculation package is to evaluate the factor of safety (FS) against foundation punching shear failure of the mechanically-stabilized earth (MSE) berm proposed for the perimeter of the Phase 14 landfill. Analyses were performed for Construction and Post-Closure Conditions, as described below.

- The Construction Condition considers the undrained shear strength of the foundation clays immediately following construction of the berm to its full height, prior to any dissipation of excess pore pressures resulting from the berm load, except as indicated below for sections where staged construction may be implemented to construct the MSE Berm to the design height.
- The Post-Closure Condition considers the undrained shear strengths of the clay foundation soils after excess pore pressures have had time to dissipate and waste has been placed in the landfill.

CONDITIONS FOR ANALYSIS

The punching shear analyses were performed considering a three-layered soil system, where overburden material consisting of Sand and Silty Sand (collectively referred to as Sand) overlies a relatively stiff clay layer (i.e., Brown Clay), which overlies a soft clay layer (i.e., Gray Clay). The analysis was performed to evaluate the potential for the Sand and Brown Clay layers to punch into the underlying Gray Clay layer under the load of the MSE berm.

Six of the eight stability cross-section locations identified in the Crossroads Phase 14 *Stability Analysis*, presented in this Volume IV of the Permit Application, namely Sections III through Section VIII, were evaluated for the punching shear failure mode. Sections I and II were not analyzed because there is no Gray Clay at these locations. The locations of the sections are indicated on Figure 1. Soil stratigraphy at these locations are based on those used in the Phase 14 *Stability Analysis* and are provided in Figures 2A trough 2F.

Written by: A. Rohrman Date: 13 Sept 2019 Reviewed by: M. Nolden/N. Yafrate Date: 27 Sept 2019

Client: WMDSM Project: Phase 14 Permit Project/Proposal No.: BE0232C Phase No.: 02

PUNCHING SHEAR ANALYSIS

The FS against punching shear failure into the Gray Clay layer was calculated at each section by evaluating the combined punching shear resistance of the Sand and Brown Clay layers relative to the stress applied by the MSE berm. A schematic of the loading condition is shown in Figure 3.

The punching shear resistance was calculated using the procedure presented by AASHTO (2002) for shear resistance of layered soils. First, the ultimate punching shear resistance of the Brown Clay is calculated considering a load the width and assumed length of the berm supported directly on the Brown Clay layer. The punching shear resistance of the Brown Clay is calculated using the following equation (after AASHTO, 2002, equation 4.4.7.1.1.7-1):

$$q_{clay} = (0.67 \times S_{u(brownclay)}) \times N_m + q$$

where:

q_{clay} = ultimate punching shear resistance of the Brown Clay (pounds per square foot [psf]);

$S_{u(brownclay)}$ = undrained shear strength of the Brown Clay (psf); and

N_m = resistance factor for punching shear;

q = effective overburden pressure on the Brown Clay beyond the toe of the MSE berm (psf).

N_m is calculated using the following equation:

$$N_m = (1/\beta_m + KN_c)$$

where

β_m = punching index = $\frac{B \times L}{2 \times (B+L) \times H}$;

B = reinforcement length (ft);

L = length of bearing area (ft); and

H = thickness of Brown Clay (ft).

$K = \frac{S_{u(grayclay)}}{S_{u(brownclay)}}$;

$s_{u(gray\ clay)}$ = undrained shear strength of Gray Clay (psf)

N_c= bearing capacity factor for cohesion (equal to 5.14 for undrained conditions);

Written by: A. Rohrman Date: 13 Sept 2019 Reviewed by: M. Nolden/N. Yafrate Date: 27 Sept 2019

Client: WMDSM Project: Phase 14 Permit Project/Proposal No.: BE0232C Phase No.: 02

q is calculated using the following equation:

$$q = D_{overburden} \times \gamma'_{overburden} \text{ (psf)}$$

where

$D_{overburden}$ = thickness of the overburden Sand outside of the exterior toe of the berm face (ft); and

$\gamma'_{overburden}$= effective unit weight of the overburden Sand outside the toe of the berm (pounds per cubic foot [pcf]).

Because the upper layer of sand is cohesionless and has a friction angle >25°, the ultimate punching shear resistance of both the Sand and Brown Clay layers together can be calculated with the following equation (after AASHTO, 2002, equation 4.4.7.1.1.7-4):

$$q_{ult} = q_{clay} \times \mathrm{e}^{0.67\left(1+\frac{B}{L}\right)\frac{D_{base}}{B}}$$

where

q_{ult} = ultimate combined bearing capacity of the Sand and Brown Clay layers (psf); and

D_{base} = thickness of the Sand below the berm (ft).

Undrained Shear Strengths

The undrained shear strength values for the Brown and Gray Clay used in this analysis were obtained from the Slide® models prepared for the *Slope Stability Analysis* package in Volume IV of the Permit Application. The strengths were calculated in Slide® using the Stress History and Normalized Soil Engineering Properties (SHANSEP) method for evaluating undrained shear strength of clays (Ladd and Foott, 1974) based on the results of consolidation and direct simple shear (DSS) strength tests. SHANSEP calculates shear strength as a function of vertical effective stress, where a higher effective stress yields a higher undrained shear strength. As such, dissipation of pore pressures over time after placement of a load increases effective stress, resulting in increased shear strength. The shear strengths for each clay layer were selected from the midpoint of each clay layer beneath the MSE berm toe.

The undrained shear strengths for the Construction Condition for Sections IV, V, VI, and VIII were calculated assuming excess pore pressures caused by the application of the MSE berm load have not yet dissipated. Calculations for Sections III and VII consider staged construction to achieve the target FS, whereby the MSE berm will be constructed in two stages, with sufficient time for partial dissipation of excess pore pressures (and corresponding strength gain) after construction of the first stage and prior to placement of the second stage.

The Post-Closure Condition shear strengths were calculated assuming full consolidation of the clay following the application of the berm load.

Sand Outside Toe of MSE Berm

The Sand layer extends outside the footprint of the MSE berm and therefore applies an effective stress to the Brown Clay layer. The overburden pressure from the sand outside the berm increases the punching shear resistance of the Brow Clay layer. The effective stress is the product of the thickness of Sand outside the MSE berm ($D_{overburden}$) multiplied by the effective unit weight of the soil ($\gamma'_{overburden}$).

Applied Stress

The applied stress (σ_v) is the change in stress resulting from constructing the MSE berm on the Sand layer, calculated as the unit weight of the berm soil multiplied by the height of the berm and length of the reinforcement (B).

Factor of Safety

The factor of safety of against punching shear failure is calculated using the following equation:

$$FS = \frac{q_{ult}}{\sigma_v}$$

where:

σ_v = change in stress due to the MSE berm (psf).

There is no minimum regulatory FS specifically for punching shear. Sowers (1970) was used as a guide in selecting acceptable minimum factors of safety. As stated in Sowers (1970), the safety factor for design depends on how accurately soil conditions and the structural loads are known and what hazards are involved in a punching shear failure. Of note in selecting factors of safety is the fact that unlike a rigid footing, the MSE berm is a flexible system and will tolerate vertical settlements and differential movements. For the Construction Condition, when the consequence of a punching shear movement would be inconvenient but would be unlikely to result in serious damage to either a structure or the environment, an FS ≥ 1.5 is considered acceptable. For the Post-Closure Condition, a higher target FS ≥ 2.0 was selected as the target minimum because of the higher consequences of punching shear failure that might lead to a compromise of the containment system.

Written by: A. Rohrman Date: 13 Sept 2019 Reviewed by: M. Nolden/N. Yafrate Date: 27 Sept 2019

Client: WMDSM Project: Phase 14 Permit Project/Proposal No.: BE0232C Phase No.: 02

SELECTED PARAMETERS

The unit weights used in this analysis were selected to be consistent with those used in the Phase 14 *Stability Analysis*. As described above, the shear strengths of the Brown and Gray Clays were selected from the strengths calculated as part of the Phase 14 *Stability Analysis.* The shear strengths for each section are summarized in Table 1. The relevant Slide® outputs are presented in Attachment 1.

The length of reinforcement used to calculate the applied pressure for each section is taken as the length of reinforcement required by the Phase 14 *Stability Analysis* for the corresponding section. The length of the bearing area is assumed to be equal to five times the length of the reinforcement (i.e., $L = 5 \times B$), as defined by AASHTO (2002) for continuous footings, which is an appropriate assumption for the MSE berm.

The thicknesses of the Sand, Brown Clay, and Gray Clay and the height of the MSE berm are based on the subsurface stratigraphy and proposed grades shown in Figures 2A through 2F.

The selected parameters for the Construction and Post-Closure Condition are summarized in Tables 2 and 3, respectively.

RESULTS

The results of the punching shear calculations are presented in Tables 2 and 3, and calculated FS against punching shear failure are summarized in Table 4. As shown, the calculated FS ranges from 1.9 to 4.6 for Construction Conditions, and 2.0 to 5.5 for Post-Closure Conditions. The target FS are met for the analyzed stability sections and conditions.

CONCLUSIONS AND RECOMMENDATIONS

The results of this punching shear analysis indicate that the MSE berm at Sections IV, V, VI, and VIII may be constructed to their full height in a single construction stage while maintaining the target FS for the Construction and Post Closure Conditions. As mentioned previously, the MSE berm at Sections I and II is not subject to punching shear because of the absence of the soft Gray Clay in those areas. Hence, the MSE berm may be constructed to full height in a single construction stage at Sections I and II.

The calculations for Sections III and VII indicate that staged construction may be necessary to maintain the target FS during the Construction Condition, whereby the MSE berm is partially constructed, strength gain occurs over time as pore pressures resulting from the MSE berm load dissipate, and remainder of the MSE berm is constructed to the design height. During preparation of the construction documents, the maximum height of the first construction stage and time to achieve strength gain resulting in the target FS must be assessed to implement staged construction. Alternatively, WMDSM may perform additional and/or more advance soil strength testing and analyses in the vicinity of these sections to assess if the clay is sufficiently strong to construct the berm to full height without staging.

Sections III and VII meet the target FS for punching shear for Post Closure Conditions.

Written by: A. Rohrman Date: 13 Sept 2019 Reviewed by: M. Nolden/N. Yafrate Date: 27 Sept 2019

Client: WMDSM Project: Phase 14 Permit Project/Proposal No.: BE0232C Phase No.: 02

REFERENCES

AASHTO (2002). *Standard Specifications for Highways and Bridges. 17thg Edition.* American Association of State Highway and Transportation Officials, Washington D.C.

Ladd, C.C. and Foott (1974). "New Design Procedure for Stability of Soft Clays". *Journal of Geotechnical Engineering Division*, July 1974.

Sowers, G.B., and Sowers, G.F., (1970) *Introductory Soil Mechanics and Foundations,* 3rd ed., The Macmillan Company, New York, NY, 1970.

TABLES

Table 1. Undrained shear strengths as calculated in Phase 14 slope stability analysis.

Section	Construction Condition		Post-Closure Condition	
	s_u (brownclay) (psf)	s_u (grayclay) (psf)	s_u (brownclay) (psf)	s_u (grayclay) (psf)
III(2)	1,900	1,255	1,950	1,350
IV	1,790	735	2,170	1,050
V	1,660	675	2,190	1,050
VI	2,710	925	3,300	1,175
VII(2)	3,170	1,090	3,200	1,125
VIII	2,050	710	2,550	990

Notes:
1. There is no Gray Clay present in Sections I and II and therefore those sections are not analyzed for punching shear.
2. Shear strength for Sections III and VII in the Construction Condition were calculated for 90% of consolidation after the first stage of MSE Berm construction.

Table 2. Selected parameters and calculation results for punching shear in the Construction Condition.

Construction Condition													
Stability Section	Analysis Inputs						Calculations						
	$D_{overburden}$ (ft)	D_{base} (ft)	H_{berm} (ft)	B (ft)	$H_{BrownClay}$ (ft)	$H_{GrayClay}$ (ft)	β_m	K	N_m	q (psf)	q_{clay} (psf)	q_{ult} (ppf)	σ_v (psf)
I	13.8	13.0	13.3	35.0	8.8	0.0	Note 1.						
II	13.7	12.7	5.2	15.0	3.3	0.0	Note 1.						
III(2)	2.0	4.2	31.5	12.0	5.8	5.3	0.9	0.70	4.60	220	6,026	7,985	3,780
IV	13.8	13.9	23.0	35.0	9.4	8.5	1.6	0.41	2.76	1,423	4,727	6,506	2,765
V	11.1	11.0	29.7	15.0	8.9	5.0	0.7	0.41	3.51	975	4,883	8,805	3,560
VI	17.6	17.0	24.1	20.0	8.5	7.3	1.0	0.34	2.77	1,794	6,831	13,530	2,890
VII(2)	10.6	10.6	36.4	22.0	5.9	2.3	1.6	0.30	2.40	663.6	5784.3	8521.0	4368.0
VIII	14.7	10.7	22.6	15.0	6.6	12.6	0.9	0.35	2.84	1,371	5,266	9,345	2,712

Notes:

1. There is no Gray Clay present in Sections I and II and therefore those sections are not analyzed for punching shear.
2. Sections III and VII calculations included staged construction as follows: Section III Stage 1 construction was calculated for an H_{berm}= 27 ft and Section VII Stage 1 construction was calculated for an H_{berm}= 33.4ft.

Table 3. Selected parameters and calculation results for punching shear in the Post-Closure Condition.

Post-Closure Condition													
Stability Section	Analysis Inputs						Calculations						
	$D_{overburden}$ (ft)	D_{base} (ft)	H_{berm} (ft)	B (ft)	$H_{BrownClay}$ (ft)	$H_{GrayClay}$ (ft)	β_m	K	N_m	q (psf)	q_{clay} (psf)	q_{ult} (ppf)	σ_v (psf)
I	13.8	13.0	13.3	35.0	8.8	0.0	Note 1.						
II	13.7	12.7	5.2	15.0	3.3	0.0	Note 1.						
III	2.0	4.2	31.5	12.0	5.8	5.3	0.9	0.69	4.65	220	5,772	7,647	3,780
IV	13.8	13.9	23.0	35.0	9.4	8.5	1.4	0.48	3.21	1,423	6,498	9,307	2,765
V	11.1	11.0	29.7	15.0	8.9	5.0	0.7	0.48	3.83	975	7,149	12,579	3,560
VI	17.6	17.0	24.1	20.0	8.5	7.3	1.0	0.36	2.85	1,794	8,357	16,552	2,890
VII	10.6	10.6	36.4	15.0	5.9	2.3	1.1	0.35	2.71	664	5,102	8,794	4,368
VIII	14.7	10.7	22.6	15.0	6.6	12.6	1.0	0.39	3.01	1,371	12,129	21,014	2,712

Notes: 1. There is no Gray Clay present in Sections I and II and therefore those sections are not analyzed for punching shear.

Table 4. Calculated factors of safety for the Construction and Post-Closure Conditions.

Section	Factor of Safety	
	Construction Condition	Post-Closure Condition
III(2)	2.1	2.2
IV	2.3	3.1
V	2.4	3.2
VI	4.6	5.5
VII(2)	1.9	2.0
VIII	3.4	4.1

Notes:
1. There is no Gray Clay present in Sections I and II and therefore those sections are not analyzed for punching shear.
2. FS values for Sections III and VII in the Construction Condition are achieved through staged construction.

FIGURES

N

LEGEND

- GROUND SURFACE ELEVATION CONTOUR (NOTE 1)
- LIMIT OF WASTE
- TOP OF WASTE
- CPT TEST LOCATION (NOTE 2)
- BORING LOCATION (NOTE 3)

NOTES:

1. EXISTING GROUND SURFACE AND FEATURES OBTAINED FROM TOPOGRAPHIC SURVEYS, DATED NOV 2017, AND SEPT 2018, PROVIDED BY BOYNTON & PICKETT. HORIZONTAL DATUM IS NORTH AMERICAN DATUM OF 1983 (NAD 83) MAINE WEST STATE PLAN. VERTICAL DATUM IS NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88).
2. CPT PERFORMED IN AUGUST AND SEPTEMBER 2018 BY GEOSYNTEC. LOCATIONS FROM SURVEY POINT FILE PREPARED BY BOYNTON & PICKETT RECEIVED 4 SEPT 2018.
3. GEOTECHNICAL BORINGS PERFORMED BY GEOSYNTEC FEBRUARY AND MARCH 2019. LOCATIONS FROM SURVEY POINT FILE PREPARED BY BOYNTON & PICKET RECEIVE DATED 17 APRIL 2019.
4. PUNCHING SHEAR WAS NOT ANALYZED AT STABILITY SECTIONS I AND II DUE TO THE ABSENCE OF GRAY CLAY BENEATH MSE BERM AT THESE LOCATIONS.

0 150' 300'
SCALE IN FEET

PUNCHING SHEAR ANALYSIS
SECTION LOCATIONS AND TOP OF WASTE GRADES
PHASE 14

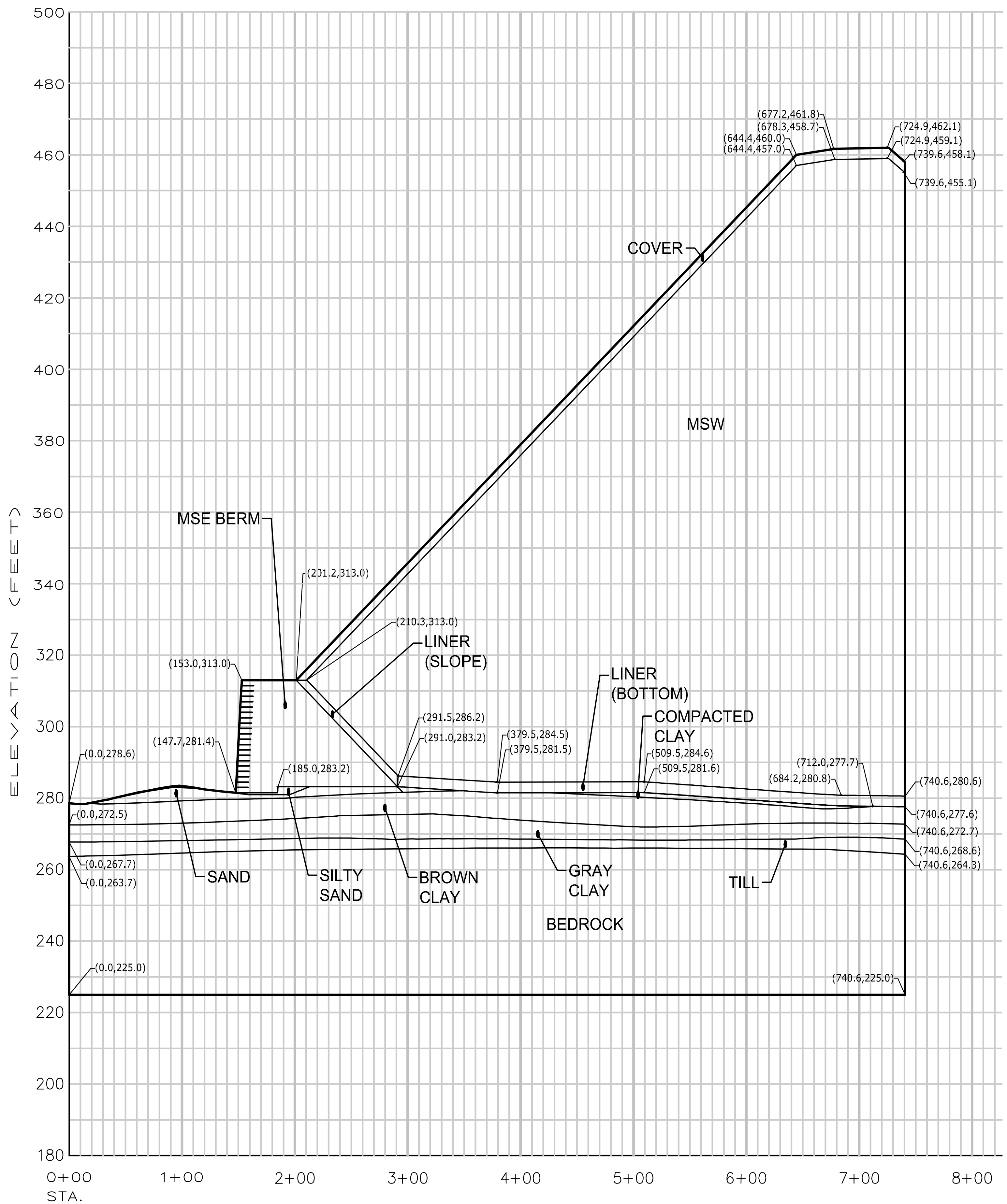
WASTE MANAGEMENT DISPOSAL SERVICES OF MAINE, INC.
CROSSROADS LANDFILL
NORRIDGEWOCK, MAINE

Geosyntec consultants

FIGURE 1

PROJECT NO: BE0232 | OCTOBER 2019

T:\PROJECTS_CADD\C\CROSSROADS LANDFILL\PHASE 14 EXPANSION\PERMIT\FIGURES\2019.10 PUNCHING SHEAR\2019.10 PUNCHING SHEAR SECT LOCS



SECTION COORDINATES:
START N = 685407.07 E = 3040321.77
END N = 684987.55 E = 3039711.42

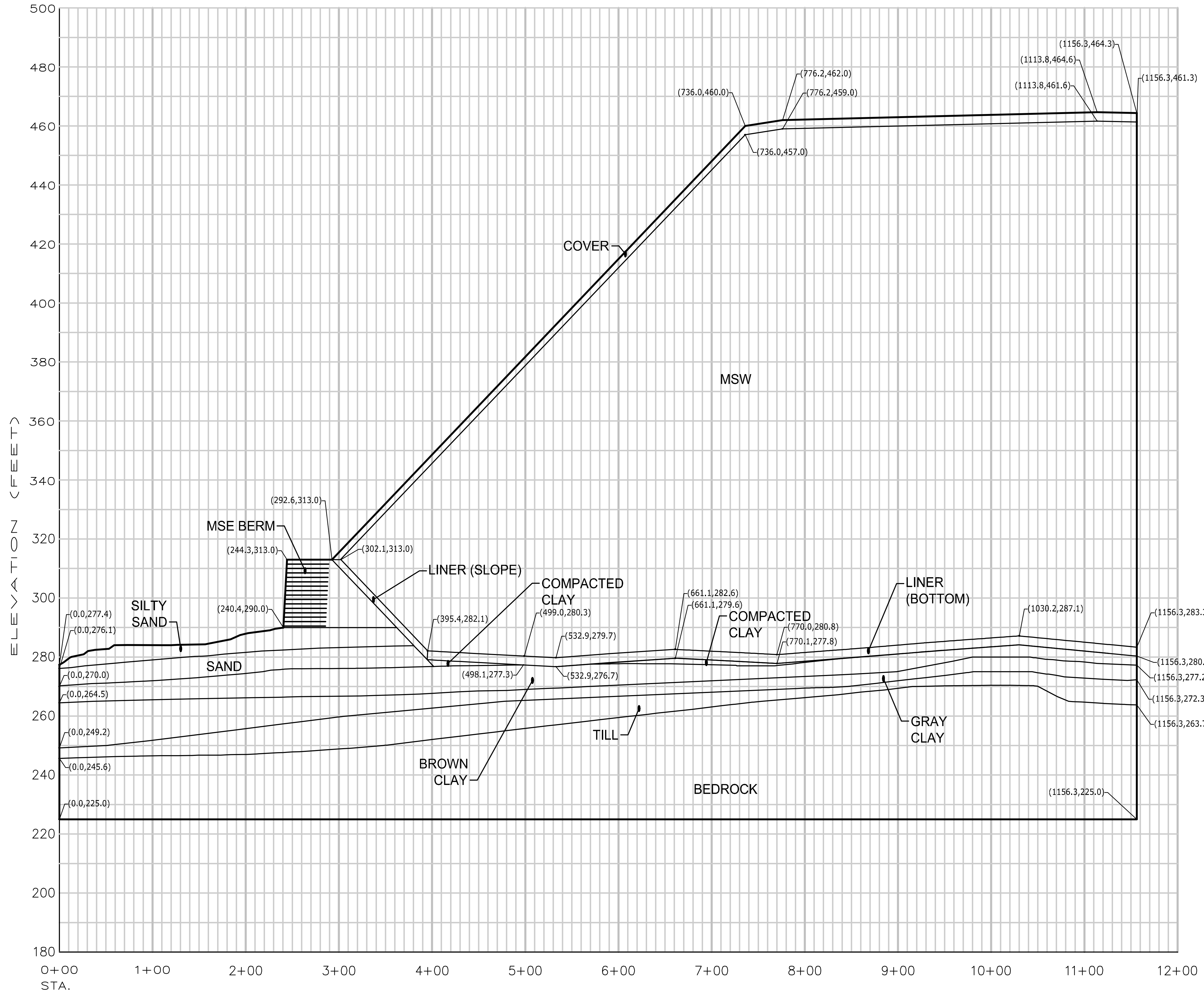
STABILITY ANALYSIS SECTION III
PHASE 14 PERMIT APPLICATION

CROSSROADS LANDFILL
NORRIDGEWOCK, MAINE

Geosyntec consultants

Figure: 2A

Acton, MA | October 2019



SECTION COORDINATES:
START N = 684515.51 E = 3040341.24
END N = 685272.08 E = 3039466.83

STABILITY ANALYSIS SECTION IV
PHASE 14 PERMIT APPLICATION

CROSSROADS LANDFILL
NORRIDGEWOCK, MAINE

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Figure: 2B

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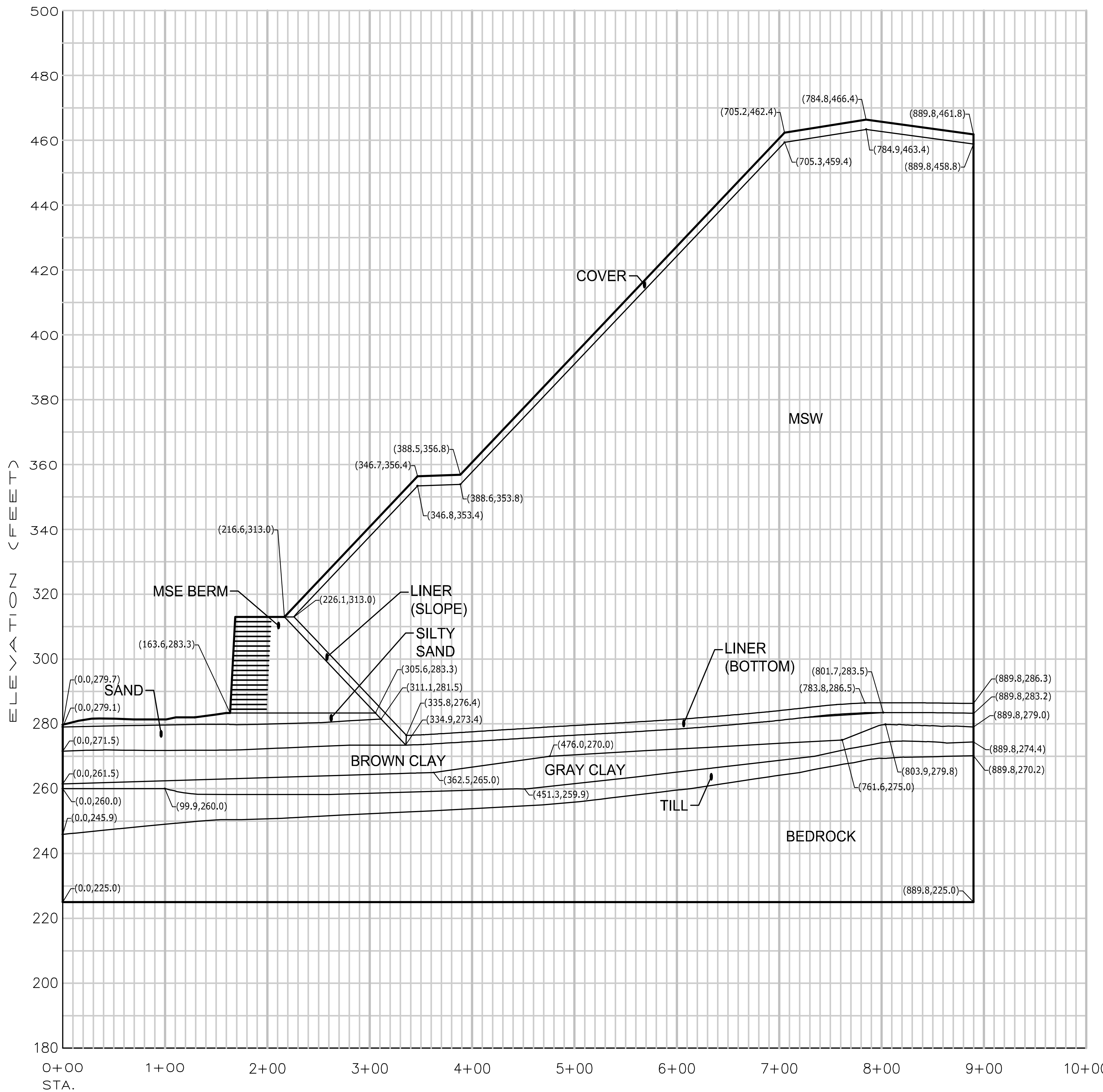
T:\PROJECTS_CADD\C\CROSSROADS LANDFILL\PHASE 14 EXPANSION\PERMIT\SLIDE SECTIONS\STABILITY FIGURES\STABIL SECT FIGURE IV (EXPLODE)

SECTION COORDINATES:
START N = 684414.78 E = 3039269.12
END N = 685254.40 E = 3039563.74



MATERIAL PROPERTIES

STABILITY ANALYSIS SECTION V
PHASE 14 PERMIT APPLICATION

CROSSROADS LANDFILL
NORRIDGEWOCK, MAINE

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Figure: 2C

Acton, MA | October 2019

T:\PROJECTS_CADD\C\CROSSROADS LANDFILL\PHASE 14 EXPANSION\PERMIT\SLIDE SECTIONS\STABILITY FIGURES\STABIL SECT FIGURE V (EXPLODE)

SECTION COORDINATES:
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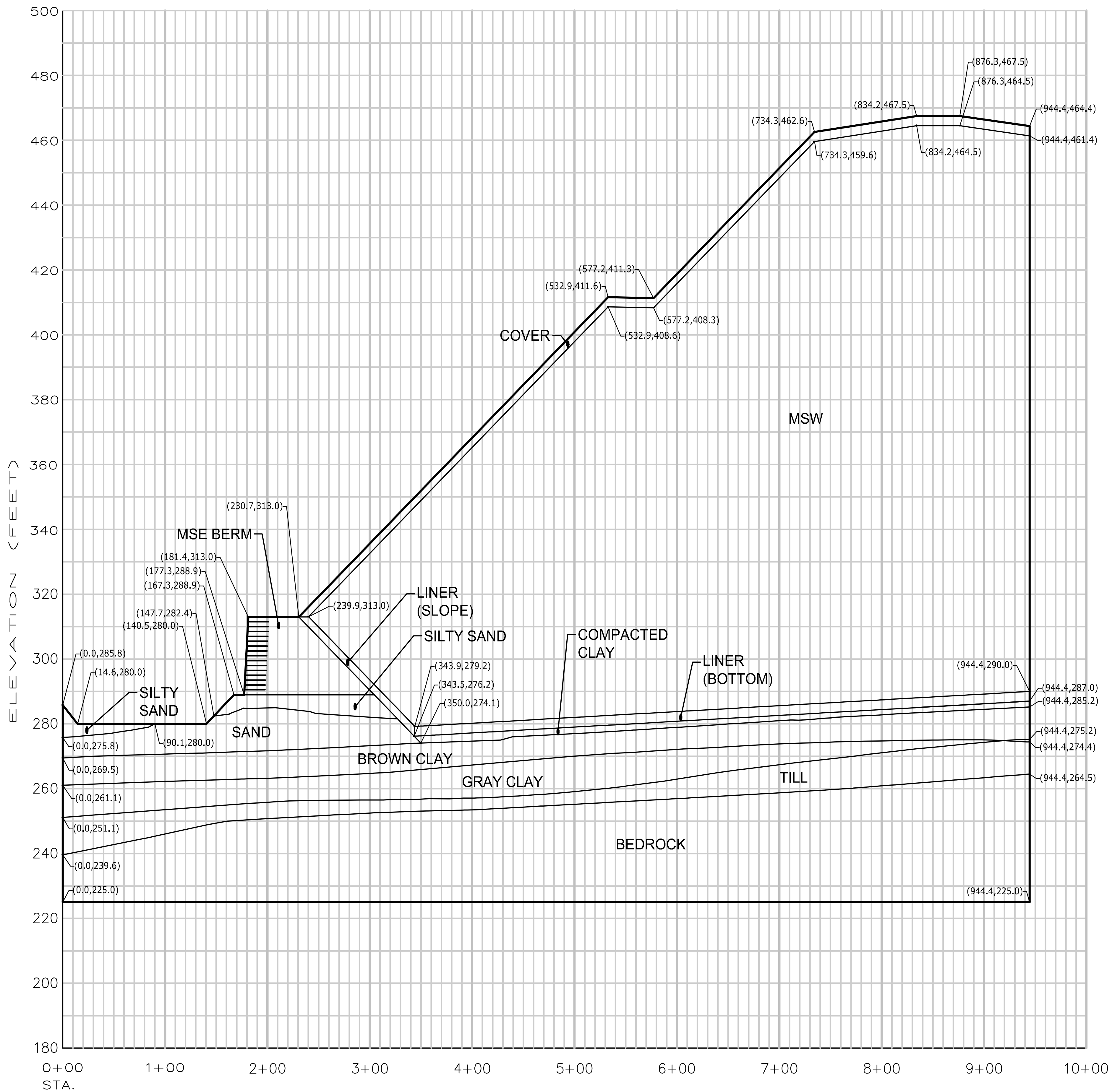


STABILITY ANALYSIS SECTION VI
PHASE 14 PERMIT APPLICATION

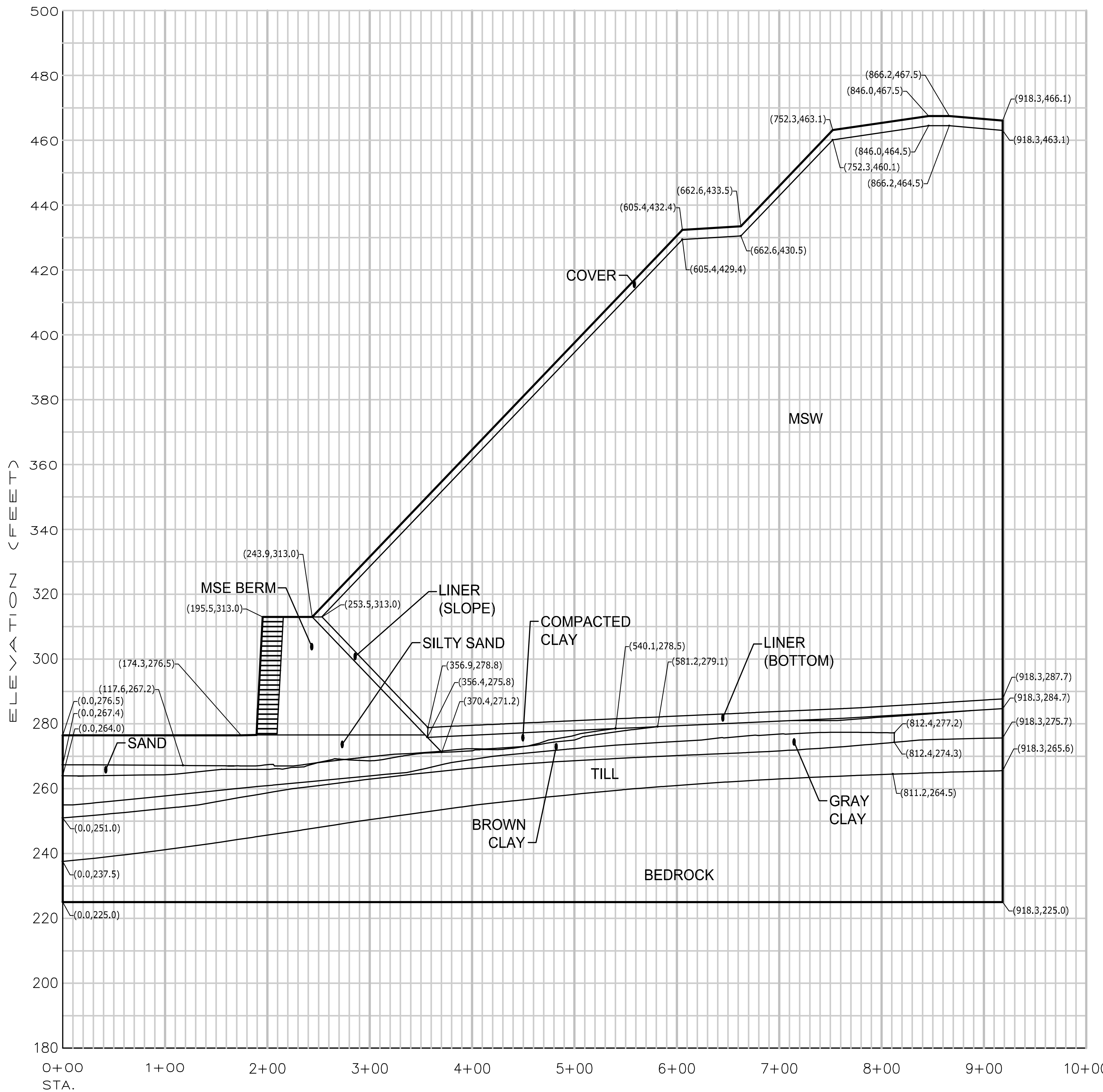
CROSSROADS LANDFILL
NORRIDGEWOCK, MAINE

Geosyntec consultants

Figure: 2D

Acton, MA | October 2019

T:\PROJECTS_CADD\C\CROSSROADS LANDFILL\PHASE 14 EXPANSION\PERMIT\SLIDE SECTIONS\STABILITY FIGURES\STABIL SECT FIGURE VI (EXPLODE)



SECTION COORDINATES:
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END N = 685477.43 E = 3039086.57

T:\PROJECTS_CADD\C\CROSSROADS LANDFILL\PHASE 14 EXPANSION\PERMIT\SLIDE SECTIONS\STABILITY FIGURES\STABIL SECT FIGURE VII (EXPLODE)

STABILITY ANALYSIS SECTION VII
PHASE 14 PERMIT APPLICATION

CROSSROADS LANDFILL
NORRIDGEWOCK, MAINE

Geosyntec consultants

Figure: 2E

Acton, MA | October 2019

SECTION COORDINATES:
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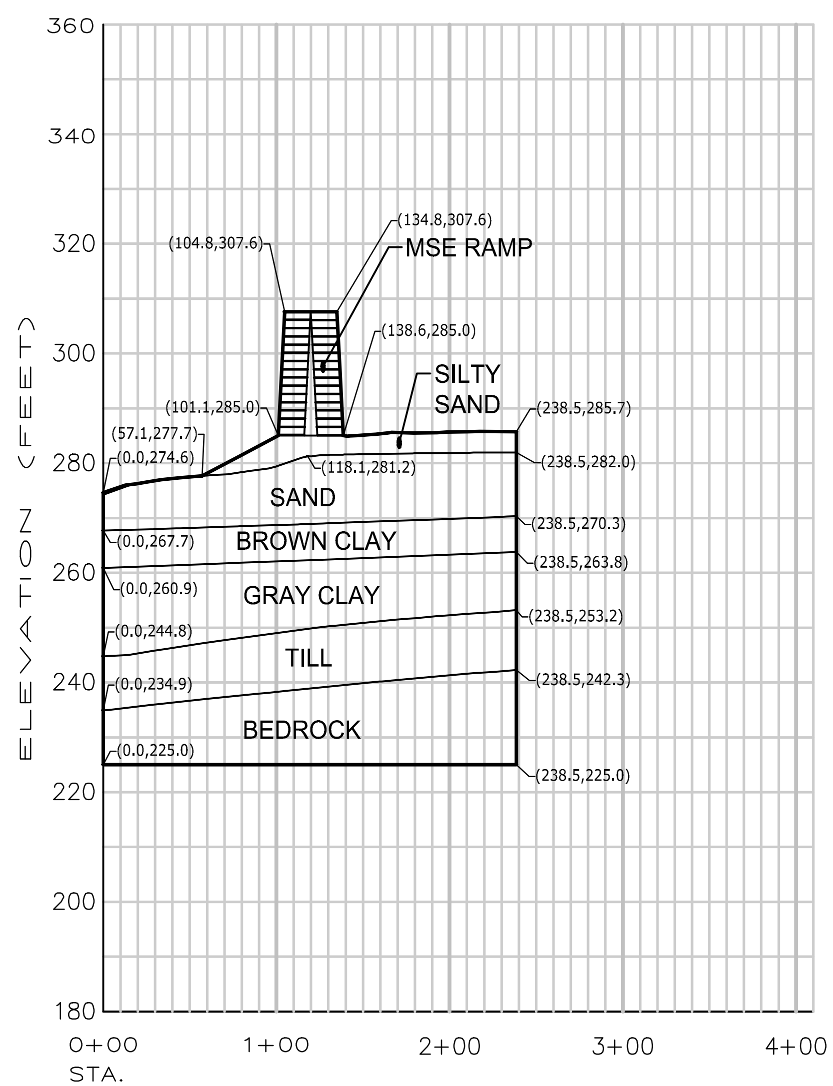


STABILITY ANALYSIS SECTION VIII
PHASE 14 PERMIT APPLICATION

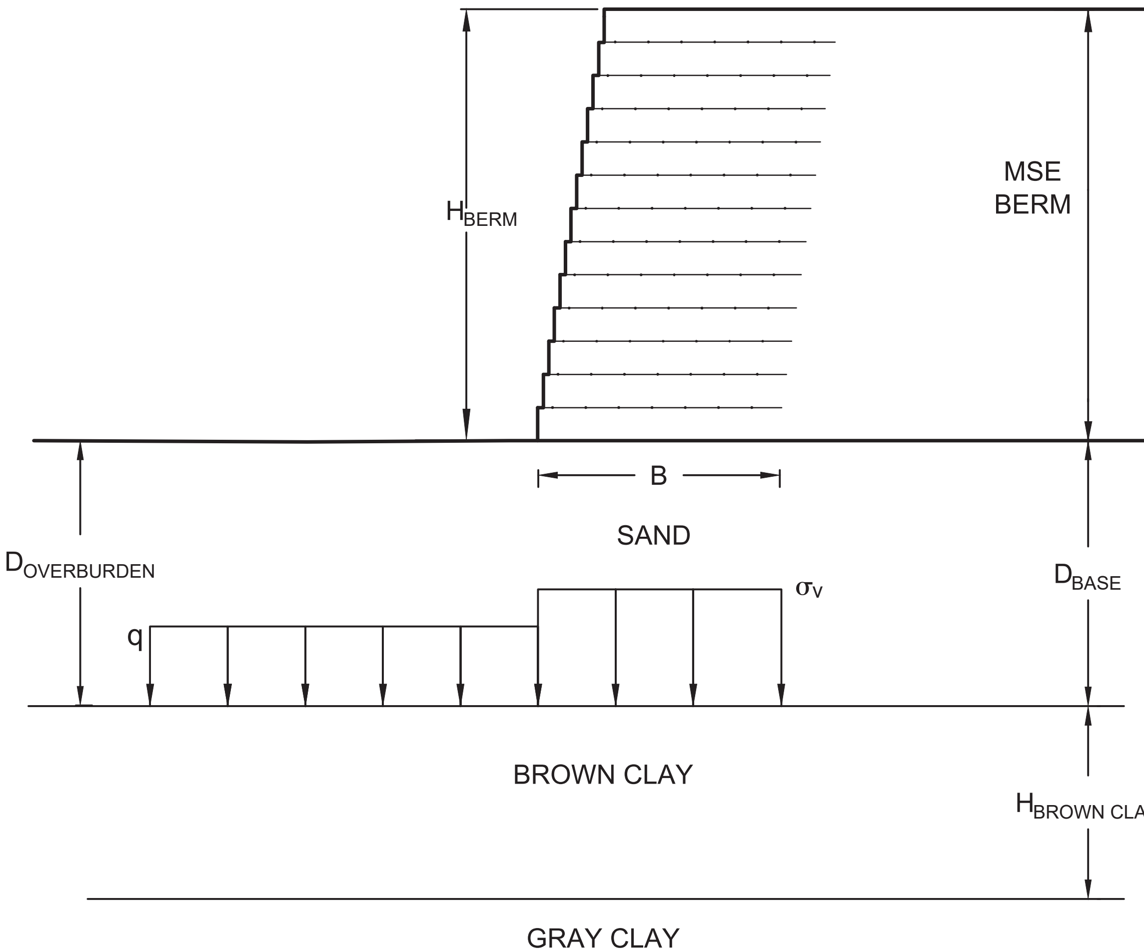
CROSSROADS LANDFILL
NORRIDGEWOCK, MAINE

Geosyntec consultants

Acton, MA | October 2019

Figure: 2F

T:\PROJECTS_CADD\C\CROSSROADS LANDFILL\PHASE 14 EXPANSION\PERMIT\SLIDE SECTIONS\STABILITY FIGURES\STABIL SECT FIGURE VIII (ROAD) EXPLODE



B LENGTH OF GEOGRID REIMFORMENT (FT)

H_{BERM} HEIGHT OF MSE BERM (FT)

$D_{OVERBURDEN}$ THICKNESS OF SAND OUTSIDE MSE BERM TOE (FT)

D_{BASE} THICKNESS OF SAND BENEATH MSE BERM (FT)

$H_{BROWN\ CLAY}$ THICKNESS OF BROWN CLAY (FT)

q OVERBURDEN PRESSURE ON BROWN CLAY OUTSIDE TOE OF THE MSE BERM (PSF)

σ_V PRESSURE OF MSE BERM IF SUPPORTED DIRECTLY ON BROWN CLAY (PSF)

PUNCHING SHEAR LOADING - PHASE 14
WASTE MANAGEMENT DISPOSAL SERVICES
OF MAINE, INC.
CROSSROADS LANDFILL
NORRIDGEWOCK, MAINE

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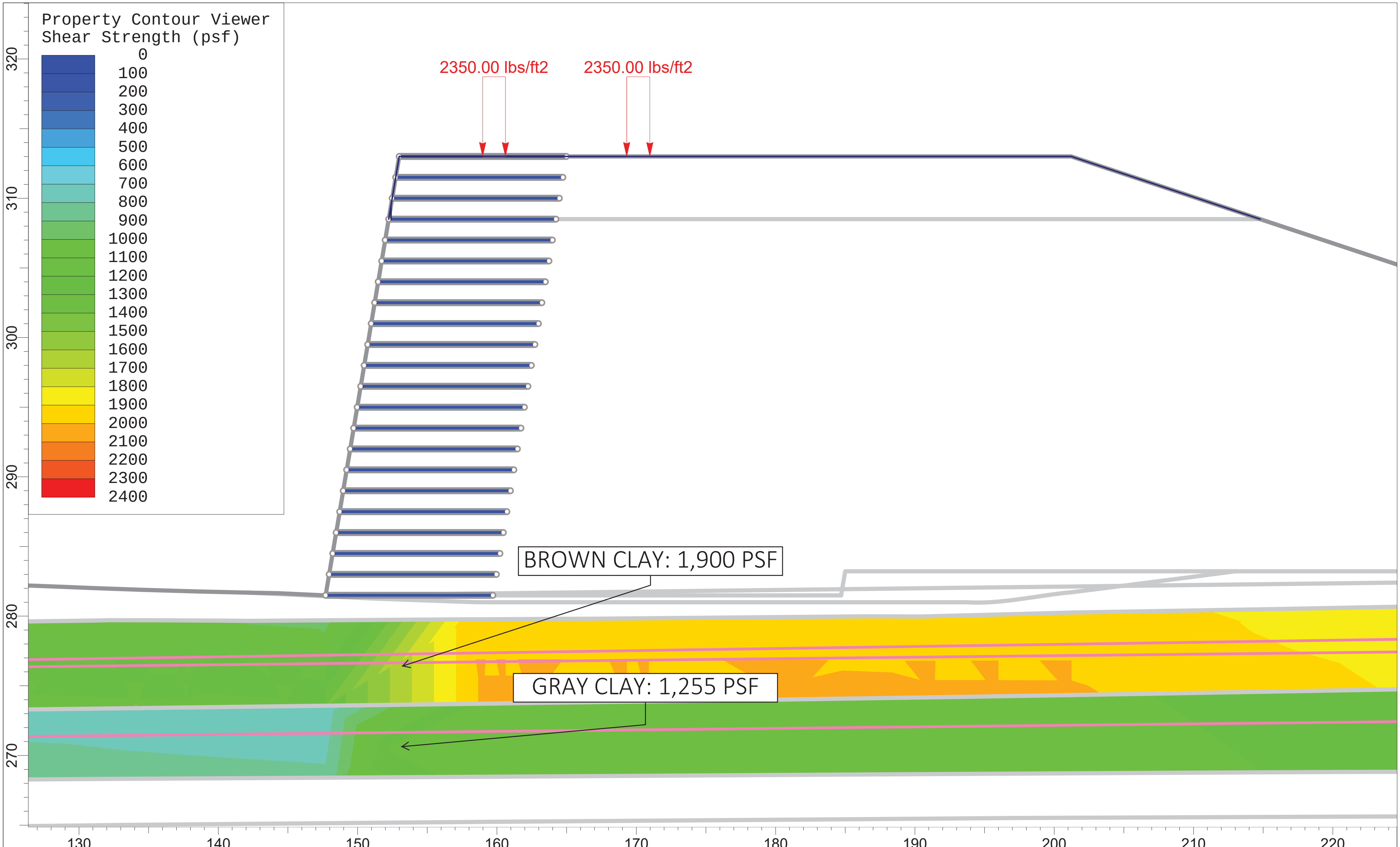
FIGURE 3

PROJECT NO: BE0232 | OCTOBER 2019

ATTACHMENT 1

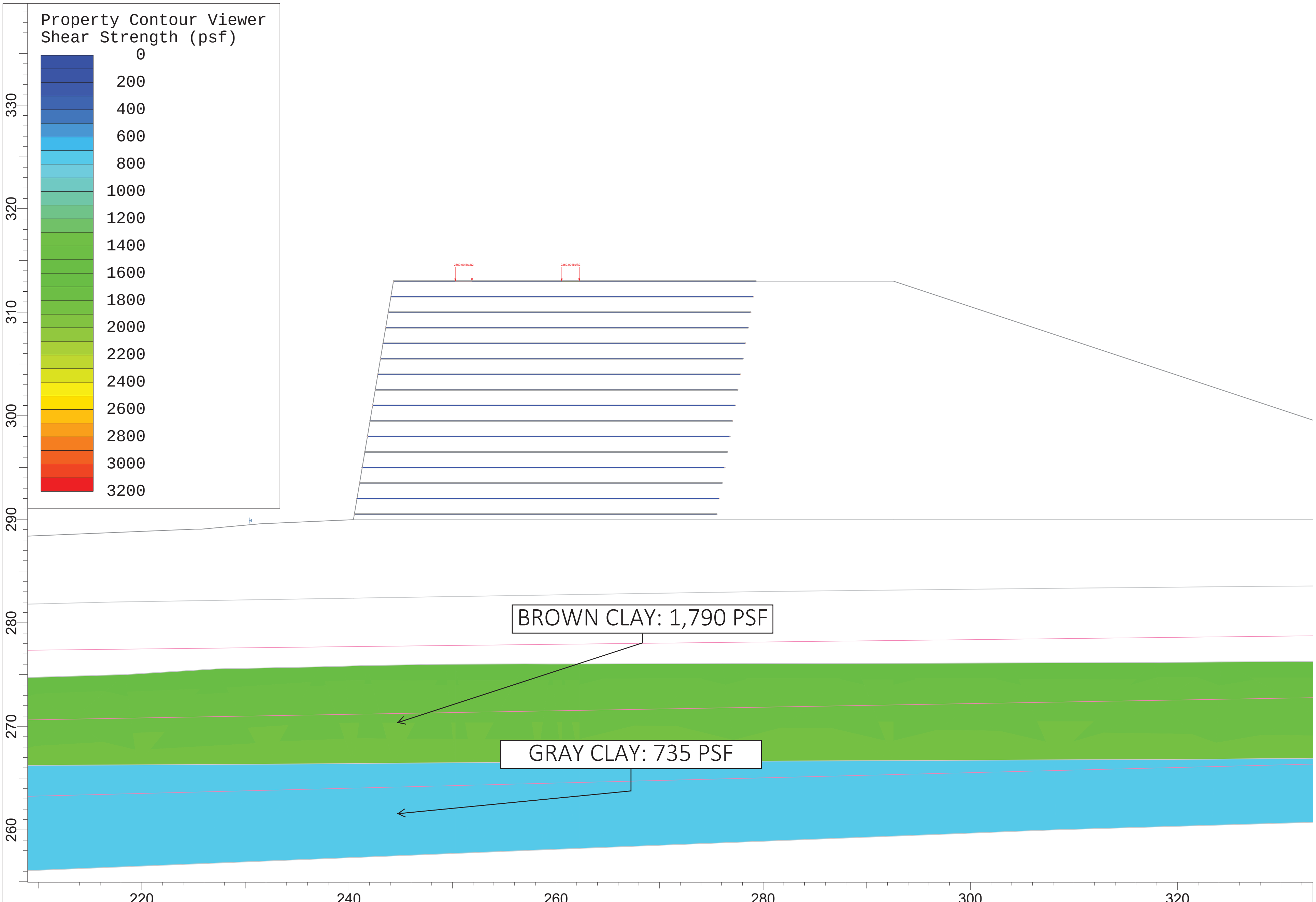
Slide® Clay Strengths



Geosyntec consultants

SLIDE 8.028

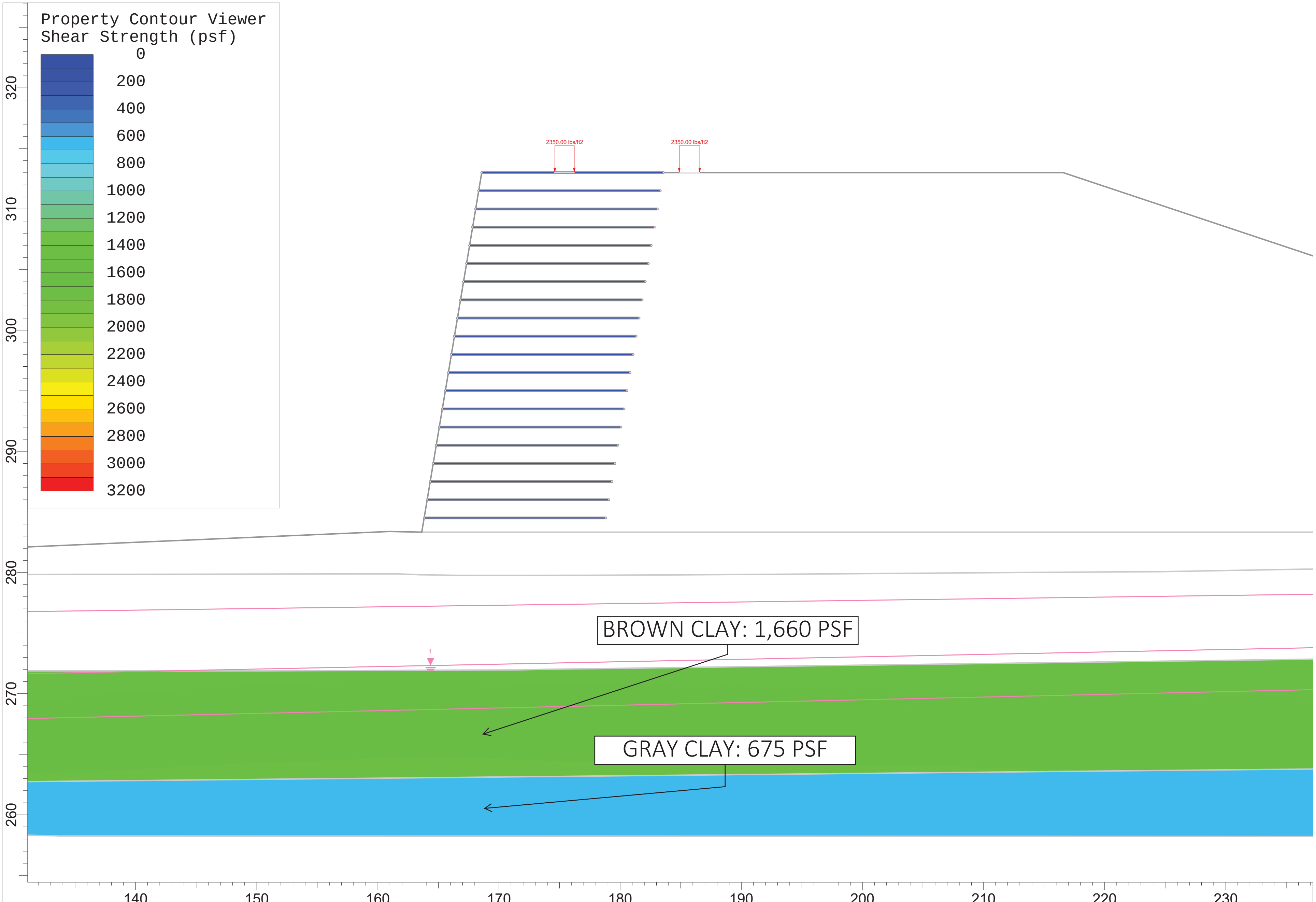
Crossroads Landfill Phase 14			
Punching Shear -- Section III Construction			
Drawn By	A. Rohrman	Company	Geosyntec Consultants
Date	10/7/2019	File Name	2019.10.01 Ph14 III Con ST2.slmd



Geosyntec consultants	Crossroads Landfill Phase 14
	Punching Shear -- Section IV Construction

Drawn By	A. Rohrman	*Company*	Geosyntec Consultants
Date	10/7/2019	*File Name*	2019.10.01 Ph14 IV Con.slmd

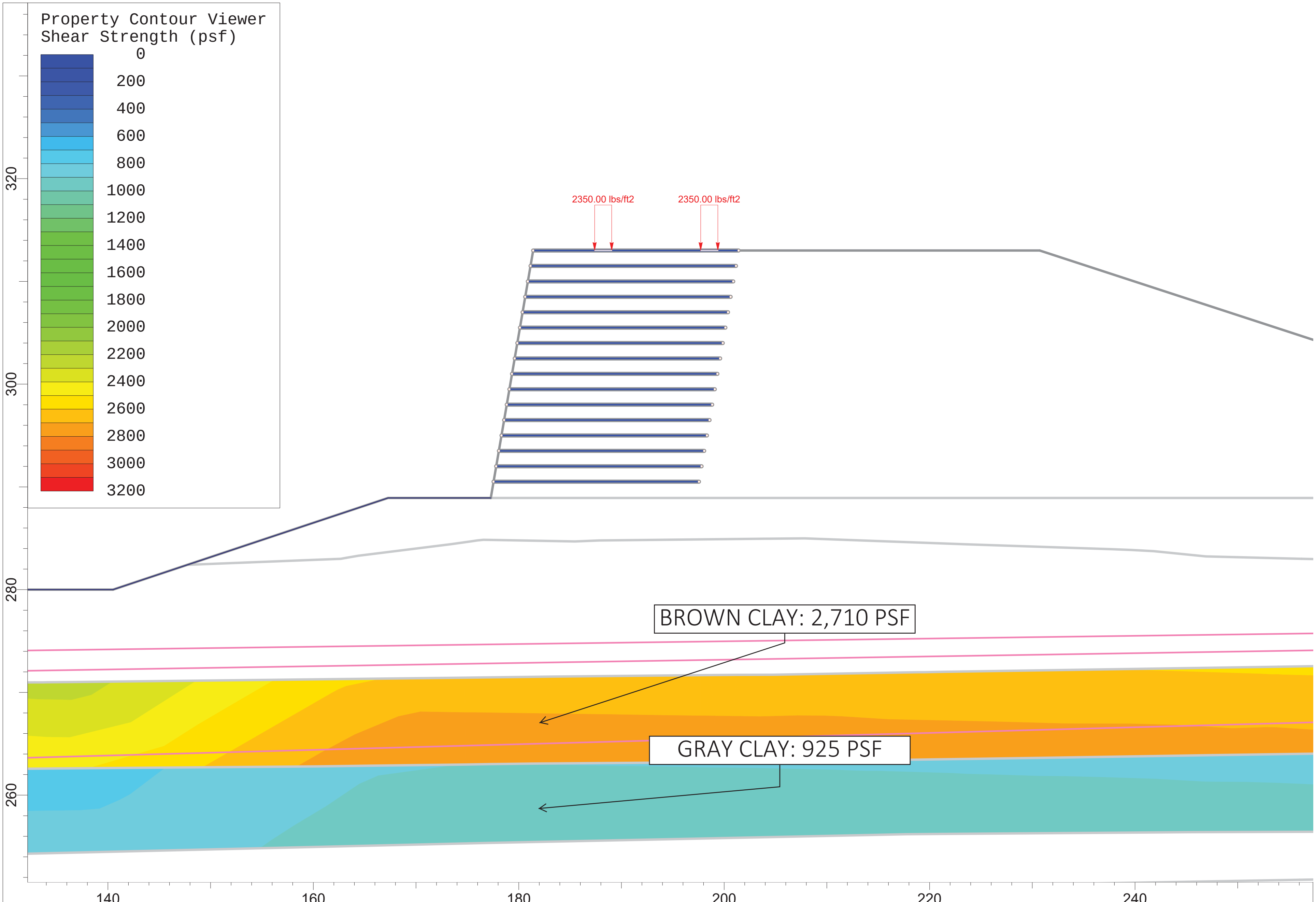
SLIDE 8.026



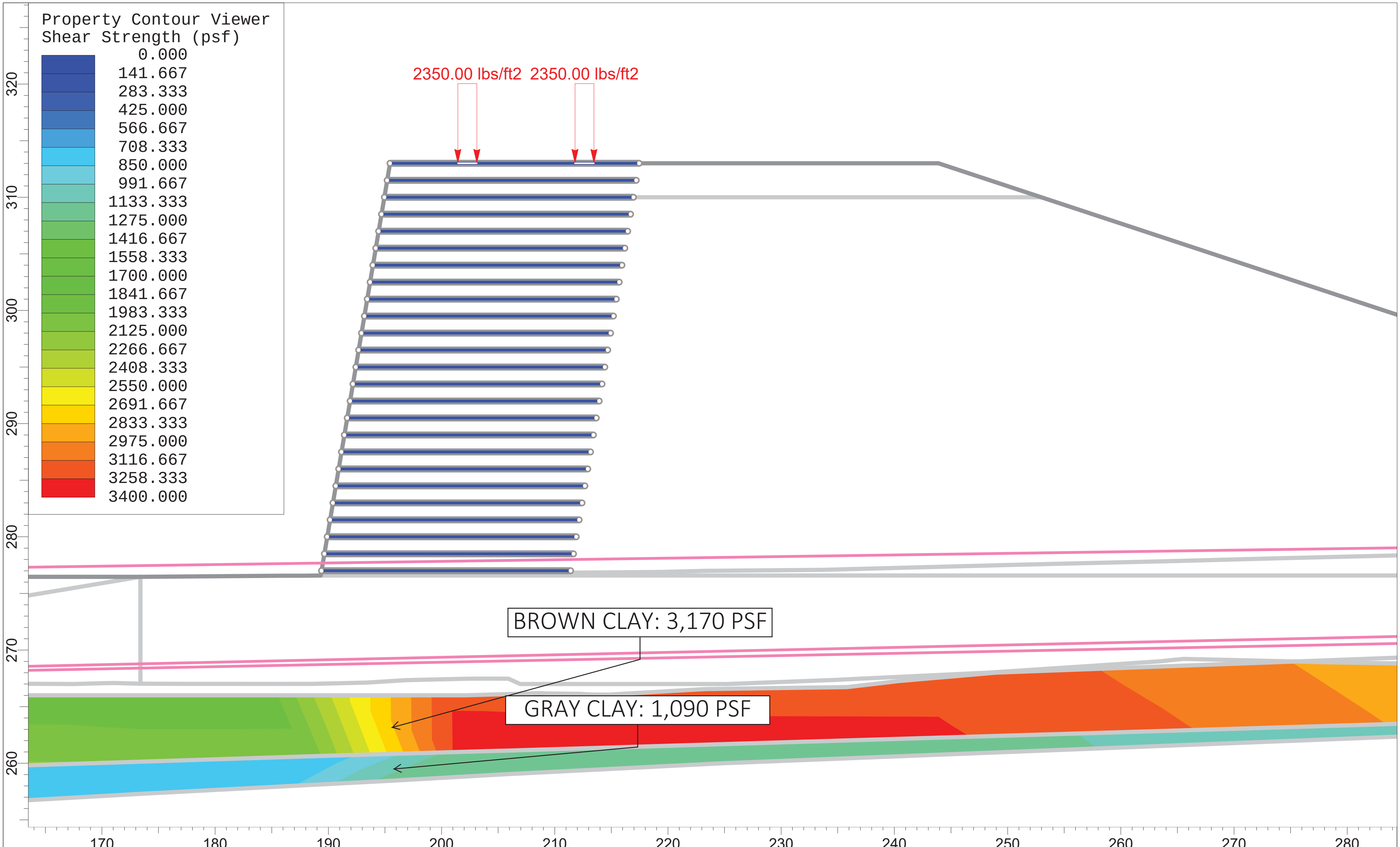
Geosyntec consultants

Crossroads Landfill Phase 14			
Punching Shear -- Section V Construction			
Drawn By	A. Rohrman	*Company*	Geosyntec Consultants
Date	10/7/2019	*File Name*	2019.10.01 Ph14 V Con.slmd

SLIDE 8.026



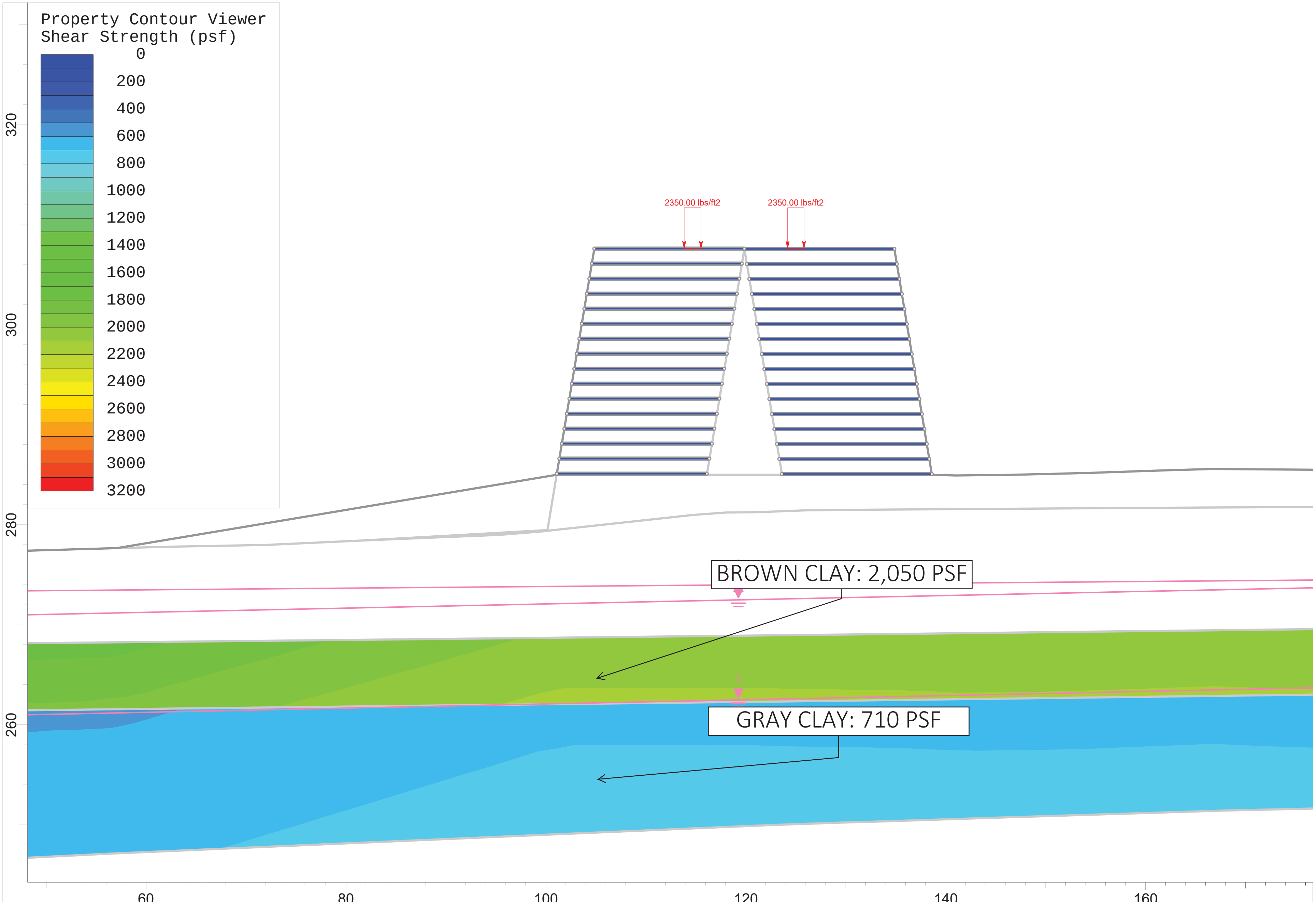
Geosyntec consultants	Crossroads Landfill Phase 14		
	Punching Shear -- Section VI Construction		
	Drawn By: A. Rohrman	Company: Geosyntec Consultants	
SLIDE 8.026	Date: 10/7/2019	File Name: 2019.10.01 Ph14 VI Con.slmd	



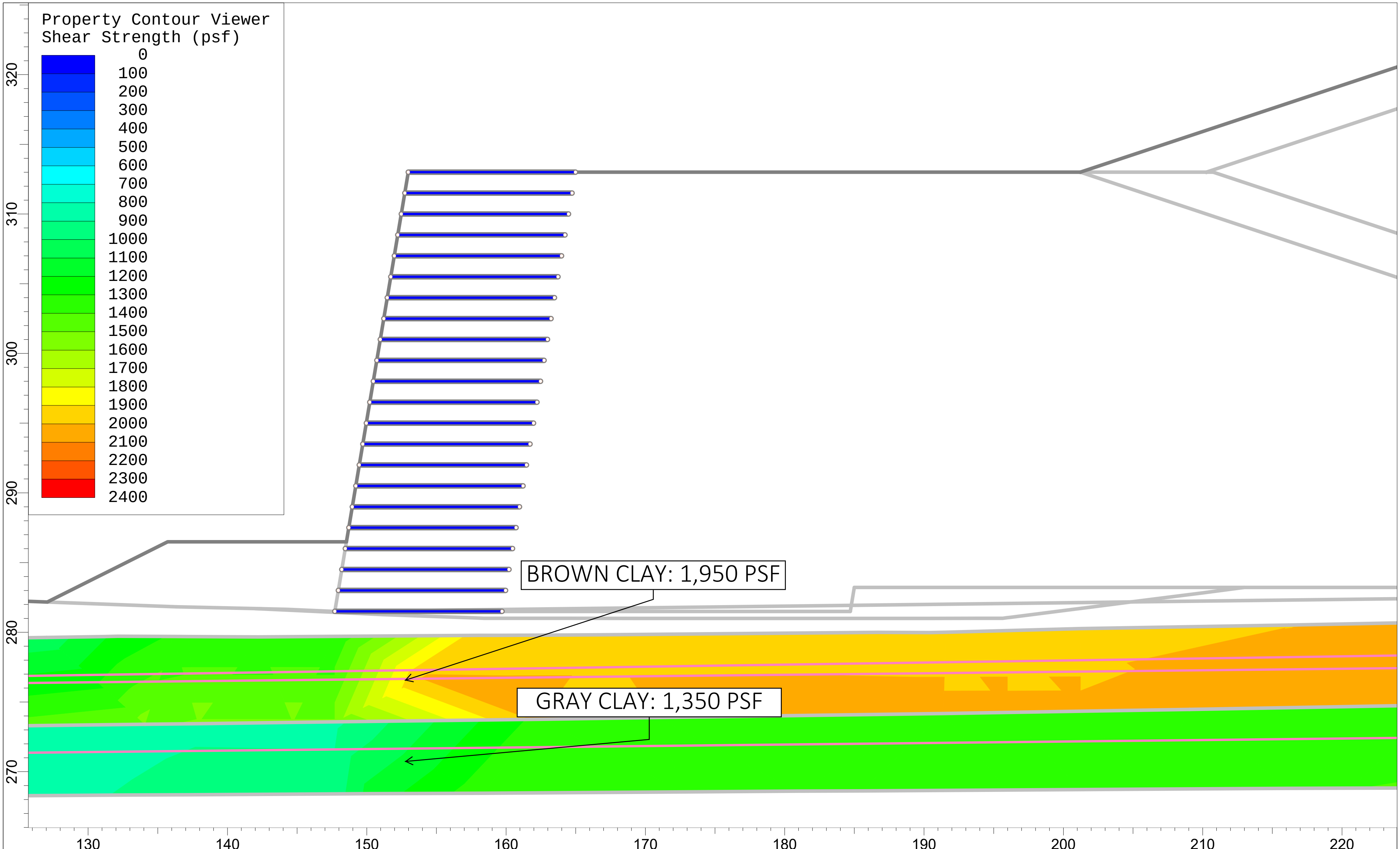
Geosyntec consultants

SLIDE 8.028

Crossroads Landfill Phase 14			
Punching Shear -- Section VII Construction			
Drawn By	A. Rohrman	*Company*	Geosyntec Consultants
Date	10/7/2019	*File Name*	2019.10.10 Ph14 VII Con ST2.slmd



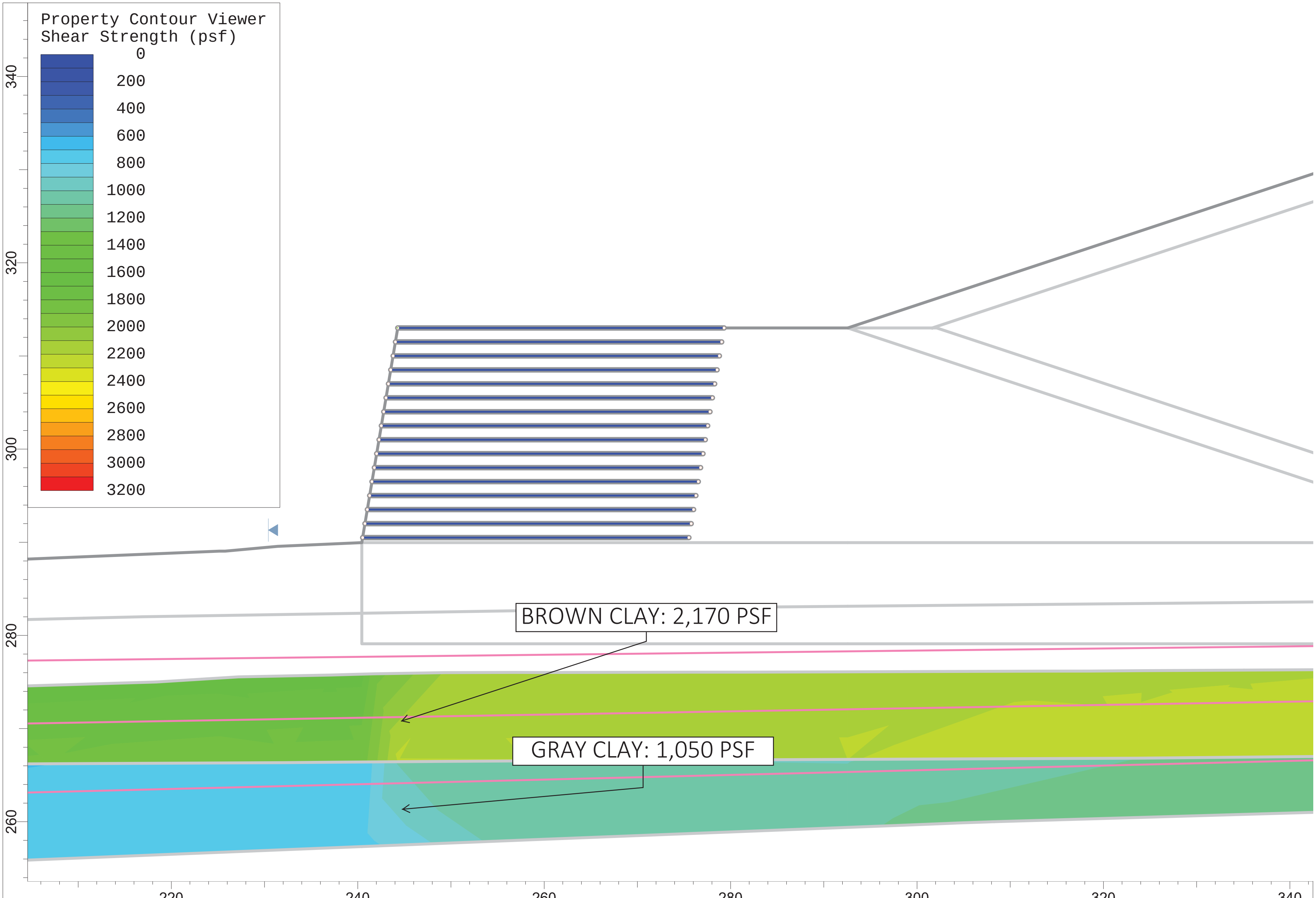
Geosyntec consultants	Crossroads Landfill Phase 14		
	Punching Shear -- Section VIII Construction		
	Drawn By A. Rohrman	*Company* Geosyntec Consultants	
SLIDE 8.026	*Date* 10/7/2019	*File Name* 2019.10.01 Ph14 VIII Con.slmd	



Geosyntec consultants

SLIDE 8.028

Crossroads Landfill Phase 14	
Punching Shear -- Section III Post-Closure	
Drawn By A. Rohrman	*Company* Geosyntec Consultants
Date 10/7/2019	*File Name* 2019.10.01 Ph14 III PC.slmd



Geosyntec consultants	Crossroads Landfill Phase 14		
	Punching Shear -- Section IV Post-Closure		
	Drawn By: A. Rohrman	Company: Geosyntec Consultants	
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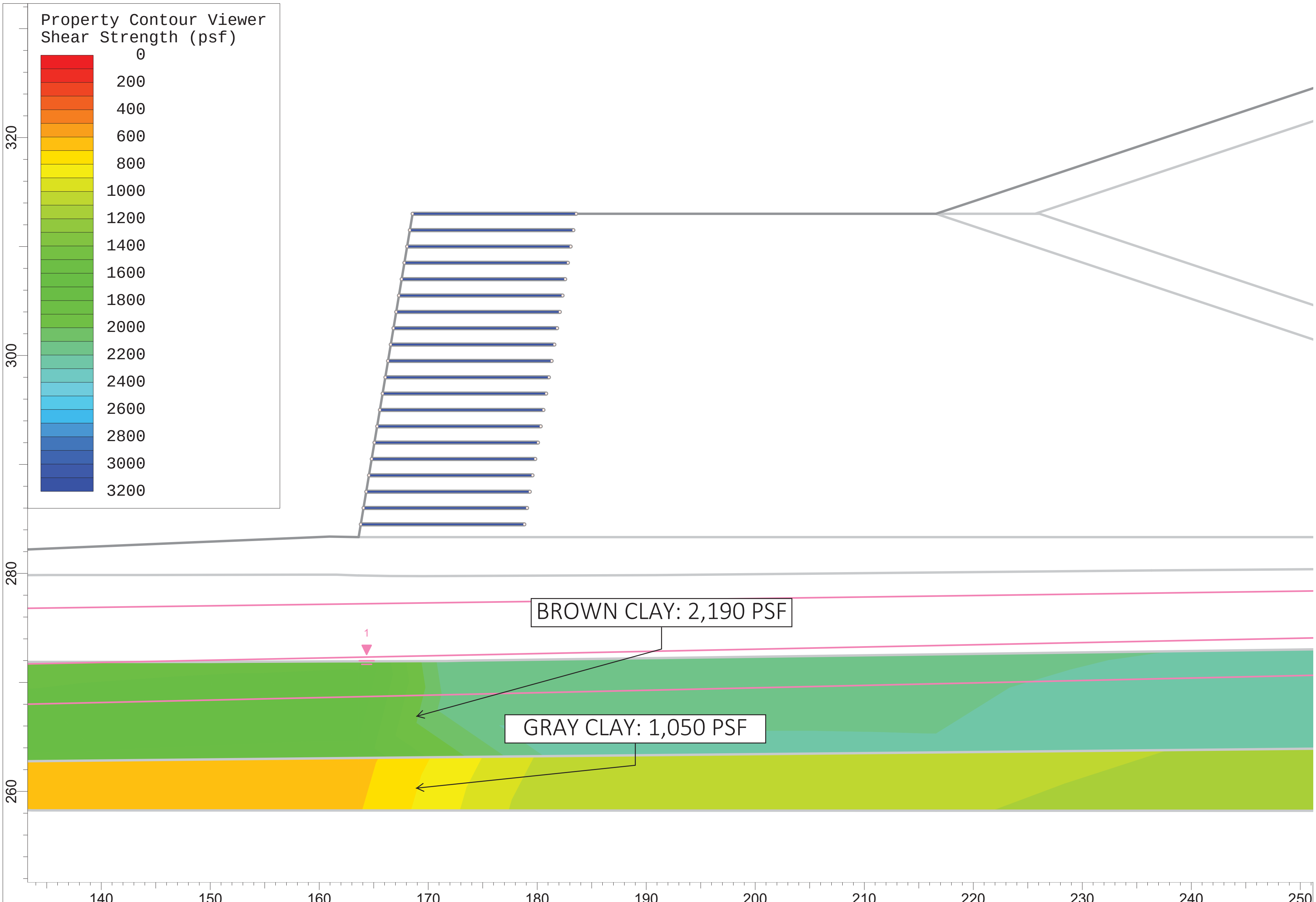

Geosyntec consultants	Crossroads Landfill Phase 14		
	Punching Shear -- Section V Post-Closure		
	Drawn By: A. Rohrman	Company: Geosyntec Consultants	
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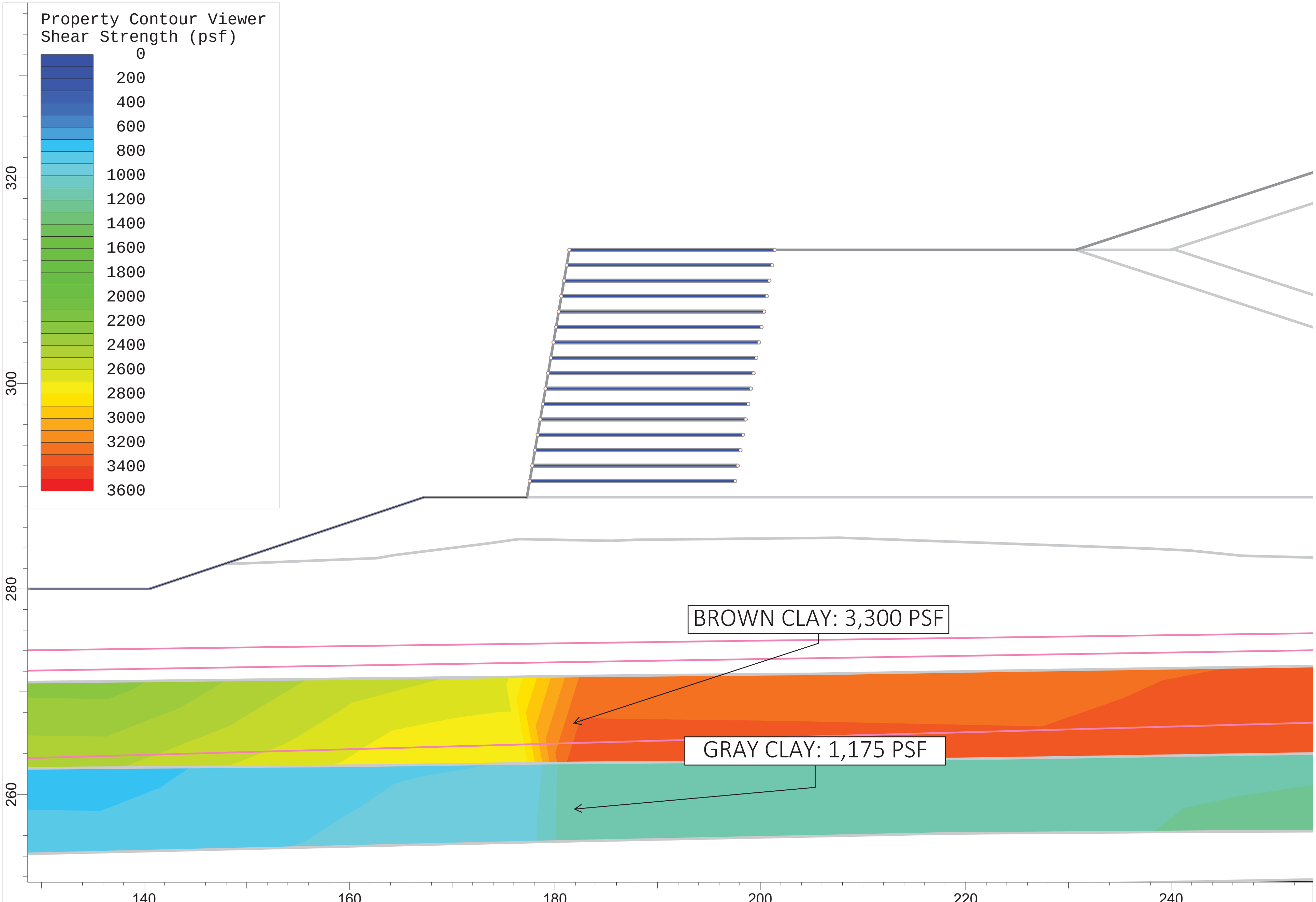
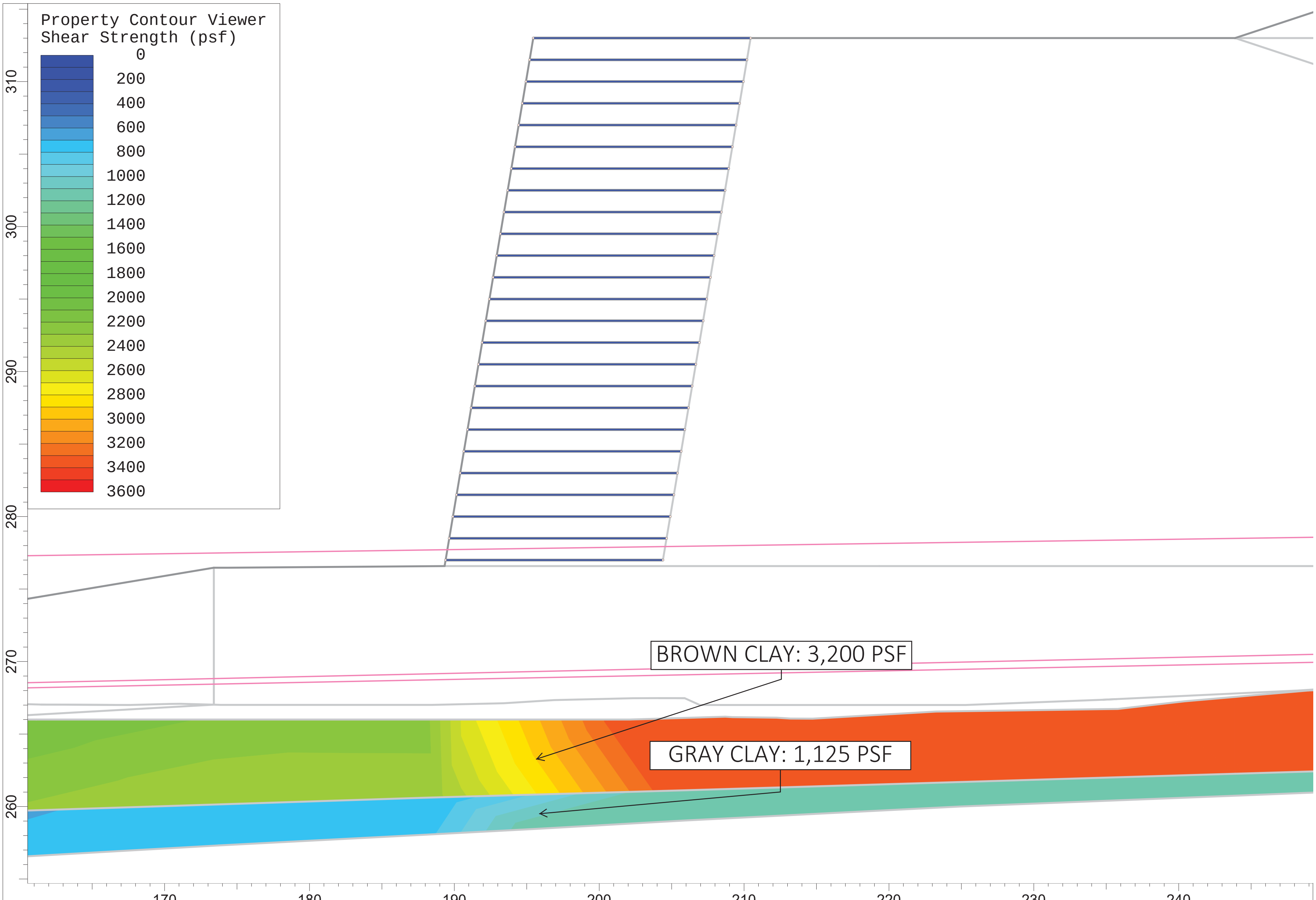


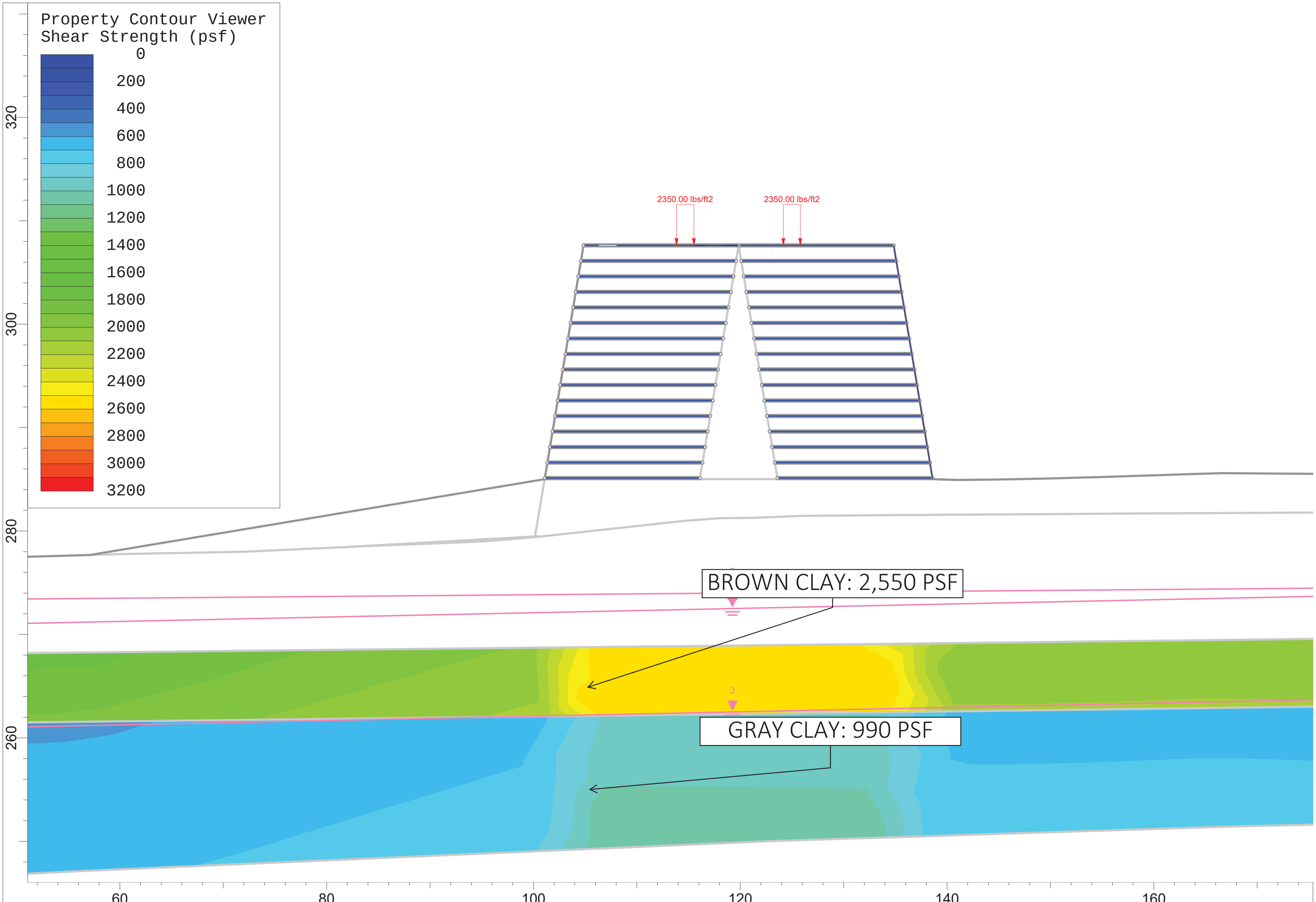
Geosyntec consultants	Crossroads Landfill Phase 14		
	Punching Shear -- Section VI Post-Closure		
	Drawn By A. Rohrman		*Company* Geosyntec Consultants
SLIDE 8.026	*Date* 10/7/2019		*File Name* 2019.10.01 Ph14 VI PC.slmd



Geosyntec consultants

Crossroads Landfill Phase 14			
Punching Shear -- Section VII Post-Closure			
Drawn By	A. Rohrman	Company	Geosyntec Consultants
Date	10/7/2019	File Name	2019.10.01 Ph14 VII PC.slmd

SLIDE 8.026



Geosyntec consultants	Crossroads Landfill Phase 14		
	Punching Shear -- Section VIII Post-Closure		
	Drawn By A. Rohrman	*Company* Geosyntec Consultants	
SLIDE 8.026	*Date* 10/7/2019	*File Name* 2019.10.01 Ph14 VIII PC.slmd	

APPENDIX IV(c)(iii)
Veneer Stability

Written by: A. Rohrman Date: 8/19/2019 Reviewed by: N. Yafrate/ M. Nolden Date: 9/23/2019

Client: WMDSM Project: Phase 14 Permit Project/Proposal No.: BE0232C Phase No.: 02

VENEER STABILITY ANALYSIS
CROSSROADS LANDFILL PHASE 14

PURPOSE

The purpose of this calculation package is to evaluate the veneer stability of the proposed Phase 14 liner and final cover systems at Waste Management Disposal Services of Maine, Inc.'s (WMDSM) Crossroads Landfill in Norridgewock, Maine. Analyses were performed for construction and post-closure conditions, as described below.

- The Construction Condition represents the liner system and slope geometry immediately following placement of the 24-inch leachate collection drainage sand, but prior to waste placement.
- The Post-Closure Condition represents the final cover system materials and waste slope geometry at design final grades.

LINER AND FINAL COVER CONFIGURATION

Liner System

The proposed liner system for Phase 14 will consist of the following components, from top to bottom:

- 24-in thick drainage sand layer;
- 200-mil thick double-sided geocomposite;
- 60-mil thick high-density polyethylene (HDPE) geomembrane;
- 250-mil thick geosynthetic clay liner (GCL); and
- 12-in thick compacted clay layer.

A representative geometry of a 42-ft high slope inclined at a three horizontal to one vertical (3H:1V) slope was selected to evaluate veneer stability of the liner. This geometry represents the highest slope on which the liner will be placed. The location of this slope section is shown on Figure 1.

Final Cover System

The proposed final cover system for Phase 14 will consist of the following components, from top to bottom:

- 6-in thick layer of vegetated topsoil;
- 12-inch thick layer of protective soil;
- 250-mil thick double-sided geocomposite drainage layer;

Written by:	A. Rohrman	Date:	8/19/2019	Reviewed by:	N. Yafrate/ M. Nolden	Date:	9/23/2019
Client:	WMDSM	Project:	Phase 14 Permit	Project/Proposal No.:	BE0232C	Phase No.:	02

- 40-mil thick HDPE textured geomembrane;
- 250-mil thick GCL; and
- 6-in thick compacted soil layer.

The representative final cover system slope geometry used in the analysis is a 467-ft long slope inclined at 3H:1V, which represents the maximum 147-ft high waste slope with no benches. The location of this slope section is shown on Figure 2.

METHOD OF ANALYSIS

Static and seismic veneer stability analysis was performed using methods published by Giroud, et al. (1995) and from Bonaparte et al. (2004), respectively. Back calculations were performed to evaluate the required (i.e., minimum allowable) interface friction angle needed to achieve the target factors of safety (FS) for the slope geometry considered. Details of the analysis are presented in Attachment 1.

Static Stability

Static veneer stability was evaluated using the sliding wedge failure analysis method outlined by Giroud et al. (1995) for geosynthetic-soil layered systems along a critical interface of a finite slope length. The minimum interface friction angle (internal friction angle along slip surface) required to achieve the target factor of safety was calculated using the following equation:

$$FS = \lambda \frac{\tan\delta}{\tan\beta} + \frac{\gamma_t(t - t_w^*) + \gamma_b t_w^*}{\gamma_t(t - t_w) + \gamma_{sat} t_w} \frac{t}{h} \frac{\sin\phi}{2\sin\beta\cos\beta\cos(\beta+\phi)} + \frac{{a_i}/{\sin\beta}}{\gamma_t(t - t_w) + \gamma_{sat} t_w} + \frac{{ct}/{h}}{\gamma_t(t - t_w) + \gamma_{sat} t_w} \frac{\cos\phi}{\sin\beta\cos(\beta+\phi)} + \frac{{T}/{h}}{\gamma_t(t - t_w) + \gamma_{sat} t_w} \quad (1)$$

where:

FS = factor of safety;

λ = $\frac{\gamma_t(t-t_w)+\gamma_b t_w}{\gamma_t(t-t_w)+\gamma_{sat} t_w}$ for critical surface above the geomembrane;

λ = 1 for critical surface below the geomembrane;

γ_t = total unit weight of soil (pounds per cubic foot [pcf]);

Written by: A. Rohrman Date: 8/19/2019 Reviewed by: N. Yafrate/ M. Nolden Date: 9/23/2019

Client: WMDSM Project: Phase 14 Permit Project/Proposal No.: BE0232C Phase No.: 02

γ_b = buoyant unit weight of soil (pcf);

γ_{sat} = saturated unit weight of soil (pcf);

δ = interface friction angle along slip surface (degrees);

β = slope angle (degrees);

a = interface adhesion (pounds per square foot [psf]);

t = thickness of soil layer (feet [ft]);

t_w = thickness of water flow along slope (ft);

t_w^* = thickness of water flow in toe of slope (ft);

h = height of slope (ft);

ϕ = internal friction angle of soil above critical surface (degrees);

c = cohesion of soil above critical surface (psf); and

T = tension in geosynthetics (pounds per foot [lb/ft]).

For the analysis of the liner and final cover systems, the interface adhesion (a) was assumed to be zero. No tension (T) was included in the geosynthetics since they are not intended to be reinforcing geosynthetic components of either system.

Seismic Stability

Seismic veneer stability of the final cover system was evaluated for the case of a two-part wedge sliding along a critical interface in a finite slope length. An approximate solution for sliding of the two-part wedge for seismic stability analysis, the pseudo-static approach (Bonaparte et al. 2004), was used as presented below. The method assumes that there is a distinct critical slip surface within the liner and within the final cover system.

$$FS = \frac{A}{B}\cdot tan\delta + \frac{a_i}{B\cdot\gamma_t\cdot t} + \frac{t}{2h}\cdot\left(\frac{sin\beta\cdot tan\phi_s}{1-\frac{B}{A}\cdot tan\phi_s}\right)\cdot\left(\frac{1+k_h^2}{A\cdot B}\right)^2 + \frac{c_s}{\gamma_t\cdot h} \cdot\left(\frac{sin\beta}{1-\frac{B}{A}\cdot tan\phi_s}\right)\cdot\left(\frac{1+k_h^2}{A\cdot B}\right) + \frac{\frac{T}{h}\cdot sin\beta}{B\cdot\gamma_t\cdot t} \quad (2)$$

where

FS = Factor of safety;

A = Dimensionless parameter, given by A = cosβ – $k_h$sinβ;

B = Dimensionless parameter, given by B = sinβ + $k_h$cosβ;

k_h = Seismic coefficient;

δ = Angle of interface friction for the critical surface;

γ_t = Total unit weight of soil (pcf);

β = Slope angle (degrees);

a_i = Interface adhesion (psf);

t = Thickness of soil layer (ft);

h = Height of slope (ft);

ϕ_s = Internal friction angle of soil above critical surface (degrees);

c_s = Cohesion of soil above critical surface (psf); and

T = Tension in geosynthetics.

As described above for the static analysis, the interface adhesion (a_i) was assumed to be zero. No tension (T) was included in the geosynthetics since they are not intended to be reinforcing geosynthetic components of either system.

Target Stability Criteria

This analysis was performed pursuant to Maine Solid Waste Management Rule (MSWMR) Ch. 401 Section 2.F(1) which requires assessment of static and seismic slope stability as follows:

- Construction Conditions:
    - Static factor of safety (FS) no less than 1.3; and
    - Seismic (pseudo-static) for the 475-year seismic event FS no less than 1.1 or calculated displacement of the landfill resulting from the design earthquake no greater than 6 to 12 inches.
- Post-Closure Conditions:
    - Static FS no less than 1.5; and
    - Seismic (pseudo-static) for the 2,500-year seismic event FS no less than 1.0 or a calculated displacement of the landfill resulting from the design earthquake no greater than 6 to 12 inches.

