I, Trevor Thomas, a licensed Professional Engineer in the State of New York, hereby certify that the work represented in the document is accurate, in conformance with applicable codes at the time of submission and has been prepared in conformance with normal and customary standards of practice and with a view to the safeguarding of life, health, property and public welfare.

Date: 8/29/2024

STATE OF NEW YORK
TREVOR ROBERT THOMAS
082483
LICENSED PROFESSIONAL ENGINEER

Trevor R. Thomas
082483

Barton Mines
Geotechnical Review

Submitted by:

Bowman Consulting, Engineering, Land Surveying and Landscape Architecture
179 River Street
Troy, NY 12180

Submitted to:

Barton Mines
North Creek, NY

August 2024

bowman.com

NEW YORK STATE OF OPPORTUNITY | Adirondack Park Agency
RECEIVED
Date: August 30, 2024

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1.0 Executive Summary

This document was developed to assess the long-term slope stability of the proposed phased expansion of the Barton Mines (Barton) residual minerals storage facility (RM Facility or RM Facility) at its Ruby Mountain Mine Site (Site) for all four phases of the project.

Currently, ore is extracted from the quarry at an average rate of 415,000 short tons per year and mechanically broken down by the permanent on-site crushing system. This material is conveyed to the concentrate mill where further mechanical breakdown occurs, and garnet particles are separated from the ore. All non-garnet materials are referred to as residual minerals (RM) and are hydraulically conveyed to the RM Facility. On average, 250,000 cubic yards (cy) of RM are deposited in the RM Facility annually and are separated into coarse-grained (sand-like) RM and fine-grained (silt-like) RM. Conservatively 10% or less resulting in 25,000 cy per year are fine-grained RM.

The RM Facility has been in operation since the 1980s with minimal changes to the ore extraction and processing methodologies. A professional engineering firm has been involved with the RM Facility design and construction since the beginning of the facility's existence. During the current life of the RM Facility, approximately 7.2 million cy of coarse-grained RM and approximately 660,000 cy of fine-grained RM have been placed in the RM Facility, and no stability failures of the embankment have been observed.

The proposed plan for future deposits of RM at the RM Facility is to build out laterally to the north and south until 2036 and then increase the elevation of the facility by approximately 4 feet per year until 2048 when the remainder of the facility will reach the currently permitted elevation of 2,275 feet above mean sea level (amsl). After 2048, the proposed facility will increase by approximately 2 feet per year until the proposed maximum facility height of 2,375 feet amsl is reached in 2090. At the end of the life of the operation, Barton will relocate the top 20 feet of material from the facility, approximately 1 million cy, and backfill the remainder of the excavated region of the quarry with the RM, bringing the final facility height to 2,355 feet amsl..

Coarse-grained RM is a well-drained material that comprises approximately 90% of the existing RM Facility. Analysis of the phreatic surface (elevation of water within the facility) through existing piezometer data and exploratory probes indicates that there is saturated coarse-grained RM at the base of the RM Facility in some areas and potentially saturated regions of coarse-grained RM adjacent to fine-grained RM storage in the middle pond area as well as the upper pond area. Fine-grained RM are slow draining hydraulically placed materials that comprises approximately 10% of the current RM Facility and are potentially saturated at most locations. Historic fine-grained RM deposition is confined to the regions underneath the current upper pond and middle pond locations.

Lower strength parameters were utilized in the stability analysis for undrained conditions both in the coarse-grained and fine-grained RM. Existing stability analyses were performed by Knight-Piesold and re-performed by Bowman Consulting, Engineering, Land Surveying, and Landscape Architecture (Bowman) and both analyses indicate that all phases of the RM Facility development under both drained and undrained conditions result meets or exceeds industry standard factors of safety (FOS, 1.5 drained and 1.3 undrained.

Under the proposed mine plan, fine-grained RM will no longer be permanently stored within the RM Facility. Instead, Barton will permanently store fine-grained RM within excavated regions of the quarry where they will be contained on all four sides and the height of RM placement will never exceed the elevation of the hard rock quarry floor.

A long-term monitoring program is proposed in this report to monitor the growth and stability of the RM Facility over the life of the operation (i.e., the entire life of mine [LOM]) specifically targeting facility geometry, pore-water pressure conditions, and potential internal and external movement of deposited materials. Barton is proposing continuous collection of piezometric data and quarterly collection of topographic and internal movement (inclinometer) data with annual reporting to the New York State Department of Environmental Conservation (NYSDEC) and the Adirondack Park Agency (APA). Annual reporting will include orthophotos, piezometric data, cross-sectional geometric analysis, rates of deposition, observations, and data interpretation under the supervision of a licensed New York State professional engineer.

2.0 Introduction

Bowman (NYS Licensed professional Engineer) has performed a review of existing data and documents and conducted slope stability analyses for the proposed Residual Mineral Storage Facility (RM Facility) at Barton's Ruby Mountain Site in support of the major permit modification application through the NYSDEC and the APA. Bowman has also developed a proposed monitoring plan to monitor the growth of the RM Facility during lateral and vertical expansion activities over the life of the operation.

3.0 Scope of Work

Bowman performed the following scope of work to assess the geotechnical stability of the proposed long-term phased development of the RM Facility.

1.) Reviewed existing data and technical reports developed by Knight Piesold to assess the RM properties and stability of long-term phased construction of the RM Facility.
2.) Evaluated the historical construction and geometry of the RM Facility through review of existing mapping for use in the slope stability analyses.
3.) Performed stability analyses at cross sectional locations identified by Knight Piesold as well as an additional location identified by Bowman to assess the stability of the proposed RM Facility over the proposed LOM.

4.) Developed a monitoring plan that outlines installation of instrumentation, data collection, and proposed reporting to the agencies.

4.0 Review of Existing Information

Knight Piesold has been the geotechnical consultant for the Barton RM Facility for more than a decade and has developed reports on material properties, exploratory drilling, instrumentation installation, pore-water conditions, RM Facility stability, and RM Facility development. Bowman reviewed the available information and developed the phased design associated with the proposed permit modification in conjunction with Knight Piesold. Bowman and Knight Piesold collectively participated in the design process with coordination meetings and technical review of all aspects of the design. Bowman utilized data and information from listed above to perform a cross check of existing facility composition, material properties, and slope stability analysis methodology detailed in this report. Initial designs were completed by NYS Licensed Engineers from SRK consulting in 1995.

Bowman also reviewed information obtained during a 2024 sonic boring campaign that advanced four exploratory holes in the vicinity of the middle pond area. Boring logs and location maps are provided in Appendix C.

5.0 Current Mining Operations

Barton mines a garnet-bearing gneissic consolidated rock by traditional drilling and blasting methods, advancing a series of approximately 60-foot-tall east-west trending mine faces in a northerly direction. Material is loaded from the active mine face by excavator into an off-highway haul truck. Material is taken from the active quarry area to the nearby primary crusher. Crushed material is conveyed to the on-site mill for additional processing and removal of RM. RM from the mill are hydraulically conveyed to the RM Facility, and water is recovered through a series of finger drains and ponds for reuse in the beneficiation process. The garnet separated at the mill is hauled to Barton's Hudson River Plant (3.6 miles away, Town of Indian Lake) for final processing and shipment directly to customers by on-road haul vehicles. The current permitted quarry life is approximately 19 years, but the functional life is estimated to be just 5 years, with this limitation being primarily related to the limited availability of RM storage space under the current permit. The above method of mining and processing is approved by the NYSDEC and APA; the activities are referenced in NYSDEC MLR Permit 5-5230-0000/0002 and APA Permit P87-39.

The RM produced from the garnet beneficiation process consist mainly of feldspar, amphibole/pyroxene and garnet minerals and a small fraction of micas and ilmenite.

The RM meet NYSDEC's criteria for uncontaminated rock to be used as a substitute for conventional aggregate, pursuant to 6 NYCRR Part 360-1.5(b)(11), and are not considered a solid waste. Furthermore, the RM meet the criteria set forth by the OSHA Hazard Communication Standard as a mixture that DOES NOT contain carcinogenic properties, pursuant to 29 CFR 1910.1200. The RM have been tested by third-party accredited laboratory methods and have been confirmed to contain less than trace quantities (<0.01%) of heavy metals and respirable quartz (free silica).

RM produced at the mill are hydraulically conveyed to the RM Facility where they are separated by a cyclone system into fine-grained (silt size) and coarse-grained (sand particle size) RM. Analysis of the RM slurry has shown that the volumetric percentage of fine-grained RM is approximately 10% and coarse-grained RM is 90%. This ratio has been corroborated through topographic and bathymetric survey and volumetric reconciliation. Fine-grained RM that leaves the cyclone system are in the form of a slurry that is conveyed via gravity to the upper pond where they settle to the bottom and water filters through the RM Facility and finger drain system. The water is recovered in the lower ponds for reuse in material processing at the on-site mill.

The currently permitted peak elevation for the RM Facility is 2,275 feet amsl with a reclamation side slope of 2:1. Under the proposed plan, fine-grained RM will no longer be permanently stored in the RM Facility and will instead be transported to excavated regions of the quarry for permanent storage. The proposed reclamation slopes of the RM Facility include a 2:1 face angle with a 30-foot bench every 100 vertical feet. The southeastern portion of the facility will have extended terraces that reach up to 375 feet to accommodate buttressing of existing embankments and visual impact requirements.

6.0 Historic Pile Construction and Geometry

Bowman assembled the existing topographic and photogrammetric data into a geographic information system (GIS) database to evaluate the historic three-dimensional development of the RM Facility over time. The historical facility geometry and location of deposited fine-grained RM are important to assessing the stability and impacts of phased expansion and the proposed gradual height increase on the FOS associated with the RM Facility buildout. The data included in the model are piezometric data, in-situ cone penetrometer testing (CPT), historic topographic data, and historic aerial imagery.

Bowman created a three-dimensional model of the information described above and generated cross sectional information at the locations identified in Figure 1. These locations, plus an additional cross Section H, were the same as those developed by Knight Piesold and utilized in the slope stability analysis. The location and extent of the fine-grained RM identified by Knight Piesold in the middle pond and upper pond region were conservative (represented the maximum extent of fine grained RM possible, and were utilized in the slope stability analysis cross-check developed for this report.

In July of 2024 sonic exploratory borings were advanced at four locations in the vicinity of the middle pond area as shown on the boring logs and location map included in Appendix C. Borings were advanced through the RM materials until bedrock refusal. An onsite geologist characterized the cutting returns and validated bedrock refusal. The characterizations of the materials encountered are presented in the attached logs. The lithology as characterized through the 2024 sonic borings validates that a conservative model of fine-grained material was developed and utilized in the slope stability analysis presented in Section 10.0.

7.0 RM Facility Material Properties

Historic material testing was performed on the RMstored in the RM Facility by the Knight Piesold Geotechnical Lab in 2014 (Appendix A). Below is a summary of the results of the testing and analysis, as well as the strength properties used in the stability analysis.

Fine-Grained RM

Particle size distribution analysis performed on the fine fraction of the RM recovered after cyclone separation results in a description of SILT and a USCS classification of ML and are non-plastic. The specific gravity of the material is 2.94.

Flexible wall permeability testing was performed on remolded samples of the fine-grained RM at multiple confining pressures. Coefficients of permeability (k) expressed in cm/sec that were observed averaged 2.4E-5 indicating that the fine-grained RM is a slow-draining material.

Coarse-Grained RM

Particle size distribution analysis performed on the coarse fraction of the RM after cyclone separation resulting in a description of poorly graded SAND with silt and a USCS classification of SP-SM. In the USCS classification system, SP represents a poorly graded (homogenous or gap graded) sand and gravelly sands, little or no fines. In the USCS classification system, SM represents a silty sand, sand-silt mix with non-plastic fines. The specific gravity of the material is 2.98.

Consolidated Undrained (CU) triaxial sheer testing was performed on remolded samples of the coarse-grained RM at multiple confining stresses (σ_3). The effective stress friction angle was determined to be 37.4 degrees (ϕ) for drained conditions. The undrained shear strength ratio of 0.30 was utilized for undrained conditions stability assessment.

Flexible wall permeability testing was performed on remolded samples of the coarse-grained RM at multiple confining pressures. Coefficients of permeability (k) expressed in cm/sec were observed ranging from 2.3E-03 to 2.8 E-03 indicating that the coarse-grained RM is a well-draining material. Historical observations of facility drainage over the past 30 years of RM storage corroborate the laboratory findings in that the coarse-grained RM drains very well with no observable ponding of water even during large storm events.

8.0 Pore Water Conditions

Vibrating wire piezometers were installed at 14 locations during CPT performed by Knight Piesold in 2014 and 2019 (Figure 1). Piezometers were installed at or near the contact between RM Facility materials and bedrock. Piezometer data have been collected regularly by Barton staff, and historical observations are presented in Table 1.

Summary of Piezometer and RMSF Elevation Data

Instrument #	Average PZ Elevation	MAX PZ Elevation	Average Phreatic Surface Depth Below Pile Surface	Average Phreatic Surface Depth Above Bedrock	Notes
	FT AMSL	FT AMSL	Feet	Feet	
PZ15-01	2183.6	2188.4	91.4	6.7	Top of RMSF
PZ15-02	2099.6	2107.2	93.4	21.1	Middle Pond Embankment West
PZ15-03	2137.7	2148.5	137.3	13.6	Top of RMSF
PZ15-04	2048.9	2053.4	141.1	3.7	Middle Pond Embankment East
PZ15-05	2126.6	2134.8	148.4	3.8	Top of RMSF
PZ15-06	2055.7	2059.6	135.3	5.5	Middle Pond Embankment East
PZ19-01	2072.8	2075.5	39.2	4.9	Toe
PZ19-02	2029.2	2032.1	50.8	7.3	Toe
PZ19-03	2017.1	2019.3	33.9	15.4	Toe
PZ19-04	2019.3	2019.8	20.7	0.0	Toe
PZ19-05	2079.3	2080.4	40.7	0.0	Toe East Side
PZ19-06	2127.8	2129.4	62.2	9.7	Middle of Pile East Side

Table 1. Summary of Piezometer and RM Facility Elevation Data

Currently, the elevation of the surface water in the upper pond is regulated by a standpipe with the invert set at elevation 2,259 feet amsl. This represents the highest elevation of the phreatic surface within the RM Facility. The phreatic surface in the vicinity of the middle pond fine-grained RM is conservatively assumed to be at the top of the deposit and then rapidly transitioning to the bottom of the coarse-grained RM within the stability analysis. This assumption is confirmed within the piezometric data and site observations (no daylighting within the downstream slope). Finger drains are installed within the compacted base of the facility to direct drainage to the lower pond for recovery and reuse in mineral processing operations. The geometry of the phreatic surface is displayed within the slope stability cross sections presented in Appendix B.

Although the most conservative interpretation of the phreatic surface and fine-grained RM deposition geometry was used in the slope stability analysis, an updated site investigation and piezometer installation program was executed in July 2024 to further characterize these parameters within the middle pond to improve the accuracy of the slope stability analysis. As of the writing of this report Barton is in the process of calibrating the instrumentation and integrating them into the monitoring network. Piezometers installed in the middle pond fine-grained RM will be utilized during deposition of coarse-grained RM overtop the fine-grained RM during future phases of the project.

Barton has invested in a data collection system that will continuously read the piezometric data from the current and future piezometers. Material will not be placed on top of the middle pond fine-grained RM until 2037 and after the buttressing material associated with phase 1 RM Facility has been placed. Beginning in 2037, the growth rate of the facility will be very slow, on average 4.0 feet per year between 2037 – 2048, and then 2.0 feet per year between 2049-2066. Constructioninduced porewater pressures in this area are not anticipated given the slow growth rate and anticipated dissipation of these pressures. Under the monitoring plan proposed in this document, Barton will continuously collect and analyze the piezometric data during this timeframe to confirm this assumption. The data obtained from the piezometers will be available to the agencies for review and summarized annually in the monitoring reporting documents.

In a similar fashion, piezometers will be installed in the upper pond fine-grained RM deposit prior to adding coarse-grained material overtop. Coarse-grained material will not be placed overtop fine-grained material in the upper pond until 2049. The anticipated rate of deposition of coarse-grained RM over the top of the upper pond is 3.8 feet per year from 2049-2066, and 2.0 feet per year from 2067-2090.

9.0 Phased RM Facility Expansion

A description of the proposed phased expansion plan of the RM Facility for the entire LOM is provided in the following timeline.

Phase 1 (Present – 2036): Build out the RM Facility to the northeast at or below the currently permitted elevation 2,275 ft amsl. There is currently between two to three years of capacity in this area. It is anticipated that a permit will be issued during this time frame and expansion of the RM Facility can continue beyond the current LOM boundary to the southeast. Once the permit has been granted, clearing and grubbing of the remainder of the Phase 1 footprint can begin. Topsoil will be stockfacilityd at the locations indicated in the proposed mine plan maps. Finger drains will be installed to promote RM Facility drainage towards the lower pond to recover process waters, and a 20-foot-thick compacted base layer constructed in 1-foot lifts and compacted with a vibratory drum roller to at least 95% of the maximum dry density utilizing modified Proctor testing will be constructed. Upon completion of the compaction layer, coarse-grained RM will be placed and reclamation grades established as shown on the mine plan drawings. Upon reaching reclamation grades, vegetative reclamation activities will be implemented to establish vegetation on the side slopes and benches of the RM Facility at this location. Fine-grained RM will be placed in the upper pond with the expected final elevation of fine-grained sediment of 2,272 feet amsl.

Phase 2 (2037 – 2048): During Phase 2 activities, coarse-grained RM will be placed over top the middle pond area until lateral reclamation grades are achieved. In addition, a minimum 10-foot-thick compacted coarse-grained base layer and finger drain system will be installed in all regions of the northeastern expansion of the RM Facility. RM will be placed in the northeastern region of the RM Facility until lateral reclamation grades are achieved. Fine-grained RM will be placed in the excavated region of the quarry. During Phase 2, the proposed height of the facility will not exceed the currently permitted height of 2,275 feet amsl. Upon reaching reclamation grades, vegetation will be established on the side slopes and benches in the regions where no additional material will be placed for the remainder of the LOM.

Phase 3 (2049 – 2066): During Phase 3, a minimum 10-foot-thick compacted base layer will be installed in all proposed expansion areas. The RM Facility height will increase from 2,275 feet amsl to 2,325 feet amsl during this time frame. Fine-grained RM will be placed within the excavated regions of the quarry. All areas that have achieved final reclamation grade will be reclaimed.

Phase 4 (2067 – 2090): During Phase 4, no additional compaction layers will be constructed given that all lateral expansion will have been achieved during previous phases. The height of the facility will increase from 2,325 feet amsl to 2,375 feet amsl. At the end of Phase 4, the top 20 feet of the facility will be removed and placed in the excavated regions of the quarry, reducing the final RM Facility height to 2,355 feet amsl During this phase, all fine-grained RM will be placed within excavated regions of the quarry.

10.0 Slope Stability Analysis

The proposed reclamation grade slope surface of the RM Facility is a 2:1 face angle with a 30-foot bench established every 100 vertical feet of facility construction. The proposed configuration results in an overall slope angle of 2.3:1 along the northern, western, and northeastern portions of the facility. For the proposed slope along the southeastern portion of the facility, in the vicinity of the middle pond, the overall proposed slope angle ranges from 3.1:1 to 4.6:1. The proposed decreased overall slope angle along the southeastern portion of the RM Facility is associated with buttressing the middle pond embankment during Phase 1 as well as reducing the proposed visual impact to Thirteenth Lake. The toe of the Phase 1 buttress will be further confined by the topographic rise of bedrock at the southern end as can be seen in Sections A and B in Appendix B. The natural angle of repose of coarse-grained material deposited in the RM Facility through the cyclone ranges from 1.7:1 to 2.3:1 depending on location in the RM Facility.

Slope stability analysis checks were performed by Bowman using the Spencer limit equilibrium methods under drained and undrained conditions and represent a conservative approach to this type of analysis. Bowman reviewed all strength parameters estimations developed by Knight Piesold (as previously discussed) and slope stability methodologies and concurs with Knight Piesold's approach and the suitability of these parameters/methodologies for the RM Facility stability assessment.

Coarse-grained RM is a well-drained material that comprises approximately 90% of the existing RM Facility. Analysis of the phreatic surface through existing piezometer data and exploratory probes indicates that there is saturated coarse-grained RM at the base of the RM Facility in some areas and potentially saturated regions of coarse-grained RM adjacent to fine-grained RM storage in the middle pond area as well as the upper pond area. Fine-grained RM are slow-draining, hydraulically placed materials that comprise approximately 10% of the RM Facility and are potentially saturated at most locations within the RM Facility. Fine-grained RM deposition is confined to the regions underneath the current upper pond and middle pond locations.

Lower strength parameters were utilized in the stability analysis for undrained conditions both in the coarse-grained and fine-grained RM materials - Tau/Sigma ratio of 0.3 and 0.22, respectively. These parameters were developed by Knight Piesold and utilized in their review of the proposed expansion RM Facility buildout.

Bowman performed analyses to cross check results developed by Knight Piesold at all cross-sectional locations and a new selected cross section location (H). All cross-sectional locations are identified on Figure 1, and graphical representations of the stability analysis results are presented in Appendix B.

All four phases of the facility development were analyzed for stability, both under drained and undrained conditions. Bowman's stability analysis results correspond well with those generated by Knight Piesold, with all FOS analysis results greater than industry standard, 1.5 for drained conditions and greater than 1.3 for undrained conditions. See Table 2.

Cross Section	Phase of Mining	Drained/Undrained Condition	FOS
A	1	D	1.7
	2		1.7
	3		1.7
	4		1.7
	1	U	1.7
	2		1.7
	3		1.7
	4		1.7
B	1	D	1.8
	2		1.9
	3		1.9
	4		1.9
	1	U	1.7
	2		1.8
	3		1.5
	4		1.5
C	1	D	1.8
	2		1.8
	3		1.8
	4		1.8
	1	U	1.7
	2		1.6
	3		1.6
	4		1.3
D	1	D	
	2		
	3		1.6
	4		1.6
	1	U	
	2		
	3		1.6
	4		1.6
E	1	D	
	2		1.6
	3		1.6
	4		1.6
	1	U	
	2		1.6
	3		1.6
	4		1.6
F	1	D	2.2
	2		2.2
	3		2.2
	4		2.2
	1	U	1.7
	2		1.7
	3		1.7
	4		1.7
G	1	D	2.2
	2		1.8
	3		1.8
	4		1.8
	1	U	2
	2		1.7
	3		1.7
	4		1.6
H	1	D	1.8
	2		1.8
	3		1.8
	4		1.8
	1	U	1.8
	2		1.8
	3		1.8
	4		1.8

Table 2. Factor of Safety Analysis Results

11.0 Monitoring Plan

Bowman has developed a monitoring plan to continually evaluate parameters associated with mine plan rate of expansion, RM Facility geometry, phreatic surface position and internal facility movement. The monitoring plan will include the following activities:

Aerial Photogrammetry: Barton will collect aerial photogrammetry on an annual basis that will include the generation of an orthophoto as well as topographic information for the RM Facility and quarry areas. This will provide Barton with an assessment of the rate of coarse-grained RM deposition as well as the quantity of ore extracted from the quarry and confirm mine planning assumptions.

Cross Section Analysis: Utilizing the topographic geometry collected, Barton will create cross sections at the locations indicated on Figure 1 of the Geotechnical Review Report and compare historic topographic geometry, previous quarterly topographic position, and the proposed phased positions of the pile.

Compaction Layer Density Testing: Barton will perform modified proctor density sampling at a minimum spacing of one test every 100-foot x 100-foot grid of compaction layer. The extent of the compaction layer and location of all density testing will be surveyed and presented in the report.

Visual Inspection: Barton will perform daily visual inspections of the RM Facility and develop monthly documentation reports that identify any issues that were observed during the month and any remedial actions that were taken. These inspection reports will be submitted to the APA and NYSDEC with the proposed annual reporting.

Continuous Piezometric Readings: Barton has established a system to continuously collect piezometric data within the RM Facility at existing piezometer locations and will expand the network to continuously collect data from future piezometer locations. Piezometric data will be summarized and graphed on a quarterly basis and submitted to the APA and NYSDEC on an annual basis.

Inclinometer Measurements: Barton will install biaxial inclinometer casings at the locations indicated on Figure 1 of the Geotechnical Review Report and collect quarterly readings that will be plotted and compared to baseline readings. Inclinometers will be installed prior to placing coarse-grained material over fine-grained material in the middle pond. As future phases of the RM Facility are constructed, an additional inclinometer will be installed in the vicinity of the upper pond to monitor movement along the north side of the RM Facility.

Factor of Safety Analysis: If any assumptions utilized in the slope stability analysis change during the course of RM Facility development, Barton will revise and update the slope stability analysis accordingly and provide to the NYSDEC and APA for their review and comment for all phases included in the life of mine.

Annual Reporting: Annual reporting will include and summarize the monitoring outlined above. The main elements are: orthophotos, piezometric data, cross sectional geometric analysis, rates of deposition, visual inspections, data interpretation and site visit observations by a qualified New York State Professional Engineer. Barton is proposing to provide annual reporting for the first five years of operation post permit approval and then decrease the frequency to every five years to align with the NYSDEC permit renewal process.

12.0 Conclusions and Recommendations

- After conducting the above-detailed data review and slope stability analysis for the proposed RM Facility, Bowman has reached the following conclusions: Bowman has reviewed the reports developed by Knight Piesold detailing the analysis of material properties, exploratory drilling, insitu properties of the proposed RM Facility for geotechnical stability and concurs with Knight Piesold's parameters and methodologies used for assessing stability of the RM Facility.
- Bowman developed models for the depositional location of coarse- and fine- grained materials over the life of the RM Facility development and concludes that the geometry utilized for the coarse-grained RM is accurate and the geometry of the fine-grained RM is conservative.
- The FOS of the RM Facility over the proposed LOM meets or exceeds the industry standard value of 1.5 for drained conditions and meets or exceeds the industry standard value of 1.3 for undrained conditions.

Bowman offers the following recommendations for construction and monitoring of the RM Facility over the life of the operation.

- Perform additional exploratory drilling in the vicinity of the middle pond, and install vibrating wire piezometers at the locations indicated.
- Install biaxial inclinometers at the locations identified and perform quarterly readings as specified.
- Execute the monitoring program as outlined, and provide annual reporting to the regulatory agencies.
- Prior to commencing placement of coarse-grained RM, install a 10-foot-thick layer of compacted coarse-grained RM to at least 95% of the maximum dry density utilizing modified Proctor testing. In the vicinity of the middle pond embankment, install a 20-foot-thick layer of compacted coarse-grained RM to at least 95% of the maximum dry density utilizing modified Proctor testing.

13.0 References

1.) Scheremeta, Jordan, P.E. (Knight Piesold), "Barton Mine Residual Minerals Storage Facility Geotechnical Assessment of Proposed Permit Modification, REV 4), October 13, 2023.

Appendix A

October 30, 2023

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Mr. Jacob Barnhart
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Project No.: DV101-00586/10
Doc. No.: DV-23-1449

Re: Barton Mine
Residual Minerals Storage Facility
Geotechnical Assessment of Proposed Permit Modification, REV4
Supersedes Prior Letter Dated October 13, 2023

Dear Jacob:

1.0 INTRODUCTION

Knight Piésold and Co. (Knight Piésold) was retained by Barton International Inc. (Barton) to provide a high-level geotechnical evaluation of a proposed permit modification with respect to its impact on the existing Barton Residual Minerals storage facility (RMSF) located at the Barton Garnet Mine near North Creek, NY. The proposed permit modification includes both an increase to the permitted facility footprint and an increase in the overall facility height. Barton is pursuing the updated mine plan to provide additional storage volume for Residual Minerals sands, a by-product of industrial garnet production, due to extension of the proposed life of mine (LOM) plan as provided by Barton. Development of the overall geometry and civil design of the proposed RMSF configuration is being completed by H2H Geoscience Engineering (H2H) of Troy, NY, while Knight Piésold is responsible for evaluating the expected geotechnical performance of the modified facility and to provide technical guidance and recommendations associated with the geotechnical aspects of the design. The purpose of this letter is to provide the results of Knight Piésold's a high-level geotechnical evaluation of the H2H design concepts together with recommended considerations for implementation of the plan.

Based on the results of the evaluation presented herein, Knight Piésold believes that the proposed plan to increase the capacity of the existing RMSF, as developed by H2H is likely to be geotechnically feasible, subject to the applicable limitations described herein. However, due to the nature of the facility, and the general lack of engineered fill placement, an observational approach has been and will continue to be taken with regards to the geotechnical design and associated construction of the Barton RMSF. As such, continued monitoring and ongoing evaluation of the facility using existing and future instrumentation, regular site investigations and updated geotechnical evaluations will be required at regular intervals to confirm that conditions remain as anticipated. As part of this process, it is possible that minor refinements to the design of the RMSF could be necessary. However, refinements that are found to be required (such as providing a slower rate of construction, flatter exterior slopes, or a lower ultimate pile height) would be designed such that the modified design would be contained within the proposed permitted footprint of the RMSF. In the event that more significant changes are needed based on observed conditions that would require construction outside of the permitted footprint, Barton would seek a subsequent permit modification at that time before proceeding with construction of those modifications. To evaluate the performance of the facility and to identify potential modifications, it is imperative that a qualified geotechnical engineer remain closely engaged with the project as the facility evolves.

It is of note that in addition to the plan proposed by Barton and H2H to increase the capacity of the existing RMSF at the Barton Mine, Residual Minerals (sands and slimes) are also proposed to be deposited and/or placed into mined out cells in the Barton open pit later in the mine life. Knight Piésold has been consulted and provided input with respect to the development of that plan and it is our understanding that the current operational philosophy contemplates the placement of Residual Minerals only into confined hard-rock pit cells. Moreover, the Residual Minerals are planned to be placed in thin horizontal lifts and are not anticipated to be constructed above the low point of each individual pit cell rim. As such, the proposed plan, as understood by Knight Piésold, should not exhibit a global geotechnical slope stability concern due to the lack of shear stress development within the Residual Minerals mass and, thus, the proposed pit cell RMSFs are outside of the scope of this geotechnical stability document. However, when detailed operating plans are being developed for Residual Minerals placement into the pit cells in the future, it would be prudent for Barton to consult a geotechnical engineer at that time to provide operational guidance associated with executing those plans.

2.0 FACILITY DESCRIPTION

An aerial photograph of the existing Barton RMSF is shown in plan view on Figure 1. A plan view of the existing facility with ground elevation contours, cross section locations used for stability analyses, and site investigation locations/piezometer locations is shown on Figure 2. The RMSF embankments are constructed of cyclone sand that is generated when the whole Residual Minerals exiting the mill are run through a cyclone process to separate the coarse-grained Residual Minerals (sands) from the fine-grained Residual Minerals (slimes) that are then hydraulically deposited into the RMSF. The sands to slimes ratio exiting the cyclone is approximately 10.0 – 20.0 to 1.0 by weight and the total Residual Minerals throughput is approximately 350,000 to 400,000 dry tons per year (tpy). The embankments, i.e., the impounding portions of the RMSF, are generally constructed with the Residual Minerals sands, while the Residual Minerals slimes are impounded behind the embankments in two containment basins designated as the Middle Pond and the Upper Pond. The cyclone process of separating the sands and slimes allows for construction of relatively well-drained, sandy embankments with little pore water pressure buildup in the embankments.

Piezometers in the facility generally indicate largely drained embankments even when significant surface water accumulates in one or both of the slimes ponds. This is due to the high hydraulic conductivity of the sands as compared to that of the slimes. Nevertheless, seepage does generally flow through the base of the sandy embankments above the underlying intact bedrock and eventually reports to the seepage collection pond, which is designated as the Lower (or Raft) Pond. The seepage results in a slightly elevated phreatic surface that fluctuates regularly but is typically a few feet above the base of the sandy embankments near the downstream toe. The water level in the lower portion of the embankment is monitored regularly with a network of vibrating wire piezometers, installed by site investigation contractors, and overseen by Knight Piésold.

Early in the life of the facility, there was a period of filtered Residual Minerals deposition where whole Residual Minerals were dewatered and mechanically stacked. However, the filtered stack operation ceased quickly relative to the operational life of the facility. When the facility was converted to a cyclone operation, a compacted earthfill starter embankment was initially constructed to form the “Middle Pond”, which housed the slimes. Initially, all slimes were deposited into the Middle Pond and the sand fraction exiting the cyclone was used to raise the embankment. Later in the facility life, a second starter embankment was constructed, also of compacted fill, that formed the start of the Upper Pond embankment. Both of these embankments continued to be raised thereafter by depositing cyclone sand and spreading that material in thick lifts with a tracked bulldozer. The current crest of the Middle Pond embankment is at an elevation of approximately 2195 feet above mean sea level (fmsl), while the Upper Pond crest is at the maximum permitted elevation for the overall facility of 2275 fmsl. Raises to both facilities have typically been constructed in a mostly downstream fashion. However, there have been some minor step-outs over the slimes at a few points in the facility life. Currently, the Middle Pond has been decommissioned and slimes are being deposited only into the Upper Pond due to some level of geotechnical risk identified as discussed below.

3.0 GEOTECHNICAL CONSIDERATIONS

The sand fraction of the Barton Residual Minerals comprising the majority of the embankment construction is relatively coarse and angular, with a relatively high angle of internal friction, i.e., the effective friction angle. As such, the material is strong when it is drained (unsaturated). However, recent work by Knight Piésold (Knight Piésold 2021) indicated that a basal layer of the sand Residual Minerals just above the bedrock foundation is saturated in some locations between the Middle Pond and lower Raft Pond due to seepage reporting from the Middle Pond to the lower Raft Pond through the pervious sand embankments and due to the impacts of water storage within the lower Raft Pond itself.

Because of the relatively loose nature of the Residual Minerals at the base of the embankments sitting above the bedrock, it was postulated that they could be subject to contractive behavior upon the occurrence of undrained loading, which was confirmed with cone penetration testing (CPT) data collected during subsequent site investigation campaigns as presented in Knight Piésold (2021). The result is that the basal portion of the sand Residual Minerals sitting above the bedrock foundation between the middle pond and the lower raft pond could behave in a contractive (weak) undrained manner upon the initiation of movement within the material along this layer. Subsequent laboratory testing also presented in Knight Piésold (2021) confirmed that contractive behavior is possible. However, the data also suggested that the material is not expected to be subject to brittle behavior, which often results in more severe reductions in strength, i.e., not anticipated to be subject to static liquefaction.

The sand embankments at Barton are relatively homogenous with limited segregation. The facility also undergoes slow rates of rise and the site has low seismicity. As such, the risk of undrained loading is low, but not negligible. A subsequent geotechnical assessment indicated that the factors of safety against instability of the embankments were marginal upon the occurrence of undrained loading. These analyses are presented in Knight Piésold (2021). Potential, albeit unlikely triggers of undrained behavior include but are not necessarily limited to: (1) erosion at the toe of the embankments leading to localized oversteepening, (2) piping of the Residual Minerals sands and associated removal of structural material from the embankment, (3) rapidly rising phreatic surface, and (4) earthquake loading, even if only moderate in nature.

The Upper Pond embankment at the Barton RMSF is more well-confined down-valley to the east within the overall facility by large embankments and only minor, low-height exterior slopes exist at the north and south extents. As such, the geotechnical risks associated with the Upper Pond are lower, relative to the Middle Pond. However, the existing embankment slopes between the Middle Pond and the lower Raft Pond are much steeper and taller, i.e., in excess of 100-feet. As such, the risks associated with undrained loading are higher for the Middle Pond impoundment than for the Upper Pond embankment. As such, Knight Piésold (2021) suggested that Barton decommission the Middle Pond and allow it to drain down to reduce risk. Since that time, Residual Minerals slimes have been deposited into the Upper Pond only. Additionally, it was recommended that Barton pursue a permit modification to allow for widening the Middle Pond embankments, which will provide for additional Residual Minerals storage while also reducing the geotechnical risks associated with undrained loading in the saturated basal Residual Minerals sands at the base of the existing embankments.

4.0 PROPOSED RMSF MODIFICATION

The proposed geometry of the ultimate RMSF configuration was developed by H2H and was provided as an AutoCAD file transmitted to Knight Piésold on January 4, 2023. A plan view of the final configuration is provided together with the slope stability cross-section locations considered in Figure 3. The RMSF construction is expected to be completed in four stages. The first stage would encompass a relatively modest lateral increase to the existing pile footprint with construction of Residual Minerals sands up to an elevation of 2210 fmsl, which is about 20-feet above the current crest of the Middle Pond embankment. During the second stage of construction, Residual Minerals sands would be placed up to an elevation of 2274 fmsl, coincident with the crest of the Upper Pond embankment. During this second phase, Residual Minerals sands would be placed overtop of the existing Middle Pond Residual Minerals surface. During stage three, sands would be placed to an elevation of 2310 fmsl, which would include Residual Minerals placement over the top of the existing Upper Pond slimes surface. The fourth stage would encompass placement of sands to a maximum elevation of 2374 fmsl, about 100-feet higher than the maximum elevation of the existing pile. During the construction, slimes would be placed into the upper pond until it reaches capacity. At that time, deposition of slimes would switch to sterilized mined out cells within the Barton open pit.

One major change associated with the permit modification in comparison to the existing operation is that the updated plan does not consider raising of the slimes impoundments beyond the current maximum elevation of the Upper Pond, i.e., 2275 fmsl. Additionally, no further slimes deposition is planned into the Middle Pond. After the current Upper Pond basin is filled to capacity with slimes, the proposed plan concept considers only placement of sands into the RMSF. Future Residual Minerals slimes will be deposited into mined out cells in the Barton open pit on the eastern side of the property. Planning, logistics and geotechnical considerations associated with the open-pit backfill of the slimes is outside Knight Piésold's scope of work.

Exterior slope benches around the proposed RMSF would be placed at angles of 2.0 Horizontal: 1.0 Vertical (2.0H:1.0V). However, intermediate benches are provided around the pile at elevations of 2110, 2210 and 2310 fmsl, which will effectively flatten the overall slope to 2.25H:1.0V around the majority of the facility. Wider benches are provided on the southeast side of the facility to provide effective buttressing for the existing Middle Pond embankments, which flattens those ultimate slopes further. In addition, a toe buttress is provided in the upper portion of the lower Raft Pond to add robustness to the existing Middle Pond embankment slopes.

To improve the geotechnical performance of the future embankments, it is recommended (and has been assumed within the modeling herein) that the following measures be taken during construction of the RMSF:

- New area within the ultimate RMSF footprint shall be cleared of all vegetation, grubbed and excavated to competent bedrock.
- Underdrainage shall be provided, including lateral and downslope finger drains to aid with the drainage of water from the sand portion of the pile.
- Residual Minerals sands shall be placed and compacted above the prepared foundation within the RMSF footprint. The material should be placed in 1-ft lifts and compacted with a vibratory drum compaction roller. The minimum dry density post-compaction should correspond to at least 95% of the maximum dry density (MDD) from modified Proctor compaction testing. The thickness of the compaction layer should be at least 10-feet in general areas and at least 20 feet in areas downstream of the middle pond embankments.
- Within the portion of the toe buttress to be constructed below the water level within lower Raft Pond, the construction material shall comprise of coarse run-of-mine waste rock from the Barton open pit. The upper portion of the lower Raft Pond should first be dredged to a competent foundation with a long-reach excavator to remove weak sediments that likely have built up in the base of the pond. The material shall then be placed and compacted with fully loaded haulage equipment.

The recommended measures in the above bullets are intended to improve the effectiveness of the buttressing to be placed and reduce the potential for a low-strength saturated contractive layer to be established at the ground surface within the increased footprint. Adherence to the compaction requirements should result in a strong, dilative basal layer that should remain strong under the potential loading conditions considered within the geotechnical evaluations presented herein.

5.0 GEOTECHNICAL SLOPE STABILITY ASSESSMENT

A geotechnical slope stability assessment was completed to assess the anticipated factor of safety for various cross sections through the RMSF at various stages during future construction. The assessment was completed to evaluate whether the proposed RMSF configuration would meet international standards for geotechnical slope stability of Residual Minerals impoundments under long-term static effective stress and static undrained loading conditions.

5.1 METHODOLOGY

Limit equilibrium slope stability analyses were completed using the computer program SLOPE/W Version 11.0, which enables the user to conduct limit equilibrium slope stability calculations by a variety of methods (GEO-SLOPE, 2021). Several methods may be used to evaluate factors of safety for potential trial slip surfaces in the search for the critical slip surface, that is, the surface with the lowest factor of safety for a given geometry and material properties. The Spencer method (1967) was used to calculate factors of safety because that procedure satisfies both force and moment equilibrium, thereby yielding a rigorous solution.

5.2 MODEL CONFIGURATIONS

Seven cross sections (Sections A, B, C, D, E, F and G) were modeled through the proposed updated configuration of the Barton RMSF. Sections A, B and C pass through the Residual Minerals slimes impounded in the Middle Pond embankment and the downstream embankments. Section D passes through the Upper Pond embankment in the northwest corner of the facility. Section E passes through only the Residual Minerals sands in the northeast corner of the facility. Section F passes through the Residual Minerals sands and the lower Raft Pond adjacent to the Middle Pond, but outside of the Middle Pond footprint. Finally, Section G passes through the Upper Pond embankment on the south side of the facility. The internal geometry of the embankments, including the location of the Middle Pond starter embankment, the interface between the Residual Minerals slimes and sands, and the bedrock surface was estimated based on site investigation information, historic ground topography from the USGS and historic design and construction records, and engineering judgment based on experience with similar facilities as appropriate.

5.3 MATERIAL PROPERTIES

Relevant material properties were adopted for slope stability analyses based on historic and recent testing, both in-situ and in the laboratory, along with relevant information from the literature and engineering judgment as described in Section 5.0 above of Knight Piésold (2021). Key parameters are summarized in Table 1. Notations with additional information regarding development of material properties are included with Table 1.

5.4 MODEL CASES

Stability model cases include the following cases as appropriate for each section.

- Drained
  - Static, Stage 1 configuration, crest elevation 2110 fmsl
  - Static, Stage 2 configuration, crest elevation 2174 fmsl

   - Static, Stage 3 configuration, crest elevation 2210 fmsl
   - Static, Stage 4 configuration, crest elevation 2274 fmsl

- Undrained
   - Static, Stage 1 configuration, crest elevation 2110 fmsl
   - Static, Stage 2 configuration, crest elevation 2174 fmsl
   - Static, Stage 3 configuration, crest elevation 2210 fmsl
   - Static, Stage 4 configuration, crest elevation 2274 fmsl

Construction Stages 1 and 2 were not analyzed for section D and Stage 1 was not analyzed for Section E due to minimal or no construction taking place along those sections at those stages of construction.

5.4.1 DRAINED EFFECTIVE STRESS CASES

Long-term drained effective stress slope stability analyses were completed assuming drained effective strength friction angles for each of the materials modeled except bedrock which was modeled as impenetrable. The resultant factors of safety represent the long-term effective stress factors of safety that control long-term stability except in the event of an undrained loading event. Drained model cases have been analyzed considering each stage of the phased construction as appropriate given the geometry of each section.

5.4.2 UNDRAINED CASES

Due to the presence of loose, saturated Residual Minerals sands at the base of the pile in some areas, which is of particular importance beneath the Middle Pond embankment slope, a corresponding layer of Residual Minerals sands characterized using undrained shear strength parameters was applied in many locations. The locations and thickness of this layer was based on engineering judgment, instrumentation data and site investigation (CPT) data, as available and appropriate. Undrained strengths were also considered for much of the basal Residual Minerals in most other areas around the pile where specific site investigations were not completed and/or instrumentation data does not exist. The exception to this is generally in the increased footprint and in areas where the basal layer was constructed after recommendations to compact the basal Residual Minerals were provided by Knight Piésold to Barton personnel, i.e., after early 2021. Additionally, undrained shear strengths were applied to the entirety of the Residual Minerals slimes deposits, since those deposits were hydraulically deposited within the ponds and are expected to be loose and remain largely saturated in the long-term. Undrained strengths considered within the modeling presented herein are peak values since laboratory testing suggested significant strain-softening is not expected for the Barton Residual Minerals. Effective stress friction angles were used elsewhere (in drained and/or compacted areas) except within the bedrock foundation, which was modeled as impenetrable, as it is anticipated to have a significantly higher strength than the overlying Residual Minerals and fill materials.

5.5 PORE WATER PRESSURE CONDITIONS

A hydrostatic phreatic surface was applied to the top surface of the Residual Minerals slimes within both deposits to account for surface water storage (in the Upper Pond), and fully saturated conditions/elevated pore pressures that likely remain within the Middle Pond impounded Residual Minerals slimes due to the nature of the material, despite a cessation of deposition into the middle pond in 2021. A site investigation and piezometer installation program within the Middle Pond slimes is expected to take place in 2023. This is partially intended to investigate the level of pore pressure reduction that may have occurred within the Middle Pond since cessation of deposition. However, for the purpose of conservatism, it is currently assumed that fully hydrostatic conditions remain within the middle pond slimes deposit.

Within the sand embankments, the phreatic surface was assumed to drop rapidly from the slimes surface to near the base of the embankment downstream of the slimes deposit. In some locations, particularly along Sections A, B, C and F, piezometric conditions are regularly monitored at the base of the embankments downstream of the Middle Pond with a series of vibrating wire piezometers. Recent data from these instruments was used to estimate the location of the phreatic surface in those areas. In general, the Residual Minerals sand below the phreatic surface was assumed to be susceptible to contractive undrained behavior except in locations where stiff, dilative material was identified with the CPT during prior site investigations. These stiff layers are shown as compacted fills on Sections A, B, C and this stiff material most likely represents the initial starter embankment that was constructed using native soils. In all cases, hydrostatic pore pressures were assumed to exist below the applied phreatic surface. In reality, seepage within the slimes drains to the surrounding sand material and consequentially, a localized zone of vertical seepage flow likely exists around the edges of the slimes deposit as seepage flows by gravity towards the underlying foundation. Upon reaching the foundation surface, the flow regime switches to largely horizontal until the seepage exits the facility near the downstream toe. Assuming hydrostatic pore pressure conditions everywhere in the modeling is therefore reasonable in most areas that are consequential to slope stability, i.e., near the downstream toe of the embankments, and is slightly conservative elsewhere where localized areas of vertical flow exist.

It is important to note that the analyses presented herein do not consider a post-construction case, which would include normal-stress induced pore pressure generation in fine-grained materials due to rapid raising and equipment loading, such as the Residual Minerals slimes. The reason no construction-induced pore pressures were considered is because due to the low production rate at Barton, the rate of loading onto the pile is expected to be sufficiently slow such that significant loading-induced pore pressures will dissipate more quickly than they will be generated due to construction. However, this assumption will need to be confirmed during construction in areas where Residual Minerals sands are to be placed overtop of existing slimes. If significant construction induced pore pressures are indicated by future instrumentation, Residual Minerals sand placement may need to be slowed or redirected to allow pore pressures to dissipate in the slimes, or additional analyses will be required to confirm adequate stability is maintained under these elevated pore pressure conditions. To monitor for these conditions, vibrating wire piezometers will need to be installed into the slimes prior to the point in time when Residual Minerals are to be placed over the existing slimes surface. Knight Piésold understands that several piezometers are planned for installation within the middle pond slimes in 2023. An additional campaign will be required in the upper pond prior to initiation of Phase 3 of the mine plan, when Residual Minerals are planned to be placed overtop of the upper pond.

5.6 STABILITY ANALYSIS RESULTS

Results of the slope stability analyses for the proposed RMSF modification are summarized in Table 2 with the slope configuration and location of critical slip surfaces illustrated in Attachment 1. For the Barton RMSF, factors of safety for long-term static effective stress loading conditions should exceed the commonly accepted minimum value of 1.5 for global slip surfaces, especially where a failure would result in loss of containment of the flowable Residual Minerals slimes. Inspection of the results indicate that the calculated factors of safety meet or exceed 1.5 for drained loading for each section and construction configuration considered.

For undrained loading scenarios, the industry-accepted minimum factor of safety for consequential slips that would impact containment typically ranges from 1.3 to 1.5, depending on the circumstances and risk factors associated with a given structure. Factors that are considered when establishing a minimum undrained factor of safety include the consequence of failure, probability of an undrained load trigger and most importantly, the potential for strain-softening or static liquefaction in contractive saturated materials. For the Barton RMSF, although the consequence of failure may be high from an environmental standpoint, the probability of an undrained load trigger is small due to the sandy well-drained nature of the Residual Minerals and the good performance of the existing structure over several decades. The potential for significant strain-softening or brittleness in the event of an undrained load scenario is low as indicated by the large-strain dilatancy observed in both triaxial shear strength testing and constant volume direct simple shear (DSS) testing results for tests performed at higher effective stresses, as presented in Knight Piésold (2021). In addition, the potential for earthquake-induced liquefaction is very low based on the results of the liquefaction triggering assessments also presented in Knight Piésold (2021). Based on these factors, Knight Piésold considers a minimum undrained factor of safety of 1.3 to be acceptable for the Barton RMSF. This minimum undrained factor of safety recommendation is also consistent with draft guidance on Residual Minerals dams recently published by the International Committee on Large Dams (ICOLD, 2022).

Based on the results of the analyses presented in Table 2, the Middle Pond embankment slopes are expected to meet the or exceed the recommended minimum undrained factor of safety upon construction of the Stage 1 configuration at each of the section locations evaluated. Additionally, the recommended minimum factor of safety are expected to continue to be met throughout the remaining construction stages, i.e., stages 2, 3 and 4.

6.0 CONCLUSIONS AND RECOMMENDATIONS

Knight Piésold has completed a high-level geotechnical evaluation of the proposed configuration of the Barton Residual Minerals storage as developed by H2H Geoscience Engineering (H2H) of Troy, NY. Based on the results of the evaluation presented herein, Knight Piésold believes that the proposed RMSF modification is likely to be geotechnically feasible. Moreover, implementation of the proposed plan would be expected to reduce the geotechnical risk profile of the existing facility, provided that the conditions modeled are representative of those in the field. As such, from a geotechnical point of view, Knight Piésold recommends that Barton submit the proposed configuration for state consideration.

Although Knight Piésold recommends approval of the plan, this document should not be taken as engineering approval to construct the entirety of the proposed facility without ongoing design work as needed during construction and operation based on the observational approach by a qualified engineer and appropriate QA/QC during the plan implementation. It is important to note that the geotechnical viability of the proposed plan is dependent on the validity of several assumptions and upon proper implementation of specific geotechnical considerations discussed within this document. Specifically, it will be important to provide adequate underdrainage in key areas and appropriate compaction in key areas and near the ground surface in all areas within the increased footprint. Although these considerations are not explicitly called out in the permit modification document, it is imperative that Barton continue to work with a qualified geotechnical engineer to complete periodic evaluations of existing conditions to confirm that the assumption utilized herein remain consistent with actual field behavior, to provide ongoing geotechnical guidance and confirm proper implementation of the recommendations presented herein. Specific recommendations for plan implementation include the following:

- Areas within the increased footprint shall be cleared of all vegetation, grubbed and excavated to competent bedrock.
- Underdrainage shall be provided in key areas, including lateral and downslope finger drains to aid in the drainage of water from the sand portion of the pile.
- Residual Minerals sands shall be placed and compacted above the prepared foundation in the increased footprint. The material should be placed in 1-ft-thick lifts and compacted with a vibratory drum compaction roller. The minimum dry density should correspond to at least 95% of the maximum dry density (MDD) from modified Proctor compaction testing. The depth of compaction should be at least 10-feet in general areas and at least 20 feet in areas downstream of the Middle Pond embankments.

- Within the portion of the toe buttress to be constructed below the water level within the lower Raft Pond, the construction material shall comprise of coarse run-of-mine waste rock from the Barton open pit. The upper portion of the lower raft pond should first be dredged to a competent foundation with a long-reach excavator to remove weak sediments that likely have built up in the base of the pond. The material shall then be placed and compacted with fully loaded haulage equipment.

It is also important to note that the analyses presented herein do not consider a post-construction case, which would include normal-stress induced pore pressure generation in fine-grained materials, such as the Residual Minerals slimes. The reason no construction-induced pore pressures were considered is because the rate of loading is expected to be sufficiently slow such that significant loading-induced pore pressures will not develop. However, this assumption will need to be confirmed during construction in areas where Residual Minerals sands are to be placed overtop of existing slimes. Vibrating wire piezometers will need to be installed into the slimes for this purpose prior to the point in time when Residual Minerals are to be placed over the existing slimes, i.e., Stage 2 for the Middle Pond and Stage 3 for the Upper Pond. Knight Piésold understands that several piezometers are planned for installation within the Middle Pond slimes in 2023 or 2024. An additional campaign will be required in the Upper Pond prior to initiation of Stage 3 of the proposed plan.

Knight Piésold recommends that the Middle Pond be allowed to continue to drain down due to the existing risks associated with the perimeter slopes downstream of the Middle Pond embankment. As such, no additional Residual Minerals slimes should not be deposited into the Middle Pond moving forward. This is consistent with the sequencing provided with the proposed plan.

Due to the nature of the facility and the lack of engineered fill placement throughout the majority of the impoundment, an observational approach has been and will continue to be taken to design, construct, and operate the Barton RMSF. As such, continued monitoring using existing and future inspections and instrumentation, regular site investigations and updated geotechnical evaluations, generally on 5-year or less intervals, will be required to confirm that conditions remain as anticipated and to assess whether refinements to the RMSF geometry or construction procedures are necessary. For these reasons, and those mentioned above regarding implementation of the plan, it is imperative that a qualified geotechnical engineer remain engaged and closely involved with the project as the facility evolves.

To document the ongoing geotechnical engineering work required for successful implementation of the proposed plan, periodic geotechnical reports with respect to the state of the Barton RMSF should be prepared by a qualified geotechnical engineer. These reports should be completed on an as-needed basis (as recommended by a qualified geotechnical engineer working closely with the project) taking into account recent and imminent construction complexity and/or complications and unusual conditions that arise during construction and operation of the facility. At no point should the interval between consecutive geotechnical reports be longer than 5 years, and shall be produced as appropriate when material changes to the design and operation of the facilities are identified. These reports should document (1) recent construction and Residual Minerals/slimes filling progress and QA/QC activities, (2) an updated understanding of subsurface conditions based on recent and historic site investigation and instrumentation data, (3) updated geotechnical engineering analyses assessing the stability of the existing facility and imminent future configurations, and (4) recommendations for continued construction, monitoring, QA/QC activities and modifications to the RMSF configuration or construction plan based on the findings.

7.0 CLOSING REMARKS

Knight Piésold is pleased to provide continued support to Barton mine with respect to the future of the Residual Minerals storage facility. If you have any questions or concerns with respect to the information contained in this letter, please contact either of the undersigned at your earliest convenience.

Sincerely,
Knight Piésold and Co.

Prepared by:

Jordan Scheremeta, P.E. (Colorado)
Geotechnical Engineer

Reviewed and approved by:

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Geotechnical Engineer

Attachments

Table 1- Summary of Material Properties for Slope Stability Analysis
Table 2- Summary of Slope Stability Analysis Results

Figure 1 – 2022 Aerial Photograph
Figure 2 – Existing Plan View with Slope Stability Analysis Sections
Figure 3 – Proposed Permit Modification Configuration with Slope Stability Analysis Sections

Attachment 1- Slope Stability Analysis Results

References

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Spencer, E., 1967, *A Method of Analysis of the Stability of Embankments Assuming Parallel Inter-Slice Forces*, Geotechnique, Vol. 17, No. 1, pp. 11-26.

