GEOTECHNICAL DATA REPORT

NP VIIS 100(3), 102(1), Etc.
Subsurface Exploration in Virgin Islands National Park
St. John, U.S. Virgin Islands

Schnabel Reference No. 21C12019.00
September 7, 2021

Schnabel ENGINEERING

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September 7, 2021

Mr. Timothy J. Ramey, PE
WSP USA, Inc.
13530 Dulles Technology Drive
Suite 300
Herndon, Virginia 20171

Subject: **Geotechnical Data Report**
NP VIIS 100(3), 102(1), Etc.
Subsurface Exploration in Virgin Islands National Park
St. John, U.S. Virgin Islands
Schnabel Reference No.: 21C12019.00

Dear Mr. Ramey:

SCHNABEL ENGINEERING, LLC (Schnabel) is pleased to submit our geotechnical data report for this project. This report includes figures and appendices with relevant data collected for this study. This study was performed in accordance with our proposal dated May 21, 2021.

We appreciate the opportunity to be of service for this project. Please call us if you have any questions regarding this report.

Sincerely,

SCHNABEL ENGINEERING, LLC

Kevin R. Morgan, PE
Project Engineer

PROFESSIONAL ENGINEER
RICHARD H. WARGO
0-30160-1B
U.S. VIRGIN ISLANDS

Richard H. Wargo
Principal

Professional Certification. I hereby certify that these documents were prepared or approved by me, and that I am a duly licensed professional engineer under the laws of the U.S. Virgin Islands. License No.0-30160-1B, Expiration Date: 8/31/2022

KRM:RHW:EB

GEOTECHNICAL DATA REPORT
NP VIIS 100(3), 102(1), ETC.
SUBSURFACE EXPLORATION IN VIRIGIN ISLANDS NATIONAL PARK
ST. JOHN, U.S. VIRGIN ISLANDS
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Appendix C: Photo Log
Appendix D: USGS Geologic Map of St. John, U.S. Virgin Islands

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1.0 SCOPE OF SERVICES

Our Work Authorization dated July 23, 2021, authorized in accordance with our Master Services Agreement dated July 23, 2021, defines the scope of services for this project. The objective of this study was to evaluate the subsurface conditions at the site and provide a geotechnical data report containing the results of our study. This study was conducted under the supervision of a Professional Engineer registered in the U.S. Virgin Islands.

2.0 DESCRIPTION OF SITE

The project site is split into two separate locations on opposite sides of the island of St. John. One site is located on the southeastern side of the island along Lameshur Road and the other site is located on the northwestern side of the island along Lyne House Road (Salomon Bay Road). Both locations are within the Virgin Islands National Park. The test borings were performed at the locations shown on the plans included in Figures 1 through 3. This report presents the results of our field investigation, test boring logs, laboratory testing results, and a site map.

Prior to our investigation, the Island of St. John had received a lot of rain over the days leading up to our subsurface exploration. Specifically, within the area of the pavement borings (PB21-01 to PB21-07), there were many locations with ponding water. The roadway, where the pavement borings are located, has many large divots and potholes that have to be navigated through and around. The park employees on site indicated that these large divots and holes often pond with water after rain, and it usually takes days for the holes to dry up. Standing water can be seen in many of the pavement boring photos at the end of this report in Appendix C.

3.0 SUBSURFACE EXPLORATION

We performed a subsurface exploration to identify the subsurface stratigraphy underlying the site and to evaluate the geotechnical properties of the materials encountered. This program consisted of Standard Penetration Testing (SPT) test borings. Exploration methods used are discussed below. The appendices to this report contain the results of our exploration.

3.1 Test Borings

Our subcontractor, Jaca & Sierra of Trujillo Alto from Puerto Rico, drilled 11 test borings (PB21-01 through PB21-07, and BH21-01 through BH21-04) under our observation between July 30 and August 2, 2021. The Standard Penetration Test (SPT) was performed at selected depths in the borings. The drilled boring depths ranged between selected depths of 6.0 ft from the ground surface and auger refusal depths of 5.3 to 8.1 ft from the ground surface. Where auger refusal was encountered, a split spoon was also driven at the refusal depth to confirm SPT refusal.

Seven pavement borings (PB21-01 through PB21-07) were planned to depths of 5.0 ft each or auger refusal with Soil Penetration Test (SPT) samples collected at 1.0 and 3.0 ft depths. However, due to the design of the drill rig, we drilled to a depth of 6.0 ft instead and collected SPT samples continuously to termination. Pavement boring PB21-01 encountered refusal at approximately 5.3 ft below the ground surface.

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Four soil borings (BH21-01 through BH21-04) were planned to depths of 30 ft or auger refusal with SPT samples collected every at 2.5 ft intervals for the top 20 ft and at 5 ft intervals thereafter. However, due to the design of the rig, we planned to collect samples continuously for the top 20 ft. All the soil borings refused between 5.6 ft and 8.1 ft from the ground surface.

The table below indicates the boring location coordinates, approximate ground surface elevations, and the respective exploration depths.

Table 1: Test Boring Coordinates, Elevations, and Exploration Depths

Boring ID	Northing (ft)	Easting (ft)	Ground Surface Elevation (ft)	Exploration Depth (ft)
PB21-01	835131.287	1250655.219	5.0	5.3
PB21-02	835193.094	1250236.004	9.5	6.0
PB21-03	835489.382	1249881.884	9.0	6.0
PB21-04	835833.135	1249555.072	7.0	6.0
PB21-05	836018.436	1249176.330	9.0	6.0
PB21-06	835860.474	1248827.153	3.5	6.0
PB21-07	835733.043	1248597.348	2.5	6.0
BH21-01	843359.915	1226947.594	10.3	5.6
BH21-02	843344.158	1226850.980	11.5	7.1
BH21-03	842494.114	1225161.389	8.0	8.1
BH21-04	842493.338	1225115.272	8.5	5.6

Note: Boring coordinates were approximated from a handheld Garmin GPS 60 unit.

A CME-55 trailer-mounted rig was used to drill the borings. The borings were advanced by turning a continuous flight auger with a center opening of 2¼ inches. Cuttings were brought to the surface by the auger flights. Sampling was performed through the center opening in the hollow stem auger, by standard methods. No water was introduced into the boring using this procedure.

The Standard Penetration Test (SPT) was performed at selected depths in the borings following the standards of ASTM D1586 (AASHTO T206). The SPT N-values indicate the Standard Penetration Test resistances encountered in a particular layer as determined from the number of blows required to drive a 2-inch O.D., 1-3/8 inch I.D. sampling spoon one foot using a 140-pound hammer falling 30-inches. This test is conducted after seating the sampler six inches in the bottom of the hole according to ASTM D1586/AASHTO T206. The N-value is determined by adding the number of blows it takes to push the spoon the second and third 6-inch intervals together.

The SPT samples were obtained using a hydraulically driven automatic trip hammer (ATH). Most correlations with the SPT data are based on N-values collected with a safety hammer. Based on the information provided to us by our subcontractor Jaca & Sierra, the energy efficiency of the site-specific

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CME-55 ATH was observed to be about 0.86 on average. The hammer energy efficiency measurements were performed in 2020. Thus, the energy applied to the split-spoon sampler using the site-specific ATH is about 43 percent greater than that applied using the safety hammer, resulting in lower N-values. The hammer blows shown on the boring logs and cross sections are uncorrected for the higher energy.

It should be noted that we considered a hammer energy efficiency of 0.86 and a rod correction factor of 0.75 (lengths shorter than 10 ft) to define soil's relative density/consistency provided on the logs.

Once split spoons are removed from the augers, the split spoon is opened and the soil within is analyzed. This analysis in the field includes visual classification, measuring the length of soil recovered, using a pocket penetrometer if the soil appears to have cohesion. The soil recovered is then placed into a zip-lock bag which is labeled with the boring number, depth, date, and blow counts; sealed; and shipped to the soil's laboratory.

No rock coring was conducted during this investigation.

Soils were classified in accordance with ASTM D2487 and AASHTO M145. The ASTM D2487 group symbols (e.g., SM) and AASHTO M145 group symbols (e.g., A-2-4), indicated on the boring logs, are based on laboratory testing of recovered soil samples and visual observations. The material description considers both visual and laboratory classifications, and with laboratory classifications having precedence over the visual method. Criteria for soil classification are given in Appendix A.

Appendix A includes specific observations, remarks, and logs for the borings; classification criteria; drilling methods; and sampling protocols. Figures 1 through 3, included at the end of this report, indicate the approximate test boring locations. We will retain soil samples for 60 days after the issuance of the final report, per your request.

4.0 SOIL LABORATORY TESTING

Schnabel's soil laboratory in Columbia, South Carolina performed tests on selected samples obtained during the subsurface exploration. The testing aided in the classification of materials encountered in the subsurface exploration and provided data for use in the development of recommendations. The results of the laboratory tests are included in Appendix B and are summarized in Section 5.2 of this report. Selected test results are shown on the boring logs in Appendix A.

4.1 Index Testing

We performed index testing on soil samples collected as part of the exploration to provide soil classifications and to provide parameters for use with published correlations with soil properties. Index testing included performing natural moisture content (ASTM D2216 / AASHTO T265), Atterberg limits (ASTM D4318 / AASHTO T89 and T90), and gradation tests (ASTM D6913 / AASHTO T88) on bag and bulk samples. The results are presented in the Summary of Laboratory Tests in Appendix B and summarized in Section 5.2.

4.2 Compaction and CBR Testing

We performed Standard Proctor compaction (ASTM D698 / AASHTO T99) and California Bearing Ratio (ASTM D1883 / AASHTO T193) to evaluate compaction characteristics and to provide soil parameters for

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pavement design. The tests were performed on bulk samples from borings PB21-01, PB21-04, PB21-07, BH21-01, and BH21-04 representing the upper onsite soils (Stratum F and Stratum A). Bulk samples were obtained by spinning the auger of the drill rig at the desired depth and collecting the spoils in a bucket with a shovel. The bucket is then labeled with the boring number, depth, and date; sealed; and shipped to the soil's laboratory. The CBR specimen was compacted to 95% of maximum dry density determined from Standard Proctor compaction. A surcharge of 50 psf was applied to the specimen to simulate the pavement weight. The test results are included in Appendix B and are summarized in Section 5.2.

5.0 SUBSURFACE CONDITIONS

5.1 Generalized Geology

As part of the subsurface exploration study, we reviewed available geologic data, the test borings performed at the project site, and information in our files. We characterized the following generalized subsurface stratigraphy based on the exploration and laboratory test data included in the appendices. Based on this review, the upper soils at the site consist of probable Fill that is believed to be associated with previous development of the site. The natural soils below existing ground surface and the probable Fill consist of Coastal soils, which are typically Recent Geologic Age alluvial surficial deposits (Qs).

In the western portion of St. John (including the areas of BH21-01 through BH21-04), the underlying disintegrated rock and rock is from the Louisenhoj Formation (Kl), a strongly cemented volcanic conglomerate. In the southern portion of St. John (including the areas of PB21-01 through PB21-07), the underlying disintegrated rock and rock is from the Lameshur Volcanic-Intrusive Complex, formed of either Phenocryst-poor Keratophyre (Kwa) or Basalt/Basaltic Andesite (Kwl).

Disintegrated rock is defined as residual material with SPT N-values between 60 blows per foot and refusal. Refusal is defined as an N-value of 50 blows for a penetration of one inch or less.

The geological map of St. John, U.S. Virgin Islands is provided as Appendix D.

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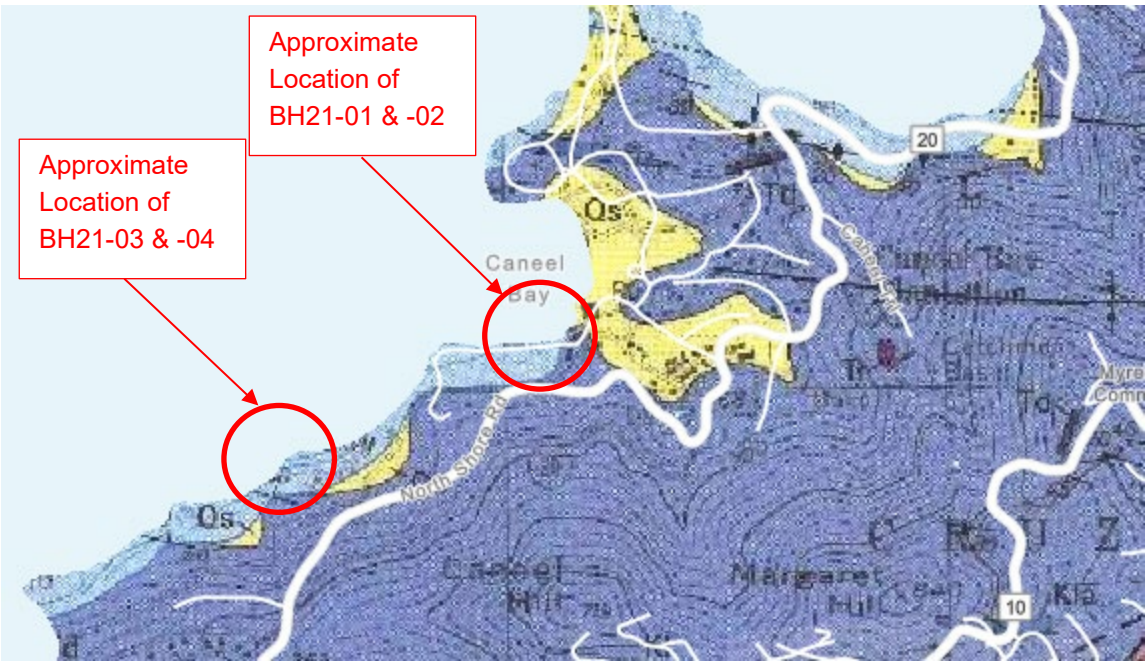
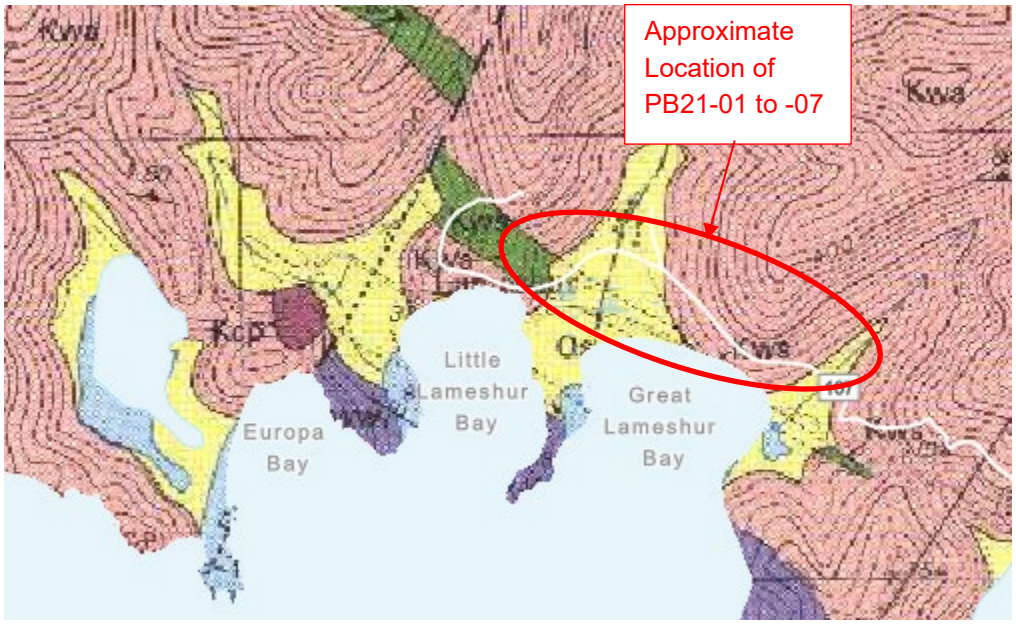


Qs: Surficial deposits; Kl: Louisenhoj Formation

Reference: Rankin, D.W. (2002). "Geology of St. John, U.S. Virgin Islands", U.S. Geological Survey.