Written by:	A. Rohrman	Date:	8/19/2019	Reviewed by:	N. Yafrate/ M. Nolden	Date:	9/23/2019
Client:	WMDSM	Project:	Phase 14 Permit	Project/Proposal No.:	BE0232C	Phase No.:	02

SELECTED PARAMETERS

The unit weight and strength of the materials in the liner and cover systems are selected to be consistent with those used in the Crossroads Phase 14 *Stability Analysis*, which is presented in Volume IV of the Permit Application. These properties are also presented in Attachment 1. The analysis assumes that the liquid (leachate) thickness on slopes does not exceed the thickness of the geocomposite, since limiting the liquid layer to the drainage layer thickness is a best practice in the design of liner and cover systems. The thickness of leachate at the toe of the liner slopes is taken as one foot (12 inches), which is consistent with the maximum allowable head on the base liner.

RESULTS

Interface friction angles of 23.0° and 23.1° were back-calculated to achieve the target factors of safety for the liner system under static and seismic conditions, respectively.

Interface friction angles of 26.5° and 24.5° were back-calculated to achieve the target factors of safety for the final cover system under static and seismic conditions, respectively.

CONCLUSIONS

The minimum shear strength represented by an interface friction angle of 23.1° for the liner materials will meet the required factor of safety under static or seismic conditions. The minimum shear strength represented by an interface friction angle of 26.5° for the cover system materials will meet the required factor of safety under static or seismic conditions.

Based on Geosyntec's experience, these required shear strengths can be met with commercially available geosynthetic products and soils. These minimum shear strength requirements will be included in the specifications for Phase 14 construction, as demonstrated by pre-qualification tests in the contractor's submittals and then confirmed by quality assurance (QA) testing of the materials proposed for the individual cells.

Written by:	A. Rohrman	Date:	8/19/2019	Reviewed by:	N. Yafrate/ M. Nolden	Date:	9/23/2019
Client:	WMDSM	Project:	Phase 14 Permit	Project/Proposal No.:	BE0232C	Phase No.:	02

REFERENCES

Bonaparte, R., Gross, B., Daniel, D.E., Koerner, R.M., and Dwyer, S.F. (2004). “Draft Technical Guidance for RCRA/CERCLA Final Covers,” U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, EPA 540-R-04-007, Washington D.C.

Giroud, J.P., Bachus, R.C., and Bonaparte, R. (1995). Influence of Water Flow on the Stability of Geosynthetic-Soil Layered Systems on Slopes, Industrial Fabrics Association International, Geosynthetics International, Vol. 2, No. 6, pp. 1149-1180.

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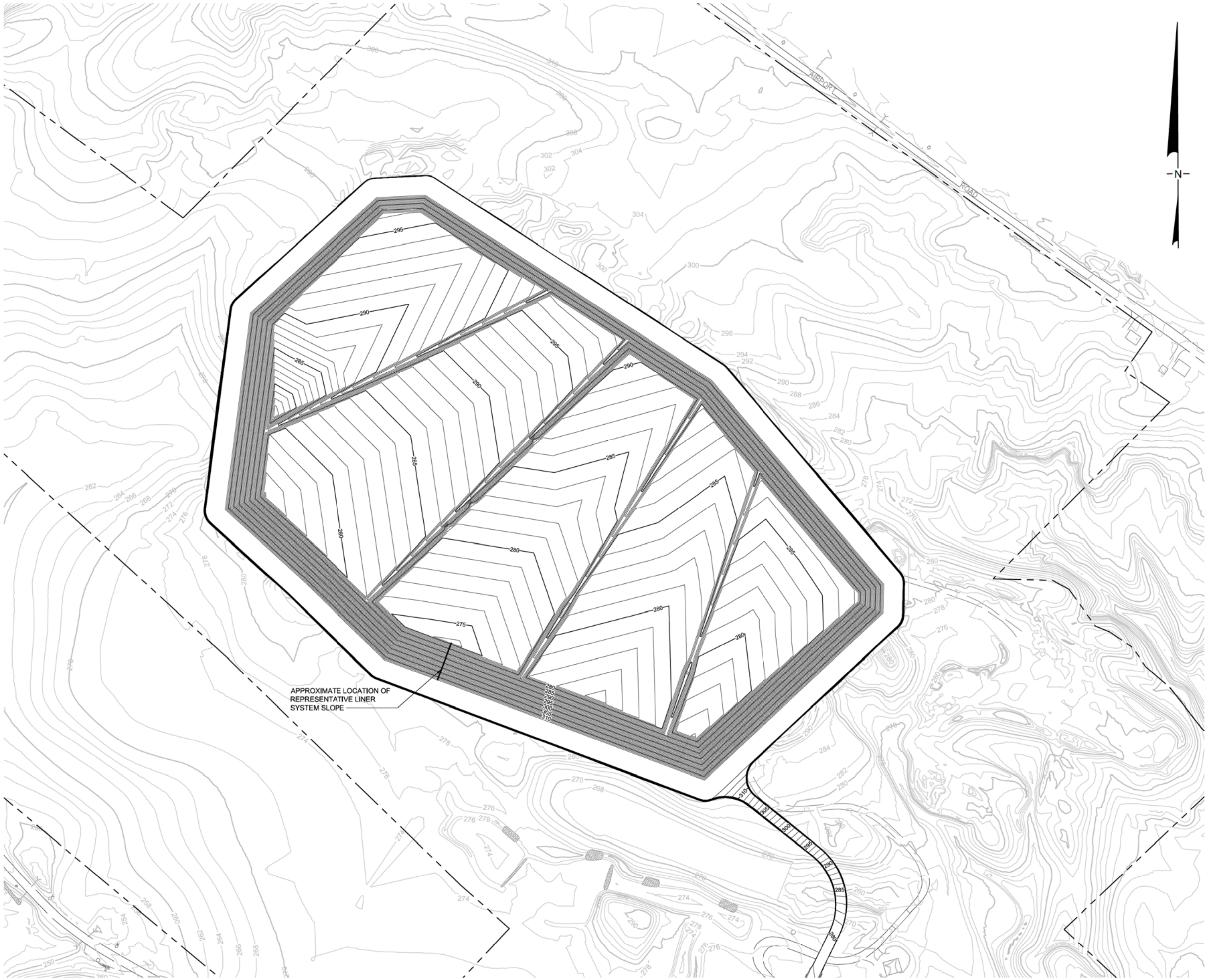
FIGURES



N

0 150'
SCALE IN FEET

LEGEND

EXISTING GROUND SURFACE (NOTE 1)

PROPOSED GRADES

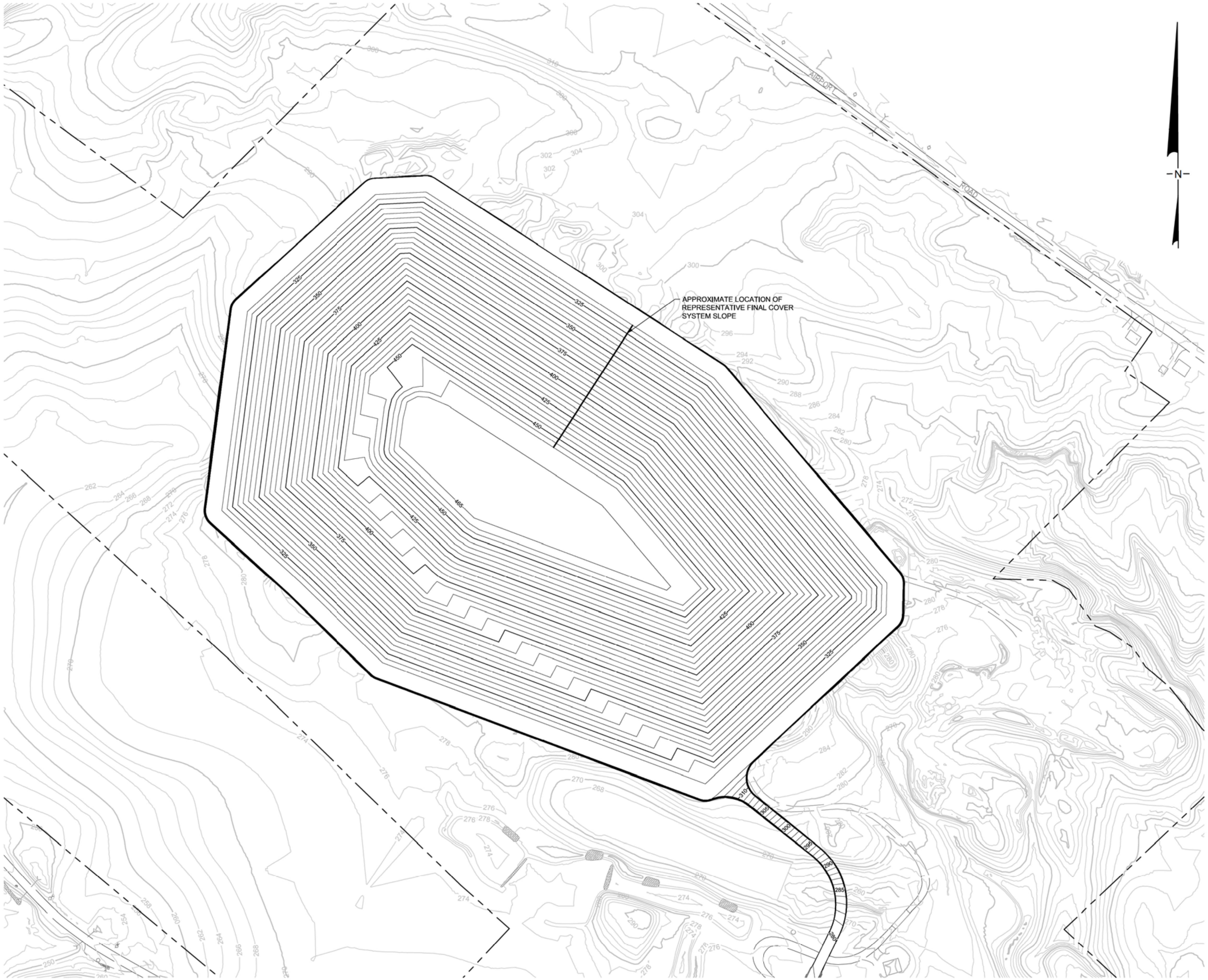
PROPERTY BOUNDARY

NOTES:

1. EXISTING GROUND SURFACE AND FEATURES OBTAINED FROM TOPOGRAPHIC SURVEYS, DATED NOV 2017, AND SEPT 2018, PROVIDED BY BOYNTON & PICKETT.
2. HORIZONTAL DATUM IS NORTH AMERICAN DATUM OF 1983 (NAD 83) MAINE WEST STATE PLAN. VERTICAL DATUM IS NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88). PROPERTY BOUNDARY SURVEYED IN UTM SCALED TO NAD 83.
3. PROPOSED GRADES REPRESENT TOP OF GEOMEMBRANE LINER, TOP OF MSE BERM AND ACCESS ROAD.

VENEER STABILITY SECTION LOCATION PHASE 14 WASTE MANAGEMENT DISPOSAL SERVICES OF MAIN, INC. CROSSROADS LANDFILL NORRIDGEWOCK, MAINE	
Geosyntec consultants	FIGURE 1
PROJECT NO: BE0232	OCTOBER 2019

T:\PROJECTS_CADD\C\CROSSROADS LANDFILL\PHASE 14 EXPANSION\PERMIT\FIGURES\2019.09.25 VENEER STABIL SECTS



N

LEGEND

EXISTING GROUND SURFACE (NOTE 1)

PROPOSED GRADES

PROPERTY BOUNDARY

0 150'
SCALE IN FEET

NOTES:

1. EXISTING GROUND SURFACE AND FEATURES OBTAINED FROM TOPOGRAPHIC SURVEYS, DATED NOV 2017, AND SEPT 2018, PROVIDED BY BOYNTON & PICKETT.

2. HORIZONTAL DATUM IS NORTH AMERICAN DATUM OF 1983 (NAD 83) MAINE WEST STATE PLAN. VERTICAL DATUM IS NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88). PROPERTY BOUNDARY SURVEYED IN UTM SCALED TO NAD 83.

3. PROPOSED GRADES REPRESENT TOP OF COVER, TOP OF MSE BERM AND ACCESS ROAD.

VENEER STABILITY SECTION LOCATION
PHASE 14

WASTE MANAGEMENT DISPOSAL SERVICES OF MAIN, INC.
CROSSROADS LANDFILL
NORRIDGEWOCK, MAINE

Geosyntec consultants

FIGURE 2

PROJECT NO: BE0232

OCTOBER 2019

T:\PROJECTS_CADD\C\CROSSROADS LANDFILL\PHASE 14 EXPANSION\PERMIT\FIGURES\2019.09.25 VENEER STABIL SECTS

ATTACHMENT 1
Veneer Stability Calculations

Veneer Stability Analysis - Liner System - Static
Crossroads Landfill Phase 14

Material Property	Value
Total Unit Weight (Slope), $\gamma_{t,s}$ (pcf)	120
Saturated Unit Weight (Slope), $\gamma_{sat,s}$ (pcf)	125
Buoyant Unit Weight (Slope), $\gamma_{b,s}$ (pcf)	62.6
Total Unit Weight (Toe), $\gamma_{t,t}$ (pcf)	120
Saturated Unit Weight (Toe), $\gamma_{sat,t}$ (pcf)	125
Buoyant Unit Weight (Toe), $\gamma_{b,t}$ (pcf)	62.6
Friction Angle (Toe), ϕ (deg)	30
Friction Angle (Toe), ϕ (rad)	0.52
Cohesion (Toe), c (psf)	0.0
Interface Friction Angle, δ (deg)	23.0
Interface Friction Angle, δ (rad)	0.40
Adhesion, a (psf)	0.0
Tension, T (lb/ft)	0.0

Slope Geometry	
Data	**Value**
Protective Soil Thickness, t (ft)	1.5
Water Depth along Slope, t_w (ft)	0.02
Water Depth at Toe, t_w* (ft)	1.0
Slope Angle, β (deg)	18.4
Slope Angle, β (rad)	0.32
Slope Height, h (ft)	42

Factor of Safety	
Data	**Value**
λ (Above Geomembrane)	0.993
λ (Below Geomembrane)	1.0
Factor of Safety	1.3

Veneer Stability Analysis - Liner System - Seismic
Crossroads Landfill Phase 14

Material Property	Value
Total Unit Weight of Soil, $\gamma_{t,s}$ (pcf)	120
Friction Angle of Soil, ϕ_s (deg)	30
Friction Angle of Soil, ϕ_s (rad)	0.524
Cohesion of Soil, c_s (psf)	0.0
Interface Friction Angle, δ (deg)	23.1
Interface Friction Angle, δ (rad)	0.40
Interface Adhesion, a_i (psf)	0.0
Tension, T (lb/ft)	0.0

Slope Geometry	
Data	**Value**
Soil Thickness, t (ft)	2.0
Slope Angle, β (deg)	18.4
Slope Angle, β (rad)	0.32
Slope Height, h (ft)	42

Factor of Safety	
Data	**Value**
k_h, psedo-static seismic coefficient (dimensionless)	0.05
A, (dimensionless)	0.93
B, (dimensionless)	0.36
Factor of Safety	1.1

Veneer Stability Analysis - Final Cover System - Static
Crossroads Landfill Phase 14

Material Property	Value
Total Unit Weight (Slope), $\gamma_{t,s}$ (pcf)	120
Saturated Unit Weight (Slope), $\gamma_{sat,s}$ (pcf)	125
Buoyant Unit Weight (Slope), $\gamma_{b,s}$ (pcf)	62.6
Total Unit Weight (Toe), $\gamma_{t,t}$ (pcf)	120
Saturated Unit Weight (Toe), $\gamma_{sat,t}$ (pcf)	125
Buoyant Unit Weight (Toe), $\gamma_{b,t}$ (pcf)	62.6
Friction Angle (Toe), ϕ (deg)	30
Friction Angle (Toe), ϕ (rad)	0.52
Cohesion (Toe), c (psf)	0.0
Interface Friction Angle, δ (deg)	26.5
Interface Friction Angle, δ (rad)	0.46
Adhesion, a (psf)	0.0
Tension, T (lb/ft)	0.0

Slope Geometry	
Data	**Value**
Protective Soil Thickness, t (ft)	1.5
Water Depth along Slope, t_w (ft)	0.02
Water Depth at Toe, t_w* (ft)	0.02
Slope Angle, β (deg)	18.4
Slope Angle, β (rad)	0.32
Slope Height, h (ft)	147

Factor of Safety	
Data	**Value**
λ (Above Geomembrane)	0.993
λ (Below Geomembrane)	1.0
Factor of Safety	1.5

Veneer Stability Analysis - Final Cover System - Seismic
Crossroads Landfill Phase 14

Material Property	Value
Total Unit Weight of Soil, $\gamma_{t,s}$ (pcf)	120
Friction Angle of Soil, ϕ_s (deg)	30
Friction Angle of Soil, ϕ_s (rad)	0.52
Cohesion of Soil, c_s (psf)	0.0
Interface Friction Angle, δ (deg)	24.5
Interface Friction Angle, δ (rad)	0.43
Interface Adhesion, a_i (psf)	0.0
Tension, T (lb/ft)	0.0

Slope Geometry	
Data	**Value**
Soil Thickness, t (ft)	1.5
Slope Angle, β (deg)	18.4
Slope Angle, β (rad)	0.32
Slope Height, h (ft)	147

Factor of Safety	
Data	**Value**
k_h, psedo-static seismic coefficient (dimensionless)	0.11
A, (dimensionless)	0.92
B, (dimensionless)	0.42
Factor of Safety	1.0

APPENDIX IV(d)
Liner Settlement Calculations

Written by: M. Nolden Date: 8/19/2019 Reviewed by: A.Rohrman/N. Yafrate Date: 8/20/2019
Client: WMDSM Project: Phase 14 Permit Project/Proposal No.: BE0232C Phase No.: 02

LINER SETTLEMENTANALYSIS
CROSSROADS LANDFILL PHASE 14

PURPOSE

The purpose of this calculation package is to evaluate settlement of the Phase 14 liner system at Waste Management Disposal Services of Maine, Inc.'s (WMDSM) Crossroads Landfill in Norridgewock, Maine. Settlement will occur to due to consolidation of the clay foundation soils after load is applied (i.e. weight of the perimeter berm, liner, waste, etc.). The estimated settlements in Phases 14A through 14E were used to evaluate whether there will be sufficient slope in the leachate collection system (LCS) pipe under post closure conditions to maintain positive drainage toward the LCS sumps. The locations of the cross-sections are shown in plan view on Figures 1A and 1B relative to the proposed liner grades and waste grades, respectively.

This calculation package was developed pursuant to the requirements for landfill liner settlement of Maine Solid Waste Rule (MSWR) Ch. 401 Section 2.F(2).

ANALYZED CROSS-SECTIONS

Settlement was calculated on the cross sections and at the locations shown on Figures 1A and 1B. The cross sections are presented in Figures 2A through 2E, which show the subsurface stratigraphy, proposed perimeter berm, liner, and final waste grades for Cells 14A, 14B, 14C, 14D, and 14E, respectively. The sections are located along the leachate collection header pipe for each landfill phase.

The subsurface stratigraphy and groundwater elevations below the landfill used in the analyses are modeled after the Phase 14 subsurface stratigraphy and potentiometric surfaces developed by Golder Associates and provided to Geosyntec as electronic shape files. The data is also presented in Volume III of the Permit Application.

METHOD OF ANALYSIS

Total Settlement

Settlement of the Brown Clay and Gray Clay layers was calculated for a minimum of three points along each cross-section, as shown on Figures 2A through 2E. Differential settlements were calculated for the selected points to evaluate whether positive drainage of leachate will be maintained within the LCS after consolidation of the underlying foundational clay layers.

Settlement was calculated at locations approximately evenly spaced along the alignment, or at points where there is a distinct change in liner slope. The first and last points generally represent the leachate sump and upper end of the proposed LCS pipe corridor. Additional points were also evaluated on Sections C, D, and E, where the clay is significantly thicker and therefore settlement has greater potential to affect the LCS pipe slope.

This analysis considers settlement due to one-dimensional consolidation of the Gray and Brown clay layers underlying the proposed Phase 14. Settlement of the individual clay layers is calculated as the sum of primary and secondary settlement due to consolidation.

Settlement due to the primary consolidation of the clay was estimated using Equation 1 (after Holtz and Kovacs, 1981):

$$S_c = H_0 \times C_{r\varepsilon} \times log\frac{\sigma'_p}{\sigma'_{v0}} + H_0 \times C_{c\varepsilon} \times log\frac{\sigma'_{v0}+\Delta\sigma'_v}{\sigma'_p} \qquad \text{Equation 1}$$

where

S_c = settlement due to primary consolidation of the clay foundation soils (ft);

H_0 = initial thickness of the clay layer being evaluated (ft);

$C_{r\varepsilon}$ = recompression ratio or modified recompression index;

σ'_p = effective preconsolidation stress of the clay as measured in the laboratory (psf);

σ'_{v0} = initial effective vertical stress at the depth being evaluated (psf);

$C_{c\varepsilon}$ = compression ratio or modified compression index; and

$\Delta\sigma'_v$ = change in effective vertical stress at the depth being evaluated (psf).

Where the clay layer being evaluated is overconsolidated and the initial effective vertical stress plus the change in effective vertical stress is less than the preconsolidation stress, settlement due to primary consolidation is calculated using Equation 2:

$$S_c = H_0 \times C_{r\varepsilon} \times log\frac{\sigma'_{v0}+\Delta\sigma'_v}{\sigma'_{v0}} \qquad \text{Equation 2}$$

Settlement due to secondary compression of the clay is estimated using Equation 3 (after Holtz and Kovacs, 1981):

$$S_s = C_{\alpha\varepsilon} \times H_0 \times log\frac{t_2}{t_1} \qquad \text{Equation 3}$$

where

S_s = settlement due to secondary compression of the clay foundation soils (ft);

$C_{\alpha\varepsilon}$ = secondary compression ratio or rate of secondary consolidation;

t_2= time at the end of secondary compression; and

t_1= time at the start of secondary compression.

The secondary compression ratio ($C_{\alpha\varepsilon}$) can be estimated from the ratio of $C_{\alpha\varepsilon}/C_{c\varepsilon}$, which is approximately constant for a variety of soils. A ratio of 0.04 is most commonly used for inorganic silts and clays, and was applied to calculate the secondary compression ratio as shown in Equation 4 (after Terzaghi et al., 1996):

$$C_{\alpha\varepsilon} = 0.04 \times C_{c\varepsilon}$$ Equation 4

The total settlement beneath the Phase 14 liner is taken as the sum of the settlement due to consolidation in each of the clay layers (Equation 5):

$$S_t = S_{gray\ clay} + S_{brown\ clay}$$ Equation 5

Differential Settlement and Tensile Strain

Differential settlement is the settlement of two separate locations relative to one another and is evaluated to determine the change in slope of the LCS corridor due to settlement. Differential settlement (ΔS) is calculated as follows:

$$\Delta S = S_1 - S_2$$ Equation 6

where

S_1 = total settlement at first location; and

S_2 = total settlement at second location.

The change in grade resulting from differential settlement is calculated as follows:

$$\Delta Grade\ (\%) = \left(\frac{\Delta S}{L}\right) \times 100\%$$ Equation 7

where

L = horizontal distance between locations of interest.

The resulting tensile strain in a geomembrane (ε) is calculated using the following equation proposed by Giroud (1977):

$$\varepsilon\ (\%) = \frac{8}{3}\left(\frac{\Delta S}{L}\right)^2 \times 100\%$$ Equation 8

The calculated tensile strain is then compared to the allowable strain of HDPE geomembrane (i.e., 4 to 5 percent) as reported by Berg and Bonaparte (1993).

Settlement Criteria

The calculated total and differential settlements were evaluated relative to the liner settlement requirements of MSWR Ch. 401 Section 2.F(2), which states the following:

An assessment must be made to predict total and differential settlement of landfill liners and leachate management structures. This assessment must include a demonstration that liners and leachate management structures will maintain their integrity and performance at maximum predicted settlements. A plan view showing settlement contours must be submitted when predicted landfill base settlements exceed two feet.

SELECTED PARAMETERS

The parameters used for the settlement analyses, and the specific consolidation tests from which they were taken, are shown in the calculation table included as Attachment 1, including the secondary compression ratios calculated using Equation 4. Preconsolidation stresses, recompression and compression ratios, and unit weights of the clays were estimated from the results of one-dimensional consolidation tests performed on Shelby tube samples collected from the brown and gray clays. Parameters were selected for each settlement point based on the point's proximity to relevant consolidation data (i.e., from the nearest boring with data for the applicable clay type). The relevant consolidation test results are presented in the *Geotechnical Site Assessment Report* in Volume IV of the Permit Application.

The unit weights of the perimeter berm fill, cover soils, waste, and the sandy soils overlying the clay were selected to be consistent with the other analyses performed for the Crossroads Phase 14 design (see *Stability Analyses* in Volume IV of the Permit Application).

Secondary settlement was calculated for a period of thirty years (equivalent to the expected post-closure care period of Phase 14) following a nominal six-month construction and filling period. As such, t_2 and t_1 are taken as 30.5 and 0.5 years, respectively.

RESULTS AND CONCLUSIONS

Settlement of the foundation clay was calculated at the selected 18 locations. The total settlement, post-settlement LCS pipe slopes, and post-settlement liner strains are presented in Table 1. The calculated settlement is between 0.1 feet and 0.7 feet and minimum calculated slope is 0.9 percent. The results indicate that, following primary and secondary settlement under the load of the final waste elevations, the LCS pipe will maintain positive drainage.

Written by:	M. Nolden	Date:	8/19/2019	Reviewed by:	A.Rohrman/N. Yafrate	Date:	8/20/2019
Client:	WMDSM	Project:	Phase 14 Permit	Project/Proposal No.:	BE0232C	Phase No.:	02

The maximum calculated tensile strain in the geomembrane is 0.01 percent, which is less than the long-term allowable strain of HDPE geomembrane (i.e., 4 to 5 percent) as reported by Berg and Bonaparte (1993), and significantly less than the minimum required tensile elongation at yield and break set forth for 60-mil textured geomembrane in the Crossroads site construction specifications.

Written by: M. Nolden Date: 8/19/2019 Reviewed by: A.Rohrman/N. Yafrate Date: 8/20/2019
Client: WMDSM Project: Phase 14 Permit Project/Proposal No.: BE0232C Phase No.: 02

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Giroud, J.P. (1977). Conception de L'etancheite des Ouvrages Hydrauliques par Geomembranes, Proceedings of 1st International Symposium on Plastic and Rubber Waterproofing in Civil Engineering, Vol. 1, Session 3, Paper 13, Liege, Belgium, June (French).

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Terzaghi et al. (1996). Soil mechanics in Engineering Practice. 3rd Edition. Wiley, New York.

TABLE

Table 1. Calculated Settlement, Post-Settlement LCS Pipe Slope, and Liner Strain.

Cell	Point Number	Calculated Total Settlement (ft)	Segment	Calculated Post-Settlement Slope	Calculated Post-Settlement Liner Strain
A	A-1	0.3	A-1:A-2	1.3%	0.00%
	A-2	0.4	A-2:A-3	1.3%	0.00%
	A-3	0.4	-		
B	B-1	0.4	B-1:B-2	1.3%	0.00%
	B-2	0.3	B-2:B-3	1.2%	0.00%
	B-3	0.5	-		
C	C-1	0.6	C-1:C-2	1.9%	0.00%
	C-2	0.6	C-2:C-3	1.4%	0.00%
	C-3	0.7	C-3:C-4	1.2%	0.01%
	C-4	0.3	-		
D	D-1	0.4	D-1:D-2	1.9%	0.00%
	D-2	0.3	D-2:D-3	2.0%	0.00%
	D-3	0.2	D-3:D-4	1.9%	0.00%
	D-4	0.2	-		
E	E-1	0.1	E-1:E-2	4.3%	0.01%
	E-2	0.3	E-2:E-3	1.1%	0.00%
	E-3	0.2	E-3:E-4	0.9%	0.00%
	E-4	0.1	-		

FIGURES

LEGEND

- EXISTING GROUND SURFACE (NOTE 1)
- PROPOSED GRADES
- PROPERTY BOUNDARY
- CPT LOCATION
- BORING LOCATION
- A-1 SETTLEMENT CALCULATION POINT

N

0 150'
SCALE IN FEET

NOTES:

1. EXISTING GROUND SURFACE AND FEATURES OBTAINED FROM TOPOGRAPHIC SURVEYS, DATED NOV 2017, AND SEPT 2018, PROVIDED BY BOYNTON & PICKETT.
2. HORIZONTAL DATUM IS NORTH AMERICAN DATUM OF 1983 (NAD 83) MAINE WEST STATE PLAN. VERTICAL DATUM IS NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88). PROPERTY BOUNDARY SURVEYED IN UTM SCALED TO NAD 83.
3. PROPOSED GRADES REPRESENT TOP OF GEOMEMBRANE LINER, TOP OF MSE BERM AND ACCESS ROAD.

SETTLEMENT CROSS SECTION LOCATIONS
PHASE 14

WASTE MANAGEMENT DISPOSAL SERVICES OF MAINE, INC.
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FIGURE 1

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N

LEGEND

EXISTING GROUND SURFACE (NOTE 1)

PROPOSED GRADES

PROPERTY BOUNDARY

CPT LOCATION

BORING LOCATION

A-1 SETTLEMENT CALCULATION POINT

NOTES:

1. EXISTING GROUND SURFACE AND FEATURES OBTAINED FROM TOPOGRAPHIC SURVEYS, DATED NOV 2017, AND SEPT 2018, PROVIDED BY BOYNTON & PICKETT.
2. HORIZONTAL DATUM IS NORTH AMERICAN DATUM OF 1983 (NAD 83) MAINE WEST STATE PLAN. VERTICAL DATUM IS NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88). PROPERTY BOUNDARY SURVEYED IN UTM SCALED TO NAD 83.
3. PROPOSED GRADES REPRESENT TOP OF COVER, TOP OF MSE BERM AND ACCESS ROAD.

SETTLEMENT CROSS SECTION LOCATIONS
PHASE 14

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FIGURE 2

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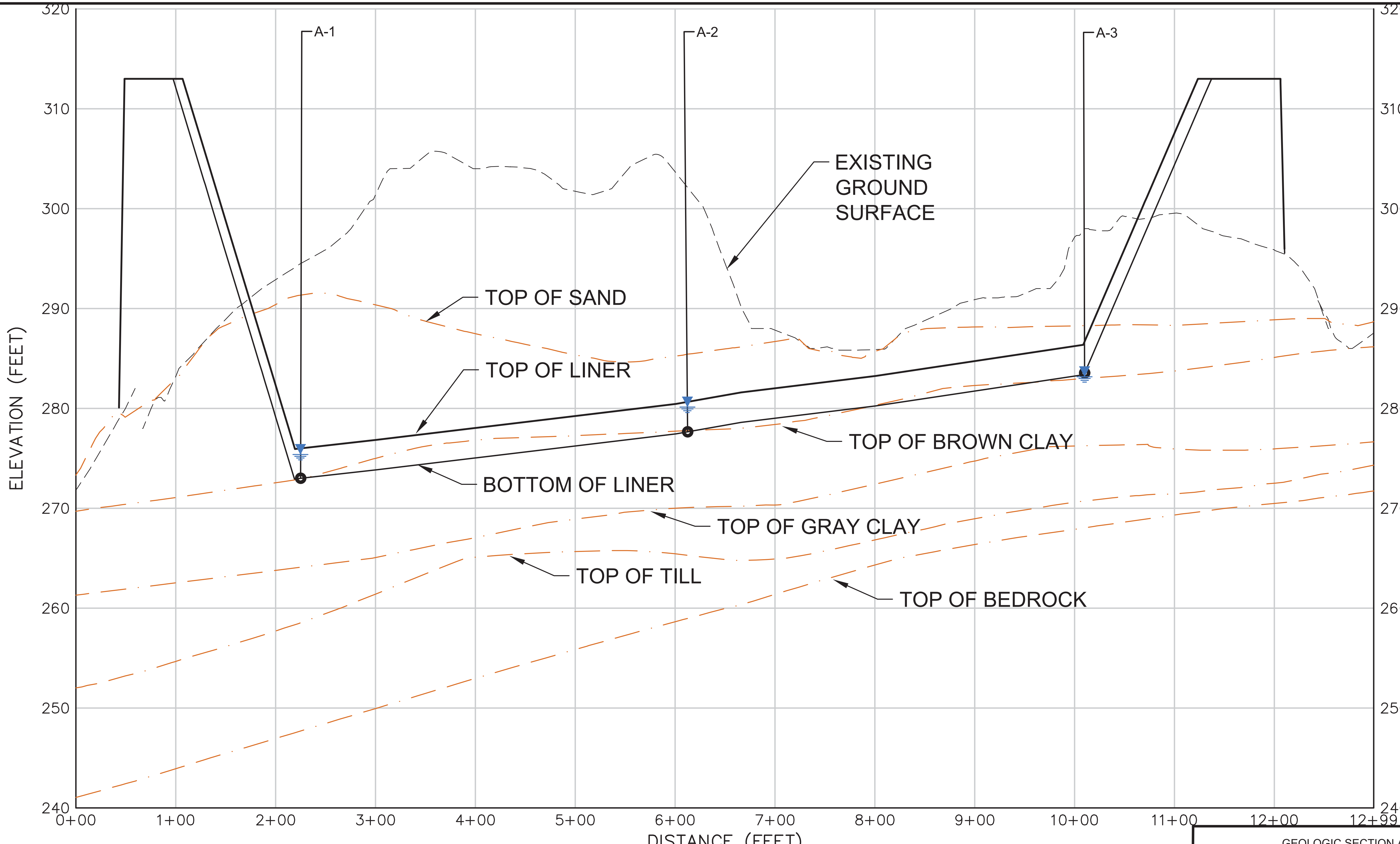

SECTION A

NOTES:

1. EXISTING GROUND SURFACE AND FEATURES OBTAINED FROM TOPOGRAPHIC SURVEYS, DATED NOV 2017, AND SEPT 2018, PROVIDED BY BOYNTON & PICKETT.
2. HORIZONTAL DATUM IS NORTH AMERICAN DATUM OF 1983 (NAD 83) MAINE WEST STATE PLAN. VERTICAL DATUM IS NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88). PROPERTY BOUNDARY SURVEYED IN UTM SCALED TO NAD 83.
3. STRATIGRAPHIC LAYERS PROVIDED IN A SHAPE FILES BY GOLDER ASSOCIATES. DATA BASED ON DATA PRESENTED IN VOLUME III OF THE PHASE 14 PERMIT APPLICATION.

GEOLOGIC SECTION A
PHASE 14

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FIGURE 2A

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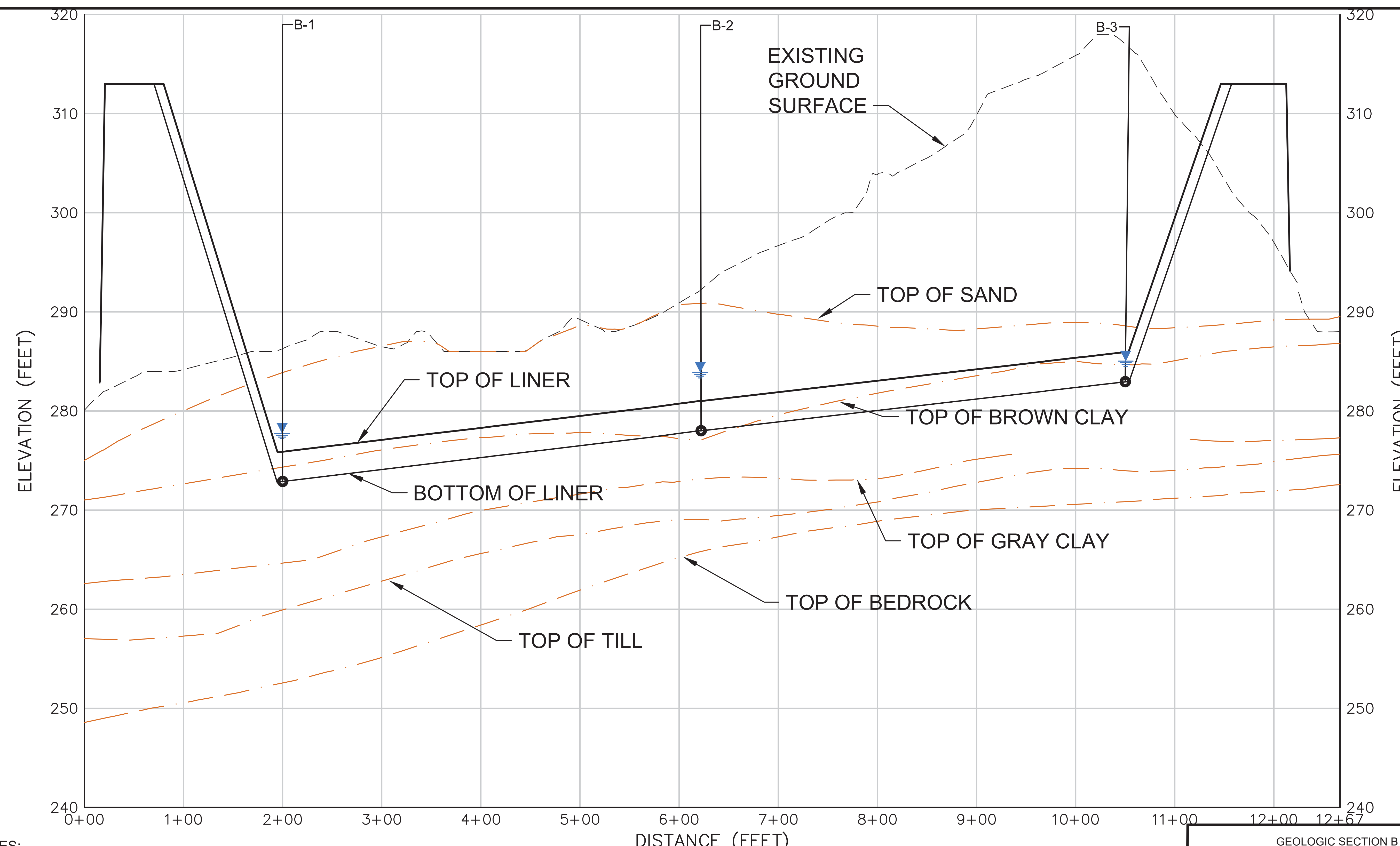

SECTION B

NOTES:

1. EXISTING GROUND SURFACE AND FEATURES OBTAINED FROM TOPOGRAPHIC SURVEYS, DATED NOV 2017, AND SEPT 2018, PROVIDED BY BOYNTON & PICKETT.
2. HORIZONTAL DATUM IS NORTH AMERICAN DATUM OF 1983 (NAD 83) MAINE WEST STATE PLAN. VERTICAL DATUM IS NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88). PROPERTY BOUNDARY SURVEYED IN UTM SCALED TO NAD 83.
3. STRATIGRAPHIC LAYERS PROVIDED IN A SHAPE FILES BY GOLDER ASSOCIATES. DATA BASED ON DATA PRESENTED IN VOLUME III OF THE PHASE 14 PERMIT APPLICATION.

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GEOLOGIC SECTION B
PHASE 14

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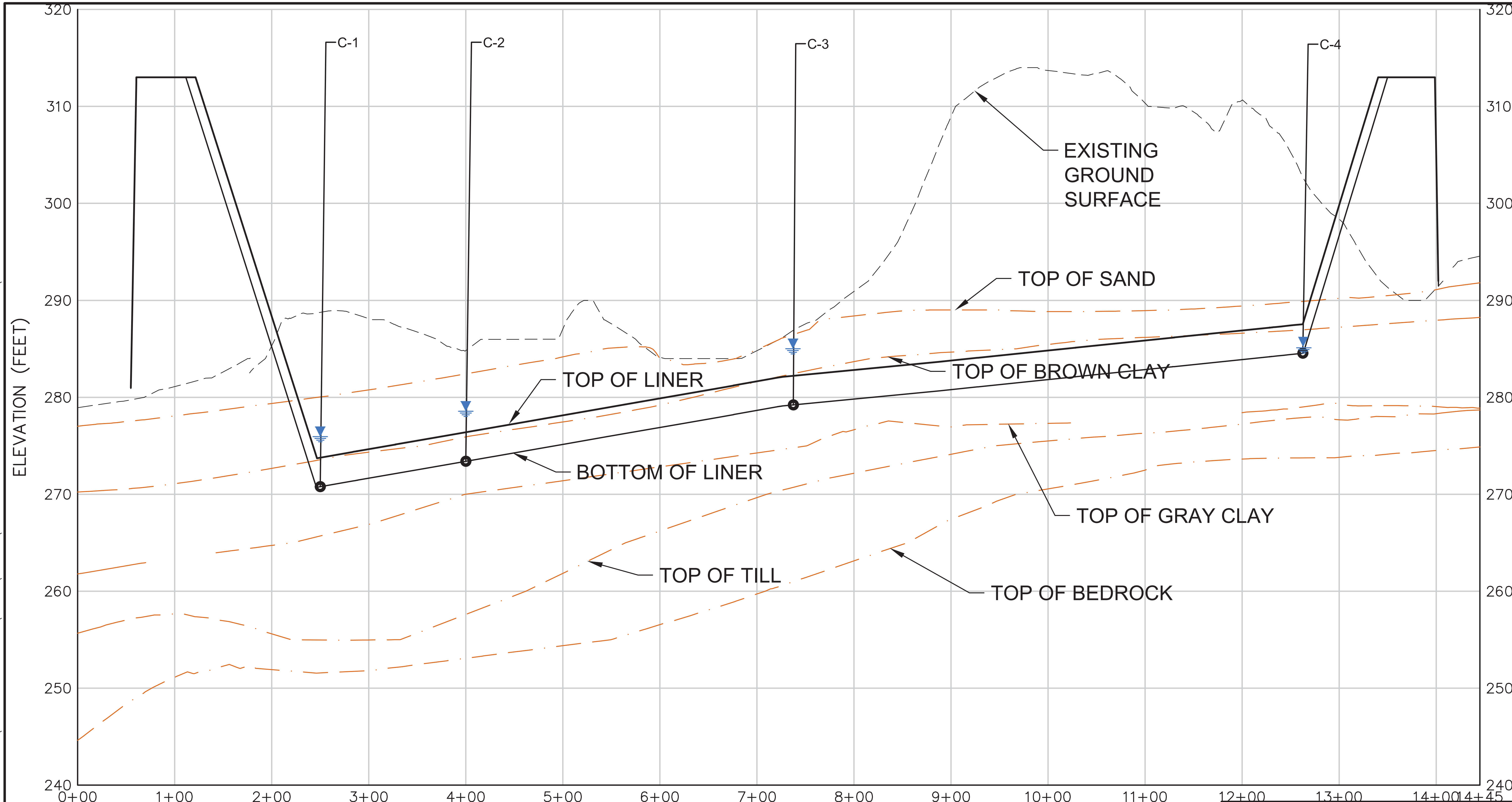
FIGURE 2B



SFCTION C

NOTES:

1. EXISTING GROUND SURFACE AND FEATURES OBTAINED FROM TOPOGRAPHIC SURVEYS, DATED NOV 2017, AND SEPT 2018, PROVIDED BY BOYNTON & PICKETT.
2. HORIZONTAL DATUM IS NORTH AMERICAN DATUM OF 1983 (NAD 83) MAINE WEST STATE PLAN. VERTICAL DATUM IS NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88). PROPERTY BOUNDARY SURVEYED IN UTM SCALED TO NAD 83.
3. STRATIGRAPHIC LAYERS PROVIDED IN A SHAPE FILES BY GOLDER ASSOCIATES. DATA BASED ON DATA PRESENTED IN VOLUME III OF THE PHASE 14 PERMIT APPLICATION.

GEOLOGIC SECTION C
PHASE 14

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FIGURE 2C

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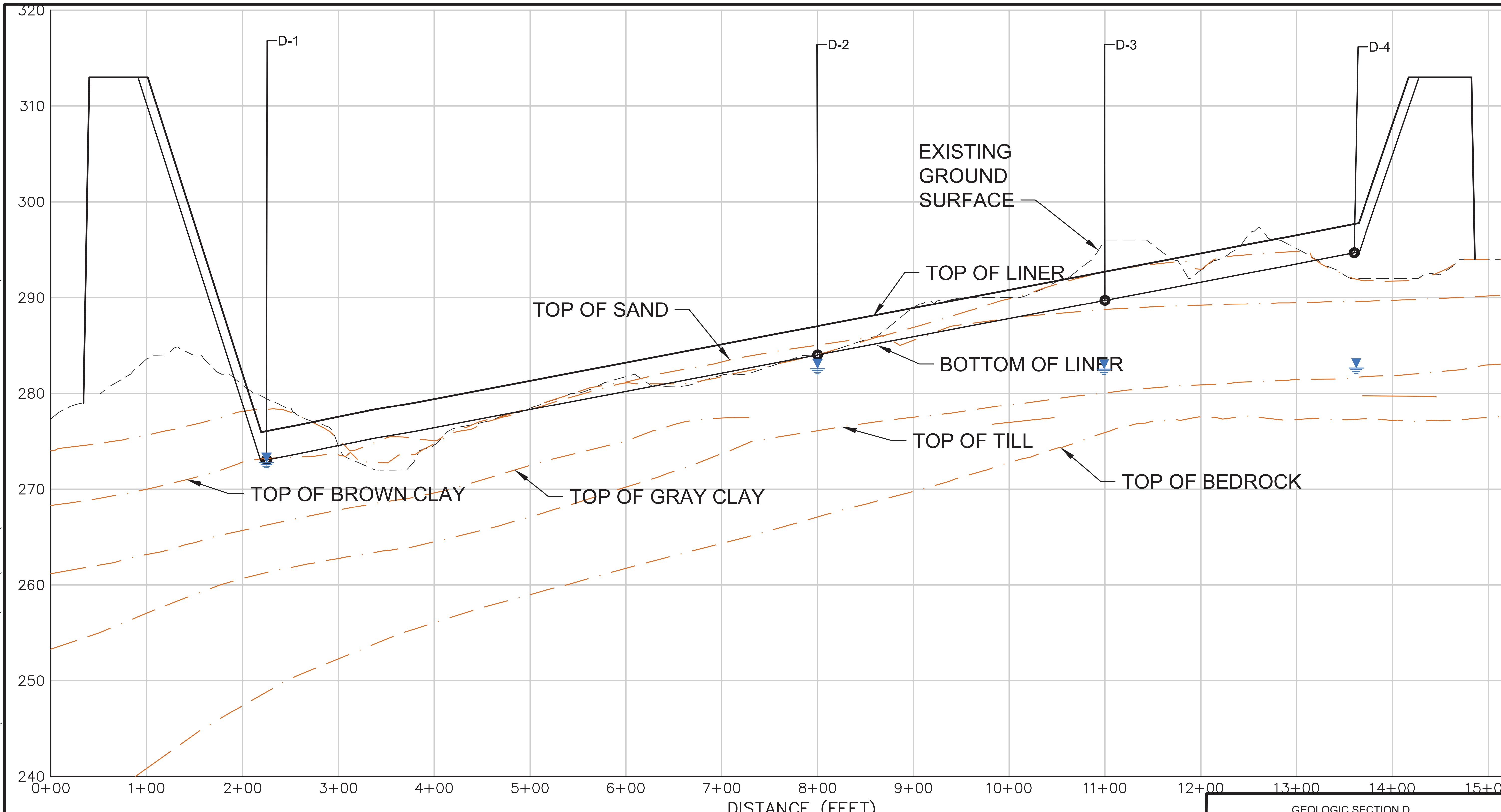

SECTION D

GEOLOGIC SECTION D
PHASE 14

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FIGURE 2D

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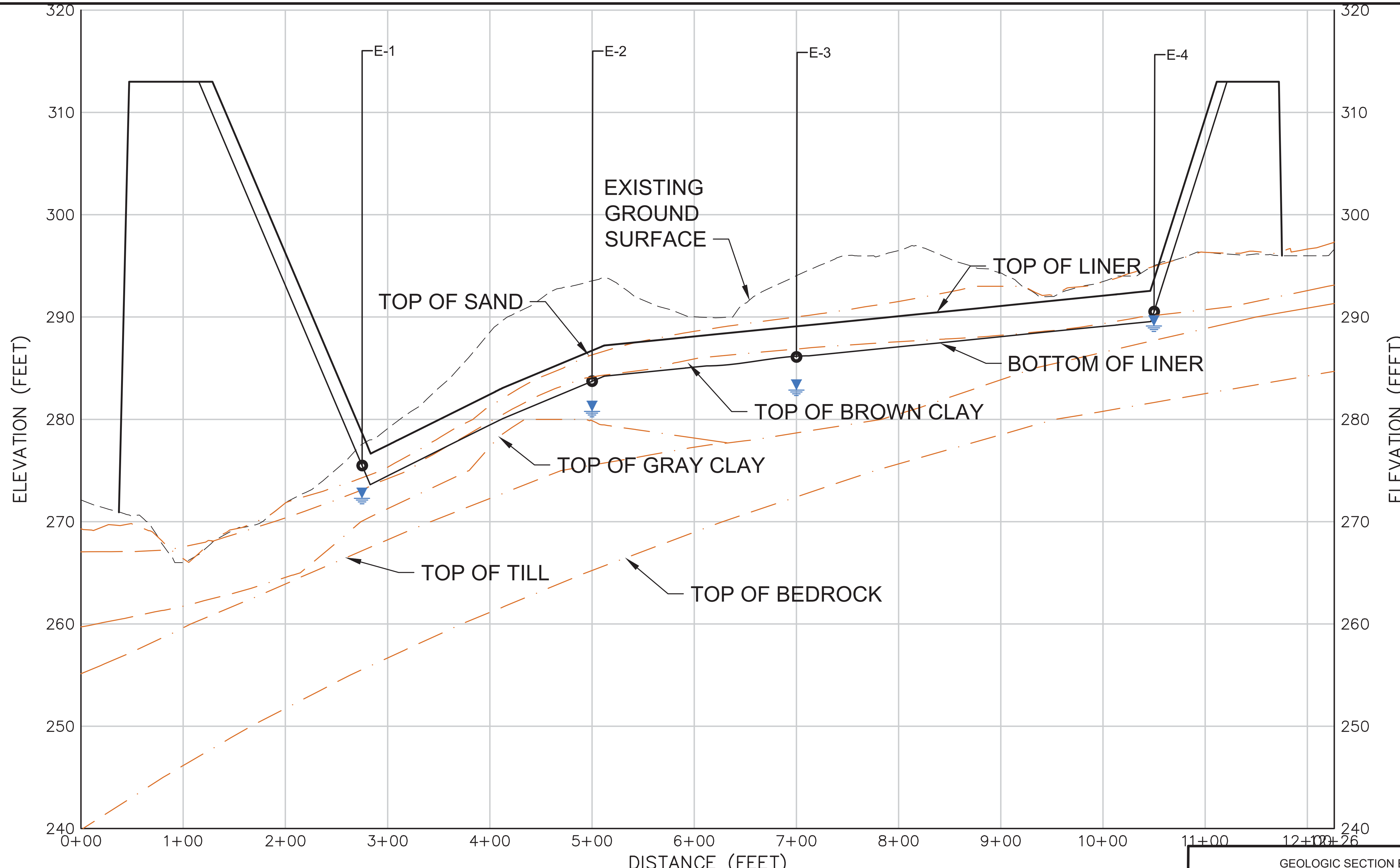

SECTION E

GEOLOGIC SECTION E
PHASE 14

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FIGURE 2E

ATTACHMENT 1

Settlement Calculations

Cell	Point Number	Station (ft)	Calculated Stresses							
			Final Waste Elev. (ft)	Final Grade Elev. (ft)	Bottom of Liner Elev. (ft)	Brown Clay Elev. (ft)	Gray Clay Elev. (ft) (1)	Till Elev. (ft)	Groundwater Elev. (ft) (2)	Change in Stress (psf)
A	A-1	222	353	355	273	273	264	258	275	6000
	A-2	615	393	395	278	278	270	266	280	8625
	A-3	1007	343	345	283	283	276	271	284	4500
B	B-1	199	348	350	273	275	265	260	278	5654
	B-2	627	461	463	278	277	274	269	284	13725
	B-3	1055	345	347	283	285	274	274	285	4634
C	C-1	245	356	358	271	274	266	255	276	6374
	C-2	400	388	390	274	276	270	258	279	8550
	C-3	755	466	468	279	282	275	271	285	14025
	C-4	1265	346	348	285	287	279	278	285	4575
D	D-1	218	355	357	273	273	266	261	273	6150
	D-2	800	465	467	284	284	-	276	283	13575
	D-3	1100	420	422	290	289	-	280	283	9750
	D-4	1365	349	351	295	290	-	282	283	4050
E	E-1	283	352	354	274	274	271	268	272	5850
	E-2	512	414	416	284	284	279	276	281	9750
	E-3	700	417	419	286	287	-	278	283	9825
	E-4	1050	356	358	289	290	-	287	289	5025

Notes:

(1) Gray Clay layer not identified in the northeastern portions of Cells B, D, and E. Settlement of the Gray Clay, therefore, is not calculated in these areas.

(2) This analysis does not consider the perched groundwater with piezometric elevation in the sand layer.

(3) The following unit weights were used in the liner settlement analysis: Cover Soils = 120 psf; Waste = 75 psf; Liner Soils = 120 psf; Brown Clay = 125 psf; and Gray Clay = 120 psf.

(4) Where data provided by Golder Associates indicated water levels above the proposed liner elevations, the water elevation was taken as the bottom of the liner elevation.

(5) Example calculation for Brown Clay at Point B-2. Procedure is repeated to calculate the settlement in the Gray Clay.

$$S_c = H_0 \times C_{r\varepsilon} \times log\frac{\sigma'_p}{\sigma'_{v0}} + H_0 \times C_{c\varepsilon} \times log\frac{\sigma'_{v0} + \Delta\sigma'_v}{\sigma'_p}$$

$$S_c = 3ft \times .018 \times \log\left(\frac{11{,}000psf}{157psf}\right) + 3ft \times 0.113 \times \log\left(\frac{157psf + 13{,}725psf}{11{,}000psf}\right) = 0.134\ ft$$

$$S_s = C_{\alpha\varepsilon} \times H_0 \times log\frac{t_2}{t_1} = 0.005 \times 3ft \times \log\left(\frac{30.5years}{0.5years}\right) = 0.024ft$$

$$S_{t,brown} = S_c + S_s = 0.134ft + 0.024ft = 0.158ft$$

$$S_{t,gray} = 0.268ft$$

Calculate total settlement $S_t = S_{t,brown} + S_{t,gray} = 0.16ft + 0.27ft = 0.43ft$

Calculate differential settlement (Between B-2 and B-3) $\Delta S = S_1 - S_2 = 0.49ft - 0.43ft = 0.03ft$

Calculate change in grade between points: $\Delta Grade\ (\%) = \left(\frac{\Delta S}{L}\right) \times 100\% = \frac{0.03ft}{428ft} \times 100\% = 7.0 \times 10^{-3}\%$

Calculate resulting Strain in the geomembrane: $\varepsilon\ (\%) = \frac{8}{3}\left(\frac{\Delta S}{L}\right)^2 \times 100\% = \frac{8}{3}\left(\frac{0.03ft}{428ft}\right)^2 \times 100\% = 1.31 \times 10^{-6}\%$

			Calculated Brown Clay Settlement													
Cell	Point Number	Station (ft)	Brown Clay Thickness (ft)	Brown Clay Midpoint El. (ft)	Brown Clay Initial Effective Stress psf)	Closest Relevant Specimen	Applicable CRS Test No.	σ'_p	C_{re}	C_{ce}	$C_{\alpha e}$	Recompression Settlement (ft)	Virgin Compression Settlement (ft)	Secondary Settlement (ft)	Total Brown Clay Settlement (ft)
A	A-1	222	9	269	282	GB-16 (17-19)	CRC-19A	21,000	0.010	0.11	0.004	0.12	0.00	0.07	0.19
	A-2	615	8	274	250	GB-16 (17-19)	CRC-19A	21,000	0.010	0.11	0.004	0.12	0.00	0.06	0.19
	A-3	1007	7	280	219	GB-15 (7-9)	CRC-8	11,500	0.018	0.11	0.005	0.17	0.00	0.06	0.22
B	B-1	199	10	270	164	GB-16 (17-19)	CRC-19A	21,000	0.010	0.11	0.004	0.15	0.00	0.08	0.23
	B-2	627	3	276	157	GB-16 (17-19)	CRC-19A	21,000	0.010	0.11	0.004	0.06	0.00	0.02	0.08
	B-3	1055	11	280	233	GB-15 (7-9)	CRC-8	11,500	0.018	0.11	0.005	0.26	0.00	0.09	0.35
C	C-1	245	8	270	63	GB-06 (21-23)	CRC-18	19,500	0.017	0.10	0.004	0.27	0.00	0.06	0.33
	C-2	400	6	273	63	GB-06 (21-23)	CRC-18	19,500	0.017	0.10	0.004	0.22	0.00	0.04	0.26
	C-3	755	7	279	31	GB-03 (3-5)	CRC-1	20,000	0.015	0.14	0.006	0.28	0.00	0.07	0.35
	C-4	1265	8	283	125	GB-03 (3-5)	CRC-1	20,000	0.015	0.14	0.006	0.19	0.00	0.08	0.27
D	D-1	218	7	270	219	GB-06 (21-23)	CRC-18	19,500	0.017	0.10	0.004	0.17	0.00	0.05	0.22
	D-2	800	8	280	313	GB-03 (3-5)	CRC-1	21,000	0.015	0.14	0.006	0.20	0.00	0.08	0.28
	D-3	1100	9	285	688	GB-03 (3-5)	CRC-1	21,000	0.015	0.14	0.006	0.16	0.00	0.09	0.25
	D-4	1365	8	286	1,125	GB-03 (3-5)	CRC-1	21,000	0.015	0.14	0.006	0.08	0.00	0.08	0.16
E	E-1	283	3	273	188	GB-01 (19-21)	CRC-21	16,500	0.008	0.14	0.006	0.04	0.00	0.03	0.07
	E-2	512	5	282	313	GB-01 (19-21)	CRC-21	16,500	0.008	0.14	0.006	0.06	0.00	0.05	0.11
	E-3	700	9	283	406	GB-01 (19-21)	CRC-21	16,500	0.008	0.14	0.006	0.10	0.00	0.09	0.19
	E-4	1050	3	289	31	GB-01 (19-21)	CRC-21	16,500	0.008	0.14	0.006	0.05	0.00	0.03	0.08

			Calculated Gray Clay Settlement												
Cell	Point Number	Station (ft)	Gray Clay Thickness (ft)	Gray Clay Midpoint El. (ft)	Gray Clay Initial Effective Stress psf)	Closest Relevant Specimen	Applicable CRS Test No.	σ'_p	C_{re}	C_{ce}	$C_{\alpha e}$	Recompression Settlement (ft)	Virgin Compression Settlement (ft)	Secondary Settlement (ft)	Total Gray Clay Settlement (ft)
A	A-1	222	6	261	736	GB-19 (17-19)	CRC-5A	7,250	0.006	0.13	0.005	0.03	0.00	0.09	0.12
	A-2	615	4	268	616	GB-16 (27-29)	CRC-20	5,800	0.010	0.12	0.005	0.04	0.10	0.07	0.20
	A-3	1007	5	274	582	GB-18 (17-19)	CRC-13	8,500	0.011	0.15	0.006	0.05	0.00	0.07	0.13
B	B-1	199	5	263	621	GB-21 (23-25)	CRC-9	7,250	0.007	0.13	0.005	0.04	0.00	0.09	0.13
	B-2	627	5	272	394	GB-21 (23-25)	CRC-9	7,250	0.007	0.13	0.005	0.04	0.19	0.03	0.26
	B-3	1055	0	274	577	GB-14 (9-11)	CRC-10	3,050	0.007	0.17	0.007	0.00	0.00	0.14	0.14
C	C-1	245	11	261	630	GB-08 (27-29)	CRC-4	8,500	0.014	0.15	0.006	0.16	0.00	0.08	0.25
	C-2	400	12	264	596	GB-08 (27-29)	CRC-4	8,500	0.014	0.15	0.006	0.19	0.06	0.06	0.31
	C-3	755	4	273	366	GB-07 (17-19)	CRC-12	4,800	0.004	0.13	0.005	0.02	0.26	0.07	0.34
	C-4	1265	1	279	404	GB-13 (17-19)	CRC-11	18,500	0.009	0.10	0.004	0.01	0.00	0.06	0.07
D	D-1	218	5	264	582	GB-06 (29-31)	CRC-24	7,150	0.017	0.14	0.006	0.09	0.00	0.07	0.16
	D-2	800	0	-	-	-	-	-	-	-	-	-	-	-	-
	D-3	1100	0	-	-	-	-	-	-	-	-	-	-	-	-
	D-4	1365	0	-	-	-	-	-	-	-	-	-	-	-	-
E	E-1	283	3	270	399	GB-05 (31-33)	CRC-14	6,500	0.007	0.13	0.005	0.03	0.00	0.03	0.05
	E-2	512	3	278	587	GB-04 (19-21)	CRC-2	7,000	0.007	0.15	0.006	0.02	0.08	0.05	0.15
	E-3	700	0	-	-	-	-	-	-	-	-	-	-	-	-
	E-4	1050	0	-	-	-	-	-	-	-	-	-	-	-	-

APPENDIX IV(e)

Leachate Management System Calculations

APPENDIX IV (e)(i)
Leachate Generation Rate and Leachate Collection System Capacity

Written by:	Youngmin Cho	Date:	2019 /09 /04 (YYYY MM DD)	Reviewed by:	A. Rohrman & N. Yafrate	Date:	2019 /09 /05; 2019 /09 /09
Client:	WMDSM	Project:	Ph 14 Permitting	Project/Proposal No.:	BE0232C	Task No:	02

LEACHATE GENERATION RATE AND LEACHATE COLLECTION SYSTEM CAPACITY

OBJECTIVE

This calculation package presents (i) the calculated maximum leachate generation rates, (ii) the calculated peak head on the geomembrane liner, and (iii) the compatibility of the geocomposite geotextile component and the drainage sand in the proposed Phase 14 area of the Crossroads Landfill.

METHODS AND ASSUMPTIONS

Leachate generation in Phase 14 was estimated for four conditions that are anticipated to occur during the life of the landfill using the HELP model, Version 3.07 (Schroeder et al., 1994): (i) an initial 10-ft thick waste lift with daily cover, (ii) 40-ft thick waste with daily cover, (iii) 40-ft thick waste with daily cover and a long-term temporary geomembrane tarp cover, and (iv) 186-ft thick waste with the final cover installed. Per the current site practice, precipitation falling onto an open area (i.e., where no waste has yet been placed) was assumed to be diverted to a stormwater management system using rain flaps and thus is not considered leachate. A schematic cross-section of the landfill system for each of these conditions is presented in Figures 1 through 4.

For each of these four conditions, the flow capacity of the leachate drainage layer was evaluated by comparing the daily peak heads on the liner (geomembrane) with a maximum allowable head of 12 inches pursuant to Chapter 401.2.D(4)(a) of the Maine Solid Waste Management Rules, which is half of the minimum thickness of the leachate drainage sand layer. Additionally, a peak leachate generation rate was calculated for use in the evaluation of the leachate collection pipe capacity (the pipe capacity assessment is presented in a separate calculation package).

The following assumptions were conservatively made for the HELP Model in this package:

- Per ME DEP CMR 06-096 Chapter 401 Section 2.D(4)(a)(i), leachate generation was estimated based on the 15-year HELP model default climate data and including a 25-year, 24-hour stormwater event occurring during a wet period (i.e., 7 rainy days in 10 days prior to the 25-year, 24-hour storm event and followed by 2 consecutive rainy days in September).
- For the 10-ft waste and 40-ft waste with daily cover conditions, the leachate generation has been calculated assuming no run-off (i.e., all the precipitation that falls on the waste or daily cover is collected in the LCS).
- The LCS layer has a post-settlement slope of 2 percent for the 10 ft of waste conditions, 1.5 percent for the 40-ft waste conditions, and 0.9 percent for the 186-ft waste (i.e., the final closure condition).

- At final closure, the maximum waste thickness is approximately 186 ft.

HELP MODEL INPUT DATA

Parameters required for development of the HELP model, including site/design specific inputs such as the layering configuration and material properties and location specific inputs such as climatic data, are described below.

Landfill Layer Data

Table 1 summarizes the properties of the design materials used in the HELP simulation. The conceptual cross-sections for each of the four analyzed landfill conditions are shown in Figures 1 through 4. The detailed input parameters can be found in the HELP output files in Attachment A.

Geomembrane Data

Geomembranes are used in both the liner and cover systems in the proposed landfill design. Assumptions pertaining to the properties of the geomembrane are presented below.

- Textured HDPE geomembrane is (i) 60-mil thick in the liner system (ii) 40-mil thick in the final cover system, and (iii) 30-mil thick in the long-term temporary tarp cover.
- A defect area of 1 cm^2 per defect (i.e., per hole) and 10 defects per acre for the long-term temporary cover (tarp) condition and 2 defects per acre for the final cover condition were assumed.
- For the geomembrane in the bottom lining system, 0 holes per acre were conservatively assumed because it will result in the largest calculated volume of leachate collected in the LCS.

Geocomposite Data Input

Geocomposite material properties used for the HELP analyses including transmissivity, thickness, slope, and drainage path length, are presented in Table 2. The transmissivity was adjusted for intrusion, creep, chemical clogging, and biological clogging as recommended by Koerner and Koerner (2007). Adjusted transmissivity and reduction factors for each of the four landfill conditions modeled are presented in Table 2. A corresponding adjusted saturated hydraulic conductivity, used in the HELP model for each condition, was calculated and is also presented in Table 2.

The flow capacity of the geotextile components of the geocomposite, accounting for soil clogging and blinding, creep, intrusion, chemical clogging, and biological clogging, was evaluated using the method presented by Koerner and Koerner (2007). Example geotextile product information is presented in Attachment B.

Weather Data

The HELP model requires input of evapotranspiration, precipitation, temperature, and solar radiation data. The HELP model provides default values and synthetically generated weather data for specific cities in the United States. The closest city available to the Crossroads Landfill site for each type of required weather data was selected for this application. Augusta, Maine was selected for evapotranspiration, temperature, and solar radiation data. No synthetically generated precipitation data was available for Augusta, Maine. Therefore, Portland, Maine, the next closest city, was selected for precipitation data. Weather data synthetically generated for a 15-year period was used. Per ME DEP CMR 06-096 Chapter 401 Section 2.D(4)(a)(i), a 25-year, 24-hour storm precipitation value of 4.90 inches was manually entered into the HELP precipitation input files during a wet period (i.e., 7 rainy days in 10 days prior to the 25-year, 24-hour storm event and followed by 2 consecutive rainy days in September) for each of the 15-year HELP analyses. The 25-year, 24-hour storm precipitation value was taken from Maine Stormwater Law Chapter 500, Appendix H for Somerset S County (Solon Area).

The HELP default values for evapotranspiration zone depth are used. For the 10-ft and 40-ft waste and daily cover conditions, bare soil is assumed to cover the site, and thus an evapotranspiration depth of 8 inches was selected per the HELP model guidance. For the long-term tarp cover condition, the evapotranspiration depth of 0.1 inch was used because the HELP model doesn't allow a geomembrane as the uppermost layer. The final cover condition of the landfill is assumed to support a good stand of grass, resulting in an evapotranspiration zone depth of 18.2 inches, which is approximately equal to the depth of the final cover system above the 40-mil thick geomembrane cover. Maximum leaf area indices (LAI) are also selected based on the HELP model guidance. LAI values of 0.0 are used for the first three conditions and a LAI value of 3.5 is used for the final cover condition.

Surface Data

HELP models the surface runoff using the Soil Conservation Service (SCS) curve number method. The SCS curve number was determined by using Figure 5 (taken from Schroeder et al. 1994). A curve number of 0 was used for the 10-ft waste and 40-ft waste daily cover conditions because runoff is not allowed in these conditions. A curve number of 80 was used for the temporary tarp condition. A curve number of 75 was used for the final cover condition, assuming a good grass vegetative cover on the landfill.

HELP allows for the input of the percent of area where surface runoff is possible, which specifies the area of the surface that is sloped in a manner that would allow drainage (i.e., no ponding of surface water). The landfill slopes will be graded to prevent ponding; therefore, 100 percent of the area in in the temporary tarped and final cover conditions will allow runoff. For the 10-ft waste and 40-ft waste with daily cover conditions, the leachate generation has been calculated assuming 0 percent runoff because all precipitation that falls in the cell will be collected by the leachate collection system.

RESULTS AND DISCUSSIONS

The HELP outputs for the four waste placement conditions analyzed are summarized in Table 3 and presented in Attachment A. The peak monthly leachate generation (29,695 gallons per day per acre) was calculated for the 10-ft waste lift with daily cover condition. In that condition, the peak head on the liner geomembrane was calculated to be 11 inches (see Table 3), which is less than the 12-inch design criterion. Therefore, the calculations indicate that the proposed LCS design has sufficient flow capacity for the anticipated daily (and monthly) peak leachate generation rate.

As presented in Table 4, the calculated flow rates of the geotextile component (i.e., typical 8-oz/yd^2 non-woven geotextile) of the geocomposite drainage layer, accounting for soil clogging and blinding, creep, intrusion, chemical clogging, and biological clogging, are evaluated to be 1,291 to 32,272 times greater than the calculated peak leachate generation rate.

Written by:	Youngmin Cho	Date:	2019/09/04 (YYYY MM DD)	Reviewed by:	A. Rohrman & N. Yafrate	Date:	2019/09/05 2019/09/09
Client:	WMDSM	Project:	Ph 14 Permitting	Project/Proposal No.:	BE0232C	Task No:	02

REFERENCES

Koerner, R.M. and Koerner, G.R. "Reduction Factors Used in Geosynthetic Design, GSI White Paper #4, Rev. 1," March 2007.

Maine Department of Environmental Protection, Solid Waste Management Regulations, 06-096 CMR Chapter 401.

Schroeder, P.R., Dozier, T.S., Zappi, P.A., McEnroe, B.M., Sjostrom, J.W., and Peyton, R.L., "The Hydrologic Evaluation of Landfill Performance (HELP) Model: User's Guide for Version 3," EPA 600/9-94/xx, U.S. Environmental Protection Agency Risk Reduction Engineering Laboratory, Cincinnati, OH, Sept 1994.

US Department of Agriculture, Soil Conservation Service, "National Engineering Handbook, Section 4, Hydrogeology," US Government Printing Office, Washington, D.C., 1985.

US Department of the Army and the Air Force. "Technical Manual – Engineering Use of Geotextiles" Army TM 5-818-8 and Air Force AFJMAN 32-1030, 1995.

US Department of Commerce, "Rainfall Frequency Atlas of the United States for Durations from 30 Minutes to 24 Hours and Return Periods from 1 to 100 Years," Technical Paper No. 40, 1961.

Table 1: Summary of Material Properties
Crossroads Landfill Phase 14
Norridgewock, ME

Layer	Material Description	HELP Soil Texture No.[2]	Porosity	Field Capacity	Wilting Point	Hydraulic Conductivity (cm/s)
Topsoil Layer & Protective Layer	Clayey Sand	10	0.398	0.244	0.136	1E-04
Daily Cover & Intermediate Cover	Clayey Sand	10	0.398	0.244	0.136	1E-04
Geocomposite Drainage Layer	Drainage net	34	0.850	0.010	0.005	see Table 2
Textured HDPE Geomembrane[1]	Textured HDPE	35	-	-	-	2E-13
Waste	MSW	18	0.671	0.292	0.077	1E-03
Drainage Sand	Poorly Graded Sand	1	0.417	0.045	0.018	1E-02
Geosynthetic Clay Liner	0.6 cm Bentonite Mat	17	0.750	0.747	0.400	3E-09

Notes:

(1) 60-mil geomembrane is assumed for the liner system, 40-mil geomembrane is assumed for the cap, and 30-mil geomembrane was assumed for temporary tarp.

(2) Porosity, field capacity, wilting point values of each material are the HELP model default values of the listed Texture No. The hydraulic conductivity of each material is the applicable specification or HELP model default values.

Table 2: Geocomposite Reduction Factors, Adjusted Transmissivity, and Hydraulic Conductivity
Crossroads Landfill Phase 14
Norridgewock, Maine

	10' Waste/Daily Cover LCS	40' Waste/Daily Cover LCS	40' Waste/Temporary Tarp LCS	Final Closure LCS	Final Closure Cover Drainage
Intrusion (RF_{IN})	1.5	1.7	1.7	1.9	1.3
Creep (RF_{CR})	1.1	1.5	1.5	1.5	1.1
Chemical Clogging (RF_{CC})	1.1	1.5	1.5	1.5	1.0
Biological Clogging (RF_{BC})	1.1	1.3	1.3	1.5	1.5
Total RF[1]	2.0	5.0	5.0	6.4	2.1
Manufactured Transmissivity[3], T (cm^2/s)	5.3	5.3	5.3	5.3	5.3
Manufactured Hydraulic Conductivity[4], K (cm/sec)	10.4	10.4	10.4	10.4	10.4
Adjusted Transmissivity[5], T_{RF} (cm^2/s)	2.65	1.07	1.07	0.83	2.47
Adjusted Hydraulic Conductivity , K_{RF} (cm/sec)	**5.22**	**2.10**	**2.10**	**1.63**	**4.86**

Notes:

(1) Total Reduction Factor (RF) = $(RF_{IN})(RF_{CR})(RF_{CC})(RF_{BC})$

(2) Reduction Factors obtained from Koerner, R.M. and Koerner, G.R. (2007). Reduction Factors Used in Geosynthetic Design, GSI White Paper #4, Rev. 1," March 2007.

(3) Assumed transmissivity values of geonet component is less than Specification Section 02520 of the most recent landfill cell (i.e., Phase 8C") construction (i.e., 12 cm^2/s) at the site.

(4) K = T ÷ (Geocomposite thickness of 0.20 inches)

(5) T_{RF} = T ÷ Total RF; K_{RF} = K ÷ Total RF.

(6) LCS = Leachate Collection System

(7) Drainage Layer configurations: (a) cover drainage - drainage length = 180 ft and slope = 33% and (b) LCS - drainage length = 120 ft and slope = 2% for the 10-ft waste conditions, 1.5% for the 40-ft waste conditions, and 0.9% for the final closure condition.

Table 3: Calculated Peak Head on the Liner and Peak Leachate Generation Rates
Crossroads Landfill Phase 14
Norridgewock, Maine

Condition	Daily Peak Leachate Generation Rate Per Acre [(1)]		Maximum Head on the Bottom Liner [(1)]
	(cu. ft.)	(gallons)	(in.)
10-ft Waste/Daily Soil Cover	3,970	29,695	11.03
40-ft Waste/Daily Soil Cover	1,116	8,345	3.054
40-ft Waste/Temporary Tarp	1.1	8	Note 2
186-ft Waste/Final Cover	0.1	1	Note 2

Note:

(1) From the HELP modeling results

(2) HELP model results are calculated for zero head on liner for these conditions.

Table 4: Flow Rate of Geotextile Component of Geocomposite Drainage Layer
Crossroads Landfill Phase 14
Norridgewock, Maine

$$q_{allow} = q_{ult}\left[\frac{1}{RF_{SCB} \times RF_{CR} \times RF_{IN} \times RF_{CC} \times RF_{BC}}\right]$$

where

q_{allow} = allowable (or design) flow rate,

q_{ult} = ultimate (or as-manufactured) flow rate,

RF_{SCB} = reduction factor for soil clogging and blinding,

RF_{CR} = reduction factor for creep reduction of void space,

RF_{IN} = reduction factor for adjacent materials intruding into void spaces,

RF_{CC} = reduction factor for chemical clogging, and

RF_{BC} = reduction factor for biological clogging.

Manufactured Flow Rate(1) **110** **gpm/ft^2**

Reduction Factor (RF)	**Low**	**Average**	**High**
Clogging and Blinding (RF_{SCB})	2	6	10
Creep (RF_{CR})	1.5	1.75	2.0
Intrusion (RF_{IN})	1.0	1.1	1.2
Chemical Clogging (RF_{CC})	1.2	1.35	1.5
Biological Clogging (RF_{BC})	2.0	3.5	5.0
Total RF	**7.2**	**54.6**	**180.0**

Adjusted Flow Rate, $q_{geotextile}$ (gpm/ft^2)	15.28	2.02	0.61
Factor of Safety (= $q_{geotextile} \div q_{peak}$(2))	**32,272**	**4,258**	**1,291**

Notes:
(1) Assumed flow rate of geotextile component by converting the required minimum permittivity of 1.47 sec^{-1} set forth in Specification Section 02520 of the most recent landfill cell (i.e., Phase 8C") construction at the site assuming 2-in constant head permittivity testing.

(2) Max Leachate Generation Rate, q_{peak} = 29,695 gpd/acre
21 gpm/acre
4.7E-04 gpm/ft^2

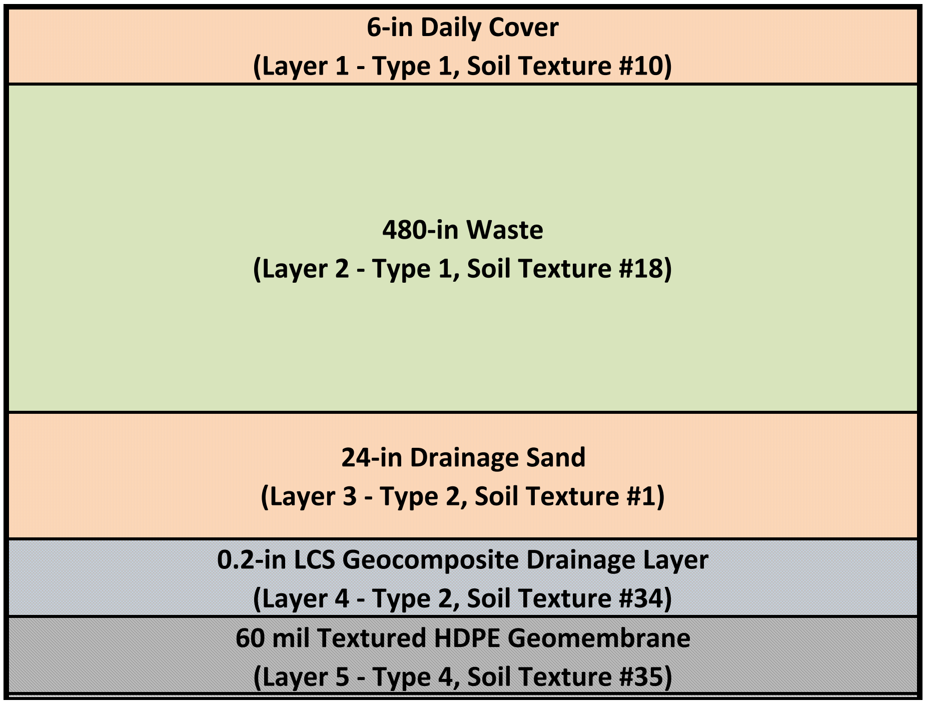
(3) Reference Koerner, R.M. and Koerner, G.R. "Reduction Factors Used in Geosynthetic Design, GSI White Paper #4, Rev. 1," March 2007.

Figure 1: HELP Model - 10-ft Waste/Daily Cover Condition
Crossroads Landfill Phase 14
Norridgewock, ME

6-in Daily Cover (Layer 1 - Type 1, Soil Texture #10)
120-in Waste (Layer 2 - Type 1, Soil Texture #18)
24-in Drainage Sand (Layer 3 - Type 2, Soil Texture #1)
0.2-in LCS Geocomposite Drainage Layer (Layer 4 - Type 2, Soil Texture #34)
60 mil Textured HDPE Geomembrane (Layer 5 - Type 4, Soil Texture #35)

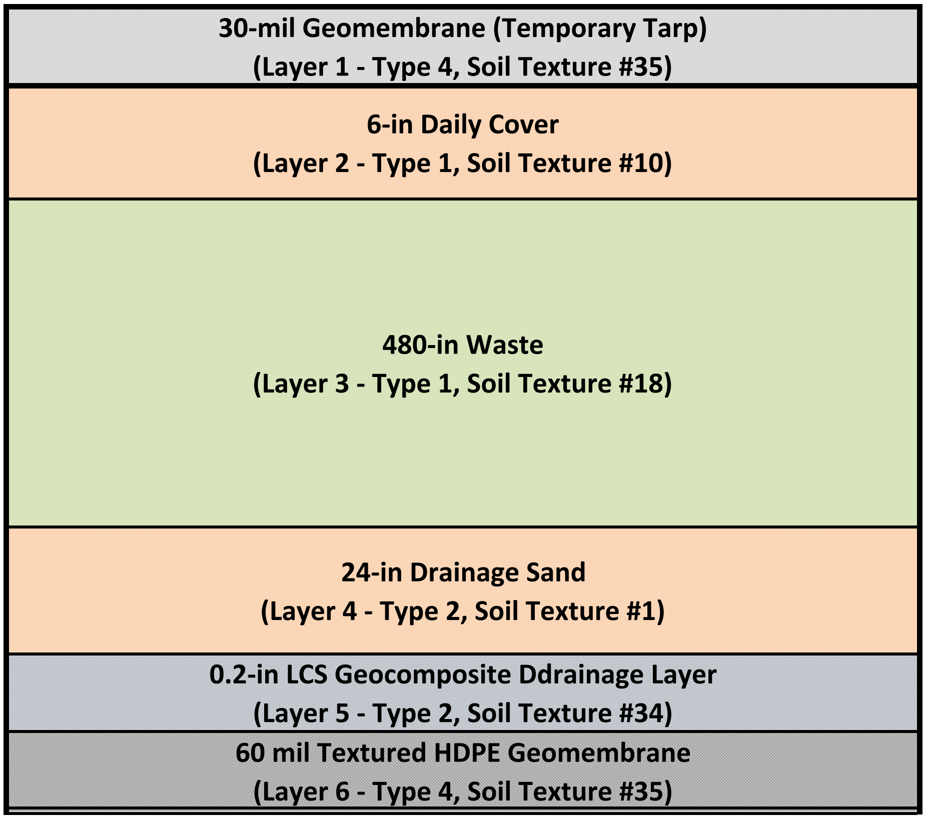
Note:
1. material properties are presented in Table 1 and Table 2.

Figure 2: HELP Model - 40-ft Waste/Daily Cover Condition
Crossroads Landfill Phase 14
Norridgewock, ME



Note:
1. material properties are presented in Table 1 and Table 2.

Figure 3: HELP Model - 40-ft Waste/Temporary Tarp Condition
Crossroads Landfill Phase 14
Norridgewock, ME



Notes:
1. material properties are presented in Table 1 and Table 2.
2. HELP requires that soil is used as the uppermost layer in the model. Therefore, a very thin soil layer (0.1-in thick) was included as Layer 1, on top of the temporary tarp for this condition.

Figure 4: HELP Model - Final Cover Condition
Crossroads Landfill Phase 14
Norridgewock, ME

6-in Topsoil (Layer 1 - Type 1, Soil Texture #10)
12-in Protective Layer (Layer 2 - Type 1, Soil Texture #10)
0.2-in Geocomposite Drainage Layer (Layer 3 - Type 2, Soil Texture #34)
40 mil Textured HDPE Geomembrane (Layer 4 - Type 4, Soil Texture #35)
0.25-in Geosynthetic Clay Liner (Layer 5 - Type 1, Soil Texture #17)
6-in Intermediate Cover (Layer 6 - Type 1, Soil Texture #10)
2,232-in Waste (Layer 7 - Type 1, Soil Texture #18)
24-in Drainage Sand (Layer 8 - Type 2, Soil Texture #1)
0.2-in LCS Geocomposite Drainage Layer (Layer 9 - Type 2, Soil Texture #34)
60 mil Textured HDPE Geomembrane (Layer 10 - Type 4, Soil Texture #35)

Note:
1. material properties are presented in Table 1 and Table 2.

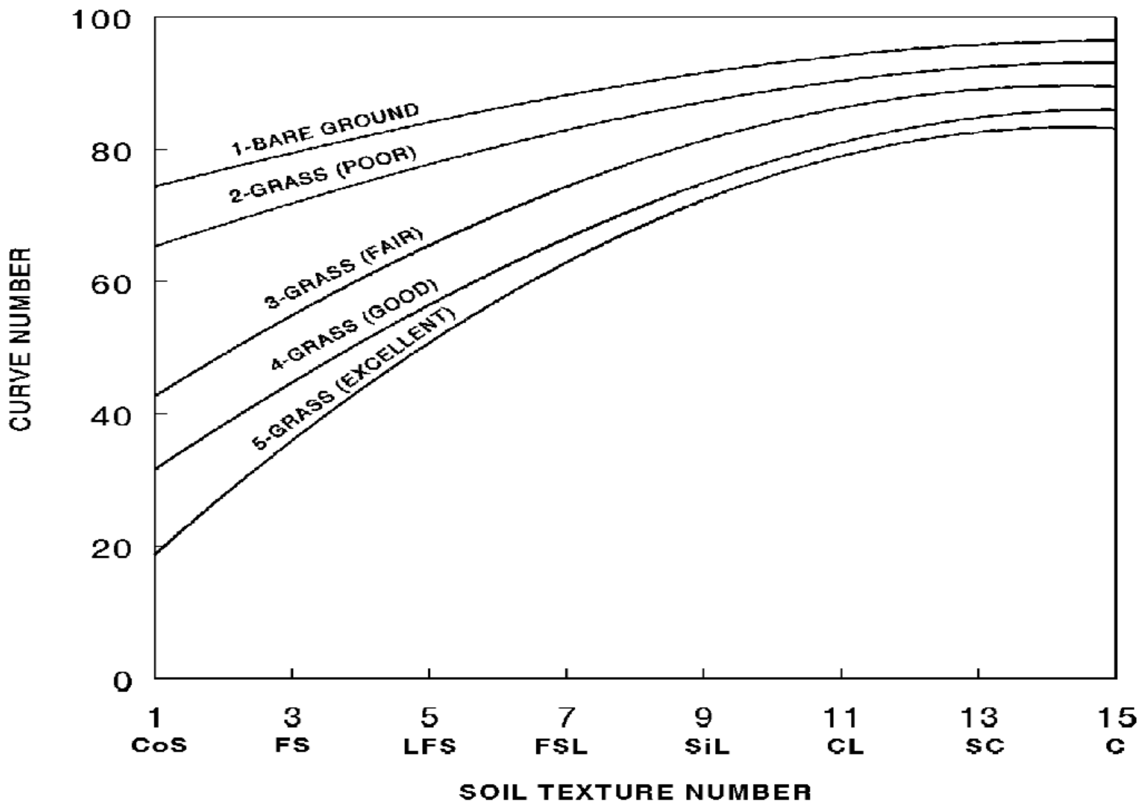


Figure 5. Relation between SCS Curve Number and Default Soil Texture Number for Various Levels of Vegetation (adapted from Schroeder et al. 1994)

ATTACHMENT A

HELP Model Results

```
******************************************************************************
******************************************************************************
**                                                                          **
**                                                                          **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE               **
**                HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)                **
**                  DEVELOPED BY ENVIRONMENTAL LABORATORY                   **
**                    USAE WATERWAYS EXPERIMENT STATION                     **
**             FOR USEPA RISK REDUCTION ENGINEERING LABORATORY              **
**                                                                          **
**                                                                          **
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PRECIPITATION DATA FILE:     C:\HELP\ph14\PREC.D4
TEMPERATURE DATA FILE:       C:\HELP\ph14\TEMP.D7
SOLAR RADIATION DATA FILE:   C:\HELP\ph14\SOLA.D13
EVAPOTRANSPIRATION DATA:     C:\HELP\ph14\EVAP.D11
SOIL AND DESIGN DATA FILE:   c:\HELP\ph14\10FT.D10
OUTPUT DATA FILE:            c:\HELP\ph14\10FT.OUT


TIME:  13:59     DATE:   9/18/2019


******************************************************************************

     TITLE:  Crossroads LF Ph14 - 10 ft Waste/Daily Cover

******************************************************************************


     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
              COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.


                                   LAYER  1
                                   --------

                     TYPE 1 - VERTICAL PERCOLATION LAYER
                         MATERIAL TEXTURE NUMBER  10
           THICKNESS                      =      6.00   INCHES
           POROSITY                       =      0.3980 VOL/VOL
           FIELD CAPACITY                 =      0.2440 VOL/VOL
           WILTING POINT                  =      0.1360 VOL/VOL
           INITIAL SOIL WATER CONTENT     =      0.4132 VOL/VOL
           EFFECTIVE SAT. HYD. COND.      =  0.119999997000E-03 CM/SEC


                                   LAYER  2
                                   --------

                     TYPE 1 - VERTICAL PERCOLATION LAYER
                         MATERIAL TEXTURE NUMBER  18
```

```
THICKNESS                    =    120.00   INCHES
POROSITY                     =      0.6710 VOL/VOL
FIELD CAPACITY               =      0.2920 VOL/VOL
WILTING POINT                =      0.0770 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.3098 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.100000005000E-02 CM/SEC


                        LAYER  3
                        --------

            TYPE 2 - LATERAL DRAINAGE LAYER
              MATERIAL TEXTURE NUMBER   1
THICKNESS                    =     24.00   INCHES
POROSITY                     =      0.4170 VOL/VOL
FIELD CAPACITY               =      0.0450 VOL/VOL
WILTING POINT                =      0.0180 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.1478 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.999999978000E-02 CM/SEC


                        LAYER  4
                        --------

            TYPE 2 - LATERAL DRAINAGE LAYER
              MATERIAL TEXTURE NUMBER   0
THICKNESS                    =      0.20   INCHES
POROSITY                     =      0.8500 VOL/VOL
FIELD CAPACITY               =      0.0100 VOL/VOL
WILTING POINT                =      0.0050 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.1129 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =   5.21999979000     CM/SEC
SLOPE                        =      2.00   PERCENT
DRAINAGE LENGTH              =    120.0    FEET


                        LAYER  5
                        --------

            TYPE 4 - FLEXIBLE MEMBRANE LINER
              MATERIAL TEXTURE NUMBER  35
THICKNESS                    =      0.06   INCHES
POROSITY                     =      0.0000 VOL/VOL
FIELD CAPACITY               =      0.0000 VOL/VOL
WILTING POINT                =      0.0000 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.0000 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.199999996000E-12 CM/SEC
FML PINHOLE DENSITY          =      0.00   HOLES/ACRE
FML INSTALLATION DEFECTS     =      0.00   HOLES/ACRE
FML PLACEMENT QUALITY        =  1 - PERFECT


        GENERAL DESIGN AND EVAPORATIVE ZONE DATA
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NOTE: SCS RUNOFF CURVE NUMBER WAS USER-SPECIFIED.

SCS RUNOFF CURVE NUMBER	=	0.00	
FRACTION OF AREA ALLOWING RUNOFF	=	0.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.000	ACRES
EVAPORATIVE ZONE DEPTH	=	8.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	3.730	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	3.730	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	0.970	INCHES
INITIAL SNOW WATER	=	2.187	INCHES
INITIAL WATER IN LAYER MATERIALS	=	43.223	INCHES
TOTAL INITIAL WATER	=	45.411	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
AUGUSTA MAINE

STATION LATITUDE	=	44.30	DEGREES
MAXIMUM LEAF AREA INDEX	=	0.00	
START OF GROWING SEASON (JULIAN DATE)	=	131	
END OF GROWING SEASON (JULIAN DATE)	=	276	
EVAPORATIVE ZONE DEPTH	=	8.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	8.70	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	70.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	72.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	77.00	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	76.00	%

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR PORTLAND MAINE

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
3.78	3.57	3.98	3.90	3.27	3.06
2.83	2.82	3.27	3.83	4.70	4.51

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR AUGUSTA MAINE

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
19.60	21.50	31.50	43.20	54.60	63.80
69.40	67.50	59.00	48.60	37.60	24.00

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR AUGUSTA MAINE

AND STATION LATITUDE = 44.30 DEGREES

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 15

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	3.58	3.06	3.75	3.47	3.30	3.13
	2.96	2.44	3.60	3.05	3.79	4.88
STD. DEVIATIONS	1.37	1.77	1.87	1.76	1.80	1.67
	1.78	0.85	2.16	1.98	2.25	1.96
RUNOFF						
TOTALS	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATIONS	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION						
TOTALS	0.509	0.472	0.525	2.071	2.694	2.630
	2.482	2.246	2.069	1.569	1.003	0.443
STD. DEVIATIONS	0.052	0.064	0.204	0.753	1.228	1.113
	1.276	0.842	0.561	0.528	0.165	0.080
LATERAL DRAINAGE COLLECTED FROM LAYER 4						
TOTALS	1.0116	0.3860	1.3941	7.3683	4.8694	1.3515
	0.5681	0.5824	0.3267	1.2265	1.1394	2.3707
STD. DEVIATIONS	0.9066	0.6111	1.9220	3.9734	1.8938	1.2656
	0.5127	0.6408	0.2569	1.1592	0.9872	1.3946
PERCOLATION/LEAKAGE THROUGH LAYER 5						
TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
DAILY AVERAGE HEAD ON TOP OF LAYER 5						
AVERAGES	0.0066	0.0028	0.0091	0.2291	0.0366	0.0091

	0.0037	0.0038	0.0022	0.0080	0.0077	0.0155
STD. DEVIATIONS	0.0059	0.0044	0.0126	0.6399	0.0279	0.0086
	0.0034	0.0042	0.0017	0.0076	0.0067	0.0091

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 15

	INCHES	CU. FEET	PERCENT
PRECIPITATION	41.00 (5.366)	148832.4	100.00
RUNOFF	0.000 (0.0000)	0.00	0.000
EVAPOTRANSPIRATION	18.715 (1.6787)	67934.89	45.645
LATERAL DRAINAGE COLLECTED FROM LAYER 4	22.59498 (4.14957)	82019.789	55.10881
PERCOLATION/LEAKAGE THROUGH LAYER 5	0.00000 (0.00000)	0.011	0.00001
AVERAGE HEAD ON TOP OF LAYER 5	0.028 (0.053)		
CHANGE IN WATER STORAGE	-0.309 (2.8454)	-1122.26	-0.754

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 15

	(INCHES)	(CU. FT.)	
PRECIPITATION	4.90	17787.000	
RUNOFF	0.000	0.0000	
DRAINAGE COLLECTED FROM LAYER 4	1.09364	3969.92871	~29,695 gals
PERCOLATION/LEAKAGE THROUGH LAYER 5	0.000001	0.00360	
AVERAGE HEAD ON TOP OF LAYER 5	8.758		
MAXIMUM HEAD ON TOP OF LAYER 5	11.025		
LOCATION OF MAXIMUM HEAD IN LAYER 4 (DISTANCE FROM DRAIN)	46.3 FEET		
SNOW WATER	15.63	56729.2383	

MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.4663
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.1213

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner
by Bruce M. McEnroe, University of Kansas
ASCE Journal of Environmental Engineering
Vol. 119, No. 2, March 1993, pp. 262-270.

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FINAL WATER STORAGE AT END OF YEAR 15

LAYER	(INCHES)	(VOL/VOL)
1	2.2339	0.3723
2	34.9247	0.2910
3	2.6226	0.1093
4	0.0088	0.0438
5	0.0000	0.0000
SNOW WATER	0.983	

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**                                                                          **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE               **
**                HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)                **
**                  DEVELOPED BY ENVIRONMENTAL LABORATORY                   **
**                    USAE WATERWAYS EXPERIMENT STATION                     **
**             FOR USEPA RISK REDUCTION ENGINEERING LABORATORY              **
**                                                                          **
**                                                                          **
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PRECIPITATION DATA FILE:     C:\HELP\ph14\PREC.D4
TEMPERATURE DATA FILE:       C:\HELP\ph14\TEMP.D7
SOLAR RADIATION DATA FILE:   C:\HELP\ph14\SOLA.D13
EVAPOTRANSPIRATION DATA:     C:\HELP\ph14\EVAP.D11
SOIL AND DESIGN DATA FILE:   c:\HELP\ph14\40FTSL.D10
OUTPUT DATA FILE:            c:\HELP\ph14\40FTSL.OUT


TIME:  14: 2     DATE:   9/18/2019


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     TITLE:  Crossroads LF Ph 14 - 40 ft Waste/Daily Cover

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     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
              COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.


                                   LAYER  1
                                   --------

                      TYPE 1 - VERTICAL PERCOLATION LAYER
                          MATERIAL TEXTURE NUMBER  10
           THICKNESS                  =      6.00   INCHES
           POROSITY                   =      0.3980 VOL/VOL
           FIELD CAPACITY             =      0.2440 VOL/VOL
           WILTING POINT              =      0.1360 VOL/VOL
           INITIAL SOIL WATER CONTENT =      0.4132 VOL/VOL
           EFFECTIVE SAT. HYD. COND.  =  0.119999997000E-03 CM/SEC


                                   LAYER  2
                                   --------

                      TYPE 1 - VERTICAL PERCOLATION LAYER
                          MATERIAL TEXTURE NUMBER  18
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THICKNESS                    =    480.00   INCHES
POROSITY                     =      0.6710 VOL/VOL
FIELD CAPACITY               =      0.2920 VOL/VOL
WILTING POINT                =      0.0770 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.3020 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.100000005000E-02 CM/SEC


                        LAYER  3
                        --------

            TYPE 2 - LATERAL DRAINAGE LAYER
              MATERIAL TEXTURE NUMBER   1
THICKNESS                    =     24.00   INCHES
POROSITY                     =      0.4170 VOL/VOL
FIELD CAPACITY               =      0.0450 VOL/VOL
WILTING POINT                =      0.0180 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.1444 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.999999978000E-02 CM/SEC


                        LAYER  4
                        --------

            TYPE 2 - LATERAL DRAINAGE LAYER
              MATERIAL TEXTURE NUMBER   0
THICKNESS                    =      0.20   INCHES
POROSITY                     =      0.8500 VOL/VOL
FIELD CAPACITY               =      0.0100 VOL/VOL
WILTING POINT                =      0.0050 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.2687 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =   2.09999990000     CM/SEC
SLOPE                        =      1.50   PERCENT
DRAINAGE LENGTH              =    120.0    FEET


                        LAYER  5
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            TYPE 4 - FLEXIBLE MEMBRANE LINER
              MATERIAL TEXTURE NUMBER  35
THICKNESS                    =      0.06   INCHES
POROSITY                     =      0.0000 VOL/VOL
FIELD CAPACITY               =      0.0000 VOL/VOL
WILTING POINT                =      0.0000 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.0000 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.199999996000E-12 CM/SEC
FML PINHOLE DENSITY          =      0.00   HOLES/ACRE
FML INSTALLATION DEFECTS     =      0.00   HOLES/ACRE
FML PLACEMENT QUALITY        =  1 - PERFECT


        GENERAL DESIGN AND EVAPORATIVE ZONE DATA
        ----------------------------------------
```

NOTE: SCS RUNOFF CURVE NUMBER WAS USER-SPECIFIED.

SCS RUNOFF CURVE NUMBER	=	0.00	
FRACTION OF AREA ALLOWING RUNOFF	=	0.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.000	ACRES
EVAPORATIVE ZONE DEPTH	=	8.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	3.730	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	3.730	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	0.970	INCHES
INITIAL SNOW WATER	=	2.194	INCHES
INITIAL WATER IN LAYER MATERIALS	=	150.966	INCHES
TOTAL INITIAL WATER	=	153.160	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
AUGUSTA MAINE

STATION LATITUDE	=	44.30	DEGREES
MAXIMUM LEAF AREA INDEX	=	0.00	
START OF GROWING SEASON (JULIAN DATE)	=	131	
END OF GROWING SEASON (JULIAN DATE)	=	276	
EVAPORATIVE ZONE DEPTH	=	8.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	8.70	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	70.00	%
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	72.00	%
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	77.00	%
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	76.00	%

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR PORTLAND MAINE

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
3.78	3.57	3.98	3.90	3.27	3.06
2.83	2.82	3.27	3.83	4.70	4.51

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR AUGUSTA MAINE

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
19.60	21.50	31.50	43.20	54.60	63.80
69.40	67.50	59.00	48.60	37.60	24.00

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR AUGUSTA MAINE

AND STATION LATITUDE = 44.30 DEGREES

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 15

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	3.58	3.06	3.75	3.47	3.30	3.13
	2.96	2.44	3.60	3.05	3.79	4.88
STD. DEVIATIONS	1.37	1.77	1.87	1.76	1.80	1.67
	1.78	0.85	2.16	1.98	2.25	1.96
RUNOFF						
TOTALS	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATIONS	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION						
TOTALS	0.509	0.472	0.525	2.067	2.652	2.622
	2.454	2.222	2.049	1.563	1.003	0.443
STD. DEVIATIONS	0.052	0.064	0.204	0.750	1.220	1.100
	1.289	0.827	0.558	0.521	0.165	0.080
LATERAL DRAINAGE COLLECTED FROM LAYER 4						
TOTALS	1.6936	0.7102	0.6250	1.9156	4.1315	3.9799
	2.7493	2.1238	0.9184	1.2027	1.0567	1.7430
STD. DEVIATIONS	1.3657	0.8200	0.8497	1.0046	1.3822	0.7330
	1.2459	1.2107	0.9652	1.0411	0.8241	0.7406
PERCOLATION/LEAKAGE THROUGH LAYER 5						
TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 5						
AVERAGES	0.0367	0.0170	0.0136	0.0489	0.0896	0.0892

	0.0596	0.0460	0.0206	0.0261	0.0237	0.0378
STD. DEVIATIONS	0.0296	0.0197	0.0184	0.0318	0.0300	0.0164
	0.0270	0.0262	0.0216	0.0226	0.0185	0.0161

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 15

	INCHES		CU. FEET	PERCENT
PRECIPITATION	41.00	(5.366)	148832.4	100.00
RUNOFF	0.000	(0.0000)	0.00	0.000
EVAPOTRANSPIRATION	18.581	(1.6700)	67447.42	45.318
LATERAL DRAINAGE COLLECTED FROM LAYER 4	22.84969	(4.41673)	82944.383	55.73005
PERCOLATION/LEAKAGE THROUGH LAYER 5	0.00000	(0.00000)	0.011	0.00001
AVERAGE HEAD ON TOP OF LAYER 5	0.042	(0.009)		
CHANGE IN WATER STORAGE	-0.430	(4.1361)	-1559.41	-1.048

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 15

	(INCHES)	(CU. FT.)	
PRECIPITATION	4.90	17787.000	
RUNOFF	0.000	0.0000	
DRAINAGE COLLECTED FROM LAYER 4	0.30735	1115.69495	~8,345 gals
PERCOLATION/LEAKAGE THROUGH LAYER 5	0.000000	0.00082	
AVERAGE HEAD ON TOP OF LAYER 5	1.996		
MAXIMUM HEAD ON TOP OF LAYER 5	3.054		
LOCATION OF MAXIMUM HEAD IN LAYER 4 (DISTANCE FROM DRAIN)	27.3 FEET		
SNOW WATER	15.63	56729.2383	

MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.4663
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.1213

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner
by Bruce M. McEnroe, University of Kansas
ASCE Journal of Environmental Engineering
Vol. 119, No. 2, March 1993, pp. 262-270.