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TABLES

Table 1
Barton International, Inc.
Geotechnical Assessment of Proposed Permit Modification

Summary of Material Properties for Slope Stability Analysis

Material Type	Unified Soil Classification System Designations	Dry Unit Weight (4) γ_{dry} (pcf)	Moisture Content w %	Moist/Saturated Unit Weight γ_{moist} (pcf)	Effective Stress Friction Angle (5) (degrees)	Effective Cohesion (psf)	Undrained Strength Ratio S_u/σ_v'
Loose Residual Minerals Sands (Existing and Expansion)(1)	SP-SM	110.00	10.0	121.00	37.4	0.0	0.30(6)
Compacted Fill (Starter Dam/Rockfill/Residual Minerals Sands) (2)	--	122.00	15.0	140.00	42.0	0.0	--
Residual Minerals Slimes (Existing) (3)	ML	96.50	31.0	126.00	30.0	0.0	0.22(7)
Bedrock	--	Impenetrable					

Notes:

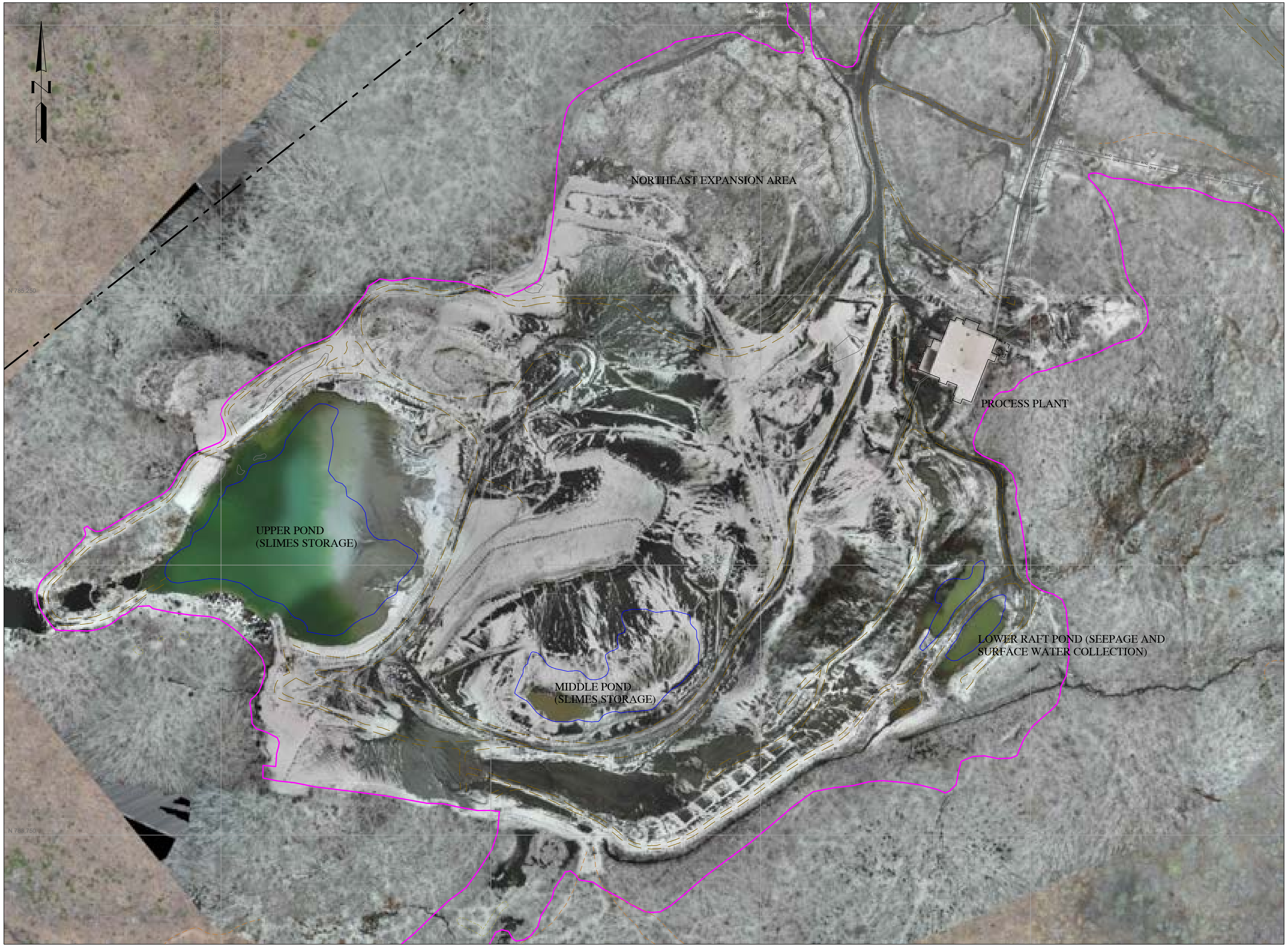
1. Loose sands are hydraulically deposited or spread in thick lifts with dozer traffic
2. Existing compacted zones were identified with CPT and/or knowledge of construction procedures. Future structural zones near the existing ground surface that may become saturated shall be compacted to 95% modified proctor maximum dry density to prevent contractive undrained behavior upon shearing. Compacted rockfill should be used in lieu of Residual Minerals sands for buttressing within the existing lower (raft) pond.
3. Slimes are considered saturated
4. Dry unit weights estimated from achieved dry unit weights in applicable laboratory tests
5. Effective fricton angles estimated from consolidated undrained triaxial shear strength testing
6. Undrained shear strength ratio of loose Residual Minerals sands is estimated from direct simple shear testing
7. Undrained shear strength ratio of Residual Minerals slimes is estimated based on experience with similar materials

Table 2
Barton International, Inc.
Geotechnical Assessment of Proposed Permit Modification

Summary of Slope Stability Analysis Results

Section	Location	Loading Condition	Model Case	Calculated Factor of Safety	Minimum Acceptable Factor of Safety
A	Middle Pond - Downstream Slope	Drained	Stage 1 Expansion - Crest = 2210 fmsl	1.6	1.5
			Stage 2 Expansion - Crest = 2274 fmsl	1.6	1.5
			Stage 3 Expansion - Crest = 2310 fmsl	1.6	1.5
			Stage 4 Expansion - Crest = 2374 fmsl	1.6	1.5
		Undrained	Stage 1 Expansion - Crest = 2210 fmsl	1.6	1.3
			Stage 2 Expansion - Crest = 2274 fmsl	1.6	1.3
			Stage 3 Expansion - Crest = 2310 fmsl	1.6	1.3
			Stage 4 Expansion - Crest = 2374 fmsl	1.6	1.3
B	Middle Pond - Downstream Slope	Drained	Stage 1 Expansion - Crest = 2210 fmsl	1.5	1.5
			Stage 2 Expansion - Crest = 2274 fmsl	1.7	1.5
			Stage 3 Expansion - Crest = 2310 fmsl	1.7	1.5
			Stage 4 Expansion - Crest = 2374 fmsl	1.7	1.5
		Undrained	Stage 1 Expansion - Crest = 2210 fmsl	1.5	1.3
			Stage 2 Expansion - Crest = 2274 fmsl	1.7	1.3
			Stage 3 Expansion - Crest = 2310 fmsl	1.6	1.3
			Stage 4 Expansion - Crest = 2374 fmsl	1.5	1.3
C	Middle Pond - Downstream Slope	Drained	Stage 1 Expansion - Crest = 2210 fmsl	1.6	1.5
			Stage 2 Expansion - Crest = 2274 fmsl	1.6	1.5
			Stage 3 Expansion - Crest = 2310 fmsl	1.6	1.5
			Stage 4 Expansion - Crest = 2374 fmsl	1.6	1.5
		Undrained	Stage 1 Expansion - Crest = 2210 fmsl	1.4	1.3
			Stage 2 Expansion - Crest = 2274 fmsl	1.3	1.3
			Stage 3 Expansion - Crest = 2310 fmsl	1.3	1.3
			Stage 4 Expansion - Crest = 2374 fmsl	1.3	1.3
D	Upper Pond - North Slope	Drained	Stage 3 Expansion - Crest = 2310 fmsl	1.5	1.5
			Stage 4 Expansion - Crest = 2374 fmsl	1.5	1.5
		Undrained	Stage 3 Expansion - Crest = 2310 fmsl	1.5	1.3
			Stage 4 Expansion - Crest = 2374 fmsl	1.5	1.3
E	Residual Minerals Pile - North Expansion Area	Drained	Stage 2 Expansion - Crest = 2274 fmsl	1.5	1.5
			Stage 3 Expansion - Crest = 2310 fmsl	1.5	1.5
			Stage 4 Expansion - Crest = 2374 fmsl	1.5	1.5
		Undrained	Stage 2 Expansion - Crest = 2274 fmsl	1.5	1.3
			Stage 3 Expansion - Crest = 2310 fmsl	1.5	1.3
			Stage 4 Expansion - Crest = 2374 fmsl	1.5	1.3
F	Residual Minerals Pile - East Slope Through Raft Pond	Drained	Stage 1 Expansion - Crest = 2210 fmsl	2.1	1.5
			Stage 2 Expansion - Crest = 2274 fmsl	2.0	1.5
			Stage 3 Expansion - Crest = 2310 fmsl	1.9	1.5
			Stage 4 Expansion - Crest = 2374 fmsl	1.8	1.5
		Undrained	Stage 1 Expansion - Crest = 2210 fmsl	1.3	1.3
			Stage 2 Expansion - Crest = 2274 fmsl	1.3	1.3
			Stage 3 Expansion - Crest = 2310 fmsl	1.3	1.3
			Stage 4 Expansion - Crest = 2374 fmsl	1.3	1.3
G	Upper Pond - South Slope	Drained	Stage 1 Expansion - Crest = 2210 fmsl	2.1	1.5
			Stage 2 Expansion - Crest = 2274 fmsl	1.6	1.5
			Stage 3 Expansion - Crest = 2310 fmsl	1.6	1.5
			Stage 4 Expansion - Crest = 2374 fmsl	1.6	1.5
		Undrained	Stage 1 Expansion - Crest = 2210 fmsl	1.5	1.3
			Stage 2 Expansion - Crest = 2274 fmsl	1.6	1.3
			Stage 3 Expansion - Crest = 2310 fmsl	1.6	1.3
			Stage 4 Expansion - Crest = 2374 fmsl	1.4	1.3

FIGURES



LEGEND:

- PROPERTY BOUNDARY
- EXISTING LOM PERMIT BOUNDARY
- EXISTING ROAD
- EXISTING FENCE
- EXISTING OVERHEAD POWERLINE
- EXISTING UTILITY LINE
- EXISTING POND

REFERENCE:
AERIAL TOPOGRAPHY DATED NOVEMBER 16, 2021

PLAN

12.5 0 12.5 25 FEET
1"=12.5' AT FULL SIZE (ANSI D)
1"=25' AT HALF SIZE (ANSI B)

NOTES:

1. SCALE BAR MEASURES 3" ON A FULL SIZE PLOT (ANSI-D) AND 1.5" ON A HALF SIZE PLOT (ANSI-B).

PROJECT	BARTON TSF GEOTECHNICAL EVALUATION OF PROPOSED PERMIT MODIFICATION
TITLE	2021 AERIAL PHOTOGRAPH
CLIENT	BARTON INTERNATIONAL

Knight Piésold CONSULTING

DESIGNED BY	CB	LOCATION	PROJECT NUMBER	FIGURE NUMBER	REVISION
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ACTIVITY CODE	N/A	XREF NUMBER	N/A		

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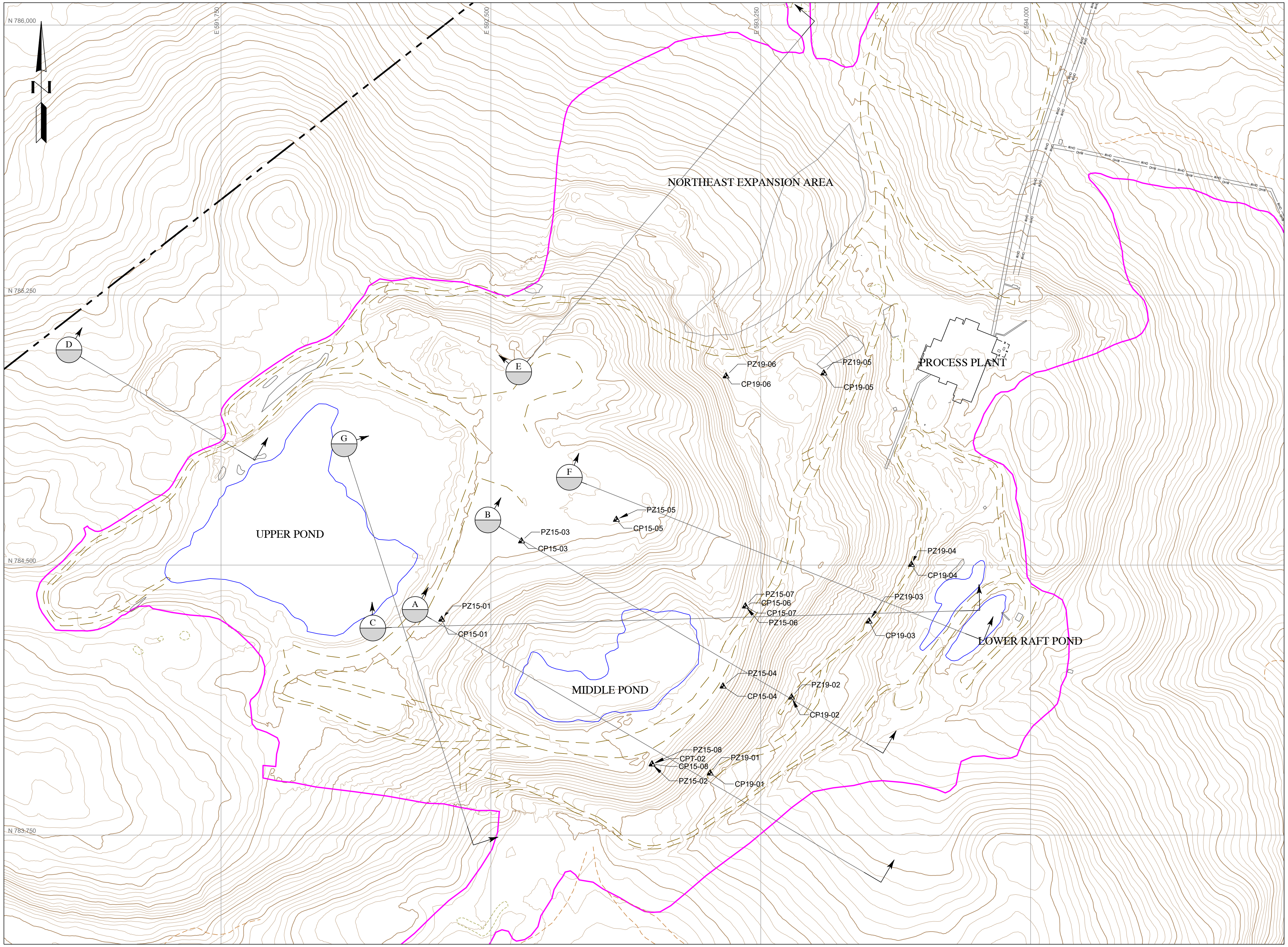

LEGEND:

- 2000 EXISTING GROUND CONTOUR AND EL, FEET
- PROPERTY BOUNDARY
- EXISTING LOM PERMIT BOUNDARY
- EXISTING ROAD
- EXISTING FENCE
- EXISTING OVERHEAD POWERLINE
- EXISTING UTILITY LINE
- EXISTING POND
- EXISTING CPT/PIEZOMETER LOCATION

REFERENCE:
AERIAL TOPOGRAPHY DATED NOVEMBER 16, 2021

PLAN

150 0 150 300 FEET
1"=150' AT FULL SIZE (ANSI D)
1"=300' AT HALF SIZE (ANSI B)

NOTES:

1. SCALE BAR MEASURES 3" ON A FULL SIZE PLOT (ANSI-D) AND 1.5" ON A HALF SIZE PLOT (ANSI-B).

PROJECT	BARTON TSF GEOTECHNICAL EVALUATION OF PROPOSED PERMIT MODIFICATION
TITLE	EXISTING PLAN VIEW WITH SLOPE STABILITY ANALYSIS SECTIONS
CLIENT	BARTON INTERNATIONAL

Knight Piésold CONSULTING

DESIGNED BY	CB	LOCATION	PROJECT NUMBER	FIGURE NUMBER	REVISION
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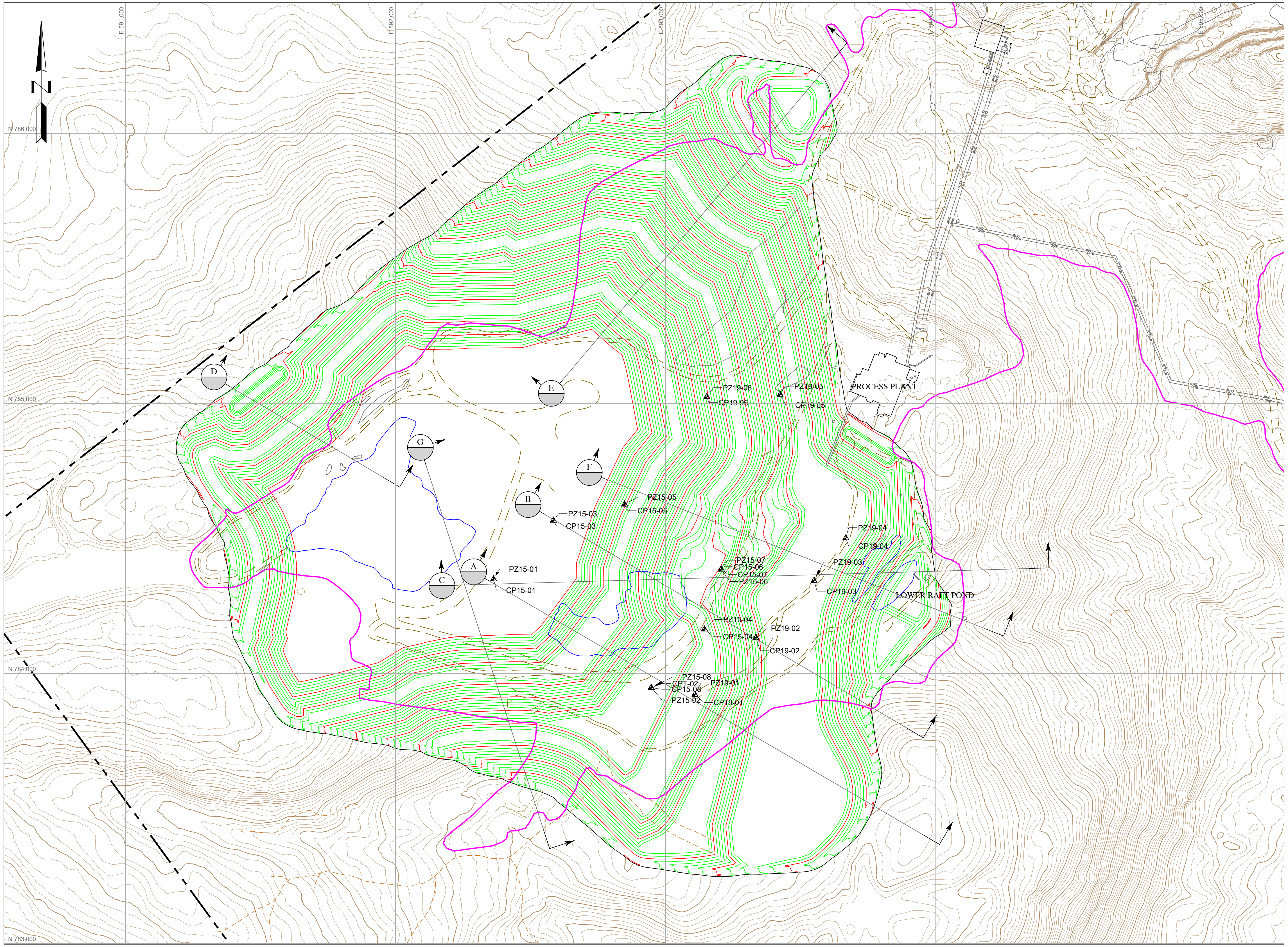

LEGEND:

- 2000 EXISTING GROUND CONTOUR AND EL, FEET
- PROPERTY BOUNDARY
- EXISTING LOM PERMIT BOUNDARY
- EXISTING ROAD
- EXISTING FENCE
- EXISTING OVERHEAD POWERLINE
- EXISTING UTILITY LINE
- EXISTING POND
- EXISTING CPT/PIEZOMETER LOCATION

REFERENCE:
AERIAL TOPOGRAPHY DATED NOVEMBER 16, 2021

NOTES:

1. SCALE BAR MEASURES 3" ON A FULL SIZE PLOT (ANSI-D) AND 1.5" ON A HALF SIZE PLOT (ANSI-B).

PLAN

200 0 200 400 FEET

1"=200' AT FULL SIZE (ANSI D)
1"=400' AT HALF SIZE (ANSI B)

PROJECT	BARTON TSF GEOTECHNICAL EVALUATION OF PROPOSED PERMIT MODIFICATION
TITLE	PROPOSED PERMIT EXPANSION CONFIGURATION WITH SLOPE STABILITY ANALYSIS SECTIONS
CLIENT	BARTON INTERNATIONAL

Knight Piésold CONSULTING

DESIGNED BY	CB	LOCATION	PROJECT NUMBER	FIGURE NUMBER	REVISION
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ACTIVITY CODE	N/A	XREF NUMBER	N/A		

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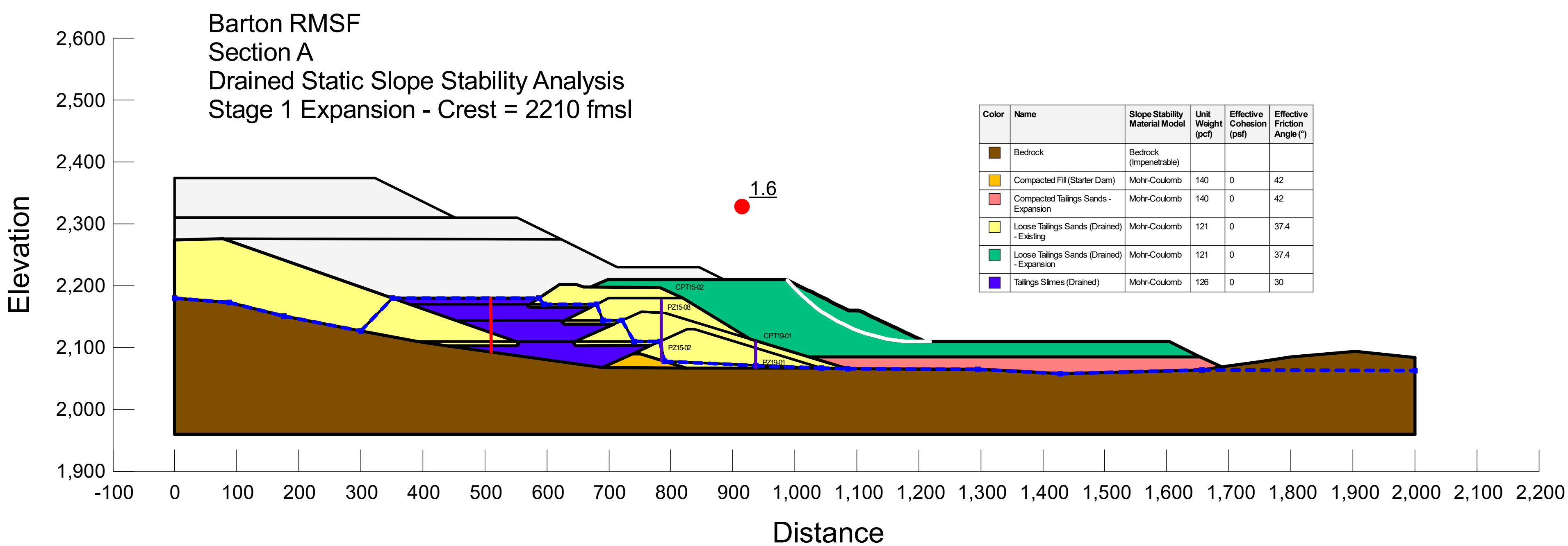
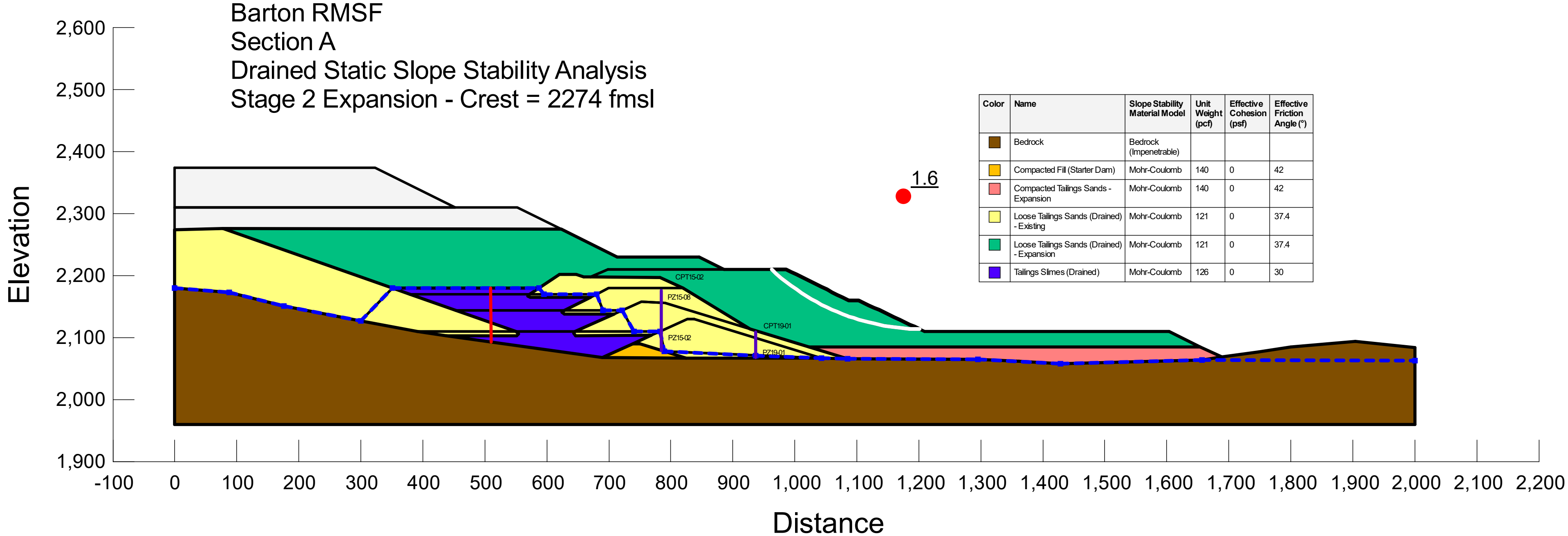
ATTACHMENT 1

Slope Stability Analysis Results

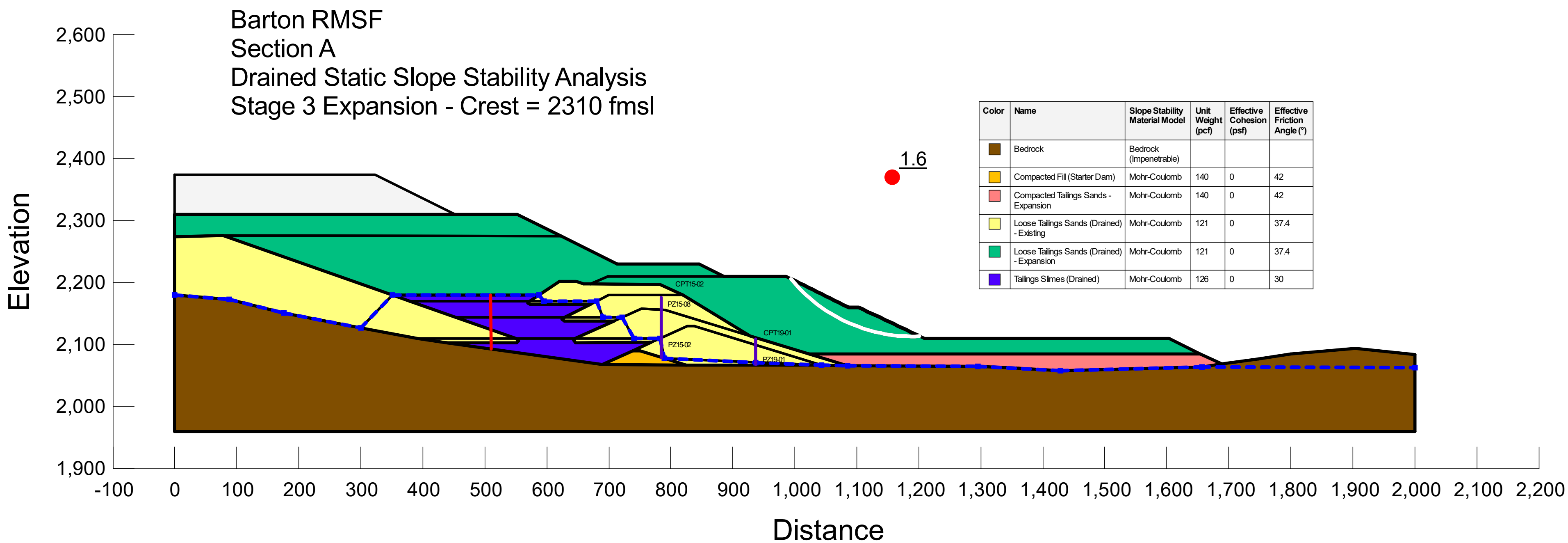


Barton RMSF
Section A
Drained Static Slope Stability Analysis
Stage 1 Expansion - Crest = 2210 fmsl
1.6
CPT15-02
PZ15-08
PZ15-02
CPT19-01
PZ19-01
Color | Name | Slope Stability Material Model | Unit Weight (pcf) | Effective Cohesion (psf) | Effective Friction Angle (°)
Bedrock | Bedrock (Impenetrable)
Compacted Fill (Starter Dam) | Mohr-Coulomb | 140 | 0 | 42
Compacted Tailings Sands - Expansion | Mohr-Coulomb | 140 | 0 | 42
Loose Tailings Sands (Drained) - Existing | Mohr-Coulomb | 121 | 0 | 37.4
Loose Tailings Sands (Drained) - Expansion | Mohr-Coulomb | 121 | 0 | 37.4
Tailings Slimes (Drained) | Mohr-Coulomb | 126 | 0 | 30
2,600
2,500
2,400
2,300
2,200
2,100
2,000
1,900
Elevation
-100
0
100
200
300
400
500
600
700
800
900
1,000
1,100
1,200
1,300
1,400
1,500
1,600
1,700
1,800
1,900
2,000
2,100
2,200
Distance

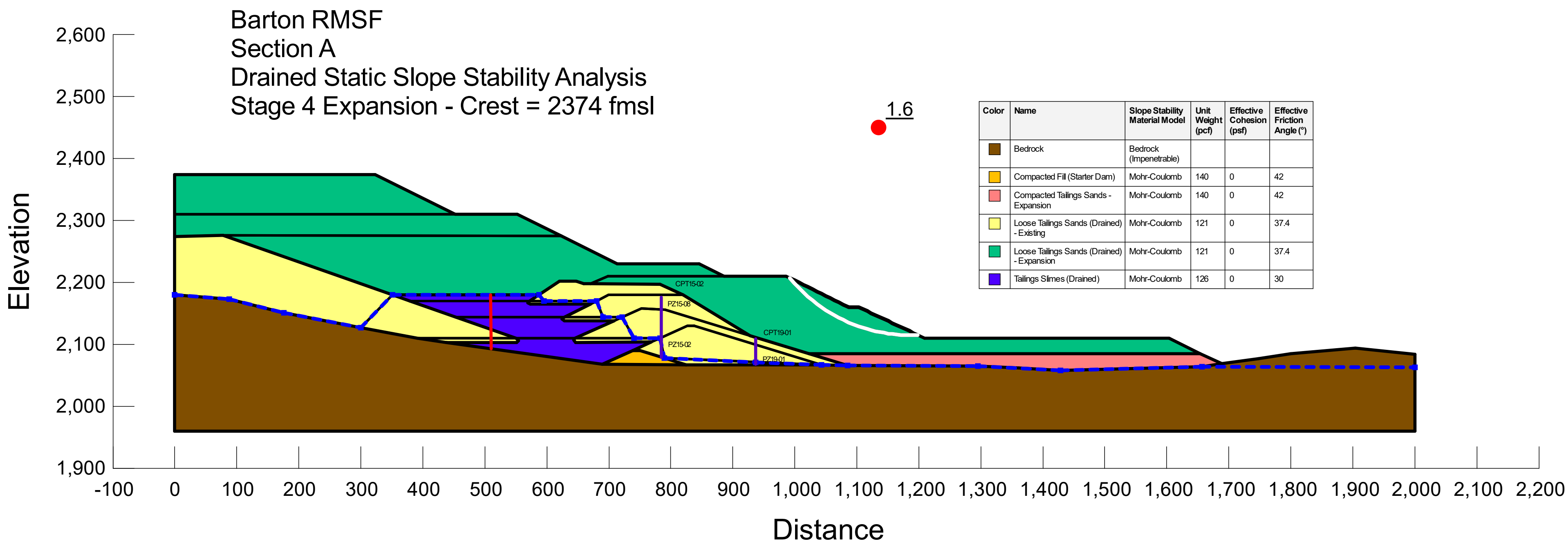
Barton RMSF
Section A
Drained Static Slope Stability Analysis
Stage 2 Expansion - Crest = 2274 fmsl



Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
	Bedrock	Bedrock (Impenetrable)			
	Compacted Fill (Starter Dam)	Mohr-Coulomb	140	0	42
	Compacted Tailings Sands - Expansion	Mohr-Coulomb	140	0	42
	Loose Tailings Sands (Drained) - Existing	Mohr-Coulomb	121	0	37.4
	Loose Tailings Sands (Drained) - Expansion	Mohr-Coulomb	121	0	37.4
	Tailings Slimes (Drained)	Mohr-Coulomb	126	0	30

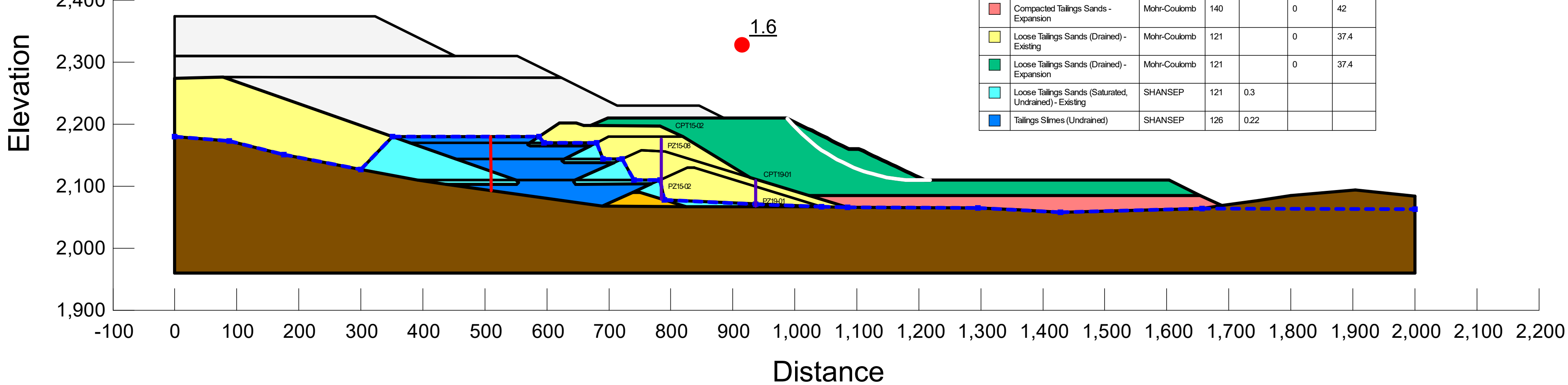


Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
	Bedrock	Bedrock (Impenetrable)			
	Compacted Fill (Starter Dam)	Mohr-Coulomb	140	0	42
	Compacted Tailings Sands - Expansion	Mohr-Coulomb	140	0	42
	Loose Tailings Sands (Drained) - Existing	Mohr-Coulomb	121	0	37.4
	Loose Tailings Sands (Drained) - Expansion	Mohr-Coulomb	121	0	37.4
	Tailings Slimes (Drained)	Mohr-Coulomb	126	0	30

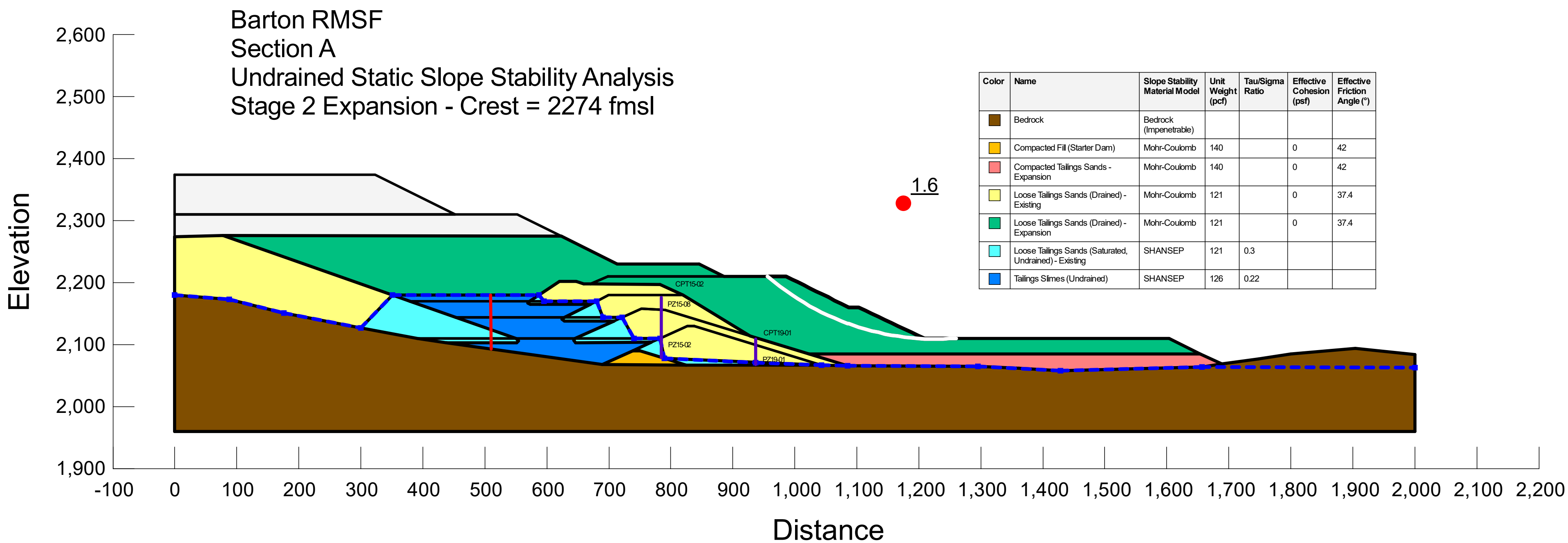


Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
	Bedrock	Bedrock (Impenetrable)			
	Compacted Fill (Starter Dam)	Mohr-Coulomb	140	0	42
	Compacted Tailings Sands - Expansion	Mohr-Coulomb	140	0	42
	Loose Tailings Sands (Drained) - Existing	Mohr-Coulomb	121	0	37.4
	Loose Tailings Sands (Drained) - Expansion	Mohr-Coulomb	121	0	37.4
	Tailings Slimes (Drained)	Mohr-Coulomb	126	0	30

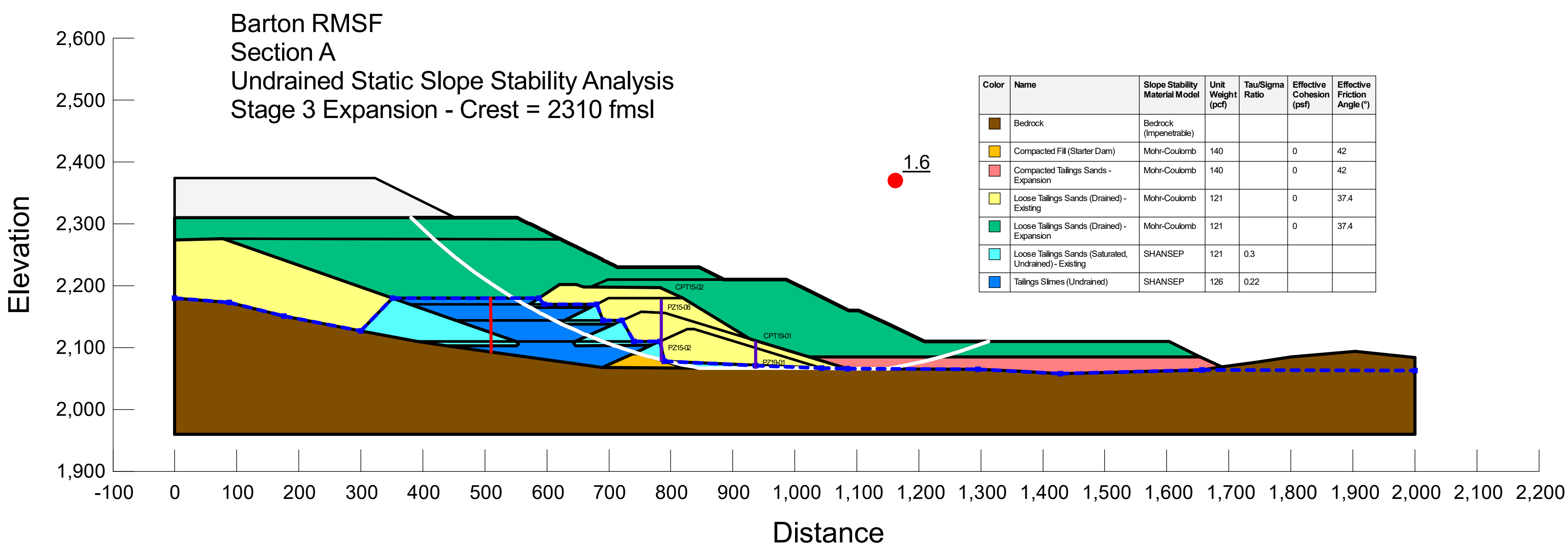
Barton RMSF
Section A
Undrained Static Slope Stability Analysis
Stage 1 Expansion - Crest = 2210 fmsl



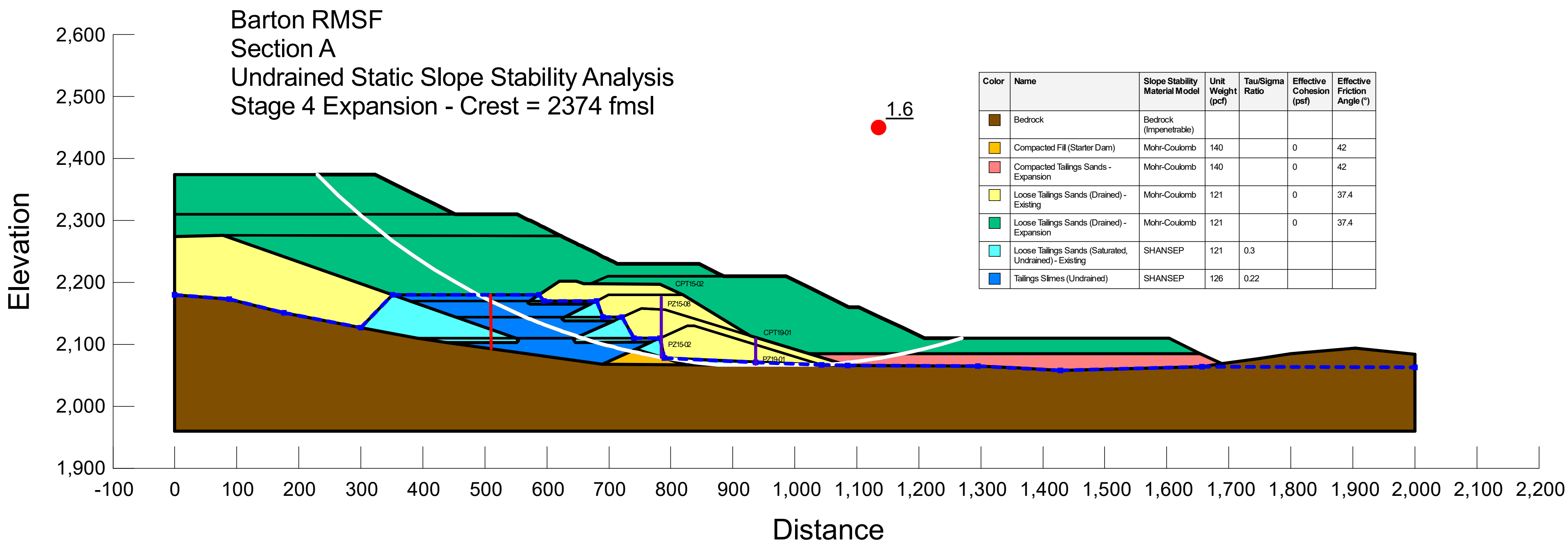
Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Tau/Sigma Ratio	Effective Cohesion (psf)	Effective Friction Angle (°)
	Bedrock	Bedrock (Impenetrable)				
	Compacted Fill (Starter Dam)	Mohr-Coulomb	140		0	42
	Compacted Tailings Sands - Expansion	Mohr-Coulomb	140		0	42
	Loose Tailings Sands (Drained) - Existing	Mohr-Coulomb	121		0	37.4
	Loose Tailings Sands (Drained) - Expansion	Mohr-Coulomb	121		0	37.4
	Loose Tailings Sands (Saturated, Undrained) - Existing	SHANSEP	121	0.3		
	Tailings Slimes (Undrained)	SHANSEP	126	0.22		



Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Tau/Sigma Ratio	Effective Cohesion (psf)	Effective Friction Angle (°)
	Bedrock	Bedrock (Impenetrable)				
	Compacted Fill (Starter Dam)	Mohr-Coulomb	140		0	42
	Compacted Tailings Sands - Expansion	Mohr-Coulomb	140		0	42
	Loose Tailings Sands (Drained) - Existing	Mohr-Coulomb	121		0	37.4
	Loose Tailings Sands (Drained) - Expansion	Mohr-Coulomb	121		0	37.4
	Loose Tailings Sands (Saturated, Undrained) - Existing	SHANSEP	121	0.3		
	Tailings Slimes (Undrained)	SHANSEP	126	0.22		

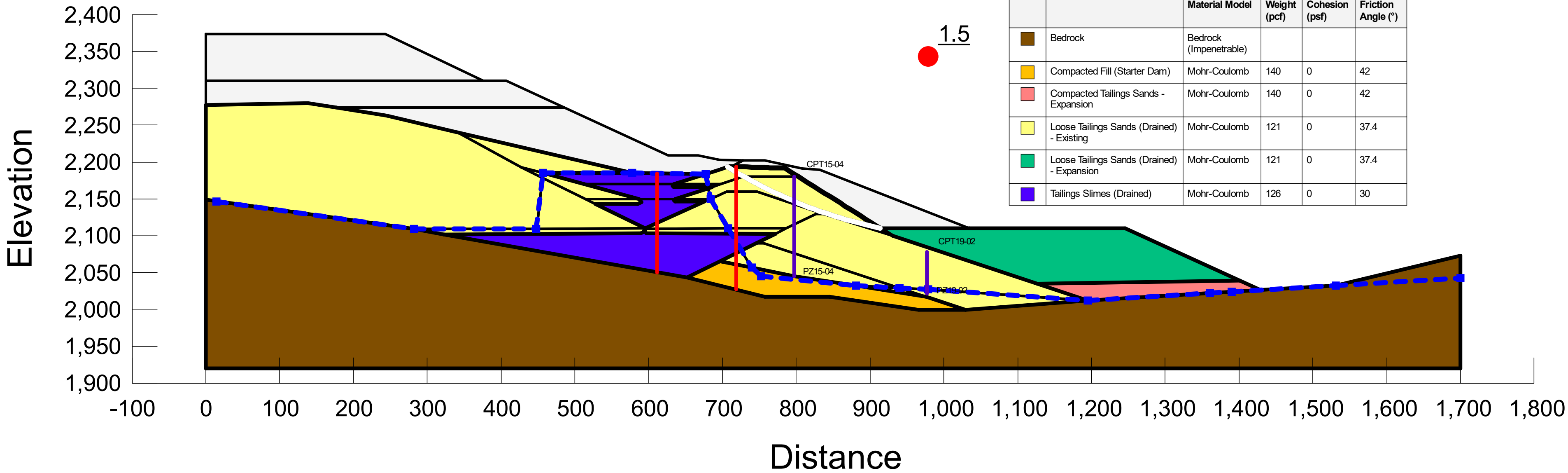


Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Tau/Sigma Ratio	Effective Cohesion (psf)	Effective Friction Angle (°)
	Bedrock	Bedrock (Impenetrable)				
	Compacted Fill (Starter Dam)	Mohr-Coulomb	140		0	42
	Compacted Tailings Sands - Expansion	Mohr-Coulomb	140		0	42
	Loose Tailings Sands (Drained) - Existing	Mohr-Coulomb	121		0	37.4
	Loose Tailings Sands (Drained) - Expansion	Mohr-Coulomb	121		0	37.4
	Loose Tailings Sands (Saturated, Undrained) - Existing	SHANSEP	121	0.3		
	Tailings Slimes (Undrained)	SHANSEP	126	0.22		



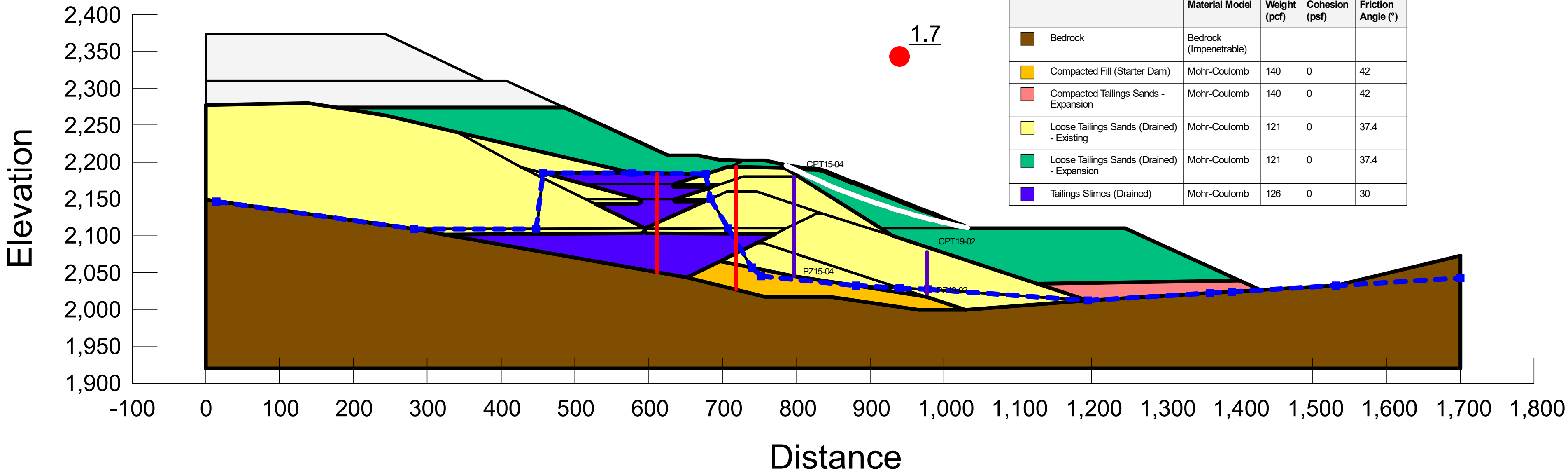
Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Tau/Sigma Ratio	Effective Cohesion (psf)	Effective Friction Angle (°)
	Bedrock	Bedrock (Impenetrable)				
	Compacted Fill (Starter Dam)	Mohr-Coulomb	140		0	42
	Compacted Tailings Sands - Expansion	Mohr-Coulomb	140		0	42
	Loose Tailings Sands (Drained) - Existing	Mohr-Coulomb	121		0	37.4
	Loose Tailings Sands (Drained) - Expansion	Mohr-Coulomb	121		0	37.4
	Loose Tailings Sands (Saturated, Undrained) - Existing	SHANSEP	121	0.3		
	Tailings Slimes (Undrained)	SHANSEP	126	0.22		

Barton RMSF
Section B
Drained Static Slope Stability Analysis
Stage 1 Expansion - Crest = 2210 fmsl



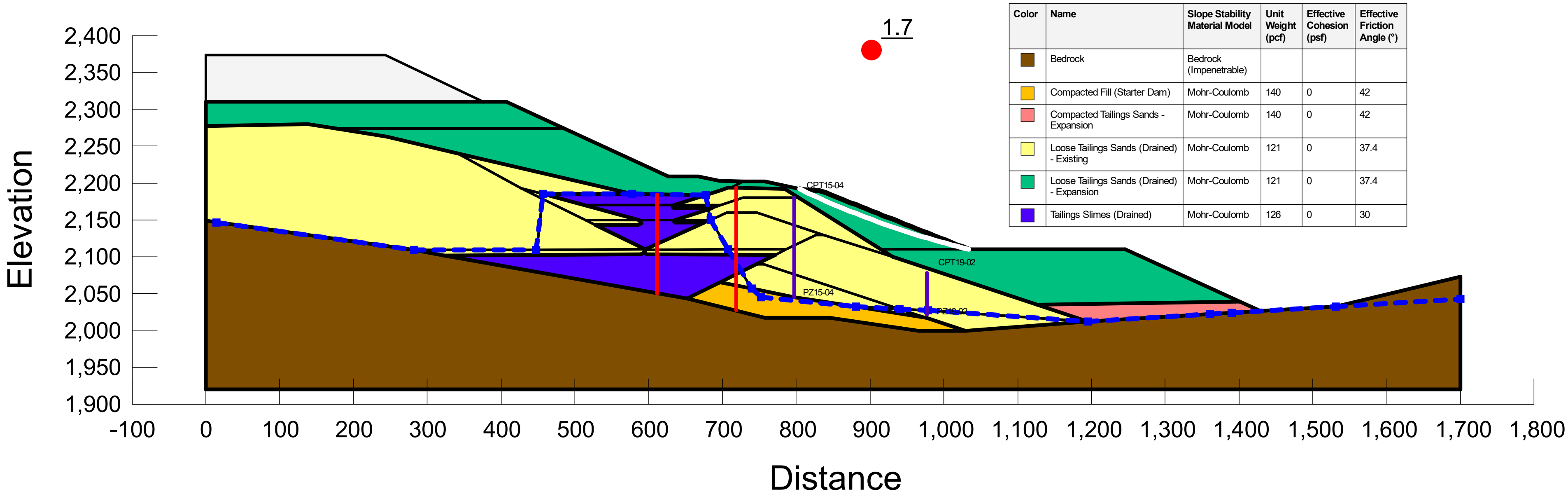
Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
	Bedrock	Bedrock (Impenetrable)			
	Compacted Fill (Starter Dam)	Mohr-Coulomb	140	0	42
	Compacted Tailings Sands - Expansion	Mohr-Coulomb	140	0	42
	Loose Tailings Sands (Drained) - Existing	Mohr-Coulomb	121	0	37.4
	Loose Tailings Sands (Drained) - Expansion	Mohr-Coulomb	121	0	37.4
	Tailings Slimes (Drained)	Mohr-Coulomb	126	0	30

Barton RMSF
Section B
Drained Static Slope Stability Analysis
Stage 2 Expansion - Crest = 2274 fmsl



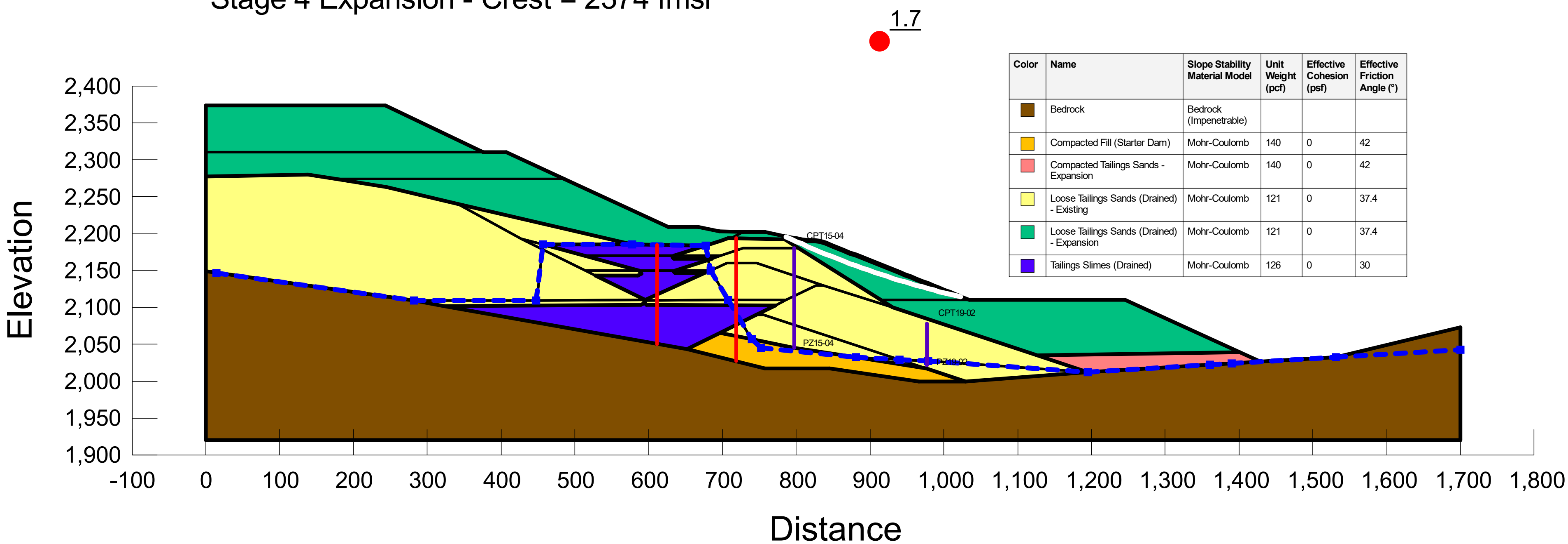
Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
	Bedrock	Bedrock (Impenetrable)			
	Compacted Fill (Starter Dam)	Mohr-Coulomb	140	0	42
	Compacted Tailings Sands - Expansion	Mohr-Coulomb	140	0	42
	Loose Tailings Sands (Drained) - Existing	Mohr-Coulomb	121	0	37.4
	Loose Tailings Sands (Drained) - Expansion	Mohr-Coulomb	121	0	37.4
	Tailings Slimes (Drained)	Mohr-Coulomb	126	0	30

Barton RMSF
Section B
Drained Static Slope Stability Analysis
Stage 3 Expansion - Crest = 2310 fmsl



Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
	Bedrock	Bedrock (Impenetrable)			
	Compacted Fill (Starter Dam)	Mohr-Coulomb	140	0	42
	Compacted Tailings Sands - Expansion	Mohr-Coulomb	140	0	42
	Loose Tailings Sands (Drained) - Existing	Mohr-Coulomb	121	0	37.4
	Loose Tailings Sands (Drained) - Expansion	Mohr-Coulomb	121	0	37.4
	Tailings Slimes (Drained)	Mohr-Coulomb	126	0	30

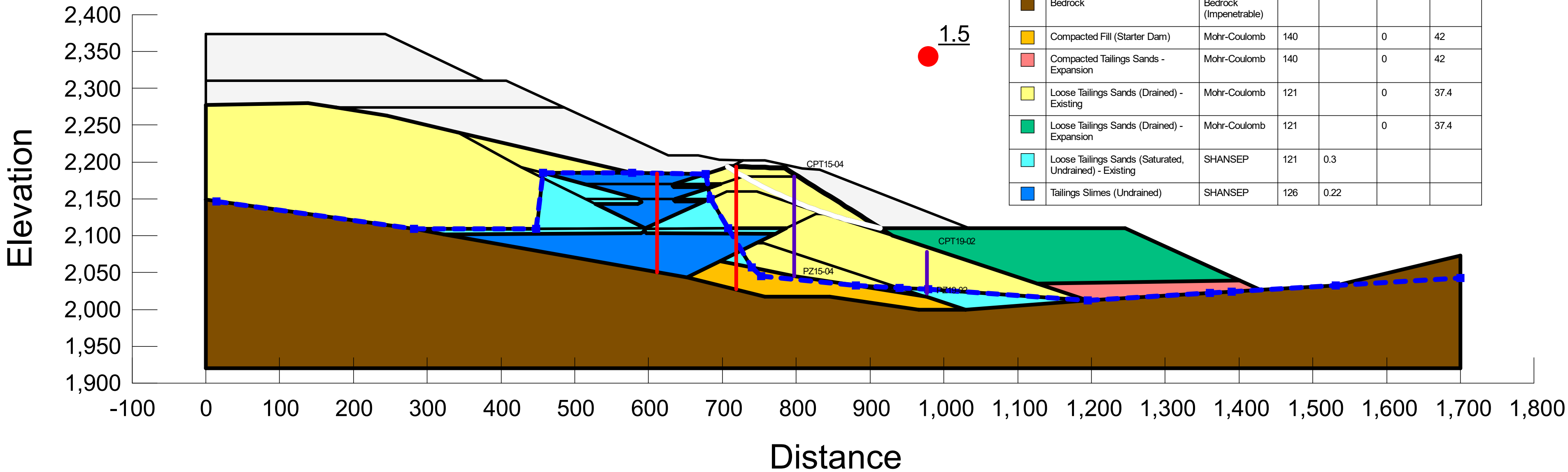
Barton RMSF
Section B
Drained Static Slope Stability Analysis
Stage 4 Expansion - Crest = 2374 fmsl



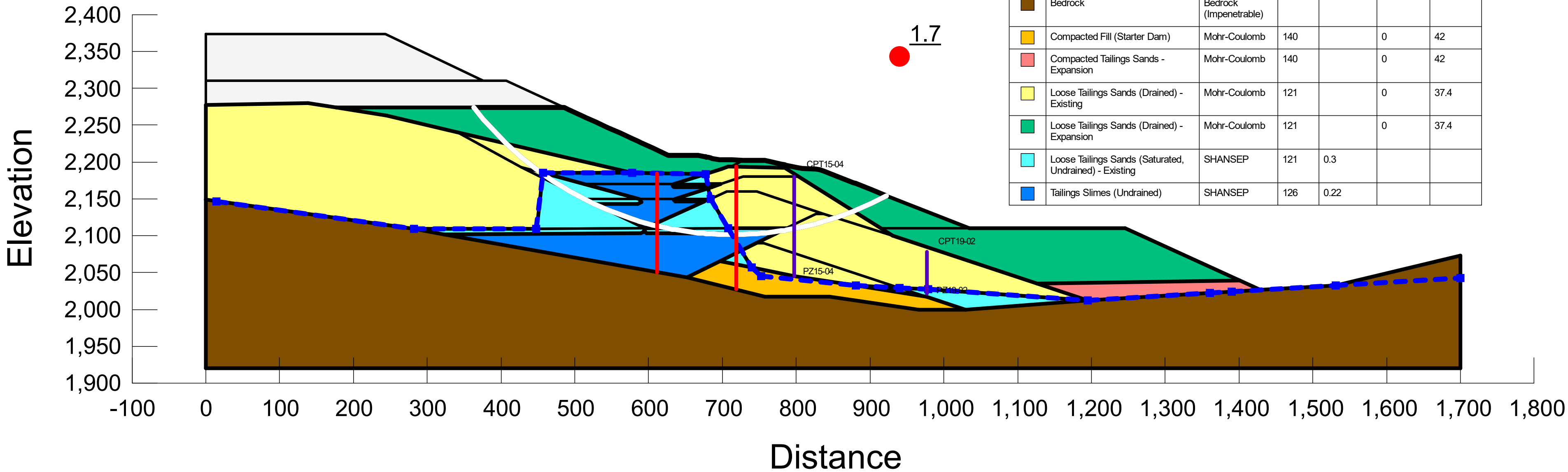
Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
	Bedrock	Bedrock (Impenetrable)			
	Compacted Fill (Starter Dam)	Mohr-Coulomb	140	0	42
	Compacted Tailings Sands - Expansion	Mohr-Coulomb	140	0	42
	Loose Tailings Sands (Drained) - Existing	Mohr-Coulomb	121	0	37.4
	Loose Tailings Sands (Drained) - Expansion	Mohr-Coulomb	121	0	37.4
	Tailings Slimes (Drained)	Mohr-Coulomb	126	0	30