Plate 1A: Geological Stratigraphy Classification at Lyne House Road (BH21-01 through BH21-04)



Qs: Surficial deposits; Kwa: Phenocryst-poor Keratophyre; Kwl: Basalt/Basaltic Andesite

Reference: Rankin, D.W. (2002). "Geology of St. John, U.S. Virgin Islands", U.S. Geological Survey.

Plate 1B: Geological Stratigraphy Classification at Lameshur Road (PB21-01 through PB21-07)

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5.2 Generalized Subsurface Stratigraphy

We characterized the following generalized subsurface stratigraphy based on the subsurface exploration and laboratory test data included in the appendices. The boring logs, included within Appendix A, also display the stratum classifications.

Table 2: Subsurface Stratigraphy at Lameshur Road (PB21-01 through PB21-07)

Material Type	Test Depth (ft)	Description
Stratum F (Probable Fill)	From Ground Surface to depths of up to 3.0 ft.	Sampled as: Silty, Clayey Sand with Gravel; light brown, brown (SC-SM) (A-2-4, A-1-b) Sandy Silt with Gravel; brown (ML) (A-7-6) Silty Sand with Gravel; light brown (SM) (A-1-b) Clayey Gravel with Sand; brown (GC) (A-2-4) Moisture Content: 3.3 to 13.1 % Liquid Limit: 20 to 47 Plasticity Index: 2 to 16 % Passing No. 200 Sieve: 19.4 to 54.1 % SPT N-Value: 7 to 50+ with an avg. of 39 blows per foot, bpf Relative Density: Loose to Very Dense
STRATUM A (Coastal)	Below Stratum F or from Ground Surface to termination depths of up to 6.0 ft.	Silty Sand with Gravel; brown (SM) (A-2-4) Clayey Sand; brown, dark brown, dark gray, brownish gray (SC) (A-2-4, A-2-7, A-6) Clayey Sand with Gravel; brown (SC) (A-2-4) Sandy Lean Clay; brownish gray (CL) (A-6) Moisture Content: 4.2 to 27.7 % Liquid Limit: 32 to 66 Plasticity Index: 13 to 50 % Passing No. 200 Sieve: 13.7 to 45.8 % SPT N-Value: 3 to 50+ with an avg. of 20 blows per foot, bpf Relative Density: Loose to Very Dense; Soft
STRATUM B (Disintegrated Rock)	Below Stratum A to refusal depth of 5.3 ft (only in PB21-01).	Sampled as: Silty Sand with Gravel; brown (SM) SPT N-Value = 50+ blows per foot, bpf Relative Density: Very Dense

It should be noted that prior to our subsurface investigation the island of St. John received a lot of rain over multiple days. This led to ponding water within multiple areas of the pavement borings (PB21-01 to PB21-07). Therefore, the natural moisture content of some of the samples within these borings may be higher than normal.

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Table 3: Subsurface Stratigraphy at Lyne House Road (BH21-01 through BH21-04)

Material Type	Test Depth (ft)	Description
Stratum F (Probable Fill)	From Ground Surface to depths of up to 2.0 ft.	Sampled as: Crushed Stone Clayey Sand; brown (SC) (A-2-4) Clayey Sand with Gravel; brown (SC) (A-2-7) Moisture Content: 4.2 to 10.2 % Liquid Limit: 26 to 48 Plasticity Index: 10 to 28 % Passing No. 200 Sieve: 29 % SPT N-Value: 6 to 50+ with an avg. of 41 blows per foot, bpf Relative Density: Loose to Very Dense
STRATUM A (Coastal)	Below Stratum F to depths of up to 7.0 ft.	Sampled as: Clayey Sand; light brown (SC) (A-2-7) Clayey Sand with Gravel; light brown, brown, (SC) (A-2-4, A-2-6) Silty, Clayey Sand with Gravel; brown (SC-SM) (A-1-b) Lean Clay with Sand; bluish gray (CL) (A-6) Silty Gravel with Sand; brown (GM) (A-7-5) Moisture Content: 3.5 to 23.7 % Liquid Limit: 24 to 47 Plasticity Index: 5 to 21 % Passing No. 200 Sieve: 17.6 to 37 % SPT N-Value = 11 to 50+ with an avg. of 31 blows per foot, bpf Relative Density: Medium Dense (Compact) to Very Dense; Stiff
STRATUM B (Disintegrated Rock)	Below Stratum A to refusal depths of up to 8.1 ft.	Sampled as: Silty Sand; brown (SM) Silty Sand with Gravel; brown (SM) Silty Gravel; brown and gray (GM) SPT N-Value: 50+ blows per foot, bpf Relative Density: Very Dense

We performed Standard Proctor compaction and CBR tests on three bulk samples representing Stratum F from Lameshur Road. The samples from the pavement borings PB21-01, PB21-04, and PB21-07 predominantly classified as Silty, Clayey Sand with Gravel (SC-SM), (A-2-4, A-2-4, and A-1-b, respectively). The compaction tests resulted in corrected maximum dry densities of 134, 131.3, and 130.1 pcf at corrected optimum moisture contents of 7.9, 9.1, and 9.7 percent, respectively. We obtained laboratory CBR values of 5.6, 8.1, and 7.2, with 0.1, 0.1, and 0 percent swell after submersion for four days, respectively.

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We performed Standard Proctor compaction and CBR tests on two bulk samples representing Stratum A and Stratum F from Lyne House Road. The samples from soil borings BH21-01 and BH21-04 predominantly classified as Clayey Sand with Gravel (SC) (A-2-6) and Clayey Sand (SC) (A-2-4), trace gravel, respectively. The compaction tests resulted in maximum dry densities of 123.2 and 125.8 pcf at optimum moisture contents of 12.8 and 11.2 percent, respectively. We obtained laboratory CBR values of 6.6 and 8.9, with 0.4 and 0.2 percent swell after submersion for four days, respectively.

5.3 Groundwater

The test boring logs in Appendix A include groundwater observations obtained during our subsurface exploration. These data include depths to groundwater encountered during drilling and upon drilling completion.

The majority of the borings at both project sites were observed to be dry during drilling.

Groundwater was observed in two of the borings (PB21-06 and PB21-07) located at Lameshur Road during drilling at approximately 5.5 ft below the ground surface.

Groundwater was observed in one of the borings (BH21-03) located at Lyne House Road during drilling at approximately 8.0 ft below the ground surface.

We did not obtain long-term water level readings since the test borings were backfilled upon completion for safety.

The groundwater levels on the logs indicate our estimate of the hydrostatic water table at the time of our subsurface exploration. Some of the water levels recorded on the logs may represent zones where groundwater is perched above a low permeability layer. The presence and elevation of perched groundwater may vary significantly with variations in weather conditions. The final design should anticipate the fluctuation of the hydrostatic water table depending on variations in precipitation, surface runoff, stream levels, tidal variations, and similar factors.

6.0 LIMITATIONS

This report has been prepared to aid in the evaluation of this site and to assist in the design and construction of the project. It is intended for use concerning this specific project. We performed a subsurface investigation consisting of soil borings at discrete locations and potentially significant variations in subsurface features may not be observed in the data. Hence the subsurface data observed and recorded at the test boring locations may vary depending on actual site conditions.

We have endeavored to complete the services identified herein in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing in the same locality and under similar conditions as this project. No other representation, express or implied, is included or intended, and no warranty or guarantee is included or intended in this report, or other instrument of service.

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FIGURES

Figure 1: Boring Location Plan – Pavement Borings PB21-01 through PB21-07
Figure 2: Boring Location Plan – Soil Borings BH21-01 and BH21-02
Figure 3: Boring Location Plan – Soil Borings BH21-03 and BH21-04
Figure 4: Subsurface Profile – Pavement Borings PB21-01 through PB21-07
Figure 5: Subsurface Profile – Soil Borings BH21-01 and BH21-02
Figure 6: Subsurface Profile – Soil Borings BH21-03 and BH21-04

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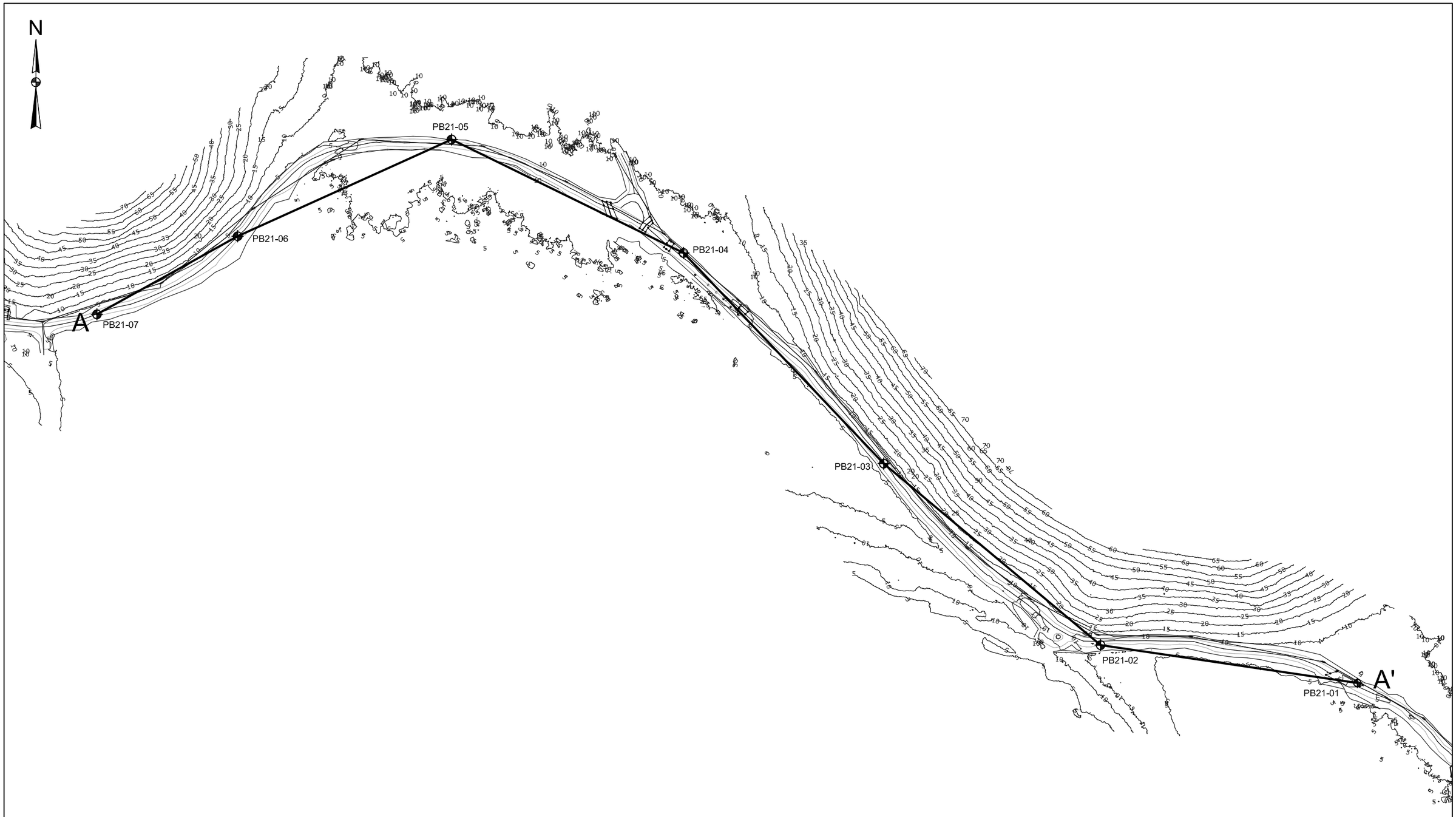

SCALE: 1"=150'

0 150' 300'

Source for Base Map: Federal Highway Administration

LEGEND

BORING LOCATION

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NP VIIS 100(3), 102(1), ETC. SUBSURFACE EXPLORATION IN VIRGIN ISLANDS NATIONAL PARK ST. JOHN, U.S. VIRGIN ISLANDS	DRAWN BY: CAB	DATE: 09/03/2021	BORING LOCATION PLAN PAVEMENT BORINGS PB21–01 THROUGH PB21–07
	CHECKED BY: KRM	SCALE: 1" = 150'	PROJECT NO. 21C12019.00 FIGURE 1

