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December 19, 2018 (Updated from December 14, 2018)  
Project No. 92270.05

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**Re: Geotechnical Design Report  
Watchic Bridge No. 2914  
State Route 113 over Page Brook  
Standish, Maine  
WIN 21703.00**

Dear Ms. Krusinski,

We are pleased to provide this Geotechnical Design Report to MaineDOT for the Watchic Bridge No. 2914 which carries State Route 113 over Page Brook in Standish, Maine. This report has been completed in accordance with the Project-Specific Task Order No, 20150610000000000814 dated August 2, 2017, and our proposal dated July 25, 2017, contract modification #1 dated April 2, 2018, and contract modification #2 dated December 11, 2018.

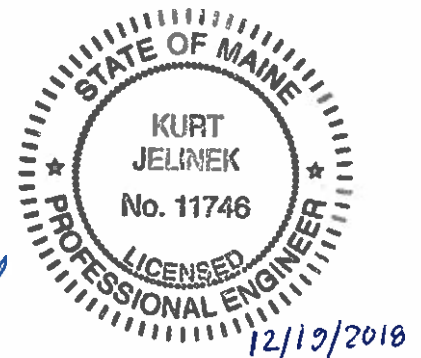
It has been a pleasure serving the MaineDOT and VHB on this project. Please let us know if you have any questions regarding this report.

Very truly yours,

**Nobis Engineering, Inc.**

Brien Waterman  
Project Manager

Kurt Jelinek, P.E.  
Director, Transportation Services





## **GEOTECHNICAL DESIGN REPORT**

**WATCHIC BRIDGE #2914**

**STANDISH, MAINE**

State Route 113 over Page Brook  
WIN 21703.00

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FOR

**Maine Department of Transportation**

**Augusta, Maine**

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**Nobis Project No. 92270.05**

**DECEMBER 19, 2018**

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## 1.0 INTRODUCTION

This geotechnical design report presents Nobis Group's (Nobis) recommendations for the MaineDOT Watchic Bridge No. 2914 located in Standish, Maine. This report is subject to the limitations contained in **Appendix A**. Nobis performed geotechnical services in accordance with the project-specific contract dated August 2, 2017, and our revised proposal dated July 25, 2017.

## 2.0 PROJECT AND SITE DESCRIPTION

Nobis understands that MaineDOT intends to replace the bridge carrying State Route 113 over Page Brook in Standish, Maine (the Site). A Site Locus Plan is included as **Figure 1**. The new bridge will consist of a precast concrete full box or rigid frame culvert with an approximate span/hydraulic opening of 23 feet. We understand that a temporary bridge may be required on the downstream side of the bridge to avoid a long detour during construction.

The existing one-span bridge was constructed in 1941 and has a total length of approximately 22 feet and curb-to-curb roadway width of approximately 31 feet with no sidewalks. The current hydraulic opening is approximately 12 feet wide. The existing foundations consist of concrete abutments supported by driven piles. Overhead powerlines are present on the east side of the bridge.



Watchic Bridge – Standish, Maine

The top of the roadway at the existing bridge approaches and along the bridge deck is relatively level, at approximately elevation (El.) 281, whereas the bed of the brook is at approximately El. 274. Elevations referenced in this report are relative to the North American Vertical Datum of 1988 (NAVD 88). Refer to **Figure 2** for the approximate location of existing and proposed site features.

## 3.0 SUBSURFACE EXPLORATIONS

To collect subsurface information and assess generalized subsurface conditions at the site, Nobis coordinated a subsurface exploration program consisting of two (2) test borings, designated BB-SPB-101 and BB-SPB-102, and three (3) streambed soil samples. The test borings were field-located at the site on October 3, 2017, by Nobis personnel using taped measurements from prominent site features. Refer to the attached **Figure 2** for the approximate locations of the test borings, and a plan view of the site.



The test borings were performed by New England Boring Contractors (NEBC) of Hermon, Maine, on November 1 through November 3, 2017. The borings were advanced using drive and wash methods with an automatic hammer, and were observed and logged by Nobis personnel.

Borings BB-SPB-101 and BB-SPB-102 were advanced to approximately 57 feet below ground surface (bgs) and 53 feet bgs, respectively. Approximately 10 feet of NQ-size bedrock core was collected from boring BB-SPB-101 and 5 feet from boring BB-SPB-102.

For the NEBC automatic hammer energy transfer ratio (ETR) calibration report, refer to **Appendix B**. Test boring logs are provided in **Appendix C**. Photo logs of the bedrock cores are provided in **Appendix D**.

#### 4.0 LABORATORY TESTING

Soil and bedrock samples obtained from the subsurface exploration program were selected by Nobis and submitted to GeoTesting Express of Acton, Massachusetts, for laboratory analysis. Laboratory tests performed include the following:

- Two (2) particle size analyses – sieve only (in accordance with ASTM D422);
- Two (2) particle size analyses – sieve and hydrometer (in accordance with ASTM D422);
- Two (2) Atterberg limits results, with water content (in accordance with ASTM D4318)
- One (1) moisture content test (ASTM D2216);
- One (1) organic content test (ASTM D2974);
- Two (2) compressive strength rock tests (ASTM D7012).

The laboratory test results are provided in **Appendix E**.

##### Streambed Soil Sample

Nobis visited the site on October 3, 2017 to premark the site and to collect streambed soil samples (designated SS-1 through SS-3). Samples were collected using hand tools approximately 1 to 2 feet below grades. Sample SS-1 was collected from the southern bank, sample SS-2 was collected from the approximate center of Page Brook, and sample SS-3 was collected from the northern bank. The approximate sample locations are shown on **Figure 2**.

Samples SS-2 and SS-3 were submitted to GeoTesting Express of Acton, Massachusetts for particle size analysis in accordance with ASTM D422. Nobis determined that samples SS-1 and SS-3 were similar, therefore, only one of the bank samples (i.e. SS-3) was submitted for testing.

Based on the particle size analyses performed on the soil samples obtained by Nobis, streambed soils consist of brown sand and gravel with trace silt. Based on the laboratory testing the  $D_{50}$  of the streambed samples was 2.23 millimeters (SS-2) and 2.30 millimeters (SS-3).

#### 5.0 SUBSURFACE CONDITIONS

The generalized stratigraphy encountered in the test borings consisted of asphalt overlying granular fill, freshwater wetland deposits, alluvium, and bedrock. Generalized descriptions of the subsurface conditions encountered in the test borings are discussed below, in order of increasing depth. Additional details are included on the boring logs included in **Appendix C** and shown on the Interpretive Subsurface Profile, **Figure 5**.

Pavement: Approximately nine (9) to ten (10) inches of roadway Hot Mix Asphalt (HMA) pavement was encountered in the borings.

Fill: The fill encountered in the test borings generally consisted of moist to wet, brown, medium dense fine to coarse sand, with little to some fine to coarse gravel, and trace to little silt, occasionally including asphalt particles and fragments. The bottom of fill was encountered at approximately 5 to 6 feet below roadway grades.

Brook Deposits: The brook deposits generally consisted of brown to grey, wet, medium dense sand and gravel with trace amounts of silt. Based on the borings, the bottom of the brook deposits was encountered approximately 10 feet below roadway grades.

Freshwater Wetland Deposits: The freshwater wetland deposits generally consisted of brown, wet, very loose, peaty organic silt, with varying amounts of gravel and sand. Based on laboratory testing, the peaty organic silt has a water content of approximately 254 percent and an organic content of approximately 36 percent. The bottom of the freshwater wetland deposits was encountered at approximately 15 feet below roadway grades.

Sand: A layer of sand was encountered below the freshwater wetland deposits, and generally consisted of grey, medium dense, fine to coarse sand with varying amounts of silt and gravel. A very loose sample, with no recovery, was encountered in boring BB-SPB-102 at approximately 16 feet below grades. The bottom of the sand stratum was encountered at 21 feet below grades in boring BB-SPB-101 and 30 feet in boring BB-SPB-102.

Silt/Clayey Silt: A layer of silt/clayey silt was encountered below the sand stratum, generally consisting of grey, very stiff to hard, clayey silt or silt with some clay and trace to little amounts of fine sand. Based on Atterberg limits results, the liquid limit of the silt/clayey silt stratum was 23 and 29 with a plasticity index of 8 and 12, respectively.

Boulders: A layer of boulders was encountered above the bedrock from approximately 40 to 42 feet below roadway grades. NQ2 cores were advanced through the boulders to advance the casing to top of bedrock.

Bedrock: Bedrock was encountered at approximately 46.2 feet (corresponding to El. 234.8) and 47.6 feet (El. 233.4) bgs in BB-SPB-101 and BB-SPB-102, respectively. Core samples generally consisted of grey, fresh to moderately weathered, fine to coarse grained granite, with very close to moderately close joints. Rock quality designations (RQDs) varied between 40% (poor quality) and 82% (good). Based on laboratory testing, the uniaxial compressive strength of the intact granite bedrock cores is above 20,000 pounds per square inch.

Groundwater: Groundwater measurements were obtained within cased borehole conditions after at least 16 hours of stabilization. Measurements varied between approximately 5.5 and 5.3 feet bgs, or El. 275.5 and El. 275.7, in BB-SPB-101 and BB-SPB-102, respectively.

Note that water was introduced to boreholes during the test boring rotary wash process, and that fluctuations in the observed groundwater levels will occur due to variations in precipitation, brook water level, temperature, and other factors different from those existing at the time the measurements were made.

## **6.0 GEOTECHNICAL DESIGN RECOMMENDATIONS**

The following sections present our geotechnical engineering evaluations of the subsurface conditions relative to the replacement culvert.

## **6.1 Concrete Culvert Supported by Structural Fill over Natural Sand**

Preliminary bearing and settlement analyses indicated that the concrete culvert could settle over 1 foot without any ground improvements. Therefore, we recommend that the organic deposits be overexcavated and replaced with Structural Fill, or the culvert be supported by ground improvement elements or driven piles. It is our understanding that overexcavate/replace is the preferred option.

Based on the working plan set prepared by VHB, provided August 23, 2018, we understand that the organic deposits within the zone of influence of the proposed footing will be overexcavated then replaced with compacted Structural Fill. The subgrades should be prepared as discussed in the Construction Considerations section below.

Preliminary loads were provided by VHB on August 29, 2018. The provided loads are provided in **Appendix F**.

## **6.2 Bearing Resistance, Settlement, and Frost Depth**

### **Bearing Resistance and Settlement**

We evaluated the bearing resistance of the proposed concrete culvert assuming the unsuitable materials (i.e. organic deposits) are overexcavated from the zone of influence and replaced with Structural Fill. We estimate approximately 4 to 5 feet of overexcavation below the concrete culvert will be required to remove the organic deposits.

The bearing resistance calculation assumed the minimum footing embedment of 5.3 feet bgs, a resistance factor of 0.45, and a minimum of 1 foot of Granular Borrow for Underwater Backfill below the concrete culvert.

Soil properties and groundwater levels featured in the analyses are developed using engineering judgment based on field measurements and soil classifications in addition to laboratory test results assuming the subgrade is prepared in accordance with the Construction Considerations section below.

Based on our analyses of the proposed concrete culvert considering an assumed  $B'$  of 15 feet, the factored bearing resistance at the strength limit state is 11.9 kips per square foot (ksf). Due to the underlying clay deposits, the service load case controls, as discussed below.

Settlement was evaluated using Settle3D. Based on the provided Service Load of approximately 1.5 ksf, we estimate approximately 1 inch of settlement during the first year after construction and 1.5-inches of additional long-term settlement (i.e. secondary settlement) over 50 years. Our bearing resistance and settlement estimate are provided in **Appendix F**.

### **Frost Depth**

Based on Figure 5-1 (MaineDOT Bridge Design Guide), the town of Standish has a design freezing index of 1,315. Additionally, the top 10 feet of soil below existing grades consists of coarse deposits (i.e. sand and gravel fill or sand and gravel). We assumed the moisture content of the coarse deposits within the top 10 feet below grades is 20 percent.

Based on a design freezing index of 1,315, and coarse deposits with a moisture content of 20 percent, we recommend a design frost penetration depth of 5.3 feet.

### **6.3 Lateral Earth Pressures**

We recommend that the proposed culvert be designed for lateral earth pressures using backfill material properties for Soil Type 4 (MaineDOT Bridge Design Guide Section 3.6.1). We recommend that the culvert be designed based on the following soil parameters:

- At-rest earth pressure coefficient = 0.47
- Sliding resistance factor for precast culvert,  $\phi_t = 0.9$  (AASHTO Table 10.5.5.2.2-1)
- Friction angle,  $\phi$ , = 32 deg. for retained soil
- Soil density,  $\gamma = 125$  pcf for retained soil

The at-rest earth pressure coefficient is based on a vertical backface for the culvert and level backfill behind the culvert. The at-rest earth pressure calculation is included in **Appendix F**.

In addition, a live load surcharge should be applied to account for vehicular traffic (AASHTO Article 3.11.6.4). The live load surcharge may be estimated as a uniform horizontal earth pressure due to an equivalent height of soil in accordance with MaineDOT Bridge Design Guide Table 3-4.

A sliding coefficient of friction ( $C * \tan \phi_f$ ) of 0.5 is recommended for the culvert, where a value of  $C = 0.8$  is used for precast concrete (AASHTO 2016 Interim Revisions 10.6.3.4-2).

### **6.4 Seismic Design Considerations**

Based on the SPT-N values, and using Method B (Table C3.10.3.1-1), the average SPT N-value is generally below 15 bpf, corresponding to Site Class E.

The seismic parameters developed for the proposed bridge are provided below per the AASHTO 8<sup>th</sup> Edition:

Mapped Ground and Spectral Response Coefficients (USGS Seismic Design Maps):

- Horizontal Peak Ground Acceleration (PGA): 0.096
- Horizontal Response Spectral Acceleration, 0.2 Sec ( $S_S$ ): 0.189
- Horizontal Response Spectral Acceleration, 1.0 Sec ( $S_1$ ): 0.047

Site Class: E (AASHTO Table 3.10.3.1-1):

- Site Factors for Site Class “E” (AASHTO Tables 3.10.3.2-1, -2, and -3):  
Zero-Period ( $F_{pga}$ ) = 2.5, Short-Period, 0.2 Sec ( $F_a$ ) = 2.5, and Long Period, 1.0 Sec ( $F_v$ ) = 3.5.
- Design Spectral Response Parameters for Site Class “E”:  
 $A_S = 0.241$ ,  $S_{DS} = 0.471$ ,  $S_{D1} = 0.164$ .

Per AASHTO Article 3.10.6-1 the site is assigned Seismic Zone 2 based on a calculated  $S_{D1}$  of 0.164. The calculation of the seismic parameters is included in **Appendix F**.

## **6.5 Global Slope Stability**

The 2D limit equilibrium software, Slide 6.0, by RocScience, Inc. was used to evaluate the global slope stability. The required resistance factor against global stability is 0.75 (AASHTO Section 11.6.2.3) for the embankments, which corresponds to a factor of safety of 1.3.

The results of our global stability evaluation indicate a safety factor above 1.3 is obtained at the north and south approach embankments. Our global stability evaluations are included in **Appendix F**.

## **6.6 Construction Considerations**

### **Subgrade Preparation Procedures**

We recommend the following subgrade preparation procedures for the proposed culvert:

- Subgrades for the culvert should be dewatered so that construction is performed in the dry.
- Unsuitable materials (e.g. organic silt) should be overexcavated within the zone of influence of the proposed culvert. The zone of influence is defined as that area within a line projecting outward and downward from the outside edges of the culvert at a one horizontal to one vertical (1H:1V) slope.
- Footings should bear on a minimum 12 inches of compacted Structural Fill within the zone of influence of footings. The materials should be placed immediately so that the natural subgrade is not disturbed. A Class I non-woven stabilization geotextile should be placed on the natural granular materials prior to placement of Structural Fill.
- Structural Fill may consist of Granular Borrow for Underwater Backfill, and should be placed in maximum 12 inch thick loose lifts, and compacted to at least 95% of its maximum dry density as determined by ASTM D-1557, Method C (Modified Proctor).

### **Re-Use of On-site Soil**

Based on soils encountered in test borings, the existing fill material and brook deposits consisted of sand and gravel with approximately 10% silt with some areas with more than 20% silt. Materials with fines over 10% can be difficult to reuse if wet. We recommend those materials be reused in landscape areas or be disposed of offsite. It is possible that existing fill materials and brook deposits with 10% silt or less could be mixed to meet the gradation requirements of Granular Borrow for Underwater Backfill.

### **Excavation and Temporary Lateral Support**

It is anticipated that temporary earth support will be required to overexcavate the organic deposits. Temporary earth support is also likely needed to allow phased construction of the culvert. A feasible option of support of excavation would include sheet piles and/or a sheet pile cofferdam. Temporary earth support systems must be designed by a professional engineer registered in the State of Maine.

Excavation geometry should conform to OSHA excavation regulations contained in 29 CFR Part

1926, latest edition. In general, temporary soil slopes of 1.5H:1V (Soil Profile Type C), or flatter, appear appropriate but should be confirmed during construction based on conditions at the time of excavation.

### **Temporary Dewatering**

In general, groundwater was encountered above the bottom of the proposed culvert. Temporary excavation dewatering should be performed so that the work conducted is completed in the dry. It is likely that a sheet piling cofferdam and pumping may be utilized to dewater the excavation. Discharge water should be managed in accordance with local, state, and federal regulations.

### **Removal of Existing Foundations**

The existing driven piles should be left in place, but should be cut at least 12 inches below the proposed concrete culvert.

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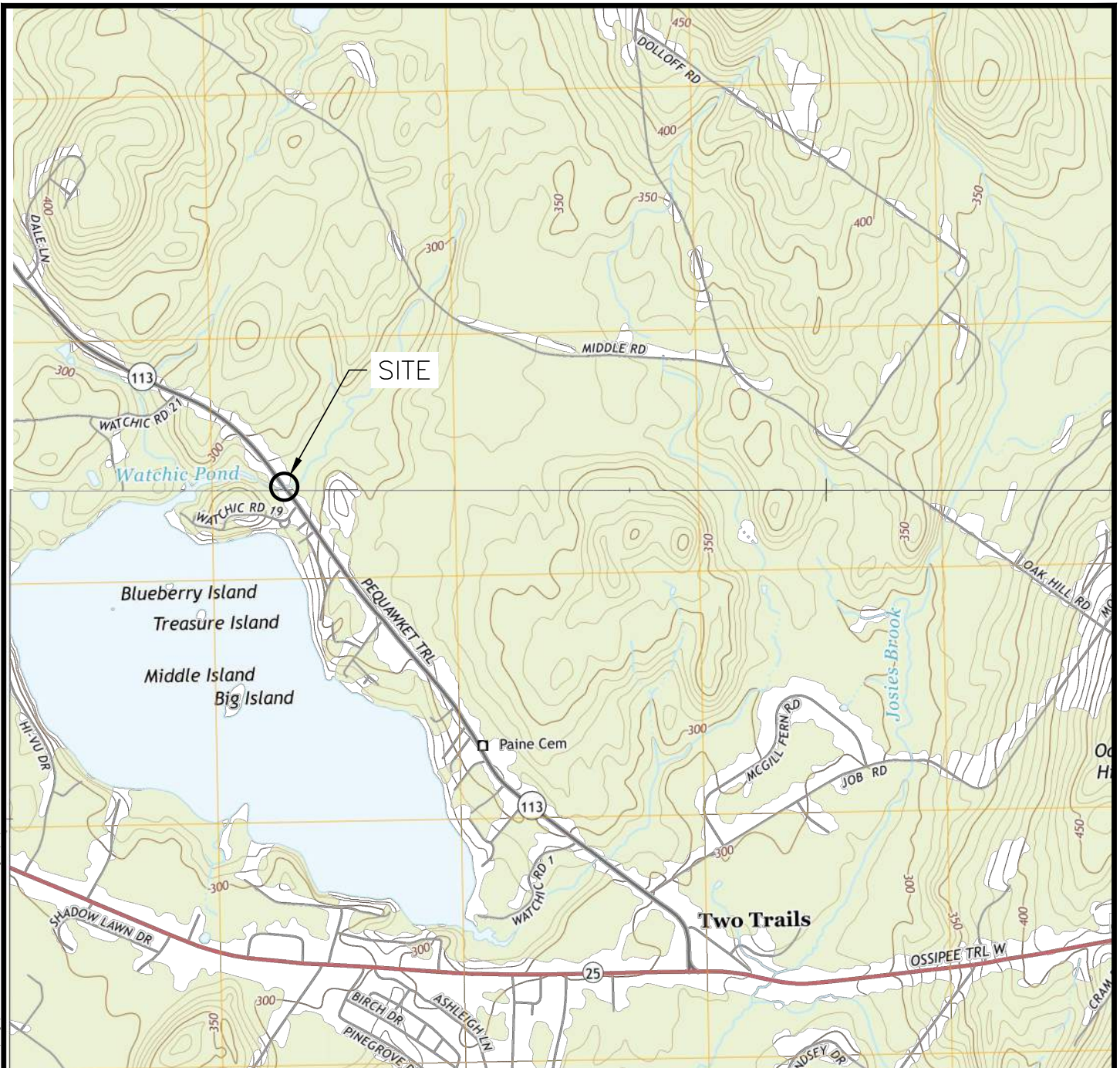
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## FIGURES

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2014 USGS TOPOGRAPHIC MAPS  
STANDISH & SEBAGO LAKE QUADRANGLES  
STANDISH, MAINE  
CONTOUR INTERVAL 10 FEET  
NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

APPROXIMATE SCALE  
1 INCH = 2,000 FEET



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QUADRANGLE LOCATION

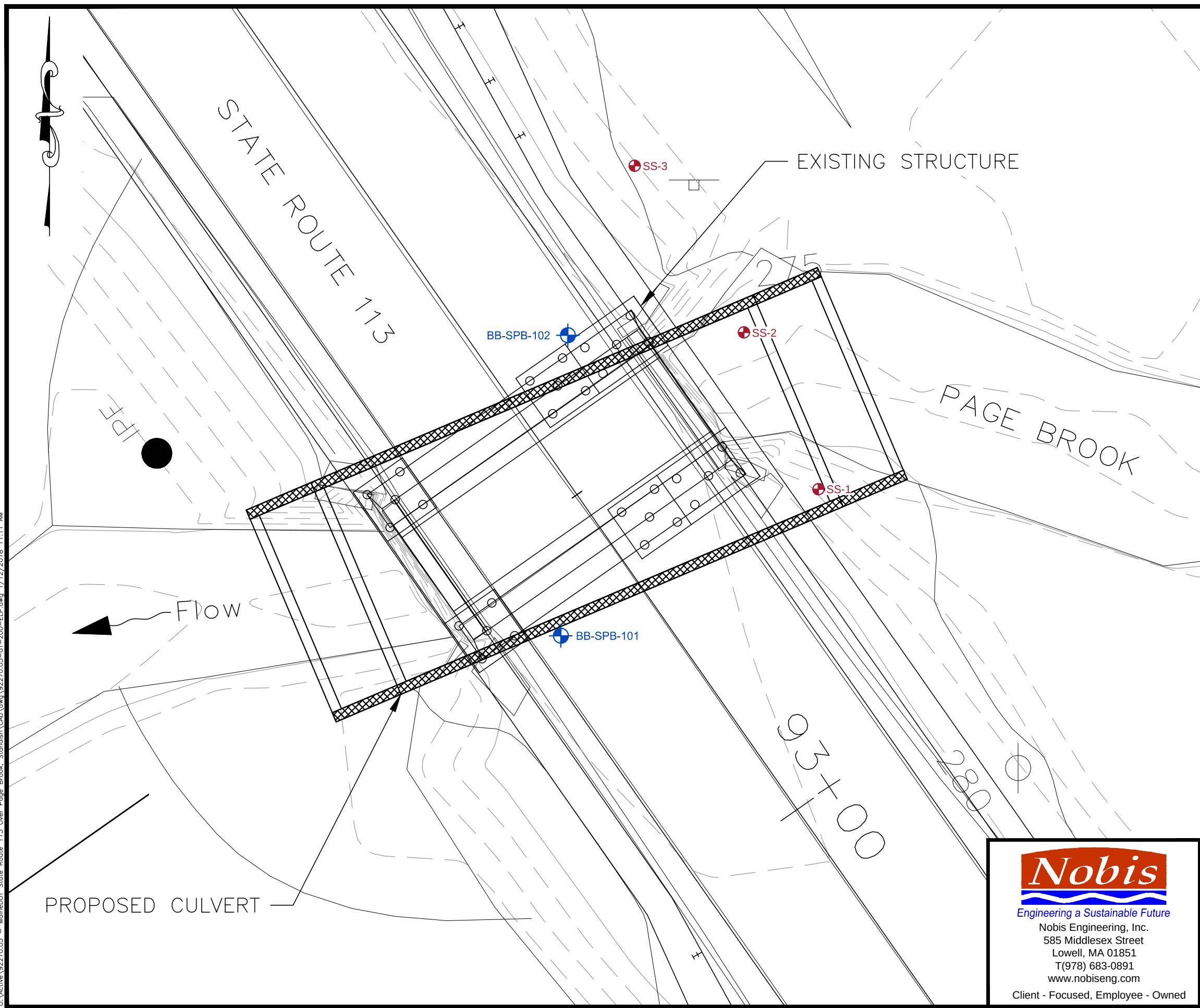
## FIGURE 1

**SITE LOCUS PLAN**  
**WATCHIC BRIDGE (#2914)**  
**STATE ROUTE 113 OVER PAGE BROOK**  
**STANDISH, MAINE**

PROJECT NO. 92270.05

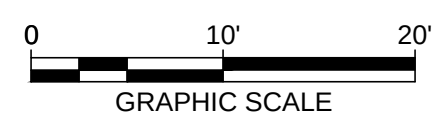
DATE: JANUARY 2018

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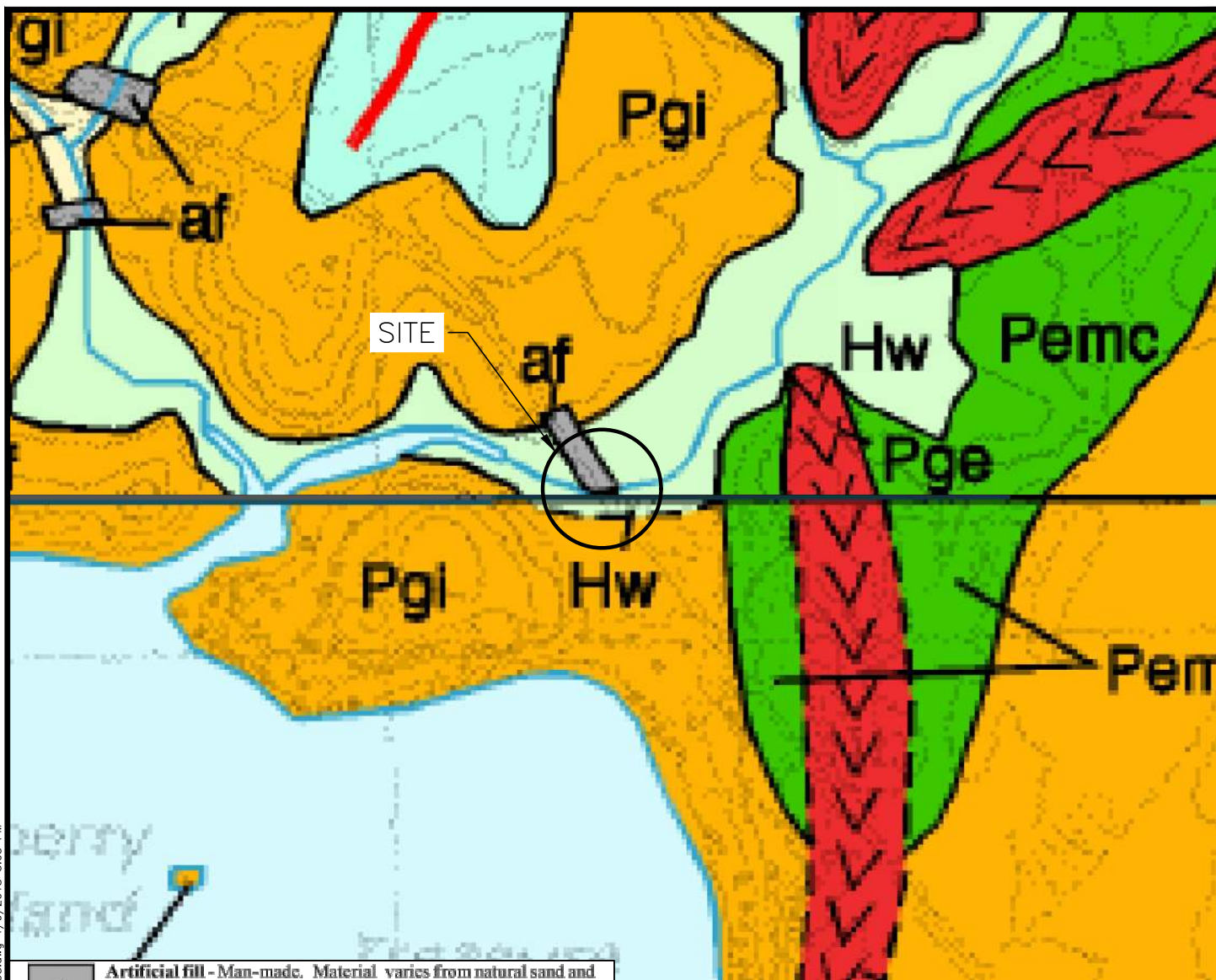
- NOTES:**
1. THE BASE PLAN WAS DEVELOPED FROM .DGN FILES PROVIDED BY MAINE DEPARTMENT OF TRANSPORTATION ON DECEMBER 27, 2017.
  2. SOIL BORINGS WERE DRILLED BY NEW ENGLAND BORING CONTRACTORS OF HERMON, MAINE, AND OBSERVED BY NOBIS BETWEEN NOVEMBER 1 AND 3, 2017.
  3. LOCATIONS AND SITE FEATURES DEPICTED ARE APPROXIMATE AND GIVEN FOR ILLUSTRATIVE PURPOSES.
  4. ELEVATIONS ARE BASED ON THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).
  5. REFER TO FIGURE 5 FOR SUBSURFACE PROFILE.

- LEGEND**
- BB-SPB-101 APPROXIMATE BORING LOCATION
  - SS-1 APPROXIMATE SEDIMENT SAMPLE LOCATION



|                                                                                                                                                                                                                                                                                      |  |                    |  |                                                                                                                |  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--------------------|--|----------------------------------------------------------------------------------------------------------------|--|
| <br><b>Engineering a Sustainable Future</b><br>Nobis Engineering, Inc.<br>585 Middlesex Street<br>Lowell, MA 01851<br>T(978) 683-0891<br>www.nobiseng.com<br>Client - Focused, Employee - Owned |  |                    |  | <b>FIGURE 2</b>                                                                                                |  |
|                                                                                                                                                                                                                                                                                      |  |                    |  | <b>BORING LOCATION PLAN<br/>WATCHIC BRIDGE (#2914)<br/>STATE ROUTE 113 OVER PAGE BROOK<br/>STANDISH, MAINE</b> |  |
| DRAWN BY: PCC                                                                                                                                                                                                                                                                        |  | CHECKED BY: BTW    |  |                                                                                                                |  |
| PROJECT NO. 92270.05                                                                                                                                                                                                                                                                 |  | DATE: JANUARY 2018 |  |                                                                                                                |  |

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|    |                                                                                                                                                                                                                                                                                                                                                                                         |
|----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| af | <b>Artificial fill - Man-made.</b> Material varies from natural sand and gravel to quarry waste to sanitary landfill; includes highway and railroad embankments and dredge spoil areas. This material is mapped only where it can be identified using the contour lines. Minor artificial fill is present in virtually all developed areas of the quadrangle. Thickness of fill varies. |
| Hw | <b>Freshwater wetlands deposit (Holocene)</b> - Muck, peat, silt, and sand. Generally 0.5 to 3 meters (1 to 10 feet) thick. In places, is indistinguishable from, grades into, or is interbedded with stream alluvium (Ha).                                                                                                                                                             |

**Pgi** **Ice-contact stratified drift (Pleistocene)** - Highly deformed, interbedded, well-sorted, internally massive and bedded, very fine to coarse sands and gravels. Commonly shows evidence of deformation, including reverse and thrust faults and folding resulting from ice contact, or evidence of collapse in the form of normal faults. Deposited mostly adjacent to ice at the head of outwash of a marine delta near Watchic Pond, just south of the quadrangle border in the Standish quadrangle (unit Pmd<sub>2</sub> of Gosse, 1999).