Barton RMSF
Section B
Undrained Static Slope Stability Analysis
Stage 1 Expansion - Crest = 2210 fmsl

Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Tau/Sigma Ratio	Effective Cohesion (psf)	Effective Friction Angle (°)
	Bedrock	Bedrock (Impenetrable)				
	Compacted Fill (Starter Dam)	Mohr-Coulomb	140		0	42
	Compacted Tailings Sands - Expansion	Mohr-Coulomb	140		0	42
	Loose Tailings Sands (Drained) - Existing	Mohr-Coulomb	121		0	37.4
	Loose Tailings Sands (Drained) - Expansion	Mohr-Coulomb	121		0	37.4
	Loose Tailings Sands (Saturated, Undrained) - Existing	SHANSEP	121	0.3		
	Tailings Slimes (Undrained)	SHANSEP	126	0.22		



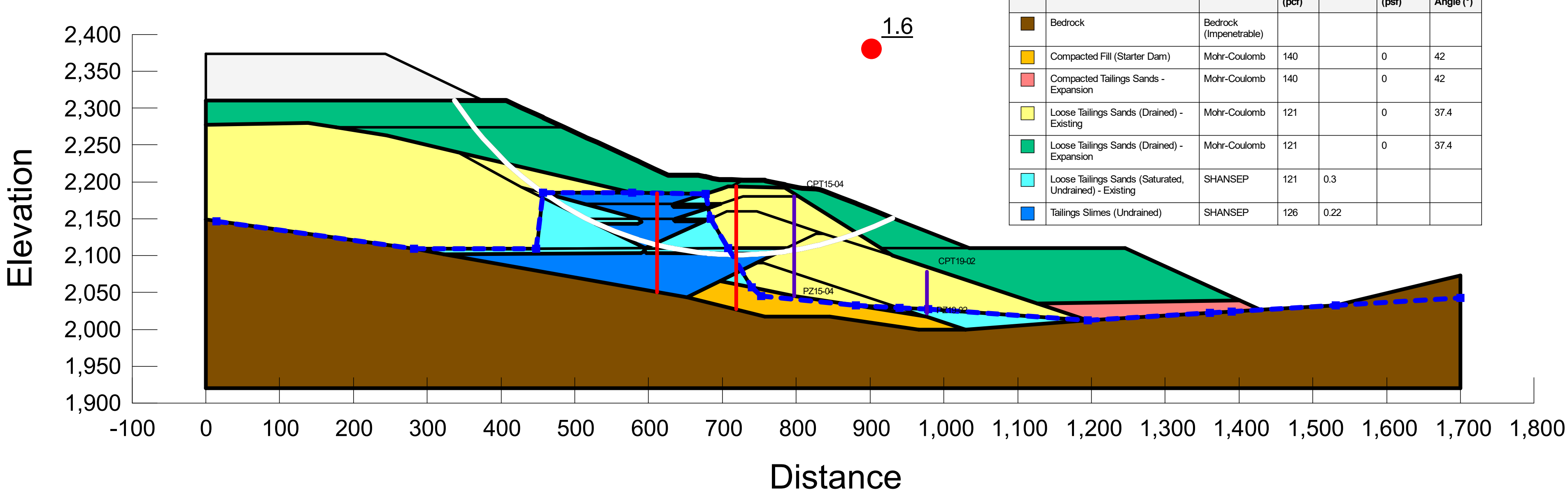
Barton RMSF
Section B
Undrained Static Slope Stability Analysis
Stage 2 Expansion - Crest = 2274 fmsl



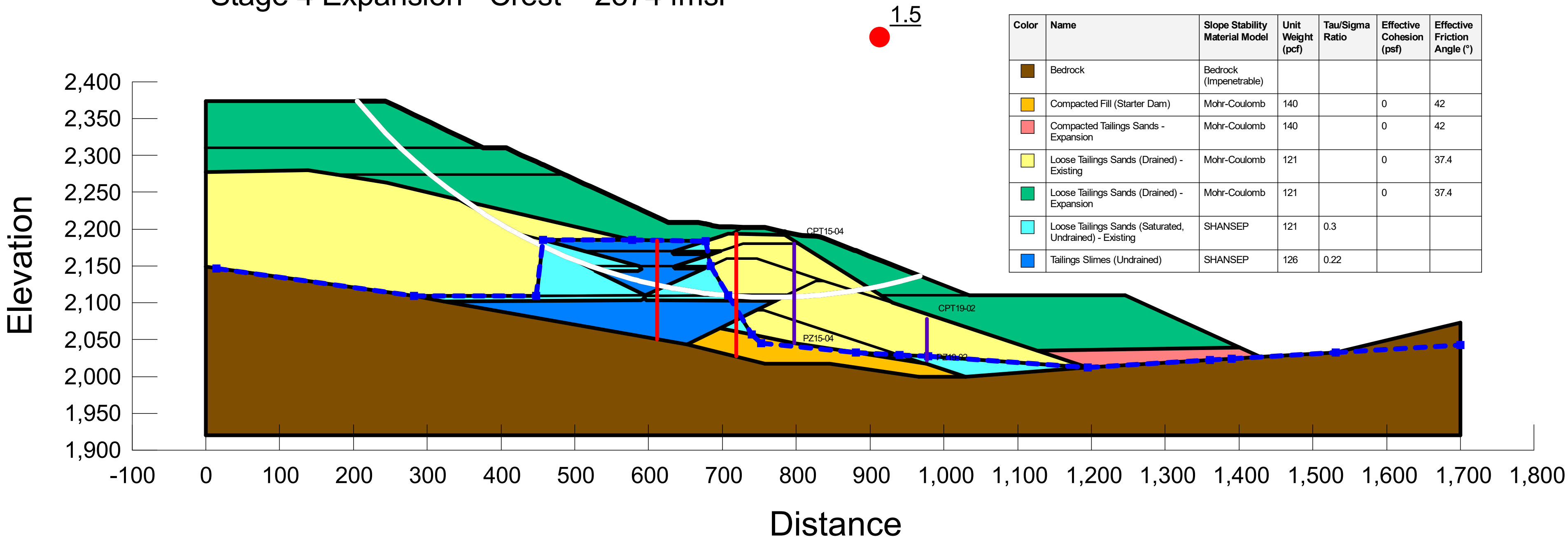
Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Tau/Sigma Ratio	Effective Cohesion (psf)	Effective Friction Angle (°)
	Bedrock	Bedrock (Impenetrable)				
	Compacted Fill (Starter Dam)	Mohr-Coulomb	140		0	42
	Compacted Tailings Sands - Expansion	Mohr-Coulomb	140		0	42
	Loose Tailings Sands (Drained) - Existing	Mohr-Coulomb	121		0	37.4
	Loose Tailings Sands (Drained) - Expansion	Mohr-Coulomb	121		0	37.4
	Loose Tailings Sands (Saturated, Undrained) - Existing	SHANSEP	121	0.3		
	Tailings Slimes (Undrained)	SHANSEP	126	0.22		

Barton RMSF
Section B
Undrained Static Slope Stability Analysis
Stage 3 Expansion - Crest = 2310 fmsl

Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Tau/Sigma Ratio	Effective Cohesion (psf)	Effective Friction Angle (°)
	Bedrock	Bedrock (Impenetrable)				
	Compacted Fill (Starter Dam)	Mohr-Coulomb	140		0	42
	Compacted Tailings Sands - Expansion	Mohr-Coulomb	140		0	42
	Loose Tailings Sands (Drained) - Existing	Mohr-Coulomb	121		0	37.4
	Loose Tailings Sands (Drained) - Expansion	Mohr-Coulomb	121		0	37.4
	Loose Tailings Sands (Saturated, Undrained) - Existing	SHANSEP	121	0.3		
	Tailings Slimes (Undrained)	SHANSEP	126	0.22		

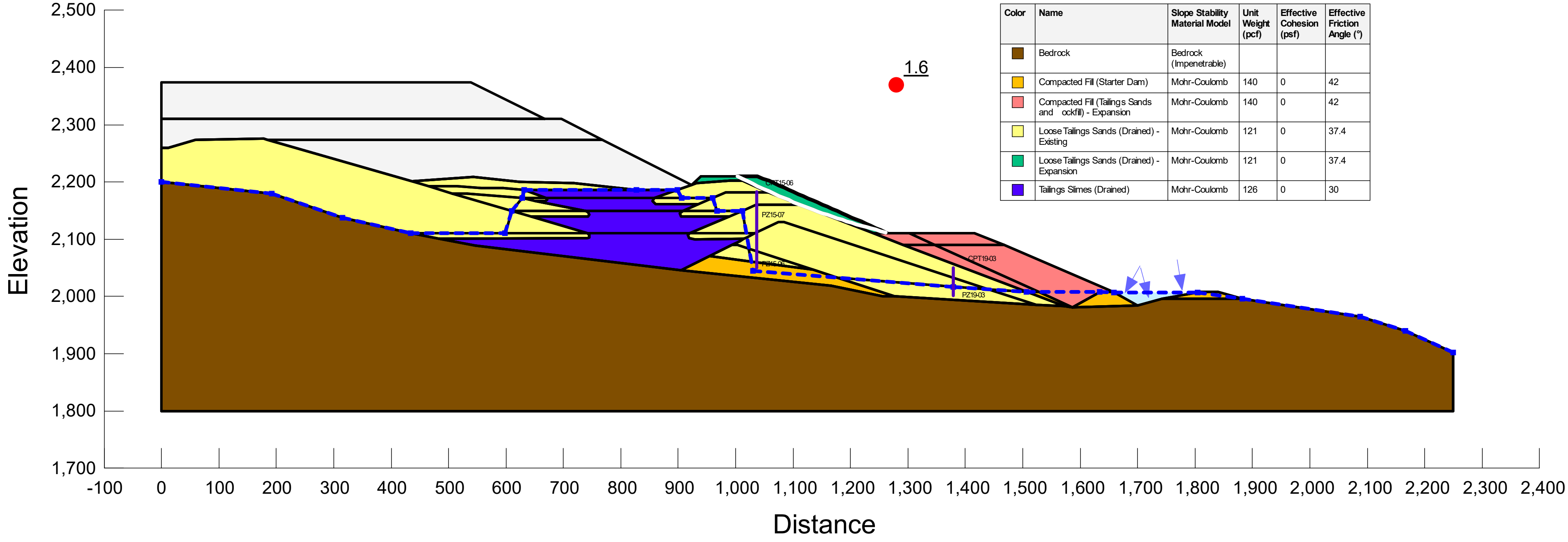


Barton RMSF
Section B
Undrained Static Slope Stability Analysis
Stage 4 Expansion - Crest = 2374 fmsl



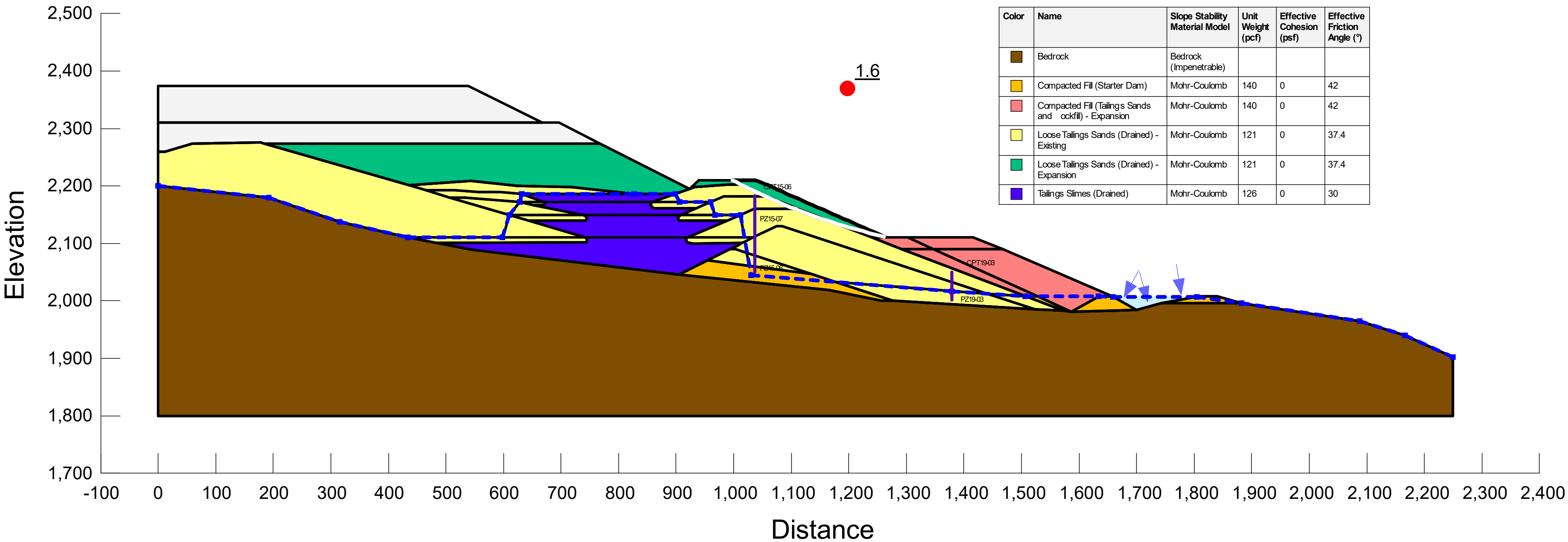
Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Tau/Sigma Ratio	Effective Cohesion (psf)	Effective Friction Angle (°)
	Bedrock	Bedrock (Impenetrable)				
	Compacted Fill (Starter Dam)	Mohr-Coulomb	140		0	42
	Compacted Tailings Sands - Expansion	Mohr-Coulomb	140		0	42
	Loose Tailings Sands (Drained) - Existing	Mohr-Coulomb	121		0	37.4
	Loose Tailings Sands (Drained) - Expansion	Mohr-Coulomb	121		0	37.4
	Loose Tailings Sands (Saturated, Undrained) - Existing	SHANSEP	121	0.3		
	Tailings Slimes (Undrained)	SHANSEP	126	0.22		

Barton RMSF
Section C
Drained Static Slope Stability Analysis
Stage 1 Expansion - Crest = 2210 fmsl



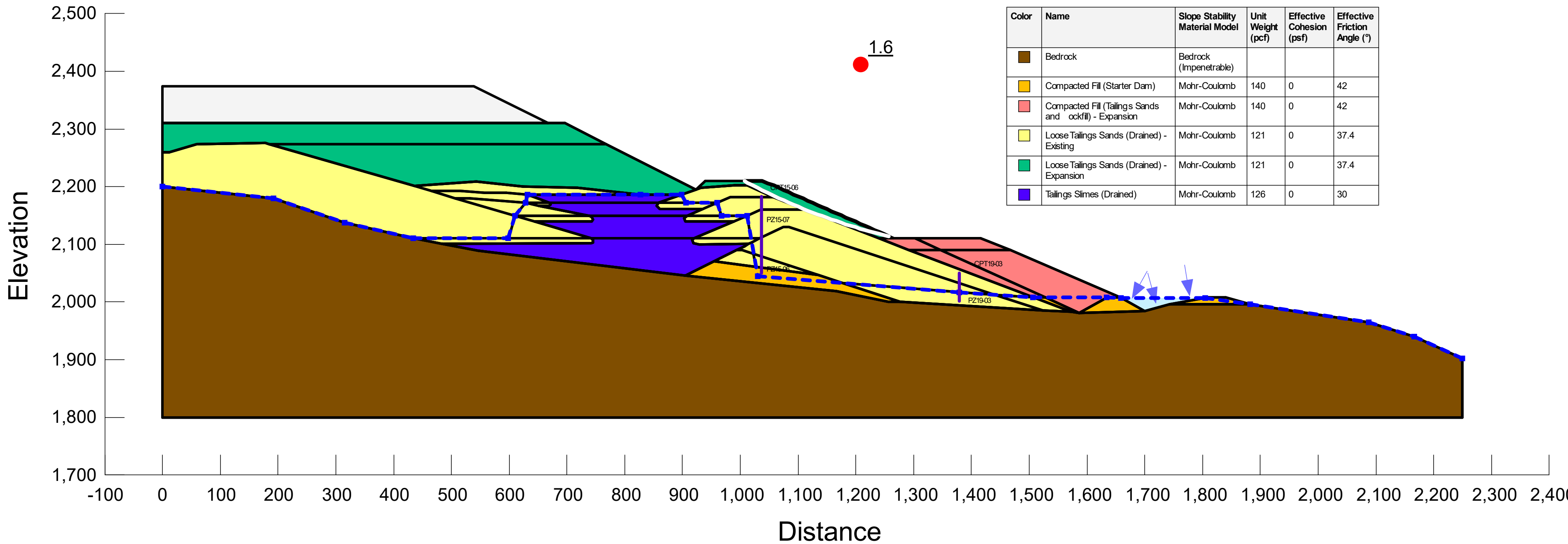
Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
	Bedrock	Bedrock (Impenetrable)			
	Compacted Fill (Starter Dam)	Mohr-Coulomb	140	0	42
	Compacted Fill (Tailings Sands and ockfill) - Expansion	Mohr-Coulomb	140	0	42
	Loose Tailings Sands (Drained) - Existing	Mohr-Coulomb	121	0	37.4
	Loose Tailings Sands (Drained) - Expansion	Mohr-Coulomb	121	0	37.4
	Tailings Slimes (Drained)	Mohr-Coulomb	126	0	30

Barton RMSF
Section C
Drained Static Slope Stability Analysis
Stage 2 Expansion - Crest = 2274 fmsl



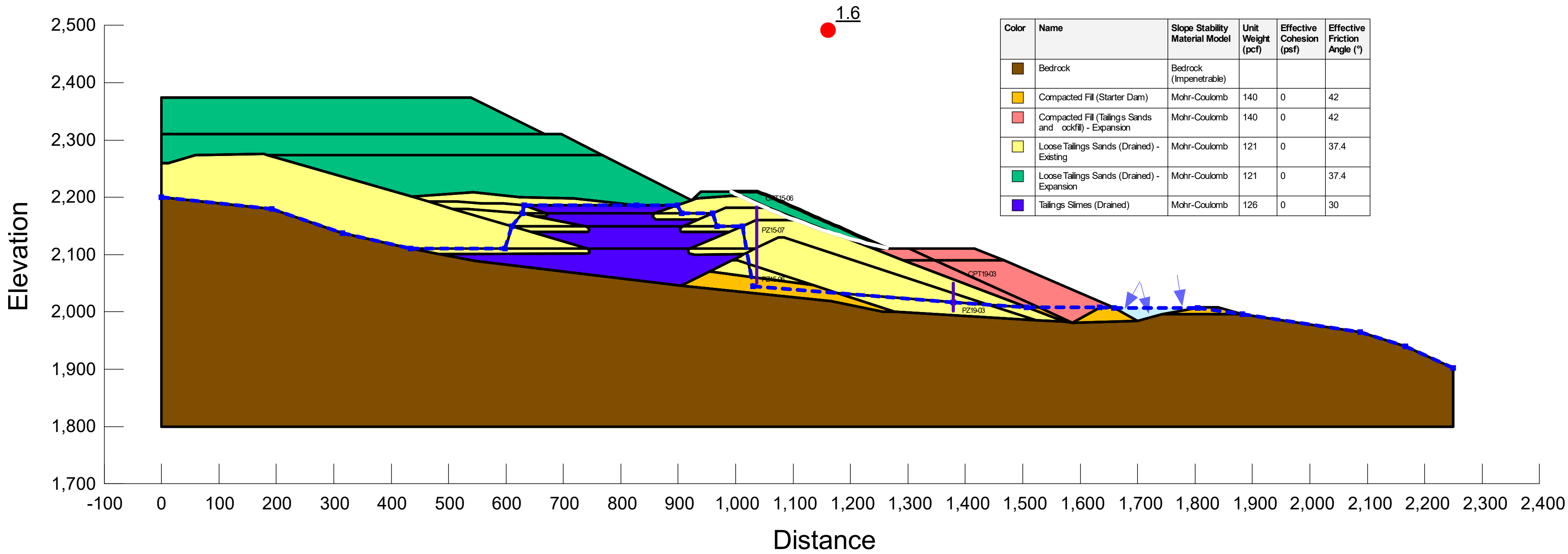
Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
	Bedrock	Bedrock (Impenetrable)			
	Compacted Fill (Starter Dam)	Mohr-Coulomb	140	0	42
	Compacted Fill (Tailings Sands and ockfill) - Expansion	Mohr-Coulomb	140	0	42
	Loose Tailings Sands (Drained) - Existing	Mohr-Coulomb	121	0	37.4
	Loose Tailings Sands (Drained) - Expansion	Mohr-Coulomb	121	0	37.4
	Tailings Slimes (Drained)	Mohr-Coulomb	126	0	30

Barton RMSF
Section C
Drained Static Slope Stability Analysis
Stage 3 Expansion - Crest = 2310 fmsl



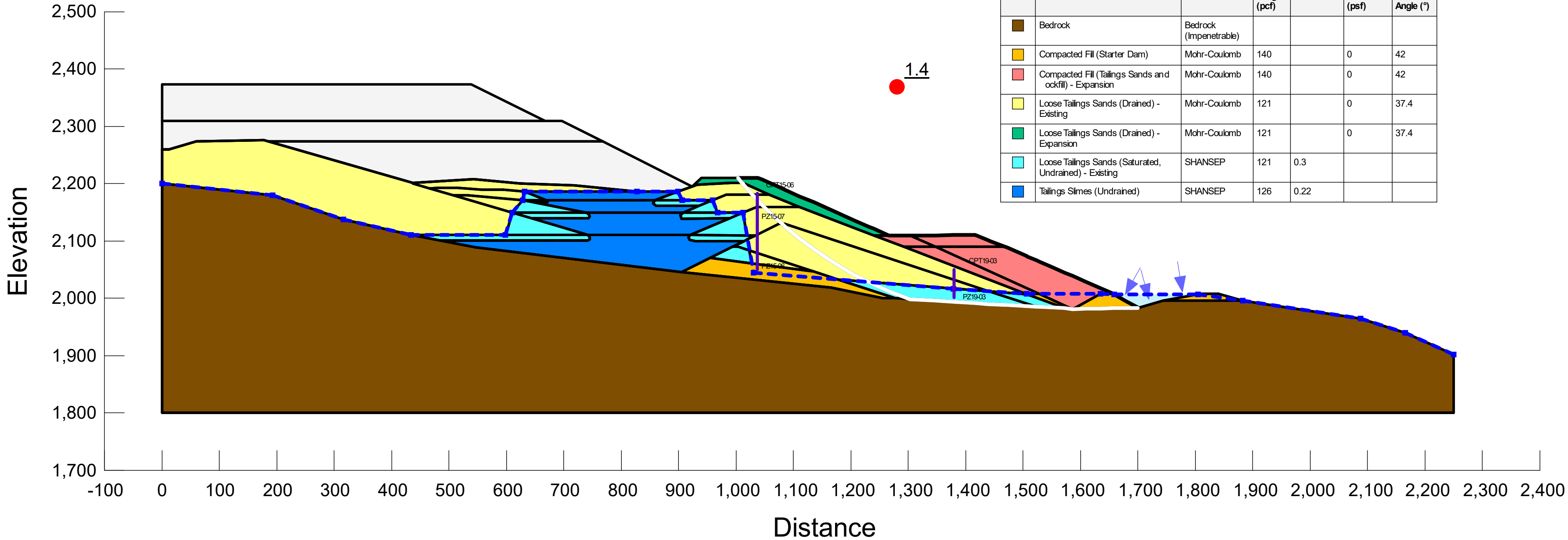
Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
	Bedrock	Bedrock (Impenetrable)			
	Compacted Fill (Starter Dam)	Mohr-Coulomb	140	0	42
	Compacted Fill (Tailings Sands and ockfill) - Expansion	Mohr-Coulomb	140	0	42
	Loose Tailings Sands (Drained) - Existing	Mohr-Coulomb	121	0	37.4
	Loose Tailings Sands (Drained) - Expansion	Mohr-Coulomb	121	0	37.4
	Tailings Slimes (Drained)	Mohr-Coulomb	126	0	30

Barton RMSF
Section C
Drained Static Slope Stability Analysis
Stage 4 Expansion - Crest = 2374 fmsl



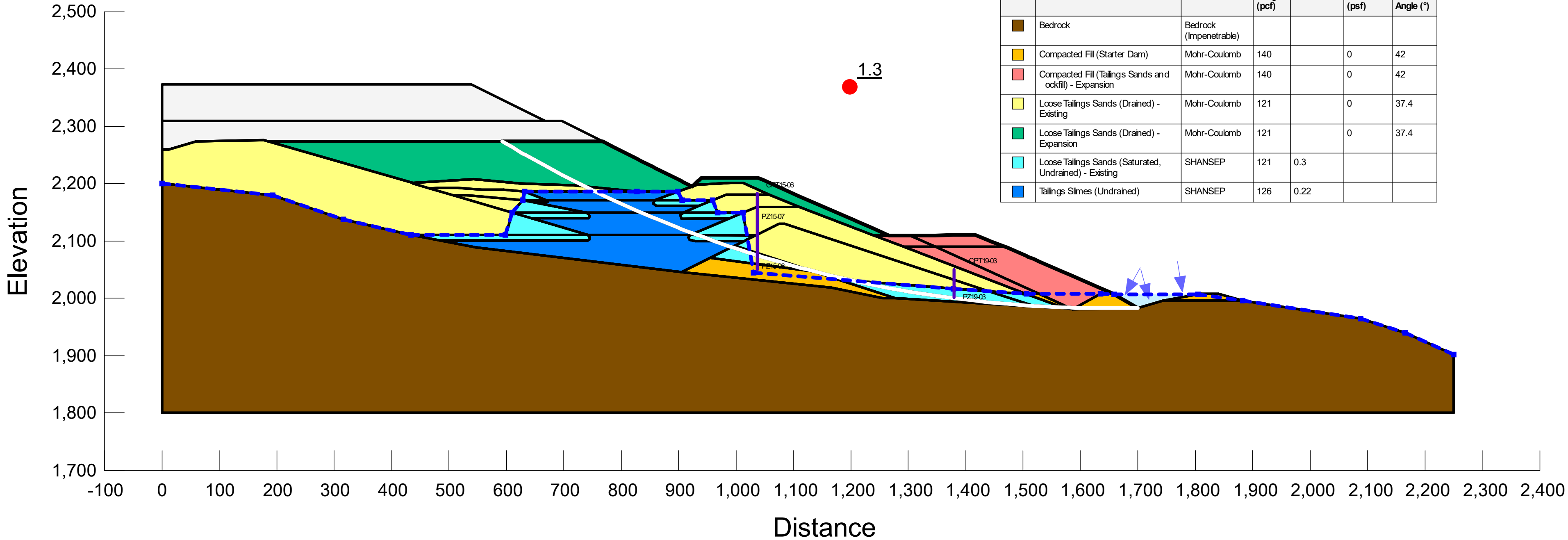
Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
	Bedrock	Bedrock (Impenetrable)			
	Compacted Fill (Starter Dam)	Mohr-Coulomb	140	0	42
	Compacted Fill (Tailings Sands and ockfill) - Expansion	Mohr-Coulomb	140	0	42
	Loose Tailings Sands (Drained) - Existing	Mohr-Coulomb	121	0	37.4
	Loose Tailings Sands (Drained) - Expansion	Mohr-Coulomb	121	0	37.4
	Tailings Slimes (Drained)	Mohr-Coulomb	126	0	30

Barton RMSF
Section C
Undrained Static Slope Stability Analysis
Stage 1 Expansion - Crest = 2210 fmsl



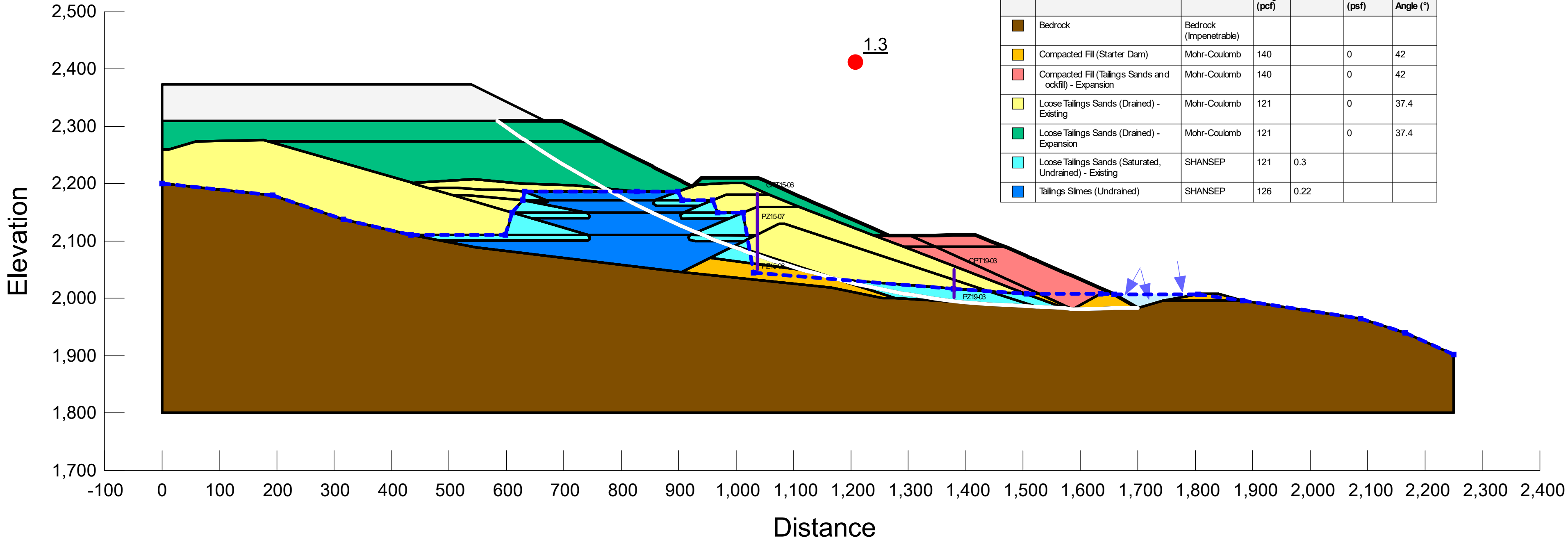
Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Tau/Sigma Ratio	Effective Cohesion (psf)	Effective Friction Angle (°)
	Bedrock	Bedrock (Impenetrable)				
	Compacted Fill (Starter Dam)	Mohr-Coulomb	140		0	42
	Compacted Fill (Tailings Sands and ockfill) - Expansion	Mohr-Coulomb	140		0	42
	Loose Tailings Sands (Drained) - Existing	Mohr-Coulomb	121		0	37.4
	Loose Tailings Sands (Drained) - Expansion	Mohr-Coulomb	121		0	37.4
	Loose Tailings Sands (Saturated, Undrained) - Existing	SHANSEP	121	0.3		
	Tailings Slimes (Undrained)	SHANSEP	126	0.22		

Barton RMSF
Section C
Undrained Static Slope Stability Analysis
Stage 2 Expansion - Crest = 2274 fmsl



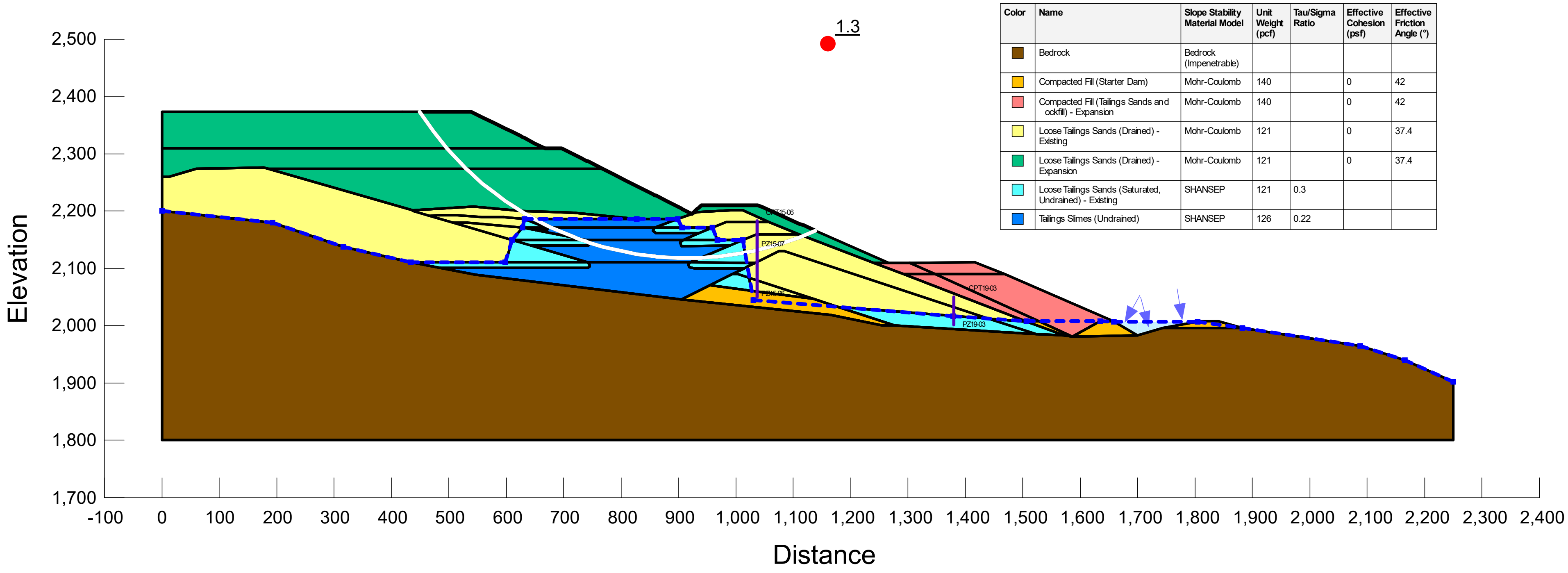
Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Tau/Sigma Ratio	Effective Cohesion (psf)	Effective Friction Angle (°)
	Bedrock	Bedrock (Impenetrable)				
	Compacted Fill (Starter Dam)	Mohr-Coulomb	140		0	42
	Compacted Fill (Tailings Sands and ockfill) - Expansion	Mohr-Coulomb	140		0	42
	Loose Tailings Sands (Drained) - Existing	Mohr-Coulomb	121		0	37.4
	Loose Tailings Sands (Drained) - Expansion	Mohr-Coulomb	121		0	37.4
	Loose Tailings Sands (Saturated, Undrained) - Existing	SHANSEP	121	0.3		
	Tailings Slimes (Undrained)	SHANSEP	126	0.22		

Barton RMSF
Section C
Undrained Static Slope Stability Analysis
Stage 3 Expansion - Crest = 2310 fmsl



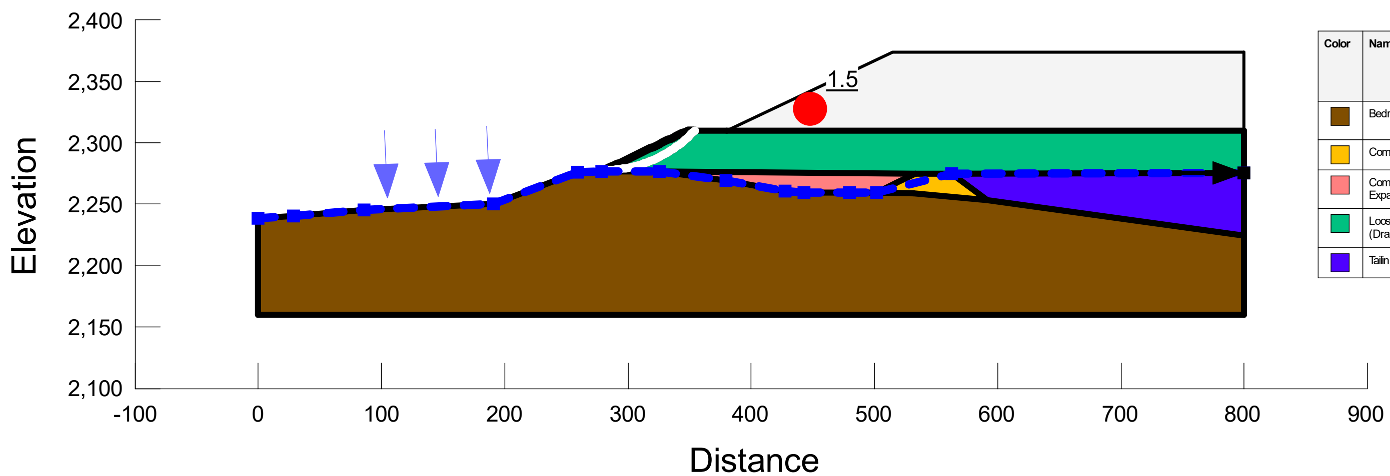
Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Tau/Sigma Ratio	Effective Cohesion (psf)	Effective Friction Angle (°)
	Bedrock	Bedrock (Impenetrable)				
	Compacted Fill (Starter Dam)	Mohr-Coulomb	140		0	42
	Compacted Fill (Tailings Sands and ockfill) - Expansion	Mohr-Coulomb	140		0	42
	Loose Tailings Sands (Drained) - Existing	Mohr-Coulomb	121		0	37.4
	Loose Tailings Sands (Drained) - Expansion	Mohr-Coulomb	121		0	37.4
	Loose Tailings Sands (Saturated, Undrained) - Existing	SHANSEP	121	0.3		
	Tailings Slimes (Undrained)	SHANSEP	126	0.22		

Barton RMSF
Section C
Undrained Static Slope Stability Analysis
Stage 4 Expansion - Crest = 2374 fmsl



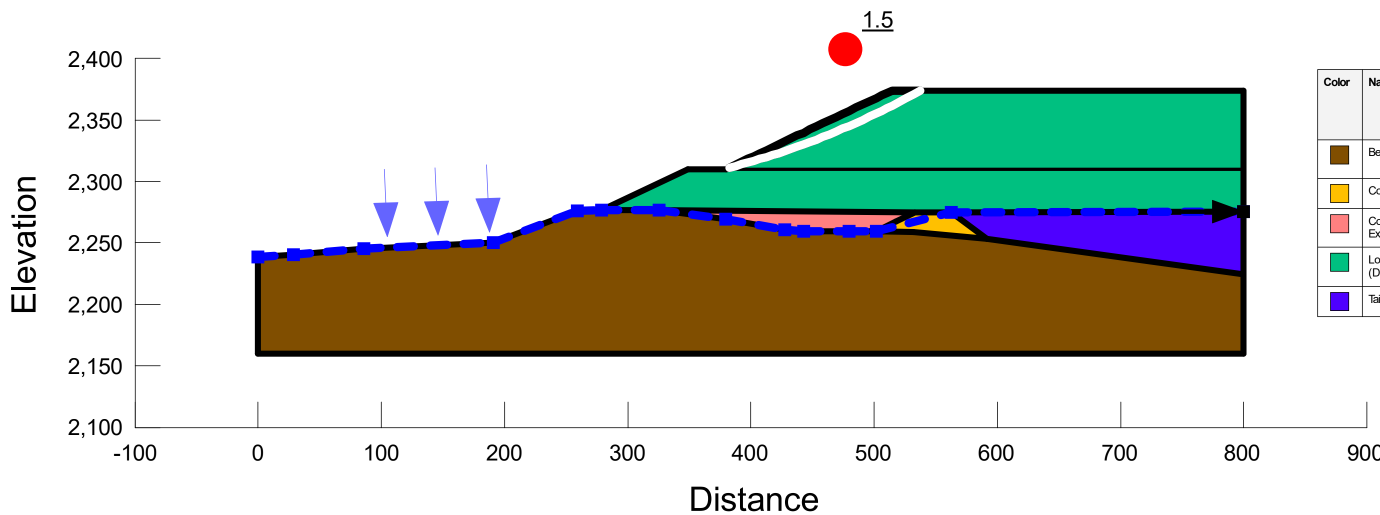
Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Tau/Sigma Ratio	Effective Cohesion (psf)	Effective Friction Angle (°)
	Bedrock	Bedrock (Impenetrable)				
	Compacted Fill (Starter Dam)	Mohr-Coulomb	140		0	42
	Compacted Fill (Tailings Sands and ockfill) - Expansion	Mohr-Coulomb	140		0	42
	Loose Tailings Sands (Drained) - Existing	Mohr-Coulomb	121		0	37.4
	Loose Tailings Sands (Drained) - Expansion	Mohr-Coulomb	121		0	37.4
	Loose Tailings Sands (Saturated, Undrained) - Existing	SHANSEP	121	0.3		
	Tailings Slimes (Undrained)	SHANSEP	126	0.22		

Barton RMSF
Section D
Drained Static Slope Stability Analysis
Stage 3 Expansion - Crest = 2310 fmsl



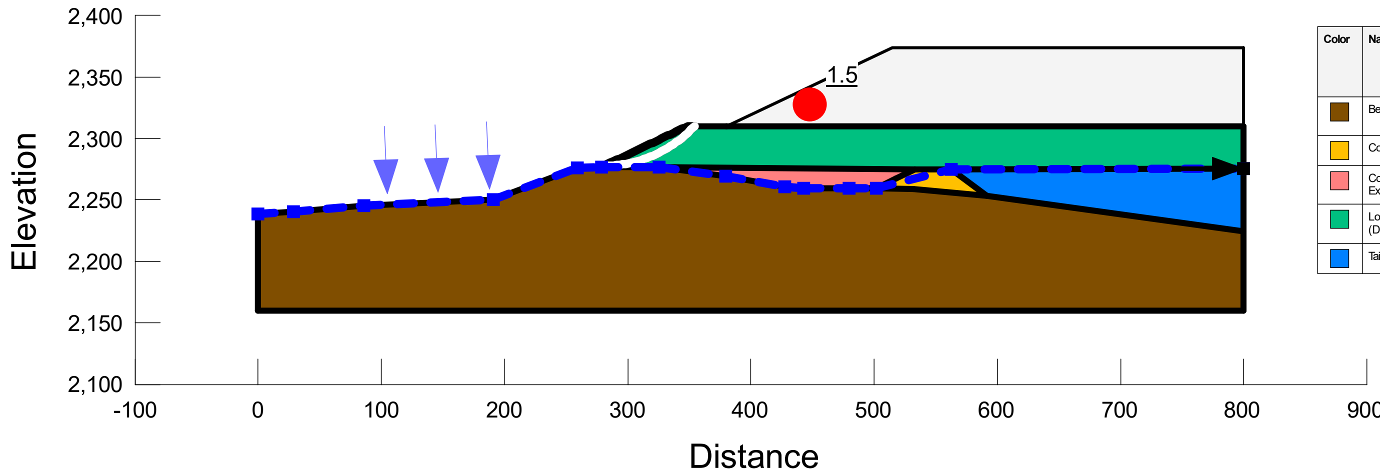
Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
	Bedrock	Bedrock (Impenetrable)			
	Compacted ill - Existing	Mohr-Coulomb	140	0	42
	Compacted Tailings Sands - Expansion	Mohr-Coulomb	140	0	42
	Loose Tailings Sands (Drained) - Expansion	Mohr-Coulomb	121	0	37.4
	Tailings Slimes (Drained)	Mohr-Coulomb	126	0	30

Barton RMSF
Section D
Drained Static Slope Stability Analysis
Stage 4 Expansion - Crest = 2374 fmsl



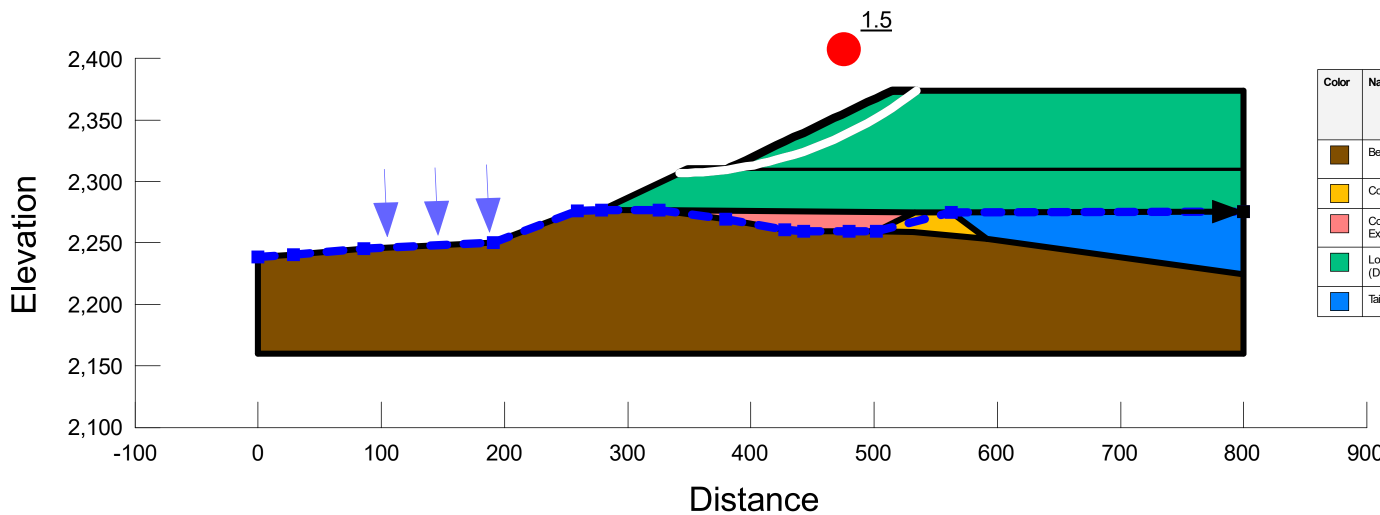
Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
	Bedrock	Bedrock (Impenetrable)			
	Compacted ill - Existing	Mohr-Coulomb	140	0	42
	Compacted Tailings Sands - Expansion	Mohr-Coulomb	140	0	42
	Loose Tailings Sands (Drained) - Expansion	Mohr-Coulomb	121	0	37.4
	Tailings Slimes (Drained)	Mohr-Coulomb	126	0	30

Barton RMSF
Section D
Undrained Static Slope Stability Analysis
Stage 3 Expansion - Crest = 2310 fmsl



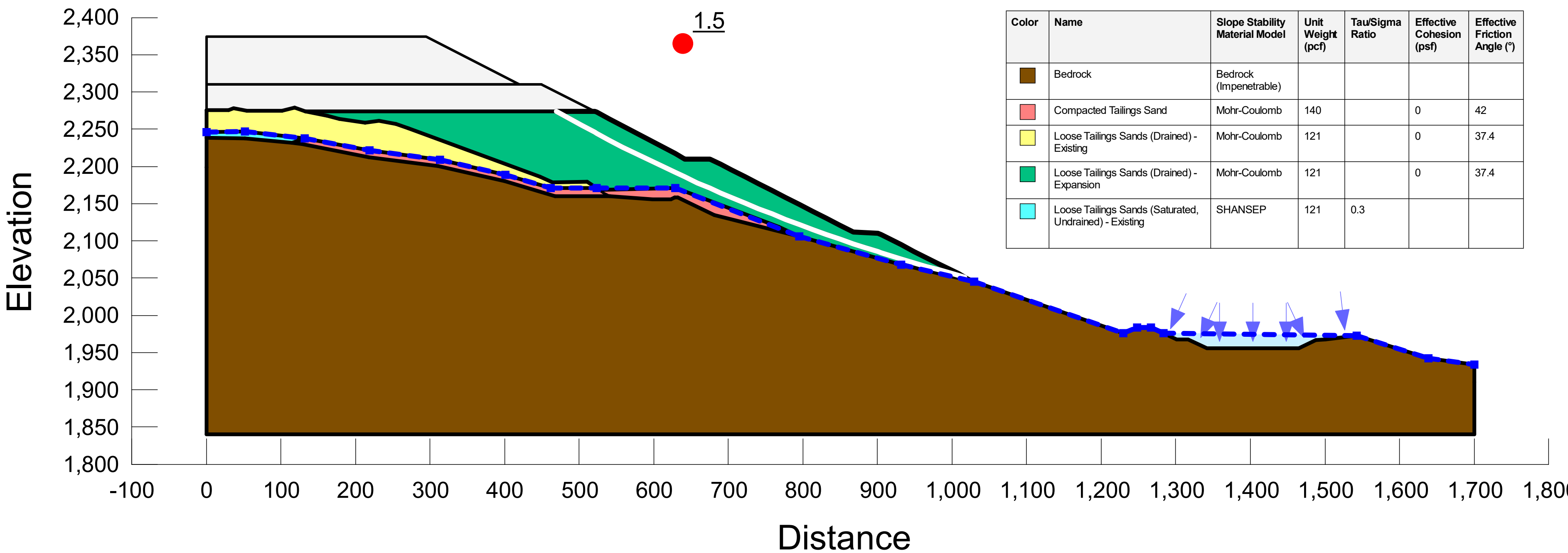
Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Tau/Sigma Ratio	Effective Cohesion (psf)	Effective Friction Angle (°)
	Bedrock	Bedrock (Impenetrable)				
	Compacted ill - Existing	Mohr-Coulomb	140		0	42
	Compacted Tailings Sands - Expansion	Mohr-Coulomb	140		0	42
	Loose Tailings Sands (Drained) - Expansion	Mohr-Coulomb	121		0	37.4
	Tailings Slimes (Undrained)	SHANSEP	126	0.22		

Barton RMSF
Section D
Undrained Static Slope Stability Analysis
Stage 4 Expansion - Crest = 2374 fmsl



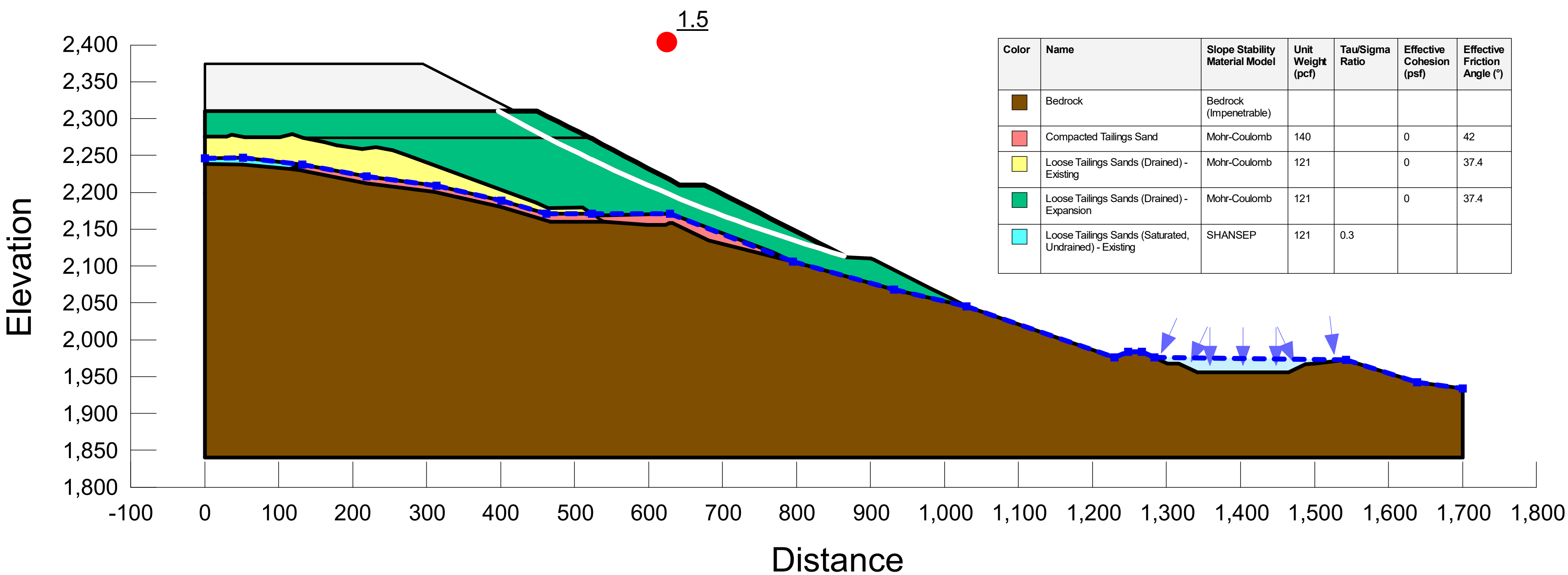
Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Tau/Sigma Ratio	Effective Cohesion (psf)	Effective Friction Angle (°)
	Bedrock	Bedrock (Impenetrable)				
	Compacted ill - Existing	Mohr-Coulomb	140		0	42
	Compacted Tailings Sands - Expansion	Mohr-Coulomb	140		0	42
	Loose Tailings Sands (Drained) - Expansion	Mohr-Coulomb	121		0	37.4
	Tailings Slimes (Undrained)	SHANSEP	126	0.22		

Barton RMSF
Section E
Drained Static Slope Stability Analysis
Stage 2 Expansion - Crest = 2274 fmsl



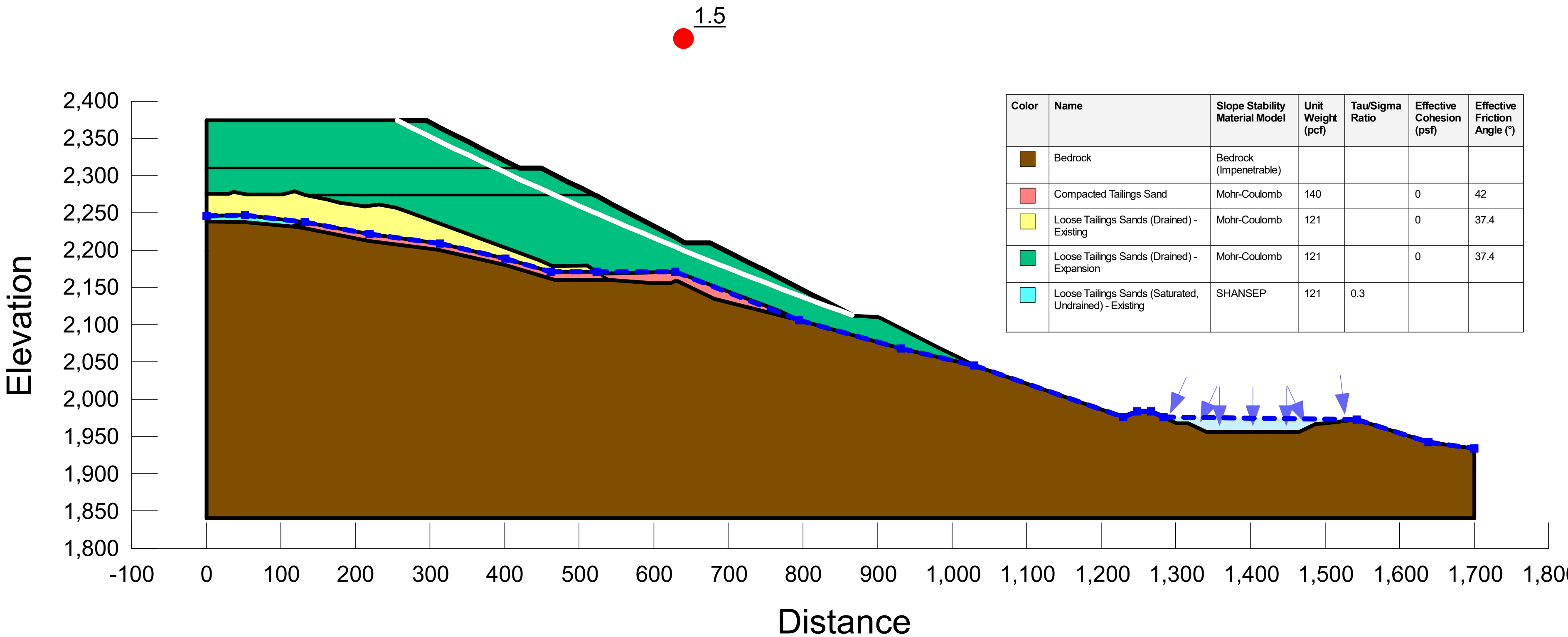
Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Tau/Sigma Ratio	Effective Cohesion (psf)	Effective Friction Angle (°)
	Bedrock	Bedrock (Impenetrable)				
	Compacted Tailings Sand	Mohr-Coulomb	140		0	42
	Loose Tailings Sands (Drained) - Existing	Mohr-Coulomb	121		0	37.4
	Loose Tailings Sands (Drained) - Expansion	Mohr-Coulomb	121		0	37.4
	Loose Tailings Sands (Saturated, Undrained) - Existing	SHANSEP	121	0.3		

Barton RMSF
Section E
Drained Static Slope Stability Analysis
Stage 3 Expansion - Crest = 2310 fmsl



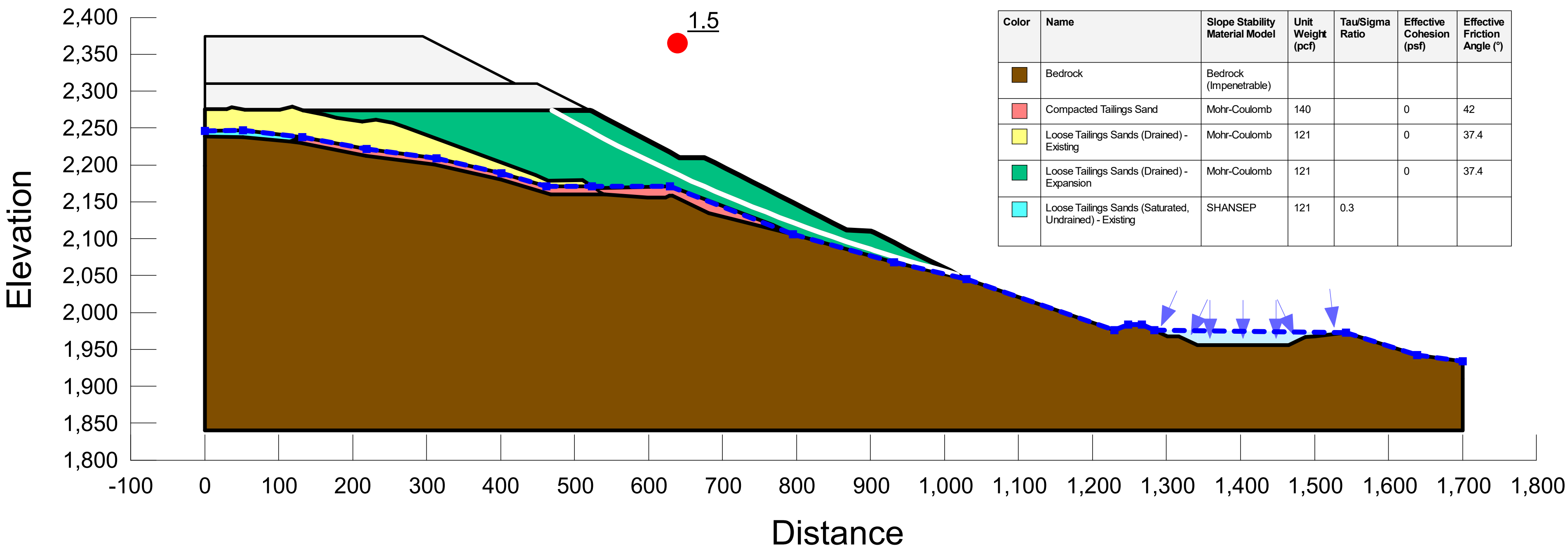
Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Tau/Sigma Ratio	Effective Cohesion (psf)	Effective Friction Angle (°)
	Bedrock	Bedrock (Impenetrable)				
	Compacted Tailings Sand	Mohr-Coulomb	140		0	42
	Loose Tailings Sands (Drained) - Existing	Mohr-Coulomb	121		0	37.4
	Loose Tailings Sands (Drained) - Expansion	Mohr-Coulomb	121		0	37.4
	Loose Tailings Sands (Saturated, Undrained) - Existing	SHANSEP	121	0.3		