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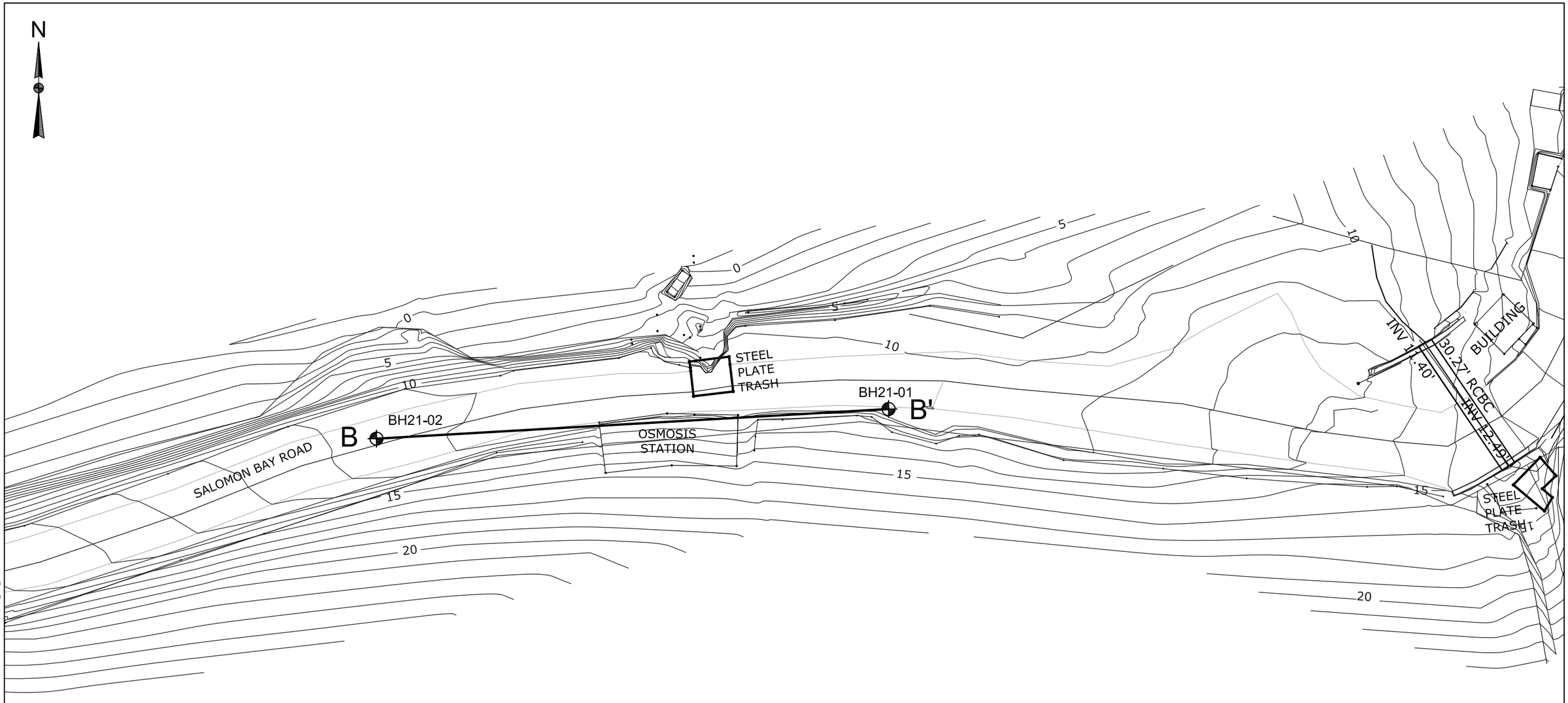

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Source for Base Map: Federal Highway Administration

LEGEND

BORING LOCATION

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SUBSURFACE EXPLORATION IN
VIRGIN ISLANDS NATIONAL PARK
ST. JOHN, U.S. VIRGIN ISLANDS

DRAWN BY: CAB	DATE: 09/03/2021	BORING LOCATION PLAN SOIL BORINGS BH21–01 & BH21–02
CHECKED BY: KRM	SCALE: 1" = 20'	PROJECT NO. 21C12019.00 FIGURE 2

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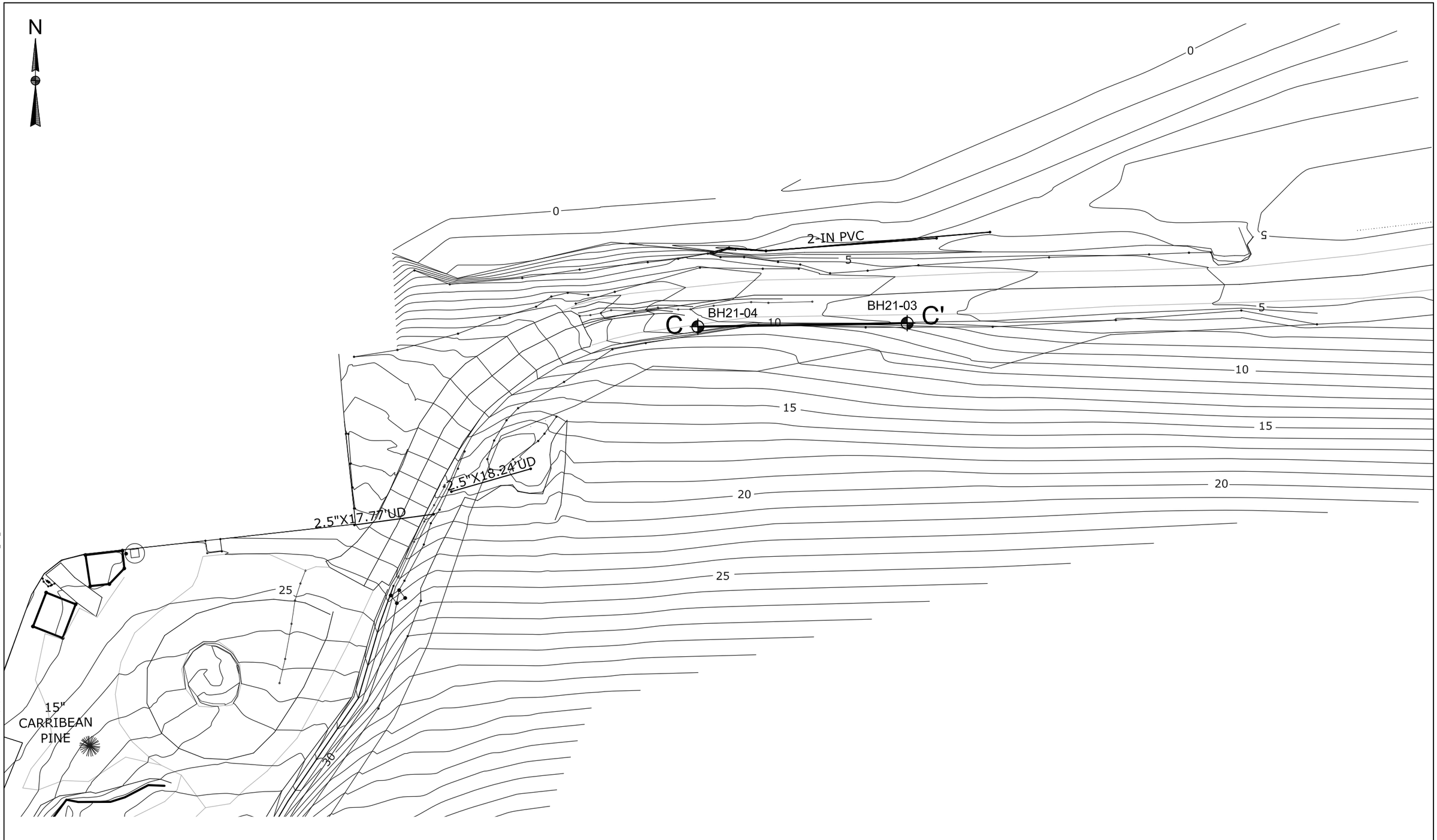
09/03/21 G:\2021 OTHER OFFICE PROJECTS\21C12019.00 EFL_ST. JOHN\03-SEPRODUCTS - COLUMBIA OFFICE\04-CAD\21C12019_BLP_FIGURE 2.DWG



SCALE: 1"=20'

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Source for Base Map: Federal Highway Administration

LEGEND

BORING LOCATION

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SUBSURFACE EXPLORATION IN
VIRGIN ISLANDS NATIONAL PARK
ST. JOHN, U.S. VIRGIN ISLANDS

DRAWN BY: CAB	DATE: 09/03/2021	BORING LOCATION PLAN SOIL BORINGS BH21–03 & BH21–04
CHECKED BY: KRM	SCALE: 1" = 20'	PROJECT NO. 21C12019.00 FIGURE 3

09/03/21

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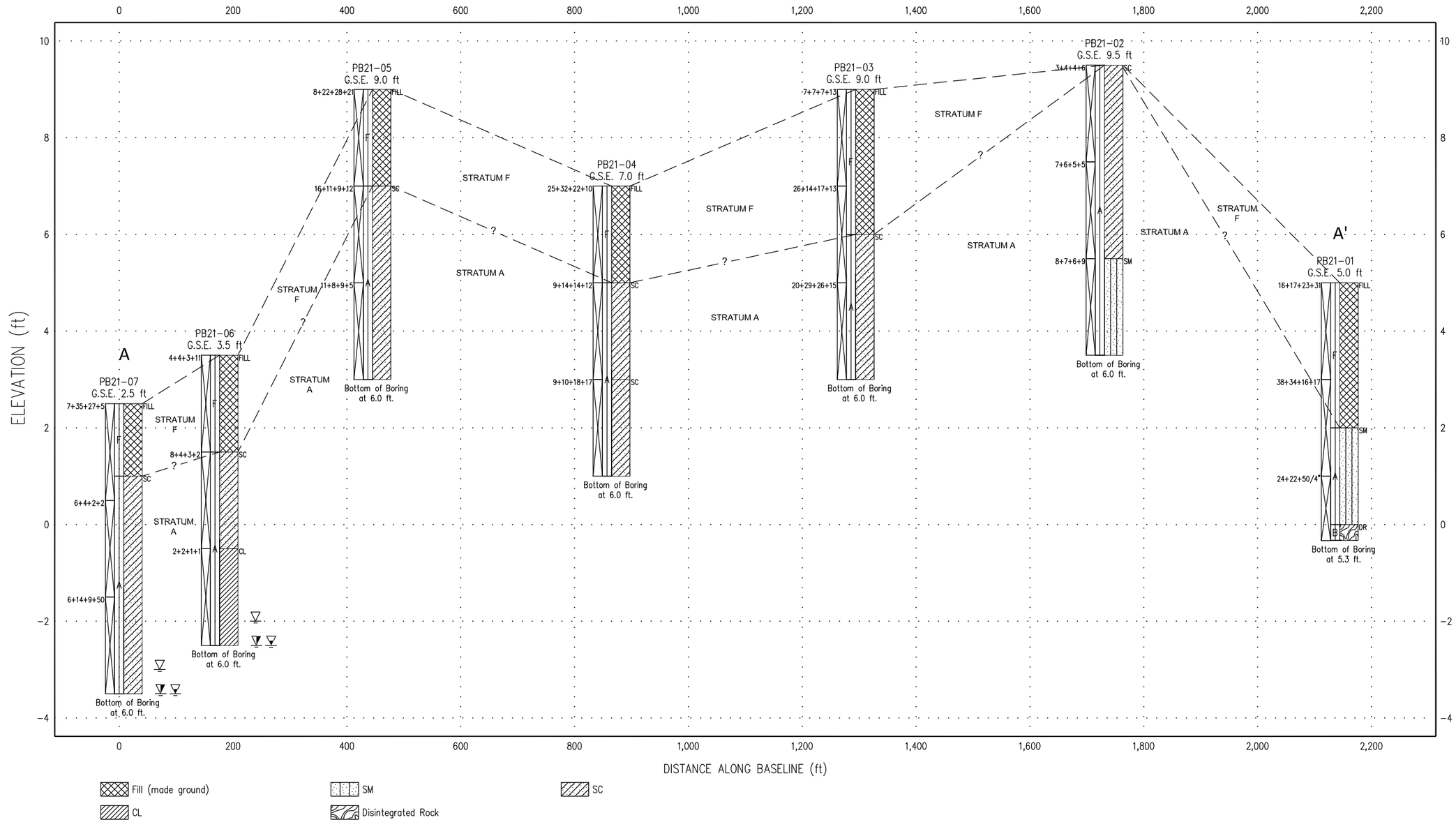

LEGEND:

- 6+4+2+2 — SPT SAMPLE LOCATION WITH NUMBER OF BLOWS IN EACH 6-INCH INCREMENT
- GROUNDWATER LEVEL ENCOUNTERED DURING DRILLING
- GROUNDWATER LEVEL AT COMPLETION
- GROUNDWATER LEVEL AFTER DRILLING
- CL — STRATUM DESIGNATION WITH USCS SYMBOL
- — — — — APPROXIMATE GROUND SURFACE BETWEEN BORINGS
- — — ? — — INTERPOLATED STRATUM BOUNDARY BETWEEN BORINGS

GENERAL NOTES

1. A DESCRIPTION OF THE STRATUM DESIGNATIONS IS PROVIDED IN THE REPORT TEXT.
2. THE LETTERS TO THE RIGHT OF THE BORING COLUMNS INDICATE THE USCS SOIL CLASSIFICATION.
3. A PLAN INDICATING THE LOCATION OF THE SUBSURFACE PROFILE ALIGNMENT BASELINE IS INCLUDED AS FIGURE 1.
4. THIS DRAWING CONTAINS INTERPRETATIONS OF TEST BORING DATA.
5. SCALE AS SHOWN.
6. BORINGS HAVE BEEN PROJECTED TO THE SUBSURFACE PROFILE.