#### 1997 & 1999 USGS SURFICIAL GEOLOGIC MAPS

"SURFICIAL GEOLOGY OF THE STANDISH QUADRANGLE, MAINE"

(1999; GOSSE, JOHNSTON, MARVINNEY, TUCKER)

"SURFICIAL GEOLOGY OF THE SEBAGO LAKE QUADRANGLE, MAINE"

(1997; HILDRETH, FOLEY, MARVINNEY, TUCKER)

NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88)

CONTOUR INTERVAL 10 FEET

APPROXIMATE SCALE  
1 INCH = 500 FEET



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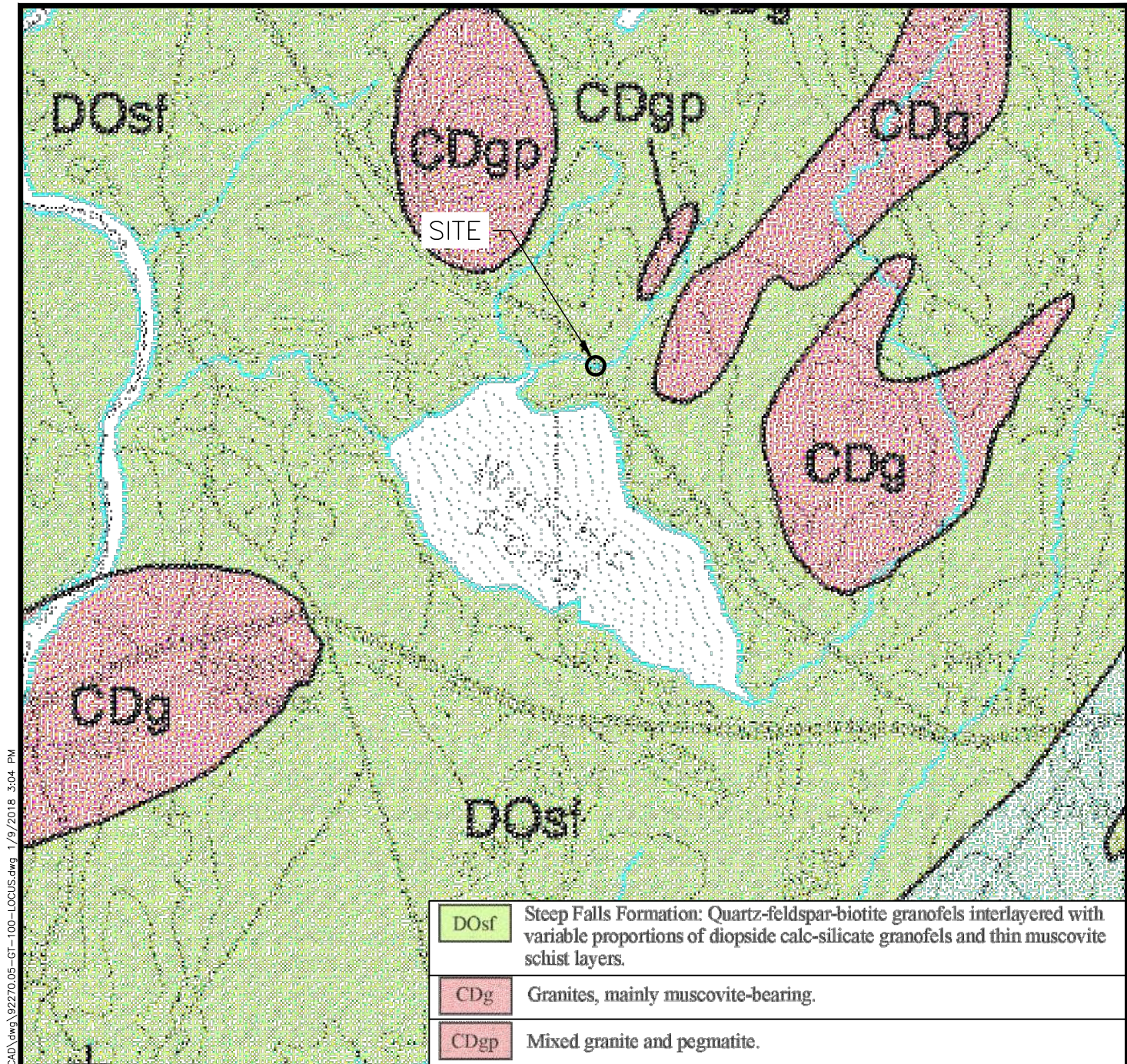
QUADRANGLE LOCATION

#### FIGURE 3

**SURFICIAL GEOLOGIC MAP**  
**WATCHIC BRIDGE (#2914)**  
**STATE ROUTE 113 OVER PAGE BROOK**  
**STANDISH, MAINE**

PROJECT NO. 92270.05

DATE: JANUARY 2018



1998 USGS BEDROCK GEOLOGIC MAP  
 "BEDROCK GEOLOGY OF THE PORTLAND 1:100,000 QUADRANGLE,  
 MAINE AND NEW HAMPSHIRE"  
 (BERRY IV & HUSSEY II)  
 ORIGINAL SCALE 1:100,000

NOT TO SCALE



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QUADRANGLE LOCATION

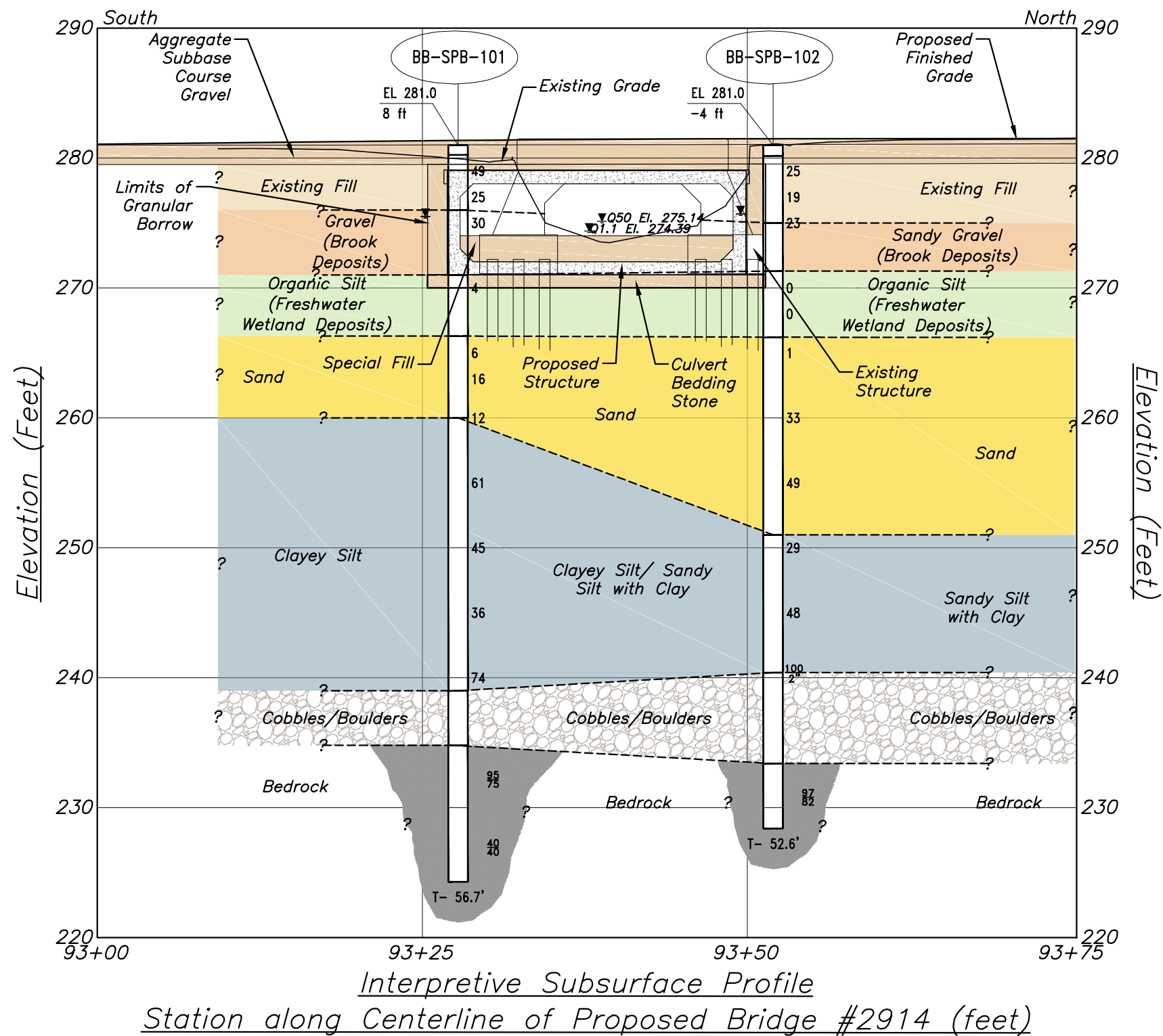
FIGURE 4

BEDROCK GEOLOGIC MAP  
 WATCHIC BRIDGE (#2914)  
 STATE ROUTE 113 OVER PAGE BROOK  
 STANDISH, MAINE

PROJECT NO. 92270.05

DATE: JANUARY 2018

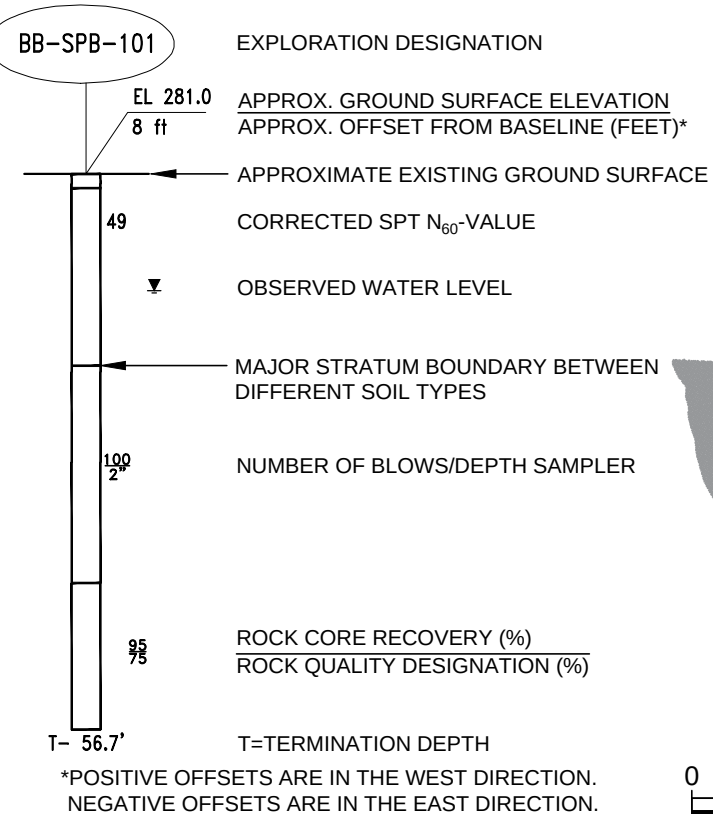
O:\Active\92270.05 - MaineDOT State Route 113 Over Page Brook, Standish\CAO\dwg\92270.05-GT-500-PRE.dwg, 1/12/2018, 11:53 AM



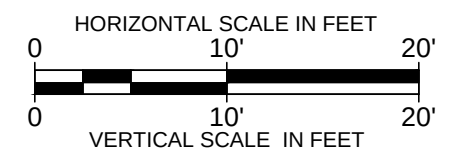
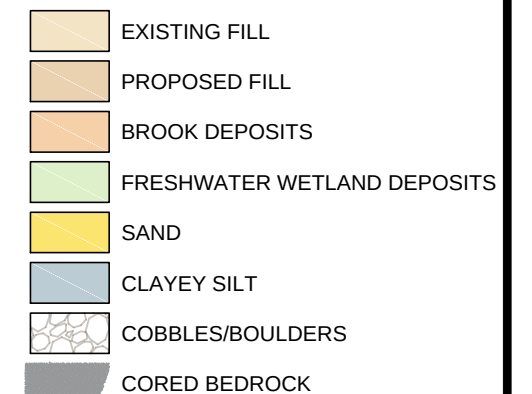
#### NOTES:

1. THIS SUBSURFACE PROFILE WAS DEVELOPED USING .DGN FILES PROVIDED BY MAINE DEPARTMENT OF TRANSPORTATION ON DECEMBER 27, 2017.
2. LINES REPRESENTING LIMITS OF STRATA ARE INTERPOLATED FROM SUBSURFACE EXPLORATION LOGS. THE SUBSURFACE EXPLORATIONS ARE WIDELY SPACED AND ARE BASED ON LIMITED SUBSURFACE INFORMATION COLLECTED DURING DRILLING. OTHER INTERPRETATIONS ARE POSSIBLE AND ACTUAL CONDITIONS MAY VARY FROM THOSE PRESENTED.
3. TOP OF BEDROCK SHOULD BE CONSIDERED APPROXIMATE AND CAN VARY SIGNIFICANTLY OVER SHORT DISTANCES.
4. WATER LEVELS PRESENTED WERE COLLECTED DURING DRILLING AND MAY NOT REPRESENT STABILIZED GROUNDWATER CONDITIONS. GROUNDWATER LEVELS WILL FLUCTUATE WITH SEASON, PRECIPITATION, AND NEARBY ACTIVITIES.
5. EXISTING AND PROPOSED SITE FEATURES DEPICTED ARE APPROXIMATE AND GIVEN FOR ILLUSTRATIVE PURPOSES.
6. SOIL BORINGS WERE DRILLED BY NEW ENGLAND BORING CONTRACTORS OF HERMON, MAINE, AND OBSERVED BY NOBIS BETWEEN NOVEMBER 1 AND 3, 2017.
7. ELEVATIONS ARE PROVIDED IN FEET, AND ARE BASED ON THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).
8. REFER TO FIGURE 2 FOR SUBSURFACE EXPLORATION LOCATIONS AND A PLAN VIEW OF THE SITE.

#### EXPLORATION LEGEND



#### STRATA LEGEND



Engineering a Sustainable Future  
Nobis Engineering, Inc.  
585 Middlesex Street  
Lowell, MA 01851  
T(978) 683-0891  
www.nobiseng.com  
Client - Focused, Employee - Owned

FIGURE 5

INTERPRETIVE SUBSURFACE PROFILE  
WATCHIC BRIDGE (#2914)  
STATE ROUTE 113 OVER PAGE BROOK  
STANDISH, MAINE

|             |          |             |              |
|-------------|----------|-------------|--------------|
| DRAWN BY:   | PCC      | CHECKED BY: | BTW          |
| PROJECT NO. | 92270.05 | DATE:       | JANUARY 2018 |

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## **APPENDIX A – Limitations**

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## GEOTECHNICAL LIMITATIONS

### Explorations and Subsurface Conditions

1. The analyses and design recommendations submitted in this report are based in part upon the data obtained from subsurface explorations. The nature and extent of variations between these explorations may not become evident until construction. If variations then appear evident, it will be necessary to reevaluate the recommendations of this report.

In preparing this report, Nobis relied on certain information provided by the Client and other parties referenced therein which were made available to Nobis at the time of our evaluation. Nobis did not attempt to independently verify the accuracy or completeness of all information reviewed or received during the course of this evaluation.

2. The generalized soil profile described in the text is intended to convey trends in subsurface conditions. The boundaries between strata are approximate and idealized and have been developed by interpretations of widely spaced explorations and samples; actual soil transitions are probably more erratic. For specific information, refer to the exploration logs.
3. Water level readings have been made in the explorations at times and under conditions stated on the logs. These data have been reviewed and interpretations have been made in the text of this report. However, it must be noted that fluctuations in the level of the groundwater may occur due to variations in rainfall, temperature, and other factors occurring since the time measurements were made. The water table encountered in the course of the work may differ from that indicated in the Report.

Recommendations for foundation drainage, waterproofing, and moisture control address the conventional geotechnical engineering aspects of seepage control. These recommendations may not preclude an environment that allows the infestation of mold or other biological pollutants.

4. Nobis' geotechnical services did not include an assessment of the presence of oil or hazardous materials at the property. Consequently, we did not consider the potential impacts (if any) that contaminants in soil or groundwater may have on construction activities, or the use of structures on the property.

### Additional Services

5. Nobis recommends that we be retained to provide services during future site observations, design, implementation activities, construction and/or property development/redevelopment. This will allow us the opportunity to: i) observe conditions and compliance with our recommendations, design concepts and/or opinions; ii) allow for changes in the event that conditions are other than anticipated; iii) provide modifications to our design recommendations; and iv) assess the consequences of changes in technologies and/or regulations.

### Use of Report

6. Nobis prepared this report on behalf of, and for the exclusive use of our Client for the stated purpose(s) and location(s) identified in our proposal and/or report. Use of this report, in whole or in part, at other locations, or for other purposes, may lead to inappropriate conclusions; and we do not accept any responsibility for the consequences of such use(s). Reliance by any party not expressly identified in the agreement, for any use, without our prior written permission, shall be at that party's sole risk, and without any liability to Nobis.

This report is for design purposes only and is not sufficient to prepare an accurate construction bid. Contractors wishing a copy of the report may secure it with the understanding that its scope is limited to design considerations only.

7. Nobis' findings and conclusions are based on the work conducted as part of the scope of work set forth in our proposal and/or report, and reflect our professional judgment. These findings and conclusions must be considered not as scientific or engineering certainties, but rather as our professional opinions considering the limited data gathered during the course of our work. If conditions other than those described in this report are found at the subject location(s), or the project design has been altered in any way, Nobis shall be so notified and afforded the opportunity to revise the report, as appropriate, to reflect the unanticipated changed conditions.
8. Nobis' services were performed using the degree of skill and care ordinarily exercised by qualified professionals performing the same type of services, at the same time, under similar conditions, at the same or a similar property. No warranty, expressed or implied, is made.

### Compliance with Codes and Regulations

9. Nobis used reasonable care in identifying and interpreting applicable codes and regulations. These codes and regulations are subject to various, and possibly contradictory, interpretations. Compliance with codes and regulations by other parties is beyond our control.

### Opinion of Cost

10. This report may contain or be based on comparative cost opinions for the purpose of evaluating alternative foundation schemes. These opinions may also involve approximate quantity evaluations. It should be noted that quantity estimates may not be accurate enough for construction bids. In addition, since we are not professional estimators of labor and materials cost, the evaluation of construction costs should be considered as approximate guidelines and could vary significantly from actual costs. Nobis does not guarantee the accuracy of our cost opinions as compared to contractor's bids for construction costs.

END OF LIMITATIONS

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## **APPENDIX B – Automatic Hammer Calibration Report**

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| Summary of Energy Measurements - Chelsea, Massachusetts |                                                                        |                                    |            |                               |                                              |    |    |         |                                                                                  |                               |                                                       |                                                 |                                                       |
|---------------------------------------------------------|------------------------------------------------------------------------|------------------------------------|------------|-------------------------------|----------------------------------------------|----|----|---------|----------------------------------------------------------------------------------|-------------------------------|-------------------------------------------------------|-------------------------------------------------|-------------------------------------------------------|
| Test Boring No.                                         | Drill Rig                                                              | Type of Test Hammer Type           | Sample No. | Sample Depth<br>top<br>bottom | SPT<br>Blows<br>per 6"<br>from field<br>logs |    |    | N-Value | Distance to<br>bottom of sampler<br>from center of<br>instrumented rod<br>(feet) | Rated<br>Energy<br>(ft.-lbs.) | Average<br>Transferred<br>Energy<br>(2)<br>(ft.-lbs.) | Average<br>Transfer<br>Efficiency<br>(2)<br>(%) | Average<br>Hammer<br>Blow Rate<br>(2)<br>(blows/min.) |
| Test Boring<br>7-13-2017                                | Truck 83<br>Mobile B-59<br>International<br>USDOT 383455<br>LIC#: 4368 | Mobile<br>140 lb. Automatic Hammer | S1         | 17'<br>19'                    | 8                                            | 9  | 9  | 10      | 18                                                                               | 21'                           | 305                                                   | 87.1                                            | 55.7                                                  |
|                                                         |                                                                        | Mobile<br>140 lb. Automatic Hammer | S2         | 10'<br>12'                    | 4                                            | 7  | 9  | 11      | 16                                                                               | 14'                           | 298                                                   | 85.2                                            | 57.0                                                  |
|                                                         |                                                                        | Mobile<br>140 lb. Automatic Hammer | S3         | 12'<br>14'                    | 15                                           | 14 | 14 | 15      | 28                                                                               | 16'                           | 310                                                   | 88.5                                            | 57.0                                                  |
|                                                         |                                                                        | Mobile<br>140 lb. Automatic Hammer |            |                               |                                              |    |    |         |                                                                                  |                               |                                                       |                                                 |                                                       |

NOTES: (1) Driller of Test Boring : Jerry Rednicki - New England Boring Contractors

(2) Averaged only for impacts during the middle 1 ft. of the test which relates to the observed N-Value

$$\text{Average Transfer Efficiency} = (87.1\% + 85.2\% + 88.5\%)/3 = 86.9\%$$

Use hammer efficiency factor of 0.869

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## **APPENDIX C – Boring Logs**

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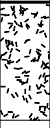
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                    |                 |                    |                                                                                                                                              |               |                 |              |                                                           |                 |                                                                                                                                                                                                      |                                |                                                       |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|-----------------|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------|---------------|-----------------|--------------|-----------------------------------------------------------|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|-------------------------------------------------------|
| <b>Maine Department of Transportation</b><br>Soil/Rock Exploration Log<br>US CUSTOMARY UNITS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                    |                 |                    | <b>Project:</b> Watchic Bridge (#2914) State Route 113<br>over Page Brook<br><b>Location:</b> Standish, Maine                                |               |                 |              | <b>Boring No.:</b> BB-SPB-101<br><br><b>WIN:</b> 21703.00 |                 |                                                                                                                                                                                                      |                                |                                                       |
| <b>Driller:</b> New England Boring Contractors                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                    |                 |                    | <b>Elevation (ft.):</b> 281                                                                                                                  |               |                 |              | <b>Auger ID/OD:</b> N/A                                   |                 |                                                                                                                                                                                                      |                                |                                                       |
| <b>Operator:</b> M. Porter                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                    |                 |                    | <b>Datum:</b> NAVD-88                                                                                                                        |               |                 |              | <b>Sampler:</b> 1-3/8" Split-Spoon                        |                 |                                                                                                                                                                                                      |                                |                                                       |
| <b>Logged By:</b> K. Kocia (Nobis)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                    |                 |                    | <b>Rig Type:</b> B-59 Mobile Truck                                                                                                           |               |                 |              | <b>Hammer Wt./Fall:</b> 140#/30"                          |                 |                                                                                                                                                                                                      |                                |                                                       |
| <b>Date Start/Finish:</b> November 1, 2017/November 2, 2017                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                    |                 |                    | <b>Drilling Method:</b> Drive and Wash                                                                                                       |               |                 |              | <b>Core Barrel:</b> NQ2                                   |                 |                                                                                                                                                                                                      |                                |                                                       |
| <b>Boring Location:</b> STA 93+28, 9' LT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                    |                 |                    | <b>Casing ID/OD:</b> 3"/3.5"                                                                                                                 |               |                 |              | <b>Water Level*:</b> 5.5' bgs                             |                 |                                                                                                                                                                                                      |                                |                                                       |
| <b>Hammer Efficiency Factor:</b> .869                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                    |                 |                    | <b>Hammer Type:</b> Automatic <input checked="" type="checkbox"/> Hydraulic <input type="checkbox"/> Rope & Cathead <input type="checkbox"/> |               |                 |              |                                                           |                 |                                                                                                                                                                                                      |                                |                                                       |
| Definitions:<br>D = Split Spoon Sample<br>MD = Unsuccessful Split Spoon Sample Attempt<br>U = Thin Wall Tube Sample<br>MU = Unsuccessful Thin Wall Tube Sample Attempt<br>V = Field Vane Shear Test, PP = Pocket Penetrometer<br>MV = Unsuccessful Field Vane Shear Test Attempt<br>R = Rock Core Sample<br>SSA = Solid Stem Auger<br>HSA = Hollow Stem Auger<br>RC = Roller Cone<br>WOH = Weight of 140lb. Hammer<br>WOR/C = Weight of Rods or Casing<br>WO1P = Weight of One Person<br>S <sub>u</sub> = Peak/Remolded Field Vane Undrained Shear Strength (psf)<br>S <sub>u</sub> (lab) = Lab Vane Undrained Shear Strength (psf)<br>q <sub>p</sub> = Unconfined Compressive Strength (ksf)<br>N-uncorrected = Raw Field SPT N-value<br>Hammer Efficiency Factor = Rig Specific Annual Calibration Value<br>N <sub>60</sub> = SPT N-uncorrected Corrected for Hammer Efficiency<br>N <sub>60</sub> = (Hammer Efficiency Factor/60%)*N-uncorrected<br>T <sub>v</sub> = Pocket Torvane Shear Strength (psf)<br>WC = Water Content, percent<br>LL = Liquid Limit<br>PL = Plastic Limit<br>PI = Plasticity Index<br>G = Grain Size Analysis<br>C = Consolidation Test |                    |                 |                    |                                                                                                                                              |               |                 |              |                                                           |                 |                                                                                                                                                                                                      |                                |                                                       |
| Depth (ft.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Sample Information |                 |                    |                                                                                                                                              |               |                 |              |                                                           | Elevation (ft.) | Graphic Log                                                                                                                                                                                          | Visual Description and Remarks | Laboratory Testing Results/ AASHTO and Unified Class. |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Sample No.         | Pen./Rec. (in.) | Sample Depth (ft.) | Blows (6 in.) Shear Strength (psf) or RQD (%)                                                                                                | N-uncorrected | N <sub>60</sub> | Casing Blows |                                                           |                 |                                                                                                                                                                                                      |                                |                                                       |
| 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                    |                 |                    |                                                                                                                                              |               |                 | RC           | 280.3                                                     |                 | Asphalt (9").                                                                                                                                                                                        |                                |                                                       |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 1D                 | 24/9            | 1.00 - 3.00        | 11/13/21/16                                                                                                                                  | 34            | 49              |              |                                                           |                 | Grey-brown, moist, dense, fine to coarse SAND, some fine gravel, trace silt, several asphalt particles and fragments, petroleum-like odor noted. (Fill).                                             |                                |                                                       |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 2D                 | 24/9            | 3.00 - 5.00        | 19/10/7/10                                                                                                                                   | 17            | 25              |              |                                                           |                 | Dark brown, wet, medium dense, fine to coarse SAND, little fine gravel, little silt, petroleum-like odor noted. (Fill).                                                                              |                                |                                                       |
| 5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 3D                 | 24/8            | 5.00 - 7.00        | 7/10/11/8                                                                                                                                    | 21            | 30              |              | 276.0                                                     |                 | Brown, wet, medium dense, fine to coarse GRAVEL, little fine to coarse sand, trace silt. (Brook Deposits).                                                                                           |                                |                                                       |
| 10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 4D                 | 24/8            | 10.00 - 12.00      | 2/2/1/1                                                                                                                                      | 3             | 4               |              | 271.0                                                     |                 | Brown, wet, soft, Peaty ORGANIC SILT, little fine to coarse gravel, little fine to coarse sand. (Freshwater Wetland Deposits).                                                                       | WC=254.2%<br>OC=35.7%          |                                                       |
| 15                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 5D                 | 24/4            | 15.00 - 17.00      | 2/2/2/2                                                                                                                                      | 4             | 6               |              | 266.3                                                     |                 | Inferred strata transition at approximately 14.7 feet bgs based on wash color change and jarred cuttings.<br>Light grey, wet, loose, fine to coarse SAND, trace silt. (Sand).                        |                                |                                                       |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 6D                 | 24/4            | 17.00 - 19.00      | 3/5/6/5                                                                                                                                      | 11            | 16              |              |                                                           |                 | Tan to light grey, wet, medium dense, fine to coarse SAND, trace silt. (Sand).                                                                                                                       |                                |                                                       |
| 20                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 7D                 | 24/9            | 20.00 - 22.00      | 4/5/3/8                                                                                                                                      | 8             | 12              |              | 260.0                                                     |                 | 7D-A (5"): Tan to light grey, wet, medium dense, fine to coarse SAND, little silt, trace fine gravel. (Sand).<br>7D-B (4"): Grey, wet, stiff, Clayey SILT, trace fine to coarse sand. (Clayey Silt). | A-4 (0)                        |                                                       |
| 25                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                    |                 |                    |                                                                                                                                              |               |                 |              |                                                           |                 |                                                                                                                                                                                                      |                                |                                                       |
| <b>Remarks:</b><br>-No casing blow counts were recorded.<br>-Borehole backfilled with native soils and sand.<br>-Pavement restored with asphalt cold patch.<br>-bgs = below ground surface.<br>-Automatic Hammer ID# B-24.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                    |                 |                    |                                                                                                                                              |               |                 |              |                                                           |                 |                                                                                                                                                                                                      |                                |                                                       |
| Stratification lines represent approximate boundaries between soil types; transitions may be gradual.<br><br>* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                    |                 |                    |                                                                                                                                              |               |                 |              |                                                           |                 | Page 1 of 3<br><br><b>Boring No.:</b> BB-SPB-101                                                                                                                                                     |                                |                                                       |