Barton RMSF
Section E
Drained Static Slope Stability Analysis
Stage 4 Expansion - Crest = 2374 fmsl



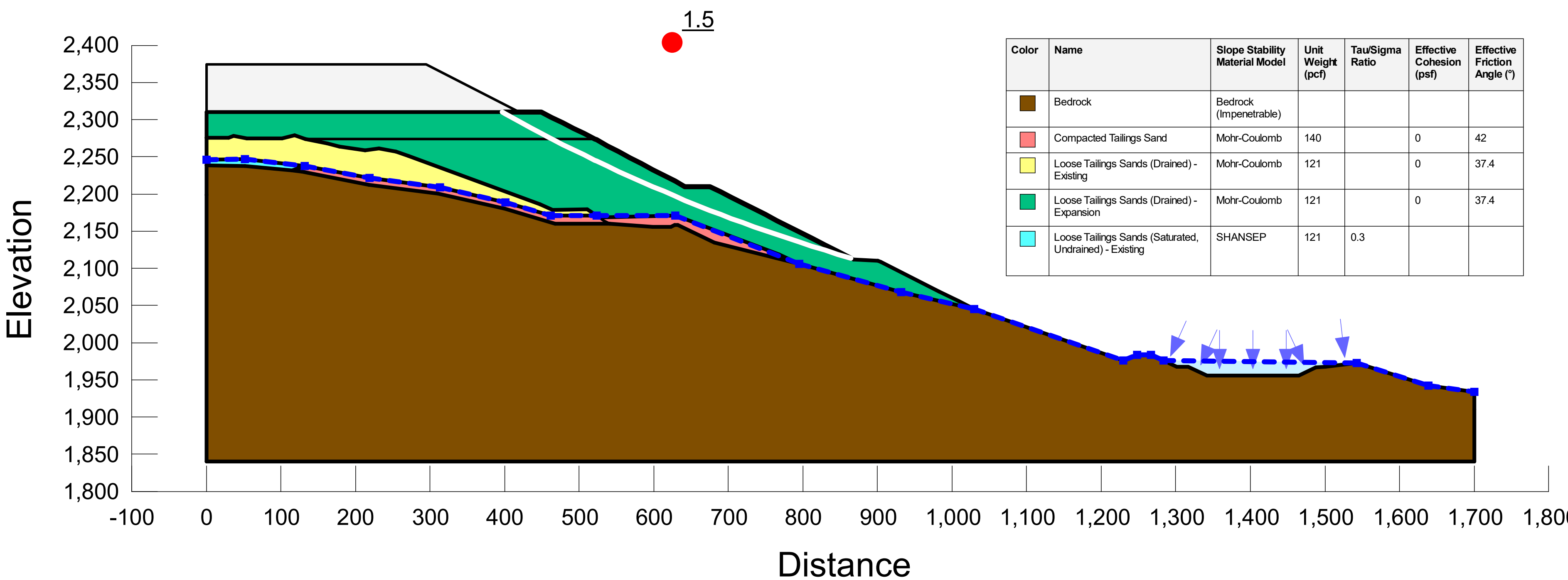
Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Tau/Sigma Ratio	Effective Cohesion (psf)	Effective Friction Angle (°)
	Bedrock	Bedrock (Impenetrable)				
	Compacted Tailings Sand	Mohr-Coulomb	140		0	42
	Loose Tailings Sands (Drained) - Existing	Mohr-Coulomb	121		0	37.4
	Loose Tailings Sands (Drained) - Expansion	Mohr-Coulomb	121		0	37.4
	Loose Tailings Sands (Saturated, Undrained) - Existing	SHANSEP	121	0.3		

Barton RMSF
Section E
Undrained Static Slope Stability Analysis
Stage 2 Expansion - Crest = 2274 fmsl



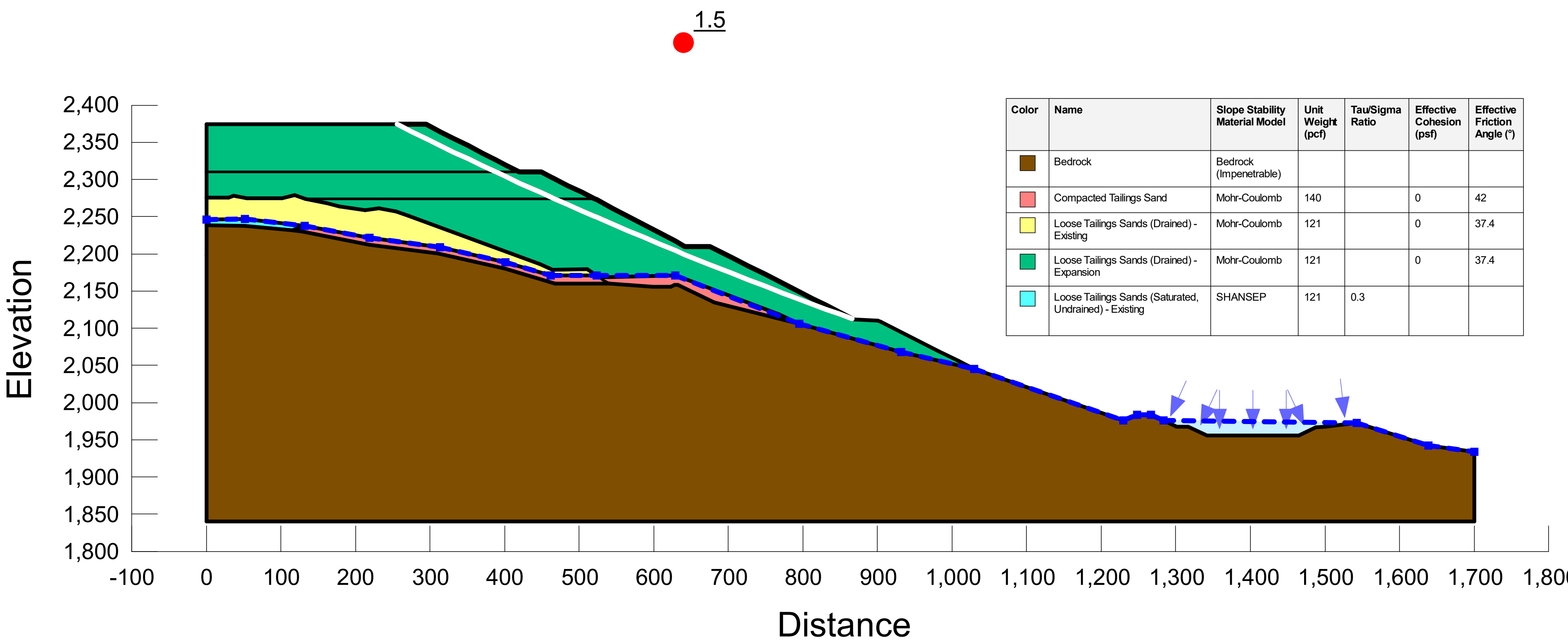
Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Tau/Sigma Ratio	Effective Cohesion (psf)	Effective Friction Angle (°)
	Bedrock	Bedrock (Impenetrable)				
	Compacted Tailings Sand	Mohr-Coulomb	140		0	42
	Loose Tailings Sands (Drained) - Existing	Mohr-Coulomb	121		0	37.4
	Loose Tailings Sands (Drained) - Expansion	Mohr-Coulomb	121		0	37.4
	Loose Tailings Sands (Saturated, Undrained) - Existing	SHANSEP	121	0.3		

Barton RMSF
Section E
Undrained Static Slope Stability Analysis
Stage 3 Expansion - Crest = 2310 fmsl



Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Tau/Sigma Ratio	Effective Cohesion (psf)	Effective Friction Angle (°)
	Bedrock	Bedrock (Impenetrable)				
	Compacted Tailings Sand	Mohr-Coulomb	140		0	42
	Loose Tailings Sands (Drained) - Existing	Mohr-Coulomb	121		0	37.4
	Loose Tailings Sands (Drained) - Expansion	Mohr-Coulomb	121		0	37.4
	Loose Tailings Sands (Saturated, Undrained) - Existing	SHANSEP	121	0.3		

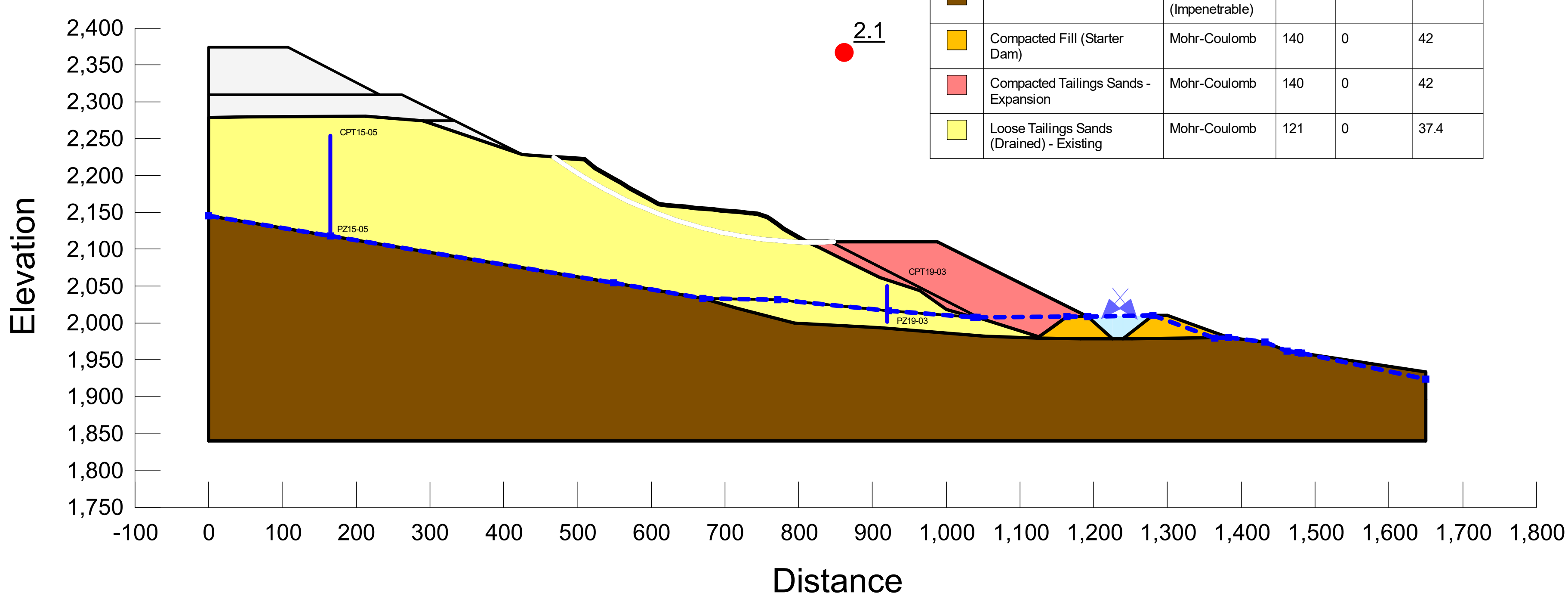
Barton RMSF
Section E
Undrained Static Slope Stability Analysis
Stage 4 Expansion - Crest = 2374 fmsl



Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Tau/Sigma Ratio	Effective Cohesion (psf)	Effective Friction Angle (°)
	Bedrock	Bedrock (Impenetrable)				
	Compacted Tailings Sand	Mohr-Coulomb	140		0	42
	Loose Tailings Sands (Drained) - Existing	Mohr-Coulomb	121		0	37.4
	Loose Tailings Sands (Drained) - Expansion	Mohr-Coulomb	121		0	37.4
	Loose Tailings Sands (Saturated, Undrained) - Existing	SHANSEP	121	0.3		

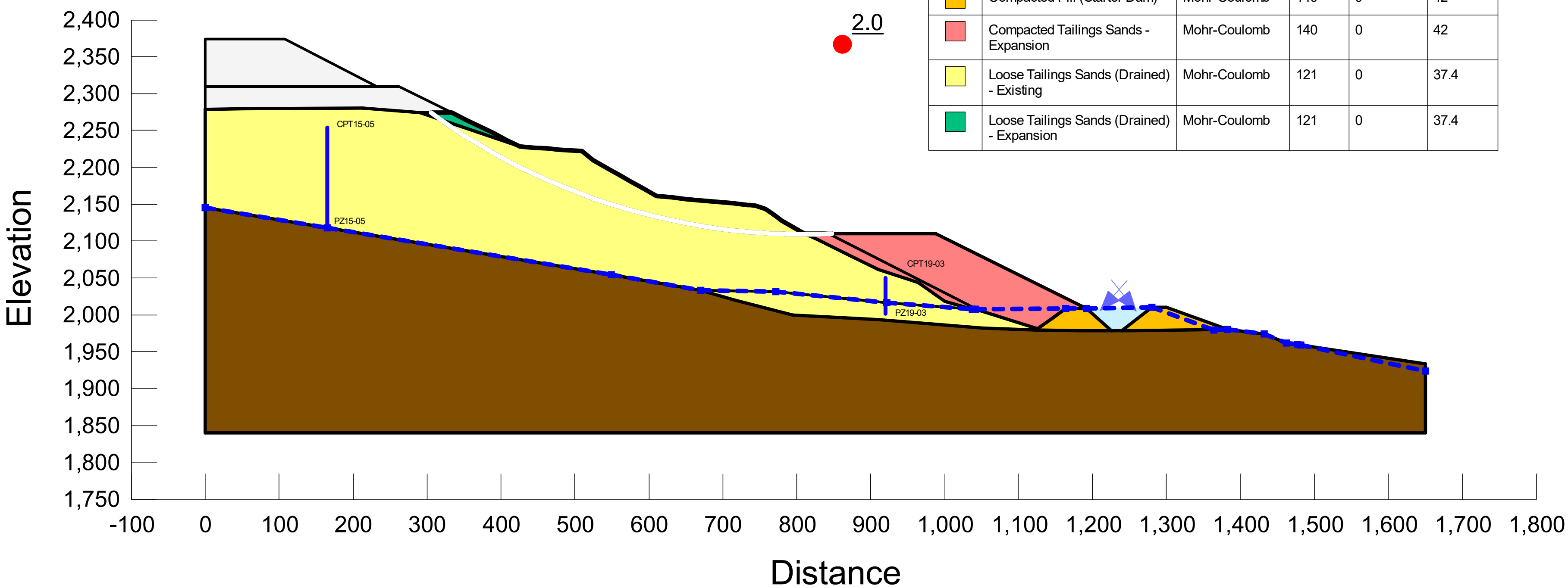
Barton RMSF
Section F
Drained Static Slope Stability Analysis
Stage 1 Expansion - Crest = 2210 fmsl

Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
	Bedrock	Bedrock (Impenetrable)			
	Compacted Fill (Starter Dam)	Mohr-Coulomb	140	0	42
	Compacted Tailings Sands - Expansion	Mohr-Coulomb	140	0	42
	Loose Tailings Sands (Drained) - Existing	Mohr-Coulomb	121	0	37.4



Barton RMSF
Section F
Drained Static Slope Stability Analysis
Stage 2 Expansion - Crest = 2274 fmsl

Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
	Bedrock	Bedrock (Impenetrable)			
	Compacted Fill (Starter Dam)	Mohr-Coulomb	140	0	42
	Compacted Tailings Sands - Expansion	Mohr-Coulomb	140	0	42
	Loose Tailings Sands (Drained) - Existing	Mohr-Coulomb	121	0	37.4
	Loose Tailings Sands (Drained) - Expansion	Mohr-Coulomb	121	0	37.4



Barton RMSF
Section F
Drained Static Slope Stability Analysis
Stage 3 Expansion - Crest = 2310 fmsl

Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
	Bedrock	Bedrock (Impenetrable)			
	Compacted Fill (Starter Dam)	Mohr-Coulomb	140	0	42
	Compacted Tailings Sands - Expansion	Mohr-Coulomb	140	0	42
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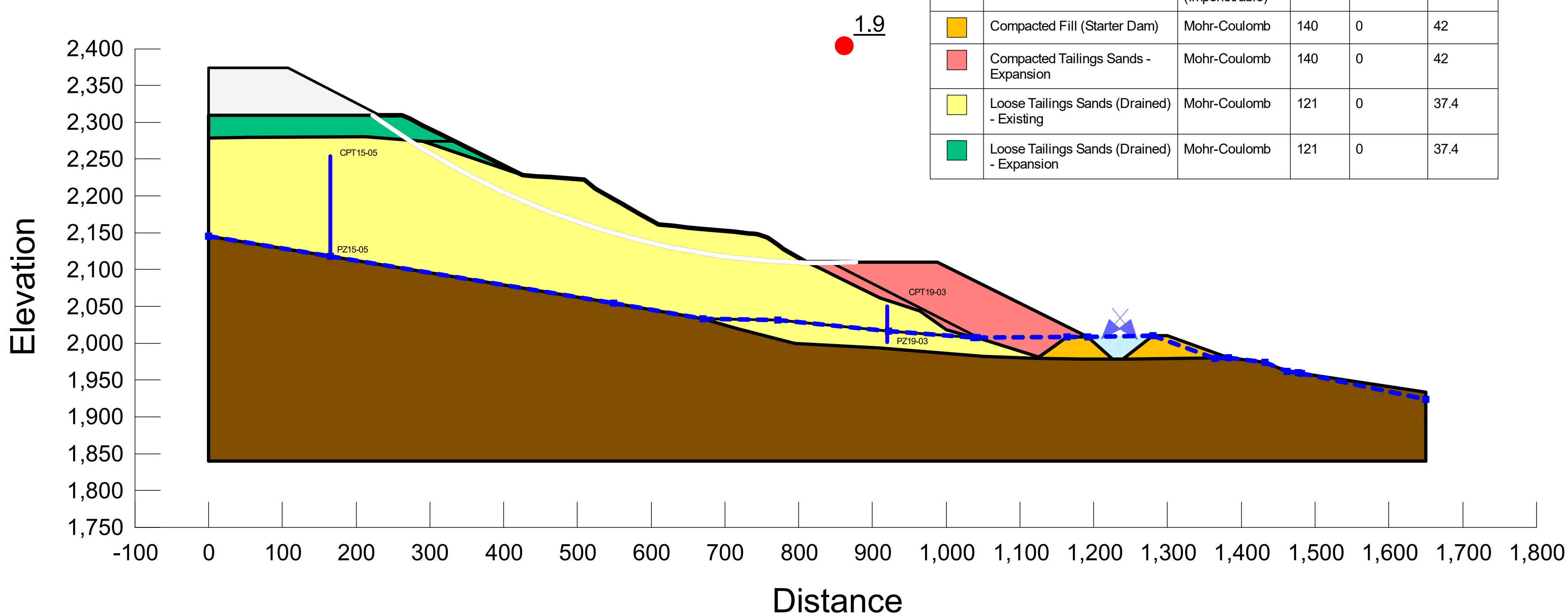
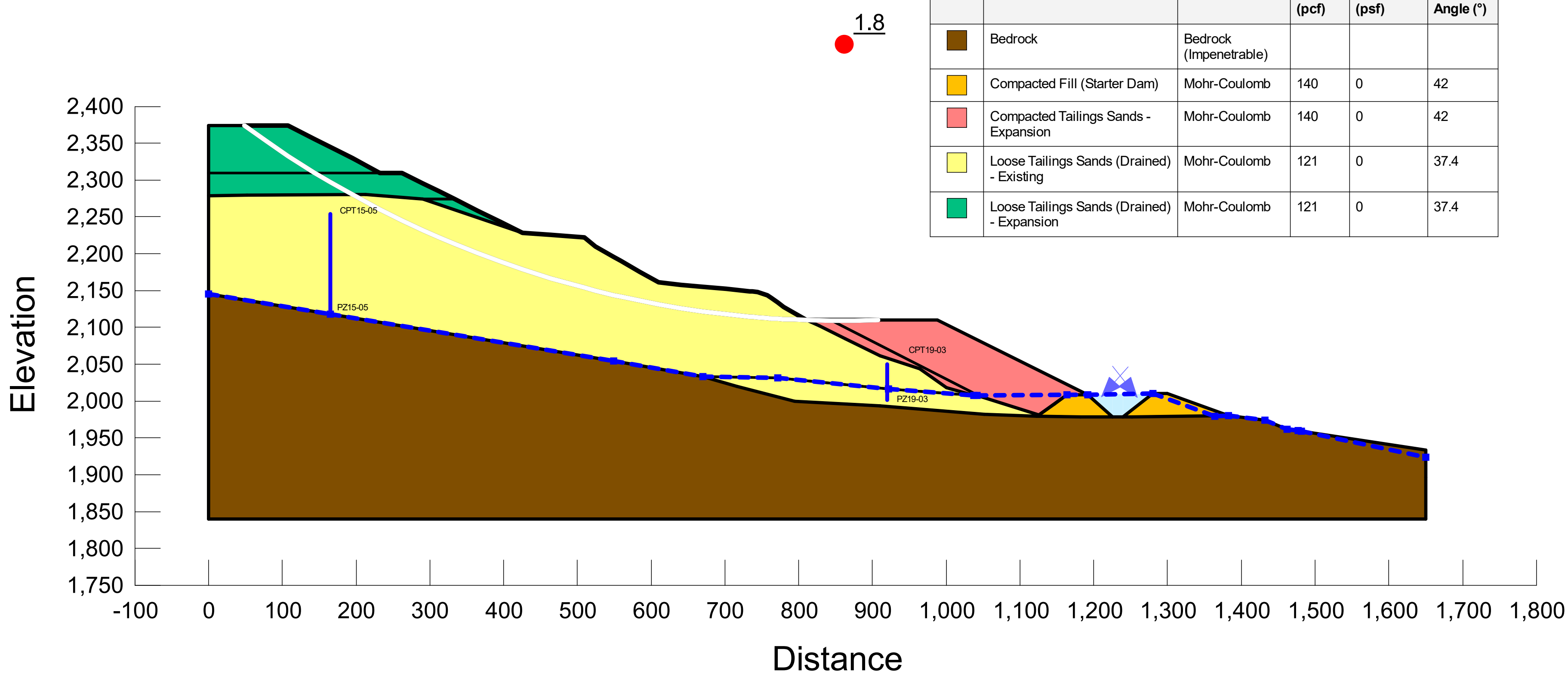


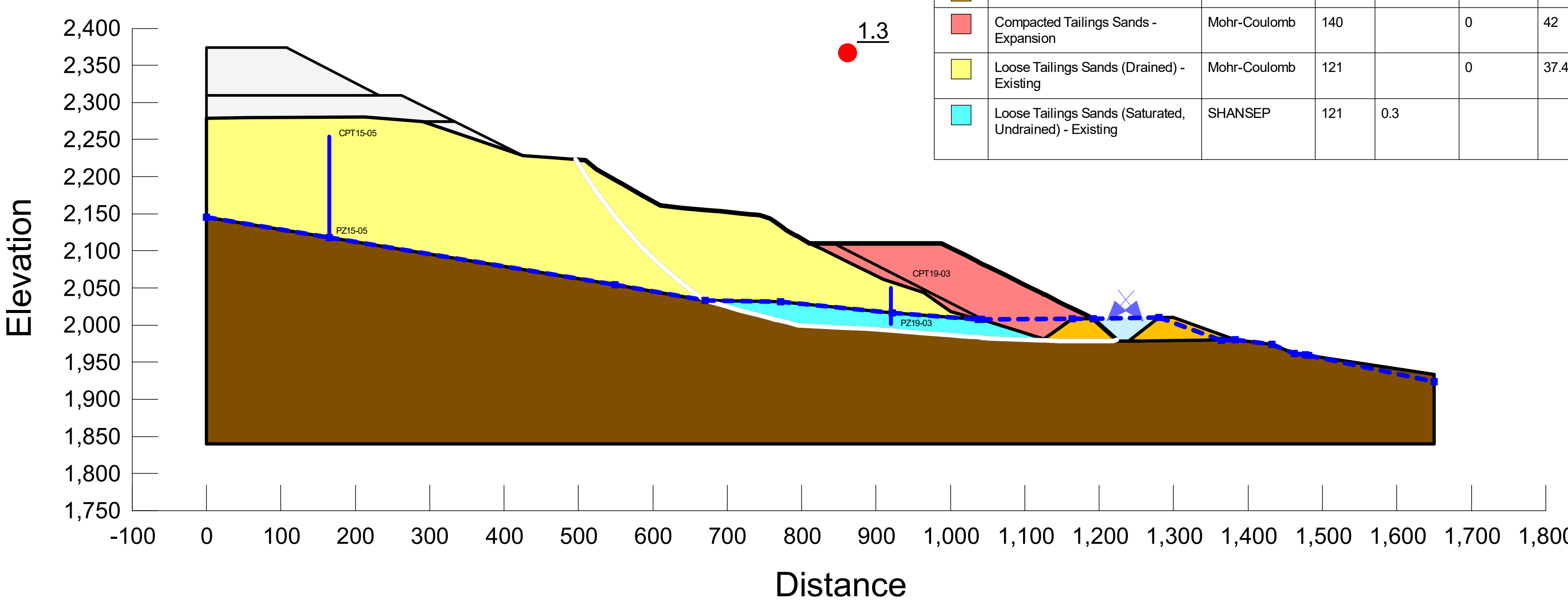
Barton RMSF
Section F
Drained Static Slope Stability Analysis
Stage 4 Expansion - Crest = 2374 fmsl

Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
	Bedrock	Bedrock (Impenetrable)			
	Compacted Fill (Starter Dam)	Mohr-Coulomb	140	0	42
	Compacted Tailings Sands - Expansion	Mohr-Coulomb	140	0	42
	Loose Tailings Sands (Drained) - Existing	Mohr-Coulomb	121	0	37.4
	Loose Tailings Sands (Drained) - Expansion	Mohr-Coulomb	121	0	37.4



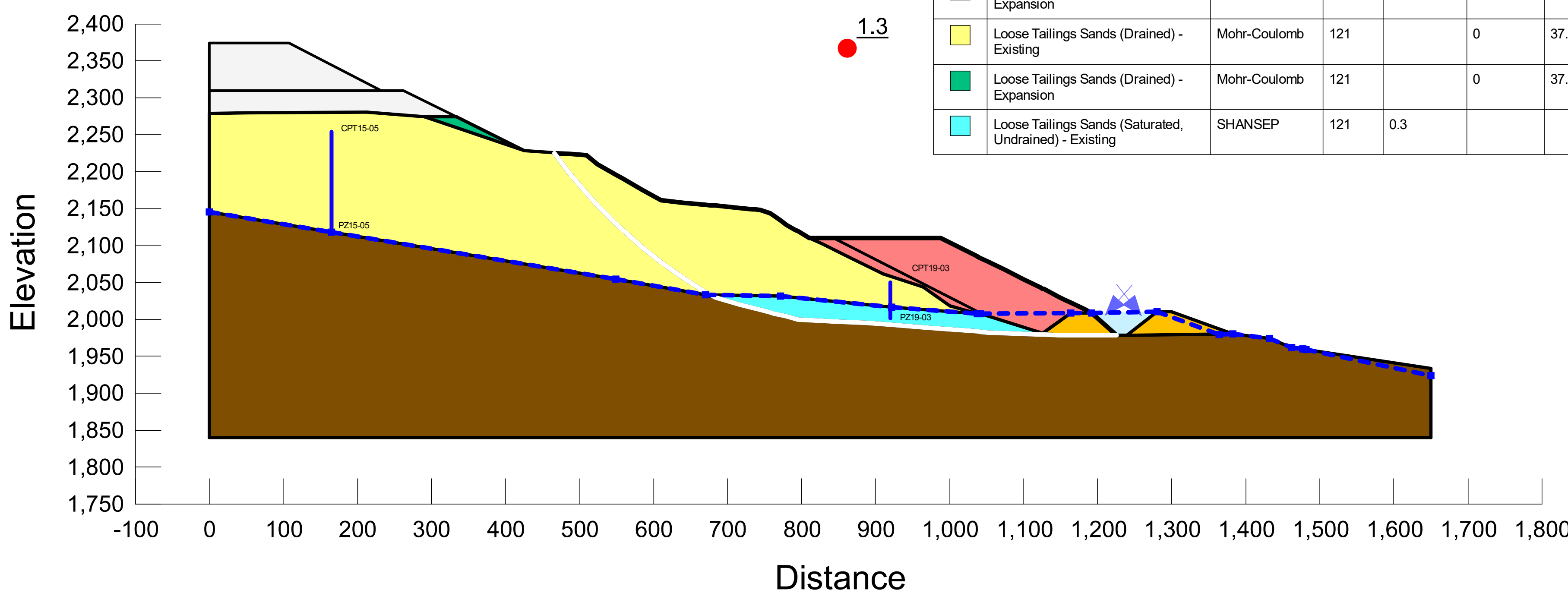
Barton RMSF
Section F
Undrained Static Slope Stability Analysis
Stage 1 Expansion - Crest = 2210 fmsl

Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Tau/Sigma Ratio	Effective Cohesion (psf)	Effective Friction Angle (°)
	Bedrock	Bedrock (Impenetrable)				
	Compacted Fill (Starter Dam)	Mohr-Coulomb	140		0	42
	Compacted Tailings Sands - Expansion	Mohr-Coulomb	140		0	42
	Loose Tailings Sands (Drained) - Existing	Mohr-Coulomb	121		0	37.4
	Loose Tailings Sands (Saturated, Undrained) - Existing	SHANSEP	121	0.3		



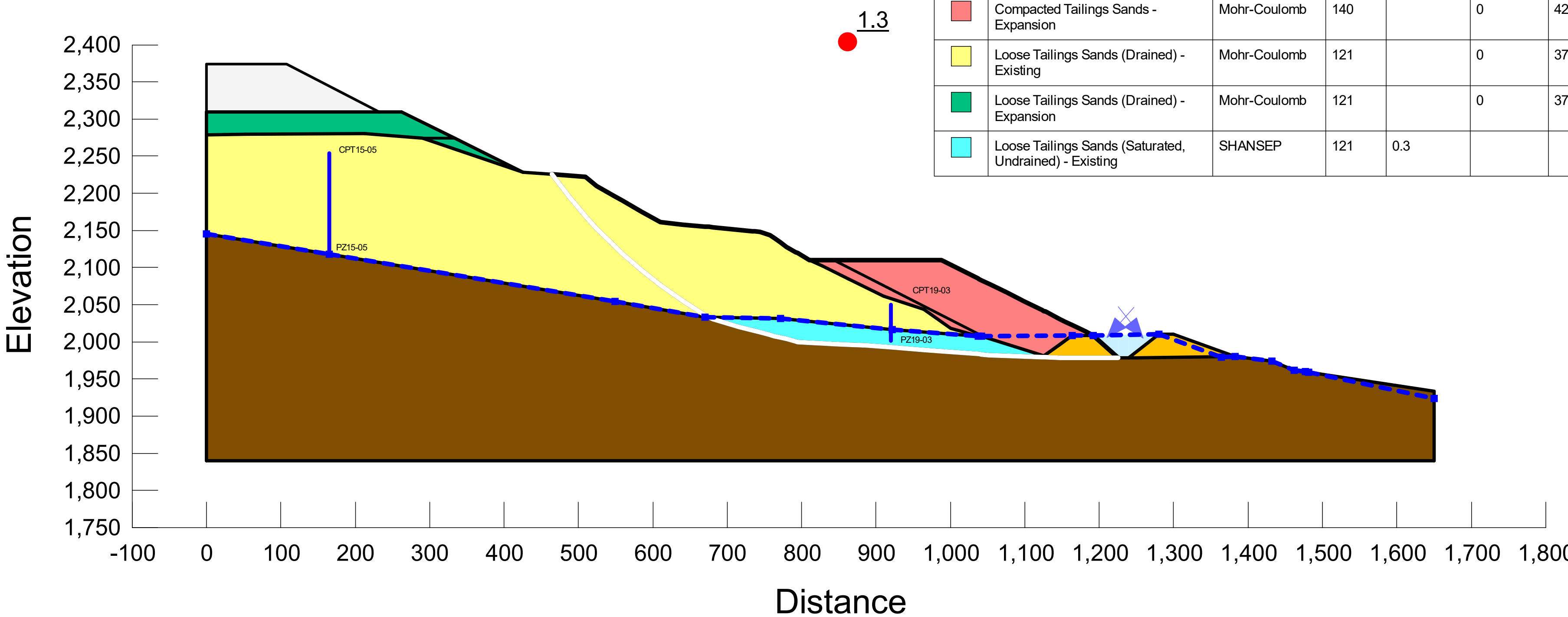
Barton RMSF
Section F
Undrained Static Slope Stability Analysis
Stage 2 Expansion - Crest = 2274 fmsl

Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Tau/Sigma Ratio	Effective Cohesion (psf)	Effective Friction Angle (°)
	Bedrock	Bedrock (Impenetrable)				
	Compacted Fill (Starter Dam)	Mohr-Coulomb	140		0	42
	Compacted Tailings Sands - Expansion	Mohr-Coulomb	140		0	42
	Loose Tailings Sands (Drained) - Existing	Mohr-Coulomb	121		0	37.4
	Loose Tailings Sands (Drained) - Expansion	Mohr-Coulomb	121		0	37.4
	Loose Tailings Sands (Saturated, Undrained) - Existing	SHANSEP	121	0.3		



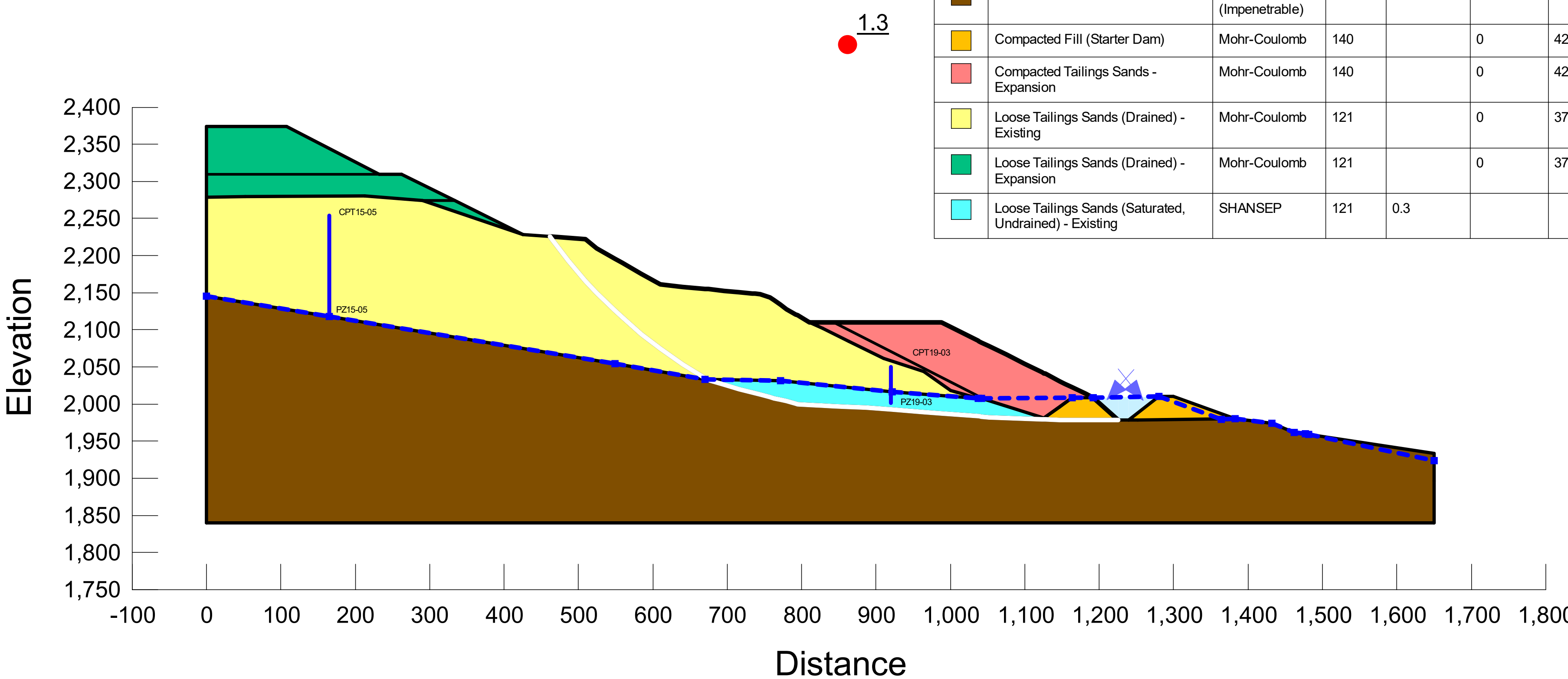
Barton RMSF
Section F
Undrained Static Slope Stability Analysis
Stage 3 Expansion - Crest = 2310 fmsl

Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Tau/Sigma Ratio	Effective Cohesion (psf)	Effective Friction Angle (°)
	Bedrock	Bedrock (Impenetrable)				
	Compacted Fill (Starter Dam)	Mohr-Coulomb	140		0	42
	Compacted Tailings Sands - Expansion	Mohr-Coulomb	140		0	42
	Loose Tailings Sands (Drained) - Existing	Mohr-Coulomb	121		0	37.4
	Loose Tailings Sands (Drained) - Expansion	Mohr-Coulomb	121		0	37.4
	Loose Tailings Sands (Saturated, Undrained) - Existing	SHANSEP	121	0.3		

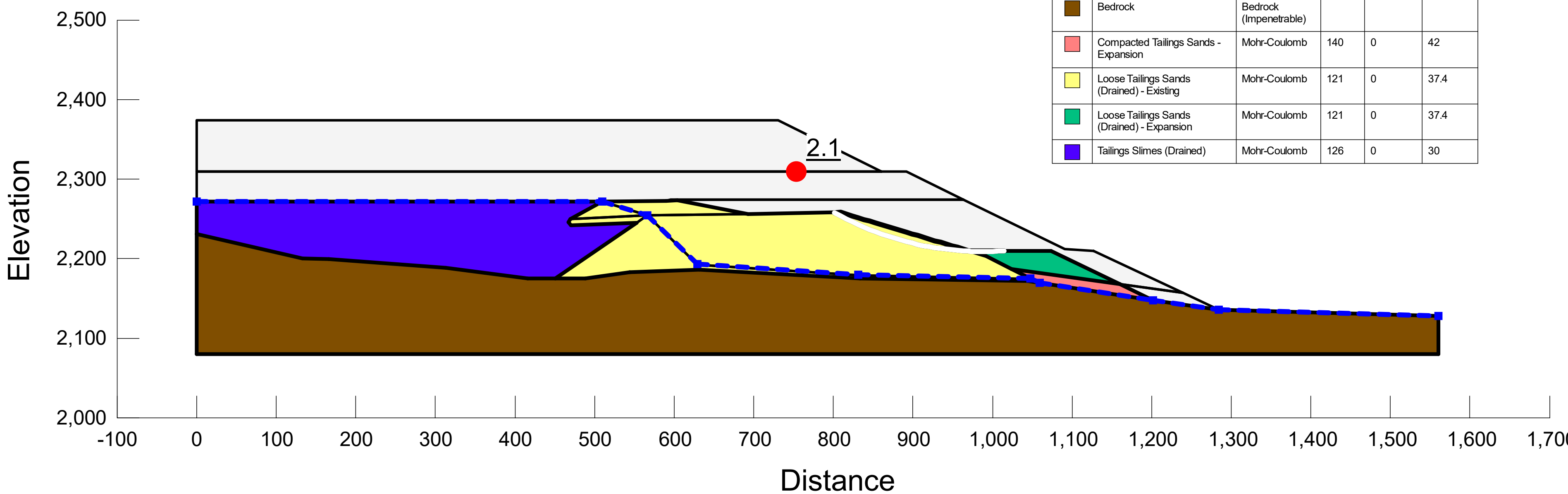


Barton RMSF
Section F
Undrained Static Slope Stability Analysis
Stage 4 Expansion - Crest = 2374 fmsl

Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Tau/Sigma Ratio	Effective Cohesion (psf)	Effective Friction Angle (°)
	Bedrock	Bedrock (Impenetrable)				
	Compacted Fill (Starter Dam)	Mohr-Coulomb	140		0	42
	Compacted Tailings Sands - Expansion	Mohr-Coulomb	140		0	42
	Loose Tailings Sands (Drained) - Existing	Mohr-Coulomb	121		0	37.4
	Loose Tailings Sands (Drained) - Expansion	Mohr-Coulomb	121		0	37.4
	Loose Tailings Sands (Saturated, Undrained) - Existing	SHANSEP	121	0.3		



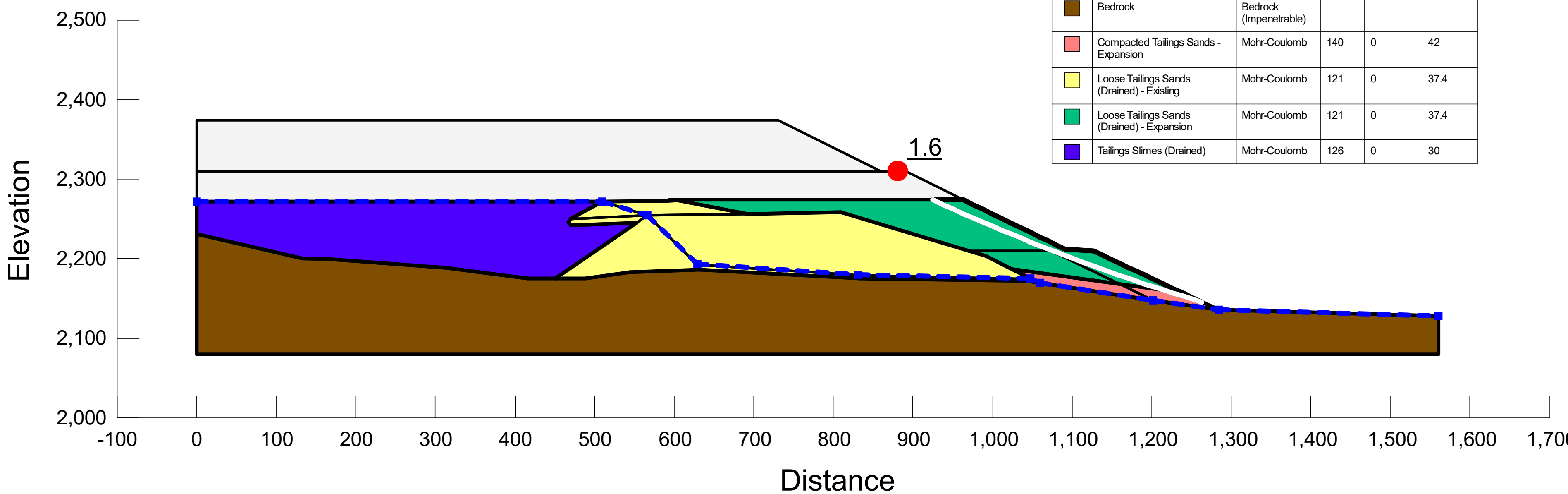
Barton RMSF
Section G
Drained Static Slope Stability Analysis
Stage 1 Expansion - Crest = 2210 fmsl



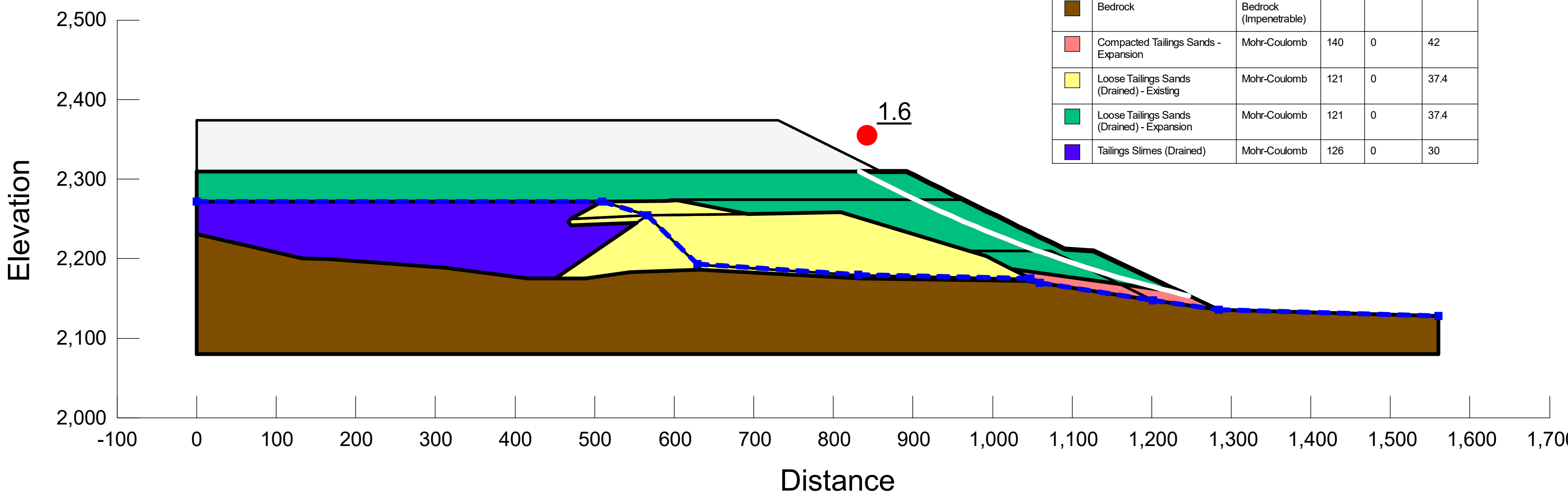
Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
	Bedrock	Bedrock (Impenetrable)			
	Compacted Tailings Sands - Expansion	Mohr-Coulomb	140	0	42
	Loose Tailings Sands (Drained) - Existing	Mohr-Coulomb	121	0	37.4
	Loose Tailings Sands (Drained) - Expansion	Mohr-Coulomb	121	0	37.4
	Tailings Slimes (Drained)	Mohr-Coulomb	126	0	30

Barton RMSF
Section G
Drained Static Slope Stability Analysis
Stage 2 Expansion - Crest = 2274 fmsl

Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
	Bedrock	Bedrock (Impenetrable)			
	Compacted Tailings Sands - Expansion	Mohr-Coulomb	140	0	42
	Loose Tailings Sands (Drained) - Existing	Mohr-Coulomb	121	0	37.4
	Loose Tailings Sands (Drained) - Expansion	Mohr-Coulomb	121	0	37.4
	Tailings Slimes (Drained)	Mohr-Coulomb	126	0	30

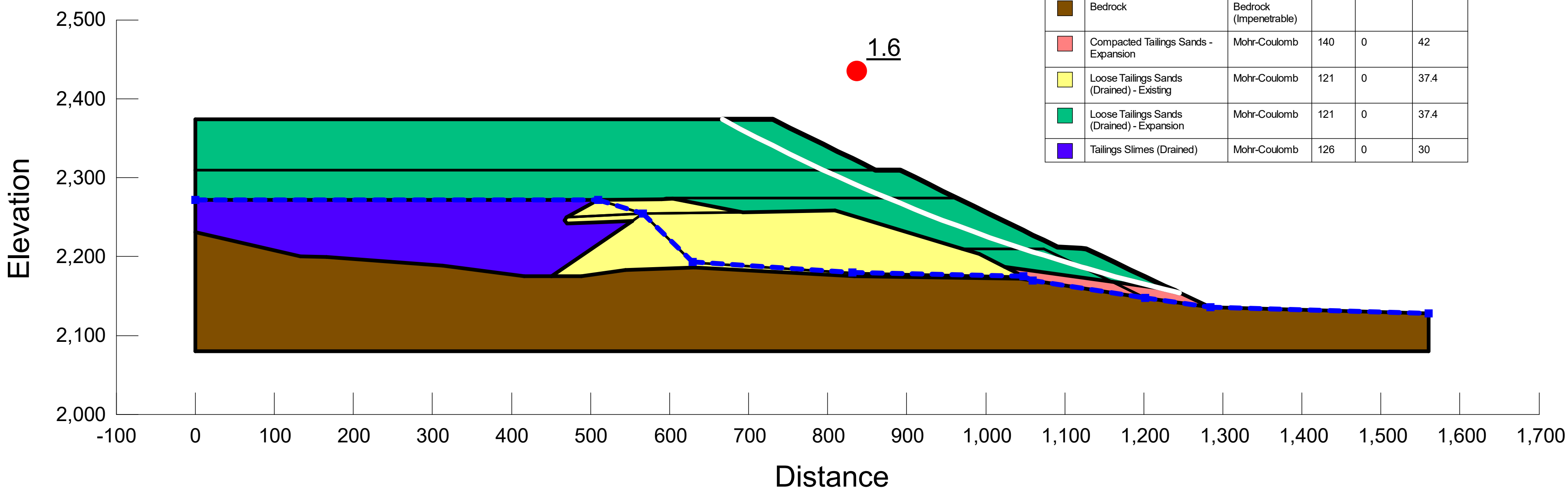


Barton RMSF
Section G
Drained Static Slope Stability Analysis
Stage 3 Expansion - Crest = 2310 fmsl



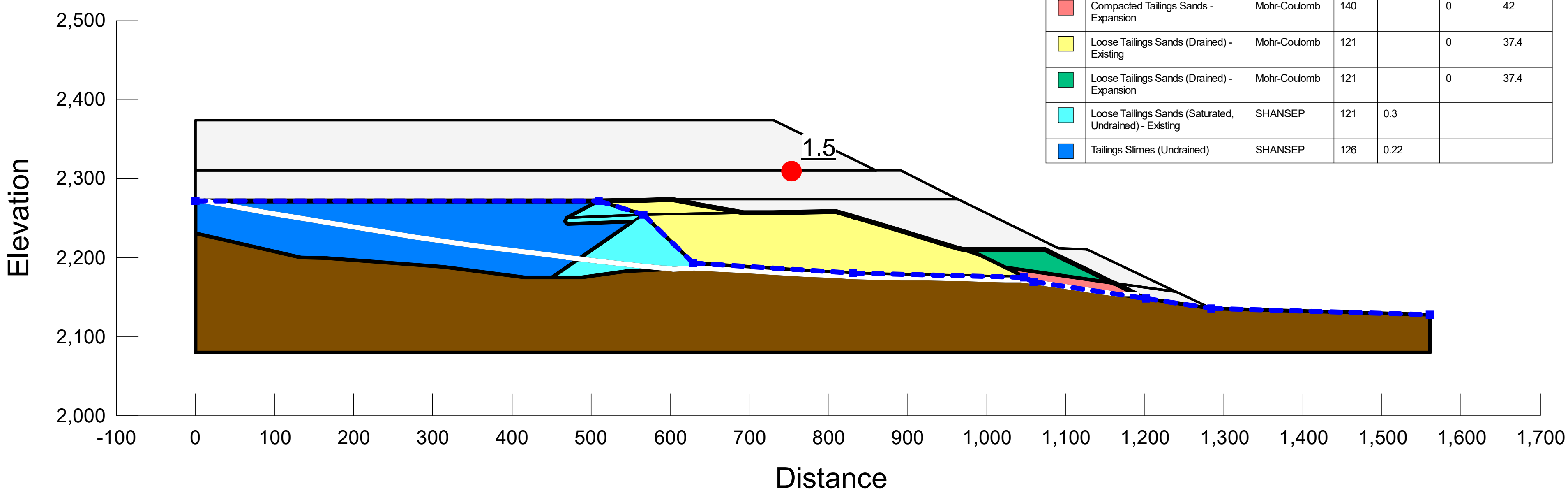
Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
	Bedrock	Bedrock (Impenetrable)			
	Compacted Tailings Sands - Expansion	Mohr-Coulomb	140	0	42
	Loose Tailings Sands (Drained) - Existing	Mohr-Coulomb	121	0	37.4
	Loose Tailings Sands (Drained) - Expansion	Mohr-Coulomb	121	0	37.4
	Tailings Slimes (Drained)	Mohr-Coulomb	126	0	30

Barton RMSF
Section G
Drained Static Slope Stability Analysis
Stage 4 Expansion - Crest = 2374 fmsl



Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
	Bedrock	Bedrock (Impenetrable)			
	Compacted Tailings Sands - Expansion	Mohr-Coulomb	140	0	42
	Loose Tailings Sands (Drained) - Existing	Mohr-Coulomb	121	0	37.4
	Loose Tailings Sands (Drained) - Expansion	Mohr-Coulomb	121	0	37.4
	Tailings Slimes (Drained)	Mohr-Coulomb	126	0	30

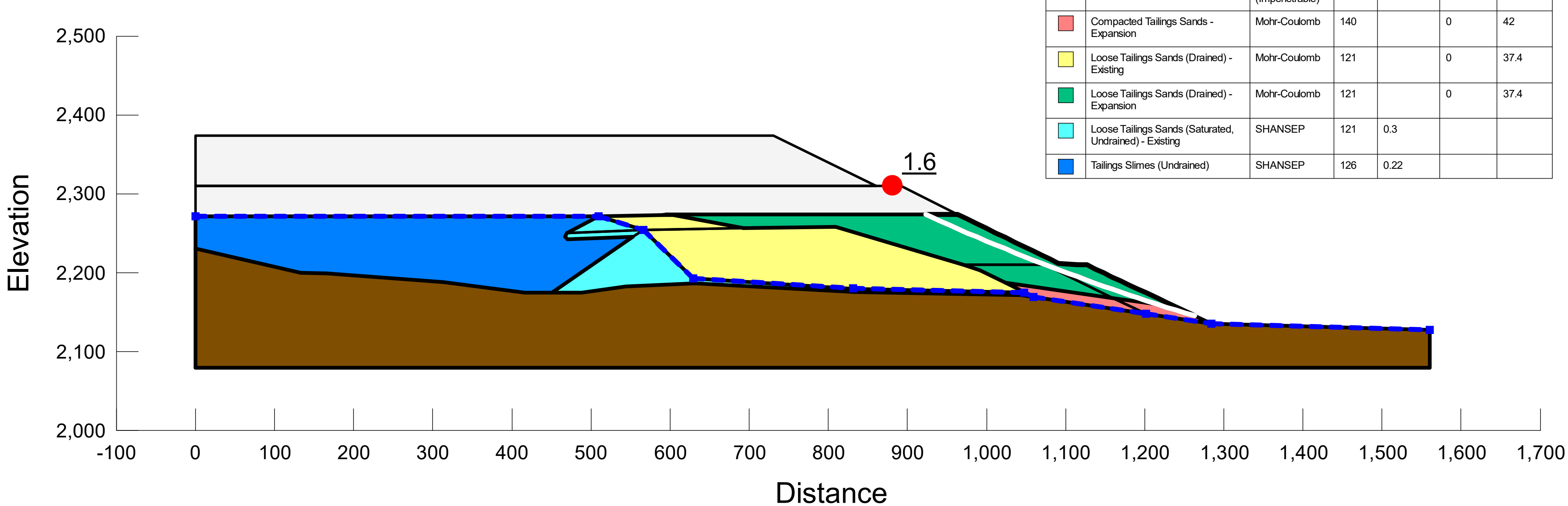
Barton RMSF
Section G
Undrained Static Slope Stability Analysis
Stage 1 Expansion - Crest = 2210 fmsl



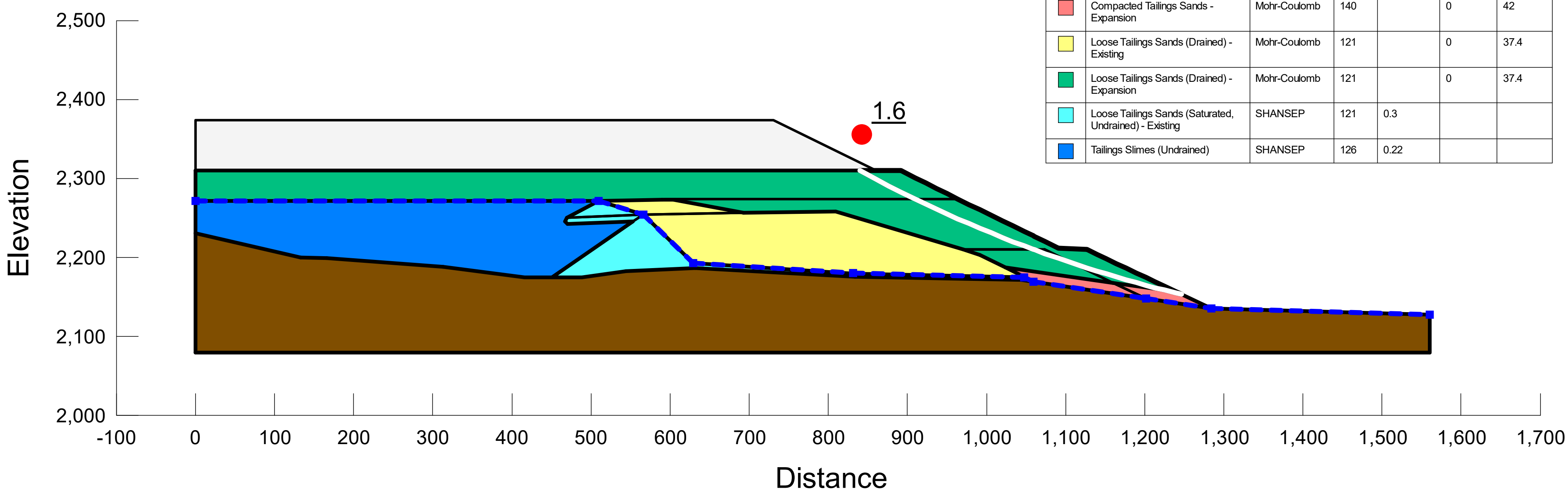
Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Tau/Sigma Ratio	Effective Cohesion (psf)	Effective Friction Angle (°)
	Bedrock	Bedrock (Impenetrable)				
	Compacted Tailings Sands - Expansion	Mohr-Coulomb	140		0	42
	Loose Tailings Sands (Drained) - Existing	Mohr-Coulomb	121		0	37.4
	Loose Tailings Sands (Drained) - Expansion	Mohr-Coulomb	121		0	37.4
	Loose Tailings Sands (Saturated, Undrained) - Existing	SHANSEP	121	0.3		
	Tailings Slimes (Undrained)	SHANSEP	126	0.22		

Barton RMSF
Section G
Undrained Static Slope Stability Analysis
Stage 2 Expansion - Crest = 2274 fmsl

Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Tau/Sigma Ratio	Effective Cohesion (psf)	Effective Friction Angle (°)
	Bedrock	Bedrock (Impenetrable)				
	Compacted Tailings Sands - Expansion	Mohr-Coulomb	140		0	42
	Loose Tailings Sands (Drained) - Existing	Mohr-Coulomb	121		0	37.4
	Loose Tailings Sands (Drained) - Expansion	Mohr-Coulomb	121		0	37.4
	Loose Tailings Sands (Saturated, Undrained) - Existing	SHANSEP	121	0.3		
	Tailings Slimes (Undrained)	SHANSEP	126	0.22		

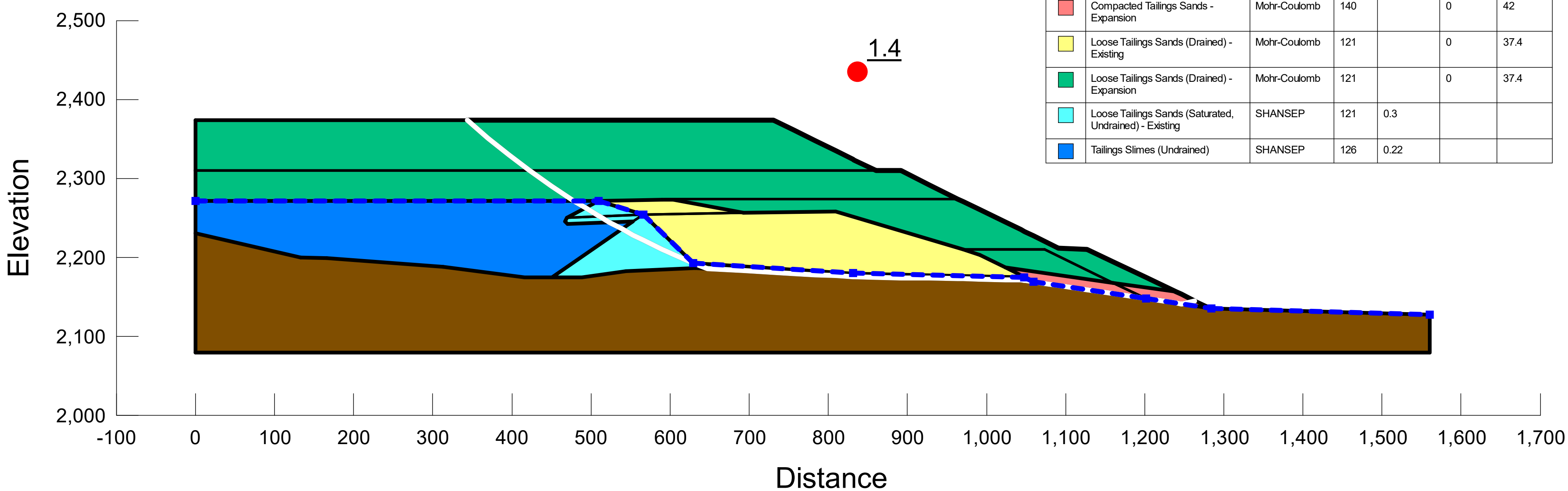


Barton RMSF
Section G
Undrained Static Slope Stability Analysis
Stage 3 Expansion - Crest = 2310 fmsl



Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Tau/Sigma Ratio	Effective Cohesion (psf)	Effective Friction Angle (°)
	Bedrock	Bedrock (Impenetrable)				
	Compacted Tailings Sands - Expansion	Mohr-Coulomb	140		0	42
	Loose Tailings Sands (Drained) - Existing	Mohr-Coulomb	121		0	37.4
	Loose Tailings Sands (Drained) - Expansion	Mohr-Coulomb	121		0	37.4
	Loose Tailings Sands (Saturated, Undrained) - Existing	SHANSEP	121	0.3		
	Tailings Slimes (Undrained)	SHANSEP	126	0.22		

Barton RMSF
Section G
Undrained Static Slope Stability Analysis
Stage 4 Expansion - Crest = 2374 fmsl



Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Tau/Sigma Ratio	Effective Cohesion (psf)	Effective Friction Angle (°)
	Bedrock	Bedrock (Impenetrable)				
	Compacted Tailings Sands - Expansion	Mohr-Coulomb	140		0	42
	Loose Tailings Sands (Drained) - Existing	Mohr-Coulomb	121		0	37.4
	Loose Tailings Sands (Drained) - Expansion	Mohr-Coulomb	121		0	37.4
	Loose Tailings Sands (Saturated, Undrained) - Existing	SHANSEP	121	0.3		
	Tailings Slimes (Undrained)	SHANSEP	126	0.22		

	Job No:	19-53102
	Client:	Barton International
	Project:	145 Ruby Mountain Rd, North River, NY
	Start Date:	09-Oct-2019
	End Date:	11-Oct-2019

CONE PENETRATION TEST SUMMARY

Sounding ID	File Name	Date	Cone	Assumed Phreatic Surface[1] (ft)	Final Depth (ft)	Northing[2] (m)	Easting[2] (m)	Refer to Notation Number
CPT19-01	19-53102_CP01	09-Oct-2019	567:T1500F15U500	35.0	40.85	4842054	571014	3
CPT19-01A	19-53102_CP01A	09-Oct-2019	567:T1500F15U500	35.0	35.35	4842055	571014	3
CPT19-02	19-53102_CP02	10-Oct-2019	567:T1500F15U500	46.9	56.92	4842136	571075	
CPT19-03	19-53102_CP03	10-Oct-2019	567:T1500F15U500	29.8	48.31	4842192	571132	
CPT19-04	19-53102_CP04	10-Oct-2019	567:T1500F15U500		16.73	4842245	571181	4
CPT19-04A	19-53102_CP04A	10-Oct-2019	567:T1500F15U500		16.98	4842246	571181	4
CPT19-04B	19-53102_CP04B	11-Oct-2019	567:T1500F15U500		19.11	4842251	571170	4
CPT19-05	19-53102_CP05	11-Oct-2019	567:T1500F15U500	40.0	40.11	4842420	571113	3
CPT19-05A	19-53102_CP05A	11-Oct-2019	567:T1500F15U500	40.0	40.68	4842406	571103	3
CPT19-06	19-53102_CP06	11-Oct-2019	567:T1500F15U500	24.0	27.72	4842402	571016	3
Totals	10 soundings				342.76			

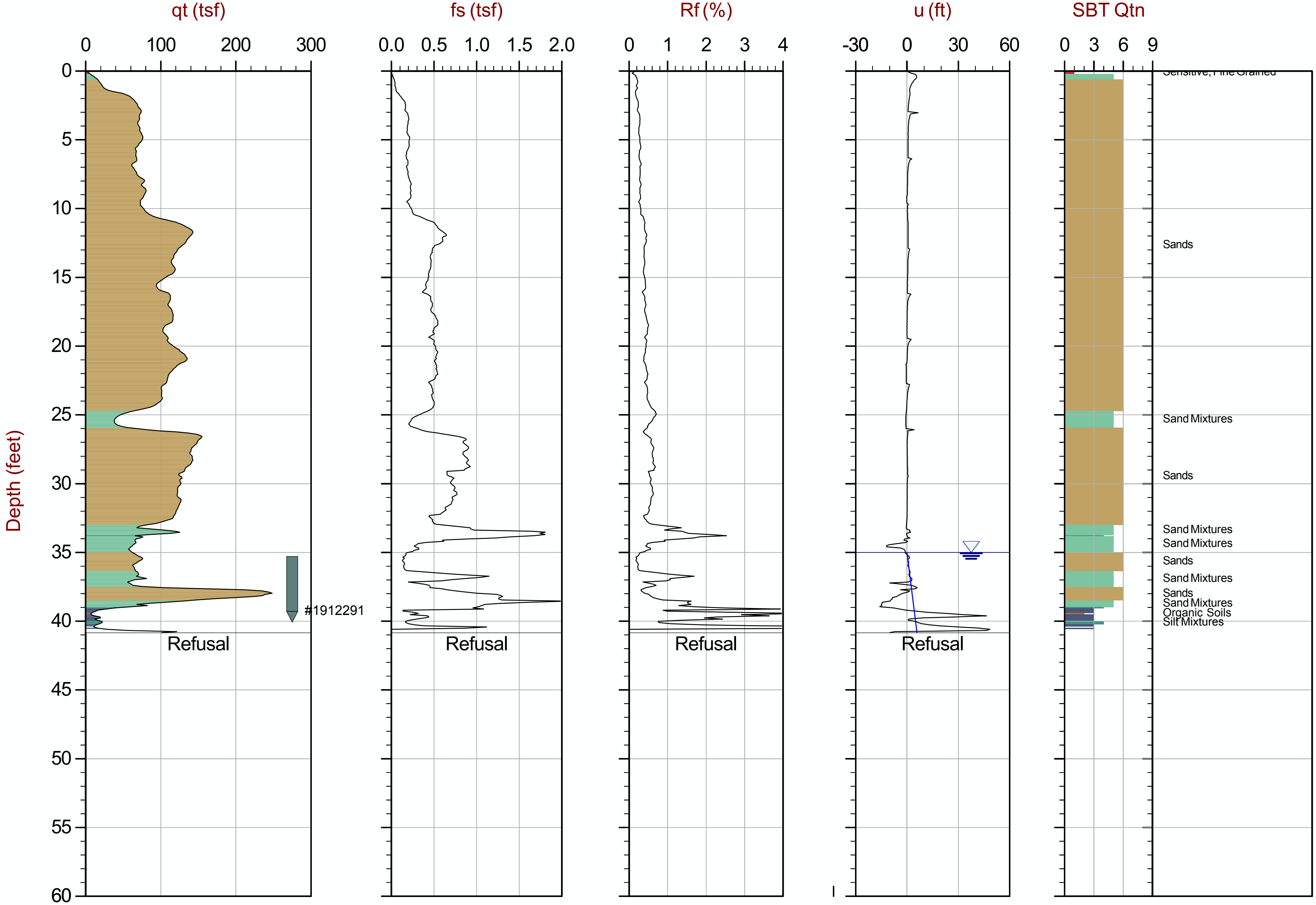
1. The assumed phreatic surface was based on pore pressure dissipation tests. Equilibrium pore pressure profiles were assumed for the calculated parameters.
2. Coordinates were acquired using a MR-350 GlobalSat GPS Receiver in datum: WGS84 / UTM Zone 18 North.
3. The assumed phreatic surface was estimated from the dynamic pore pressure data.
4. No phreatic surface detected.