Schnabel ENGINEERING	NP VIIS 100(3), 102(1), ETC. SUBSURFACE EXPLORATION IN VIRGIN ISLANDS NATIONAL PARK ST. JOHN, U.S. VIRGIN ISLANDS	DRAWN BY: CAB	DATE: 09/02/2021	BORING LOCATION PLAN PAVEMENT BORINGS PB21-01 THROUGH PB21-07
		CHECKED BY: RHW	SCALE: AS SHOWN	PROJECT NO. 21C12019.00 FIGURE 4

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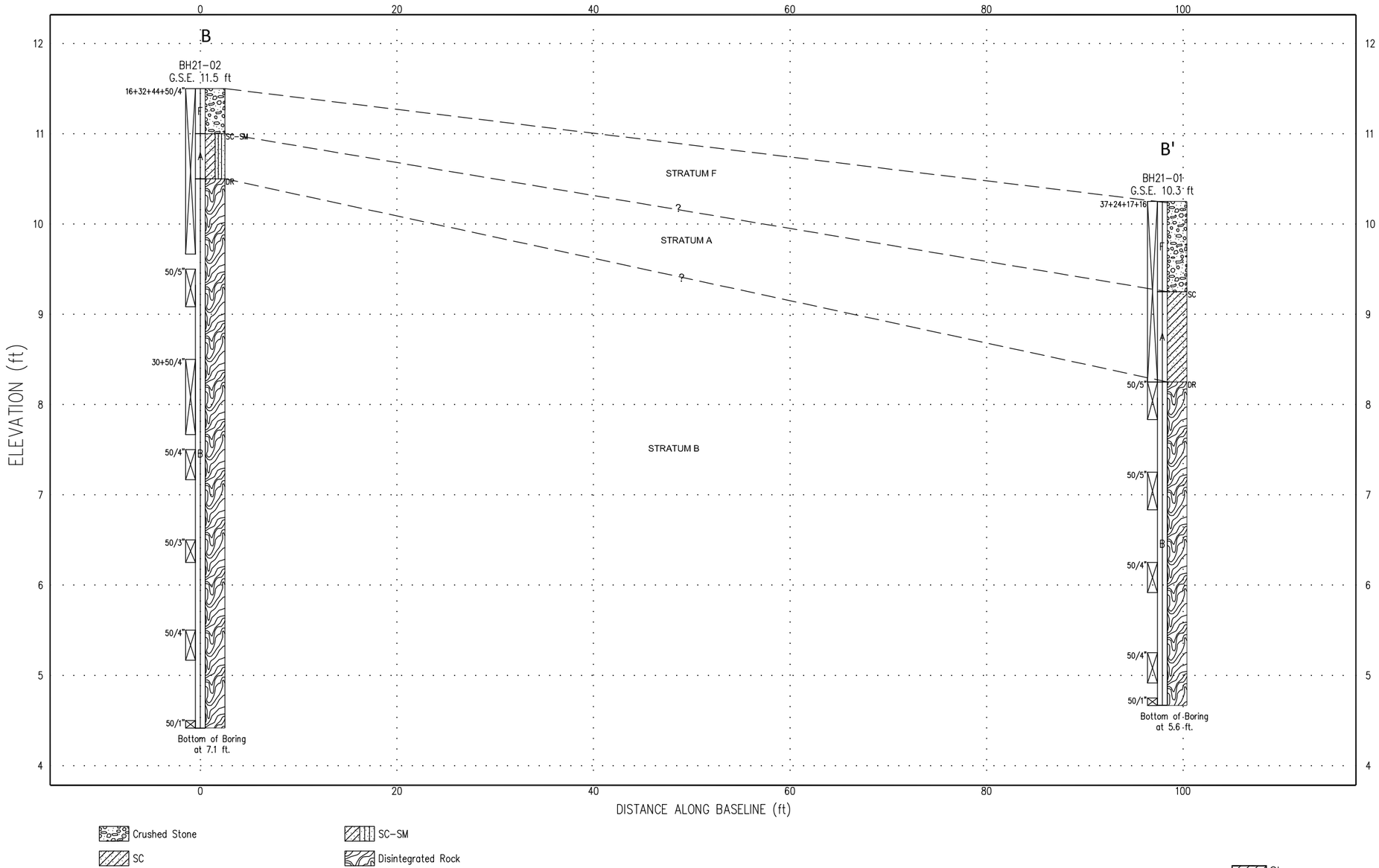

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1. A DESCRIPTION OF THE STRATUM DESIGNATIONS IS PROVIDED IN THE REPORT TEXT.
2. THE LETTERS TO THE RIGHT OF THE BORING COLUMNS INDICATE THE USCS SOIL CLASSIFICATION.
3. A PLAN INDICATING THE LOCATION OF THE SUBSURFACE PROFILE ALIGNMENT BASELINE IS INCLUDED AS FIGURE 2.
4. THIS DRAWING CONTAINS INTERPRETATIONS OF TEST BORING DATA.
5. SCALE AS SHOWN.
6. BORINGS HAVE BEEN PROJECTED TO THE SUBSURFACE PROFILE.

LEGEND:

6+4+2+2 ☒ SPT SAMPLE LOCATION WITH NUMBER OF BLOWS IN EACH 6-INCH INCREMENT

CL STRATUM DESIGNATION WITH USCS SYMBOL

— — — — APPROXIMATE GROUND SURFACE BETWEEN BORINGS

— — ? — — INTERPOLATED STRATUM BOUNDARY BETWEEN BORINGS

Schnabel ENGINEERING	NP VIIS 100(3), 102(1), ETC. SUBSURFACE EXPLORATION IN VIRGIN ISLANDS NATIONAL PARK ST. JOHN, U.S. VIRGIN ISLANDS	DRAWN BY: CAB	DATE: 09/02/2021	SUBSURFACE PROFILE SOIL BORINGS BH21-01 & BH21-02
		CHECKED BY: RHW	SCALE: AS SHOWN	PROJECT NO. 21C12019.00 FIGURE 5

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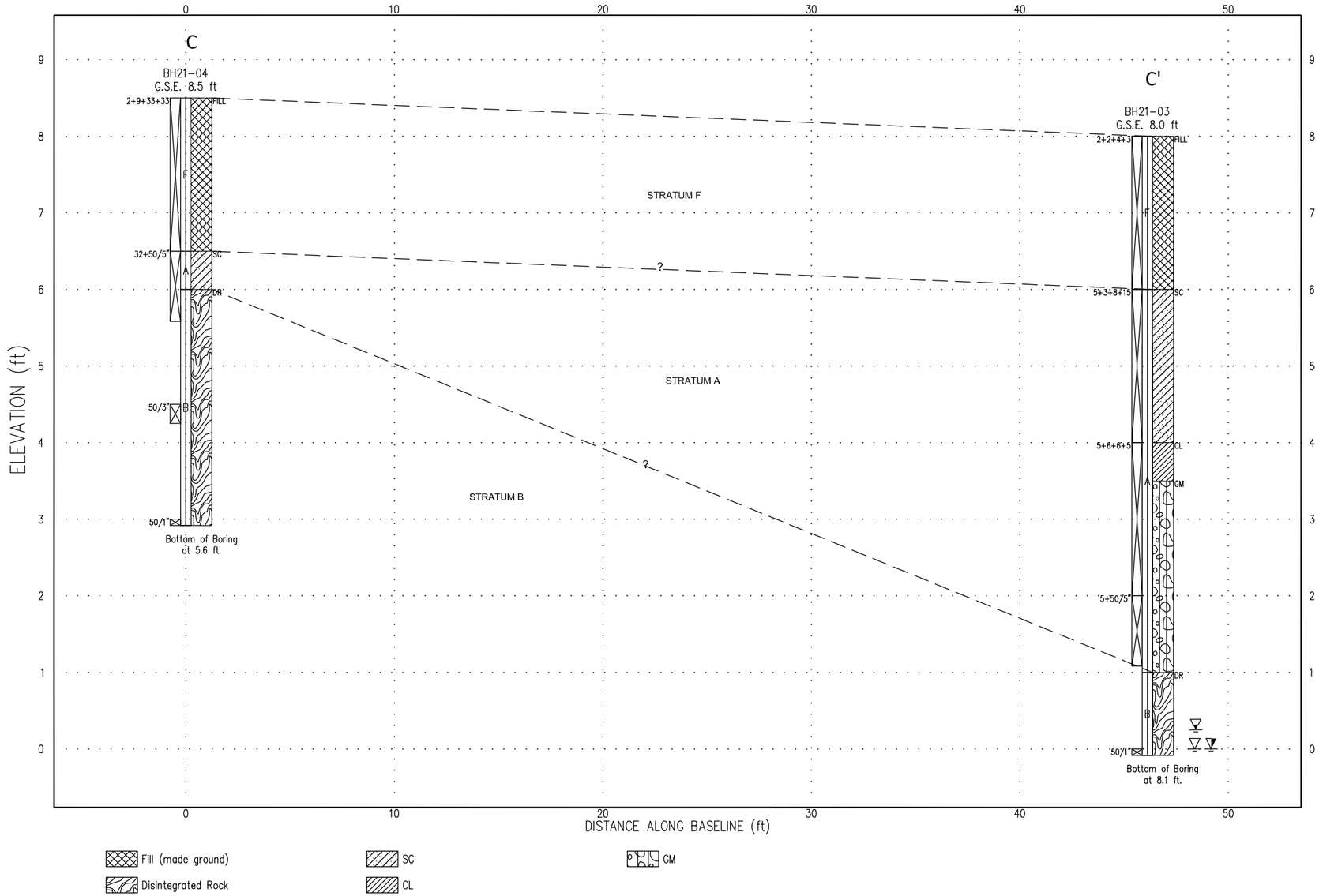
G:\2021 OTHER OFFICE PROJECTS\21C12019.00 EFL ST. JOHN\03-SEPRODUCTS - COLUMBIA OFFICE\04-CAD\21C12019.00 ST JOHNS PROFILES 09022021.DWG
09/02/21



LEGEND:

- 6+4+2+2 — SPT SAMPLE LOCATION WITH NUMBER OF BLOWS IN EACH 6-INCH INCREMENT
- GROUNDWATER LEVEL ENCOUNTERED DURING DRILLING
- GROUNDWATER LEVEL AT COMPLETION
- GROUNDWATER LEVEL AFTER DRILLING
- CL — STRATUM DESIGNATION WITH USCS SYMBOL
- APPROXIMATE GROUND SURFACE BETWEEN BORINGS
- ? — INTERPOLATED STRATUM BOUNDARY BETWEEN BORINGS

GENERAL NOTES

1. A DESCRIPTION OF THE STRATUM DESIGNATIONS IS PROVIDED IN THE REPORT TEXT.
2. THE LETTERS TO THE RIGHT OF THE BORING COLUMNS INDICATE THE USCS SOIL CLASSIFICATION.
3. A PLAN INDICATING THE LOCATION OF THE SUBSURFACE PROFILE ALIGNMENT BASELINE IS INCLUDED AS FIGURE 3.
4. THIS DRAWING CONTAINS INTERPRETATIONS OF TEST BORING DATA.
5. SCALE AS SHOWN.
6. BORINGS HAVE BEEN PROJECTED TO THE SUBSURFACE PROFILE.

Schnabel ENGINEERING	NP VIIS 100(3), 102(1), ETC. SUBSURFACE EXPLORATION IN VIRGIN ISLANDS NATIONAL PARK ST. JOHN, U.S. VIRGIN ISLANDS	DRAWN BY: CAB	DATE: 09/02/2021	SUBSURFACE PROFILE SOIL BORINGS BH21-03 & BH21-04
		CHECKED BY: RHW	SCALE: AS SHOWN	PROJECT NO. 21C12019.00 FIGURE 6

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G:\2021 OTHER OFFICE PROJECTS\21C12019.00 EFL ST. JOHN\03-SE\PRODUCTS - COLUMBIA OFFICE\04-CAD\21C12019.00 ST JOHNS PROFILES 09\22\21.DWG
09/02/21

APPENDIX A

SUBSURFACE EXPLORATION DATA

Subsurface Exploration Procedures
General Notes for Subsurface Exploration Logs
Identification of Soil – ASTM D2487 and AASHTO M145
Boring Logs, Pavement Borings PB21-01 through PB-21-07, and Soil Borings BH21-01 and BH21-04

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SUBSURFACE EXPLORATION PROCEDURES

Test Borings – Hollow Stem Augers

The borings are advanced by turning an auger with a center opening of 2¼ or 3¼ inches. A plug device blocks off the center opening while augers are advanced. Cuttings are brought to the surface by the auger flights. Sampling is performed through the center opening in the hollow stem auger by standard methods after removal of the plug. Usually, no water is introduced into the boring using this procedure.

Standard Penetration Test Results

The Standard Penetration Test (SPT) is performed in the borings at regular depth intervals to collect soil samples. The numbers in the Sampling Data column of the boring logs represent SPT results. Each number represents the blows needed to drive a 2-inch O.D., 1⅜-inch I.D. split-spoon sampler 6 inches, using a 140-pound hammer falling 30 inches. The sampler is typically driven a total of 18 or 24 inches. The first 6 inches are considered a seating interval. The total of the number of blows for the second and third 6-inch intervals is the SPT "N-value." The Standard Penetration Test is performed according to ASTM D1586 (AASHTO T206).

Soil Classification Criteria

The group symbols on the logs represent the Unified Soil Classification System Group Symbols (ASTM D2487) and AASHTO Soil Classification System Group Symbols (AASHTO M145) based on visual observation and limited laboratory testing of the samples. Criteria for visual identification of soil samples are included in this appendix. Some variation can be expected between samples visually classified and samples classified in the laboratory.

Boring Locations

Boring locations were located by Schnabel Engineering as shown on Figures 1 through 3. Boring coordinates were determined using a handheld Garmin GPS 60 unit, and are indicated on the boring logs. Locations should be considered no more accurate than the methods used to determine them.