| <b>Maine Department of Transportation</b><br>Soil/Rock Exploration Log<br>US CUSTOMARY UNITS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                    |                 |                    | <b>Project:</b> Watchic Bridge (#2914) State Route 113<br>over Page Brook<br><b>Location:</b> Standish, Maine                                |               |                 |              | <b>Boring No.:</b> BB-SPB-101<br><br><b>WIN:</b> 21703.00 |             |                                                                                                                                                                                                                                                            |                                                       |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|-----------------|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------|---------------|-----------------|--------------|-----------------------------------------------------------|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|
| <b>Driller:</b> New England Boring Contractors                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                    |                 |                    | <b>Elevation (ft.):</b> 281                                                                                                                  |               |                 |              | <b>Auger ID/OD:</b> N/A                                   |             |                                                                                                                                                                                                                                                            |                                                       |
| <b>Operator:</b> M. Porter                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                    |                 |                    | <b>Datum:</b> NAVD-88                                                                                                                        |               |                 |              | <b>Sampler:</b> 1-3/8" Split-Spoon                        |             |                                                                                                                                                                                                                                                            |                                                       |
| <b>Logged By:</b> K. Kocia (Nobis)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                    |                 |                    | <b>Rig Type:</b> B-59 Mobile Truck                                                                                                           |               |                 |              | <b>Hammer Wt./Fall:</b> 140#/30"                          |             |                                                                                                                                                                                                                                                            |                                                       |
| <b>Date Start/Finish:</b> November 1, 2017/November 2, 2017                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                    |                 |                    | <b>Drilling Method:</b> Drive and Wash                                                                                                       |               |                 |              | <b>Core Barrel:</b> NQ2                                   |             |                                                                                                                                                                                                                                                            |                                                       |
| <b>Boring Location:</b> STA 93+28, 9' LT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                    |                 |                    | <b>Casing ID/OD:</b> 3"/3.5"                                                                                                                 |               |                 |              | <b>Water Level*:</b> 5.5' bgs                             |             |                                                                                                                                                                                                                                                            |                                                       |
| <b>Hammer Efficiency Factor:</b> .869                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                    |                 |                    | <b>Hammer Type:</b> Automatic <input checked="" type="checkbox"/> Hydraulic <input type="checkbox"/> Rope & Cathead <input type="checkbox"/> |               |                 |              |                                                           |             |                                                                                                                                                                                                                                                            |                                                       |
| Definitions:<br>D = Split Spoon Sample<br>MD = Unsuccessful Split Spoon Sample Attempt<br>U = Thin Wall Tube Sample<br>MU = Unsuccessful Thin Wall Tube Sample Attempt<br>V = Field Vane Shear Test, PP = Pocket Penetrometer<br>MV = Unsuccessful Field Vane Shear Test Attempt<br>R = Rock Core Sample<br>SSA = Solid Stem Auger<br>HSA = Hollow Stem Auger<br>RC = Roller Cone<br>WOH = Weight of 140 lb. Hammer<br>WOR/C = Weight of Rods or Casing<br>WO1P = Weight of One Person<br>S <sub>u</sub> = Peak/Remolded Field Vane Undrained Shear Strength (psf)<br>S <sub>u</sub> (lab) = Lab Vane Undrained Shear Strength (psf)<br>q <sub>u</sub> = Unconfined Compressive Strength (ksf)<br>N-uncorrected = Raw Field SPT N-value<br>Hammer Efficiency Factor = Rig Specific Annual Calibration Value<br>N <sub>60</sub> = SPT N-uncorrected Corrected for Hammer Efficiency<br>N <sub>60</sub> = (Hammer Efficiency Factor/60%)*N-uncorrected<br>T <sub>v</sub> = Pocket Torvane Shear Strength (psf)<br>WC = Water Content, percent<br>LL = Liquid Limit<br>PL = Plastic Limit<br>PI = Plasticity Index<br>G = Grain Size Analysis<br>C = Consolidation Test |                    |                 |                    |                                                                                                                                              |               |                 |              |                                                           |             |                                                                                                                                                                                                                                                            |                                                       |
| Depth (ft.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Sample Information |                 |                    |                                                                                                                                              |               |                 |              | Elevation (ft.)                                           | Graphic Log | Visual Description and Remarks                                                                                                                                                                                                                             | Laboratory Testing Results/ AASHTO and Unified Class. |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Sample No.         | Pen./Rec. (in.) | Sample Depth (ft.) | Blows (6 in.) Shear Strength (psf) or RQD (%)                                                                                                | N-uncorrected | N <sub>60</sub> | Casing Blows |                                                           |             |                                                                                                                                                                                                                                                            |                                                       |
| 25                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 8D                 | 24/19           | 25.00 - 27.00      | 12/20/22/31                                                                                                                                  | 42            | 61              |              |                                                           |             | Tan to grey, wet, hard, Clayey SILT, little fine to medium sand. (Clayey Silt).                                                                                                                                                                            |                                                       |
| 30                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 9D                 | 24/23           | 30.00 - 32.00      | 11/13/18/22                                                                                                                                  | 31            | 45              |              |                                                           |             | Tan to grey, wet, hard, Clayey SILT, little fine to medium sand. (Clayey Silt).                                                                                                                                                                            |                                                       |
| 35                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 10D                | 24/19           | 35.00 - 37.00      | 13/11/14/16                                                                                                                                  | 25            | 36              |              |                                                           |             | Tan to grey, wet, hard, Clayey SILT, trace fine sand. (Clayey Silt).                                                                                                                                                                                       | WC=13.0%<br>LL=23<br>PL=15<br>PI=8                    |
| 40                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 11D                | 24/24           | 40.00 - 42.00      | 22/24/27/85                                                                                                                                  | 51            | 74              |              |                                                           |             | Tan to grey, wet, hard, Clayey SILT, little fine sand. (Clayey Silt).                                                                                                                                                                                      |                                                       |
| 45                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | R1                 | 44/33           | 42.00 - 45.67      |                                                                                                                                              |               |                 |              | 239.0                                                     |             | R1: Grey-black, very fine-grained BOULDER fragments and pieces.<br>R1: Core Times (min:sec)<br>42'-43' (2:00)<br>43'-44' (2:00)<br>44'-45' (1:15)<br>45'-45.7' (1:45)                                                                                      |                                                       |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | R2                 | 6/6             | 45.70 - 46.20      |                                                                                                                                              |               |                 |              | 234.8                                                     |             | R2: Grey-black, very fine-grained BOULDER fragments and pieces.<br>R2: Core Times (min:sec)<br>45.7'-46.2' (3:00)                                                                                                                                          |                                                       |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | R3                 | 60/57           | 46.70 - 51.70      | RQD = 75%                                                                                                                                    |               |                 |              |                                                           |             | R3: Tan to grey, fine to coarse-grained GRANITE with mica, hard to very hard, slightly to moderately weathered, slightly fractured, horizontal to shallow-dipping, very close to moderately close joints.<br>RQD = 75% (Fair).<br>R3: Core Times (min:sec) | UCT q <sub>p</sub> = 20,593 psi                       |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                    |                 |                    |                                                                                                                                              |               |                 |              |                                                           |             |                                                                                                                                                                                                                                                            |                                                       |
| 50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                    |                 |                    |                                                                                                                                              |               |                 |              |                                                           |             |                                                                                                                                                                                                                                                            |                                                       |
| <b>Remarks:</b><br>-No casing blow counts were recorded.<br>-Borehole backfilled with native soils and sand.<br>-Pavement restored with asphalt cold patch.<br>-bgs = below ground surface.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                    |                 |                    |                                                                                                                                              |               |                 |              |                                                           |             |                                                                                                                                                                                                                                                            |                                                       |
| Stratification lines represent approximate boundaries between soil types; transitions may be gradual.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                    |                 |                    |                                                                                                                                              |               |                 |              |                                                           |             | Page 2 of 3                                                                                                                                                                                                                                                |                                                       |
| * Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                    |                 |                    |                                                                                                                                              |               |                 |              |                                                           |             | Boring No.: BB-SPB-101                                                                                                                                                                                                                                     |                                                       |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                    |                 |                    |                                                                                                                                              |               |                 |              |                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                       |                                                          |  |
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| <b>Maine Department of Transportation</b><br>Soil/Rock Exploration Log<br>US CUSTOMARY UNITS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                    |                 |                    | <b>Project:</b> Watchic Bridge (#2914) State Route 113<br>over Page Brook<br><b>Location:</b> Standish, Maine                                |               |                 |              | <b>Boring No.:</b> BB-SPB-101<br><b>WIN:</b> 21703.00                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                       |                                                          |  |
| <b>Driller:</b> New England Boring Contractors                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                    |                 |                    | <b>Elevation (ft.)</b> 281                                                                                                                   |               |                 |              | <b>Auger ID/OD:</b> N/A                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                       |                                                          |  |
| <b>Operator:</b> M. Porter                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                    |                 |                    | <b>Datum:</b> NAVD-88                                                                                                                        |               |                 |              | <b>Sampler:</b> 1-3/8" Split-Spoon                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                       |                                                          |  |
| <b>Logged By:</b> K. Kocia (Nobis)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                    |                 |                    | <b>Rig Type:</b> B-59 Mobile Truck                                                                                                           |               |                 |              | <b>Hammer Wt./Fall:</b> 140#/30"                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                       |                                                          |  |
| <b>Date Start/Finish:</b> November 1, 2017/November 2, 2017                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                    |                 |                    | <b>Drilling Method:</b> Drive and Wash                                                                                                       |               |                 |              | <b>Core Barrel:</b> NQ2                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                       |                                                          |  |
| <b>Boring Location:</b> STA 93+28, 9' LT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                    |                 |                    | <b>Casing ID/OD:</b> 3"/3.5"                                                                                                                 |               |                 |              | <b>Water Level*:</b> 5.5' bgs                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                       |                                                          |  |
| <b>Hammer Efficiency Factor:</b> .869                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                    |                 |                    | <b>Hammer Type:</b> Automatic <input checked="" type="checkbox"/> Hydraulic <input type="checkbox"/> Rope & Cathead <input type="checkbox"/> |               |                 |              |                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                       |                                                          |  |
| <div>Definitions:<br/>D = Split Spoon Sample<br/>MD = Unsuccessful Split Spoon Sample Attempt<br/>U = Thin Wall Tube Sample<br/>MU = Unsuccessful Thin Wall Tube Sample Attempt<br/>V = Field Vane Shear Test, PP = Pocket Penetrometer<br/>MV = Unsuccessful Field Vane Shear Test Attempt</div> <div>R = Rock Core Sample<br/>SSA = Solid Stem Auger<br/>HSA = Hollow Stem Auger<br/>RC = Roller Cone<br/>WOH = Weight of 140 lb. Hammer<br/>WOR/C = Weight of Rods or Casing<br/>WO1P = Weight of One Person</div> <div>S<sub>u</sub> = Peak/Remolded Field Vane Undrained Shear Strength (psf)<br/>S<sub>u</sub>(lab) = Lab Vane Undrained Shear Strength (psf)<br/>q<sub>u</sub> = Unconfined Compressive Strength (ksf)<br/>N-uncorrected = Raw Field SPT N-value<br/>Hammer Efficiency Factor = Rig Specific Annual Calibration Value<br/>N<sub>60</sub> = SPT N-uncorrected Corrected for Hammer Efficiency<br/>N<sub>60</sub> = (Hammer Efficiency Factor/60%)*N-uncorrected</div> <div>T<sub>v</sub> = Pocket Torvane Shear Strength (psf)<br/>WC = Water Content, percent<br/>LL = Liquid Limit<br/>PL = Plastic Limit<br/>PI = Plasticity Index<br/>G = Grain Size Analysis<br/>C = Consolidation Test</div> |                    |                 |                    |                                                                                                                                              |               |                 |              |                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                       |                                                          |  |
| Depth (ft.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Sample Information |                 |                    |                                                                                                                                              |               |                 |              | Graphic Log                                                                       | Visual Description and Remarks                                                                                                                                                                                                                                                                                                                                                                                                                      | Laboratory Testing Results/ AASHTO and Unified Class. |                                                          |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Sample No.         | Pen./Rec. (in.) | Sample Depth (ft.) | Blows (6 in.) Shear Strength (psf) or RQD (%)                                                                                                | N-uncorrected | N <sub>60</sub> | Casing Blows |                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                       |                                                          |  |
| 50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | R4                 | 60/24           | 51.70 - 56.70      | RQD = 40%                                                                                                                                    |               |                 |              |  | 46.7'-47.7' (3:00)<br>47.7'-48.7' (3:30)<br>48.7'-49.7' (2:15)<br>49.7'-50.7' (1:30)<br>50.7'-51.7' (1:30)<br>R4: Tan to grey, fine to coarse-grained GRANITE with mica, hard to very hard, fresh to slightly weathered, sound, horizontal to shallow-dipping, moderately close joints. RQD = 40% (Poor).<br>R4: Core Times (min:sec)<br>51.7'-52.7' (1:45)<br>52.7'-53.7' (1:30)<br>53.7'-54.7' (1:30)<br>54.7'-55.7' (1:00)<br>55.7'-56.7' (1:25) |                                                       |                                                          |  |
| 55                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                    |                 |                    |                                                                                                                                              |               |                 |              |                                                                                   | 224.3                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                       | 56.7                                                     |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                    |                 |                    |                                                                                                                                              |               |                 |              |                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                       | Bottom of Exploration at 56.7 feet below ground surface. |  |
| 60                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                    |                 |                    |                                                                                                                                              |               |                 |              |                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                       |                                                          |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                    |                 |                    |                                                                                                                                              |               |                 |              |                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                       |                                                          |  |
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| 65                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                    |                 |                    |                                                                                                                                              |               |                 |              |                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                       |                                                          |  |
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| 70                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                    |                 |                    |                                                                                                                                              |               |                 |              |                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                       |                                                          |  |
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| 75                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                    |                 |                    |                                                                                                                                              |               |                 |              |                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                       |                                                          |  |
| <b>Remarks:</b><br>-No casing blow counts were recorded.<br>-Borehole backfilled with native soils and sand.<br>-Pavement restored with asphalt cold patch.<br>-bgs = below ground surface.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                    |                 |                    |                                                                                                                                              |               |                 |              |                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                       |                                                          |  |
| Stratification lines represent approximate boundaries between soil types; transitions may be gradual.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                    |                 |                    |                                                                                                                                              |               |                 |              |                                                                                   | Page 3 of 3                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                       |                                                          |  |
| * Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                    |                 |                    |                                                                                                                                              |               |                 |              |                                                                                   | Boring No.: BB-SPB-101                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                       |                                                          |  |

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| <b>Maine Department of Transportation</b><br>Soil/Rock Exploration Log<br>US CUSTOMARY UNITS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                    |                 |                    | <b>Project:</b> Watchic Bridge (#2914) State Route 113<br>over Page Brook<br><b>Location:</b> Standish, Maine                                |               |                 |              | <b>Boring No.:</b> BB-SPB-102<br><br><b>WIN:</b> 21703.00 |                 |                                                                                                                                                                                                                                                                                                                          |                                |                                                       |
| <b>Driller:</b> New England Boring Contractors                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                    |                 |                    | <b>Elevation (ft.):</b> 281                                                                                                                  |               |                 |              | <b>Auger ID/OD:</b> N/A                                   |                 |                                                                                                                                                                                                                                                                                                                          |                                |                                                       |
| <b>Operator:</b> M. Porter                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                    |                 |                    | <b>Datum:</b> NAVD-88                                                                                                                        |               |                 |              | <b>Sampler:</b> 1-3/8" Split-Spoon                        |                 |                                                                                                                                                                                                                                                                                                                          |                                |                                                       |
| <b>Logged By:</b> K. Kocia (Nobis)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                    |                 |                    | <b>Rig Type:</b> B-59 Mobile ATV                                                                                                             |               |                 |              | <b>Hammer Wt./Fall:</b> 140#/30"                          |                 |                                                                                                                                                                                                                                                                                                                          |                                |                                                       |
| <b>Date Start/Finish:</b> November 2, 2017/November 3, 2017                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                    |                 |                    | <b>Drilling Method:</b> B-53 Mobile Truck                                                                                                    |               |                 |              | <b>Core Barrel:</b> NQ2                                   |                 |                                                                                                                                                                                                                                                                                                                          |                                |                                                       |
| <b>Boring Location:</b> STA 93+52, 8' RT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                    |                 |                    | <b>Casing ID/OD:</b> 3"/3.5"                                                                                                                 |               |                 |              | <b>Water Level*:</b> 5.3' bgs                             |                 |                                                                                                                                                                                                                                                                                                                          |                                |                                                       |
| <b>Hammer Efficiency Factor:</b> .869                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                    |                 |                    | <b>Hammer Type:</b> Automatic <input checked="" type="checkbox"/> Hydraulic <input type="checkbox"/> Rope & Cathead <input type="checkbox"/> |               |                 |              |                                                           |                 |                                                                                                                                                                                                                                                                                                                          |                                |                                                       |
| Definitions:<br>D = Split Spoon Sample<br>MD = Unsuccessful Split Spoon Sample Attempt<br>U = Thin Wall Tube Sample<br>MU = Unsuccessful Thin Wall Tube Sample Attempt<br>V = Field Vane Shear Test, PP = Pocket Penetrometer<br>MV = Unsuccessful Field Vane Shear Test Attempt<br>R = Rock Core Sample<br>SSA = Solid Stem Auger<br>HSA = Hollow Stem Auger<br>RC = Roller Cone<br>WOH = Weight of 140lb. Hammer<br>WOR/C = Weight of Rods or Casing<br>WO1P = Weight of One Person<br>S <sub>u</sub> = Peak/Remolded Field Vane Undrained Shear Strength (psf)<br>S <sub>u</sub> (lab) = Lab Vane Undrained Shear Strength (psf)<br>q <sub>p</sub> = Unconfined Compressive Strength (ksf)<br>N-uncorrected = Raw Field SPT N-value<br>Hammer Efficiency Factor = Rig Specific Annual Calibration Value<br>N <sub>60</sub> = SPT N-uncorrected Corrected for Hammer Efficiency<br>N <sub>60</sub> = (Hammer Efficiency Factor/60%)*N-uncorrected<br>T <sub>v</sub> = Pocket Torvane Shear Strength (psf)<br>WC = Water Content, percent<br>LL = Liquid Limit<br>PL = Plastic Limit<br>PI = Plasticity Index<br>G = Grain Size Analysis<br>C = Consolidation Test |                    |                 |                    |                                                                                                                                              |               |                 |              |                                                           |                 |                                                                                                                                                                                                                                                                                                                          |                                |                                                       |
| Depth (ft.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Sample Information |                 |                    |                                                                                                                                              |               |                 |              |                                                           | Elevation (ft.) | Graphic Log                                                                                                                                                                                                                                                                                                              | Visual Description and Remarks | Laboratory Testing Results/ AASHTO and Unified Class. |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Sample No.         | Pen./Rec. (in.) | Sample Depth (ft.) | Blows (6 in.) Shear Strength (psf) or RQD (%)                                                                                                | N-uncorrected | N <sub>60</sub> | Casing Blows |                                                           |                 |                                                                                                                                                                                                                                                                                                                          |                                |                                                       |
| 0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                    |                 |                    |                                                                                                                                              |               |                 | RC           | 280.2                                                     |                 | Asphalt (10").                                                                                                                                                                                                                                                                                                           |                                |                                                       |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 1D                 | 24/5            | 1.00 - 3.00        | 6/9/8/9                                                                                                                                      | 17            | 25              |              |                                                           |                 | Dark grey-brown, moist, medium dense, fine to coarse SAND, little coarse gravel, trace silt, numerous asphalt particles and fragments. (Fill).                                                                                                                                                                           | 0.8'                           |                                                       |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 2D                 | 24/10           | 3.00 - 5.00        | 10/6/7/9                                                                                                                                     | 13            | 19              |              |                                                           |                 | Grey-brown, moist, medium dense, fine to coarse SAND, some fine to coarse gravel, trace silt, few asphalt particles, faint petroleum-like odor noted. (Fill).                                                                                                                                                            |                                |                                                       |
| 5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 3D                 | 24/11           | 5.00 - 7.00        | 5/6/10/12                                                                                                                                    | 16            | 23              |              | 275.0                                                     |                 | 3D-A (5"): Grey-brown, wet, medium dense, fine to coarse SAND, some fine to coarse gravel, trace silt, very few asphalt particles. (Fill).<br>3D-B (6"): Tan to grey, wet, medium dense, fine to coarse Sandy GRAVEL, trace silt. (Brook Deposits).                                                                      | 6.0'                           |                                                       |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                    |                 |                    |                                                                                                                                              |               |                 |              | 271.3                                                     |                 | Inferred strata transition at approximately 9.7 feet bgs based on wash color change.<br>No recovery.<br>Wood fragments observed in wash cuttings between approximately 10 and 14 feet bgs.<br>Brown, wet, very soft, ORGANIC SILT, some fine to coarse gravel, trace fine to coarse sand. (Freshwater Wetland Deposits). | 9.7'                           |                                                       |
| 10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 4D                 | 24/0            | 10.00 - 12.00      | WOR/WOH/WOH/ WOH                                                                                                                             | 0             | 0               |              |                                                           |                 |                                                                                                                                                                                                                                                                                                                          |                                |                                                       |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 5D                 | 24/2            | 12.00 - 14.00      | WOH/WOH/WOH/1                                                                                                                                | 0             | 0               |              |                                                           |                 |                                                                                                                                                                                                                                                                                                                          |                                |                                                       |
| 15                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 6D                 | 24/0            | 15.00 - 17.00      | WOR/1/WOR/1                                                                                                                                  | 1             | 1               |              | 266.2                                                     |                 | Inferred strata transition at approximately 14.8 feet bgs based on wash color change.<br>No recovery                                                                                                                                                                                                                     | 14.8'                          |                                                       |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                    |                 |                    |                                                                                                                                              |               |                 |              | 261.2                                                     |                 | Inferred strata transition at approximately 19.8 feet bgs based on wash color change.<br>Tan to grey, wet, dense, fine to medium SAND, trace silt. (Sand).                                                                                                                                                               | 19.8'                          |                                                       |
| 20                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 7D                 | 24/13           | 20.00 - 22.00      | 4/7/16/15                                                                                                                                    | 23            | 33              |              |                                                           |                 |                                                                                                                                                                                                                                                                                                                          |                                |                                                       |
| 25                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                    |                 |                    |                                                                                                                                              |               |                 |              |                                                           |                 |                                                                                                                                                                                                                                                                                                                          |                                |                                                       |
| <b>Remarks:</b><br>-No casing blow counts were recorded.<br>-Borehole backfilled with native soils and sand.<br>-Pavement restored with asphalt cold patch.<br>-bgs = below ground surface.<br>-Automatic Hammer ID# B-24.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                    |                 |                    |                                                                                                                                              |               |                 |              |                                                           |                 |                                                                                                                                                                                                                                                                                                                          |                                |                                                       |
| Stratification lines represent approximate boundaries between soil types; transitions may be gradual.<br><br>* Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                    |                 |                    |                                                                                                                                              |               |                 |              |                                                           |                 | Page 1 of 3<br><br><b>Boring No.:</b> BB-SPB-102                                                                                                                                                                                                                                                                         |                                |                                                       |

| <b>Maine Department of Transportation</b><br>Soil/Rock Exploration Log<br>US CUSTOMARY UNITS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                    |                 |                    | <b>Project:</b> Watchic Bridge (#2914) State Route 113<br>over Page Brook<br><b>Location:</b> Standish, Maine                                |               |                 |              | <b>Boring No.:</b> BB-SPB-102<br><br><b>WIN:</b> 21703.00 |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                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| <b>Driller:</b> New England Boring Contractors                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                    |                 |                    | <b>Elevation (ft.):</b> 281                                                                                                                  |               |                 |              | <b>Auger ID/OD:</b> N/A                                   |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                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| <b>Operator:</b> M. Porter                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                    |                 |                    | <b>Datum:</b> NAVD-88                                                                                                                        |               |                 |              | <b>Sampler:</b> 1-3/8" Split-Spoon                        |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      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| <b>Logged By:</b> K. Kocia (Nobis)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                    |                 |                    | <b>Rig Type:</b> B-59 Mobile ATV                                                                                                             |               |                 |              | <b>Hammer Wt./Fall:</b> 140#/30"                          |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       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| <b>Date Start/Finish:</b> November 2, 2017/November 3, 2017                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                    |                 |                    | <b>Drilling Method:</b> B-53 Mobile Truck                                                                                                    |               |                 |              | <b>Core Barrel:</b> NQ2                                   |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                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| <b>Boring Location:</b> STA 93+52, 8' RT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               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| <b>Hammer Efficiency Factor:</b> .869                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                    |                 |                    | <b>Hammer Type:</b> Automatic <input checked="" type="checkbox"/> Hydraulic <input type="checkbox"/> Rope & Cathead <input type="checkbox"/> |               |                 |              |                                                           |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                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| <div style="display: flex; justify-content: space-between; font-size: 0.8em;"> <div> <b>Definitions:</b><br/>           D = Split Spoon Sample<br/>           MD = Unsuccessful Split Spoon Sample Attempt<br/>           U = Thin Wall Tube Sample<br/>           MU = Unsuccessful Thin Wall Tube Sample Attempt<br/>           V = Field Vane Shear Test, PP = Pocket Penetrometer<br/>           MV = Unsuccessful Field Vane Shear Test Attempt         </div> <div>           R = Rock Core Sample<br/>           SSA = Solid Stem Auger<br/>           HSA = Hollow Stem Auger<br/>           RC = Roller Cone<br/>           WOH = Weight of 140 lb. Hammer<br/>           WOR/C = Weight of Rods or Casing<br/>           WO1P = Weight of One Person         </div> <div>           S<sub>u</sub> = Peak/Remolded Field Vane Undrained Shear Strength (psf)<br/>           S<sub>u</sub>(lab) = Lab Vane Undrained Shear Strength (psf)<br/>           q<sub>p</sub> = Unconfined Compressive Strength (ksf)<br/>           N-uncorrected = Raw Field SPT N-value<br/>           Hammer Efficiency Factor = Rig Specific Annual Calibration Value<br/>           N<sub>60</sub> = SPT N-uncorrected Corrected for Hammer Efficiency<br/>           N<sub>60</sub> = (Hammer Efficiency Factor/60%)*N-uncorrected         </div> <div>           T<sub>v</sub> = Pocket Torvane Shear Strength (psf)<br/>           WC = Water Content, percent<br/>           LL = Liquid Limit<br/>           PL = Plastic Limit<br/>           PI = Plasticity Index<br/>           G = Grain Size Analysis<br/>           C = Consolidation Test         </div> </div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            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| <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2">Depth (ft.)</th> <th colspan="7">Sample Information</th> <th rowspan="2">Elevation (ft.)</th> <th rowspan="2">Graphic Log</th> <th rowspan="2">Visual Description and Remarks</th> <th rowspan="2">Laboratory Testing Results/ AASHTO and Unified Class.</th> </tr> <tr> <th>Sample No.</th> <th>Pen./Rec. (in.)</th> <th>Sample Depth (ft.)</th> <th>Blows (6 in.) Shear Strength (psf) or RQD (%)</th> <th>N-uncorrected</th> <th>N<sub>60</sub></th> <th>Casing Blows</th> </tr> </thead> <tbody> <tr> <td>25</td> <td>8D</td> <td>24/5</td> <td>25.00 - 27.00</td> <td>21/11/23/26</td> <td>34</td> <td>49</td> <td></td> <td>256.0</td> <td rowspan="10"> </td> <td rowspan="10">           Tan to light grey, wet, dense, fine SAND, some fine to coarse gravel, some silt. (Gravelly Sand).<br/><br/>           Inferred boulder encountered between approximately 28.5 and 29.7 feet bgs.<br/><br/>           Tan to grey, wet, very stiff, SILT, some clay, trace fine sand. (Sandy Silt with Clay).<br/><br/>           Tan to grey, wet, hard, SILT, little clay, trace fine sand. (Sandy Silt with Clay).<br/><br/>           11D-A (7"): Tan to grey, wet, fine to coarse SAND, some silt, little clay. (Sandy Silt with Clay).<br/>           11D-B (1"): Inferred COBBLE/BOULDER fragments.<br/>           R1: Grey-black, very fine-grained BOULDER fragments and pieces.<br/>           R1: Core Times (min:sec)<br/>           41.1'-42.1' (6:30)<br/>           42.1'-43.1' (0:30)<br/>           43.1'-44.1' (0:45)<br/>           44.1'-45.1' (0:30)<br/>           45.1'-46.1' (2:00)<br/><br/>           R2: Grey, fine to coarse-grained GRANITE with mica, hard to very hard, slightly weathered to fresh, moderately fractured to sound, horizontal to moderately-dipping, close to moderately close joints. RQD = 82% (Good).         </td> <td rowspan="10">           A-4 (0)<br/><br/><br/><br/><br/><br/><br/><br/><br/><br/>           WC=17.0%<br/>           LL=29<br/>           PL=17<br/>           PI=12<br/><br/><br/><br/><br/><br/><br/><br/><br/><br/>           UCT q<sub>p</sub>= 23,275 psi         </td> </tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr> <td>30</td> <td>9D</td> <td>24/15</td> <td>30.00 - 32.00</td> <td>10/8/12/18</td> <td>20</td> <td>29</td> <td></td> <td>251.0</td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr> <td>35</td> <td>10D</td> <td>24/21</td> <td>35.00 - 37.00</td> <td>12/15/18/29</td> <td>33</td> <td>48</td> <td></td> <td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr> <td>40</td> <td>11D</td> <td>8/8</td> <td>40.00 - 40.67</td> <td>14/100/2"</td> <td>--</td> <td></td> <td></td> <td>241.0</td><td></td><td></td><td></td></tr> <tr> <td></td> <td>R1</td> <td>60/18</td> <td>41.10 - 46.10</td> <td>RQD = 5%</td> <td></td> <td></td> <td></td> <td>240.4</td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr> <td>45</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr> <td></td> <td>R2</td> <td>60/58</td> <td>47.60 - 52.60</td> <td>RQD = 82%</td> <td></td> <td></td> <td></td> <td>233.4</td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr> <td>50</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td><td></td><td></td><td></td></tr> </tbody> </table> |                    |                 |                    |                                                                                                                                              |               |                 |              |                                                           |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                           | Depth (ft.) | Sample Information |  |  |  |  |  |  | Elevation (ft.) | Graphic Log | Visual Description and Remarks | Laboratory Testing Results/ AASHTO and Unified Class. | Sample No. | Pen./Rec. (in.) | Sample Depth (ft.) | Blows (6 in.) Shear Strength (psf) or RQD (%) | N-uncorrected | N <sub>60</sub> | Casing Blows | 25 | 8D | 24/5 | 25.00 - 27.00 | 21/11/23/26 | 34 | 49 |  | 256.0 |  | Tan to light grey, wet, dense, fine SAND, some fine to coarse gravel, some silt. (Gravelly Sand).<br><br>Inferred boulder encountered between approximately 28.5 and 29.7 feet bgs.<br><br>Tan to grey, wet, very stiff, SILT, some clay, trace fine sand. (Sandy Silt with Clay).<br><br>Tan to grey, wet, hard, SILT, little clay, trace fine sand. (Sandy Silt with Clay).<br><br>11D-A (7"): Tan to grey, wet, fine to coarse SAND, some silt, little clay. (Sandy Silt with Clay).<br>11D-B (1"): Inferred COBBLE/BOULDER fragments.<br>R1: Grey-black, very fine-grained BOULDER fragments and pieces.<br>R1: Core Times (min:sec)<br>41.1'-42.1' (6:30)<br>42.1'-43.1' (0:30)<br>43.1'-44.1' (0:45)<br>44.1'-45.1' (0:30)<br>45.1'-46.1' (2:00)<br><br>R2: Grey, fine to coarse-grained GRANITE with mica, hard to very hard, slightly weathered to fresh, moderately fractured to sound, horizontal to moderately-dipping, close to moderately close joints. RQD = 82% (Good). | A-4 (0)<br><br><br><br><br><br><br><br><br><br>WC=17.0%<br>LL=29<br>PL=17<br>PI=12<br><br><br><br><br><br><br><br><br><br>UCT q <sub>p</sub> = 23,275 psi |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 30 | 9D | 24/15 | 30.00 - 32.00 | 10/8/12/18 | 20 | 29 |  | 251.0 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 35 | 10D | 24/21 | 35.00 - 37.00 | 12/15/18/29 | 33 | 48 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 40 | 11D | 8/8 | 40.00 - 40.67 | 14/100/2" | -- |  |  | 241.0 |  |  |  |  | R1 | 60/18 | 41.10 - 46.10 | RQD = 5% |  |  |  | 240.4 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 45 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | R2 | 60/58 | 47.60 - 52.60 | RQD = 82% |  |  |  | 233.4 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 50 |  |  |  |  |  |  |  |  |  |  |  |
| Depth (ft.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Sample Information |                 |                    |                                                                                                                                              |               |                 |              | Elevation (ft.)                                           | Graphic Log | Visual Description and Remarks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Laboratory Testing Results/ AASHTO and Unified Class.                                                                                                     |             |                    |  |  |  |  |  |  |                 |             |                                |                                                       |            |                 |                    |                                               |               |                 |              |    |    |      |               |             |    |    |  |       |  |                                                                                                                                          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(in.) | Sample Depth (ft.) | Blows (6 in.) Shear Strength (psf) or RQD (%)                                                                                                | N-uncorrected | N <sub>60</sub> | Casing Blows |                                                           |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              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                                  | 8D                 | 24/5            | 25.00 - 27.00      | 21/11/23/26                                                                                                                                  | 34            | 49              |              | 256.0                                                     |             | Tan to light grey, wet, dense, fine SAND, some fine to coarse gravel, some silt. (Gravelly Sand).<br><br>Inferred boulder encountered between approximately 28.5 and 29.7 feet bgs.<br><br>Tan to grey, wet, very stiff, SILT, some clay, trace fine sand. (Sandy Silt with Clay).<br><br>Tan to grey, wet, hard, SILT, little clay, trace fine sand. (Sandy Silt with Clay).<br><br>11D-A (7"): Tan to grey, wet, fine to coarse SAND, some silt, little clay. (Sandy Silt with Clay).<br>11D-B (1"): Inferred COBBLE/BOULDER fragments.<br>R1: Grey-black, very fine-grained BOULDER fragments and pieces.<br>R1: Core Times (min:sec)<br>41.1'-42.1' (6:30)<br>42.1'-43.1' (0:30)<br>43.1'-44.1' (0:45)<br>44.1'-45.1' (0:30)<br>45.1'-46.1' (2:00)<br><br>R2: Grey, fine to coarse-grained GRANITE with mica, hard to very hard, slightly weathered to fresh, moderately fractured to sound, horizontal to moderately-dipping, close to moderately close joints. RQD = 82% (Good). | A-4 (0)<br><br><br><br><br><br><br><br><br><br>WC=17.0%<br>LL=29<br>PL=17<br>PI=12<br><br><br><br><br><br><br><br><br><br>UCT q <sub>p</sub> = 23,275 psi |             |                    |  |  |  |  |  |  |                 |             |                                |                                                       |            |                 |                    |                                               |               |                 |              |    |    |      |               |             |    |    |  |       |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                           |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |    |    |       |               |            |    |    |  |       |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |    |     |       |               |             |    |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |    |     |     |               |           |    |  |  |       |  |  |  |  |    |       |               |          |  |  |  |       |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |    |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |    |       |               |           |  |  |  |       |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |    |  |  |  |  |  |  |  |  |  |  |  |
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| <b>Remarks:</b><br>-No casing blow counts were recorded.<br>-Borehole backfilled with native soils and sand.<br>-Pavement restored with asphalt cold patch.<br>-bgs = below ground surface.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            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| Stratification lines represent approximate boundaries between soil types; transitions may be gradual.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  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| * Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        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                |                                                                                                                                              |               |                 |              |                                                           |             | <b>Boring No.:</b> BB-SPB-102                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                           |             |                    |  |  |  |  |  |  |                 |             |                                |                                                       |            |                 |                    |                                               |               |                 |              |    |    |      |               |             |    |    |  |       |  |                                                                                                                                                                                                                        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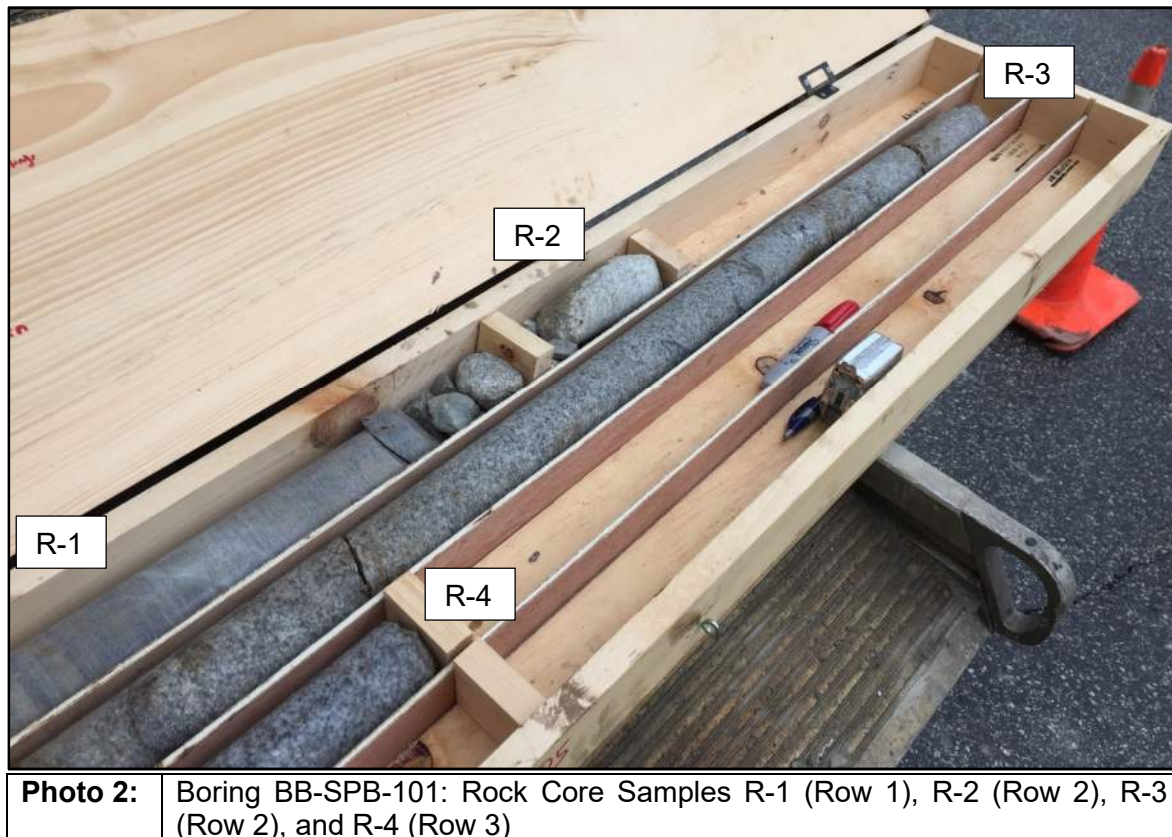
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                    |                 |                    |                                                                                                                                              |               |                 |              |                                                           |                                                                                   |                                                                                                                                                                                                        |                                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|-----------------|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------|---------------|-----------------|--------------|-----------------------------------------------------------|-----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|
| <b>Maine Department of Transportation</b><br><u>Soil/Rock Exploration Log</u><br><u>US CUSTOMARY UNITS</u>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                    |                 |                    | <b>Project:</b> Watchic Bridge (#2914) State Route 113<br>over Page Brook<br><b>Location:</b> Standish, Maine                                |               |                 |              | <b>Boring No.:</b> BB-SPB-102<br><br><b>WIN:</b> 21703.00 |                                                                                   |                                                                                                                                                                                                        |                                                       |
| <b>Driller:</b> New England Boring Contractors                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                    |                 |                    | <b>Elevation (ft.)</b> 281                                                                                                                   |               |                 |              | <b>Auger ID/OD:</b> N/A                                   |                                                                                   |                                                                                                                                                                                                        |                                                       |
| <b>Operator:</b> M. Porter                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                    |                 |                    | <b>Datum:</b> NAVD-88                                                                                                                        |               |                 |              | <b>Sampler:</b> 1-3/8" Split-Spoon                        |                                                                                   |                                                                                                                                                                                                        |                                                       |
| <b>Logged By:</b> K. Kocia (Nobis)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                    |                 |                    | <b>Rig Type:</b> B-59 Mobile ATV                                                                                                             |               |                 |              | <b>Hammer Wt./Fall:</b> 140#/30"                          |                                                                                   |                                                                                                                                                                                                        |                                                       |
| <b>Date Start/Finish:</b> November 2, 2017/November 3, 2017                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                    |                 |                    | <b>Drilling Method:</b> B-53 Mobile Truck                                                                                                    |               |                 |              | <b>Core Barrel:</b> NQ2                                   |                                                                                   |                                                                                                                                                                                                        |                                                       |
| <b>Boring Location:</b> STA 93+52, 8' RT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                    |                 |                    | <b>Casing ID/OD:</b> 3"/3.5"                                                                                                                 |               |                 |              | <b>Water Level*:</b> 5.3' bgs                             |                                                                                   |                                                                                                                                                                                                        |                                                       |
| <b>Hammer Efficiency Factor:</b> .869                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                    |                 |                    | <b>Hammer Type:</b> Automatic <input checked="" type="checkbox"/> Hydraulic <input type="checkbox"/> Rope & Cathead <input type="checkbox"/> |               |                 |              |                                                           |                                                                                   |                                                                                                                                                                                                        |                                                       |
| <div>Definitions:<br/>D = Split Spoon Sample<br/>MD = Unsuccessful Split Spoon Sample Attempt<br/>U = Thin Wall Tube Sample<br/>MU = Unsuccessful Thin Wall Tube Sample Attempt<br/>V = Field Vane Shear Test, PP = Pocket Penetrometer<br/>MV = Unsuccessful Field Vane Shear Test Attempt</div> <div>R = Rock Core Sample<br/>SSA = Solid Stem Auger<br/>HSA = Hollow Stem Auger<br/>RC = Roller Cone<br/>WOH = Weight of 140 lb. Hammer<br/>WOR/C = Weight of Rods or Casing<br/>WO1P = Weight of One Person</div> <div>S<sub>u</sub> = Peak/Remolded Field Vane Undrained Shear Strength (psf)<br/>S<sub>u</sub>(lab) = Lab Vane Undrained Shear Strength (psf)<br/>q<sub>u</sub> = Unconfined Compressive Strength (ksf)<br/>N-uncorrected = Raw Field SPT N-value<br/>Hammer Efficiency Factor = Rig Specific Annual Calibration Value<br/>N<sub>60</sub> = SPT N-uncorrected Corrected for Hammer Efficiency<br/>N<sub>60</sub> = (Hammer Efficiency Factor/60%)*N-uncorrected</div> <div>T<sub>v</sub> = Pocket Torvane Shear Strength (psf)<br/>WC = Water Content, percent<br/>LL = Liquid Limit<br/>PL = Plastic Limit<br/>PI = Plasticity Index<br/>G = Grain Size Analysis<br/>C = Consolidation Test</div> |                    |                 |                    |                                                                                                                                              |               |                 |              |                                                           |                                                                                   |                                                                                                                                                                                                        |                                                       |
| Depth (ft.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Sample Information |                 |                    |                                                                                                                                              |               |                 |              | Elevation (ft.)                                           | Graphic Log                                                                       | Visual Description and Remarks                                                                                                                                                                         | Laboratory Testing Results/ AASHTO and Unified Class. |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Sample No.         | Pen./Rec. (in.) | Sample Depth (ft.) | Blows (6 in.) Shear Strength (psf) or RQD (%)                                                                                                | N-uncorrected | N <sub>60</sub> | Casing Blows |                                                           |                                                                                   |                                                                                                                                                                                                        |                                                       |
| 50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                    |                 |                    |                                                                                                                                              |               |                 |              | 228.4                                                     |  | R1: Core Times (min:sec)<br>47.6'-48.6' (3:00)<br>48.6'-49.6' (1:15)<br>49.6'-50.6' (1:30)<br>50.6'-51.6' (1:30)<br>51.6'-52.6' (1:30)<br><br>Bottom of Exploration at 52.6 feet below ground surface. |                                                       |
| 55                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                    |                 |                    |                                                                                                                                              |               |                 |              |                                                           |                                                                                   |                                                                                                                                                                                                        |                                                       |
| 60                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                    |                 |                    |                                                                                                                                              |               |                 |              |                                                           |                                                                                   |                                                                                                                                                                                                        |                                                       |
| 65                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                    |                 |                    |                                                                                                                                              |               |                 |              |                                                           |                                                                                   |                                                                                                                                                                                                        |                                                       |
| 70                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                    |                 |                    |                                                                                                                                              |               |                 |              |                                                           |                                                                                   |                                                                                                                                                                                                        |                                                       |
| 75                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                    |                 |                    |                                                                                                                                              |               |                 |              |                                                           |                                                                                   |                                                                                                                                                                                                        |                                                       |
| <b>Remarks:</b><br>-No casing blow counts were recorded.<br>-Borehole backfilled with native soils and sand.<br>-Pavement restored with asphalt cold patch.<br>-bgs = below ground surface.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                    |                 |                    |                                                                                                                                              |               |                 |              |                                                           |                                                                                   |                                                                                                                                                                                                        |                                                       |
| Stratification lines represent approximate boundaries between soil types; transitions may be gradual.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                    |                 |                    |                                                                                                                                              |               |                 |              |                                                           |                                                                                   | Page 3 of 3                                                                                                                                                                                            |                                                       |
| * Water level readings have been made at times and under conditions stated. Groundwater fluctuations may occur due to conditions other than those present at the time measurements were made.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                    |                 |                    |                                                                                                                                              |               |                 |              |                                                           |                                                                                   | Boring No.: BB-SPB-102                                                                                                                                                                                 |                                                       |