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FINAL WATER STORAGE AT END OF YEAR 15

LAYER	(INCHES)	(VOL/VOL)
1	2.2361	0.3727
2	140.0551	0.2918
3	3.3785	0.1408
4	0.0631	0.3153
5	0.0000	0.0000
SNOW WATER	0.983	

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**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE              **
**                HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)               **
**                 DEVELOPED BY ENVIRONMENTAL LABORATORY                    **
**                   USAE WATERWAYS EXPERIMENT STATION                      **
**             FOR USEPA RISK REDUCTION ENGINEERING LABORATORY             **
**                                                                          **
**                                                                          **
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PRECIPITATION DATA FILE:     C:\HELP\ph14\PREC.D4
TEMPERATURE DATA FILE:       C:\HELP\ph14\TEMP.D7
SOLAR RADIATION DATA FILE:   C:\HELP\ph14\SOLA.D13
EVAPOTRANSPIRATION DATA:     C:\HELP\ph14\EVAP.D11
SOIL AND DESIGN DATA FILE:   c:\HELP\ph14\40FTTP.D10
OUTPUT DATA FILE:            c:\HELP\ph14\40FTTP.OUT


TIME:  14: 4     DATE:   9/18/2019


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     TITLE:  Crossroads LF Ph 14 - 40 ft Waste/Temp Tarp

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     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
              COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.


                                  LAYER  1
                                  --------

                    TYPE 1 - VERTICAL PERCOLATION LAYER
                        MATERIAL TEXTURE NUMBER  10
           THICKNESS                     =      0.10   INCHES
           POROSITY                      =      0.3980 VOL/VOL
           FIELD CAPACITY                =      0.2440 VOL/VOL
           WILTING POINT                 =      0.1360 VOL/VOL
           INITIAL SOIL WATER CONTENT    =      0.3960 VOL/VOL
           EFFECTIVE SAT. HYD. COND.     =  0.119999997000E-03 CM/SEC


                                  LAYER  2
                                  --------

                      TYPE 4 - FLEXIBLE MEMBRANE LINER
                        MATERIAL TEXTURE NUMBER  35
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THICKNESS                   =      0.03   INCHES
POROSITY                    =      0.0000 VOL/VOL
FIELD CAPACITY              =      0.0000 VOL/VOL
WILTING POINT               =      0.0000 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.0000 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.199999996000E-12 CM/SEC
FML PINHOLE DENSITY         =      0.00   HOLES/ACRE
FML INSTALLATION DEFECTS    =     10.00   HOLES/ACRE
FML PLACEMENT QUALITY       =  4 - POOR


                        LAYER  3
                        --------

          TYPE 1 - VERTICAL PERCOLATION LAYER
              MATERIAL TEXTURE NUMBER  10
THICKNESS                   =      6.00   INCHES
POROSITY                    =      0.3980 VOL/VOL
FIELD CAPACITY              =      0.2440 VOL/VOL
WILTING POINT               =      0.1360 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.2440 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.119999997000E-03 CM/SEC


                        LAYER  4
                        --------

          TYPE 1 - VERTICAL PERCOLATION LAYER
              MATERIAL TEXTURE NUMBER  18
THICKNESS                   =    480.00   INCHES
POROSITY                    =      0.6710 VOL/VOL
FIELD CAPACITY              =      0.2920 VOL/VOL
WILTING POINT               =      0.0770 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.2920 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.100000005000E-02 CM/SEC


                        LAYER  5
                        --------

            TYPE 2 - LATERAL DRAINAGE LAYER
              MATERIAL TEXTURE NUMBER   1
THICKNESS                   =     24.00   INCHES
POROSITY                    =      0.4170 VOL/VOL
FIELD CAPACITY              =      0.0450 VOL/VOL
WILTING POINT               =      0.0180 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.0473 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.999999978000E-02 CM/SEC


                        LAYER  6
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            TYPE 2 - LATERAL DRAINAGE LAYER
              MATERIAL TEXTURE NUMBER   0
```

THICKNESS	=	0.20 INCHES
POROSITY	=	0.8500 VOL/VOL
FIELD CAPACITY	=	0.0100 VOL/VOL
WILTING POINT	=	0.0050 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0100 VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	2.09999990000 CM/SEC
SLOPE	=	1.50 PERCENT
DRAINAGE LENGTH	=	120.0 FEET

LAYER 7

TYPE 4 - FLEXIBLE MEMBRANE LINER
MATERIAL TEXTURE NUMBER 35

THICKNESS	=	0.06 INCHES
POROSITY	=	0.0000 VOL/VOL
FIELD CAPACITY	=	0.0000 VOL/VOL
WILTING POINT	=	0.0000 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0000 VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.199999996000E-12 CM/SEC
FML PINHOLE DENSITY	=	0.00 HOLES/ACRE
FML INSTALLATION DEFECTS	=	0.00 HOLES/ACRE
FML PLACEMENT QUALITY	=	1 - PERFECT

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS USER-SPECIFIED.

SCS RUNOFF CURVE NUMBER	=	80.00
FRACTION OF AREA ALLOWING RUNOFF	=	100.0 PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.000 ACRES
EVAPORATIVE ZONE DEPTH	=	0.1 INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	0.040 INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	0.040 INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	0.014 INCHES
INITIAL SNOW WATER	=	2.187 INCHES
INITIAL WATER IN LAYER MATERIALS	=	142.801 INCHES
TOTAL INITIAL WATER	=	144.989 INCHES
TOTAL SUBSURFACE INFLOW	=	0.00 INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
AUGUSTA MAINE

STATION LATITUDE	=	44.30 DEGREES
MAXIMUM LEAF AREA INDEX	=	0.00
START OF GROWING SEASON (JULIAN DATE)	=	131
END OF GROWING SEASON (JULIAN DATE)	=	276
EVAPORATIVE ZONE DEPTH	=	0.1 INCHES
AVERAGE ANNUAL WIND SPEED	=	8.70 MPH

AVERAGE 1ST QUARTER RELATIVE HUMIDITY = 70.00 %
AVERAGE 2ND QUARTER RELATIVE HUMIDITY = 72.00 %
AVERAGE 3RD QUARTER RELATIVE HUMIDITY = 77.00 %
AVERAGE 4TH QUARTER RELATIVE HUMIDITY = 76.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR PORTLAND MAINE

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
3.78	3.57	3.98	3.90	3.27	3.06
2.83	2.82	3.27	3.83	4.70	4.51

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR AUGUSTA MAINE

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
19.60	21.50	31.50	43.20	54.60	63.80
69.40	67.50	59.00	48.60	37.60	24.00

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR AUGUSTA MAINE
AND STATION LATITUDE = 44.30 DEGREES

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 15

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	3.58	3.06	3.75	3.47	3.30	3.13
	2.96	2.44	3.60	3.05	3.79	4.88
STD. DEVIATIONS	1.37	1.77	1.87	1.76	1.80	1.67
	1.78	0.85	2.16	1.98	2.25	1.96
RUNOFF						
TOTALS	0.660	0.889	9.088	5.117	2.875	2.746
	2.636	2.064	3.213	2.446	3.619	0.976
STD. DEVIATIONS	1.027	1.177	4.030	4.618	1.689	1.569
	1.705	0.801	2.077	2.061	1.929	1.135

EVAPOTRANSPIRATION

TOTALS	0.509	0.472	0.428	0.413	0.414	0.375
	0.325	0.373	0.377	0.296	0.350	0.370
STD. DEVIATIONS	0.052	0.064	0.136	0.098	0.162	0.146
	0.113	0.106	0.130	0.121	0.114	0.083

PERCOLATION/LEAKAGE THROUGH LAYER 2

TOTALS	0.0018	0.0016	0.0051	0.0050	0.0044	0.0043
	0.0038	0.0043	0.0041	0.0036	0.0053	0.0058
STD. DEVIATIONS	0.0009	0.0010	0.0017	0.0014	0.0016	0.0013
	0.0013	0.0009	0.0011	0.0013	0.0022	0.0023

LATERAL DRAINAGE COLLECTED FROM LAYER 6

TOTALS	0.0013	0.0014	0.0032	0.0028	0.0024	0.0022
	0.0024	0.0025	0.0023	0.0022	0.0027	0.0026
STD. DEVIATIONS	0.0013	0.0013	0.0026	0.0022	0.0019	0.0017
	0.0018	0.0019	0.0017	0.0018	0.0020	0.0020

PERCOLATION/LEAKAGE THROUGH LAYER 7

TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 2

AVERAGES	0.0105	0.0101	0.0306	0.0312	0.0269	0.0270
	0.0232	0.0260	0.0255	0.0217	0.0327	0.0348
STD. DEVIATIONS	0.0057	0.0071	0.0098	0.0085	0.0099	0.0082
	0.0081	0.0056	0.0069	0.0078	0.0134	0.0137

DAILY AVERAGE HEAD ON TOP OF LAYER 7

AVERAGES	0.0000	0.0000	0.0001	0.0001	0.0001	0.0000
	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001
STD. DEVIATIONS	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 15

	INCHES	CU. FEET	PERCENT

PRECIPITATION	41.00	(5.366)	148832.4	100.00
RUNOFF	36.329	(4.4733)	131874.39	88.606
EVAPOTRANSPIRATION	4.703	(0.3621)	17071.74	11.470
PERCOLATION/LEAKAGE THROUGH LAYER 2	0.04898	(0.00485)	177.807	0.11947
AVERAGE HEAD ON TOP OF LAYER 2	0.025	(0.002)		
LATERAL DRAINAGE COLLECTED FROM LAYER 6	0.02792	(0.02096)	101.334	0.06809
PERCOLATION/LEAKAGE THROUGH LAYER 7	0.00000	(0.00000)	0.007	0.00000
AVERAGE HEAD ON TOP OF LAYER 7	0.000	(0.000)		
CHANGE IN WATER STORAGE	-0.059	(2.9357)	-215.04	-0.144

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 15

	(INCHES)	(CU. FT.)	
PRECIPITATION	4.90	17787.000	
RUNOFF	6.542	23747.3535	
PERCOLATION/LEAKAGE THROUGH LAYER 2	0.000548	1.98796	
AVERAGE HEAD ON TOP OF LAYER 2	0.100		
DRAINAGE COLLECTED FROM LAYER 6	0.00029	1.06801	~8 gals
PERCOLATION/LEAKAGE THROUGH LAYER 7	0.000000	0.00002	
AVERAGE HEAD ON TOP OF LAYER 7	0.000		
MAXIMUM HEAD ON TOP OF LAYER 7	0.000		
LOCATION OF MAXIMUM HEAD IN LAYER 6 (DISTANCE FROM DRAIN)	0.0 FEET		
SNOW WATER	15.63	56729.2383	

MAXIMUM VEG. SOIL WATER (VOL/VOL) 0.3980

MINIMUM VEG. SOIL WATER (VOL/VOL) 0.1360

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner
by Bruce M. McEnroe, University of Kansas
ASCE Journal of Environmental Engineering
Vol. 119, No. 2, March 1993, pp. 262-270.

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FINAL WATER STORAGE AT END OF YEAR 15

LAYER	(INCHES)	(VOL/VOL)
1	0.0390	0.3899
2	0.0000	0.0000
3	1.4640	0.2440
4	140.1600	0.2920
5	1.4517	0.0605
6	0.0021	0.0103
7	0.0000	0.0000
SNOW WATER	0.983	

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**                                                                          **
**                                                                          **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE               **
**               HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)                 **
**                 DEVELOPED BY ENVIRONMENTAL LABORATORY                    **
**                   USAE WATERWAYS EXPERIMENT STATION                      **
**             FOR USEPA RISK REDUCTION ENGINEERING LABORATORY              **
**                                                                          **
**                                                                          **
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******************************************************************************


PRECIPITATION DATA FILE:     C:\HELP\ph14\PREC.D4
TEMPERATURE DATA FILE:       C:\HELP\ph14\TEMP.D7
SOLAR RADIATION DATA FILE:   C:\HELP\ph14\SOLA.D13
EVAPOTRANSPIRATION DATA:     C:\HELP\ph14\EVAP.D11
SOIL AND DESIGN DATA FILE:   c:\HELP\ph14\FINAL.D10
OUTPUT DATA FILE:            c:\HELP\ph14\FINAL.OUT


TIME:  14: 6     DATE:   9/18/2019


******************************************************************************

     TITLE:  Crossroads LF Ph 14 - Final Cover

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     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
              COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.


                                   LAYER  1
                                   --------

                     TYPE 1 - VERTICAL PERCOLATION LAYER
                         MATERIAL TEXTURE NUMBER  10
           THICKNESS                  =      6.00   INCHES
           POROSITY                   =      0.3980 VOL/VOL
           FIELD CAPACITY             =      0.2440 VOL/VOL
           WILTING POINT              =      0.1360 VOL/VOL
           INITIAL SOIL WATER CONTENT =      0.3972 VOL/VOL
           EFFECTIVE SAT. HYD. COND.  =  0.119999997000E-03 CM/SEC


                                   LAYER  2
                                   --------

                     TYPE 1 - VERTICAL PERCOLATION LAYER
                         MATERIAL TEXTURE NUMBER  10
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```
THICKNESS                   =     12.00   INCHES
POROSITY                    =      0.3980 VOL/VOL
FIELD CAPACITY              =      0.2440 VOL/VOL
WILTING POINT               =      0.1360 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.2627 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.119999997000E-03 CM/SEC


                        LAYER  3
                        --------

            TYPE 2 - LATERAL DRAINAGE LAYER
              MATERIAL TEXTURE NUMBER   0
THICKNESS                   =      0.20   INCHES
POROSITY                    =      0.8500 VOL/VOL
FIELD CAPACITY              =      0.0100 VOL/VOL
WILTING POINT               =      0.0050 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.0108 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =   4.86000013000     CM/SEC
SLOPE                       =     33.00   PERCENT
DRAINAGE LENGTH             =    180.0    FEET


                        LAYER  4
                        --------

            TYPE 4 - FLEXIBLE MEMBRANE LINER
              MATERIAL TEXTURE NUMBER  35
THICKNESS                   =      0.04   INCHES
POROSITY                    =      0.0000 VOL/VOL
FIELD CAPACITY              =      0.0000 VOL/VOL
WILTING POINT               =      0.0000 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.0000 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.199999996000E-12 CM/SEC
FML PINHOLE DENSITY         =      0.00   HOLES/ACRE
FML INSTALLATION DEFECTS    =      2.00   HOLES/ACRE
FML PLACEMENT QUALITY       =  2 - EXCELLENT


                        LAYER  5
                        --------

          TYPE 1 - VERTICAL PERCOLATION LAYER
              MATERIAL TEXTURE NUMBER  17
THICKNESS                   =      0.25   INCHES
POROSITY                    =      0.7500 VOL/VOL
FIELD CAPACITY              =      0.7470 VOL/VOL
WILTING POINT               =      0.4000 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.6574 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.300000003000E-08 CM/SEC


                        LAYER  6
                        --------
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          TYPE 1 - VERTICAL PERCOLATION LAYER
              MATERIAL TEXTURE NUMBER  10
THICKNESS                  =      6.00   INCHES
POROSITY                   =      0.3980 VOL/VOL
FIELD CAPACITY             =      0.2440 VOL/VOL
WILTING POINT              =      0.1360 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.2440 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.119999997000E-03 CM/SEC


                        LAYER  7
                        --------

          TYPE 1 - VERTICAL PERCOLATION LAYER
              MATERIAL TEXTURE NUMBER  18
THICKNESS                  =   2232.00   INCHES
POROSITY                   =      0.6710 VOL/VOL
FIELD CAPACITY             =      0.2920 VOL/VOL
WILTING POINT              =      0.0770 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.2920 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.100000005000E-02 CM/SEC


                        LAYER  8
                        --------

            TYPE 2 - LATERAL DRAINAGE LAYER
              MATERIAL TEXTURE NUMBER   1
THICKNESS                  =     24.00   INCHES
POROSITY                   =      0.4170 VOL/VOL
FIELD CAPACITY             =      0.0450 VOL/VOL
WILTING POINT              =      0.0180 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.0459 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.999999978000E-02 CM/SEC


                        LAYER  9
                        --------

            TYPE 2 - LATERAL DRAINAGE LAYER
              MATERIAL TEXTURE NUMBER   0
THICKNESS                  =      0.20   INCHES
POROSITY                   =      0.8500 VOL/VOL
FIELD CAPACITY             =      0.0100 VOL/VOL
WILTING POINT              =      0.0050 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.0100 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =   1.63000000000     CM/SEC
SLOPE                      =      0.90   PERCENT
DRAINAGE LENGTH            =    120.0    FEET


                        LAYER 10
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            TYPE 4 - FLEXIBLE MEMBRANE LINER
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MATERIAL TEXTURE NUMBER 35

THICKNESS	=	0.06 INCHES
POROSITY	=	0.0000 VOL/VOL
FIELD CAPACITY	=	0.0000 VOL/VOL
WILTING POINT	=	0.0000 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0000 VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.199999996000E-12 CM/SEC
FML PINHOLE DENSITY	=	0.00 HOLES/ACRE
FML INSTALLATION DEFECTS	=	0.00 HOLES/ACRE
FML PLACEMENT QUALITY	=	1 - PERFECT

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS USER-SPECIFIED.

SCS RUNOFF CURVE NUMBER	=	75.00	
FRACTION OF AREA ALLOWING RUNOFF	=	100.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.000	ACRES
EVAPORATIVE ZONE DEPTH	=	8.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	3.028	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	3.184	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	1.088	INCHES
INITIAL SNOW WATER	=	2.187	INCHES
INITIAL WATER IN LAYER MATERIALS	=	660.015	INCHES
TOTAL INITIAL WATER	=	662.202	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
AUGUSTA MAINE

STATION LATITUDE	=	44.30 DEGREES
MAXIMUM LEAF AREA INDEX	=	0.00
START OF GROWING SEASON (JULIAN DATE)	=	131
END OF GROWING SEASON (JULIAN DATE)	=	276
EVAPORATIVE ZONE DEPTH	=	8.0 INCHES
AVERAGE ANNUAL WIND SPEED	=	8.70 MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	70.00 %
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	72.00 %
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	77.00 %
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	76.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR PORTLAND MAINE

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
3.78	3.57	3.98	3.90	3.27	3.06
2.83	2.82	3.27	3.83	4.70	4.51

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR AUGUSTA MAINE

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
19.60	21.50	31.50	43.20	54.60	63.80
69.40	67.50	59.00	48.60	37.60	24.00

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR AUGUSTA MAINE
AND STATION LATITUDE = 44.30 DEGREES

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 15

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	3.58	3.06	3.75	3.47	3.30	3.13
	2.96	2.44	3.60	3.05	3.79	4.88
STD. DEVIATIONS	1.37	1.77	1.87	1.76	1.80	1.67
	1.78	0.85	2.16	1.98	2.25	1.96
RUNOFF						
TOTALS	0.499	0.594	8.512	3.219	0.116	0.021
	0.013	0.000	0.170	0.050	0.129	0.119
STD. DEVIATIONS	0.903	0.890	3.878	4.866	0.385	0.081
	0.025	0.000	0.411	0.105	0.326	0.269
EVAPOTRANSPIRATION						
TOTALS	0.509	0.472	0.462	1.952	2.578	2.608
	2.407	2.205	2.016	1.526	1.003	0.443
STD. DEVIATIONS	0.052	0.064	0.169	0.758	1.199	1.090
	1.259	0.831	0.551	0.515	0.166	0.080
LATERAL DRAINAGE COLLECTED FROM LAYER 3						
TOTALS	0.0452	0.0000	0.2339	1.4319	0.7601	0.2756
	0.8512	0.2628	1.1322	1.2449	2.1409	1.1125
STD. DEVIATIONS	0.0450	0.0000	0.6851	1.0831	0.6286	0.3888
	0.8018	0.2727	1.2041	1.3521	1.4383	0.9902

PERCOLATION/LEAKAGE THROUGH LAYER 4

TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

LATERAL DRAINAGE COLLECTED FROM LAYER 9

TOTALS	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
STD. DEVIATIONS	0.0002	0.0002	0.0003	0.0003	0.0003	0.0003
	0.0003	0.0003	0.0002	0.0003	0.0002	0.0002

PERCOLATION/LEAKAGE THROUGH LAYER 10

TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 4

AVERAGES	0.0000	0.0000	0.0002	0.0010	0.0005	0.0002
	0.0006	0.0002	0.0008	0.0009	0.0016	0.0008
STD. DEVIATIONS	0.0000	0.0000	0.0005	0.0008	0.0004	0.0003
	0.0006	0.0002	0.0009	0.0010	0.0011	0.0007

DAILY AVERAGE HEAD ON TOP OF LAYER 10

AVERAGES	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 15

	INCHES	CU. FEET	PERCENT
PRECIPITATION	41.00 (5.366)	148832.4	100.00
RUNOFF	13.442 (3.7345)	48795.07	32.785
EVAPOTRANSPIRATION	18.178 (1.5001)	65986.13	44.336
LATERAL DRAINAGE COLLECTED	9.49117 (2.89887)	34452.953	23.14882

FROM LAYER 3				
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.00000 (	0.00000)	0.005	0.00000
AVERAGE HEAD ON TOP OF LAYER 4	0.001 (	0.000)		
LATERAL DRAINAGE COLLECTED FROM LAYER 9	0.00231 (	0.00296)	8.372	0.00563
PERCOLATION/LEAKAGE THROUGH LAYER 10	0.00000 (	0.00000)	0.007	0.00000
AVERAGE HEAD ON TOP OF LAYER 10	0.000 (	0.000)		
CHANGE IN WATER STORAGE	-0.113 (	2.7858)	-410.12	-0.276

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PEAK DAILY VALUES FOR YEARS 1 THROUGH 15

	(INCHES)	(CU. FT.)
PRECIPITATION	4.90	17787.000
RUNOFF	6.526	23688.8613
DRAINAGE COLLECTED FROM LAYER 3	1.58562	5755.81738
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.000000	0.00003
AVERAGE HEAD ON TOP OF LAYER 4	0.035	
MAXIMUM HEAD ON TOP OF LAYER 4	0.109	
LOCATION OF MAXIMUM HEAD IN LAYER 3 (DISTANCE FROM DRAIN)	0.0 FEET	
DRAINAGE COLLECTED FROM LAYER 9	0.00002	0.08806 ~1 gal
PERCOLATION/LEAKAGE THROUGH LAYER 10	0.000000	0.00002
AVERAGE HEAD ON TOP OF LAYER 10	0.000	
MAXIMUM HEAD ON TOP OF LAYER 10	0.000	
LOCATION OF MAXIMUM HEAD IN LAYER 9 (DISTANCE FROM DRAIN)	0.0 FEET	
SNOW WATER	15.63	56729.2383

MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.3975
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.1360

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner
by Bruce M. McEnroe, University of Kansas
ASCE Journal of Environmental Engineering
Vol. 119, No. 2, March 1993, pp. 262-270.

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FINAL WATER STORAGE AT END OF YEAR 15

LAYER	(INCHES)	(VOL/VOL)
1	2.1161	0.3527
2	2.9639	0.2470
3	0.0021	0.0106
4	0.0000	0.0000
5	0.1521	0.6086
6	1.4640	0.2440
7	651.7440	0.2920
8	1.0800	0.0450
9	0.0020	0.0100
10	0.0000	0.0000
SNOW WATER	0.983	

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ATTACHMENT B

Geotextile Examples

GEOTEXTILES

Product Name (Structure [1]/ Polymer Type [2])	Mass Per Unit Area ASTM D 5261 g/m² (oz/yd²)	M288 Transportation-Related Applications: Filtration/Hydraulic Properties: Percent Open Area CW0-22125 %	Apparent Opening Size ASTM D 4751 mm (U.S. sieve)	Permittivity ASTM D 4491 sec-1 Flow Rate (FH or CH) [3] l/min/m² (gal/min/ft²)	Physical Properties: Puncture ASTM D 6241 kN (lb)	Trapezoid Tearing Strength ASTM D 4533 kN (lb)	Grab Tensile/Elongation ASTM D 4632 kN (lb)/%	M288 Survivability Class	M288 Applications [4]	Reinforcement Applications: Wide Width Tensile/Elongation ASTM D 4595 kN/m (lb/in)/%: Strength @ 5% Strain [5] MD	Strength @ 5% Strain [5] XD	Ultimate Strength % (Tult) [5] MD	Ultimate Strength % (Tult) [5] XD	Creep Limited Strength-MD ASTM D 5262 [6] kN/m (lb/ft)	LTDS GRI GT7-MD (in sand) [7] kN/m (lb/ft)	Other Manufacturer's Suggested Applications [8]
ACE Geosynthetics Inc. | www.geoace.com																
ACETex GT70-I PP (W/PP)	440 (13)	NP	0.425 (40)	0.40/1200 (29), CH	8.0 (1796)	0.8 x 1.8 (180 x 404)	2.0x3.5 (449x786)/NP	1	F, SP, ST	NP	NP	70 (399)	105 (599)	NP	NP	F, R, SP, ST
ACETex GT175-II PP (W/PP)	840 (25)	NP	0.425 (40)	0.40/1200 (29), CH	20 (4491)	3.5 x 3.5 (786 x 786)	5x5 (1123x1123)/NP	1	F, SP, ST	NP	NP	175 (998)	175 (998)	NP	NP	F, R, SP, ST
ACETex GT200-II PP (W/PP)	950 (28)	NP	0.297 (50)	0.45/1350 (33), CH	23 (5164)	4.0 x 4.0 (898 x 898)	7x6 (1572x1347)/NP	1	F, SP, ST	NP	NP	200 (1141)	200 (1141)	NP	NP	F, R, SP, ST
ACETex GT300-II (W/PET)	1050 (31)	NP	0.5 (35)	0.15/450 (11), CH	20 (4491)	4.0 x 3.5 (898 x 786)	5.8x7.6 (1302x1706)/NP	1	SP, ST	45 (257)	120 (684)	300 (1711)	300 (1711)	NP	NP	R, SP, ST
ACETex GT600-I (W/PET)	1200 (35)	NP	NA	0.4/1200 (29), CH	15 (3368)	5.0 x NP (1123 x NP)	8xNP (1796xNP)/NP	1	SP, ST	230 (1312)	NP	600 (3422)	NP	NP	NP	R, SP, ST
ACETex GT1000-I (W/PET)	2100 (62)	NP	NA	0.1/300 (7), CH	25 (5613)	14 x NP (3143 x NP)	10xNP (2245xNP)/NP	1	SP, ST	370 (2110)	NP	1000 (5703)	NP	NP	NP	R, SP, ST
Agru America Inc. | www.agruamerica.com																
Agrutex 041 (NP-P/PP)	136 (4)	NA	.212 (70)	1.8/ CH 5467 (135)	1.38 (310)	.200 (45)	.445 (100)/50	NA	NA	NA	NA	NA	NA	NA	NA	S/T, S/P, F, D, E, P
Agrutex 061 (NW-P/PP)	203 (6)	NA	.212 (70)	1.5/ CH 4479 (110)	1.94 (435)	.289 (65)	.756 (170)/50	2,3	D,SP,ST	NA	NA	NA	NA	NA	NA	S/T, S/P, F, D, E, P
Agrutex 081 (NW-P/PP)	271 (8)	NA	.180 (80)	1.3/ CH 3895 (95)	2.67 (600)	.423 (95)	.979 (220)/50	1,2,3	F,E,SP,ST	NA	NA	NA	NA	NA	NA	S/T, S/P, F, D, E, P, R
Agrutex 101 (NP-P/PP)	339 (10)	NA	.150 (100)	1.1/ CH 3280 (80)	3.23 (725)	.467 (105)	1.20 (270)/50	1,2,3	F,E,SP,ST	NA	NA	NA	NA	NA	NA	S/T, S/P, F, D, E, P, R
Agrutex 121 (NP-P/PP)	401 (12)	NA	.150 (100)	1.0/ CH 2870 (70)	4.12 (925)	.556 (125)	1.42 (320)/50	1,2,3	F,E,SP,ST	NA	NA	NA	NA	NA	NA	S/T, S/P, F, D, E, P, R
Agrutex 161 (NP-P/PP)	544 (16)	NA	.150 (100)	0.7/ CH 2050 (50)	5.00 (1125)	.668 (150)	1.74 (390)/50	1,2,3	F,E,SP,ST	NA	NA	NA	NA	NA	NA	S/T, S/P, F, D, E, P, R
Belton Industries Inc. | www.beltonindustries.com																
Beltech 180, Style 1980, (W-SF/PP)	NA	NA	0.600 (30)	0.05/160 (4), FH	0.400 (90)	0.334 (75)	0.800 (180)/15	3	SP	NP	NP	NP	NP	NP	NP	SP
Beltech 250, Style 1475 (W-SF/PP)	NA	NA	0.600 (30)	0.05/160 (4), FH	0.445 (100)	0.400 (90)	1.11 (250)/15	2	SP	NP	NP	NP	NP	NP	NP	SP
Beltech 315, Style 977 (W-SF/PP)	NA	NA	0.500 (35)	0.05/160 (4), FH	0.534 (120)	0.534 (120)	1.40 (315)/15	1	ST	NP	NP	30.7 (175) 20	30.7 (175) 15	NP	NP	ST
Beltech 400, Style 884 (W-SF/PP)	NA	NA	0.500 (35)	0.05/160 (4), FH	1.00 (225)	0.76 x 0.89 (170x200)	2.17x2.36 (490x530)/ 25x20	NP	NP	NP	NP	52.5 (300) 25	56.0 (320) 20	NP	NP	ST
Beltech 2x2 (W-SF/PP)	NA	NA	0.500 (35)	0.5/1600 (40), FH	NP	NP	NP	NP	NP	NP	NP	35.0 (200) 25	35.0 (200) 15	NP	NP	ST

[1] NW = Non woven, -P = needlepunched, -h = calendered
W = Woven, -SF = slit film t = thermally bonded
K = Knitted O/C = Other/combination
[2] PP = Polypropylene, PET = Polyester, * = average
[3] FH = Test is run by the falling head method
CH = Test is run by the constant head method
[4] SP = Separation S/F = Silt Fence
ST = Stabilization D = Drainage
F = Filtration E = Erosion Control
A/O = Asphalt overlay
[5] MD = Machine direction XD = Cross-machine direction

[6] For a minimum of 10,000 hours, extrapolated to a 75 year time period
[7] LTDS = $\frac{T_{ult}}{RF_{CR} \times RF_{ID} \times RF_{D}}$
RF_{CR} = Reduction factor for creep
RF_{ID} = Reduction factor for installation damage
RF_{D} = Reduction factor for durability
NOTE: this equation does not include other reduction factors which may apply to design. Reduction factors are site specific and should be reviewed on a per project basis. Contact the manufacturer for recommendations.

[8] R = Reinforcement P = Protection
SP = Separation S/F = Silt Fence
ST = Stabilization D = Drainage
F = Filtration E = Erosion Control
RC = Reinforcement Composite
A/O = Asphalt overlay
NP = Not provided by manufacturer
NA = Not applicable, per manufacturer
Companies were requested to provide minimum average roll values (MARV). All claims are the responsibility of the manufacturer.

« *Geosynthetics* recommends you contact the manufacturers before making any specifying/purchasing decisions »

GEOTEXTILES

		M288 Transportation-Related Applications								Reinforcement Applications						
		Filtration/Hydraulic Properties			Physical Properties					Wide Width Tensile/Elongation ASTM D 4595 kN/m (lb/in)/%						
										Strength @ 5% Strain [5]		Ultimate Strength % (Tult) [5]				
Product Name (Structure [1]/ Polymer Type [2])	Mass Per Unit Area ASTM D 5261 g/m² (oz/yd²)	Percent Open Area CW0-22125 %	Apparent Opening Size ASTM D 4751 mm (U.S. sieve)	Permittivity ASTM D 4491 sec-1 Flow Rate (FH or CH) [3] l/min/m² (gal/min/ft²)	Puncture ASTM D 6241 kN (lb)	Trapezoid Tearing Strength ASTM D 4533 kN (lb)	Grab Tensile/Elongation ASTM D 4632 kN (lb)/%	M288 Survivability Class	M288 Applications [4]	MD	XD	MD	XD	Creep Limited Strength-MD ASTM D 5262 [6] kN/m (lb/ft)	LTDS GRI GT7-MD (in sand) [7] kN/m (lb/ft)	Other Manufacturer's Suggested Applications [8]
Fiberweb Geosynthetics | www.fiberweb.com/geosynthetics/																
Typar 3341 NW-PP-t	116* (3.4)	NA	0.25 (60)	0.7/3485 (85), FH	NP	0.180 (40)	0.533 (120)/60	NP	NP	NP	NP	NP	NP	NA	NA	SP, F, D
Typar 3401 NW-PP-t	136* (4.0)	NA	0.21 (70)	0.7/2460 (60), FH	0.99 (225)	0.270 (60)	0.578 (130)/60	3	SP, ST, D, E	NP	NP	NP	NP	NA	NA	SP, ST, F, D, E, P
Typar 3501 NW-PP-t	170* (5.0)	NA	0.20 (70)	0.5/2050 (50), FH	1.375 (310)	0.270 (60)	0.710 (160)/60	2	SP, ST, D, E	NP	NP	NP	NP	NA	NA	F, D, SP, ST, E, P
Typar 3601 NW-PP-t	204* (6.0)	NA	0.10 (140)	0.10/615 (15), FH	1.650 (370)	0.400 (90)	1.067 (240)/60	2	SP, ST, D, E	NP	NP	NP	NP	NA	NA	F, D, SP, ST, E, R, P
Typar 3631 NW-PP-t	214* (6.3)	NA	0.10 (140)	0.20/820 (20), FH	NP	0.400 (90)	1.110 (250)/60	1	SP, ST, D, E	NP	NP	NP	NP	NA	NA	F, D, SP, ST, E, R, P
Typar 3801 NW-PP-t	272* (8.0)	NA	0.09 (170)	0.10/328 (8), FH	2.285 (510)	0.425 (95)	1.335 (300)/60	1	SP, ST	NP	NP	NP	NP	NA	NA	E, SP, ST, R, P
Typar 3100 NW-PP-t	339* (10.0)	NA	NP	0.123/328 (8) FH	3.136 (697)	0.556(125)	2.000 (450)/60	1	SP, ST	NP	NP	NP	NP	NA	NA	E, SP, ST, R, P
GSE Lining Technology Inc. | www.gseworld.com																
NW4 (NW-P/PP)	135 (4)	NA	0.212 (70)	1.8 5495 (135)	0.265 (60)	0.22 (50)	0.53 (120)/50	3	SP, D, F, E, A/O	NP	NP	NP	NP	NP	NP	NP
NW6 (NW-P/PP)	200 (6)	NA	0.212 (70)	1.5 4480 (110)	0.395 (90)	0.29 (65)	0.71 (160)/50	2	SP, D, F, E, A/O	NP	NP	NP	NP	NP	NP	NP
NW8 (NW-P/PP)	270 (8)	NA	0.18 (80)	1.3 3865 (95)	0.525 (120)	0.40 (90)	0.97 (220)/50	1	SP, D, F, E, P	NP	NP	NP	NP	NP	NP	NP
NW10 (NW-P/PP)	335 (10)	NA	0.15 (100)	1.0 3050 (75)	0.725 (165)	0.45 (100)	1.15 (260)/50	>1	SP, D, F, E, P	NP	NP	NP	NP	NP	NP	NP
NW12 (NW-P/PP)	405 (12)	NA	0.15 (100)	0.8 2440 (60)	0.835 (190)	0.55 (125)	1.42 (320)/50	>>1	SP, D, F, E, P	NP	NP	NP	NP	NP	NP	NP
NW16 (NW-P/PP)	540 (16)	NA	0.15 (100)	0.6 1830 (45)	1.055 (240)	0.66 (150)	1.73 (390)/50	>>>1	SP, D, F, E, P	NP	NP	NP	NP	NP	NP	NP
NW20 (NW-P/PP)	675 (20)	NA	NA	NA	0.88 (200)	0.55 (125)	1.98 (450)/50	>>>1	F, D, E	NP	NP	NP	NP	NP	NP	P, ST
NW24 (NW-P/PP)	810 (24)	NA	NA	NA	1.1 (250)	0.88 (200)	2.20 (500)/50	>>>1	F, D, E	NP	NP	NP	NP	NP	NP	P, ST
NW28 (NW-P/PP)	950 (28)	NA	NA	NA	1.3 (300)	1.1 (250)	2.42 (550)/50	>>>1	F, D, E	NP	NP	NP	NP	NP	NP	P, ST
NW32 (NW-P/PP)	1080 (32)	NA	NA	NA	1.5 (350)	1.19 (270)	2.64 (600)/50	>>>1	F, D, E	NP	NP	NP	NP	NP	NP	P, ST

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[3] FH = Test is run by the falling head method
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[4] SP = Separation S/F = Silt Fence
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[5] MD = Machine direction XD = Cross-machine direction

[6] For a minimum of 10,000 hours, extrapolated to a 75 year time period
[7] $LTDS = \frac{T_{ult}}{RF_{CR} \times RF_{ID} \times RF_D}$
RF_{CR} = Reduction factor for creep
RF_{ID} = Reduction factor for installation damage
RF_D = Reduction factor for durability
NOTE: this equation does not include other reduction factors which may apply to design. Reduction factors are site specific and should be reviewed on a per project basis. Contact the manufacturer for recommendations.

[8] R = Reinforcement P = Protection
SP = Separation S/F = Silt Fence
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APPENDIX IV(e)(ii)

Leachate Collection Pipe Flow Capacity

Written by:	Youngmin Cho	Date:	2019/09/04 (YYYY MM DD)	Reviewed by:	A.Rohrman / N.Yafrate	Date:	2019/09/13 2019/09/11
Client:	WMDSM	Project:	Ph 14 Permitting	Project/Proposal No.:	BE0232C	Task No:	02

LEACHATE COLLECTION PIPE FLOW CAPACITY

CROSSROADS LANDFILL PHASE 14

PURPOSE

The purpose of this calculation is to evaluate the flow capacity of the proposed leachate collection system (LCS) pipe design at the Crossroads landfill Phase 14. The proposed LCS system detail is presented in Figure 1. In this calculation package, the following evaluations of the LCS were performed: (1) flow capacity of the geotextile filter accounting for flow rate reduction, soil clogging and blinding, intrusion, creeping, chemical clogging, and biological clogging, (2) flow capacity through perforations of LCS lateral pipes, and (3) flow capacity of the LCS lateral and header pipes. Note, the flow capacity of the crushed stone surrounding the LCS pipes is not evaluated because the hydraulic conductivity of the crushed stone is typically 100 to 1,000 times greater than the leachate drainage sand; therefore, the stone will not impede leachate flow from the drainage sand into the LCS pipes.

This calculation package was prepared pursuant to Chapter 401 Section 2.D.(4)(a)(ix) of the Maine Solid Waste Management Rules, stating "*The leachate transport system must be designed to convey the design flows from the leachate collection and detection systems.*"

DESIGN PARAMETERS

LCS Pipe Layout and Slope

The plan layout of the proposed leachate collection system grading plan is shown on Sheet 7 of the Phase 14 Permit Drawings. Each landfill phase will have multiple lateral collection pipes spaced approximately 120-ft apart to collect leachate from the leachate drainage layer (i.e., geocomposite and Drainage Sand components of the liner system) and convey the leachate to a leachate header pipe running down the long corridor axis of each cell to the LCS sump. The lateral collection pipes and header pipes will be 8-inch diameter high density polyethylene (HDPE). The final liner conditions (i.e. slope) after settlement were used to design the LCS header pipe capacity. As presented in the calculation package, titled *Liner Settlement Analysis* presented as Volume IV Appendix D of the Phase 14 Permit Application a minimum post-settlement gradient (slope) of the LCS header pipe was calculated to be 0.9% (within the Phase 14E area).

Peak Leachate Generation Rate

The LCS pipes must be designed to accommodate the maximum daily leachate flow. The HELP model was used to calculate the maximum daily leachate flow as presented in the calculation package, titled *Evaluation of Peak Leachate Generation Rate and Leachate Collection System Capacity* presented in Volume IV Appendix E(i) of the Phase 14 Permit Application. The calculated maximum leachate flow rate is 29,695 gallons per day per acre. Phase 14 will consist of five sub-phases (Phases 14A through 14E), and each sub-phase will have an LCS main header pipe. The anticipated maximum area of the sub-phases is approximately 12.5 acres (i.e., the area of Phase 14D). Therefore, the anticipated maximum leachate flow rate of the largest sub-phase is approximately 371,188 gallons per day (gpd), which corresponds to 258 gallons per minute (gpm).

PROCEDURE

<u>Flow Capacity of Geotextile</u>

The flow capacity of the geotextile filter was adjusted for soil clogging and blinding, creep, intrusion, chemical clogging and biological clogging as recommended by Koerner and Koerner (2007). A flow rate of typical 16-oz/yd^2 non-woven geotextile is presented in Attachment A.

The leachate flow rate through the geotextile filter surface, facing (catching) leachate flows, per acre was calculated as follows:

1. Estimate a total length of LCS lateral pipes per one acre
    a. Assuming the 1-acre area is square, the length of each edge of the square area is 208.7 ft.
    b. Assuming the 120 ft spacing of the LCS laterals[1], the length of the representative LCS lateral is estimated to be 363 ft (i.e., 208.7 ft/120 ft × 208.7 ft).
2. Estimate a total area of geotextile facing (catching) leachate flows
    a. Based on the HELP model output, the peak head on the liner is calculated to be approximately 11 inches (0.92 ft). Therefore, leachate will flow through approximately 333 ft^2 of geotextile filter surface per acre (i.e., 363 ft × 0.92 ft).
3. The flow rate of geotextile is then multiplied by the calculated geotextile filter surface per acre.

The calculated flow rate (per acre) of the geotextile filter is then compared with the peak leachate generation rate (i.e., 29,695 gallons/day/acre or 21 gallons/minute/acre).

<u>Flow Capacity of LCS Pipe Perforations</u>

The maximum allowable diameter of the perforations in the collector pipes to provide particle retention of gravel particles 1 ½-inch crushed stone (AASHTO 57 stone) may be calculated as follows (USEPA 1988, see Attachment A):

---

[1] Per The calculation package, titled *Evaluation of Peak Leachate Generation Rate and Leachate Collection System Capacity*.

$$d_{h\max} = \frac{d_{85}}{F}$$

Where:

$d_{h\,max}$ = Maximum perforation diameter to provide particle retention;

d_{85} = Particle size of the pipe bedding material for which 85 percent by weight of the particle are finer; and

F = Factor varying between 1.2 and 2.

For calculations of the maximum perforation diameter in the leachate collection pipes surrounded by 1 ½-inch crushed stone, a particle gradation curve is shown in Figure 2 (see Attachment A for AASHTO 57 stone gradation specification). As shown, the range of d_{85} varies from 19.5 mm (0.768 inches) to 22 mm (0.866 inches). For design, the minimum d_{85} will be used with an F value of 1.5. The calculation for maximum pipe perforation size allowable for pipes surrounded by AASHTO NO. 57 stone is therefore:

$$d_{h\max} = \frac{0.768\ in}{1.5}$$

$$d_{h\,max} = 0.512 \text{ inches}$$

Based on the above calculation, a perforation diameter 0.5 inches was selected.

The ability of the pipe perforations to convey leachate into the pipe was evaluated using the equation of flow (Q) through an orifice:

$$Q = a\,C_B\,\sqrt{2gh}$$

where:

Q = flow rate (ft^3/sec);

a = area of the orifice (ft^2);

C_B = orifice coefficient (usually 0.6);

g = acceleration due to gravity (32.2 ft/s^2); and

h = liquid depth above the hole (ft).

Thus, for a 0.5-in diameter pipe perforation with an assumed leachate head of 6.7 in (estimated average head per hole for a maximum leachate head buildup situation for an 8.625-in outer diameter pipe with perforations positioned as shown on Figure 3), the calculated flow is:

$$Q = \left(\frac{0.5\ in}{2} \times \frac{1ft}{12in}\right)^2 \pi\ (0.6)\ \sqrt{2(32.2\ \text{ft}/s^2)(\frac{6.7}{12}\ \text{ft})}$$
$$= 0.0049\ ft^3/\text{sec/hole} = 2.2\ \text{gpm/hole}$$

The proposed pipe perforation spacing is one hole per every 6-in. linearly and 4 holes around the pipe per linear location, resulting in 8 total perforations per linear foot. Based on the HELP model used in the above-mentioned leachate generation and LCS capacity calculation, a spacing of lateral LCS lateral pipes of 120 ft will maintain hydrostatic head on the geomembrane liner below 12 inches. Assuming the 12.5-acre LCS area is square (i.e., an edge length is approximately 738 ft) and 120-ft perforated LCS lateral pipe spacing, six rows of 737-ft long LCS lateral pipes will be needed to cover the 12.5-acre LCS area. This equates to a total perforated LCS lateral pipe length of 4,422 ft, and therefore a total of 35,376 perforations. An equivalent flow capacity factor of safety, *FS(perf)*, through the perforations into the LCS pipes can be calculated as follows:

$$FS(perf) = \frac{Total\ Flow\ Rate\ Through\ LCS\ Lateral\ Perforations}{Maximum\ Leachate\ Collection\ Rate}$$

$$FS(perf) = \frac{\frac{2.2gpm}{hole} \cdot 35{,}376\ holes}{258gpm}$$

$$FS(perf) = 302$$

Flow Capacity in LCS Pipe

The pipe capacity is calculated using Manning's equation:

$$Q_{avail} = \frac{1.49}{n}\ A\ R_h^{2/3}\ S^{1/2}$$

where:

Q_{avail} = available flow rate (cubic ft per sec);

R_h = hydraulic radius (ft) (wetted area/wetted perimeter);

S = hydraulic gradient (ft/ft);

A = cross-sectional flow area (ft^2); and

n = Manning's roughness coefficient.

The proposed LCS header pipe design is an 8-inch nominal outer diameter (OD) HDPE pipe. A conservatively low Manning's coefficient (n) of 0.013 for a deteriorated surface condition used. The cross-sectional flow area of a typical 8-inch nominal diameter HDPE pipe was calculated using dimension information in Attachment A (pipe for standard dimension ratio (SDR) 13.5, 8.625-inch OD with a 0.639-inch wall thickness and 7.27-inch inside diameter (ID)) and the following calculation:

$$A = \pi\,(ID/2)^2$$

$$A = \pi\,(7.27\text{ in} / 2)^2$$

$$A = 41.5\text{ in}^2 = 0.288\text{ ft}^2$$

where:

ID = inner pipe diameter (in); and

A = cross-sectional flow area (in^2).

The hydraulic radius is determined from the following calculation:

$$R_h = \frac{A_w}{P_w}$$

$$R_h = \frac{41.5 in^2}{\pi \cdot ID} = \frac{41.5 in^2}{\pi \cdot 7.27 in}$$

$$R_h = 1.817\text{ in} = 0.151\text{ ft}$$

where:

R_h = hydraulic radius (in) (wetted area/wetted perimeter);

A_w = wetted area (in^2) = cross-sectional flow area when flowing full; and

P_w = wetted perimeter (in).

The hydraulic gradient used in calculating the full flow pipe capacity corresponds to the slope of the leachate collection pipe after settlement. For this analysis, calculations were done for a gradient (post-settlement slope of the LCS pipe) of 0.9%.

The full flowing pipe capacity for 8-inch nominal pipe size with a 13.5 SDR and a 0.9% gradient:

$$Q_{avail} = \frac{1.49}{0.013}(0.288ft^2)\cdot(0.151ft)^{2/3}\cdot(0.009)^{1/2} = 0.89\ \text{ft}^3/\text{sec}$$

$$\boldsymbol{Q_{avail}} = 0.89\frac{\boldsymbol{ft^3}}{\boldsymbol{sec}}\times\frac{\boldsymbol{60sec}}{\boldsymbol{min}}\times\frac{\boldsymbol{7.48gal}}{\boldsymbol{ft^3}} = 399\ \text{gal/min}$$

The factor of safety for flow within the LCS pipes can be calculated as:

$$FS(pipe) = \frac{Q_{avail}}{Q_{\max}}$$

Therefore, for a 0.9% gradient

$$FS(pipe) = \frac{Q_{avail}}{Q_{max}} = \frac{399\ \text{gal/min}}{258\ \text{gal/min}} = 1.55$$

RESULTS AND CONCLUSIONS

Flow Capacity of Geotextile

As presented in Table 1, the calculated flow rates of the filter geotextile surface facing (catching) leachate flows in the drainage sand range from 83 gpm/acre to 2,080 gpm/acre, depending on the selected reduction factors accounting for soil clogging and blinding, creep, soil intrusion, chemical clogging, and biological clogging. These calculated filter geotextile flow rates are significantly greater than the peak leachate generation rate of 21 gpm/acre. Therefore, the geotextile is evaluated to have a sufficient flow capacity to manage the calculated peak leachate generation rate.

Flow Capacity through Perforations into LCS Laterals

The maximum pipe perforation size allowable for pipes surrounded by AASHTO No. 57 stone is calculated to be 0.5 inch. The calculated factor of safety for leachate flow into the pipes through the 0.5-inch diameter perforations (8 perforations per linear foot of pipe) of the LCS lateral pipes is 302. Therefore, the 0.5-in diameter perforation size with 8 perforations per linear foot of pipe is sufficient to convey the calculated peak leachate flow into the LCS pipes.

LCS Pipe Flow Capacity

Based on the analysis presented, the factor of safety of the LCS header pipe flow is approximately 1.55 for the calculated peak LCS flow. Therefore, the LCS header pipe size of 8 inches (nominal diameter) is sufficient. Since each lateral pipe will transmit significantly less leachate than the LCS header pipe, the 8-inch diameter LCS lateral pipe will have a sufficient flow capacity to manage the calculated peak leachate generation rate.

REFERENCES

Koerner, R.M. and Koerner, G.R. "Reduction Factors Used in Geosynthetic Design, GSI White Paper #4, Rev. 1," March 2007.

Maine Department of Environmental Protection, Solid Waste Management Regulations, 06-096 CMR Chapter 401.

Chevron Phillips Chemical Company, Corporate Communications. Information and Technical Brochure.2012. 23 March 2012.

USEPA, "Lining of Waste Containment and Other Impoundment Facilities" EPA/600/2-88/052, U.S. Environmental Protection Agency, Risk Reduction Engineering Laboratory, Cincinnati, Ohio, September 1988. 1041 p.

Table 1: Flow Rate of 16-oz/syd Non-Woven Geotextile Filter
Crossroads Landfill Phase 14
Norridgewock, Maine

$$q_{allow} = q_{ult}\left[\frac{1}{RF_{SCB} \times RF_{CR} \times RF_{IN} \times RF_{CC} \times RF_{BC}}\right]$$

where

q_{allow} = allowable (or design) flow rate,

q_{ult} = ultimate (or as-manufactured) flow rate,

RF_{SCB} = reduction factor for soil clogging and blinding,

RF_{CR} = reduction factor for creep reduction of void space,

RF_{IN} = reduction factor for adjacent materials intruding into void spaces,

RF_{CC} = reduction factor for chemical clogging, and

RF_{BC} = reduction factor for biological clogging.

Manufactured Flow Rate **45** **gpm/ft^2**

Reduction Factor (RF)	Low	Average	High
Clogging and Blinding (RF_{SCB})	2	6	10
Creep (RF_{CR})	1.5	1.75	2.0
Intrusion (RF_{IN})	1.0	1.1	1.2
Chemical Clogging (RF_{CC})	1.2	1.35	1.5
Biological Clogging (RF_{BC})	2.0	3.5	5.0
Total RF	**7.2**	**54.6**	**180.0**
Adjusted Flow Rate (gpm/ft^2)	**6.25**	**0.82**	**0.25**
Adjusted Flow Rate of Geotextile Filer Per acre, q_{filter} (gpm/acre)	**2,080**	**274**	**83**
Factor of Safety (= $q_{filter} \div q_{peak}$)	**101**	**13**	**4**

Notes,

1. Max Leachate Generation Rate, q_{peak} = 29,695 gpd/acre
   21 gpm/acre
2. Area of the geotextile filter per acre = 333 ft^2/acre
3. Typical (as-manufactured) flow rate of 16-oz/syd non-woven geotextile filter was adapted from the datasheet of WINFAB 1600NE.
4. Reference Koerner, R.M. and Koerner, G.R. "Reduction Factors Used in Geosynthetic Design, GSI White Paper #4, Rev. 1," March 2007.

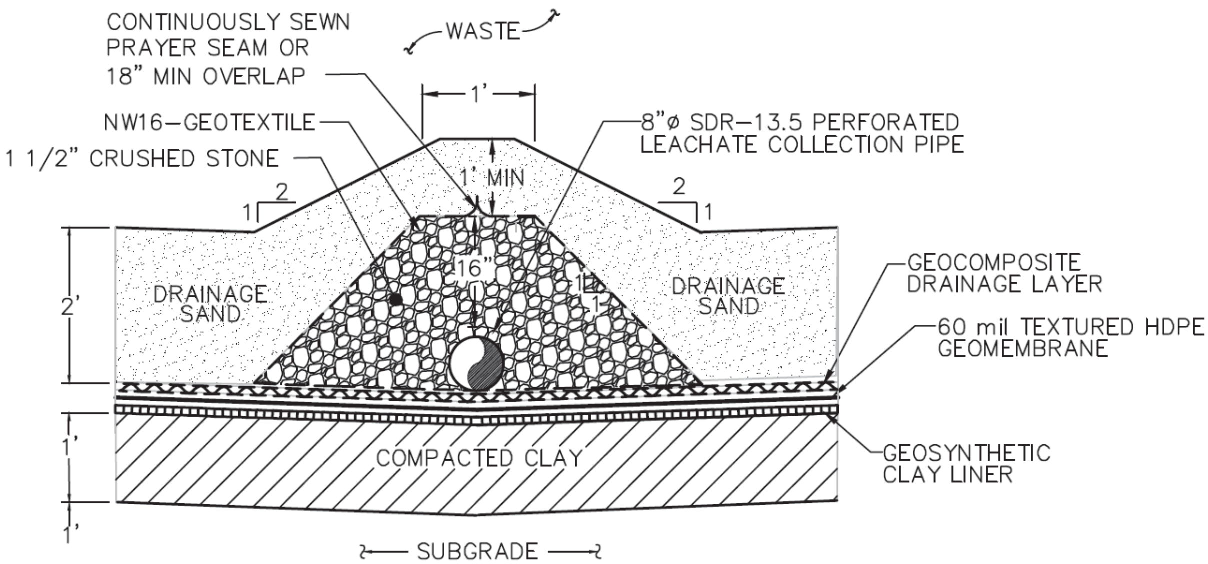

Figure 1. Proposed Phase 14 Leachate Collection System

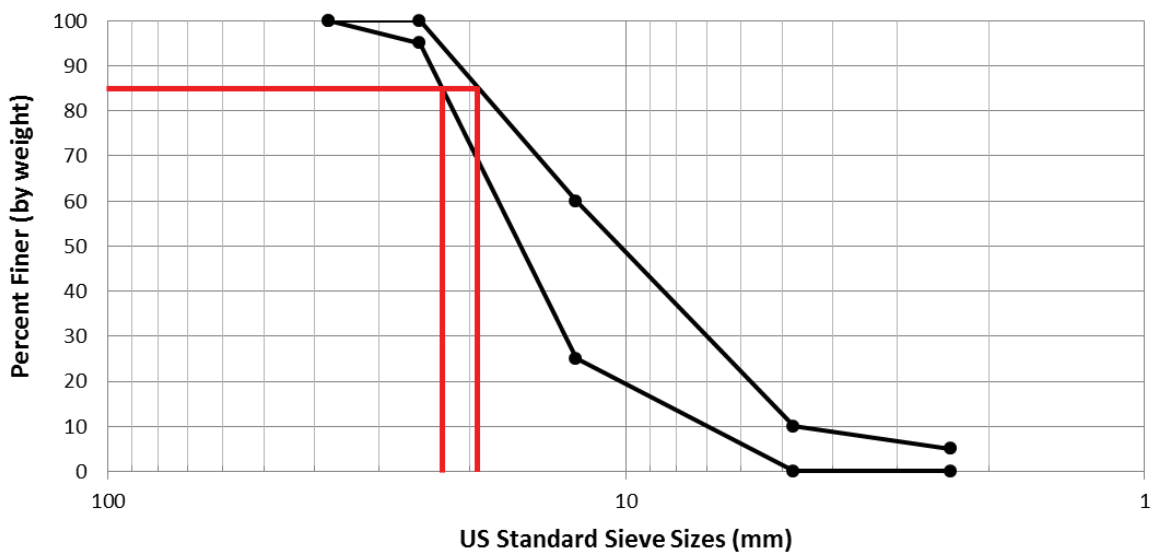

Figure 2. AASHTO NO. 57 Stone Distribution Chart

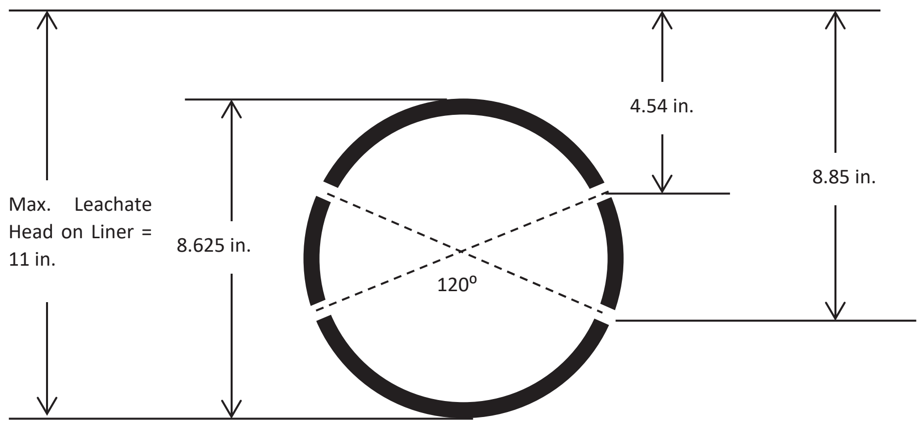

Figure 3. Orientation of Leachate Collection Pipe Perforations and Static Hydraulic Head under Full Flow Condition

ATTACHMENT A

REFERENCES

PE 3408 Industrial Piping System
Pipe Data and Pressure Ratings

Bulletin No. 301

Chevron Plexco

(Pipe weights are calculated in accordance with PPI TR-7) Average inside diameter calculated in using nominal OD and minimum wall plus 6% for use in estimating fluid flows. Actual ID will vary. When designing components to fit the pipe ID, refer to pipe dimensions and tolerances in applicable pipe specifications.

Pressure Ratings are for water at 73ºF. For other fluids and service temperatures ratings may differ, refer to Plexco/Spirolite Engineering Manual Book 1 Engineering Properties.

Pressure Rating		255 psi DR 7.3			200 psi DR 9.0			160psi DR 11.0			130 psi DR 13.5			110 psi DR 15.5			
IPS* Pipe Size	Nominal OD (in.)	Minimum Wall (in.)	Average ID (in.)	Weight LB/FT	Minimum Wall (in.)	Average ID (in.)	Weight LB/FT	Minimum Wall (in.)	Average ID (in.)	Weight LB/FT	Minimum Wall (in.)	Average ID (in.)	Weight LB/FT	Minimum Wall (in.)	Average ID (in.)	Weight LB/FT	IPS* Pipe Size
1 1/4"	1.660	0.227	1.179	0.44	0.184	1.270	0.37	0.151	1.340	0.31	0.123	1.399	0.26	0.107	1.433	0.23	1 1/4"
1 1/2"	1.900	0.260	1.349	0.58	0.211	1.453	0.49	0.173	1.533	0.41	0.141	1.601	0.34	0.123	1.639	0.30	1 1/2"
2"	2.375	0.325	1.686	0.91	0.264	1.815	0.76	0.216	1.917	0.64	0.176	2.002	0.53	0.153	2.051	0.47	2"
3"	3.500	0.479	2.485	1.98	0.389	2.675	1.65	0.318	2.826	1.39	0.259	2.951	1.15	0.226	3.021	1.02	3"
4"	4.500	0.616	3.194	3.27	0.500	3.440	2.74	0.409	3.633	2.30	0.333	3.794	1.90	0.290	3.885	1.67	4"
5 3/8"	5.375	0.736	3.815	4.66	0.597	4.109	3.90	0.489	4.338	3.27	0.398	4.531	2.72	0.347	4.639	2.40	5 3/8"
5"	5.563	0.762	3.948	5.00	0.618	4.253	4.18	0.506	4.490	3.50	0.412	4.690	2.91	0.359	4.802	2.57	5"
6"	6.625	0.908	4.700	7.09	0.736	5.065	5.93	0.602	5.349	4.97	0.491	5.584	4.13	0.427	5.720	3.64	6"
7 1/8"	7.125	0.976	5.056	8.20	0.792	5.446	6.87	0.648	5.751	5.75	0.528	6.006	4.78	0.460	6.150	4.21	7 1/8"
8"	8.625	1.182	6.119	12.01	0.958	6.594	10.05	0.784	6.963	8.42	0.639	7.270	7.00	0.556	7.446	6.16	8"
10"	10.750	1.473	7.627	18.66	1.194	8.219	15.62	0.977	8.679	13.09	0.796	9.062	10.87	0.694	9.279	9.59	10"
12"	12.750	1.747	9.046	26.25	1.417	9.746	21.97	1.159	10.293	18.42	0.944	10.749	15.30	0.823	11.005	13.47	12"
13 3/8"	13.375	1.832	9.491	28.88	1.486	10.225	24.17	1.216	10.797	20.26	0.991	11.274	16.83	0.863	11.545	14.83	13 3/8"
14"	14.000	1.918	9.934	31.64	1.556	10.701	26.49	1.273	11.301	22.20	1.037	11.802	18.44	0.903	12.086	16.24	14"
16"	16.000	2.192	11.353	41.34	1.778	12.231	34.61	1.455	12.915	29.00	1.185	13.488	24.09	1.032	13.812	21.21	16"
18"	18.000	2.466	12.772	52.31	2.000	13.760	43.79	1.636	14.532	36.69	1.333	15.174	30.48	1.161	15.539	26.85	18"
20"	20.000	2.740	14.191	64.57	2.222	15.289	54.05	1.818	16.146	45.30	1.481	16.860	37.64	1.290	17.265	33.13	20"
22"	22.000	3.014	15.610	78.15	2.444	16.819	65.41	2.000	17.760	54.82	1.630	18.544	45.56	1.419	18.992	40.09	22"
24"	24.000	3.288	17.029	92.99	2.667	18.346	77.85	2.182	19.374	65.24	1.778	20.231	54.22	1.548	20.718	47.72	24"
†26"	26.000	3.562	18.449	109.15	2.889	19.875	91.35	2.364	20.988	76.58	1.926	21.917	63.63	1.677	22.445	56.02	†26"
†28"	28.000				3.111	21.405	105.96	2.545	22.605	88.79	2.074	23.603	73.76	1.806	24.171	64.94	†28"
†30"	30.000				3.333	22.934	121.62	2.727	24.219	101.94	2.222	25.289	84.68	1.935	25.898	74.56	†30"
†32"	32.000							2.909	25.833	115.99	2.370	26.976	96.35	2.065	27.622	84.88	†32"
†34"	34.000							3.091	27.447	130.92	2.519	28.660	108.80	2.194	29.349	95.83	†34"
†36"	36.000													2.323	31.075	107.40	†36"
†42"	42.000																†42"
†48"	48.000																†48"
†54"	54.000																†54"

*Industrial PE (polyethylene) pipe sizes are identified by IPS (iron pipe size) diameters which designate the nominal diameter for 12" IPS AND SMALLER PIPE, AND O.D. (outside diameter) for 14" IPS and larger pipe.

PLEXCO can produce to specialized pipe dimensions. Check with your PLEXCO sales office for availability of dimensions not listed.
†SUBJECT TO MINIMUM ORDER QUANTITIES, AND AVAILABILITY OF TOOLING.

TABLE 703.01-1 SIZE OF COARSE AGGREGATE (AASHTO M 43)

Size No.	Nominal size [1] square openings inch	Nominal size [1] square openings mm	Amounts finer than each laboratory sieve (square openings), percent by weight: 4 in. 100 mm	3 1/2 in. 90 mm	3 in. 75 mm	2 1/2 in. 63 mm	2 in. 50 mm	1 1/2 in. 37.5 mm	1 in. 25 mm	3/4 in. 19 mm	1/2 in. 12.5 mm	3/8 in. 9.5 mm	No. 4 4.75 mm	No. 8 2.36 mm	No. 16 1.18 mm	No. 50 300 μm	No. 100 150 μm
1	3 1/2 to 1 1/2	90 to 37.5	100	90 to 100		25 to 60		0 to 15		0 to 5							
2	2 1/2 to 1 1/2	63 to 37.5			100	90 to 100	35 to 70	0 to 15		0 to 5							
24	3 1/2 to 3/4	63 to 19			100	90 to 100		25 to 60		0 to 10	0 to 5						
3	2 to 1	50 to 25				100	90 to 100	35 to 70	0 to 15		0 to 5						
357	2 to No. 4	50 to 4.75				100	95 to 100		35 to 70		10 to 30		0 to 5				
4	1 1/2 to 3/4	37.5 to 19					100	90 to 100	20 to 55	0 to 15		0 to 5					
467	1 1/2 to No. 4	37.5 to 4.75					100	95 to 100		35 to 70		10 to 30	0 to 5				
5	1 to 1/2	25 to 12.5						100	90 to 100	20 to 55	0 to 10	0 to 5					
56	1 to 3/8	25 to 9.5						100	90 to 100	40 to 75	15 to 35	0 to 15	0 to 5				
57	1 to No. 4	25 to 4.75						100	95 to 100		25 to 60		0 to 10	0 to 5			
6	3/4 to 3/8	19 to 9.5							100	90 to 100	20 to 55	0 to 15	0 to 5				
67	3/4 to No. 4	19 to 4.75							100	90 to 100		20 to 55	0 to 10	0 to 5			
68	3/4 to No. 8	19 to 2.36							100	90 to 100		30 to 65	5 to 25	0 to 10	0 to 5		
7	1/2 to No. 4	12.5 to 4.75								100	90 to 100	40 to 70	0 to 15	0 to 5			
78	1/2 to No. 8	12.5 to 2.36								100	90 to 100	40 to 75	5 to 25	0 to 10	0 to 5		
8	3/8 to No. 8	9.5 to 2.36									100	85 to 100	10 to 30	0 to 10	0 to 5		
89	3/8 to No. 16	9.5 to 1.18									100	90 to 100	20 to 55	5 to 30	0 to 10	0 to 5	
9	No. 4 to 16	4.75 to 1.18										100	85 to 100	10 to 40	0 to 10	0 to 5	
10	No. 4 to 0 [2]	4.75 to 0 [2]										100	85 to 100				10 to 30

[1] Numbered sieves are those of the United States Standard Sieve Series.

[2] Screenings.

Where standard size of coarse aggregate designated by two or three digit numbers are specified, obtain the specified gradation by combining the appropriate single digit standard size aggregates by a suitable proportioning device which has a separate compartment for each coarse aggregate combined. Perform the blending as directed by the Laboratory.

USEPA, "Lining of Waste Containment and Other Impoundment Facilities"EPA/600/2-88/052, U.S. Environmental Protection Agency, Risk Reduction Engineering Laboratory, Cincinnati, Ohio, September 1988. 1041 p.

depends on flow through leaks in the top liner. In this case, pipe size and spacing need to be sufficient to allow rapid transmission of liquids and need not be designed to remove some predetermined volume rate of flow (EPA, 1985). In the field, 2-in. diameter pipes have been used, particularly in early design. At present, 6-in. diameter pipes are generally used and are recommended since larger pipes allow for simpler system maintenance and greater protection against clogging (E. C. Jordan, 1984). Ramke (1986) recommends using 200-mm (8-in.) pipe in order to ensure that the pipes can be inspected by television probes and can be cleaned out with rinsing devices. Equations for using leachate flow rate to determine pipe size and spacing are presented in Appendix I.

The collection pipe design must consider the size, spacing, and orientation of holes or slots used to perforate the pipe. Perforations must allow the leachate or waste to pass but prevent the passage of granular drainage media into the collection pipe. The size or diameter of these perforations, therefore, must be matched with the particle size of the drainage media. Satisfactory performance can be expected (Young et al, 1982) if the drain gravel gradation and perforation, diameter, or slotting width selected for the drain pipe satisfies the following U.S. Army Corps of Engineers (1955) criteria for gradation of filter materials in relation to pipe openings:

For slots:

$$\frac{D_{85} \text{ of the drainage media}}{\text{slot width}} \geqq 1.2.$$

For circular holes:

$$\frac{D_{85} \text{ of the drainage media}}{\text{hole diameter}} \geqq 1.2.$$

The Bureau of Reclamation (1977, p 235) uses the following criterion for grain size of filter materials in relation to openings in pipes:

$$\frac{D_{85} \text{ of the drainage media nearest the pipe}}{\text{maximum opening of drain pipe}} \geqq 2.$$

where D_{85} is the screen size through which 85% of the drain rock (by weight) can pass. Cedergren (1967) suggests that the above equations represent a reasonable range over which satisfactory performance can be expected. Another criterion for pipe hole size considers the movement of liquid into the pipe as a function of the ratio between slot width and the wall thickness of the drain pipe. Knobloch (1969) recommends that the ratio of the slot width to wall thickness should be greater than or equal to 1.5 in order to maintain the widest possible hole with low flow resistance. The spacing of perforations depends on flow as well as pipe strength considerations (Mohammad and Skaggs, 1983).

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WINFAB 1600NE

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WINFAB 1600NE is manufactured using polypropylene fibers that are formed into a dimensionally stable network, which allows the fibers to maintain their relative position.

WINFAB 1600NE resists ultraviolet deterioration, rotting, and biological degradation and is inert to commonly encountered soil chemicals.

PROPERTY	TEST METHOD	MARV ENGLISH	MARV METRIC
Weight	ASTM D5261	16.0 oz/yd^2	542 g/m^2
Thickness	ASTM D5199	175 mils	4.45 mm
Tensile Strength (Grab)	ASTM D4632	425 x 425 lbs	1,890.5 x 1,890.5 N
Elongation (Grab)	ASTM D4632	50% x 50%	50% x 50%
Trapezoidal Tear Strength	ASTM D4533	150 x 150 lbs	667 x 667 N
CBR Puncture	ASTM D6241	1,200 lbs	5,338 N
UV Resistance (500 hrs)	ASTM D4355	70%	70%
Apparent Opening Size*	ASTM D4751	100 US Std. Sieve	0.150 mm
Permittivity	ASTM D4491	0.57 sec^{-1}	0.57 sec^{-1}
Permeability	ASTM D4491	.25 cm/sec	.25 cm-sec
Water Flow Rate	ASTM D4491	45 gpm/ft^2	1,833 lpm/m^2

***Maximum Average Roll Valve**

PROPERTY	TEST METHOD	TYPICAL ENGLISH	TYPICAL METRIC
Roll Dimensions	Measured	15 ft x 300 ft	4.6 x 91.5 m
Roll Area	Measured	500 yd^2	418 m^2

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GMA Geosynthetic Materials Association

GAI-LAP
Initials: GK #: 87
Date: 2016

APPENDIX IV(e)(iii)
Leachate Collection Pipe Strength

LEACHATE COLLECTION SYSTEM (LCS) PIPE STRENGTH

CROSSROADS LANDFILL PHASE 14

PURPOSE

The purpose of this calculation package is to evaluate the structural capacity of the leachate collection system (LCS) pipes for the Phase 14 landfill. The LCS pipes are evaluated for structural stability in terms of wall crushing, buckling, and ring deflection.

This calculation package was prepared pursuant to Maine Solid Waste Management Rules Chapter 401 Section 2.F which requires presentation of pipe design calculations.

BACKGROUND LCS PIPE PARAMETERS

The proposed LCS pipes are 8-inch diameter high density polyethylene (HDPE) with a standard dimension ratio (SDR) of 13.5, where the SDR of the pipe is defined as the nominal outer diameter of the pipe divided by the minimum wall thickness of the pipe.

Engineering properties for HDPE pipes are taken from the Bulletin No. 301 of Chevron Plexco PE 3408 Pipe SDR 13.5 (see Attachment A) and summarized below:

Nominal diameter	8 inches
SDR (Standard Dimension Ratio)	13.5
Outer diameter	8.625 inches
Wall thickness	0.639 inches
Inner diameter	7.270 inches

METHODOLOGY

Structural stability of the LCS pipes (e.g., wall crushing, buckling, and ring deflection) was evaluated using the engineering procedures described in Plastic Pipe Institute's (PPI) *Handbook of Polyethylene Pipe* (PPI 2013, see Attachment A). The following critical loading conditions are analyzed:

CASE 1: The maximum pressure on the pipe induced by equipment during construction.

CASE 2: The maximum pressure exerted on the pipe due to the overburden pressure of waste placed in the landfill after the final grades have been achieved (i.e., final closure condition).

Induced Pipe Stresses

Case 1 (Construction Traffic)

LCS pipes will be covered with 16 inches of 1½-inch crushed stone before construction equipment crosses the pipe. The maximum construction equipment load is expected to result from a Caterpillar 735 articulated truck driving over the soil (i.e., the stone bedding material) during landfill construction. The full specifications for a Caterpillar 735 are presented in Attachment A and summarized in the table below (Caterpillar, 2010).

735 Articulated Truck (Caterpillar, 2010)

Parameter	Value
Empty operating weight (lbs)	69,206
Maximum load (tons)	36
Front axle load distribution (%)	34.9
Middle axle load distribution (%)	33.1
Rear axle load distribution (%)	32.0

To determine the load on each tire, which is also the maximum point load above the pipe from the truck, the following equation was used:

$$P_{tire} = \frac{P_{\max} \cdot d_{axle}}{N}$$

where:

P_{tire} = load on wheel (lbs);

P_{max} = truck operating weight plus the maximum load capacity (lbs);

d_{axle} = loaded weight distribution on axle (%); and

N = number of tires per axle (N = 2 for this calculation).

For the front tires, where the maximum percentage of the truck load is distributed, the tire load is calculated as follows:

$$P_{max} = 69{,}206 \text{ lbs} + 36 \text{ tons} \times 2{,}000 \text{ lbs/ton}$$

$$P_{max} = 141{,}206 \text{ lbs}$$

$$p_{tire,front} = \frac{141{,}206 lbs \times 0.349}{2}$$

$$p_{tire,front} = 24{,}640\ lbs$$

Using this load, the stress on the pipe was calculated as described in PPI (2013):

$$P_L = \frac{I_f P_{tire}}{a_c}\left(1 - \frac{H^3}{(r_T^2 + H^2)^{1.5}}\right)$$

Where:

P_L	=	Vertical soil pressure due to live load (lb/ft^2);
I_f	=	Impact factor (2 for an unpaved condition);
P_{tire}	=	Wheel load (24,640 lbs);
a_c	=	Contact area (ft^2);
r_T	=	Equivalent radius = $\sqrt{a_c/\pi}$; and
H	=	Depth of cover (16 inches = 1.33 ft).

From the Ground Pressure Chart in Attachment A, a ground pressure of 53 psi was selected assuming tire pressure of 65 psi and zero penetration for the maximum tire load. This results in a contact area (a_c) of 3.23 ft^2 (i.e., 24,640 lbs ÷ 53 psi = 464.9 in^2 = 3.23 ft^2).

Therefore,

$$P_L = \frac{2(24{,}640)}{3.23}\left(1 - \frac{1.33^3}{\left(\sqrt{\frac{3.23}{\pi}}^{\,2} + 1.33^2\right)^{1.5}}\right)$$

P_L = 7,584 psf = 52.7 psi

Case 2 (Post Closure)

During post closure conditions the LCS pipes will be subjected to a maximum calculated overburden stresses resulting from the overlying LCS components, waste, and the landfill cover components. The maximum applied stress (σ_{max}) in this case was calculated to be 14,395 psf (100 psi) as follows:

Layer	Thickness (ft)	Unit Weight (pcf)	Vertical Stress (psf)
Cover System	2 (0.5-ft topsoil, 1-ft protective layer, 0.5-ft intermediate cover)	120	240
Waste	185	75	13,875
Leachate Drainage Sand	1	120	120
Crushed Stone for Leachate collection System pipe protection	1.33	120	160
		Total Overburden Stress to LCS Pipe	14,395 psf (100 psi)

Maximum Calculated Vertical Stress

Comparison of the vertical stresses calculated for Cases 1 and 2 indicates the maximum calculated vertical stress that will be applied to the LCS pipes is 100 psi during the Case 2 Post Closure period. Hence, the pipe strength calculations presented below were performed for the post-closure vertical stress case.

PIPE STRENGTH CALCULATIONS

Pipe Strength Reduction due to Perforations

The LCS pipes will have four 0.5-inch perforations every six inches as presented in the *Leachate Collection Pipe Flow Capacity* calculation package. According to FEMA (2007), perforations result in a loss of pipe strength proportional to the perforation percent open area. The reduction in surface area for each 1 ft long section of 8-inch diameter HPDE SDR-13.5 pipe with eight 0.5-inch perforations is 0.5%. In the following pipe strength calculations, a 0.5% reduction is applied to the allowable long-term compressive stress of the pipe (S_{Allow}) for wall crushing, the deformation factor (D_F) for ring deflection, and the critical constrained buckling pressure (P_{CR}).

Wall Crushing

Wall crushing can occur when the stress in the pipe wall, due to external vertical pressure, exceeds the compressive strength of the pipe material. The factor of safety against pipe wall crushing for HDPE pipes can be calculated using the following equations (PPI 2013):

$$S_A = \frac{1.43 M_s r_{cent}}{E \cdot A}$$

$$VAF = 0.88 - 0.71\frac{S_A - 1}{S_A + 2.5}$$

$$P_{RD} = VAF(\Sigma \gamma_{soil} z)$$

$$S = \frac{(P_{RD} - P_L)DR}{288}$$

$$FS_{WC} = \frac{S_{Allow}}{S}$$

Where:

S_A = Hoop thrust stiffness ratio;

M_s = One-dimensional modulus of soil (lb/in^2);

r_{cent} = Deformation factor;

E = Apparent modulus of elasticity of pipe material (lb/in^2);

A = Wall thickness of pipe (in) [for standard dimension ratio pipe];

VAF = Vertical arching factor;

P_{RD} = Radially directed earth pressure (lb/ft^2);

γ_{soil} = Soil (stone bedding) unit weight (lb/ft^3);

z = Pipe depth (ft);

S = Estimated pipe wall compressive stress (lb/in^2);

P_L = Vertical soil pressure due to live load (lb/ft^2);

DR = Dimension ratio of pipe;

S_{Allow} = Long-term compressive stress of pipe (lb/in^2); and

FS_{WC} = Factor of Safety against wall crushing.

Detailed calculations are presented in Attachment B and calculation parameters are provided in Attachment A. The factor of safety against wall crushing was calculated to equal 1.7 for the 8-inch diameter HDPE SDR-13.5 LCS pipe.

Ring Deflection

Ring deflection is the change in vertical diameter of the pipe as the pipe/bedding aggregate system deforms under the external vertical pressure. The actual ring deflection of the pipe must be less than the allowable ring deflection of the pipe. For deep fill installations (i.e., post closure condition), the pipe ring deflection may be estimated using the following equations (PPI 2013):

$$R_F = \frac{12E_S(DR-1)^3}{E}$$

$$E_S = \frac{M_s(1+\mu)(1-2\mu)}{1-\mu}$$

$$\varepsilon_s = \frac{\gamma_{soil} z}{144(\frac{in^2}{ft^2})E_s}$$

$$\frac{\Delta x}{D_m} = D_f \varepsilon_s 100(\%)$$

Where:

R_F = Rigidity (or reduction) factor;

E_s = Secant modulus of soil (lb/in^2);

DR = Dimension ratio of pipe;

E = Apparent modulus of elasticity of pipe material (lb/in^2);

M_s = One-dimensional modulus of soil (psi);

μ = Soil Poisson Ratio;

ε_s = Soil Strain (%)

γ_{soil} = Soil unit weight (lb/ft^3);

z = Pipe depth (ft);

D_f = Deformation factor; and

$\Delta x/D_m$ = Pipe deflection/pipe diameter.

Detailed calculations are presented in Attachment B and calculation parameters are included in Attachment A. For the 8-inch diameter LCS pipes, the estimated ring deflection, $\Delta x/D_m$, value is 5.9%. According to PPI (2013) for non-pressure applications, a deflection limit of 7.5% provides a sufficient safety factor against instability and strain.

Wall Buckling

Wall buckling, a longitudinal wrinkling in the pipe wall, can occur when the external vertical pressure exceeds the critical buckling pressure of the pipe/bedding aggregate system. The factor of safety against pipe wall buckling for HDPE pipes can be calculated using the following equations (PPI 2013):

$$P_{CR} = \frac{2.4\phi R_H}{D_M}(E \cdot I)^{1/3}(E_S{}^*)^{2/3}$$

$$FS_{WB} = \frac{P_{CR}}{P_E}$$

Where:

P_{CR}	=	Critical constrained buckling pressure (lb/in^2);
φ	=	Calibration factor;
R_H	=	Geometry factor;
D_M	=	Mean pipe diameter (in);
E	=	Apparent modulus of elasticity of pipe material (lb/in^2);
I	=	Pipe wall moment of inertia (in^4/in) [= $t^3 \div 12$ for solid-wall pipe];
t	=	Pipe wall thickness (in);
E_s^*	=	$E_s \div (1-\mu)$;
E_s	=	Soil secant modulus (lb/in^2);
μ	=	Poisson's Ratio of soil;
P_E	=	Overburden pressure (lb/in^2); and
FS_{WB}	=	Factor of safety against wall buckling.

Detailed calculations are presented in Attachment B and calculation parameters are presented in Attachment A. For the 8-inch diameter LCS pipe, the critical constrained buckling pressure, P_{CR}, was estimated to be 313 lb/in^2,which is reduced to 311 lb/in^2 due to perforations. Using the reduced P_{CR}, the factor of safety against wall buckling is estimated to be 3.1 for the 8-in diameter LCS pipe.

CONCLUSIONS

The factors of safety computed for wall crushing and wall buckling are acceptable, and the calculated pipe deflections are less than the allowable deflection for these materials without loss of functionality. Therefore, the 8-inch diameter SDR 13.5 HDPE LCS pipes are calculated to be strong enough to withstand the loading from construction equipment traffic and from the overburden pressure from the final height of waste in the landfill.

REFERENCES

Chevron Plexco, "PE 3408 Industrial Piping System – Pipe Data and Pressure Ratings," Bulletin No. 301downloaded from Chevron website: www.cpchem.com (2008).

Federal Emergency Management Agency, "Technical Manual: Plastic Pipe Used in Embankment Dams," (2007).

Goodman, Richard, *"Introduction to Rock Mechanics,"* Second Edition, Wiley, pp. 186. (1989).

Plastic Pipe Institute (PPI), "*Second Edition Handbook of Polyethylene Pipe,*" downloaded from Plastic Pipe Institute website: www.plasticpipe.org (2013).

ATTACHMENT A

REFERENCES

PE 3408 Industrial Piping System
Pipe Data and Pressure Ratings

Bulletin No. 301

Chevron Plexco

(Pipe weights are calculated in accordance with PPI TR-7) Average inside diameter calculated in using nominal OD and minimum wall plus 6% for use in estimating fluid flows. Actual ID will vary. When designing components to fit the pipe ID, refer to pipe dimensions and tolerances in applicable pipe specifications.

Pressure Ratings are for water at 73ºF. For other fluids and service temperatures ratings may differ, refer to Plexco/Spirolite Engineering Manual Book 1 Engineering Properties.

Pressure Rating		255 psi DR 7.3			200 psi DR 9.0			160psi DR 11.0			130 psi DR 13.5			110 psi DR 15.5			
IPS* Pipe Size	Nominal OD (in.)	Minimum Wall (in.)	Average ID (in.)	Weight LB/FT	Minimum Wall (in.)	Average ID (in.)	Weight LB/FT	Minimum Wall (in.)	Average ID (in.)	Weight LB/FT	Minimum Wall (in.)	Average ID (in.)	Weight LB/FT	Minimum Wall (in.)	Average ID (in.)	Weight LB/FT	IPS* Pipe Size
1 1/4"	1.660	0.227	1.179	0.44	0.184	1.270	0.37	0.151	1.340	0.31	0.123	1.399	0.26	0.107	1.433	0.23	1 1/4"
1 1/2"	1.900	0.260	1.349	0.58	0.211	1.453	0.49	0.173	1.533	0.41	0.141	1.601	0.34	0.123	1.639	0.30	1 1/2"
2"	2.375	0.325	1.686	0.91	0.264	1.815	0.76	0.216	1.917	0.64	0.176	2.002	0.53	0.153	2.051	0.47	2"
3"	3.500	0.479	2.485	1.98	0.389	2.675	1.65	0.318	2.826	1.39	0.259	2.951	1.15	0.226	3.021	1.02	3"
4"	4.500	0.616	3.194	3.27	0.500	3.440	2.74	0.409	3.633	2.30	0.333	3.794	1.90	0.290	3.885	1.67	4"
5 3/8"	5.375	0.736	3.815	4.66	0.597	4.109	3.90	0.489	4.338	3.27	0.398	4.531	2.72	0.347	4.639	2.40	5 3/8"
5"	5.563	0.762	3.948	5.00	0.618	4.253	4.18	0.506	4.490	3.50	0.412	4.690	2.91	0.359	4.802	2.57	5"
6"	6.625	0.908	4.700	7.09	0.736	5.065	5.93	0.602	5.349	4.97	0.491	5.584	4.13	0.427	5.720	3.64	6"
7 1/8"	7.125	0.976	5.056	8.20	0.792	5.446	6.87	0.648	5.751	5.75	0.528	6.006	4.78	0.460	6.150	4.21	7 1/8"
8"	8.625	1.182	6.119	12.01	0.958	6.594	10.05	0.784	6.963	8.42	0.639	7.270	7.00	0.556	7.446	6.16	8"
10"	10.750	1.473	7.627	18.66	1.194	8.219	15.62	0.977	8.679	13.09	0.796	9.062	10.87	0.694	9.279	9.59	10"
12"	12.750	1.747	9.046	26.25	1.417	9.746	21.97	1.159	10.293	18.42	0.944	10.749	15.30	0.823	11.005	13.47	12"
13 3/8"	13.375	1.832	9.491	28.88	1.486	10.225	24.17	1.216	10.797	20.26	0.991	11.274	16.83	0.863	11.545	14.83	13 3/8"
14"	14.000	1.918	9.934	31.64	1.556	10.701	26.49	1.273	11.301	22.20	1.037	11.802	18.44	0.903	12.086	16.24	14"
16"	16.000	2.192	11.353	41.34	1.778	12.231	34.61	1.455	12.915	29.00	1.185	13.488	24.09	1.032	13.812	21.21	16"
18"	18.000	2.466	12.772	52.31	2.000	13.760	43.79	1.636	14.532	36.69	1.333	15.174	30.48	1.161	15.539	26.85	18"
20"	20.000	2.740	14.191	64.57	2.222	15.289	54.05	1.818	16.146	45.30	1.481	16.860	37.64	1.290	17.265	33.13	20"
22"	22.000	3.014	15.610	78.15	2.444	16.819	65.41	2.000	17.760	54.82	1.630	18.544	45.56	1.419	18.992	40.09	22"
24"	24.000	3.288	17.029	92.99	2.667	18.346	77.85	2.182	19.374	65.24	1.778	20.231	54.22	1.548	20.718	47.72	24"
†26"	26.000	3.562	18.449	109.15	2.889	19.875	91.35	2.364	20.988	76.58	1.926	21.917	63.63	1.677	22.445	56.02	†26"
†28"	28.000				3.111	21.405	105.96	2.545	22.605	88.79	2.074	23.603	73.76	1.806	24.171	64.94	†28"
†30"	30.000				3.333	22.934	121.62	2.727	24.219	101.94	2.222	25.289	84.68	1.935	25.898	74.56	†30"
†32"	32.000							2.909	25.833	115.99	2.370	26.976	96.35	2.065	27.622	84.88	†32"
†34"	34.000							3.091	27.447	130.92	2.519	28.660	108.80	2.194	29.349	95.83	†34"
†36"	36.000													2.323	31.075	107.40	†36"
†42"	42.000																†42"
†48"	48.000																†48"
†54"	54.000																†54"

*Industrial PE (polyethylene) pipe sizes are identified by IPS (iron pipe size) diameters which designate the nominal diameter for 12" IPS AND SMALLER PIPE, AND O.D. (outside diameter) for 14" IPS and larger pipe.

PLEXCO can produce to specialized pipe dimensions. Check with your PLEXCO sales office for availability of dimensions not listed.
†SUBJECT TO MINIMUM ORDER QUANTITIES, AND AVAILABILITY OF TOOLING.

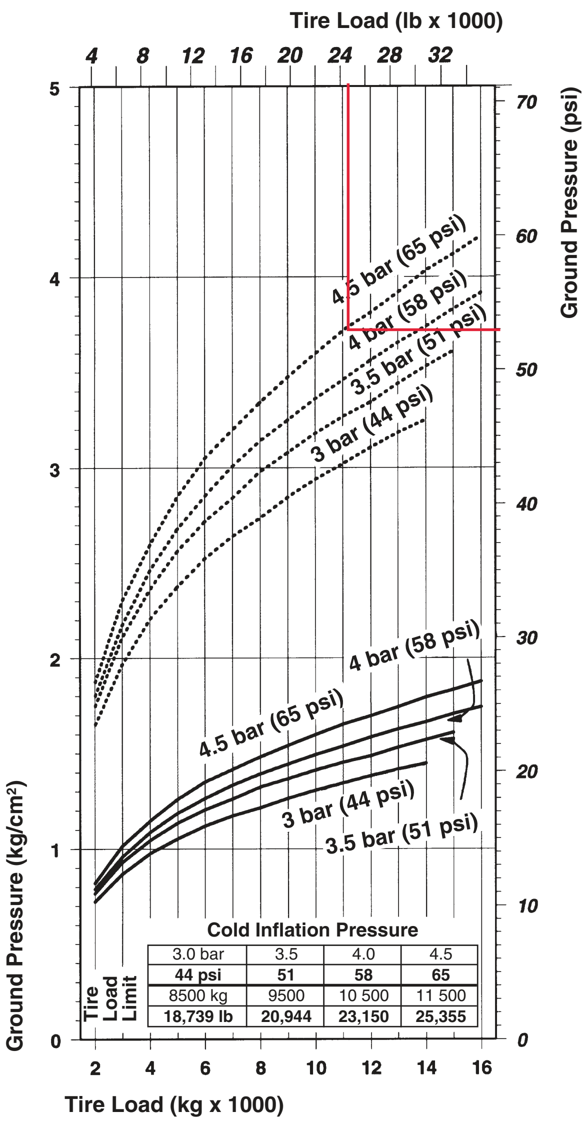


MODEL	735		740		740 Ejector	
Gross Power — SAE J1995	324 kW	**435 hp**	350 kW	**469 hp**	350 kW	**469 hp**
Net Power — SAE J1349	313 kW	**419 hp**	338 kW	**453 hp**	338 kW	**453 hp**
Net Power — ISO 9249	319 kW	**424 hp**	342 kW	**458 hp**	342 kW	**458 hp**
Net Power — EEC 80/1269	319 kW	**424 hp**	342 kW	**458 hp**	342 kW	**458 hp**
Operating Weight (Empty)*	31 391 kg	**69,206 lb**	33 100 kg	**72,973 lb**	35 610 kg	**78,507 lb**
Top Speed (Loaded)	51.3 km/h	**31.9 mph**	54.7 km/h	**34 mph**	54.7 km/h	**34 mph**
GMW — Gross Machine Weight	64 091 kg	**141,297 lb**	72 600 kg	**160,055 lb**	73 610 kg	**162,282 lb**
Distribution Empty:						
Front	**60.5%**		**58.6%**		**55.6%**	
Center	**20.8%**		**21.8%**		**23.1%**	
Rear	**18.7%**		**19.6%**		**21.3%**	
Distribution Loaded:						
Front	**34.9%**		**33.9%**		**29.1%**	
Center	**33.1%**		**33.5%**		**35.9%**	
Rear	**32.0%**		**32.6%**		**35.0%**	
Max. Capacity**	32.7 t	**36 T**	39.5 t	**43.5 T**	38 t	**42 T**
Struck (SAE)	14.5 m^3	**19.0 yd^3**	18.5 m^3	**24.2 yd^3**	17.8 m^3	**23.3 yd^3**
Heaped (2:1) (SAE)	19.7 m^3	**25.8 yd^3**	24 m^3	**31.4 yd^3**	23.1 m^3	**30.2 yd^3**
Engine Model	**ACERT C15**		**ACERT C15**		**ACERT C15**	
No. Cylinders	**6**		**6**		**6**	
Bore	137 mm	**5.4"**	137 mm	**5.4"**	137 mm	**5.4"**
Stroke	171.5 mm	**6.75"**	171.5 mm	**6.75"**	171.5 mm	**6.75"**
Displacement	15.2 L	**926 in^3**	15.2 L	**926 in^3**	15.2 L	**926 in^3**
Tires, Front, Center, Rear	**26.5R25 Radials**		**29.5R25 Radials**		**29.5R25 Radials**	
Circular Clearance Diameter	17.2 m	**56'5"**	17.2 m	**56'5"**	18.2 m	**59'6"**
Fuel Tank Refill Capacity	532 L	**140.5 U.S. gal**	532 L	**140.5 U.S. gal**	532 L	**140.5 U.S. gal**
General Dimensions (Empty):						
Height to Cab Top	3.7 m	**12'1"**	3.75 m	**12'3"**	3.75 m	**12'3"**
Wheel Base (Front-Center of Bogie)	5.23 m	**17'2"**	5.23 m	**17'2"**	5.58 m	**18'3"**
Overall Length	10.89 m	**35'7"**	10.89 m	**35'7"**	11.59 m	**38'0"**
Loading Height (Empty)	2.98 m	**9'8"**	3.2 m	**10'6"**	3.07 m	**10'1"**
Height at Full Dump	6.81 m	**22'4"**	7.1 m	**23'4"**	—	
Body Length	6.09 m	**20'0"**	6.3 m	**20'6"**	6.73 m	**22'1"**
Width (Operating — Over Mirrors)	3.82 m	**12'6"**	3.82 m	**12'6"**	3.82 m	**12'6"**
Front Tire Tread	2.69 m	**8'8"**	2.69 m	**8'8"**	2.69 m	**8'8"**

*Includes coolant, lubricant and full fuel tank.
**Rating dependent on optional equipment. Maximum gross weight (empty weight plus payload) should not be exceeded.

10

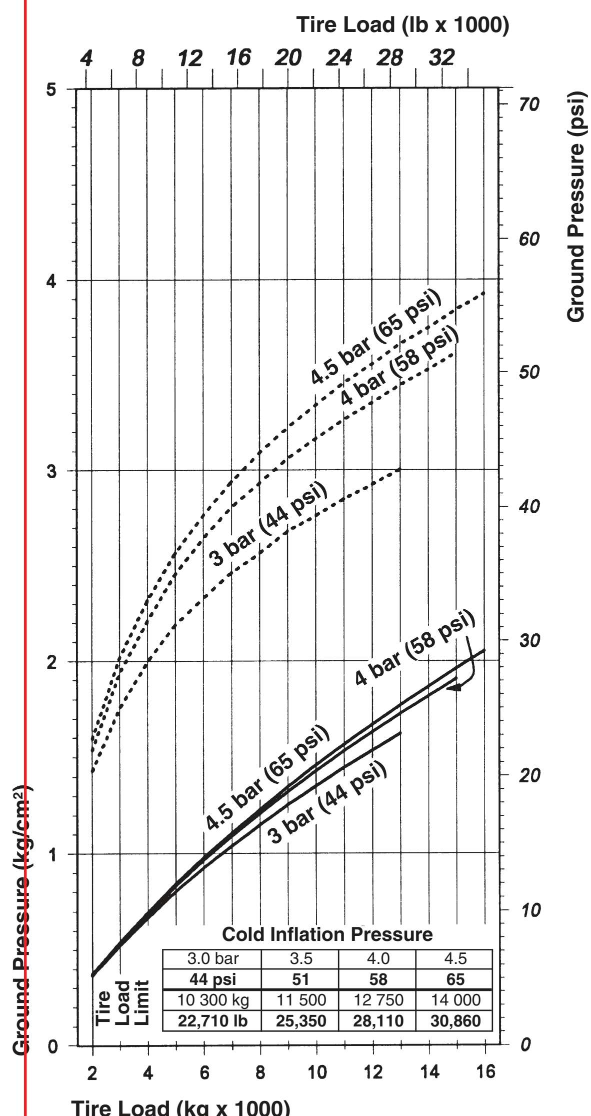
26.5R25 Tires*



Cold Inflation Pressure

	3.0 bar	3.5	4.0	4.5
	44 psi	**51**	**58**	**65**
Tire Load Limit	8500 kg	9500	10 500	11 500
	18,739 lb	**20,944**	**23,150**	**25,355**

29.5R25 Tires*



Cold Inflation Pressure

	3.0 bar	3.5	4.0	4.5
	44 psi	**51**	**58**	**65**
Tire Load Limit	10 300 kg	11 500	12 750	14 000
	22,710 lb	**25,350**	**28,110**	**30,860**

KEY

- - - - - - - - Zero Penetration (Flat Plate)

———— 76 mm (3") Penetration

*Charts based on Michelin XADN tire characteristics. Results may differ for other tread patterns and/or brands. Charts are to be used to calculate ground pressure. To determine the inflation as a function of load and conditions or when loads exceed tire load limit, contact your tire manufacturer representative.

Compressive Ring Thrust

Where deep fill applications are in dry soil, Luscher's equation (Eq. 3-15 or 3-16) may often be too conservative for design as it considers a radial driving force from ground water or vacuum. Moore and Selig[17] developed a constrained pipe wall buckling equation suitable for pipes in dry soils, which is given in a following section.

Considerable care should be taken in the design of deeply buried pipes whose failure may cause slope failure in earthen structures, or refuse piles or whose failure may have severe environmental or economical impact. These cases normally justify the use of methods beyond those given in this Chapter, including finite element analysis and field testing, along with considerable professional design review.

Compressive Ring Thrust and the Vertical Arching Factor

The combined horizontal and vertical earth load acting on a buried pipe creates a radially-directed compressive load acting around the pipe's circumference. When a PE pipe is subjected to ring compression, thrust stress develops around the pipe hoop, and the pipe's circumference will ever so slightly shorten. The shortening permits "thrust arching," that is, the pipe hoop thrust stiffness is less than the soil hoop thrust stiffness and, as the pipe deforms, less load follows the pipe. This occurs much like the vertical arching described by Marston.[18] Viscoelasticity enhances this effect. McGrath[19] has shown thrust arching to be the predominant form of arching with PE pipes.

Burns and Richard[6] have published equations that give the resulting stress occurring in a pipe due to arching. As discussed above, the arching is usually considered when calculating the ring compressive stress in profile pipes. For deeply buried pipes McGrath [19] has simplified the Burns and Richard's equations to derive a vertical arching factor as given by Equation 3-21.

(3-21)

$$VAF = 0.88 - 0.71\frac{S_A - 1}{S_A + 2.5}$$

WHERE

VAF = **Vertical Arching Factor**

S_A = **Hoop Thrust Stiffness Ratio**

(3-22)

$$S_A = \frac{1.43\, M_S\, r_{CENT}}{EA}$$

WHERE

r_{CENT} = **radius to centroidal axis of pipe, in**

M_s= **one-dimensional modulus of soil, psi**

E = **apparent modulus of elasticity of pipe material, psi (See Appendix, Chapter 3)**

A= **profile wall average cross-sectional area, in^2/in, or wall thickness (in) for DR pipe**

Plastic Pipe Institute (PPI), "*Second Edition Handbook of Polyethylene Pipe,*" downloaded from Plastic Pipe Institute website: www.plasticpipe.org (2013).

One-dimensional modulus values for soil can be obtained from soil testing, geotechnical texts, or Table 3-12 which gives typical values. The typical values in Table 3-12 were obtained by converting values from McGrath [20].

@ vertical stress

TABLE 3-12
Typical Values of M_S, One-Dimensional Modulus of Soil

Vertical Soil Stress[1] (psi)	Gravelly Sand/Gravels 95% Std. Proctor (psi)	Gravelly Sand/Gravels 90% Std. Proctor (psi)	Gravelly Sand/Gravels 85% Std. Proctor (psi)
10	3000	1600	550
20	3500	1800	650
40	4200	2100	800
60	5000	2500	1000
80	6000	2900	1300
100	6500	3200	1450

* Adapted and extended from values given by McGrath[20]. For depths not shown in McGrath[20], the MS values were approximated using the hyperbolic soil model with appropriate values for K and n where n=0.4 and K=200, K=100, and K=45 for 95% Proctor, 90% Proctor, and 85% Proctor, respectively.

[1] Vertical Soil Stress (psi) = [soil depth (ft) x soil density (pcf)]/144

The radial directed earth pressure can be found by multiplying the prism load (pressure) by the vertical arching factor as shown in Eq. 3-23.

(3-23) $$P_{RD} = (VAF)wH$$

WHERE

P_{RD} **= radial directed earth pressure, lb/ft²**

w **= unit weight of soil, pcf**

H **= depth of cover, ft**

The ring compressive stress in the pipe wall can be found by substituting P_{RD} from Equation 3-23 for P_E in Equation 3-13 for DR pipe and Equation 3-14 for profile wall pipe.

Earth Pressure Example

Determine the earth pressure acting on a 36" profile wall pipe buried 30 feet deep. The following properties are for one unique 36" profile pipe made from PE3608 material. Other 36" profile pipe may have different properties. The pipe's cross-sectional area, A, equals 0.470 inches^2/inch, its radius to the centroidal axis is 18.00 inches plus 0.58 inches, and its apparent modulus is 27,000 psi. Its wall height is 2.02 in and its D_O equals 36 in +2 (2.02 in) or 40.04 in. Assume the pipe is installed in a clean granular soil compacted to 90% Standard Proctor (Ms = 1875 psi), the insitu soil is as stiff as the embedment, and the backfill weighs 120 pcf. (Where the excavation

Plastic Pipe Institute (PPI), "*Second Edition Handbook of Polyethylene Pipe,*" downloaded from Plastic Pipe Institute website: www.plasticpipe.org (2013).

Appendix B

Apparent Elastic Modulus

B.1 – Apparent Elastic Modulus for the Condition of Either a Sustained Constant Load or a Sustained Constant Deformation

B.1.1 – Design Values for the Base Temperature of 73°F (23°C)

TABLE B.1.1
Apparent Elastic Modulus for 73°F (23°C)

Duration of Sustained Loading	Design Values For 73°F (23°C) (1,2,3)					
	PE 2XXX		PE3XXX		PE4XXX	
	psi	MPa	psi	MPa	psi	MPa
0.5hr	62,000	428	78,000	538	82,000	565
1hr	59,000	407	74,000	510	78,000	538
2hr	57,000	393	71,000	490	74,000	510
10hr	50,000	345	62,000	428	65,000	448
12hr	48,000	331	60,000	414	63,000	434
24hr	46,000	317	57,000	393	60,000	414
100hr	42,000	290	52,000	359	55,000	379
1,000hr	35,000	241	44,000	303	46,000	317
1 year	30,000	207	38,000	262	40,000	276
10 years	26,000	179	32,000	221	34,000	234
50 years	22,000	152	28,000	193	29,000	200
100 years	21,000	145	27,000	186	28,000	193

(1) Although there are various factors that determine the exact apparent modulus response of a PE, a major factor is its ratio of crystalline to amorphous content – a parameter that is reflected by a PE's density. Hence, the major headings PE2XXX, PE3XXX and, PE4XXX, which are based on PE's Standard Designation Code. The first numeral of this code denotes the PE's density category in accordance with ASTM D3350 (An explanation of this code is presented in Chapter 5).

(2) The values in this table are applicable to both the condition of sustained and constant loading (under which the resultant strain increases with increased duration of loading) and that of constant strain (under which an initially generated stress gradually relaxes with increased time).

(3) The design values in this table are based on results obtained under uni-axial loading, such as occurs in a test bar that is being subjected to a pulling load. When a PE is subjected to multi-axial stressing its strain response is inhibited, which results in a somewhat higher apparent modulus. For example, the apparent modulus of a PE pipe that is subjected to internal hydrostatic pressure – a condition that induces bi-axial stressing – is about 25% greater than that reported by this table. Thus, the Uni-axial condition represents a conservative estimate of the value that is achieved in most applications.

It should also be kept in mind that these values are for the condition of continually sustained loading. If there is an interruption or a decrease in the loading this, effectively, results in a somewhat larger modulus.

In addition, the values in this table apply to a stress intensity ranging up to about 400psi, a value that is seldom exceeded under normal service conditions.

Compressive Ring Thrust

Earth pressure exerts a radial-directed force around the circumference of a pipe that results in a compressive ring thrust in the pipe wall. (This thrust is exactly opposite to the tensile hoop thrust induced when a pipe is pressurized.) See Figure 3-1B. Excessive ring compressive thrust may lead to two different performance limits: crushing of the material or buckling (loss of stability) of the pipe wall. See Figure 3-1C. This section will discuss crushing, and the next section will discuss buckling.

As is often the case, the radial soil pressure causing the stress is not uniform around the pipe's circumference. However, for calculation purposes it is assumed uniform and equal to the vertical soil pressure at the pipe crown.

Pressure pipes often have internal pressure higher than the radial pressure applied by the soil. As long as there is pressure in the pipe that exceeds the external pressure, the net thrust in the pipe wall is tensile rather than compressive, and wall crush or buckling checks are not necessary. Whether one needs to check this or not can be quickly determined by simply comparing the internal pressure with the vertical soil pressure.

Crushing occurs when the compressive stress in the wall exceeds the compressive yield stress of the pipe material. Equations 3-13 and 3-14 give the compressive stress resulting from earth and live load pressure for conventional extruded DR pipe and for ASTM F894 profile wall PE Pipe:

(3-13)
$$S = \frac{(P_E + P_L)\,DR}{288}$$

(3-14)
$$S = \frac{(P_E + P_L)\,D_O}{288A}$$

WHERE

P_E = **vertical soil pressure due to earth load, psf**

P_L = **vertical soil pressure due to live-load, psf**

S = **pipe wall compressive stress, lb/in^2**

DR = **Dimension Ratio, D_O/t**

D_O = **pipe outside diameter (for profile pipe $D_O = D_I + 2H_P$), in**

D = **pipe inside diameter, in**

$_P$ = **profile wall height, in**

A = **profile wall average cross-sectional area, in^2/in**
(Obtain the profile wall area from the manufacturer of the profile pipe.)

(Note: These equations contain a factor of 144 in the denominator for correct units conversions.)

Plastic Pipe Institute (PPI), "*Second Edition Handbook of Polyethylene Pipe,*" downloaded from Plastic Pipe Institute website: www.plasticpipe.org (2013).

Appendix C
Allowable Compressive Stress

Table C.1 lists allowable compressive stress values for 73°F (23°C). Values for allowable compressive stress for other temperatures may be determined by application of the same multipliers that are used for pipe pressure rating (See Table A.2).

TABLE C.1
Allowable Compressive Stress for 73°F (23°C)

	Pe Pipe Material Designation Code[1]					
	PE 2406		PE3408		PE 4710	
	PE 2708		PE 3608			
			PE 3708			
			PE 3710			
			PE 4708			
	psi	MPa	psi	MPa	psi	MPa
Allowable Compressive Stress	800	5.52	1000	6.90	1150	7.93

(1) See Chapter 5 for an explanation of the PE Pipe Material Designation Code.

Appendix D
Poisson's Ratio

Poisson's Ratio for ambient temperature for all PE pipe materials is approximately 0.45.

This 0.45 value applies both to the condition of tension and compression. While this value increases with temperature, and vice versa, the effect is relatively small over the range of typical working temperatures.

Ring Deflection

this method is that it assumes a constant Deformation Factor independent of depth of cover and it does not address the effect of the presence of ground water on the Deformation Factor.

To use the Watkins-Gaube Graph, the designer first determines the relative stiffness between pipe and soil, which is given by the Rigidity Factor, R_F. Equation 3-24 and 3-25 are for DR pipe and for profile pipe respectively:

(3-24)

$$R_F = \frac{12\,E_S\,(DR-1)^3}{E}$$

(3-25)

$$R_F = \frac{E_S D_m^{\ 3}}{EI}$$

WHERE

DR = **Dimension Ratio**

E_S = **Secant modulus of the soil, psi**

E = **Apparent modulus of elasticity of pipe material, psi**

I = **Pipe wall moment of inertia of pipe, in^4/in**

D_m = **Mean diameter (D_I + 2z or D_O – t), in**

The secant modulus of the soil may be obtained from testing or from a geotechnical engineer's evaluation. In lieu of a precise determination, the soil modulus may be related to the one-dimensional modulus, M_S, from Table 3-12 by the following equation where μ is the soil's Poisson ratio.

(3-26)

$$E_S = M_S \frac{(1+\mu)(1-2\mu)}{(1-\mu)}$$

TABLE 3-13
Typical range of Poisson's Ratio for Soil (Bowles[21])

Soil Type	Poisson's Ratio, μ
Saturated Clay	0.4-0.5
Unsaturated Clay	0.1-0.3
Sandy Clay	0.2-0.3
Silt	0.3-0.35
Sand (Dense)	0.2-0.4
Coarse Sand (Void Ratio 0.4-0.7)	0.15
Fine-grained Sand (Void Ratio 0.4-0.7)	0.25

Goodman, Richard, *"Introduction to Rock Mechanics,"* Second Edition, Wiley, (1989).

Table 6.1 Modulus Ratio E/q_u and Poisson's Ratio ν for the Rock Specimens of Table 3.1[a]

Description	E/q_u	ν
Berea sandstone	261	0.38
Navajo sandstone	183	0.46
Tensleep sandstone	264	0.11
Hackensack siltstone	214	0.22
Monticello Dam greywacke	253	0.08
Solenhofen limestone	260	0.29
Bedford limestone	559	0.29
Tavernalle limestone	570	0.30
Oneota dolomite	505	0.34
Lockport dolomite	565	0.34
Flaming Gorge shale	157	0.25
Micaceous shale	148	0.29
Dworshak Dam gneiss	331	0.34
Quartz mica schist	375	0.31
Baraboo quartzite	276	0.11
Taconic marble	773	0.40
Cherokee marble	834	0.25
Nevada Test Site granite	523	0.22
Pikes Peak granite	312	0.18
Cedar City tonalite	189	0.17
Palisades diabase	339	0.28
Nevada Test Site basalt	236	0.32
John Day Basalt	236	0.29
Nevada Test Site tuff	323	0.29

[a] *E* reported here includes both recoverable and nonrecoverable deformation, mixed in unknown proportions.

The Poisson's ratio for 1-1/2" Crushed Stone of 0.3 is assumed using an approximate average of the poisson's ration values of highlighted gneiss, granite, and basalt.

The negative slope of the tail of the complete stress-strain curve is not a stress-strain curve in the conventional sense but is a yield function; in particular, it is the envelope of yield points from all reloading curves. Figure 6.3c shows the value of ν calculated from lateral deformation of a compression specimen on its virgin loading curve. The ratio of lateral to axial strain begins at a value near 0.2 and increases gradually until near the peak load when it begins to accelerate, even surpassing the theoretical maximum value of ν for isotropic materials—0.5. (Equation 6.6 shows that K approaches infinity as ν tends toward 0.5.) The rock cannot be described as elastic as it moves on the yield surface after the peak since it is cracked and large lateral deformations occur

Plastic Pipe Institute (PPI), "*Second Edition Handbook of Polyethylene Pipe,*" downloaded from Plastic Pipe Institute website: www.plasticpipe.org (2013).

Next, the designer determines the Deformation Factor, D_F, by entering the Watkins-Gaube Graph with the Rigidity Factor. See Fig. 3-6. The Deformation Factor is the proportionality constant between vertical deflection (compression) of the soil layer containing the pipe and the deflection of the pipe. Thus, pipe deflection can be obtained by multiplying the proportionality constant D_F times the soil settlement. If D_F is less than 1.0 in Fig. 3-6, use 1.0.

The soil layer surrounding the pipe bears the entire load of the overburden above it without arching. Therefore, settlement (compression) of the soil layer is proportional to the prism load and not the radial directed earth pressure. Soil strain, ε_S, may be determined from geotechnical analysis or from the following equation:

(3-27)

$$\varepsilon_S = \frac{wH}{144 E_S}$$

WHERE

w = **unit weight of soil, pcf**

H = **depth of cover (height of fill above pipe crown), ft**

E_S = **secant modulus of the soil, psi**

The designer can find the pipe deflection as a percent of the diameter by multiplying the soil strain, in percent, by the deformation factor:

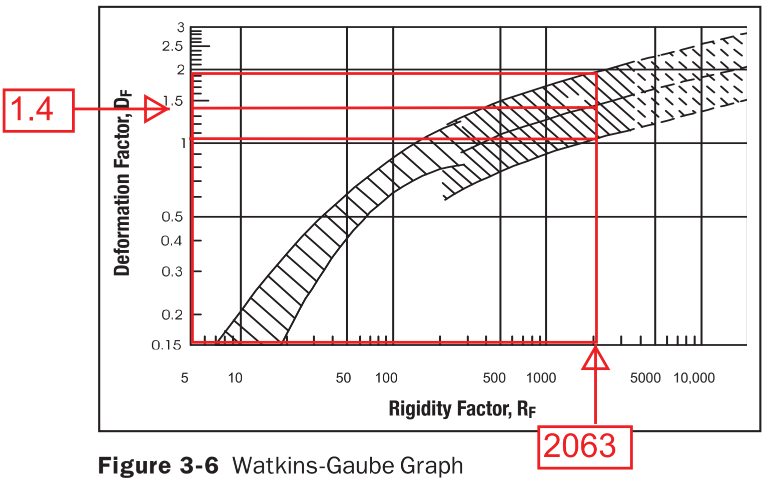


Figure 3-6 Watkins-Gaube Graph

(3-28)

$$\frac{\Delta X}{D_M}(100) = D_F \varepsilon_S$$

WHERE

$\Delta X / D_M$ **multiplied by 100 gives percent deflection.**

Buckling

The Moore-Selig Equation for critical buckling pressure follows: (Critical buckling pressure is the pressure at which buckling will occur. A safety factor should be provided.)

(3-29)

$$P_{CR} = \frac{2.4\,\varphi\,R_H}{D_M}(EI)^{\frac{1}{3}}(E_S^*)^{\frac{2}{3}}$$

WHERE

P_{CR} = Critical constrained buckling pressure, psi

φ = Calibration Factor, 0.55 for granular soils

R_H = Geometry Factor

E = Apparent modulus of elasticity of pipe material, psi

I = Pipe wall moment of Inertia, in^4/in ($t^3/12$, if solid wall construction)

E_S^* = E_S /(1-μ)

E_S = Secant modulus of the soil, psi

μ_S = Poisson's Ratio of Soil (Consult a textbook on soil for values. Bowles (1982) gives typical values for sand and rock ranging from 0.1 to 0.4.)

The geometry factor is dependent on the depth of burial and the relative stiffness between the embedment soil and the insitu soil. Moore has shown that for deep burials in uniform fills, R_H equals 1.0.

Critical Buckling Example

Determine the critical buckling pressure and safety factor against buckling for the 6" SDR 11 pipe (5.987" mean diameter) in the previous example.

SOLUTION:

$$E_S^* = \frac{2000}{(1-0.3)} = 2860\ \frac{lbs}{inch^2}$$

$$P_{CR} = \frac{2.4*0.55*1.0}{5.987}(29000*0.018)^{\frac{1}{3}}(2860)^{\frac{2}{3}} = 358\ \frac{lbs}{in^2}$$

Determine the Safety Factor against buckling:

$$S.F. = \frac{P_{CR}}{P_E} = \frac{358*144}{140*75} = 4.9$$

Installation Category #4: Shallow Cover Flotation Effects

Shallow cover presents some special considerations for flexible pipes. As already discussed, full soil structure interaction (membrane effect) may not occur, and live loads are carried in part by the bending stiffness of the pipe. Even if the pipe has sufficient strength to carry live load, the cover depth may not be sufficient to prevent

ATTACHMENT B

PIPE STRENGTH CALCULATIONS

Compressive Ring Thrust Stress (Wall Crushing)

Analysis based on Plastic Pipe Institutes (PPI) Handbook of Polyethylene Pipe (2013) for deep fill installation → downloaded from www.plasticpipe.org

Step 1. Estimate Hoop Thrust Stiffness Ratio, S_A

$$S_A = \frac{1.43\, M_s\, r_{cent}}{EA}$$

where S_A = Hoop thrust stiffness ratio

M_s = One-dimensional modulus of soil (Attachment A) = 3,200 psi

r_{cent} = Deformation factor = (OD - t)/2 = 3.993 in

OD = Outter Diameter of pipe (Attachment A) = 8.625 in

t = Wall thickness of pipe (Attachment A) = 0.639 in

E = Apparent modulus of elasticity of pipe material (Attachment A) = 27,000 psi

A = Wall thickness (t) for DR pipe (Attachment A) = 0.639 in

S **A**	**1.059**

Step 2. Calculate Vertical Arching Factor, VAF

$$VAF = 0.88 - 0.71\frac{S_A - 1}{S_A + 2.5}$$

VAF	**0.868**

Step 3. Estimate Radially Directed Earth Pressure, P_{RD}

$$P_{RD} = VAF\,(\Sigma\,\gamma\,z)$$

Σ γz for LCS pipe = 14,395 psf

Layer	Thickness (ft)	Unit Weight (pcf)
Cover System	2.0	120
Waste	185.0	75
LCS	1.0	120
LCS Stone	1.3	120

P **RD =**	**12,497.65**	**psf for LCS Pipe**

Step 4. Calculate the Ring Compressive Stress, S

$$S = \frac{(P_{RD} + P_L)DR}{288}$$

where S = Estimated pipe wall compressive stress (psi)

P_L = Vertical soil pressure due to live load for final waste (closed landfill) condition = 0 psf

DR = Dimension ratio of Pipe = 13.5

S =	**586**	**psi for LCS Pipe**

Step 5. Estimate Factor of Safety against Wall Crushing, FS

$$FS_{WC} = \frac{S_{Allow}}{S}$$

where S_{Allow} = Allowable long-term compressive stress = 1,000 psi
(see Attachment A)

$S_{allow,Reduced\ (for\ perforations)}$ = 994.8 psi

FS wc =	**1.7**	**for LCS Pipe**

Estimation of Ring Deflection

Analysis based on Plastic Pipe Institutes (PPI) Handbook of Polyethylene Pipe (2013) for deep fill installation → downloaded from www.plasticpipe.org

Step 1. Estimate Rigidity Factor, R_F

$$R_F = \frac{12E_s(DR-1)^3}{E}$$

where:

R_F = Rigidity (or reduction) factor

E_s = Secant modulus of soil

$$E_S = \frac{M_S(1+\mu)(1-2\mu)}{1-\mu}$$

where

Ms = One-dimensional modulus of soil (Attachment A) =	3200	psi
μ = Soil Poisson Ratio (Attachment A) =	0.3	
Es =	2,377	psi
DR = Dimension ratio of pipe for =	13.5	
E = Apparent modulus of elasticity of pipe material (Attachment A) =	27,000	psi

R_F = 2,063

Step 2. Estimate the Deformation Factor, D_F

For R_F = 2,063

D_F = 1.1 to 2.1 can be used (see Attachment A).

Use an approximate median $D_{F,Reduced\ (for\ perforations)}$ value of 1.4

Note: if D_F is less than 1.0, use 1.0.

Step 3. Estimate Soil Strain, ε_s

$$\varepsilon_s = \frac{\sum \gamma z}{144\ (\frac{in^2}{ft^2})E_s}$$

Es = Secant modulus of soil =	2,377	psi
$\Sigma\ \gamma_{soil}z$ for LCS pipe =	14,395	psf

ε_s = 0.042 for LCS Pipe

Step 4. Estimate Pipe Deflection as Percent of Diameter

$$\frac{\Delta x}{D_m} = D_F \varepsilon_s (100\ \%)$$

where Δx/Dm = Pipe deflection/pipe diameter.

$\Delta x/D_m$ = 5.9 % for LCS Pipe

According to PPI (2013) for non-pressure applications (i.e., applications without pressure inside the pipe), a deflection limit of 7.5% provides a sufficient safety factor against instability and strain.

Constrained Wall Buckling

Analysis based on Plastic Pipe Institutes (PPI) Handbook of Polyethylene Pipe (2013) for deep fill installation → downloaded from www.plasticpipe.org

$$P_{CR} = \frac{2.4\varphi R_H}{D_M}(EI)^{1/3}\left(E_S^{*}\right)^{2/3}$$

where	P_{CR} = Critical constrained buckling pressure (psi)		
	φ = Calibration factor (for granular soil, see Attachment A) =	0.55	
	R_H = Geometry factor (for deep burials in uniform fills, see Attachment A) =	1	
	D_M = Mean pipe diameter (in) = (OD - t) =	7.986	in
	OD = Outter Diameter of pipe =	8.625	in
	t = Wall thickness of pipe =	0.639	in
	E = Apparent modulus of elasticity of pipe material =	27,000	psi
	I = Pipe wall moment of inertia (in^4/in) [= $t^3/12$]	0.0217	in
	Es* = Es/(1-μ) =	3,396	psi
	Es = secant modulus of soil as calculated in Ring Deflection section.		
	μ = Stone Poisson Ratio (Attachment A) =	0.3	

P_{CR} (psi)	313

$P_{CR,Reduced\ (for\ perforations)}$ (psi)	311

$$FS_{WB} = \frac{P_{CR}}{P_E}$$

where	FS_{WB} = Factor of safety against wall buckling		
	P_E = Calculated maximum overburden pressure (psi) = Σγz		
	P_E =	100	psi for full waste height over LCS Pipe

FS_{WB}	3.1	for LCS Pipe

APPENDIX IV(e)(iv)

Leachate Collection System Sump And Pumps

Written by:	A. Rohrman	Date:	2019 /09 /20 (YYYY MM DD)	Reviewed by:	Youngmin Cho	Date:	2019 /09 /25
					Nicholas Yafrate		2019 /10 /24
Client:	WMDSM	Project:	Ph 14 Permitting	Project/Proposal No.:	BE0232C	Task No:	02

LEACHATE COLLECTION SYSTEM SUMP AND PUMP
PHASE 14 CROSSROADS LANDFILL

PURPOSE

The purpose of this calculation package is to evaluate the proposed dimensions and sizing of the sump, pump, and piping for the Phase 14 leachate collection and transmission system.

An overview of the leachate collection system (LCS) plan, including the layout of LCS pipes and sumps, proposed for Phase 14 is provided on Sheet 7 of the Permit Drawings. Details of the proposed sump and pumping system are presented on Sheet 24 of the Permit Drawings. Each sump will have two pumps capable of accommodating two conditions; i.e., a normal operation condition and a peak leachate generation condition. The primary pump will be for average leachate generation rates (i.e., normal operation conditions), and the auxiliary pump will be used in conjunction with the primary pump to accommodate the peak leachate generation rates, when required. The leachate level in each sump will be measured with a pressure transducer that will trigger the on and off cycles of the sump pump in accordance with the pump-on and pump-off height values selected in this calculation package. As shown on Sheet 23 of the Permit Drawings, leachate collected by each sump will be pumped via a buried leachate forcemain in the perimeter berm of Phase 14 and access road to the existing South Central pump station. It will then be pumped from the South Central pump station to the existing leachate storage tank facility.

This calculation package was developed pursuant to the requirements for leachate transmission system design provided by Maine Solid Waste Rule (MSWR) Ch. 401 Section 2.F(4)(ix) which states: *The leachate transport system must be designed to convey the design flows from the leachate collection and detection systems.*

METHOD OF ANALYSIS

The size of the sump is dependent on the leachate flow into the sump, and pumping rate of the pump, both of which affect other parameters, including the number of pump on-off cycles per day. As such, the sump and pump sizing is an iterative process to satisfy the following design criteria:

- The sump shall have dimensions to accommodate two leachate collection sump pipes (the adequacy of the pipe length and diameter is evaluated based on the allowable flow rate through the pipe perforations in the following calculation) and to store leachate between pumping cycles;
- Each leachate collection sump pipe shall have sufficient perforations to allow the estimated peak leachate flow into the sump pump;

- The leachate collection sump pipes shall accommodate a primary submersible sump pump with a flow capacity greater than the average leachate generation rate or an auxiliary submersible pump which, together with the primary pump, will have a flow capacity greater than the estimated peak leachate generation rate of each landfill cell;
- The pumps shall have a pumping capacity that requires fewer than 100 starts per day, as per manufacturer recommendations. Run times (t_{on}) will be set to a minimum of one minute to allow for heat buildup from the starting current to dissipate; and
- The sump pump shall have a sufficient head capacity exceeding an estimated total dynamic head (i.e., the elevation head from the sump pump (ranging 271 ft to 276 ft) to the top of the Phase 14 perimeter berm (at elevation 313 ft) plus the friction head loss in the pipes from the sump to the South Central Pump Station where the Phase 14 forcemain ties in).

After multiple iterations, this calculation package presents the calculations and results performed based the following assumptions to demonstrate the adequacy of the proposed sump and pump system:

- The calculated average and peak leachate generation rates (in gallons per minute, gpm) to each sump (q_{in}) are estimated based on the output of the Hydrologic Evaluation of Landfill Performance (HELP) model analysis performed as part of the *Leachate Generation Rate and Leachate Collection System Capacity* calculations and presented in Tables 1 & 2.
  - The average leachate generation rates are estimated based on the average yearly generation rates for the 10-ft waste with daily cover condition. For cell sizes ranging from 7.5 to 12.5 acres, the average generation rate of 1.2 gpm[1] per acre results in a total average leachate generation of 8.8 to 14.6 gpm in each cell.
  - The peak leachate generation rates are estimated based on the peak daily generation rates from the HELP model. In Phase 14A, the 10-ft waste with daily cover condition is assumed for the entire cell. For Phases 14B through 14E, it is assumed that half of the cell has the 10-ft waste with daily cover condition, and the other half has the 40-ft waste with daily cover condition. The peak generation rate for the 10-ft waste condition is 20.6 gpm[2] per acre and the peak generation rate for the 40-ft condition is 5.8 gpm [3] per acre. This results in peak leachate generation rates of 111 to 165 gpm in each cell.
- Each sump has dimensions of base length (L) of 10 ft, base width (W) of 10 ft, and depth (D) of 3 ft;

[1] HELP output = 8,2019.8 cu ft per year per acre which is equivalent 1.2 gpm.
[2] HELP output = 3,969.9 cu ft per day per acre which is equivalent to 20.6 gpm.
[3] HELP output = 1,115.7 cu ft per day per acre which is equivalent to 5.8 gpm.

- Each sump is backfilled with 1 ½-inch crushed stone (AASHTO 57 stone), the porosity of which is 0.45;
- Each leachate collection sump pipe is 10-ft long and 24 inches in diameter;
- The sump pipe perforation spacing is one hole per every 6 inches linearly and 4 holes around the pipe per linear location, resulting in 8 total perforations per linear foot. For a 10-ft length of pipe, this equates to a total of 80 perforations. The pipe perforations will be ½-inch diameter holes;
- Each primary sump pump has a flow rate (capacity) of 60 gpm;
- The primary and auxiliary sump pumps have a combined flow rate (capacity) of 175 gpm (i.e., the auxiliary pump flow rate capacity is 115 gpm);
- Each primary sump pump has an operating head of 50 ft, and each auxiliary sump pump has an operating head of 100 ft;
- The pump-on height (h_{on}) is 2.5 ft above the bottom of the sump, and the pump-off height (h_{off}) is 1.0 ft above the sump bottom;
- The diameter of the sump pump discharge pipe (high density polyethylene, HDPE) is 3 inches; and
- The diameter of the leachate transmission forcemain HDPE pipe is 8 inches. The forcemain is approximately 6,000 ft long and transmits leachate from the top of the Phase 14 perimeter berm (approximately at elevation 313 ft) to South Central Pump Station (approximately at elevation 254 ft), which is 59 ft lower. Types and number of the forcemain fittings are presented in Tables 1, 2, and 3.

Sump Size and Pump Off-On Cycle

The pooling area at the pump-off height (A_{off}) and pooling area at the pump-on height (A_{on}) are calculated as shown below, assuming sump side slope grades of S horizontal to 1 vertical.

$$A_{on} = (L + 2 \cdot S \cdot h_{on}) \times (B + 2 \cdot S \cdot h_{on})$$

$$A_{off} = (L + 2 \cdot S \cdot h_{off}) \times (B + 2 \cdot S \cdot h_{off})$$

Where:

$L =$ base length,

$B =$ base width,

$h_{on} =$ pump-on height, and

h_{off} = pump-off height.

The net leachate storage volume within the sump (V) is calculated using the equation:

$$V = \frac{n \cdot (h_{on} - h_{off})}{3}\left(A_{off} + A_{on} + \sqrt{A_{off}A_{on}}\right)$$

Where:

n = porosity of gravel backfill.

The pump time off (t_{off}) and pump time on (t_{on}) are calculated as:

$$t_{off} = \frac{V}{q_{in}}$$

$$t_{on} = \frac{V}{(q_p - q_{in})}$$

Where:

q_p = flow rate of pump, and

q_{in} = leachate generation rate.

The number of pump cycles per day (C) is calculated as:

$$C = \frac{1440\ minutes}{t_{on} + t_{off}}$$

Total Dynamic Head for Pumps

The pump must be able to operate at the desired pumping rate while overcoming the total dynamic head (TDH) in the system, which is calculated using the following:

$$TDH = h_e + h_f$$

Where:

h_e = elevation head, and

h_f = frictional head losses.

The friction head loss (h_f, feet) in the HDPE pipe is determined using the Hazen-Williams formula as follows:

$$h_f = 10.44 \cdot L_p \frac{(q_{p,gpm})^{1.85}}{C^{1.85} \cdot (d_{inches})^{4.8655}} + \sum h_m$$

Where

L_p = length of the pipe (in),

$d =$ diameter of the pipe (in),

$q_p =$ flow rate (gpm),

$C =$ Hazen-Williams coefficient for HDPE pipe, and

$h_m =$ minor frictional head losses (h_m).

Additional minor frictional head losses occur at pipe elbows, pipe connections, and pipe valves. This is calculated using the equivalent length of straight pipe for each fitting (L_e), which can be calculated as follows:

$$L_e = K'D$$

where

$K' =$ resistance coefficient of fitting, and

$D =$ pipe bore diameter in ft.

The K' values for various polyethylene pipe fittings are presented in Attachment A (Plastic Pipe Institute, 2007).

The TDH is calculated using three different pipe segments; (1) the leachate riser pipe from the sump to the leachate vault at the top of the berm, (2) the leachate forcemain along the top of the berm, and (3) the leachate forcemain from the top of the Phase 14 MSE access ramp to the South Central Pumping Station. This third segment uses gravitational flow, and as long as the frictional losses are not greater than the elevation head (i.e. the total dynamic head is negative), no additional head capacity is needed from the pump(s) for this segment.

Table 1 shows the elevations, pipe dimensions, assumed pipe fittings and connections, and resulting total dynamic head for the calculated average leachate generation pumping rate (i.e. the primary pump) for Segments 1 and 2. Similarly, Table 2 contains these same values using the calculated peak leachate generation rate (i.e. the primary and auxiliary pumps together). Table 3 contains the total dynamic head calculation parameters for Segment 3 in both average and peak pumping conditions.

Leachate Collection Sump Pipe Perforation Sizing

Consistent with the perforation size of the leachate collection pipes, a perforation diameter of 0.5 inches was selected. The compatibility of the selected leachate collection pipe perforation size and 1½-inch crushed stone (AASHTO 57 stone) is demonstrated in the calculation package titled *Leachate Collection Pipe Flow Capacity*. The number of perforations must be chosen to allow for the selected pumping rate and the peak leachate generation rate.

The ability of the ½-inch diameter perforations in the sump pipe to convey collected leachate was evaluated using the equation of flow (Q) through an orifice:

$$Q = a\,C_B\,\sqrt{2gh}$$

where:

$Q =$ flow rate (ft^3/sec);

$a =$ area of the orifice (ft^2);

$C_B =$ orifice coefficient (usually 0.6);

$g =$ acceleration due to gravity (32.2 ft/s^2); and

$h =$ liquid height above the hole (ft).

Based on the assumed sump and pipe sizes, an average leachate head on the pipe perforations, $h =$ 3.5 ft (42 inches) was calculated; i.e., an average of approximately 2.5 ft at the top perforations and 4.5 ft at the bottom perforations.

Forcemain Flow

Maximum flow through the forcemain pipe can be found using Manning's Equation:

$$Q_{avail} = \frac{1.49}{n} A\, R_h^{2/3} S^{1/2}$$

Where:

Q_{avail} = available flow rate (cubic ft per sec);

R_h = hydraulic radius (ft) (wetted area/wetted perimeter);

S = hydraulic gradient (ft/ft);

A = cross-sectional flow area (ft^2); and

n = Manning's roughness coefficient.

The proposed forcemain pipe is an 8-inch nominal outer diameter (OD) HDPE pipe. A conservatively low Manning's coefficient (n) of 0.013 for a deteriorated surface condition is used. The hydraulic gradient used is based on the hydraulic head and the length of the forcemain pipe. The hydraulic head is the difference between the elevation of the pump plus the pumping head, and the elevation of the pumping station.

RESULTS AND CONCLUSIONS

The calculation results are presented in Tables 1 to 3. Based on the iterative calculations to meet the aforementioned design criteria, the adequacy of the proposed sump and pump system is demonstrated as follows:

- **Sump pipe perforations:** The proposed leachate collection sump pipe (with dimensions of 24 inches in diameter and 10 ft in length and with 80 perforations each having 0.5-in diameter) has a total allowable flow rate through the perforations of 440 gpm, which is significantly greater than the calculated peak leachate generation rate of approximately 111 gpm to 165 gpm (at the sump of each landfill cell);
- **Sump size:** The proposed sump has base dimensions of 10 ft × 10 ft and a height of 3 ft with a 2H:1V sideslope (resulting in total length and width dimensions of 24 ft × 24 ft at the top of the sump), which is sufficient to install two 10-ft long, 24-in diameter sump pipes in each sump;
- **Pump on/off cycle:** The pump-on height (h_{on}) will be 2.5 ft above sump bottom, and the pump-off height (h_{off}) will be 1.0 ft above sump bottom. In combination with the sump size, these pump on/off heights result in pump on/off cycle of 7 to 11 per day for the average leachate generation rates, and up to 40 per day for the peak leachate generation rates. Both cases have substantially less pump cycles than the pump manufacturers' recommended upper limit of 100 per day. The calculated minimum pump run time (t_{on}) per each on/off cycle is 23 minutes which is substantially greater than the manufacturer's requirement of 1 minute;
- **Pump flow rate capacity:**
  - Each primary sump pump has a pumping rate capacity of 60 gpm to accommodate the average leachate generation rate of each landfill cell, ranging from 8.8 to 14.6 gpm as shown in Table 1; and
  - Each sump has a primary pump and an auxiliary pump with a combined pumping rate capacity of 175 gpm to accommodate the calculated peak leachate generation rate of each landfill cell, ranging 111 to 165 gpm as shown in Table 2.

- **Pump head capacity:**
  - Each primary sump pump has an operating pumping head of 50 ft, which is greater than the estimated combined total dynamic head in Segments 1 and 2 of the leachate transmission system for average leachate generation, ranging from 39 to 44 ft;
  - Each auxiliary sump pump has a combined pumping operating head of 100 ft, which is greater than the estimated combined total dynamic head in Segments 1 and 2 of the leachate transmission system for peak leachate generation, ranging from 51 to 58 ft; and
  - Segment 3 of the leachate transmission system has estimated frictional losses of 1 ft and 4 ft during average and peak leachate generation rates, respectively. This loss is substantially less than the 59 ft of elevation from the top of berm down to the South Central pump station. Therefore, the pumps do not require extra head capacity to transmit leachate through this segment.
- **Forcemain Flow capacity:**
  - As presented in Table 4, the primary pump operating head results in a hydraulic gradient of 1.5% and the resulting flow through the forcemain pipe is 506 gpm, which is significantly greater than the total flow of all primary pumps operating simultaneously (i.e., an estimated flow rate of approximately 300 gpm).
  - Also, as shown in Table 4, the auxiliary pump operating head results in a hydraulic gradient of 2.3% and the resulting flow through the forcemain pipe is 635 gpm. This capacity allows for up to three of the auxiliary pumps to be operating simultaneously. Per historic site operations, it is anticipated that use of temporary tarps and rain flaps will prevent peak leachate generation rates from occurring in multiple cells simultaneously, and therefore the forcemain flow capacity is evaluated to be sufficient to convey the peak leachate generation condition.

REFERENCES

Plastic Pipe Institute (PPI), Handbook of Polyethylene Pipe, 2007.

Table 1 - Leachate Collection Sump and Pump Design Calculations for Average Pumping Rate
Phase 14
Crossroads Landfill, Norridgewock, Maine

Cell	Phase 14A	Phase 14B	Phase 14C	Phase 14D	Phase 14E
Leachate Generation Rate					
Cell Area (acres)	7.5	9.0	11.3	12.5	8.4
Leachate Generation Rate per acre (gpm) (refer to HELP model)	1.2	1.2	1.2	1.2	1.2
Average Leachate Flow Rate (q_{in}, gpm) - See Note 1	8.8	10.5	13.2	14.6	9.8
Sump Dimensions					
Height (H, ft)	3	3	3	3	3
Slope (S:1)	2	2	2	2	2
Base Length (L, ft)	10	10	10	10	10
Base Width (B, ft)	10	10	10	10	10
Porosity of Sump 1.5" Crushed Stone Backfill (n)	0.45	0.45	0.45	0.45	0.45
Pump On Level (h_{on}, ft above sump bottom)	2.5	2.5	2.5	2.5	2.5
Pump Off Level (h_{off}, ft above sump bottom)	1	1	1	1	1
Max. Pool Elevation Area (A_m, sft)	400	400	400	400	400
Permanent Pool Elevation Area (A_p, sft)	196	196	196	196	196
Net Storage Volume (V, cft)	197	197	197	197	197
Net Storage Volume (V, gal)	1474	1474	1474	1474	1474
Pump Cycle					
Assumed pumping rate (q_p, gpm)	60	60	60	60	60
Pump Off (t_{off}, min.)	168	140	112	101	150
Pump On (t_{on}, min.)	29	30	31	32	29
Cycles (/day)	**7**	**8**	**10**	**11**	**8**
Total Dynamic Head					
Segment 1 - Leachate Riser Pipe					
Elevation Head (h_e, ft)	37	40	42	40	40
Friction Head Loss of Discharge Pipe ($h_{f,\ discharge}$, ft)	2	2	2	2	2
Horizontal Distance from Sump to Leachate Vault	119	128	131	127	124
Length of Sump Pump Discharge Pipe (L_p, ft)	125	134	138	133	130
Diameter of Leachate Discharge Pipe (d, in)	3	3	3	3	3
Hazen-Williams Coefficient (C) - see Note 2	120	120	120	120	120
Segment 2 - Forcemain on top of Berm					
Elevation Head (h_e, ft)	0	0	0	0	0
Friction Head Loss of Forcemain Pipe ($h_{f,\ forcemain}$, ft)	0	0	0	0	0
Length of Forcemain Pipe (L_p, ft)	70	354	824	1620	2000
Equivalent Length of Fittings (L_e, ft)	295	425	555	699	829
Assumed Number of 90˚ Elbows	0	0	0	0	1
Assumed Number of 45˚ Elbows	2	2	2	3	4
Assumed Number of Tees	1	2	3	4	4
Assumed Number of Check Valves	0	1	2	3	4
Assumed Number of Globe Valves	1	1	1	1	1
Diameter of LeachateForcemain (d, in)	8	8	8	8	8
Hazen-Williams Coefficient (C) - see Note 2	120	120	120	120	120
Total Dynamic Head for Pump (TDH, ft)	**39**	**42**	**44**	**42**	**42**

Note,
1. The average leachate flow rate was calculated using the yearly average per-acre generation rate for the 10-ft waste thickness with a daily cover soil, which is presented in a separate calculation package, titled "Leachate Generation Rate and Leachate Collection System Capacity," prepared by Geosyntec for the Phase 14 permit application package.
2. C ranges from 120 to 150 for HDPE piping. 120 is selected for these analyses.
3. Allowable flow rate through the perforations of the leachate collection pump calculated as

$$Q = aC_B\sqrt{2gh} = (0.00136\,ft^2)(0.6)\sqrt{2(32\,ft/s^2)(3.5ft)} = 0.0122\frac{ft^3}{sec} \times \frac{7.481\,gallons}{ft^3} \times \frac{60\,sec}{minute} \times 80\,perforations = 440gpm$$

Table 2 - Leachate Collection Sump and Pump Design Calculations for Peak Pumping Rate
Phase 14
Crossroads Landfill, Norridgewock, Maine

Cell	Phase 14A	Phase 14B	Phase 14C	Phase 14D	Phase 14E
Leachate Generation Rate					
Cell Area (acres)	7.5	9.0	11.3	12.5	8.4
10-ft Leachate Generation Rate per acre (gpm) (refer to HELP model)	20.6	20.6	20.6	20.6	20.6
40-ft Leachate Generation Rate per acre (gpm) (refer to HELP model)	-	5.8	5.8	5.8	5.8
Max. Leachate Flow Rate (q_{in}, gpm) - See Note 1	155	119	149	165	111
Sump Dimensions					
Height (H, ft)	3	3	3	3	3
Slope (S:1)	2	2	2	2	2
Base Length (L, ft)	10	10	10	10	10
Base Width (B, ft)	10	10	10	10	10
Porosity of Sump 1.5" crushed stoneBackfill (n)	0.45	0.45	0.45	0.45	0.45
Pump On Level (h_{on}, ft above sump bottom)	2.5	2.5	2.5	2.5	2.5
Pump Off Level (h_{off}, ft above sump bottom)	1	1	1	1	1
Max. Pool Elevation Area (A_m, sft)	400	400	400	400	400
Permanent Pool Elevation Area (A_p, sft)	196	196	196	196	196
Net Storage Volume (V, cft)	197	197	197	197	197
Net Storage Volume (V, gal)	1474	1474	1474	1474	1474
Pump Cycle					
Assumed pumping rate (q_p, gpm)	175	175	175	175	175
Pump Off (t_{off}, min.)	10	12	10	9	13
Pump On (t_{on}, min.)	72	26	57	147	23
Pump off/on Ratio	0.1	0.5	0.2	0.1	0.6
Cycles (/day)	**18**	**37**	**22**	**9**	**40**
Total Dynamic Head					
Segment 1 - Leachate Riser Pipe					
Elevation Head (h_e, ft)	37	40	42	40	40
Friction Head Loss of Discharge Pipe ($h_{f,\ discharge}$, ft)	14	15	15	14	14
Horizontal Distance from Sump to Leachate Vault	119	128	131	127	124
Length of Sump Pump Discharge Pipe (L_p, ft)	125	134	138	133	130
Diameter of Leachate Discharge Pipe (d, in)	3	3	3	3	3
Hazen-Williams Coefficient (C) - see Note 2	120	120	120	120	120
Segment 2 - Forcemain on top of Berm					
Elevation Head (h_e, ft)	0	0	0	0	0
Friction Head Loss of Forcemain Pipe ($h_{f,\ forcemain}$, ft)	0	1	1	2	2
Length of Forcemain Pipe (L_p, ft)	70	354	824	1620	2000
Equivalent Length of Fittings (L_e, ft)	295	425	555	699	829
Assumed Number of 90˚ Elbows	0	0	0	0	1
Assumed Number of 45˚ Elbows	2	2	2	3	4
Assumed Number of Tees	1	2	3	4	4
Assumed Number of Check Valves	0	1	2	3	4
Assumed Number of Globe Valves	1	1	1	1	1
Diameter of LeachateForcemain (d, in)	8	8	8	8	8
Hazen-Williams Coefficient (C) - see Note 2	120	120	120	120	120
Total Dynamic Head for Pump (TDH, ft)	**51**	**55**	**58**	**56**	**57**

Note,
1. The maximum leachate flow rate was calculated using the per-acre generation rate for the 10-ft and 40-ft waste thickness with a daily cover soil conditions, which is presented in a separate calculation package, titled “Leachate Generation Rate and Leachate Collection System Capacity,” prepared by Geosyntec for the Phase 14 permit application package.
2. C ranges from 120 to 150 for HDPE piping. 120 is selected for these analyses.
3. Allowable flow rate through the perforations of the leachate collection pump calculated as

$$Q = aC_B\sqrt{2gh} = (0.00136\ ft^2)(0.6)\sqrt{2(32\ ft/s^2)(3.5ft)} = 0.0122\frac{ft^3}{sec}\times\frac{7.481\ gallons}{ft^3}\times\frac{60\ sec}{minute}\times 80\ perforations = 440gpm$$

Table 3 - Gravity Flow Forcemain Total Dynamic Head Design Calculations
Phase 14
Crossroads Landfill, Norridgewock, Maine

Segment 3 - Forcemain from Access Ramp to Pump Station	Average	Peak
Assumed Pumping Rate (gpm)	60	175
Elevation Head (h_e, ft)	-59	-59
Friction Head Loss of Forcemain Pipe ($h_{f, forcemain}$, ft)	1	4
Length of Forcemain Pipe (L_p, ft)	4000	4000
Equivalent Length of Fittings (L_e, ft)	1000	1000
Assumed Number of 90˚ Elbows	2	2
Assumed Number of 45˚ Elbows	0	0
Assumed Number of Tees	0	0
Assumed Number of Check Valves	8	8
Assumed Number of Globe Valves	1	1
K' value for 90˚ elbows	40	40
K' value for 45˚ elbows	21	21
K' value for Tees	60	60
K' value for Check Valves	135	135
K' value for Globe Valves	340	340
Diameter of LeachateForcemain (d, in)	8	8
Hazen-Williams Coefficient (C) - see Note 1	120	120
Total Dynamic Head for Pump (TDH, ft)	**-58**	**-55**

Note,
1. C ranges from 120 to 150 for HDPE piping. 120 is selected for these analyses.

Table 4 - Forcemain Flow Calculations

Phase 14

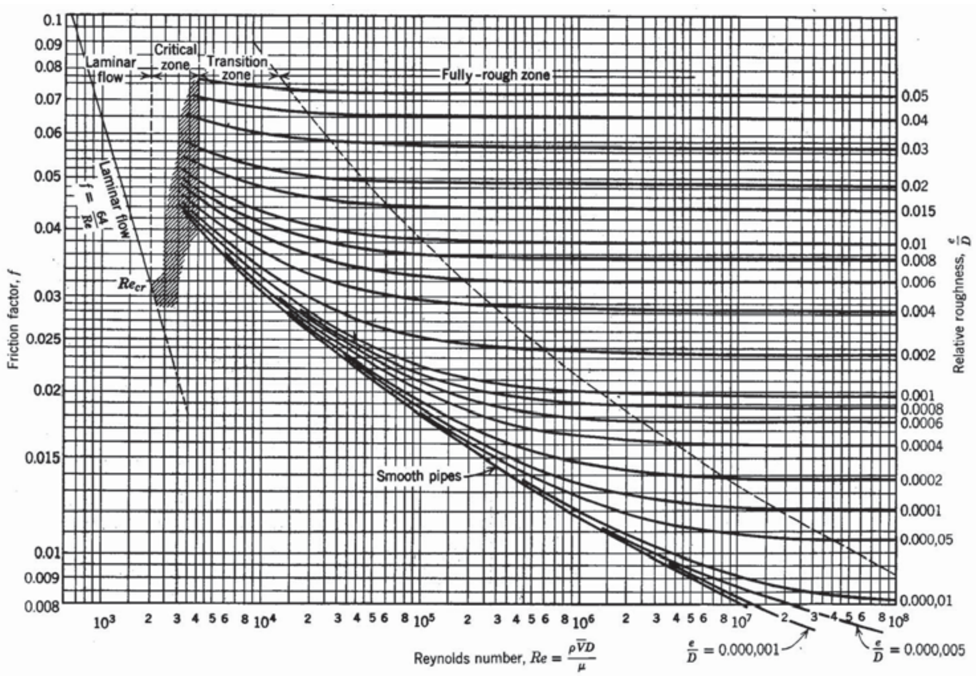
Crossroads Landfill, Norridgewock, Maine

Leachate Generation Condition	Average	Peak
Minimum Pump Elevation Head (ft)	37	37
Pumping Head (ft)	50	100
Length of forcemain (ft)	6000	6000
Hydraulic Gradient, S	0.015	0.023
Forcemain Flow, Q (cfs)	1.13	1.41
Forcemain Flow, Q (gpm)	506	635

ATTACHMENT A

REFERENCES

Plastic Pipe Institute (PPI), "*Handbook of Polyethylene Pipe,*" Plastic Pipe Institute website: www.plasticpipe.org, 2007.



Note for the Moody Diagram: D = pipe inside diameter, ft

Figure 2-1 The Moody Diagram

Head Loss in Fittings

Fluids flowing through a fitting or valve will experience a friction loss that can be directly expressed using a resistance coefficient, K', which represents the loss in terms of an equivalent length of pipe of the same diameter.[20] As shown in the discussion that follows, this allows the loss through a fitting to be conveniently added into the system flow calculations. Table 2-2 presents K' factors for various fittings.

Where a pipeline contains a large number of fittings in close proximity to each other, this simplified method of predicting flow loss may not be adequate due to the cumulative systems effect. Where this is a design consideration, the designer should consider an additional frictional loss allowance, or a more thorough treatment of the fluid mechanics.

The equivalent length of pipe to be used to estimate the friction loss due to fittings may be obtained by Eq. 2-9 where L_{EFF} = Effective Pipeline length, ft; D is pipe bore diameter in ft.; and K' is obtained from Table 2-2.

(2-9) $L_{EFF} = K'D$

Plastic Pipe Institute (PPI), "*Handbook of Polyethylene Pipe*," Plastic Pipe Institute website: www.plasticpipe.org, 2007.

TABLE 2-2
Representative Fittings Factor, K', To Determine Equivalent Length of Pipe

Piping Component	K'
90° Molded Elbow	40
45° Molded elbow	21
15° Molded Elbow	6
90° Fabricated Elbow (3 or more miters)	24
90° Fabricated Elbow (2 miters)	30
90° Fabricated Elbow (1 miters)	60
60° Fabricated Elbow (2 or more miters)	25
60° Fabricated Elbow (1 miters)	16
45° Fabricated Elbow (2 or more miters)	15
45° Fabricated Elbow (1 miters)	12
30° Fabricated Elbow (2 or more miters)	8
30° Fabricated Elbow (1 miters)	8
15° Fabricated Elbow (1 miters)	6
Equal Outlet Tee, Run/Branch	60
Equal Outlet Tee, Run/Run	20
Globe Valve, Conventional, Fully Open	340
Angle Valve, Conventional, Fully Open	145
Butterfly Valve, >8", Fully Open	40
Check Valve, Conventional Swing	135

- K values are based on Crane Technical Paper No 410-C
- K value for Molded Elbows is based on a radius that is 1.5 times the diameter.
- K value for Fabricated Elbows is based on a radius that is approximately 3 times the diameter.

Head Loss Due to Elevation Change

Line pressure may be lost or gained from a change in elevation. For liquids, the pressure for a given elevation change is given by:

(2-10) $$h_E = h_2 - h_1$$

WHERE

h_E = Elevation head, ft of liquid

h_1 = Pipeline elevation at point 1, ft

h_2 = Pipeline elevation at point 2, ft

If a pipeline is subject to a uniform elevation rise or fall along its length, the two points would be the elevations at each end of the line. However, some pipelines may have several elevation changes as they traverse rolling or mountainous terrain. These pipelines may be evaluated by choosing appropriate points where the pipeline slope changes, then summing the individual elevation heads for an overall pipeline elevation head.

APPENDIX IV(f)
Stormwater Calculations

APPENDIX IV(f)(i)
General Stormwater Design

STORMWATER MANAGEMENT CALCULATIONS
PHASE 14
CROSSROADS LANDFILL

INTRODUCTION

The purpose of this calculation package is to perform hydrologic and hydraulic analyses for evaluation of the proposed stormwater management system for Crossroads Landfill Phase 14 closure (Phase 14). The proposed stormwater management system, consisting of cover system benches, rip-rap lined downchutes, catch basins, swales, and pipes, and erosion control structure (ECS) basins, is shown on Sheet 15 of the Permit Drawings.

REGULATORY OVERVIEW

The stormwater management system for Phase 14 was designed in accordance with applicable portions of the following statutes related to stormwater management, solid waste and flood protection.

- ***State of Maine Site Location of Development Law Guidelines for Solid Waste Management (06-096 CMR, Chapter 400):***
  - ***Section 4H – No Unreasonable Adverse Effect on Surface Water Quality***
  - ***Section 4J – Soil Types That are Suitable and Will Not Cause Unreasonable Erosion***
  - ***Section 4M – Not Unreasonably Cause or Increase Flooding***
- ***State of Maine Site Location of Development Law Guidelines for Stormwater Management (06-096 CMR, Chapter 500)***
- ***State of Maine Erosion and Sediment Control Best Management Practices – Manual for Designers and Engineers (2016)***
- ***State of Maine Stormwater Management Design Manual (2016)***

DESIGN CRITERIA

The following design criteria were established for the post-closure stormwater management system based on the regulatory requirements listed above:

- **Water Quality Protection (06-096 CMR, Chapter 400, Part 4.H.(1)a) -** The stormwater management system should reduce the potential of discharge of any water pollutants, directly or indirectly, that affect the state classification of a surface water body, as specified in 38 M.R.S.A. §464.

- **Not Unreasonably Cause or Increase Flooding (*06-096 CMR, Chapter 400 Section 4.M(1)a*) -** The design of the facility should not restrict the flow of a 100 year flood event.

- **Control Discharge Rates (*06-096 CMR, Chapter 400 Section 4.M(1)b*)** - The post-development (i.e., post-closure) stormwater management system should control run-on and run-off, such that the rate of flow of stormwater from the landfill after closure does not exceed the rate of outflow of stormwater from the landfill site prior to the construction of the landfill during a storm of an intensity up to and including a 25-year, 24-hour design storm.

The following design objectives were established for development of the post-closure stormwater management system based on site-specific design requirements that have been used in previous landfill phase design packages at the Crossroads landfill facility:

- Conveyances (i.e., channels, downchutes, ditches, swales, and pipes) should convey peak flow rate of contributing drainage area associated with up to the 25-year, 24-hour design storm in a non-erosive manner.
- Conveyances (i.e., channels, downchutes, ditches, and swales) should not overtop during a peak flow rate associated with the 100-year, 24-hour design storm.
- Cover system benches were designed to have a typical cross section that was designed for the largest contributing drainage area of any one cover system bench. For Phase 14, this cover system bench was the top most cover system bench located in drainage area DA-22. The controlling drainage area receives flows from 4.2 acres.
- Rip-rap lined downchutes were designed to have a typical cross section that was designed for the largest contributing drainage area of any one downchute. For Phase 14, this cover system bench was located in drainage area DA-33B. The downchute receives flows from the entire drainage area which is 14.5 acres.
- The rip-rap lined roadside ditch was designed to have a typical cross section that was designed for the contributing drainage area. For Phase 14, this 5 acre drainage area is the portion of DA-22 upstream of the roadside ditch.
- Perimeter drainage ditches were designed to have a typical cross section that was designed for the largest contributing drainage area of any one perimeter drainage ditch. For Phase 14, this perimeter drainage ditch was located in drainage area DA-33A. The controlling drainage was 3.6 acres and discharged into the westernmost perimeter drainage ditch of DA-33A.
- Perimeter pipes were designed to convey flows designed for the largest contributing drainage area of any one perimeter pipe. For Phase 14, the controlling flowrate was 24 cubic feet per second coming from a drainage area in DA-22. Due to large variances in

pipe elevations from upstream to downstream, a range of pipe slopes were selected to meet elevation constraints. Pipe diameters were selected based on the longitudinal slopes to have a minimum flow capacity of 24 cubic feet per second.

- Catch basin grates should pass the peak flowrate from the 25-year, 24-hour design storm without overtopping the adjacent infrastructure (e.g., headwater required to pass flow through grate does not cause the upstream channel to overtop).
- Pipes were sized to convey the 25-year, 24-hour design storm without flowing full (i.e., without pressurized pipe flow).
- ECS Basins should be sized to be able to completely retain the 25-year, 24-hour design storm runoff volume and dewater this volume over a period of 72 hours.
- ECS basin outlet riser structures include grated horizontal orifice (i.e., the top of the riser structures) which were sized to pass the 25-year 24-hour peak flowrate without activating the basin's emergency spillway.
- ECS Basin emergency spillways are sized to pass the 100-year, 24-hour design storm peak discharge without overtopping the ECS Basins.

METHODOLOGY

The United States Environmental Protection Agency (USEPA) Stormwater Management Model (SWMM) [EPA, August 2016] was used to perform the hydrologic modeling for the proposed stormwater management system. The USEPA SWMM model was setup to model runoff utilizing Soil Conservation Service (SCS) Curve Number (CN) method. More detailed documentation of the EPA SWMM model can be found on the SWMM User's Manual and Reference Manuals[1]. The hydrologic parameters used for this analysis are described below.

- **Rainfall Distribution and Depth:**
  Per 06-096 CMR Chapter 500 Stormwater Management Rules Appendix H, the Type II 24-hour duration rainfall distribution for Somerset S (Solon Area) was used. Rainfall depths for each return period is summarized below. These rainfall depth data per 06-096 CMR Chapter 500 Stormwater Management Rules Appendix H were extracted by the Maine Department of Environmental Protection from the Northeast Regional Climate Center website (http://precip.eas.cornell.edu), Extreme Precipitation Tables in June 2014. The data represent the most currently available precipitation data for the northeast region. Therefore, the Northeast Regional Climate Center data are the most likely data representing climate change and increased precipitation depths in the northeast.

[1] https://www.epa.gov/water-research/storm-water-management-model-swmm#tab-2

Table 1. 24-Hour Design Storm Rainfall Depths

Return Period (years)	Rainfall Depth (inches)
2	2.7
10	3.9
25	4.9
100	6.7

- **Hydrologic Soil Groups and Curve Numbers:**
  A CN of 77 was used to represent the final cover surface, which is the average value for hydrologic soil group C and D for "open space in good condition (grass cover > 75%)". For direct rainfall into the basins and direct runoff, a CN of 98 was used.

- **Imperviousness:**
  The post-closure landfill will consist of vegetative cover. While vegetation is considered pervious, 10% imperviousness value was assumed to be conservative. This would account for miscellaneous impervious surfaces that may be present at the site. Access road drainage was modeled with 90% imperviousness.

Sizing of gravity conveyance systems including pipes, open channels (e.g., cover system benches, downchutes, swales, etc.), and spillways, was performed using Bentley FlowMaster® V8i hydraulic calculator (Bentley Systems, 2010) to calculate capacities of conveyance systems. For pipes and open channels, Manning's equation was used. Emergency spillways at the ECS basins were sized using equations for broad-crested weirs. The following values were chosen to represent the Manning's roughness coefficient for the various surfaces present on site:

- **Manning's Roughness Coefficient (n):**
  n = 0.030 for vegetated swales and cover system benches with erosion control mats
  n = 0.078 for rip-rap lined downchutes, roadside ditches, and emergency spillways
  n = 0.013 for reinforced concrete pipe or corrugated high-density polyethylene (HDPE) pipes with smooth interior

CONVEYANCE DESIGN

The following sizing and geometry was found to meet the design criteria of the proposed stormwater management system.

Sideslope drainage benches (Figure 1):

- Trapezoidal vegetated open channel cross section
- Depth: 2 ft minimum
- Bottom width: 2 ft
- 1% minimum longitudinal slope
- Interior downslope side of bench is sloped at 1H:1V
- Upslope side of the bench matches the landfill slope 3H:1V

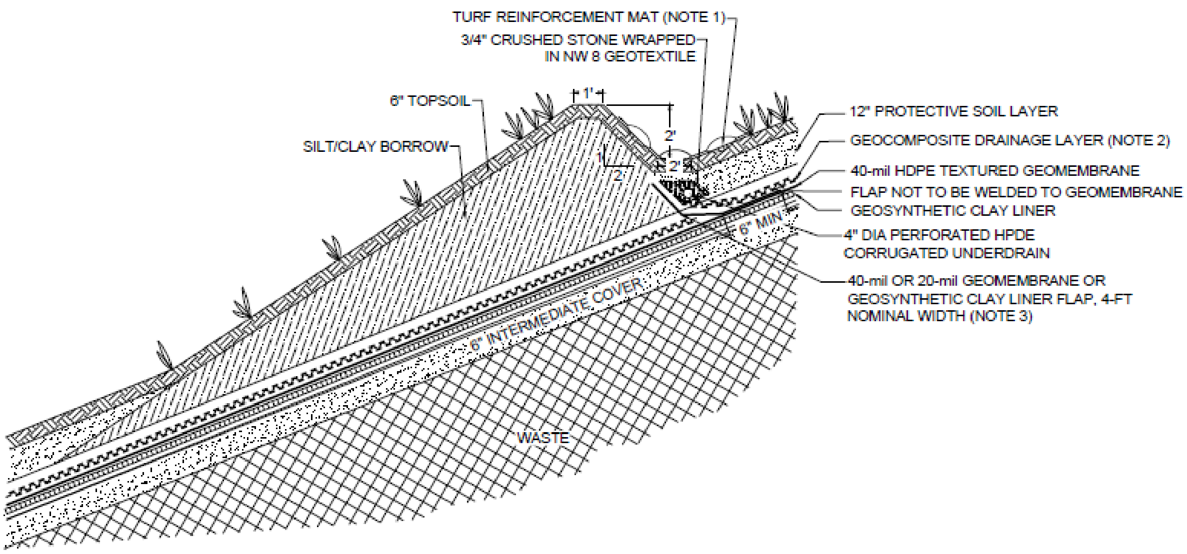


Figure 1: Typical Cover System Sideslope Drainage Bench Section

Rip-rap lined downchute (Figure 2):

- Trapezoidal rip-rap lined open channel cross section
- Depth: 2 ft minimum
- Bottom width: 4 ft
- Longitudinal slope following landfill side slope (33% typical slope)
- 2H:1V side slopes

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Client:	WMDSM	Project:	Crossroads LF – Ph 14	Project/ Proposal No.:	BE0232C	Task No.:	02

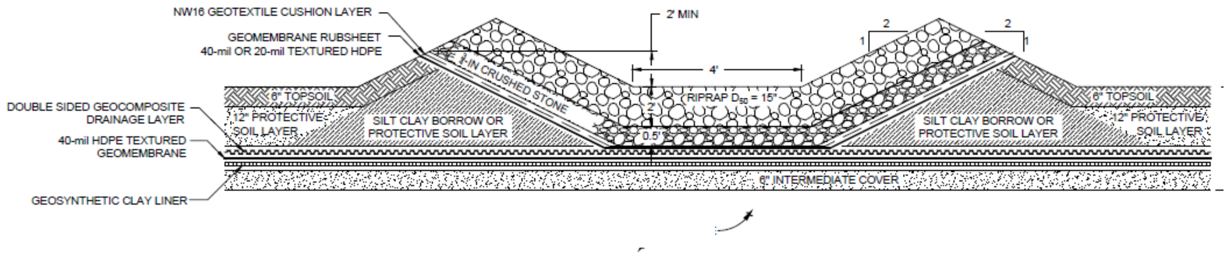

Figure 2: Typical Rip-rap Lined Downchute Section

Roadside ditch (Figure 3):

- Trapezoidal rip-rap lined open channel cross section
- Depth: 2 ft minimum
- Bottom width: 3 ft
- Longitudinal slope following access road (7.8%)
- 2H:1V side slopes

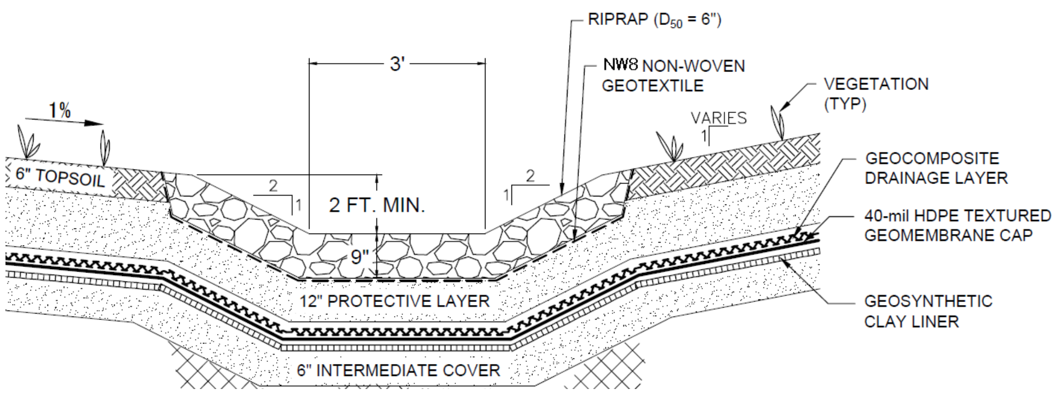

Figure 3: Typical Rip-rap Lined Roadside Ditch Section

Perimeter drainage ditch (Figure 4):

- Trapezoidal open channel cross section
- Modelled assuming sediment accumulation and establishment of vegetation in geomembrane-lined perimeter swales[2]
- Depth: 1.4 ft maximum

[2] A hydrologic and hydraulic analysis was performed to confirm that modeling the perimeter drainage ditch with geomembrane does not significantly change the time of concentration or the peak flow rates into or out of the ECS basins and does not change the conclusions of this calculation package.

- Bottom width: 4 ft
- 0.75% minimum slope
- 9.9 ft maximum width from crest to crest[3]
- Minimum side slopes of 2H:1V for perimeter swale

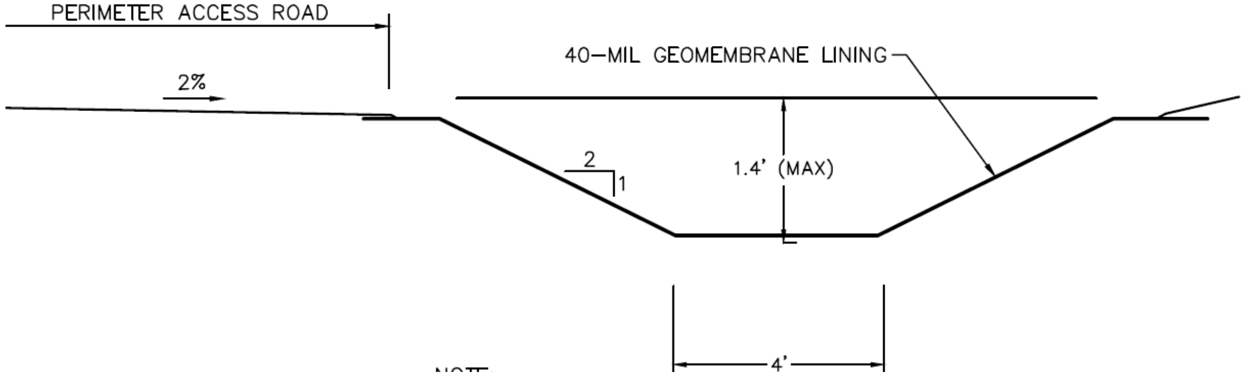

Figure 4: Typical Perimeter Drainage Ditch Section

Grass-lined swale (Figure 5):

- Trapezoidal open channel cross section
- 4 ft bottom width
- 2 ft minimum height
- Modelled assuming vegetation
- 1% minimum slope
- Minimum side slopes of 3H:1V for grass-lined swale

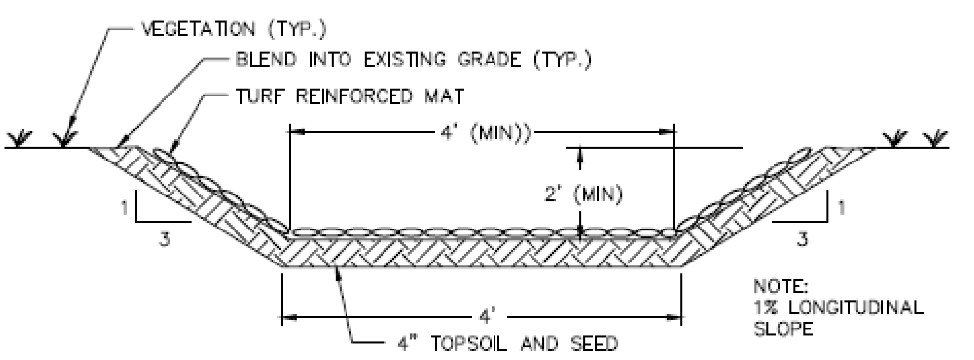

Figure 5: Typical Grass-lined Swale Section

[3] Perimeter ditch design required a maximum top width of 9.9 feet to fit within the constraints of the road corridor layout on the MSE berm around the perimeter of the Phase 14.

Buried perimeter pipes and basin inlet pipes:

- Diameter: 2 ft minimum
- 1% minimum longitudinal slope (except for the 221 linear foot section of 24 inch diameter buried pipe on the east size of Phase 14 with a longitudinal slope of 0.5%)
- Reinforced concrete or corrugated H/DPE pipe with smooth interior (n = 0.013)

Rip-rap sizing for plunge pools and aprons for discharge structure and spillways:

- Median rip-rap diameter ("D_{50}") sized per design guidelines from Maine Erosion and Sediment Control Best Management Practices Manual for Engineers and Designers (October 2016)

Catch Basins and Grates:

- At intermediate locations in the perimeter drainage ditch: minimum 2.5 ft by 2.5 ft grate inlet, minimum open grate area 2.5 sq. ft.
- At downchute locations: minimum 4 ft by 4 ft grate inlet, minimum open grate area 6.4 sq ft.
- ECS Basin overflow riser grate: minimum 4.5 ft by 4.5 ft grate inlet

ECS Basins:

- Outlet riser discharge structures:
  - a minimum of 6 inches of freeboard from top of horizontal grated overflow riser to invert of emergency spillway
- Emergency Spillway
  - 1-foot deep emergency spillways
  - Rip-rap lined
- Stage and storage information can be found in Attachment B

PROPOSED DRAINAGE

The post-closure landfill surface was divided into four sub-catchment areas. Each sub-area drains to a single ECS Basin. Drainage area IDs correspond to the basins to which they drain. Drawing 15 of the Permit Drawings shows the site layout with drainage areas. Sub-area 33 was further subdivided into sub-areas 33A and 33B which drain to the same ECS Basin (ECS-33). Phase 14 post-closure grades (also shown on Sheet 15) were used to delineate the post-closure sub-watershed areas. Table 2 summarizes the four drainage areas of the Phase 14 closure.

Drainage Area 22 (DA-22) is the largest drainage area at 22.6 acres and is located in the southeast quadrant of the landfill. Runoff from DA-22 generally drains southeast and is carried via pipe flow west and south before being discharged to ECS Basin 22. Runoff collected in the stormwater management system in DA-22 ultimately drains via a 3 ft culvert pipe to ECS Basin 22.

Drainage Area 32 (DA-32) is 9.5 acres and located on the west quadrant of the landfill. Runoff collected in the stormwater management system in DA-32 ultimately drains via a 2.5 ft culvert pipe to ECS Basin 32.

Drainage Area 33A (DA-33A) is 10.8 acres and located on the northwest quadrant of the landfill. Runoff collected in the stormwater management system in DA-33A ultimately drains via a 2.5 ft culvert pipe to ECS Basin 33.

Drainage Area 33B (DA-33B) is 14.3 acres and located on the northeast quadrant of the landfill. Runoff collected in the stormwater management system in DA-33B ultimately drains via a 3 ft culvert pipe to ECS Basin 33.

An access road (MSE Ramp) on the southeast portion of the landfill provides vehicular access into Phase 14. The paved access road is 0.7 acres and will drain via curb and gutter and discharge to existing ECS Basin 23. A portion of the access road south of the ECS Basin 23 is intended to drain via "country drainage;" runoff from the impervious road will drain via overland flow onto the adjacent vegetated road shoulder.

Table 2. Drainage Area Characteristics Summary ECS Basin

ECS Basin	Drainage Area ID	Drainage Area (acres)	Curve Number	Imperviousness (Percent)	Slope (Percent)	25-Year, 24-Hour Design Storm Peak Flowrate (cfs)	25-Year, 24 Hour Design Storm Volume (Acre-feet)
22	22	22.6	77	10	8	51.9	6.5
32	32	9.5	77	10	10.5	30.6	2.6
33	33A	10.8	77	10	15.9	35.2	7.0
	33B	14.3	77	10	15.7	46.5	
23	Access Road Drainage	0.7	77	90	3.3	4.4	0.3
TOTAL	**N/A**	**57.9**	**N/A**	**N/A**	**N/A**	**N/A**	**16.4**

The four landfill drainage areas were analyzed to identify and delineate the largest subdrainage areas contributing flow to a single cover system bench, downchute, perimeter swale, and pipe. These subdrainage areas were selected to represent the maximum peak flowrate associated with a design storm to conservatively design the conveyance system. The resulting subdrainage characteristics are summarized in Table 3, below.

Table 3. Conveyance Subdrainage Characteristics Summary

Controlling Subdrainage Area ID	Drainage Area (Acres)	Curve Number	Imperviousness (Percent)	Slope (Percent)	25-Year, 24-Hour Peak Flowrate (CFS)
Sideslope Drainage Bench	4.2	77	10	1.8	8.7
Downchute	14.3	77	10	5.3	28.8
Perimeter Drainage Ditch	3.6	77	10	1.9	7.9
Perimeter Pipe	12.1	77	10	1.7	24.2
Roadside Ditch	5.0	77	10	7.8	11.7

Complete SWMM input and results files for drainage analysis are found in Attachment C.

RESULTS - SIZING OF STORMWATER CONVEYANCES

The proposed sizing of conveyance system meets the regulatory requirements and design criteria described above. SWMM results describe design volume and peak flowrate requirements for the 25-year, 24-hour design storm. Conveyance systems were sized using FlowMaster based on the design criteria and the flowrate and volume requirements. Sideslope drainage benches, downchutes, perimeter drainage ditches, roadside ditches, and grass-lined swales were designed with a uniform cross section and lining throughout to conservatively convey the largest peak flowrate and simplify construction. Catch basin grate inlets were designed so there is no backup of stormwater resulting in overtopping of the perimeter drainage ditch during a 25-year, 24-hour design storm. FlowMaster input and results files are found in Attachment D.

Tables 4 and 5 summarize the flow characteristics between the proposed conveyance systems with the required peak flowrate for respective tributary areas.

Table 4. Open Channel Flow Results Summary

Subdrainage Area ID	Peak Flowrate (CFS)	Conveyance System	Flow Capacity (CFS)	Flow Velocity (FT/S)	Flow Depth[1] (FT)	Available Freeboard[1] (FT)
Sideslope Drainage Bench	8.7[1]	Sideslope Drainage Bench	43.6	3.1	1.7	0.3
Sideslope Drainage Bench	14.8[2]					
Downchute	28.8	Downchute	29.0	7.0	0.8	0.3
Perimeter Drainage Ditch	7.9	Perimeter Drainage Ditch	24.5	3.6	1.1	0.3
Roadside Ditch	11.7[1]	Roadside Ditch	58.9	5.4	1.7	0.3
	19.7[2]					

1. Corresponds to the 25-year 24-hour storm event.
2. Corresponds to the 100-year 24-hour storm event.

Table 5. ECS Basin Inlet Conveyances Analysis Summary

Drainage Area ID	Peak Flowrate[1] (CFS)	Pipe Diameter (Feet)	Longitudinal Slope (Percent)	Maximum Flow Capacity (CFS)
22	51.9	3	0.7	55.8
			2.5	105.5
23	4.4	1	1.5	4.4
32	30.6	2.5	10	129.7
33A	35.2	2.5	1	41.0
33B	46.5	3	1	66.7

1. Corresponds to the 25-year 24-hour storm event.

Table 6 compares the volume requirement for each ECS Basin due to runoff volume generated by tributary areas to ECS Basins and the storage volume provided. Runoff volume generated corresponds to the 25-year, 24-hour design storm. Each ECS Basin was designed to include intra-basin berms that form internal bays within each basin. In general, stormwater runoff entering the basin flows sequentially through the intra-basin bays to increase filtration and reduce the potential for basin short-circuiting.

Table 6. ECS Basin Storage Results Summary

Basin	Runoff Volume Generated (acre-feet)	Provided Storage (acre-feet)	Top of Outlet Riser (Elev)	Top of Basin Berm (Elev)	Emergency Spillway Invert (Elev)	Emergency Spillway Width (FT)
ECS Basin 22A	6.5	16.4	279.5	281	280	17
ECS Basin 32	2.6	2.6	286.5	288	287	11
ECS Basin 33	7.0	7.0	308.5	310	309	29
ECS Basin 23	0.3	0.4	270	271.9	270.9	6

CONCLUSION

The calculations presented in this package indicate that the stormwater management system as designed meet the regulatory design criteria as follows:

- **Water Quality Protection (06-096 CMR, Chapter 400, Part 4.H.(1)a) -** The components of the proposed stormwater management system were designed per the Guidelines for Stormwater Management (06-096 CMR, Chapter 500) to reduce the potential of discharge of any water pollutants, directly or indirectly, that affect the state classification of a surface water body, as specified in 38 M.R.S.A. §464.

- **Not Unreasonably Cause or Increase Flooding (*06-096 CMR, Chapter 400 Section 4.M(1)a)*** - The components of the proposed stormwater management system were designed to not restrict the flow of a 100 year flood event from the Facility or result in potential for upstream or downstream flooding in Mill Stream.

- **Control Discharge Rates (*06-096 CMR, Chapter 400 Section 4.M(1)b)*** - The post-development (i.e., post-closure) stormwater management system incorporates an MSE berm around the perimeter of the Phase 14 that eliminates the potential for run-on to the Phase 14 closure. In the post-development condition, runoff from the Phase 14 closure will be collected in a series of cover system benches, rip-rap lined downchutes, catch basins, swales, and pipes that drain to ECS Basins. The ECS Basins were designed to detain stormwater runoff volume for storms up through the 25-year, 24-hour design storm. The ECS Basin outlet structures were designed with a low flow outlet to slowly release the storm volume (up through the 25-year, 24-hour) over a 72 hour period. This results in the post-construction discharge rate not exceeding the rate of outflow of stormwater from the landfill site prior to the construction of the landfill during a storm of an intensity up to and including a 25-year, 24-hour design storm.

In the pre-development condition, the existing site is located within low-lying areas and wetlands. All runoff from the existing (i.e., pre-development) site drains to surrounding wetlands that ultimately drain to Mill Stream. Runoff from the proposed Phase 14 stormwater management system will also drain to the surrounding wetlands and ultimately drain to Mill Stream.

The calculations presented in this package also indicate that the stormwater management system as designed meet the site-specific design criteria.

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ATTACHMENT A
ECS Basin Stage and Storage Information

Area Capacity Curve Information
Data from AutoCAD Civil 3D 2019

Pond ECS-22

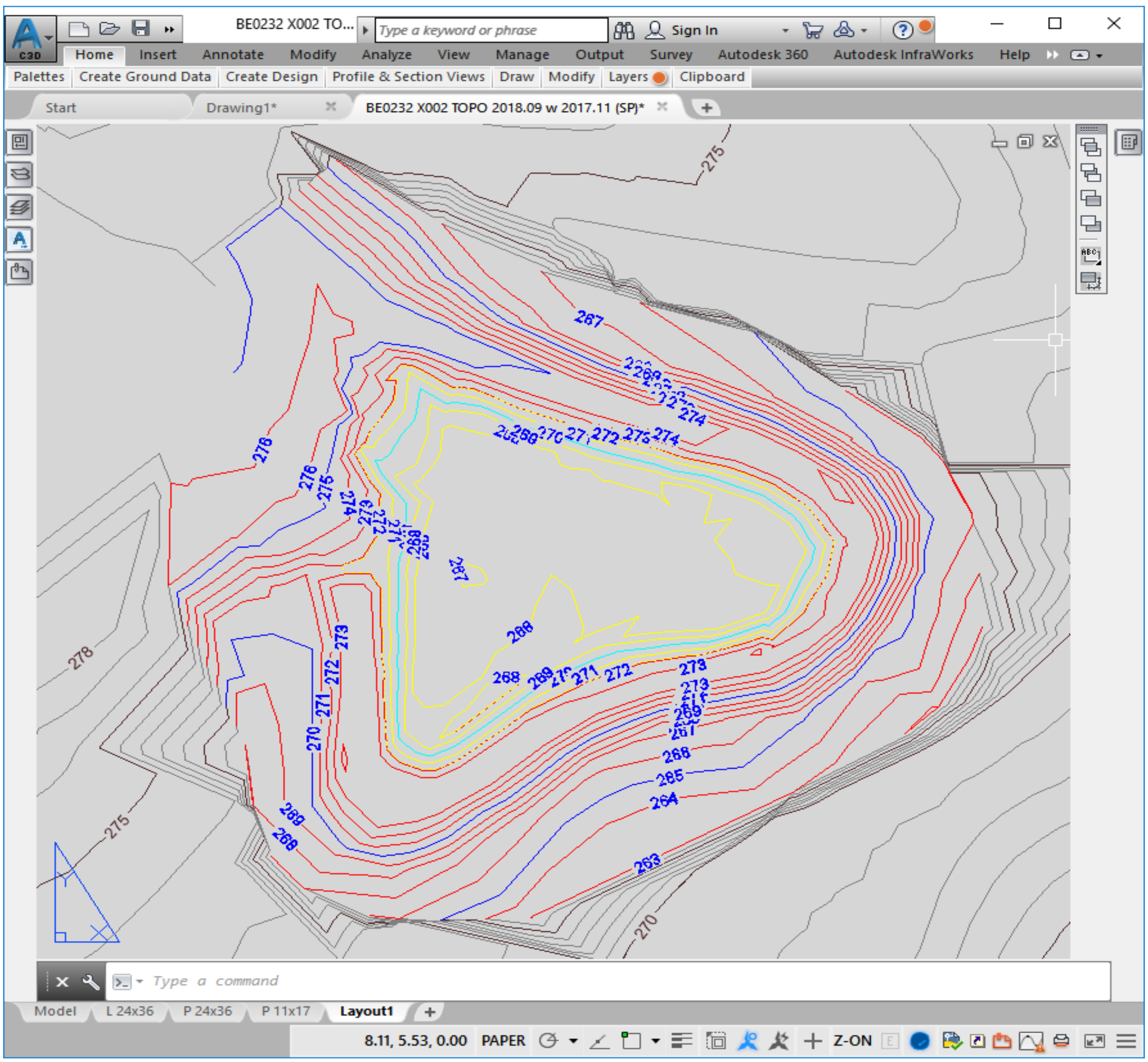
Elevation (ft)	Area (sf)	Area (acres)	Depth	End Area Vol (cu ft)	End Area Vol Sum (cu ft)	End Area Vol Sum (ac-ft)
273.5	70462.61	1.617599011	N/A		0	0
274	78010.58	1.790876428	0.5	37118.3	37118.3	0.852121
275	84111.80	1.930941205	1	81061.19	118179.5	2.713035
276	89986.66	2.065809449	1	87049.23	205228.7	4.711415
277	95762.20	2.198397599	1	92874.43	298103.1	6.843524
278	101296.95	2.325458072	1	98529.58	396632.7	9.105458
279	104046.02	2.388568019	1	102671.5	499304.2	11.46248
280	106773.27	2.45117711	1	105409.6	604713.9	13.88236
281	109503.51	2.513854612	1	108138.4	712852.2	16.36488

Basin ECS-23

Project: Crossroads LF, Phase 14

JOC, 7/25/19

Contour Elevation	Contour Area (sq. ft)	Depth (ft)	Incremental Volume Avg. End (cu. ft)	Cumulative Volume Avg. End (cu. ft)	Incremental Volume Conic (cu. ft)	Cumulative Volume Conic (cu. ft)
267	62.78	N/A	N/A	0	N/A	0
268	159.07	1	110.93	110.93	107.26	107.26
268	6,871.16	0	0	110.93	0	107.26
269	9,957.58	1	8414.37	8525.3	8366.8	8474.06
270	11,324.25	1	10640.92	19166.22	10633.6	19107.66
271	12,716.84	1	12020.54	31186.76	12013.82	31121.47
271.9	14,104.31	0.9	12069.52	43256.28	12064.13	43185.6

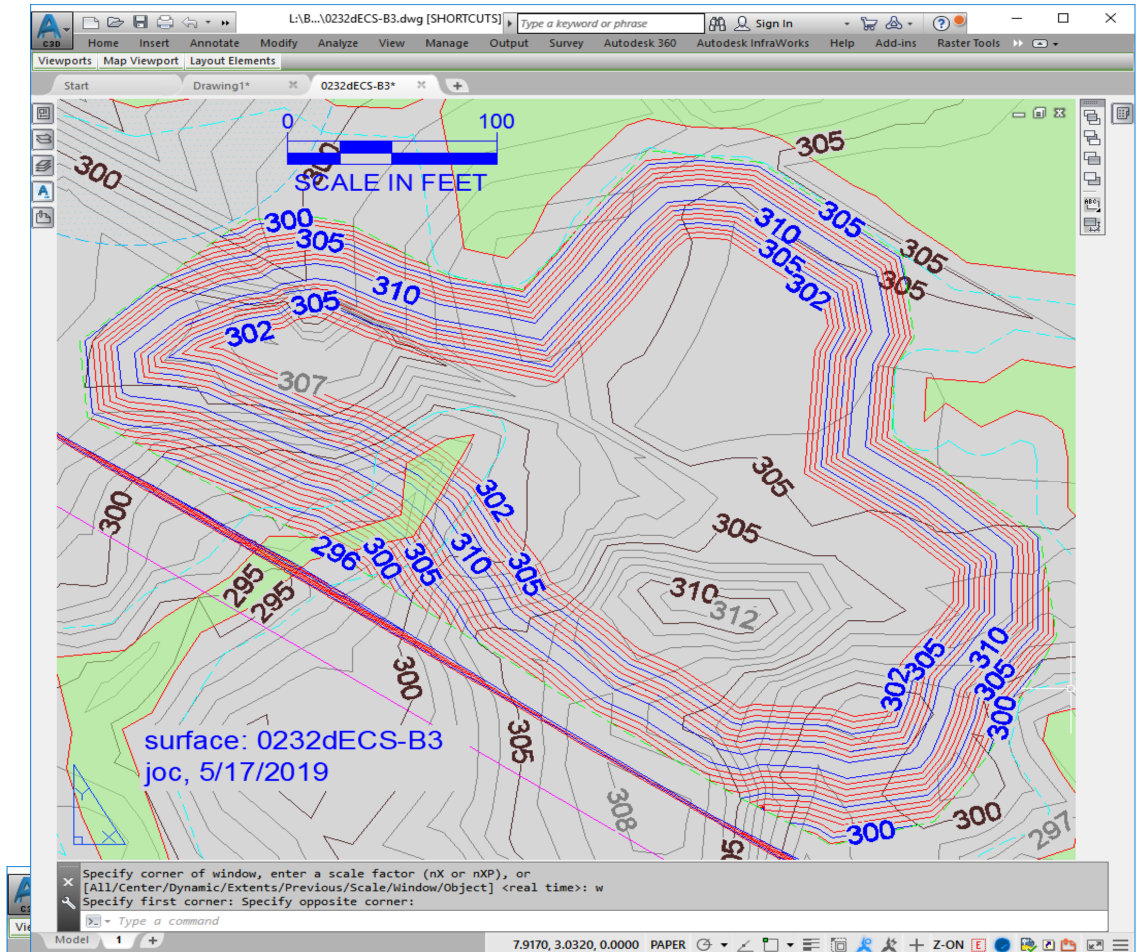


Basin ECS-33 stage-storage

Project: Crossroads Phase 4

JOC, 5/17/19

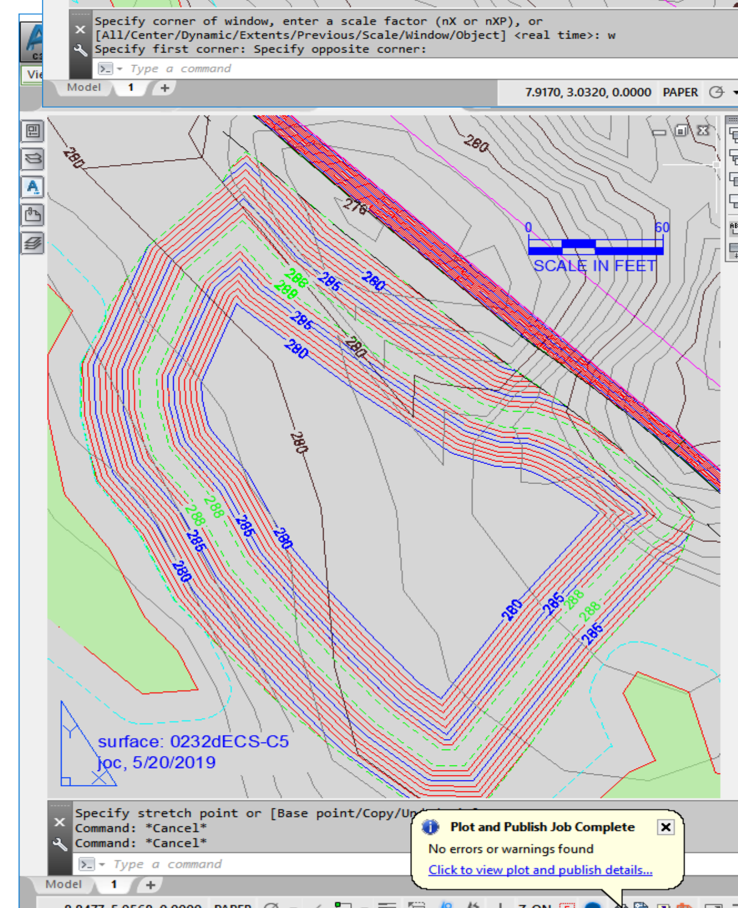
Contour Elevation	Contour Area (sq. ft)	Depth (ft)	Incremental Volume Avg. End (cu. ft)	Cumulative Volume Avg. End (cu. ft)		Incremental Volume Conic (cu. ft)	Cumulative Volume Conic (cu. ft)	
302	38,118.64	N/A	N/A	0		N/A	0	
303	40,882.25	1	39500.44	39500.44		39492.39	39492.39	
304	43,705.66	1	42293.95	81794.4		42286.1	81778.48	
305	46,588.88	1	45147.27	126941.67		45139.6	126918.08	
306	49,530.26	1	48059.57	175001.24		48052.07	174970.15	
307	52,521.72	1	51025.99	226027.23		51018.68	225988.83	
308	55,562.30	1	54042.01	**280,069.24**	**c.f.**	54034.88	**280,023.71**	**c.f.**
			CUM VOL =	**10,372.93**	**C.Y.**	CUM VOL =	**10,371.25**	**C.Y.**



Basin ECS-32 stage-storage

JOC, 5/20/19

Contour Elevation	Contour Area (sq. ft)	Depth (ft)	Incremental Volume Avg. End (cu. ft)	Cumulative Volume Avg. End (cu. ft)		Incremental Volume Conic (cu. ft)	Cumulative Volume Conic (cu. ft)	
280	15,251.67	N/A	N/A	0		N/A	0	
281	16,651.88	1	15951.77	15951.77		15946.65	15946.65	
282	18,100.82	1	17376.35	33328.13		17371.32	33317.97	
283	19,599.37	1	18850.09	52178.22		18845.13	52163.1	
284	21,148.03	1	20373.7	72551.92		20368.79	72531.89	
285	22,745.82	1	21946.92	94498.84		21942.08	94473.96	
286	24,390.60	1	23568.21	**118,067.05**	**c.f.**	23563.42	**118,037.39**	**c.f.**
			CUM VOL =	**4,372.85**	**C.Y.**	CUM VOL =	**4,371.76**	**C.Y.**



ATTACHMENT B
SWMM Input and Results