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GENERAL NOTES FOR SUBSURFACE EXPLORATION LOGS

1. Numbers in sampling data column next to Standard Penetration Test (SPT) symbols indicate blows required to drive a 2-inch O.D., 1⅜-inch I.D. sampling spoon 6 inches using a 140 pound hammer falling 30 inches. The Standard Penetration Test (SPT) N value is the number of blows required to drive the sampler 12 inches, after a 6 inch seating interval. The Standard Penetration Test is performed in general accordance with ASTM D1586.
2. Visual classification of soil is in accordance with terminology set forth in “Identification of Soil.” The ASTM D2487 group symbols (e.g., CL) shown in the classification column are based on visual observations.
3. Estimated water levels indicated on the logs are only estimates from available data and may vary with precipitation, porosity of the soil, site topography, and other factors.
4. Refusal at the surface of rock, boulder, or other obstruction is defined as an SPT resistance of 100 blows for 2 inches or less of penetration.
5. The logs and related information depict subsurface conditions only at the specific locations and at the particular time when drilled or excavated. Soil conditions at other locations may differ from conditions occurring at these locations. Also, the passage of time may result in a change in the subsurface soil and water level conditions at the subsurface exploration location.
6. The stratification lines represent the approximate boundary between soil and rock types as obtained from the subsurface exploration. Some variation may also be expected vertically between samples taken. The soil profile, water level observations and penetration resistances presented on these logs have been made with reasonable care and accuracy and must be considered only an approximate representation of subsurface conditions to be encountered at the particular location.
7. Key to symbols and abbreviations:

S-1, SPT	Sample No., Standard Penetration Test
5+10+1+4	Number of blows in each 6-inch increment

MC	Moisture Content (percent)
LL	Liquid Limit
PL	Plastic Limit
DR	Disintegrated Rock
PP	Pocket Penetrometer
%Passing#200	Percent by weight passing a No. 200 Sieve

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IDENTIFICATION OF SOIL

I. DEFINITION OF SOIL GROUP NAMES (ASTM D2487)

			SYMBOL	GROUP NAME
Coarse-Grained Soils More than 50% retained on No. 200 sieve	Gravels – More than 50% of coarse fraction retained on No. 4 sieve Coarse, ¾" to 3" Fine, No. 4 to ¾"	Clean Gravels Less than 5% fines	GW	WELL GRADED GRAVEL
			GP	POORLY GRADED GRAVEL
		Gravels with fines More than 12% fines	GM	SILTY GRAVEL
			GC	CLAYEY GRAVEL
	Sands – 50% or more of coarse Fraction passes No. 4 sieve Coarse, No. 10 to No. 4 Medium, No. 40 to No. 10 Fine, No. 200 to No. 40	Clean Sands Less than 5% fines	SW	WELL GRADED SAND
			SP	POORLY GRADED SAND
		Sands with fines More than 12% fines	SM	SILTY SAND
			SC	CLAYEY SAND
Fine-Grained Soils 50% or more passes the No. 200 sieve	Silts and Clays – Liquid Limit less than 50 Low to medium plasticity	Inorganic	CL	LEAN CLAY
			ML	SILT
		Organic	OL	ORGANIC CLAY
				ORGANIC SILT
	Silts and Clays – Liquid Limit 50 or more Medium to high plasticity	Inorganic	CH	FAT CLAY
			MH	ELASTIC SILT
		Organic	OH	ORGANIC CLAY
				ORGANIC SILT
Highly Organic Soils	Primarily organic matter, dark in color and organic odor		PT	PEAT

II. DEFINITION OF SOIL COMPONENT PROPORTIONS (ASTM D2487)

			Examples
Adjective Form	GRAVELLY SANDY	>30% to <50% coarse grained component in a fine-grained soil	GRAVELLY LEAN CLAY
	CLAYEY SILTY	>12% to <50% fine grained component in a coarse-grained soil	SILTY SAND
"With"	WITH GRAVEL WITH SAND	>15% to <30% coarse grained component in a fine-grained soil	FAT CLAY WITH GRAVEL
	WITH GRAVEL WITH SAND	>15% to <50% coarse grained component in a coarse-grained soil	POORLY GRADED GRAVEL WITH SAND
	WITH SILT WITH CLAY	>5% to <12% fine grained component in a coarse-grained soil	POORLY GRADED SAND WITH SILT

III. GLOSSARY OF MISCELLANEOUS TERMS

SYMBOLS ..... Unified Soil Classification Symbols are shown above as group symbols. A dual symbol "-" indicates the soil belongs to two groups. A borderline symbol "/" indicates the soil belongs to two possible groups.

FILL ..... Man-made deposit containing soil, rock and often foreign matter.

PROBABLE FILL ..... Soils that contain no visually detected foreign matter but which are suspect with regard to origin.

DISINTEGRATED ROCK (DR) ..... Residual materials with a standard penetration resistance (SPT) between 60 blows per foot and refusal. Refusal is defined as an SPT of 100 blows for 2" or less penetration.

PARTIALLY WEATHERED ROCK (PWR)..... Residual materials with a standard penetration resistance (SPT) between 100 blows per foot and refusal. Refusal is defined as an SPT of 100 blows for 2" or less penetration.

BOULDERS & COBBLES..... Boulders are considered rounded pieces of rock larger than 12 inches, while cobbles range from 3 to 12-inch size.

LENSES..... 0 to ½-inch seam within a material in a test pit.

LAYERS ..... ½ to 12-inch seam within a material in a test pit.

POCKET..... Discontinuous body within a material in a test pit.

MOISTURE CONDITIONS..... Wet, moist or dry to indicate visual appearance of specimen.

COLOR..... Overall color, with modifiers such as light to dark or variation in coloration.

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IV. AASHTO SOIL CLASSIFICATION (AASHTO M145)

General Classification	Granular Materials (35% or less passing the 0.075 mm sieve)							Silt-Clay Materials (More than 35% passing the 0.075 mm sieve)			
Group Classification	A-1		A-3	A-2				A-4	A-5	A-6	A-7
	A-1-a	A-1-b		A-2-4	A-2-5	A-2-6	A-2-7				A-7-5 A-7-6
Sieve Analysis, % passing:											
2.00 mm (No. 10)	≤ 50	—	—	—	—	—	—	—	—	—	—
0.425 (No. 40)	≤ 30	≤ 50	≥ 51	—	—	—	—	—	—	—	—
0.075 (No. 200)	≤ 15	≤ 25	≤ 10	≤ 35	≤ 35	≤ 35	≤ 35	≥ 36	≥ 36	≥ 36	≥ 36
Characteristics of fraction passing 0.425 mm (No. 40):											
Liquid Limit	—		—	≤ 40	≥ 41	≤ 40	≥ 41	≤ 40	≥ 41	≤ 40	≥ 41
Plasticity Index	6 max		N.P.	≤ 10	≤ 10	≥ 11	≥ 11	≤ 10	≤ 10	≥ 11	≥ 11
Usual types of significant constituent materials	stone fragments, gravel and sand		fine sand	silty or clayey gravel and sand				silty soils		clayey soils	
General rating as a subgrade	excellent to good							fair to poor			

Plasticity index of A-7-5 subgroup is equal to or less than the LL - 30. Plasticity index of A-7-6 subgroup is greater than LL – 30.

NP = Non-Plastic (use “0”). Symbol “—” means that the particular sieve analysis is not considered for that classification.

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Schnabel ENGINEERING	TEST BORING LOG	Project: NP VIIS 100(3), 102(1), Etc. Subsurface Exploration in Virgin Islands National Park St. John, U.S. Virgin Islands	Boring Number: **PB21-01** Contract Number: 21C12019.00 Sheet: 1 of 1

Contractor: Jaca & Sierra
Trujilo Alto, Puerto Rico

Contractor Foreman: S. Perez

Schnabel Representative: K. Morgan

Equipment: CME-55 (Trailer)

Method: 2-1/4" I.D. Hollow Stem Auger

Hammer Type: Auto Hammer (140 lb)

Dates Started: 7/30/21 **Finished:** 7/30/21

North: 835131.287 ft **East:** 1250655.219 ft **By:** Handheld GPS

Ground Surface Elevation: 5.0 (ft) **Total Depth:** 5.3 ft

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered	7/30	---	Dry	---	---
Completion	7/30	---	Dry	---	5.3'
After Drilling	7/30	---	Dry	---	5.3'

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING DEPTH	SAMPLING DATA	TESTS	REMARKS
	PROBABLE FILL, sampled as silty, clayey sand with gravel, fine to medium grained sand; moist, brown, dense to very dense, (A-2-4)	FILL		F		S-01, SPT 16+17+23+31 REC=21", 88% S-02, SPT 38+34+16+17 REC=12", 50%	LL = 22 PL = 17 MC = 4.1% % Passing #200 = 27.1	Bulk Sample Obtained from 0.0 to 3.0 ft.
3.0	SILTY SAND WITH GRAVEL, fine to medium grained sand; moist, brown, very dense, probable COASTAL material, (A-2-4)	SM	2.0	A		S-03, SPT 24+22+50/4" REC=12", 75%		
5.0	DISINTEGRATED ROCK, sampled as silty sand with gravel, fine to medium grained sand; dry, brown, very dense	DR	0.0	B	5			
5.3			-0.3					

Bottom of Boring at 5.3 ft.
Boring terminated at auger refusal.
Boring backfilled with cuttings upon completion.

Schnabel ENGINEERING	TEST BORING LOG	Project: NP VIIS 100(3), 102(1), Etc. Subsurface Exploration in Virgin Islands National Park St. John, U.S. Virgin Islands	Boring Number: **PB21-02** Contract Number: 21C12019.00 Sheet: 1 of 1

Contractor: Jaca & Sierra
Trujilo Alto, Puerto Rico

Contractor Foreman: S. Perez

Schnabel Representative: K. Morgan

Equipment: CME-55 (Trailer)

Method: 2-1/4" I.D. Hollow Stem Auger

Hammer Type: Auto Hammer (140 lb)

Dates Started: 7/30/21 **Finished:** 7/30/21

North: 835193.094 ft **East:** 1250236.004 ft **By:** Handheld GPS

Ground Surface Elevation: 9.5 (ft) **Total Depth:** 6.0 ft

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered	7/30	---	Dry	---	---
Completion	7/30	---	Dry	---	6.0'
After Drilling	7/30	---	Dry	---	6.0'

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING DEPTH	SAMPLING DATA	TESTS	REMARKS
	CLAYEY SAND, fine to medium grained sand; dry, dark brown, trace gravel, loose to compact, probable COASTAL material, (A-2-7)	SC		A		S-01, SPT 3+4+4+6 REC=17", 71%	LL = 66 PL = 16 MC = 5.3% % Passing #200 = 13.7	
						S-02, SPT 7+6+5+5 REC=16", 67%		
4.0	SILTY SAND WITH GRAVEL, fine to medium grained sand; dry, brown, compact, (A-2-4)	SM	5.5			S-03, SPT 8+7+6+9 REC=18", 75%		
					5			
6.0			3.5					

Bottom of Boring at 6.0 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

Schnabel ENGINEERING	TEST BORING LOG	Project: NP VIIS 100(3), 102(1), Etc. Subsurface Exploration in Virgin Islands National Park St. John, U.S. Virgin Islands	Boring Number: **PB21-03** Contract Number: 21C12019.00 Sheet: 1 of 1

Contractor: Jaca & Sierra
Trujilo Alto, Puerto Rico

Contractor Foreman: S. Perez

Schnabel Representative: K. Morgan

Equipment: CME-55 (Trailer)

Method: 2-1/4" I.D. Hollow Stem Auger

Hammer Type: Auto Hammer (140 lb)

Dates Started: 7/30/21 **Finished:** 7/30/21

North: 835489.382 ft **East:** 1249881.884 ft **By:** Handheld GPS

Ground Surface Elevation: 9.0 (ft) **Total Depth:** 6.0 ft

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered	7/30	---	Dry	---	---
Completion	7/30	---	Dry	---	6.0'
After Drilling	7/30	---	Dry	---	6.0'

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING DEPTH	SAMPLING DATA	TESTS	REMARKS
	PROBABLE FILL, sampled as sandy silt with gravel, fine to medium grained sand; moist, brown, stiff to very stiff, (A-7-5)	FILL		F		S-01, SPT 7+7+7+13 REC=22", 92%	LL = 47 PL = 31 MC = 13.1% % Passing #200 = 54.1 PP = 4.50 tsf	
						S-02, SPT 26+14+17+13 REC=4", 17%	PP = 4.50 tsf	
3.0	CLAYEY SAND WITH GRAVEL, fine to medium grained sand; moist, brown, very dense, probable COASTAL material, (A-2-4)	SC	6.0	A		S-03, SPT 20+29+26+15 REC=5", 21%		
					5			
6.0			3.0					

Bottom of Boring at 6.0 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

Schnabel ENGINEERING	TEST BORING LOG	Project: NP VIIS 100(3), 102(1), Etc. Subsurface Exploration in Virgin Islands National Park St. John, U.S. Virgin Islands	Boring Number: **PB21-04** Contract Number: 21C12019.00 Sheet: 1 of 1

Contractor: Jaca & Sierra
Trujilo Alto, Puerto Rico

Contractor Foreman: S. Perez

Schnabel Representative: K. Morgan

Equipment: CME-55 (Trailer)

Method: 2-1/4" I.D. Hollow Stem Auger

Hammer Type: Auto Hammer (140 lb)

Dates Started: 7/30/21 **Finished:** 7/30/21

North: 835833.135 ft **East:** 1249555.072 ft **By:** Handheld GPS

Ground Surface Elevation: 7.0 (ft) **Total Depth:** 6.0 ft

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered	7/30	---	Dry	---	---
Completion	7/30	---	Dry	---	6.0'
After Drilling	7/30	---	Dry	---	6.0'

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING DEPTH	SAMPLING DATA	TESTS	REMARKS
	PROBABLE FILL, sampled as silty, clayey sand with gravel, fine to medium grained sand; moist, light brown, very dense, (A-1-b)	FILL		F		S-01, SPT 25+32+22+10 REC=19", 79%	LL = 24 PL = 20 MC = 7.4% % Passing #200 = 19.4	Bulk Sample Obtained from 0.0 to 2.0 ft.
2.0	CLAYEY SAND, fine to medium grained sand; moist, brown, trace gravel, dense, probable COASTAL material, (A-2-4)	SC	5.0			S-02, SPT 9+14+14+12 REC=17", 71%		
4.0	CLAYEY SAND WITH GRAVEL, fine to medium grained sand; moist, brown, dense, (A-2-4)	SC	3.0	A	5	S-03, SPT 9+10+18+17 REC=16", 67%		
6.0			1.0					