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## **APPENDIX D – Photo Logs of Rock Core Samples**

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92270.05 – Watchic Bridge (#2914) – Standish, ME – Bedrock Core Photo Log





**Photo 3:** Boring BB-SPB-102: Rock Core Samples R-1 (Row 2), R-2 (Row 3). Note: Row 1 contains a rock core from a separate project.



**Photo 4:** Boring BB-SPB-102: Rock Core Samples R-2 (middle).



**Photo 5:** Boring BB-SPB-102: Rock Core Samples R-2 (End).

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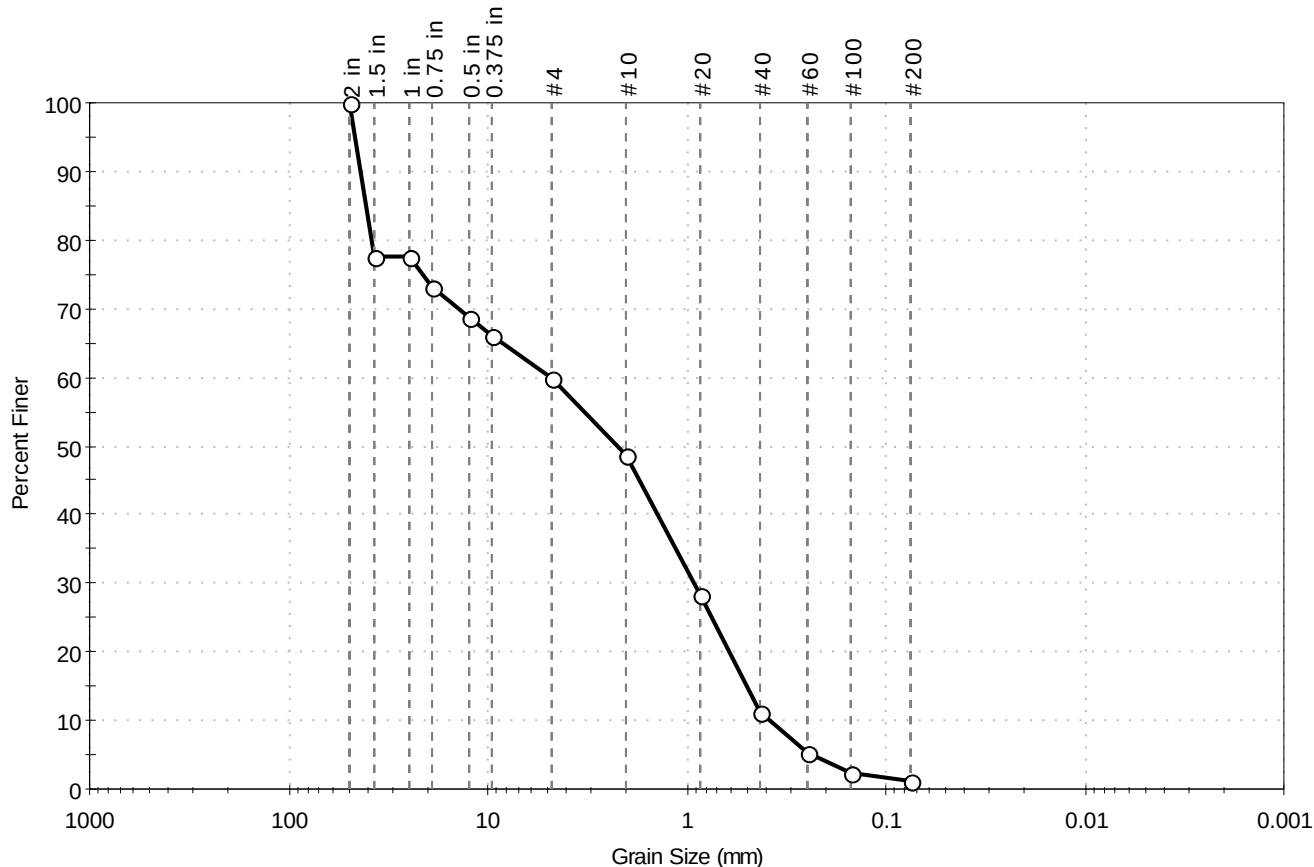
## **APPENDIX E – Laboratory Test Results**

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|                     |                               |              |            |
|---------------------|-------------------------------|--------------|------------|
| Client:             | Nobis Engineering, Inc.       |              |            |
| Project:            | Rt 113 over Page Brook        |              |            |
| Location:           | Standish, ME                  | Project No:  | GTX-307131 |
| Boring ID:          | 92270.05                      | Sample Type: | bag        |
| Sample ID:          | SS-2                          | Test Date:   | 10/12/17   |
| Depth :             | 0-1.5 ft                      | Test Id:     | 427689     |
| Test Comment:       | ---                           |              |            |
| Visual Description: | Moist, brown sand with gravel |              |            |
| Sample Comment:     | Contains asphalt              |              |            |

## Particle Size Analysis - ASTM D422



| % Cobble | % Gravel | % Sand | % Silt & Clay Size |
|----------|----------|--------|--------------------|
| ---      | 40.1     | 58.8   | 1.1                |

| Sieve Name | Sieve Size, mm | Percent Finer | Spec. Percent | Complies |
|------------|----------------|---------------|---------------|----------|
| 2 in       | 50.00          | 100           |               |          |
| 1.5 in     | 37.50          | 77            |               |          |
| 1 in       | 25.00          | 77            |               |          |
| 0.75 in    | 19.00          | 73            |               |          |
| 0.5 in     | 12.50          | 69            |               |          |
| 0.375 in   | 9.50           | 66            |               |          |
| #4         | 4.75           | 60            |               |          |
| #10        | 2.00           | 49            |               |          |
| #20        | 0.85           | 28            |               |          |
| #40        | 0.42           | 11            |               |          |
| #60        | 0.25           | 5             |               |          |
| #100       | 0.15           | 2             |               |          |
| #200       | 0.075          | 1.1           |               |          |
|            |                |               |               |          |
|            |                |               |               |          |

### Coefficients

|                              |                             |
|------------------------------|-----------------------------|
| D <sub>85</sub> = 41.2868 mm | D <sub>30</sub> = 0.9090 mm |
| D <sub>60</sub> = 4.8476 mm  | D <sub>15</sub> = 0.4933 mm |
| D <sub>50</sub> = 2.2304 mm  | D <sub>10</sub> = 0.3792 mm |
| C <sub>u</sub> = 12.784      | C <sub>c</sub> = 0.450      |

### Classification

**ASTM** Poorly graded sand with gravel (SP)

**AASHTO** Stone Fragments, Gravel and Sand (A-1-a (1))

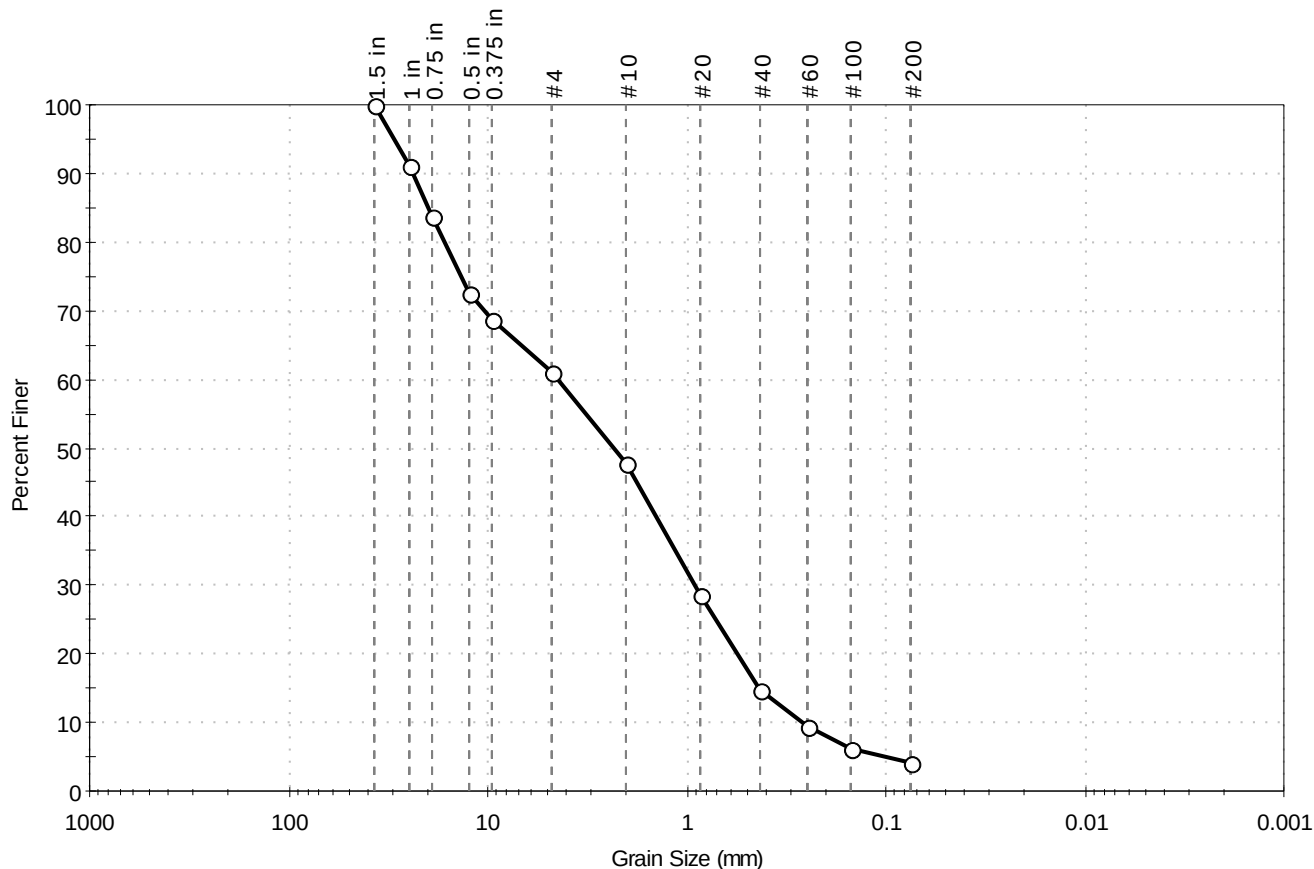
### Sample / Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

|                                                   |                        |
|---------------------------------------------------|------------------------|
| Client: Nobis Engineering, Inc.                   | Project No: GTX-307131 |
| Project: Rt 113 over Page Brook                   |                        |
| Location: Standish, ME                            |                        |
| Boring ID: 92270.05                               | Sample Type: bag       |
| Sample ID: SS-3                                   | Test Date: 10/12/17    |
| Depth: 1-2 ft                                     | Test Id: 427690        |
| Test Comment: ---                                 | Tested By: jbr         |
| Visual Description: Moist, brown sand with gravel | Checked By: jsc        |
| Sample Comment: ---                               |                        |

## Particle Size Analysis - ASTM D422



| % Cobble | % Gravel | % Sand | % Silt & Clay Size |
|----------|----------|--------|--------------------|
| ---      | 38.9     | 57.0   | 4.1                |

| Sieve Name | Sieve Size, mm | Percent Finer | Spec. Percent | Complies |
|------------|----------------|---------------|---------------|----------|
| 1.5 in     | 37.50          | 100           |               |          |
| 1 in       | 25.00          | 91            |               |          |
| 0.75 in    | 19.00          | 84            |               |          |
| 0.5 in     | 12.50          | 73            |               |          |
| 0.375 in   | 9.50           | 69            |               |          |
| #4         | 4.75           | 61            |               |          |
| #10        | 2.00           | 48            |               |          |
| #20        | 0.85           | 29            |               |          |
| #40        | 0.42           | 15            |               |          |
| #60        | 0.25           | 9             |               |          |
| #100       | 0.15           | 6             |               |          |
| #200       | 0.075          | 4.1           |               |          |
|            |                |               |               |          |
|            |                |               |               |          |

### Coefficients

|                              |                             |
|------------------------------|-----------------------------|
| D <sub>85</sub> = 19.8039 mm | D <sub>30</sub> = 0.9032 mm |
| D <sub>60</sub> = 4.4025 mm  | D <sub>15</sub> = 0.4297 mm |
| D <sub>50</sub> = 2.3033 mm  | D <sub>10</sub> = 0.2650 mm |
| C <sub>u</sub> = 16.613      | C <sub>c</sub> = 0.699      |

### Classification

**ASTM** Poorly graded sand with gravel (SP)

**AASHTO** Stone Fragments, Gravel and Sand (A-1-a (1))

### Sample / Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD



|                     |                                           |              |            |
|---------------------|-------------------------------------------|--------------|------------|
| Client:             | Nobis Engineering, Inc.                   |              |            |
| Project:            | Rt 113 over Page Brook                    |              |            |
| Location:           | Standish, ME                              | Project No:  | GTX-307131 |
| Boring ID:          | BB-SPB-101                                | Sample Type: | jar        |
| Sample ID:          | S-4                                       | Test Date:   | 11/22/17   |
| Depth :             | 10-12                                     | Test Id:     | 433289     |
| Test Comment:       | ---                                       |              |            |
| Visual Description: | Moist, very dark brown silt with organics |              |            |
| Sample Comment:     | ---                                       |              |            |

## Moisture Content of Soil and Rock - ASTM D2216

| Boring ID  | Sample ID | Depth | Description                               | Moisture Content, % |
|------------|-----------|-------|-------------------------------------------|---------------------|
| BB-SPB-101 | S- 4      | 10-12 | Moist, very dark brown silt with organics | 254.2               |

Notes: Temperature of Drying : 110° Celsius



|                     |                                           |              |            |
|---------------------|-------------------------------------------|--------------|------------|
| Client:             | Nobis Engineering, Inc.                   |              |            |
| Project:            | Rt 113 over Page Brook                    |              |            |
| Location:           | Standish, ME                              | Project No:  | GTX-307131 |
| Boring ID:          | BB-SPB-101                                | Sample Type: | jar        |
| Sample ID:          | S-4                                       | Test Date:   | 11/21/17   |
| Depth :             | 10-12                                     | Test Id:     | 433290     |
| Test Comment:       | ---                                       |              |            |
| Visual Description: | Moist, very dark brown silt with organics |              |            |
| Sample Comment:     | ---                                       |              |            |

## Moisture, Ash, and Organic Matter - ASTM D2974

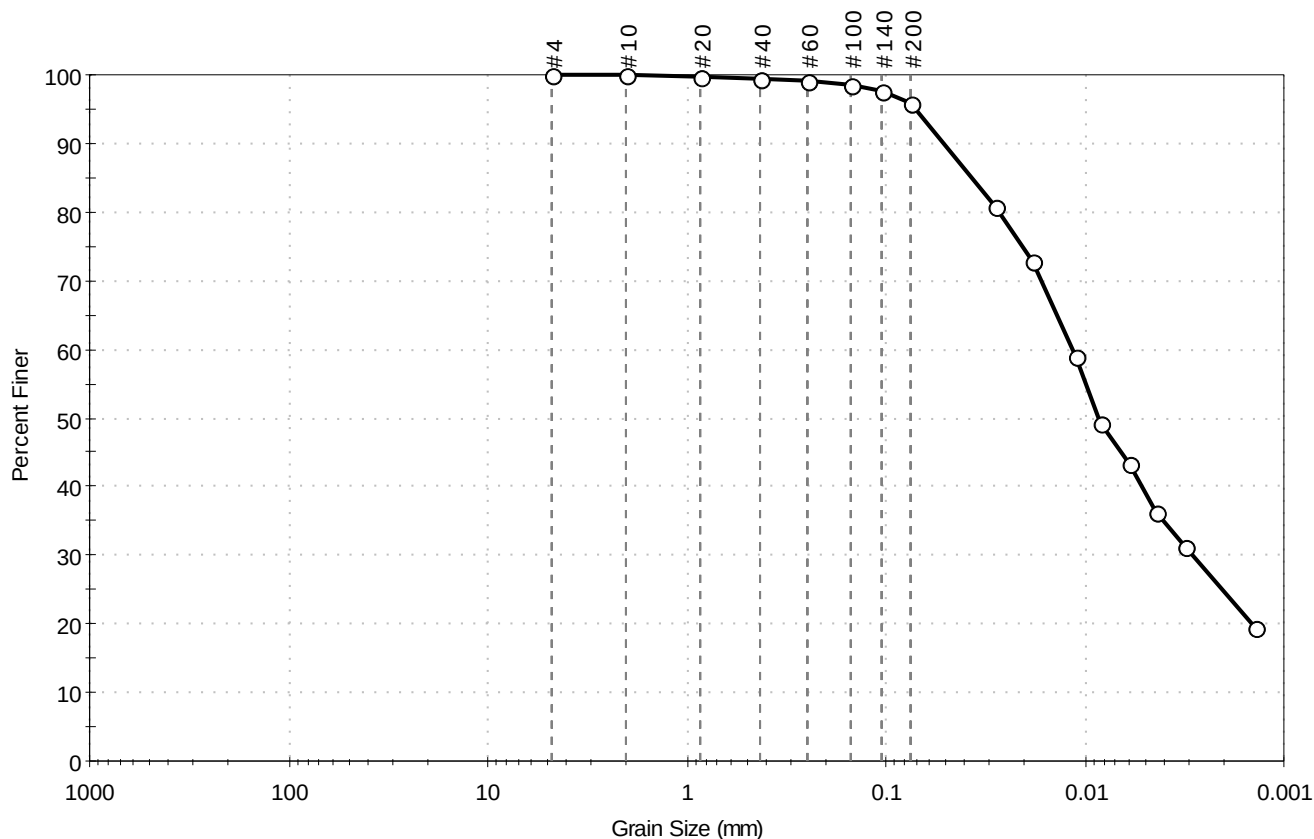
| Boring ID  | Sample ID | Depth | Description                               | Moisture Content, % | Ash Content, % | Organic Matter, % |
|------------|-----------|-------|-------------------------------------------|---------------------|----------------|-------------------|
| BB-SPB-101 | S-4       | 10-12 | Moist, very dark brown silt with organics | 254                 | 64.3           | 35.7              |

Notes: Moisture content determined by Method A and reported as a percentage of oven-dried mass;  
dried to a constant mass at temperature of 105° C  
Ash content and organic matter determined by Method C; dried to constant mass at temperature 440° C



|                     |                         |              |            |
|---------------------|-------------------------|--------------|------------|
| Client:             | Nobis Engineering, Inc. | Project No:  | GTX-307131 |
| Project:            | Rt 113 over Page Brook  |              |            |
| Location:           | Standish, ME            |              |            |
| Boring ID:          | BB-SPB-101              | Sample Type: | jar        |
| Sample ID:          | S-7B                    | Test Date:   | 11/30/17   |
| Depth :             | 20-22                   | Test Id:     | 433287     |
| Test Comment:       | ---                     | Tested By:   | jbr        |
| Visual Description: | Moist, gray clay        | Checked By:  | emm        |
| Sample Comment:     | ---                     |              |            |

## Particle Size Analysis - ASTM D422



| % Cobble | % Gravel | % Sand | % Silt & Clay Size |
|----------|----------|--------|--------------------|
| ---      | 0.0      | 4.2    | 95.8               |

| Sieve Name | Sieve Size, mm     | Percent Finer | Spec. Percent | Complies |
|------------|--------------------|---------------|---------------|----------|
| #4         | 4.75               | 100           |               |          |
| #10        | 2.00               | 100           |               |          |
| #20        | 0.85               | 100           |               |          |
| #40        | 0.42               | 99            |               |          |
| #60        | 0.25               | 99            |               |          |
| #100       | 0.15               | 98            |               |          |
| #140       | 0.11               | 98            |               |          |
| #200       | 0.075              | 96            |               |          |
| ---        | Particle Size (mm) | Percent Finer | Spec. Percent | Complies |
| ---        | 0.0282             | 81            |               |          |
| ---        | 0.0184             | 73            |               |          |
| ---        | 0.0112             | 59            |               |          |
| ---        | 0.0084             | 49            |               |          |
| ---        | 0.0060             | 43            |               |          |
| ---        | 0.0044             | 36            |               |          |
| ---        | 0.0031             | 31            |               |          |
| ---        | 0.0014             | 19            |               |          |

### Coefficients

|                             |                             |
|-----------------------------|-----------------------------|
| D <sub>85</sub> = 0.0370 mm | D <sub>30</sub> = 0.0029 mm |
| D <sub>60</sub> = 0.0116 mm | D <sub>15</sub> = N/A       |
| D <sub>50</sub> = 0.0086 mm | D <sub>10</sub> = N/A       |
| C <sub>u</sub> = N/A        | C <sub>c</sub> = N/A        |

### Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

### Sample / Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

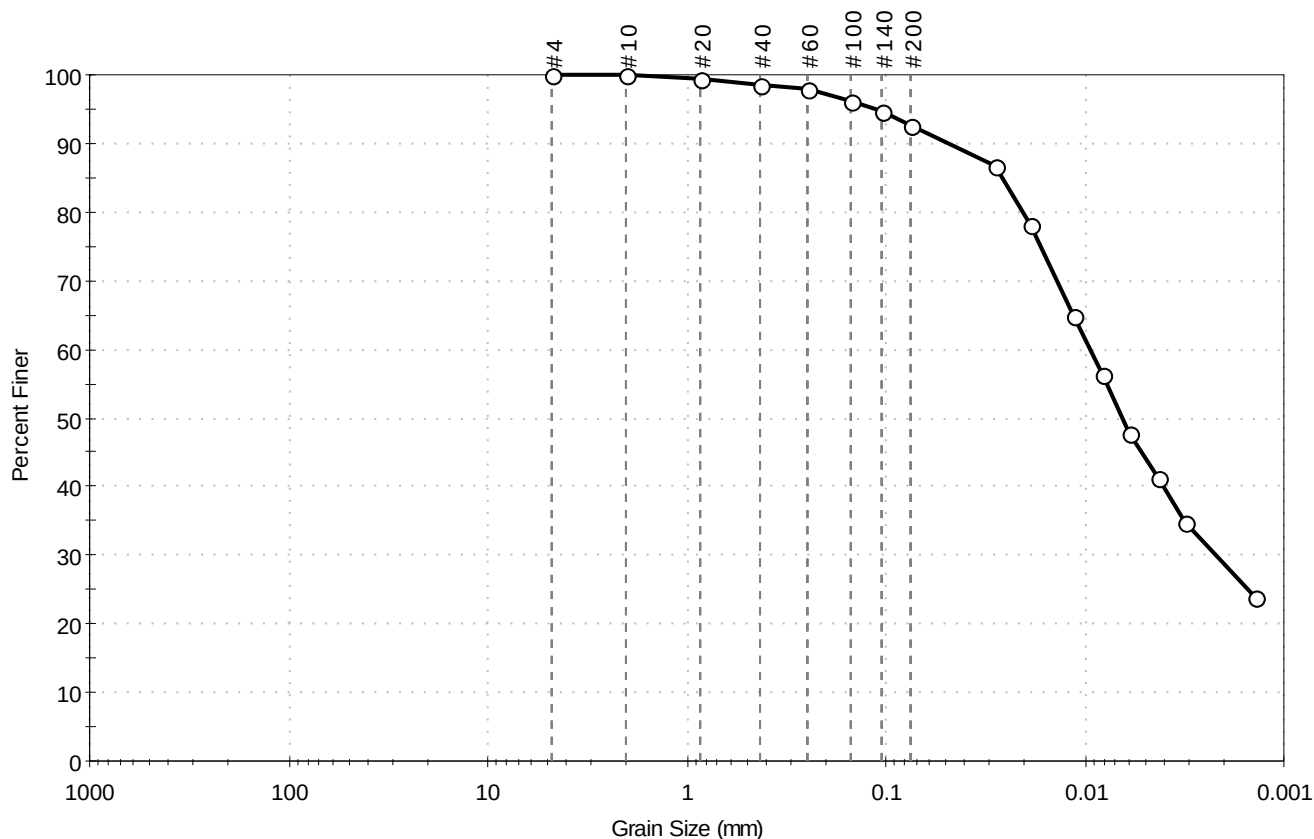
Dispersion Period : 1 minute

Specific Gravity : 2.65

Separation of Sample: #200 Sieve

|                                      |                        |
|--------------------------------------|------------------------|
| Client: Nobis Engineering, Inc.      | Project No: GTX-307131 |
| Project: Rt 113 over Page Brook      |                        |
| Location: Standish, ME               |                        |
| Boring ID: BB-SPB-102                | Sample Type: jar       |
| Sample ID: S-9                       | Test Date: 11/30/17    |
| Depth: 30-32                         | Test Id: 433288        |
| Test Comment: ---                    | Tested By: jbr         |
| Visual Description: Moist, gray clay | Checked By: emm        |
| Sample Comment: ---                  |                        |

## Particle Size Analysis - ASTM D422



| % Cobble | % Gravel | % Sand | % Silt & Clay Size |
|----------|----------|--------|--------------------|
| ---      | 0.0      | 7.5    | 92.5               |

| Sieve Name | Sieve Size, mm     | Percent Finer | Spec. Percent | Complies |
|------------|--------------------|---------------|---------------|----------|
| #4         | 4.75               | 100           |               |          |
| #10        | 2.00               | 100           |               |          |
| #20        | 0.85               | 99            |               |          |
| #40        | 0.42               | 99            |               |          |
| #60        | 0.25               | 98            |               |          |
| #100       | 0.15               | 96            |               |          |
| #140       | 0.11               | 95            |               |          |
| #200       | 0.075              | 92            |               |          |
| ---        | Particle Size (mm) | Percent Finer | Spec. Percent | Complies |
| ---        | 0.0285             | 87            |               |          |
| ---        | 0.0188             | 78            |               |          |
| ---        | 0.0114             | 65            |               |          |
| ---        | 0.0082             | 56            |               |          |
| ---        | 0.0059             | 48            |               |          |
| ---        | 0.0043             | 41            |               |          |
| ---        | 0.0031             | 35            |               |          |
| ---        | 0.0014             | 24            |               |          |

### Coefficients

$D_{85} = 0.0263 \text{ mm}$        $D_{30} = 0.0022 \text{ mm}$   
 $D_{60} = 0.0094 \text{ mm}$        $D_{15} = \text{N/A}$   
 $D_{50} = 0.0065 \text{ mm}$        $D_{10} = \text{N/A}$   
 $C_u = \text{N/A}$        $C_c = \text{N/A}$

### Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

### Sample / Test Description

Sand/Gravel Particle Shape : ---  
 Sand/Gravel Hardness : ---  
 Dispersion Device : Apparatus A - Mech Mixer  
 Dispersion Period : 1 minute  
 Specific Gravity : 2.65  
 Separation of Sample: #200 Sieve



|            |                         |              |            |
|------------|-------------------------|--------------|------------|
| Client:    | Nobis Engineering, Inc. |              |            |
| Project:   | Rt 113 over Page Brook  |              |            |
| Location:  | Standish, ME            | Project No:  | GTX-307131 |
| Boring ID: | ---                     | Sample Type: | ---        |
| Sample ID: | ---                     | Test Date:   | 11/27/17   |
| Depth :    | ---                     | Test Id:     | 433292     |
|            |                         | Tested By:   | rlc        |
|            |                         | Checked By:  | jsc        |

## Bulk Density and Compressive Strength of Rock Core Specimens by ASTM D7012 Method C

| Boring ID  | Sample Number | Depth     | Bulk Density, pcf | Compressive strength, psi | Failure Type | Meets ASTM D4543 | Note(s) |
|------------|---------------|-----------|-------------------|---------------------------|--------------|------------------|---------|
| BB-SPB-101 | RC-3          | 46.7-51.7 | 161               | 20953                     | 1            | Yes              | ---     |
| BB-SPB-102 | RC-2          | 47.6-52.6 | 163               | 23275                     | 1            | Yes              | ---     |

Notes: Density determined on core samples by measuring dimensions and weight and then calculating.  
All specimens tested at the approximate as-received moisture content and at standard laboratory temperature.  
The axial load was applied continuously at a stress rate that produced failure in a test time between 2 and 15 minutes.  
Failure Type: 1 = Intact Material Failure; 2 = Discontinuity Failure; 3 = Intact Material and Discontinuity Failure  
(See attached photographs)

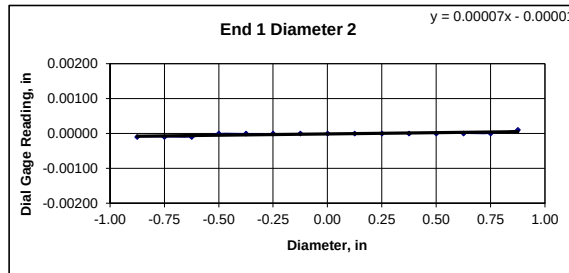
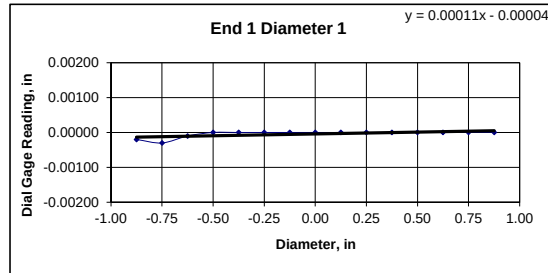


|                     |                         |             |            |
|---------------------|-------------------------|-------------|------------|
| Client:             | Nobis Engineering, Inc. | Test Date:  | 11/27/2017 |
| Project Name:       | Rt. 113 over Page Brook | Tested By:  | rlc        |
| Project Location:   | Standish, ME            | Checked By: | jsc        |
| GTX #:              | 307131                  |             |            |
| Boring ID:          | BB-SPB-101              |             |            |
| Sample ID:          | RC-3                    |             |            |
| Depth:              | 46.7-51.7 ft            |             |            |
| Visual Description: | See photographs         |             |            |

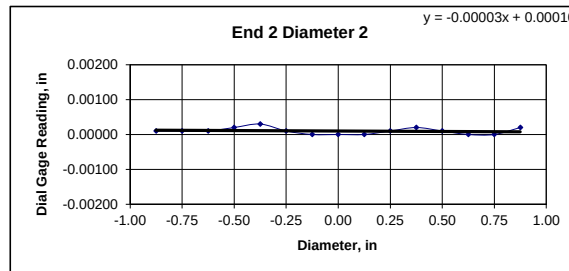
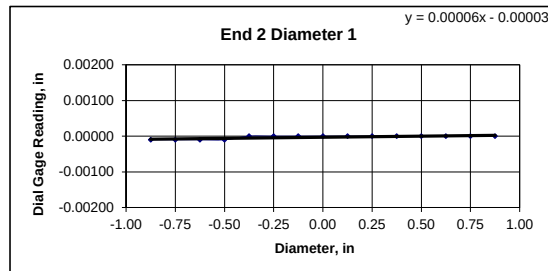
## UNIT WEIGHT DETERMINATION AND DIMENSIONAL AND SHAPE TOLERANCES OF ROCK CORE SPECIMENS BY ASTM D4543

| BULK DENSITY                       |        |                                             |         | DEVIATION FROM STRAIGHTNESS (Procedure S1)                                                               |  |
|------------------------------------|--------|---------------------------------------------|---------|----------------------------------------------------------------------------------------------------------|--|
|                                    | 1      | 2                                           | Average | Maximum gap between side of core and reference surface plate:<br>Is the maximum gap $\leq$ 0.02 in.? YES |  |
| Specimen Length, in:               | 4.20   | 4.20                                        | 4.20    | Maximum difference must be $< 0.020$ in.                                                                 |  |
| Specimen Diameter, in:             | 1.98   | 1.98                                        | 1.98    | Straightness Tolerance Met? YES                                                                          |  |
| Specimen Mass, g:                  | 548.44 |                                             |         |                                                                                                          |  |
| Bulk Density, lb/ft <sup>3</sup> : | 161    |                                             |         |                                                                                                          |  |
| Length to Diameter Ratio:          | 2.1    | Minimum Diameter Tolerance Met? YES         |         |                                                                                                          |  |
|                                    |        | Length to Diameter Ratio Tolerance Met? YES |         |                                                                                                          |  |

| END FLATNESS AND PARALLELISM (Procedure FP1)                         |          |          |          |          |         |         |         |         |         |         |         |         |         |         |
|----------------------------------------------------------------------|----------|----------|----------|----------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| END 1                                                                | -0.875   | -0.750   | -0.625   | -0.500   | -0.375  | -0.250  | -0.125  | 0.000   | 0.125   | 0.250   | 0.375   | 0.500   | 0.625   | 0.750   |
| Diameter 1, in                                                       | -0.00020 | -0.00030 | -0.00010 | 0.00000  | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| Diameter 2, in (rotated 90°)                                         | -0.00010 | -0.00010 | -0.00010 | 0.00000  | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00010 |
| Difference between max and min readings, in:                         |          |          |          |          |         |         |         |         |         |         |         |         |         |         |
| 0° = 0.00030 90° = 0.00020                                           |          |          |          |          |         |         |         |         |         |         |         |         |         |         |
| END 2                                                                | -0.875   | -0.750   | -0.625   | -0.500   | -0.375  | -0.250  | -0.125  | 0.000   | 0.125   | 0.250   | 0.375   | 0.500   | 0.625   | 0.750   |
| Diameter 1, in                                                       | -0.00010 | -0.00010 | -0.00010 | -0.00010 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 |
| Diameter 2, in (rotated 90°)                                         | 0.00010  | 0.00010  | 0.00010  | 0.00020  | 0.00030 | 0.00010 | 0.00000 | 0.00000 | 0.00000 | 0.00010 | 0.00020 | 0.00010 | 0.00000 | 0.00020 |
| Difference between max and min readings, in:                         |          |          |          |          |         |         |         |         |         |         |         |         |         |         |
| 0° = 0.0001 90° = 0.0003                                             |          |          |          |          |         |         |         |         |         |         |         |         |         |         |
| Maximum difference must be $< 0.0020$ in. Difference = $\pm 0.00015$ |          |          |          |          |         |         |         |         |         |         |         |         |         |         |
| Flatness Tolerance Met? YES                                          |          |          |          |          |         |         |         |         |         |         |         |         |         |         |



|                                               |         |
|-----------------------------------------------|---------|
| DIAMETER 1                                    |         |
| End 1:                                        |         |
| Slope of Best Fit Line                        | 0.00011 |
| Angle of Best Fit Line:                       | 0.00636 |
| End 2:                                        |         |
| Slope of Best Fit Line                        | 0.00006 |
| Angle of Best Fit Line:                       | 0.00344 |
| Maximum Angular Difference:                   | 0.00292 |
| Parallelism Tolerance Met? Spherically Seated | YES     |



|                                               |         |
|-----------------------------------------------|---------|
| DIAMETER 2                                    |         |
| End 1:                                        |         |
| Slope of Best Fit Line                        | 0.00007 |
| Angle of Best Fit Line:                       | 0.00401 |
| End 2:                                        |         |
| Slope of Best Fit Line                        | 0.00003 |
| Angle of Best Fit Line:                       | 0.00172 |
| Maximum Angular Difference:                   | 0.00229 |
| Parallelism Tolerance Met? Spherically Seated | YES     |

| PERPENDICULARITY (Procedure P1) |                                       |                |         |        |                                 | Maximum angle of departure must be $\leq 0.25^\circ$ |  |
|---------------------------------|---------------------------------------|----------------|---------|--------|---------------------------------|------------------------------------------------------|--|
| END 1                           | Difference, Maximum and Minimum (in.) | Diameter (in.) | Slope   | Angle° | Perpendicularity Tolerance Met? |                                                      |  |
| Diameter 1, in                  | 0.00030                               | 1.980          | 0.00015 | 0.009  | YES                             |                                                      |  |
| Diameter 2, in (rotated 90°)    | 0.00020                               | 1.980          | 0.00010 | 0.006  | YES                             | Perpendicularity Tolerance Met? YES                  |  |
| END 2                           |                                       |                |         |        |                                 |                                                      |  |
| Diameter 1, in                  | 0.00010                               | 1.980          | 0.00005 | 0.003  | YES                             |                                                      |  |
| Diameter 2, in (rotated 90°)    | 0.00030                               | 1.980          | 0.00015 | 0.009  | YES                             |                                                      |  |



|                   |                         |
|-------------------|-------------------------|
| Client:           | Nobis Engineering, Inc. |
| Project Name:     | Rt. 113 over Page Brook |
| Project Location: | Standish, ME            |
| GTX #:            | 307131                  |
| Test Date:        | 11/27/2017              |
| Tested By:        | rlc                     |
| Checked By:       | jsc                     |
| Boring ID:        | BB-SPB-101              |
| Sample ID:        | RC-3                    |
| Depth, ft:        | 46.7-51.7               |



After cutting and grinding



After break

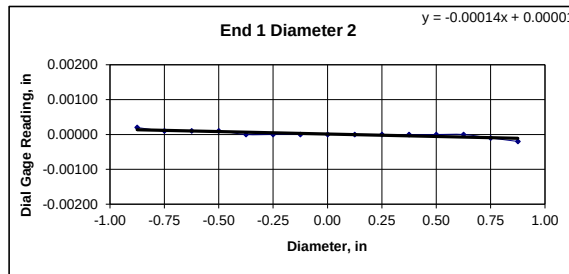
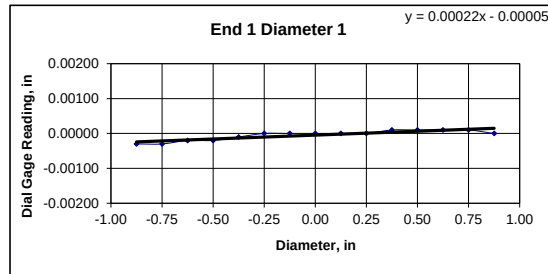


|                     |                         |             |            |
|---------------------|-------------------------|-------------|------------|
| Client:             | Nobis Engineering, Inc. | Test Date:  | 11/27/2017 |
| Project Name:       | Rt. 113 over Page Brook | Tested By:  | rlc        |
| Project Location:   | Standish, ME            | Checked By: | jsc        |
| GTX #:              | 307131                  |             |            |
| Boring ID:          | BB-SPB-102              |             |            |
| Sample ID:          | RC-2                    |             |            |
| Depth:              | 47.6-52.6 ft            |             |            |
| Visual Description: | See photographs         |             |            |

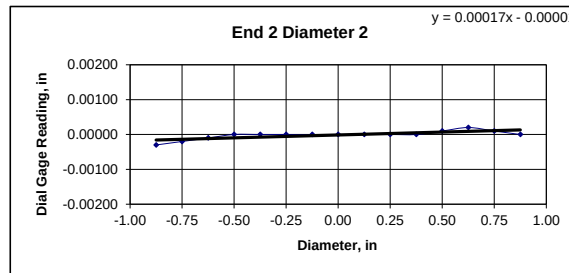
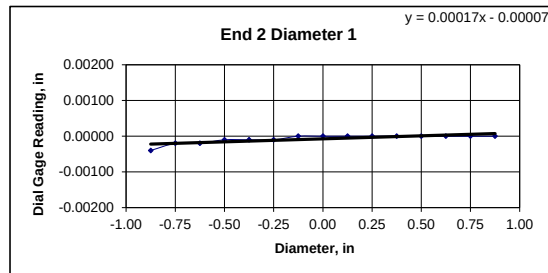
## UNIT WEIGHT DETERMINATION AND DIMENSIONAL AND SHAPE TOLERANCES OF ROCK CORE SPECIMENS BY ASTM D4543

| BULK DENSITY                       |        |                                             |         | DEVIATION FROM STRAIGHTNESS (Procedure S1)                                                               |  |
|------------------------------------|--------|---------------------------------------------|---------|----------------------------------------------------------------------------------------------------------|--|
|                                    | 1      | 2                                           | Average | Maximum gap between side of core and reference surface plate:<br>Is the maximum gap $\leq$ 0.02 in.? YES |  |
| Specimen Length, in:               | 4.20   | 4.20                                        | 4.20    | Maximum difference must be $< 0.020$ in.                                                                 |  |
| Specimen Diameter, in:             | 1.98   | 1.98                                        | 1.98    | Straightness Tolerance Met? YES                                                                          |  |
| Specimen Mass, g:                  | 554.65 |                                             |         |                                                                                                          |  |
| Bulk Density, lb/ft <sup>3</sup> : | 163    |                                             |         |                                                                                                          |  |
| Length to Diameter Ratio:          | 2.1    | Minimum Diameter Tolerance Met? YES         |         |                                                                                                          |  |
|                                    |        | Length to Diameter Ratio Tolerance Met? YES |         |                                                                                                          |  |

| END FLATNESS AND PARALLELISM (Procedure FP1)                         |          |          |          |          |          |          |         |         |         |         |         |         |         |          |
|----------------------------------------------------------------------|----------|----------|----------|----------|----------|----------|---------|---------|---------|---------|---------|---------|---------|----------|
| END 1                                                                | -0.875   | -0.750   | -0.625   | -0.500   | -0.375   | -0.250   | -0.125  | 0.000   | 0.125   | 0.250   | 0.375   | 0.500   | 0.625   | 0.750    |
| Diameter 1, in                                                       | -0.00030 | -0.00030 | -0.00020 | -0.00020 | -0.00010 | 0.00000  | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00010 | 0.00010 | 0.00010 | 0.00000  |
| Diameter 2, in (rotated 90°)                                         | 0.00020  | 0.00010  | 0.00010  | 0.00010  | 0.00000  | 0.00000  | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | -0.00020 |
| Difference between max and min readings, in:                         |          |          |          |          |          |          |         |         |         |         |         |         |         |          |
| 0° = 0.00040 90° = 0.00040                                           |          |          |          |          |          |          |         |         |         |         |         |         |         |          |
| END 2                                                                | -0.875   | -0.750   | -0.625   | -0.500   | -0.375   | -0.250   | -0.125  | 0.000   | 0.125   | 0.250   | 0.375   | 0.500   | 0.625   | 0.750    |
| Diameter 1, in                                                       | -0.00040 | -0.00020 | -0.00020 | -0.00010 | -0.00010 | -0.00010 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000  |
| Diameter 2, in (rotated 90°)                                         | -0.00030 | -0.00020 | -0.00010 | 0.00000  | 0.00000  | 0.00000  | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00000 | 0.00010 | 0.00010 | 0.00000  |
| Difference between max and min readings, in:                         |          |          |          |          |          |          |         |         |         |         |         |         |         |          |
| 0° = 0.0004 90° = 0.0005                                             |          |          |          |          |          |          |         |         |         |         |         |         |         |          |
| Maximum difference must be $< 0.0020$ in. Difference = $\pm 0.00025$ |          |          |          |          |          |          |         |         |         |         |         |         |         |          |
| Flatness Tolerance Met? YES                                          |          |          |          |          |          |          |         |         |         |         |         |         |         |          |



|                                               |         |
|-----------------------------------------------|---------|
| DIAMETER 1                                    |         |
| End 1:                                        |         |
| Slope of Best Fit Line                        | 0.00022 |
| Angle of Best Fit Line:                       | 0.01261 |
| End 2:                                        |         |
| Slope of Best Fit Line                        | 0.00017 |
| Angle of Best Fit Line:                       | 0.00974 |
| Maximum Angular Difference:                   | 0.00286 |
| Parallelism Tolerance Met? Spherically Seated | YES     |



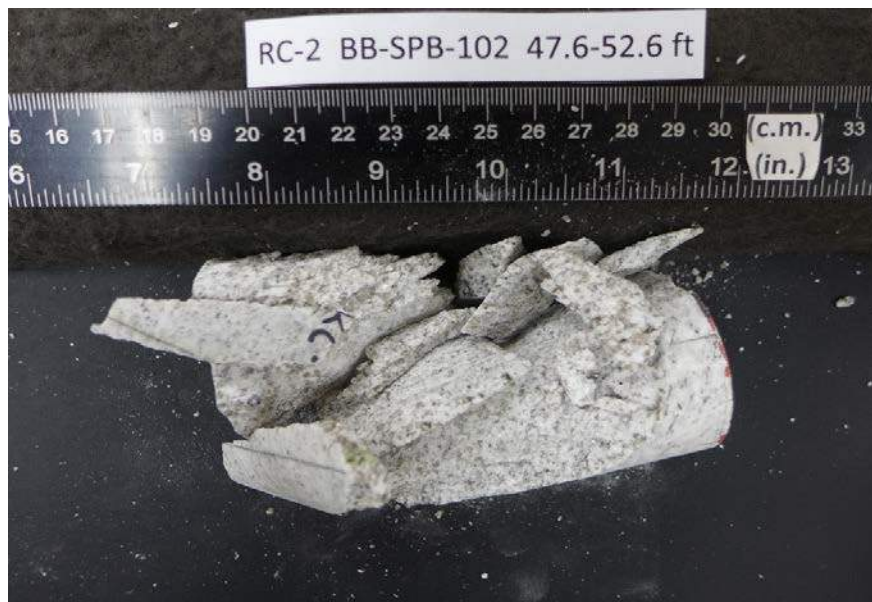
|                                               |         |
|-----------------------------------------------|---------|
| DIAMETER 2                                    |         |
| End 1:                                        |         |
| Slope of Best Fit Line                        | 0.00014 |
| Angle of Best Fit Line:                       | 0.00802 |
| End 2:                                        |         |
| Slope of Best Fit Line                        | 0.00017 |
| Angle of Best Fit Line:                       | 0.00974 |
| Maximum Angular Difference:                   | 0.00172 |
| Parallelism Tolerance Met? Spherically Seated | YES     |

| PERPENDICULARITY (Procedure P1) (Calculated from End Flatness and Parallelism measurements above) |                                       |                |         |        |                                 | Maximum angle of departure must be $\leq 0.25^\circ$ |     |
|---------------------------------------------------------------------------------------------------|---------------------------------------|----------------|---------|--------|---------------------------------|------------------------------------------------------|-----|
| END 1                                                                                             | Difference, Maximum and Minimum (in.) | Diameter (in.) | Slope   | Angle° | Perpendicularity Tolerance Met? |                                                      |     |
| Diameter 1, in                                                                                    | 0.00040                               | 1.980          | 0.00020 | 0.012  | YES                             |                                                      |     |
| Diameter 2, in (rotated 90°)                                                                      | 0.00040                               | 1.980          | 0.00020 | 0.012  | YES                             | Perpendicularity Tolerance Met?                      | YES |
| END 2                                                                                             |                                       |                |         |        |                                 |                                                      |     |
| Diameter 1, in                                                                                    | 0.00040                               | 1.980          | 0.00020 | 0.012  | YES                             |                                                      |     |
| Diameter 2, in (rotated 90°)                                                                      | 0.00050                               | 1.980          | 0.00025 | 0.014  | YES                             |                                                      |     |

|                   |                         |
|-------------------|-------------------------|
| Client:           | Nobis Engineering, Inc. |
| Project Name:     | Rt. 113 over Page Brook |
| Project Location: | Standish, ME            |
| GTX #:            | 307131                  |
| Test Date:        | 11/27/2017              |
| Tested By:        | rlc                     |
| Checked By:       | jsc                     |
| Boring ID:        | BB-SPB-102              |
| Sample ID:        | RC-2                    |
| Depth, ft:        | 47.6-52.6               |



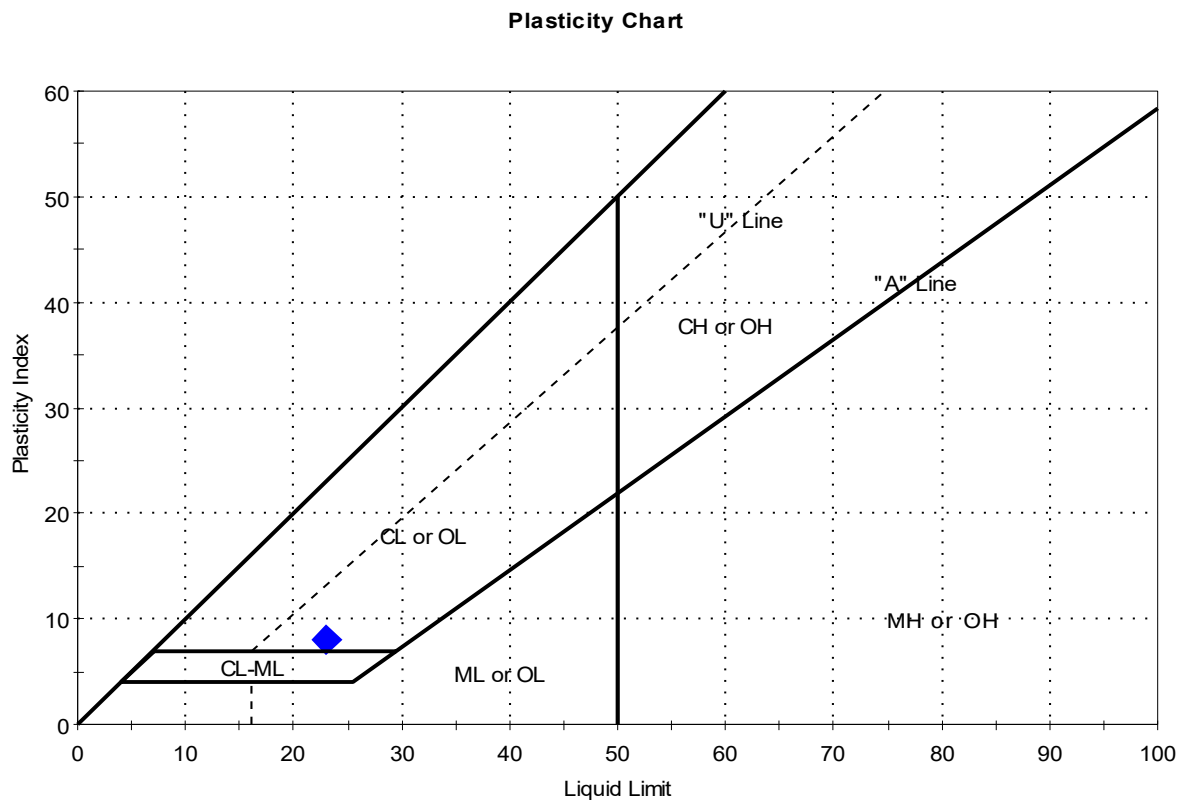
After cutting and grinding



After break

|                     |                                    |              |          |             |            |
|---------------------|------------------------------------|--------------|----------|-------------|------------|
| Client:             | Nobis Engineering, Inc.            |              |          | Project No: | GTX-308727 |
| Project:            | Watchic Bridge (#2914)             |              |          |             |            |
| Location:           | Standish, ME                       |              |          |             |            |
| Boring ID:          | BB-SPB-101                         | Sample Type: | jar      | Tested By:  | cam        |
| Sample ID:          | S-10                               | Test Date:   | 09/10/18 | Checked By: | emm        |
| Depth :             | 35-37                              | Test Id:     | 470999   |             |            |
| Test Comment:       | ---                                |              |          |             |            |
| Visual Description: | Moist, light gray clay with gravel |              |          |             |            |
| Sample Comment:     | ---                                |              |          |             |            |

## Atterberg Limits - ASTM D4318



| Symbol | Sample ID | Boring   | Depth | Natural Moisture Content, % | Liquid Limit | Plastic Limit | Plasticity Index | Liquidity Index | Soil Classification |
|--------|-----------|----------|-------|-----------------------------|--------------|---------------|------------------|-----------------|---------------------|
| ◆      | S-10      | B-SPB-10 | 35-37 | 13                          | 23           | 15            | 8                | -0.2            |                     |

Sample Prepared using the WET method

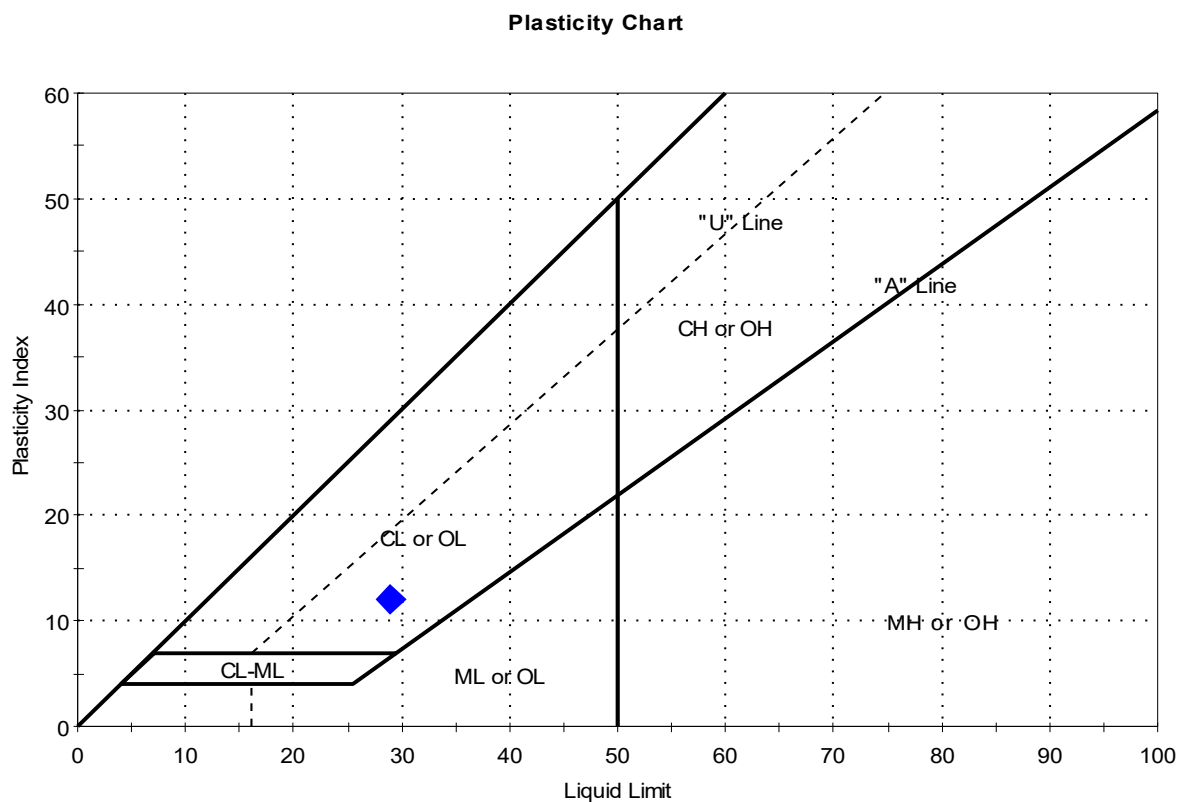
Dry Strength: VERY HIGH

Dilatancy: SLOW

Toughness: LOW

|                     |                         |              |            |
|---------------------|-------------------------|--------------|------------|
| Client:             | Nobis Engineering, Inc. |              |            |
| Project:            | Watchic Bridge (#2914)  |              |            |
| Location:           | Standish, ME            | Project No:  | GTX-308727 |
| Boring ID:          | BB-SPB-102              | Sample Type: | jar        |
| Sample ID:          | S-10                    | Test Date:   | 09/10/18   |
| Depth :             | 35-37                   | Test Id:     | 470998     |
| Test Comment:       | ---                     |              |            |
| Visual Description: | Moist, gray clay        |              |            |
| Sample Comment:     | ---                     |              |            |

## Atterberg Limits - ASTM D4318



| Symbol | Sample ID | Boring   | Depth | Natural Moisture Content, % | Liquid Limit | Plastic Limit | Plasticity Index | Liquidity Index | Soil Classification |
|--------|-----------|----------|-------|-----------------------------|--------------|---------------|------------------|-----------------|---------------------|
| ◆      | S-10      | B-SPB-10 | 35-37 | 17                          | 29           | 17            | 12               | 0               |                     |

Sample Prepared using the WET method

Dry Strength: VERY HIGH

Dilatancy: SLOW

Toughness: LOW

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## **APPENDIX F - Calculations**

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## **APPENDIX F.1 – Preliminary Loads Provided by VHB**

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## SECTION 2 - FACTORED LOADS PER AASHTO ARTICLE 3.4

**Bottom Slab Load (Uniformly Distributed)**

|                                        | Reaction 1 |  | Reaction 2 |  | SERVICE-I   |  | STRENGTH-I  |
|----------------------------------------|------------|--|------------|--|-------------|--|-------------|
| Component self-weight:                 | 21.978 kip |  | 21.978 kip |  | 382.3 PSF   |  | 477.8 PSF   |
| Vertical earth pressure:               | 15.288 kip |  | 15.288 kip |  | 265.9 PSF   |  | 345.7 PSF   |
| Lateral earth pressure:                | 0.000 kip  |  | 0.000 kip  |  | 0.0 PSF     |  | 0.0 PSF     |
| Exterior lateral hydrostatic pressure: | 0.000 kip  |  | 0.000 kip  |  | 0.0 PSF     |  | 0.0 PSF     |
| Other loads:                           | 0.000 kip  |  | 0.000 kip  |  | 0.0 PSF     |  | 0.0 PSF     |
| Interior lateral hydrostatic pressure: | 21.526 kip |  | 21.526 kip |  | 374.4 PSF   |  | 374.4 PSF   |
| Live load surcharge:                   | 0.000 kip  |  | 0.000 kip  |  | 0.0 PSF     |  | 0.0 PSF     |
| 125% HL-93 WHEEL LOAD:                 | 30.471 kip |  | 19.429 kip |  | 434.0 PSF   |  | 1,139.2 PSF |
| HL-93 TANDEM AXLE LOAD:                | 14.177 kip |  | 17.010 kip |  | 271.2 PSF   |  | 569.6 PSF   |
| MDOT TRI-AXLE LOAD:                    | 20.386 kip |  | 26.957 kip |  | 411.7 PSF   |  | 864.6 PSF   |
| Other Live Load 4:                     | 0.000 kip  |  | 0.000 kip  |  | 0.0 PSF     |  | 0.0 PSF     |
| Other Live Load 5:                     | 0.000 kip  |  | 0.000 kip  |  | 0.0 PSF     |  | 0.0 PSF     |
| Other Live Load 6:                     | 0.000 kip  |  | 0.000 kip  |  | 0.0 PSF     |  | 0.0 PSF     |
| MAX SOIL BEARING PRESSURES =           |            |  |            |  | 1,456.5 PSF |  | 2,337.1 PSF |

EQUIVALENT WIDTH = 62.7 in = 5.227 ft

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## **APPENDIX F.2 – Bearing Resistance and Settlement**

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### Bearing Resistance Calculations for Proposed Precast Concrete Culvert.

**Objective:** Evaluate bearing resistance of proposed culvert supported by compacted granular fill overlying natural granular soil.

**References:** 1) AASHTO LRFD Bridge Design Specifications: 2017 Edition  
2) Boring BB-SPB-101 and -102 performed by Nobis in November 2017.  
3) Draft Working Plan Set dated 8/23/18 and provided by VHB.