```
[TITLE]
;;Project Title/Notes

[OPTIONS]
;;Option             Value
FLOW_UNITS           CFS
INFILTRATION         CURVE_NUMBER
FLOW_ROUTING         KINWAVE
LINK_OFFSETS         DEPTH
MIN_SLOPE            0
ALLOW_PONDING        NO
SKIP_STEADY_STATE    NO

START_DATE           05/02/2019
START_TIME           00:00:00
REPORT_START_DATE    05/02/2019
REPORT_START_TIME    00:00:00
END_DATE             05/04/2019
END_TIME             00:00:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          00:00:06
WET_STEP             00:00:06
DRY_STEP             01:00:00
ROUTING_STEP         0:00:06

INERTIAL_DAMPING     PARTIAL
NORMAL_FLOW_LIMITED  BOTH
FORCE_MAIN_EQUATION  H-W
VARIABLE_STEP        0.75
LENGTHENING_STEP     0
MIN_SURFAREA         12.566
MAX_TRIALS           8
HEAD_TOLERANCE       0.005
SYS_FLOW_TOL         5
LAT_FLOW_TOL         5
MINIMUM_STEP         0.5
THREADS              1

[EVAPORATION]
;;Data Source    Parameters
;;-------------- ----------------
CONSTANT         0.0
DRY_ONLY         NO

[RAINGAGES]
;;Name           Format    Interval SCF      Source
```

```
;;-------------- --------- ------ ------ ----------
RG_TypeII_4.9    CUMULATIVE 0:06     1.0      TIMESERIES TypeII_25Yr_24Hr_4.9
;100-yr 24-hr storm event
RG_TypeII_6.7    CUMULATIVE 0:06     1.0      TIMESERIES TypeII_100Yr_24Hr_6.7

[SUBCATCHMENTS]
;;Name           Rain Gage        Outlet           Area     %Imperv  Width    %Slope
  CurbLen  SnowPack
;;-------------- ---------------- ---------------- -------- -------- --------
-------- -------- ----------------
DA22             RG_TypeII_4.9    ECS-22           22.6     10       522      8
  0
DA32             RG_TypeII_4.9    ECS-32           9.5      10       509.2    10.5
  0
DA33A            RG_TypeII_4.9    ECS-33           10.8     10       497      15.9
  0
;Rainfall that falls directly into the basin
Basin22_water    RG_TypeII_4.9    ECS-22           2.33     10       100      1
  0
;Rainfall that falls directly into the basin
Basin32_water    RG_TypeII_4.9    ECS-32           0.56     10       100      1
  0
;Rainfall that falls directly into the basin
Basin33_water    RG_TypeII_4.9    ECS-33           1.27     10       100      1
  0
Max_subarea_drng_bnch RG_TypeII_4.9    Out_max_dnrg_bnch 4.2      10       162
1.8      0
DA33B            RG_TypeII_4.9    ECS-33           14.3     10       652.1    15.7
  0
Max_subarea_perimeter_pipe RG_TypeII_4.9    Out_max_per_pipe 12.1     10       444.3
   1.7      0
Max_subarea_downchute RG_TypeII_4.9    Out_max_downchute 14.5     10       298.6
5.27     0
Lower_perimeter_pipe RG_TypeII_4.9    Out_lower_perim_pipe 0.8      10       112.4
 16.1     0
Road_drainage    RG_TypeII_4.9    ECS-23           0.7      90       29.8     3.3
  0
;Rainfall that falls directly onto basin
Basin23_water    RG_TypeII_4.9    ecs-23           0.32     10       100      1
  0
Max_subarea_perimeter_swale RG_TypeII_4.9    Out_max_per_swale 3.6      10
153.8    1.9      0
Road_Channel_Drainage RG_TypeII_4.9    Out_road_channel 5        10       120.7
8.1      0

[SUBAREAS]
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo
PctRouted
```

```
;;-------------- ---------- ---------- ---------- ---------- ---------- ----------
----------
DA22             0.01       0.1        0.05       0.05       25         OUTLET
DA32             0.01       0.1        0.05       0.05       25         OUTLET
DA33A            0.01       0.1        0.05       0.05       25         OUTLET
Basin22_water    0.01       0.1        0.05       0.05       25         OUTLET
Basin32_water    0.01       0.1        0.05       0.05       25         OUTLET
Basin33_water    0.01       0.1        0.05       0.05       25         OUTLET
Max_subarea_drng_bnch 0.01       0.1        0.05       0.05       25         OUTLET

DA33B            0.01       0.1        0.05       0.05       25         OUTLET
Max_subarea_perimeter_pipe 0.01       0.1        0.05       0.05       25
OUTLET
Max_subarea_downchute 0.01       0.1        0.05       0.05       25         OUTLET

Lower_perimeter_pipe 0.01       0.1        0.05       0.05       25         OUTLET

Road_drainage    0.01       0.1        0.05       0.05       25         OUTLET
Basin23_water    0.01       0.1        0.05       0.05       25         OUTLET
Max_subarea_perimeter_swale 0.01       0.1        0.05       0.05       25
OUTLET
Road_Channel_Drainage 0.01       0.1        0.05       0.05       25         OUTLET


[INFILTRATION]
;;Subcatchment   CurveNum              DryTime
;;-------------- ---------- ---------- ----------
DA22             77         0.5        7
DA32             77         0.5        7
DA33A            77         0.5        7
Basin22_water    98         0.5        7
Basin32_water    98         0.5        7
Basin33_water    98         0.5        7
Max_subarea_drng_bnch 77         0.5        7
DA33B            77         0.5        7
Max_subarea_perimeter_pipe 77         0.5        7
Max_subarea_downchute 77         0.5        7
Lower_perimeter_pipe 77         0.5        7
Road_drainage    98         0.5        7
Basin23_water    77         0.5        7
Max_subarea_perimeter_swale 77         0.5        7
Road_Channel_Drainage 77         0.5        7

[OUTFALLS]
;;Name           Elevation  Type       Stage Data       Gated    Route To
;;-------------- ---------- ---------- ---------------- -------- ----------------
Out32            286.5      FREE                        NO
Out22            277        FREE                        NO
```

```
Out33            308.53     FREE                        NO
Out_max_dnrg_bnch 0          FREE                        NO
Out_max_per_pipe 0          FREE                        NO
Out_max_downchute 0          FREE                        NO
Out_lower_perim_pipe 0          FREE                        NO

Out23            270        FREE                        NO
Out_max_per_swale 0          FREE                        NO
Out_road_channel 0          FREE                        NO

[STORAGE]
;;Name           Elev.    MaxDepth   InitDepth  Shape      Curve Name/Params
   N/A      Fevap    Psi      Ksat     IMD
;;-------------- -------- ---------- ----------- ----------
---------------------------- -------- --------          -------- --------
ECS-22           273.5    6          0          TABULAR    ECS-22
   0        0
ECS-32           280      6.5        0          TABULAR    ECS-32
   0        0
ECS-33           302      6.52       0          TABULAR    ECS-33
   0        0
ECS-23           267      3          0          TABULAR    ECS-23
   0        0

[OUTLETS]
;;Name           From Node        To Node          Offset     Type
QTable/Qcoeff    Qexpon     Gated
;;-------------- ---------------- ---------------- ---------- ---------------
---------------- ---------- --------
Outlet32         ECS-32           Out32            6.5        FUNCTIONAL/DEPTH 10.0
           0.5        NO
Outlet22         ECS-22           Out22            3.5        FUNCTIONAL/DEPTH 10.0
           0.5        NO
Outlet33         ECS-33           Out33            6.53       FUNCTIONAL/DEPTH 10.0
           0.5        NO
Outlet23         ECS-23           Out23            3          FUNCTIONAL/DEPTH 10.0
           0.5        NO

[CURVES]
;;Name           Type       X-Value    Y-Value
;;-------------- ---------- ---------- ----------
;Storage Basin
ECS-33           Storage    0          38118.64
ECS-33                      1          40882.25
ECS-33                      2          43705.66
ECS-33                      3          46588.88
ECS-33                      4          49530.26
ECS-33                      5          52521.72
```

```
ECS-33                        6          55562.30
ECS-33                        7          58649.38
;
;Storage Basin ECS-C
ECS-32           Storage      0          15251.67
ECS-32                        1          16651.88
ECS-32                        2          18100.82
ECS-32                        3          19599.37
ECS-32                        4          21148.03
ECS-32                        5          22745.82
ECS-32                        6          24390.60
ECS-32                        7          26080.73
;
;Basin Storage
ECS-22           Storage      0          70462.61
ECS-22                        .5         78010.6
ECS-22                        1.5        84111.8
ECS-22                        2.5        89986.7
ECS-22                        3.5        95762.2
ECS-22                        4.5        101297.0
ECS-22                        5.5        104046.0
ECS-22                        6.5        106773.3
ECS-22                        7.5        109503.5
;
;Road Drainage Basin
ECS-23           Storage      0          62.78
ECS-23                        1          6712.09
ECS-23                        2          9957.58
ECS-23                        3          11324.25
ECS-23                        4          12716.84
ECS-23                        4.9        14104.31