Bottom of Boring at 6.0 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

Schnabel ENGINEERING	TEST BORING LOG	Project: NP VIIS 100(3), 102(1), Etc. Subsurface Exploration in Virgin Islands National Park St. John, U.S. Virgin Islands	Boring Number: **PB21-05** Contract Number: 21C12019.00 Sheet: 1 of 1

Contractor: Jaca & Sierra
Trujilo Alto, Puerto Rico

Contractor Foreman: S. Perez

Schnabel Representative: K. Morgan

Equipment: CME-55 (Trailer)

Method: 2-1/4" I.D. Hollow Stem Auger

Hammer Type: Auto Hammer (140 lb)

Dates Started: 7/30/21 **Finished:** 7/30/21

North: 836018.436 ft **East:** 1249176.33 ft **By:** Handheld GPS

Ground Surface Elevation: 9.0 (ft) **Total Depth:** 6.0 ft

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered	7/30	---	Dry	---	---
Completion	7/30	---	Dry	---	6.0'
After Drilling	7/30	---	Dry	---	6.0'

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING DEPTH	SAMPLING DATA	TESTS	REMARKS
	PROBABLE FILL, sampled as silty sand with gravel, fine to medium grained sand; dry, light brown, very dense, (A-1-b)	FILL		F		S-01, SPT 8+22+28+21 REC=22", 92%	LL = 20 PL = 18 MC = 3.3% % Passing #200 = 20.9	
2.0	CLAYEY SAND, fine to medium grained sand; dry, brown, trace gravel, compact, probable COASTAL material, (A-2-4)	SC	7.0	A		S-02, SPT 16+11+9+12 REC=16", 67%	MC = 4.2% PP = 4.50 tsf	
					5	S-03, SPT 11+8+9+5 REC=8", 33%		
6.0			3.0					

Bottom of Boring at 6.0 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

Schnabel ENGINEERING	TEST BORING LOG	Project: NP VIIS 100(3), 102(1), Etc. Subsurface Exploration in Virgin Islands National Park St. John, U.S. Virgin Islands	Boring Number: **PB21-06** Contract Number: 21C12019.00 Sheet: 1 of 1

Contractor: Jaca & Sierra
Trujilo Alto, Puerto Rico

Contractor Foreman: S. Perez

Schnabel Representative: K. Morgan

Equipment: CME-55 (Trailer)

Method: 2-1/4" I.D. Hollow Stem Auger

Hammer Type: Auto Hammer (140 lb)

Dates Started: 7/30/21 **Finished:** 7/30/21

North: 835860.474 ft **East:** 1248827.153 ft **By:** Handheld GPS

Ground Surface Elevation: 3.5 (ft) **Total Depth:** 6.0 ft

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered	7/30	---	5.5'	---	---
Completion	7/30	---	6.0'	---	6.0'
After Drilling	7/30	---	6.0'	---	6.0'

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING DEPTH	SAMPLING DATA	TESTS	REMARKS
	PROBABLE FILL, sampled as clayey gravel with sand, fine to medium grained sand; moist, brown, loose, (A-2-4)	FILL		F		S-01, SPT 4+4+3+11 REC=13", 54%	LL = 28 PL = 19 MC = 6.9% % Passing #200 = 25.0	
2.0	CLAYEY SAND, fine to medium grained sand; moist, brownish gray, trace gravel, loose, probable COASTAL material, (A-6)	SC	1.5			S-02, SPT 8+4+3+2 REC=20", 83%	LL = 32 PL = 17 MC = 16.5% % Passing #200 = 45.8 PP = 0.50 tsf	
4.0	SANDY LEAN CLAY; brownish gray, trace gravel, soft, (A-6)	CL	-0.5	A	5	S-03, SPT 2+2+1+1 REC=8", 33%	MC = 27.7% PP = 0.25 tsf	
	Change: wet							
6.0			-2.5					

Bottom of Boring at 6.0 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

Schnabel ENGINEERING **TEST BORING LOG**

Project: NP VIIS 100(3), 102(1), Etc. Subsurface Exploration in Virgin Islands National Park
St. John, U.S. Virgin Islands

Boring Number: **PB21-07**
Contract Number: 21C12019.00
Sheet: 1 of 1

Contractor: Jaca & Sierra
Trujilo Alto, Puerto Rico
Contractor Foreman: S. Perez
Schnabel Representative: K. Morgan
Equipment: CME-55 (Trailer)
Method: 2-1/4" I.D. Hollow Stem Auger
Hammer Type: Auto Hammer (140 lb)
Dates Started: 7/30/21 **Finished:** 7/30/21
North: 835733.043 ft **East:** 1248597.348 ft **By:** Handheld GPS
Ground Surface Elevation: 2.5 (ft) **Total Depth:** 6.0 ft

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered	7/30	---	5.5'	---	---
Completion	7/30	---	6.0'	---	6.0'
After Drilling	7/30	---	6.0'	---	6.0'

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING DEPTH	SAMPLING DATA	TESTS	REMARKS
	PROBABLE FILL, sampled as silty, clayey sand with gravel, fine to medium grained sand; light brown, very dense, (A-2-4)	FILL		F		S-01, SPT 7+35+27+5 REC=14", 58%	LL = 23 PL = 18 MC = 8.9% % Passing #200 = 35.1	Bulk Sample Obtained from 0.0 to 1.5 ft.
1.5	CLAYEY SAND, fine to medium grained sand; moist, brown, trace gravel, loose to compact, probable COASTAL material, (A-2-6)		1.0			S-02, SPT 6+4+2+2 REC=10", 42%	LL = 36 PL = 23 MC = 22.0% % Passing #200 = 33.8	
	Change: dark gray							
	Change: brown	SC		A		S-03, SPT 6+14+9+50 REC=16", 67%	MC = 7.5%	
					5			
	Change: wet							
6.0			-3.5					

Bottom of Boring at 6.0 ft.
Boring terminated at selected depth.
Boring backfilled with cuttings upon completion.

Schnabel ENGINEERING	TEST BORING LOG	Project: NP VIIS 100(3), 102(1), Etc. Subsurface Exploration in Virgin Islands National Park St. John, U.S. Virgin Islands	Boring Number: **BH21-01** Contract Number: 21C12019.00 Sheet: 1 of 1

Contractor: Jaca & Sierra
Trujilo Alto, Puerto Rico

Contractor Foreman: S. Perez

Schnabel Representative: K. Morgan

Equipment: CME-55 (Trailer)

Method: 2-1/4" I.D. Hollow Stem Auger

Hammer Type: Auto Hammer (140 lb)

Dates Started: 8/2/21 **Finished:** 8/2/21

North: 843359.915 ft **East:** 1226947.594 ft **By:** Handheld GPS

Ground Surface Elevation: 10.3 (ft) **Total Depth:** 5.6 ft

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered	8/2	---	Dry	---	---
Completion	8/2	---	Dry	---	5.5'
After Drilling	8/2	---	Dry	---	5.5'

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING DEPTH	SAMPLING DATA	TESTS	REMARKS
	Crushed stone; dense, (12-inches)			F		S-01, SPT 37+24+17+16 REC=21", 88%		
1.0	CLAYEY SAND WITH GRAVEL, fine to medium grained sand; dry, brown, compact, probable COASTAL material, (A-2-6)	SC	9.3	A			LL = 27 PL = 19 MC = 3.8% % Passing #200 = 35.2	Bulk Sample Obtained from 0.0 to 2.0 ft.
2.0	DISINTEGRATED ROCK, sampled as silty sand, fine to medium grained sand; dry, brown, trace gravel, very dense	DR	8.3	B		S-02, SPT 50/5" REC=4", 80%		
						S-03, SPT 50/5" REC=4", 80%		
						S-04, SPT 50/4" REC=4", 100%		
					5	S-05, SPT 50/4" REC=3", 75%		
5.6			4.7			S-06, SPT 50/1" REC=1", 100%		

Bottom of Boring at 5.6 ft.
Boring terminated at auger refusal.
Boring backfilled with cuttings upon completion.

Schnabel ENGINEERING	TEST BORING LOG	Project: NP VIIS 100(3), 102(1), Etc. Subsurface Exploration in Virgin Islands National Park St. John, U.S. Virgin Islands	Boring Number: **BH21-02** Contract Number: 21C12019.00 Sheet: 1 of 1

Contractor: Jaca & Sierra
Trujilo Alto, Puerto Rico

Contractor Foreman: S. Perez

Schnabel Representative: K. Morgan

Equipment: CME-55 (Trailer)

Method: 2-1/4" I.D. Hollow Stem Auger

Hammer Type: Auto Hammer (140 lb)

Dates Started: 8/2/21 **Finished:** 8/2/21

North: 843344.158 ft **East:** 1226850.98 ft **By:** Handheld GPS

Ground Surface Elevation: 11.5 (ft) **Total Depth:** 7.1 ft

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered	8/2	---	Dry	---	---
Completion	8/2	---	Dry	---	5.0'
After Drilling	8/2	---	Dry	---	5.0'

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING DEPTH	SAMPLING DATA	TESTS	REMARKS
	Crushed stone; very dense, (6-inches)			F		S-01, SPT 16+32+44+50/4" REC=22", 100%		
0.5	SILTY, CLAYEY SAND WITH GRAVEL, fine to medium grained sand; dry, brown, very dense, probable COASTAL material, (A-1-b)	SC-SM	11.0	A			LL = 24 PL = 19 MC = 3.5% % Passing #200 = 17.6	
1.0	DISINTEGRATED ROCK, sampled as silty sand with gravel, fine to medium grained sand; dry, brown, very dense		10.5			S-02, SPT 50/5" REC=4", 80%		
						S-03, SPT 30+50/4" REC=7", 70%		
		DR		B		S-04, SPT 50/4" REC=3", 75%		
					5	S-05, SPT 50/3" REC=3", 100%		
						S-06, SPT 50/4" REC=3", 75%		
7.1			4.4			S-07, SPT 50/1" REC=1", 100%		

Bottom of Boring at 7.1 ft.
Boring terminated at auger refusal.
Boring backfilled with cuttings upon completion.

Schnabel ENGINEERING	TEST BORING LOG	Project: NP VIIS 100(3), 102(1), Etc. Subsurface Exploration in Virgin Islands National Park St. John, U.S. Virgin Islands	Boring Number: **BH21-03** Contract Number: 21C12019.00 Sheet: 1 of 1

Contractor: Jaca & Sierra
Trujilo Alto, Puerto Rico

Contractor Foreman: S. Perez

Schnabel Representative: K. Morgan

Equipment: CME-55 (Trailer)

Method: 2-1/4" I.D. Hollow Stem Auger

Hammer Type: Auto Hammer (140 lb)

Dates Started: 7/31/21 **Finished:** 7/31/21

North: 842494.114 ft **East:** 1225161.389 ft **By:** Handheld GPS

Ground Surface Elevation: 8.0 (ft) **Total Depth:** 8.1 ft

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered	7/31	---	8.0'	---	---
Completion	7/31	---	8.0'	---	8.0'
After Drilling	7/31	---	7.8'	---	7.8'

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING DEPTH	SAMPLING DATA	TESTS	REMARKS
	PROBABLE FILL, sampled as clayey sand with gravel, fine to medium grained sand; moist, brown, loose, (A-2-7)	FILL		F		S-01, SPT 2+2+4+3 REC=8", 33%	LL = 48 PL = 20 MC = 10.2% % Passing #200 = 29.0	
2.0	CLAYEY SAND, fine to medium grained sand; moist, light brown, trace gravel, compact, probable COASTAL material, (A-2-7)	SC	6.0			S-02, SPT 5+3+8+15 REC=22", 92%	LL = 42 PL = 21 MC = 14.6% % Passing #200 = 28.4 PP = 2.00 tsf	
4.0	LEAN CLAY WITH SAND; moist, bluish gray, stiff, (A-6)	CL	4.0			S-03, SPT 5+6+6+5 REC=22", 92%	PP = 2.00 tsf	
4.5	SILTY GRAVEL WITH SAND; moist, brown, compact to very dense, (A-7-6)	GM	3.5	A	5	S-04, SPT 5+50/5" REC=8", 73%	LL = 47 PL = 28 MC = 23.7% % Passing #200 = 37.0	
7.0	DISINTEGRATED ROCK, sampled as silty gravel; wet, brown and gray, very dense	DR	1.0	B				
8.1			-0.1			S-05, SPT 50/1" REC=1", 100%		

Bottom of Boring at 8.1 ft.
Boring terminated at auger refusal.
Boring backfilled with cuttings upon completion.

Schnabel ENGINEERING	TEST BORING LOG	Project: NP VIIS 100(3), 102(1), Etc. Subsurface Exploration in Virgin Islands National Park St. John, U.S. Virgin Islands	Boring Number: **BH21-04** Contract Number: 21C12019.00 Sheet: 1 of 1

Contractor: Jaca & Sierra
Trujilo Alto, Puerto Rico

Contractor Foreman: S. Perez

Schnabel Representative: K. Morgan

Equipment: CME-55 (Trailer)

Method: 2-1/4" I.D. Hollow Stem Auger

Hammer Type: Auto Hammer (140 lb)

Dates Started: 7/30/21 **Finished:** 7/30/21

North: 842493.338 ft **East:** 1225115.272 ft **By:** Handheld GPS

Ground Surface Elevation: 8.5 (ft) **Total Depth:** 5.6 ft

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered	7/30	---	Dry	---	---
Completion	7/30	---	Dry	---	5.5'
After Drilling	7/30	---	Dry	---	5.5'

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING DEPTH	SAMPLING DATA	TESTS	REMARKS
	PROBABLE FILL, sampled as clayey sand, fine to medium grained sand; moist, brown, trace gravel, dense, (A-2-4)	FILL		F		S-01, SPT 2+9+33+33 REC=24", 100%	LL = 26 PL = 16 MC = 4.2% % Passing #200 = 29.0	Bulk Sample Obtained from 0.5 to 2.0 ft.
2.0	CLAYEY SAND WITH GRAVEL, fine to medium grained sand; moist, light brown, very dense, probable COASTAL material, (A-2-4)	SC	6.5	A		S-02, SPT 32+50/5" REC=4", 36%	PP = 4.50 tsf	
2.5	DISINTEGRATED ROCK, sampled as silty gravel; moist, brown and gray, very dense	DR	6.0	B		S-03, SPT 50/3" REC=3", 100%		
					5			
5.6			2.9			S-04, SPT 50/1" REC=1", 100%		

Bottom of Boring at 5.6 ft.
Boring terminated at auger refusal.
Boring backfilled with cuttings upon completion.