ConeTec

Barton International

Job No: 19-53102
Date: 2019-10-09 11:51
Site: 145 Ruby Mountain Rd, North River, NY

Sounding: CPT19-01
Cone: 567:T1500F15U500



Max Depth: 12.450 m / 40.85 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 19-53102_CP01.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: UTM Zone 18 N: 4842054m E: 571014m

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

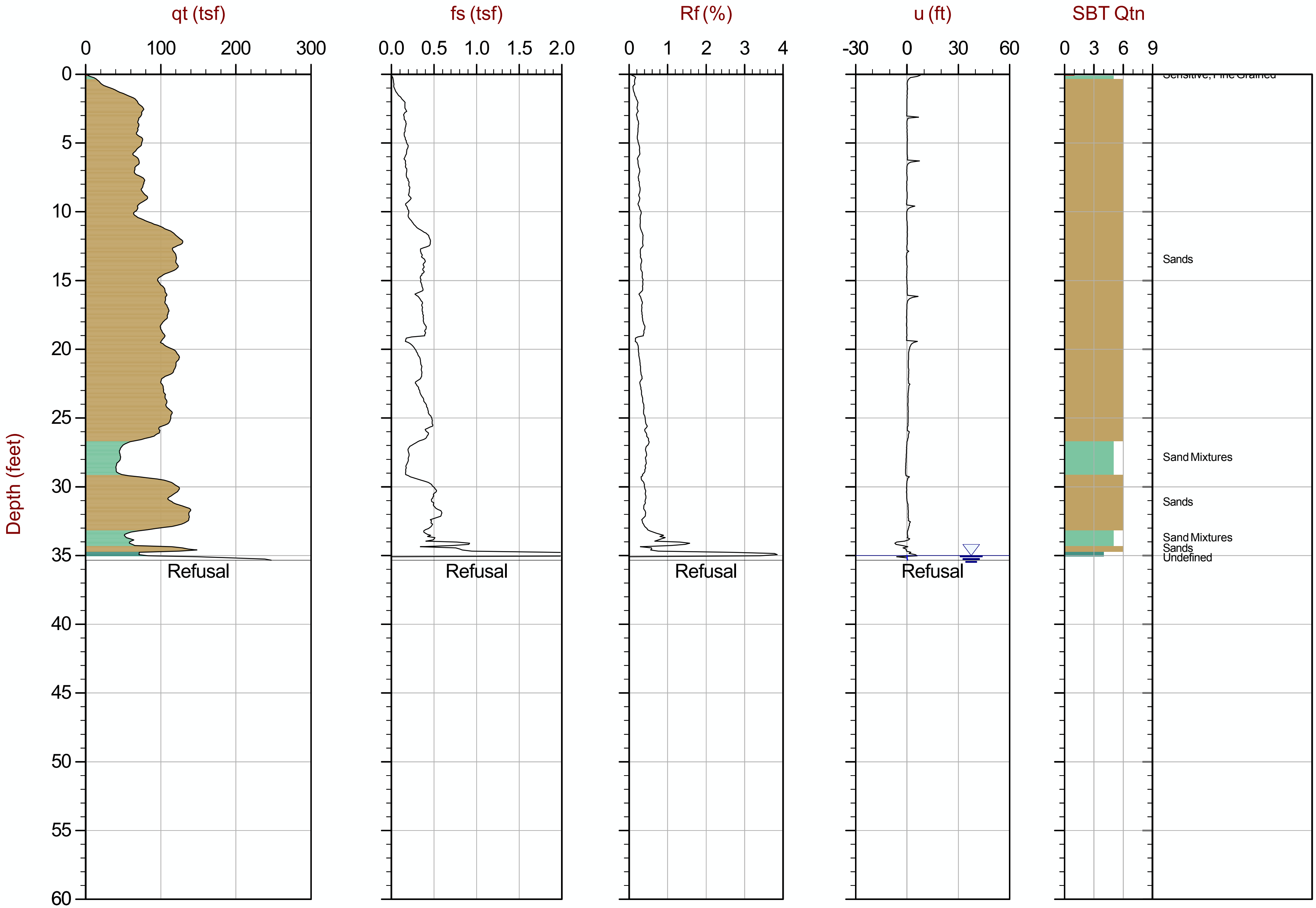
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Barton International

Job No: 19-53102
Date: 2019-10-09 12:36
Site: 145 Ruby Mountain Rd, North River, NY

Sounding: CPT19-01A
Cone: 567:T1500F15U500



Max Depth: 10.775 m / 35.35 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 19-53102_CP01A.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: UTM Zone 18 N: 4842055m E: 571014m

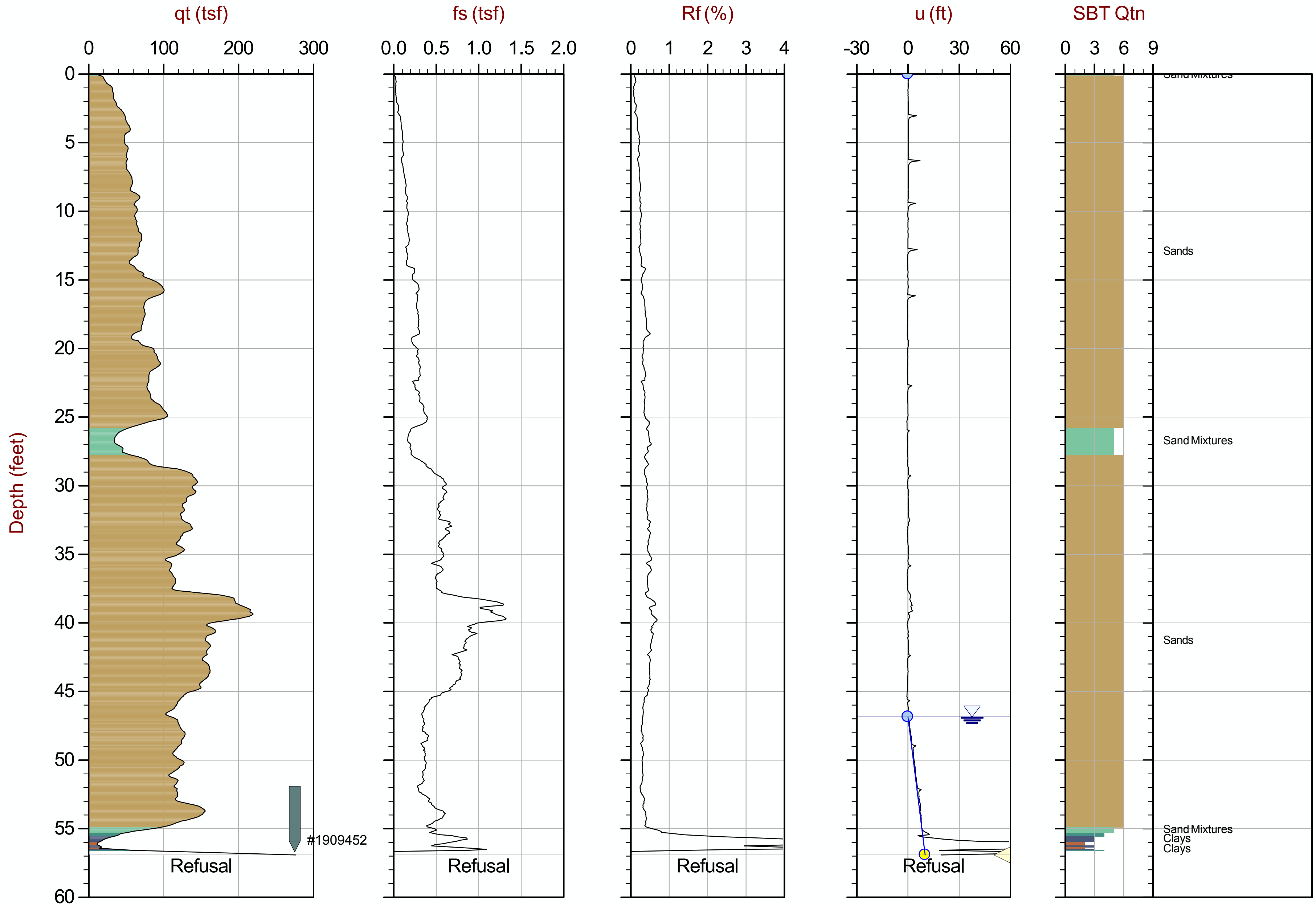
Hydrostatic Line ○ Ueq ● Assumed Ueq ◁ PPD, Ueq achieved ◁ PPD, Ueq not achieved

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

CONETEC

Barton International

Job No: 19-53102
Date: 2019-10-10 07:31
Site: 145 Ruby Mountain Rd, North River, NY
Sounding: CPT19-02
Cone: 567:T1500F15U500



Max Depth: 17.350 m / 56.92 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 19-53102_CP02.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: UTM Zone 18 N: 4842136m E: 571075m

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

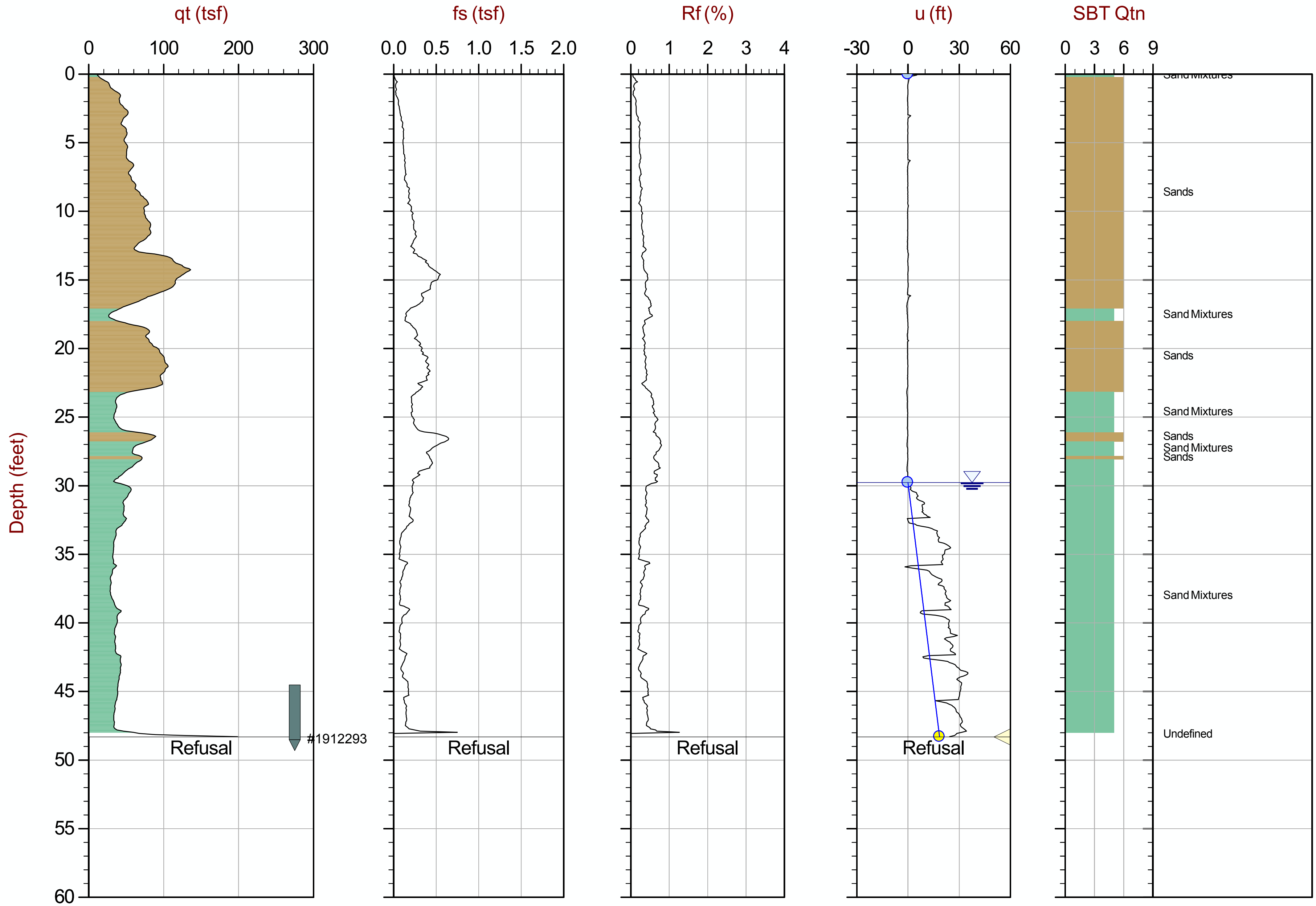
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Barton International

Job No: 19-53102
Date: 2019-10-10 09:47
Site: 145 Ruby Mountain Rd, North River, NY

Sounding: CPT19-03
Cone: 567:T1500F15U500



Max Depth: 14.725 m / 48.31 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 19-53102_CP03.COR
Unit Wt: SBTQtn (PKR2009)

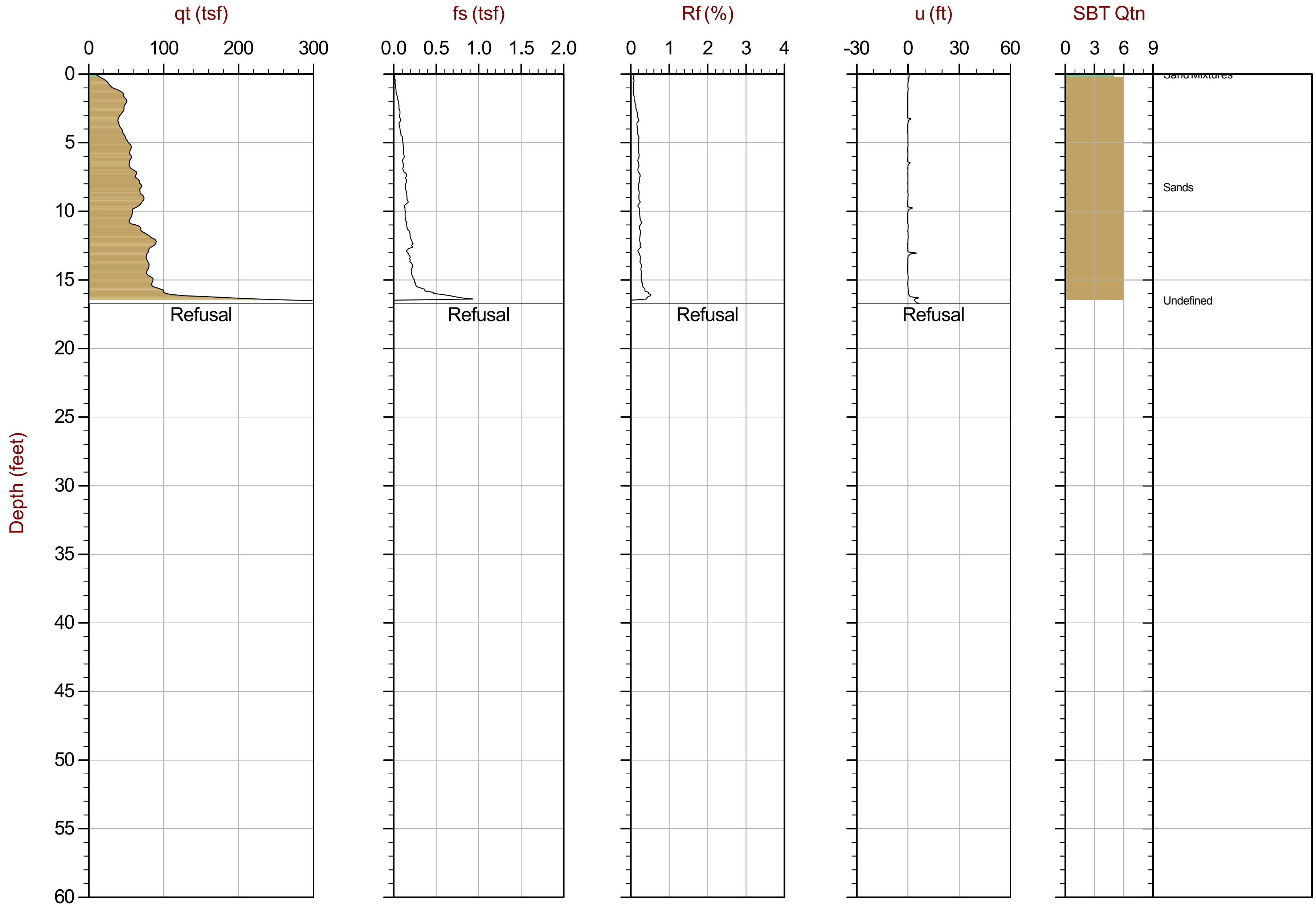
SBT: Robertson, 2009 and 2010
Coords: UTM Zone 18 N: 4842192m E: 571132m

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

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

Barton International

Job No: 19-53102
Date: 2019-10-10 12:07
Site: 145 Ruby Mountain Rd, North River, NY
Sounding: CPT19-04
Cone: 567:T1500F15U500



Max Depth: 5.100 m / 16.73 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 19-53102_CP04.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: UTM Zone 18 N: 4842245m E: 571181m

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

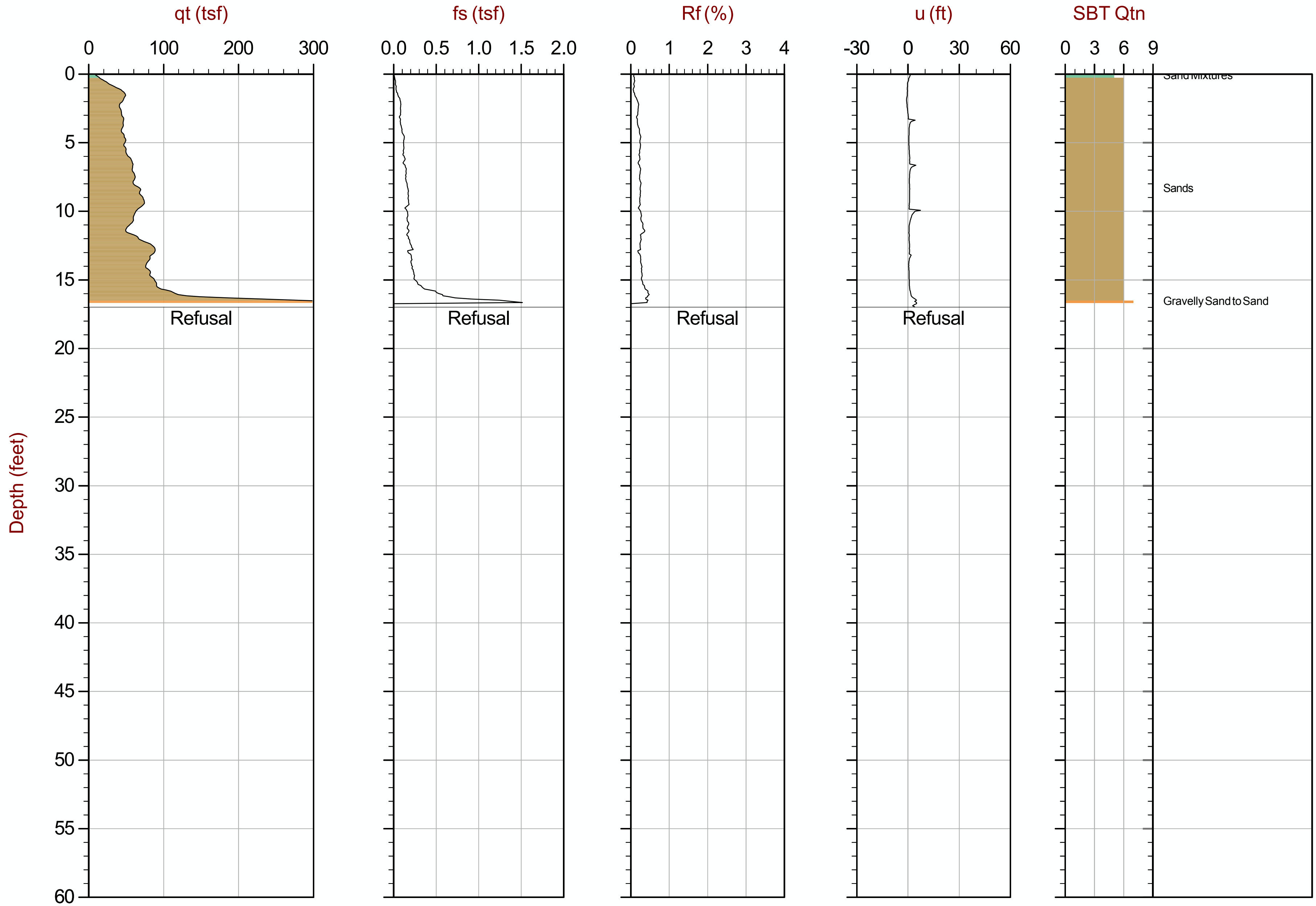
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Barton International

Job No: 19-53102
Date: 2019-10-10 12:34
Site: 145 Ruby Mountain Rd, North River, NY

Sounding: CPT19-04A
Cone: 567:T1500F15U500



Max Depth: 5.175 m / 16.98 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 19-53102_CP04A.COR
Unit Wt: SBTQtn (PKR2009)

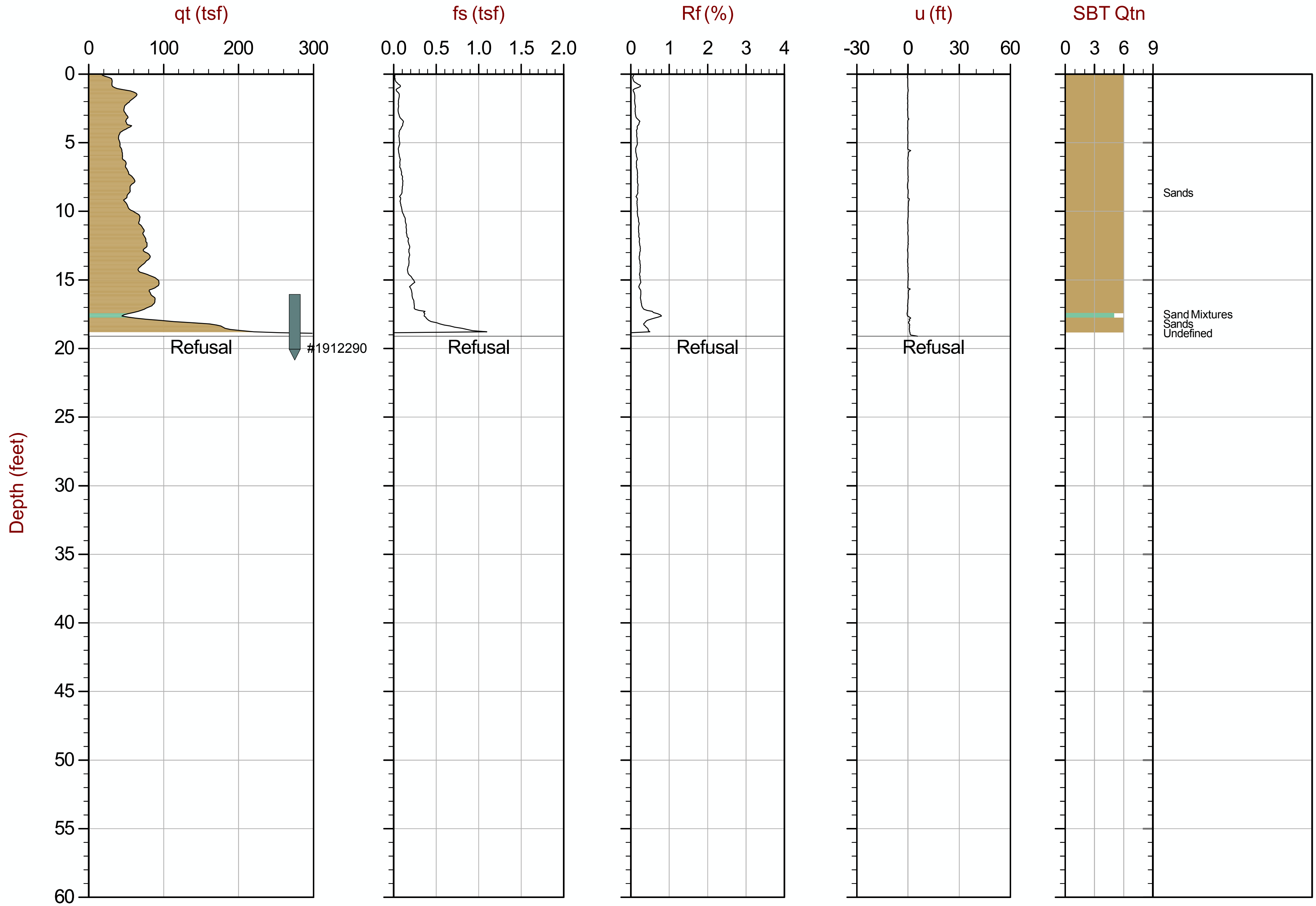
SBT: Robertson, 2009 and 2010
Coords: UTM Zone 18 N: 4842246m E: 571181m

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

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

Job No: 19-53102
Date: 2019-10-11 12:36
Site: 145 Ruby Mountain Rd, North River, NY
Sounding: CPT19-04B
Cone: 567:T1500F15U500

Barton International



Max Depth: 5.825 m / 19.11 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 19-53102_CP04B.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: UTM Zone 18 N: 4842251m E: 571170m

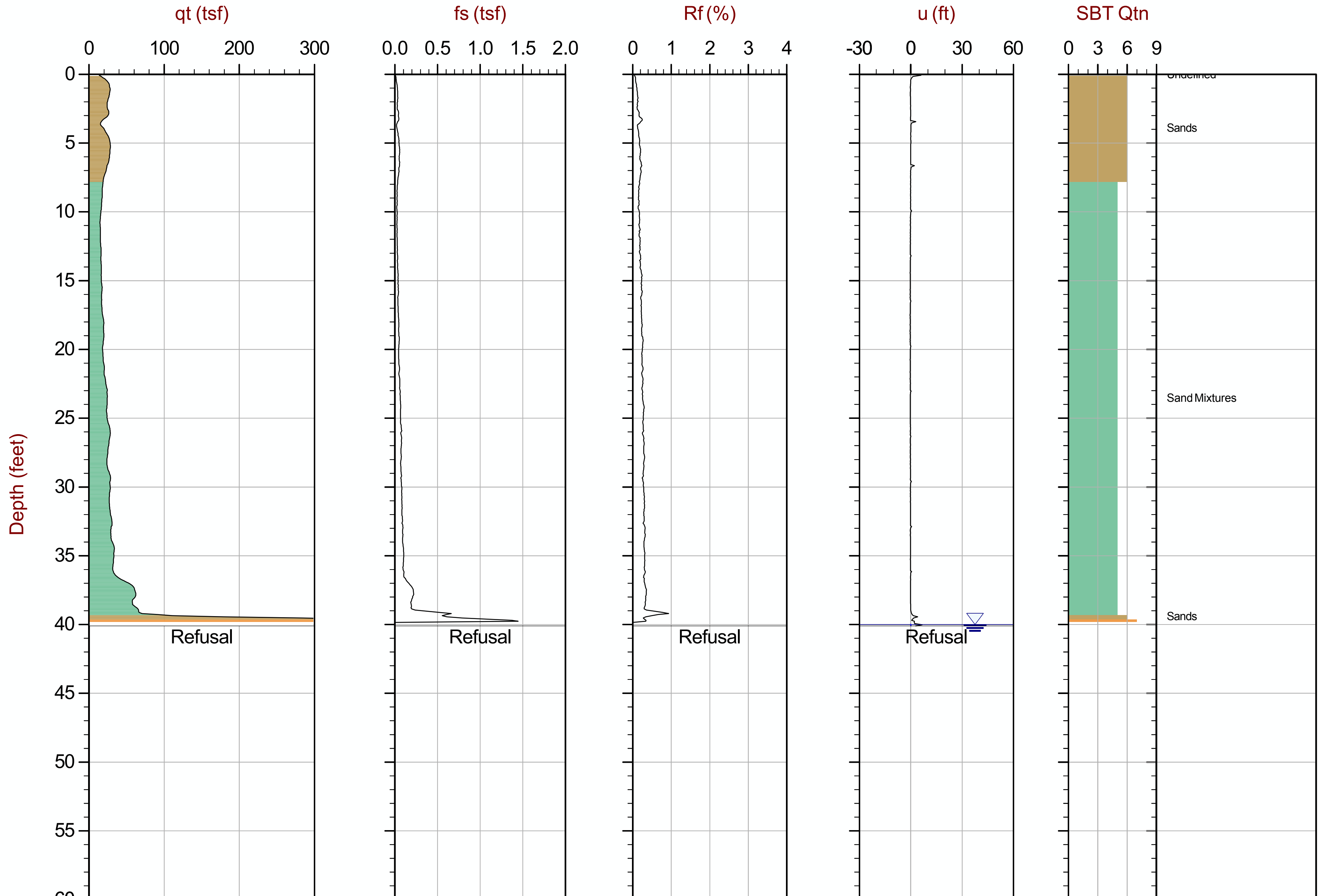
Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

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

CONETEC

Barton International

Job No: 19-53102
Date: 2019-10-11 07:26
Site: 145 Ruby Mountain Rd, North River, NY
Sounding: CPT19-05
Cone: 567:T1500F15U500



Max Depth: 12.225 m / 40.11 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 19-53102_CP05.COR
Unit Wt: SBTQtn (PKR2009)

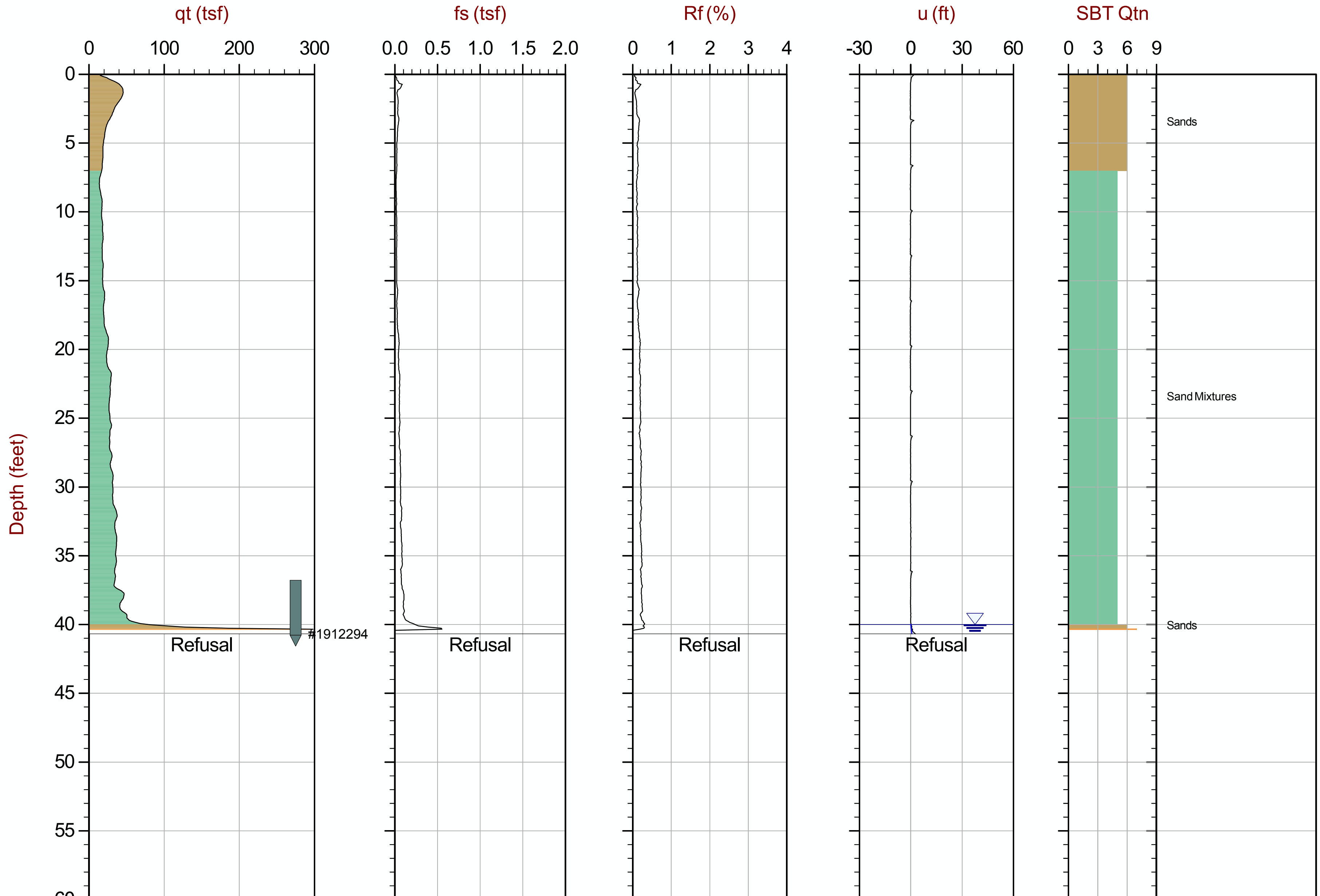
SBT: Robertson, 2009 and 2010
Coords: UTM Zone 18 N: 4842420m E: 571113m

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

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

Barton International

Job No: 19-53102
Date: 2019-10-11 09:28
Site: 145 Ruby Mountain Rd, North River, NY
Sounding: CPT19-05A
Cone: 567:T1500F15U500



Max Depth: 12.400 m / 40.68 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 19-53102_CP05A.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: UTM Zone 18 N: 4842406m E: 571103m

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

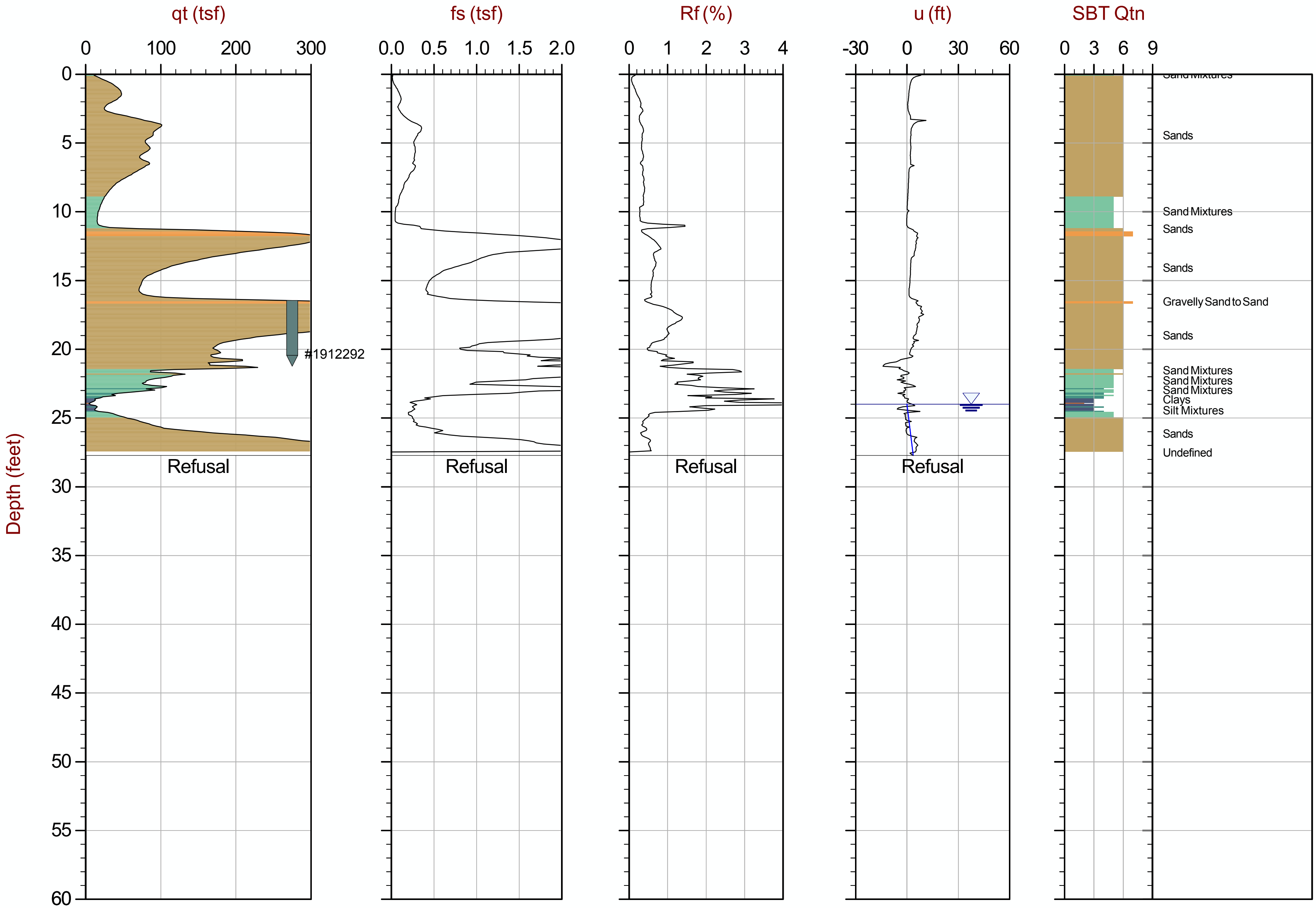
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Barton International

Job No: 19-53102
Date: 2019-10-11 08:16
Site: 145 Ruby Mountain Rd, North River, NY

Sounding: CPT19-06
Cone: 567:T1500F15U500



Max Depth: 8.450 m / 27.72 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 19-53102_CP06.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: UTM Zone 18 N: 4842402m E: 571016m

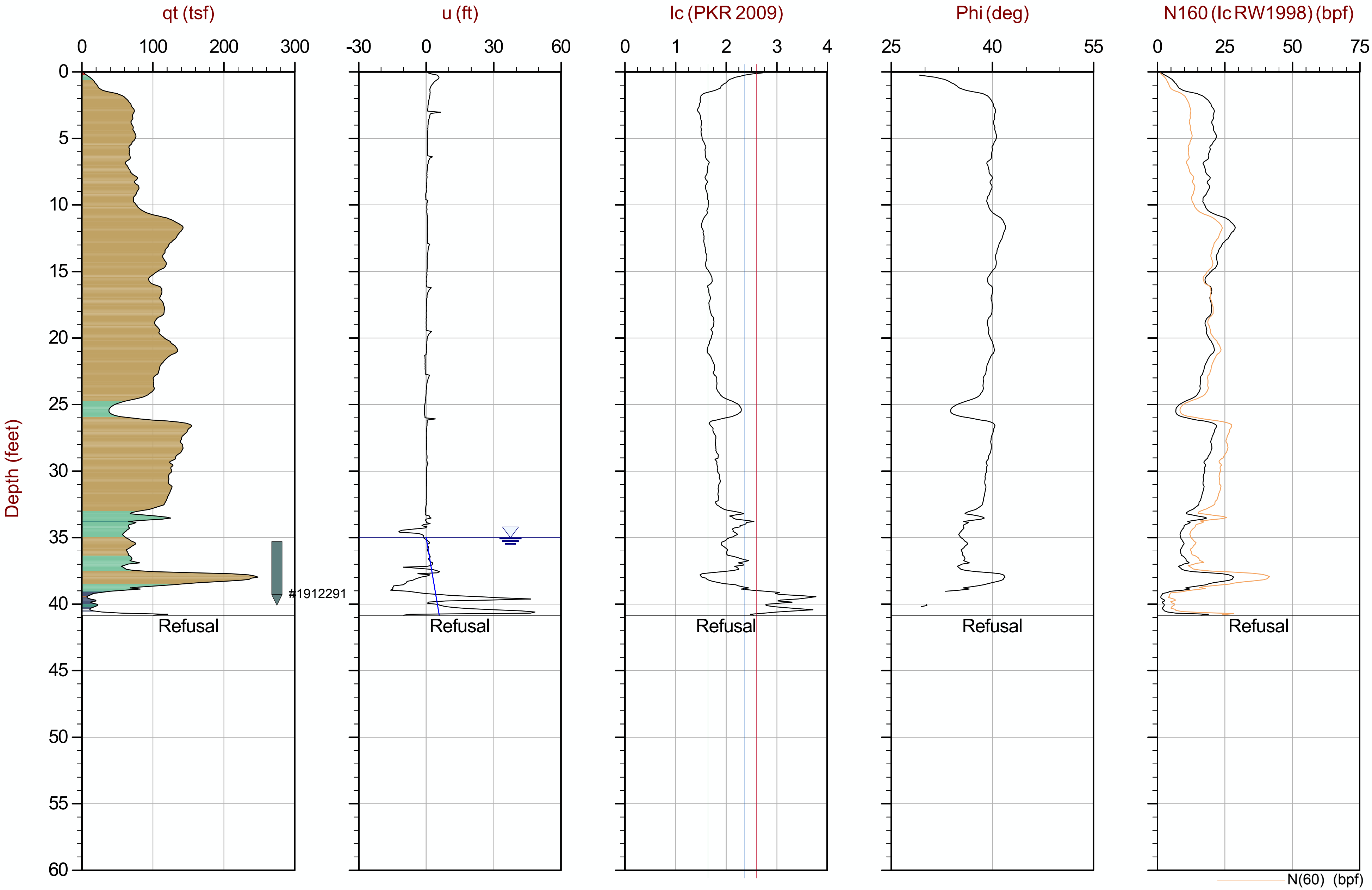
Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

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

CONETEC

Barton International

Job No: 19-53102
Date: 2019-10-09 11:51
Site: 145 Ruby Mountain Rd, North River, NY
Sounding: CPT19-01
Cone: 567:T1500F15U500



Max Depth: 12.450 m / 40.85 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 19-53102_CP01.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: UTM Zone 18 N: 4842054m E: 571014m

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

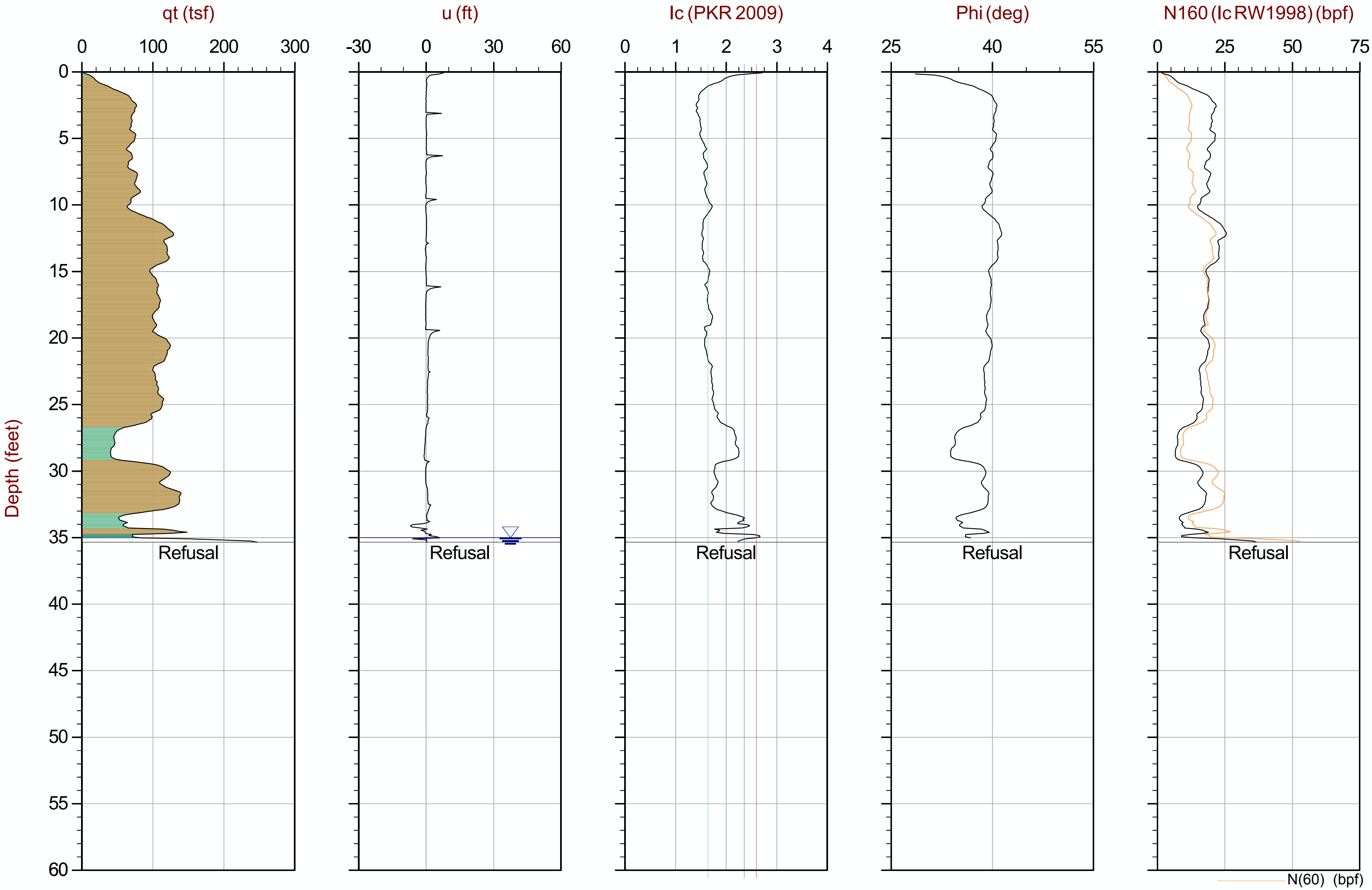
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

ConeTec

Barton International

Job No: 19-53102
Date: 2019-10-09 12:36
Site: 145 Ruby Mountain Rd, North River, NY

Sounding: CPT19-01A
Cone: 567:T1500F15U500



Max Depth: 10.775 m / 35.35 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 19-53102_CP01A.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: UTM Zone 18 N: 4842055m E: 571014m

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

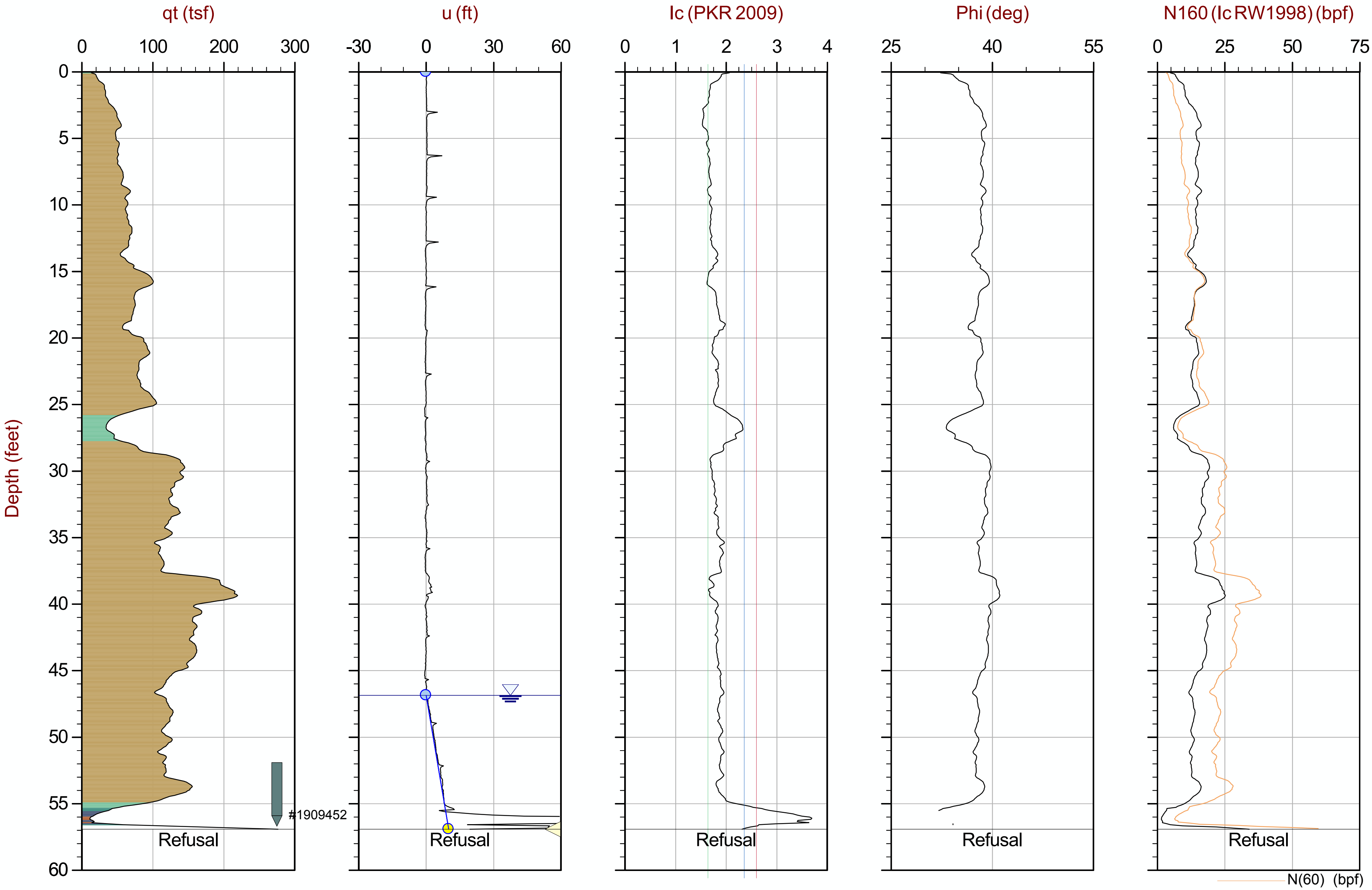
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

ConeTec

Barton International

Job No: 19-53102
Date: 2019-10-10 07:31
Site: 145 Ruby Mountain Rd, North River, NY

Sounding: CPT19-02
Cone: 567:T1500F15U500



Max Depth: 17.350 m / 56.92 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 19-53102_CP02.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: UTM Zone 18 N: 4842136m E: 571075m