[TIMESERIES]
;;Name           Date       Time       Value
;;-------------- ---------- ---------- ----------
TypeII_25Yr_24Hr_4.9            0.0        0
TypeII_25Yr_24Hr_4.9            0.1        0.004949
TypeII_25Yr_24Hr_4.9            0.2        0.009898
TypeII_25Yr_24Hr_4.9            0.3        0.014945
TypeII_25Yr_24Hr_4.9            0.4        0.019992
TypeII_25Yr_24Hr_4.9            0.5        0.025137
TypeII_25Yr_24Hr_4.9            0.6        0.030282
TypeII_25Yr_24Hr_4.9            0.7        0.035525
TypeII_25Yr_24Hr_4.9            0.8        0.040768
TypeII_25Yr_24Hr_4.9            0.9        0.046109
TypeII_25Yr_24Hr_4.9            1.0        0.05145
TypeII_25Yr_24Hr_4.9            1.1        0.056889
TypeII_25Yr_24Hr_4.9            1.2        0.062328
```

CrossroadsPh14.inp

TypeII_25Yr_24Hr_4.9	1.3	0.067865
TypeII_25Yr_24Hr_4.9	1.4	0.073402
TypeII_25Yr_24Hr_4.9	1.5	0.079037
TypeII_25Yr_24Hr_4.9	1.6	0.084672
TypeII_25Yr_24Hr_4.9	1.7	0.090405
TypeII_25Yr_24Hr_4.9	1.8	0.096138
TypeII_25Yr_24Hr_4.9	1.9	0.101969
TypeII_25Yr_24Hr_4.9	2.0	0.1078
TypeII_25Yr_24Hr_4.9	2.1	0.113729
TypeII_25Yr_24Hr_4.9	2.2	0.119658
TypeII_25Yr_24Hr_4.9	2.3	0.125685
TypeII_25Yr_24Hr_4.9	2.4	0.131712
TypeII_25Yr_24Hr_4.9	2.5	0.137837
TypeII_25Yr_24Hr_4.9	2.6	0.143962
TypeII_25Yr_24Hr_4.9	2.7	0.150185
TypeII_25Yr_24Hr_4.9	2.8	0.156408
TypeII_25Yr_24Hr_4.9	2.9	0.162729
TypeII_25Yr_24Hr_4.9	3.0	0.16905
TypeII_25Yr_24Hr_4.9	3.1	0.175469
TypeII_25Yr_24Hr_4.9	3.2	0.181888
TypeII_25Yr_24Hr_4.9	3.3	0.188405
TypeII_25Yr_24Hr_4.9	3.4	0.194922
TypeII_25Yr_24Hr_4.9	3.5	0.201537
TypeII_25Yr_24Hr_4.9	3.6	0.208152
TypeII_25Yr_24Hr_4.9	3.7	0.214865
TypeII_25Yr_24Hr_4.9	3.8	0.221578
TypeII_25Yr_24Hr_4.9	3.9	0.228389
TypeII_25Yr_24Hr_4.9	4.0	0.2352
TypeII_25Yr_24Hr_4.9	4.1	0.242109
TypeII_25Yr_24Hr_4.9	4.2	0.249116
TypeII_25Yr_24Hr_4.9	4.3	0.256221
TypeII_25Yr_24Hr_4.9	4.4	0.263424
TypeII_25Yr_24Hr_4.9	4.5	0.270725
TypeII_25Yr_24Hr_4.9	4.6	0.278124
TypeII_25Yr_24Hr_4.9	4.7	0.285621
TypeII_25Yr_24Hr_4.9	4.8	0.293216
TypeII_25Yr_24Hr_4.9	4.9	0.300909
TypeII_25Yr_24Hr_4.9	5.0	0.3087
TypeII_25Yr_24Hr_4.9	5.1	0.316589
TypeII_25Yr_24Hr_4.9	5.2	0.324576
TypeII_25Yr_24Hr_4.9	5.3	0.332661
TypeII_25Yr_24Hr_4.9	5.4	0.340844
TypeII_25Yr_24Hr_4.9	5.5	0.349125
TypeII_25Yr_24Hr_4.9	5.6	0.357504
TypeII_25Yr_24Hr_4.9	5.7	0.365981
TypeII_25Yr_24Hr_4.9	5.8	0.374556
TypeII_25Yr_24Hr_4.9	5.9	0.383229
TypeII_25Yr_24Hr_4.9	6.0	0.392

TypeII_25Yr_24Hr_4.9	6.1	0.400869
TypeII_25Yr_24Hr_4.9	6.2	0.409836
TypeII_25Yr_24Hr_4.9	6.3	0.418901
TypeII_25Yr_24Hr_4.9	6.4	0.428064
TypeII_25Yr_24Hr_4.9	6.5	0.437325
TypeII_25Yr_24Hr_4.9	6.6	0.446684
TypeII_25Yr_24Hr_4.9	6.7	0.456141
TypeII_25Yr_24Hr_4.9	6.8	0.465696
TypeII_25Yr_24Hr_4.9	6.9	0.475349
TypeII_25Yr_24Hr_4.9	7.0	0.4851
TypeII_25Yr_24Hr_4.9	7.1	0.494949
TypeII_25Yr_24Hr_4.9	7.2	0.504896
TypeII_25Yr_24Hr_4.9	7.3	0.514941
TypeII_25Yr_24Hr_4.9	7.4	0.525084
TypeII_25Yr_24Hr_4.9	7.5	0.535325
TypeII_25Yr_24Hr_4.9	7.6	0.545664
TypeII_25Yr_24Hr_4.9	7.7	0.556101
TypeII_25Yr_24Hr_4.9	7.8	0.566636
TypeII_25Yr_24Hr_4.9	7.9	0.577269
TypeII_25Yr_24Hr_4.9	8.0	0.588
TypeII_25Yr_24Hr_4.9	8.1	0.599025
TypeII_25Yr_24Hr_4.9	8.2	0.61054
TypeII_25Yr_24Hr_4.9	8.3	0.622545
TypeII_25Yr_24Hr_4.9	8.4	0.63504
TypeII_25Yr_24Hr_4.9	8.5	0.648025
TypeII_25Yr_24Hr_4.9	8.6	0.6615
TypeII_25Yr_24Hr_4.9	8.7	0.675465
TypeII_25Yr_24Hr_4.9	8.8	0.68992
TypeII_25Yr_24Hr_4.9	8.9	0.704865
TypeII_25Yr_24Hr_4.9	9.0	0.7203
TypeII_25Yr_24Hr_4.9	9.1	0.73598
TypeII_25Yr_24Hr_4.9	9.2	0.75166
TypeII_25Yr_24Hr_4.9	9.3	0.76734
TypeII_25Yr_24Hr_4.9	9.4	0.78302
TypeII_25Yr_24Hr_4.9	9.5	0.7987
TypeII_25Yr_24Hr_4.9	9.6	0.814772
TypeII_25Yr_24Hr_4.9	9.7	0.831628
TypeII_25Yr_24Hr_4.9	9.8	0.849268
TypeII_25Yr_24Hr_4.9	9.9	0.867692
TypeII_25Yr_24Hr_4.9	10.0	0.8869
TypeII_25Yr_24Hr_4.9	10.1	0.907088
TypeII_25Yr_24Hr_4.9	10.2	0.928452
TypeII_25Yr_24Hr_4.9	10.3	0.950992
TypeII_25Yr_24Hr_4.9	10.4	0.974708
TypeII_25Yr_24Hr_4.9	10.5	0.9996
TypeII_25Yr_24Hr_4.9	10.6	1.02606
TypeII_25Yr_24Hr_4.9	10.7	1.05448
TypeII_25Yr_24Hr_4.9	10.8	1.08486

TypeII_25Yr_24Hr_4.9	10.9	1.1172
TypeII_25Yr_24Hr_4.9	11.0	1.1515
TypeII_25Yr_24Hr_4.9	11.1	1.189132
TypeII_25Yr_24Hr_4.9	11.2	1.231468
TypeII_25Yr_24Hr_4.9	11.3	1.278508
TypeII_25Yr_24Hr_4.9	11.4	1.330252
TypeII_25Yr_24Hr_4.9	11.5	1.3867
TypeII_25Yr_24Hr_4.9	11.6	1.503516
TypeII_25Yr_24Hr_4.9	11.7	1.736364
TypeII_25Yr_24Hr_4.9	11.8	2.110871
TypeII_25Yr_24Hr_4.9	11.9	2.782514
TypeII_25Yr_24Hr_4.9	12.0	3.2487
TypeII_25Yr_24Hr_4.9	12.1	3.341604
TypeII_25Yr_24Hr_4.9	12.2	3.423336
TypeII_25Yr_24Hr_4.9	12.3	3.493896
TypeII_25Yr_24Hr_4.9	12.4	3.553284
TypeII_25Yr_24Hr_4.9	12.5	3.6015
TypeII_25Yr_24Hr_4.9	12.6	3.642856
TypeII_25Yr_24Hr_4.9	12.7	3.681664
TypeII_25Yr_24Hr_4.9	12.8	3.717924
TypeII_25Yr_24Hr_4.9	12.9	3.751636
TypeII_25Yr_24Hr_4.9	13.0	3.7828
TypeII_25Yr_24Hr_4.9	13.1	3.812004
TypeII_25Yr_24Hr_4.9	13.2	3.839836
TypeII_25Yr_24Hr_4.9	13.3	3.866296
TypeII_25Yr_24Hr_4.9	13.4	3.891384
TypeII_25Yr_24Hr_4.9	13.5	3.9151
TypeII_25Yr_24Hr_4.9	13.6	3.93764
TypeII_25Yr_24Hr_4.9	13.7	3.9592
TypeII_25Yr_24Hr_4.9	13.8	3.97978
TypeII_25Yr_24Hr_4.9	13.9	3.99938
TypeII_25Yr_24Hr_4.9	14.0	4.018
TypeII_25Yr_24Hr_4.9	14.1	4.035983
TypeII_25Yr_24Hr_4.9	14.2	4.053574
TypeII_25Yr_24Hr_4.9	14.3	4.070871
TypeII_25Yr_24Hr_4.9	14.4	4.087776
TypeII_25Yr_24Hr_4.9	14.5	4.104387
TypeII_25Yr_24Hr_4.9	14.6	4.120606
TypeII_25Yr_24Hr_4.9	14.7	4.136531
TypeII_25Yr_24Hr_4.9	14.8	4.152064
TypeII_25Yr_24Hr_4.9	14.9	4.167303
TypeII_25Yr_24Hr_4.9	15.0	4.18215
TypeII_25Yr_24Hr_4.9	15.1	4.196703
TypeII_25Yr_24Hr_4.9	15.2	4.210864
TypeII_25Yr_24Hr_4.9	15.3	4.224731
TypeII_25Yr_24Hr_4.9	15.4	4.238206
TypeII_25Yr_24Hr_4.9	15.5	4.251387
TypeII_25Yr_24Hr_4.9	15.6	4.264176

TypeII_25Yr_24Hr_4.9	15.7	4.276671
TypeII_25Yr_24Hr_4.9	15.8	4.288774
TypeII_25Yr_24Hr_4.9	15.9	4.300583
TypeII_25Yr_24Hr_4.9	16.0	4.312
TypeII_25Yr_24Hr_4.9	16.1	4.323221
TypeII_25Yr_24Hr_4.9	16.2	4.334295
TypeII_25Yr_24Hr_4.9	16.3	4.345271
TypeII_25Yr_24Hr_4.9	16.4	4.3561
TypeII_25Yr_24Hr_4.9	16.5	4.366831
TypeII_25Yr_24Hr_4.9	16.6	4.377415
TypeII_25Yr_24Hr_4.9	16.7	4.387901
TypeII_25Yr_24Hr_4.9	16.8	4.39824
TypeII_25Yr_24Hr_4.9	16.9	4.408481
TypeII_25Yr_24Hr_4.9	17.0	4.418575
TypeII_25Yr_24Hr_4.9	17.1	4.428571
TypeII_25Yr_24Hr_4.9	17.2	4.43842
TypeII_25Yr_24Hr_4.9	17.3	4.448171
TypeII_25Yr_24Hr_4.9	17.4	4.457775
TypeII_25Yr_24Hr_4.9	17.5	4.467281
TypeII_25Yr_24Hr_4.9	17.6	4.47664
TypeII_25Yr_24Hr_4.9	17.7	4.485901
TypeII_25Yr_24Hr_4.9	17.8	4.495015
TypeII_25Yr_24Hr_4.9	17.9	4.504031
TypeII_25Yr_24Hr_4.9	18.0	4.5129
TypeII_25Yr_24Hr_4.9	18.1	4.521671
TypeII_25Yr_24Hr_4.9	18.2	4.530295
TypeII_25Yr_24Hr_4.9	18.3	4.538821
TypeII_25Yr_24Hr_4.9	18.4	4.5472
TypeII_25Yr_24Hr_4.9	18.5	4.555481
TypeII_25Yr_24Hr_4.9	18.6	4.563615
TypeII_25Yr_24Hr_4.9	18.7	4.571651
TypeII_25Yr_24Hr_4.9	18.8	4.57954
TypeII_25Yr_24Hr_4.9	18.9	4.587331
TypeII_25Yr_24Hr_4.9	19.0	4.594975
TypeII_25Yr_24Hr_4.9	19.1	4.602521
TypeII_25Yr_24Hr_4.9	19.2	4.60992
TypeII_25Yr_24Hr_4.9	19.3	4.617221
TypeII_25Yr_24Hr_4.9	19.4	4.624375
TypeII_25Yr_24Hr_4.9	19.5	4.631431
TypeII_25Yr_24Hr_4.9	19.6	4.63834
TypeII_25Yr_24Hr_4.9	19.7	4.645151
TypeII_25Yr_24Hr_4.9	19.8	4.651815
TypeII_25Yr_24Hr_4.9	19.9	4.658381
TypeII_25Yr_24Hr_4.9	20.0	4.6648
TypeII_25Yr_24Hr_4.9	20.1	4.67117
TypeII_25Yr_24Hr_4.9	20.2	4.677491
TypeII_25Yr_24Hr_4.9	20.3	4.683812
TypeII_25Yr_24Hr_4.9	20.4	4.690084

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TypeII_25Yr_24Hr_4.9          20.5      4.696356
TypeII_25Yr_24Hr_4.9          20.6      4.702579
TypeII_25Yr_24Hr_4.9          20.7      4.708802
TypeII_25Yr_24Hr_4.9          20.8      4.714976
TypeII_25Yr_24Hr_4.9          20.9      4.72115
TypeII_25Yr_24Hr_4.9          21.0      4.727275
TypeII_25Yr_24Hr_4.9          21.1      4.7334
TypeII_25Yr_24Hr_4.9          21.2      4.739476
TypeII_25Yr_24Hr_4.9          21.3      4.745552
TypeII_25Yr_24Hr_4.9          21.4      4.751579
TypeII_25Yr_24Hr_4.9          21.5      4.757606
TypeII_25Yr_24Hr_4.9          21.6      4.763584
TypeII_25Yr_24Hr_4.9          21.7      4.769562
TypeII_25Yr_24Hr_4.9          21.8      4.775491
TypeII_25Yr_24Hr_4.9          21.9      4.78142
TypeII_25Yr_24Hr_4.9          22.0      4.7873
TypeII_25Yr_24Hr_4.9          22.1      4.79318
TypeII_25Yr_24Hr_4.9          22.2      4.799011
TypeII_25Yr_24Hr_4.9          22.3      4.804842
TypeII_25Yr_24Hr_4.9          22.4      4.810624
TypeII_25Yr_24Hr_4.9          22.5      4.816406
TypeII_25Yr_24Hr_4.9          22.6      4.822139
TypeII_25Yr_24Hr_4.9          22.7      4.827872
TypeII_25Yr_24Hr_4.9          22.8      4.833556
TypeII_25Yr_24Hr_4.9          22.9      4.83924
TypeII_25Yr_24Hr_4.9          23.0      4.844875
TypeII_25Yr_24Hr_4.9          23.1      4.85051
TypeII_25Yr_24Hr_4.9          23.2      4.856096
TypeII_25Yr_24Hr_4.9          23.3      4.861682
TypeII_25Yr_24Hr_4.9          23.4      4.867219
TypeII_25Yr_24Hr_4.9          23.5      4.872756
TypeII_25Yr_24Hr_4.9          23.6      4.878244
TypeII_25Yr_24Hr_4.9          23.7      4.883732
TypeII_25Yr_24Hr_4.9          23.8      4.889171
TypeII_25Yr_24Hr_4.9          23.9      4.89461
TypeII_25Yr_24Hr_4.9          24.0      4.9
;
TypeII_100Yr_24Hr_6.7          0.0       0.00000
TypeII_100Yr_24Hr_6.7          0.1       0.00677
TypeII_100Yr_24Hr_6.7          0.2       0.01353
TypeII_100Yr_24Hr_6.7          0.3       0.02044
TypeII_100Yr_24Hr_6.7          0.4       0.02734
TypeII_100Yr_24Hr_6.7          0.5       0.03437
TypeII_100Yr_24Hr_6.7          0.6       0.04141
TypeII_100Yr_24Hr_6.7          0.7       0.04858
TypeII_100Yr_24Hr_6.7          0.8       0.05574
TypeII_100Yr_24Hr_6.7          0.9       0.06305
TypeII_100Yr_24Hr_6.7          1.0       0.07035
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	CrossroadsPh14.inp	
TypeII_100Yr_24Hr_6.7	1.1	0.07779
TypeII_100Yr_24Hr_6.7	1.2	0.08522
TypeII_100Yr_24Hr_6.7	1.3	0.09280
TypeII_100Yr_24Hr_6.7	1.4	0.10037
TypeII_100Yr_24Hr_6.7	1.5	0.10807
TypeII_100Yr_24Hr_6.7	1.6	0.11578
TypeII_100Yr_24Hr_6.7	1.7	0.12362
TypeII_100Yr_24Hr_6.7	1.8	0.13145
TypeII_100Yr_24Hr_6.7	1.9	0.13943
TypeII_100Yr_24Hr_6.7	2.0	0.14740
TypeII_100Yr_24Hr_6.7	2.1	0.15551
TypeII_100Yr_24Hr_6.7	2.2	0.16361
TypeII_100Yr_24Hr_6.7	2.3	0.17186
TypeII_100Yr_24Hr_6.7	2.4	0.18010
TypeII_100Yr_24Hr_6.7	2.5	0.18847
TypeII_100Yr_24Hr_6.7	2.6	0.19685
TypeII_100Yr_24Hr_6.7	2.7	0.20536
TypeII_100Yr_24Hr_6.7	2.8	0.21386
TypeII_100Yr_24Hr_6.7	2.9	0.22251
TypeII_100Yr_24Hr_6.7	3.0	0.23115
TypeII_100Yr_24Hr_6.7	3.1	0.23993
TypeII_100Yr_24Hr_6.7	3.2	0.24870
TypeII_100Yr_24Hr_6.7	3.3	0.25762
TypeII_100Yr_24Hr_6.7	3.4	0.26653
TypeII_100Yr_24Hr_6.7	3.5	0.27557
TypeII_100Yr_24Hr_6.7	3.6	0.28462
TypeII_100Yr_24Hr_6.7	3.7	0.29380
TypeII_100Yr_24Hr_6.7	3.8	0.30297
TypeII_100Yr_24Hr_6.7	3.9	0.31229
TypeII_100Yr_24Hr_6.7	4.0	0.32160
TypeII_100Yr_24Hr_6.7	4.1	0.33105
TypeII_100Yr_24Hr_6.7	4.2	0.34063
TypeII_100Yr_24Hr_6.7	4.3	0.35034
TypeII_100Yr_24Hr_6.7	4.4	0.36019
TypeII_100Yr_24Hr_6.7	4.5	0.37018
TypeII_100Yr_24Hr_6.7	4.6	0.38029
TypeII_100Yr_24Hr_6.7	4.7	0.39054
TypeII_100Yr_24Hr_6.7	4.8	0.40093
TypeII_100Yr_24Hr_6.7	4.9	0.41145
TypeII_100Yr_24Hr_6.7	5.0	0.42210
TypeII_100Yr_24Hr_6.7	5.1	0.43289
TypeII_100Yr_24Hr_6.7	5.2	0.44381
TypeII_100Yr_24Hr_6.7	5.3	0.45486
TypeII_100Yr_24Hr_6.7	5.4	0.46605
TypeII_100Yr_24Hr_6.7	5.5	0.47738
TypeII_100Yr_24Hr_6.7	5.6	0.48883
TypeII_100Yr_24Hr_6.7	5.7	0.50042
TypeII_100Yr_24Hr_6.7	5.8	0.51215

	CrossroadsPh14.inp	
TypeII_100Yr_24Hr_6.7	5.9	0.52401
TypeII_100Yr_24Hr_6.7	6.0	0.53600
TypeII_100Yr_24Hr_6.7	6.1	0.54813
TypeII_100Yr_24Hr_6.7	6.2	0.56039
TypeII_100Yr_24Hr_6.7	6.3	0.57278
TypeII_100Yr_24Hr_6.7	6.4	0.58531
TypeII_100Yr_24Hr_6.7	6.5	0.59798
TypeII_100Yr_24Hr_6.7	6.6	0.61077
TypeII_100Yr_24Hr_6.7	6.7	0.62370
TypeII_100Yr_24Hr_6.7	6.8	0.63677
TypeII_100Yr_24Hr_6.7	6.9	0.64997
TypeII_100Yr_24Hr_6.7	7.0	0.66330
TypeII_100Yr_24Hr_6.7	7.1	0.67677
TypeII_100Yr_24Hr_6.7	7.2	0.69037
TypeII_100Yr_24Hr_6.7	7.3	0.70410
TypeII_100Yr_24Hr_6.7	7.4	0.71797
TypeII_100Yr_24Hr_6.7	7.5	0.73198
TypeII_100Yr_24Hr_6.7	7.6	0.74611
TypeII_100Yr_24Hr_6.7	7.7	0.76038
TypeII_100Yr_24Hr_6.7	7.8	0.77479
TypeII_100Yr_24Hr_6.7	7.9	0.78933
TypeII_100Yr_24Hr_6.7	8.0	0.80400
TypeII_100Yr_24Hr_6.7	8.1	0.81908
TypeII_100Yr_24Hr_6.7	8.2	0.83482
TypeII_100Yr_24Hr_6.7	8.3	0.85124
TypeII_100Yr_24Hr_6.7	8.4	0.86832
TypeII_100Yr_24Hr_6.7	8.5	0.88608
TypeII_100Yr_24Hr_6.7	8.6	0.90450
TypeII_100Yr_24Hr_6.7	8.7	0.92360
TypeII_100Yr_24Hr_6.7	8.8	0.94336
TypeII_100Yr_24Hr_6.7	8.9	0.96380
TypeII_100Yr_24Hr_6.7	9.0	0.98490
TypeII_100Yr_24Hr_6.7	9.1	1.00634
TypeII_100Yr_24Hr_6.7	9.2	1.02778
TypeII_100Yr_24Hr_6.7	9.3	1.04922
TypeII_100Yr_24Hr_6.7	9.4	1.07066
TypeII_100Yr_24Hr_6.7	9.5	1.09210
TypeII_100Yr_24Hr_6.7	9.6	1.11408
TypeII_100Yr_24Hr_6.7	9.7	1.13712
TypeII_100Yr_24Hr_6.7	9.8	1.16124
TypeII_100Yr_24Hr_6.7	9.9	1.18644
TypeII_100Yr_24Hr_6.7	10.0	1.21270
TypeII_100Yr_24Hr_6.7	10.1	1.24030
TypeII_100Yr_24Hr_6.7	10.2	1.26952
TypeII_100Yr_24Hr_6.7	10.3	1.30034
TypeII_100Yr_24Hr_6.7	10.4	1.33276
TypeII_100Yr_24Hr_6.7	10.5	1.36680
TypeII_100Yr_24Hr_6.7	10.6	1.40298

CrossroadsPh14.inp

TypeII_100Yr_24Hr_6.7	10.7	1.44184
TypeII_100Yr_24Hr_6.7	10.8	1.48338
TypeII_100Yr_24Hr_6.7	10.9	1.52760
TypeII_100Yr_24Hr_6.7	11.0	1.57450
TypeII_100Yr_24Hr_6.7	11.1	1.62596
TypeII_100Yr_24Hr_6.7	11.2	1.68384
TypeII_100Yr_24Hr_6.7	11.3	1.74816
TypeII_100Yr_24Hr_6.7	11.4	1.81892
TypeII_100Yr_24Hr_6.7	11.5	1.89610
TypeII_100Yr_24Hr_6.7	11.6	2.05583
TypeII_100Yr_24Hr_6.7	11.7	2.37421
TypeII_100Yr_24Hr_6.7	11.8	2.88629
TypeII_100Yr_24Hr_6.7	11.9	3.80466
TypeII_100Yr_24Hr_6.7	12.0	4.44210
TypeII_100Yr_24Hr_6.7	12.1	4.56913
TypeII_100Yr_24Hr_6.7	12.2	4.68089
TypeII_100Yr_24Hr_6.7	12.3	4.77737
TypeII_100Yr_24Hr_6.7	12.4	4.85857
TypeII_100Yr_24Hr_6.7	12.5	4.92450
TypeII_100Yr_24Hr_6.7	12.6	4.98105
TypeII_100Yr_24Hr_6.7	12.7	5.03411
TypeII_100Yr_24Hr_6.7	12.8	5.08369
TypeII_100Yr_24Hr_6.7	12.9	5.12979
TypeII_100Yr_24Hr_6.7	13.0	5.17240
TypeII_100Yr_24Hr_6.7	13.1	5.21233
TypeII_100Yr_24Hr_6.7	13.2	5.25039
TypeII_100Yr_24Hr_6.7	13.3	5.28657
TypeII_100Yr_24Hr_6.7	13.4	5.32087
TypeII_100Yr_24Hr_6.7	13.5	5.35330
TypeII_100Yr_24Hr_6.7	13.6	5.38412
TypeII_100Yr_24Hr_6.7	13.7	5.41360
TypeII_100Yr_24Hr_6.7	13.8	5.44174
TypeII_100Yr_24Hr_6.7	13.9	5.46854
TypeII_100Yr_24Hr_6.7	14.0	5.49400
TypeII_100Yr_24Hr_6.7	14.1	5.51859
TypeII_100Yr_24Hr_6.7	14.2	5.54264
TypeII_100Yr_24Hr_6.7	14.3	5.56629
TypeII_100Yr_24Hr_6.7	14.4	5.58941
TypeII_100Yr_24Hr_6.7	14.5	5.61212
TypeII_100Yr_24Hr_6.7	14.6	5.63430
TypeII_100Yr_24Hr_6.7	14.7	5.65607
TypeII_100Yr_24Hr_6.7	14.8	5.67731
TypeII_100Yr_24Hr_6.7	14.9	5.69815
TypeII_100Yr_24Hr_6.7	15.0	5.71845
TypeII_100Yr_24Hr_6.7	15.1	5.73835
TypeII_100Yr_24Hr_6.7	15.2	5.75771
TypeII_100Yr_24Hr_6.7	15.3	5.77667
TypeII_100Yr_24Hr_6.7	15.4	5.79510

TypeII_100Yr_24Hr_6.7	15.5	5.81312
TypeII_100Yr_24Hr_6.7	15.6	5.83061
TypeII_100Yr_24Hr_6.7	15.7	5.84769
TypeII_100Yr_24Hr_6.7	15.8	5.86424
TypeII_100Yr_24Hr_6.7	15.9	5.88039
TypeII_100Yr_24Hr_6.7	16.0	5.89600
TypeII_100Yr_24Hr_6.7	16.1	5.91134
TypeII_100Yr_24Hr_6.7	16.2	5.92649
TypeII_100Yr_24Hr_6.7	16.3	5.94149
TypeII_100Yr_24Hr_6.7	16.4	5.95630
TypeII_100Yr_24Hr_6.7	16.5	5.97097
TypeII_100Yr_24Hr_6.7	16.6	5.98545
TypeII_100Yr_24Hr_6.7	16.7	5.99978
TypeII_100Yr_24Hr_6.7	16.8	6.01392
TypeII_100Yr_24Hr_6.7	16.9	6.02792
TypeII_100Yr_24Hr_6.7	17.0	6.04173
TypeII_100Yr_24Hr_6.7	17.1	6.05539
TypeII_100Yr_24Hr_6.7	17.2	6.06886
TypeII_100Yr_24Hr_6.7	17.3	6.08219
TypeII_100Yr_24Hr_6.7	17.4	6.09533
TypeII_100Yr_24Hr_6.7	17.5	6.10832
TypeII_100Yr_24Hr_6.7	17.6	6.12112
TypeII_100Yr_24Hr_6.7	17.7	6.13378
TypeII_100Yr_24Hr_6.7	17.8	6.14625
TypeII_100Yr_24Hr_6.7	17.9	6.15857
TypeII_100Yr_24Hr_6.7	18.0	6.17070
TypeII_100Yr_24Hr_6.7	18.1	6.18269
TypeII_100Yr_24Hr_6.7	18.2	6.19449
TypeII_100Yr_24Hr_6.7	18.3	6.20614
TypeII_100Yr_24Hr_6.7	18.4	6.21760
TypeII_100Yr_24Hr_6.7	18.5	6.22892
TypeII_100Yr_24Hr_6.7	18.6	6.24005
TypeII_100Yr_24Hr_6.7	18.7	6.25103
TypeII_100Yr_24Hr_6.7	18.8	6.26182
TypeII_100Yr_24Hr_6.7	18.9	6.27247
TypeII_100Yr_24Hr_6.7	19.0	6.28293
TypeII_100Yr_24Hr_6.7	19.1	6.29324
TypeII_100Yr_24Hr_6.7	19.2	6.30336
TypeII_100Yr_24Hr_6.7	19.3	6.31334
TypeII_100Yr_24Hr_6.7	19.4	6.32313
TypeII_100Yr_24Hr_6.7	19.5	6.33277
TypeII_100Yr_24Hr_6.7	19.6	6.34222
TypeII_100Yr_24Hr_6.7	19.7	6.35153
TypeII_100Yr_24Hr_6.7	19.8	6.36065
TypeII_100Yr_24Hr_6.7	19.9	6.36962
TypeII_100Yr_24Hr_6.7	20.0	6.37840
TypeII_100Yr_24Hr_6.7	20.1	6.38711
TypeII_100Yr_24Hr_6.7	20.2	6.39575

```
TypeII_100Yr_24Hr_6.7            20.3        6.40440
TypeII_100Yr_24Hr_6.7            20.4        6.41297
TypeII_100Yr_24Hr_6.7            20.5        6.42155
TypeII_100Yr_24Hr_6.7            20.6        6.43006
TypeII_100Yr_24Hr_6.7            20.7        6.43857
TypeII_100Yr_24Hr_6.7            20.8        6.44701
TypeII_100Yr_24Hr_6.7            20.9        6.45545
TypeII_100Yr_24Hr_6.7            21.0        6.46383
TypeII_100Yr_24Hr_6.7            21.1        6.47220
TypeII_100Yr_24Hr_6.7            21.2        6.48051
TypeII_100Yr_24Hr_6.7            21.3        6.48882
TypeII_100Yr_24Hr_6.7            21.4        6.49706
TypeII_100Yr_24Hr_6.7            21.5        6.50530
TypeII_100Yr_24Hr_6.7            21.6        6.51347
TypeII_100Yr_24Hr_6.7            21.7        6.52165
TypeII_100Yr_24Hr_6.7            21.8        6.52975
TypeII_100Yr_24Hr_6.7            21.9        6.53786
TypeII_100Yr_24Hr_6.7            22.0        6.54590
TypeII_100Yr_24Hr_6.7            22.1        6.55394
TypeII_100Yr_24Hr_6.7            22.2        6.56191
TypeII_100Yr_24Hr_6.7            22.3        6.56989
TypeII_100Yr_24Hr_6.7            22.4        6.57779
TypeII_100Yr_24Hr_6.7            22.5        6.58570
TypeII_100Yr_24Hr_6.7            22.6        6.59354
TypeII_100Yr_24Hr_6.7            22.7        6.60138
TypeII_100Yr_24Hr_6.7            22.8        6.60915
TypeII_100Yr_24Hr_6.7            22.9        6.61692
TypeII_100Yr_24Hr_6.7            23.0        6.62463
TypeII_100Yr_24Hr_6.7            23.1        6.63233
TypeII_100Yr_24Hr_6.7            23.2        6.63997
TypeII_100Yr_24Hr_6.7            23.3        6.64761
TypeII_100Yr_24Hr_6.7            23.4        6.65518
TypeII_100Yr_24Hr_6.7            23.5        6.66275
TypeII_100Yr_24Hr_6.7            23.6        6.67025
TypeII_100Yr_24Hr_6.7            23.7        6.67776
TypeII_100Yr_24Hr_6.7            23.8        6.68519
TypeII_100Yr_24Hr_6.7            23.9        6.69263
TypeII_100Yr_24Hr_6.7            24.0        6.70000

[REPORT]
;;Reporting Options
INPUT      NO
CONTROLS   NO
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]
```

```
[SYMBOLS]
;;Gage           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
RG_TypeII_4.9    -3705.148          9188.768
RG_TypeII_6.7    -4547.582          9485.179
```

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.011)
--------------------------------------------------------------


*********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
*********************************************************

****************
Analysis Options
****************
Flow Units ............... CFS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Infiltration Method ...... CURVE_NUMBER
Flow Routing Method ...... KINWAVE
Starting Date ............ 05/02/2019 00:00:00
Ending Date .............. 05/04/2019 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:00:06
Wet Time Step ............ 00:00:06
Dry Time Step ............ 01:00:00
Routing Time Step ........ 6.00 sec


**************************        Volume         Depth
Runoff Quantity Continuity     acre-feet        inches
**************************     ---------       -------
Total Precipitation ......        41.887         4.900
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........        13.998         1.638
Surface Runoff ...........        27.471         3.214
Final Storage ............         0.418         0.049
Continuity Error (%) .....        -0.000


**************************        Volume        Volume
Flow Routing Continuity        acre-feet      10^6 gal
**************************     ---------     ---------
```

```
  Dry Weather Inflow .......         0.000         0.000
  Wet Weather Inflow .......        27.471         8.952
  Groundwater Inflow .......         0.000         0.000
  RDII Inflow ..............         0.000         0.000
  External Inflow ..........         0.000         0.000
  External Outflow .........        10.481         3.415
  Flooding Loss ............         0.000         0.000
  Evaporation Loss .........         0.000         0.000
  Exfiltration Loss ........         0.000         0.000
  Initial Stored Volume ....         0.000         0.000
  Final Stored Volume ......        16.990         5.536
  Continuity Error (%) .....         0.000


  *********************************
  Highest Flow Instability Indexes
  *********************************
  All links are stable.


  *************************
  Routing Time Step Summary
  *************************
  Minimum Time Step           :     6.00 sec
  Average Time Step           :     6.00 sec
  Maximum Time Step           :     6.00 sec
  Percent in Steady State     :     0.00
  Average Iterations per Step :     1.00
  Percent Not Converging      :     0.00


  ***************************
  Subcatchment Runoff Summary
  ***************************


--------------------------------------------------------------------------------------
--------------------
                             Total      Total      Total      Total      Total
Total     Peak  Runoff
                            Precip      Runon       Evap      Infil     Runoff
Runoff   Runoff   Coeff
  Subcatchment                  in         in         in         in         in
10^6 gal      CFS

--------------------------------------------------------------------------------------
--------------------
  DA22                        4.90       0.00       0.00       1.72       3.14
```

```
1.92     51.86    0.640
  DA32                          4.90         0.00         0.00         1.70         3.16
0.81     30.57    0.644
  DA33A                         4.90         0.00         0.00         1.69         3.16
0.93     35.22    0.644
  Basin22_water                 4.90         0.00         0.00         0.18         4.66
0.30      6.96    0.952
  Basin32_water                 4.90         0.00         0.00         0.18         4.67
0.07      2.62    0.954
  Basin33_water                 4.90         0.00         0.00         0.18         4.67
0.16      4.77    0.953
  Max_subarea_drng_bnch          4.90         0.00         0.00         1.72         3.13
 0.36      8.69    0.638
  DA33B                         4.90         0.00         0.00         1.69         3.16
1.23     46.46    0.644
  Max_subarea_perimeter_pipe         4.90         0.00         0.00         1.73         3.13
      1.03     24.15    0.638
  Max_subarea_downchute          4.90         0.00         0.00         1.73         3.13
 1.23     28.77    0.638
  Lower_perimeter_pipe          4.90         0.00         0.00         1.68         3.17
0.07      3.40    0.647
  Road_drainage                 4.90         0.00         0.00         0.02         4.84
0.09      4.39    0.988
  Basin23_water                 4.90         0.00         0.00         1.69         3.16
0.03      1.18    0.646
  Max_subarea_perimeter_swale         4.90         0.00         0.00         1.72         3.13
       0.31      7.89    0.639
  Road_Channel_Drainage          4.90         0.00         0.00         1.71         3.14
 0.43     11.72    0.640


  ******************
  Node Depth Summary
  ******************

  ---------------------------------------------------------------------------------
                                 Average  Maximum  Maximum  Time of Max    Reported
                                   Depth    Depth      HGL   Occurrence   Max Depth
  Node                 Type         Feet     Feet     Feet  days hr:min        Feet
  ---------------------------------------------------------------------------------
  Out32                OUTFALL      0.00     0.00   286.50     0  00:00        0.00
  Out22                OUTFALL      0.00     0.00   277.00     0  00:00        0.00
  Out33                OUTFALL      0.00     0.00   308.53     0  00:00        0.00
  Out_max_dnrg_bnch    OUTFALL      0.00     0.00     0.00     0  00:00        0.00
  Out_max_per_pipe     OUTFALL      0.00     0.00     0.00     0  00:00        0.00
  Out_max_downchute    OUTFALL      0.00     0.00     0.00     0  00:00        0.00
  Out_lower_perim_pipe OUTFALL      0.00     0.00     0.00     0  00:00        0.00
  Out23                OUTFALL      0.00     0.00   270.00     0  00:00        0.00
```

Out_max_per_swale	OUTFALL	0.00	0.00	0.00	0	00:00	0.00
Out_road_channel	OUTFALL	0.00	0.00	0.00	0	00:00	0.00
ECS-22	STORAGE	2.48	3.49	276.99	2	00:00	3.49
ECS-32	STORAGE	4.35	6.01	286.01	2	00:00	6.01
ECS-33	STORAGE	4.71	6.52	308.52	2	00:00	6.52
ECS-23	STORAGE	1.88	2.42	269.42	2	00:00	2.42

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days	Time of Max Occurrence hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent
Out32	OUTFALL	0.00	0.00	0	00:00	0	0	0.000 gal
Out22	OUTFALL	0.00	0.00	0	00:00	0	0	0.000 gal
Out33	OUTFALL	0.00	0.00	0	00:00	0	0	0.000 gal
Out_max_dnrg_bnch	OUTFALL	8.69	8.69	0	12:06	0.357	0.357	0.000
Out_max_per_pipe	OUTFALL	24.15	24.15	0	12:06	1.03	1.03	0.000
Out_max_downchute	OUTFALL	28.77	28.77	0	12:06	1.23	1.23	0.000
Out_lower_perim_pipe	OUTFALL	3.40	3.40	0	12:00	0.0688	0.0688	0.000
Out23	OUTFALL	0.00	0.00	0	00:00	0	0	0.000 gal
Out_max_per_swale	OUTFALL	7.89	7.89	0	12:06	0.306	0.306	0.000
Out_road_channel	OUTFALL	11.72	11.72	0	12:06	0.426	0.426	0.000
ECS-22	STORAGE	58.81	58.81	0	12:06	2.22	2.22	-0.000

```
  ECS-32                STORAGE      33.14     33.14      0  12:06       0.885
0.885      -0.000
  ECS-33                STORAGE      86.44     86.44      0  12:06        2.31
2.31       0.000
  ECS-23                STORAGE       5.57      5.57      0  12:00        0.12
0.12       0.000
```

```
  *********************
  Node Surcharge Summary
  *********************
```

No nodes were surcharged.

```
  ********************
  Node Flooding Summary
  ********************
```

No nodes were flooded.

```
  *********************
  Storage Volume Summary
  *********************
```

Storage Unit	Average Volume 1000 ft3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 ft3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CFS
ECS-22	209.876	38	0	0	296.670	54	2 00:00	0.00
ECS-32	84.745	65	0	0	118.329	91	2 00:00	0.00
ECS-33	221.262	72	0	0	309.133	100	2 00:00	0.00
ECS-23	11.762	53	0	0	15.977	71	2 00:00	0.00

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CFS	Max Flow CFS	Total Volume 10^6 gal
Out32	0.00	0.00	0.00	0.000
Out22	0.00	0.00	0.00	0.000
Out33	0.00	0.00	0.00	0.000
Out_max_dnrg_bnch	64.10	0.43	8.69	0.357
Out_max_per_pipe	65.65	1.21	24.15	1.027
Out_max_downchute	65.87	1.45	28.77	1.230
Out_lower_perim_pipe	52.33	0.10	3.40	0.069
Out23	0.00	0.00	0.00	0.000
Out_max_per_swale	62.87	0.38	7.89	0.306
Out_road_channel	62.00	0.53	11.72	0.426
System	37.28	4.10	84.24	3.415

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
Outlet32	DUMMY	0.00	0 00:00			
Outlet22	DUMMY	0.00	0 00:00			
Outlet33	DUMMY	0.00	0 00:00			
Outlet23	DUMMY	0.00	0 00:00			

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Thu Oct 17 11:32:44 2019
Analysis ended on: Thu Oct 17 11:32:45 2019
Total elapsed time: 00:00:01

```
[TITLE]
;;Project Title/Notes

[OPTIONS]
;;Option             Value
FLOW_UNITS           CFS
INFILTRATION         CURVE_NUMBER
FLOW_ROUTING         KINWAVE
LINK_OFFSETS         DEPTH
MIN_SLOPE            0
ALLOW_PONDING        NO
SKIP_STEADY_STATE    NO

START_DATE           05/02/2019
START_TIME           00:00:00
REPORT_START_DATE    05/02/2019
REPORT_START_TIME    00:00:00
END_DATE             05/04/2019
END_TIME             00:00:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          00:00:06
WET_STEP             00:00:06
DRY_STEP             01:00:00
ROUTING_STEP         0:00:06

INERTIAL_DAMPING     PARTIAL
NORMAL_FLOW_LIMITED  BOTH
FORCE_MAIN_EQUATION  H-W
VARIABLE_STEP        0.75
LENGTHENING_STEP     0
MIN_SURFAREA         12.566
MAX_TRIALS           8
HEAD_TOLERANCE       0.005
SYS_FLOW_TOL         5
LAT_FLOW_TOL         5
MINIMUM_STEP         0.5
THREADS              1

[EVAPORATION]
;;Data Source    Parameters
;;-------------- ----------------
CONSTANT         0.0
DRY_ONLY         NO

[RAINGAGES]
;;Name           Format    Interval SCF      Source
```

```
;;-------------- --------- ------ ------ ----------
RG_TypeII_4.9    CUMULATIVE 0:06     1.0      TIMESERIES TypeII_25Yr_24Hr_4.9
;100-yr 24-hr storm event
RG_TypeII_6.7    CUMULATIVE 0:06     1.0      TIMESERIES TypeII_100Yr_24Hr_6.7

[SUBCATCHMENTS]
;;Name           Rain Gage        Outlet           Area     %Imperv  Width    %Slope
  CurbLen  SnowPack
;;-------------- ---------------- ---------------- -------- -------- --------
-------- -------- ----------------
DA22             RG_TypeII_6.7    ECS-22           22.6     10       522      8
  0
DA32             RG_TypeII_6.7    ECS-32           9.5      10       509.2    10.5
  0
DA33A            RG_TypeII_6.7    ECS-33           10.8     10       497      15.9
  0
;Rainfall that falls directly into the basin
Basin22_water    RG_TypeII_6.7    ECS-22           2.33     10       100      1
  0
;Rainfall that falls directly into the basin
Basin32_water    RG_TypeII_6.7    ECS-32           0.56     10       100      1
  0
;Rainfall that falls directly into the basin
Basin33_water    RG_TypeII_6.7    ECS-33           1.27     10       100      1
  0
Max_subarea_drng_bnch RG_TypeII_4.9    Out_max_dnrg_bnch 4.2      10       162
1.8      0
DA33B            RG_TypeII_6.7    ECS-33           14.3     10       652.1    15.7
  0
Max_subarea_perimeter_pipe RG_TypeII_4.9    Out_max_per_pipe 3.6      10       153.8
   1.9      0
Max_subarea_downchute RG_TypeII_4.9    Out_max_downchute 14.5     10       298.6
5.27     0
Lower_perimeter_pipe RG_TypeII_4.9    Out_lower_perim_pipe 0.8      10       112.4
 16.1     0
Road_drainage    RG_TypeII_6.7    ECS-23           0.7      90       29.8     3.3
  0
;Rainfall that falls directly onto basin
Basin23_water    RG_TypeII_6.7    ecs-23           0.32     10       100      1
  0
Road_Channel_Drainage RG_TypeII_6.7    Out_road_channel 5        10       120.7
8.1      0

[SUBAREAS]
;;Subcatchment   N-Imperv   N-Perv     S-Imperv   S-Perv     PctZero    RouteTo
PctRouted
;;-------------- ---------- ---------- ---------- ---------- ---------- ----------
----------
```

```
DA22             0.01       0.1        0.05       0.05       25         OUTLET
DA32             0.01       0.1        0.05       0.05       25         OUTLET
DA33A            0.01       0.1        0.05       0.05       25         OUTLET
Basin22_water    0.01       0.1        0.05       0.05       25         OUTLET
Basin32_water    0.01       0.1        0.05       0.05       25         OUTLET
Basin33_water    0.01       0.1        0.05       0.05       25         OUTLET
Max_subarea_drng_bnch 0.01       0.1        0.05       0.05       25         OUTLET

DA33B            0.01       0.1        0.05       0.05       25         OUTLET
Max_subarea_perimeter_pipe 0.01       0.1        0.05       0.05       25
OUTLET
Max_subarea_downchute 0.01       0.1        0.05       0.05       25         OUTLET

Lower_perimeter_pipe 0.01       0.1        0.05       0.05       25         OUTLET

Road_drainage    0.01       0.1        0.05       0.05       25         OUTLET
Basin23_water    0.01       0.1        0.05       0.05       25         OUTLET
Road_Channel_Drainage 0.01       0.1        0.05       0.05       25         OUTLET


[INFILTRATION]
;;Subcatchment   CurveNum              DryTime
;;-------------- ---------- ---------- ----------
DA22             77         0.5        7
DA32             77         0.5        7
DA33A            77         0.5        7
Basin22_water    98         0.5        7
Basin32_water    98         0.5        7
Basin33_water    98         0.5        7
Max_subarea_drng_bnch 77         0.5        7
DA33B            77         0.5        7
Max_subarea_perimeter_pipe 77         0.5        7
Max_subarea_downchute 77         0.5        7
Lower_perimeter_pipe 77         0.5        7
Road_drainage    98         0.5        7
Basin23_water    77         0.5        7
Road_Channel_Drainage 77         0.5        7

[OUTFALLS]
;;Name           Elevation  Type       Stage Data       Gated    Route To
;;-------------- ---------- ---------- ---------------- -------- ----------------
Out_max_dnrg_bnch 0          FREE                        NO
Out_max_per_pipe 0          FREE                        NO
Out_max_downchute 0          FREE                        NO
Out_lower_perim_pipe 0          FREE                        NO

Out32_E_Spill    287        FREE                        NO
Out22_E_Spill    280        FREE                        NO
```

```
Out23_E_Spill    270.9      FREE                        NO
Out33_E_Spill    309        FREE                        NO
Out_road_channel 0          FREE                        NO

[STORAGE]
;;Name           Elev.    MaxDepth   InitDepth  Shape      Curve Name/Params
   N/A      Fevap    Psi      Ksat     IMD
;;-------------- -------- ---------- ----------- ----------
---------------------------- -------- --------          -------- --------
ECS-22           273.5    7.5        0          TABULAR    ECS-22
   0        0
ECS-32           280      8          0          TABULAR    ECS-32
   0        0
ECS-33           302      8          0          TABULAR    ECS-33
   0        0
ECS-23           267      4.9        0          TABULAR    ECS-23
   0        0

[WEIRS]
;;Name           From Node        To Node          Type         CrestHt    Qcoeff
 Gated    EndCon   EndCoeff   Surcharge  RoadWidth  RoadSurf
;;-------------- ---------------- ---------------- ------------ ----------
---------- -------- -------- ---------- ---------- ---------- ----------
E_Spillway_32    ECS-32           Out32_E_Spill    TRANSVERSE   0          2.83
 NO       0        0          YES
E_Spillway_33    ECS-33           Out33_E_Spill    TRANSVERSE   0          2.83
 NO       0        0          YES
E_Spillway_23    ECS-23           Out23_E_Spill    TRANSVERSE   0          2.83
 NO       0        0          YES
E_Spillway_22    ECS-22           Out22_E_Spill    TRANSVERSE   0          2.83
 NO       0        0          YES

[XSECTIONS]
;;Link           Shape        Geom1            Geom2      Geom3      Geom4
Barrels    Culvert
;;-------------- ------------ ---------------- ---------- ---------- ----------
---------- ----------
E_Spillway_32    RECT_OPEN    1                19         0          0
E_Spillway_33    RECT_OPEN    1                29         0          0
E_Spillway_23    RECT_OPEN    1                6          0          0
E_Spillway_22    RECT_OPEN    1                11         0          0

[CURVES]
;;Name           Type       X-Value    Y-Value
;;-------------- ---------- ---------- ----------
;Storage Basin
ECS-33           Storage    0          38118.64
ECS-33                      1          40882.25
```

```
ECS-33                     2          43705.66
ECS-33                     3          46588.88
ECS-33                     4          49530.26
ECS-33                     5          52521.72
ECS-33                     6          55562.30
ECS-33                     7          55562.30
ECS-33                     8          55562.3
;
;Storage Basin ECS-C
ECS-32           Storage   0          15251.67
ECS-32                     1          16651.88
ECS-32                     2          18100.82
ECS-32                     3          19599.37
ECS-32                     4          21148.03
ECS-32                     5          22745.82
ECS-32                     6          24390.60
ECS-32                     7          24390.6
ECS-32                     8          24390.6
;
;Basin Storage
ECS-22           Storage   0          70462.61
ECS-22                     .5         78010.6
ECS-22                     1.5        84111.8
ECS-22                     2.5        89986.7
ECS-22                     3.5        95762.2
ECS-22                     4.5        101297.0
ECS-22                     5.5        104046.0
ECS-22                     6.5        106773.3
ECS-22                     7.5        109503.5
;
;Road Drainage Basin
ECS-23           Storage   0          62.78
ECS-23                     1          6712.09
ECS-23                     2          9957.58
ECS-23                     3          11324.25
ECS-23                     4          12716.84
ECS-23                     4.9        14104.31

[TIMESERIES]
;;Name           Date       Time       Value
;;-------------- ---------- ---------- ----------
TypeII_25Yr_24Hr_4.9           0.0        0
TypeII_25Yr_24Hr_4.9           0.1        0.004949
TypeII_25Yr_24Hr_4.9           0.2        0.009898
TypeII_25Yr_24Hr_4.9           0.3        0.014945
TypeII_25Yr_24Hr_4.9           0.4        0.019992
TypeII_25Yr_24Hr_4.9           0.5        0.025137
TypeII_25Yr_24Hr_4.9           0.6        0.030282
```

TypeII_25Yr_24Hr_4.9	0.7	0.035525
TypeII_25Yr_24Hr_4.9	0.8	0.040768
TypeII_25Yr_24Hr_4.9	0.9	0.046109
TypeII_25Yr_24Hr_4.9	1.0	0.05145
TypeII_25Yr_24Hr_4.9	1.1	0.056889
TypeII_25Yr_24Hr_4.9	1.2	0.062328
TypeII_25Yr_24Hr_4.9	1.3	0.067865
TypeII_25Yr_24Hr_4.9	1.4	0.073402
TypeII_25Yr_24Hr_4.9	1.5	0.079037
TypeII_25Yr_24Hr_4.9	1.6	0.084672
TypeII_25Yr_24Hr_4.9	1.7	0.090405
TypeII_25Yr_24Hr_4.9	1.8	0.096138
TypeII_25Yr_24Hr_4.9	1.9	0.101969
TypeII_25Yr_24Hr_4.9	2.0	0.1078
TypeII_25Yr_24Hr_4.9	2.1	0.113729
TypeII_25Yr_24Hr_4.9	2.2	0.119658
TypeII_25Yr_24Hr_4.9	2.3	0.125685
TypeII_25Yr_24Hr_4.9	2.4	0.131712
TypeII_25Yr_24Hr_4.9	2.5	0.137837
TypeII_25Yr_24Hr_4.9	2.6	0.143962
TypeII_25Yr_24Hr_4.9	2.7	0.150185
TypeII_25Yr_24Hr_4.9	2.8	0.156408
TypeII_25Yr_24Hr_4.9	2.9	0.162729
TypeII_25Yr_24Hr_4.9	3.0	0.16905
TypeII_25Yr_24Hr_4.9	3.1	0.175469
TypeII_25Yr_24Hr_4.9	3.2	0.181888
TypeII_25Yr_24Hr_4.9	3.3	0.188405
TypeII_25Yr_24Hr_4.9	3.4	0.194922
TypeII_25Yr_24Hr_4.9	3.5	0.201537
TypeII_25Yr_24Hr_4.9	3.6	0.208152
TypeII_25Yr_24Hr_4.9	3.7	0.214865
TypeII_25Yr_24Hr_4.9	3.8	0.221578
TypeII_25Yr_24Hr_4.9	3.9	0.228389
TypeII_25Yr_24Hr_4.9	4.0	0.2352
TypeII_25Yr_24Hr_4.9	4.1	0.242109
TypeII_25Yr_24Hr_4.9	4.2	0.249116
TypeII_25Yr_24Hr_4.9	4.3	0.256221
TypeII_25Yr_24Hr_4.9	4.4	0.263424
TypeII_25Yr_24Hr_4.9	4.5	0.270725
TypeII_25Yr_24Hr_4.9	4.6	0.278124
TypeII_25Yr_24Hr_4.9	4.7	0.285621
TypeII_25Yr_24Hr_4.9	4.8	0.293216
TypeII_25Yr_24Hr_4.9	4.9	0.300909
TypeII_25Yr_24Hr_4.9	5.0	0.3087
TypeII_25Yr_24Hr_4.9	5.1	0.316589
TypeII_25Yr_24Hr_4.9	5.2	0.324576
TypeII_25Yr_24Hr_4.9	5.3	0.332661
TypeII_25Yr_24Hr_4.9	5.4	0.340844

TypeII_25Yr_24Hr_4.9	5.5	0.349125
TypeII_25Yr_24Hr_4.9	5.6	0.357504
TypeII_25Yr_24Hr_4.9	5.7	0.365981
TypeII_25Yr_24Hr_4.9	5.8	0.374556
TypeII_25Yr_24Hr_4.9	5.9	0.383229
TypeII_25Yr_24Hr_4.9	6.0	0.392
TypeII_25Yr_24Hr_4.9	6.1	0.400869
TypeII_25Yr_24Hr_4.9	6.2	0.409836
TypeII_25Yr_24Hr_4.9	6.3	0.418901
TypeII_25Yr_24Hr_4.9	6.4	0.428064
TypeII_25Yr_24Hr_4.9	6.5	0.437325
TypeII_25Yr_24Hr_4.9	6.6	0.446684
TypeII_25Yr_24Hr_4.9	6.7	0.456141
TypeII_25Yr_24Hr_4.9	6.8	0.465696
TypeII_25Yr_24Hr_4.9	6.9	0.475349
TypeII_25Yr_24Hr_4.9	7.0	0.4851
TypeII_25Yr_24Hr_4.9	7.1	0.494949
TypeII_25Yr_24Hr_4.9	7.2	0.504896
TypeII_25Yr_24Hr_4.9	7.3	0.514941
TypeII_25Yr_24Hr_4.9	7.4	0.525084
TypeII_25Yr_24Hr_4.9	7.5	0.535325
TypeII_25Yr_24Hr_4.9	7.6	0.545664
TypeII_25Yr_24Hr_4.9	7.7	0.556101
TypeII_25Yr_24Hr_4.9	7.8	0.566636
TypeII_25Yr_24Hr_4.9	7.9	0.577269
TypeII_25Yr_24Hr_4.9	8.0	0.588
TypeII_25Yr_24Hr_4.9	8.1	0.599025
TypeII_25Yr_24Hr_4.9	8.2	0.61054
TypeII_25Yr_24Hr_4.9	8.3	0.622545
TypeII_25Yr_24Hr_4.9	8.4	0.63504
TypeII_25Yr_24Hr_4.9	8.5	0.648025
TypeII_25Yr_24Hr_4.9	8.6	0.6615
TypeII_25Yr_24Hr_4.9	8.7	0.675465
TypeII_25Yr_24Hr_4.9	8.8	0.68992
TypeII_25Yr_24Hr_4.9	8.9	0.704865
TypeII_25Yr_24Hr_4.9	9.0	0.7203
TypeII_25Yr_24Hr_4.9	9.1	0.73598
TypeII_25Yr_24Hr_4.9	9.2	0.75166
TypeII_25Yr_24Hr_4.9	9.3	0.76734
TypeII_25Yr_24Hr_4.9	9.4	0.78302
TypeII_25Yr_24Hr_4.9	9.5	0.7987
TypeII_25Yr_24Hr_4.9	9.6	0.814772
TypeII_25Yr_24Hr_4.9	9.7	0.831628
TypeII_25Yr_24Hr_4.9	9.8	0.849268
TypeII_25Yr_24Hr_4.9	9.9	0.867692
TypeII_25Yr_24Hr_4.9	10.0	0.8869
TypeII_25Yr_24Hr_4.9	10.1	0.907088
TypeII_25Yr_24Hr_4.9	10.2	0.928452

TypeII_25Yr_24Hr_4.9	10.3	0.950992
TypeII_25Yr_24Hr_4.9	10.4	0.974708
TypeII_25Yr_24Hr_4.9	10.5	0.9996
TypeII_25Yr_24Hr_4.9	10.6	1.02606
TypeII_25Yr_24Hr_4.9	10.7	1.05448
TypeII_25Yr_24Hr_4.9	10.8	1.08486
TypeII_25Yr_24Hr_4.9	10.9	1.1172
TypeII_25Yr_24Hr_4.9	11.0	1.1515
TypeII_25Yr_24Hr_4.9	11.1	1.189132
TypeII_25Yr_24Hr_4.9	11.2	1.231468
TypeII_25Yr_24Hr_4.9	11.3	1.278508
TypeII_25Yr_24Hr_4.9	11.4	1.330252
TypeII_25Yr_24Hr_4.9	11.5	1.3867
TypeII_25Yr_24Hr_4.9	11.6	1.503516
TypeII_25Yr_24Hr_4.9	11.7	1.736364
TypeII_25Yr_24Hr_4.9	11.8	2.110871
TypeII_25Yr_24Hr_4.9	11.9	2.782514
TypeII_25Yr_24Hr_4.9	12.0	3.2487
TypeII_25Yr_24Hr_4.9	12.1	3.341604
TypeII_25Yr_24Hr_4.9	12.2	3.423336
TypeII_25Yr_24Hr_4.9	12.3	3.493896
TypeII_25Yr_24Hr_4.9	12.4	3.553284
TypeII_25Yr_24Hr_4.9	12.5	3.6015
TypeII_25Yr_24Hr_4.9	12.6	3.642856
TypeII_25Yr_24Hr_4.9	12.7	3.681664
TypeII_25Yr_24Hr_4.9	12.8	3.717924
TypeII_25Yr_24Hr_4.9	12.9	3.751636
TypeII_25Yr_24Hr_4.9	13.0	3.7828
TypeII_25Yr_24Hr_4.9	13.1	3.812004
TypeII_25Yr_24Hr_4.9	13.2	3.839836
TypeII_25Yr_24Hr_4.9	13.3	3.866296
TypeII_25Yr_24Hr_4.9	13.4	3.891384
TypeII_25Yr_24Hr_4.9	13.5	3.9151
TypeII_25Yr_24Hr_4.9	13.6	3.93764
TypeII_25Yr_24Hr_4.9	13.7	3.9592
TypeII_25Yr_24Hr_4.9	13.8	3.97978
TypeII_25Yr_24Hr_4.9	13.9	3.99938
TypeII_25Yr_24Hr_4.9	14.0	4.018
TypeII_25Yr_24Hr_4.9	14.1	4.035983
TypeII_25Yr_24Hr_4.9	14.2	4.053574
TypeII_25Yr_24Hr_4.9	14.3	4.070871
TypeII_25Yr_24Hr_4.9	14.4	4.087776
TypeII_25Yr_24Hr_4.9	14.5	4.104387
TypeII_25Yr_24Hr_4.9	14.6	4.120606
TypeII_25Yr_24Hr_4.9	14.7	4.136531
TypeII_25Yr_24Hr_4.9	14.8	4.152064
TypeII_25Yr_24Hr_4.9	14.9	4.167303
TypeII_25Yr_24Hr_4.9	15.0	4.18215

TypeII_25Yr_24Hr_4.9	15.1	4.196703
TypeII_25Yr_24Hr_4.9	15.2	4.210864
TypeII_25Yr_24Hr_4.9	15.3	4.224731
TypeII_25Yr_24Hr_4.9	15.4	4.238206
TypeII_25Yr_24Hr_4.9	15.5	4.251387
TypeII_25Yr_24Hr_4.9	15.6	4.264176
TypeII_25Yr_24Hr_4.9	15.7	4.276671
TypeII_25Yr_24Hr_4.9	15.8	4.288774
TypeII_25Yr_24Hr_4.9	15.9	4.300583
TypeII_25Yr_24Hr_4.9	16.0	4.312
TypeII_25Yr_24Hr_4.9	16.1	4.323221
TypeII_25Yr_24Hr_4.9	16.2	4.334295
TypeII_25Yr_24Hr_4.9	16.3	4.345271
TypeII_25Yr_24Hr_4.9	16.4	4.3561
TypeII_25Yr_24Hr_4.9	16.5	4.366831
TypeII_25Yr_24Hr_4.9	16.6	4.377415
TypeII_25Yr_24Hr_4.9	16.7	4.387901
TypeII_25Yr_24Hr_4.9	16.8	4.39824
TypeII_25Yr_24Hr_4.9	16.9	4.408481
TypeII_25Yr_24Hr_4.9	17.0	4.418575
TypeII_25Yr_24Hr_4.9	17.1	4.428571
TypeII_25Yr_24Hr_4.9	17.2	4.43842
TypeII_25Yr_24Hr_4.9	17.3	4.448171
TypeII_25Yr_24Hr_4.9	17.4	4.457775
TypeII_25Yr_24Hr_4.9	17.5	4.467281
TypeII_25Yr_24Hr_4.9	17.6	4.47664
TypeII_25Yr_24Hr_4.9	17.7	4.485901
TypeII_25Yr_24Hr_4.9	17.8	4.495015
TypeII_25Yr_24Hr_4.9	17.9	4.504031
TypeII_25Yr_24Hr_4.9	18.0	4.5129
TypeII_25Yr_24Hr_4.9	18.1	4.521671
TypeII_25Yr_24Hr_4.9	18.2	4.530295
TypeII_25Yr_24Hr_4.9	18.3	4.538821
TypeII_25Yr_24Hr_4.9	18.4	4.5472
TypeII_25Yr_24Hr_4.9	18.5	4.555481
TypeII_25Yr_24Hr_4.9	18.6	4.563615
TypeII_25Yr_24Hr_4.9	18.7	4.571651
TypeII_25Yr_24Hr_4.9	18.8	4.57954
TypeII_25Yr_24Hr_4.9	18.9	4.587331
TypeII_25Yr_24Hr_4.9	19.0	4.594975
TypeII_25Yr_24Hr_4.9	19.1	4.602521
TypeII_25Yr_24Hr_4.9	19.2	4.60992
TypeII_25Yr_24Hr_4.9	19.3	4.617221
TypeII_25Yr_24Hr_4.9	19.4	4.624375
TypeII_25Yr_24Hr_4.9	19.5	4.631431
TypeII_25Yr_24Hr_4.9	19.6	4.63834
TypeII_25Yr_24Hr_4.9	19.7	4.645151
TypeII_25Yr_24Hr_4.9	19.8	4.651815

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TypeII_25Yr_24Hr_4.9            19.9       4.658381
TypeII_25Yr_24Hr_4.9            20.0       4.6648
TypeII_25Yr_24Hr_4.9            20.1       4.67117
TypeII_25Yr_24Hr_4.9            20.2       4.677491
TypeII_25Yr_24Hr_4.9            20.3       4.683812
TypeII_25Yr_24Hr_4.9            20.4       4.690084
TypeII_25Yr_24Hr_4.9            20.5       4.696356
TypeII_25Yr_24Hr_4.9            20.6       4.702579
TypeII_25Yr_24Hr_4.9            20.7       4.708802
TypeII_25Yr_24Hr_4.9            20.8       4.714976
TypeII_25Yr_24Hr_4.9            20.9       4.72115
TypeII_25Yr_24Hr_4.9            21.0       4.727275
TypeII_25Yr_24Hr_4.9            21.1       4.7334
TypeII_25Yr_24Hr_4.9            21.2       4.739476
TypeII_25Yr_24Hr_4.9            21.3       4.745552
TypeII_25Yr_24Hr_4.9            21.4       4.751579
TypeII_25Yr_24Hr_4.9            21.5       4.757606
TypeII_25Yr_24Hr_4.9            21.6       4.763584
TypeII_25Yr_24Hr_4.9            21.7       4.769562
TypeII_25Yr_24Hr_4.9            21.8       4.775491
TypeII_25Yr_24Hr_4.9            21.9       4.78142
TypeII_25Yr_24Hr_4.9            22.0       4.7873
TypeII_25Yr_24Hr_4.9            22.1       4.79318
TypeII_25Yr_24Hr_4.9            22.2       4.799011
TypeII_25Yr_24Hr_4.9            22.3       4.804842
TypeII_25Yr_24Hr_4.9            22.4       4.810624
TypeII_25Yr_24Hr_4.9            22.5       4.816406
TypeII_25Yr_24Hr_4.9            22.6       4.822139
TypeII_25Yr_24Hr_4.9            22.7       4.827872
TypeII_25Yr_24Hr_4.9            22.8       4.833556
TypeII_25Yr_24Hr_4.9            22.9       4.83924
TypeII_25Yr_24Hr_4.9            23.0       4.844875
TypeII_25Yr_24Hr_4.9            23.1       4.85051
TypeII_25Yr_24Hr_4.9            23.2       4.856096
TypeII_25Yr_24Hr_4.9            23.3       4.861682
TypeII_25Yr_24Hr_4.9            23.4       4.867219
TypeII_25Yr_24Hr_4.9            23.5       4.872756
TypeII_25Yr_24Hr_4.9            23.6       4.878244
TypeII_25Yr_24Hr_4.9            23.7       4.883732
TypeII_25Yr_24Hr_4.9            23.8       4.889171
TypeII_25Yr_24Hr_4.9            23.9       4.89461
TypeII_25Yr_24Hr_4.9            24.0       4.9
;
TypeII_100Yr_24Hr_6.7            0.0        0.00000
TypeII_100Yr_24Hr_6.7            0.1        0.00677
TypeII_100Yr_24Hr_6.7            0.2        0.01353
TypeII_100Yr_24Hr_6.7            0.3        0.02044
TypeII_100Yr_24Hr_6.7            0.4        0.02734
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TypeII_100Yr_24Hr_6.7	0.5	0.03437
TypeII_100Yr_24Hr_6.7	0.6	0.04141
TypeII_100Yr_24Hr_6.7	0.7	0.04858
TypeII_100Yr_24Hr_6.7	0.8	0.05574
TypeII_100Yr_24Hr_6.7	0.9	0.06305
TypeII_100Yr_24Hr_6.7	1.0	0.07035
TypeII_100Yr_24Hr_6.7	1.1	0.07779
TypeII_100Yr_24Hr_6.7	1.2	0.08522
TypeII_100Yr_24Hr_6.7	1.3	0.09280
TypeII_100Yr_24Hr_6.7	1.4	0.10037
TypeII_100Yr_24Hr_6.7	1.5	0.10807
TypeII_100Yr_24Hr_6.7	1.6	0.11578
TypeII_100Yr_24Hr_6.7	1.7	0.12362
TypeII_100Yr_24Hr_6.7	1.8	0.13145
TypeII_100Yr_24Hr_6.7	1.9	0.13943
TypeII_100Yr_24Hr_6.7	2.0	0.14740
TypeII_100Yr_24Hr_6.7	2.1	0.15551
TypeII_100Yr_24Hr_6.7	2.2	0.16361
TypeII_100Yr_24Hr_6.7	2.3	0.17186
TypeII_100Yr_24Hr_6.7	2.4	0.18010
TypeII_100Yr_24Hr_6.7	2.5	0.18847
TypeII_100Yr_24Hr_6.7	2.6	0.19685
TypeII_100Yr_24Hr_6.7	2.7	0.20536
TypeII_100Yr_24Hr_6.7	2.8	0.21386
TypeII_100Yr_24Hr_6.7	2.9	0.22251
TypeII_100Yr_24Hr_6.7	3.0	0.23115
TypeII_100Yr_24Hr_6.7	3.1	0.23993
TypeII_100Yr_24Hr_6.7	3.2	0.24870
TypeII_100Yr_24Hr_6.7	3.3	0.25762
TypeII_100Yr_24Hr_6.7	3.4	0.26653
TypeII_100Yr_24Hr_6.7	3.5	0.27557
TypeII_100Yr_24Hr_6.7	3.6	0.28462
TypeII_100Yr_24Hr_6.7	3.7	0.29380
TypeII_100Yr_24Hr_6.7	3.8	0.30297
TypeII_100Yr_24Hr_6.7	3.9	0.31229
TypeII_100Yr_24Hr_6.7	4.0	0.32160
TypeII_100Yr_24Hr_6.7	4.1	0.33105
TypeII_100Yr_24Hr_6.7	4.2	0.34063
TypeII_100Yr_24Hr_6.7	4.3	0.35034
TypeII_100Yr_24Hr_6.7	4.4	0.36019
TypeII_100Yr_24Hr_6.7	4.5	0.37018
TypeII_100Yr_24Hr_6.7	4.6	0.38029
TypeII_100Yr_24Hr_6.7	4.7	0.39054
TypeII_100Yr_24Hr_6.7	4.8	0.40093
TypeII_100Yr_24Hr_6.7	4.9	0.41145
TypeII_100Yr_24Hr_6.7	5.0	0.42210
TypeII_100Yr_24Hr_6.7	5.1	0.43289
TypeII_100Yr_24Hr_6.7	5.2	0.44381

TypeII_100Yr_24Hr_6.7	5.3	0.45486
TypeII_100Yr_24Hr_6.7	5.4	0.46605
TypeII_100Yr_24Hr_6.7	5.5	0.47738
TypeII_100Yr_24Hr_6.7	5.6	0.48883
TypeII_100Yr_24Hr_6.7	5.7	0.50042
TypeII_100Yr_24Hr_6.7	5.8	0.51215
TypeII_100Yr_24Hr_6.7	5.9	0.52401
TypeII_100Yr_24Hr_6.7	6.0	0.53600
TypeII_100Yr_24Hr_6.7	6.1	0.54813
TypeII_100Yr_24Hr_6.7	6.2	0.56039
TypeII_100Yr_24Hr_6.7	6.3	0.57278
TypeII_100Yr_24Hr_6.7	6.4	0.58531
TypeII_100Yr_24Hr_6.7	6.5	0.59798
TypeII_100Yr_24Hr_6.7	6.6	0.61077
TypeII_100Yr_24Hr_6.7	6.7	0.62370
TypeII_100Yr_24Hr_6.7	6.8	0.63677
TypeII_100Yr_24Hr_6.7	6.9	0.64997
TypeII_100Yr_24Hr_6.7	7.0	0.66330
TypeII_100Yr_24Hr_6.7	7.1	0.67677
TypeII_100Yr_24Hr_6.7	7.2	0.69037
TypeII_100Yr_24Hr_6.7	7.3	0.70410
TypeII_100Yr_24Hr_6.7	7.4	0.71797
TypeII_100Yr_24Hr_6.7	7.5	0.73198
TypeII_100Yr_24Hr_6.7	7.6	0.74611
TypeII_100Yr_24Hr_6.7	7.7	0.76038
TypeII_100Yr_24Hr_6.7	7.8	0.77479
TypeII_100Yr_24Hr_6.7	7.9	0.78933
TypeII_100Yr_24Hr_6.7	8.0	0.80400
TypeII_100Yr_24Hr_6.7	8.1	0.81908
TypeII_100Yr_24Hr_6.7	8.2	0.83482
TypeII_100Yr_24Hr_6.7	8.3	0.85124
TypeII_100Yr_24Hr_6.7	8.4	0.86832
TypeII_100Yr_24Hr_6.7	8.5	0.88608
TypeII_100Yr_24Hr_6.7	8.6	0.90450
TypeII_100Yr_24Hr_6.7	8.7	0.92360
TypeII_100Yr_24Hr_6.7	8.8	0.94336
TypeII_100Yr_24Hr_6.7	8.9	0.96380
TypeII_100Yr_24Hr_6.7	9.0	0.98490
TypeII_100Yr_24Hr_6.7	9.1	1.00634
TypeII_100Yr_24Hr_6.7	9.2	1.02778
TypeII_100Yr_24Hr_6.7	9.3	1.04922
TypeII_100Yr_24Hr_6.7	9.4	1.07066
TypeII_100Yr_24Hr_6.7	9.5	1.09210
TypeII_100Yr_24Hr_6.7	9.6	1.11408
TypeII_100Yr_24Hr_6.7	9.7	1.13712
TypeII_100Yr_24Hr_6.7	9.8	1.16124
TypeII_100Yr_24Hr_6.7	9.9	1.18644
TypeII_100Yr_24Hr_6.7	10.0	1.21270

TypeII_100Yr_24Hr_6.7	10.1	1.24030
TypeII_100Yr_24Hr_6.7	10.2	1.26952
TypeII_100Yr_24Hr_6.7	10.3	1.30034
TypeII_100Yr_24Hr_6.7	10.4	1.33276
TypeII_100Yr_24Hr_6.7	10.5	1.36680
TypeII_100Yr_24Hr_6.7	10.6	1.40298
TypeII_100Yr_24Hr_6.7	10.7	1.44184
TypeII_100Yr_24Hr_6.7	10.8	1.48338
TypeII_100Yr_24Hr_6.7	10.9	1.52760
TypeII_100Yr_24Hr_6.7	11.0	1.57450
TypeII_100Yr_24Hr_6.7	11.1	1.62596
TypeII_100Yr_24Hr_6.7	11.2	1.68384
TypeII_100Yr_24Hr_6.7	11.3	1.74816
TypeII_100Yr_24Hr_6.7	11.4	1.81892
TypeII_100Yr_24Hr_6.7	11.5	1.89610
TypeII_100Yr_24Hr_6.7	11.6	2.05583
TypeII_100Yr_24Hr_6.7	11.7	2.37421
TypeII_100Yr_24Hr_6.7	11.8	2.88629
TypeII_100Yr_24Hr_6.7	11.9	3.80466
TypeII_100Yr_24Hr_6.7	12.0	4.44210
TypeII_100Yr_24Hr_6.7	12.1	4.56913
TypeII_100Yr_24Hr_6.7	12.2	4.68089
TypeII_100Yr_24Hr_6.7	12.3	4.77737
TypeII_100Yr_24Hr_6.7	12.4	4.85857
TypeII_100Yr_24Hr_6.7	12.5	4.92450
TypeII_100Yr_24Hr_6.7	12.6	4.98105
TypeII_100Yr_24Hr_6.7	12.7	5.03411
TypeII_100Yr_24Hr_6.7	12.8	5.08369
TypeII_100Yr_24Hr_6.7	12.9	5.12979
TypeII_100Yr_24Hr_6.7	13.0	5.17240
TypeII_100Yr_24Hr_6.7	13.1	5.21233
TypeII_100Yr_24Hr_6.7	13.2	5.25039
TypeII_100Yr_24Hr_6.7	13.3	5.28657
TypeII_100Yr_24Hr_6.7	13.4	5.32087
TypeII_100Yr_24Hr_6.7	13.5	5.35330
TypeII_100Yr_24Hr_6.7	13.6	5.38412
TypeII_100Yr_24Hr_6.7	13.7	5.41360
TypeII_100Yr_24Hr_6.7	13.8	5.44174
TypeII_100Yr_24Hr_6.7	13.9	5.46854
TypeII_100Yr_24Hr_6.7	14.0	5.49400
TypeII_100Yr_24Hr_6.7	14.1	5.51859
TypeII_100Yr_24Hr_6.7	14.2	5.54264
TypeII_100Yr_24Hr_6.7	14.3	5.56629
TypeII_100Yr_24Hr_6.7	14.4	5.58941
TypeII_100Yr_24Hr_6.7	14.5	5.61212
TypeII_100Yr_24Hr_6.7	14.6	5.63430
TypeII_100Yr_24Hr_6.7	14.7	5.65607
TypeII_100Yr_24Hr_6.7	14.8	5.67731

TypeII_100Yr_24Hr_6.7	14.9	5.69815
TypeII_100Yr_24Hr_6.7	15.0	5.71845
TypeII_100Yr_24Hr_6.7	15.1	5.73835
TypeII_100Yr_24Hr_6.7	15.2	5.75771
TypeII_100Yr_24Hr_6.7	15.3	5.77667
TypeII_100Yr_24Hr_6.7	15.4	5.79510
TypeII_100Yr_24Hr_6.7	15.5	5.81312
TypeII_100Yr_24Hr_6.7	15.6	5.83061
TypeII_100Yr_24Hr_6.7	15.7	5.84769
TypeII_100Yr_24Hr_6.7	15.8	5.86424
TypeII_100Yr_24Hr_6.7	15.9	5.88039
TypeII_100Yr_24Hr_6.7	16.0	5.89600
TypeII_100Yr_24Hr_6.7	16.1	5.91134
TypeII_100Yr_24Hr_6.7	16.2	5.92649
TypeII_100Yr_24Hr_6.7	16.3	5.94149
TypeII_100Yr_24Hr_6.7	16.4	5.95630
TypeII_100Yr_24Hr_6.7	16.5	5.97097
TypeII_100Yr_24Hr_6.7	16.6	5.98545
TypeII_100Yr_24Hr_6.7	16.7	5.99978
TypeII_100Yr_24Hr_6.7	16.8	6.01392
TypeII_100Yr_24Hr_6.7	16.9	6.02792
TypeII_100Yr_24Hr_6.7	17.0	6.04173
TypeII_100Yr_24Hr_6.7	17.1	6.05539
TypeII_100Yr_24Hr_6.7	17.2	6.06886
TypeII_100Yr_24Hr_6.7	17.3	6.08219
TypeII_100Yr_24Hr_6.7	17.4	6.09533
TypeII_100Yr_24Hr_6.7	17.5	6.10832
TypeII_100Yr_24Hr_6.7	17.6	6.12112
TypeII_100Yr_24Hr_6.7	17.7	6.13378
TypeII_100Yr_24Hr_6.7	17.8	6.14625
TypeII_100Yr_24Hr_6.7	17.9	6.15857
TypeII_100Yr_24Hr_6.7	18.0	6.17070
TypeII_100Yr_24Hr_6.7	18.1	6.18269
TypeII_100Yr_24Hr_6.7	18.2	6.19449
TypeII_100Yr_24Hr_6.7	18.3	6.20614
TypeII_100Yr_24Hr_6.7	18.4	6.21760
TypeII_100Yr_24Hr_6.7	18.5	6.22892
TypeII_100Yr_24Hr_6.7	18.6	6.24005
TypeII_100Yr_24Hr_6.7	18.7	6.25103
TypeII_100Yr_24Hr_6.7	18.8	6.26182
TypeII_100Yr_24Hr_6.7	18.9	6.27247
TypeII_100Yr_24Hr_6.7	19.0	6.28293
TypeII_100Yr_24Hr_6.7	19.1	6.29324
TypeII_100Yr_24Hr_6.7	19.2	6.30336
TypeII_100Yr_24Hr_6.7	19.3	6.31334
TypeII_100Yr_24Hr_6.7	19.4	6.32313
TypeII_100Yr_24Hr_6.7	19.5	6.33277
TypeII_100Yr_24Hr_6.7	19.6	6.34222

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TypeII_100Yr_24Hr_6.7          19.7       6.35153
TypeII_100Yr_24Hr_6.7          19.8       6.36065
TypeII_100Yr_24Hr_6.7          19.9       6.36962
TypeII_100Yr_24Hr_6.7          20.0       6.37840
TypeII_100Yr_24Hr_6.7          20.1       6.38711
TypeII_100Yr_24Hr_6.7          20.2       6.39575
TypeII_100Yr_24Hr_6.7          20.3       6.40440
TypeII_100Yr_24Hr_6.7          20.4       6.41297
TypeII_100Yr_24Hr_6.7          20.5       6.42155
TypeII_100Yr_24Hr_6.7          20.6       6.43006
TypeII_100Yr_24Hr_6.7          20.7       6.43857
TypeII_100Yr_24Hr_6.7          20.8       6.44701
TypeII_100Yr_24Hr_6.7          20.9       6.45545
TypeII_100Yr_24Hr_6.7          21.0       6.46383
TypeII_100Yr_24Hr_6.7          21.1       6.47220
TypeII_100Yr_24Hr_6.7          21.2       6.48051
TypeII_100Yr_24Hr_6.7          21.3       6.48882
TypeII_100Yr_24Hr_6.7          21.4       6.49706
TypeII_100Yr_24Hr_6.7          21.5       6.50530
TypeII_100Yr_24Hr_6.7          21.6       6.51347
TypeII_100Yr_24Hr_6.7          21.7       6.52165
TypeII_100Yr_24Hr_6.7          21.8       6.52975
TypeII_100Yr_24Hr_6.7          21.9       6.53786
TypeII_100Yr_24Hr_6.7          22.0       6.54590
TypeII_100Yr_24Hr_6.7          22.1       6.55394
TypeII_100Yr_24Hr_6.7          22.2       6.56191
TypeII_100Yr_24Hr_6.7          22.3       6.56989
TypeII_100Yr_24Hr_6.7          22.4       6.57779
TypeII_100Yr_24Hr_6.7          22.5       6.58570
TypeII_100Yr_24Hr_6.7          22.6       6.59354
TypeII_100Yr_24Hr_6.7          22.7       6.60138
TypeII_100Yr_24Hr_6.7          22.8       6.60915
TypeII_100Yr_24Hr_6.7          22.9       6.61692
TypeII_100Yr_24Hr_6.7          23.0       6.62463
TypeII_100Yr_24Hr_6.7          23.1       6.63233
TypeII_100Yr_24Hr_6.7          23.2       6.63997
TypeII_100Yr_24Hr_6.7          23.3       6.64761
TypeII_100Yr_24Hr_6.7          23.4       6.65518
TypeII_100Yr_24Hr_6.7          23.5       6.66275
TypeII_100Yr_24Hr_6.7          23.6       6.67025
TypeII_100Yr_24Hr_6.7          23.7       6.67776
TypeII_100Yr_24Hr_6.7          23.8       6.68519
TypeII_100Yr_24Hr_6.7          23.9       6.69263
TypeII_100Yr_24Hr_6.7          24.0       6.70000

[REPORT]
;;Reporting Options
INPUT      NO
```

```
CONTROLS   NO
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]

[MAP]
DIMENSIONS -1169.065 0.000 11169.065 10000.000
Units      None

[SYMBOLS]
;;Gage           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
RG_TypeII_4.9    -3705.148          9188.768
RG_TypeII_6.7    -4547.582          9485.179
```

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.011)
--------------------------------------------------------------

*********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
*********************************************************

****************
Analysis Options
****************
Flow Units ............... CFS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Infiltration Method ...... CURVE_NUMBER
Flow Routing Method ...... KINWAVE
Starting Date ............ 05/02/2019 00:00:00
Ending Date .............. 05/04/2019 00:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:00:06
Wet Time Step ............ 00:00:06
Dry Time Step ............ 01:00:00
Routing Time Step ........ 6.00 sec


**************************        Volume         Depth
Runoff Quantity Continuity     acre-feet        inches
**************************     ---------       -------
Total Precipitation ......        47.053         6.240
Evaporation Loss .........         0.000         0.000
Infiltration Loss ........        13.248         1.757
Surface Runoff ...........        33.436         4.434
Final Storage ............         0.369         0.049
Continuity Error (%) .....        -0.000


**************************        Volume        Volume
Flow Routing Continuity        acre-feet      10^6 gal
**************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
```

```
  Wet Weather Inflow .......        33.436        10.896
  Groundwater Inflow .......         0.000         0.000
  RDII Inflow ..............         0.000         0.000
  External Inflow ..........         0.000         0.000
  External Outflow .........        11.754         3.830
  Flooding Loss ............         0.000         0.000
  Evaporation Loss .........         0.000         0.000
  Exfiltration Loss ........         0.000         0.000
  Initial Stored Volume ....         0.000         0.000
  Final Stored Volume ......        21.682         7.065
  Continuity Error (%) .....         0.000


  *******************************
  Highest Flow Instability Indexes
  *******************************
  All links are stable.


  *************************
  Routing Time Step Summary
  *************************
  Minimum Time Step           :     6.00 sec
  Average Time Step           :     6.00 sec
  Maximum Time Step           :     6.00 sec
  Percent in Steady State     :     0.00
  Average Iterations per Step :     1.00
  Percent Not Converging      :     0.00


  ***************************
  Subcatchment Runoff Summary
  ***************************


--------------------------------------------------------------------------------------
--------------------
                            Total      Total      Total      Total      Total
Total     Peak   Runoff
                           Precip      Runon       Evap      Infil     Runoff
Runoff   Runoff   Coeff
  Subcatchment                 in         in         in         in         in
10^6 gal      CFS

--------------------------------------------------------------------------------------
--------------------
  DA22                       6.70       0.00       0.00       1.91       4.75
2.91    87.33   0.708
```

```
  DA32                          6.70        0.00        0.00        1.89        4.77
1.23    48.58   0.711
  DA33A                         6.70        0.00        0.00        1.88        4.77
1.40    55.77   0.711
  Basin22_water                 6.70        0.00        0.00        0.18        6.46
0.41    10.40   0.965
  Basin32_water                 6.70        0.00        0.00        0.18        6.47
0.10     3.83   0.966
  Basin33_water                 6.70        0.00        0.00        0.18        6.47
0.22     6.98   0.965
  Max_subarea_drng_bnch          4.90        0.00        0.00        1.72        3.13
 0.36     8.69   0.638
  DA33B                         6.70        0.00        0.00        1.88        4.77
1.85    73.65   0.711
  Max_subarea_perimeter_pipe         4.90        0.00        0.00        1.72        3.13
      0.31     7.89   0.639
  Max_subarea_downchute          4.90        0.00        0.00        1.73        3.13
 1.23    28.77   0.638
  Lower_perimeter_pipe          4.90        0.00        0.00        1.68        3.17
0.07     3.40   0.647
  Road_drainage                 6.70        0.00        0.00        0.02        6.64
0.13     6.14   0.991
  Basin23_water                 6.70        0.00        0.00        1.88        4.77
0.04     1.91   0.712
  Road_Channel_Drainage          6.70        0.00        0.00        1.90        4.75
 0.64    19.69   0.708
```

****
Node Depth Summary
****

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min	Reported Max Depth Feet
Out_max_dnrg_bnch	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
Out_max_per_pipe	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
Out_max_downchute	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
Out_lower_perim_pipe	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
Out32_E_Spill	OUTFALL	0.00	0.00	287.00	0 00:00	0.00
Out22_E_Spill	OUTFALL	0.00	0.00	280.00	0 00:00	0.00
Out23_E_Spill	OUTFALL	0.00	0.00	270.90	0 00:00	0.00
Out33_E_Spill	OUTFALL	0.00	0.00	309.00	0 00:00	0.00
Out_road_channel	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
ECS-22	STORAGE	3.56	4.96	278.46	2 00:00	4.96
ECS-32	STORAGE	5.29	7.09	287.09	0 16:18	7.09

ECS-33	STORAGE	5.33	7.17	309.17	0	14:39	7.17
ECS-23	STORAGE	2.34	3.01	270.01	2	00:00	3.01

```
******************
Node Inflow Summary
******************
```

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days	Time of Max Occurrence hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent
Out_max_dnrg_bnch	OUTFALL	8.69	8.69	0	12:06	0.357	0.357	0.000
Out_max_per_pipe	OUTFALL	7.89	7.89	0	12:06	0.306	0.306	0.000
Out_max_downchute	OUTFALL	28.77	28.77	0	12:06	1.23	1.23	0.000
Out_lower_perim_pipe	OUTFALL	3.40	3.40	0	12:00	0.0688	0.0688	0.000
Out32_E_Spill	OUTFALL	0.00	1.53	0	16:18	0	0.262	0.000
Out22_E_Spill	OUTFALL	0.00	0.00	0	00:00	0	0	0.000 gal
Out23_E_Spill	OUTFALL	0.00	0.00	0	00:00	0	0	0.000 gal
Out33_E_Spill	OUTFALL	0.00	5.96	0	14:39	0	0.961	0.000
Out_road_channel	OUTFALL	19.69	19.69	0	12:06	0.644	0.644	0.000
ECS-22	STORAGE	97.73	97.73	0	12:06	3.32	3.32	0.000
ECS-32	STORAGE	52.21	52.21	0	12:06	1.33	1.33	-0.000
ECS-33	STORAGE	136.40	136.40	0	12:06	3.47	3.47	-0.000
ECS-23	STORAGE	8.04	8.04	0	12:00	0.168	0.168	-0.000

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 ft3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 ft3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CFS
ECS-22	316.062	44	0	0	443.960	62	2 00:00	0.00
ECS-32	107.152	64	0	0	144.733	87	0 16:17	1.53
ECS-33	254.929	65	0	0	345.298	88	0 14:39	5.96
ECS-23	16.537	36	0	0	22.421	48	2 00:00	0.00

****
Outfall Loading Summary
****

Flow Avg Max Total

CrossroadsPh14 100-yr_w_spillway.rpt

Outfall Node	Freq Pcnt	Flow CFS	Flow CFS	Volume 10^6 gal
Out_max_dnrg_bnch	64.10	0.43	8.69	0.357
Out_max_per_pipe	62.87	0.38	7.89	0.306
Out_max_downchute	65.87	1.45	28.77	1.230
Out_lower_perim_pipe	52.33	0.10	3.40	0.069
Out32_E_Spill	41.81	0.48	1.53	0.262
Out22_E_Spill	0.00	0.00	0.00	0.000
Out23_E_Spill	0.00	0.00	0.00	0.000
Out33_E_Spill	65.84	1.13	5.96	0.961
Out_road_channel	63.57	0.78	19.69	0.644
System	46.27	4.75	68.06	3.830

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
E_Spillway_32	WEIR	1.53	0 16:18			0.00
E_Spillway_33	WEIR	5.96	0 14:39			0.00
E_Spillway_23	WEIR	0.00	0 00:00			0.00
E_Spillway_22	WEIR	0.00	0 00:00			0.00

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Thu Oct 17 11:37:43 2019
Analysis ended on: Thu Oct 17 11:37:44 2019
Total elapsed time: 00:00:01

ATTACHMENT C
FlowMaster Input Parameters and Results

FlowMaster Inputs and Results

Worksheet for Circular Pipe

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.00500	ft/ft
Normal Depth	2.50	ft
Diameter	2.50	ft

Results

Discharge	29.00	ft³/s
Flow Area	4.91	ft²
Wetted Perimeter	7.85	ft
Hydraulic Radius	0.63	ft
Top Width	0.00	ft
Critical Depth	1.84	ft
Percent Full	100.0	%
Critical Slope	0.00632	ft/ft
Velocity	5.91	ft/s
Velocity Head	0.54	ft
Specific Energy	3.04	ft
Froude Number	0.00	
Maximum Discharge	31.20	ft³/s
Discharge Full	29.00	ft³/s
Slope Full	0.00500	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s

Worksheet for Circular Pipe

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	2.50	ft
Critical Depth	1.84	ft
Channel Slope	0.00500	ft/ft
Critical Slope	0.00632	ft/ft

FlowMaster Inputs and Results

Worksheet for Circular Pipe

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.01000	ft/ft
Normal Depth	2.50	ft
Diameter	2.50	ft

Results

Discharge	41.01	ft³/s
Flow Area	4.91	ft²
Wetted Perimeter	7.85	ft
Hydraulic Radius	0.63	ft
Top Width	0.00	ft
Critical Depth	2.15	ft
Percent Full	100.0	%
Critical Slope	0.00926	ft/ft
Velocity	8.36	ft/s
Velocity Head	1.08	ft
Specific Energy	3.58	ft
Froude Number	0.00	
Maximum Discharge	44.12	ft³/s
Discharge Full	41.01	ft³/s
Slope Full	0.01000	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s

Worksheet for Circular Pipe

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	2.50	ft
Critical Depth	2.15	ft
Channel Slope	0.01000	ft/ft
Critical Slope	0.00926	ft/ft

Worksheet for Circular Pipe

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.02000	ft/ft
Normal Depth	2.50	ft
Diameter	2.50	ft

Results

Discharge	58.00	ft³/s
Flow Area	4.91	ft²
Wetted Perimeter	7.85	ft
Hydraulic Radius	0.63	ft
Top Width	0.00	ft
Critical Depth	2.38	ft
Percent Full	100.0	%
Critical Slope	0.01733	ft/ft
Velocity	11.82	ft/s
Velocity Head	2.17	ft
Specific Energy	4.67	ft
Froude Number	0.00	
Maximum Discharge	62.40	ft³/s
Discharge Full	58.00	ft³/s
Slope Full	0.02000	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s

Worksheet for Circular Pipe

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	2.50	ft
Critical Depth	2.38	ft
Channel Slope	0.02000	ft/ft
Critical Slope	0.01733	ft/ft

FlowMaster Inputs and Results

Worksheet for Circular Pipe

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.10000	ft/ft
Normal Depth	2.50	ft
Diameter	2.50	ft

Results

Discharge	129.70	ft³/s
Flow Area	4.91	ft²
Wetted Perimeter	7.85	ft
Hydraulic Radius	0.63	ft
Top Width	0.00	ft
Critical Depth	2.49	ft
Percent Full	100.0	%
Critical Slope	0.09622	ft/ft
Velocity	26.42	ft/s
Velocity Head	10.85	ft
Specific Energy	13.35	ft
Froude Number	0.00	
Maximum Discharge	139.52	ft³/s
Discharge Full	129.70	ft³/s
Slope Full	0.10000	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s

Worksheet for Circular Pipe

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	2.50	ft
Critical Depth	2.49	ft
Channel Slope	0.10000	ft/ft
Critical Slope	0.09622	ft/ft

FlowMaster Inputs and Results

Worksheet for Circular Pipe

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.00500	ft/ft
Normal Depth	2.00	ft
Diameter	2.00	ft

Results

Discharge	16.00	ft³/s
Flow Area	3.14	ft²
Wetted Perimeter	6.28	ft
Hydraulic Radius	0.50	ft
Top Width	0.00	ft
Critical Depth	1.44	ft
Percent Full	100.0	%
Critical Slope	0.00662	ft/ft
Velocity	5.09	ft/s
Velocity Head	0.40	ft
Specific Energy	2.40	ft
Froude Number	0.00	
Maximum Discharge	17.21	ft³/s
Discharge Full	16.00	ft³/s
Slope Full	0.00500	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s

Worksheet for Circular Pipe

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	2.00	ft
Critical Depth	1.44	ft
Channel Slope	0.00500	ft/ft
Critical Slope	0.00662	ft/ft

FlowMaster Inputs and Results

Worksheet for Circular Pipe

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.01000	ft/ft
Normal Depth	2.00	ft
Diameter	2.00	ft

Results

Discharge	22.62	ft^3/s
Flow Area	3.14	ft^2
Wetted Perimeter	6.28	ft
Hydraulic Radius	0.50	ft
Top Width	0.00	ft
Critical Depth	1.69	ft
Percent Full	100.0	%
Critical Slope	0.00946	ft/ft
Velocity	7.20	ft/s
Velocity Head	0.81	ft
Specific Energy	2.81	ft
Froude Number	0.00	
Maximum Discharge	24.33	ft^3/s
Discharge Full	22.62	ft^3/s
Slope Full	0.01000	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s

Worksheet for Circular Pipe

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	2.00	ft
Critical Depth	1.69	ft
Channel Slope	0.01000	ft/ft
Critical Slope	0.00946	ft/ft

FlowMaster Inputs and Results

Worksheet for Circular Pipe

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.00700	ft/ft
Normal Depth	3.00	ft
Diameter	3.00	ft

Results

Discharge	55.80	ft³/s
Flow Area	7.07	ft²
Wetted Perimeter	9.42	ft
Hydraulic Radius	0.75	ft
Top Width	0.00	ft
Critical Depth	2.42	ft
Percent Full	100.0	%
Critical Slope	0.00719	ft/ft
Velocity	7.89	ft/s
Velocity Head	0.97	ft
Specific Energy	3.97	ft
Froude Number	0.00	
Maximum Discharge	60.03	ft³/s
Discharge Full	55.80	ft³/s
Slope Full	0.00700	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s

Worksheet for Circular Pipe

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	3.00	ft
Critical Depth	2.42	ft
Channel Slope	0.00700	ft/ft
Critical Slope	0.00719	ft/ft

FlowMaster Inputs and Results

Worksheet for Circular Pipe

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.01000	ft/ft
Normal Depth	3.00	ft
Diameter	3.00	ft

Results

Discharge	66.69	ft^3/s
Flow Area	7.07	ft^2
Wetted Perimeter	9.42	ft
Hydraulic Radius	0.75	ft
Top Width	0.00	ft
Critical Depth	2.61	ft
Percent Full	100.0	%
Critical Slope	0.00912	ft/ft
Velocity	9.44	ft/s
Velocity Head	1.38	ft
Specific Energy	4.38	ft
Froude Number	0.00	
Maximum Discharge	71.74	ft^3/s
Discharge Full	66.69	ft^3/s
Slope Full	0.01000	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s

Worksheet for Circular Pipe

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	3.00	ft
Critical Depth	2.61	ft
Channel Slope	0.01000	ft/ft
Critical Slope	0.00912	ft/ft

FlowMaster Inputs and Results

Worksheet for Circular Pipe

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.02500	ft/ft
Normal Depth	3.00	ft
Diameter	3.00	ft

Results

Discharge	105.45	ft³/s
Flow Area	7.07	ft²
Wetted Perimeter	9.42	ft
Hydraulic Radius	0.75	ft
Top Width	0.00	ft
Critical Depth	2.91	ft
Percent Full	100.0	%
Critical Slope	0.02206	ft/ft
Velocity	14.92	ft/s
Velocity Head	3.46	ft
Specific Energy	6.46	ft
Froude Number	0.00	
Maximum Discharge	113.44	ft³/s
Discharge Full	105.45	ft³/s
Slope Full	0.02500	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s

Worksheet for Circular Pipe

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	3.00	ft
Critical Depth	2.91	ft
Channel Slope	0.02500	ft/ft
Critical Slope	0.02206	ft/ft

FlowMaster Inputs and Results

Worksheet for Downchute Capacity

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Roughness Coefficient	0.078	
Channel Slope	0.33300	ft/ft
Normal Depth	0.75	ft
Left Side Slope	2.00	ft/ft (H:V)
Right Side Slope	2.00	ft/ft (H:V)
Bottom Width	4.00	ft

Results

Discharge	30.84	ft^3/s
Flow Area	4.13	ft^2
Wetted Perimeter	7.35	ft
Hydraulic Radius	0.56	ft
Top Width	7.00	ft
Critical Depth	1.03	ft
Critical Slope	0.10467	ft/ft
Velocity	7.48	ft/s
Velocity Head	0.87	ft
Specific Energy	1.62	ft
Froude Number	1.72	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.75	ft
Critical Depth	1.03	ft
Channel Slope	0.33300	ft/ft

Worksheet for Downchute Capacity

GVF Output Data

Critical Slope	0.10467	ft/ft

Worksheet for Cover System Bench Capacity

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Roughness Coefficient	0.030	
Channel Slope	0.01000	ft/ft
Normal Depth	1.70	ft
Left Side Slope	1.00	ft/ft (H:V)
Right Side Slope	3.00	ft/ft (H:V)
Bottom Width	2.00	ft

Results

Discharge	43.59	ft^3/s
Flow Area	9.18	ft^2
Wetted Perimeter	9.78	ft
Hydraulic Radius	0.94	ft
Top Width	8.80	ft
Critical Depth	1.54	ft
Critical Slope	0.01526	ft/ft
Velocity	4.75	ft/s
Velocity Head	0.35	ft
Specific Energy	2.05	ft
Froude Number	0.82	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.70	ft
Critical Depth	1.54	ft
Channel Slope	0.01000	ft/ft

Worksheet for Cover System Bench Capacity

GVF Output Data

Critical Slope	0.01526	ft/ft

Worksheet for Grass-lined swale min

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Roughness Coefficient	0.030	
Channel Slope	0.01000	ft/ft
Normal Depth	0.70	ft
Left Side Slope	3.00	ft/ft (H:V)
Right Side Slope	3.00	ft/ft (H:V)
Bottom Width	4.00	ft

Results

Discharge	13.44	ft³/s
Flow Area	4.27	ft²
Wetted Perimeter	8.43	ft
Hydraulic Radius	0.51	ft
Top Width	8.20	ft
Critical Depth	0.60	ft
Critical Slope	0.01758	ft/ft
Velocity	3.15	ft/s
Velocity Head	0.15	ft
Specific Energy	0.85	ft
Froude Number	0.77	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.70	ft
Critical Depth	0.60	ft
Channel Slope	0.01000	ft/ft

Worksheet for Grass-lined swale min

GVF Output Data

Critical Slope	0.01758	ft/ft

Worksheet for Grass-lined swale max

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Roughness Coefficient	0.030	
Channel Slope	0.01000	ft/ft
Normal Depth	1.70	ft
Left Side Slope	3.00	ft/ft (H:V)
Right Side Slope	3.00	ft/ft (H:V)
Bottom Width	4.00	ft

Results

Discharge	79.09	ft³/s
Flow Area	15.47	ft²
Wetted Perimeter	14.75	ft
Hydraulic Radius	1.05	ft
Top Width	14.20	ft
Critical Depth	1.58	ft
Critical Slope	0.01368	ft/ft
Velocity	5.11	ft/s
Velocity Head	0.41	ft
Specific Energy	2.11	ft
Froude Number	0.86	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.70	ft
Critical Depth	1.58	ft
Channel Slope	0.01000	ft/ft

Worksheet for Grass-lined swale max

GVF Output Data

Critical Slope	0.01368	ft/ft

FlowMaster Inputs and Results

Worksheet for Perimeter Swale Capacity

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Roughness Coefficient	0.030	
Channel Slope	0.00750	ft/ft
Normal Depth	1.10	ft
Left Side Slope	2.00	ft/ft (H:V)
Right Side Slope	2.00	ft/ft (H:V)
Bottom Width	4.00	ft

Results

Discharge	24.46	ft^3/s
Flow Area	6.82	ft^2
Wetted Perimeter	8.92	ft
Hydraulic Radius	0.76	ft
Top Width	8.40	ft
Critical Depth	0.90	ft
Critical Slope	0.01599	ft/ft
Velocity	3.59	ft/s
Velocity Head	0.20	ft
Specific Energy	1.30	ft
Froude Number	0.70	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.10	ft
Critical Depth	0.90	ft
Channel Slope	0.00750	ft/ft

Worksheet for Perimeter Swale Capacity

GVF Output Data

Critical Slope	0.01599	ft/ft

FlowMaster Inputs and Results

Worksheet for Roadside Ditch

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Roughness Coefficient	0.078	
Channel Slope	0.07800	ft/ft
Normal Depth	1.70	ft
Left Side Slope	2.00	ft/ft (H:V)
Right Side Slope	2.00	ft/ft (H:V)
Bottom Width	3.00	ft

Results

Discharge	58.90	ft³/s
Flow Area	10.88	ft²
Wetted Perimeter	10.60	ft
Hydraulic Radius	1.03	ft
Top Width	9.80	ft
Critical Depth	1.62	ft
Critical Slope	0.09630	ft/ft
Velocity	5.41	ft/s
Velocity Head	0.46	ft
Specific Energy	2.16	ft
Froude Number	0.91	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.70	ft
Critical Depth	1.62	ft
Channel Slope	0.07800	ft/ft

Worksheet for Roadside Ditch

GVF Output Data

Critical Slope	0.09630	ft/ft

APPENDIX IV(f)(ii)
Arch Culvert Stream Crossing Analysis

Written by:	E. Grimes	Date:	9/13/2019	Reviewed by:	D. Bourdeau	Date:	9/26/2019
Client:	WMDSM	Project:	Crossroads LF – Ph 14	Project/ Proposal No.:	BE0232C	Task No.:	02

STREAM CROSSING CALCULATIONS
PHASE 14
CROSSROADS LANDFILL

INTRODUCTION

The purpose of this calculation package is to describe hydrologic and hydraulic analyses performed for the stream crossing for the access ramp into Phase 14. The proposed stream crossing, consisting of a buried pipe-arch culvert is shown on the Sheet 37 of the Permit Drawings. In general, the culvert of the proposed stream crossing is sized to: (i) span a minimum width of 1.2 times the bankfull width of the existing stream; (ii) convey the 25-year, 24-hour peak flow rate associated with the stream; and (iii) convey the 100-year, 24-hour peak flow rate associated with the stream without overtopping the road.