### **Solution:**

#### Bearing Soil Properties/Subsurface Information

|                                                 |            |         |
|-------------------------------------------------|------------|---------|
| Unit Weight of Bearing Soil ( $\gamma$ ):       | 125 pcf    | Assumed |
| Unit Weight of Soil Above Footing ( $\gamma$ ): | 125 pcf    | Assumed |
| Cohesion of Bearing Soil ( $c$ ):               | 0 psf      | Assumed |
| Friction Angle of Bearing Soil ( $\phi'$ ):     | 33 degrees | Assumed |

Soil Description: Overexcavate very soft to soft Peaty Organic Silt in the zone of influence of the footing and replace with compacted granular fill. Underlying soils consist of loose to medium dense sand.

|                                |                   |                 |
|--------------------------------|-------------------|-----------------|
| Footing Elevation:             | 271 ft, NAVD-88   | Reference No. 3 |
| Ground Surface (GS) Elevation: | 276.3 ft, NAVD-88 | Assumed         |
| Groundwater Elevation:         | 275.5 ft, NAVD-88 | Reference No. 2 |

#### Footing Geometry

|                                  |         |                         |
|----------------------------------|---------|-------------------------|
| Minimum Footing Depth ( $D_f$ ): | 5.3 ft  | Approximate frost depth |
| Groundwater Depth Below GS:      | 0.8 ft  | Reference No. 2         |
| Width ( $B$ ):                   | 23 ft   | Reference No. 3         |
| Length ( $L$ ):                  | 64.5 ft | Reference No. 3         |
| Width Eccentricity ( $e_B$ ):    | 4.0 ft  | Assumed                 |
| Length Eccentricity ( $e_L$ ):   | 0 ft    | Assumed                 |
| Effective Width ( $B'$ ):        | 15.0 ft |                         |
| Effective Length ( $L'$ ):       | 64.5 ft |                         |

**Notes:** 1) See the geotechnical design report for a discussion of the anticipated service load settlements.

### Example Bearing Resistance Calculation

Factored Bearing Resistance:  $q_R = q_n * \phi_b$

Resistance Factor (  $\phi_b$  ) =

0.45

Eq. 10.6.3.1.1-1

Tb. 10.5.5.2.2-1

Nominal Resistance (  $q_n$  ) =

$$q_n = c * N_{cm} + \gamma * D_f * N_m * C_{wq} + 0.5 * \gamma * B' * N_{ym} * C_{wy}$$

Eq. 10.6.3.1.2a-1

$$N_{qm} = N_q * s_q * d_q * i_q$$

Eq. 10.6.3.1.2a-3

Bearing Capacity Factor (  $N_q$  )

26.1

Tb. 10.6.3.1.2a-1

Shape Correction Factor (  $s_q$  )

1.15

Tb. 10.6.3.1.2a-3

Load Inclination Factor (  $i_q$  )

1.00

Assumed

Depth Correction Factor (  $d_q$  )

1.0

Tb. 10.6.3.1.2a-4

$N_{qm} =$

30.04

$$N_{cm} = N_c * s_c * i_c$$

Eq. 10.6.3.1.2a-2

Bearing Capacity Factor (  $N_c$  )

38.6

Tb. 10.6.3.1.2a-1

Shape Correction Factor (  $s_c$  )

1.16

Tb. 10.6.3.1.2a-3

Load Inclination Factor (  $i_c$  )

1.00

Assumed

$N_{cm} =$

44.67

$$N_{ym} = N_y * s_y * i_y$$

Eq. 10.6.3.1.2a-4

Bearing Capacity Factor (  $N_y$  )

35.2

Tb. 10.6.3.1.2a-1

Shape Correction Factor (  $s_y$  )

0.91

Tb. 10.6.3.1.2a-3

Load Inclination Factor (  $i_y$  )

1.00

Assumed

$N_{ym} =$

31.93

### Groundwater Coefficients

Tb. 10.6.3.1.2a-2

(  $C_{wq}$  )

0.58

(  $C_{wy}$  )

0.50

$q_n =$

26.4 ksf

$q_R =$

11.9 ksf (SERVICE LOAD CONTROLS - See Report)

$$N_1 = C_N N \quad (10.4.6.2.4-1)$$

$N_1$  = *SPT* blow count corrected for overburden pressure,  $\sigma'_v$  (blows/ft)

$$C_N = [0.77 \log_{10}(40/\sigma'_v)], \text{ and } C_N < 2.0$$

$\sigma'_v$  = vertical effective stress (ksf)

$N$  = uncorrected *SPT* blow count (blows/ft)

**Table 10.6.2.4.2-1—Elastic Shape and Rigidity Factors, EPRI (1983)**

| $L/B$    | Flexible, $\beta_z$<br>(average) | $\beta_z$<br>Rigid |
|----------|----------------------------------|--------------------|
| Circular | 1.04                             | 1.13               |
| 1        | 1.06                             | 1.08               |
| 2        | 1.09                             | 1.10               |
| 3        | 1.13                             | 1.15               |
| 5        | 1.22                             | 1.24               |
| 10       | 1.41                             | 1.41               |

**Table 10.6.3.1.2a-1—Bearing Capacity Factors  $N_c$  (Prandtl, 1921),  $N_q$  (Reissner, 1924), and  $N_\gamma$  (Vesic, 1975)**

| $\phi_f$ | $N_c$ | $N_q$ | $N_\gamma$ | $\phi_f$ | $N_c$ | $N_q$ | $N_\gamma$ |
|----------|-------|-------|------------|----------|-------|-------|------------|
| 0        | 5.14  | 1.0   | 0.0        | 23       | 18.1  | 8.7   | 8.2        |
| 1        | 5.4   | 1.1   | 0.1        | 24       | 19.3  | 9.6   | 9.4        |
| 2        | 5.6   | 1.2   | 0.2        | 25       | 20.7  | 10.7  | 10.9       |
| 3        | 5.9   | 1.3   | 0.2        | 26       | 22.3  | 11.9  | 12.5       |
| 4        | 6.2   | 1.4   | 0.3        | 27       | 23.9  | 13.2  | 14.5       |
| 5        | 6.5   | 1.6   | 0.5        | 28       | 25.8  | 14.7  | 16.7       |
| 6        | 6.8   | 1.7   | 0.6        | 29       | 27.9  | 16.4  | 19.3       |
| 7        | 7.2   | 1.9   | 0.7        | 30       | 30.1  | 18.4  | 22.4       |
| 8        | 7.5   | 2.1   | 0.9        | 31       | 32.7  | 20.6  | 26.0       |
| 9        | 7.9   | 2.3   | 1.0        | 32       | 35.5  | 23.2  | 30.2       |
| 10       | 8.4   | 2.5   | 1.2        | 33       | 38.6  | 26.1  | 35.2       |
| 11       | 8.8   | 2.7   | 1.4        | 34       | 42.2  | 29.4  | 41.1       |
| 12       | 9.3   | 3.0   | 1.7        | 35       | 46.1  | 33.3  | 48.0       |
| 13       | 9.8   | 3.3   | 2.0        | 36       | 50.6  | 37.8  | 56.3       |
| 14       | 10.4  | 3.6   | 2.3        | 37       | 55.6  | 42.9  | 66.2       |
| 15       | 11.0  | 3.9   | 2.7        | 38       | 61.4  | 48.9  | 78.0       |
| 16       | 11.6  | 4.3   | 3.1        | 39       | 67.9  | 56.0  | 92.3       |
| 17       | 12.3  | 4.8   | 3.5        | 40       | 75.3  | 64.2  | 109.4      |
| 18       | 13.1  | 5.3   | 4.1        | 41       | 83.9  | 73.9  | 130.2      |
| 19       | 13.9  | 5.8   | 4.7        | 42       | 93.7  | 85.4  | 155.6      |
| 20       | 14.8  | 6.4   | 5.4        | 43       | 105.1 | 99.0  | 186.5      |
| 21       | 15.8  | 7.1   | 6.2        | 44       | 118.4 | 115.3 | 224.6      |
| 22       | 16.9  | 7.8   | 7.1        | 45       | 133.9 | 134.9 | 271.8      |

**Table 10.6.3.1.2a-3—Shape Correction Factors  $s_c$ ,  $s_p$ ,  $s_q$**

| Factor                           | Friction Angle | Cohesion Term ( $s_c$ )                                         | Unit Weight Term ( $s_\gamma$ )      | Surcharge Term ( $s_q$ )                     |
|----------------------------------|----------------|-----------------------------------------------------------------|--------------------------------------|----------------------------------------------|
| Shape Factors<br>$s_c, s_p, s_q$ | $\phi_f = 0$   | $1 + \left( \frac{B}{5L} \right)$                               | 1.0                                  | 1.0                                          |
|                                  | $\phi_f > 0$   | $1 + \left( \frac{B}{L} \right) \left( \frac{N_q}{N_c} \right)$ | $1 - 0.4 \left( \frac{B}{L} \right)$ | $1 + \left( \frac{B}{L} \tan \phi_f \right)$ |

**Table 10.6.3.1.2a-4—Depth Correction Factor  $d_q$**

| Friction Angle, $\phi_f$<br>(degrees) | $D_f/B$ | $d_q$ |
|---------------------------------------|---------|-------|
| 32                                    | 1       | 1.20  |
|                                       | 2       | 1.30  |
|                                       | 4       | 1.35  |
|                                       | 8       | 1.40  |
| 37                                    | 1       | 1.20  |
|                                       | 2       | 1.25  |
|                                       | 4       | 1.30  |
|                                       | 8       | 1.35  |
| 42                                    | 1       | 1.15  |
|                                       | 2       | 1.20  |
|                                       | 4       | 1.25  |
|                                       | 8       | 1.30  |

**Table C10.4.6.3-1—Elastic Constants of Various Soils (modified after U.S. Department of the Navy, 1982; Bowles, 1988)**

| Soil Type                                                         | Typical Range<br>of Young's<br>Modulus<br>Values, $E_s$<br>(ksi) | Poisson's<br>Ratio, $\nu$ (dim) |
|-------------------------------------------------------------------|------------------------------------------------------------------|---------------------------------|
| Clay:<br>Soft sensitive<br>Medium stiff<br>to stiff<br>Very stiff | <br>0.347–2.08<br>2.08–6.94<br>6.94–13.89                        | <br>0.4–0.5<br>(undrained)      |
| Loess                                                             | 2.08–8.33                                                        | 0.1–0.3                         |
| Silt                                                              | 0.278–2.78                                                       | 0.3–0.35                        |
| Fine Sand:<br>Loose<br>Medium dense<br>Dense                      | <br>1.11–1.67<br>1.67–2.78<br>2.78–4.17                          | <br>0.25                        |
| Sand:<br>Loose<br>Medium dense<br>Dense                           | <br>1.39–4.17<br>4.17–6.94<br>6.94–11.11                         | <br>0.20–0.36<br>0.30–0.40      |
| Gravel:<br>Loose<br>Medium dense<br>Dense                         | <br>4.17–11.11<br>11.11–13.89<br>13.89–27.78                     | <br>0.20–0.35<br>0.30–0.40      |
| Estimating $E_s$ from $SPT\ N$ Value                              |                                                                  |                                 |
| Soil Type                                                         | $E_s$ (ksi)                                                      |                                 |
| Silts, sandy silts, slightly cohesive mixtures                    | 0.056 $N_{160}$                                                  |                                 |
| Clean fine to medium sands and slightly silty sands               | 0.097 $N_{160}$                                                  |                                 |
| Coarse sands and sands with little gravel                         | 0.139 $N_{160}$                                                  |                                 |
| Sandy gravel and gravels                                          | 0.167 $N_{160}$                                                  |                                 |
| Estimating $E_s$ from $q_c$ (static cone resistance)              |                                                                  |                                 |
| Sandy soils                                                       | 0.028 $q_c$                                                      |                                 |

For  $\phi_f = 0$ :

$$i_c = 1 - (mH/cBLN_c) \quad (10.6.3.1.2a-5)$$

For  $\phi_f > 0$ :

$$i_c = i_q - [(1 - i_q)/(N_q - 1)] \quad (10.6.3.1.2a-6)$$

in which:

$$i_q = \left[ 1 - \frac{H}{(V + cBL \cot \phi_f)} \right]^n \quad (10.6.3.1.2a-7)$$

$$i_\gamma = \left[ 1 - \frac{H}{V + cBL \cot \phi_f} \right]^{(n+1)} \quad (10.6.3.1.2a-8)$$

$c$  = cohesion, taken as undrained shear strength (ksf)

$N_c$  = cohesion term (undrained loading) bearing capacity factor as specified in Table 10.6.3.1.2a-1 (dim)

$N_q$  = surcharge (embedment) term (drained or undrained loading) bearing capacity factor as specified in Table 10.6.3.1.2a-1 (dim)

$N_\gamma$  = unit weight (footing width) term (drained loading) bearing capacity factor as specified in Table 10.6.3.1.2a-1 (dim)

$\gamma$  = total (moist) unit weight of soil above or below the bearing depth of the footing (kcf)

$D_f$  = footing embedment depth (ft)

$B$  = footing width (ft)

$C_{wq}, C_{w\gamma}$  = correction factors to account for the location of the groundwater table as specified in Table 10.6.3.1.2a-2 (dim)

$s_{cs}, s_{\gamma p}, s_{\gamma q}$  = footing shape correction factors as specified in Table 10.6.3.1.2a-3 (dim)

$d_q$  = correction factor to account for the shearing resistance along the failure surface passing through cohesionless material above the bearing elevation as specified in Table 10.6.3.1.2a-4 (dim)

$i_c, i_p, i_q$  = load inclination factors determined from Eqs. 10.6.3.1.2a-5 or 10.6.3.1.2a-6, and 10.6.3.1.2a-7 and 10.6.3.1.2a-8 (dim)

$$q_n = cN_{cm} + \gamma D_f N_{qm} C_{\gamma q} + 0.5\gamma B N_{\gamma m} C_{\gamma \gamma} \quad (10.6.3.1.2a-1)$$

$$N_{cm} = N_c s_c i_c \quad (10.6.3.1.2a-2)$$

$$N_{qm} = N_q s_q d_q i_q \quad (10.6.3.1.2a-3)$$

$$N_{\gamma m} = N_{\gamma} s_{\gamma} i_{\gamma} \quad (10.6.3.1.2a-4)$$

$$S_e = \frac{\left[ q_o (1 - \nu^2) \sqrt{A'} \right]}{144 E_s \beta_z} \quad (10.6.2.4.2-1)$$

where:

$q_o$  = applied vertical stress (ksf)

$A'$  = effective area of footing (ft<sup>2</sup>)

$E_s$  = Young's modulus of soil taken as specified in Article 10.4.6.3 if direct measurements of  $E_s$  are not available from the results of in situ or laboratory tests (ksi)

$\beta_z$  = shape factor taken as specified in Table 10.6.2.4.2-1 (dim)

$\nu$  = Poisson's Ratio, taken as specified in Article 10.4.6.3 if direct measurements of  $\nu$  are not available from the results of in situ or laboratory tests (dim)

**Table 10.5.5.2.2-1—Resistance Factors for Geotechnical Resistance of Shallow Foundations at the Strength Limit State**

| Method/Soil/Condition |             |                                                                      | Resistance Factor |
|-----------------------|-------------|----------------------------------------------------------------------|-------------------|
| Bearing Resistance    | $\phi_b$    | Theoretical method (Munfakh et al., 2001), in clay                   | 0.50              |
|                       |             | Theoretical method (Munfakh et al., 2001), in sand, using <i>CPT</i> | 0.50              |
|                       |             | Theoretical method (Munfakh et al., 2001), in sand, using <i>SPT</i> | 0.45              |
|                       |             | Semi-empirical methods (Meyerhof, 1957), all soils                   | 0.45              |
|                       |             | Footings on rock                                                     | 0.45              |
|                       |             | Plate Load Test                                                      | 0.55              |
| Sliding               | $\phi_s$    | Precast concrete placed on sand                                      | 0.90              |
|                       |             | Cast-in-Place Concrete on sand                                       | 0.80              |
|                       |             | Cast-in-Place or precast Concrete on Clay                            | 0.85              |
|                       |             | Soil on soil                                                         | 0.90              |
|                       | $\phi_{ep}$ | Passive earth pressure component of sliding resistance               | 0.50              |

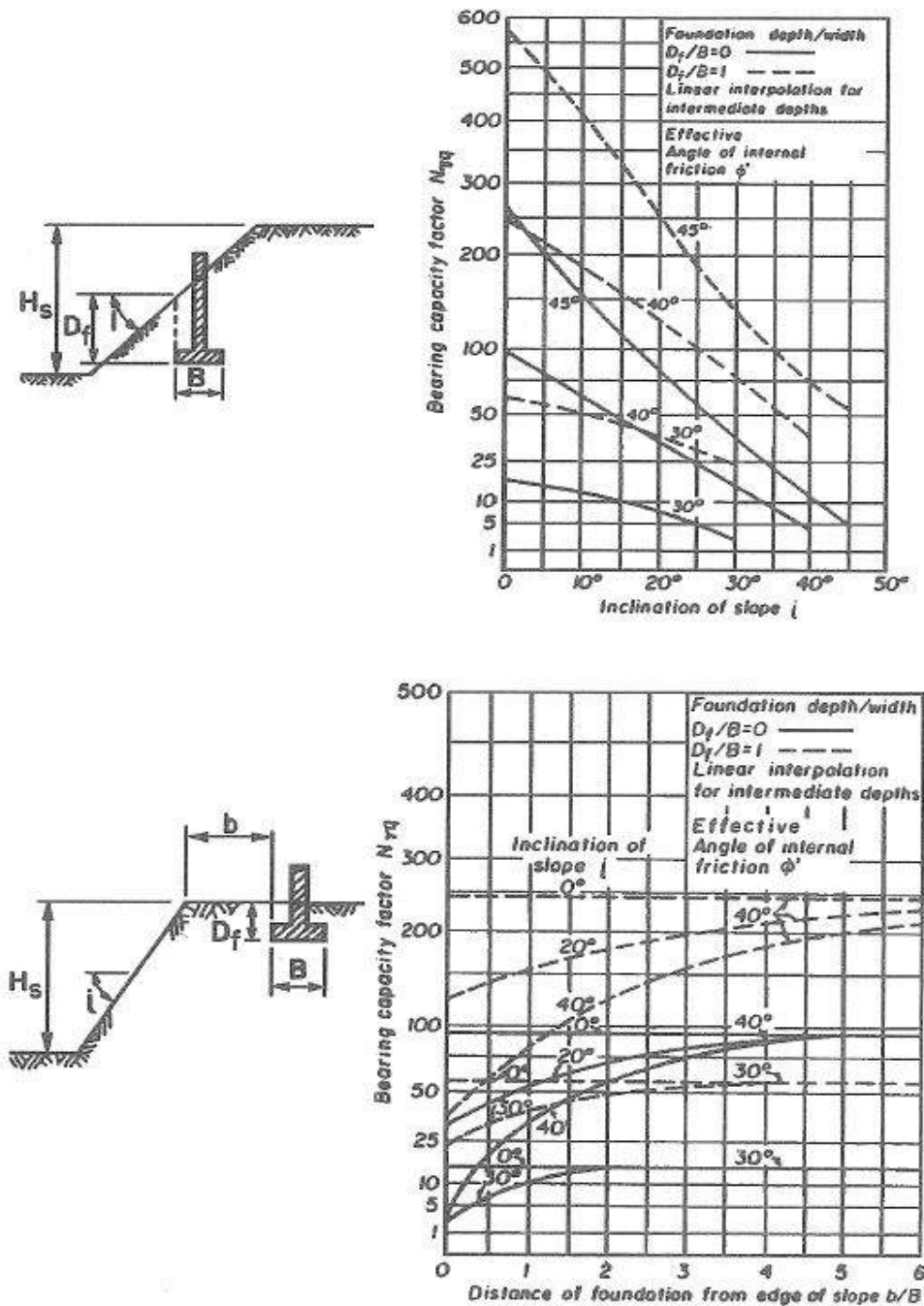


Figure 10.6.3.1.2c-2—Modified Bearing Capacity Factors for Footing in Cohesionless Soils and on or adjacent to Sloping Ground after Meyerhof (1957)

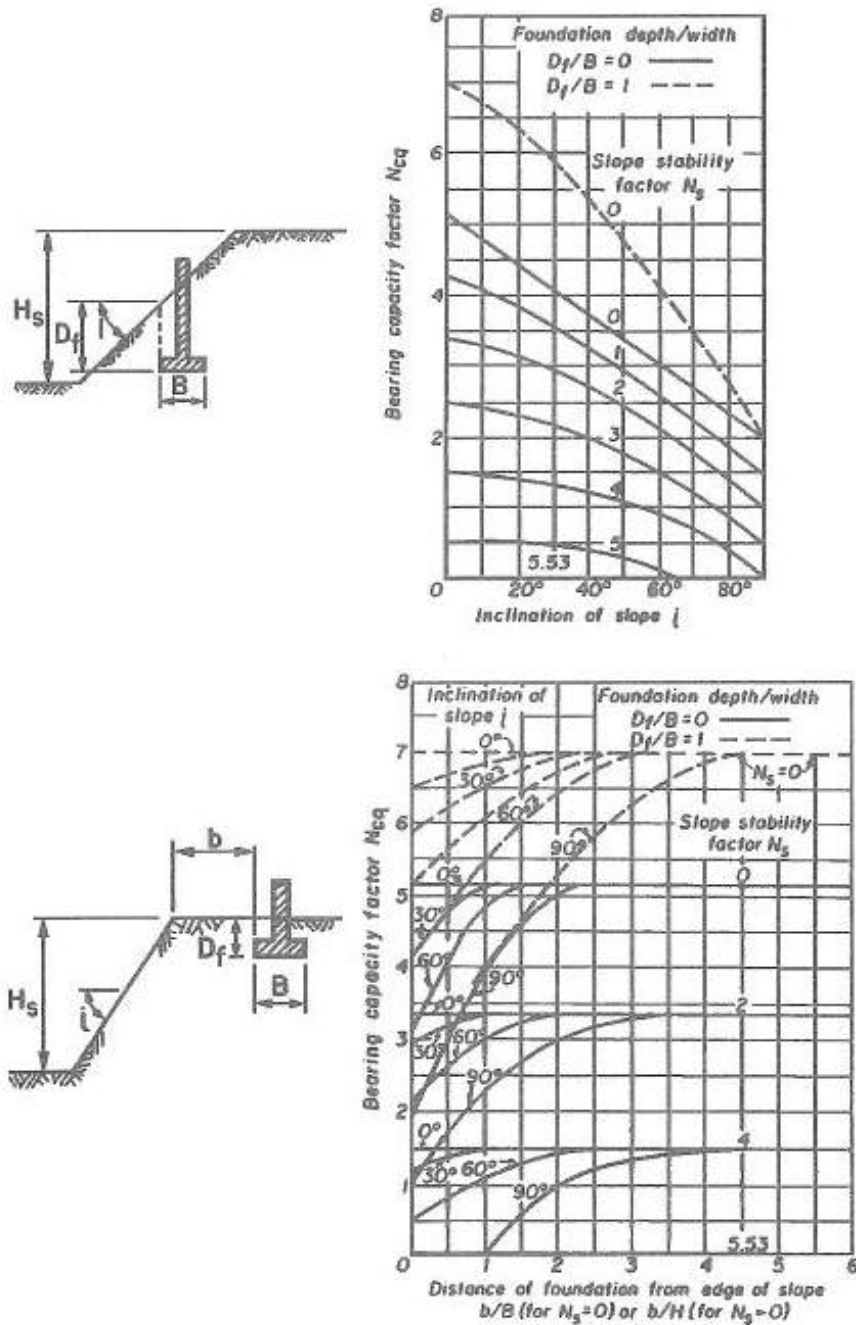


Figure 10.6.3.1.2c-1—Modified Bearing Capacity Factors for Footing in Cohesive Soils and on or adjacent to Sloping Ground after Meyerhof (1957)

## Preliminary Settlement Calculation

**Objective:** Estimate Settlement (primary, secondary, elastic) induced by proposed precast concrete culvert.

**References:**

- 1) An Introduction to Geotechnical Engineering, Holtz & Kovacs
- 2) Borings logs BB-SPB-101 and BB-SPB-102
- 3) Working plan set and preliminary loads provided by VHB on August 23 and August 28, 2018, respectively.
- 4) The Engineering Aspects of the Presumpscot Formation, David Andrews.

**Assumptions:** 1) The unsuitable organic silt stratum will be removed from the zone of influence of the proposed culvert and will be replaced with Granular Borrow.

**Table 1: Material Properties used for Settlement Analysis**

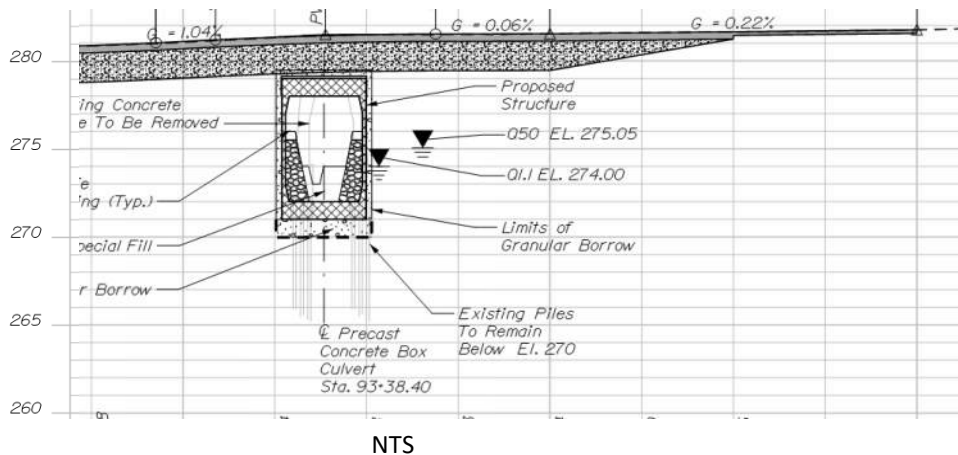
| Stratum         | Unit Weight | Young's Modulus | OCR | Compression Ratio | Recompression Ratio | Secondary Compression Index | Coefficient of Consolidation, $C_v$ |
|-----------------|-------------|-----------------|-----|-------------------|---------------------|-----------------------------|-------------------------------------|
|                 | (pcf)       | (ksf)           |     | CR, strain        | RR, strain          | Calpha, strain              | (ft <sup>2</sup> /year)             |
| Fill            | 130         | 1800            | -   | -                 | -                   | -                           | -                                   |
| Sand and Gravel | 130         | 1500            | -   | -                 | -                   | -                           | -                                   |
| Organic Silt    | 95          | -               | 1   | 1                 | 0.1                 | 0.022                       | 64.5                                |
| Sand            | 125         | 300             | -   | -                 | -                   | -                           | -                                   |
| Clayey Silt     | 115         | -               | 3   | 0.2               | 0.02                | 0.005                       | 36.5                                |
| Boulders        | 135         | 3500            | -   | -                 | -                   | -                           | -                                   |

**Notes:**

- 1) Additional details regarding the material properties are included below.
- 2) The Organic Silt properties were not used in the settlement model due to overexcavation.

**Solution:** Evaluate settlement at the South Approach Embankment (BB-SPB-101)

## Proposed Culvert (Reference 3)



**Generalized Subsurface Profile**

BB-SPB-101 - South

\_\_\_\_\_ 281

Fill

\_\_\_\_\_ 276

Sand & Gravel

<- Groundwater at El. 275.5

\_\_\_\_\_ 271

Organic Silt

<- Proposed Bottom of Footing at El. 270

<- Overexcavate unsuitable organic deposits and replace with Granular Borrow

\_\_\_\_\_ 266

Sand

\_\_\_\_\_ 260

Clayey Silt

\_\_\_\_\_ 239

Boulders

## Loads

Based on Reference 3, the Service-1 load is 1,456.5 pounds per square foot (psf). An additional 120 psf was added to account for replacing organic silt with Granular Borrow.

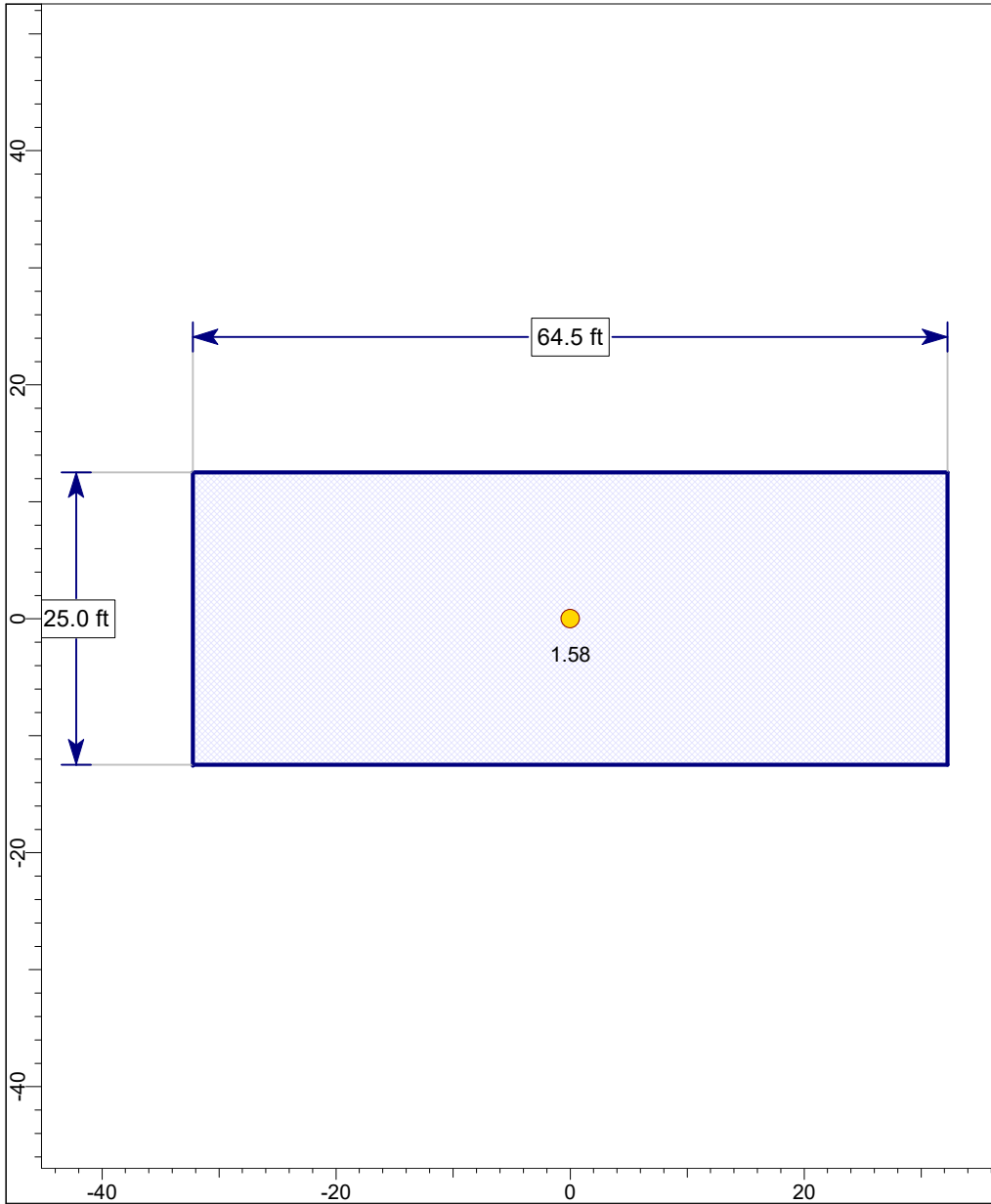
**Footing Load = 1576.5 psf**

## Material Properties

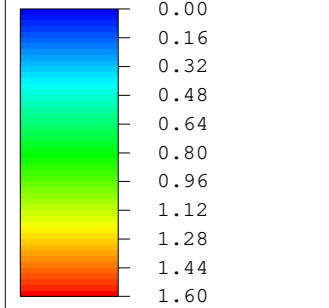
|                          |                                                                                                                                                                                                                                                                                                  |
|--------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Fill</b>              | Medium dense to dense sand with little to some fine gravel, trace to little silt.                                                                                                                                                                                                                |
| Unit weight =            | 130 pcf (est.)                                                                                                                                                                                                                                                                                   |
| Es =                     | 1,800 ksf (est.)                                                                                                                                                                                                                                                                                 |
| <b>Sand &amp; Gravel</b> | Medium dense gravel, little fine to coarse sand, trace silt.                                                                                                                                                                                                                                     |
| Unit weight =            | 130 pcf (est.)                                                                                                                                                                                                                                                                                   |
| Es =                     | 1,500 ksf (est.)                                                                                                                                                                                                                                                                                 |
| <b>Organic Silt</b>      | Not used in evaluation                                                                                                                                                                                                                                                                           |
| <b>Granular Borrow</b>   | Fill placed in lifts and compacted.                                                                                                                                                                                                                                                              |
| Unit weight =            | 125 pcf (assumed)                                                                                                                                                                                                                                                                                |
| Es =                     | 1,500 ksf (assumed)                                                                                                                                                                                                                                                                              |
| <b>Clayey Silt</b>       | Medium stiff to hard clayey silt with N60 values ranging from 36 to 74. Based on Atterberg limits results, liquid limit ranges between 23 and 29.                                                                                                                                                |
|                          | The clayey silt has a relatively low plasticity, similar to Presumpscot Formation clay. Therefore, Reference 4 was used to estimate material properties. Due to the high blow counts (i.e. N60 > 35), the lower ranges were used. Additionally, we assumed that the deposit is overconsolidated. |
| Unit weight =            | 115 pcf (est.)                                                                                                                                                                                                                                                                                   |
| CR =                     | 0.2                                                                                                                                                                                                                                                                                              |
| RR =                     | 0.02 (10% of CR)                                                                                                                                                                                                                                                                                 |
| Calpha=                  | 0.005                                                                                                                                                                                                                                                                                            |
| Cv =                     | 36.5 ft <sup>2</sup> /year                                                                                                                                                                                                                                                                       |
| OCR =                    | 3                                                                                                                                                                                                                                                                                                |
| <b>Boulders</b>          | Cored through boulder layer                                                                                                                                                                                                                                                                      |
| Unit weight =            | 135 pcf (assumed)                                                                                                                                                                                                                                                                                |
| Es =                     | 3,500 ksf (assumed)                                                                                                                                                                                                                                                                              |

**Results:** See attached graphs of total, primary consolidation, immediate, and secondary settlement estimates.

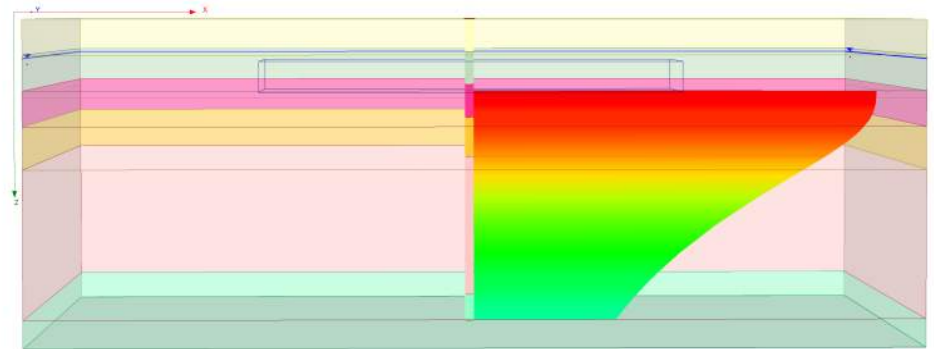
We estimate that the proposed culvert will experience total settlement on the order of 1 inch within the first year of construction. Long-term secondary settlement over the next 50 years could contribute an additional settlement of approximately 1.5 inches.