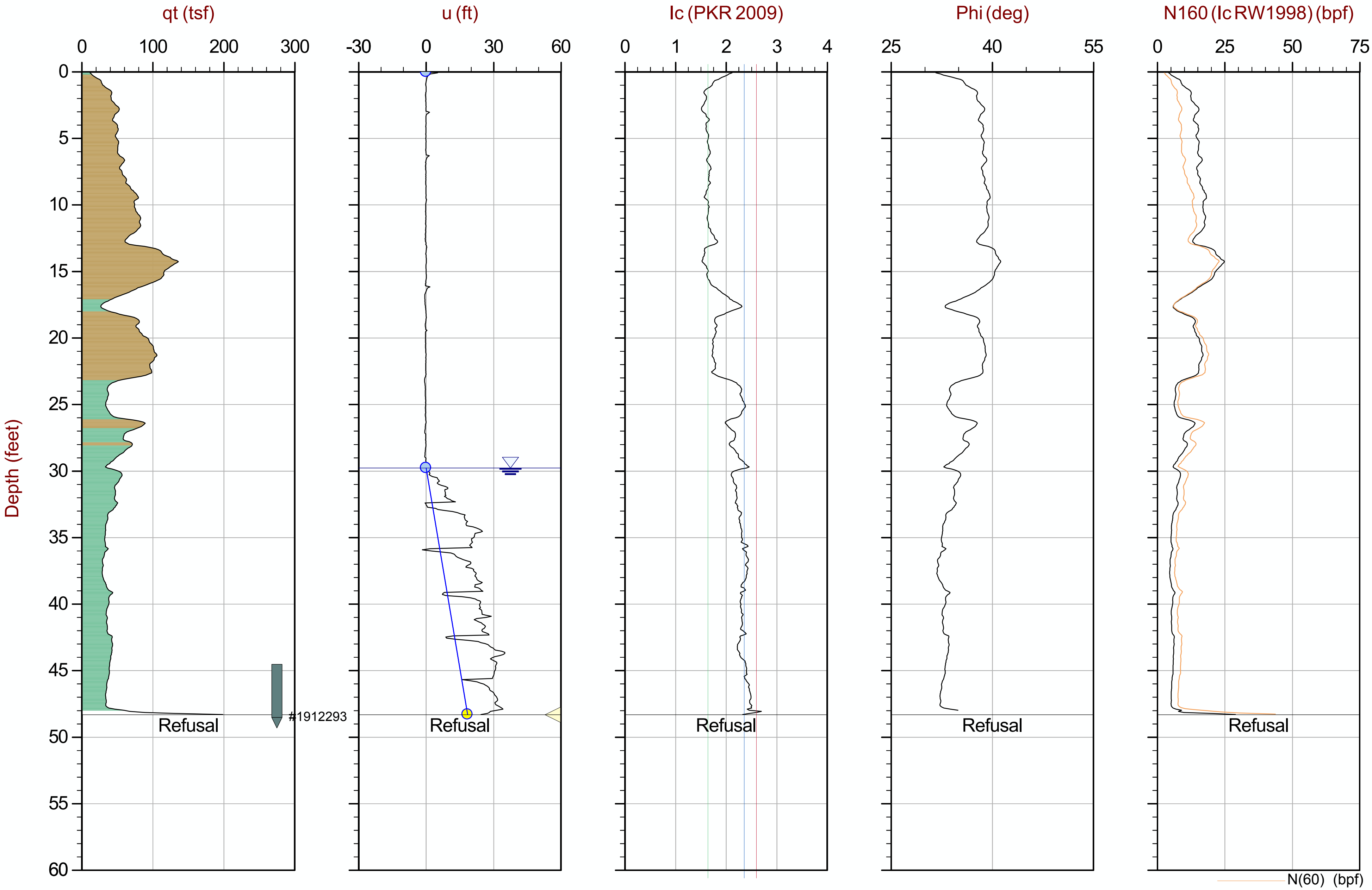
Hydrostatic Line | Ueq | Assumed Ueq | PPD, Ueq achieved | PPD, Ueq not achieved

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

CONETEC

Barton International

Job No: 19-53102
Date: 2019-10-10 09:47
Site: 145 Ruby Mountain Rd, North River, NY
Sounding: CPT19-03
Cone: 567:T1500F15U500



Max Depth: 14.725 m / 48.31 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 19-53102_CP03.COR
Unit Wt: SBTQtn (PKR2009)

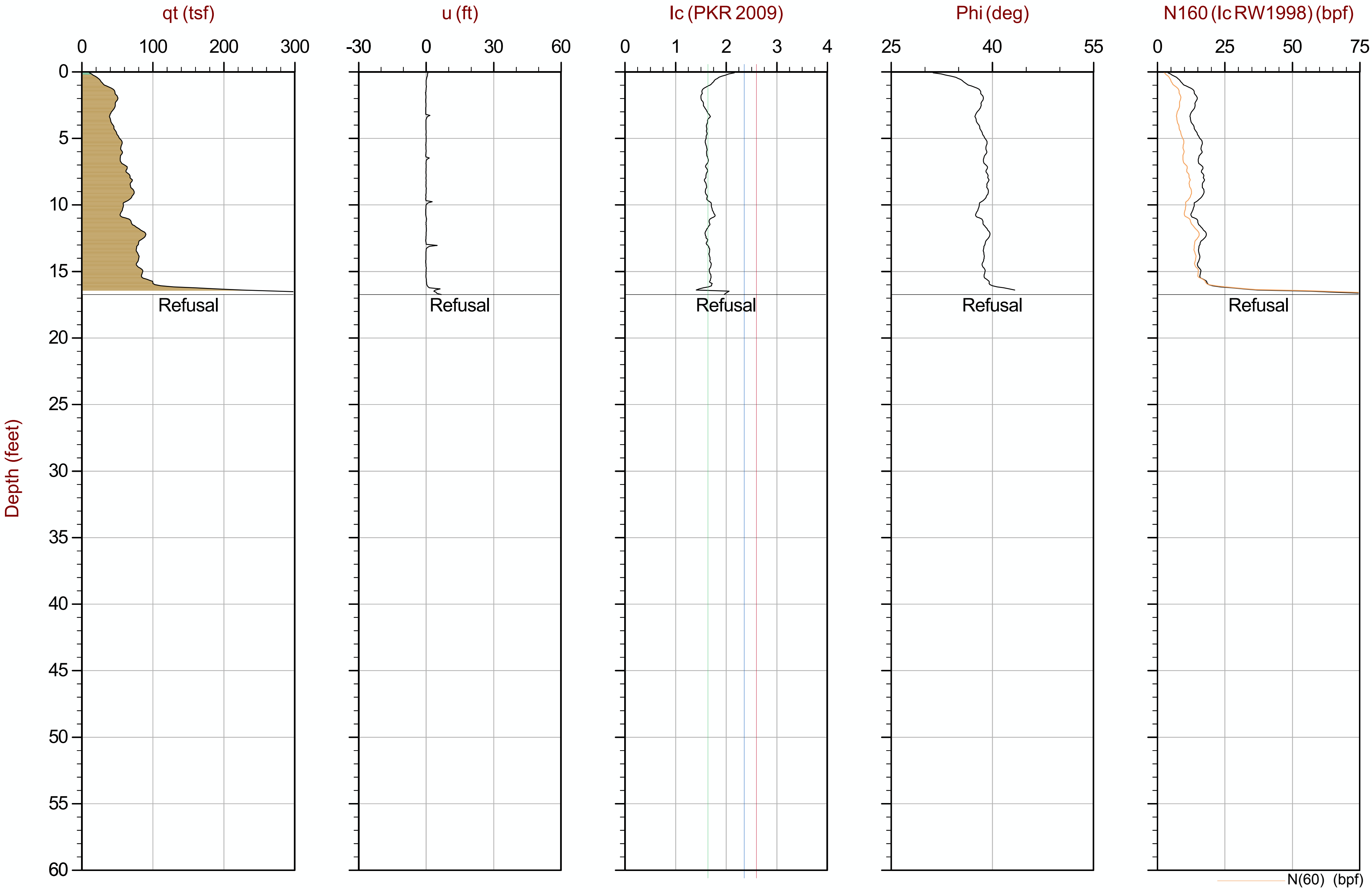
SBT: Robertson, 2009 and 2010
Coords: UTM Zone 18 N: 4842192m E: 571132m

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

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

Barton International

Job No: 19-53102
Date: 2019-10-10 12:07
Site: 145 Ruby Mountain Rd, North River, NY
Sounding: CPT19-04
Cone: 567:T1500F15U500



Max Depth: 5.100 m / 16.73 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 19-53102_CP04.COR
Unit Wt: SBTQtn (PKR2009)

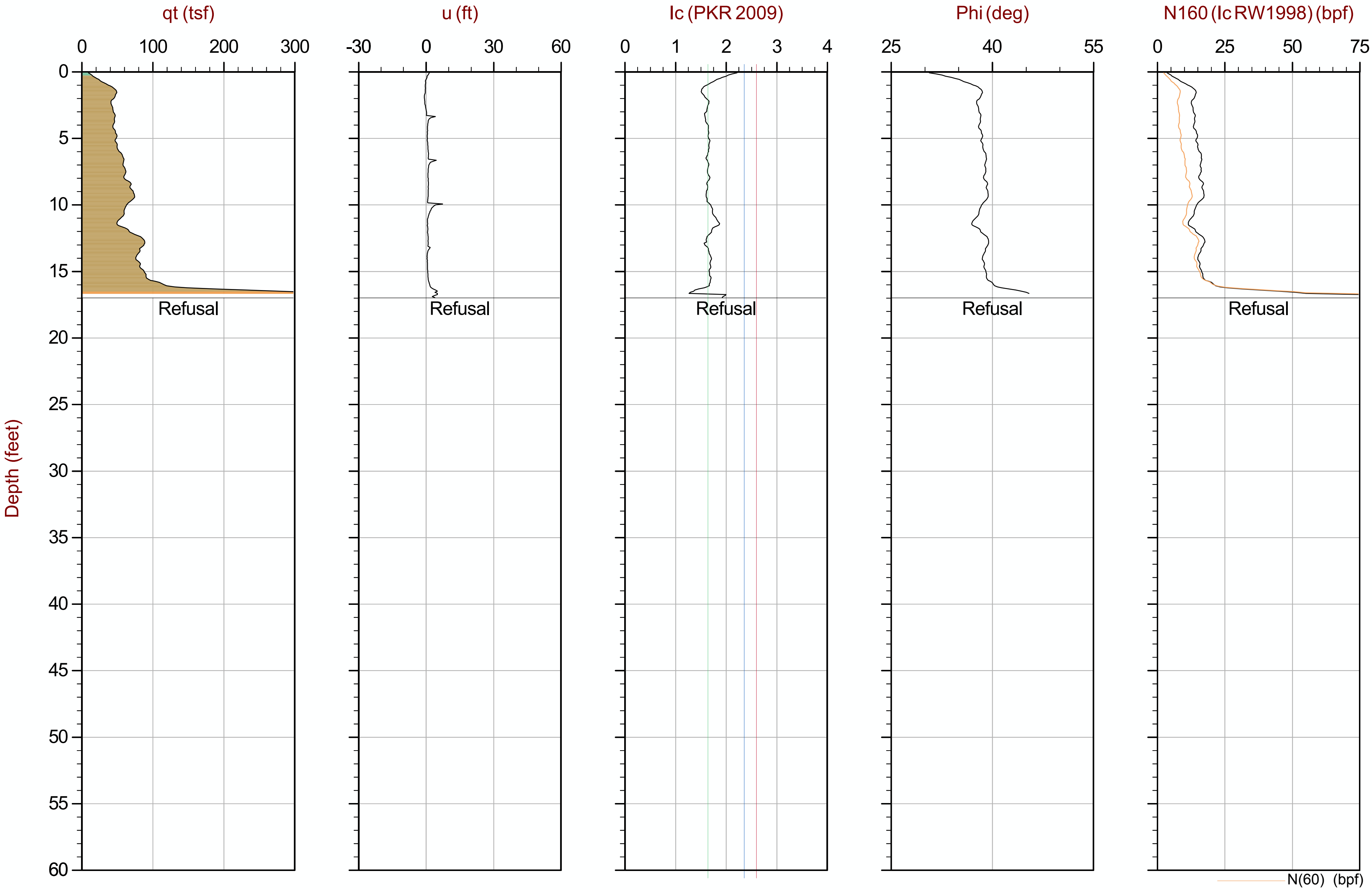
SBT: Robertson, 2009 and 2010
Coords: UTM Zone 18 N: 4842245m E: 571181m

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

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

Barton International

Job No: 19-53102
Date: 2019-10-10 12:34
Site: 145 Ruby Mountain Rd, North River, NY
Sounding: CPT19-04A
Cone: 567:T1500F15U500



Max Depth: 5.175 m / 16.98 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 19-53102_CP04A.COR
Unit Wt: SBTQtn (PKR2009)

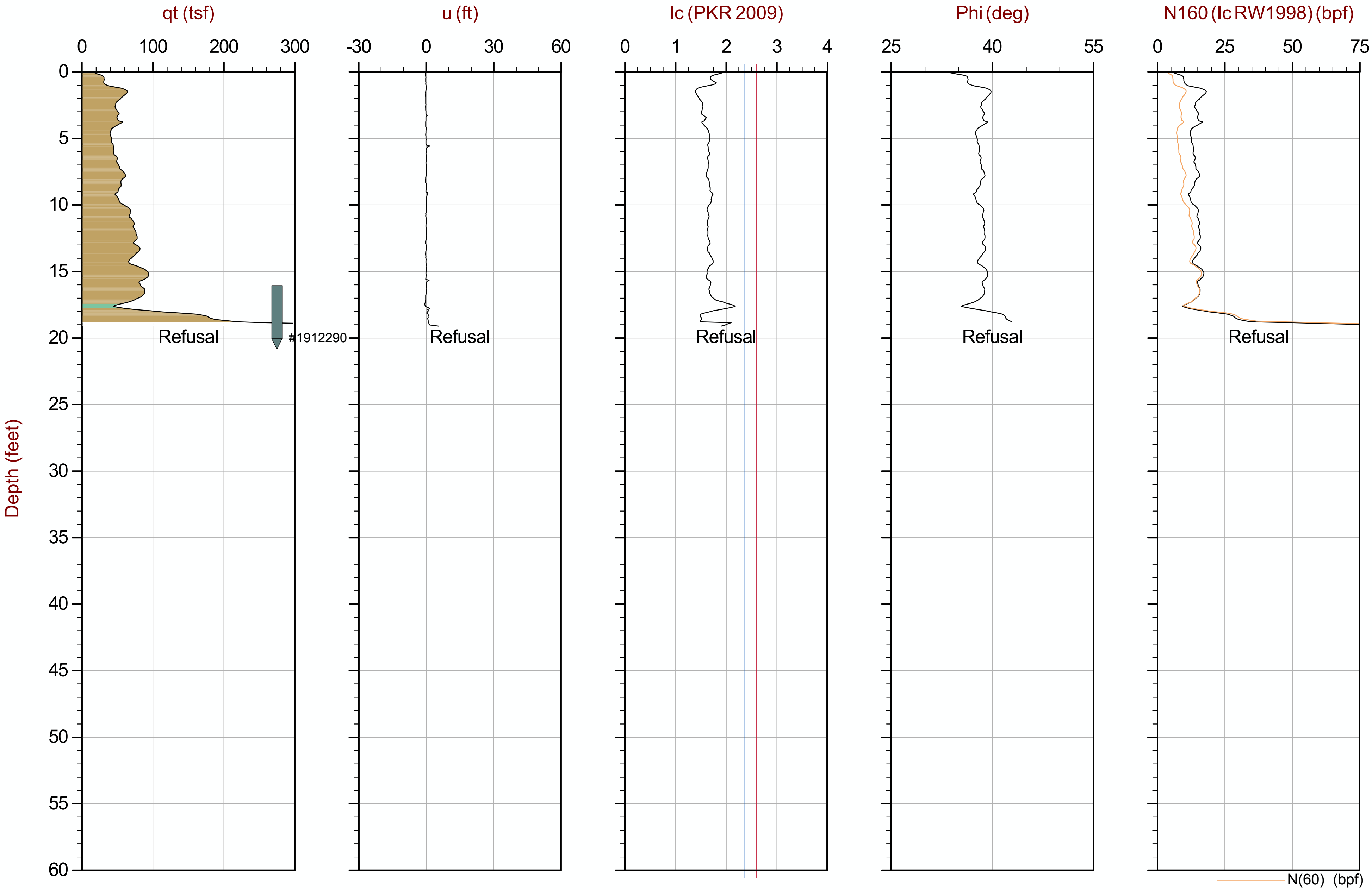
SBT: Robertson, 2009 and 2010
Coords: UTM Zone 18 N: 4842246m E: 571181m

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

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

Barton International

Job No: 19-53102
Date: 2019-10-11 12:36
Site: 145 Ruby Mountain Rd, North River, NY
Sounding: CPT19-04B
Cone: 567:T1500F15U500



Max Depth: 5.825 m / 19.11 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 19-53102_CP04B.COR
Unit Wt: SBTQtn (PKR2009)

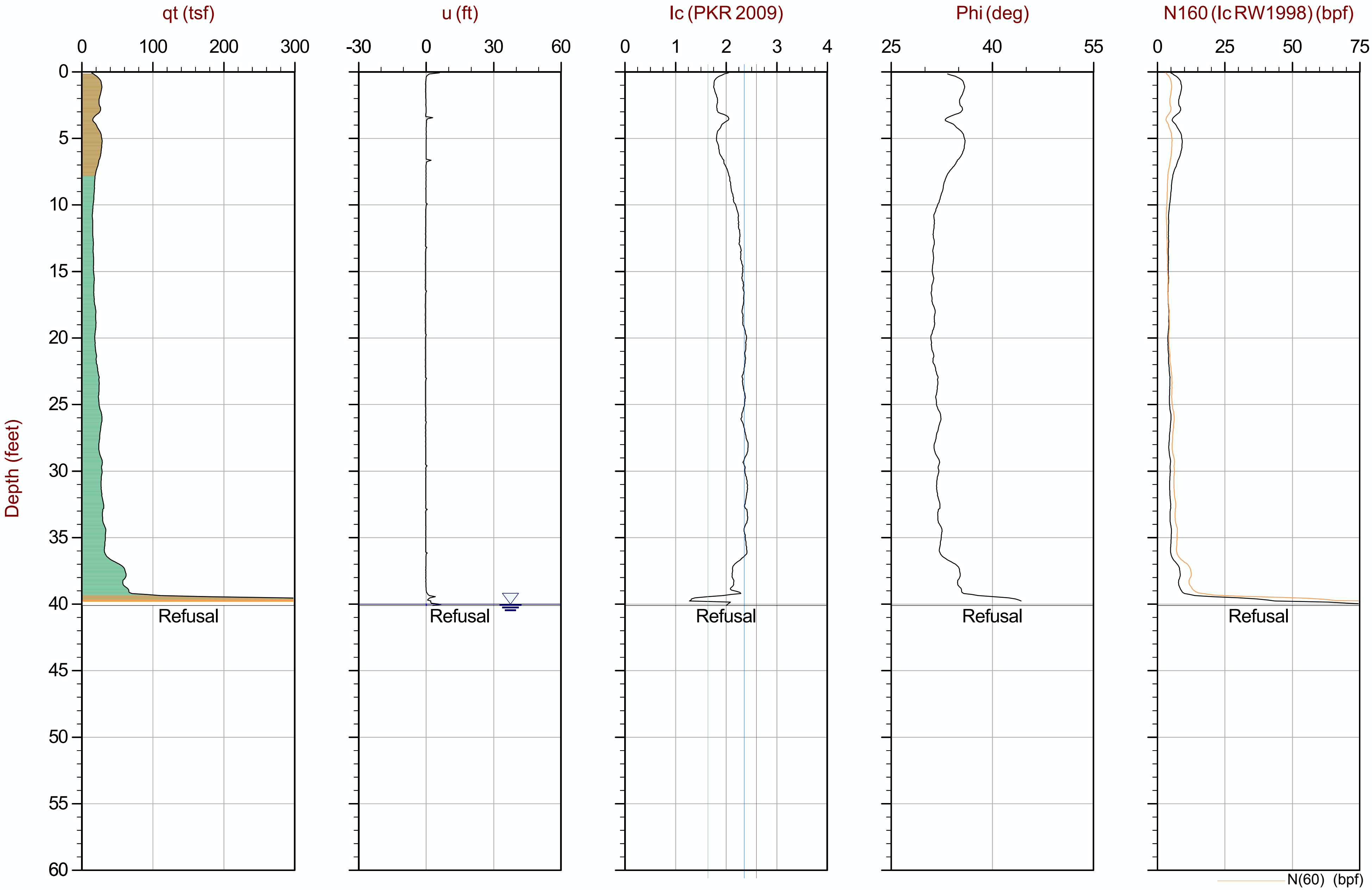
SBT: Robertson, 2009 and 2010
Coords: UTM Zone 18 N: 4842251m E: 571170m

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

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

Barton International

Job No: 19-53102
Date: 2019-10-11 07:26
Site: 145 Ruby Mountain Rd, North River, NY
Sounding: CPT19-05
Cone: 567:T1500F15U500



Max Depth: 12.225 m / 40.11 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 19-53102_CP05.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: UTM Zone 18 N: 4842420m E: 571113m

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

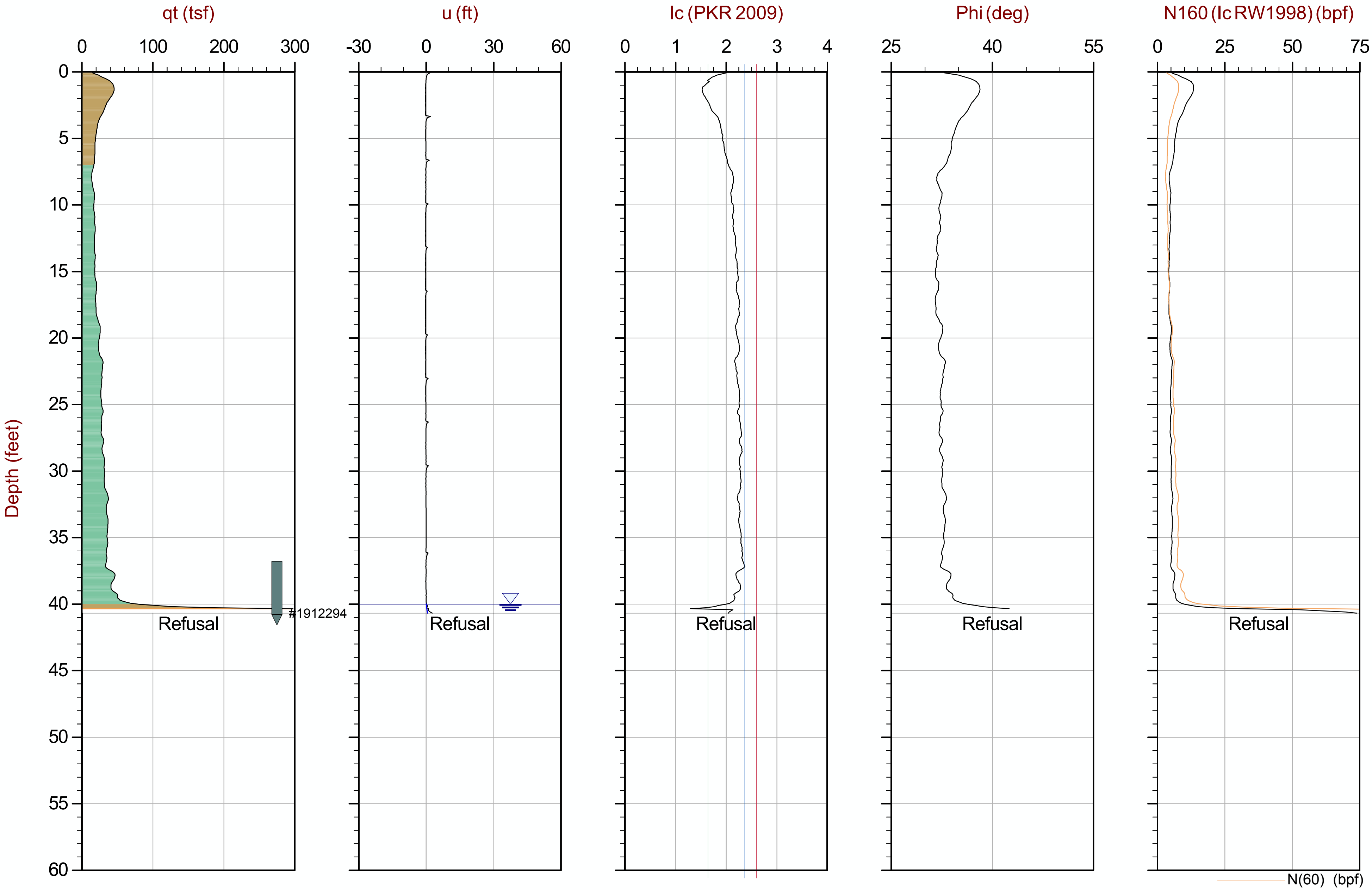
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

Barton International

Job No: 19-53102
Date: 2019-10-11 09:28
Site: 145 Ruby Mountain Rd, North River, NY

Sounding: CPT19-05A
Cone: 567:T1500F15U500



Max Depth: 12.400 m / 40.68 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 19-53102_CP05A.COR
Unit Wt: SBTQtn (PKR2009)

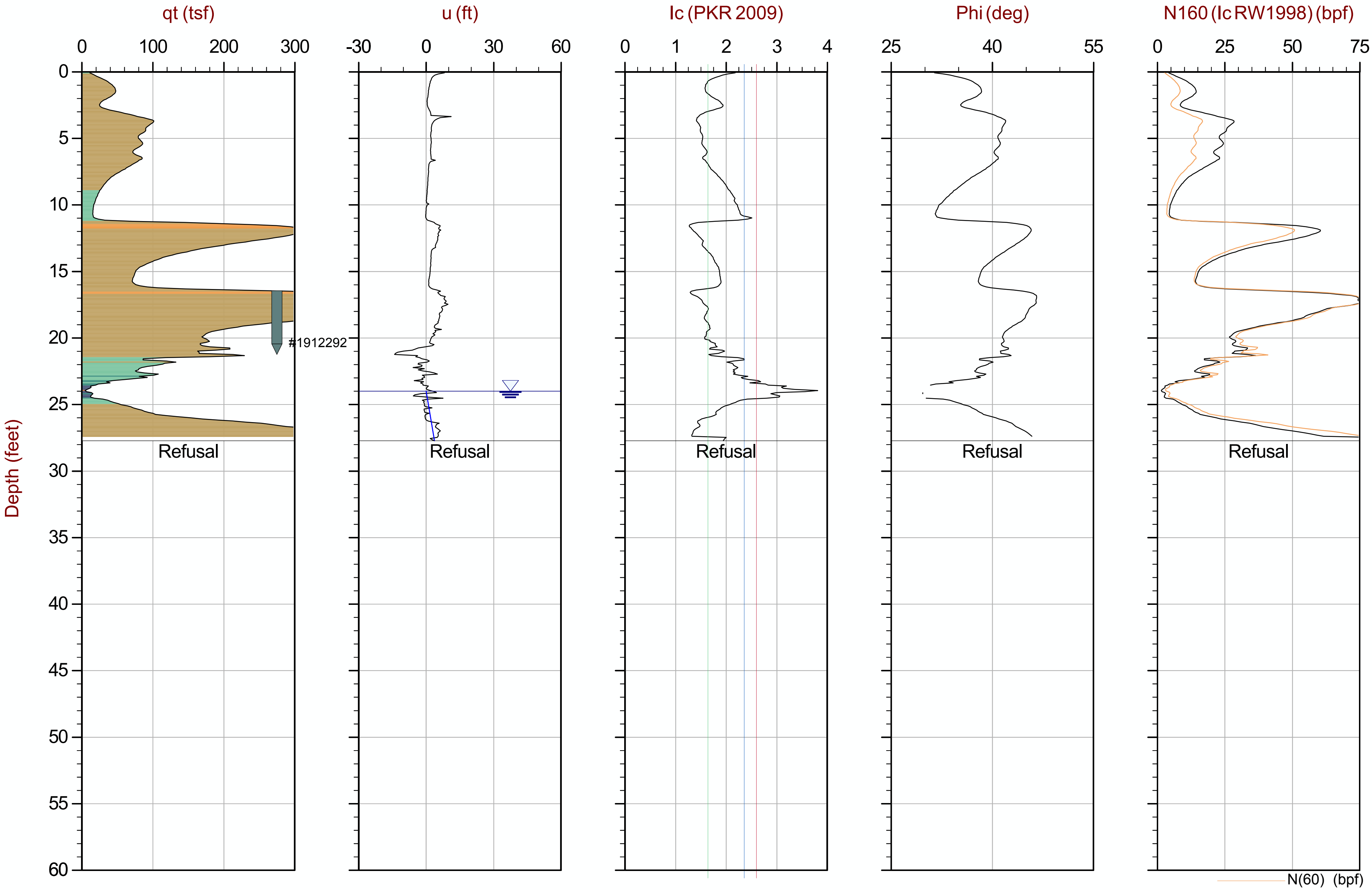
SBT: Robertson, 2009 and 2010
Coords: UTM Zone 18 N: 4842406m E: 571103m

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

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

Barton International

Job No: 19-53102
Date: 2019-10-11 08:16
Site: 145 Ruby Mountain Rd, North River, NY
Sounding: CPT19-06
Cone: 567:T1500F15U500



Max Depth: 8.450 m / 27.72 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

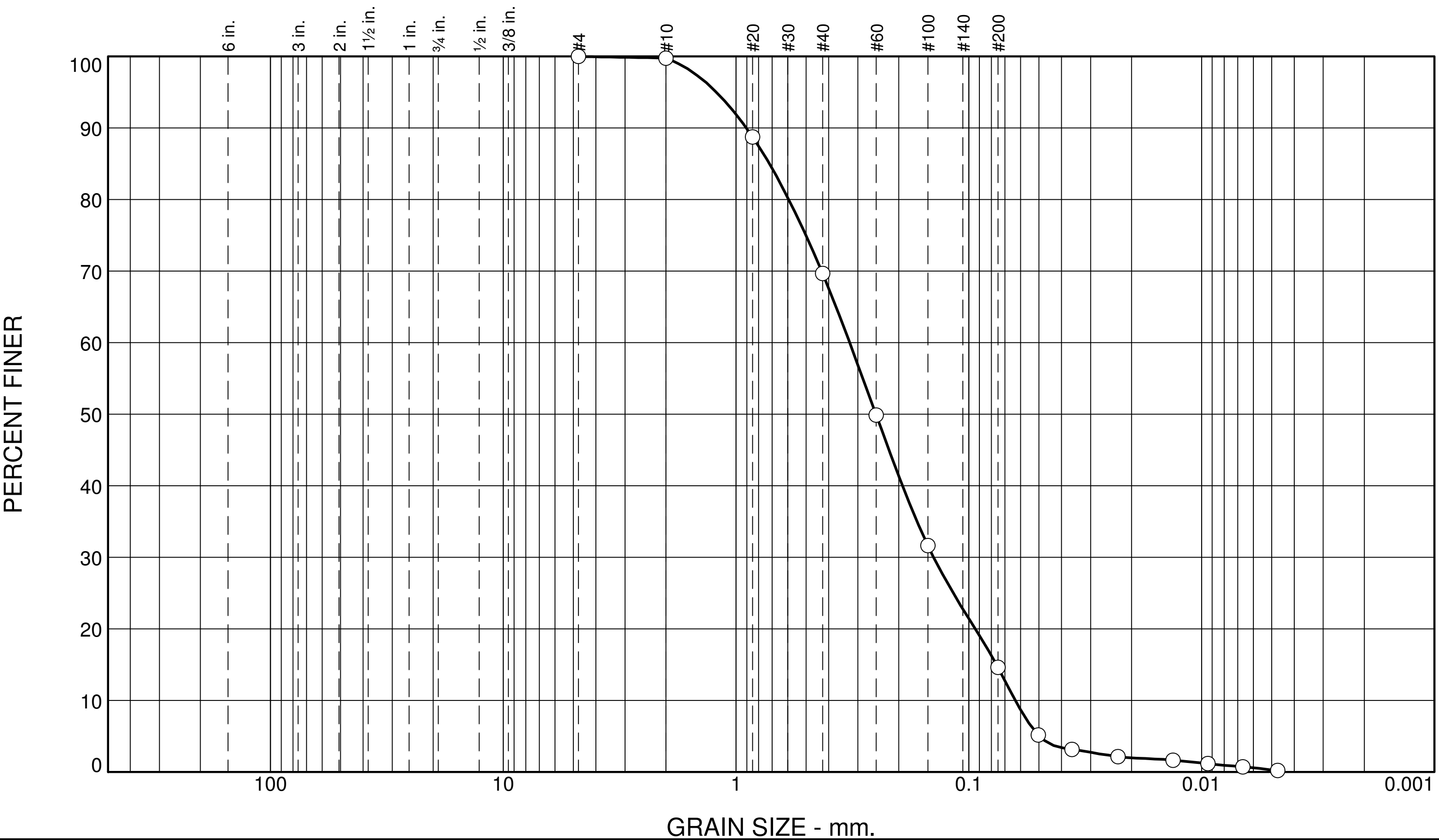
File: 19-53102_CP06.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: UTM Zone 18 N: 4842402m E: 571016m

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

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

Particle Size Distribution Report ASTM D6913/7928



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.2	30.1	55.1	14.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.8		
#20	88.8		
#40	69.7		
#60	49.9		
#100	31.6		
#200	14.6		
0.0503 mm.	5.2		
0.0360 mm.	3.2		
0.0229 mm.	2.2		
0.0133 mm.	1.7		
0.0094 mm.	1.2		
0.0066 mm.	0.7		
0.0047 mm.	0.2		

* (no specification provided)

Soil Description

silty sand

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{90}= 0.9031 D_{85}= 0.7192 D_{60}= 0.3252
D_{50}= 0.2507 D_{30}= 0.1418 D_{15}= 0.0761
D_{10}= 0.0630 C_u= 5.16 C_c= 0.98

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

Specific gravity is assumed.

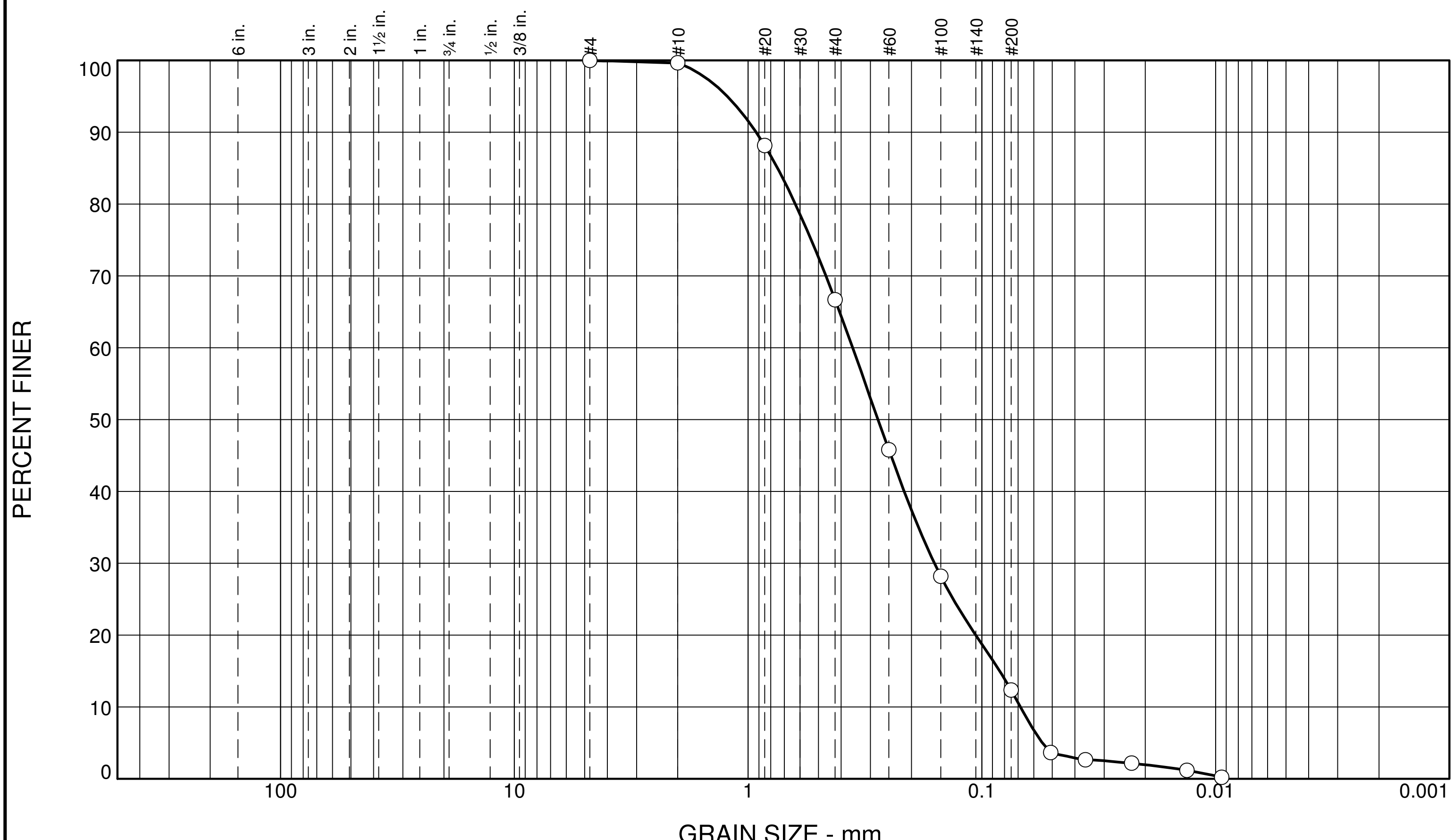
Sample No.: Bucket #1 **Source of Sample:** **Date:** 11/04/19
Location: **Elev./Depth:**

Knight Piésold CONSULTING

Client:
Project:
Project No: **Figure**

Tested By: JStaley/ICloud **Checked By:** JBruce

Particle Size Distribution Report ASTM D6913/7928



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.3	33.0	54.3	12.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.7		
#20	88.2		
#40	66.7		
#60	45.8		
#100	28.2		
#200	12.4		
0.0507 mm.	3.7		
0.0360 mm.	2.7		
0.0229 mm.	2.2		
0.0133 mm.	1.2		
0.0094 mm.	0.2		

* (no specification provided)

Soil Description

silty sand

Atterberg Limits

PL= NP LL= NP PI= NP

Coefficients

D_{90}= 0.9239 D_{85}= 0.7483 D_{60}= 0.3572
D_{50}= 0.2780 D_{30}= 0.1598 D_{15}= 0.0839
D_{10}= 0.0684 C_u= 5.23 C_c= 1.05

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

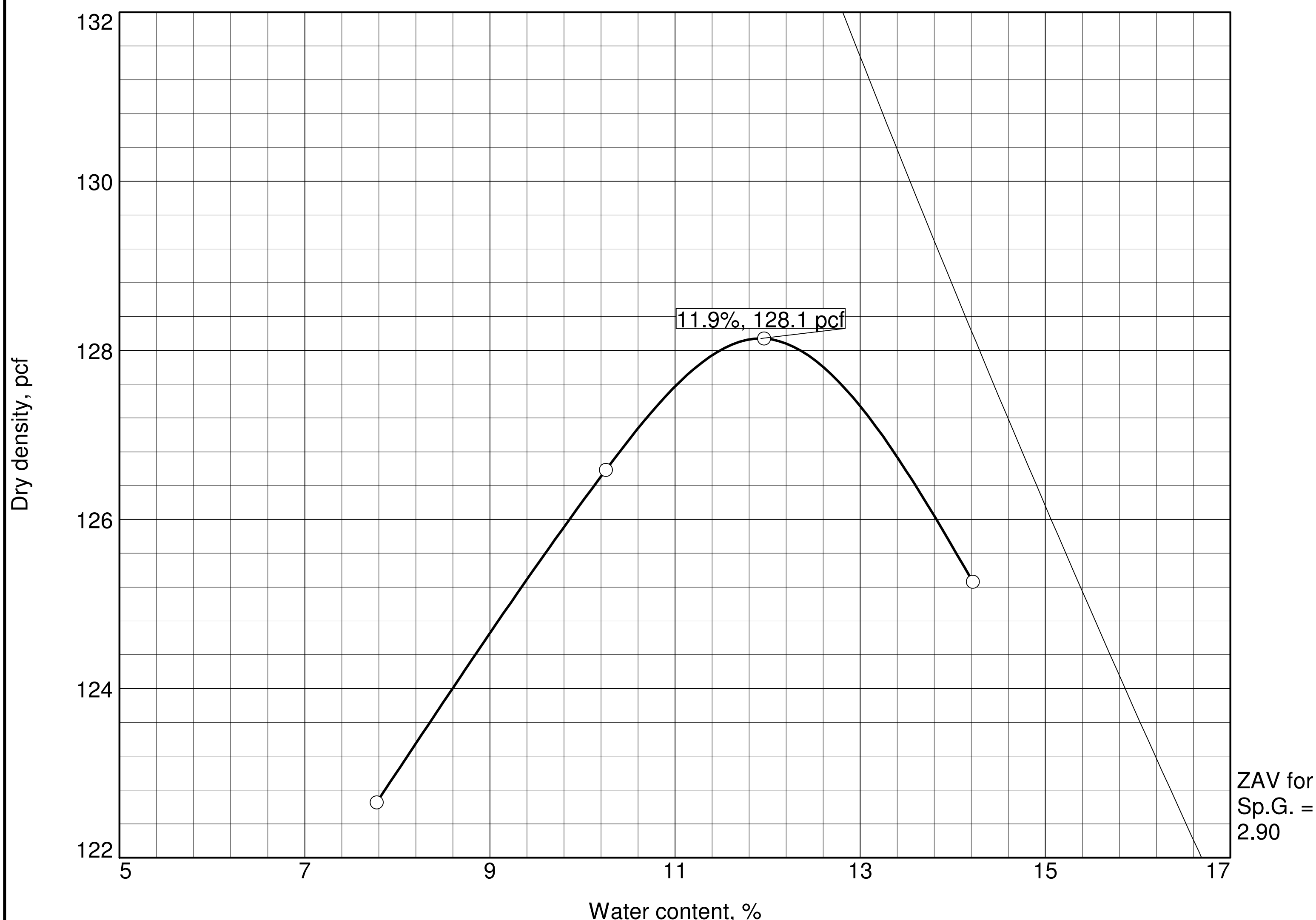
Specific gravity is assumed.

Sample No.: Bucket #2 **Source of Sample:** **Date:** 11/04/19
Location: **Elev./Depth:**

Knight Piésold CONSULTING

Client:
Project:
Project No: **Figure**

Tested By: JStaley/ICloud **Checked By:** JBruce



Test specification: ASTM D 1557-12 Method A Modified

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > #4	% < No.200
	USCS	AASHTO						
	SM	A-2-4(0)		2.8	NP	NP	0.0	14.6

TEST RESULTS	MATERIAL DESCRIPTION
Maximum dry density = 128.1 pcf Optimum moisture = 11.9 %	silty sand

Project No. DV101-00586/09 **Client:** Barton Mines LLC
Project: Barton Mine- 5Yr Tailings Storage Facility Plan
Date: 11/12/19

○

Knight Piésold CONSULTING

Remarks:

Figure

Tested By: MReund **Checked By:** JBruce

FLEXIBLE WALL PERMEABILITY TEST
ASTM D 5084-16a
Falling Head / Increasing Tailwater Pressure

PROJECT:	Barton Mine-5 Yr Tailings Storage Facility Plan	PROJECT NO. :	DV101-00586/09
LOCATION:	Tailings	LAB NO. :	L2019-091
DEPTH:		SAMPLE ID:	2019-091-01
SAMPLE NO.:		TEST STARTED :	12/02/19
SAMPLE TYPE:	Reconstituted	TEST FINISHED :	12/05/19
CONF. PRESSURE. (kPa):	100	SATURATED TEST:	YES

MOISTURE/DENSITY DATA	BEFORE TEST	AFTER TEST
Wt. Soil + Moisture (g)	821.00	839.01
Wt. Wet Soil & Pan (g)	596.27	957.00
Wt. Dry Soil & Pan (g)	544.81	849.70
Wt. Moisture Lost (g)	51.46	107.30
Wt. of Pan Only (g)	115.45	117.99
Wt. of Dry Soil (g)	429.36	731.71
Moisture Content %	12.0	14.7
Wet Density (g/cc)	2.28	2.38
Dry Density (g/cc)	2.04	2.08

Init. Diameter (in)	2.371	(cm)	6.022
Init. Area (sq in)	4.415	(sq cm)	28.485
Init. Height (in)	4.973	(cm)	12.631
Height Change (in)	0.016	(cm)	0.041
Consol. Height (in)	4.957	(cm)	12.591
Area After Consol. (sq in)	4.332	(sq cm)	27.950

Vol. Before Consol. (cu ft)	0.01271	Specific Gravity	3.00
Vol. Before Consol. (cc)	359.8	Assumed?	Yes
Change in Vol. (cc)	7.9		
Cell Exp. (cc)	0.0	Init. Saturation	75.8
Vol. After Consol. (cc)	351.9	Init. Void Ratio	0.472
Vol. After Consol. (cu ft)	0.01243	Final Saturation	99.8
Effective Porosity %	32.08	Final Void Ratio	0.440
Pressure Difference (psi):	0.33		
C =	0.47806	Buret Constant, a	0.922
k, cm/s = C/t*log(h1/h2)			

Permeability Test Trials

Time min.	Cap Elevation cc	Pedestal Elevation cc	Elevation Head cm	Total Head cm	Coefficient of Permeability, k cm/sec
0.0	0.3	49.5	53.4	76.6	
0.5	6.1	43.6	40.7	63.9	1.3E-03
0.0	0.2	49.7	53.7	76.9	
0.5	6.0	43.8	41.0	64.2	1.2E-03
0.0	0.2	49.4	53.4	76.6	
0.5	6.1	43.4	40.5	63.7	1.3E-03
0.0	0.5	49.9	53.6	76.8	
0.5	6.4	43.9	40.7	63.9	1.3E-03
			Avg.of Last 4 Rdgs.		**1.3E-03**
			Max.Hyd.Gradient:	5.6	

General Test Notes:
1) Tap water was used as the permeant.
2) Back pressure saturation continued until 'B' parameter a minimum of 0.95.
3) Sample was tamped loosely into membrane.
4) Flow rates may have exceeded the maximum capacity of equipment.

Tested By: JHS Checked By: JDB

FLEXIBLE WALL PERMEABILITY TEST
ASTM D 5084-16a
Falling Head / Increasing Tailwater Pressure

PROJECT:	Barton Mine-5 Yr Tailings Storage Facility Plan	PROJECT NO. :	DV101-00586/09
LOCATION:	Tailings	LAB NO. :	L2019-091
DEPTH:		SAMPLE ID:	2019-091-01
SAMPLE NO.:		TEST STARTED :	12/02/19
SAMPLE TYPE:	Reconstituted	TEST FINISHED :	12/05/19
CONF. PRESSURE. (kPa):	200	SATURATED TEST:	YES

MOISTURE/DENSITY DATA	BEFORE TEST	AFTER TEST
Wt. Soil + Moisture (g)	821.50	851.57
Wt. Wet Soil & Pan (g)	596.27	969.50
Wt. Dry Soil & Pan (g)	544.81	857.80
Wt. Moisture Lost (g)	51.46	111.70
Wt. of Pan Only (g)	115.45	117.93
Wt. of Dry Soil (g)	429.36	739.87
Moisture Content %	12.0	15.1
Wet Density (g/cc)	2.24	2.40
Dry Density (g/cc)	2.00	2.08

Init. Diameter (in)	2.390	(cm)	6.071
Init. Area (sq in)	4.486	(sq cm)	28.944
Init. Height (in)	4.993	(cm)	12.682
Height Change (in)	0.016	(cm)	0.041
Consol. Height (in)	4.977	(cm)	12.642
Area After Consol. (sq in)	4.358	(sq cm)	28.119

Vol. Before Consol. (cu ft)	0.01296	Specific Gravity	3.00
Vol. Before Consol. (cc)	367.1	Assumed?	Yes
Change in Vol. (cc)	11.6		
Cell Exp. (cc)	0.0	Init. Saturation	73.0
Vol. After Consol. (cc)	355.5	Init. Void Ratio	0.501
Vol. After Consol. (cu ft)	0.01255	Final Saturation	100.0
Effective Porosity %	33.38	Final Void Ratio	0.454
Pressure Difference (psi):	0.05		
C =	0.47710	Buret Constant, a	0.922
k, cm/s = C/t*log(h1/h2)			

Permeability Test Trials

Time min.	Cap Elevation cc	Pedestal Elevation cc	Elevation Head cm	Total Head cm	Coefficient of Permeability, k cm/sec
0.0	0.5	49.5	53.2	56.7	
0.5	6.1	43.9	41.0	44.5	1.7E-03
0.0	0.4	49.6	53.4	56.9	
0.5	6.1	44.0	41.1	44.6	1.7E-03
0.0	0.4	50.0	53.8	57.3	
0.5	6.1	44.3	41.4	45.0	1.7E-03
0.0	0.2	50.0	54.0	57.5	
0.5	5.9	44.4	41.8	45.3	1.7E-03
			Avg.of Last 4 Rdgs.		**1.7E-03**
			Max.Hyd.Gradient:	4.0	

General Test Notes:
1) Tap water was used as the permeant.
2) Back pressure saturation continued until 'B' parameter a minimum of 0.95.
3) Sample was tamped loosely into membrane.
4) Flow rates may have exceeded the maximum capacity of equipment.

Tested By: JHS Checked By: JDB

FLEXIBLE WALL PERMEABILITY TEST
ASTM D 5084-16a
Falling Head / Increasing Tailwater Pressure

PROJECT:	Barton Mine-5 Yr Tailings Storage Facility Plan	PROJECT NO. :	DV101-00586/09
LOCATION:	Tailings	LAB NO. :	L2019-091
DEPTH:		SAMPLE ID:	2019-091-01
SAMPLE NO.:		TEST STARTED :	11/27/19
SAMPLE TYPE:	Reconstituted	TEST FINISHED :	12/04/19
CONF. PRESSURE. (kPa):	400	SATURATED TEST:	YES

MOISTURE/DENSITY DATA	BEFORE TEST	AFTER TEST
Wt. Soil + Moisture (g)	821.80	861.12
Wt. Wet Soil & Pan (g)	596.27	976.60
Wt. Dry Soil & Pan (g)	544.81	857.70
Wt. Moisture Lost (g)	51.46	118.90
Wt. of Pan Only (g)	115.45	115.48
Wt. of Dry Soil (g)	429.36	742.22
Moisture Content %	12.0	16.0
Wet Density (g/cc)	2.25	2.40
Dry Density (g/cc)	2.01	2.07

Init. Diameter (in)	2.395	(cm)	6.083
Init. Area (sq in)	4.505	(sq cm)	29.065
Init. Height (in)	4.947	(cm)	12.565
Height Change (in)	0.021	(cm)	0.053
Consol. Height (in)	4.926	(cm)	12.512
Area After Consol. (sq in)	4.447	(sq cm)	28.693
Vol. Before Consol. (cu ft)	0.01290	Specific Gravity	3.00
Vol. Before Consol. (cc)	365.2	Assumed?	Yes
Change in Vol. (cc)	6.2		
Cell Exp. (cc)	0.0	Init. Saturation	74.7
Vol. After Consol. (cc)	359.0	Init. Void Ratio	0.493
Vol. After Consol. (cu ft)	0.01268	Final Saturation	100.0
Effective Porosity %	33.02	Final Void Ratio	0.468
Pressure Difference (psi):	0.15		
C =	0.46276	Buret Constant, a	0.922
k, cm/s = C/t*log(h1/h2)			

Permeability Test Trials

Time min.	Cap Elevation cc	Pedestal Elevation cc	Elevation Head cm	Total Head cm	Coefficient of Permeability, k cm/sec
0.0	0.4	49.8	53.6	64.1	
0.5	5.7	44.4	42.0	52.5	1.3E-03
0.0	0.3	49.7	53.6	64.1	
0.5	5.6	44.3	42.0	52.5	1.3E-03
0.0	0.5	49.6	53.3	63.8	
0.5	5.7	44.2	41.8	52.3	1.3E-03
0.0	0.5	49.9	53.6	64.1	
0.5	5.8	44.5	42.0	52.5	1.3E-03
			Avg.of Last 4 Rdgs.		**1.3E-03**
			Max.Hyd.Gradient:	4.7	

General Test Notes:
1) Tap water was used as the permeant.
2) Back pressure saturation continued until 'B' parameter a minimum of 0.95.
3) Sample was tamped loosely into membrane.
4) Flow rates may have exceeded the maximum capacity of equipment.
Tested By: JHS   Checked By: JDB

FLEXIBLE WALL PERMEABILITY TEST
ASTM D 5084-16a
Falling Head / Increasing Tailwater Pressure

PROJECT:	Barton Mine-5 Yr Tailings Storage Facility Plan	PROJECT NO. :	DV101-00586/09
LOCATION:	Tailings	LAB NO. :	L2019-091
DEPTH:		SAMPLE ID:	2019-091-01
SAMPLE NO.:		TEST STARTED :	12/06/19
SAMPLE TYPE:	Reconstituted	TEST FINISHED :	12/13/19
CONF. PRESSURE. (kPa):	800	SATURATED TEST:	YES

MOISTURE/DENSITY DATA	BEFORE TEST	AFTER TEST
Wt. Soil + Moisture (g)	821.30	850.21
Wt. Wet Soil & Pan (g)	596.27	968.10
Wt. Dry Soil & Pan (g)	544.81	849.10
Wt. Moisture Lost (g)	51.46	119.00
Wt. of Pan Only (g)	115.45	117.89
Wt. of Dry Soil (g)	429.36	731.21
Moisture Content %	12.0	16.3
Wet Density (g/cc)	2.25	2.34
Dry Density (g/cc)	2.01	2.01

Init. Diameter (in)	2.391	(cm)	6.073
Init. Area (sq in)	4.490	(sq cm)	28.968
Init. Height (in)	4.967	(cm)	12.616
Height Change (in)	0.041	(cm)	0.103
Consol. Height (in)	4.926	(cm)	12.513
Area After Consol. (sq in)	4.507	(sq cm)	29.079

Vol. Before Consol. (cu ft)	0.01291	Specific Gravity	3.00
Vol. Before Consol. (cc)	365.5	Assumed?	Yes
Change in Vol. (cc)	1.6		
Cell Exp. (cc)	0.0	Init. Saturation	72.2
Vol. After Consol. (cc)	363.9	Init. Void Ratio	0.495
Vol. After Consol. (cu ft)	0.01285	Final Saturation	99.7
Effective Porosity %	33.11	Final Void Ratio	0.488
Pressure Difference (psi):	0.08		
C =	0.45666	Buret Constant, a	0.922
k, cm/s = C/t*log(h1/h2)			

Permeability Test Trials

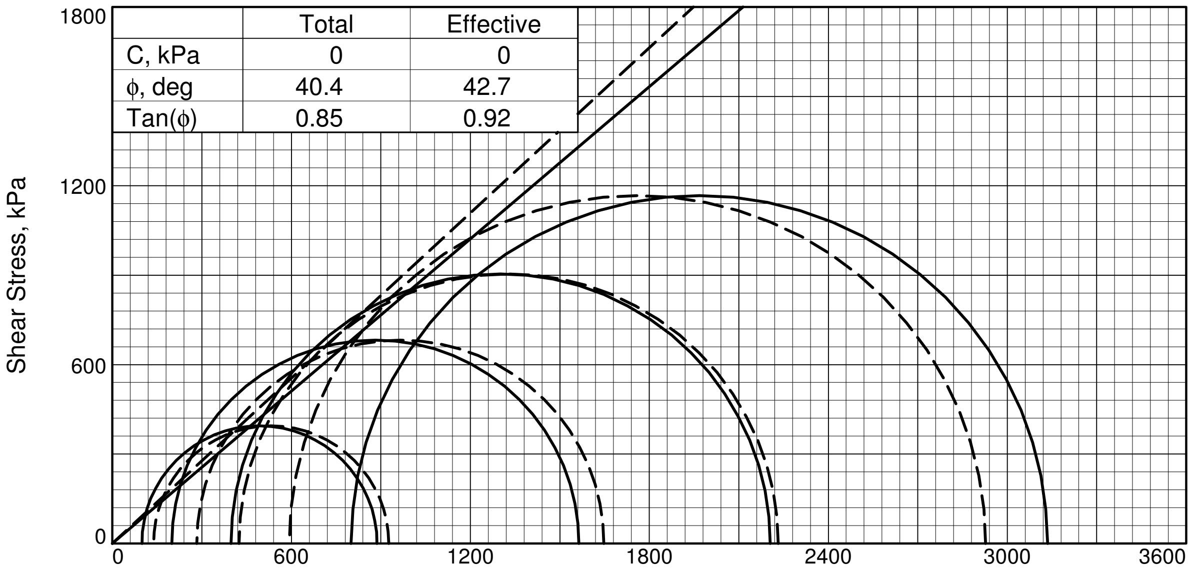
Time min.	Cap Elevation cc	Pedestal Elevation cc	Elevation Head cm	Total Head cm	Coefficient of Permeability, k cm/sec
0.0	0.5	49.6	53.3	58.9	
0.5	4.4	45.7	44.8	50.4	1.0E-03
0.0	0.3	49.7	53.6	59.2	
0.5	4.3	45.7	44.9	50.5	1.0E-03
0.0	0.2	50.0	54.0	59.7	
0.5	4.2	46.0	45.4	51.0	1.0E-03
0.0	0.3	49.6	53.5	59.1	
0.5	4.1	45.5	44.9	50.5	1.0E-03
			Avg.of Last 4 Rdgs.		**1.0E-03**
			Max.Hyd.Gradient:	4.4	

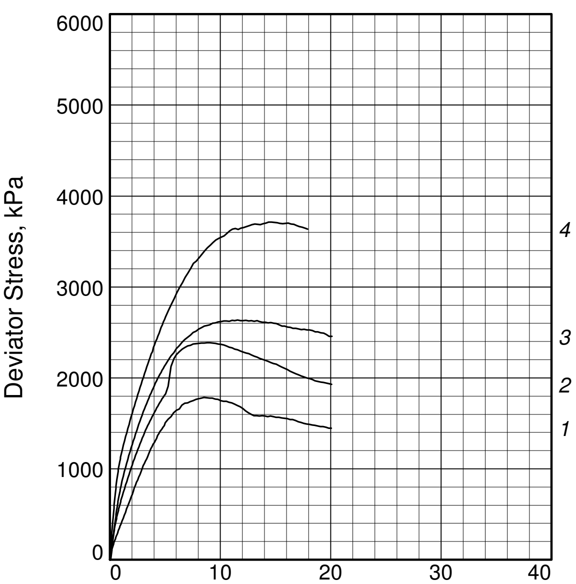
General Test Notes:
1) Tap water was used as the permeant.
2) Back pressure saturation continued until 'B' parameter a minimum of 0.95.
3) Sample was tamped loosely into membrane.
4) Flow rates may have exceeded the maximum capacity of equipment.

Tested By: JHS Checked By: JDB

Cursory interpretations provided require review by a professional engineer. Knight Piesold accepts no responsibility in subsequent analyses.

	Total	Effective
C, kPa	0	0
ϕ, deg	40.4	42.7
Tan(ϕ)	0.85	0.92





Specimen No.		1	2	3	4
Initial	Water Content, %	12.0	12.0	12.0	12.0
	Dry Density, g/cm^3	2.04	2.00	2.01	2.01
	Saturation, %	76.1	71.9	72.8	72.6
	Void Ratio	0.4723	0.5002	0.4939	0.4949
	Diameter, mm.	60.2	60.7	60.8	60.7
	Height, mm.	126.3	126.7	125.7	126.2
At Test	Water Content, %	14.7	15.1	15.6	16.3
	Dry Density, g/cm^3	2.08	2.06	2.04	2.02
	Saturation, %	100.0	100.0	100.0	100.0
	Void Ratio	0.4400	0.4528	0.4686	0.4884
	Diameter, mm.	59.7	59.8	60.4	60.8
	Height, mm.	125.9	126.3	125.2	125.1
Strain rate, %/min.		0.03	0.03	0.03	0.03
Eff. Cell Pressure, kPa		99	199	397	800
Fail. Stress, kPa		788	1365	1808	2335
Excess Pore Pr., kPa		-39	-84	-27	208
Strain, %		2.2	3.0	3.6	3.9
Ult. Stress, kPa					
Excess Pore Pr., kPa					
Strain, %					
$\bar{\sigma}_1$ Failure, kPa		926	1647	2232	2927
$\bar{\sigma}_3$ Failure, kPa		138	282	424	593

Type of Test:
CU with Pore Pressures

Sample Type: Reconstituted

Description: silty sand

LL= NP **PI=** NP

Assumed Specific Gravity= 3

Remarks: Failure chosen at peak principal stress ratio with no cohesion intercept.