APPENDIX B

SOIL LABORATORY TEST DATA

Summary of Laboratory Tests
Gradation Curves
Atterberg Limits
Moisture-Density Relations (Standard Proctor Curves)
California Bearing Ratio (CBR)

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Summary Of Laboratory Tests

Project Number: 21C12019.00

Boring No.	Sample Depth ft / Elevation ft	Sample Type	Description of Soil Specimen	Stratum	Natural Moisture (%)	Liquid Limit	Plastic Limit	Plasticity Index	Percent Gravel	Percent Sand	Percent Fines	Uncorrected Maximum Dry Density (pcf)	Uncorrected Optimum Moisture Content (%)	CBR Value
PB21-01	0.0 - 3.0 / 5.0 - 2.0	Bulk	SILTY, CLAYEY SAND WITH GRAVEL (SC-SM), brown, (A-2-4)	F	4.1	22	17	5	29.5	43.4	27.1	132.6	8.2	5.6
PB21-02	0.0 - 2.0 / 9.5 - 7.5	SPT	CLAYEY SAND (SC), trace gravel, dark brown, (A-2-7)	A	5.3	66	16	50	12.7	73.6	13.7	--	--	--
PB21-03	0.0 - 2.0 / 9.0 - 7.0	SPT	SANDY SILT WITH GRAVEL (ML), brown, (A-7-5)	F	13.1	47	31	16	15.2	30.7	54.1	--	--	--
PB21-04	0.0 - 2.0 / 7.0 - 5.0	Bulk	SILTY, CLAYEY SAND WITH GRAVEL (SC-SM), light brown, (A-1-b)	F	7.4	24	20	4	30.8	49.8	19.4	131.3	9.1	8.1
PB21-05	0.0 - 2.0 / 9.0 - 7.0	SPT	SILTY SAND WITH GRAVEL (SM), light brown, (A-1-b)	F	3.3	20	18	2	28.3	50.8	20.9	--	--	--
PB21-05	2.0 - 4.0 / 7.0 - 5.0	SPT	CLAYEY SAND (SC), trace gravel, brown,(A-2-4) (visual)	A	4.2	--	--	--	--	--	--	--	--	--
PB21-06	0.0 - 2.0 / 3.5 - 1.5	SPT	CLAYEY GRAVEL WITH SAND (GC), brown, (A-2-4)	F	6.9	28	19	9	38.9	36.1	25.0	--	--	--

Notes:
1. Soil tests in general accordance with ASTM standards.
2. Soil classifications are in general accordance with ASTM D2487 (AASHTO M 145) (as applicable), based on testing indicated and visual classification.
3. Key to abbreviations: NP=Non-Plastic; -- indicates no test performed.
4. ASTM Methods: Natural Moisture D2216 (AASHTO T 265), Atterberg D4318 (AASHTO T 89 and T 90), Gradation D6913 (AASHTO T 88), Moisture-Density Relationship D698 (AASHTO T 99), California Bearing Ratio D1883 (AASHTO T 193).

Schnabel ENGINEERING

Project: NP VIIS 100(3), 102(1), Etc. Subsurface Exploration in Virgin Islands National Park
St. John, U.S. Virgin Islands

DYNAMIC LAB SUMMARY ST. JOHN EFL LOGS.GPJ TEST TEMPLATE.GDT 9/2/21

Summary Of Laboratory Tests

Project Number: 21C12019.00

Boring No.	Sample Depth ft / Elevation ft	Sample Type	Description of Soil Specimen	Stratum	Natural Moisture (%)	Liquid Limit	Plastic Limit	Plasticity Index	Percent Gravel	Percent Sand	Percent Fines	Uncorrected Maximum Dry Density (pcf)	Uncorrected Optimum Moisture Content (%)	CBR Value
PB21-06	2.0 - 4.0 / 1.5 - -0.5	SPT	CLAYEY SAND (SC), trace gravel, brownish gray, (A-6)	A	16.5	32	17	15	6.9	47.3	45.8	--	--	--
PB21-06	4.0 - 6.0 / -0.5 - -2.5	SPT	SANDY LEAN CLAY (CL), trace gravel, brownish gray, (A-6) (visual)	A	27.7	--	--	--	--	--	--	--	--	--
PB21-07	0.0 - 1.5 / 2.5 - 1.0	Bulk	SILTY, CLAYEY SAND WITH GRAVEL (SC-SM), light brown, (A-2-4)	F	8.9	23	18	5	17.9	47.0	35.1	127.4	10.4	7.2
PB21-07	2.0 - 4.0 / 0.5 - -1.5	SPT	CLAYEY SAND (SC), trace gravel, brown, (A-2-6)	A	22.0	36	23	13	11.3	54.9	33.8	--	--	--
PB21-07	4.0 - 6.0 / -1.5 - -3.5	SPT	CLAYEY SAND (SC), trace gravel, brown, (A-2-6) (visual)	A	7.5	--	--	--	--	--	--	--	--	--
BH21-01	1.0 - 2.0 / 9.3 - 8.3	Bulk	CLAYEY SAND WITH GRAVEL (SC), brown, (A-2-6)	A	3.8	27	19	8	16.6	48.2	35.2	123.2	12.8	6.6
BH21-02	0.5 - 1.0 / 11.0 - 10.5	SPT	SILTY, CLAYEY SAND WITH GRAVEL (SC-SM), brown, (A-1-b)	A	3.5	24	19	5	33.2	49.2	17.6	--	--	--

Notes:
1. Soil tests in general accordance with ASTM standards.
2. Soil classifications are in general accordance with ASTM D2487 (AASHTO M 145) (as applicable), based on testing indicated and visual classification.
3. Key to abbreviations: NP=Non-Plastic; -- indicates no test performed.
4. ASTM Methods: Natural Moisture D2216 (AASHTO T 265), Atterberg D4318 (AASHTO T 89 and T 90), Gradation D6913 (AASHTO T 88), Moisture-Density Relationship D698 (AASHTO T 99), California Bearing Ratio D1883 (AASHTO T 193).

Schnabel ENGINEERING

Project: NP VIIS 100(3), 102(1), Etc. Subsurface Exploration in Virgin Islands National Park
St. John, U.S. Virgin Islands

DYNAMIC LAB SUMMARY ST. JOHN EFL LOGS.GPJ TEST TEMPLATE.GDT 9/2/21

Summary Of Laboratory Tests

Project Number: 21C12019.00

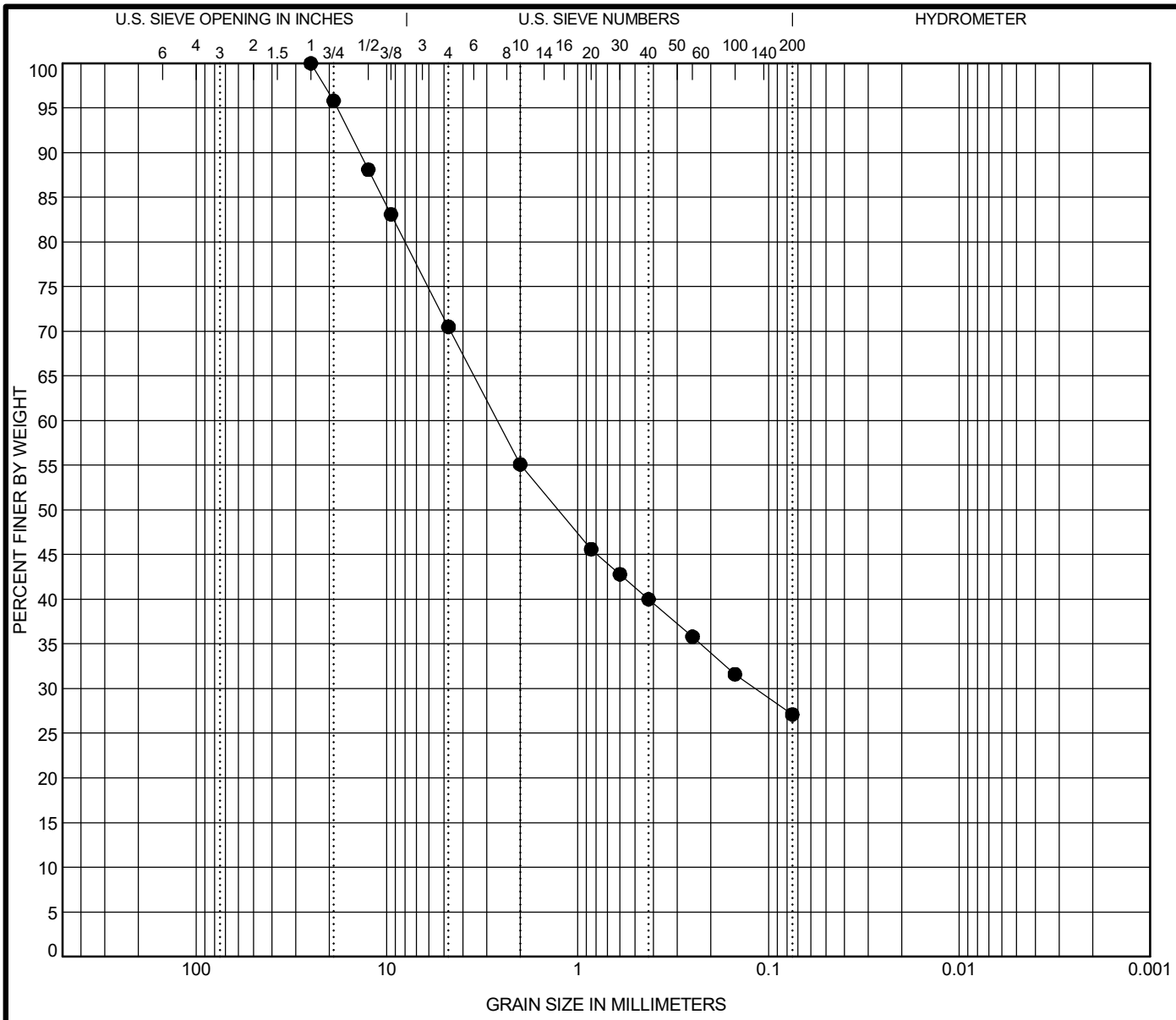
Boring No.	Sample Depth ft / Elevation ft	Sample Type	Description of Soil Specimen	Stratum	Natural Moisture (%)	Liquid Limit	Plastic Limit	Plasticity Index	Percent Gravel	Percent Sand	Percent Fines	Uncorrected Maximum Dry Density (pcf)	Uncorrected Optimum Moisture Content (%)	CBR Value
BH21-03	0.0 - 2.0 / 8.0 - 6.0	SPT	CLAYEY SAND WITH GRAVEL (SC), brown, (A-2-7)	F	10.2	48	20	28	21.2	49.8	29.0	--	--	--
BH21-03	2.0 - 4.0 / 6.0 - 4.0	SPT	CLAYEY SAND WITH GRAVEL (SC), light brown, (A-2-7)	A	14.6	42	21	21	22.8	48.8	28.4	--	--	--
BH21-03	4.5 - 6.0 / 3.5 - 2.0	SPT	SILTY GRAVEL WITH SAND (GM), brown, (A-7-6)	A	23.7	47	28	19	35.4	27.6	37.0	--	--	--
BH21-04	0.5 - 2.0 / 8.0 - 6.5	Bulk	CLAYEY SAND (SC), trace gravel, brown, (A-2-4)	F	4.2	26	16	10	12.6	58.4	29.0	125.8	11.2	8.9

Notes:
1. Soil tests in general accordance with ASTM standards.
2. Soil classifications are in general accordance with ASTM D2487 (AASHTO M 145) (as applicable), based on testing indicated and visual classification.
3. Key to abbreviations: NP=Non-Plastic; -- indicates no test performed.
4. ASTM Methods: Natural Moisture D2216 (AASHTO T 265), Atterberg D4318 (AASHTO T 89 and T 90), Gradation D6913 (AASHTO T 88), Moisture-Density Relationship D698 (AASHTO T 99), California Bearing Ratio D1883 (AASHTO T 193).