REGULATORY OVERVIEW

The stream crossing for the Phase 14 access ramp was designed in accordance with applicable portions of the following statutes related to stream work and crossings.

- ***Department of the Army General Permit for the State of Maine***
  - ***Section IV – 45. Stream Work and Crossing & Wetland Crossing***
- ***State of Maine Site Location of Development Law Guidelines for Stormwater Management (06-096 CMR, Chapter 500)***
- ***Natural Resources Protection Act – Permit By Rule (06-096 CMR, Chapter 305)***
  - ***Section 10 – Stream Crossings (bridges, culverts and fords)***
- ***Maine Land Use Districts and Standards – Chapter 10***
  - ***Section 10.27D – Roads and Water Crossings***

DESIGN OBJECTIVES

The following design objectives were established for development of the stream crossing:

1. The culvert must be sized to convey the 25-year, 24-hour peak flow rate;
2. The culvert must be sized to pass the 100-year, 24-hour peak flow rate without overtopping the access road; and

3. The culvert must have a minimum span of 1.2 times the bankfull width of the existing stream. The bankfull width of a stream is the water level at which a stream is at the top of its banks and any further rise would result in water moving into the floodplain.

METHODOLOGY

For hydrologic modeling, the United States Geological Survey (USGS) Peak Flow Regression Equations for Small, Ungaged Steams in Maine Scientific Investigation Report[1] was used to perform the hydrologic modeling for the proposed stream crossing culvert. These regression equations to estimate peak stream flows with 1- to 500-year recurrence intervals were developed based on the study of 40 USGS stream gaging stations with small drainage basins in Maine. The regression equations were set up to model peak flow rates by utilizing drainage basin explanatory variables, such as drainage area and wetland percentage. The various hydrologic parameters used for this analysis are described below.

- **Peak Flow Rate:**

Per 06-096 CMR Chapter 305 Natural Resources Protection Act– Permit by Rule, the crossing was sized to accommodate a 25-year peak flow rate. The Peak Flow Regression equation for a 25-year flow rate occurrence is:

$$Q_{25} = 171.791(A)^{.814}10^{-.017(W)}$$

where Q_{25} is the peak flow associated with a 25-year recurrence in cubic feet per second; A is the drainage area in square miles; and W is the percent of basin wetlands.

The crossing was also evaluated under the 100-year peak flow rate. The Peak Flow Regression equation for a 100-year flow rate occurrence is:

$$Q_{100} = 238.781(A)^{.817}10^{-.018(W)}$$

where Q_{100} is the peak flow associated with a 100-year recurrence in cubic feet per second; A is the drainage area in square miles; and W is the percent of basin wetlands.

- **Culvert Capacity:**

The Federal Highway Administration Chart 6: Headwater Depth for Pipe-Arch Culverts with Inlet Control of the HEC-5 Circular was used to size the culvert crossing. The nomograph in

[1] Lombard, P.J., and Hodgkins, G.A., (2015). *Peak Flow Regression Equations for Small, Ungaged Streams in Maine: Comparing Map-Based to Field-Based Variables.* U.S. Geological Survey Scientific Investigations Report 2015-5049.

Chart 6 gives the headwater-discharge relationship for a conventional pipe-arch culvert with inlet control based on laboratory research.

DESIGN CRITERIA

The following regulatory design criteria was used to size and verify the capacity of the culvert for the proposed stream crossing:

- Culverts must have a minimum span of 1.2 times bankfull width (Maine General Permit, ACOE)
- Pipe arches must be embedded in the stream a minimum of 1-foot (Maine General Permit, ACOE)
- Culverts must be limited to 75-feet in length (Maine Permit by Rule, NRPA)
- Crossings must have an opening with a cross-sectional area at least equal to 3 times the cross-sectional area of the stream channel *or* sufficient in size to accommodate 25-year frequency water flows (Maine Permit by Rule, NRPA). Note, the culvert sized for the proposed stream crossing was designed to convey 25-year frequency water flows.
- The culvert crossing must have a clear cover within the cover height limits determined by the American Association of State Highway and Transportation Officials (AASHTO) HS-20 live load ratings. The HS-20 live load ratings express the extreme load effect created by heavy vehicles acting on a crossing.

The following standard of practice design criteria was used to verify the capacity of the culvert for the proposed stream crossing:

- Sufficient in size to pass the 100-year frequency peak flow rate without overtopping the access road.

PEAK FLOW RATE

The peak flow rate at the point of the proposed stream crossing was calculated using the USGS Peak Flow Regression Equation (USGS, 2015) for a 25-year and 100-year recurrence interval, as described above. The peak flow rate was determined using two drainage basin characteristics: (i) the drainage area and (ii) the basin wetland percentage.

The drainage area was delineated to convey the flow rate associated with the 25-year and 100-year recurrence intervals to the proposed culvert under the existing condition (i.e., prior to the Phase 14 development). The existing, or pre-development, condition was used because this condition represents the largest contributing drainage area to the proposed culvert crossing location. In addition, the Phase 14 landfill will be developed over a period of time with the access road being an early construction phase of the project. It was confirmed that the peak flow rate for the pre-development was greater by comparing the peak flow rates for conditions before and after the Phase 14 development[2]. Therefore, the pre-development condition is the most applicable relative to peak flow rate. A Geographic Information System (GIS) was used to delineate the drainage area before development to the point of the proposed stream crossing as shown in Attachment A. The drainage area was estimated to be 11 acres (0.017 square miles).

The percent of wetlands was calculated as the percentage of wetland area in the designated drainage basin. The measurement tool was used to calculate the wetland area from the Surface Water Management Plan (Sheet 15 of the Permit Set) located in Attachment A. Approximately 3 acres (0.005 square miles) of wetlands were identified within the drainage area. Table 1 includes the drainage characteristics for the watershed contributing flow to the proposed culvert crossing.

Table 1: Peak Flow Rate Summary

Drainage Area (sq. mi.)	Wetland Percentage (%)	Peak Flow Rate (cfs)
0.017	0.30	6 (25-year)
0.017	0.30	9 (100-year)

PROPOSED SIZING OF CULVERT CROSSING

The proposed sizing of the culvert crossing meets the regulatory requirements and design criteria described above. Results describe peak flow rate requirements for the 25-year and 100-year recurrence intervals. The proposed culvert was designed as a concrete pipe-arch.

According to the General Permit for the State of Maine produced by the U.S. Army Corps of Engineers (ACOE, 2015), the minimum span of the proposed crossing must be 1.2 times the bankfull width of the stream. The proposed stream crossing spans a portion of the tributary that is characterized by a braided stream. The bankfull width of the stream was measured at a location downstream of the proposed crossing location where the stream has a well-defined cross section. A survey conducted by Boynton & Pickett L.L.C (Boynton & Pickett) indicated that the stream

[2] The post-development peak flow rate was determined using the same methodology as the pre-development peak flow rate. The post-development condition has a drainage area of 0.01 square miles and a wetland percentage of 0.50 The peak flow rate for post-development was determined to be approximately 4 cubic feet per second (cfs) for a 25-year recurrence interval and 5 cfs for a 100-year recurrence interval.

has a current bankfull width of 5-feet. The bankfull width of the stream measured at the location downstream of the proposed crossing is shown in Attachment B. Table 2 describes the minimum span requirements for the proposed pipe-arch culvert.

Table 2: Minimum Span Requirements

Bankfull Width (in)	Minimum Span (in)
60	72

The standard size of a concrete pipe-arch that meets the minimum span required is a pipe-arch with a 73-inch span and a 45-inch rise. Table 3 summarizes the flow capacity at varying headwater levels within a 73-inch by 45-inch concrete pipe-arch. The flow capacities were determined using Chart 6: Headwater Depth for Pipe-Arch Culverts with Inlet Control published by the Federal Highway Administration (FHWA, 1965). The headwater levels and flow capacities within Table 3 accommodate an embedment depth of 1.5-feet.

Table 3: Flow Capacities of 73" x 45" Pipe-Arch Culvert

Percent Full	Headwater (ft)	Discharge Capacity (cfs)
0.35	0.79	20
0.40	0.90	26
0.50	1.13	40
0.60	1.35	55
0.70	1.58	70
0.80	1.80	85
0.90	2.03	100
1.0	2.25	120

Table 4 compares the maximum discharge capacity of the selected pipe-arch with the 25-year and 100-year peak flow rate for the drainage area. The maximum flow capacity calculated from the nomograph on Chart 6 of the HEC-5 were used to confirm that a pipe-arch with a minimum span of 72-inches is sufficient to convey the peak flow rate associated with the 25-year recurrence interval of the drainage area and will not cause overtopping of the road during a 100-year recurrence interval peak flow.

Table 4: Culvert Pipe-Arch Analysis Summary

Pipe Dimensions (in)	Maximum Flow Capacity (cfs)	25-year Peak Flow Rate (cfs)	100-year Peak Flow Rate (cfs)
73 x 45	120	6	9

The AASHTO HS-20 live load ratings were used to determine the cover limits for a concrete pipe-arch. A concrete pipe-arch with a minimum span of 73-inches and a maximum rise of 45-inches must have a minimum clear cover of 0.5-feet above the top of the proposed arch-pipe to maintain structural integrity (ACPA, 2016). A Class V concrete pipe-arch with a minimum span of 73-inches and a maximum rise of 45-inches has a maximum cover of 22-feet above the top of the proposed arch-pipe to maintain structural integrity (ACPA, 2016). The culvert may be comprised of other material (e.g., HDPE), however, hydraulic and clear cover requirements will need to be evaluated based on the proposed culvert material.

CONCLUSION

The calculations presented in this package indicate that the proposed stream crossing culvert as designed is at least 1.2 times the bankfull width of the existing stream, will adequately convey the peak flow rate associated with the 25-year recurrence interval in accordance with the regulations presented herein and will not cause overtopping of the access road during a 100-year recurrence interval flow event.

REFERENCES

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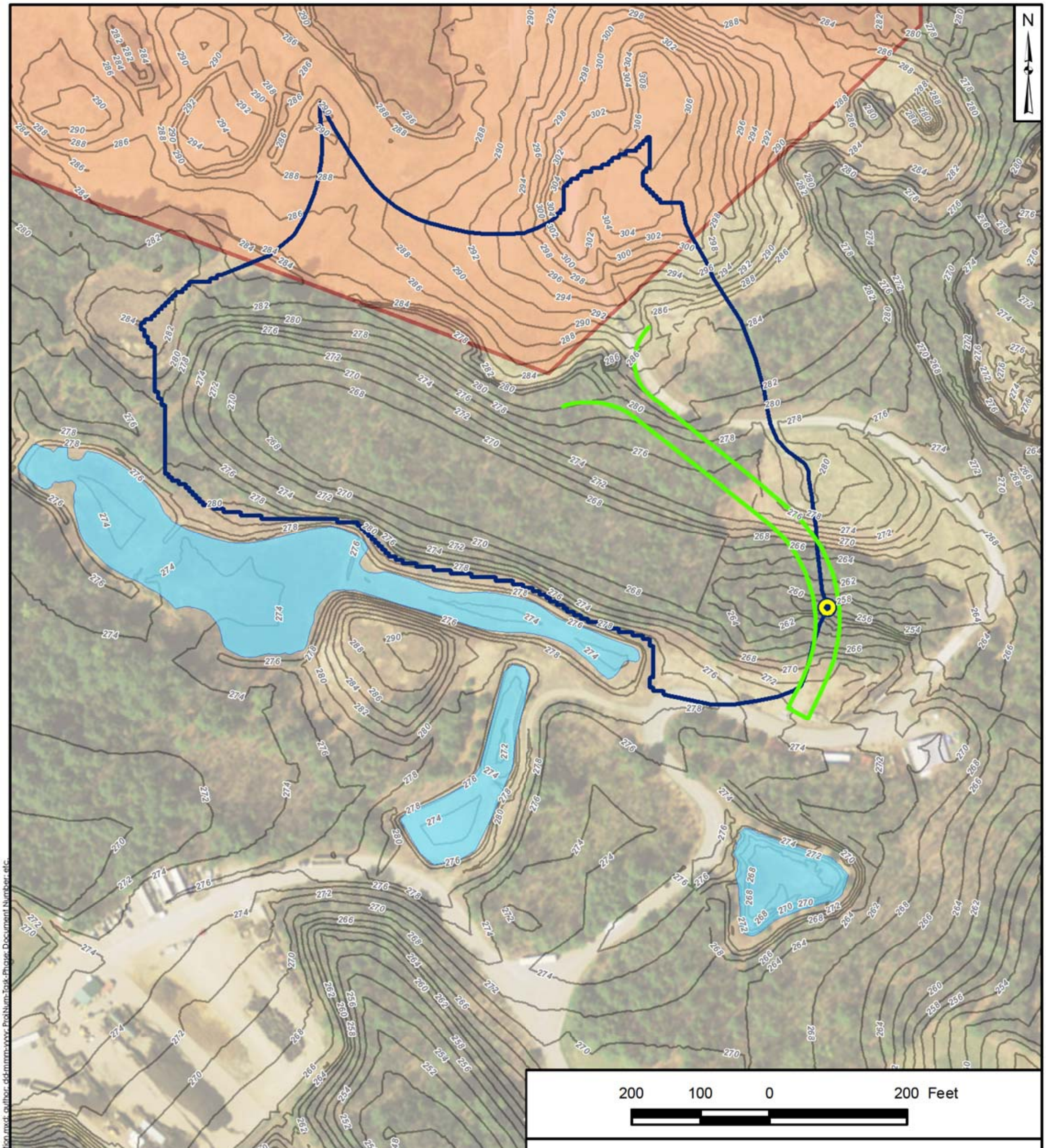
Lombard, P.J., and Hodgkins, G.A., (2015). *Peak Flow Regression Equations for Small, Ungaged Streams in Maine: Comparing Map-Based to Field-Based Variables.* U.S. Geological Survey Scientific Investigations Report 2015-5049

State of Maine. (2016). *Maine Stormwater Best Management Practices Manual*. Retrieved April 2014, from Maine Department of Environmental Protection: http://www.maine.gov/dep/land/stormwater/stormwaterbmps/

ATTACHMENT A

DRAINAGE AREA DELINEATION



Legend

- Proposed Culvert Crossing Location
- Approximate Drainage Area
- Phase 14 Boundary
- Proposed MSE Ramp
- Proposed ECS Basin
- Topographic Contours

Drainage Delineation

Waste Management Disposal Services of Maine, Inc.
Crossroads Landfill
Norridgewock, Maine

Geosyntec consultants

Acton, Massachusetts | September 2019

Figure 1

ATTACHMENT B

BANKFULL WIDTH

Attachment B: Photo of bankfull width in tributary channel downstream of proposed culvert crossing.

APPENDIX IV(g)
Landfill Gas Management System

PHASE 14 LFG COLLECTION AND CONTROL SYSTEM DESIGN REPORT

PHASE 14 SOLID WASTE PERMIT APPLICATION

CROSSROADS LANDFILL

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Norridgewock, Maine 04957

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LICENSED
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Table of Contents

Appendices

1 INTRODUCTION

Waste Management Disposal Services of Maine, Inc. (WMDSM), a subsidiary of Waste Management, has installed and operates landfill gas (LFG) management systems in Phases 8, 9, 10, 11 and 12 of the Crossroads Landfill (Landfill) in Norridgewock, Maine. The primary purpose of the LFG management systems is to collect and combust LFG generated within these areas of the Landfill to control odors and reduce the potential for LFG migration. In addition, these systems direct LFG to an on-site landfill gas-to-energy facility (LFGE facility) for renewable energy purposes. The LFG management systems include collection devices (e.g., wells, horizontal collectors, leachate cleanouts, surface collectors), collection headers and laterals, a blower/flare station (at Phase 11 and Phase 8), and a LFGE facility.

This report addresses the landfill gas and odor control requirements of Maine Solid Waste Management Rules (Maine SWMR), Chapters 400 and 401, for the proposed Phase 14 landfill, including:

- Chapter 400.4.G(2)(a): Evidence that an air emission license has been or will be obtained (see Section 6).
- Chapter 400.4.G(2)(b): Fugitive dust control plan (see separate document)
- Chapter 400.4.G(2)(c) through (e): Nuisance odor control plan (see Section 7).
- Chapter 401.2.F(6): Gas Management (see Sections 2 through 5)

The proposed Phase 14 LFG collection system is presented in the drawings in Appendix A.

2 SITE BACKGROUND

WMDSM owns and operates the Landfill located on Mercer Road in Somerset County, Norridgewock, Maine. The Landfill has been owned and operated by WMDSM since October 1990. The previous owner, Consolidated Waste Services, Inc., purchased the landfill property in 1983 from Elizabeth Lappi, who had managed the site under the name of Consolidated Sanitary Landfill, since its opening in 1976.

Currently, the WMDSM facility consists of eight landfill units: the Asbestos Landfill (final closure construction completed 1994) and seven secure landfill units (Phase 1-6, Phase 7, Phase 8, Phase 9, Phase 10, Phase 11, and Phase 12). The secure landfill units at Crossroads are geosynthetic-lined facilities, with leachate collection and removal systems. The Phase 1-6, 7 and 9 landfills are completely overfilled by Phase 8 and form one contiguous mound.

Municipal solid waste (MSW) was not disposed in Phases 1-6, Phase 7, Phase 10, or the Asbestos Landfill. Therefore, the generation of LFG in these areas is minimal. With that said, Phase 10 landfill received minimal relocated waste (some of which was MSW) from Phase 8 in order to achieve permitted waste grades prior to final closure. As a result, LFG surface collectors were installed within the top waste layer as a precautionary measure to provide for LFG collection, if necessary. Phase 10 is expected to produce negligible LFG and therefore has not been considered relative to modeling, as discussed later in this report. The Phase 8, 9, 11, and 12 Secure Landfills contain MSW and hence, generate LFG. Gas collection and control systems are installed at Phase 8, 9, 10, 11, and 12.

WASTE QUANTITIES AND CHARACTERISTICS

Major waste types include special waste, MSW, construction and demolition (C&D), and alternative cover material (ACM). Within the special waste category, most waste can be categorized as wastewater treatment plant sludge, ash or contaminated soils. Projected Phase 14 MSW, C&D and sludge tonnages are summarized in the table in Appendix B.

For LFG modeling purposes, WMDSM projected the waste landfilled in Phase 14 will include 28 percent MSW, 22 percent C&D, and 9 percent sludge, as follows:

- Total Phase 14 Waste: 450,000 tons annually
- MSW: 126,000 tons annually
- C&D: 99,000 tons annually
- Sludge: 40,500 tons annually

The projected waste percentages are based on the rates included in the public benefit application and an evaluation of current and projected MSW sources. Inert wastes are present in the waste stream but do not contribute to LFG generation.

Gas generation from wastewater treatment plant sludge that undergoes anaerobic decomposition is reported to range from 8 to 12 cubic feet per dry organic pound. LFG generation from MSW ranges from 3 to 4 cubic feet per dry organic pound. Therefore, a ton of sludge produces about 3 times the amount of gas compared to a ton of MSW. Within the sludge category, we reviewed available information concerning solids and organic content for the sludge that originates from WMDSM's major accounts. Based on this information, we estimated that the average solids content will be 20 percent and the average organic content will be 75 percent, or 15 percent organic total. With a gas production factor of 3, this is equivalent to a waste with an organic content of 45 percent. The organic content of MSW typically ranges from 40 to 50 percent. Hence, a ton of sludge received at the Landfill is about equal to a ton of MSW from an organic content and a gas generation perspective. For this reason, the same modeling parameters are used for the MSW and sludge gas recovery models (see Section 3).

EXISTING LANDFILL GAS CONTROL SYSTEM

Two landfill gas-fired internal combustion engines commenced operation on March 9, 2009. All the LFG from the Phase 8, 9, 10, 11 and 12 landfill areas are combined and combusted in the engines. After startup of the engine facility, the Phase 8 and 11 flares have operated on an intermittent basis, during downtime of the engines only. A third landfill gas-fired internal combustion engine has been permitted but not installed. Additional control device capacity will be gained from the installation of the third engine. The capacities of the permitted control devices are listed in Exhibit 1.

Exhibit 1. Control Device Capacity

Control Device	Maximum Capacity (scfm)
Flare #3 (Phase 8/9)	2,500
Flare #1 (Phase 11/12)	2,000
Existing LFGE Facility	1,200
Future (third) Engine at LFGE Facility	350
Total Flare Capacity	4,500
Total LFGE Facility	1,550
Total Facility Capacity	**6,050**

3 LFG RECOVERY ESTIMATES

This section provides estimates of the type, volume and concentration of landfill gas to be generated during operations, closure and post-closure, as required by Maine SWMR Chapter 401.2.F(6)(a)(i).

Several models are available for estimating the gas recovery rate from a landfill using site-specific input parameters. SCS typically estimates LFG recovery rates from landfills using the Landfill Gas Emission Model (LandGEM) which has been adopted by the U.S. EPA as part of the New Source Performance Standards (NSPS) for MSW landfills. The LandGEM is a simplistic, first order, single stage model with only two input parameters other than waste receipts and LFG composition. It assumes that the gas generation rate is at its peak upon initial waste placement, after a short lag time during which anaerobic conditions are established in the landfill. The gas generation rate is then assumed to decrease exponentially (i.e., first order decay) as the organic fraction of the landfill refuse decreases.

The model equation is as follows:

$$Q = \sum_{i=1}^{n} 2\, k\, L_0\, M_i \left(e^{-kt_i}\right)$$

where,

Q = Methane generation rate from the landfill in the i^{th} year, cf/yr

k = Methane generation rate constant, 1/yr

L_0 = Methane generation potential, cf/ton

M_i = Mass of refuse in the i^{th} section, ton

t_i = Age of the i^{th} section, yrs

i = Section number

The theoretical value for potential methane generation capacity of refuse, L_0, depends on the type of refuse only. The higher the cellulose content of the refuse, the higher the value of the theoretical methane generation capacity. The theoretical methane generation capacity is determined by a stoichiometric method which is based on a gross empirical formula representing the chemical composition of composite refuse or individual refuse type. Some researchers have reported "obtainable L_0" which accounts for the nutrient availability, pH, and moisture content within the landfill. The researchers point out that "obtainable L_0" is less than the theoretical L_0. Even though refuse may have a high cellulose content, if the landfill conditions are not hospitable to the methanogens, the potential methane generation capacity of the refuse may never be reached. The "obtainable L_0" is approximated from overall biodegradability of "typical" composite refuse or individual waste components, assuming a conversion efficiency based on landfill conditions.

The methane generation rate constant, k, determines how quickly the methane generation rate decreases, once it reaches the peak rate upon placement. The higher the value of k, the faster the methane generation rate from each submass decreases over time. The value of k is a function of the following major factors: (1) refuse moisture content, (2) availability of the nutrients for methanogens, (3) pH, and (4) temperature. In general, increasing moisture content increases the rate of methane generation rate.

Typical values for L_0 and k are published by the U.S. EPA's Office of Air Quality Planning and Standards, which develops emission factors for various industries, including landfills. In most cases, emission factors are simply averages of all available data of acceptable quality, and are generally assumed to be representative of long-term averages for all facilities in a particular source category. Emission factors are updated periodically and published in a document entitled "A Compilation of Air Pollutant Emission Factors", which is commonly referred to by its document number, AP-42. The current AP-42 values (November 1998) for wet MSW landfills (25 inches or more of precipitation per year) are k of 0.04 yr^{-1} and a L_0 of 3,200 cubic feet per ton of waste received.

SCS' New York office has analyzed LFG recovery (not generation) from numerous MSW landfill sites in the northeast. The k values for each of these landfills were estimated using actual collection rates measured at the site over multiple years. The average k value of the landfills in the northeast is 0.14 yr^{-1}.

A k value of 0.14 yr^{-1} was selected for the Crossroads Landfill based on the northeast average.

Over the past several years, SCS has also analyzed LFG recovery from over 100 MSW landfill sites across the country to calibrate the LandGEM. Based on this analysis, a L_0 of 3,000 cubic feet per ton best fits the LFG recovery from an average MSW landfill with a comprehensive collection system (assumes a methane content of 50 percent).

Review and adjustment of the k and L_0 values as applied to the C&D quantities are needed. Typical C&D waste consists of bricks, concrete, drywall, wood, dirt, soil and other materials. As noted above, L_0 depends largely on the cellulose content of the refuse. Qualitatively, we expect that C&D waste will have a lower cellulose content than MSW. Based on our experience with actual LFG recovery from dedicated C&D landfills, we selected a L_0 of 1,500 cubic feet per ton.

Values for k depend on the refuse moisture content and other variables noted above. Qualitatively, we expect that the as-received moisture content of C&D waste and nutrient availability are less than that of MSW (due to the lack of wet components such as food waste, sludges, etc.). However, both waste types will be exposed to the same levels of precipitation and landfill conditions. Quantitatively, we estimate that the k value for C&D landfills may be somewhat less than that for MSW/sludge, or is estimated at 0.11 yr^{-1}.

Appendix C contains LFG recovery projections for MSW, sludge, and C&D from the Phase 14 landfill area.

At closure, we estimate that a comprehensive LFG collection system could recover on the order of 2,250 scfm of LFG at 50 percent methane in 2042 (see Appendix C) from Phase 14.

We note that our estimates are expected flows based on the use of the k and L_0 values noted above. At any particular landfill, the actual recovery may exceed or be less than the average, expected flow. Actual recovery usually falls within plus or minus 25 percent of the average, expected flows.

Existing Landfill LFG Recovery Estimates

LFG recovery estimates for Phases 8, 9, 11 and 12 have been updated for Phase 14 (see Exhibit C-3 in Appendix C). In 2042, the peak flow year for all Landfill phases combined, we expect recovery of approximately 2,400 scfm of LFG at 50 percent methane (see Exhibit C-2 in Appendix C).

The assumptions made above in preparation of the LFG models result in predicted recovery that has been greater than actual recovery measured at Crossroads. Therefore, the assumptions generate a conservative estimate of LFG quantities for design of the collection and control system features.

4 LFG SYSTEM MASTER PLAN

This section provides a detailed description of the methods to be used for installation of the gas collection system as required by Maine SWMR Chapter 401.2.F(6)(a)(iv).

The recommended layout for the LFG vertical wells, at closure of the Phase 14 Secure Landfill, is shown in Appendix A. The proposed LFG system will be comprised of three main components: (1) the LFG collection system (vertical wells, leachate pipe cleanouts, surface collectors, and header pipes); (2) the control system; and (3) the condensate management system. The individual components are described below.

LFG COLLECTION SYSTEM

Vertical Extraction Wells

The proposed gas collection system for Phase 14 will include approximately 68 LFG vertical extraction wells installed in the waste mass. The following criteria were used to design the vertical extraction wells:

Exhibit 2. Criteria for Design of Vertical Extraction Wells

Vertical Extraction Well Design Criteria	Phase 14
Maximum well depth (bottom up wells)	Refuse depth minus 10 feet
Minimum well depth (bottom up and drilled wells)	40 feet
Drilled well depth (typical range, as necessary)	60 to 120 feet
Well solid pipe	20 feet from surface
Radius of influence (ROI)	100 feet

Information on the landfill depth (i.e., base and final grades) provided by Geosyntec Consultants was reviewed to estimate the drilled extraction well depths. The base and final elevations were estimated from the liner grades and the proposed final grades. The extraction wells were spaced/located throughout the landfill using the design criteria to cover the majority of the landfill area. The well depths will vary over the landfill as the depth of waste will vary at each well location. Well locations and construction details are shown on Drawing Nos. 3, 4 and 6. All wells will be constructed using Schedule 80 PVC pipe.

Each well will be provided with a well head assembly (see Drawing No. 4). The well head includes a gate valve to permit the adjustment of the well flow rates, and monitoring ports designed to allow the measurement of gas composition.

A ROI of 100 feet for new MSW landfills is typically assumed. The ROI depends on a number of variables including gas generation rate, applied vacuum, and density of the refuse. At the Landfill, SCS expects that the gas generation rate will be lower due to the waste types, but the waste density will be greater than that at a typical MSW landfill. These factors balance, and a 100-foot ROI is appropriate and was used for the vertical well layout (see well layout with ROI in Appendix A).

Bottom-Up Construction of Vertical Wells

WMDSM plans to install vertical extraction wells, during waste placement, in accordance with the details on Drawing No. 6 in Appendix A. After placement of the first lift of waste over the leachate drainage layer, a 10 foot by 10 foot by 10 foot stone drainage pit is excavated down in the vicinity of the leachate collection drainage sand layer. A 10-foot long perforated section of 6-inch HDPE, connected to a 6-inch HDPE lateral, is installed over the stone drainage pit. The well is constructed over the drain pit as filling occurs using a 36-inch HDPE slip well casing, with 8-inch perforated PVC well and stone backfill installed inside the casing. The 6-inch HDPE lateral is extended to a remote wellhead for early collection of landfill gas from the stone drainage pit and from the bottom of the vertical extraction well, constructed over the drain pit. Collection from the bottom of the well minimizes excessive air intrusion. The lateral is replaced at the top of the well, if the initial lateral gets crushed or settles during filling.

Leachate System Pipe Cleanouts

The leachate collection system pipe cleanouts in Phase 14 will be connected to the LFG collection system, using a wellhead assembly. Condensate from low points of the main header may be drained into the cleanouts, as necessary. The well head includes a gate valve to permit the adjustment of the well flow rates, and monitoring ports designed to allow the measurement of gas composition.

Surface Collectors

Surface collectors may be installed during final cap construction. The cross-section of a surface collector is a 12-inch by 1-inch perforated ADS Advanedge pipe, installed in a 6-inch thick sand bedding layer (gas venting sand), directly below the final cover system (see details on Drawing No. 5 in Appendix A). The perforated ADS Advanedge pipe transitions to a 4-inch solid HDPE riser and is connected to the LFG collection system. The spacing and length of the surface collector is dependent on the portion of the area to be capped and the need to supplement gas collection within that area.

Header

The Phase 14 landfill is expected to have a loop header around the perimeter of the Landfill and will use sub-headers to connect to the individual wells. The loop header will connect to a new main header installed in the Phase 14 perimeter access road and main Facility road, to deliver gas to the inlet of the LFGE facility.

The following design criteria were used to locate and size the main header:

- Assume 2,600 cfm of LFG for Phase 14 flow (includes 15% contingency).
- Header pipe size selected so that the LFG velocity does not exceed 20 feet per second with countercurrent flow of gas and condensate and a maximum friction loss of 1 inch of water column per 100 feet of pipe.
- Minimum header size: 6 inches.
- Minimum lateral size: 6 inches.
- Header pipe placed at a minimum 5 percent grade in landfill areas to allow gravity drainage of condensate.
- Condensate drains to the main loop header or, in the case of remote wellheads, condensate drains back into the wells/cleanouts. Main loop header drains to surface water leachate collection cleanouts, leachate cleanouts and risers, or to the LFGE facility.
- Minimize low points.

All header and lateral piping is primarily SDR 17 HDPE (PE 3608/3408 or PE4710) pipe. Header pipe will be installed in corrugated metal or polyethylene pipe at road crossings.

The header system will be divided into segments, each of which is controlled by butterfly valves. The primary purpose of these valves is to allow for the isolation of different sections of the well field. By closing the appropriate butterfly valves, malfunctioning or damaged components can be isolated, investigated, and repaired without shutting down the entire system.

The isolation valve details are shown on Drawing No. 4. The monitoring port on the upstream side of the butterfly valves allow for measurement of pressure and gas composition.

The Phase 14 header and lateral system will be designed during staged construction of the Phase 14 landfill. The main pipeline from the Phase 14 landfill to the LFGE facility is expected to be 24-inch SDR 26 HDPE. The main header sizing calculations are included in Appendix D.

LFG CONTROL SYSTEM

The existing permitted blower/flare station and LFGE facility will continue to combust LFG collected from the Landfill. The LFGE facility is expected to be the primary control device for the LFG collected from the Phase 14 landfill. WMDSM plans to relocate the Phase 8/9 flare adjacent to the LFGE facility. This will allow collection from all Landfill areas to a central location for control. A summary of the expected LFG recovery potential for various years and the existing control capacity is provided in Exhibit 3 below.

Exhibit 3. LFG Recovery Potential and Control Capacity.

Year	LFG Recovery Potential- Facility Total (scfm)	LFGE Capacity (1) (scfm)	Excess LFG (Flared) (scfm)
2024	1,900	1,550	350
2030	2,200	1,550	650
2042	2,400	1,550	850

(1) Includes installation of the third engine at the LFGE.

During periods when the LFGE facility capacity is exceeded, the existing flares will be operated to combust excess LFG. WMDSM will also evaluate the possibility of installation of a larger third engine at the LFGE facility, then what is currently permitted. There is sufficient flare capacity to combust all collected LFG during downtime of the LFGE facility.

During preparation of construction documents, WMDSM will evaluate the vacuum and flow capacity of each blower on the flare skids and of the compression system at the LFGE facility to ensure they are capable of overcoming the estimated head losses in the Phase 14 pipeline and collection piping and provide sufficient vacuum at each collection device. Upgrades will be made to the blower and compression systems as appropriate at the time of construction and could include replacement of existing blowers or installation of a booster blower on the Phase 14 pipeline.

CONDENSATE MANAGEMENT

The Phase 14 landfill loop header is expected to slope from high points at the top of the landfill and various points on the landfill side slopes. Condensate drains from low points on the loop header to leachate cleanouts located around the perimeter of the Phase 14 landfill.

All sub-headers will drain into the loop header. All condensate in the vicinity of the Landfill will ultimately drain to the leachate collection system. As such, condensate will continue to be managed in the same way that leachate is managed, which includes temporary storage in on-site tanks and then trucking to off-site treatment plants.

Condensate management in the main header from Phase 14 to the LFGE facility will be managed, as necessary, via pump stations and force mains. Condensate will be pumped in the leachate collection system.

MIGRATION POTENTIAL

Concerning Maine SWMR Chapter 401.2.F(6)(a)(ii), we do not expect gas migration to occur at the Phase 14 landfill, as it will be a fully lined landfill. With that said, permanent LFG probes will be positioned around the landfill and monitored routinely to ensure the absence of LFG migration.

Based on a review of perimeter gas migration monitoring probe data from 2016 through 2019, there has been no migration of landfill gas from the existing landfill areas.

ENHANCED LIQUIDS MANAGEMENT

WMDSM expects to request approval for an alternative final cover system for Phase 14 as has been approved for the Phase 8 landfill. It is our understanding that leachate recirculation will be conducted in the landfill areas where the alternative final cover system will be installed. WMDSM will ensure that these liquids are properly managed, and that the LFG generated as a result of introducing these liquids is collected and directed to the LFGE facility.

WMDSM plans to implement their corporate-developed 'Enhanced Gas and Liquids Management for Deep and Wet Landfills' Guidance Plan at the Phase 14 landfill to effectively collect LFG, remove liquids, and prevent heat accumulation within the waste. Features to enhance gas and liquids removal are focused primarily on enhanced drainage in the waste around and within gas wells; details of these features will be developed during preparation of construction-level documents as incremental stages of the gas collection and control system (GCCS) are installed.

5 PHASE 14 STAGED INSTALLATION

The Phase 14 LFG collection and control system will be installed on an incremental basis corresponding with the fill progression of the landfill. The vertical extraction wells will be installed from the bottom up, as appropriate. Alternatively, vertical extraction wells will be installed as the waste reaches final grades. Horizontal collectors may also be used as an interim measure for gas collection corresponding with the fill progression of the landfill.

Upon closure of Phase 14, a determination will be made as to whether the horizontal collectors are sufficient to control LFG odors/migration in combination with the remaining vertical extraction wells. A comprehensive evaluation will be performed at the time of final closure to determine the configuration of the final gas collection and control system. The evaluation will be based on the existing collection system performance, site specific gas generation conditions and projections of future gas generation. The evaluations and final gas collection and control system configuration will be submitted to Maine Department of Environmental Protection (MEDEP) for review and approval.

LFG HORIZONTAL COLLECTORS

The horizontal collection trenches will be constructed along the top of a completed lift, as needed. The cross-section of a trench will be a minimum 2-foot wide by 2-foot deep. Perforated HDPE pipe will be placed in a trench filled with tire chips, or other suitable material, and geotextile will be placed over the top of the trench.

The collectors will be spaced approximately 100 feet apart from each other in the horizontal direction and about 75 feet away from the nearest side slope. A minimum of 75 feet of solid HDPE will connect the perforated sections of the collectors to the loop header. A valve and monitoring port will be installed at the loop header connection to control and monitor vacuum to the collector.

6 AIR PERMITTING CONSIDERATIONS

This section provides a review and discussion of state and federal air permitting requirements for the Phase 14 landfill.

Chapter 400.4.G(2)(a) requires that evidence of an air emission license has been or will be obtained, if required. The Landfill currently operates in accordance with Part 70 Air Emission License Renewal with Amendment (A-816-70-C-R/A), issued on July 18, 2014, and the following amendments:

- Amendment #1 (A-816-70-E-A), issued on April 5, 2016.
- Amendment #2 (A-816-70-F-A), issued on December 9, 2016.
- Amendment #3 (A-816-70-G-A), issued on April 1, 2019.

WMDSM will apply for a New Source Review license amendment and modification to the Part 70 Air Emission license for the Phase 14 landfill, prior to commencement of construction and filling of the first cell.

As required by Maine SWMR Chapter 401.2.F(6)(b), we note that WMDSM has historically been subject to 40 CFR Part 60, Subpart WWW, New Source Performance Standards (NSPS) for Municipal Solid Waste Landfills. WMDSM has calculated the non-methane organic compound (NMOC) emission rate from the landfill using a Tier 2 analysis, in accordance with the Subpart WWW regulations. Since the NMOC emission rates has historically been below 50 megagrams per year (Mg/yr), the facility is not required to install a gas collection and control (GCCS) system that complies with Subpart WWW.

However, on June 30, 2019, the Landfill became subject to Subpart XXX regulations, due a license received on January 13, 2017 for the modification of the final waste grades of the Phase 8 landfill. WMDSM is in the process of submitting the Initial Design Capacity and NMOC Emission Rate Reports, in accordance with the Subpart XXX timeline. If the NMOC emission rates exceed 34 Mg/yr, the facility will be required to install a GCCS that complies with Subpart XXX.

As such, the GCCS, described above and depicted on the drawings, are designed to be compliant with Subpart XXX should the Landfill become subject to the collection and control requirements of NSPS in the future. Specifically, the GCCS proposed in this design package will meet the requirements set forth in *§60.762 – Standards for Air Emissions from Municipal Solid Waste Landfills and §60.769 - Specifications for Active Collection Systems.*

7 OPERATIONS AND ODOR CONTROL

OPERATIONS

Concerning Maine SWMR Chapter 401.2.F(6)(a)(iii), WMDSM maintains and implements a GCCS Operations and Monitoring Plan (GCCS O&M Plan) for the entire site. The most recent revision of the GCCS O&M Plan is dated December 2016. The GCCS O&M Plan will be updated when the initial Phase 14 GCCS is installed and with each expansion of the Phase 14 GCCS thereafter. The updates will include a description of the Phase 14 GCCS devices, the Phase 14 pipeline and the condensate management system. Operational, monitoring, maintenance and recordkeeping parameters will be updated as appropriate.

The purpose of the GCCS O&M Plan is:

- To document the goals of the GCCS;
- To describe the GCCS;
- To specify operational and monitoring requirements; and
- To specify record keeping and reporting requirements.

The GCCS O&M Plan was prepared to be a technical guide for the owner and operator (i.e., WMDSM). A routine operation and monitoring program is required to adequately maintain efficient LFG collection and control. Over time, adjustments to the extraction rates may be necessary. The need for adjustment is indicated through routine monitoring of the collection devices. Measurements may also reveal operational problems such as obstructions in the LFG conveyance or condensate drainage pipes or issues with the mechanical components of the system. Additionally, WMDSM will remain alert to activities and changing conditions at the landfill that could decrease the effectiveness of the GCCS.

ODOR CONTROL

Chapter 400.4.G(2)(c) through (e) requires identification of any sources of odors from the facility, an estimation of the area that would be affected by the nuisance odor, and the proposed process to control, reduce or eliminate odors. There are two main sources of odors at the Landfill: waste disposal operations and landfill gas.

Odor-control inspections will be conducted on a regular basis in the areas of active waste disposal (i.e., during normal operations in the Phase 14 area). This monitoring will be conducted, as needed, in order to ensure the effectiveness of the gas collection system that will be installed during the ongoing operations and in order to ensure that the operational odor controls are effective. These odor control procedures include:

- Installation of daily and intermediate cover to minimize exposed waste surfaces;
- Installation and operation of an active landfill gas management system in the areas where waste has been placed;
- Regular monitoring, maintenance, and adjustments to the landfill gas management system to ensure it is functioning as intended; and
- WMDSM's on-going commitment, if necessary, to the application of misting water and /or odor neutralizing agents.

In addition, to further reduce nuisance odor emissions, the waste hauling trucks are required to be covered.

These measures will reduce the potential for fugitive odors. In addition, WMDSM personnel will be on-site throughout the project to make adjustments to the odor control procedures, as necessary, to respond to changing site-specific conditions and to minimize the potential for off-site odors.

We note that the LFG collection system is currently expanded on an annual basis corresponding with the fill progression of the landfill and to ensure any potential odors are addressed. WMDSM plans to approach expansions of the gas collection system at Phase 14 in a similar manner.

Appendix A

Phase 14 LFG Collection and Control System Drawings

PHASE 14 LANDFILL GAS SYSTEM
SOLID WASTE PERMIT APPLICATION
CROSSROADS LANDFILL

WASTE MANAGEMENT DISPOSAL SERVICES OF MAINE, INC.

SEPTEMBER 2019, REVISION 0

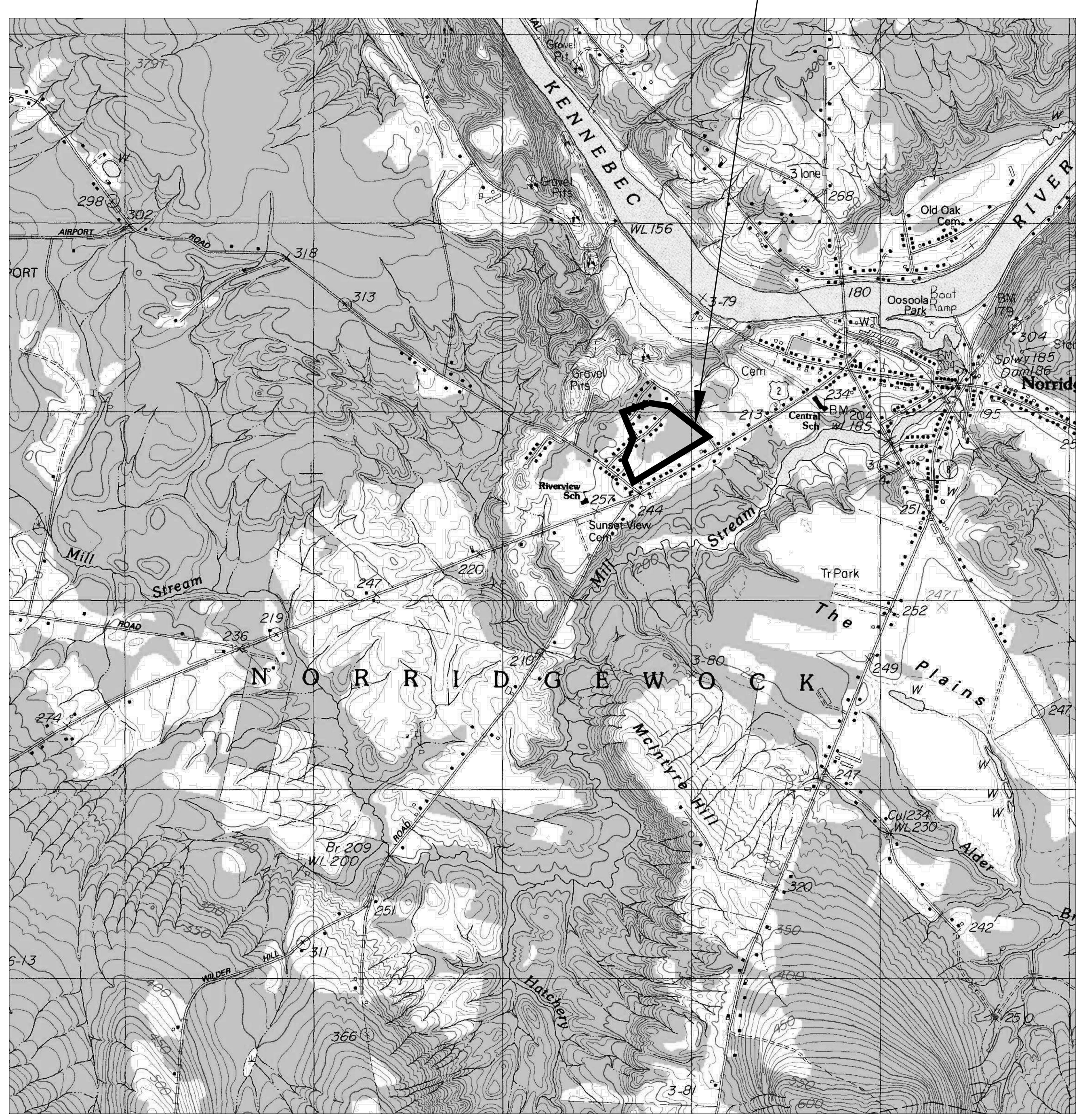
PREPARED FOR:

WASTE MANAGEMENT DISPOSAL
SERVICES OF MAINE, INC.
357 MERCER ROAD
NORRIDGEWOCK, ME

PREPARED BY:

SCS ENGINEERS
4 EXECUTIVE BLVD. SUITE 303
SUFFERN, NEW YORK
(845) 357-1510

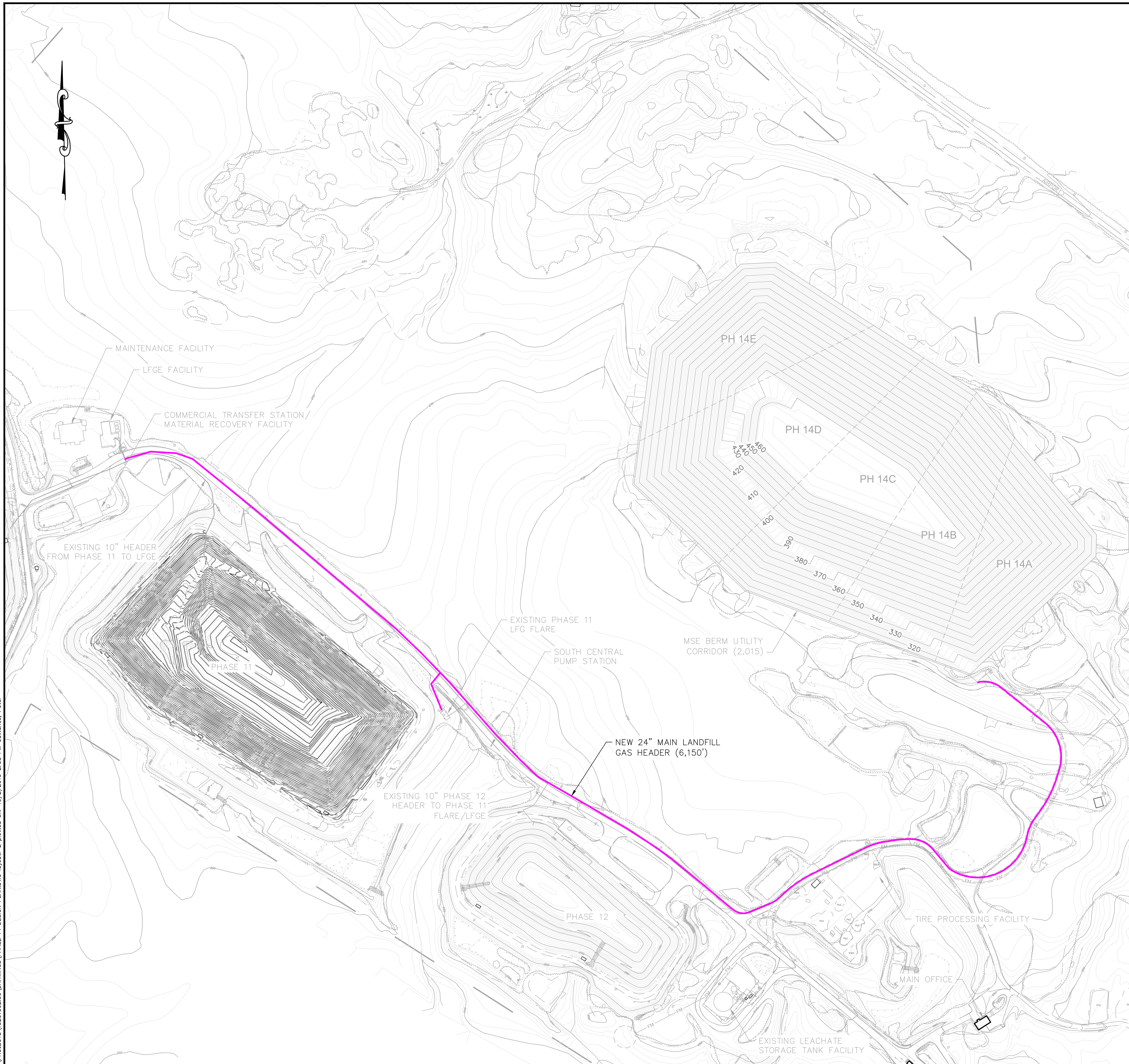
PROJECT LOCATION



LOCATION MAP

SOURCE: BASED ON NORRIDGEWOCK QUADRANGLE MAINE–SOMERSET CO, 7.5 MINUTE SERIES (TOPOGRAPHIC)

INDEX OF SHEETS	
SHEET NO.	DRAWING TITLE
1	COVER SHEET
2	LFG SITE OVERVIEW
3	PHASE 14 LFG SITE PLAN
4	LFG DETAILS 1
5	LFG DETAILS 2
6	LFG DETAILS 3



LEGEND:

FINAL WASTE 10-FT CONTOUR (PHASE 14)
FINAL WASTE 2-FT CONTOUR (PHASE 14)
NEW LFG HEADER/LATERAL

NOTES:

1. FINAL WASTE GRADE INFORMATION BASED ON DRAWING PROVIDED BY GEOSYNTEC ON 8/7/2019 (FILENAME: PHASE 14 TOP OF WASTE.dwg).
2. EXISTING SITE SURFACE INFORMATION BASED ON DRAWING PROVIDED BY GEOSYNTEC ON 8/14/2019 (FILENAME: BE0232 F601 (FULL SITE).dwg).

100 50 0 100 200
SCALE: 1"=100'

NO.	REVISION	DATE
1	ISSUED FOR PERMIT APPLICATION	10/02/19

SHEET TITLE
LFG SITE OVERVIEW

PROJECT TITLE
PHASE 14 LANDFILL GAS SYSTEM
CROSSROADS LANDFILL

CLIENT
WASTE MANAGEMENT DISPOSAL SERVICES OF MAINE, INC.
357 MERCER ROAD
NORRIDGEWOCK, ME

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT CONSULTING ENGINEERS, INC.
4 EXECUTIVE BLVD, SUITE 303, SUFFERN, NY 10901
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PROJ. NO. 13201002.30 | DWN. BY: PSC | Q/A RVW BY: LKW
DSN. BY: LKW | CHK. BY: LKW | APP. BY: LKW

CADD FILE: DESIGN PLAN
DATE: 10/2/2019
SCALE: 1" = 100'
DRAWING NO. 2 of 6

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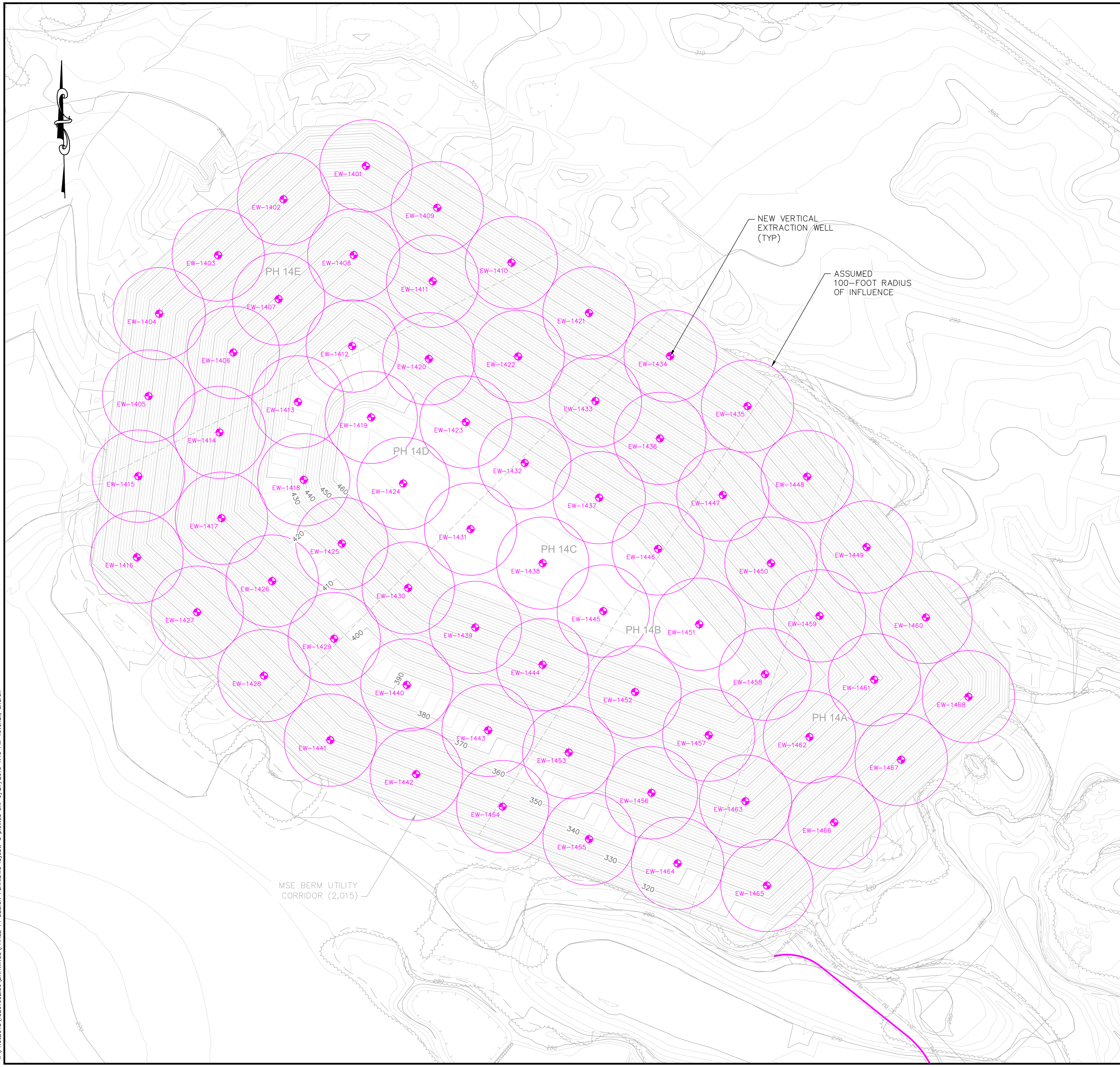

LEGEND:

- FINAL WASTE 10-FT CONTOUR (PHASE 14)
- FINAL WASTE 2-FT CONTOUR (PHASE 14)
- NEW LFG HEADER/LATERAL
- EW-1401 NEW VERTICAL EXTRACTION WELLHEAD

NOTES:

1. FINAL WASTE GRADE INFORMATION BASED ON DRAWING PROVIDED BY GEOSYNTEC ON 8/7/2019 (FILENAME: PHASE 14 TOP OF WASTE.dwg).
2. EXISTING SITE SURFACE INFORMATION BASED ON DRAWING PROVIDED BY GEOSYNTEC ON 8/14/2019 (FILENAME: BE0232 F601 (FULL SITE).dwg).

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SCALE: 1"=100'

NO.	REVISION	DATE
1	ISSUED FOR PERMIT APPLICATION	09/27/19

SHEET TITLE
PHASE 14 LFG SITE PLAN

PROJECT TITLE
PHASE 14 LANDFILL GAS SYSTEM CROSSROADS LANDFILL

CLIENT
WASTE MANAGEMENT DISPOSAL SERVICES OF MAINE, INC.
357 MERCER ROAD
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PROJ. NO. 13201002.30 | DSN. BY: LKW | DWN. BY: PSC | CHK. BY: LKW | Q/A RVW BY: LKW | APP. BY: LKW

CADD FILE: DESIGN PLAN

DATE: 9/27/2019

SCALE: 1" = 100'

DRAWING NO. **3** of **6**

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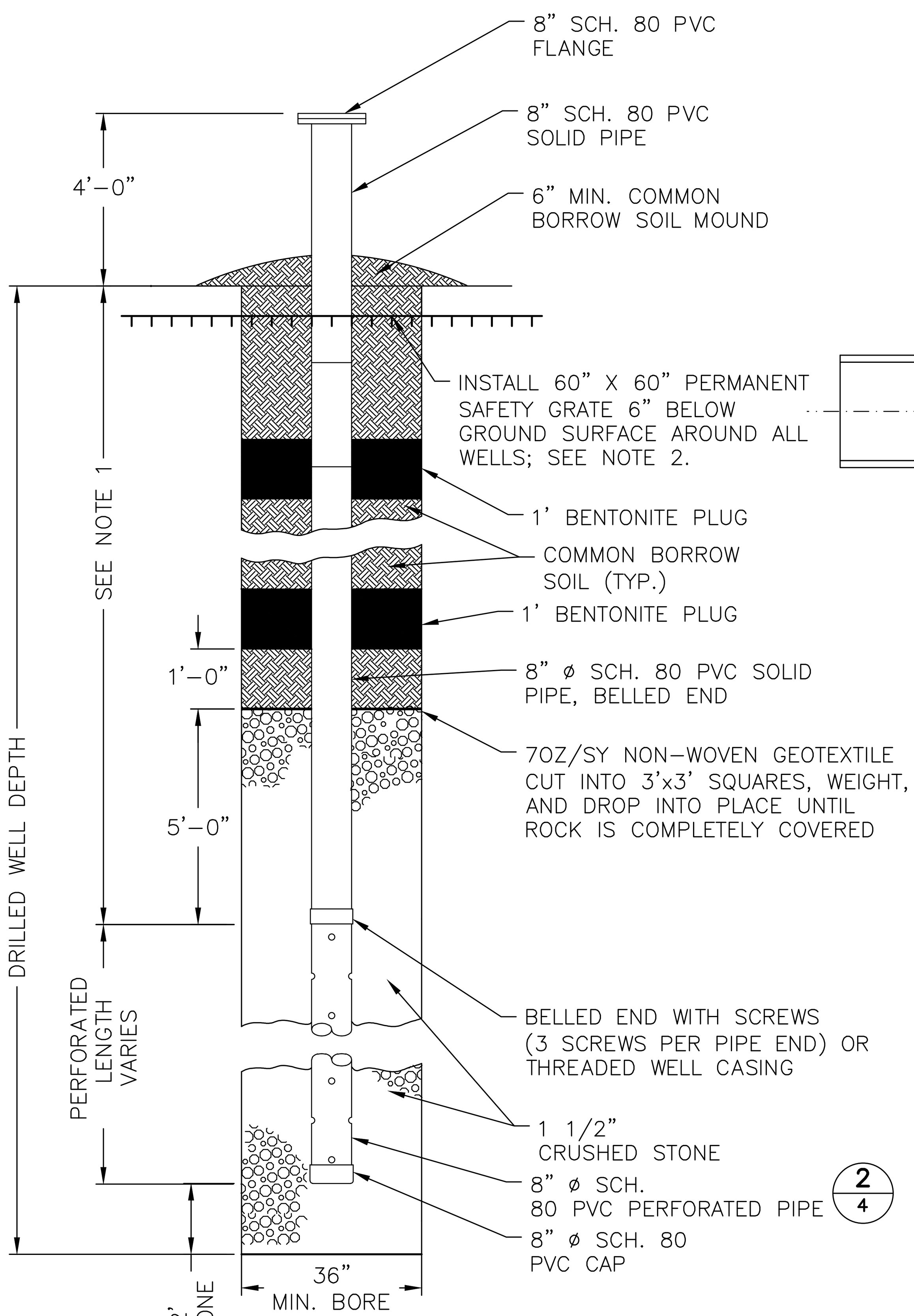
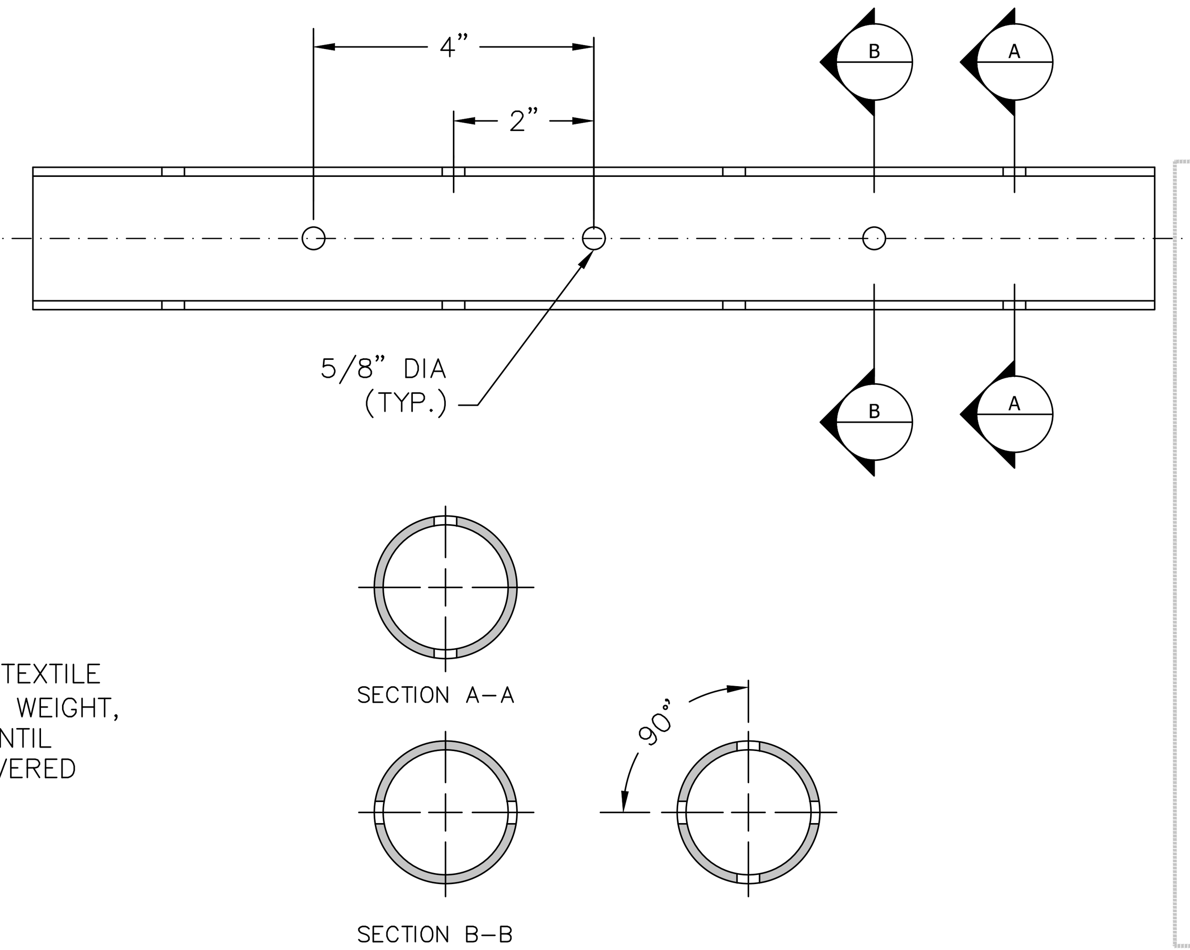


NOTES:

1. SOLID PIPE SHALL EXTEND 20' BELOW GRADE
2. ALLOWABLE OPENING SIZES FOR SAFETY GRATE:
   4" X 2" WITH MIN. WIRE DIAMETER OF 0.25"
   4" X 4" WITH MIN. WIRE DIAMETER OF 0.299"
   4" X 2" WITH MIN. WIRE DIAMETER OF 0.309"
   4" X 2" WITH MIN. WIRE DIAMETER OF 0.309"

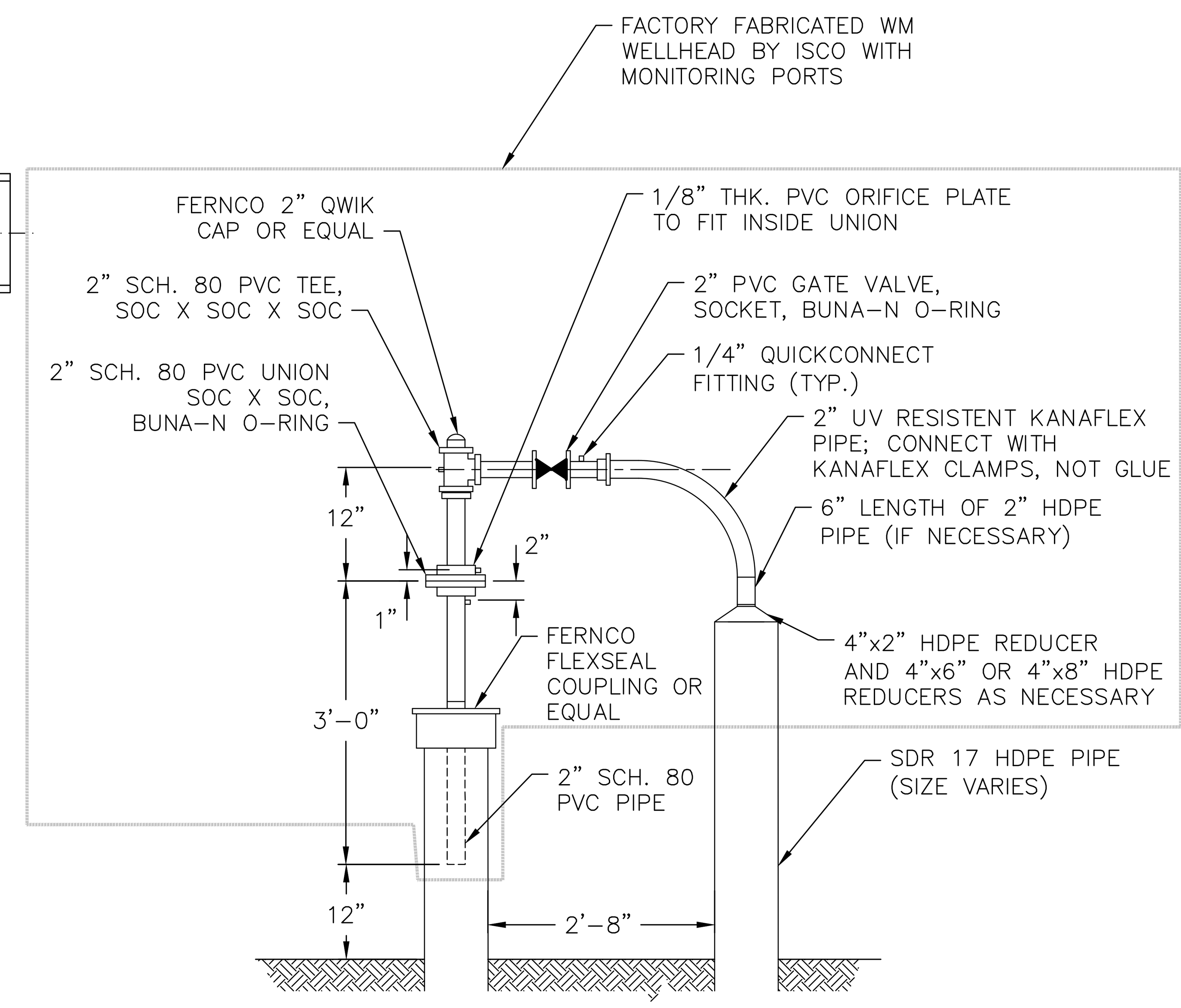
1/4 LFG DRILLED EXTRACTION WELL DETAIL
NTS



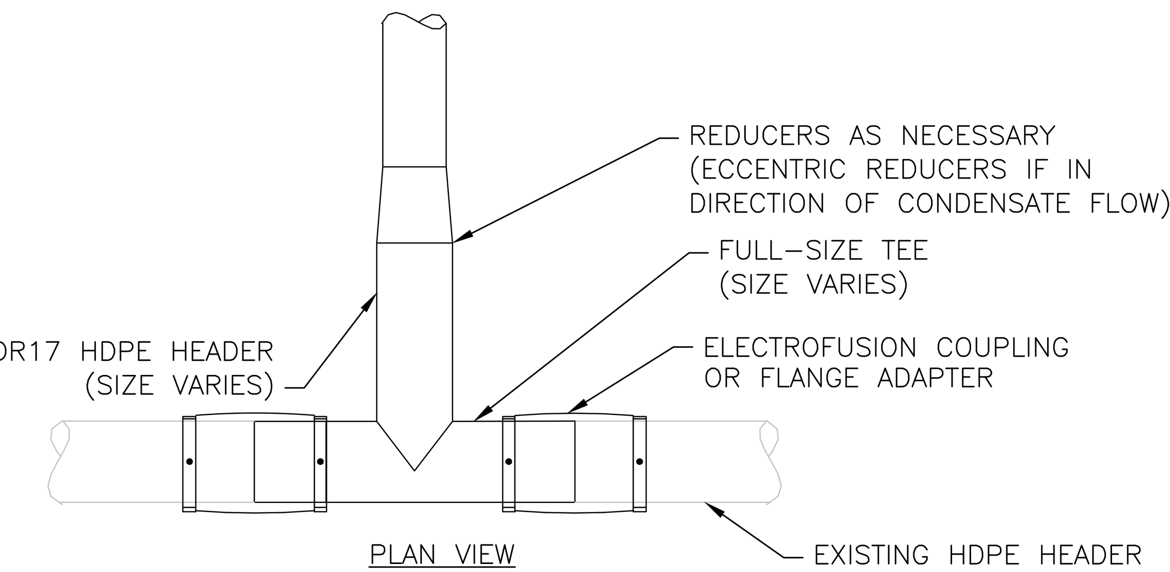
NOTE:

1. PERFORATED PIPE SHALL BE SCH80 PVC FOR VERTICAL EXTRACTION WELLS, AND 6" SDR17 HDPE FOR HORIZONTAL COLLECTORS

2/4 PERFORATED PIPE
NTS



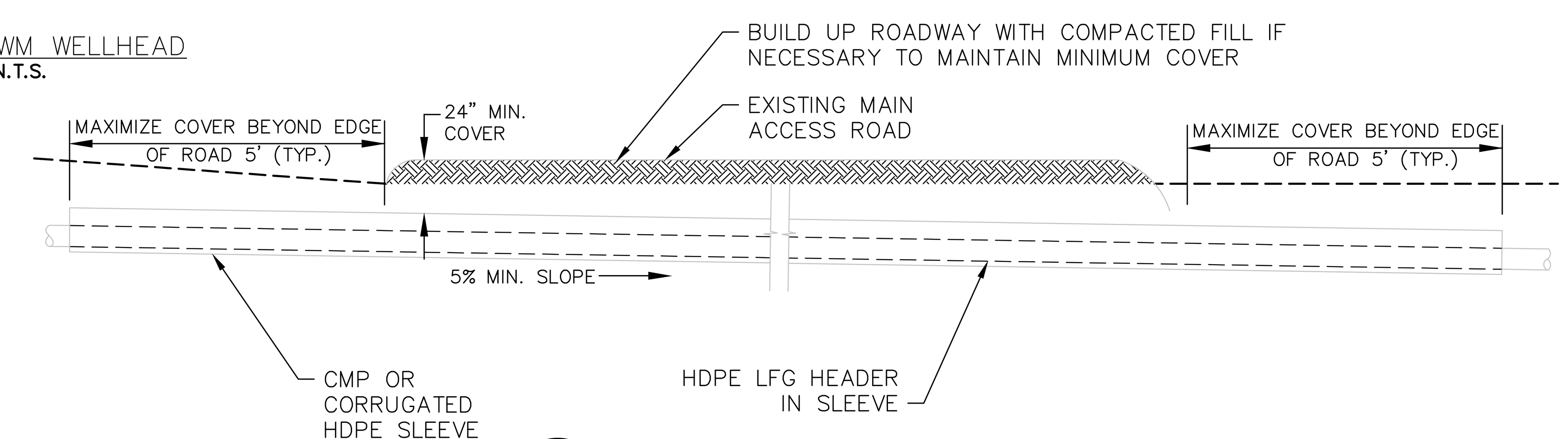
3/4 WM WELLHEAD
N.T.S.



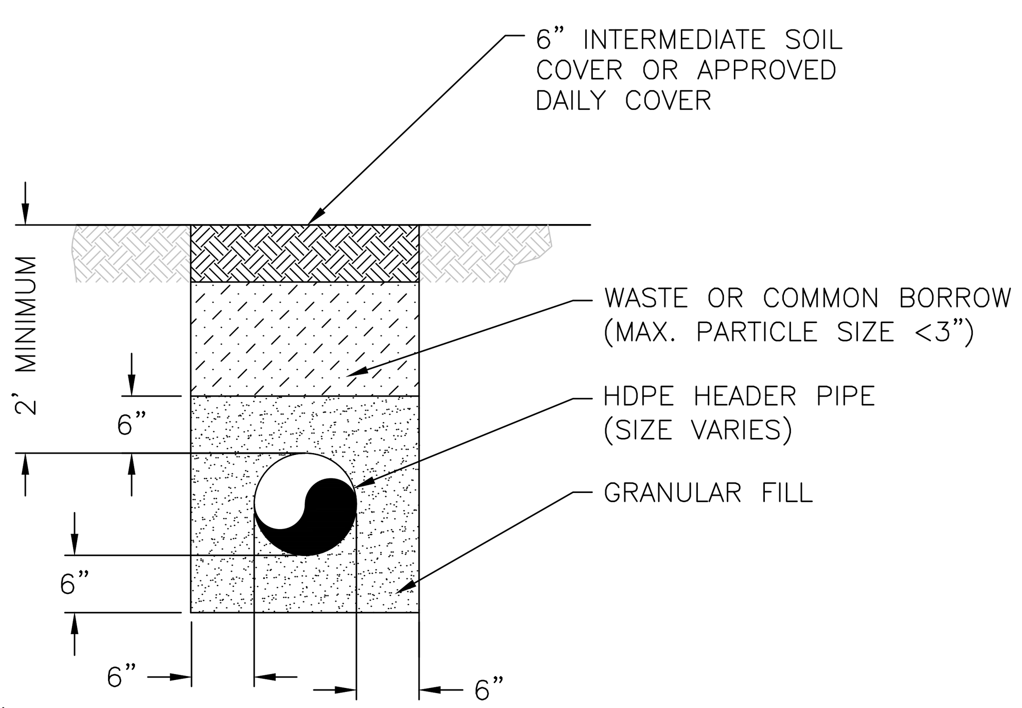
NOTES:

1. COORDINATE TIE–IN AND LFG SYSTEM ISOLATION WITH OWNER.
2. CONTRACTOR WILL DIG TEST PITS TO LOCATE EXISTING HEADER AND DETERMINE ELEVATIONS BEFORE HEADER INSTALLATION.
3. SLOPE HEADER AT 5% MINIMUM TOWARDS LOW POINT.

4/4 TIE–IN TO EXISTING PIPING
NTS



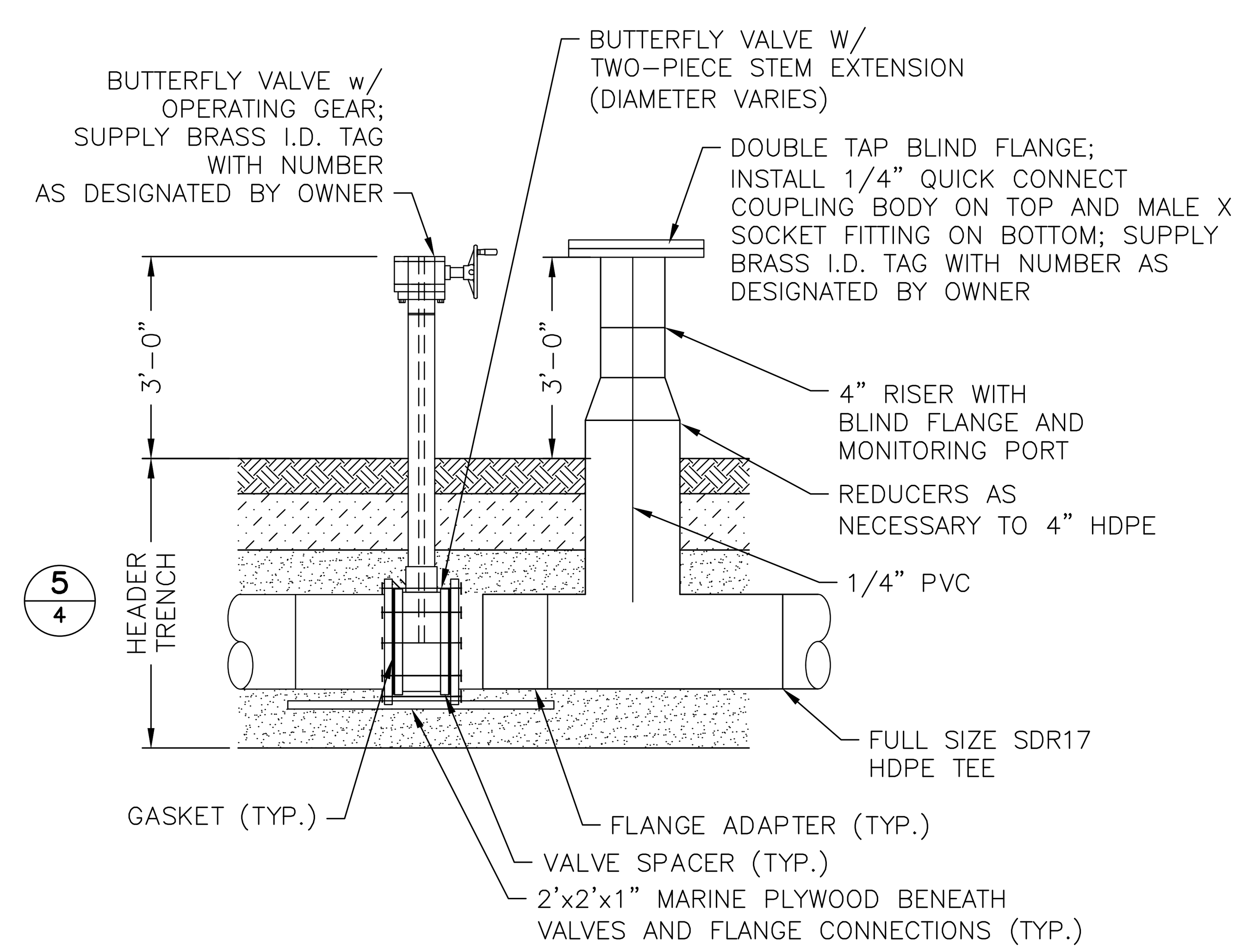
7/4 ROAD CROSSING DETAIL
N.T.S.



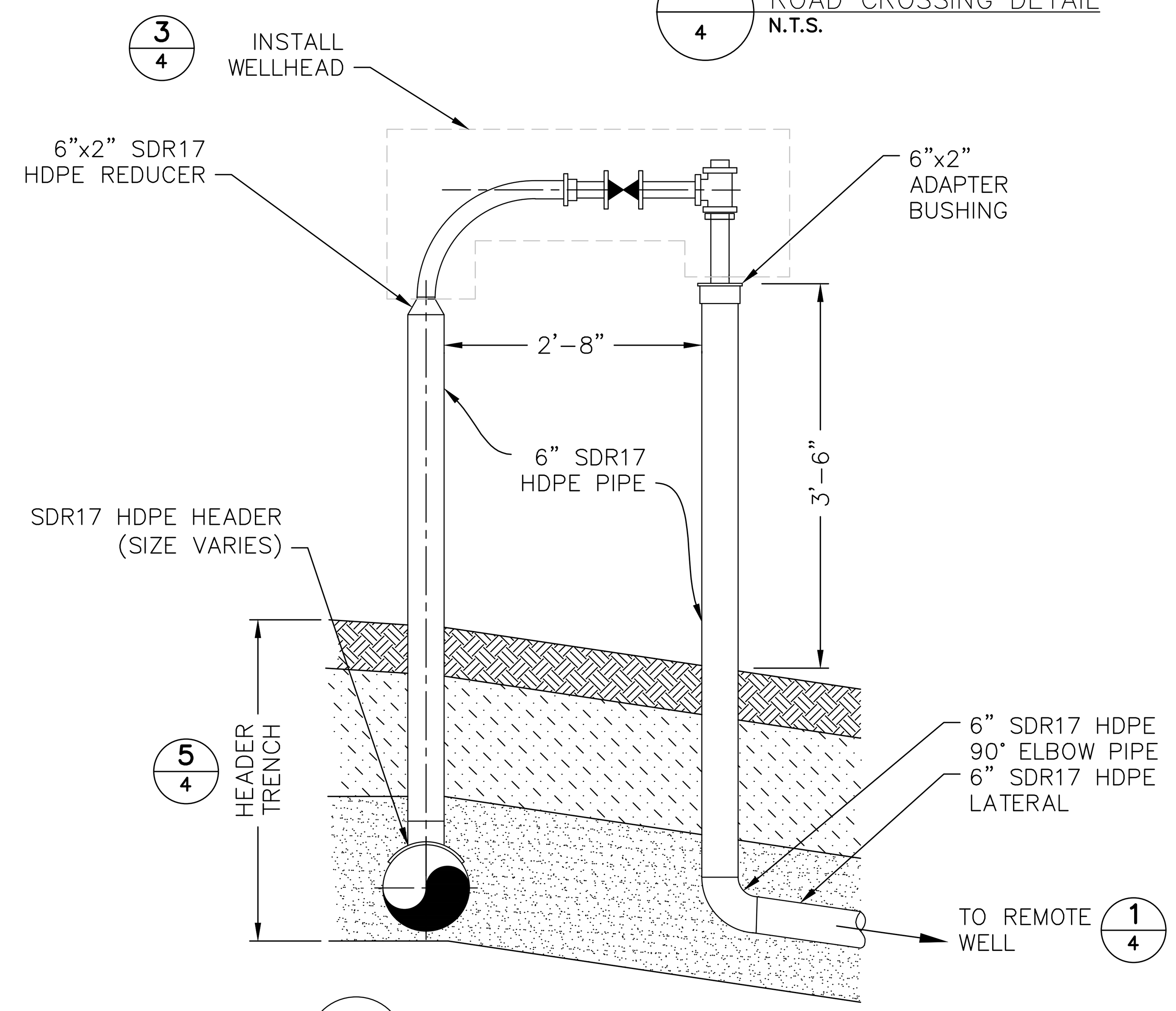
NOTES:

1. SLOPE OF PIPE IN ALL LANDFILL AREAS MUST BE 5% MINIMUM OR AS SPECIFIED. CONTRACTOR MAY NEED TO EXCAVATE DEEPER THAN SHOWN TO MAINTAIN MINIMUM SLOPE.
2. MULTIPLE PIPES MAY BE INSTALLED IN ONE TRENCH.

5/4 LFG HEADER TRENCH
N.T.S.



6/4 BUTTERFLY VALVE AND MONITORING PORT
NOT TO SCALE



8/4 LFG REMOTE WELLHEAD DETAIL
N.T.S.

NO.	REVISION	DATE
1	ISSUED FOR PERMIT APPLICATION	09/27/19

SHEET TITLE: LFG DETAILS 1

PROJECT TITLE: PHASE 14 LANDFILL GAS SYSTEM CROSSROADS LANDFILL

CLIENT: WASTE MANAGEMENT DISPOSAL SERVICES OF MAINE, INC.
357 MERCER ROAD
NORRIDGEWOCK, ME

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT CONSULTING ENGINEERS, INC.
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PROJ. NO. 13201002.30 | DWN. BY: PSC | Q/A RVW BY: LKW
DSN. BY: LKW | CHK. BY: LKW | APP. BY: LKW

CADD FILE: DETAILS
DATE: 9/27/2019
SCALE: AS SHOWN
DRAWING NO. 4 of 6

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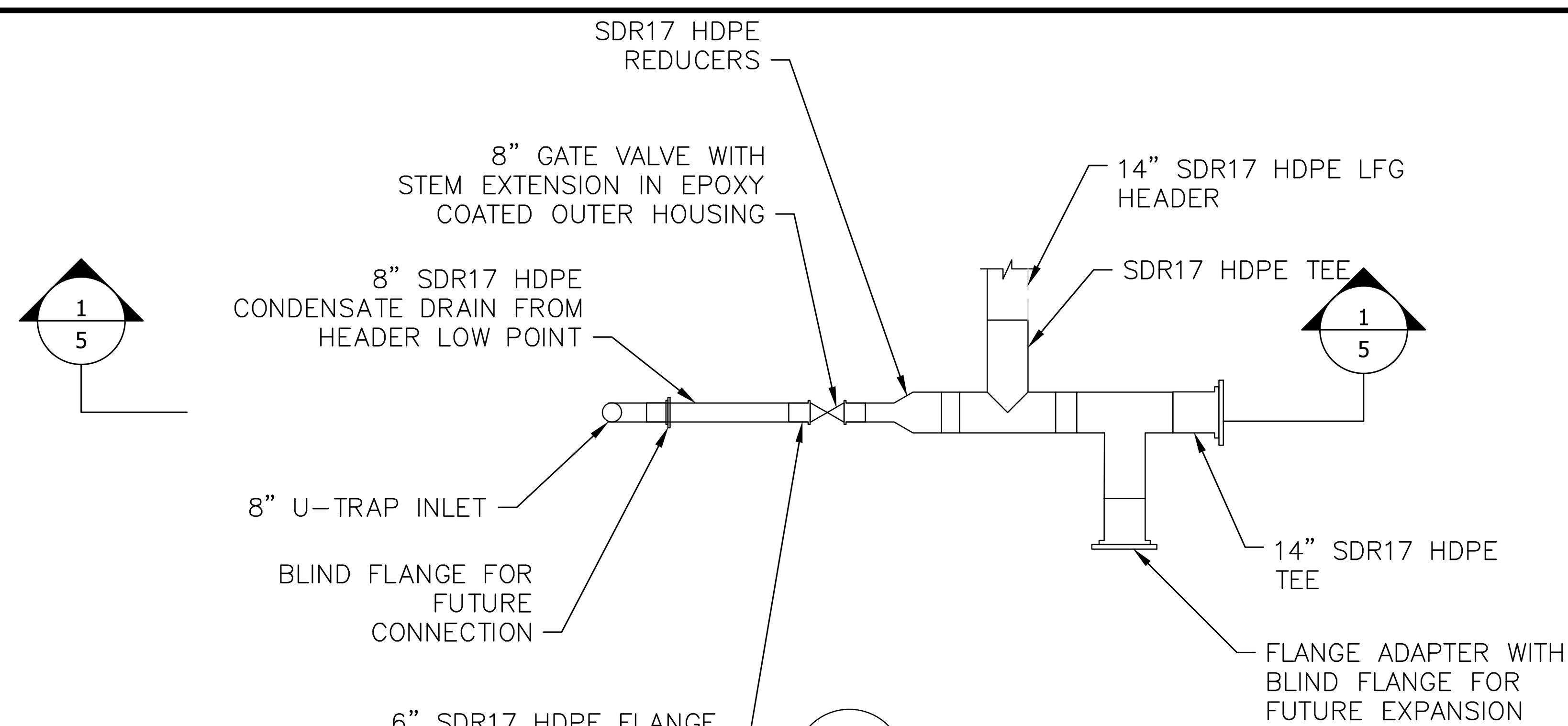
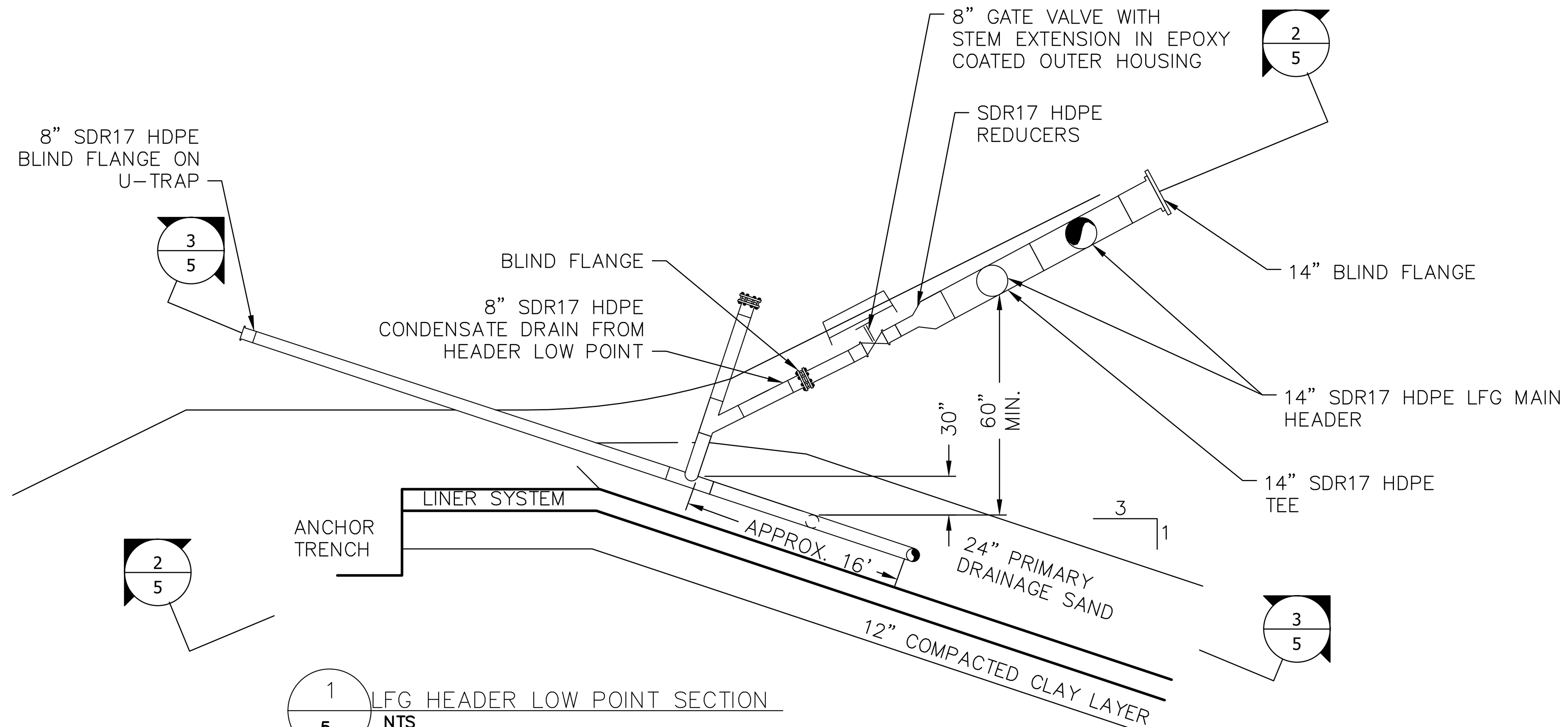
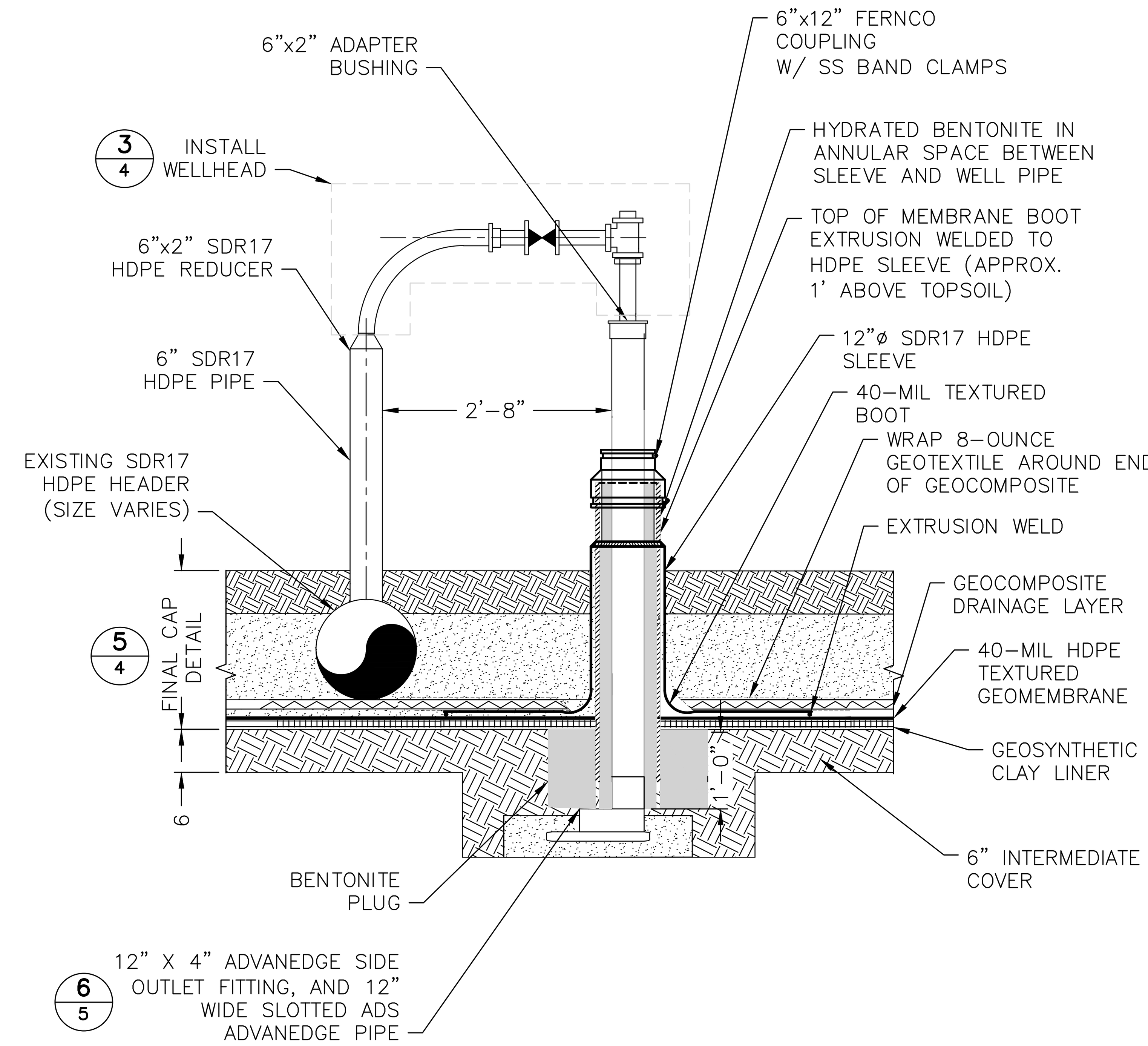


2 / 5 LFG HEADER LOW POINT–PLAN VIEW
NTS



1 / 5 LFG HEADER LOW POINT SECTION
NTS



5 / 5 SURFACE COLLECTOR WELLHEAD AND PIPE BOOT DETAIL
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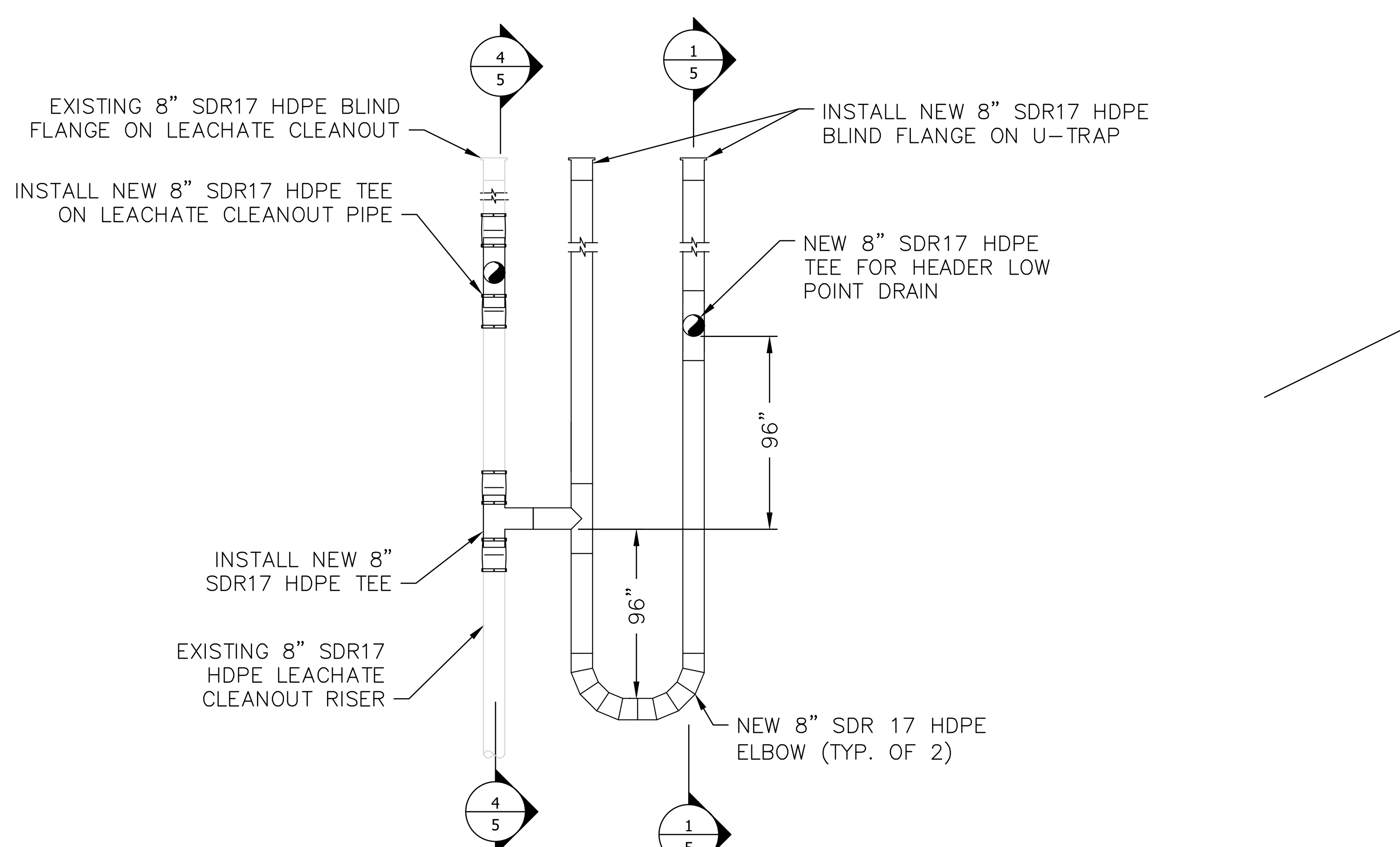
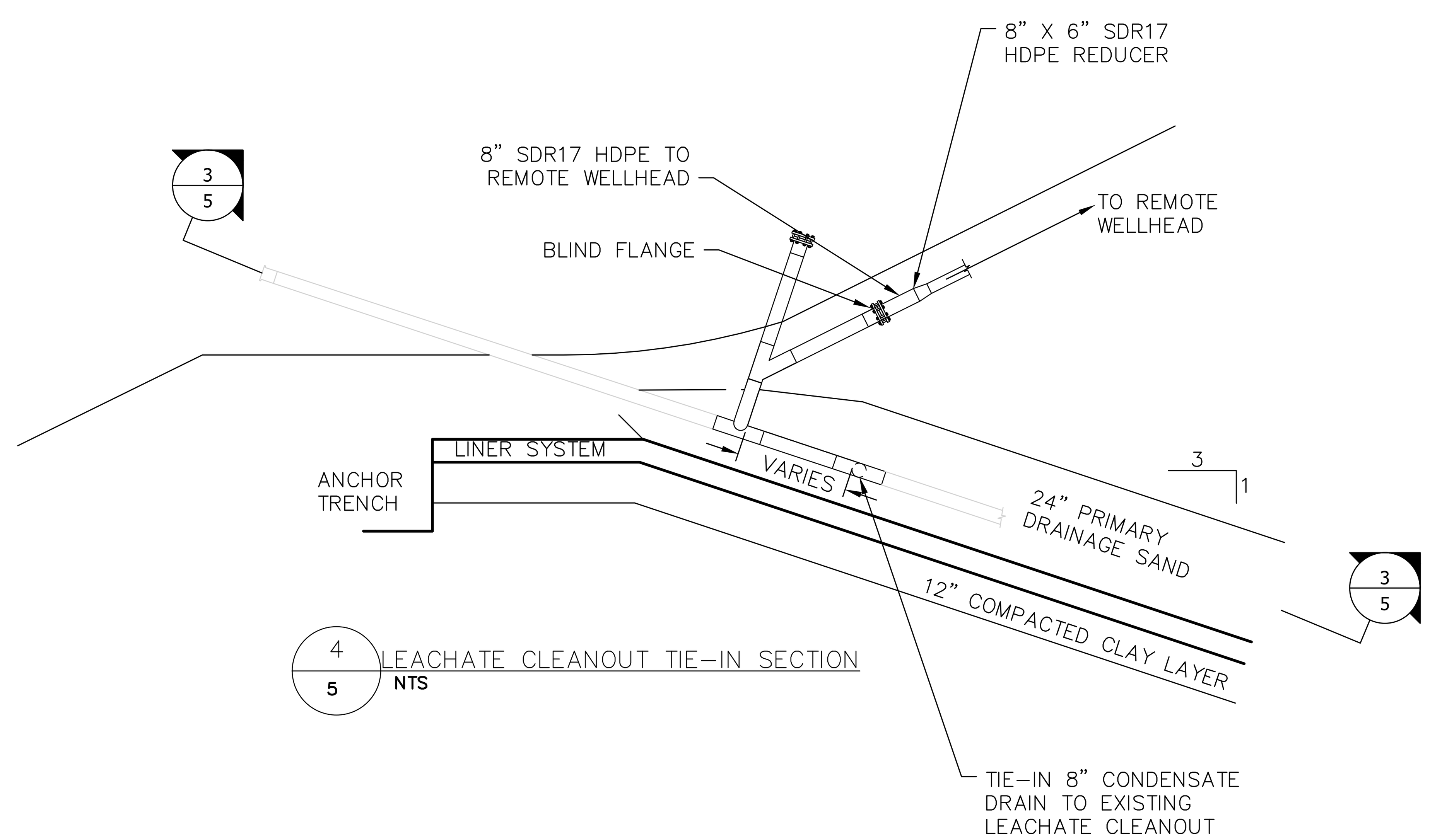


NOTES:

1. THIS DETAIL SHOWS THE PIPING LAID ON THE 3:1 LANDFILL INTERNAL SIDE/SLOPE. A FLATTER SLOPE WILL REQUIRE THE LENGTH BE INCREASED.
2. MAXIMUM TRAP OPERATING VACUUM IS 60 INCHES W.C.