Figure ________

Client: Barton Mines LLC

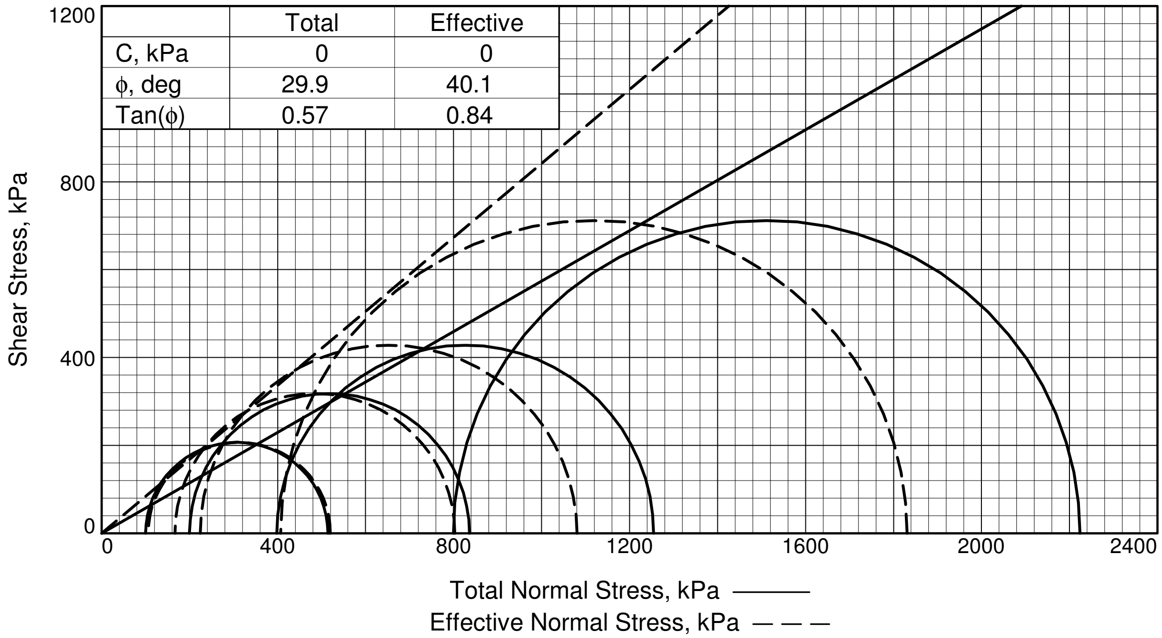
Project: Barton Mine- 5Yr Tailings Storage Facility Plan

Location: Tailings Composite

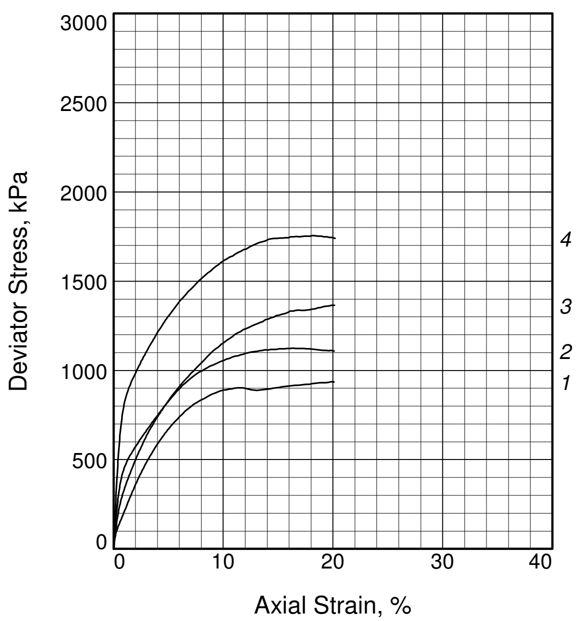
Proj. No.: DV101-00586/09 **Date Sampled:** 11/04/19

Knight Piésold CONSULTING

Tested By: JHS **Checked By:** JDB



	Total	Effective
C, kPa	0	0
ϕ, deg	29.9	40.1
Tan(ϕ)	0.57	0.84



Specimen No.		1	2	3	4
Initial	Water Content, %	12.6	12.6	12.1	12.6
	Dry Density, g/cm3	1.82	1.82	1.86	1.85
	Saturation, %	58.5	58.6	59.4	60.8
	Void Ratio	0.6456	0.6440	0.6114	0.6212
	Diameter, mm.	61.5	61.5	61.2	61.2
	Height, mm.	127.3	127.3	126.5	127.0
At Test	Water Content, %	18.8	19.7	17.4	18.2
	Dry Density, g/cm3	1.92	1.88	1.97	1.87
	Saturation, %	100.0	100.0	100.0	90.3
	Void Ratio	0.5629	0.5919	0.5213	0.6038
	Diameter, mm.	60.0	60.7	59.7	61.1
	Height, mm.	126.8	126.6	125.6	125.8
Strain rate, %/min.		0.03	0.03	0.03	0.03
Eff. Cell Pressure, kPa		100	200	398	800
Fail. Stress, kPa		414	636	856	1424
Excess Pore Pr., kPa		-6	33	174	392
Strain, %		2.4	3.0	5.3	6.6
Ult. Stress, kPa					
Excess Pore Pr., kPa					
Strain, %					
$\overline{\sigma}_1$ Failure, kPa		520	803	1080	1831
$\overline{\sigma}_3$ Failure, kPa		106	167	224	407

Type of Test:
CU with Pore Pressures

Sample Type: Reconstituted

Description: silty sand

Assumed Specific Gravity= 3

Remarks: Failure chosen at peak principal stress ratio. No cohesion intercept.

Figure ________

Client: Barton Mines LLC

Project: Barton Mine- 5Yr Tailings Storage Facility Plan

Location: Tailings Composite

Sample Number: 90% MDD

Proj. No.: DV101-00586/09 **Date Sampled:** 11/23/20

Knight Piésold CONSULTING

Tested By: JStaley **Checked By:** JBruce

Cursory interpretations provided require review by a professional engineer. Knight Piesold accepts no responsibility in subsequent analyses.

Appendix B

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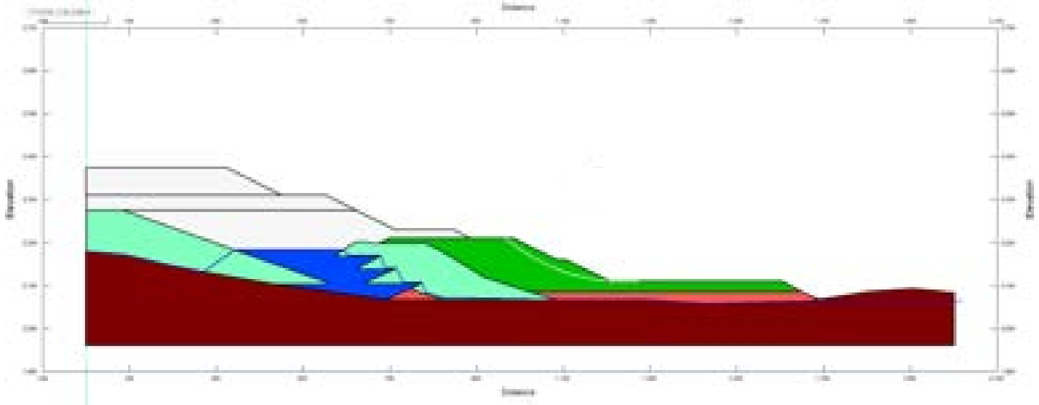
Section A Drained Condition

Phase 1



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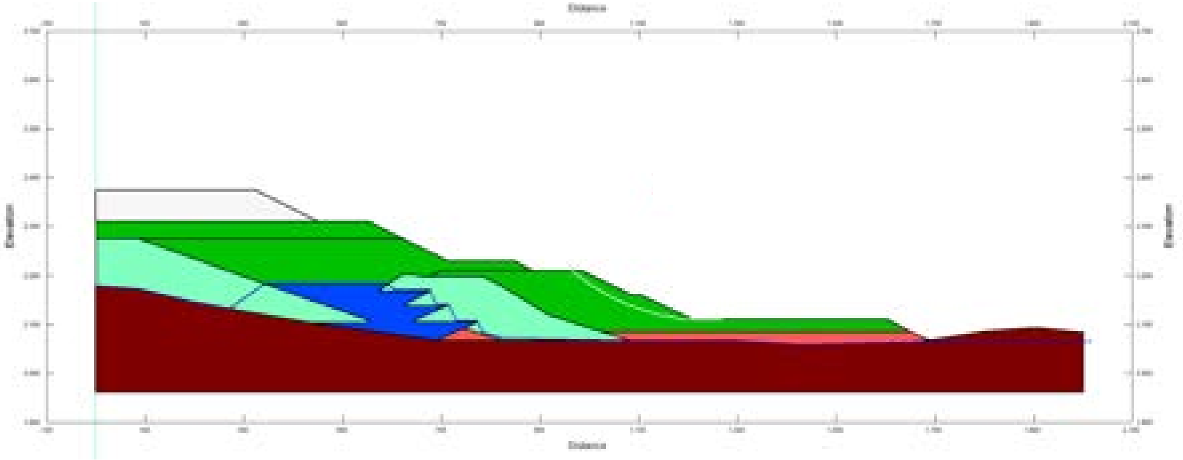
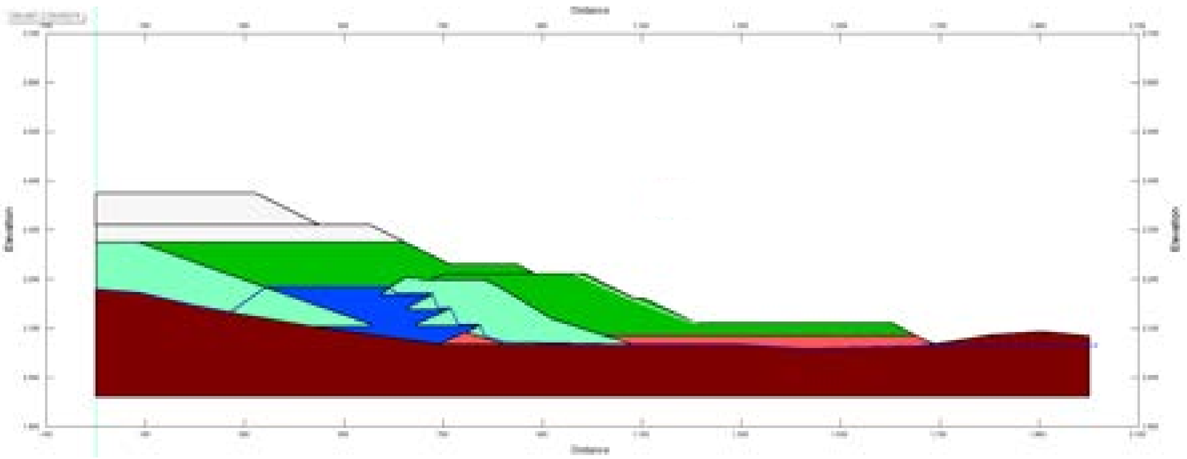
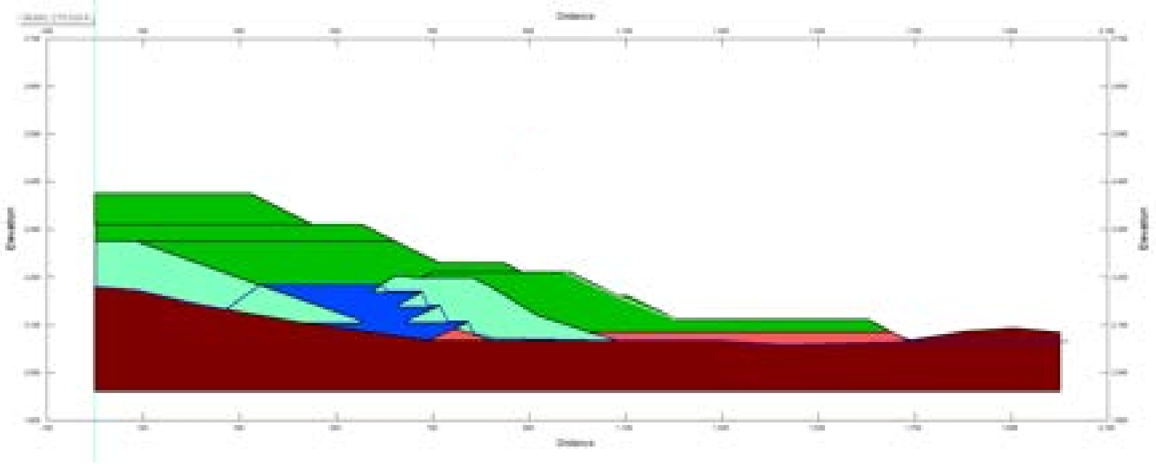


Phase 3

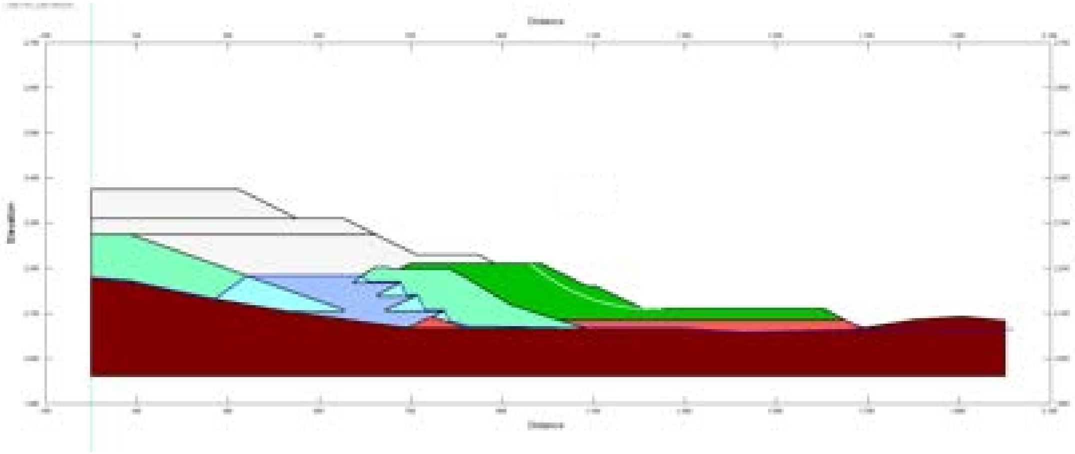


Phase 4



Section A Undrained Condition

Phase 1



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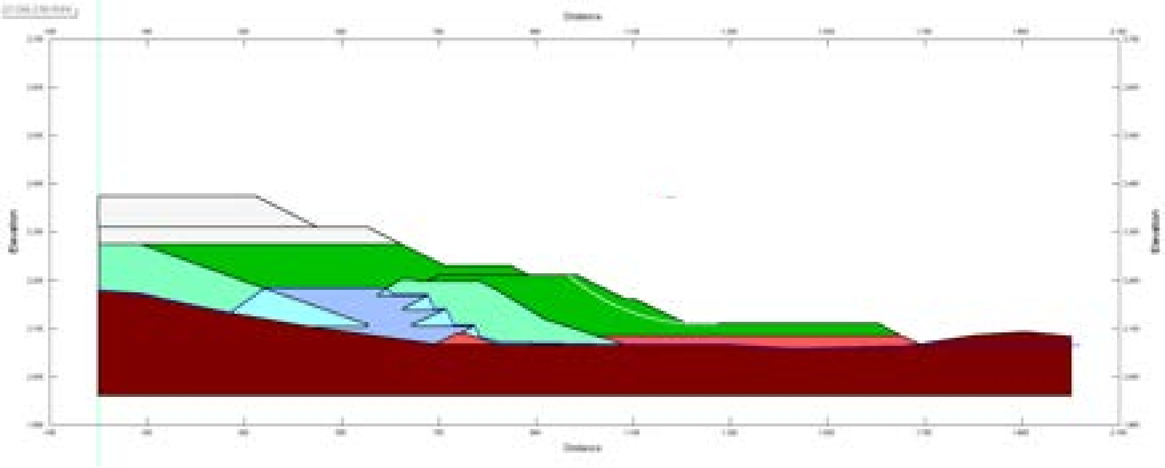

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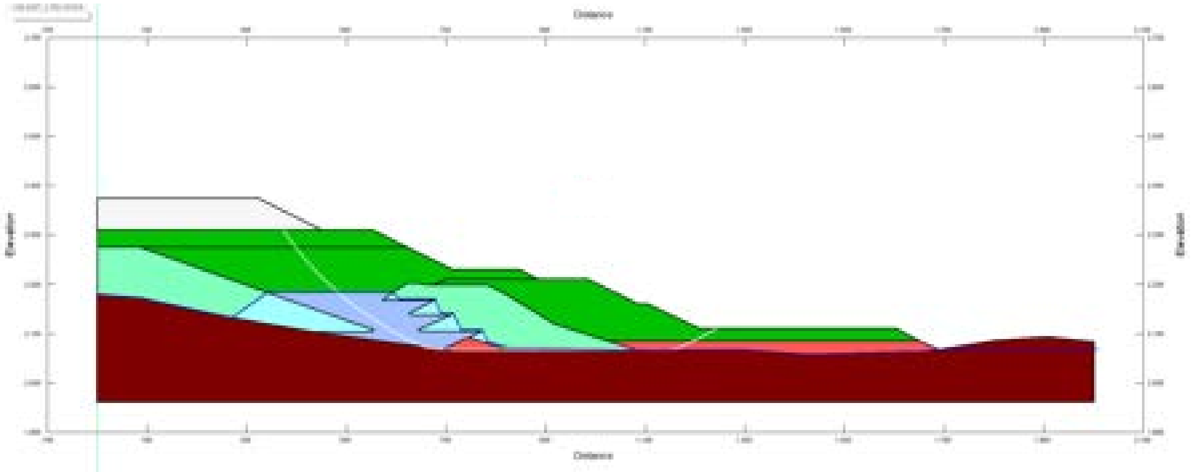
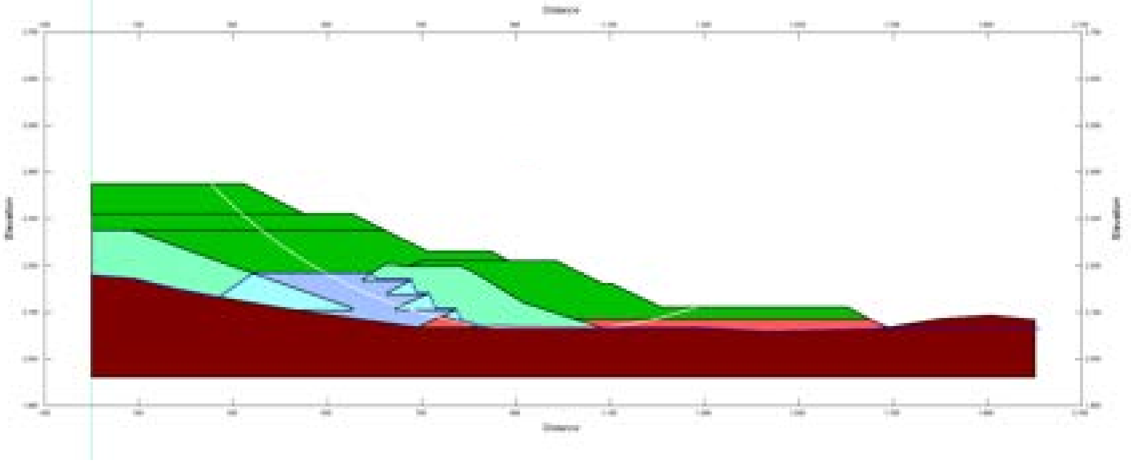
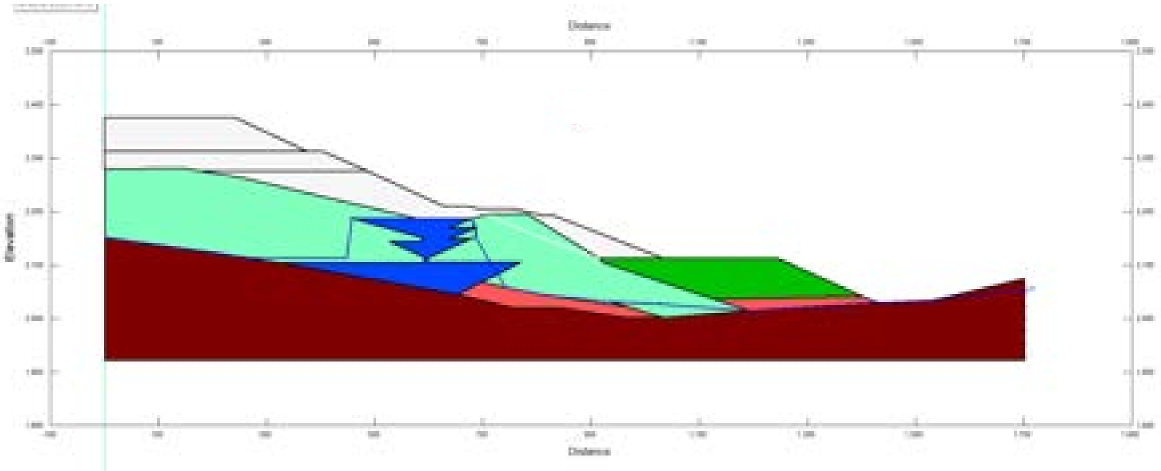


Phase 4



Section B Drained Condition

Phase 1



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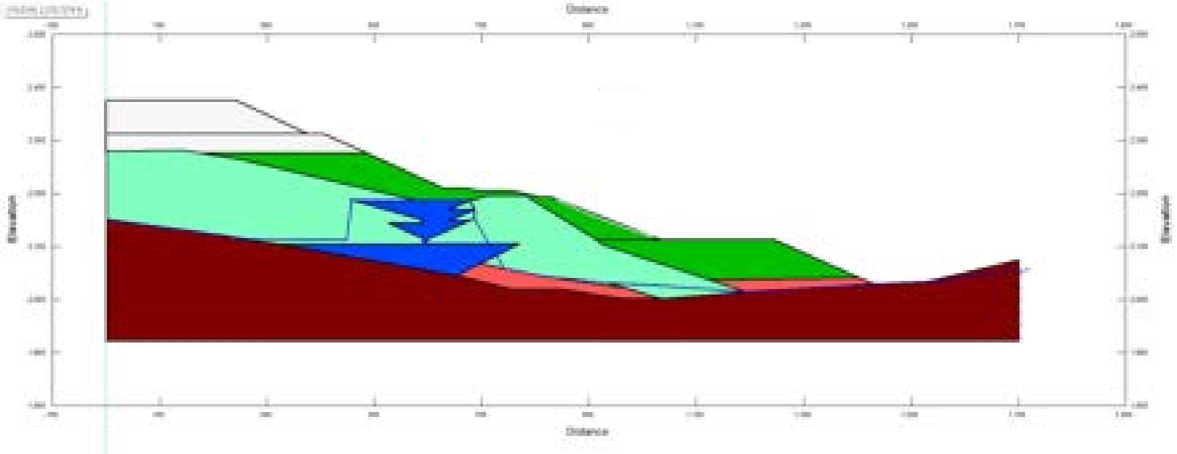

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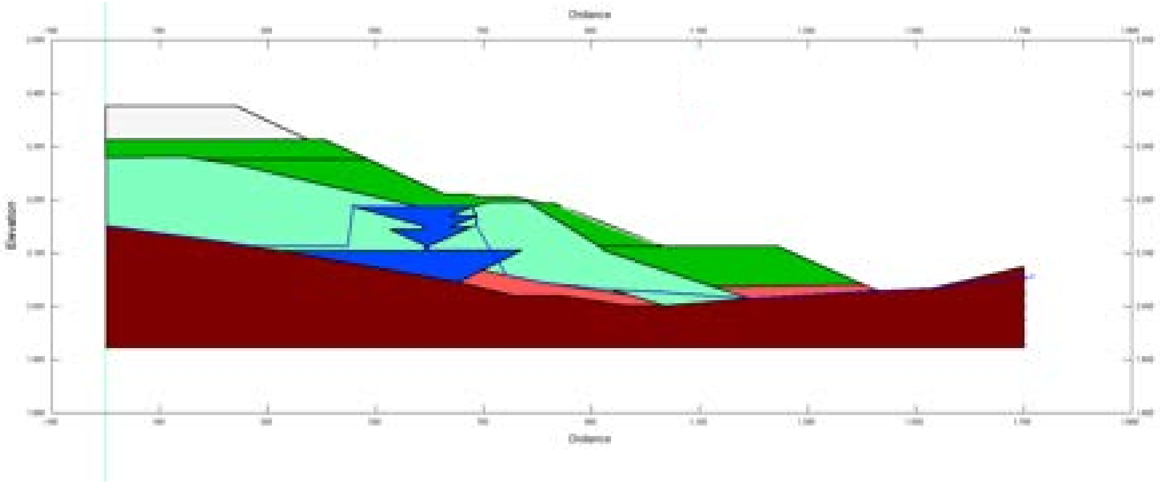

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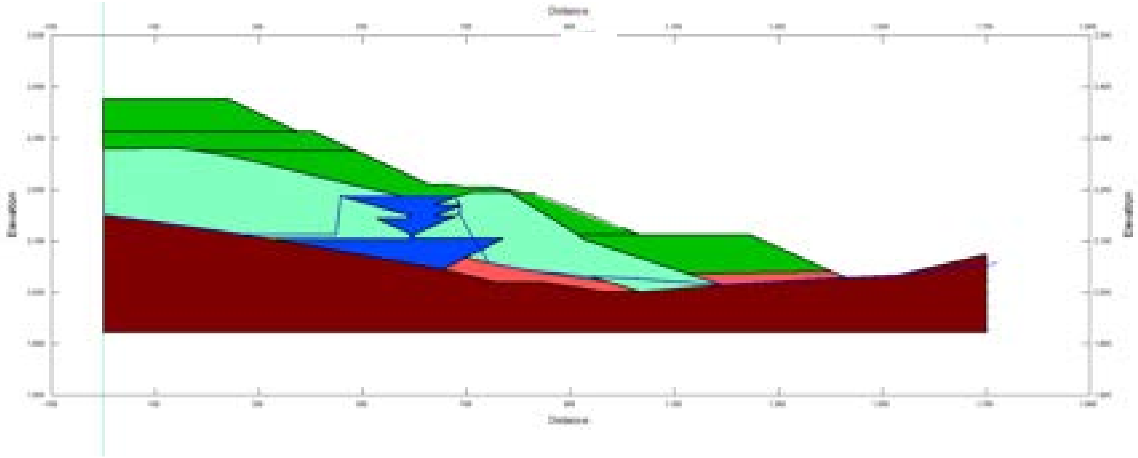
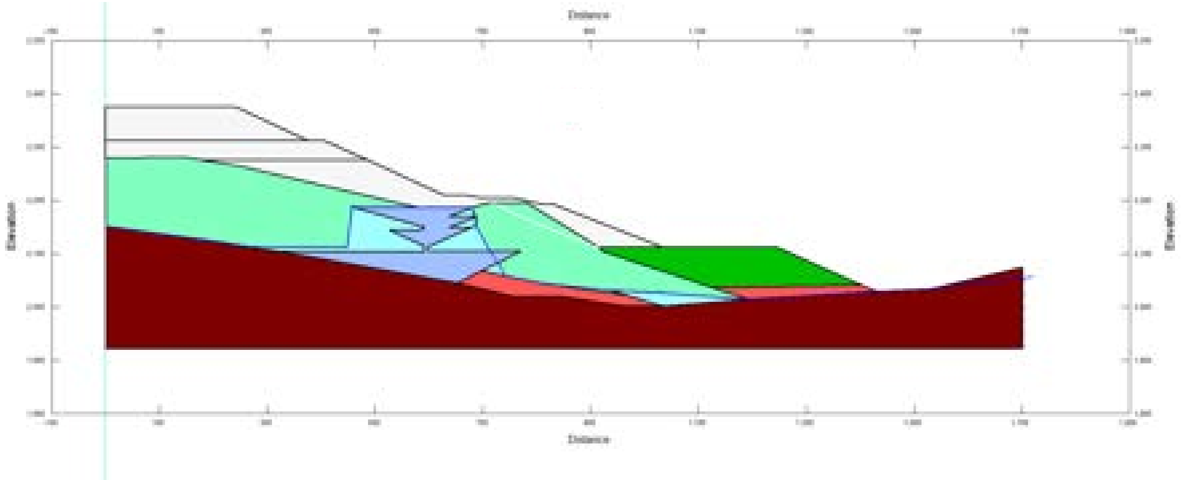


Section B Undrained Condition

Phase 1



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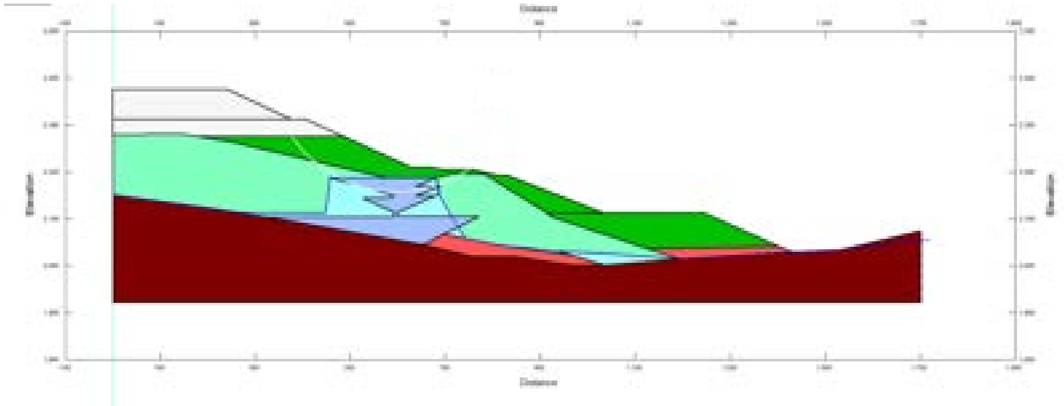

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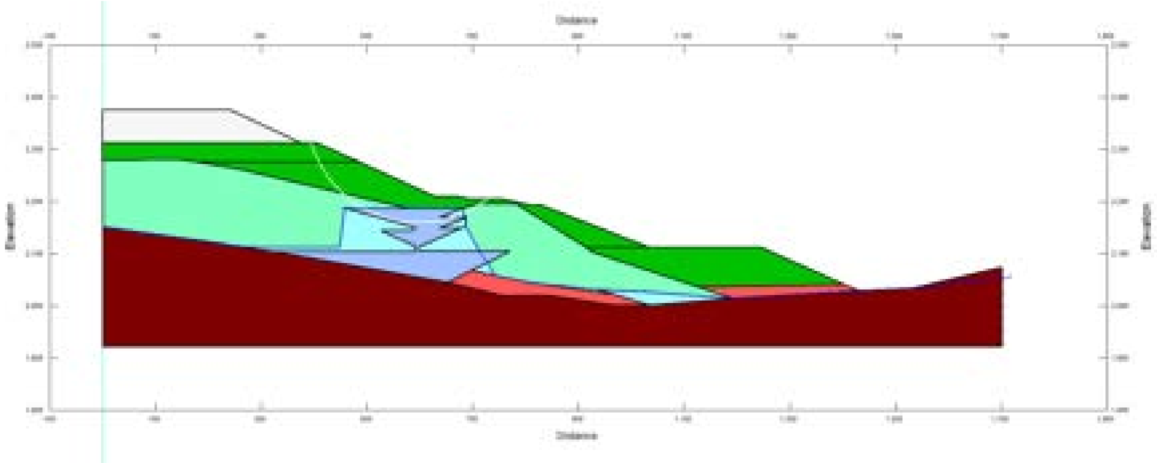

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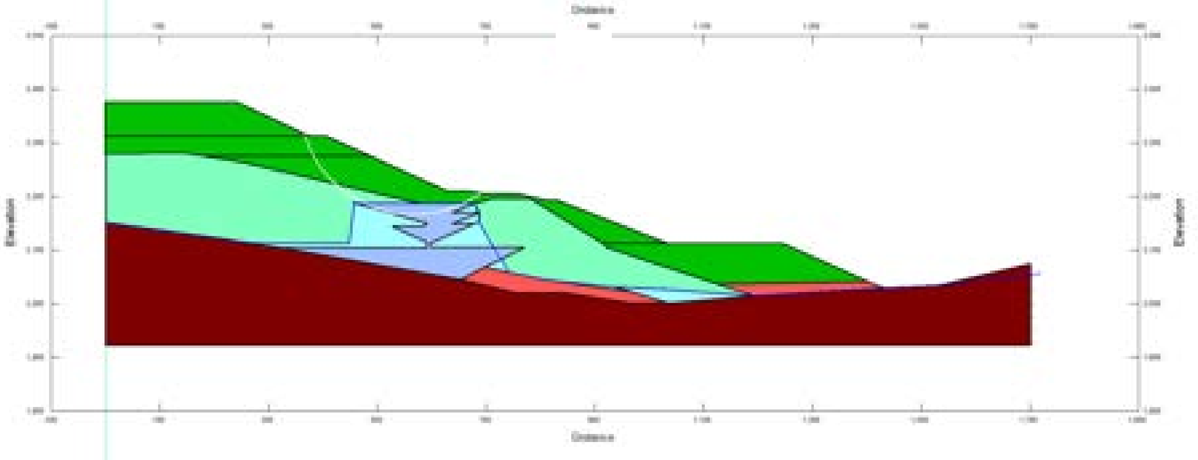
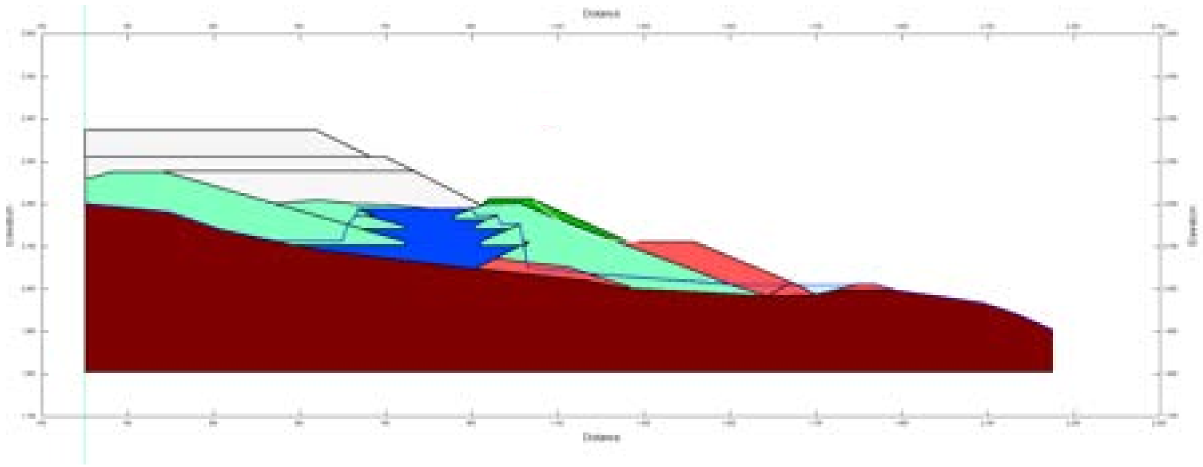
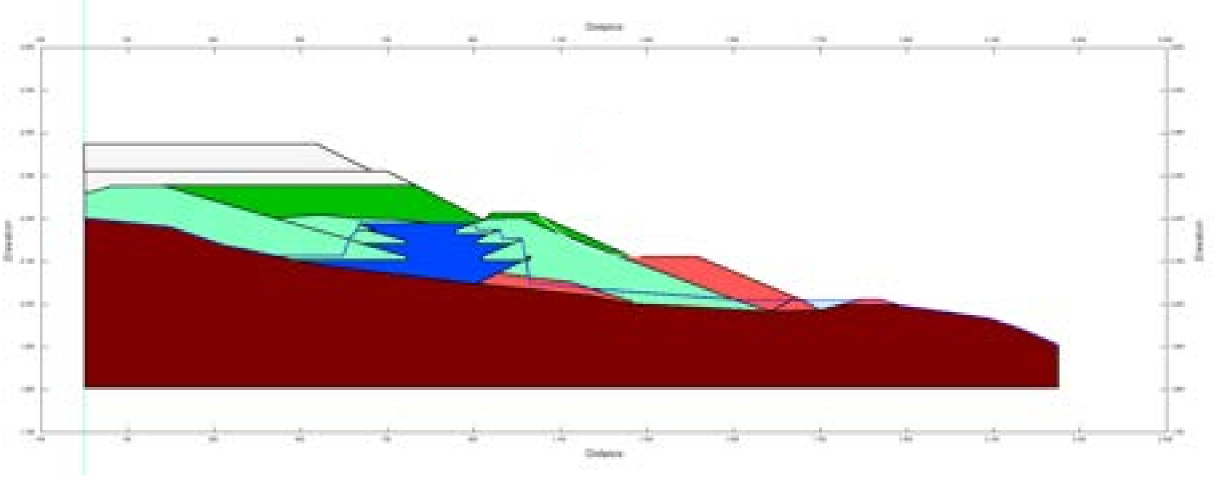


Section C Drained Condition

Phase 1

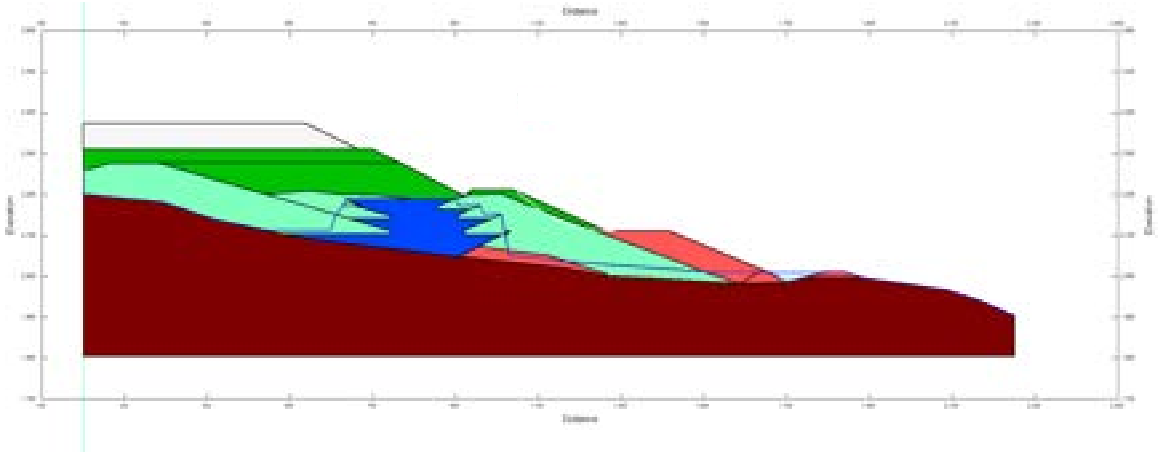
Phase 2

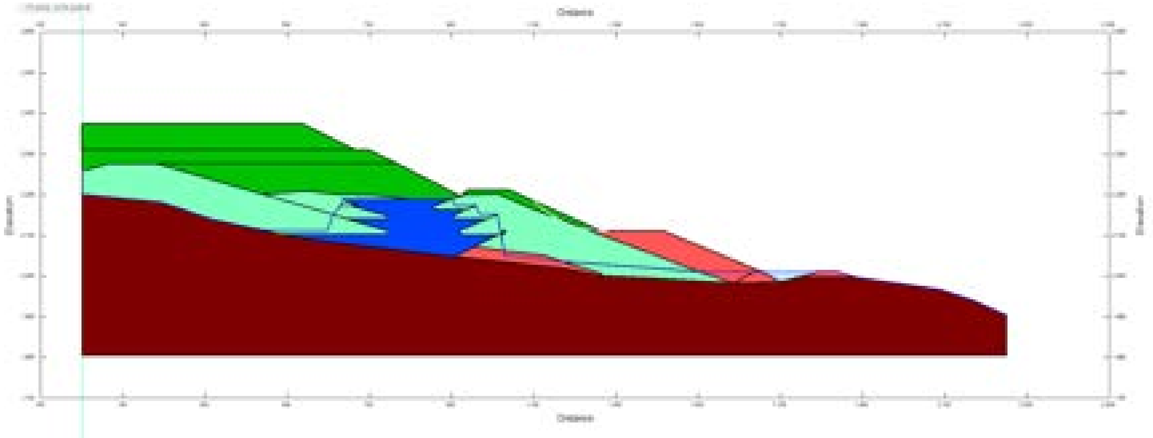




Phase 3

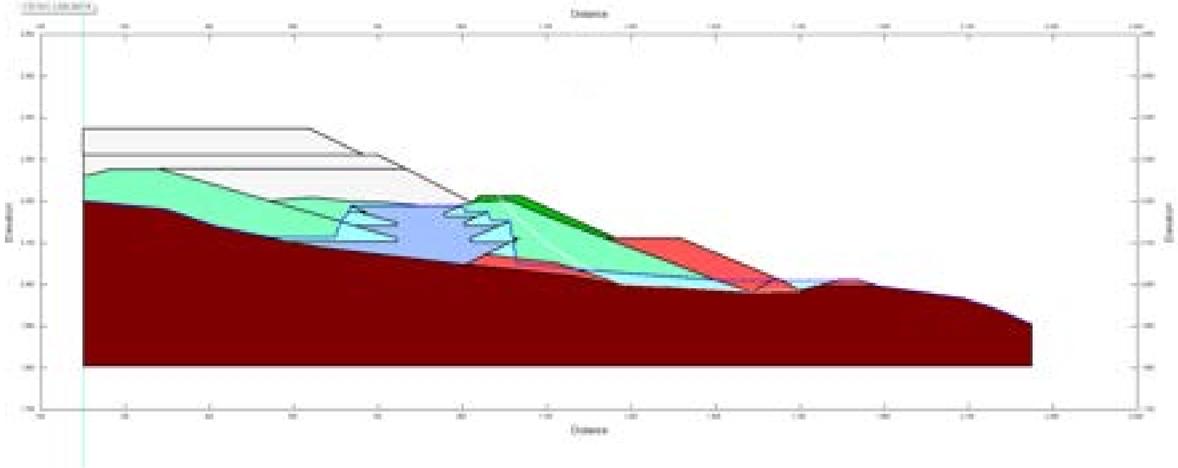
Phase 4





Section C Undrained Condition

Phase 1



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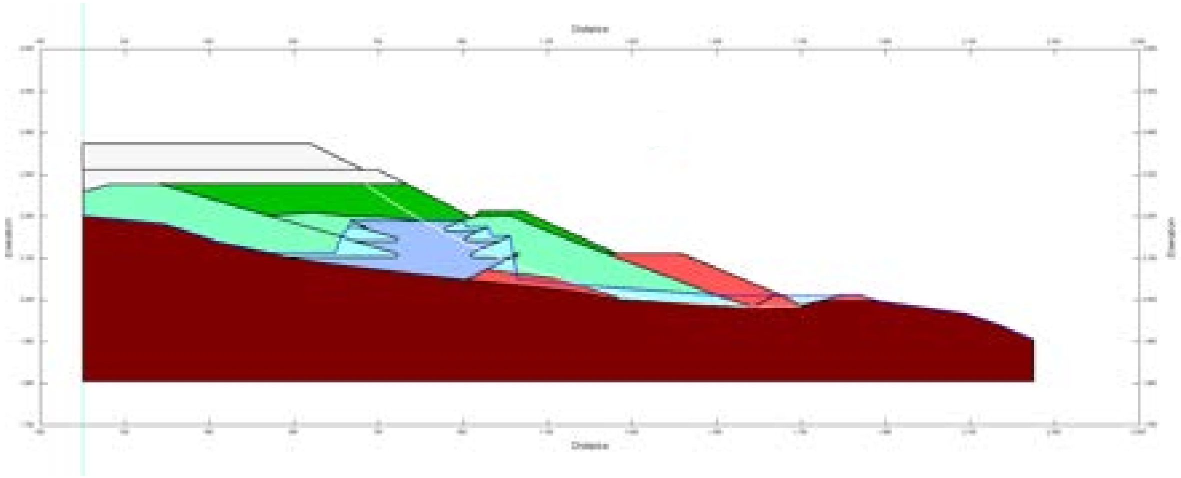

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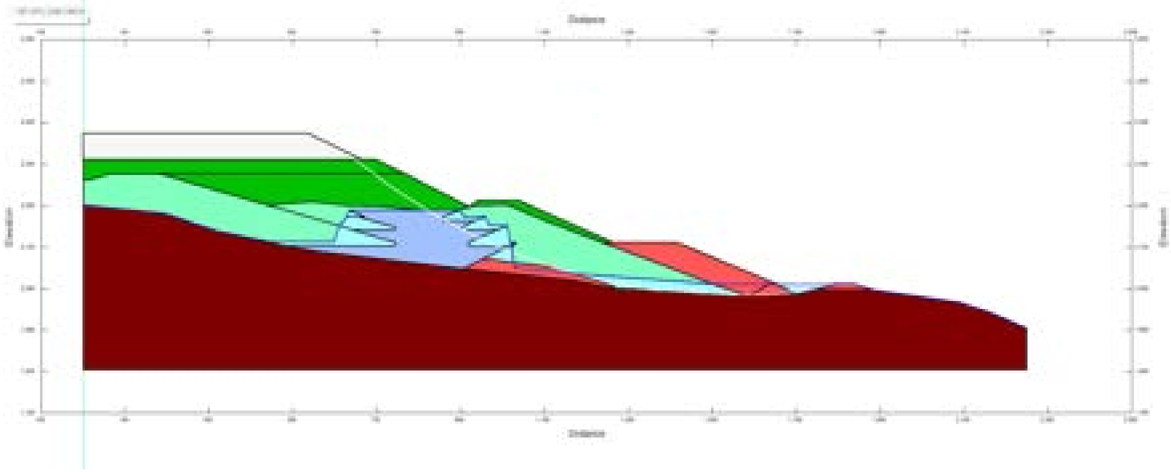

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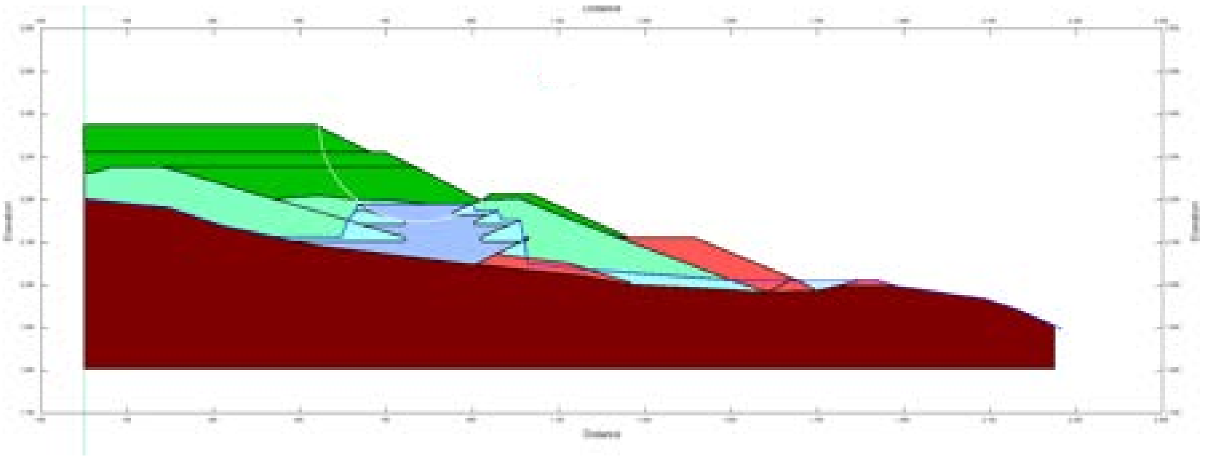

Section D Drained Condition

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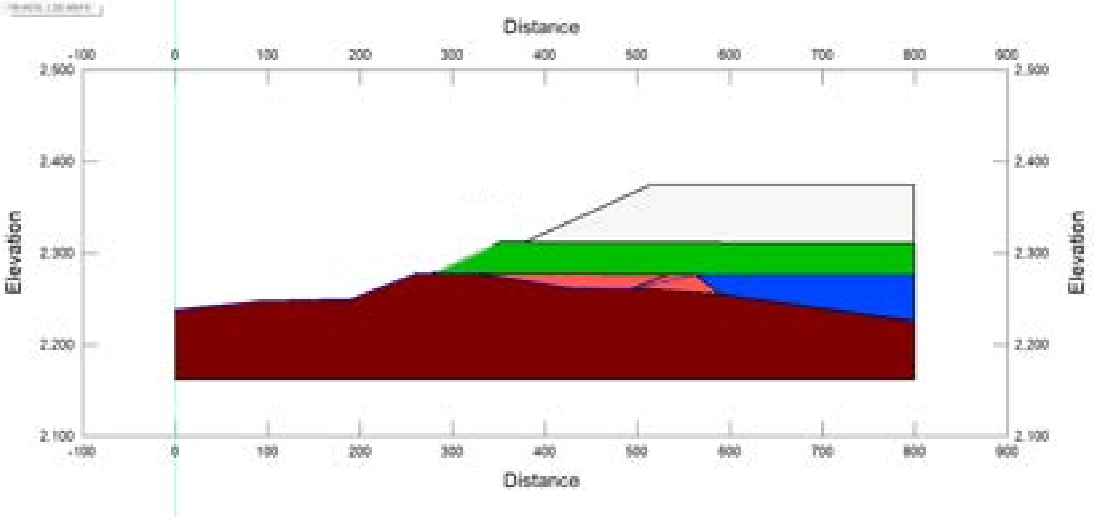
Phase 1

Phase 2

Phase 3



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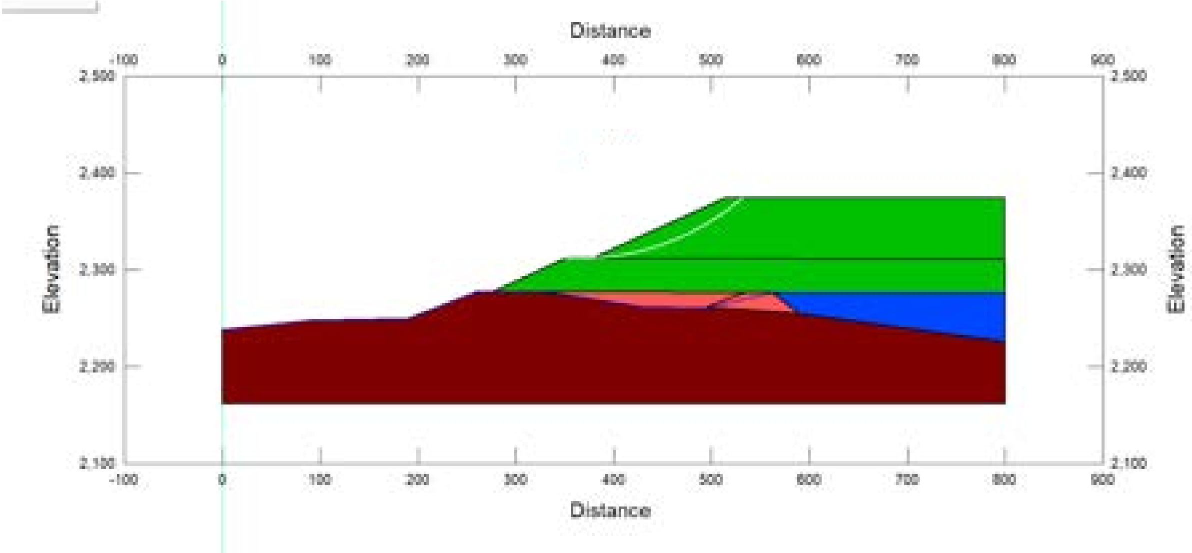
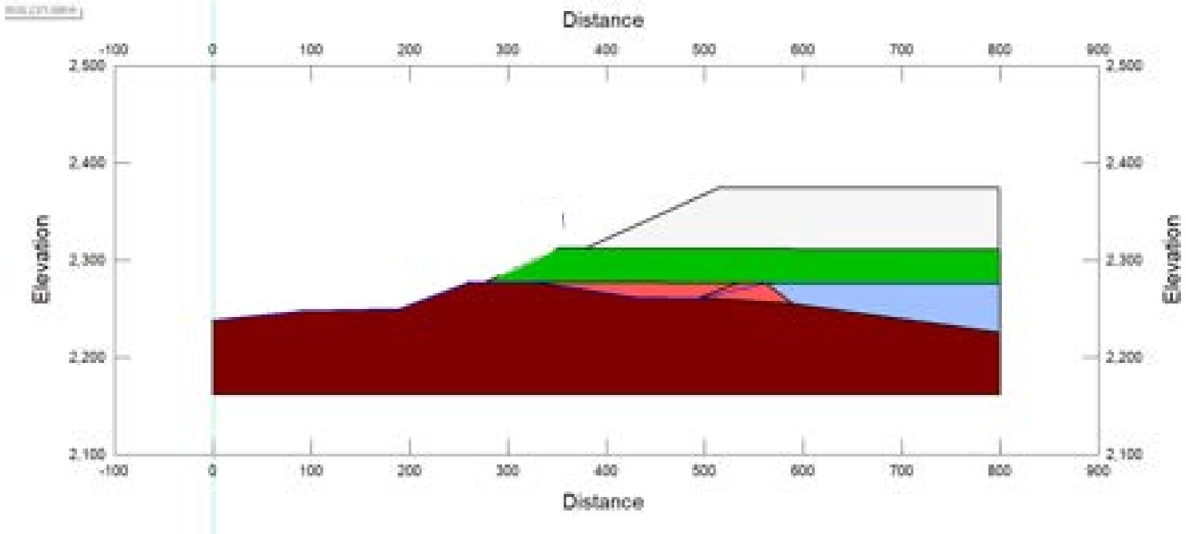


Section D Undrained Condition

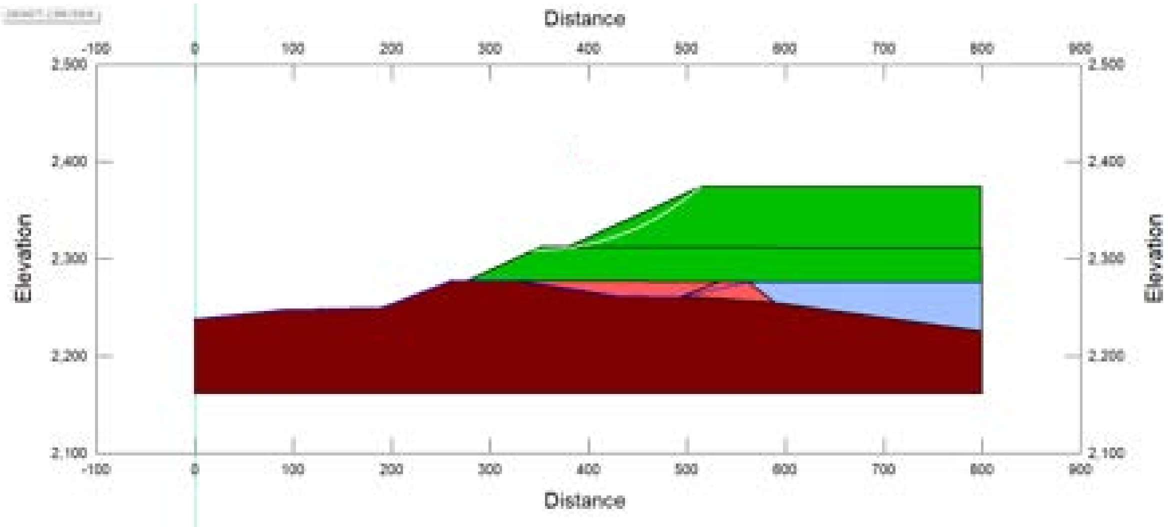
Phase 1

Phase 2

Phase 3



Phase 4

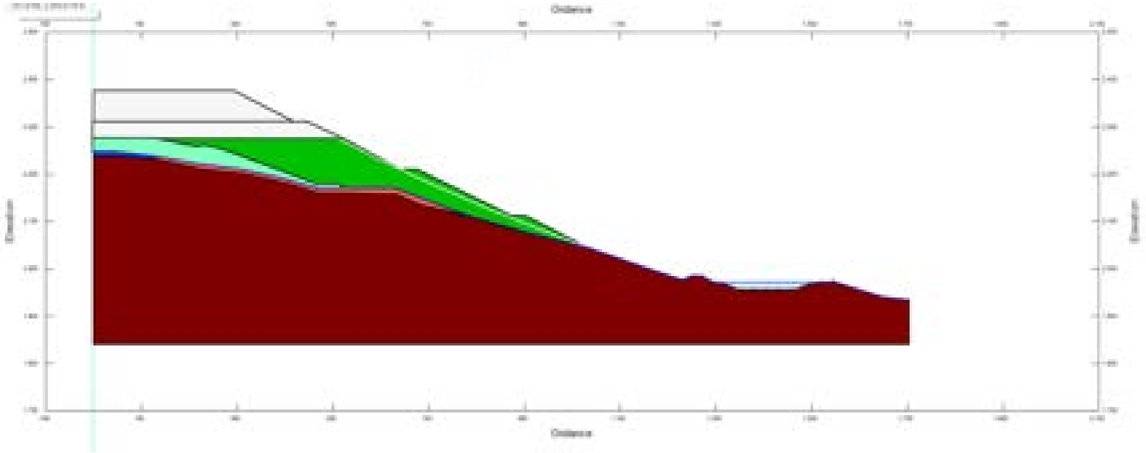


Section E Drained Condition

Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Su/Sigma Ratio	Minimum Shear Strength (psf)	Effective Friction Angle (°)
	Bedrock	Bedrock (Impenetrable)				
	Compacted Coarse Fill	Mohr-Coulomb	[illegible]			[illegible]
	Existing Loose Coarse Fill	Mohr-Coulomb	[illegible]			[illegible]
	Existing Loose Coarse Fill (Saturated Undrained)	SHANSEP	[illegible]	[illegible]	[illegible]	
	Expansion Loose Coarse Fill	Mohr-Coulomb	[illegible]			[illegible]
	Fine Grained Fill (Undrained)	SHANSEP	[illegible]	[illegible]	[illegible]	

Phase 1

Phase 2



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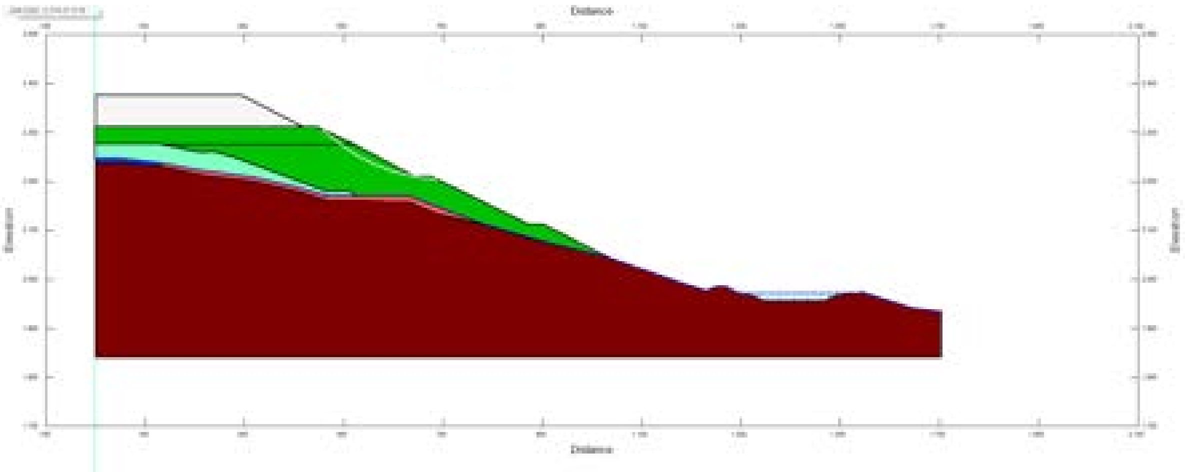