Loading Stress ZZ (ksf)



max (stage): 1.58 ksf  
max (all): 1.58 ksf



Project

State Route 113 Over Page Brook

Analysis Description

Proposed Culvert - Rev. 1

Drawn By

BTW Chk:

Scale

\$ModelScale

Company

Nobis

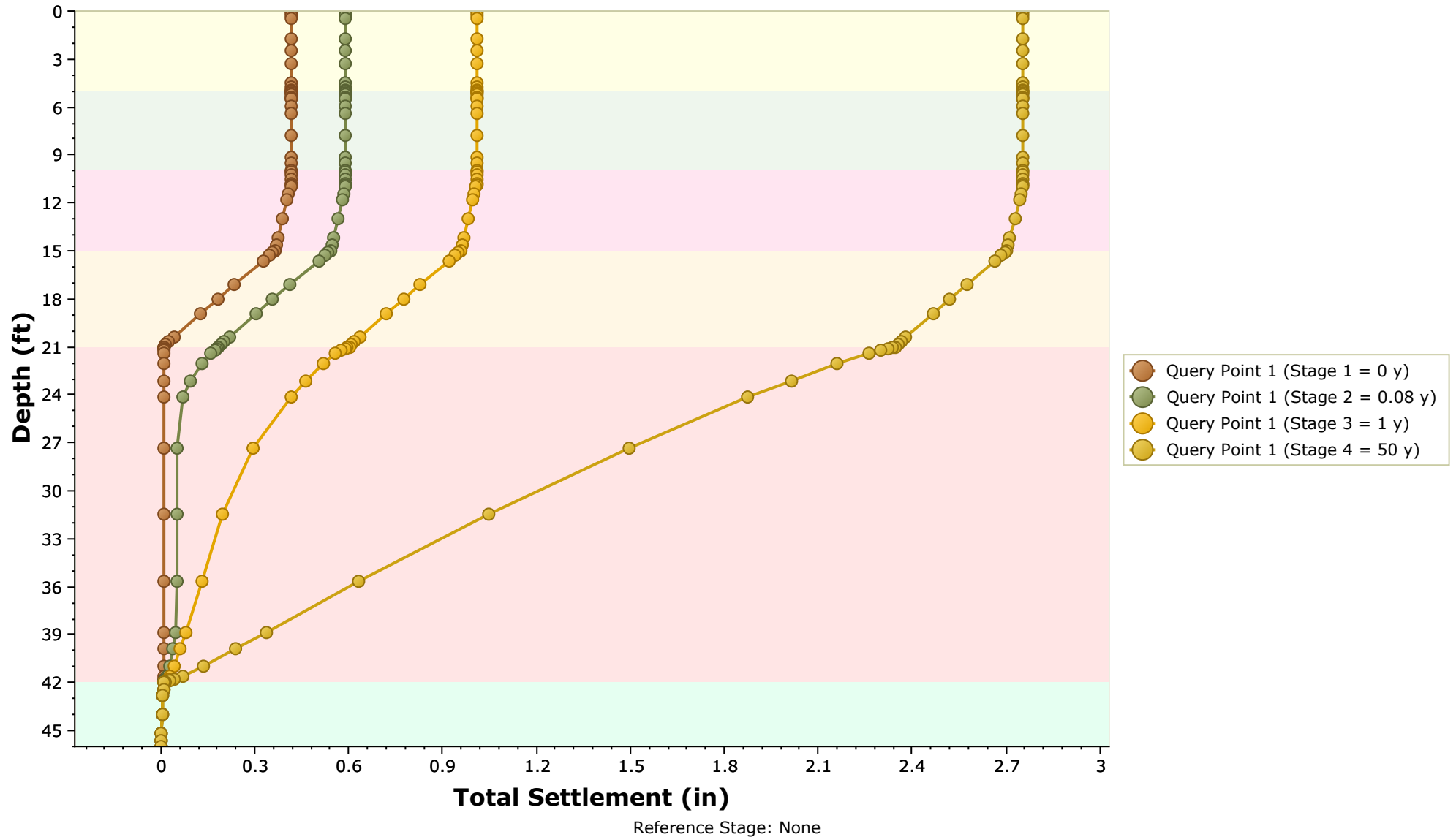
Date

10/9/2018

File Name

Settlement - South Embankment - Rev. 1 - Overexc.s3z

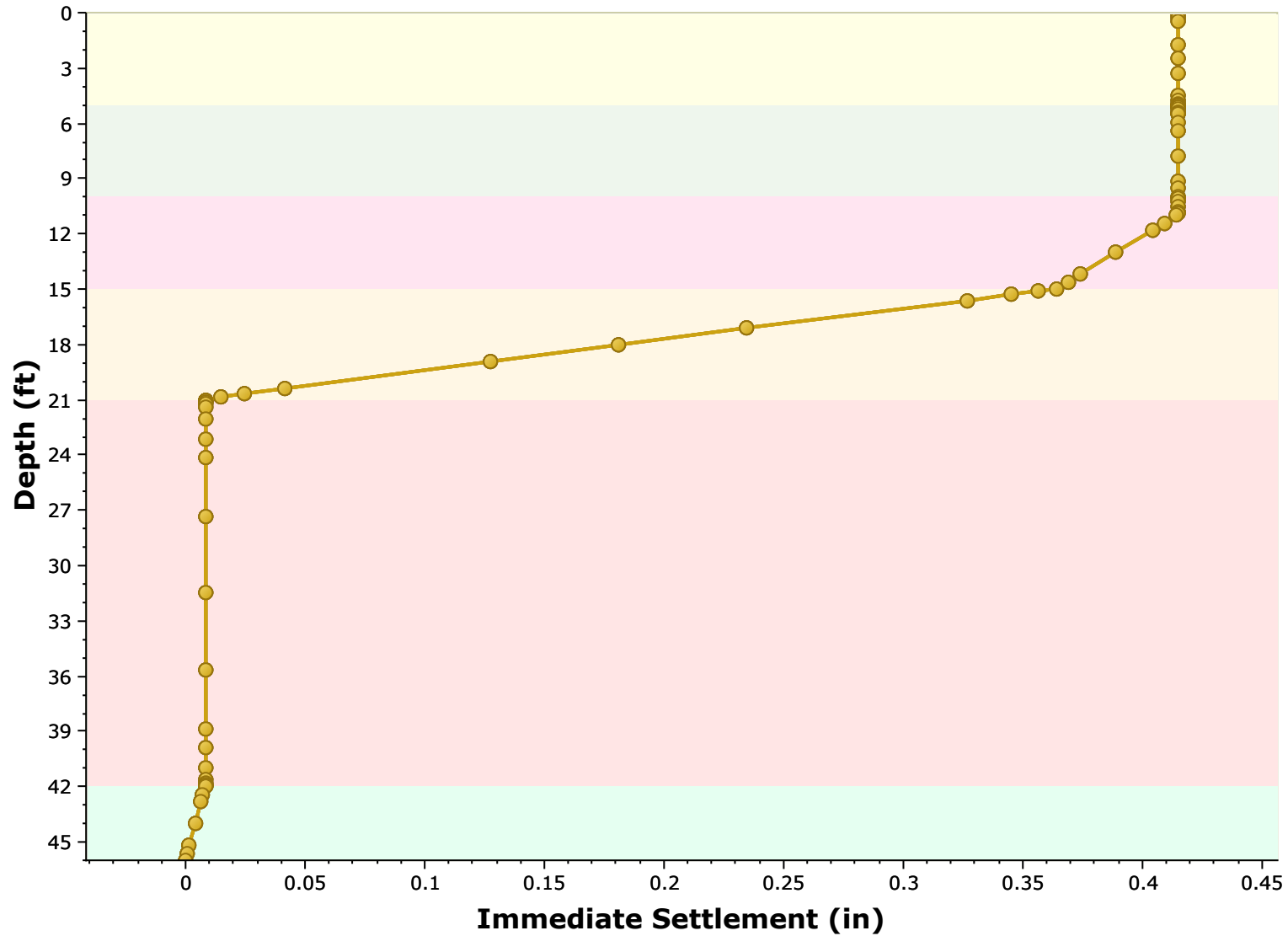
## Total Settlement vs. Depth



Engineering a Sustainable Future

|                      |     |                                                      |              |
|----------------------|-----|------------------------------------------------------|--------------|
| Project              |     | State Route 113 Over Page Brook                      |              |
| Analysis Description |     | Proposed Culvert - Rev. 1                            |              |
| Drawn By             | BTW | Scale                                                | \$ModelScale |
| Date                 |     | 10/9/2018                                            |              |
| Company              |     | Nobis                                                |              |
| File Name            |     | Settlement - South Embankment - Rev. 1 - Overexc.s3z |              |

## Immediate Settlement vs. Depth



Reference Stage: None



Engineering a Sustainable Future

Project

State Route 113 Over Page Brook

Analysis Description

Proposed Culvert - Rev. 1

Drawn By

BTW Chk:

Scale

\$ModelScale

Company

Nobis

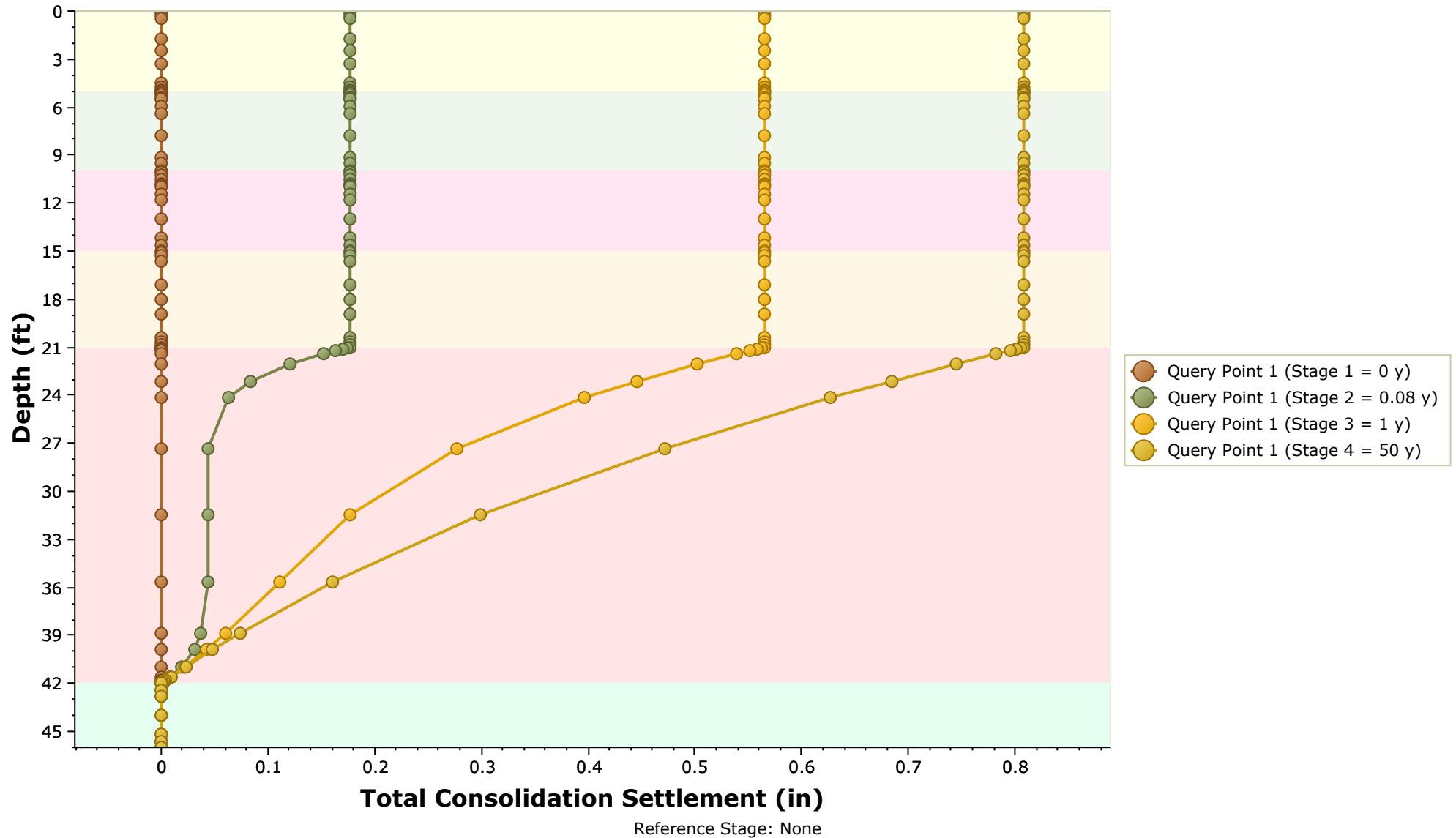
Date

10/9/2018

File Name

Settlement - South Embankment - Rev. 1 - Overexc.s3z

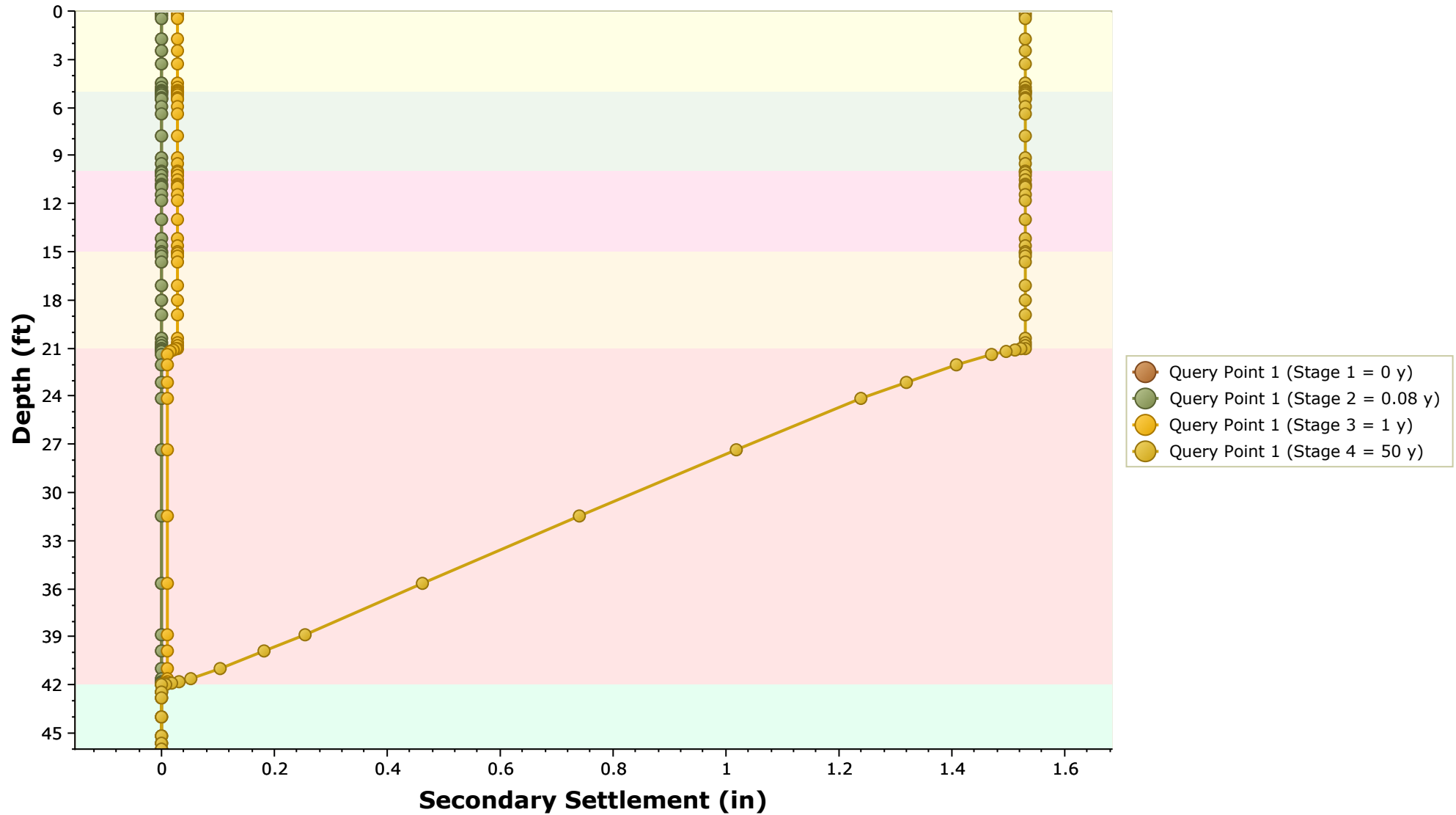
## Total Consolidation Settlement vs. Depth



Engineering a Sustainable Future

|                      |           |                                 |                                                      |
|----------------------|-----------|---------------------------------|------------------------------------------------------|
| Project              |           | State Route 113 Over Page Brook |                                                      |
| Analysis Description |           | Proposed Culvert - Rev. 1       |                                                      |
| Drawn By             | BTW Chk:  | Scale                           | Company                                              |
| Date                 | 10/9/2018 | \$ModelScale                    | Nobis                                                |
|                      |           | File Name                       | Settlement - South Embankment - Rev. 1 - Overexc.s3z |

## Secondary Settlement vs. Depth



|                      |           |                                 |                                                      |
|----------------------|-----------|---------------------------------|------------------------------------------------------|
| Project              |           | State Route 113 Over Page Brook |                                                      |
| Analysis Description |           | Proposed Culvert - Rev. 1       |                                                      |
| Drawn By             | BTW Chk:  | Scale                           | Company                                              |
| Date                 | 10/9/2018 | \$ModelScale                    | Nobis                                                |
|                      |           | File Name                       | Settlement - South Embankment - Rev. 1 - Overexc.s3z |

The Engineering Aspects  
Of The  
Presumpscot Formation

By

David W. Andrews, P.E.  
Morrison Geotechnical Engineering

Ralph Peck, a leading geotechnical engineer, has said that the three things a geotechnical engineer must have are a good understanding of Soil Mechanics and Geology and experience. It is the goal of this symposium to explore the soil mechanics and geology of one of Maine's problem soils, the Presumpscot Formation (PF) silty clay, and to share our experiences working with it. If Ralph Peck is right, we should have better success in dealing with the Presumpscot Formation after this symposium.

What are some of the problems geotechnical engineers encounter with the Presumpscot Formation?

- The deposit is prone to landslides and slope failures that are difficult to explain and predict.
- Some buildings and embankments, underlain by the Presumpscot Formation, have experienced unacceptable settlement.
- Prediction of settlement rates are often unreliable.
- Bearing failures have occurred.

- Frost damage of roads with the Presumpscot Formation have happened.
- Hydrogeologic studies involving the Presumpscot Formation often require considerable estimation of hydraulic properties.

Engineers and geologists have been interested in the Presumpscot Formation since colonial times. As early as the 1860's professionals were trying to understand the engineering properties of the Presumpscot Formation. Professor Morse, in 1869, for example, wrote about the "slippery, very tenacious, plastic blue clay" in an article on the landslides of the Portland, Maine area. However, until recently, engineers have only had experience to guide them in solving of foundation problems involving the Presumpscot Formation.

With the development of the science of Soil Mechanics, by Terzaghi and others in the 1930's and 1940's, the understanding of the Presumpscot Formation moved from the empirical to the rational. Soil Mechanics is concerned with the behavior and performance of soil as a support (in a broad sense) for engineering construction. It is a new science and in practice, is still much dependent on empirical relationships as well as analytical theories, and experience is still an important teacher.

#### ENGINEERING PROPERTIES

The soft to very soft silty clay fraction of the Presumpscot Formation deposit is the soil of greatest concern to the geotechnical engineer.

Experience has taught the profession that the very soft stratum problems are related to low strength, compressibility, and sensitivity. These characteristics usually have negative (read more cost) impact on a project.

The soil properties that relate to these characteristics can be generally grouped into three categories:

- index properties,
- consolidation properties, and
- strength properties.

The following are summaries of these engineering properties commonly used in geotechnical analysis and design. The properties are taken from various published articles and unpublished geotechnical reports, including proprietary reports belonging to Morrison Geotechnical Engineering. The data presented has been taken at face value. No attempt was made to check the validity of the numbers nor the methods used in determining the values.

For some soil properties, there is a great deal of data. For others, the data is scanty. The data is all site specific and there is an obvious bias toward the Portland, Maine, area. The Presumpscot Formation has variable characteristics, and, therefore, the presented data should not be used for design purposes.

## INDEX PROPERTIES

Index properties are those physical properties of a soil that can be easily, inexpensively, be determined. Index properties are usually not a direct measure of significant soil characteristics but are an indicator of (hence the name index property) these more important characteristics. The relationship between index properties and other characteristics is usually empirical. The relationship may be direct as with gradation to permeability, but usually the index properties place the soil in a classification with known characteristics.

### Natural Water Content, WC

The soft, blue-gray stratum of the Presumpscot Formation is considered fully saturated. The average WC for the Presumpscot Formation varies with depth and stress history and generally increases with depth. Table I, Natural Water Content, presents the WC data on the silty clay.

TABLE I

#### Natural Water Content

| <u>Location</u> | <u>WC, Percent</u> |
|-----------------|--------------------|
| Portsmouth      | 45 to 55           |
| Wells           | 36 to 44           |
| Portland        | 42                 |
| Westbrook       | 40 to 43           |
| Norridgewock    | 15 to 36           |

The stiff crust has a water content of around 20 to 25 percent.

Not 10, but ratio of water to dry wt.

### Unit Weight

The dry unit weight for the soft Presumpscot Formation is in the range of 85 to 95 pounds per cubic foot. The dry unit weight appears to be constant with depth, which is interesting in that the water content does not remain constant with depth. The stiff crust has a dry unit weight of between 95 and 100 pounds per cubic foot.

### Specific Gravity, G

The specific gravity, G, of the Presumpscot Formation, is reported to be 2.74 to 2.79 by several sources. This is somewhat higher than would be expected if the Presumpscot Formation's principal constituent was quartz ( $G = 2.62$ ). The micas ( $G = 2.8$  to  $3.1$ ) and chlorides ( $G = 2.6$  to  $3.0$ ) in the Presumpscot Formation may account for the higher value.

### Void Ratio, e

The void ratio of a soil is defined as:

$$e = \frac{\text{volume of soil voids}}{\text{volume of soil solids}}$$

The void ratio can also be determined for a saturated soil by:

$$E = (WC)G$$

Numerous reports give the e for the Presumpscot Formation in the range of 0.9 to 1.3.

### Plasticity Characteristics

The plasticity characteristics of a fine-grained soil are expressed as water content "limits" above which the soil has a different consistency. The limits are determined by a set of standardized laboratory tests referred to by the name of a scientist who originated the system - A. Atterberg.

The principal limits of concern with the Presumpscot Formation are:

- Liquid Limit: The water content above which the soil acts as a viscous liquid, i.e., the soil has no measurable shear strength.
- Plastic Limit: The water content above which the soil acts as a "plastic" material.
- Plastic Index: The water content difference between the liquid and plastic limits.

Table II, Atterberg Limits, presents Atterberg limit data from several reports.

TABLE II

#### Atterberg Limits

| <u>Location</u> | <u>Liquid Limit</u> | <u>Plastic Limit</u> | <u>Plastic Index</u> |
|-----------------|---------------------|----------------------|----------------------|
| Portsmouth      | 30 to 40            | 18 to 22             | -                    |
| Portland        | 25 to 30            | 15 to 25             | -                    |
| Brunswick       | 25 to 39            | 17 to 23             | 6 to 18              |
| Waterville      | 31 to 41            | 18 to 21             | 13 to 20             |

### Gradation Analysis

The grain size distribution within the deposit varies with both horizontally and vertically. The silty clay fraction has a grain size range between 90 percent and 100 percent passing the No. 200 (0.074 mm) sieve and 40 percent to 60 percent smaller than 0.005 mm (clay size).

### Classification

Classification systems are used by geotechnical engineers to determine typical properties of a soil or to determine the suitability of a soil for specific engineering applications.

Unified Soil Classification System. The unified system is widely used as a general purpose classification. The Presumpscot Formation silty clay is almost always classified as CL, "an inorganic clay of low to medium plasticity", under the system.

AASHTO. The AASHTO classification is specifically intended for road subgrade suitability. The Presumpscot Formation is reported to be an A-7-5 soil with a group index of 12.

Frost Design Classification. The Corps of Engineers Frost Design Classification places the Presumpscot Formation in the F-4 group, "banded fine-grained sediments", that are most frost reactive.

## CONSOLIDATION CHARACTERISTICS

When a saturated, fine-grained soil is subjected to an increase in vertical stress, the soil skeleton undergoes deformation or strain. This compressional strain results in surface settlement. Because the Presumpscot Formation has a very low permeability, the vertical stresses are initially carried by the pressurization of the soil pore water. The stresses are then transferred to the soil skeleton as the water pressure slowly dissipates. Consolidation is, therefore, time dependent. Compression, due to increased load, is called primary compression.

The changes in soil volume with load and other related consolidation characteristics of the Presumpscot Formation are typically studied by performing consolidation tests. A small "undisturbed" Presumpscot Formation sample is vertically compressed with a series of increasing loads. The amount of soil compression at time intervals for each load is recorded. Analysis of the data plus soil index properties permit the geotechnical engineer to estimate total compression of the stratum, the consolidation rate and the stress history of the strata.

The stress history is an important factor in evaluating the settlement that a structure will experience. If a deposit appears to have been subjected to vertical stress levels in the past that were greater than currently exist due to self weight of the deposit, then the deposit is said to be preconsolidated or

over-consolidated. The higher "past pressures",  $P_c$ , may be a result of soil unloading by erosion or water table change or may actually be caused by physio-chemical changes in the soil such as cementation or secondary compression. A soil that is in-equilibrium with existing stresses is normally consolidated.

If an over-consolidated soil is loaded, say with a large building or highway embankment, settlement will be less than if the soil was normally consolidated. Significant settlement will take place only after the past pressure is exceeded. This fact can be used to advantage by geotechnical engineers in the design of foundations on the Presumpscot Formation deposit.

#### Compression Index, $C_c$

The most commonly determined characteristic is the compression index,  $C_c$ .  $C_c$  is the slope of the portion of a void ratio versus log effective vertical pressure plot at pressures greater than the past pressures.  $C_c$  values for the Presumpscot Formation are given in Table III, Compression Index.

TABLE III

#### Compression Index

| <u>Location</u> | <u><math>C_c</math></u> |
|-----------------|-------------------------|
| Wells           | 0.38                    |
| Portland        | 0.4 to 0.6              |
| Portland        | 0.33                    |
| Augusta         | 0.4                     |
| Kennebunk       | 0.56                    |
| Bath            | 0.34                    |

There is little information available on compression indices determined in-situ from instrumented sites. One study done in Portsmouth, New Hampshire, had a field derived  $C_c$  of 0.8, while the laboratory value was 0.6, a significant difference.

#### Recompression Index

The recompression index is the slope of the void ratio versus log vertical effective pressure curve for pressures below the  $p_c$ . The value is usually about 8 percent to 10 percent of  $C_c$ .

#### Secondary Compression

Soil continues to compress after completion of primary compression, i.e., after compression associated with pore water pressure dissipation. The subsequent compression, called secondary compression or creep, takes place at a much slower rate and without load increase. Reported values for secondary compression are in the range of 0.5 to 1.5 percent of strain/cycle time.

The Presumpscot Formation silty clay has undergone some secondary compression, as would be expected for this soil type and geologic history.

#### Coefficient of Consolidation

The coefficient of consolidation is used in computing the rate of settlement. The rate of settlement is important, as it may dictate what schemes the geotechnical engineer can use to decrease the risks of settlement.

The coefficient of compression varies with orientation within the soil mass. The vertical coefficient is measured by conventional testing methods. The horizontal coefficient takes special devices. The co-efficients are also a function of testing procedures.

Vertical coefficients for the Presumpscot Formation in the Portland area are reported in the 0.05 to 0.15 square feet per day range. One report gives the ratio of horizontal to vertical coefficient of 1.2 to 1.5.

With information on the coefficient of consolidation in hand, the settlement rate can be predicted if the drainage characteristics of the deposit, such as sand layer spacings and overlying soil permeability, are known.

#### Over-Consolidation Ratio, OCR

The Presumpscot Formation is an over-consolidated deposit. The upper crust has been significantly over-consolidated due, probably to the combined forces of dessication, drying and wetting in the presence of certain salts (Bowles, 1979), and chemical bonding. The soft, deeper deposit is also slightly over-consolidated as the result of secondary compression.

The amount of over-consolidation can be expressed as the Over-Consolidation Ratio, OCR:

$$\text{OCR} = \frac{\text{Apparent past vertical pressure, } P_c}{\text{Existing vertical pressure, } P}$$

Table IV, Over-Consolidation Ratio, presents OCR data for a well-documented site in Portland, Maine.

TABLE IV

| <u>Over-Consolidation Ratio</u> |            |
|---------------------------------|------------|
| <u>Depth (Feet)</u>             | <u>OCR</u> |
| 5                               | 4.4        |
| 10                              | 2.25       |
| 15                              | 1.47       |
| 20                              | 1.20       |
| 30                              | 1.14       |
| 40                              | 1.13       |
| 50                              | 1.12       |
| 60                              | 1.12       |

#### Permeability

The coefficient of permeability,  $k$ , of the Presumpscot Formation varies with the deposit's void ratio and is different in the horizontal and vertical directions because of natural stratification. The permeability of the silty clay is on the order of  $5 \times 10^{-8}$  to  $1 \times 10^{-7}$  centimeters per second. The ratio of horizontal to vertical permeability of the silty clay is estimated to be 1.2 to 1.5. It is important to note that these values are for small laboratory samples of the silty clay. The permeability of a Presumpscot Formation deposit, as a whole, would probably be higher because of sand layers.

## SHEAR STRENGTH

Failure of a soil under imposed load, such as a footing, embankment, or anchor block, is due to a combination of normal compressive and shearing stresses. The ability of a soil to resist these forces lies in its frictional (angle of internal friction) and cohesive shear strength. For fine-grained soil, like the Presumpscot Formation, the resistance is primarily cohesive under normal loading conditions.

The shearing strength of the Presumpscot Formation has been determined from both field tests, such as bore hole vane shear and laboratory tests, such as unconfined compression and triaxial compression under various loading conditions.

### Undrained Shear Strength, $S_u$

The undrained shear strength,  $S_u$ , of the Presumpscot Formation silty clay is a function of the overburden pressure. It has been found that the ratio between the undrained shear strength to the overburden pressure ( $S_u/p$ ) is a constant for a given deposit. The overburden pressure, however, may not actually be the currently existing vertical stress but may be the past pressure, as discussed in the consolidation section of the paper. Therefore, it would be expected that the  $S_u/p$  ratio will vary with the deposit's OCR.

The Presumpscot Formation crust has an undrained shear strength that is very high because of the high OCR. The Presumpscot Formation strength decreases with depth and then increases again as the overburden pressure increases.

Laboratory derived data on  $S_u$  and  $S_u/p$  for a site in Portland, Maine, are presented in Table V, Undrained Shear Strength.

TABLE V

## Undrained Shear Strength

| <u>Depth, Feet</u> | <u><math>S_u</math>, psf</u> | <u><math>S_u/p</math></u> |
|--------------------|------------------------------|---------------------------|
| 30                 | 420                          | 0.41                      |
| 40                 | 355                          | 0.24                      |
| 50                 | 445                          | 0.23                      |
| 60                 | 555                          | 0.23                      |
| 70                 | 645                          | 0.23                      |
| 80                 | 750                          | 0.23                      |

---

psf = pounds per square foot.

The stiff crust is reported to have  $S_u$  in the 2,000 to 3,500 psf range.

The general opinion is that the field vanes give somewhat higher shear strengths than laboratory tests. Hand-held torvane devices are also sometimes used to obtain shear strength. My experience with the torvane indicates that the device may be under-estimating shear strength, slightly.

It should be noted that the type of test and the assumptions used in the test have a good deal to do with the resulting shear strength. (Amos, 1986), for example, obtained shear strengths of 215 psf from a field vane test and 748 psf from a triaxial test for supposedly the same soil under the same conditions.

## REFERENCE LIST

Tozier, D., (1982). "Jacking of a 72-Inch Pipe Under Congress Street in Portland, Maine". 1982 National Convention, Society of Women Engineers. Unpublished. 10 pgs.

Young, D., (1966). "Physical Soil Properties as a Means of Predicting the Compression Index and Pre-Consolidation Pressure of Maine Clay". MS, University of Maine. Unpublished. 86 pgs.

### Remolded Shear Strength

The remolded shear strength is the cohesion that remains after a soil has been greatly disturbed or remolded. The remolded shear strength of the Presumpscot Formation silty clay is on the order of 15 percent to 35 percent of the undisturbed shear strength.