3 / 5 LEACHATE CLEANOUT TIE-IN TRAP-PLAN
NTS



4 / 5 LEACHATE CLEANOUT TIE-IN SECTION
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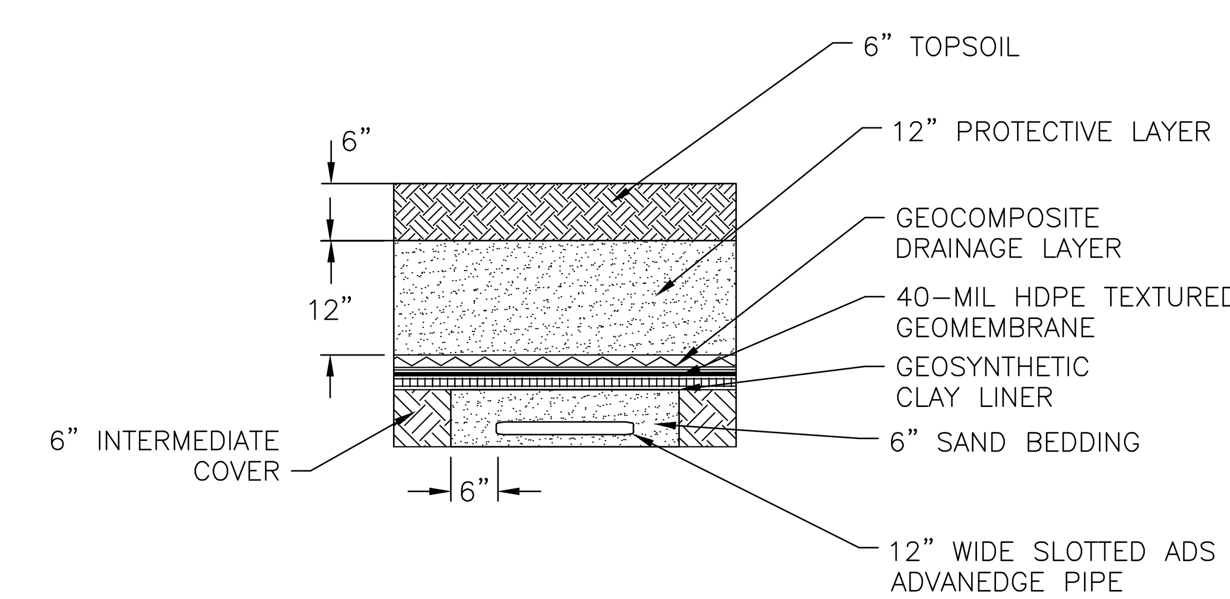

6 / 5 SURFACE COLLECTOR TRENCH DETAIL
N.T.S.

NO.	REVISION	DATE
1	ISSUED FOR PERMIT APPLICATION	10/02/19

SHEET TITLE
LFG DETAILS 2

PROJECT TITLE
PHASE 14 LANDFILL GAS SYSTEM
CROSSROADS LANDFILL

CLIENT
WASTE MANAGEMENT DISPOSAL SERVICES OF MAINE, INC.
357 MERCER ROAD
NORRIDGEWOCK, ME

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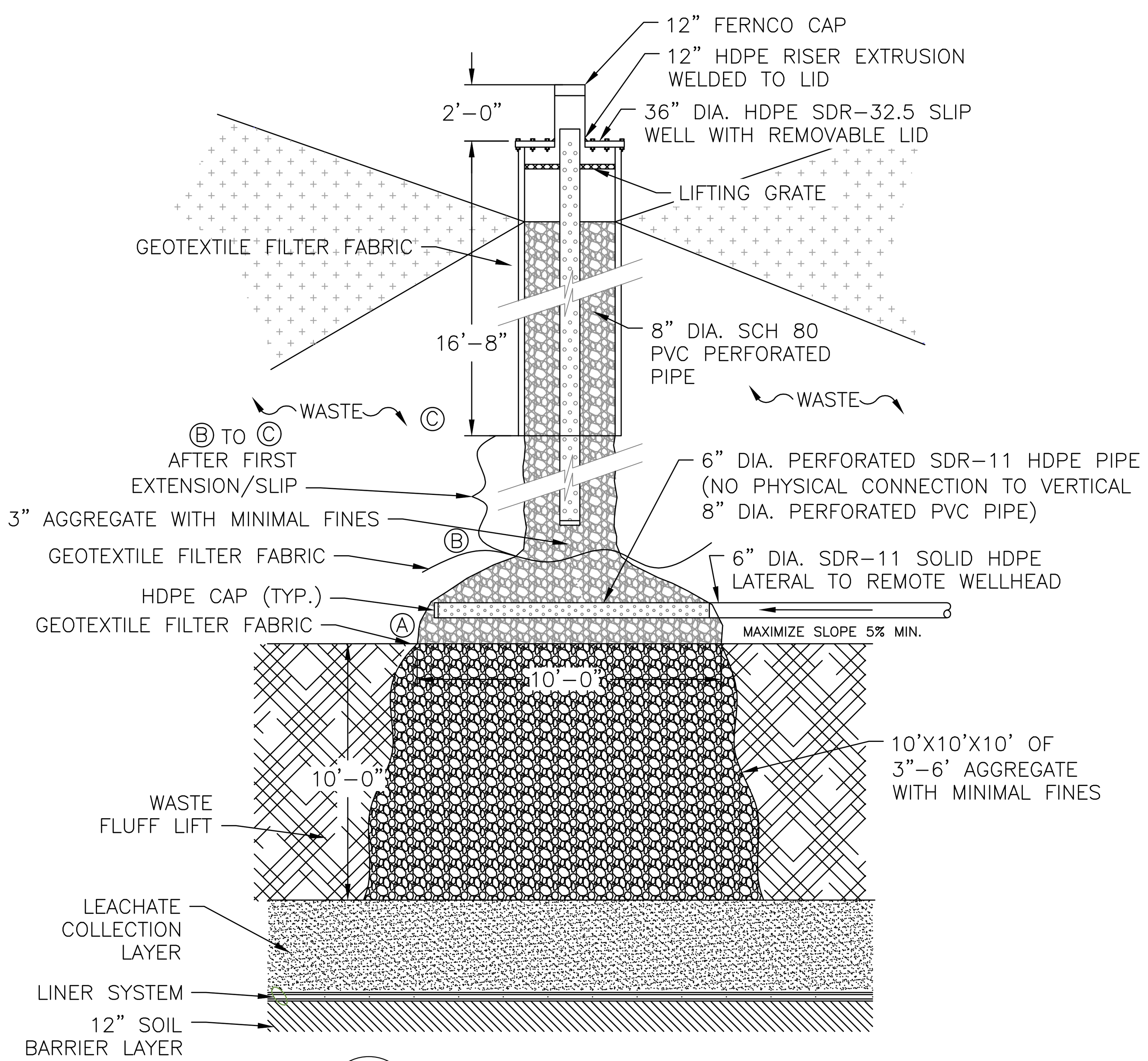
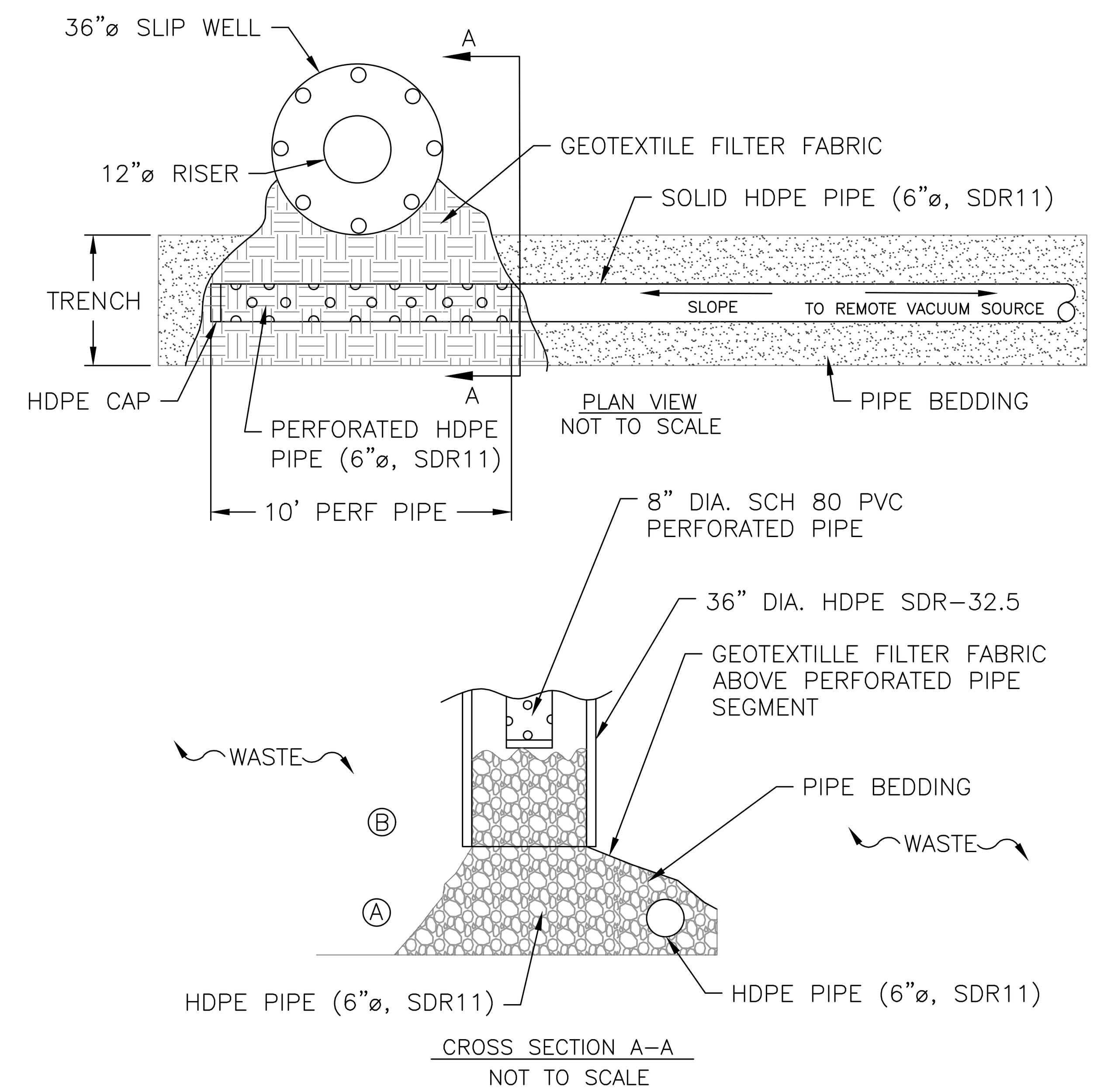
PROJ. NO. 13201002.30 | DWN. BY: PSC | Q/A RVW BY: LKW
DSN. BY: LKW | CHK. BY: LKW | APP. BY: LKW

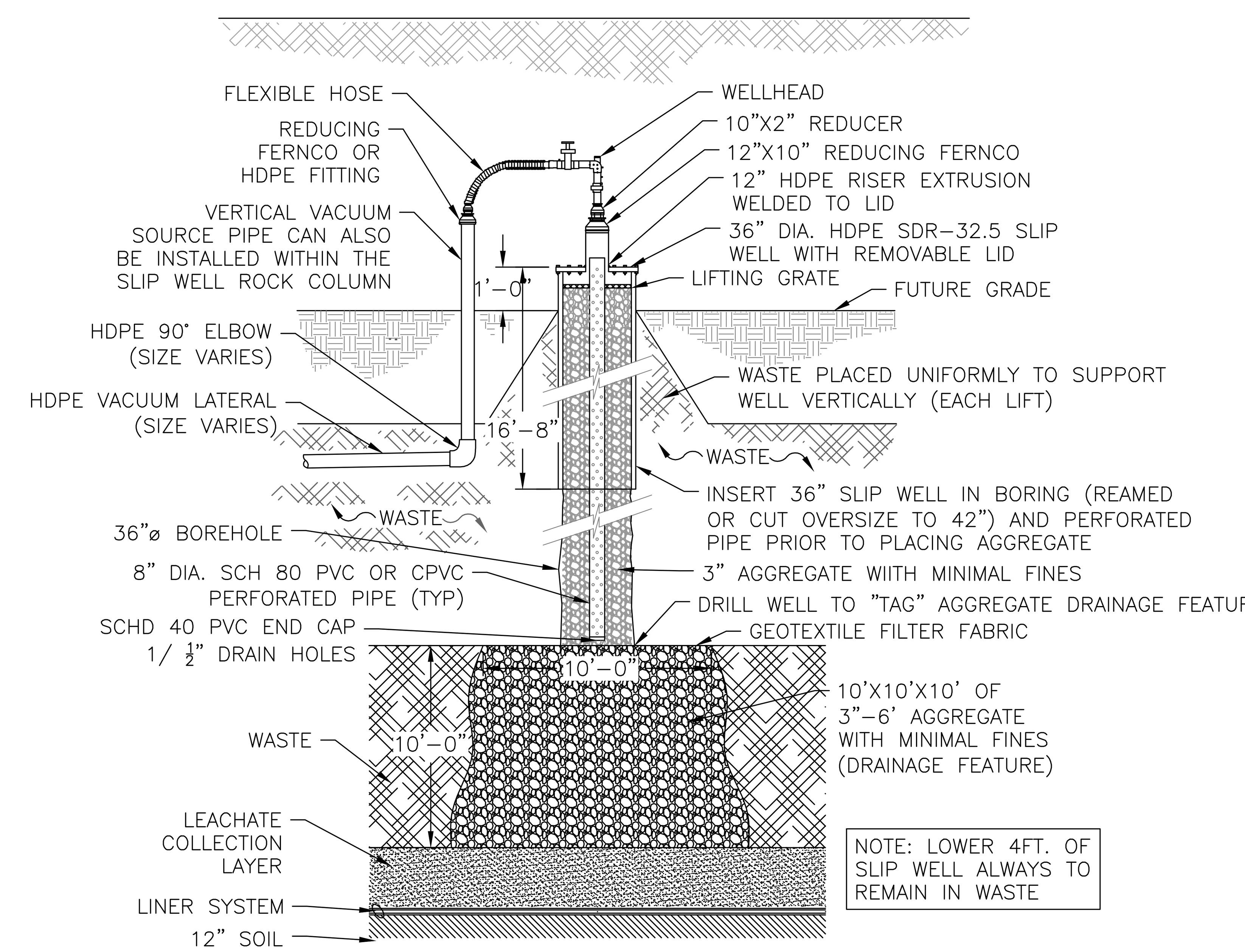
CADD FILE: DETAILS
DATE: 10/02/2019
SCALE: AS SHOWN
DRAWING NO. **5** of **6**



1/6 NO-DRILL COMPLETED SLIP WELL
N.T.S.



2/6 NO-DRILL SLIP WELL
N.T.S.



3/6 DRILLED SLIP WELL
N.T.S.

NO.	REVISION	DATE
1	ISSUED FOR PERMIT APPLICATION	09/27/19

SHEET TITLE
LFG DETAILS 3

PROJECT TITLE
PHASE 14 LANDFILL GAS SYSTEM CROSSROADS LANDFILL

CLIENT
WASTE MANAGEMENT DISPOSAL SERVICES OF MAINE, INC.
357 MERCER ROAD NORRIDGEWOCK, ME

SCS ENGINEERS
STEARNS, CONRAD AND SCHMIDT CONSULTING ENGINEERS, INC.
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PROJ. NO. 13201002.30 | DWN. BY: PSC | Q/A RVW BY: LKW
DSN. BY: LKW | CHK. BY: LKW | APP. BY: LKW

CADD FILE: DETAILS
DATE: 9/27/2019
SCALE: AS SHOWN
DRAWING NO. **6** of **6**

Appendix B

Waste Quantities

Waste Quantities for 2019 LFG Model Update
Crossroads Landfill, Norridgewock, Maine

Year	Phase 14 (1)				
	MSW	C&D	Sludge	Inert	Total
2024	94,500	74,250	30,375	138375	337,500
2025	126,000	99,000	40,500	184500	450,000
2026	126,000	99,000	40,500	184500	450,000
2027	126,000	99,000	40,500	184500	450,000
2028	126,000	99,000	40,500	184500	450,000
2029	126,000	99,000	40,500	184500	450,000
2030	126,000	99,000	40,500	184500	450,000
2031	126,000	99,000	40,500	184500	450,000
2032	126,000	99,000	40,500	184500	450,000
2033	126,000	99,000	40,500	184500	450,000
2034	126,000	99,000	40,500	184500	450,000
2035	126,000	99,000	40,500	184500	450,000
2036	126,000	99,000	40,500	184500	450,000
2037	126,000	99,000	40,500	184500	450,000
2038	126,000	99,000	40,500	184500	450,000
2039	126,000	99,000	40,500	184500	450,000
2040	126,000	99,000	40,500	184500	450,000
2041	126,000	99,000	40,500	184500	450,000
2042	63,700	50,050	20,475	93275	227,500

(1) Phase 14 total projected tonnage provided by WMDSM as included in public benefit determination. Phase 14 capacity is 7,750,000 cy with fill rate of 450,000 tpy and density of 1.06 tons/cy = 18.25 years

Assumed percentages of total projected tonnages provided by WMDSM as is based on the rates included in the public benefit application and an evaluation of current and projected MSW sources

MSW	28%
C&D	22%
Sludge	9%
Other (inert)	41%

Appendix C

LFG Modeling Results

EXHIBIT C-1. LFG RECOVERY PROJECTION
PHASE 14, CROSSROADS LANDFILL, ME

	LFG Recovery Potential			
	MSW	C&D	Sludge	Total
Year	(scfm)	(scfm)	(scfm)	(scfm)
2024	0	0	0	0
2025	142	44	46	232
2026	313	99	101	513
2027	462	148	148	759
2028	591	192	190	973
2029	704	231	226	1,161
2030	801	267	258	1,325
2031	886	298	285	1,469
2032	960	326	309	1,595
2033	1,024	352	329	1,705
2034	1,080	374	347	1,801
2035	1,129	395	363	1,886
2036	1,171	413	376	1,960
2037	1,207	429	388	2,025
2038	1,239	444	398	2,081
2039	1,267	457	407	2,131
2040	1,291	469	415	2,175
2041	1,312	479	422	2,213
2042	1,330	488	428	2,246
2043	1,252	468	403	2,122
2044	1,089	419	350	1,857
2045	946	375	304	1,626
2046	823	336	264	1,423
2047	715	301	230	1,246
2048	622	270	200	1,091
2049	541	242	174	956
2050	470	216	151	838
2051	409	194	131	734
2052	355	174	114	643
2053	309	156	99	564
2054	268	139	86	494
2055	233	125	75	433
2056	203	112	65	380
2057	176	100	57	333
2058	153	90	49	292
2059	133	80	43	257
2060	116	72	37	225
2061	101	65	32	198

	MSW	C&D	Sludge
Methane Content of LFG Adjusted to	50%	50%	50%
Selected Decay Rate Constant (k):	0.140	0.110	0.140
Selected Ultimate Methane Recovery Rate (Lo), cu ft/ton:	3,000	1,500	3000

EXHIBIT C-2. LFG RECOVERY PROJECTION - FACILITY-WIDE
CROSSROADS LANDFILL, ME

Year	LFG Recovery Potential			
	Phase 14 Total (scfm)	Phase 8/9 Total (scfm)	Phase 11/12 Total (scfm)	Facility Total (scfm)
2024	0	1,778	78	1,856
2025	232	1,637	68	1,937
2026	513	1,432	59	2,004
2027	759	1,253	52	2,063
2028	973	1,097	45	2,115
2029	1,161	960	39	2,160
2030	1,325	840	34	2,200
2031	1,469	736	30	2,235
2032	1,595	644	26	2,265
2033	1,705	564	23	2,292
2034	1,801	494	20	2,316
2035	1,886	433	18	2,337
2036	1,960	380	15	2,355
2037	2,025	333	13	2,371
2038	2,081	292	12	2,385
2039	2,131	256	10	2,397
2040	2,175	224	9	2,408
2041	2,213	197	8	2,417
2042	2,246	173	7	2,426
2043	2,122	151	6	2,280
2044	1,857	133	5	1,996
2045	1,626	117	5	1,747
2046	1,423	102	4	1,530
2047	1,246	90	4	1,340
2048	1,091	79	3	1,174
2049	956	69	3	1,028
2050	838	61	2	901
2051	734	54	2	790

EXHIBIT C-3. LFG RECOVERY PROJECTION

PHASE 8/9, CROSSROADS LANDFILL

	LFG Recovery Potential			
	MSW	Sludge	C&D	TOTAL
Year	(scfm)	(scfm)	(scfm)	
2020	1,065	235	311	1,611
2021	1,116	266	338	1,719
2022	1,138	285	355	1,779
2023	1,137	295	364	1,797
2024	1,115	297	366	1,778
2025	1,019	274	343	1,637
2026	886	239	308	1,432
2027	770	207	276	1,253
2028	669	180	247	1,097
2029	582	157	221	960
2030	506	136	198	840
2031	440	118	177	736
2032	382	103	159	644
2033	332	90	142	564
2034	289	78	128	494
2035	251	68	114	433
2036	218	59	102	380
2037	190	51	92	333
2038	165	44	82	292
2039	144	39	74	256
2040	125	34	66	224
2041	108	29	59	197
2042	94	25	53	173
2043	82	22	47	151
2044	71	19	42	133
2045	62	17	38	117
2046	54	15	34	102
2047	47	13	31	90
2048	41	11	27	79
2049	35	10	25	69
2050	31	8	22	61
2051	27	7	20	54

Methane Content of LFG Adjusted to:

Selected Decay Rate Constant (k): 0.14 for MSW
0.14 for Sludge
0.11 for C&D

Selected Ultimate Methane Recovery Rate (Lo, cu. Ft/ton):
3000 for MSW
3000 for Sludge
1500 for C&D

PHASE 11/12 CROSSROADS LANDFILL

	LFG Recovery Potential			
	MSW	Sludge	C&D	TOTAL
Year	(scfm)	(scfm)	(scfm)	
2020	85	32	16	134
2021	74	28	15	117
2022	64	25	13	102
2023	56	21	12	89
2024	49	19	10	78
2025	42	16	9	68
2026	37	14	8	59
2027	32	12	8	52
2028	28	11	7	45
2029	24	9	6	39
2030	21	8	5	34
2031	18	7	5	30
2032	16	6	4	26
2033	14	5	4	23
2034	12	5	3	20
2035	10	4	3	18
2036	9	3	3	15
2037	8	3	3	13
2038	7	3	2	12
2039	6	2	2	10
2040	5	2	2	9
2041	4	2	2	8
2042	4	1	1	7
2043	3	1	1	6
2044	3	1	1	5
2045	3	1	1	5
2046	2	1	1	4
2047	2	1	1	4
2048	2	1	1	3
2049	1	1	1	3
2050	1	0	1	2
2051	1	0	1	2

0.14 for MSW
0.14 for Sludge
0.11 for C&D

Selected Ultimate Methane Recovery Rate (Lo, cu. Ft/ton):
3000 for MSW
3000 for Sludge
500 for C&D

Appendix D

Header Sizing Calculations

Phase 14 Header
Estimated Headloss Calculations
Case 1

Total Flow[1]	2,600	sefm at 0 in-w.c. vacuum, 60 deg. F, 50%CH4, 40%CO2, 1%O2, 9%Bal., 14.40 psia BP, 100%RH
	2,940	acfm at wellfield vacuum, 80 deg. F, 50%CH4, 40%CO2, 1%O2, 9% Bal., 14.40 psia BP, 100%RH
Vacuum	-25.00	in-w.c.

Phase 14 Header Headloss

Items	Nominal Diameter	ID	Eq. Length	Flow	Velocity	Velocity	Calculated Headloss	Pipe Pressure	Comments
	(in)	(in)	(ft)	(acfm)	(fpm)	(fps)	(in-w.c.)	(in-w.c.)	
Spool	24	21.007	2,375.3	2,940	1,222	20	2.58	-27.58	
90° Elbow	24	21.007	44.0	2,960	1,230	21	0.05	-27.63	
Spool	24	21.007	1,843.9	2,961	1,230	21	2.03	-29.67	
Tee Run	24	21.007	27.0	2,977	1,237	21	0.03	-29.70	
Spool	24	21.007	1,748.5	2,977	1,237	21	1.95	-31.65	
90° Elbow	24	21.007	44.0	2,992	1,243	21	0.05	-31.69	
Spool	24	21.007	53.2	2,993	1,243	21	0.06	-31.75	
Tee Run	24	21.007	27.0	2,993	1,244	21	0.03	-31.79	
Spool	24	21.007	128.4	2,994	1,244	21	0.14	-31.93	

Total Headloss **6.9 in-w.c.**

APPENDIX IV(h)
Stability and Settlement Monitoring Plan

Geosyntec consultants

engineers | scientists | innovators

PHASE 14 STABILITY & SETTLEMENT MONITORING PLAN

Prepared for

Waste Management Disposal Services of Maine, Inc.
357 Mercer Rd.
Norridgewock, Maine 04957

Prepared by

Geosyntec Consultants, Inc.
289 Great Road, Suite 202
Acton, MA 01720

Project Number: BE0232C

October 2019

TABLE OF CONTENTS

TABLE

FIGURE

CHARTS

APPENDIX

1. PLAN DESCRIPTION

The purpose of this Stability and Settlement Monitoring Plan (SSMP) is to describe procedures and requirements for monitoring the stability of Phase 14 at the Waste Management Disposal Services of Maine, Inc. (WMDSM) – Crossroads Landfill facility in Norridgewock, Maine, pursuant to Chapter 401.2.F(3) of the Maine Solid Waste Management Rules (SWMR). This plan was prepared by Nicholas Yafrate, P.E. and Scott Luettich, P.E. both of Geosyntec Consultants, the landfill designer (LFD) of several disposal units previously constructed at Crossroads and the LFD and geotechnical engineer (GT) for the implementation of this SSMP for the proposed Phase 14 Secure Landfill.

This SSMP was developed based on results and experience from the ongoing stability and settlement monitoring program at other landfill units at Crossroads. WMDSM utilizes various instruments to monitor the stability and settlement. Generally, a technician reads the non-automated instrumentation at a prescribed frequency and reports the results to the GT/LFD for interpretation. Automated instrumentation measurements are downloaded and interpreted at the prescribed frequency. The GT/LFD, in conjunction with WMDSM personnel, evaluate the data and compare the results against established threshold values (i.e. action levels) to assess whether landfill operations can continue as planned or if modifications to the filling operations are necessary. If the data indicates established action levels have been exceeded, WMDSM is required to notify the Maine Department of Environmental Protection (MEDEP). This SSMP provides further details on the stability and settlement monitoring process, and outlines, action levels, and response actions associated with the plan.

2. ROLES AND RESPONSIBILITIES (CHAIN OF COMMAND)

2.1 Key Personnel

The following is a summary of key personnel involved with the execution of the SSMP:

Party	Contact	Contact Information
Owner	Sherwood McKenney WMDSM	207-634-2714 ext. 223 207-240-9787 (cell) smckenne@wm.com
Landfill Designer (LFD) / Geotechnical Engineer (GT)	Scott Luettich, P.E. Geosyntec or Nicholas Yafrate, P.E. Geosyntec	207-446-0140 (cell) sluettich@geosyntec.com 508-965-1501 (cell) nyafrate@geosyntec.com
Technician	Darren Files WMDSM	207-877-4242 (cell) dfiles@wm.com
Regulatory Agency	Linda Butler MEDEP or Kathy Tarbuck MEDEP	207-287-7688 linda.j.butler@maine.gov 207-287-9931 kathy.tarbuck@maine.gov

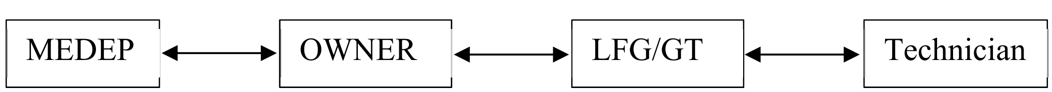
2.2 Roles and Responsibilities

A summary of the roles and responsibilities of each party involved with execution of the SSMP is defined below:

Party	Responsibilities
Owner - WMDSM	▪ Ensure all parties necessary for the implementation of the SSMP are in-place and complete their respective responsibilities in a timely manner. ▪ Communicate directly with MEDEP (reporting action level exceedances, general discussions, etc.). ▪ Ensure that WMDSM personnel are tracking and recording daily waste placement and leachate recirculation information and forwarding it to the LFD/GT for review. ▪ Provide a summary of proposed landfill activities to GT/LFD, as necessary. ▪ Authority to stop or modify work.
Landfill Designer (LFD) / Geotechnical Engineer (GT) - Geosyntec	▪ Confirm technician's assessment of monitoring requirements based upon description of work activities and protocol outlined in this plan is accurate. ▪ Confirm required instrument readings are obtained by technician for non-automated instruments at the frequency outlined in this SSMP. ▪ Download the monitoring data from the automated instruments at the frequency outlined in this SSMP. ▪ Reduce and review data and evaluate stability. ▪ Coordinate additional monitoring based upon review of data. ▪ Notify WMDSM if action levels are exceeded in the geotechnical instruments. ▪ Provide recommendations to WMDSM for modifying operations (if necessary). ▪ Provide periodic inspections of the landfill and activities occurring at the site, as necessary. ▪ Prepare yearly stability monitoring report and post data to web portal as well as incorporate into Crossroads facility Annual Report submitted to the MEDEP by April 30th of each year. ▪ Recommend or carry out maintenance on automated instrumentation. ▪ Reports directly to Owner.
Technician - WMDSM	▪ Monitor instrumentation in accordance with the plan and complete preliminary review of data; obtain re-reads as required by the plan or by GT, LFD, or WMDSM. ▪ Transmit data to GT/LFD in a timely manner. ▪ Notify WMDSM & GT/LFD if action levels are exceeded. ▪ Notify WMDSM & GT/LFD if manually read instrumentation is not functioning properly. ▪ Reports to GT/LFD & Owner.
Regulatory Agency - MEDEP	▪ Provide regulatory oversight to ensure compliance with state and federal laws and regulations. ▪ Communicate with WMDSM representative on project and operation related issues.

2.3 Chain of Command - Communication

Communications related to the SSMP will be in accordance with the following diagram:



3. STABILITY MONITORING INSTRUMENTATION

3.1 Stability Monitoring Instrumentation

In order to evaluate the stability of the landfill units as filling progresses, WMDSM will install instrumentation to monitor displacements and pore water pressures within the subsurface soils.

Figure 1 depicts the approximate locations of the instrumentation that will be installed. Table 1 presents a list of the instrumentation that is monitored as part of the SSMP.

The following are general descriptions of the instrumentation that is utilized as part of the SSMP:

Slope Inclinometer (SI) - These devices consist of vertical, 2.75-inch diameter, machine-grooved, plastic casings grouted in a borehole that will be drilled into till at the toe of landfill slopes. The horizontal displacement of the casing will be measured with an inclinometer probe that is raised and lowered in the casing. Measurements of horizontal displacement will be used to assess strain and strain rate to provide information regarding slope stability. These instruments are not automated and are monitored by the Technician.

Shape Accelerometer Array (SAA) - These devices are automated versions of the slope inclinometers described above. The SAAs consists of a small diameter (1-inch) vertical PVC plastic casing that is secured with compacted sand in an existing inclinometer casing or in a borehole that is drilled into till at the toe of landfill slopes. A continuous string of one-foot spaced sensors (accelerometers) is placed in the casing and the horizontal and vertical movement of each sensor is measured electronically. The information is transmitted to a data logger located just above the ground surface. The data logger can be contacted via a wireless cell phone connection for data retrieval. The amount of strain and the rate of strain will be monitored to provide information regarding slope stability. SAA casings will be installed within the vicinity of the SI locations. The SAA monitoring devices will be routinely moved between the various SAA casings throughout the site depending on the schedule of landfill operations (e.g., waste filling, leachate recirculation), and construction related projects (e.g., landfill final cap, landfill cell construction).

Vibrating Wire Piezometer (PZ) - These pressure sensing devices are used to monitor the pore pressure at a specific depth in the soil stratum. The PZs measure the pore pressures within the Presumpscot clay below or adjacent to Phase 14. The data will be used to evaluate the stability of the slopes and strength gain in the clay as a result of consolidation. At each PZ location, the instruments will be installed in clusters so that pore pressure measurements can be obtained from different depths within the same clay profile. These piezometers can be read manually by the Technician or automatically with a data logger.

3.2 Settlement Monitoring Instrumentation

Settlement Sensor (SZ) - SZs will be installed to monitor settlement of the Phase 14 foundation at the locations shown on Figure 1. The settlement monitoring data will be used to evaluate the integrity and performance of the Phase 14 lining and leachate collection system pursuant to Chapter 401.2.F(2) and (3) of the Maine SWMR. This data may be used to aid in the interpretation and understanding of stability monitoring measurements.

3.3 Instrumentation Damage and Repair

If instruments are damaged as a result of the on-going operations or are observed to be malfunctioning, the Technician and/or GT/LFD will assess the problem. The GT/LFD will provide recommendations to Owner for repair/replacement of the instrument on a case-by-case basis depending on the location of the instrument, significance of the data that it provides, and the proposed schedule of on-going activities in the area of the instrument.

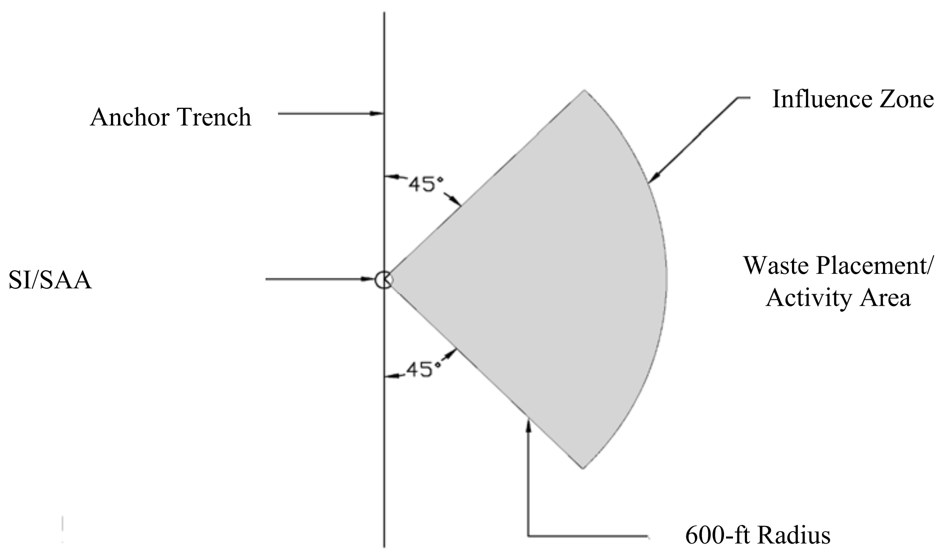
WMDSM operations personnel are responsible for repairs associated with stability and settlement monitoring instrumentation. Such activity will be supervised by WMDSM personnel or qualified personnel designated by WMDSM. The GT/LFD will be notified prior to WMDSM personnel undertaking any repairs in order to provide comments, and GT/LFD will be involved with repairs as desired by WMDSM. The GT/LFD and MEDEP will be informed prior to repairs, decommissioning or relocating of any instrumentation.

Guidelines for instrument repair are presented in Appendix A.

4. ROUTINE MONITORING FREQUENCY

4.1 Frequency of Readings

Measurements will be taken with the instruments included in the SSMP (Table 1) on a routine schedule based on the activities undertaken (past, present, or future) within the influence zone of the SI/SAA installed at the site. The influence zone of a SI/SAA is generally described as the quarter-circle area defined in the sketch below:



The radius of the influence zone is 600 ft in the direction of the activity area. The influence zone of each SI/SAA included in the stability and settlement monitoring program is shown graphically on Figure 1.

"Activity" is defined to include waste placement, leachate recirculation, and construction activity (a.k.a. interior access roads, final cover, liner system, etc.).

The Technician is responsible for obtaining readings of the SIs and their associated PZs, while the GT/LFD is responsible for downloading the data obtained from the SAAs and their associated PZs and SZs.

Refer to the attached Chart 1 for a graphical diagram of the frequency at which SIs and/or SAAs and their associated PZs and SZs shall be read. The monitoring frequencies were established by the GT/LFD based on the occurrence of any activity (past, present, or future) undertaken within the influence zone of the SI/SAA. The intent of the reading schedule is to gather background data within an influence zone with increasing frequency in advance of activity occurring, monitor it at a high frequency when activities are occurring, and then taper off the readings once activity has ceased.

SAAs will primarily be used in areas of active waste filling, leachate recirculation, and or final cap construction. In locations where SAA casings are installed, it is WMDSM's intent to install a SAA in the casing approximately four weeks prior to undertaking activity within the influence zone. When SAAs are used, a data logger will be set-up to automatically take and record measurements one or more times per day. The GT/LFD will download the data and review it in accordance with the schedule on Chart 1. Table 1 includes a summary of which SI is associated with each SAA.

At the request of the GT/LFD, supplemental readings of the SIs may be performed if the initial results reveal questionable data related to instrumentation errors/equipment problems or if threshold action levels are exceeded (See Section 5.1).

Stockpiling of materials (such as cover materials) within the influence zone of SIs/SAAs to levels below the waste placement grades that have been approved by MEDEP does not constitute an activity as defined above. In the event WMDSM elects to temporarily stockpile materials at the site within the influence zone of a SI/SAA above approved waste placement grades, they shall notify the GT/LFD, and one reading of the SI/SAA in question shall be obtained. The data will be reviewed by the GT/LFD and additional readings may be requested.

4.2 Tracking of Activity and Coordination

On a routine basis (typically daily), WMDSM personnel will electronically record in which location(s) waste placement activity occurred and the approximate elevation of the waste in the referenced location(s). The site grid, shown on Figure 1, will be used to identify locations of waste placement activity. WMDSM personnel will upload the electronic version of the summary to the project web portal or email it to the GT/LFD on a regular basis for the GT/LFD to upload. A sample copy of the electronic spreadsheet used for data tracking is included in Appendix A. Leachate introduction logs maintained as part of the recirculation program will be provided to the GT/LFD.

The Owner will be responsible for providing the GT/LFD with a schedule of proposed landfill activities. The Owner will routinely communicate with the GT/LFD to allow for proper coordination of instrument readings in accordance with the schedule set forth in Chart 1 of the SSMP.

The Technician will coordinate with WMDSM field personnel to verify reported site activities (landfilling, leachate recirculation, etc.).

5. DATA EVLAUATION AND NOTIFICATION REQUIREMENTS

5.1 Data Evaluation

Once the monitoring data has been obtained in accordance with Section 4, the Technician and/or GT/LFD will evaluate the results using the following methodology:

Slope Inclinometer (SI) - Compute the incremental displacement or strain over each 2-foot vertical increment since the last reading. Plot incremental displacement vs depth for each set of measurements.

Shape Accelerometer Array (SAA) – Compute incremental strain and plot incremental strain versus depth. Strains should be averaged over 3 SAA segments to account for the shorter spacing increment and lower stiffness of the SAA casing as compared to the SI measurement increment. Strain rates will be calculated by the SAA program over the two-week period preceding the reading.

Vibrating Wire Piezometer (PZ) – Compute and plot elevation head versus time.

Settlement Sensor (SZ) – Compute and plot vertical displacement versus time.

Using Chart 2 evaluate the data to establish the next steps and notification requirements (if any).

The action level criteria contained within Chart 2 were established based on evaluations of the site subsurface conditions and review of past data collected from the clay foundation soils at other landfills on the site and are consistent with the action levels used for Phase 8. These action levels are subject to change based on the interpretation of the actual monitoring results from Phase 14. WMDSM will inform MEDEP of the updated action levels if applicable. The action levels and the corresponding responses are intended to provide an early warning system such that, if the action levels are exceeded, activities can be modified in a timely manner to slow or stop movements and pore pressure increases before they represent a potential stability concern.

Note that alert levels are defined for PZ and SZ measurements. The results of these measurements may be used to corroborate SI and SAA measurements.

The settlement monitoring results will be compared to the anticipated differential settlements calculated and presented in Appendix D of Volume IV of the Phase 14 permit application package.

5.2 Data Reporting

Data obtained from routine instrument readings will be transmitted from the Technician to the GT/LFD via e-mail or posted to a secure (password protected) project web portal. The data will be reviewed by the GT/LFD, and plots of the data will be posted to the web portal site regularly (generally monthly) by the GT/LFD. WMDSM and MEDEP will have access to the secure web portal site and can view and download the data at any time.

At the end of each calendar year, the LFD/GT will prepare an annual stability and settlement monitoring report to summarize and transmit the monitoring data. The report will include an assessment of the data by the GT/LFD as it relates to the settlement and stability of Phase 14.

WMDSM will transmit the summary report to the MEDEP. Copies of the interim data plots will remain on the web portal until the annual report is issued.

5.3 Action Level Response Protocol

Stability Monitoring

If the readings indicate that action criteria are exceeded, the notifications, additional instrument readings, and response actions outlined in Chart 2 will be followed. Notifications between the Technician and the GT/LFD, and Owner will be made by phone and or e-mail communication with the transmission of the appropriate data. Notifications to the MEDEP will be made via e-mail or by phone communication from WMDSM personnel (typically Owner).

The GT/LFD and Owner personnel will review each exceedance on a case-by-case basis to assess if remedial actions other than those listed on Chart 2 are necessary. MEDEP personnel will be notified by WMDSM personnel (typically Owner) via e-mail or phone of additional recommended remedial actions. WMDSM (typically Owner) will seek concurrence from the MEDEP prior to undertaking additional remedial actions not specifically addressed in this plan.

The LFD/GT will evaluate the measurements for potential false alarms. If false alarms occur, the response actions described in Chart 2 will be performed and the GT/LFD may request additional readings. False alarms may include:

- *Exceedance of Slope Inclinometer and Shape Accelerometer Array displacement criteria near the ground surface:* Measurements within 10 to 15 ft of the ground surface are susceptible to displacements resulting from freeze thaw, vehicular traffic, etc. that may not represent an actual stability concern.
- *Non-concurrence of nearby instruments*: Measurements will be compared to measurements of nearby instruments (e.g. the SI associated with and SAA, or PZs associated with an SI, etc.). Should the nearby instrument not corroborate the exceedance, it may not represent an actual stability concern.
- *Data fluctuation:* Occasionally instrumentation measurements will fluctuate for various reasons (e.g. dirt in an inclinometer casing; buckling of a SAA conduit due to settlement, etc.). Measurements will be assessed for data fluctuation which may not represent an actual stability concern.
- *Strain magnitude:* Measurements will not be considered an exceedance if the cumulative strain is less than or equal to the previous cumulative strain at the measurement depth of concern or the measurement depth immediately above or below the depth of concern.

Settlement Monitoring

Should the measured settlement exceed the anticipated settlement calculated and presented in Appendix D of Volume IV of the Phase 14 permit application package, the liner integrity and leachate collection system performance will be evaluated. The GT/LFD will submit the evaluation result to MEDEP. WMDSM (typically Owner) will seek concurrence from the MEDEP prior to undertaking additional remedial actions not specifically addressed in this plan.

TABLE 1 - SUMMARY OF STABILITY & SETTLEMENT MONITORING PLAN INSTRUMENTATION

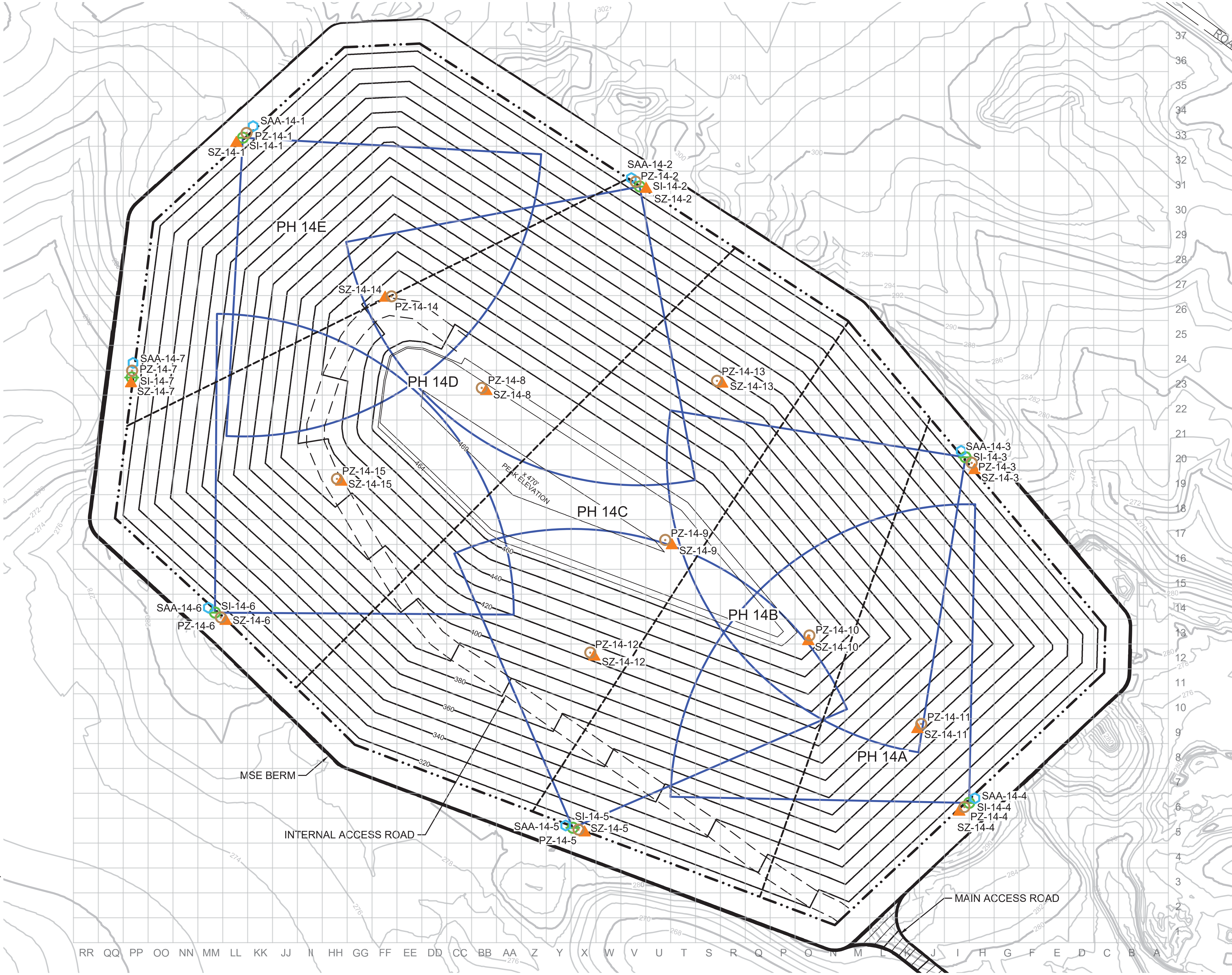
Inclinometers (SI or SAA)

Designation	Location	Type of Inclinometer	Associated Instrumentation
SI-14-1	Phase 14E - West	SI-Manual - Technician Read	PZ-14-1, SZ-14-1
SAA -14-1	Phase 14E - West	SAA - Automated	PZ-14-1, SZ-14-1
SI-14-2	Phase 14D - North	SI-Manual - Technician Read	PZ-14-2, SZ-14-2
SAA -14-2	Phase 14D - North	SAA - Automated	PZ-14-2, SZ-14-2
SI-14-3	Phase 14A - North	SI-Manual - Technician Read	PZ-14-3, SZ-14-3
SAA -14-3	Phase 14A - North	SAA - Automated	PZ-14-3, SZ-14-3
SI-14-4	Phase 14A - East	SI-Manual - Technician Read	PZ-14-4, SZ-14-4
SAA -14-4	Phase 14A - East	SAA - Automated	PZ-14-4, SZ-14-4
SI-14-5	Phase 14B - South	SI-Manual - Technician Read	PZ-14-5, SZ-14-5
SAA -14-5	Phase 14B - South	SAA - Automated	PZ-14-5, SZ-14-5
SI-14-6	Phase 14D - South	SI-Manual - Technician Read	PZ-14-6, SZ-14-6
SAA -14-6	Phase 14D - South	SAA - Automated	PZ-14-6, SZ-14-6
SI-14-7	Phase 14E - South	SI-Manual - Technician Read	PZ-14-7, SZ-14-7
SAA -14-7	Phase 14E - South	SAA - Automated	PZ-14-7, SZ-14-7

Piezometers (PZ)

Designation	Location	Read Out Box Location	Associated Instrumentation
PZ-14-1	Phase 14E - West	TBD	SI-14-1, SAA-14-1, SZ-14-1
PZ-14-2	Phase 14D - North	TBD	SI-14-2, SAA-14-2, SZ-14-2
PZ-14-3	Phase 14A - North	TBD	SI-14-3, SAA-14-3, SZ-14-3
PZ-14-4	Phase 14A - East	TBD	SI-14-4, SAA-14-4, SZ-14-4
PZ-14-5	Phase 14B - South	TBD	SI-14-5, SAA-14-5, SZ-14-5
PZ-14-6	Phase 14D - South	TBD	SI-14-6, SAA-14-6, SZ-14-6
PZ-14-7	Phase 14E - South	TBD	SI-14-7, SAA-14-7, SZ-14-7
PZ-14-8	Phase 14D - Central	TBD	SZ-14-8
PZ-14-9	Phase 14C - Central	TBD	SZ-14-9
PZ-14-10	Phase 14B - Central	TBD	SZ-14-10
PZ-14-11	Phase 14A - Cenral	TBD	SZ-14-11
PZ-14-12	Phase 14D - Central	TBD	SZ-14-12
PZ-14-13	Phase 14C - Central	TBD	SZ-14-13
PZ-14-14	Phase 14C-D - Central	TBD	SZ-14-14
PZ-14-15	Phase 14D - Central	TBD	SZ-14-15

Notes:
1. "SI" refers to Slope Inclinometer.
2. "SAA" refers to Shape Accelerometer Array.
3. "PZ" refers to piezometer cluster.
4. "SZ" refers to settlement plate.
4. "TBD" refers to to be determined.



LEGEND

- EXISTING GROUND MAJOR CONTOUR (10')
- EXISTING GROUND MINOR CONTOUR (2')
- TOP OF FINAL COVER GRADE CONTOURS (10')
- PHASE 14 DESIGN LIMIT OF WASTE
- SUB CELL BOUNDARY
- VW PIEZOMETER (PZ)
- SETTLEMENT SENSOR PLATE (SZ)
- SHAPE ACCELEROMETER ARRAY (SAA)
- SLOPE INCLINOMETER (SI)
- INSTRUMENTATION INFLUENCE ZONE

NOTES:

1. EXISTING GROUND SURFACE AND FEATURES OBTAINED FROM TOPOGRAPHIC SURVEYS, DATED NOV 2017, AND SEPT 2018, PROVIDED BY BOYNTON & PICKETT.
2. HORIZONTAL DATUM IS NORTH AMERICAN DATUM OF 1983 (NAD 83) MAINE WEST STATE PLAN. VERTICAL DATUM IS NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88). PROPERTY BOUNDARY SURVEYED IN UTM SCALED TO NAD 83.
3. INSTRUMENT LOCATIONS ARE ARE APPROXIMATE AND WILL BE ADJUSTED IN THE CONSTRUCTION DOCUMENTS.

0 100' 200'
SCALE IN FEET

INSTRUMENTATION LAYOUT AND
INFLUENCE ZONE
PHASE 14

WASTE MANAGEMENT DISPOSAL SERVICES OF MAINE, INC.
CROSSROADS LANDFILL
NORRIDGEWOCK, MAINE

Geosyntec consultants

FIGURE

1

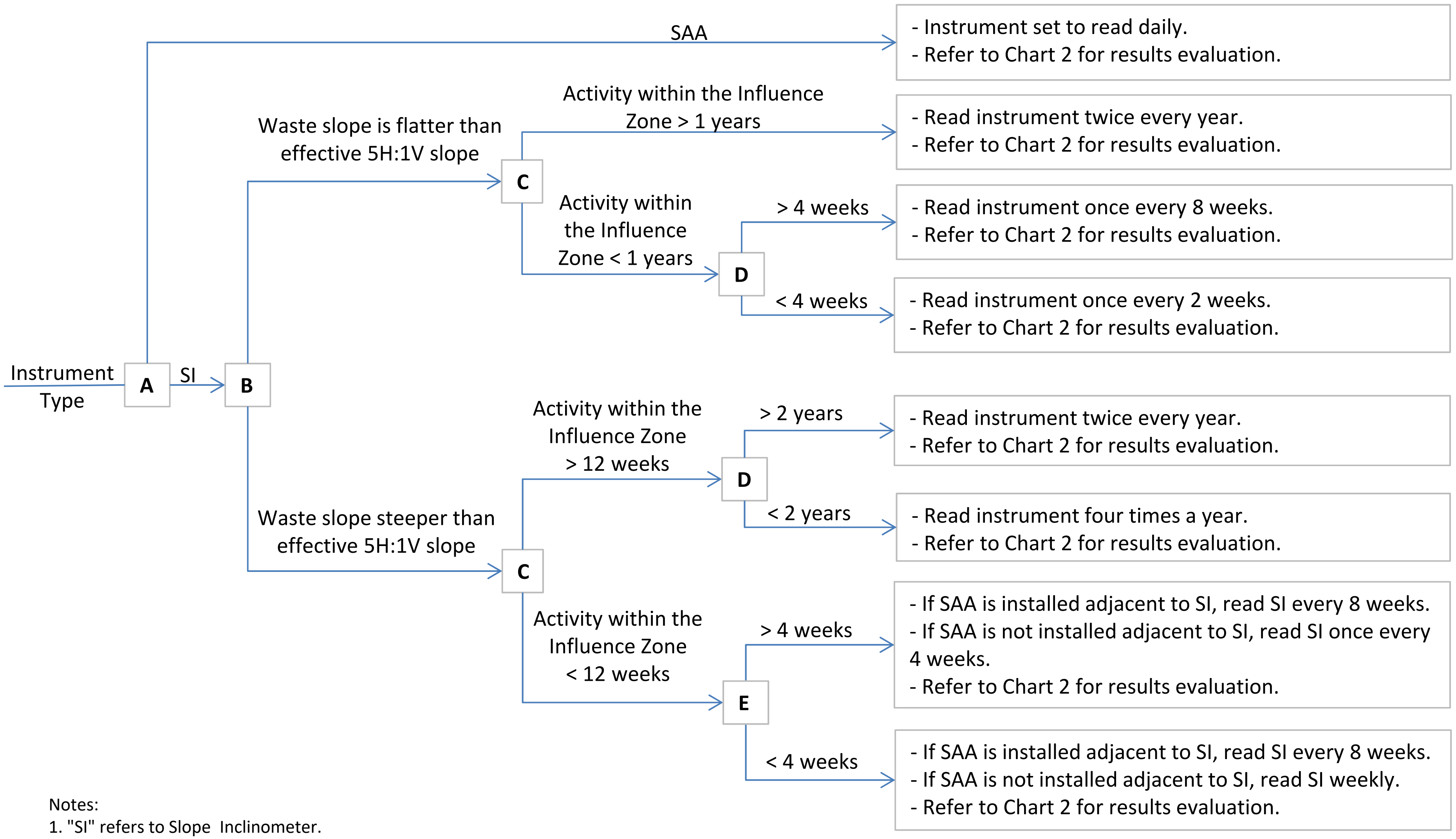
PROJECT NO: BE0232C

OCTOBER 2019

T:\PROJECTS_CADD\C\CROSSROADS LANDFILL\PHASE 14 EXPANSION\PERMIT\FIGURES\2019.09 INSTRUMENTATION FIGURES\BE0232C F001 (INSTRUMENT LAYOUT)

CHARTS

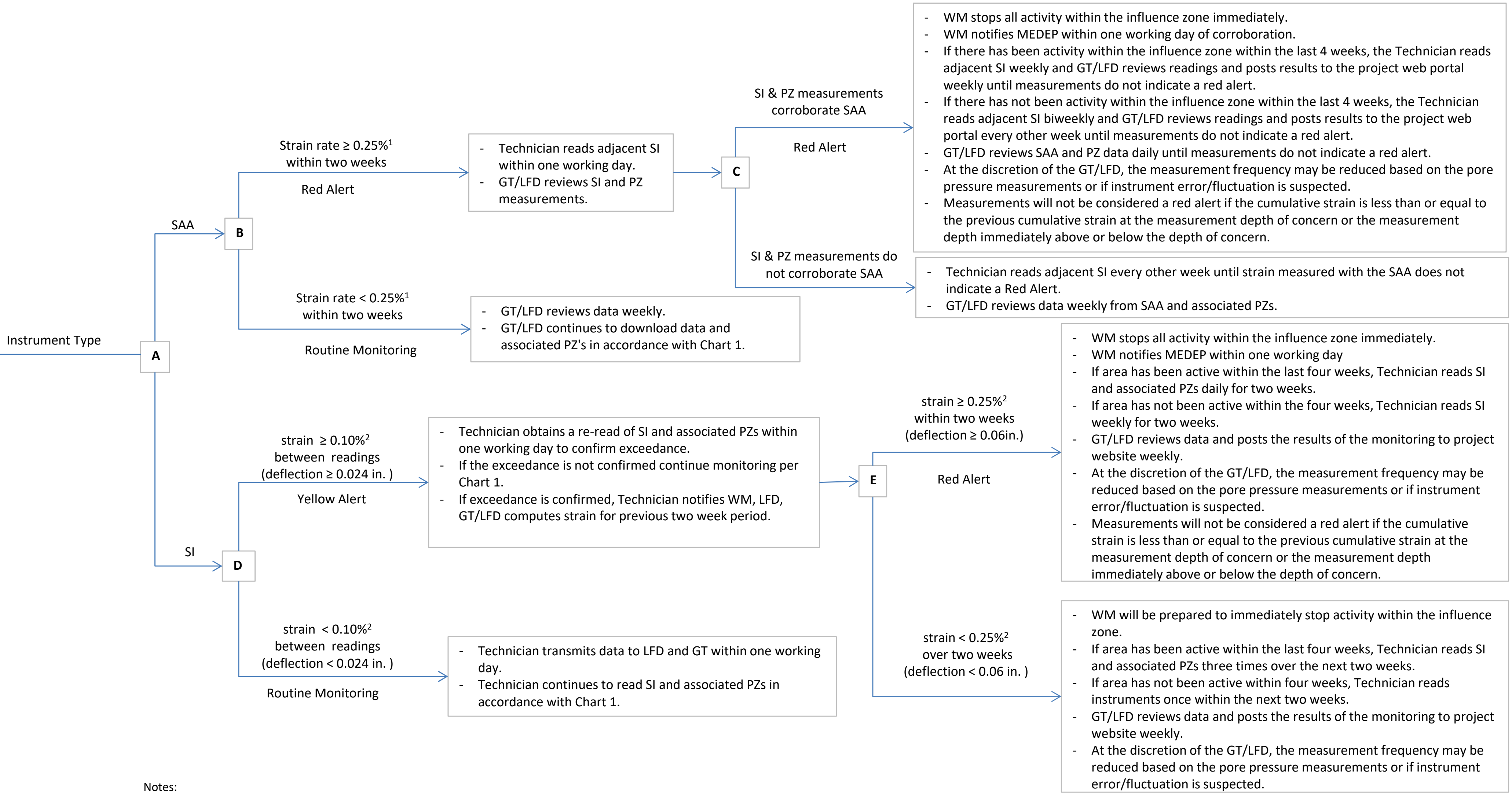
CHART 1
INSTRUMENT READING FREQUENCY



Notes:

1. "SI" refers to Slope Inclinometer.
2. "SAA" refers to Shape Accelerometer Array.
3. "> and <" refers to the timeframe when activity will occur or has already occurred. For example, >12 weeks means proposed activity will not occur in the next 12 weeks, and it has been more than 12 weeks since past activity has occurred.
4. "Activity" is defined as waste placement, leachate recirculation, construction activity (including excavation at the toe of the slope) or waste relocation within the influence zone. See SSMP text for information on reading frequency where stockpiles are placed.
5. Technician will read SIs and adjacent piezometers. Geotechnical Engineer/Landfill Designer (GT/LFD) will download and review SAA data.
6. SAAs will be used near active waste placement, cap construction, and or leachate recirculation. GT/LFD will place SAA in area of landfill to undergo activity approximately four weeks prior to activity occurring and will leave SAA in place until approximately four weeks after activity has occurred. Adjacent SIs will be read quarterly while SAA measurements are taken.

CHART 2
ACTION LEVELS



Notes:
1. "Strain" in SAA refers to strain over a two week period, averaged over a 3-foot vertical increment, in the Gray Presumpscot Clay.
2. "Strain" in SI refers to incremental strain between successive data sets (unless noted otherwise) measured over 2-vertical foot increments in the Gray Presumpscot Clay.
3. "Deflection" refers to incremental deflections between successive data sets measured over 2-vertical foot increments in the Gray Presumpscot Clay.
4. "WM" refers to Waste Management Disposal Services of Maine, Inc, "GT" refers to Geotechnical Engineer, and “LFD” refers to Landfill Designer
5. "PZ" refers to piezometer, "SI" refers to slope inclinometer, and SZ refers to settlement sensor.
6. "MEDEP" refers to Maine Department of Environmental Protection.
7. Where SAAs are used, PZ and SZ data will be obtained with the data logger used to record SAA data. Data from the adjacent SI will be obtained by the Technician.
8. If observed total incremental strain is less than the previously observed total incremental strain then it shall not be considered an alert.
9. SZ measurements shall be obtained with PZ measurements.

APPENDIX A

INSTRUMENT REPAIR GUIDELINES

INSTRUMENT REPAIR GUIDELINES

Inclinometers

Vertical inclinometer casing(s) that are struck by an object (i.e. vehicle, sliding snow, ice, or construction equipment) or separate due to frost heave will be repaired with a splint as described below. Typically, during such occurrences only the upper portion of ABS pipe becomes damaged and installation of a new inclinometer is not necessary. If a new inclinometer is necessary, WMDSM will contact GT and/or LFD for further recommendations.

Standard Vertical Inclinometer Splint Repair

1. Tie-off the aluminum or steel protective casing to 3 driven grade stakes utilizing a 2-lb hammer and a 100' nylon rope.
2. Open or remove locking lid on the protective casing and survey top of blue ABS cap (which is inserted within the ABS casing) in order to extend replacement to same elevation. A surveyor's level and rod is needed to accomplish this task.
3. Excavate and shovel (around inclinometer) to approximately 1.5' below the ABS casing problem area utilizing an excavator and a hand shovel. Protective casings are approximately 7.5' long and extend above the ground's surface 2'-5'.
4. Tie top of protective casing unit to the excavator bucket with a strap. While relieving downward pressure, saw the ABS casing with a carpenter's saw as square as possible and plug the hole with a towel when finished.
5. Using the blue ABS cap as a guide, file the end of the cut with a wood rasp until square. Clean around ABS casing approximately 1' below cut with paper towels.
6. Saw a 1'section from the male end of a new 10' ABS casing and square the cut end. A measuring tape will be needed to perform this procedure. Generally, the coupling portion of the male piece is not counted as part of the one-foot length.
7. Butt (squared ends to each other) the 1' ABS section to the previously exposed ABS casing within the ground. Apply ABS cement to butt surface and tape outside area of both sections using electrician's tape.
8. Insert rodded T Tool into the grooves of ABS casing to the butted area of the two sections. Vice grip the rod at this location in order to achieve the necessary groove alignment between the casings once the splint has been placed.
9. Apply ABS cement on outside surface of both casing sections approximately 6" above and below the butt.
10. Place 3" Schedule 80 PVC splint with 3/8 gap along entire 10" length on the butt and tighten the two 3.5" hose clamps located near the ends with a screwdriver.
11. Apply ABS cement to the split along the PVC and duct tape entire splint.

12. Apply ABS cement to the outside surface of the eventual coupling placement location of the splinted 1’ ABS section. Insert the ABS coupling and apply ABS cement in the same fashion to the replacement section, which will extend to the previously surveyed elevation.
13. Apply Vaseline® with a putty knife around splint, 1’ ABS section, and ABS replacement section to help prevent heave of casing or wrap multiple layers of plastic around the ABS section(s) to achieve the same effect. Upon completion place ABS cap on casing.
14. Backfill around ABS column with fine to course sand until top of aluminum anodized protective casing would be approximately 1” above the ABS casing upon replacement.
15. Center the aluminum protective casing over the ABS column and backfill around casing with fine to course sand. Tamper and compact sand by foot or butt of shovel while plumbing protective casing with a level until the original ground surface has been reached. The excavator will backfill the remaining area simultaneously and assure the inclinometer is accessible by vehicle.
16. Sand is then placed within the aluminum protective casing (around the ABS casing) until the top is encountered.
17. Place lower portion of lid with a 5/32” Alan wrench in order to secure upper locking cap.

NOTE: The underlined words denote materials needed to perform the procedure.

Piezometers

Should a vibrating wire piezometer cable become damaged, the necessary repairs will be performed in accordance with manufacturer's and/or GT’s or LFD’s recommendations.

SAAs

Should an SAA become damaged, the necessary repairs will be performed in accordance with manufacturer's and/or GT’s or LFD’s recommendations.

Settlement Sensors

Should a settlement sensor become damaged, the necessary repairs will be performed in accordance with manufacturer's and/or GT’s or LFD’s recommendations.

APPENDIX B

DAILY ACTIVITY LOG (SAMPLE)

DAILY SUMMARY OF LANDFILL ACTIVITY FOR PHASE 14 - CROSSROADS LANDFILL

DATE ______________

AREAS OF WASTE PLACEMENT

GRID # WHERE WASTE WAS PLACED	APPROX. WASTE ELEV.

AREAS OF LEACHATE RECIRCULATION

GRID #	APPROX. WASTE ELEV.	QUANTITY OF LEACHATE (gal)

Other Details:

Notes:

1. If a grid location is listed in the table above it means that waste was placed within that cell on the referenced date.
2. The elevation reported for each grid location is the approximate final waste elevation for the day within that grid location.

APPENDIX IV(i)
Alternative Final Cover System Engineering Report

Geosyntec consultants

engineers | scientists | innovators

ALTERNATIVE FINAL COVER SYSTEM ENGINEERING REPORT FOR PHASE 14

Crossroads Landfill

Norridgewock, Maine

Prepared for

Waste Management Disposal Services of Maine, Inc.
357 Mercer Road
Norridgewock, Maine 04957

Prepared by

Geosyntec Consultants, Inc.
289 Great Road, Suite 202
Acton, MA 01720

Project Number: BE0232

October 2019

TABLE OF CONTENTS

FIGURES

APPENDICES

1. INTRODUCTION

1.1 Terms of Reference

The purpose of this document is to present an engineering assessment to support the alternative final cover system proposed for the Phase 14 landfill unit at the Crossroads Landfill site (the Site). Pursuant to the alternative design criteria set forth in the Maine Solid Waste Management Rules (SWMR) - Chapter 401.5.H, this report presents a thorough demonstration of the technical validity of the alternative cover system, including equivalency comparisons to the cover system prescribed in SWMR Chapter 401.5.G (herein referred to as the SWMR-prescribed cover).

This report was prepared by Youngmin Cho, Ph.D., Nicholas J. Yafrate, P.E., and Scott M. Luettich, P.E., all of Geosyntec Consultants (Geosyntec) and was reviewed by Sherwood McKenney of Waste Management Disposal Services of Maine, Inc. (WMDSM).

1.2 Report Organization

The remaining sections of this report are organized as follows:

- Section 2, *Background Information*, summarizes the relevant regulatory review criteria, and describes the alternative final cover system and proposed operational aspects that WMDSM intends to implement at the Site.
- Section 3, *Design and Construction Aspects*, presents engineering analyses and computations associated with the predicted performance of the alternative cover system.
- Section 4, *Evaluation of Environmental Risk associated with the Alternative Cover System*, presents several analyses showing the unique siting, design, and operational aspects of the Crossroads Landfill (Crossroads) facility that further show how the proposed Phase 14 landfill, when closed with the alternative cover system, will be fully protective of the environment.
- Section 5, *Summary and Conclusions*, summarizes the information presented in this report and provides conclusions on the appropriateness of the use of the proposed alternative cover system for the Phase 14 landfill unit.

2. BACKGROUND INFORMATION

2.1 Introduction and Regulatory Overview

The Phase 14 landfill will encompass approximately 48.6 acres of lined area, consisting of five contiguous cells (Phases 14A through 14E). The Phase 14 liner system will be installed in accordance with applicable requirements identified within the Maine SWMR with a leachate collection system and sump in each cell, as shown on Sheet 7 of the Permit Drawings submitted as APPENDIX IV(a) in Volume IV of the Phase 14 Solid Waste Permit Application. And, as illustrated conceptually on Sheets 10, 11, and 12 of the Permit Drawings, the final cover system will be placed incrementally as final waste grades are achieved.

The Maine SWMR allow solid-waste applicants to seek approval for an alternative final cover design based on a demonstration of technical equivalency consistent with the requirements of Chapter 401.5.H. The information in this report demonstrates that the proposed final cover system will provide equal performance to a closure implemented under the SWMR-prescribed cover system. A discussion of the benefits, drawbacks, and constructability of the alternative cover design, and a demonstration that the alternative cover coupled with leachate recirculation will result in equal or better performance in comparison to the SWMR-prescribed final cover system are included in Sections 3 and 4 of this report.

It is noted that the same alternative final cover system was approved for the Phase 8 landfill unit at the Crossroads Landfill. Since Phase 14 will be a continuation of the same filling operations as currently used in Phase 8, with similar construction methods, waste types, and operational activities, WMDSM considers the proposed Phase 14 alternative final cover system to be consistent with the alternative final cover for Phase 8 in its ability to perform equivalently to the SWMR-prescribed cover system and to be fully protective of the environment.

2.2 Description of Final Cover Systems

2.2.1 SWMR, Chapter 401.5.G (Prescribed Cover System)

The prescriptive final cover system design is set forth in Chapter 401.5.G of the Maine SWMR. A schematic diagram of a typical final cover system is shown in Figure 1 and consists of the following components, from top to bottom:

- 6-inch Topsoil
- 12-inch Protective Cover Soil
- Double-Sided Geocomposite Drainage Layer
- 40-mil High-Density Polyethylene (HDPE) Geomembrane
- Geosynthetic Clay Liner (GCL)
- 12-inch Barrier Soil Layer with hydraulic conductivity $\leq 1\times10^{-5}$ cm/s
- 6-inch Gas Vent Layer

2.2.2 Alternative Cover System

A schematic diagram of the alternative final cover system design is shown in Figure 2. The alternative cover system is identical to the SWMR-prescribed cover system (with the exception of the compacted soil barrier layer) and consists of the following components, from top to bottom:

- 6-inch Topsoil
- 12-inch Protective Cover Soil
- Double-Sided Geocomposite Drainage Layer
- 40-mil High-Density Polyethylene (HDPE) Geomembrane
- Geosynthetic Clay Liner (GCL)
- 6-inch Intermediate Cover/Gas Vent Layer

The alternative cover system is an engineered highly redundant system that prevents stormwater from infiltrating into the landfill. WMDSM's proposed use of the alternative cover system presented in this report is based on the extensive experience of Waste Management and Geosyntec in closing landfills not only for several previous landfill units at Crossroads, but in many other states as well. Upon reviewing solid-waste regulations in many other states, Geosyntec has found that closure of several lined landfills has been allowed using geomembrane only or geomembrane/GCL composite barriers similar to the proposed alternative final cover system for Phase 14. A pertinent example of this includes the Waste Management owned and operated landfill facility, Turnkey Recycling and Environmental Enterprises (T.R.E.E.), in the neighboring state of New Hampshire. T.R.E.E. has successfully closed large landfill disposal units using only a geomembrane for the barrier layer. WMDSM's proposed Phase 14 alternative final cover system using a composite geomembrane/GCL barrier layer is more robust than the cover system used at T.R.E.E. because of the complimentary role served by the GCL which provides a redundant barrier to defects (if they were to occur) in the geomembrane.

2.3 Proposed Leachate Recirculation

Similar to the Phase 8 alternative final cover design approval discussed in Section 2.1 and as part of the plan for the Phase 14 alternative final cover system, WMDSM intends to perform leachate recirculation in Phase 14 to degrade and biologically stabilize the waste more rapidly than accomplished with conventional landfilling practices. The Phase 14 Leachate Recirculation Plan (LRP) is provided in Appendix A of this report. The LRP describes the leachate recirculation method, allowable leachate recirculation quantity, limitations, performance monitoring, training, and reporting. The quantity of leachate recirculated will be determined based on location-specific factors such as efficiency of the leachate collection system (LCS), performance of the landfill gas collection and control system (LFGCCS) including gas constituents, flow rates, and temperatures, landfill stability, and final cap construction schedule. Furthermore, weather conditions will be considered such that leachate recirculation is reduced or suspended during periods of extreme cold weather, heavy or prolonged rainfall, and rapid snowmelt, such that only acceptable amounts of liquid are introduced into the landfill.

As is currently being conducted in Phase 8, the quantities of leachate recirculated will be recorded for each recirculation event. Records will be maintained at the landfill, uploaded to a secure web portal, and available for MEDEP review. Further details of the leachate recirculation infrastructure and procedures are provided in the LRP.

3. DESIGN AND CONSTRUCTION ASPECTS

The primary purpose of the final cover system is to prevent stormwater from infiltrating into the landfill after closure. [describe]. This section identifies the potential risks associated with eliminating the compacted soil layer and how those risks are mitigated, describes the advantages in constructability of the alternative cover system, and discusses some of the other benefits associated with eliminating the soil layer from the cover system.

3.1 Puncture Resistance

Final cover systems are most susceptible to puncture from equipment operating during construction of the final cover system and to repair the final closure system during the post-closure care period. WMDSM’s specifications and construction quality assurance manual require very thick layers of soil to be used for any temporary construction roads on the landfill on which heavy construction equipment and vehicles may operate over the barrier components of the liner and cover systems. Additionally, the Phase 14 alternative cover system will include a nonwoven geotextile component as part of the double-sided geocomposite drainage layer that will provide additional protection to the underlying geomembrane against puncture from heavy equipment. To demonstrate this, calculations were performed to evaluate the protection provided by the bottom portion of the nonwoven geotextile only of the double-sided geocomposite drainage layer such that particles within the protective cover soil layer above will not puncture the underlying geomembrane when subjected to equipment traveling over it. A worst-case scenario of a fully loaded CAT 740 articulated dump truck for the final closure construction and a CAT D6T dozer for the post-closure care was assumed in the calculation (presented in Appendix B). The input parameters or similar values established in the calculation have been used to specify the maximum particle size in the granular protective cover material and geotextile component of the geocomposite drainage layer under the access road alignment.

WMDSM’s construction specifications for temporary construction roads and rigorous construction oversight by Construction Quality Assurance (CQA) personnel will minimize the likelihood of puncture during construction. Additonally, WMDSM’s restrictions against operating vehicles and minimizing heavy equipment use on the final cover systems of closed landfill units at Crossroads further reduces the risk of puncture during the post-closure period.

3.2 Settlement Durability

The performance of final cover systems can be affected by settlement in one of two ways: (i) excessive differential settlement may flatten or even cause grade-reversal thereby affecting the stormwater drainage off the final cover system; and (ii) excessive settlement may induce unacceptably high tensile stress and strain in the hydraulic barrier components which could lead to localized geosynthetics tearing.

Leachate recirculation will accelerate waste stabilization while waste placement is occurring (before closure) and therefore will reduce the potential for differential settlement to occur after final closure. With respect to flattening of grades, the alternative final cover system will perform better or equivalently to the SWMR-prescribed cover system, since the grading layout of stormwater features have been designed to adequately convey water off the closed landfill and to the on-site erosion control structure (ECS) basins.

With respect to tensile stress/strain in the cover system, calculations have been performed for the alternative final cover system to assess the performance of the hydraulic barrier components in minimizing the introduction of stormwater into the landfill after final closure. The calculations, which were conducted in accordance with the procedure set forth in *Final Cover System Guidance Document for Municipal Solid Waste Landfills* [MEDEP, 1995], are presented in Appendix C. As shown, even for an extreme set of assumptions, the calculated tensile stress in the geomembrane or GCL components of the alternative cover system remains considerably lower than the tensile strength and strain compatibility of these materials. WMDSM's operational procedures prevent placement of large uncompacted discrete pieces of degradable or collapsible waste within the uppermost layer of waste directly beneath the cover system reducing the likelihood of this severe case from actually occurring. Furthermore, if a large area of subsidence of the final cover were to develop, it would be visually detectable and repaired.

3.3 Freeze-Thaw Durability of Compacted Clay

The durability of the soil barrier layer in the SWMR-prescribed cover system can be negatively affected by repeated freeze-thaw cycles typical of New England climate conditions. Specifically, the hydraulic integrity of the compacted soil layer could be significantly compromised by fissures caused by natural freeze-thaw cycles, thereby bringing into question its effectiveness as a barrier layer. Freeze-thaw problems are not applicable in the proposed Phase 14 alternative final cover system, which does not include a compacted soil barrier layer.

3.4 Landfill Gas System Design

The design of the LFGCCS will remain unaffected by the alternative cover system. The number and spacing of vertical extraction wells will not be altered, the granular blanket LFG collection layer directly under the cover system will remain a minimum of 6 inches thick, and will continue to be specified to have a minimum allowable hydraulic conductivity, $k \geq 1 \times 10^{-4}$ cm/s.

WMDSM's intent to recirculate leachate as part of the Phase 14 operations is expected to increase the rate of LFG production. This will allow the on-site LFGTE facility to produce energy more rapidly than if leachate were not recirculated, and as such, will result in less landfill gas generation during the post-closure period. Therefore, WMDSM's proposed alternative final cover system, when used in conjunction with leachate recirculation and the LFGTE system, is superior to the cover system described in SWMR-prescribed cover system.

3.5 Stormwater Design

3.5.1 Erosion and Sediment Control

During construction of final cover systems, erosion and sediment (E&S) control measures are implemented to limit erosion of the cover system materials and the transport of sediment from the Site. The SWMR-prescribed cover system includes a low permeability soil layer which requires the material to be exposed to storm events during borrow area excavation, transport, placement, and compaction activities. Although WMDSM and its contractors are diligent in ensuring best management E&S control practices are used at the Site, erosion of the compacted soil barrier material increases the risk of environmental impacts during closure construction. Since the alternative cover system does not include the compacted soil layer, less potential will exist for sediment problems during construction activities related to placing and compacting fine-grained soil. Therefore, in terms of environmental risks from E&S release during construction, the proposed alternative cover system is superior to the SWMR-prescribed cover system.

E&S control measures for the remaining soil and geosynthetics components of the alternative final cover system during construction, are identical to the SWMR-prescribed cover system, as these layers are the same. For this aspect of E&S control, the alternative cover system and the cover system described in Chapter 401.5.G of the Maine SWMR are equivalent.

3.5.2 Stormwater Management Design

During the post-closure period, surface water drainage for the alternative cover system will be identical to the SWMR-prescribed cover system because the surface and drainage components for each cover system are the same. Stormwater will be shed off the vegetated topsoil layer to drainage benches and into downchutes. Surface water that infiltrates into the final cover soils will be conveyed by the geocomposite drainage layer which is identical to the geocomposite drainage layer in the SWMR-prescribed cover system. Therefore, the alternative cover system in relation to surface water drainage aspects of the landfill after construction, is equivalent to the SWMR-prescribed cover system.

3.6 Constructability

The alternative cover system from the GCL up to the topsoil is identical to the SWMR-prescribed cover system. The constructability of these layers (i.e., the GCL, geomembrane, geocomposite drainage layer, protective cover soil, and topsoil) is therefore equivalent. Beneath the GCL, however, the constructability of the alternative cover system compared to the SWMR-prescribed cover system is quite different. Construction of the alternative cover system offers a significant advantage because construction complexities related to installation of the compacted soil layer (e.g., compacted silt clay) are eliminated. The alternative configuration allows for a more streamlined approach to constructing the cover system. Impacts related to sourcing the silt clay material and transporting it to the Phase 14 area will also be eliminated. Coupled with the reduced potential for erosion and sediment problems (previously discussed in Section 3.5.1), the constructability of the alternative cover system is superior to that of the SWMR-prescribed cover system.

3.7 Cost of Construction

Another aspect in evaluating the alternative cover system relative to the SWMR-prescribed cover system is the associated cost of construction. The costs related to purchasing, transporting, placing, and compacting a 12-inch silt-clay layer over the gas vent sand layer are not insignificant. Additionally, Construction Quality Assurance (CQA) services, which include substantial field monitoring, evaluation of construction techniques, and laboratory/field testing of the compacted soil layer are required. This soil-barrier layer construction and required CQA oversight results in an approximate combined unit cost of $0.85/ft^2$ over 48.6 acres, or approximately $1.8 million more to construct the SWMR-prescribed cover system than the proposed alternative final cover system.

3.8 Increased Airspace

An additional benefit of the alternative final cover system is associated with disposal capacity at the Crossroads facility. A 12-inch compacted soil layer, when constructed over the 48.6 acres of Phase 14, will occupy more than 78,000 cubic yards of airspace in the landfill. In light of the documented effectiveness of a geomembrane/GCL composite barrier layer, this landfill capacity volume would be more beneficial in servicing the State of Maine for waste disposal purposes rather than being occupied by a layer of soil.

4. EVALUATION OF ENVIRONMENTAL RISKS ASSOCIATED WITH THE ALTERNATIVE COVER SYSTEM

4.1 Introduction

The purpose of this section is to demonstrate that closure of the Phase 14 landfill with the alternative final cover system design will be fully protective of the environment at the Site. As discussed below, the alternative final cover system will pose no increased environmental risk when compared to the SWMR-prescribed cover system because of the robust design of the liner and closure containment systems, WMDSM's intent to recirculate leachate thereby stabilizing the waste more rapidly, and the presence of the very low permeability natural clay at the Phase 14 site that provides additional environmental protection.

The information in this section demonstrates that the probability of leachate being unknowingly transported from the Phase 14 landfill is very small and will not increase as a result of the alternative cover system design. Additionally, WMDSM's ability to detect problems with the alternative cover system (if they were to occur) will be no different than with the SWMR-prescribed cover system. An overview of the information in this section is presented below.

- Hydraulic Transport Analyses:
  - Results of hydraulic analyses showing how small the potential leakage from the Phase 14 landfill, if closed with the alternative cover system, would be when compared to the leakage from the landfill if closed with the SWMR-prescribed cover system.
  - Results of a Geologic and Hydrogeologic Assessment report (i.e., Volume III of the Phase 14 Solid Waste Permit Application), prepared by Golder Associates, that shows how the in-situ clay foundation conditions at this site provide redundant protection against leachate migration if a leak in the liner system were to occur.
- WMDSM's Ability to Detect and Repair Problems with the Final Cover System:
  - Demonstration of how damage to the final cover system (if it were to occur) will be detected by changes in the flow quantities collected in the Phase 14 LCS.

4.2 Hydraulic Transport Analyses

4.2.1 Leakage Modeling Results

Hydraulic Evaluation of Landfill Performance (HELP) modeling [Version 3.07] was conducted to evaluate the predicted performance of the alternative final cover system. The outputs of the HELP modeling are presented in Appendix D of this report. The results show that calculated flow of stormwater into the landfill is the same for both the alternative cover system and SWMR-prescribed cover system (i.e., 0.00022 gal/acre/day (gad)). More importantly, the calculated leakage rate through defects in the bottom liner (if any defects were to occur) is the same for both the alternative cover system and the SWMR-prescribed cover system (i.e., 0.00015 gad). As small as these values are, they become even less significant in light of the hydrogeologic setting at Crossroads (discussed below).

4.2.2 Natural Clay Foundation and Time of Travel

The Phase 14 subgrade design incorporates removal of undifferentiated soil/fill material and silty fine sand, such that the baseliner will be constructed directly on top of the Presumpscot clay and/or compacted clay backfill. Laboratory testing of Presumpscot clay samples indicates the clays are composed of greater than 97% silt and clay particles, and the geometric mean of the vertical hydraulic conductivity for the Presumpscot clay in the Phase 14 area is 1.3×10^{-7} cm/sec for the upper stiff clay facies and 1.8×10^{-7} cm/sec for the lower soft clay layer. Slug testing revealed a horizontal hydraulic conductivity of 7.7×10^{-7} cm/sec for the Presumpscot clay in the Phase 14 area. These test results substantiate the unique setting of the Phase 14 site in that the strata below the landfill has a hydraulic conductivity that is 13 to 75 less (slower) than the hydraulic conductivity required in the SWMR for subgrade below municipal solid waste landfills in Maine. These parameters were used to assess the time of travel of leakage (if it were to occur) from the landfill to the nearest sensitive receptor, as discussed in the following paragraph.

The Geologic and Hydrogeologic Assessment report, prepared by Golder Associates (i.e., Volume III of the Phase 14 Solid Waste Permit Application) describes the compliance of Phase 14 with the requirements of Chapter 401.2.B, C, and G of the Maine SWMR. The report describes the regional and local hydrogeological setting and includes a detailed evaluation of the travel time that would be required for leachate to potentially migrate to sensitive receptors through the groundwater if a leak in the liner system were to occur. The analyses showed transport times ranging from 25 to more than 1,500 years, significantly exceeding the required transport time of no less than 6 years set forth in the SWMR.

4.3 Ability to Detect, Assess, and Repair Damage

Section VIII of the Site Operations Manual describes the Post-Closure Monitoring and Maintenance Program for the Crossroads facility. Specifically, Article 3 in this section of the Operations Manual describes the inspection routine performed by trained WMDSM personnel for the closed landfill units and includes a checklist for documenting the inspections and any required actions.

Engineering calculations presented in Section 3 of this report showed how the construction access road on the Phase 14 cover will be designed to prevent puncture of the cover components. Although WMDSM does not intend to have a formal road on the final cover system, there may be infrequent occasions during the post-closure period when equipment would be required to operate on portions of the final cover system. Such activities could be necessary, for example, to maintain vegetation, repair LFG wellheads, or to make minor repairs to areas exhibiting signs of erosion. WMDSM performs these types of activities using small low-ground pressure vehicles/equipment such as all-terrain vehicles (ATVs) and appropriate low-ground pressure bulldozers. Considering the thickness of protective cover soil and topsoil layers over the hydraulic-barrier components of the alternative cover system, the potential for unobserved puncture due to equipment performing maintenance activities is small. However, such damage would be visually observable and easily repairable, and calculations have been performed to assess whether the situation would be detectable in the routine monitoring activities of the LCS, as discussed in the following paragraphs.

In order to assess the detectability of significant damage to the alternative final cover, the volume of surface water that would flow through a large hypothetical hole (i.e., a 4-ft gash) in both barrier components of the alternative cover system was evaluated. The calculated flow into the landfill was then compared to actual LCS flow data from two landfill units that are covered without a compacted clay layer. The first is the Phase 11C lined disposal unit at Crossroads (see Figure 3), which was covered with a temporary geomembrane cover for several years prior to removal of the temporary geomembrane in early 2017 to allow final waste placement followed by final closure in 2018. The second is the TLR-II lined disposal unit at T.R.E.E. in New Hampshire (see Figure 4), which has been closed with a hydraulic barrier consisting of a geomembrane only for more than 13 years.

Results of this analysis (presented in Appendix E) show that the calculated peak flow through a 4-ft gash in the alternative cover system would be approximately 1,185 gal/day. When applied to the largest landfill cell within Phase 14 (Phase 14 D, 12.5 acre), this would equate to approximately 95 gad. Comparison of this value to the leachate generation flows in the Phase 11C and the TLR-II landfill units at T.R.E.E. (shown on Figures 3 and 4) reveals that a sustained anomalous flow increase (spike) in the LCS on the order of 95 gad would be unusual and obvious. Repeated correlation of such peaks to precipitation events would prompt WMDSM to initiate response activities to locate/repair such a breach in the final cover system.

5. SUMMARY AND CONLUSIONS

The alternative cover design is fully protective of the environment and provides some improved benefits compared to the SWMR-prescribed cover system. The leachate recirculation program will enhance and accelerate waste degradation, reduce the amount leachate treated and disposed off-site, and will facilitate more efficient generation of landfill gas that is used to generate electricity at the on-site LFGTE facility. Removal of the soil layer will allow for additional disposal capacity, which is an important resource, and will eliminate the need to obtain and transport significant volumes of soil to the site providing considerable cost savings. The construction process will also be streamlined with reduced potential for erosion and sedimentation impacts.

Due to the unique conditions at the Crossroads site, the risk of leakage from the landfill associated with the alternative design is equivalent to that associated with the SWMR-prescribed system. Phase 14 site is located over a thick stratum of very low permeability clay and is downgradient from sensitive groundwater resources. When coupled with low groundwater gradients, the travel time for contaminants to be transported off site (if a leak in the liner system were to occur) is considerably longer than required by the Maine SWMR. Moreover, even if additional stormwater were to temporarily infiltrate into the landfill through the cover system, there are mechanisms in place to detect and correct such an event, and there is no reason to believe that any additional water entering the landfill would escape from the containment system. Leak detection based on continued evaluation of leachate generation volumes and chemistry along with the environmental protective groundwater monitoring system would provide more than ample time to implement corrective measures in the unlikely event they were needed.

Additionally, WMDSM has measures in place to reduce the potential for the cover system to be breached. The cover system is subject to visual inspection and can be readily accessed for repairs if necessary, and the LCS provides detection capabilities that will alert WMDSM in the unlikely event that significant damage to the cover system were to occur during the post-closure period.

This report has provided clear and convincing discussions of the equivalency and benefits of the alternative final cover and demonstrates that the distinctive design, site characteristics, and operational aspects of the Crossroads facility will ensure compliance with all solid waste laws and rules, and the alternative cover system will not result in air or water contamination nor constitute a hazard to the environment or the health and welfare of the state of Maine.

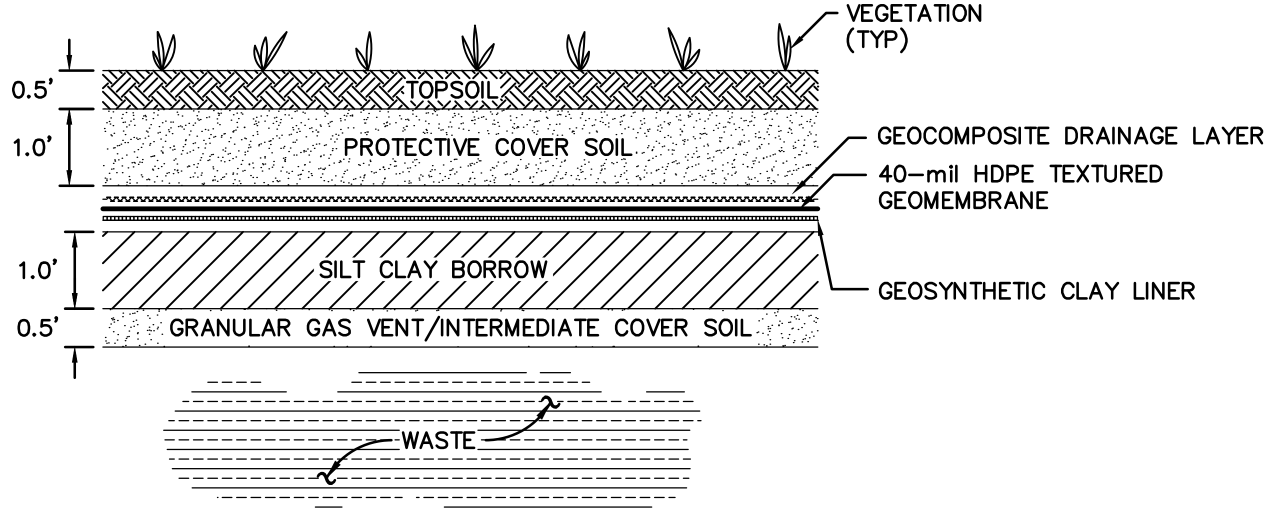
6. REFERENCES

Maine Department of Environmental Protection, *Final Cover System Guidance Document for Municipal Solid Waste Landfills*, November 1995.

Schroeder, P.R., et al., *The Hydrologic Evaluation of Landfill Performance (HELP) Model: Engineering Documentation of Version 3*, EPA/600/9-94, U.S. Environmental Protection Agency Risk Reduction Engineering Laboratory, Cincinnati, Ohio, 1994.

Golder Associates, "Volume III: Geologic and Hydrogeologic Assessment", *Landfill Siting Application – Phase 14 – Crossroads Landfill*, October 2019.

FIGURES



SWMR CHAPTER 401.5.G FINAL COVER SYSTEM

CROSSROADS LANDFILL
NORIDGEWOCK, MAINE

Geosyntec consultants

Figure 1

Augusta, ME | OCTOBER 2019

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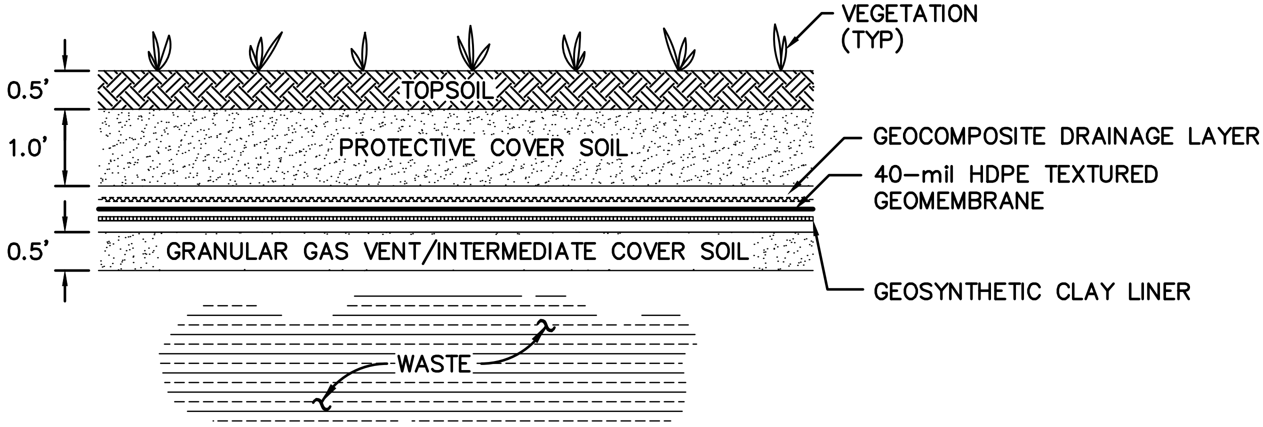

REVISED FINAL COVER SYSTEM

CROSSROADS LANDFILL
NORIDGEWOCK, MAINE

Geosyntec consultants

Augusta, ME | OCTOBER 2019

Figure 2

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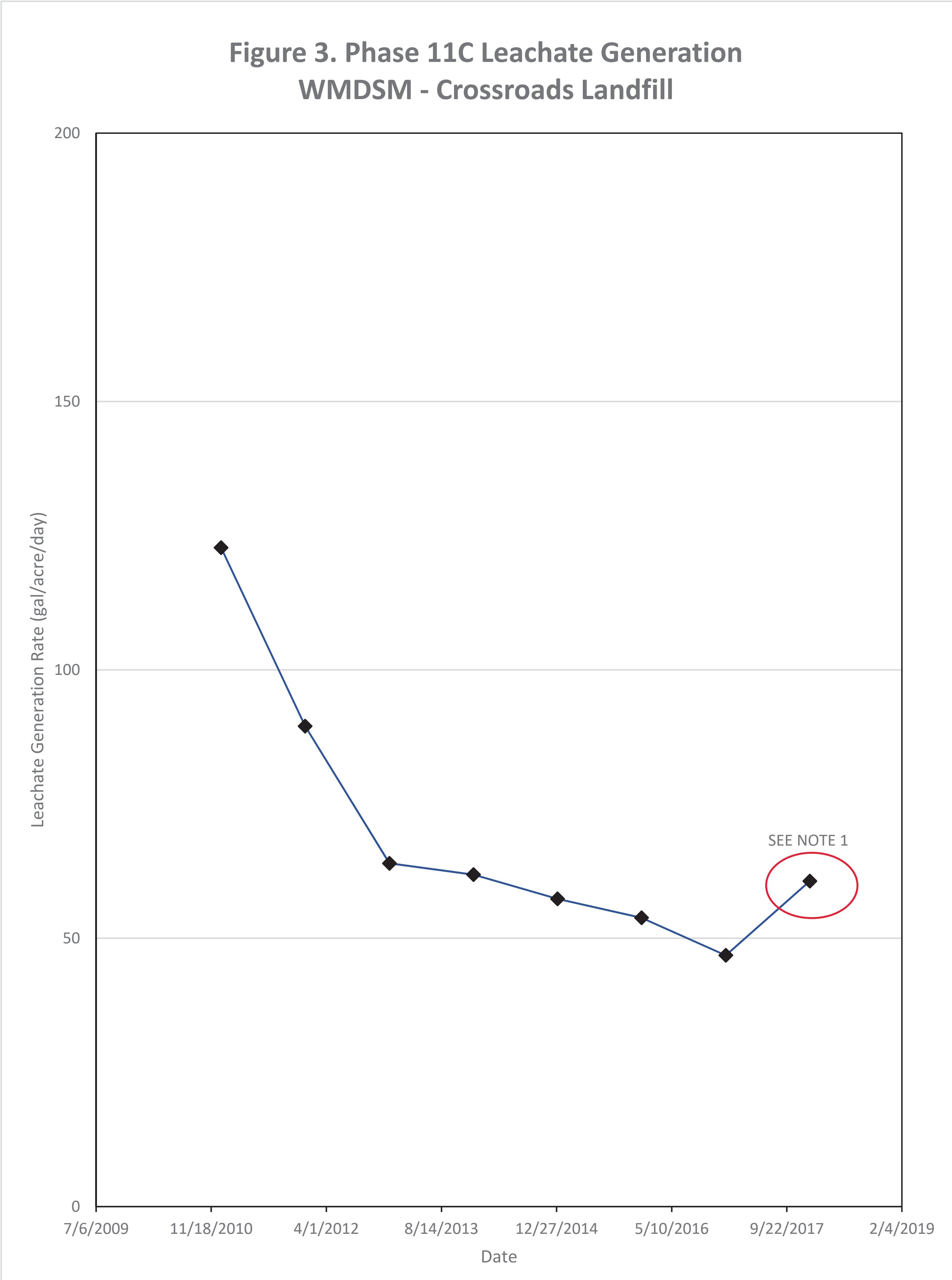
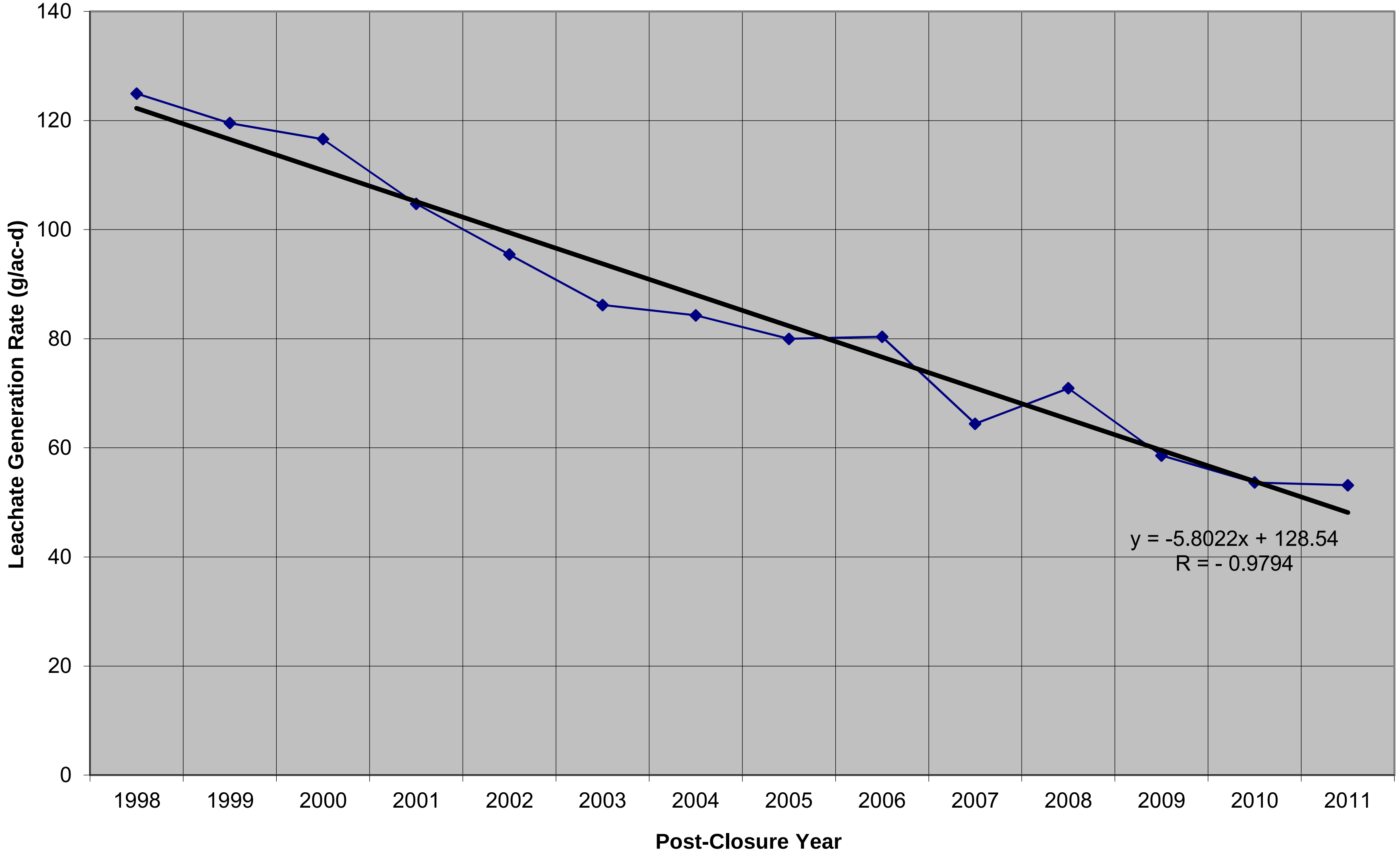


NOTE 1: Upward trend in leachate generation in 2016-2017 was the result of tarp removal prior to final cover construction.