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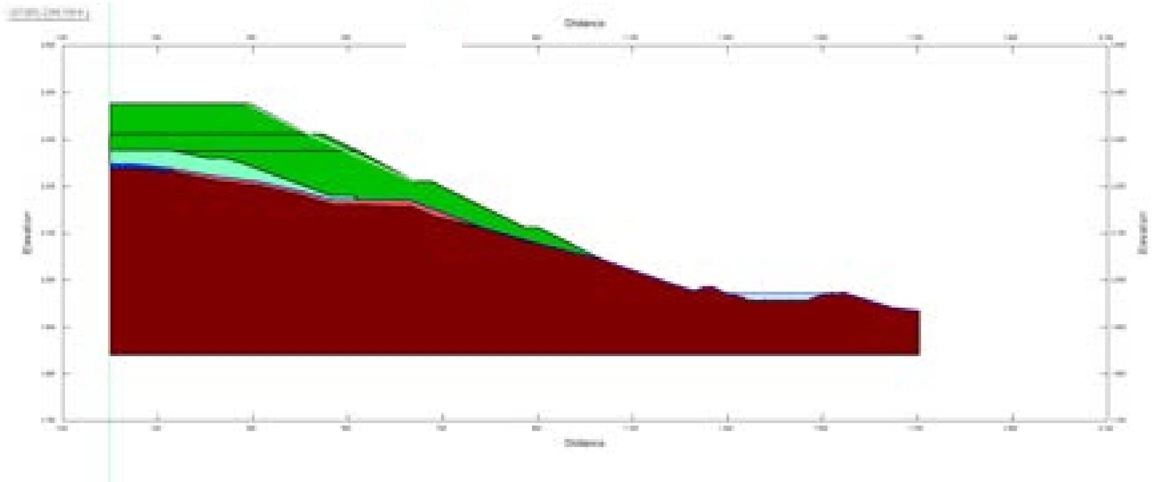
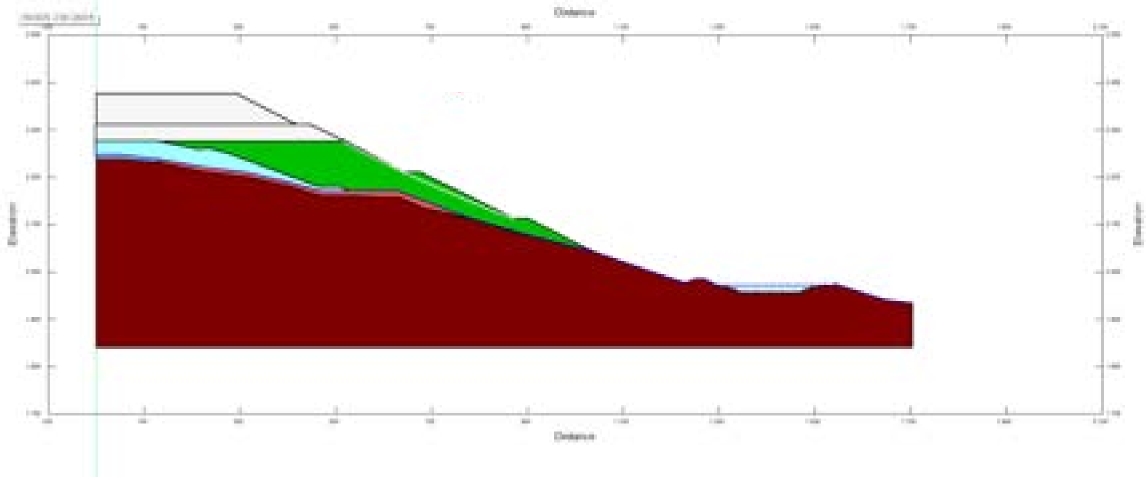


Section E Undrained Condition

Phase 1

Phase 2



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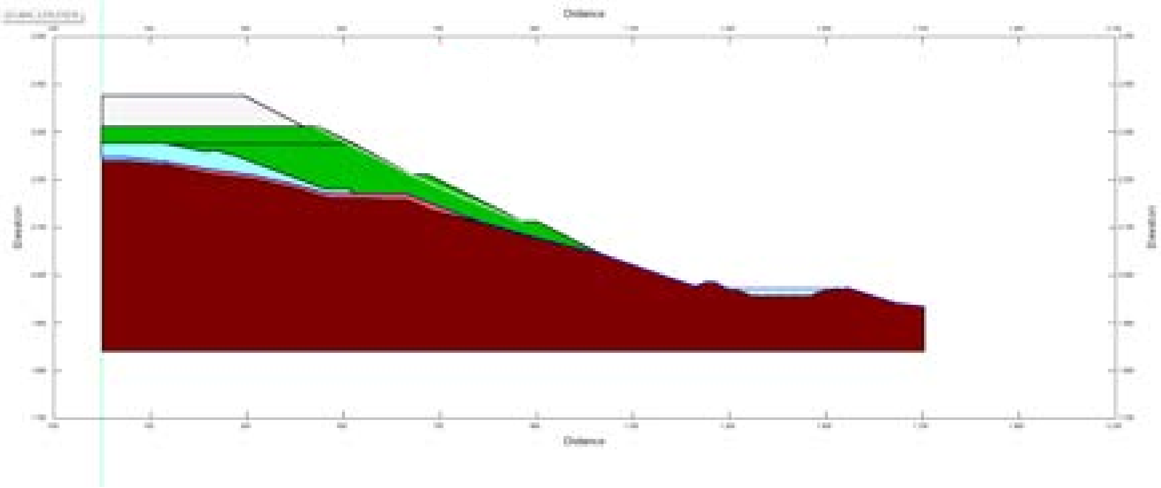
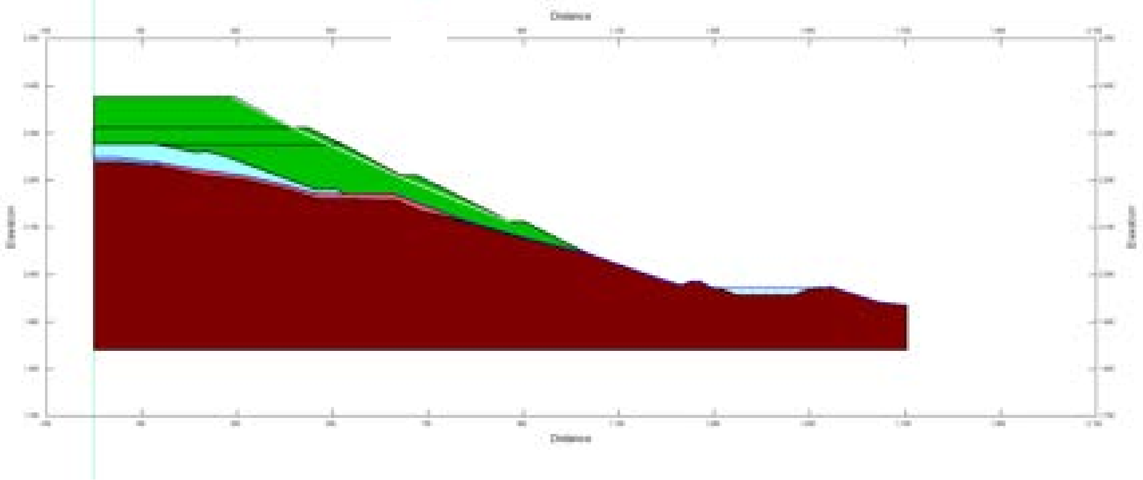


Phase 4



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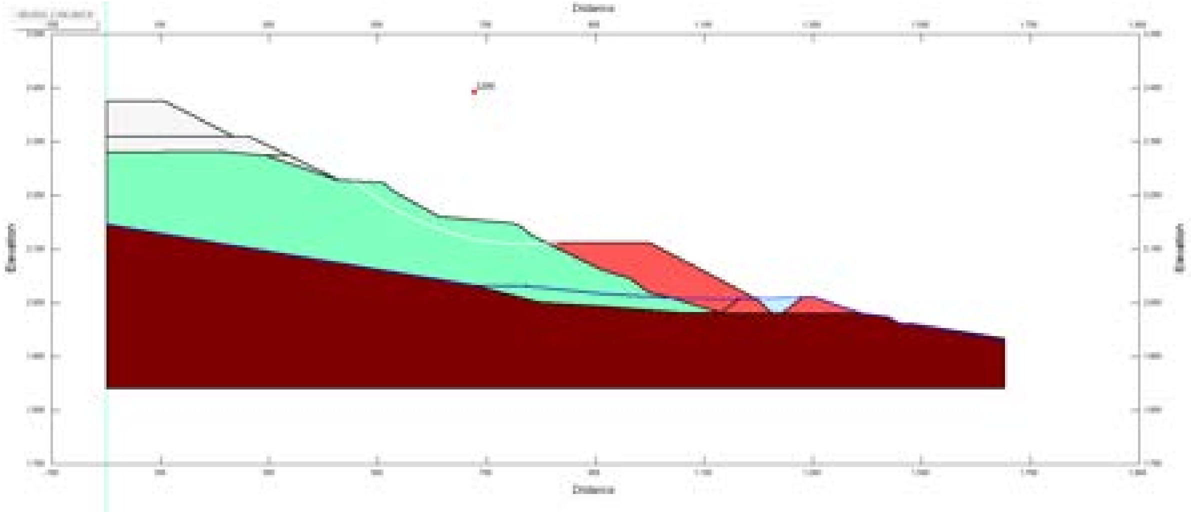
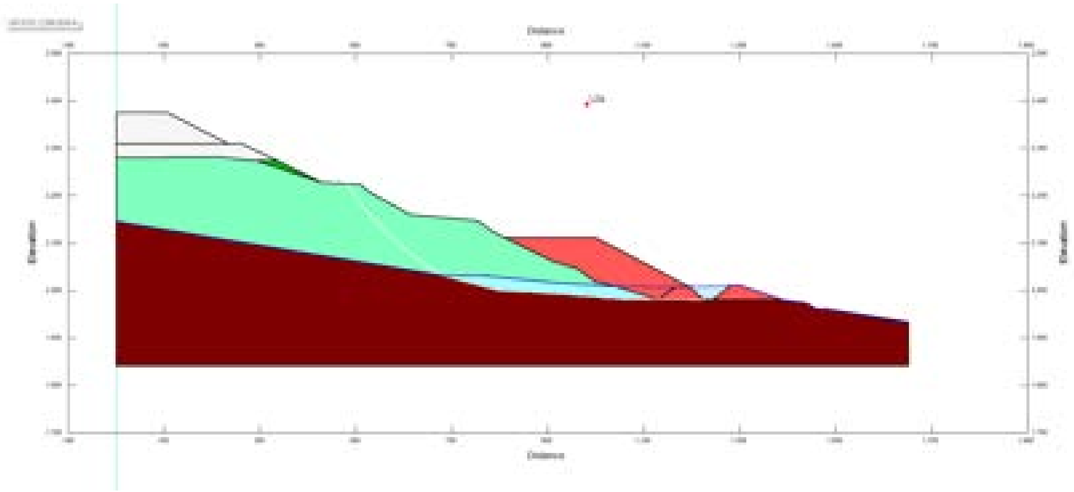
Section F Drained Condition

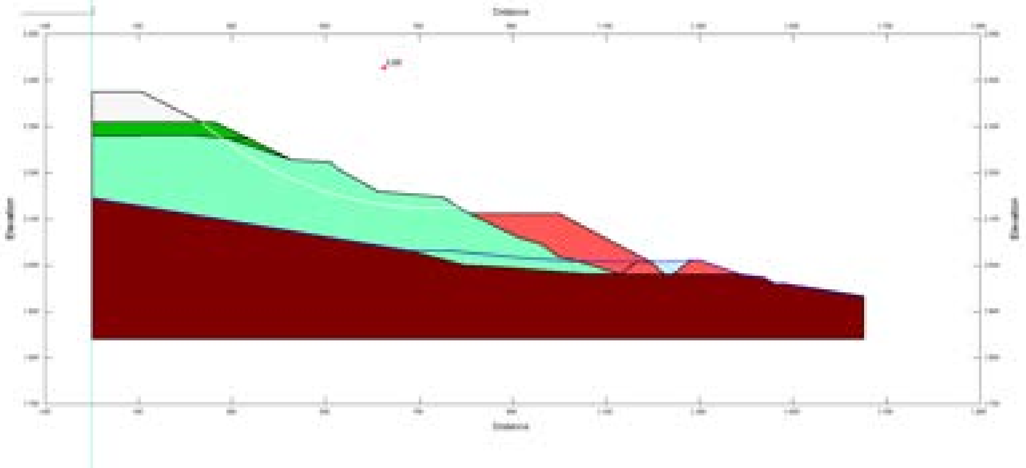
Phase 1



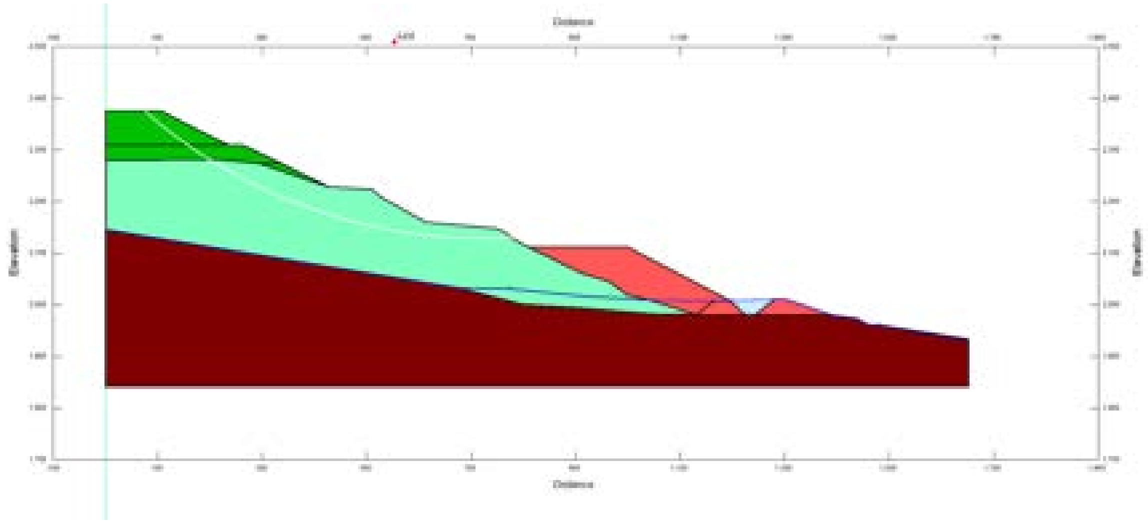
Phase 2



Phase 3

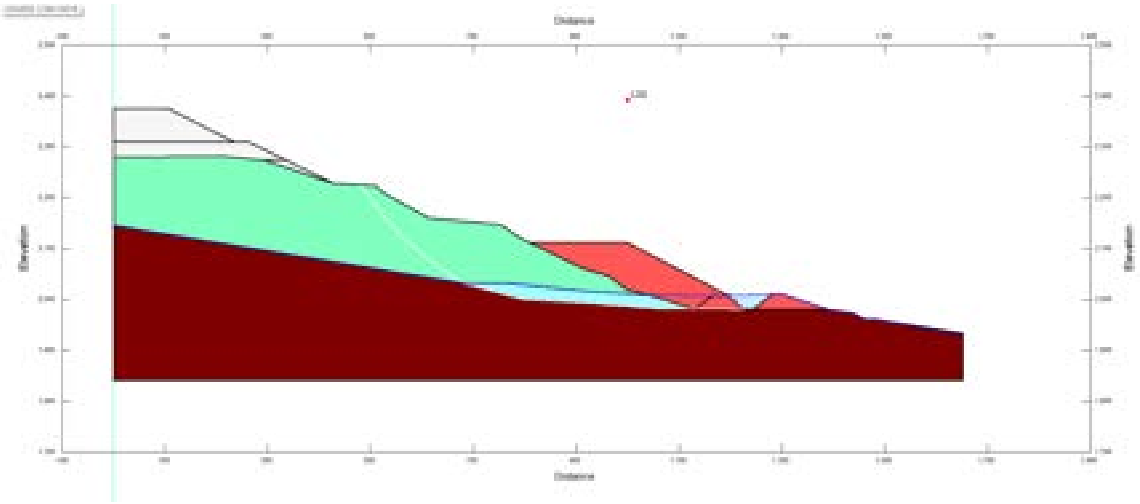


Phase 4



Section F Undrained Condition

Phase 1



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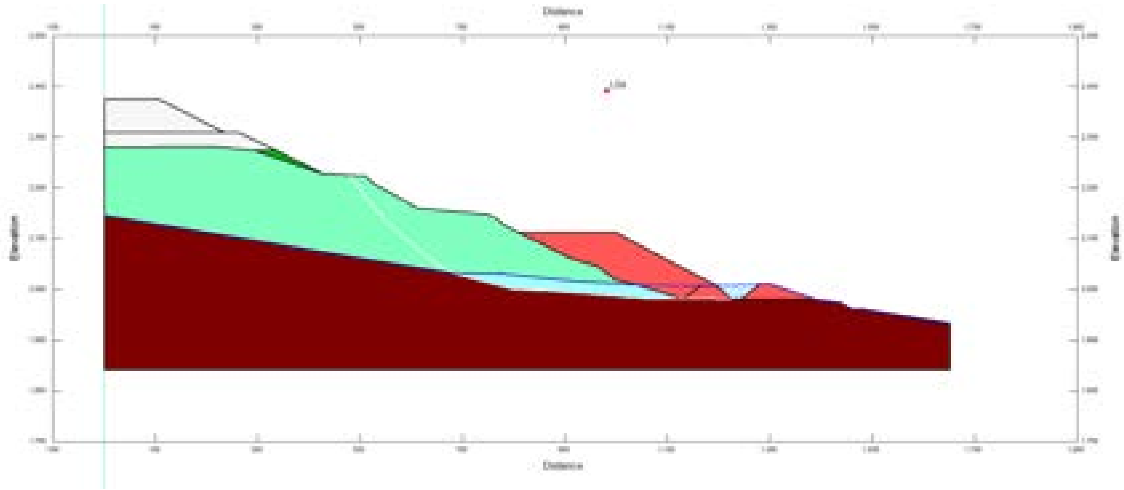
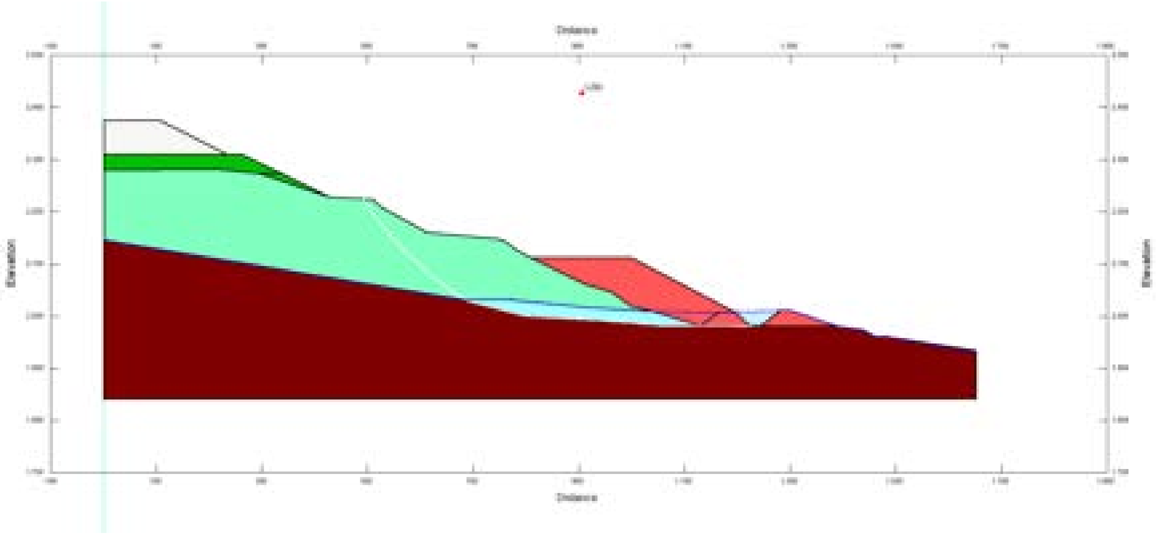


Phase 3



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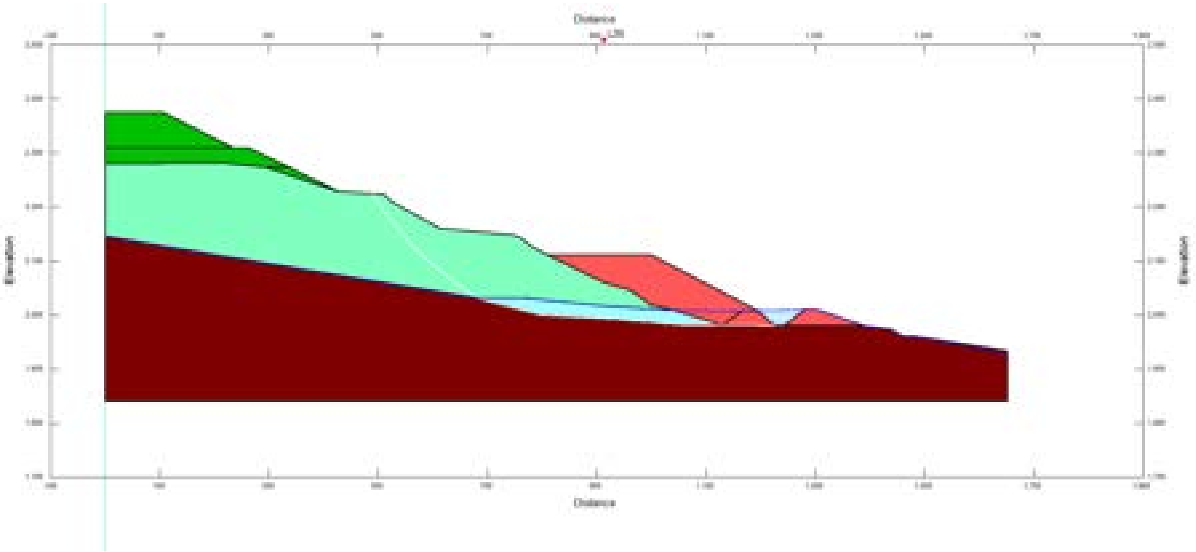
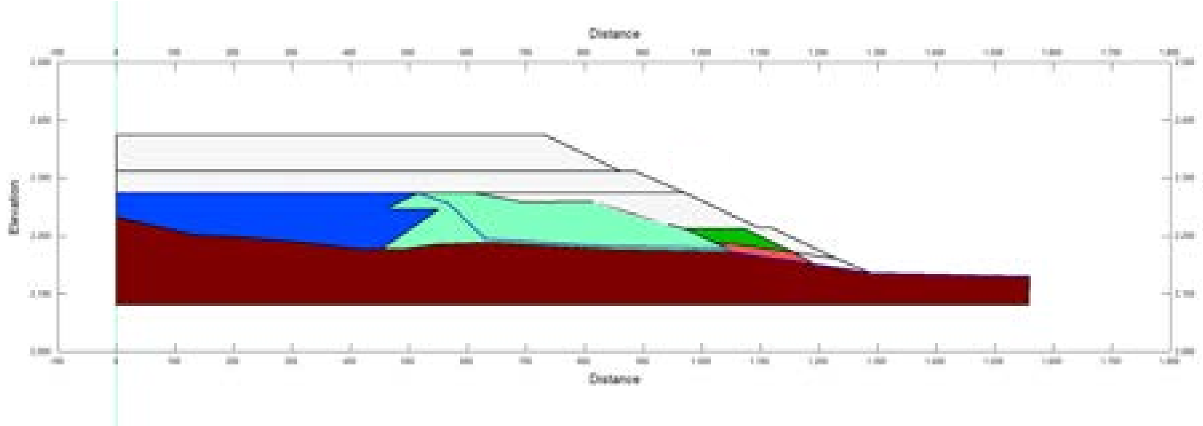
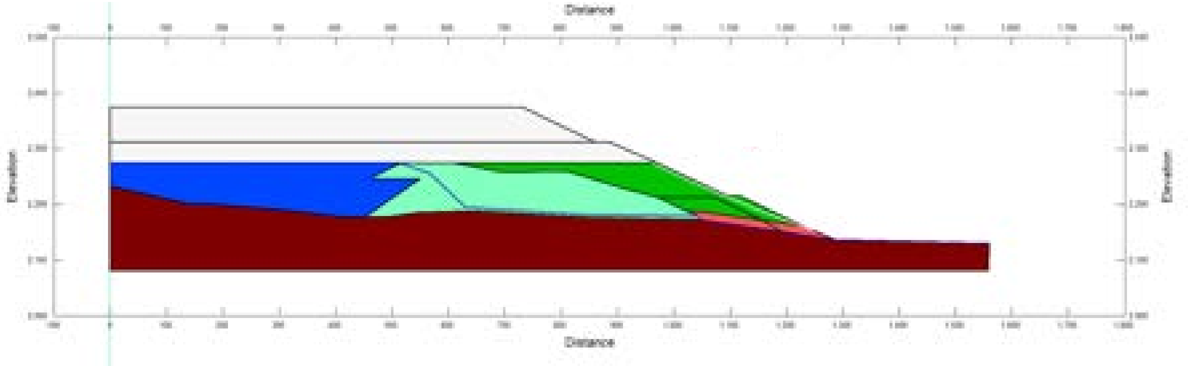


Section G Drained Condition

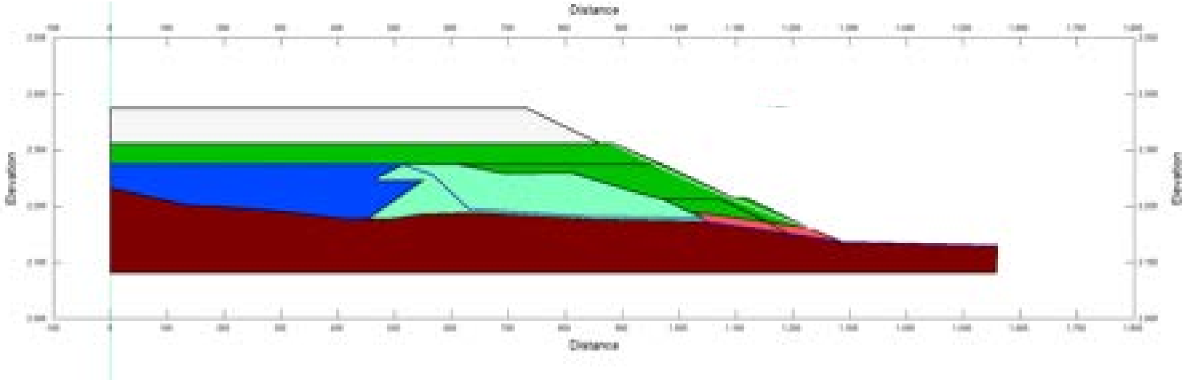
Phase 1



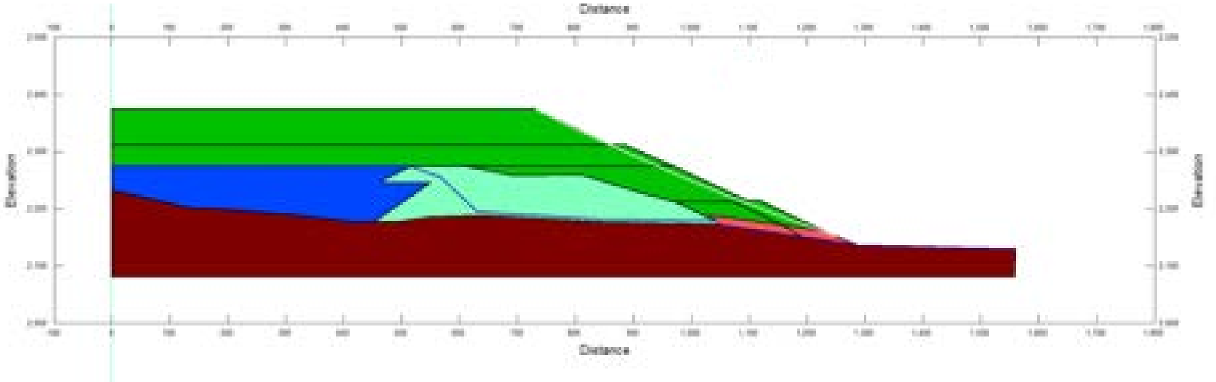
Phase 2



Phase 3

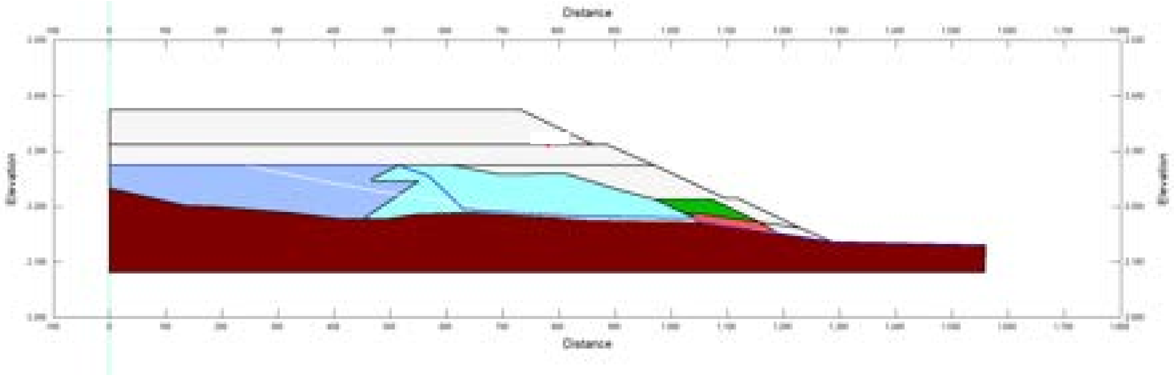


Phase 4

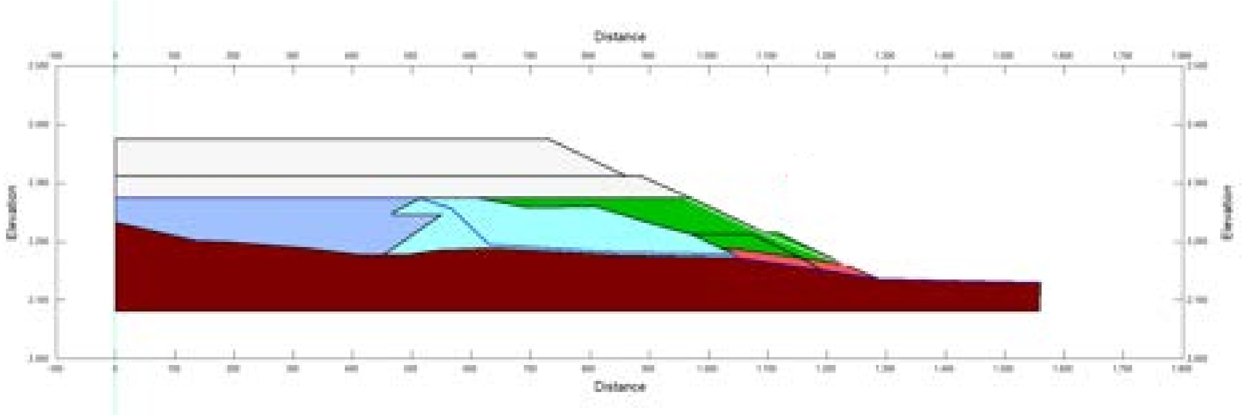


Section G Undrained Condition

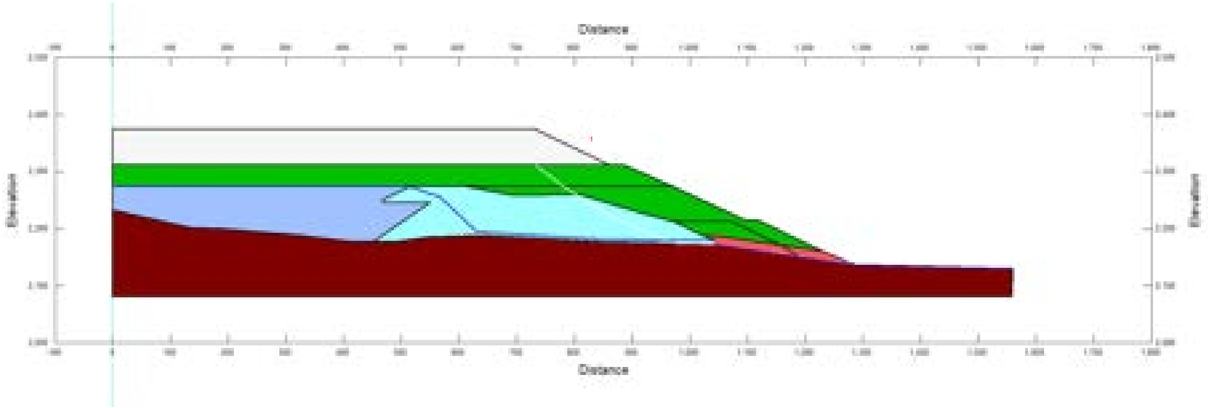
Phase 1



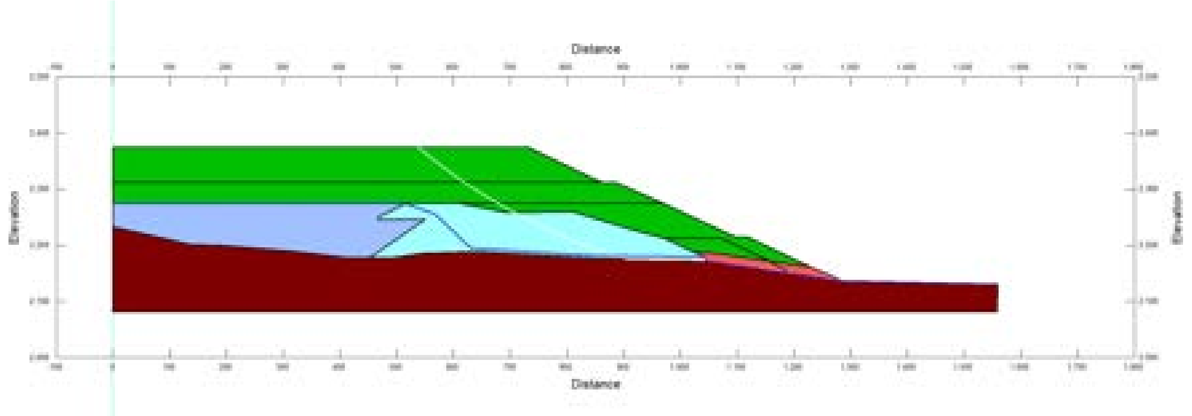
Phase 2



Phase 3

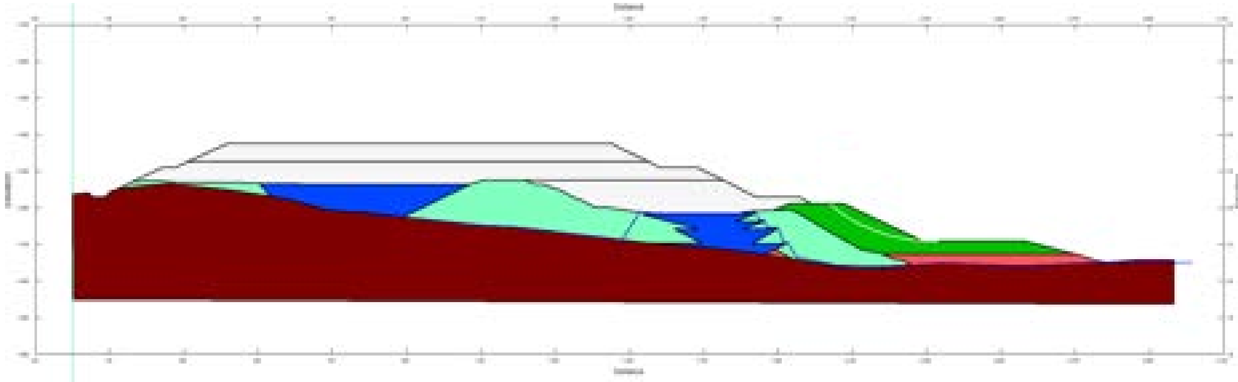


Phase 4

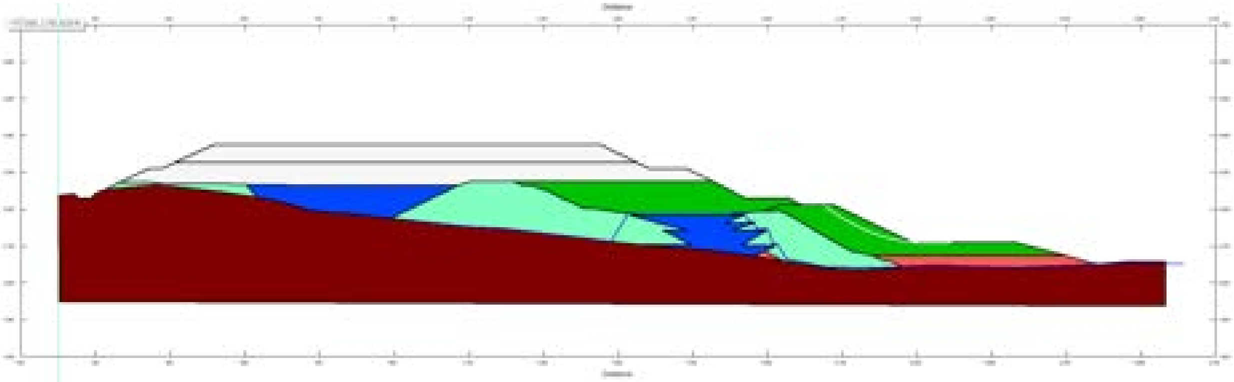


Section H Drained Condition

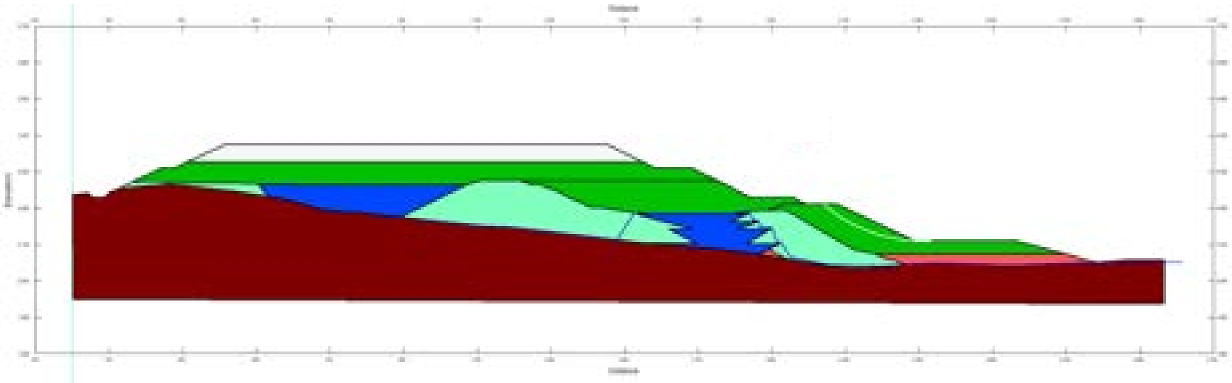
Phase 1



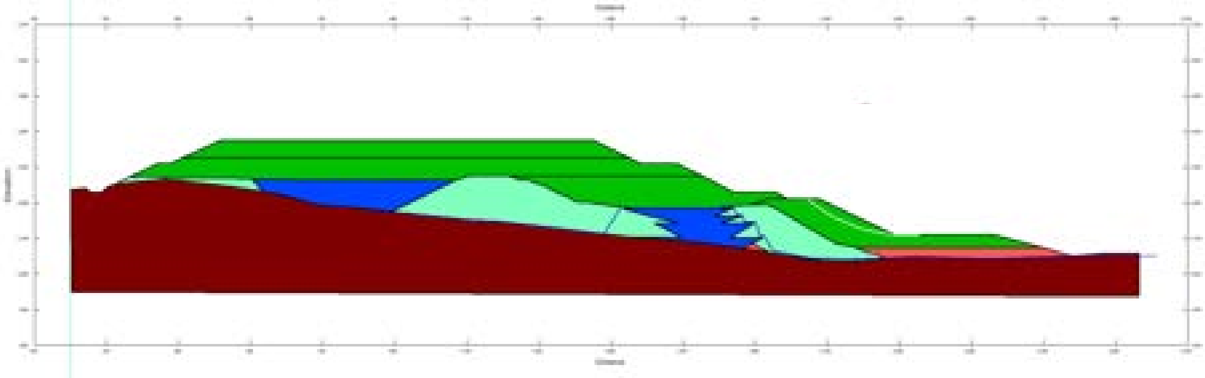
Phase 2



Phase 3



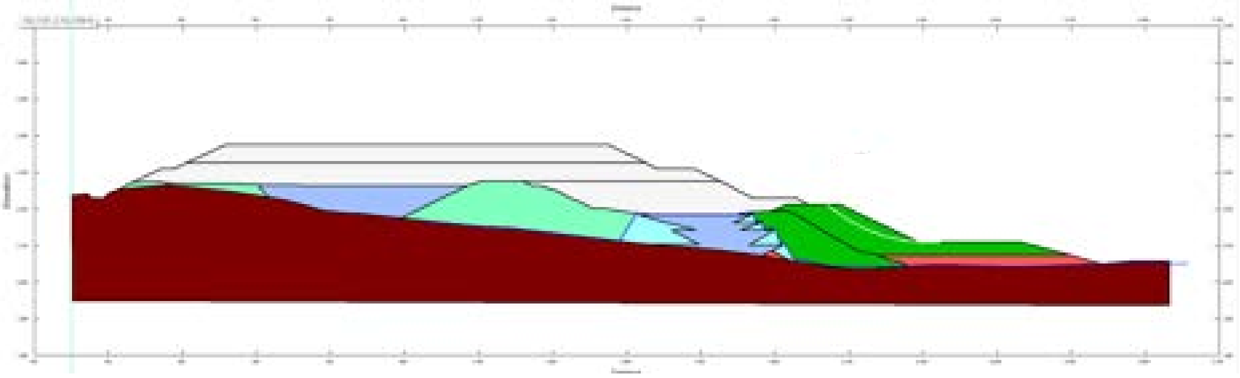
Phase 4



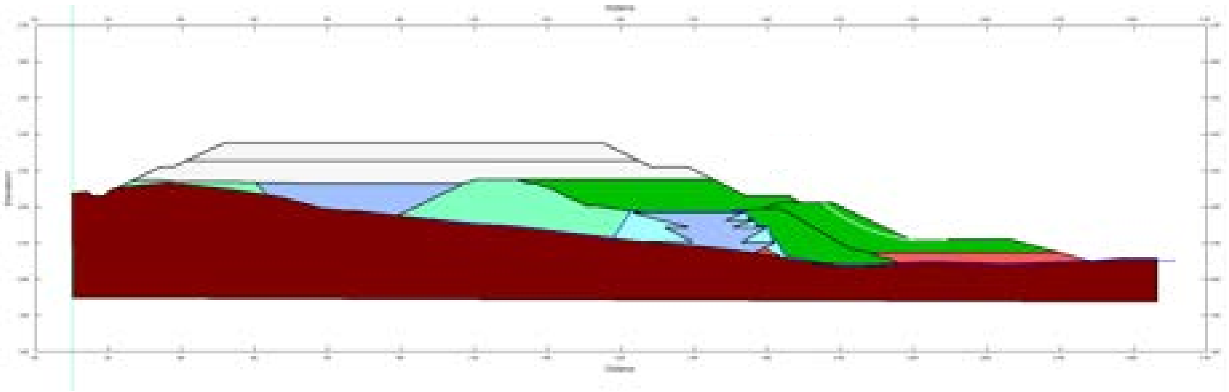
Section H Undrained Condition

Color	Name	Slope Stability Material Model	Unit Weight (pcf)	Tau/Sigma Ratio	Minimum Shear Strength (psf)	Effective Friction Angle (°)
	Bedrock	Bedrock (Impenetrable)				
	Compacted Coarse Fill	Mohr-Coulomb	140			40
	Existing Loose Coarse Fill	Mohr-Coulomb	127			37.6
	Existing Loose Coarse Fill (Saturated Undrained)	SHANSEP	127	0.3	0	
	Expansion Loose Coarse Fill	Mohr-Coulomb	127			37.6
	Fine Grained Fill (Undrained)	SHANSEP	108	0.22	0	

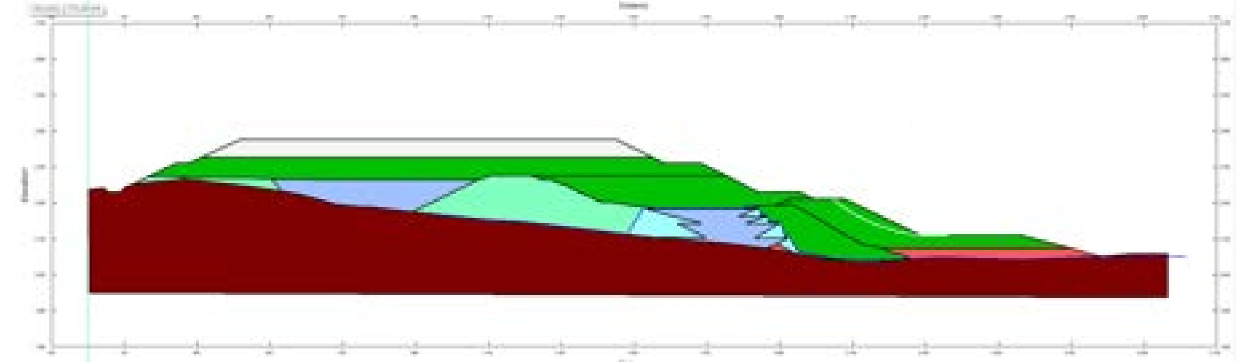
Phase 1



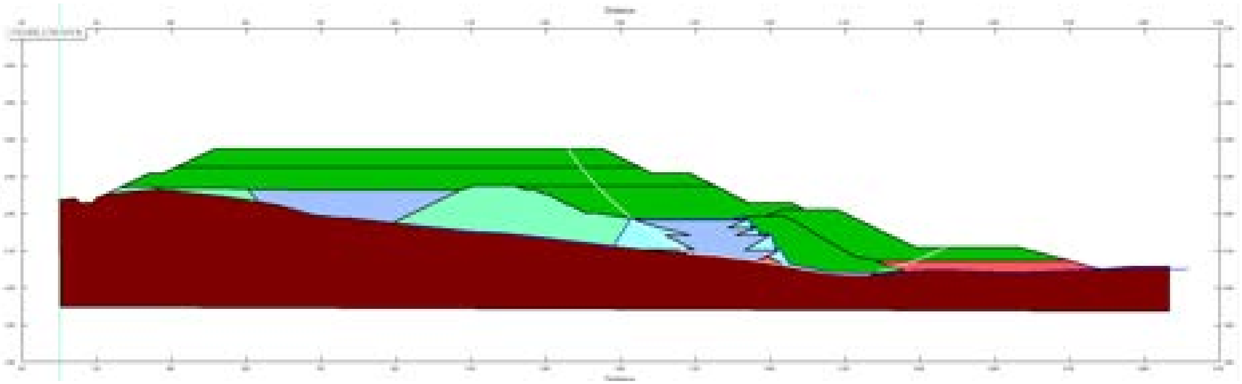
Phase 2



Phase 3



Phase 4



Appendix C

179 River Street, Troy, New York 12180
H2HG-E.com | bowman.com

LEGEND

1250	EXISTING INDEX CONTOUR
	EXISTING INTERMEDIATE CONTOUR
B-2	APPROXIMATE TEST BORING LOCATION

BORING TABLE

BORE	LATITUDE	LONGITUDE
B-1	N043.728711	W074.119826
B-2	N043.729305	W074.118661
B-3	N043.729418	W074.118337
B-4	N043.729155	W074.118349

SCALE IN FEET

0 60 120

REFERENCE

1. EXISTING CONTOURS AND ORTHOIMAGERY ARE BY OTHERS PROVIDED BY BARTON INTERNATIONAL ON AUGUST 16, 2024 IN FILE TITLED, "2024-04-01 BARTON MINE BASEMAP_.DWG".

CEC
Civil & Environmental Consultants, Inc.
700 Cherrington Parkway · Moon Township, PA 15108
412-429-2324 · 800-365-2324
www.cecinc.com

BARTON INTERNATIONAL
MIDDLE POND PIEZOMETER INSTALLATION
BARTON MINES, NORTH RIVER
NEW YORK

BORING LOCATION PLAN

DRAWN BY: QPB	CHECKED BY: DRAFT	APPROVED BY: DRAFT	FIGURE NO.: 1
DATE: AUGUST 2024	DWG SCALE: 1" = 60'	PROJECT NO: 330-152	

\\svr-fs-pit\projects\320-000\328-302\-CADD\Dwg\GT01\328302-GT01-Boring Location Plan.dwg{LAYOUT1} LS:(8/16/2024 - qbarnhart) - LP: 8/16/2024 1:35 PM

Civil & Environmental Consultants, Inc.
700 Cherrington Parkway
Moon Township, PA 15108

BORING NUMBER B-1

CLIENT	Barton International	**PROJECT NAME**	Middle Pond Piezometer Installation
PROJECT NUMBER	328-302	**PROJECT LOCATION**	North River, New York
DATE STARTED	7/16/24	**COMPLETED**	7/17/24
GROUND ELEVATION	2187 ft	**BACKFILL**	Cement Bentonite Grout
SOIL SAMPLING CONTRACTOR	Connelly & Associates	**WATER LEVELS:**	
SOIL SAMPLING METHOD	Direct Push	∇ **AT END OF SOIL SAMPLING**	65.0 ft / Elev 2122.0 ft
CEC REP	QPB	**CHECKED BY**	ALD
		AT END OF CORING	--- / Not Applicable
NOTES		**24hrs AFTER DRILLING**	--- / Backfilled Immediately

DEPTH (ft)	SAMPLE TYPE NUMBER	MATERIAL DESCRIPTION	Elevation
0	1	Brownish Gray, Poorly-Graded Sand with Silt, SP-SM, Moist, **(TAILINGS)**	
10	2		
20	3		
30	4		
39.8		Gray, Silt, ML, Moist, **(SLIME)**	2147.2
40.6	5	Brownish Gray, Poorly-Graded Sand with Silt, SP-SM, Moist, **(TAILINGS)** *Vibrating Wire Piezometer S/N 2246033 Installed at approximately 43.4 feet bgs.*	2146.4
50	6		
60	7	∇	
71.0	8	*Vibrating Wire Piezometer S/N 2246029 Installed at approximately 70.4 feet bgs.*	2116.0
72.5		Brown, Lean Clay with Gravel, CL, Moist, **(GLACIOLACUSTRINE)**	2114.5
73.4		Brownish Gray, Moderately Weathered Gneiss, **(BEDROCK)**	2113.6

Bottom of boring at 73.4 feet.

Civil & Environmental Consultants, Inc.
700 Cherrington Parkway
Moon Township, PA 15108

CLIENT Barton International
PROJECT NAME Middle Pond Piezometer Installation
PROJECT NUMBER 328-302
PROJECT LOCATION North River, New York
DATE STARTED 7/18/24 **COMPLETED** 7/18/24
GROUND ELEVATION 2189 ft **BACKFILL** Cement Bentonite Grout
SOIL SAMPLING CONTRACTOR Connelly & Associates
WATER LEVELS:
SOIL SAMPLING METHOD Direct Push
AT END OF SOIL SAMPLING --- >100 feet
CEC REP QPB **CHECKED BY** ALD
AT END OF CORING --- / Not Applicable
NOTES
24hrs AFTER DRILLING --- / Backfilled Immediately

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	Depth (ft)	MATERIAL DESCRIPTION	Elevation
0	1			Brownish Gray, Poorly-Graded Sand with Silt, SP-SM, **(TAILINGS)**	
			9.0	Gray, Silt, ML, **(SLIME)**	2180.0
10	2				
20	3				
30	ST 1	100		*Shelby Tube obtained from approximately 29-31 feet bgs with a downward pressure of 0-500 psi.*	
	4		31.0	Brownish Gray, Poorly-Graded Sand with Silt, SP-SM, **(TAILINGS)**	2158.0
			38.0	Gray, Silt, ML, **(SLIME)**	2151.0
			38.5	Brownish Gray, Poorly-Graded Sand with Silt, SP-SM, **(TAILINGS)**	2150.5
40	5				
50	6				
60	7			*Vibrating Wire Piezometer S/N 2246032 Installed at approximately 60.0 feet bgs.*	
			68.0	Gray, Silt, ML, **(SLIME)**	2121.0
			69.0	Brownish Gray, Poorly-Graded Sand with Silt, SP-SM, **(TAILINGS)**	2120.0
70	8				
			77.5	Gray, Silt, ML, **(SLIME)**	2111.5
80					

(Continued Next Page)

Civil & Environmental Consultants, Inc.
700 Cherrington Parkway
Moon Township, PA 15108

BORING NUMBER B-2

CLIENT Barton International
PROJECT NAME Middle Pond Piezometer Installation
PROJECT NUMBER 328-302
PROJECT LOCATION North River, New York

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	GRAPHIC LOG	Depth	MATERIAL DESCRIPTION	Elevation
80						
				81.0	Brownish Gray, Poorly-Graded Sand with Silt, SP-SM, **(TAILINGS)**	2108.0
	9			86.0		2103.0
				86.5	Gray, Silt, ML, **(SLIME)**	2102.5
90				90.0	Brownish Gray, Poorly-Graded Sand with Silt, SP-SM, **(TAILINGS)**	2099.0
	10				Gray, Silt, ML, **(SLIME)**	
100	11				*Vibrating Wire Piezometer S/N 2246030 Installed at approximately 100.0 feet bgs.*	
110				112.0		2077.0
	12				Brownish Gray, Poorly-Graded Sand with Silt, SP-SM, **(TAILINGS)**	
120	13				*Vibrating Wire Piezometer S/N 2246024 Installed at approximately 127.0 feet bgs.*	
130				130.0		2059.0
				132.0	Brown, Poorly-Graded Sand with Silt and Gravel, SP-SM, **(GLACIOLACUSTRINE)**	2057.0
	14			139.0	Brown And Black, Slightly Weathered Gneiss, **(BEDROCK)**	2050.0

Bottom of boring at 139.0 feet.

BORING NUMBER B-3

Civil & Environmental Consultants, Inc.
700 Cherrington Parkway
Moon Township, PA 15108

CLIENT Barton International
PROJECT NAME Middle Pond Piezometer Installation
PROJECT NUMBER 328-302
PROJECT LOCATION North River, New York
DATE STARTED 7/9/24 **COMPLETED** 7/10/24
GROUND ELEVATION 2203 ft **BACKFILL** Cement Bentonite Grout
SOIL SAMPLING CONTRACTOR Connelly & Associates
SOIL SAMPLING METHOD Direct Push
CEC REP QPB **CHECKED BY** ALD
NOTES

WATER LEVELS:
AT END OF SOIL SAMPLING --- >100 feet
AT END OF CORING --- / Not Applicable
24hrs AFTER DRILLING --- / Backfilled Immediately

DEPTH (ft)	SAMPLE TYPE NUMBER	GRAPHIC LOG	MATERIAL DESCRIPTION	Elevation
0	1		Brownish Gray, Poorly-Graded Sand with Silt, SP-SM, **(TAILINGS)**	
10	2			
20	3			
24.5			Gray, Silt, ML, **(SLIME)**	2178.5
25.5			*Vibrating Wire Piezometer S/N 2246034 Installed at approximately 24.8 feet bgs.* Brownish Gray, Poorly-Graded Sand with Silt, SP-SM, **(TAILINGS)**	2177.5
30	4			
34.5			Gray, Silt, ML, **(SLIME)**	2168.5
35.5			Brownish Gray, Poorly-Graded Sand with Silt, SP-SM, **(TAILINGS)**	2167.5
40	5			
50	6			
60	7			
70	8			
80				

(Continued Next Page)

Civil & Environmental Consultants, Inc.
700 Cherrington Parkway
Moon Township, PA 15108

BORING NUMBER B-3

CLIENT Barton International
PROJECT NAME Middle Pond Piezometer Installation
PROJECT NUMBER 328-302
PROJECT LOCATION North River, New York

DEPTH (ft)	SAMPLE TYPE NUMBER	GRAPHIC LOG	MATERIAL DESCRIPTION	
80				
	9		Brownish Gray, Poorly-Graded Sand with Silt, SP-SM, **(TAILINGS)** *(continued)*	
90	10		*Vibrating Wire Piezometer S/N 2246027 Installed at approximately 94.8 feet bgs.*	
100	11			
			109.0	2094.0
110			109.5 Gray, Silt, ML, **(SLIME)**	2093.5
	12		Brownish Gray, Poorly-Graded Sand with Silt, SP-SM, **(TAILINGS)**	
120	13			
130	14			
140	15			
150	16			
			156.0	2047.0
			Brown, Poorly-Graded Sand with Silt and Gravel, SP-SM, **(GLACIOLACUSTRINE)**	
160	17		*Vibrating Wire Piezometer S/N 2246023 Installed at approximately 161.8 feet bgs.*	
			167.0	2036.0
			168.0 Light Brown And Black, Slightly Weathered Gneiss, **(BEDROCK)**	2035.0
			Bottom of boring at 168.0 feet.	

Civil & Environmental Consultants, Inc.
700 Cherrington Parkway
Moon Township, PA 15108

BORING NUMBER B-4

CLIENT Barton International

PROJECT NAME Middle Pond Piezometer Installation

PROJECT NUMBER 328-302

PROJECT LOCATION North River, New York

DATE STARTED 7/11/24 **COMPLETED** 7/15/24

GROUND ELEVATION 2195 ft **BACKFILL** Cement Bentonite Grout

SOIL SAMPLING CONTRACTOR Connelly & Associates

WATER LEVELS:

SOIL SAMPLING METHOD Direct Push

AT END OF SOIL SAMPLING --- >100 feet

CEC REP QPB **CHECKED BY** ALD

AT END OF CORING --- / Not Applicable

NOTES

24hrs AFTER DRILLING --- / Backfilled Immediately

DEPTH (ft)	SAMPLE TYPE NUMBER	GRAPHIC LOG	MATERIAL DESCRIPTION
0			Brownish Gray, Poorly-Graded Sand with Silt, SP-SM, **(TAILINGS)**
	1		
10			
	2		
20			
	3		
30			
	4		
40			
	5		
50			
	6		
60			*Vibrating Wire Piezometer S/N 2246031 Installed at approximately 60.0 feet bgs.*
	7		
70			
	8		
80			

(Continued Next Page)

CLIENT Barton International **PROJECT NAME** Middle Pond Piezometer Installation

PROJECT NUMBER 328-302 **PROJECT LOCATION** North River, New York

DEPTH (ft)	SAMPLE TYPE NUMBER	GRAPHIC LOG	MATERIAL DESCRIPTION	
80	9		Brownish Gray, Poorly-Graded Sand with Silt, SP-SM, **(TAILINGS)** *(continued)*	
90	10			
100	11	99.6		2095.4
		100.4	Gray, Silt, ML, **(SLIME)** *Vibrating Wire Piezometer S/N 2246027 Installed at approximately 100.0 feet bgs.*	2094.6
			Brownish Gray, Poorly-Graded Sand with Silt, SP-SM, **(TAILINGS)**	
110	12			
120	13			
130	14	129.2		2065.8
		130.2	Gray, Silt, ML, **(SLIME)**	2064.8
			Brownish Gray, Poorly-Graded Sand with Silt, SP-SM, **(TAILINGS)**	
140	15			
150	16	150.0		2045.0
			Brown, Poorly-Graded Sand with Silt and Gravel, SP-SM, **(GLACIOLACUSTRINE)**	
		154.0		2041.0
		155.0	Brown And Black, Well-Graded Gravel with Sand, GW, **(GLACIOLACUSTRINE)**	2040.0
			Brown, Poorly-Graded Sand with Silt and Gravel, SP-SM, **(GLACIOLACUSTRINE)**	
160	17	160.0	*Vibrating Wire Piezometer S/N 2247192 Installed at approximately 160.0 feet bgs.*	2035.0
			Brown And Black, Slightly Weathered Gneiss, **(BEDROCK)**	
		163.5		2031.5

Bottom of boring at 163.5 feet.