### Sensitivity

The sensitivity of a soil is the ratio of it's undisturbed shear strength to it's remolded shear strength. The more sensitive a soil, the greater the likelihood of rapid, progressive-type landslides. The Presumpscot Formation has a sensitivity in the 5 to 15 range which would classify it as a sensitive to very sensitive deposit.

### CLOSURE

The preceeding paper has presented a very brief overview of the engineering aspects of the Presumpscot Formation. Much additional information can be found in the documents in the reference list that follows.

## REFERENCE LIST

- Andrews, D., "A Summary of Geotechnical Engineering Information on the Presumpscot Formation Silty Clay". Unpublished. University of Maine and Morrison Geotechnical Engineering. 34 pgs.
- Amos, J., and Sanford, T., (1986). "Landslides in Presumpscot Formation - An Engineering Study for the Maine Geological Survey, Augusta, Maine". University of Maine. Unpublished. 21 pgs.
- Bragdon, F., (Undated). "Terra Firma, A Muddy History of Westbrook, Maine". 1 pg.
- City of Portland and Parsons, Brinkerhoff, Quade, and Douglas, Inc., (1981). Geotechnical Report. "Portland Fish Pier Complex". Volumes I and II. Unpublished. 40 pgs.
- Hodgkins, J., (1961). "Consolidation and Strength Characteristics of a Compacted Clay". MS, University of Maine. Unpublished. 95 pgs.
- Ladd, C., (1972). "Test Embankment on Sensitive Clay", ASCE SMFD, Proc. Conf. on Performance of Earth and Earth-Supported Structures. pp. 101-127.
- Ladd, C., Rixner, J., and Gifford, D., (1984). "Failure of a Dredged Slope in Sensitive Clay". International Conf. on Case Histories in Geotechnical Engineering. University of Missouri. Volume II, pp. 671-678.
- Maine State Highway Commission and Haley & Aldrich, Inc., (1969), Report No. 1. "Engineering Properties of the Foundation Soils, Long Creek-Fore River and Back Cove Area". Portland, Maine. Unpublished. 36 pgs. (This report was written by Johnson and Ladd and is close to the definitive work on the Presumpscot Formation. The report forms the basis for the proceeding articles by Ladd et al.)
- Morse, E., (1869). "On the Landslides in the Vicinity of Portland, Maine". Boston Society of Natural History. Boston, Massachusetts. Volume XII, pp. 236-244.
- Peterlein, W., (1985). "The Presumpscot Formation, It's Pleistocene Glacial History, It's Physical and Chemical Composition, and the Relation of It's Physical Properties to Values of Compression Index and Pre-Consolidation Pressure". University of Maine. Unpublished. 11 pgs.
- Simons, M., Christian, T., and Ladd, C., (1974). "Analysis of Undrained Behavior of Loads on Clays". ASCE, Proc. of Conf. on Analysis and Design in Geotechnical Engineering. Volume I, pp. 51-83.

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## **APPENDIX F.3 – At-Rest Earth Pressure**

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**Objective:** Calculate lateral earth pressure coefficient for the proposed concrete culvert.

**Approach:** Determine at-rest earth pressure coefficient in accordance with MaineDOT Bridge Design Manual.

**References:** 1. MaineDOT Bridge Design Guide, 2003, with revisions through 2014.  
2. AASHTO Bridge Design Specifications, 2017 Edition.

### At-Rest Earth Pressure

$$K_o = 1 - \sin(\phi)$$

$$K_o = 0.47$$

Effective friction angle of soil:  $\phi = 32^\circ$

$\phi$  = soil friction angle

We recommend that the proposed concrete culvert be designed for lateral earth pressures using backfill material properties for Soil Type 4 (MaineDOT Bridge Design Guide Section 3.6.1). In accordance with the MaineDOT Bridge Manual Soil Type 4 has a friction angle of 32 degrees.

Table 3-3 Material Classification

| Soil Type | Soil Description                                                                                                                                            | Internal Angle of Friction of Soil, $\phi$ | Soil Total Unit Weight (pcf) | Coeff. of Friction, $\tan \delta$ , Concrete to Soil | Interface Friction, Angle, Concrete to Soil $\delta$ |
|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|------------------------------|------------------------------------------------------|------------------------------------------------------|
| 1         | Very loose to loose silty sand and gravel<br>Very loose to loose sand<br>Very loose to medium density sandy silt<br>Stiff to very stiff clay or clayey silt | 29°*                                       | 100                          | 0.35                                                 | 19°                                                  |
| 2         | Medium density silty sand and gravel<br>Medium density to dense sand<br>Dense to very dense sandy silt                                                      | 33°                                        | 120                          | 0.40                                                 | 22°                                                  |
| 3         | Dense to very dense silty sand and gravel<br>Very dense sand                                                                                                | 36°                                        | 130                          | 0.45                                                 | 24°                                                  |
| 4         | Granular underwater backfill<br>Granular borrow                                                                                                             | 32°                                        | 125                          | 0.45                                                 | 24°                                                  |
| 5         | Gravel Borrow                                                                                                                                               | 36°                                        | 135                          | 0.50                                                 | 27°                                                  |

\* The value given for the internal angle of friction ( $\phi$ ) for stiff to very stiff silty clay or clayey silt should be used with caution due to the large possible variation with different moisture contents.

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## **APPENDIX F.4 Seismic Design Considerations**

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## **Seismic site classification for the Watchic Bridge - State Route 113 over Page Brook**

**Objective:** Evaluate seismic site classification for the above-referenced project site in Standish, Maine.

### **References:**

- 1) AASHTO LRFD Bridge Design Specifications, 8th Edition.
- 2) Borings observed by Nobis Group in November, 2017.
- 3) MaineDOT Bridge Design Manual, 2003, with revisions through March, 2017.

### **Solution:**

AASHTO Section 3.10 was used to determine the seismic site classification for the Watchic Bridge project site, as follows:

**Step** Check for the three categories of Site Class F as described in Table 3.10.3.1-1 - Site Classification

**1:** Definitions, as follows:

1. Peats or highly organic clays ( $H > 10$  ft of peat or highly organic clay where  $H$  = thickness of soil).
2. Very high plasticity clays ( $H > 25$  ft with  $PI > 75$ ).
3. Very thick soft/medium stiff clays ( $H > 120$  ft).

**Soil conditions for Site Class F were not shown on the Nobis Boring Logs.**

**Step** Check for existence of a soft layer with total thickness  $> 10$  ft, where soft layer is defined by  $su < 0.5$  ksf,

**2:**  $w > 40\%$ , and  $PI > 20$ . If these criteria are met, classify site as Site Class E.

**Soil conditions for Site Class E were not shown on the Nobis Boring Logs.**

**Step** Categorize the site using one of three methods (i.e. A, B, or C).  
**3:**

Method B (N-bar Method) was used to determine the average Standard Penetration Test (SPT) blow count (blows/ft) for the upper 100 ft of the soil profile using the 2017 borings. See attached Table 3.10.3.1-1. The borings were performed in general accordance with ASTM D1586. The samples were obtained using a 1-3/8" diameter sampler driven with a 140-lb safety hammer dropping a distance of 30 inches.

### **Conclusion:**

Based on the Nobis boring logs, the average Standard Penetration Resistance, N-bar, for the site ranges from 6 to 23. Per Reference 1, the seismic site classification for the site is **Site Class E - Soft Soil Profile**. The calculated values for the borings are summarized in the following table. See attached tables presenting the value of SPT-N vs. depth for the respective borings.



**Sample Calculation:** Consider Boring BB-SPB-101

Determine N-bar: Use the average N value of each layer,  $N_i$ , for each layer provided in the table toward the end of this report.

$$\bar{N} = \frac{\sum_{i=1}^n d_i}{\sum_{i=1}^n \frac{d_i}{N_i}} \quad \bar{N} = \frac{3.0' + 2.0' + 5.0' + 4.7' + 2.3' + 4.0' + 2.5' + 5.0' + 5.0' + 5.0' + 3.5' + 58'}{\frac{3.0'}{34} + \frac{2.0'}{17} + \frac{5.0'}{21} + \frac{4.7'}{3} + \frac{2.3'}{4} + \frac{4.0'}{11} + \frac{2.5'}{8} + \frac{5.0'}{42} + \frac{5.0'}{31} + \frac{5.0'}{25} + \frac{3.5'}{51} + \frac{58'}{100}} = 23 \text{ bpf}$$

Determine the site class for this boring using the Site Class Definitions, attached (Table 3.10.3.1-1, Reference 1)

Below, summary tables provide general information for all of the borings considered in this analysis.

**Table:** Summary of Seismic Site Classification from Borings Performed by Nobis Group

| Boring No. | N-bar (bpf) | Site Class | Comments                             |
|------------|-------------|------------|--------------------------------------|
| BB-SPB-101 | 23          | D          | Bedrock encountered at 46.2 feet bgs |
| BB-SPB-102 | 6           | E          | Bedrock encountered at 47.6 feet bgs |

**Data from Boring BB-SPB-101 (performed November, 2017)**

| Layer | Depth Range |          | Thickness ( $d_i$ ) | $N_i$    | $d_i/N_i$ | Comments                 |
|-------|-------------|----------|---------------------|----------|-----------|--------------------------|
|       | Start [ft]  | End [ft] | [ft]                | blows/ft |           |                          |
| 1     | 0           | 3        | 3                   | 34       | 0.088     | Fill                     |
| 2     | 3           | 5        | 2                   | 17       | 0.118     |                          |
| 3     | 5           | 10       | 5                   | 21       | 0.238     | Gravel                   |
| 4     | 10          | 14.7     | 4.7                 | 3        | 1.567     | Organic Silt             |
| 5     | 14.7        | 17       | 2.3                 | 4        | 0.575     | Sand                     |
| 6     | 17          | 21       | 4                   | 11       | 0.364     |                          |
| 7     | 21          | 23.5     | 2.5                 | 8        | 0.313     | Clayey Silt              |
| 8     | 23.5        | 28.5     | 5                   | 42       | 0.119     |                          |
| 9     | 28.5        | 33.5     | 5                   | 31       | 0.161     |                          |
| 10    | 33.5        | 38.5     | 5                   | 25       | 0.200     |                          |
| 11    | 38.5        | 42       | 3.5                 | 51       | 0.069     | Cobbles/Boulders/Bedrock |
| 12    | 42          | 100      | 58                  | 100      | 0.580     |                          |

**SUM**

**100**

**4.391**

|       |           |
|-------|-----------|
| N-bar | <b>23</b> |
|-------|-----------|

|                                  |
|----------------------------------|
| <b>Site Class D - Stiff Soil</b> |
|----------------------------------|



Data from Boring BB-SPB-102 (performed November, 2017)

| Layer | Depth Range |          | Thickness ( $d_i$ ) | $N_i$    | $d_i/N_i$ | Comments                 |
|-------|-------------|----------|---------------------|----------|-----------|--------------------------|
|       | Start [ft]  | End [ft] | [ft]                | blows/ft |           |                          |
| 1     | 0           | 3        | 3                   | 17       | 0.176     | Fill                     |
| 2     | 3           | 5        | 2                   | 13       | 0.154     |                          |
| 3     | 5           | 6        | 1                   | 16       | 0.063     |                          |
| 4     | 6           | 9.7      | 3.7                 | 16       | 0.231     | Gravel                   |
| 5     | 9.7         | 14.8     | 5.1                 | 0.5      | 10.200    | Organic Silt             |
| 6     | 14.8        | 19.8     | 5                   | 1        | 5.000     | Sand                     |
| 7     | 19.8        | 25       | 5.2                 | 23       | 0.226     |                          |
| 8     | 25          | 30       | 5                   | 34       | 0.147     | Gravelly Sand            |
| 9     | 30          | 33.5     | 3.5                 | 20       | 0.175     | Silt                     |
| 10    | 33.5        | 40       | 6.5                 | 33       | 0.197     |                          |
| 11    | 40          | 100      | 60                  | 100      | 0.600     | Cobbles/Boulders/Bedrock |

SUM

100

17.169

|       |   |
|-------|---|
| N-bar | 6 |
|-------|---|

Site Class E - Soft Soil

# Design Maps Summary Report

## User-Specified Input

**Report Title** Watchic Bridge, Standish, Maine  
Thu December 6, 2018 15:27:23 UTC

**Building Code Reference Document** 2009 AASHTO Guide Specifications for LRFD Seismic Bridge Design  
(which utilizes USGS hazard data available in 2002)

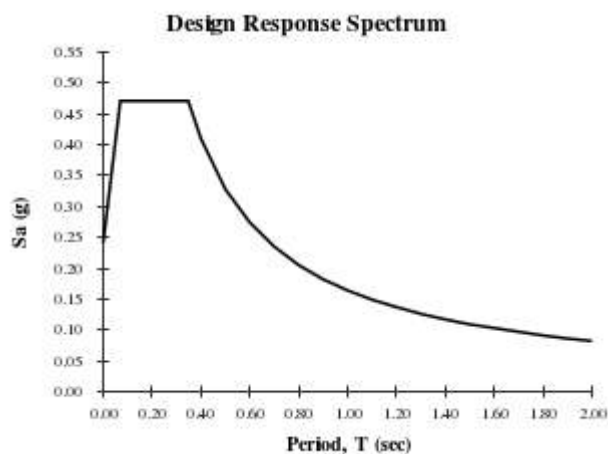
**Site Coordinates** 43.75014°N, 70.61098°W

**Site Soil Classification** Site Class E – “Soft Clay Soil”



## USGS-Provided Output

|                        |         |                         |         |
|------------------------|---------|-------------------------|---------|
| <b>PGA</b> =           | 0.096 g | <b>A<sub>s</sub></b> =  | 0.241 g |
| <b>S<sub>s</sub></b> = | 0.189 g | <b>S<sub>DS</sub></b> = | 0.471 g |
| <b>S<sub>1</sub></b> = | 0.047 g | <b>S<sub>D1</sub></b> = | 0.164 g |



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# Design Maps Detailed Report

2009 AASHTO Guide Specifications for LRFD Seismic Bridge Design (43.75014°N, 70.61098°W)

Site Class E – “Soft Clay Soil”

## Article 3.4.1 — Design Spectra Based on General Procedure

Note: Maps in the 2009 AASHTO Specifications are provided by AASHTO for Site Class B. Adjustments for other Site Classes are made, as needed, in Article 3.4.2.3.

From [Figure 3.4.1-2](#)<sup>[1]</sup>

PGA = 0.096 g

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From [Figure 3.4.1-3](#)<sup>[2]</sup>

S<sub>s</sub> = 0.189 g

---

From [Figure 3.4.1-4](#)<sup>[3]</sup>

S<sub>1</sub> = 0.047 g

---

### Article 3.4.2.1 — Site Class Definitions

The authority having jurisdiction (not the USGS), site-specific geotechnical data, and/or the default has classified the site as Site Class E, based on the site soil properties in accordance with Article 3.4.2.

Table 3.4.2.1–1 Site Class Definitions

| <b>SITE CLASS</b> | <b>SOIL PROFILE NAME</b>      | <b>Soil shear wave velocity, <math>\bar{v}_s</math>, (ft/s)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>Standard penetration resistance, <math>\bar{N}</math></b> | <b>Soil undrained shear strength, <math>\bar{s}_u</math>, (psf)</b> |
|-------------------|-------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|---------------------------------------------------------------------|
| A                 | Hard rock                     | $\bar{v}_s > 5,000$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | N/A                                                          | N/A                                                                 |
| B                 | Rock                          | $2,500 < \bar{v}_s \leq 5,000$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | N/A                                                          | N/A                                                                 |
| C                 | Very dense soil and soft rock | $1,200 < \bar{v}_s \leq 2,500$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | $\bar{N} > 50$                                               | >2,000 psf                                                          |
| D                 | Stiff soil profile            | $600 \leq \bar{v}_s < 1,200$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | $15 \leq \bar{N} \leq 50$                                    | 1,000 to 2,000 psf                                                  |
| E                 | Stiff soil profile            | $\bar{v}_s < 600$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | $\bar{N} < 15$                                               | <1,000 psf                                                          |
| E                 | —                             | Any profile with more than 10 ft of soil having the characteristics: <ol style="list-style-type: none"> <li>1. Plasticity index <math>PI &gt; 20</math>,</li> <li>2. Moisture content <math>w \geq 40\%</math>, and</li> <li>3. Undrained shear strength <math>\bar{s}_u &lt; 500</math> psf</li> </ol>                                                                                                                                                                                                                                                                                                                                                                 |                                                              |                                                                     |
| F                 | —                             | Any profile containing soils having one or more of the following characteristics: <ol style="list-style-type: none"> <li>1. Soils vulnerable to potential failure or collapse under seismic loading such as liquefiable soils, quick and highly sensitive clays, collapsible weakly cemented soils.</li> <li>2. Peats and/or highly organic clays (<math>H &gt; 10</math> feet of peat and/or highly organic clay where <math>H</math> = thickness of soil)</li> <li>3. Very high plasticity clays (<math>H &gt; 25</math> feet with plasticity index <math>PI &gt; 75</math>)</li> <li>4. Very thick soft/medium stiff clays (<math>H &gt; 120</math> feet)</li> </ol> |                                                              |                                                                     |

For SI: 1ft/s = 0.3048 m/s 1lb/ft<sup>2</sup> = 0.0479 kN/m<sup>2</sup>

### Article 3.4.2.3 — Site Coefficients

Table 3.4.2.3-1 (for  $F_{PGA}$ )—Values of  $F_{PGA}$  as a Function of Site Class and Mapped Peak Ground Acceleration Coefficient

| Site Class | Mapped Peak Ground Acceleration |            |            |            |            |
|------------|---------------------------------|------------|------------|------------|------------|
|            | PGA ≤ 0.10                      | PGA = 0.20 | PGA = 0.30 | PGA = 0.40 | PGA ≥ 0.50 |
| A          | 0.8                             | 0.8        | 0.8        | 0.8        | 0.8        |
| B          | 1.0                             | 1.0        | 1.0        | 1.0        | 1.0        |
| C          | 1.2                             | 1.2        | 1.1        | 1.0        | 1.0        |
| D          | 1.6                             | 1.4        | 1.2        | 1.1        | 1.0        |
| E          | 2.5                             | 1.7        | 1.2        | 0.9        | 0.9        |
| F          | See AASHTO Article 3.4.3        |            |            |            |            |

Note: Use straight-line interpolation for intermediate values of PGA

**For Site Class = E and PGA = 0.096 g,  $F_{PGA} = 2.500$**

Table 3.4.2.3-1 (for  $F_a$ )—Values of  $F_a$  as a Function of Site Class and Mapped Short-Period Spectral Acceleration Coefficient

| Site Class | Spectral Response Acceleration Parameter at Short Periods |              |              |              |                 |
|------------|-----------------------------------------------------------|--------------|--------------|--------------|-----------------|
|            | $S_s \leq 0.25$                                           | $S_s = 0.50$ | $S_s = 0.75$ | $S_s = 1.00$ | $S_s \geq 1.25$ |
| A          | 0.8                                                       | 0.8          | 0.8          | 0.8          | 0.8             |
| B          | 1.0                                                       | 1.0          | 1.0          | 1.0          | 1.0             |
| C          | 1.2                                                       | 1.2          | 1.1          | 1.0          | 1.0             |
| D          | 1.6                                                       | 1.4          | 1.2          | 1.1          | 1.0             |
| E          | 2.5                                                       | 1.7          | 1.2          | 0.9          | 0.9             |
| F          | See AASHTO Article 3.4.3                                  |              |              |              |                 |

Note: Use straight-line interpolation for intermediate values of  $S_s$

**For Site Class = E and  $S_s = 0.189$  g,  $F_a = 2.500$**

Table 3.4.2.3-2—Values of  $F_v$  as a Function of Site Class and Mapped 1-sec Period Spectral Acceleration Coefficient

| Site Class | Mapped Spectral Response Acceleration Coefficient at 1-sec Periods |              |              |              |                 |
|------------|--------------------------------------------------------------------|--------------|--------------|--------------|-----------------|
|            | $S_1 \leq 0.10$                                                    | $S_1 = 0.20$ | $S_1 = 0.30$ | $S_1 = 0.40$ | $S_1 \geq 0.50$ |
| A          | 0.8                                                                | 0.8          | 0.8          | 0.8          | 0.8             |
| B          | 1.0                                                                | 1.0          | 1.0          | 1.0          | 1.0             |
| C          | 1.7                                                                | 1.6          | 1.5          | 1.4          | 1.3             |
| D          | 2.4                                                                | 2.0          | 1.8          | 1.6          | 1.5             |
| E          | 3.5                                                                | 3.2          | 2.8          | 2.4          | 2.4             |
| F          | See AASHTO Article 3.4.3                                           |              |              |              |                 |

Note: Use straight-line interpolation for intermediate values of  $S_1$

**For Site Class = E and  $S_1 = 0.047$  g,  $F_v = 3.500$**

**Equation (3.4.1-1):**

$$A_S = F_{PGA} \text{ PGA} = 2.500 \times 0.096 = 0.241 \text{ g}$$

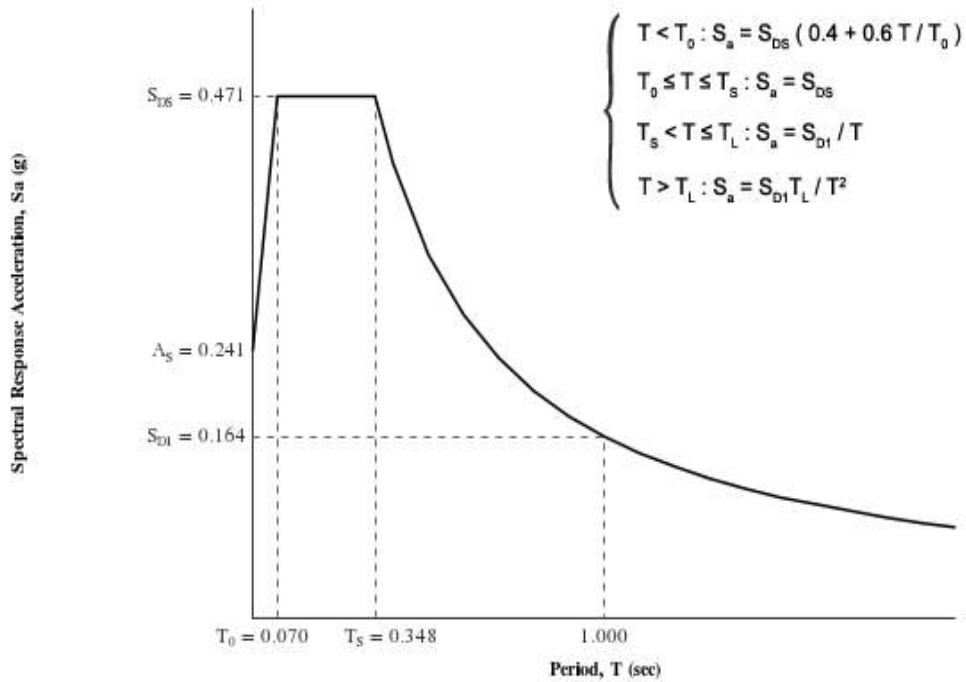
**Equation (3.4.1-2):**

$$S_{DS} = F_a S_S = 2.500 \times 0.189 = 0.471 \text{ g}$$

**Equation (3.4.1-3):**

$$S_{D1} = F_v S_1 = 3.500 \times 0.047 = 0.164 \text{ g}$$

Figure 3.4.1-1: Design Response Spectrum



Article 3.5 - Selection of Seismic Design Category (SDC)

Table 3.5-1—Partitions for Seismic Design Categories A, B, C, and D

| VALUE OF $S_{D1}$           | SDC |
|-----------------------------|-----|
| $S_{D1} < 0.15g$            | A   |
| $0.15g \leq S_{D1} < 0.30g$ | B   |
| $0.30g \leq S_{D1} < 0.50g$ | C   |
| $0.50g \leq S_{D1}$         | D   |

For  $S_{D1} = 0.164\text{ g}$ , Seismic Design Category = B

Seismic Design Category  $\equiv$  “the design category in accordance with Table 3.5-1” = B

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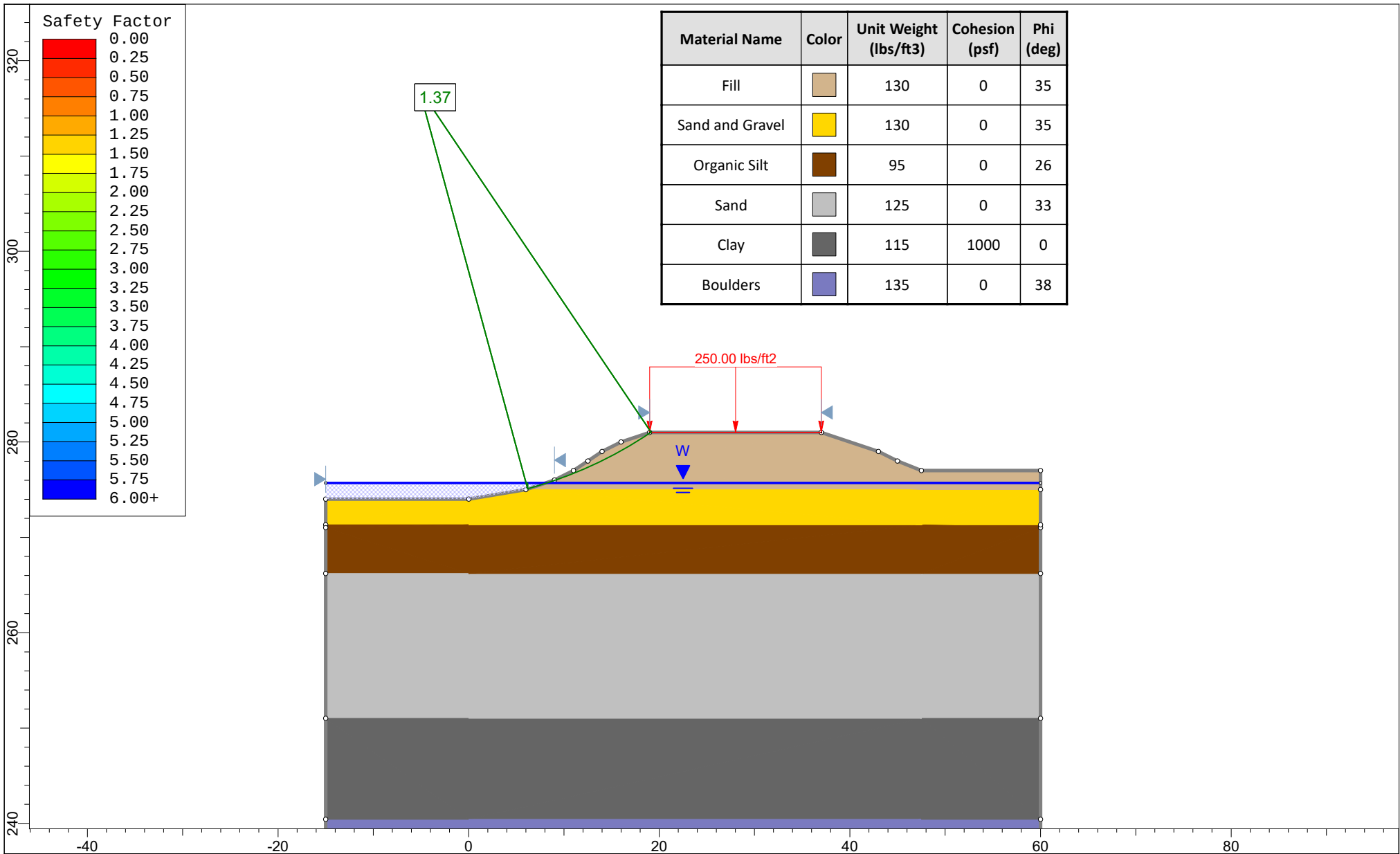
## References

1. *Figure 3.4.1-2*: <https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/AASHTO-2009-Figure-3.4.1-2.pdf>
2. *Figure 3.4.1-3*: <https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/AASHTO-2009-Figure-3.4.1-3.pdf>
3. *Figure 3.4.1-4*: <https://earthquake.usgs.gov/hazards/designmaps/downloads/pdfs/AASHTO-2009-Figure-3.4.1-4.pdf>

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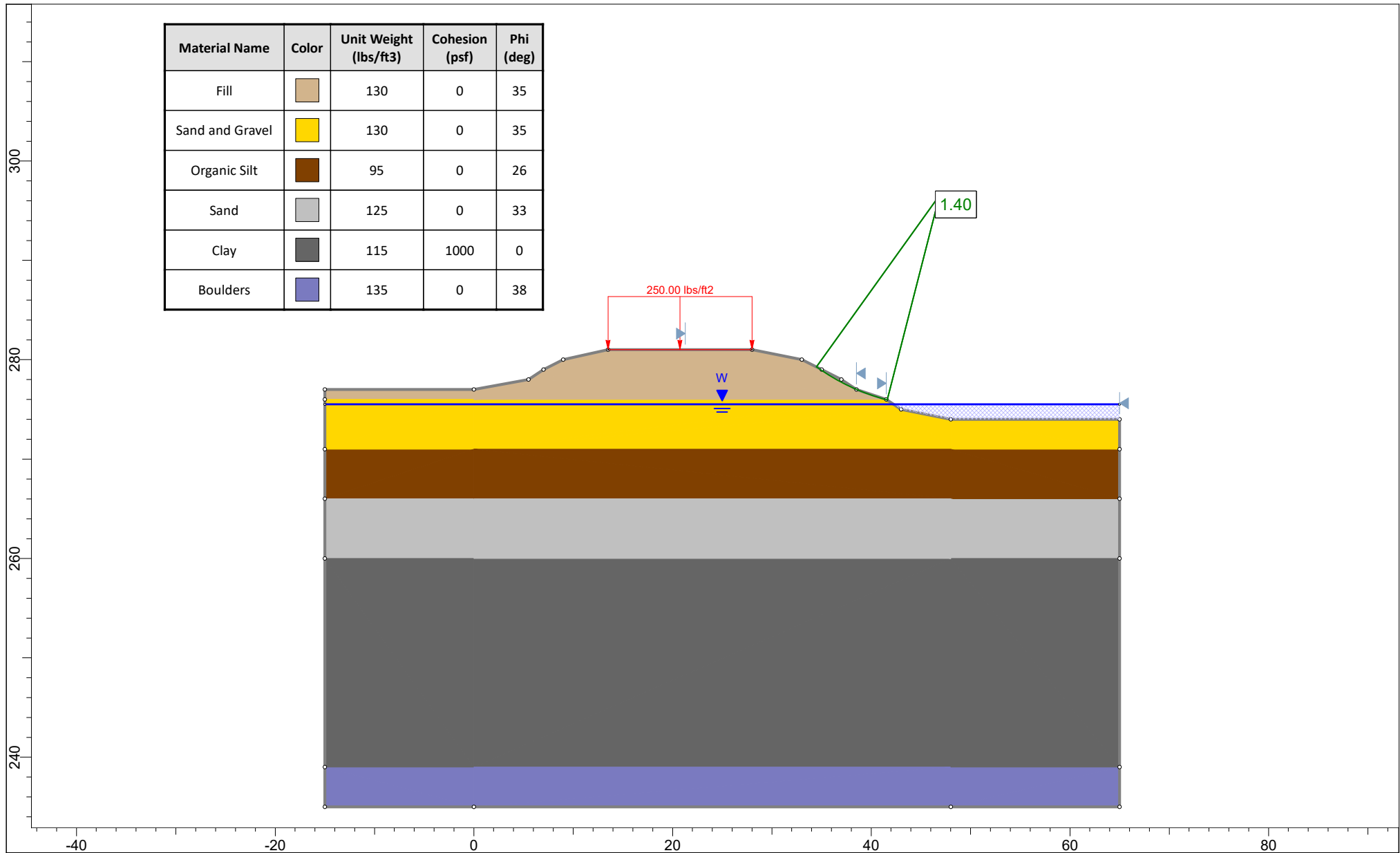
## **APPENDIX F.5 – Global Slope Stability**

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|                                                                                    |                               |  |       |                                   |
|------------------------------------------------------------------------------------|-------------------------------|--|-------|-----------------------------------|
|  | Project                       |  |       |                                   |
|                                                                                    | Watchic Bridge - Standish, ME |  |       |                                   |
|                                                                                    | Analysis Description          |  |       |                                   |
|                                                                                    | Global Slope Stability        |  |       |                                   |
| Drawn By                                                                           | BTW                           |  | Scale | 1:167                             |
|                                                                                    | Company                       |  | Nobis |                                   |
| Date                                                                               | 12/20/2017, 10:19:05 AM       |  |       | File Name                         |
|                                                                                    |                               |  |       | North Embankment - Global SS.slim |

| Material Name   | Color                                                                             | Unit Weight (lbs/ft3) | Cohesion (psf) | Phi (deg) |
|-----------------|-----------------------------------------------------------------------------------|-----------------------|----------------|-----------|
| Fill            |  | 130                   | 0              | 35        |
| Sand and Gravel |  | 130                   | 0              | 35        |
| Organic Silt    |  | 95                    | 0              | 26        |
| Sand            |  | 125                   | 0              | 33        |
| Clay            |  | 115                   | 1000           | 0         |
| Boulders        |  | 135                   | 0              | 38        |



|                      |                         |                               |                                   |
|----------------------|-------------------------|-------------------------------|-----------------------------------|
| Project              |                         | Watchic Bridge - Standish, ME |                                   |
| Analysis Description |                         | Global Slope Stability        |                                   |
| Drawn By             | BTW                     | Chk: KJ                       | Scale 1:160                       |
| Date                 | 12/20/2017, 10:19:05 AM |                               | Company Nobis                     |
|                      |                         | File Name                     | South Embankment - Global SS.slim |