Figure 4. TLR-II Post-Closure Leachate Generation
Waste Management Turnkey Landfill



APPENDIX A

PHASE 14 LEACHATE RECIRCULATION PLAN

Geosyntec consultants

engineers | scientists | innovators

PHASE 14

LEACHATE RECIRCULATION PLAN

Crossroads Landfill
Norridgewock, Maine

Prepared for

Waste Management Disposal Services of Maine, Inc.
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Project Number: BE0232

October 2019

TABLE OF CONTENTS

FIGURES

APPENDIX

1. INTRODUCTION

1.1 Terms of Reference

This Leachate Recirculation Plan (Plan) for the Phase 14 landfill was prepared by Youngmin Cho, Ph.D., Nicholas Yafrate, Ph.D., P.E. and Scott Luettich, P.E. of Geosyntec Consultants (Geosyntec) under the direction of Sherwood McKenney, District Engineer at the Waste Management Disposal Services of Maine, Inc. (WMDSM) Crossroads Landfill in Norridgewock, Maine (the Site).

This Plan was developed to support a proposed revised Phase 14 final cover system consistent with the revised final cover system that was previously approved for the Phase 8 landfill on 23 July 2014 by the Maine Department of Environmental Protection (MEDEP). The Department issued License Amendment #S-010735-WD-XH-A, which granted WMDSM conditional approval to construct a revised final cover system in approved areas of the Phase 8 landfill. MEDEP acceptance of the revised Phase 8 final cover system was based on a demonstration of equivalency between the alternative final cover design and the cover design specified by Maine Solid Waste Management Rules (SWMR). The alterative final cover system for the previously approved Phase 8 landfill and the proposed Phase 14 landfill relies on the use of leachate recirculation to degrade and stabilize the in-place waste more quickly. This Plan presents the leachate recirculation and monitoring program to be implemented for Phase 14 landfill at the Site.

1.2 Document Organization

The remainder of this document is organized as follows:

- Section 2, *Facility Information*, identifies the areas of the site, infrastructure, and equipment relevant to Phase 14 leachate recirculation activities
- Section 3, *Recirculation Procedures*, describes the methods and frequencies of how leachate will be introduced into the waste, including requirements for documentation
- Section 4, *Recirculation Quantity and Limitations*, describes the maximum quantity to be recirculated in the areas specified in this Plan, and operational limitations while recirculating leachate in the subject areas
- Section 5, *Recirculation Performance Monitoring*, describes the monitoring parameters to evaluate the performance of leachate recirculation and the activities that will be conducted to monitor the recirculation parameters
- Section 6, *Documentation and Reporting*, describes the monitoring documentation and reporting requirements
- Section 7, *Training*, describes the curriculum that will be provided to WMDSM employees responsible for operating the leachate recirculation system
- Section 8, *References*, presents references used to develop this Plan

Health and Safety (H&S) procedures applicable to the leachate recirculation or performance monitoring activities are the responsibility of WMDSM and are not addressed in this Plan.

2. FACILITY INFORMATION

2.1 Leachate Recirculation Areas

Leachate recirculation is planned for the active areas of Phase 14. Active areas of the landfill are defined as areas in which waste is being placed (also referred to as working face or active face in this Plan).

2.2 Site Infrastructure Relevant to Leachate Recirculation

Infrastructure pertinent to the leachate recirculation activities are summarized below including the leachate load-out station and flow meter, tanker truck parking platform, tanker truck load-out containment area (consisting of a concrete pad, curb, and drainage/overfill sump to control potentially spilled leachate), and tanker truck.

There are two leachate storage tanks at the Site. Both tanks are located at the Leachate Storage Tank Facility south of the Phase 12 secure disposal unit (see Figure 1). The larger storage tank has a capacity of 948,000 gallons and the smaller tank has a capacity of 91,000 gallons. Photographs of the storage tanks are shown in Figures 2 and 3.

Leachate from the active and inactive disposal units is managed by the Site's leachate collection / transfer system in which leachate is pumped to the storage tanks via forcemain pipes. The leachate is typically transferred from the storage tanks to tanker trucks at the adjacent leachate load-out station for off-site disposal. The load-out station will be used to transfer leachate into a tanker truck so it can be transported to the landfill for introduction (recirculation) into the waste. Photographs of the load-out station area are shown in Figures 4, 5, and 6.

The leachate load-out station includes an electronically activated pump connected with steel piping to an elevated overhead port. A flexible PVC hose is attached to the port. The truck hook-up is elevated such that leachate is loaded into the top of the tanker trucks. The truck hook-up is located directly above the tanker truck load-out containment area. A magnetic totalizing flow meter is located adjacent to the load-out station. The flow meter is used to monitor and record the amount of leachate transferred into the tanker truck before each leachate-introduction event. A photograph of the flow meter and readout panel is shown in Figure 7.

2.3 Leachate Recirculation Equipment and Documentation Forms

The equipment and documentation forms associated with the leachate recirculation system include:

- Tanker truck
- Hose for conveying leachate from the tanker truck to the active face
- Stop watch or timer
- Documentation forms for the leachate introduction events and for incident reporting (Appendix A)

Each of these is described below.

Tanker Truck: The tanker truck is used to transport leachate from the Leachate Storage Tank Facility to the Phase 14 active face. A photograph of the tanker is shown in Figure 8. The tanker has approximately 1,800-gallon capacity and is filled from a port on the top of the tank. The tanker is equipped with a pump and a mounted spray nozzle to distribute leachate on new waste at the active face. An overfill port is also located on the top of the tanker which directs liquid to the overfill sump in case the tanker is overfilled at the storage tank filling station.

Clock/Timer: A clock or timer will be used by the tanker truck driver to record the time that leachate is introduced during each event.

Documentation Forms: The following forms will be used to document activities associated with the leachate recirculation activities.

1. *Leachate Introduction Log* - used to document the date, time, and approximate amount of leachate sprayed on active working faces during each introduction event. A blank template of the log is provided in Appendix A of this Plan.

2. *Leachate Recirculation Incident Report Log and Incident Report* - used to document if any incident associated with the leachate recirculation activities were to occur. Examples of incidents include spillage of leachate near the ports or elsewhere on the landfill potentially of environmental concern; observance of gas or liquid in unexpected areas of the landfill; or any event that might compromise the integrity of the leachate recirculation system, the landfill gas collection system, the liner system, or the final cover system. A blank template of the Leachate Recirculation Incident Report is provided in Appendix A of this Plan. All incident must also be recorded on the Leachate Recirculation Incident Report Log, which is also included as a blank form in Appendix A.

3. RECIRCULATION PROCEDURES

3.1 Overview

The following procedures will be used for the recirculation of leachate in active areas. Leachate will be applied to the active face by spraying it with a pump and spray nozzle system mounted on the tanker truck dedicated to leachate recirculation. Spraying of leachate on the active face should be accomplished such that the leachate is evenly applied to the new waste, rather than concentrated application in discrete areas. The procedures outlined below shall not be altered without review and approval from WMDSM's District Engineer.

3.2 Tanker Truck Filling Procedures

1. Drive the tanker to the leachate load-out station.

2. Fill the tanker with the volume of leachate to be used for the leachate recirculation event (i.e., ~1,800 gallons).

3. Verify the volume in the tanker using the flow meter at the load-out station.

4. Close the hatch where leachate is loaded into the tanker.

5. Insert a plug into the open end of the site tube before departing the load-out station to prevent potential leachate release from the tube.

3.3 Recirculation Procedures & Documentation

The following procedure shall be followed between 30 April and 15 November. Leachate recirculation on active areas will not occur between the period of 15 November and 30 April due to likely freezing conditions. Weather conditions between this time frame do not typically present a situation whereby day-time temperatures are above freezing for extended periods of time, warranting the tanker truck to be taken out of winterization. It is not feasible to perform leachate recirculation during this time frame for short periods of time requiring continual/repeated winterization of the tanker truck after each recirculation event due to freezing conditions.

1. Operations will provide safe access and a safe parking (near the working face) so the leachate technician can manage the recirculation process without disrupting landfilling activities. Heavy equipment operators and the leachate technician will communicate to effectively spray new waste while ensuring the safety of WMDSM customers.

2. Record the start time on the Leachate Introduction Log (blank form in Appendix A).

3. Start the pump, open necessary valves, and operate the spray nozzle over the desired area.

4. Stop leachate recirculation in areas where prolonged pooling of leachate occurs, where the waste is visibly saturated, or where leachate does not readily absorb into the waste. If leachate pooling is observed, terminate the recirculation process immediately and allow leachate to completely percolate into underlying waste prior to restarting the procedure.

5. Once the volume of leachate in the tanker is expended, close necessary valves, shut the pump off, and record the stop time.

6. Return the tanker truck to the storage location until the next leachate recirculation event.

3.4 Equipment Outage

In the event that equipment is damaged or in need of repair, such that leachate recirculation cannot be performed, leachate recirculation will be postponed until the equipment is repaired or replaced. Equipment outages will be noted in the Leachate Recirculation Incident Log.

4. LEACHATE RECIRCULATION QUANTITIES AND LIMITATIONS

This section addresses the recommended leachate recirculation quantity and additional limitations pertaining to leachate recirculation. The recommended leachate recirculation quantities were developed based on the calculated increase in waste density that will result from the addition of leachate.

4.1 Recirculation Quantity

Leachate recirculation quantities for the active areas of Phase 14 were calculated such that the total increase in waste density resulting from leachate recirculation will be no greater than 75 pcf (Geosyntec 2014d). Based on the historic site records, the calculated waste density prior to leachate recirculation is 70.5 pcf so leachate can be added to result in a density increase of 4.5 pcf (15.3 gallons/ton). Using the projected annual waste acceptance of 450,000 tons during the Phase 14 operation period, the maximum quantity of leachate corresponds to 135,380 gallons of leachate addition per week (i.e., 75 truckloads per week at 1,800 gallons each). If the average gate receipt tonnage changes, then the total quantity of leachate must be adjusted accordingly.

The Site performed an active face leachate recirculation pilot program throughout the summer and fall of 2015 and found that up to approximately 12 truckloads (at 1,800 gallons each) could be safely and effectively introduced to the active face weekly. Introducing additional leachate may result in operational problems related to trafficability, safety, odors, and accumulation of liquids on the waste surface. In addition, excessive liquid addition, in combination with other conditions such as high overburden pressure, air intrusion, and presence of certain metals (e.g., aluminum), can result in increasing temperatures in the waste and gas. For these reasons, the Site will plan to recirculate approximately 12 truckloads weekly. Should conditions change such that additional leachate can be introduced without causing operation problems, no more than the maximum leachate quantity discussed in the previous paragraph will be introduced.

4.2 Recirculation Limitations

Limitations pertaining to leachate recirculation in the active area include:

- Do not add leachate within 10 ft laterally of proposed final exterior waste slopes. Doing so could saturate the waste in areas that could lead to instability of the waste and/or the final cover system.
- Do not directly add leachate to special wastes, such as sludge, that already have high water content. The addition of leachate to such materials will not significantly enhance degradation and without overburden from waste placed above may result in increased moisture content and reduced strength of the waste mass.
- Do not add leachate to areas where the waste thickness over the liner is less than 5 ft. Adding leachate to a thin layer of waste placed just above the liner system will not significantly enhance degradation of such a thin layer and could result in very soft (mushy) waste that is not sufficiently protective of the liner system.

- Stop leachate recirculation in areas where prolonged pooling of leachate occurs, where the waste is visibly saturated, or where leachate does not readily absorb into the waste. Continuing to recirculate leachate in such an area will not significantly improve biodegradation and can lead to slope instability and trafficability problems.
- Discontinue leachate recirculation in the areas where an adjacent gas extraction well has watered out or is experiencing significant reduction in gas flow.
- Discontinue leachate recirculation in active areas where Operations experiences a sustained presence of landfill gas odors.
- Discontinue leachate recirculation for the scheduled day(s) when safe access is not possible or when leachate recirculation activity will disrupt landfilling operations (e.g., traffic).
- No leachate recirculation will be performed during heavy rain, and leachate recirculation activities will be discontinued for the following day so the water can soak into the waste in the active area.

5. RECIRCULATION PERFORMANCE MONITORING

5.1 Parameters for Assessing Leachate Recirculation Performance

5.1.1 Overview

Leachate recirculation, when performed correctly, accelerates decomposition of the waste. In order to assess the efficacy of a leachate recirculation program, characteristics or properties of the landfill gas (LFG), leachate, and the waste can be monitored and evaluated. The waste decomposition process is discussed below relative to LFG, leachate, and waste characteristics. The means by which these characteristics will be monitored and evaluated at the Site is presented in the Section 5.2.

5.1.2 LFG Characteristics

The waste decomposition process consists of three primary phases. Initially, a preliminary aerobic phase occurs during which oxygen that was present in the waste upon being deposited is consumed by aerobic organisms. An example of this initial aerobic phase is the consumption of cellulose in the waste and oxygen according to the following formula:

$$C_6H_{10}O_5 + 6O_2 \rightarrow 6CO_2 + 5H_2O \qquad \text{[Equation 1]}$$

where: $C_6H_{10}O_5$ is cellulose, O_2 is oxygen, CO_2 is carbon dioxide and H_2O is water. This preliminary aerobic phase is usually short-lived in most landfill settings.

As the oxygen is consumed, anaerobic organisms start to dominate the decomposition process which shifts the overall waste-degradation process into the second phase. This phase, termed the anaerobic phase, is much longer than the aerobic phase, and is characterized by further consumption of biodegradable organic materials in the presence of water. The anaerobic degradation of cellulose occurs according to the following formula:

$$C_6H_{10}O_5 + H_2O \rightarrow 3CH_4 + 3CO_2 \qquad \text{[Equation 2]}$$

where: $C_6H_{10}O_5$ is cellulose, H_2O is water, CH_4 is methane, and CO_2 is carbon dioxide. Recirculation of leachate during the anaerobic phase facilitates waste decomposition by providing the water needed (see Equation 2), and by distributing nutrients throughout the waste mass. LFG generation is most prevalent during the anaerobic phase.

The final phase (termed the final aerobic phase) takes place after the organic fraction of the waste (mainly cellulose and hemicellulose) has been consumed and the conditions return to aerobic. Additional decomposition at this stage is negligible.

As indicated by Equation 1, oxygen is consumed during the early stages shortly after the waste has been placed (i.e., during the preliminary aerobic phase). Therefore, trends in the oxygen content in the LFG may give an indication of whether the waste has progressed through the preliminary aerobic phase and has achieved the conditions of the anaerobic phase. During the transition from the preliminary aerobic phase to the anaerobic phase, the amount (percent) of oxygen in the LFG should decrease and the makeup of the gas should change to approximately 50% methane and 50% carbon dioxide, thereby indicating an increase in microbial decomposition[1].

On the basis of the above information, waste subjected to leachate recirculation should exhibit the following trends when compared to dry-tomb landfilling:

- the initial oxygen content may decrease more rapidly;
- methane concentrations are expected to increase more rapidly; and
- carbon dioxide concentrations are expected to increase more rapidly

Eventually, downward trends in the quantities of methane and carbon dioxide will indicate the waste is reaching the end of the anaerobic decomposition phase and is entering into the final aerobic phase.

5.1.3 Leachate Characteristics

Chemical oxygen demand (COD) and biological (or biochemical) oxygen demand (BOD) in the leachate are indicators of waste decomposition. COD is a measure of oxygen to be consumed for chemical reactions including biological decomposition. BOD is a measure of oxygen to be consumed by biological decomposition and is therefore an indicator of biologically degradable organic content in liquid. In most landfill leachate, BOD decreases over time as the nutrients within the leachate are consumed by the biodegradation process. As waste decomposes, the ratio of BOD to COD typically decreases from a value close to 1.0 for fresh waste to values below 0.5 (USEPA, 2006), and even as low as 0.1 for fully degraded waste. Since leachate recirculation increases the rate of microbial decomposition of the waste, the rate at which the BOD:COD ratio decreases is faster in recirculation landfills compared to dry-tomb landfills.

Temperatures within the waste are expected to increase due to microbial activity. Since leachate recirculation facilitates the microbial decomposition process, average temperatures in the waste should, in theory, be higher (or at least achieve higher temperatures faster) in waste subjected to leachate recirculation than in similar dry-tomb landfills. Changes in the temperature of the leachate or liquid in gas-wells may potentially be an indicator of changes in the temperature in the waste and can be measured more readily than direct thermal measurements within the waste mass.

As described above in the LFG discussion, the waste decomposition process consists of three phases. The second phase (i.e., the anaerobic phase) actually consists of two sub-phases: (i) the acid-forming anaerobic subphase and (ii) the methane-forming anaerobic subphase. During the acid-forming subphase, microbes break down large molecules into smaller soluble molecules; other organisms produce acids from these soluble molecules. Then, another group of organisms (methanogenic bacteria) produce CH_4 and CO_2 from the acids. On this basis, the pH of the leachate can assist in identifying the phase of the waste degradation process. As microbial activity first transitions into the anaerobic phase (i.e., into the acid-forming sub-phase), the pH of the leachate should decrease. Then, as the process moves into the methane producing part of the anaerobic

[1] In reality, the % methane and % carbon dioxide will not comprise 100% of the gas, since small amounts of balance gases (typically nitrogen and water vapor) will also be present.

phase, the pH of the leachate should increase back to the neutral range (USEPA, 2006). A pH range of 6.8 to 7.6 is considered optimal for further anaerobic decomposition activity (USEPA, 2006).

Chloride concentration has also been referenced as an indicator of landfill leachate stabilization for the following reasons: (i) chloride concentration in leachate is typically high compared to other inorganic compounds and thus it is more easily detectible; (ii) changes in chloride concentration in leachate can theoretically correlate to degradation of waste (i.e., high concentration in the early stage after waste placement followed by a gradual decrease and then reaching pseudo steady-state low concentration phase); and (iii) chloride is not redox sensitive. Therefore, monitoring chloride concentrations may be useful in indicating when waste degradation has reached an advanced stage (as represented by chloride concentrations entering the pseudo steady-state phase). Because the rate of waste degradation is expected to be enhanced resulting from leachate recirculation, this pseudo steady-state equilibrium would be expected to be achieved more quickly than in other comparable conventional dry-tomb type landfills.

5.1.4 Waste Characteristics

As previously discussed, recirculation of leachate, especially during the anaerobic phase, facilitates waste decomposition by providing the water needed (see Equation 2) and by distributing nutrients throughout the waste mass. The optimum moisture content (OMC) for waste degradation is widely accepted to be the “field capacity” of the waste. The field capacity of any media is defined as the quantity of liquid that can be held within the medium against the influence of gravity. The field capacity of landfilled waste depends on many factors including waste composition, particle size distribution, age, and the degree of compaction. Commonly accepted values of field capacity range from 35-45% (Townsend, 2008) to 40-60% (Zornberg et al, 1999). Moisture content analyses of the waste can therefore be used to assess whether OMC conditions have been achieved within the portions of the landfill that are subjected to leachate recirculation.

Waste settlement in a landfill can be the result of consolidation of the waste mass under its own weight, from the placement of additional loading (more waste and/or cover soils), and from the decomposition of organic material in the waste. In a traditional dry-tomb landfill the settlement rate decreases due to slower decomposition of organic material in the waste after completion of mechanical consolidation. However, in landfills where leachate is recirculated, the accelerated waste decomposition is sometimes manifested by more rapid settlement of the landfill surface (Benson et al. 2007; El-Fadel et al. 1999; Sanchez-Aliciturrie et al 1995). Similar to many other parameters discussed herein, the magnitude of total settlement is not necessarily greater in landfills that recirculate leachate, but the rate of settlement may be more rapid with recirculation than in dry-tomb landfills. Measurements of settlement at the landfill surface, however, are often obscured by additional waste placement or other equipment activities which render settlement monitoring data too imprecise to be quantitatively correlated to waste degradation in recirculation areas compared to areas where recirculation is not performed.

5.2 Recirculation Performance Monitoring

5.2.1 Overview

As discussed in Section 5.1, characteristics of the LFG, leachate, and waste can be used to assess the performance of leachate recirculation programs. It is noted, however, that the discussion in Section 5.1 is based largely on academic information rather than records from actual leachate recirculation landfills. Although measurements of the subject parameters can be performed, meaningful analyses of the data is challenging because the waste has often been deposited in the landfill for varying amounts of time before recirculation is started, and isolating the measured parameters to only the portion of the waste that is subject to recirculation is often difficult for landfills that were not originally designed for recirculation activities. In light of these challenges, the means by which the LFG, leachate, and waste parameters can be measured and evaluated are presented below.

5.2.2 LFG Monitoring and Evaluation

As discussed in Section 5.1.2, trends in the concentrations of oxygen, methane, and carbon dioxide in the LFG can be indicators of which phase of the decomposition process is occurring in the waste. WMDSM personnel will measure the LFG flow rate and concentrations of oxygen, methane, and carbon dioxide at active LFG wellheads in/near the areas leachate is recirculated on at least a quarterly basis. Monitoring will be terminated three months after completion of leachate recirculation in a leachate recirculation area.

Ongoing plots of the O_2, CH_4, and CO_2 concentrations at selected wellheads as a function of time will be maintained to evaluate the trends in the LFG data. The wellhead plots will be compared to LFG data obtained at the landfill gas to energy (LFGTE) plant to investigate variations in the trends and assess when the waste in the recirculation portions of the landfill has progressed through the first two decomposition phases (i.e., Phase 1 – Preliminary Aerobic, and Phase 2 – Anaerobic), and eventually enters into the final aerobic phase after most of the degradation is complete.

5.2.3 Leachate Monitoring and Evaluation

As discussed in Section 5.1.3, trends in BOD:COD ratio, temperature, pH, and chloride concentration of the leachate can be indicators of which phase of the decomposition process is occurring in the waste. Leachate samples will be collected from the Phase 14 LCS sumps on an annual basis and sent to a pre-approved analytical chemistry laboratory for BOD, COD, pH, and chloride testing. The temperature of the leachate samples will be measured/recorded in the field immediately upon being obtained. Ongoing plots of the BOD:COD ratio, temperature, pH, and chloride at the sumps as a function of time will be maintained to evaluate the trends in the leachate data. These plots will be reviewed to assess when the waste in the recirculation portions of the landfill has progressed through the first two decomposition phases (i.e., Phase 1 - Preliminary Aerobic and Phase 2 – Anaerobic), and eventually enters into the final aerobic phase after most of the degradation is complete.

5.2.4 Waste Monitoring and Evaluation

WMDSM tracks waste density at the Site on a quarterly basis. These analyses, termed Airspace Utilization Factor (AUF) analyses, are accomplished using aerial and topographical ground survey data and the cumulative tonnage data from the facility scale house. The updated densities will be factored into ongoing assessments of the landfill stability, specifically as incremental cell construction and filling is performed. Leachate recirculation quantities may be adjusted depending on the calculated waste densities and stability analyses.

6. DOCUMENTATION AND REPORTING

6.1 Monthly Records Update

WMDSM will retain electronic records of the data from the leachate recirculation and performance monitoring activities described in this Plan. Geosyntec will maintain a web-based FTP (SharePoint) folder in which Crossroads leachate recirculation data will be uploaded on a monthly basis to which MEDEP will have real-time access.

6.2 Annual Report – Leachate Recirculation Summary

WMDSM will prepare a summary of leachate recirculation activities occurring throughout the year within the Annual Report submitted to the MEDEP by April 30th.

7. TRAINING

7.1 Overview of Training Program

Leachate Recirculation Training is mandatory for all operators and maintenance personnel at the Site. The purpose of Leachate Recirculation Training is to promote applicable health and safety and environmentally protective practices. WMDSM will retain a list of all trainees who have completed the Leachate Recirculation Training outlined herein. The training will include a combination of classroom and field instruction as described below.

7.2 Training

Training will include, at a minimum, 1 hour of instruction provided by WMDSM's District Engineer, Operations Manager and/or other qualified person selected by the District Engineer. Prior to undertaking the training, the trainee(s) will be provided with a copy of this *Leachate Recirculation Plan* and any other pertinent sections of the *Site Operations Manual* for review.

The purpose of the training is to familiarize the trainee(s) with the practices and procedures identified above. The training will include verbal review of:

- Recirculation equipment and infrastructure, including proper operation of all equipment
- Recirculation procedures, including flow volume calibration, tanker filling, and leachate-introduction activities for both warm and cold weather conditions
- Documentation requirements for recirculation events
- Procedures for routine inspection of the leachate recirculation system and areas of the landfill in which recirculation will be performed
- Safety procedures specific to leachate recirculation (not covered in this Plan)
- Emergency procedures to be followed in the event of a problem during recirculation (not covered in this Plan)

Trainee(s) will participate in hands-on training using the same equipment and procedures required for completion of actual recirculation activities. The field training will coincide with regular leachate recirculation events. The trainee(s) will observe and assist with the recirculation event under the direct supervision of WMDSM's District Engineer and/or Operations Manager. At a minimum, the field training shall include:

- Review and inspection of the recirculation equipment, including leachate load-out station and tanker truck
- Observation of and/or assistance with:
  - Filling of tanker and confirmatory calculation of volume using flow meter at load-out station
  - Connection of flexible hose to tanker truck at introduction ports

- o Starting, monitoring, and stopping the flow of leachate from the tanker to the introduction ports and from the tanker truck leachate spray hose (or nozzles)
- o Completion of Leachate Introduction Log

After satisfactory completion of the classroom and field training, the trainee(s) will be allowed to perform leachate recirculation work at the Site in accordance with the procedures outlined in this Plan and any other applicable sections of the *Site Operations Manual*. A list of trained employees will be maintained in the office. Employees who have not completed the training will not be allowed to perform leachate recirculation.

7.3 Field Checks

At the discretion of the WMDSM's District Engineer and/or Operations Manager, field checks may be performed to verify conformance with the procedures for leachate recirculation identified in this Plan.

8. REFERENCES

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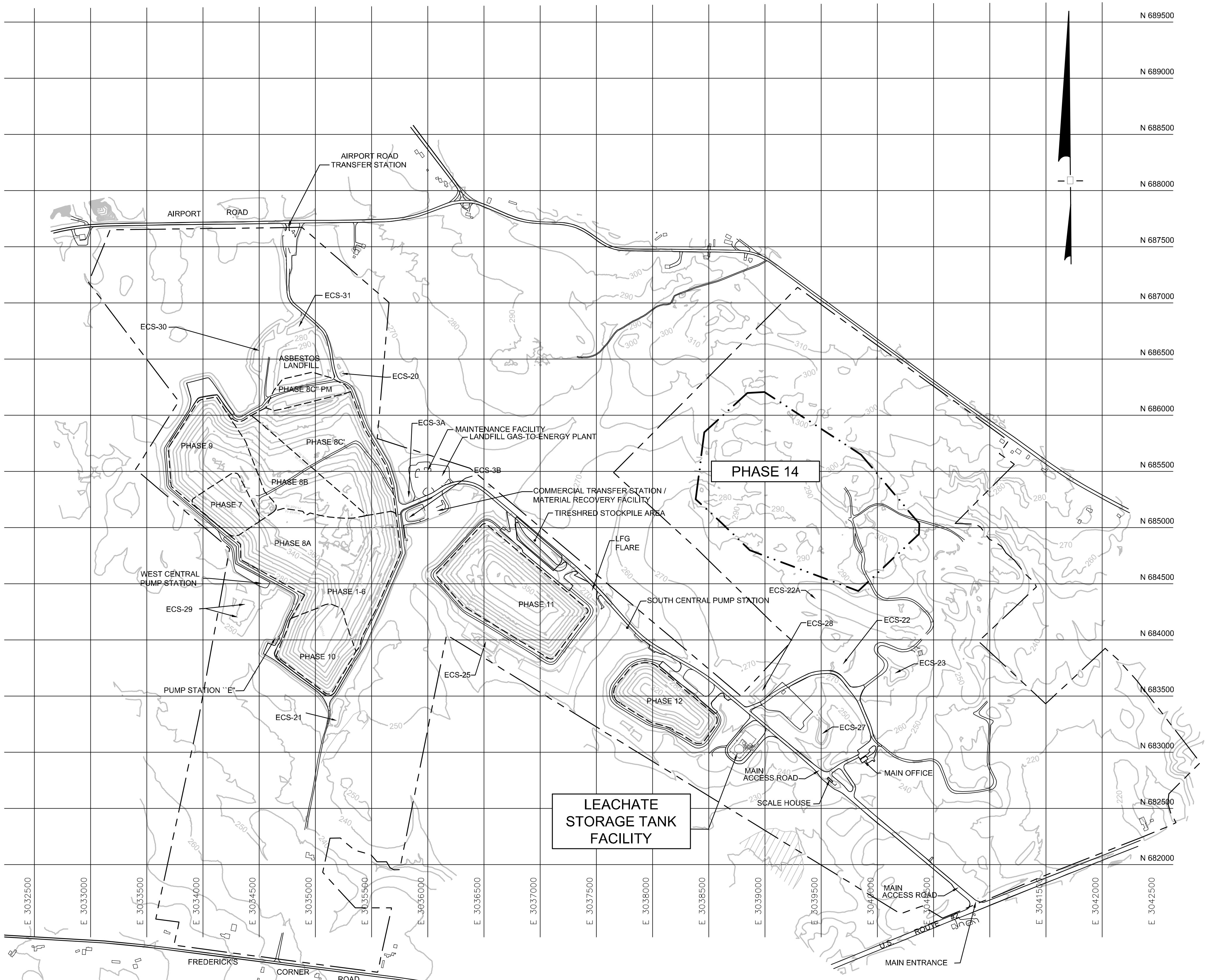
FIGURES



LEGEND

	GROUND SURFACE ELEVATION CONTOUR
	EXISTING BUILDINGS
	WMDSM FACILITY SITE BOUNDARY
	PHASE 14 DESIGN LIMIT OF WASTE
	ACCESS ROAD

NOTES:

1. EXISTING GROUND SURFACE AND FEATURES OBTAINED FROM TOPOGRAPHIC SURVEYS, DATED NOV 2017, AND SEPT 2018, PROVIDED BY BOYNTON & PICKETT.
2. HORIZONTAL DATUM IS NORTH AMERICAN DATUM OF 1983 (NAD 83) MAINE WEST STATE PLAN. VERTICAL DATUM IS NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88). PROPERTY BOUNDARY SURVEYED IN UTM SCALED TO NAD 83.

SCALE IN FEET

Geosyntec consultants

WASTE MANAGEMENT DISPOSAL SERVICES OF MAINE, INC.
357 MERCER ROAD
NORRIDGEWOCK, MAINE 04957
TELEPHONE: (207) 634-2714

PHASE 14 PERMIT APPLICATION

1

Figure 2. Small Leachate Storage Tank

Figure 3. Large Leachate Storage Tank

Figure 4. Leachate Load-out Station – Drive-in View

Figure 5. Leachate Load-out Station – Side View

Figure 6. Load-out Station Pipe

Figure 7. Flow Meter at Load-Out Station

Figure 8. Leachate Tanker Truck

APPENDIX A

DOCUMENTATION FORM TEMPLATES

Waste Management Disposal Services of Maine
Crossroads Landfill - Norridgewock, ME
Leachate Introduction Log
Active Area

Date of Recirculation Event (yyyy/mm/dd)	Operator Name(1)	Outside Temperature (F)	Initial Flowmeter Reading (gallons)	Final Flowmeter Reading (gallons)	Start Time	Stop Time	Volum of Leachate Indtroduced	Grid	Elevation (ft)

Waste Management Disposal Services of Maine
Crossroads Landfill - Norridgewock, ME
Leachate Recirculation Incident Report Log

Incident Report Number	Date	Time	Reported By (Name)	Incident Location	Date Follow Up Action Implemented	Signature of Person Resp. for Follow-up

Waste Management Disposal Services of Maine
Crossroads Landfill - Norridgewock, ME
Leachate Recirculation Incident Report

Date: ______________________ Weather: ______________

Time: ______________________ Temperature: ______________

Reported By: ______________________________

Signature: ______________________________

INCIDENT TYPE AND DESCRIPTION

Spill ☐ Damage to Landfill Cap ☐

Equipment Malfunction ☐ Leachate Seeps ☐

Infrastructure Damage ☐ Other ☐

Location: ______________________________________

Incident Description: ______________________________________

FOR OFFICE USE ONLY

Responsible Party for Follow-up Action (Name): ______________________________

Required Follow-up Action: ______________________________________

APPENDIX B

Puncture Resistance Design Computations

Written by:	Youngmin Cho	Date:	2019.10.23	Reviewed by:	Andrew Rohrman Nick Yafrate	Date:	2019.10.23 2019.10.24
Client:	WMDSM	Project:	Phase 14 Permitting	Project/ Proposal No.:	BE0232C	Task No.:	02

GEOMEMBRANE PUNCTURE PROTECTION ANALYSIS
REVISED FINAL COVER SYSTEM
WMDSM - CROSSROADS LANDFILL PHASE 14
NORRIDGEWOCK, MAINE

The purpose of this analysis is to evaluate the puncture resistance of the geomembrane component of the final cover system (cap) due to the stress imparted by heavy construction equipment traffic during construction and post-closure period of Phase 14 at the Crossroads Landfill, located in Norridgewock, Maine.

DESCRIPTION OF REVISED FINAL COVER SYSTEM

The proposed revised final cover system consists of the following components, from top to bottom:

- Topsoil with a minimum thickness of 6 in;
- Protective cover layer with a minimum thickness of 12 in;
- Double-sided geocomposite drainage layer (geocomposite);
- 40-mil (1.0-mm) high density polyethylene (HDPE) geomembrane;
- Geosynthetic clay liner (GCL); and
- Intermediate cover/gas vent layer (i.e., granular material) with a minimum thickness of 6 in placed directly over the waste.

During the construction of the final closure system, a 3-ft (minimum) thick temporary access road will be constructed on top of the geosynthetic components of the final cover system to transport final closure construction material. The temporary access road is assumed to be constructed using the protective cover soil. Assessment of the potential traffic loads indicates that the heaviest load that will occur from construction equipment is an articulated truck during closure construction, or a bulldozer for repair of the final closure system during the post-closure period.

The level of stress imparted on the geomembrane by the construction vehicle loading was estimated using an assumed 1:1 stress distribution ratio for the lateral spread of vertical stress with increasing depth of cover soil/material and presented in Table 1.

Written by:	Youngmin Cho	Date:	2019.10.23	Reviewed by:	Andrew Rohrman Nick Yafrate	Date:	2019.10.23 2019.10.24
Client:	WMDSM	Project:	Phase 14 Permitting	Project/ Proposal No.:	BE0232C	Task No.:	02

Table 1: Pressure Distribution due to Equipment Loading

Loading	Pressure at Ground Surface[1]	At Ground Surface			Depth to GM	At Geomembrane				
		Contact Area	Tire Width	Length of Contact		Load Distribution Width	Load Distribution Length	Load Distribution Area	Pressure	Pressure
(-)	(lb/in^2)	(in^2)	(in)	(in)	(in)	(in)	(in)	(in^2)	(lb/in^2)	(lb/ft^2)
Truck - CAT 740 Art. Dump[(1)]	51	505	34.6	14.6	36	106.6	86.6	9,232	2.79	410
Dozer - CAT D6T	9	4557	43.8	104.0	18	79.8	140.0	11,174	3.63	530

Note:

1. The maximum loading was assumed to be from a Caterpillar 740 articulated dump truck with a tire loading estimated to be 27,129 lbs per tire, which corresponds to a pressure of 51 lbs/in^2 on the road surface. Truck and tire specifications, with details of the estimated tire loading, are provided in Attachment A

A summary of the stress imposed on the geomembrane is provided in Table 2 below.

Table 2: Summary of Stress on the Geomembrane

Stress on Geomembrane	Thickness (ft)	Unit Weight (lb/ft^3)	Stress (lb/ft^2)
Protective cover layer (Temporary Construction Road)	3.0	120	360
Equipment (CAT 740 Art. Dump Truck)	—	—	410
Total	—	—	770
Topsoil	0.5	110	55
Protective cover layer	1.0	120	120
Equipment (Dozer – CAT D6T)	—	—	530
Total	—	—	705

METHODOLOGY

Design of the cap requires addressing the potential for puncture of the geomembrane layer by soil particles contacting the geomembrane. Puncture protection is generally provided by inclusion of an appropriately sized (mass per unit area, oz/yd^2) nonwoven geotextile cushion layer, which prevents direct contact between the granular material and the geomembrane. As presented above, the geomembrane will be overlain by double-sided geocomposite and underlain by GCL. The allowable pressure, P_{allow}, to protect the geomembrane from puncture is calculated using the Koerner (2005) design method, which proposes a basic empirical equation for protection of a 1.5 mm (60-mil) thick HDPE geomembrane against puncture:

$$p_{allow} = \left(50 + 0.00045\,\frac{M}{H^2}\right)\left[\frac{1}{MF_S \times MF_{PD} \times MF_A}\right]\left[\frac{1}{RF_{CR} \times RF_{CBD}}\right]$$

Where:

p_{allow} = allowable pressure on geomembrane (kPa);
M = mass per unit area of geotextile (g/m^2)
H = protrusion height (m) = d_{50};
d_{50} = grain diameter (mm) corresponding to 50% passing by weight;
MF_S = modification factor for protrusion shape;
MF_{PD} = modification factor for packing density;
MF_A = modification factor for arching in solids;
RF_{CR} = reduction factor for long-term creep; and
RF_{CBD} = reduction factor for long-term chemical/biological degradation.

Note that the above equation was developed specifically for 1.5 mm (60-mil) thick HDPE geomembrane. In accordance with Koerner's method, the equation can be modified to account for geomembranes of different thicknesses (e.g., 40-mil) (Koerner et al. 2010). The value of the first constant (50 kPa) in the equation is the puncture resistance value of the 1.5-mm HDPE geomembrane. This value can be adjusted to account for different geomembrane thicknesses by multiplying the original value of the constant by the ratio of design geomembrane thickness to that of a 1.5-mm geomembrane (i.e., 50 kPa x $T_{actual}/T_{1.5mm}$). Recommended modification and reduction factors are presented in Koerner (2005), with updates presented in Koerner et al. (2010) and included in Attachment B. Values selected for each parameter for geomembrane puncture analysis are shown in Attachment C. The site specification for the final closure requires the geocomposite to be double-sided with minimum 8-oz/yd^2 (or 271 g/m^2) nonwoven geotextile on each side (see Volume VI of the Phase 14 permit application).

d_{50} = 2 mm was selected per the site protective cover soil specification (see Volume VI of the Phase 14 permit application); note, the intermediate cover/gas vent layer soil, which will be placed below GCL, has a smaller d_{50} (i.e., approximately 0.42 mm or less).

RESULTS AND CONCLUSION

As presented in Attachment C, for the evaluated loading conditions the calculated allowable pressures on the 40-mil HDPE geomembrane overlain by one layer of 8-oz/yd^2 nonwoven geotextile is approximately 499 to 545 times greater than the assumed vertical stress due to an articulated truck or dozer and overlain soils. It is noted that the upper 8-oz/yd^2 nonwoven geotextile and geonet of the double-sided geocomposite will provide additional protection of geomembrane from puncture.

Written by:	**Youngmin Cho**	Date:	**2019.10.23**	Reviewed by:	**Andrew Rohrman**	Date:	**2019.10.23**
					Nick Yafrate		**2019.10.24**
Client:	**WMDSM**	Project:	**Phase 14 Permitting**	Project/ Proposal No.:	**BE0232C**	Task No.:	**02**

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ATTACHMENT A
Copies of Construction Loading Calculation References

MODEL	**735**		**740**		**740 Ejector**	
Gross Power — SAE J1995	324 kW	**435 hp**	350 kW	**469 hp**	350 kW	**469 hp**
Net Power — SAE J1349	313 kW	**419 hp**	338 kW	**453 hp**	338 kW	**453 hp**
Net Power — ISO 9249	319 kW	**424 hp**	342 kW	**458 hp**	342 kW	**458 hp**
Net Power — EEC 80/1269	319 kW	**424 hp**	342 kW	**458 hp**	342 kW	**458 hp**
Operating Weight (Empty)*	31 391 kg	**69,206 lb**	33 100 kg	**72,973 lb**	35 610 kg	**78,507 lb**
Top Speed (Loaded)	51.3 km/h	**31.9 mph**	54.7 km/h	**34 mph**	54.7 km/h	**34 mph**
GMW — Gross Machine Weight	64 091 kg	**141,297 lb**	72 600 kg	**160,055 lb**	73 610 kg	**162,282 lb**
Distribution Empty:						
Front	**60.5%**		**58.6%**		**55.6%**	
Center	**20.8%**		**21.8%**		**23.1%**	
Rear	**18.7%**		**19.6%**		**21.3%**	
Distribution Loaded:						
Front	**34.9%**		**33.9%**		**29.1%**	
Center	**33.1%**		**33.5%**		**35.9%**	
Rear	**32.0%**		**32.6%**		**35.0%**	
Max. Capacity**	32.7 t	**36 T**	39.5 t	**43.5 T**	38 t	**42 T**
Struck (SAE)	14.5 m³	**19.0 yd³**	18.5 m³	**24.2 yd³**	17.8 m³	**23.3 yd³**
Heaped (2:1) (SAE)	19.7 m³	**25.8 yd³**	24 m³	**31.4 yd³**	23.1 m³	**30.2 yd³**
Engine Model	**ACERT C15**		**ACERT C15**		**ACERT C15**	
No. Cylinders	**6**		**6**		**6**	
Bore	137 mm	**5.4"**	137 mm	**5.4"**	137 mm	**5.4"**
Stroke	171.5 mm	**6.75"**	171.5 mm	**6.75"**	171.5 mm	**6.75"**
Displacement	15.2 L	**926 in³**	15.2 L	**926 in³**	15.2 L	**926 in³**
Tires, Front, Center, Rear	**26.5R25 Radials**		**29.5R25 Radials**		**29.5R25 Radials**	
Circular Clearance Diameter	17.2 m	**56'5"**	17.2 m	**56'5"**	18.2 m	**59'6"**
Fuel Tank Refill Capacity	532 L	**140.5 U.S. gal**	532 L	**140.5 U.S. gal**	532 L	**140.5 U.S. gal**
General Dimensions (Empty):						
Height to Cab Top	3.7 m	**12'1"**	3.75 m	**12'3"**	3.75 m	**12'3"**
Wheel Base (Front-Center of Bogie)	5.23 m	**17'2"**	5.23 m	**17'2"**	5.58 m	**18'3"**
Overall Length	10.89 m	**35'7"**	10.89 m	**35'7"**	11.59 m	**38'0"**
Loading Height (Empty)	2.98 m	**9'8"**	3.2 m	**10'6"**	3.07 m	**10'1"**
Height at Full Dump	6.81 m	**22'4"**	7.1 m	**23'4"**	—	
Body Length	6.09 m	**20'0"**	6.3 m	**20'6"**	6.73 m	**22'1"**
Width (Operating — Over Mirrors)	3.82 m	**12'6"**	3.82 m	**12'6"**	3.82 m	**12'6"**
Front Tire Tread	2.69 m	**8'8"**	2.69 m	**8'8"**	2.69 m	**8'8"**

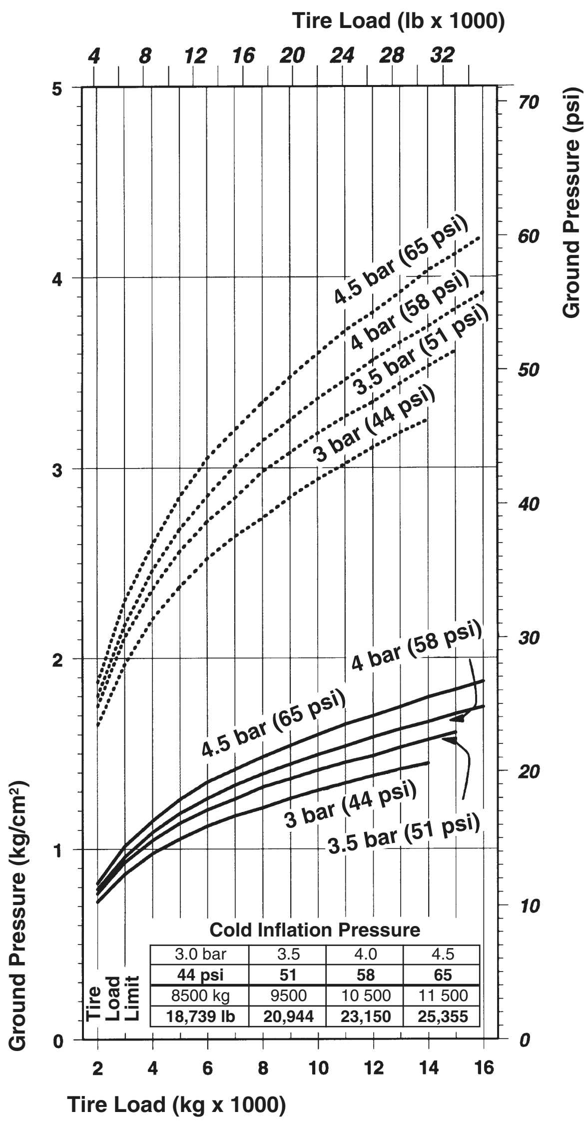
*Includes coolant, lubricant and full fuel tank.
**Rating dependent on optional equipment. Maximum gross weight (empty weight plus payload) should not be exceeded.

10

For 740,
Tire Load = (160,055 lbs x 0.339)/(2 Tires) = 27,129 lbs

Reference: Caterpillar Performance Handbook Edition 40

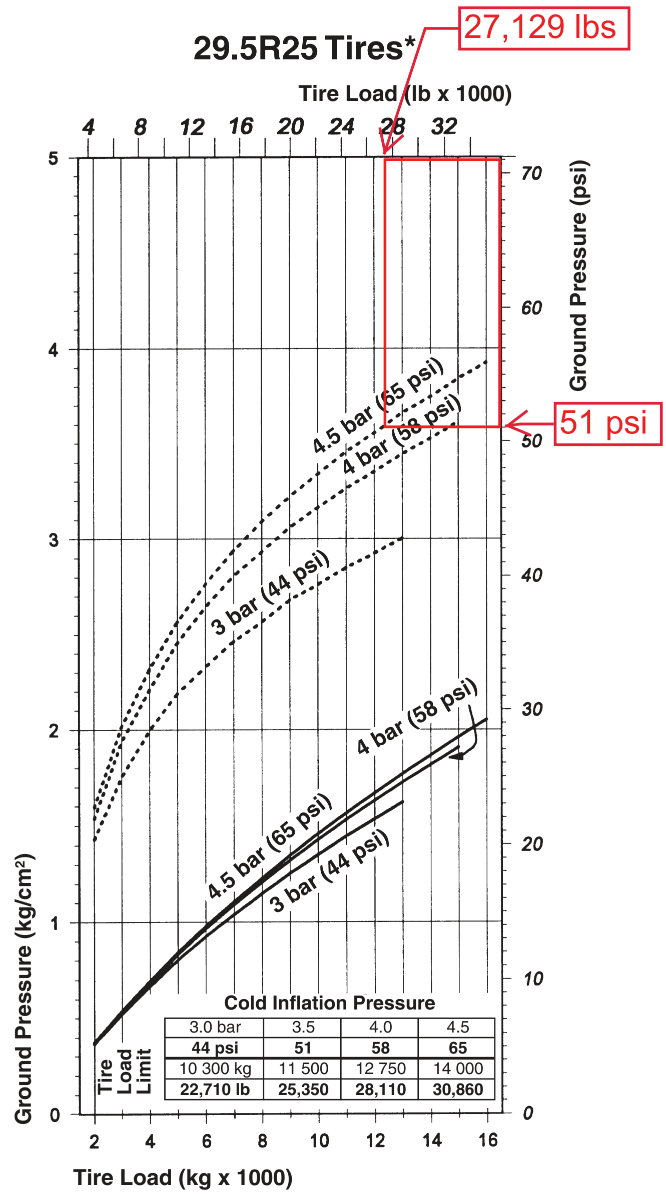
26.5R25 Tires*



Cold Inflation Pressure

Tire Load Limit				
	3.0 bar	3.5	4.0	4.5
	44 psi	**51**	**58**	**65**
	8500 kg	9500	10 500	11 500
	18,739 lb	**20,944**	**23,150**	**25,355**

29.5R25 Tires*



Cold Inflation Pressure

Tire Load Limit				
	3.0 bar	3.5	4.0	4.5
	44 psi	**51**	**58**	**65**
	10 300 kg	11 500	12 750	14 000
	22,710 lb	**25,350**	**28,110**	**30,860**

KEY

-------- Zero Penetration (Flat Plate)

——— 76 mm (3") Penetration

*Charts based on Michelin XADN tire characteristics. Results may differ for other tread patterns and/or brands. Charts are to be used to calculate ground pressure. To determine the inflation as a function of load and conditions or when loads exceed tire load limit, contact your tire manufacturer representative.

Reference: Caterpillar Performance Handbook Edition 40

29.5R25 Off-the-Road Tire Data Sheet

29.5R25 GP-2B Loader (L-3T*)

FEATURES	BENEFITS
Solid center rib	Good lateral traction, long wear and smooth ride
Open shoulder grooves	Excellent traction and self-cleaning tread design
100-Level tread depth	Cooler running in load and carry operations
Non-directional tread design	High fore and aft traction
Enhanced radial construction	Good stability, improved mobility, softer ride, improved treadwear and greater fuel economy
Specially formulated high synthetic compound	Long wearing tread and ultra abrasion cut resistance
High tensile steel belt package	Impact resistant

SUMMARY STATEMENT:

All types of underfoot conditions can be tamed by this long-wearing radial tire. The open shoulder grooves provide excellent traction and self-cleaning, while the solid center rib and grooves promote good lateral traction, long wear and a smooth ride.

DIMENSIONAL SPECS

Tread Depth: 48 /32" Overall Diameter: 73.1 in.
Design Rim Width: 25.00-3.5 in. Static Loaded Radius: 32.2 in.
New Tire Width: 30.5 in. Revs per mile: 288
Loaded Tire Width: 34.6 in. Gross Contact Area: 505 sq.in.
Minimum Dual Spacing: Compound/Construction: 6S
Performance Capability Data: Product Code: 136-090-276
Industry Code: L-3T* Ply Rating: 1*

RATED LOAD/INFLATION TABLE
(Per ETRO & T&RA Industry Standards)
Operation Speed (mph) 0.0
2.5
5.0
10.0
15.0
25.0
30.0
45.0

Rated Load (lbs) 39700
Inflation (psi) 73

Gross contact area = 505 in^2
Width of contact area = 34.6 in
Therefore,
Length of contact area = 505 in^2/34.6 in = 14.6 in

* T = Traction

OTR Tires | Used OTR Tires History | Order OTR Tires | Contact Skippers Central Tire

MODEL	D6T		D6T XL		D6T XW		D6T LGP	
Flywheel Power	138 kW	**185 hp**	149 kW	**200 hp**	149 kW	**200 hp**	149 kW	**200 hp**
Operating Weight:*								
Power Shift Differential Steer								
SU Blade	18 393 kg	**40,550 lb**	20 148 kg	**44,420 lb**	20 740 kg	**45,723 lb**	21 783 kg	**48,024 lb**
Engine Model	**C9 ACERT**		**C9 ACERT**		**C9 ACERT**		**C9 ACERT**	
Rated Engine RPM: Power Shift	**1850**		**1850**		**1850**		**1850**	
No. of Cylinders	**6**		**6**		**6**		**6**	
Bore	112 mm	**4.4"**	112 mm	**4.4"**	112 mm	**4.4"**	112 mm	**4.4"**
Stroke	149 mm	**5.9"**	149 mm	**5.9"**	149 mm	**5.9"**	149 mm	**5.9"**
Displacement	8.8 L	**537 in^3**	8.8 L	**537 in^3**	8.8 L	**537 in^3**	8.8 L	**537 in^3**
Track Rollers (Each Side)	**6**		**7**		**7**		**8**	
Width of Standard Track Shoe	560 mm	**22"**	560 mm	**22"**	760 mm	**30"**	915 mm	**36"**
VPAT	—		560 mm	**22"**	710 mm	**28"**	785 mm	**31"**
Length of Track on Ground	2.63 m	**8'8"**	2.84 m	**9'4"**	2.84 m	**9'4"**	3.25 m	**10'8"**
Ground Contact Area (W/Std. Shoe)	2.94 m^2	**4557 in^2**	3.18 m^2	**4929 in^2**	4.31 m^2	**6681 in^2**	5.95 m^2	**9223 in^2**
VPAT	—		3.18 m^2	**4929 in^2**	4.03 m^2	**6247 in^2**	5.10 m^2	**7905 in^2**
Track Gauge	1.88 m	**74"**	1.88 m	**74"**	2.03 m	**80"**	2.29 m	**90"**
VPAT	—		2.13 m	**84"**	2.29 m	**90"**	2.29 m	**90"**
GENERAL DIMENSIONS:								
Height** (Stripped Top)***	2.40 m	**7'10"**	2.44 m	**8'0"**	2.44 m	**8'0"**	2.45 m	**8'0"**
Height** (To Top of ROPS Canopy)	3.20 m	**10'6"**	3.20 m	**10'6"**	3.20 m	**10'6"**	3.25 m	**10'8"**
Height** (To Top of ROPS Cab)	3.11 m	**10'2"**	3.15 m	**10'4"**	3.15 m	**10'4"**	3.15 m	**10'4"**
Overall Length (Without Blade)	3.86 m	**12'8"**	3.86 m	**12'8"**	3.86 m	**12'8"**	4.25 m	**13'11"**
With S Blade	4.90 m	**16'1"**	—		—		5.47 m	**17'11"**
With SU Blade	5.10 m	**16'9"**	5.33 m	**17'6"**	5.33 m	**17'6"**	—	
With VPAT Blade	—		5.27 m	**17'4"**	5.27 m	**17'4"**	5.97 m	**19'7"**
With Angle Blade	5.01 m	**16'5"**	5.21 m	**17'1"**	5.21 m	**17'1"**	5.82 m	**19'1"**
Width (Over Trunnion)	2.64 m	**8'8"**	2.64 m	**8'8"**	2.95 m	**9'8"**	3.43 m	**8'8"**
Width (w/o Trunnion — Std. Track)	2.44 m	**8'0"**	2.44 m	**8'0"**	2.79 m	**9'2"**	3.20 m	**10'6"**
Ground Clearance**	384 mm	**1'3"**	384 mm	**1'3"**	384 mm	**1'3"**	434 mm	**1'5"**
Blade Types and Widths:								
Straight	3.36 m	**11'0"**	—		—		4.06 m	**13'4"**
Angle Straight	4.17 m	**13'8"**	4.17 m	**13'8"**	4.50 m	**14'9"**	5.07 m	**16'8"**
Full 25° Angle	3.78 m	**12'5"**	3.78 m	**12'5"**	3.81 m	**12'6"**	4.63 m	**15'2"**
Semi-U	3.26 m	**10'8"**	3.26 m	**10'8"**	3.56 m	**11'8"**	—	
VPAT								
Straight	—		3.88 m	**12'9"**	4.16 m	**13'8"**	4.16 m	**13'8"**
Full 24° Angle	—		3.55 m	**11'8"**	3.81 m	**12'6"**	3.81 m	**12'6"**
Fuel Tank Refill Capacity	425 L	**112 U.S. gal**	425 L	**112 U.S. gal**	425 L	**112 U.S. gal**	425 L	**112 U.S. gal**

*Operating weight includes cab, operator, lubricants, coolant, full fuel tank, standard track, hydraulic controls and fluid, SU blade, drawbar, and counterweight.
**Dimensions measured from ground line. Add grouser height for total dimension on hard surfaces.
***Height (Stripped Top) — without ROPS canopy, exhaust, seat back or other easily removed encumbrances.

APPENDIX C

Settlement Computations

Written by:	Youngmin C.	Date:	2019.10.01	Reviewed by:	Andrew R. Nick Yafrate	Date:	2019.10.03 2019.10.07
Client:	WMDSM	Project:	Phase 14 Permitting	Project/Proposal No.:	BE0232	Task No.:	2

LOCALIZED SETTLEMENT DUE TO VOIDS FORMING IN WASTE FOR REVISED FINAL CLOSURE SYSTEM

WMDSM - CROSSROADS LANDFILL PHASE 14 NORRIDGEWOCK, MAINE

PURPOSE

The purpose of this calculation package is to evaluate the magnitude of tensile strain that may occur in the final cover system (cap) geosynthetic barrier layers of Phase 14 (i.e., geomembrane and geosynthetic clay liner (GCL)) as a result of localized differential settlement should collapse of a near-surface void in the waste occur.

PROCEDURE

A simplified method for estimation of localized settlement due to the formation of a shallow, subsurface void is presented in Sagaseta (1987). Sagaseta developed a set plots for estimating settlement based on an assumed void geometry and location. Based on the differential settlement estimated using Sagaseta's method, a simple evaluation of tensile strain in the geosynthetics can be completed. The method utilized for this analysis is consistent with recommendations included in the Maine Department of Environmental Protection's *Final Cover System Guidance Document – Municipal Solid Waste Landfills*, dated November 1995.

Assumed Void Size and Location

To result in a localized depression of the landfill cover system, a void in the waste must be sufficiently large and sufficiently close to the surface to prohibit bridging by the overlying waste. For this analysis, a representative void was assumed to be a 5-ft diameter sphere, located (center of sphere) 3-ft below the top of waste (i.e., 5-ft below the ground surface for a 2-ft thick final cover system).

Normalized Settlement Curves

Sagaseta (1987) presents normalized curves for estimating settlement resulting from the assumed void based on:

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Client:	WMDSM	Project:	Phase 14 Permitting	Project/Proposal No.:	BE0232	Task No.:	2

$$Normalized\ Horizontal\ Position = \frac{x}{h}$$
$$Normalized\ Vertical\ Position = \frac{z}{h}$$

Where:

x = horizontal distance of the analysis point from the center of void;
z = depth to the analysis point from ground surface; and
h = depth to the center of the void from ground surface = 5 ft.

Based on the intercept of the horizontal and vertical lines of the calculated *x/h* and *z/h*, the normalized settlement ratio can be selected based on the curves shown on Figure 12(b), included as Attachment A, from Sagaseta (1987).

The settlement ratio can then be used to back-calculate the estimated settlement as follows:

$$Settlment\ Ratio = \frac{S_z \times h^2}{a^3}$$
$$S_{z@x=0} = \frac{a^3}{h^2} \times Settlement\ Ratio$$

Where:

S_z = estimated vertical displacement (i.e., settlement);
h = depth to center of the void; and
a = radius of the void = 2.5 ft.

<u>Settlement of Cover System Geosynthetics</u>

Based on the assumed void characteristics described above, the magnitude of settlement experienced by the geosynthetic components of the cover system (located 1.5-ft below the ground system) directly over the void and the horizontal distance away from the void to where settlement is no longer expected to occur as a result of the void were estimated using the above equations and the plots presented in Figure 12b of Sagaseta (1987).

<u>Maximum Vertical Displacement</u>

For a location directly above the center of the void, i.e., $x = 0$ and $z = 2\ ft$ (location of maximum vertical displacement):

$$Normalized\ Horizontal\ Position, \frac{x}{h} = \frac{0}{5\ ft} = 0$$

Written by:	Youngmin C.	Date:	2019.10.01	Reviewed by:	Andrew R. Nick Yafrate	Date:	2019.10.03 2019.10.07
Client:	WMDSM	Project:	Phase 14 Permitting	Project/Proposal No.:	BE0232	Task No.:	2

$$Normalized\ Vertical\ Position, \frac{Z}{h} = \frac{2\ ft}{5\ ft} = 0.4$$

From Figure 12(b), the corresponding Settlement Ratio is 0.1925.

S_z is calculated as follows:

$$S_{z@x=0} = \frac{a^3}{h^2} \times Settlement\ Ratio = \frac{(2.5\ ft)^3}{(5)^2} \times\ 0.1925 = 0.12\ ft$$

Limit of Influence

The limit of influence of the void (i.e., location where the cover system no longer experiences localized settlement, i.e., $S_z = 0$) can be estimated by finding the corresponding x/h using the curves in Figure 12(b). Using the same $Z/h = 0.4$ and the $S_z = 0$ curve, the Normalized Horizontal Position is $x/h\ = 1.95$ which can be used to calculated the horizontal position where no settlement occurs:

$$x = \ 1.95 \times h = 1.95\ \times 5\ ft = 9.75\ ft$$

Tensile Strain in Geosynthetics

The tensile strain in the geosynthetic components of the cap can be estimated using the vertical displacement (0.12 ft) and the limit of influence (horizontal distance, 9.75 ft) estimated above as follows:

$$\varepsilon = \frac{L_f - L_d}{L_d}\ x\ 100$$

Where:

ε = tensile strain of the cover system (%);

$L_f\ = (x^2 +\ S_z^2)^{\frac{1}{2}}$, length of a line connecting adjacent settlement points in their post-settlement positions (ft), calculated using the Pythagorean theorem; and

L_d = length of a line connecting adjacent settlement points in their initial positions (ft).

The tensile strain in the geosynthetic components is estimated to be:

$$\varepsilon = \frac{(9.75^2 +\ 0.12^2)^{\frac{1}{2}} - 9.75}{9.75} x\ 100 = 7.6\ x\ 10^{-3}\ \% = 0.0076\ \%$$

RESULTS AND CONCLUSION

Results of this analysis indicate that the tensile strain in the geosynthetic barrier components of the final cover system due to localized waste subsidence is 0.0076%, significantly below the typical allowable value for the barrier layers in the proposed revised final closure system, i.e., geomembrane (10 – 15 %) and GCLs (15 – 26%) (Koerner, 2007).

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Client:	WMDSM	Project:	Phase 14 Permitting	Project/Proposal No.:	BE0232	Task No.:	2

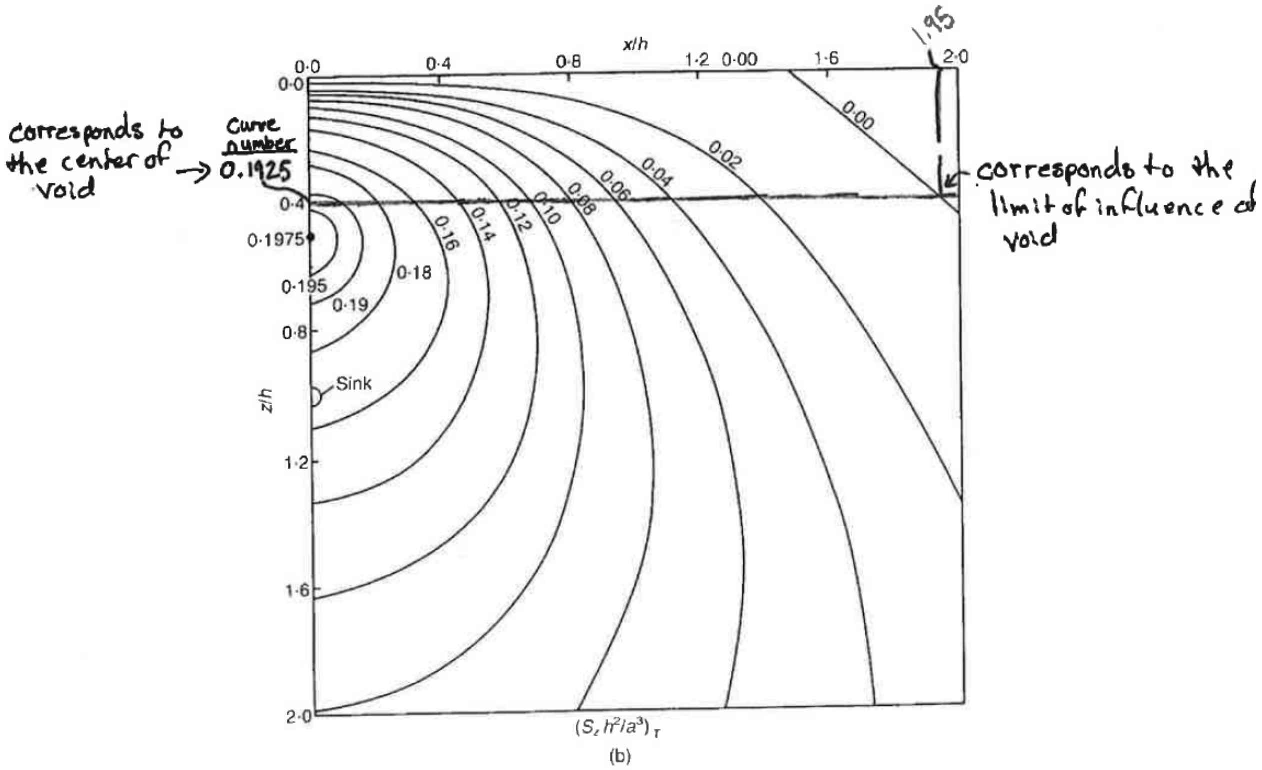
REFERENCES

Maine Department of Environmental Protection, "Final Cover System Guidance Document – Municipal Solid Waste Landfills", Prepared by Geosyntec Consultants, Atlanta Georgia, November 1995.

Koerner, R. M., *The Questionable Use of Compacted Clay Liners in the Closure (i.e., Capping) of Municipal Solid Waste Landfills*, GRI White Paper #10, Geosynthetic Institute and Drexel University, Folsom, PA.,2007.

Sagaseta, C. "Analysis of Undrained Soil Deformation Due to Ground Loss," Geotechnique, Vol. 37, No. 3, Sep 1987, pp. 301-320.

ATTACHMENT A
Settlement Ratio, Figure 12(b) from Sagaseta, 1987



(b)

Fig. 12. Point sink, three dimensions, surface stress relief: (a) horizontal displacements; (b) vertical displacements

APPENDIX D

H.E.L.P. Model Results

```
******************************************************************************
******************************************************************************
**                                                                          **
**                                                                          **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE               **
**                HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)                **
**                  DEVELOPED BY ENVIRONMENTAL LABORATORY                   **
**                    USAE WATERWAYS EXPERIMENT STATION                     **
**               FOR USEPA RISK REDUCTION ENGINEERING LABORATORY            **
**                                                                          **
**                                                                          **
******************************************************************************
******************************************************************************


PRECIPITATION DATA FILE:     C:\HELP\ph14\PREC.D4
TEMPERATURE DATA FILE:       C:\HELP\ph14\TEMP.D7
SOLAR RADIATION DATA FILE:   C:\HELP\ph14\SOLA.D13
EVAPOTRANSPIRATION DATA:     C:\HELP\ph14\EVAP.D11
SOIL AND DESIGN DATA FILE:   c:\HELP\ph14\StdFin2.D10
OUTPUT DATA FILE:            c:\HELP\ph14\stdfin2.OUT


TIME:  16:49     DATE:  10/21/2019


******************************************************************************

     TITLE:  Crossroads LF Ph14 - Final Cover with Low Perm Soil

******************************************************************************


     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
              COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.


                                  LAYER  1
                                  --------

                       TYPE 1 - VERTICAL PERCOLATION LAYER
                           MATERIAL TEXTURE NUMBER  10
          THICKNESS                    =      6.00   INCHES
```

```
POROSITY                    =      0.3980 VOL/VOL
FIELD CAPACITY              =      0.2440 VOL/VOL
WILTING POINT               =      0.1360 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.3972 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.119999997000E-03 CM/SEC


                        LAYER  2
                        --------

          TYPE 1 - VERTICAL PERCOLATION LAYER
              MATERIAL TEXTURE NUMBER  10
THICKNESS                   =     12.00   INCHES
POROSITY                    =      0.3980 VOL/VOL
FIELD CAPACITY              =      0.2440 VOL/VOL
WILTING POINT               =      0.1360 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.2627 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.119999997000E-03 CM/SEC


                        LAYER  3
                        --------

            TYPE 2 - LATERAL DRAINAGE LAYER
              MATERIAL TEXTURE NUMBER   0
THICKNESS                   =      0.20   INCHES
POROSITY                    =      0.8500 VOL/VOL
FIELD CAPACITY              =      0.0100 VOL/VOL
WILTING POINT               =      0.0050 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.0108 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =   4.86000013000     CM/SEC
SLOPE                       =     33.00   PERCENT
DRAINAGE LENGTH             =    180.0    FEET


                        LAYER  4
                        --------

            TYPE 4 - FLEXIBLE MEMBRANE LINER
              MATERIAL TEXTURE NUMBER  35
THICKNESS                   =      0.04   INCHES
POROSITY                    =      0.0000 VOL/VOL
FIELD CAPACITY              =      0.0000 VOL/VOL
WILTING POINT               =      0.0000 VOL/VOL
```

```
INITIAL SOIL WATER CONTENT  =      0.0000 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.199999996000E-12 CM/SEC
FML PINHOLE DENSITY         =      0.00   HOLES/ACRE
FML INSTALLATION DEFECTS    =      2.00   HOLES/ACRE
FML PLACEMENT QUALITY       =  2 - EXCELLENT


                        LAYER  5
                        --------

              TYPE 1 - VERTICAL PERCOLATION LAYER
                  MATERIAL TEXTURE NUMBER  17
THICKNESS                   =      0.25   INCHES
POROSITY                    =      0.7500 VOL/VOL
FIELD CAPACITY              =      0.7470 VOL/VOL
WILTING POINT               =      0.4000 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.6574 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.300000003000E-08 CM/SEC


                        LAYER  6
                        --------

              TYPE 1 - VERTICAL PERCOLATION LAYER
                  MATERIAL TEXTURE NUMBER   0
THICKNESS                   =     12.00   INCHES
POROSITY                    =      0.4370 VOL/VOL
FIELD CAPACITY              =      0.3730 VOL/VOL
WILTING POINT               =      0.2660 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.3730 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.999999975000E-05 CM/SEC
```

12-in Low Permeability Soil Layer

```
                        LAYER  7
                        --------

              TYPE 1 - VERTICAL PERCOLATION LAYER
                  MATERIAL TEXTURE NUMBER  10
THICKNESS                   =      6.00   INCHES
POROSITY                    =      0.3980 VOL/VOL
FIELD CAPACITY              =      0.2440 VOL/VOL
WILTING POINT               =      0.1360 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.2440 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.119999997000E-03 CM/SEC
```

```
                       LAYER  8
                       --------

              TYPE 1 - VERTICAL PERCOLATION LAYER
                MATERIAL TEXTURE NUMBER  18
THICKNESS                    =   2232.00   INCHES
POROSITY                     =      0.6710 VOL/VOL
FIELD CAPACITY               =      0.2920 VOL/VOL
WILTING POINT                =      0.0770 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.2920 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.100000005000E-02 CM/SEC


                       LAYER  9
                       --------

               TYPE 2 - LATERAL DRAINAGE LAYER
                MATERIAL TEXTURE NUMBER   1
THICKNESS                    =     24.00   INCHES
POROSITY                     =      0.4170 VOL/VOL
FIELD CAPACITY               =      0.0450 VOL/VOL
WILTING POINT                =      0.0180 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.0459 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =  0.999999978000E-02 CM/SEC


                       LAYER 10
                       --------

               TYPE 2 - LATERAL DRAINAGE LAYER
                MATERIAL TEXTURE NUMBER   0
THICKNESS                    =      0.20   INCHES
POROSITY                     =      0.8500 VOL/VOL
FIELD CAPACITY               =      0.0100 VOL/VOL
WILTING POINT                =      0.0050 VOL/VOL
INITIAL SOIL WATER CONTENT   =      0.0100 VOL/VOL
EFFECTIVE SAT. HYD. COND.    =   1.63000000000     CM/SEC
SLOPE                        =      0.90   PERCENT
DRAINAGE LENGTH              =    120.0    FEET
```

```
                         LAYER 11
                         --------

              TYPE 4 - FLEXIBLE MEMBRANE LINER
                MATERIAL TEXTURE NUMBER  35
   THICKNESS                   =      0.06   INCHES
   POROSITY                    =      0.0000 VOL/VOL
   FIELD CAPACITY              =      0.0000 VOL/VOL
   WILTING POINT               =      0.0000 VOL/VOL
   INITIAL SOIL WATER CONTENT  =      0.0000 VOL/VOL
   EFFECTIVE SAT. HYD. COND.   =  0.199999996000E-12 CM/SEC
   FML PINHOLE DENSITY         =      0.00   HOLES/ACRE
   FML INSTALLATION DEFECTS    =      0.00   HOLES/ACRE
   FML PLACEMENT QUALITY       =  1 - PERFECT


          GENERAL DESIGN AND EVAPORATIVE ZONE DATA
          ----------------------------------------

 NOTE:  SCS RUNOFF CURVE NUMBER WAS USER-SPECIFIED.

SCS RUNOFF CURVE NUMBER             =     75.00
FRACTION OF AREA ALLOWING RUNOFF    =    100.0    PERCENT
AREA PROJECTED ON HORIZONTAL PLANE  =      1.000  ACRES
EVAPORATIVE ZONE DEPTH              =      8.0    INCHES
INITIAL WATER IN EVAPORATIVE ZONE   =      3.028  INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE  =      3.184  INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE  =      1.088  INCHES
INITIAL SNOW WATER                  =      2.187  INCHES
INITIAL WATER IN LAYER MATERIALS    =    664.491  INCHES
TOTAL INITIAL WATER                 =    666.678  INCHES
TOTAL SUBSURFACE INFLOW             =      0.00   INCHES/YEAR


           EVAPOTRANSPIRATION AND WEATHER DATA
           -----------------------------------

 NOTE:  EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
          AUGUSTA               MAINE

     STATION LATITUDE                        =  44.30 DEGREES
     MAXIMUM LEAF AREA INDEX                 =   0.00
     START OF GROWING SEASON (JULIAN DATE)   =    131
     END OF GROWING SEASON (JULIAN DATE)     =    276
```

EVAPORATIVE ZONE DEPTH = 8.0 INCHES
AVERAGE ANNUAL WIND SPEED = 8.70 MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY = 70.00 %
AVERAGE 2ND QUARTER RELATIVE HUMIDITY = 72.00 %
AVERAGE 3RD QUARTER RELATIVE HUMIDITY = 77.00 %
AVERAGE 4TH QUARTER RELATIVE HUMIDITY = 76.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR PORTLAND MAINE

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
3.78	3.57	3.98	3.90	3.27	3.06
2.83	2.82	3.27	3.83	4.70	4.51

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR AUGUSTA MAINE

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
19.60	21.50	31.50	43.20	54.60	63.80
69.40	67.50	59.00	48.60	37.60	24.00

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING COEFFICIENTS FOR AUGUSTA MAINE AND STATION LATITUDE = 44.30 DEGREES

****

AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 15

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						

```
-------------
  TOTALS                  3.58     3.06     3.75     3.47     3.30     3.13
                          2.96     2.44     3.60     3.05     3.79     4.88

  STD. DEVIATIONS         1.37     1.77     1.87     1.76     1.80     1.67
                          1.78     0.85     2.16     1.98     2.25     1.96

RUNOFF
------
  TOTALS                  0.499    0.594    8.512    3.219    0.116    0.021
                          0.013    0.000    0.170    0.050    0.129    0.119

  STD. DEVIATIONS         0.903    0.890    3.878    4.866    0.385    0.081
                          0.025    0.000    0.411    0.105    0.326    0.269

EVAPOTRANSPIRATION
------------------
  TOTALS                  0.509    0.472    0.462    1.952    2.578    2.608
                          2.407    2.205    2.016    1.526    1.003    0.443

  STD. DEVIATIONS         0.052    0.064    0.169    0.758    1.199    1.090
                          1.259    0.831    0.551    0.515    0.166    0.080

LATERAL DRAINAGE COLLECTED FROM LAYER  3
----------------------------------------
  TOTALS                  0.0452   0.0000   0.2339   1.4319   0.7601   0.2756
                          0.8512   0.2628   1.1322   1.2449   2.1409   1.1125

  STD. DEVIATIONS         0.0450   0.0000   0.6851   1.0831   0.6286   0.3888
                          0.8018   0.2727   1.2041   1.3521   1.4383   0.9902

PERCOLATION/LEAKAGE THROUGH LAYER  4
------------------------------------
  TOTALS                  0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
                          0.0000   0.0000   0.0000   0.0000   0.0000   0.0000

  STD. DEVIATIONS         0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
                          0.0000   0.0000   0.0000   0.0000   0.0000   0.0000

LATERAL DRAINAGE COLLECTED FROM LAYER 10
----------------------------------------
  TOTALS                  0.0002   0.0002   0.0002   0.0002   0.0002   0.0002
                          0.0002   0.0002   0.0002   0.0002   0.0002   0.0002

  STD. DEVIATIONS         0.0002   0.0002   0.0003   0.0003   0.0003   0.0003
                          0.0003   0.0003   0.0002   0.0003   0.0002   0.0002

PERCOLATION/LEAKAGE THROUGH LAYER 11
------------------------------------
  TOTALS                  0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
```

	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 4

AVERAGES	0.0000	0.0000	0.0002	0.0010	0.0005	0.0002
	0.0006	0.0002	0.0008	0.0009	0.0016	0.0008
STD. DEVIATIONS	0.0000	0.0000	0.0005	0.0008	0.0004	0.0003
	0.0006	0.0002	0.0009	0.0010	0.0011	0.0007

DAILY AVERAGE HEAD ON TOP OF LAYER 11

AVERAGES	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

****

****

AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 15

	INCHES	CU. FEET	PERCENT
PRECIPITATION	41.00 (5.366)	148832.4	100.00
RUNOFF	13.442 (3.7345)	48795.07	32.785
EVAPOTRANSPIRATION	18.178 (1.5001)	65986.13	44.336
LATERAL DRAINAGE COLLECTED FROM LAYER 3	9.49117 (2.89887)	34452.953	23.14882
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.00000 (0.00000)	0.005	0.00000
AVERAGE HEAD ON TOP	0.001 (0.000)		

```
  OF LAYER  4

 LATERAL DRAINAGE COLLECTED      0.00231 (   0.00296)        8.372    0.00563
   FROM LAYER 10

 PERCOLATION/LEAKAGE THROUGH     0.00000 (   0.00000)        0.007     0.00000
   LAYER 11

 AVERAGE HEAD ON TOP             0.000 (    0.000)
  OF LAYER 11

 CHANGE IN WATER STORAGE        -0.113    (  2.7858)      -410.13     -0.276

******************************************************************************
```

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******************************************************************************

                PEAK DAILY VALUES FOR YEARS    1 THROUGH   15
   ------------------------------------------------------------------------
                                                 (INCHES)      (CU. FT.)
                                                ----------    -------------
      PRECIPITATION                               4.90          17787.000

      RUNOFF                                      6.526         23688.8613

      DRAINAGE COLLECTED FROM LAYER  3            1.58562        5755.81738

      PERCOLATION/LEAKAGE THROUGH LAYER  4        0.000000          0.00003

      AVERAGE HEAD ON TOP OF LAYER  4             0.035

      MAXIMUM HEAD ON TOP OF LAYER  4             0.109

      LOCATION OF MAXIMUM HEAD IN LAYER  3
            (DISTANCE FROM DRAIN)                 0.0 FEET

      DRAINAGE COLLECTED FROM LAYER 10            0.00002           0.08806

      PERCOLATION/LEAKAGE THROUGH LAYER 11        0.000000          0.00002

      AVERAGE HEAD ON TOP OF LAYER 11             0.000

      MAXIMUM HEAD ON TOP OF LAYER 11             0.000

      LOCATION OF MAXIMUM HEAD IN LAYER 10
            (DISTANCE FROM DRAIN)                 0.0 FEET
```

0.00003 cu. ft/acre/day
= 0.00022 gal/acre/day

0.00002 cu. ft/acre/day
= 0.00015 gal/acre/day

SNOW WATER 15.63 56729.2383

MAXIMUM VEG. SOIL WATER (VOL/VOL) 0.3975

MINIMUM VEG. SOIL WATER (VOL/VOL) 0.1360

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner
by Bruce M. McEnroe, University of Kansas
ASCE Journal of Environmental Engineering
Vol. 119, No. 2, March 1993, pp. 262-270.

****

****

FINAL WATER STORAGE AT END OF YEAR 15

LAYER	(INCHES)	(VOL/VOL)
1	2.1161	0.3527
2	2.9639	0.2470
3	0.0021	0.0106
4	0.0000	0.0000
5	0.1521	0.6086
6	4.4760	0.3730
7	1.4640	0.2440
8	651.7440	0.2920
9	1.0800	0.0450
10	0.0020	0.0100
11	0.0000	0.0000

SNOW WATER 0.983

****
****

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**                                                                          **
**                                                                          **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE               **
**                HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)                **
**                  DEVELOPED BY ENVIRONMENTAL LABORATORY                   **
**                    USAE WATERWAYS EXPERIMENT STATION                     **
**             FOR USEPA RISK REDUCTION ENGINEERING LABORATORY              **
**                                                                          **
**                                                                          **
******************************************************************************
******************************************************************************


PRECIPITATION DATA FILE:    C:\HELP\ph14\PREC.D4
TEMPERATURE DATA FILE:      C:\HELP\ph14\TEMP.D7
SOLAR RADIATION DATA FILE:  C:\HELP\ph14\SOLA.D13
EVAPOTRANSPIRATION DATA:    C:\HELP\ph14\EVAP.D11
SOIL AND DESIGN DATA FILE:  c:\HELP\ph14\FINAL.D10
OUTPUT DATA FILE:           c:\HELP\ph14\FINAL.OUT


TIME:  14: 6     DATE:   9/18/2019


******************************************************************************

     TITLE:  Crossroads LF Ph 14 - Final Cover

******************************************************************************


     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
              COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.


                                   LAYER  1
                                   --------

                     TYPE 1 - VERTICAL PERCOLATION LAYER
                         MATERIAL TEXTURE NUMBER  10
           THICKNESS                    =      6.00   INCHES
           POROSITY                     =      0.3980 VOL/VOL
           FIELD CAPACITY               =      0.2440 VOL/VOL
           WILTING POINT                =      0.1360 VOL/VOL
           INITIAL SOIL WATER CONTENT   =      0.3972 VOL/VOL
           EFFECTIVE SAT. HYD. COND.    =  0.119999997000E-03 CM/SEC


                                   LAYER  2
                                   --------

                     TYPE 1 - VERTICAL PERCOLATION LAYER
                         MATERIAL TEXTURE NUMBER  10
```

```
THICKNESS                   =     12.00   INCHES
POROSITY                    =      0.3980 VOL/VOL
FIELD CAPACITY              =      0.2440 VOL/VOL
WILTING POINT               =      0.1360 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.2627 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.119999997000E-03 CM/SEC


                        LAYER  3
                        --------

            TYPE 2 - LATERAL DRAINAGE LAYER
              MATERIAL TEXTURE NUMBER   0
THICKNESS                   =      0.20   INCHES
POROSITY                    =      0.8500 VOL/VOL
FIELD CAPACITY              =      0.0100 VOL/VOL
WILTING POINT               =      0.0050 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.0108 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =   4.86000013000     CM/SEC
SLOPE                       =     33.00   PERCENT
DRAINAGE LENGTH             =    180.0    FEET


                        LAYER  4
                        --------

            TYPE 4 - FLEXIBLE MEMBRANE LINER
              MATERIAL TEXTURE NUMBER  35
THICKNESS                   =      0.04   INCHES
POROSITY                    =      0.0000 VOL/VOL
FIELD CAPACITY              =      0.0000 VOL/VOL
WILTING POINT               =      0.0000 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.0000 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.199999996000E-12 CM/SEC
FML PINHOLE DENSITY         =      0.00   HOLES/ACRE
FML INSTALLATION DEFECTS    =      2.00   HOLES/ACRE
FML PLACEMENT QUALITY       =  2 - EXCELLENT


                        LAYER  5
                        --------

          TYPE 1 - VERTICAL PERCOLATION LAYER
              MATERIAL TEXTURE NUMBER  17
THICKNESS                   =      0.25   INCHES
POROSITY                    =      0.7500 VOL/VOL
FIELD CAPACITY              =      0.7470 VOL/VOL
WILTING POINT               =      0.4000 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.6574 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.300000003000E-08 CM/SEC


                        LAYER  6
                        --------
```

```
           TYPE 1 - VERTICAL PERCOLATION LAYER
               MATERIAL TEXTURE NUMBER  10
THICKNESS                  =      6.00   INCHES
POROSITY                   =      0.3980 VOL/VOL
FIELD CAPACITY             =      0.2440 VOL/VOL
WILTING POINT              =      0.1360 VOL/VOL
INITIAL SOIL WATER CONTENT =      0.2440 VOL/VOL
EFFECTIVE SAT. HYD. COND.  =  0.119999997000E-03 CM/SEC


                         LAYER  7
                         --------

           TYPE 1 - VERTICAL PERCOLATION LAYER
               MATERIAL TEXTURE NUMBER  18
THICKNESS                  =   2232.00   INCHES
POROSITY                   =      0.6710 VOL/VOL
FIELD CAPACITY             =      0.2920 VOL/VOL
WILTING POINT              =      0.0770 VOL/VOL
INITIAL SOIL WATER CONTENT =      0.2920 VOL/VOL
EFFECTIVE SAT. HYD. COND.  =  0.100000005000E-02 CM/SEC


                         LAYER  8
                         --------

             TYPE 2 - LATERAL DRAINAGE LAYER
               MATERIAL TEXTURE NUMBER   1
THICKNESS                  =     24.00   INCHES
POROSITY                   =      0.4170 VOL/VOL
FIELD CAPACITY             =      0.0450 VOL/VOL
WILTING POINT              =      0.0180 VOL/VOL
INITIAL SOIL WATER CONTENT =      0.0459 VOL/VOL
EFFECTIVE SAT. HYD. COND.  =  0.999999978000E-02 CM/SEC


                         LAYER  9
                         --------

             TYPE 2 - LATERAL DRAINAGE LAYER
               MATERIAL TEXTURE NUMBER   0
THICKNESS                  =      0.20   INCHES
POROSITY                   =      0.8500 VOL/VOL
FIELD CAPACITY             =      0.0100 VOL/VOL
WILTING POINT              =      0.0050 VOL/VOL
INITIAL SOIL WATER CONTENT =      0.0100 VOL/VOL
EFFECTIVE SAT. HYD. COND.  =   1.63000000000     CM/SEC
SLOPE                      =      0.90   PERCENT
DRAINAGE LENGTH            =    120.0    FEET


                         LAYER 10
                         --------

             TYPE 4 - FLEXIBLE MEMBRANE LINER
```

MATERIAL TEXTURE NUMBER 35

THICKNESS	=	0.06 INCHES
POROSITY	=	0.0000 VOL/VOL
FIELD CAPACITY	=	0.0000 VOL/VOL
WILTING POINT	=	0.0000 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0000 VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.199999996000E-12 CM/SEC
FML PINHOLE DENSITY	=	0.00 HOLES/ACRE
FML INSTALLATION DEFECTS	=	0.00 HOLES/ACRE
FML PLACEMENT QUALITY	=	1 - PERFECT

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS USER-SPECIFIED.

SCS RUNOFF CURVE NUMBER	=	75.00	
FRACTION OF AREA ALLOWING RUNOFF	=	100.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	1.000	ACRES
EVAPORATIVE ZONE DEPTH	=	8.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	3.028	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	3.184	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	1.088	INCHES
INITIAL SNOW WATER	=	2.187	INCHES
INITIAL WATER IN LAYER MATERIALS	=	660.015	INCHES
TOTAL INITIAL WATER	=	662.202	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
AUGUSTA MAINE

STATION LATITUDE	=	44.30 DEGREES
MAXIMUM LEAF AREA INDEX	=	0.00
START OF GROWING SEASON (JULIAN DATE)	=	131
END OF GROWING SEASON (JULIAN DATE)	=	276
EVAPORATIVE ZONE DEPTH	=	8.0 INCHES
AVERAGE ANNUAL WIND SPEED	=	8.70 MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	70.00 %
AVERAGE 2ND QUARTER RELATIVE HUMIDITY	=	72.00 %
AVERAGE 3RD QUARTER RELATIVE HUMIDITY	=	77.00 %
AVERAGE 4TH QUARTER RELATIVE HUMIDITY	=	76.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR PORTLAND MAINE

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
3.78	3.57	3.98	3.90	3.27	3.06
2.83	2.82	3.27	3.83	4.70	4.51

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR AUGUSTA MAINE

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
19.60	21.50	31.50	43.20	54.60	63.80
69.40	67.50	59.00	48.60	37.60	24.00

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR AUGUSTA MAINE
AND STATION LATITUDE = 44.30 DEGREES

****

AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 15

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	3.58	3.06	3.75	3.47	3.30	3.13
	2.96	2.44	3.60	3.05	3.79	4.88
STD. DEVIATIONS	1.37	1.77	1.87	1.76	1.80	1.67
	1.78	0.85	2.16	1.98	2.25	1.96
RUNOFF						
TOTALS	0.499	0.594	8.512	3.219	0.116	0.021
	0.013	0.000	0.170	0.050	0.129	0.119
STD. DEVIATIONS	0.903	0.890	3.878	4.866	0.385	0.081
	0.025	0.000	0.411	0.105	0.326	0.269
EVAPOTRANSPIRATION						
TOTALS	0.509	0.472	0.462	1.952	2.578	2.608
	2.407	2.205	2.016	1.526	1.003	0.443
STD. DEVIATIONS	0.052	0.064	0.169	0.758	1.199	1.090
	1.259	0.831	0.551	0.515	0.166	0.080
LATERAL DRAINAGE COLLECTED FROM LAYER 3						
TOTALS	0.0452	0.0000	0.2339	1.4319	0.7601	0.2756
	0.8512	0.2628	1.1322	1.2449	2.1409	1.1125
STD. DEVIATIONS	0.0450	0.0000	0.6851	1.0831	0.6286	0.3888
	0.8018	0.2727	1.2041	1.3521	1.4383	0.9902

PERCOLATION/LEAKAGE THROUGH LAYER 4

TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

LATERAL DRAINAGE COLLECTED FROM LAYER 9

TOTALS	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
STD. DEVIATIONS	0.0002	0.0002	0.0003	0.0003	0.0003	0.0003
	0.0003	0.0003	0.0002	0.0003	0.0002	0.0002

PERCOLATION/LEAKAGE THROUGH LAYER 10

TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)

DAILY AVERAGE HEAD ON TOP OF LAYER 4

AVERAGES	0.0000	0.0000	0.0002	0.0010	0.0005	0.0002
	0.0006	0.0002	0.0008	0.0009	0.0016	0.0008
STD. DEVIATIONS	0.0000	0.0000	0.0005	0.0008	0.0004	0.0003
	0.0006	0.0002	0.0009	0.0010	0.0011	0.0007

DAILY AVERAGE HEAD ON TOP OF LAYER 10

AVERAGES	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 15

	INCHES	CU. FEET	PERCENT
PRECIPITATION	41.00 (5.366)	148832.4	100.00
RUNOFF	13.442 (3.7345)	48795.07	32.785
EVAPOTRANSPIRATION	18.178 (1.5001)	65986.13	44.336
LATERAL DRAINAGE COLLECTED	9.49117 (2.89887)	34452.953	23.14882

FROM LAYER 3				
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.00000 (	0.00000)	0.005	0.00000
AVERAGE HEAD ON TOP OF LAYER 4	0.001 (	0.000)		
LATERAL DRAINAGE COLLECTED FROM LAYER 9	0.00231 (	0.00296)	8.372	0.00563
PERCOLATION/LEAKAGE THROUGH LAYER 10	0.00000 (	0.00000)	0.007	0.00000
AVERAGE HEAD ON TOP OF LAYER 10	0.000 (	0.000)		
CHANGE IN WATER STORAGE	-0.113 (	2.7858)	-410.12	-0.276

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*******************************************************************************

            PEAK DAILY VALUES FOR YEARS    1 THROUGH   15
   ------------------------------------------------------------------------
                                               (INCHES)      (CU. FT.)
                                              ----------    -------------
      PRECIPITATION                             4.90         17787.000

      RUNOFF                                    6.526        23688.8613

      DRAINAGE COLLECTED FROM LAYER  3          1.58562       5755.81738

      PERCOLATION/LEAKAGE THROUGH LAYER  4      0.000000         0.00003

      AVERAGE HEAD ON TOP OF LAYER  4           0.035

      MAXIMUM HEAD ON TOP OF LAYER  4           0.109

      LOCATION OF MAXIMUM HEAD IN LAYER  3
            (DISTANCE FROM DRAIN)               0.0 FEET

      DRAINAGE COLLECTED FROM LAYER  9          0.00002          0.08806

      PERCOLATION/LEAKAGE THROUGH LAYER 10      0.000000         0.00002

      AVERAGE HEAD ON TOP OF LAYER 10           0.000

      MAXIMUM HEAD ON TOP OF LAYER 10           0.000

      LOCATION OF MAXIMUM HEAD IN LAYER  9
            (DISTANCE FROM DRAIN)               0.0 FEET

      SNOW WATER                               15.63         56729.2383


      MAXIMUM VEG. SOIL WATER (VOL/VOL)                 0.3975

      MINIMUM VEG. SOIL WATER (VOL/VOL)                 0.1360


       ***  Maximum heads are computed using McEnroe's equations.  ***

            Reference:  Maximum Saturated Depth over Landfill Liner
                        by Bruce M. McEnroe, University of Kansas
                        ASCE Journal of Environmental Engineering
                        Vol. 119, No. 2, March 1993, pp. 262-270.

*******************************************************************************
```

0.00003 cu. ft/acre/day
= 0.00022 gal/acre/day

0.00002 cu. ft/acre/day
= 0.00015 gal/acre/day

****

FINAL WATER STORAGE AT END OF YEAR 15

LAYER	(INCHES)	(VOL/VOL)
1	2.1161	0.3527
2	2.9639	0.2470
3	0.0021	0.0106
4	0.0000	0.0000
5	0.1521	0.6086
6	1.4640	0.2440
7	651.7440	0.2920
8	1.0800	0.0450
9	0.0020	0.0100
10	0.0000	0.0000
SNOW WATER	0.983	

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****

APPENDIX E

Inflow Through Hypothetical Damaged Area

Written by:	Youngmin C.	Date:	2019.10.02	Reviewed by:	Andrew R. N. Yafrate	Date:	2019.10.04 2019.10.07
Client:	WMDSM	Project:	Phase 14 Permitting	Project/ Proposal No.:	BE0232	Task No.:	02

INFILTRATION THROUGH A HYPOTHETICAL DAMAGED AREA
REVISED FINAL COVER SYSTEM

WMDSM - CROSSROADS LANDFILL PHASE 14
NORRIDGEWOCK, MAINE

PURPOSE

This calculation package presents an estimate of the potential infiltration into the landfill through a hypothetical damaged area in the cap (i.e., through a hole in the geomembrane and GCL layers).

PROCEDURE AND CALCULATIONS

An estimate of the volume of water that might enter the landfill through a hypothetical damaged area of the cap can be made using several simplifying assumptions, including:

1. **Geometry and Orientation of Damage** – for this estimate, an assumed 4-ft long defect (hole) was assumed to occur through the entire thickness of the cap barrier layers. The defect is assumed to be oriented perpendicular to the flow path of infiltrated stormwater (i.e., oriented in the cross-slope direction) to intersect the greatest possible water volume;
2. **Location of Damage** – the hypothetical hole is assumed to occur at the bottom of the longest typical side-slope drainage length (assumed 300 ft), i.e., the landfill peak to a side-slope drainage bench. The side-slope drainage length is measured off from Sheet 15 of the Phase 14 Permit Drawings;
3. **Contributing Area** – The upslope width of the contributing drainage area is assumed to be same as the width of the defect (i.e., 4 ft). By multiplying the assumed drainage length (i.e., 300 ft) and the damage width (i.e., 4 ft), the contributing area is estimated to be 1,200 ft^2; and
4. **Cover Soil Infiltration Rate** – the peak daily infiltration rate through the final cover soils (i.e., 6-in topsoil and 12-in protective cover) was estimated using the HELP model (i.e., 1.586 in/day = 0.132 ft/day). See Appendix C of the Revised Final Cover System Engineering Report for Phase 14 Variance Request for the output from the HELP model for the proposed revised final cover; Attachment A of this calculation package presents applicable the excerpts from the HELP model output.

The volume of water infiltrating the landfill through a defect in the cap can be estimated as follows:

$$Quantity\ of\ Flow = Contributing\ Area\ \times Cover\ Soil\ Infiltration\ Rate$$

$$= 1{,}200\ ft^2\ \times 0.132\ ft/day = 158.4\ \frac{ft^3}{day} \times \frac{7.48\ gal}{ft^3} = 1{,}185\ \frac{gal}{day}$$

RESULTS AND CONCLUSION

The peak flow rate through a 4-ft wide gash in the final cover barrier layer (i.e., geomembrane and geosynthetic clay liner) is estimated to be 1,185 gal/day.

ATTACHMENT A
HELP Model Output for Revised Final Cover System

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******************************************************************************
******************************************************************************
**                                                                          **
**                                                                          **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE               **
**                HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)                **
**                  DEVELOPED BY ENVIRONMENTAL LABORATORY                   **
**                    USAE WATERWAYS EXPERIMENT STATION                     **
**             FOR USEPA RISK REDUCTION ENGINEERING LABORATORY              **
**                                                                          **
**                                                                          **
******************************************************************************
******************************************************************************


PRECIPITATION DATA FILE:    C:\HELP\ph14\PREC.D4
TEMPERATURE DATA FILE:      C:\HELP\ph14\TEMP.D7
SOLAR RADIATION DATA FILE:  C:\HELP\ph14\SOLA.D13
EVAPOTRANSPIRATION DATA:    C:\HELP\ph14\EVAP.D11
SOIL AND DESIGN DATA FILE:  c:\HELP\ph14\FINAL.D10
OUTPUT DATA FILE:           c:\HELP\ph14\FINAL.OUT


TIME:  14: 6     DATE:   9/18/2019


******************************************************************************

     TITLE:  Crossroads LF Ph 14 - Final Cover

******************************************************************************


     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
              COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.


                                   LAYER  1
                                   --------

                     TYPE 1 - VERTICAL PERCOLATION LAYER
                         MATERIAL TEXTURE NUMBER  10
           THICKNESS                  =      6.00   INCHES
           POROSITY                   =      0.3980 VOL/VOL
           FIELD CAPACITY             =      0.2440 VOL/VOL
           WILTING POINT              =      0.1360 VOL/VOL
           INITIAL SOIL WATER CONTENT  =      0.3972 VOL/VOL
           EFFECTIVE SAT. HYD. COND.   =  0.119999997000E-03 CM/SEC


                                   LAYER  2
                                   --------

                     TYPE 1 - VERTICAL PERCOLATION LAYER
                         MATERIAL TEXTURE NUMBER  10
```

****

PEAK DAILY VALUES FOR YEARS 1 THROUGH 15

	(INCHES)	(CU. FT.)
PRECIPITATION	4.90	17787.000
RUNOFF	6.526	23688.8613
DRAINAGE COLLECTED FROM LAYER 3	1.58562	5755.81738
PERCOLATION/LEAKAGE THROUGH LAYER 4	0.000000	0.00003
AVERAGE HEAD ON TOP OF LAYER 4	0.035	
MAXIMUM HEAD ON TOP OF LAYER 4	0.109	
LOCATION OF MAXIMUM HEAD IN LAYER 3 (DISTANCE FROM DRAIN)	0.0 FEET	
DRAINAGE COLLECTED FROM LAYER 9	0.00002	0.08806
PERCOLATION/LEAKAGE THROUGH LAYER 10	0.000000	0.00002
AVERAGE HEAD ON TOP OF LAYER 10	0.000	
MAXIMUM HEAD ON TOP OF LAYER 10	0.000	
LOCATION OF MAXIMUM HEAD IN LAYER 9 (DISTANCE FROM DRAIN)	0.0 FEET	
SNOW WATER	15.63	56729.2383

MAXIMUM VEG. SOIL WATER (VOL/VOL) 0.3975

MINIMUM VEG. SOIL WATER (VOL/VOL) 0.1360

*** Maximum heads are computed using McEnroe's equations. ***

Reference: Maximum Saturated Depth over Landfill Liner
by Bruce M. McEnroe, University of Kansas
ASCE Journal of Environmental Engineering
Vol. 119, No. 2, March 1993, pp. 262-270.

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