Schnabel ENGINEERING

Project: NP VIIS 100(3), 102(1), Etc. Subsurface Exploration in Virgin Islands National Park
St. John, U.S. Virgin Islands

DYNAMIC LAB SUMMARY ST. JOHN EFL LOGS.GPJ TEST TEMPLATE.GDT 9/2/21



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen		Sample Description	LL	PL	PI	Test Method
● PB21-01	0.0 - 3.0 ft	**SILTY, CLAYEY SAND WITH GRAVEL (SC-SM), brown, (A-2-4)**	**22**	**17**	**5**	Atterberg ASTM D4318

Test Method	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
ASTM D6913	**25**	**2.634**	**0.117**		**29.5**	**43.4**	**27.1**	

Percent Finer

Sieve Size	200	100	60	40	30	20	10	4	3/8"	1/2"	3/4"	1.0"
% Finer	27.1	31.6	35.8	40.0	42.8	45.6	55.1	70.5	83.1	88.1	95.8	100.0

Tested By	Tested Date	Reviewed by	Calc by
LNG	8/11/21	SRH	EC

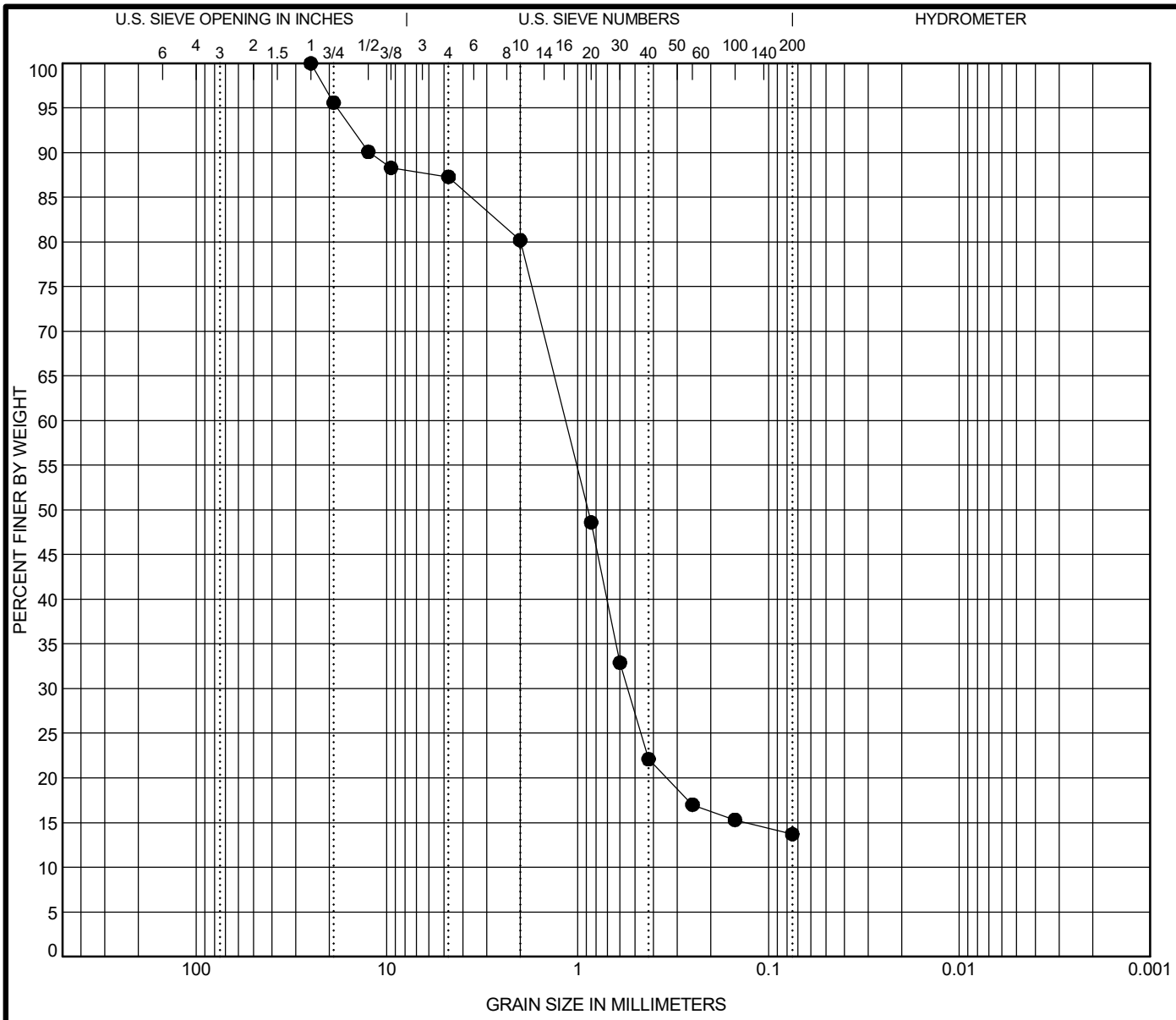
Schnabel ENGINEERING

GRADATION CURVE

Project: NP VIIS 100(3), 102(1), Etc. Subsurface Exploration in Virgin Islands National Park St. John, U.S. Virgin Islands

Contract: 21C12019.00

SIEVE 1/SHEET ST. JOHN EFL LOGS.GPJ TEST TEMPLATE.GDT 9/2/21



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen		Sample Description	LL	PL	PI	Test Method
●	PB21-02	0.0 - 2.0 ft	**CLAYEY SAND (SC), trace gravel, dark brown, (A-2-7)**	**66**	**16**	**50**	Atterberg ASTM D4318

Test Method	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
ASTM D6913	**25**	**1.157**	**0.547**		**12.7**	**73.6**	**13.7**	

Percent Finer

Sieve Size	200	100	60	40	30	20	10	4	3/8"	1/2"	3/4"	1.0"
% Finer	13.7	15.3	17.0	22.1	32.9	48.6	80.2	87.3	88.3	90.1	95.6	100.0

Tested By	Tested Date	Reviewed by	Calc by
MDE	8/5/21	SRH	MDE

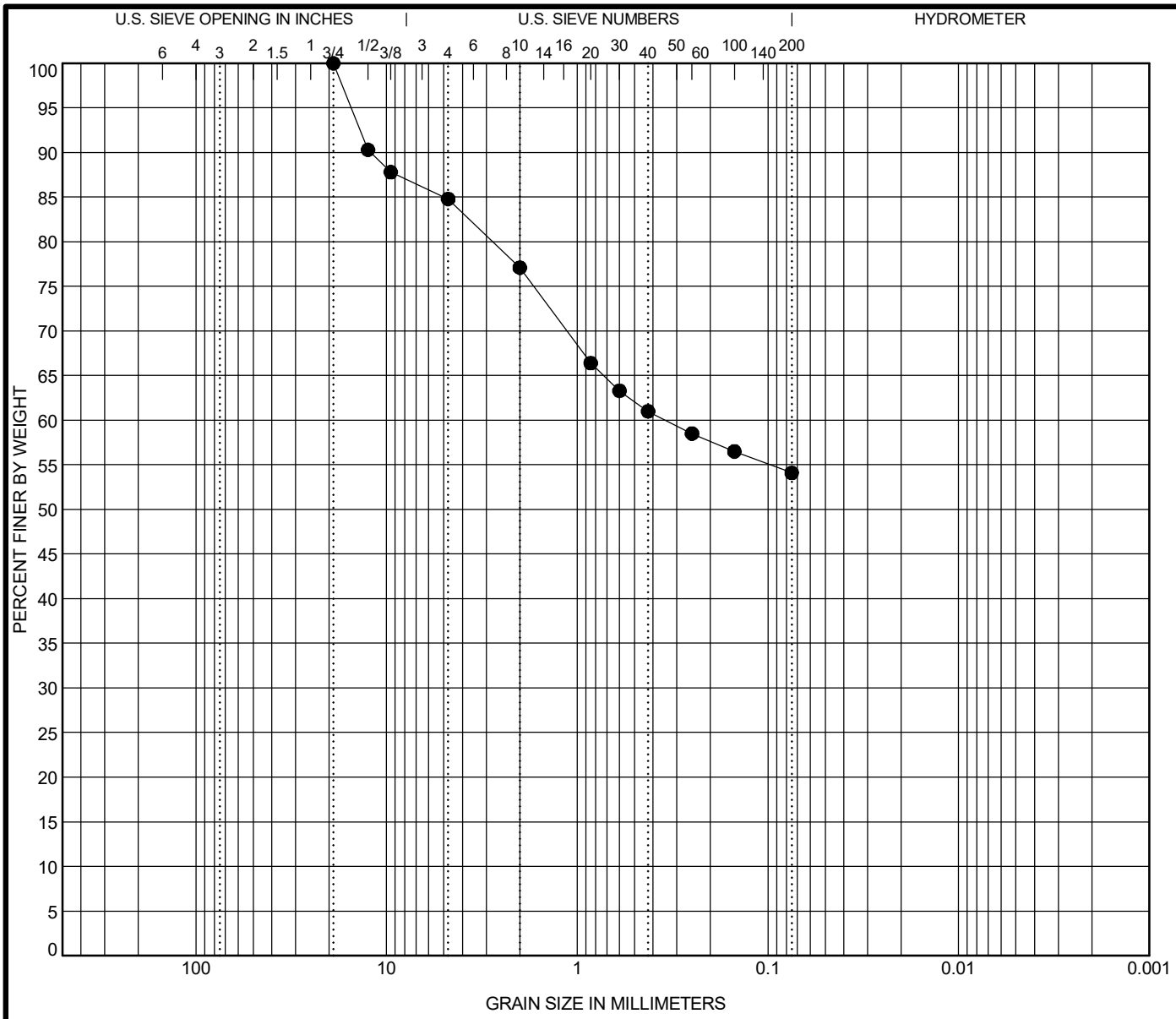
Schnabel ENGINEERING

GRADATION CURVE

Project: NP VIIS 100(3), 102(1), Etc. Subsurface Exploration in Virgin Islands National Park St. John, U.S. Virgin Islands

Contract: 21C12019.00

SIEVE 1/SHEET ST. JOHN EFL LOGS.GPJ TEST TEMPLATE.GDT 9/2/21



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen		Sample Description	LL	PL	PI	Test Method
●	PB21-03	0.0 - 2.0 ft	**SANDY SILT WITH GRAVEL (ML), brown, (A-7-5)**	**47**	**31**	**16**	Atterberg ASTM D4318

Test Method	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
ASTM D6913	**19**	**0.344**			**15.2**	**30.7**	**54.1**	

Percent Finer

Sieve Size	200	100	60	40	30	20	10	4	3/8"	1/2"	3/4"
% Finer	54.1	56.5	58.5	61.0	63.3	66.4	77.1	84.8	87.8	90.3	100.0

Tested By	Tested Date	Reviewed by	Calc by
MDE	8/5/21	SRH	MDE

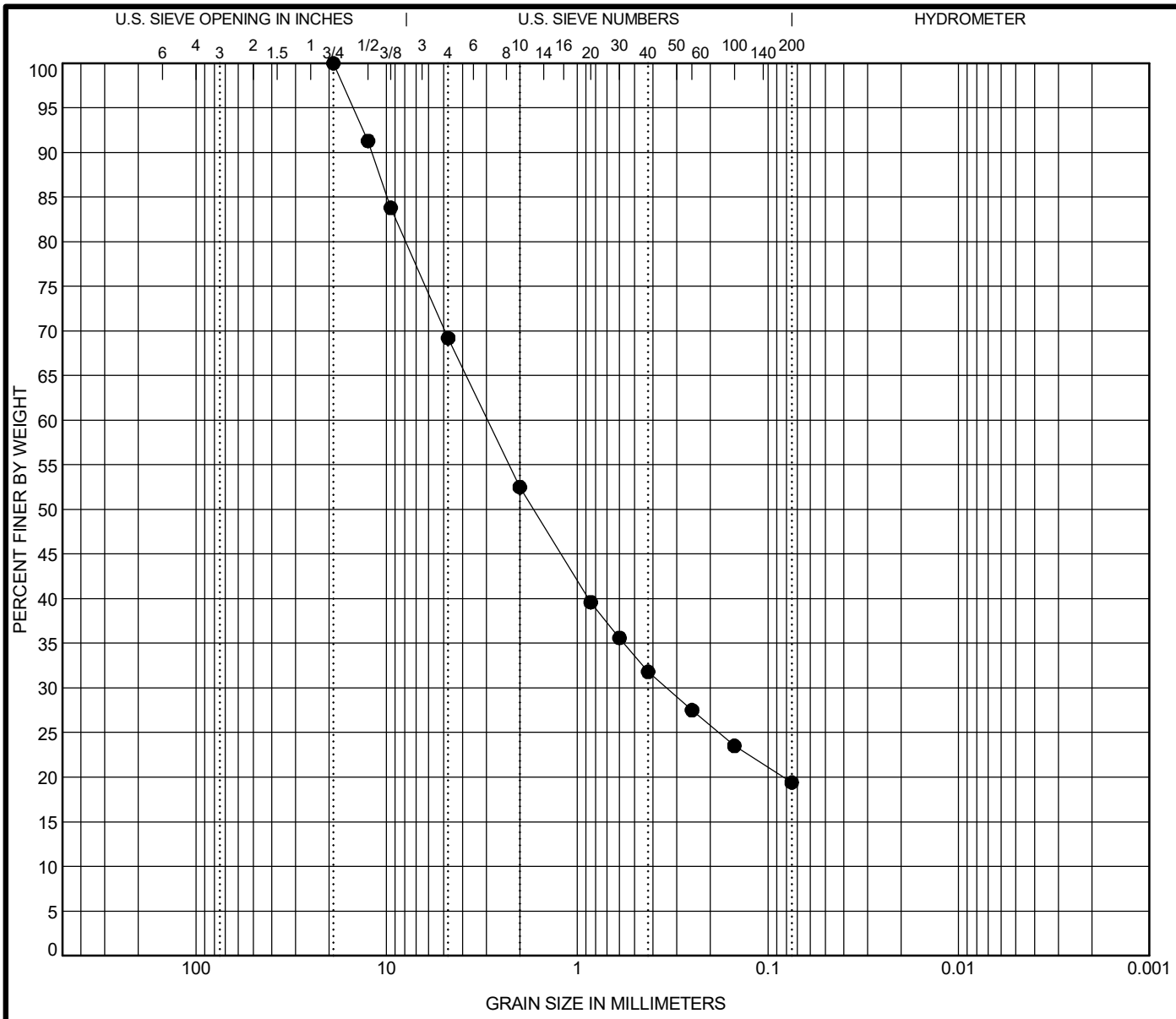
Schnabel ENGINEERING

GRADATION CURVE

Project: NP VIIS 100(3), 102(1), Etc. Subsurface Exploration in Virgin Islands National Park St. John, U.S. Virgin Islands

Contract: 21C12019.00

SIEVE 1/SHEET ST. JOHN EFL LOGS.GPJ TEST TEMPLATE.GDT 9/2/21



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen		Sample Description	LL	PL	PI	Test Method
●	PB21-04	0.0 - 2.0 ft	**SILTY, CLAYEY SAND WITH GRAVEL (SC-SM), light brown, (A-1-b)**	**24**	**20**	**4**	Atterberg ASTM D4318

Test Method	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
ASTM D6913	**19**	**2.949**	**0.34**		**30.8**	**49.8**	**19.4**	

Percent Finer

Sieve Size	200	100	60	40	30	20	10	4	3/8"	1/2"	3/4"
% Finer	19.4	23.5	27.5	31.8	35.6	39.6	52.5	69.2	83.8	91.3	100.0

Tested By	Tested Date	Reviewed by	Calc by
LNG	8/11/21	SRH	EC

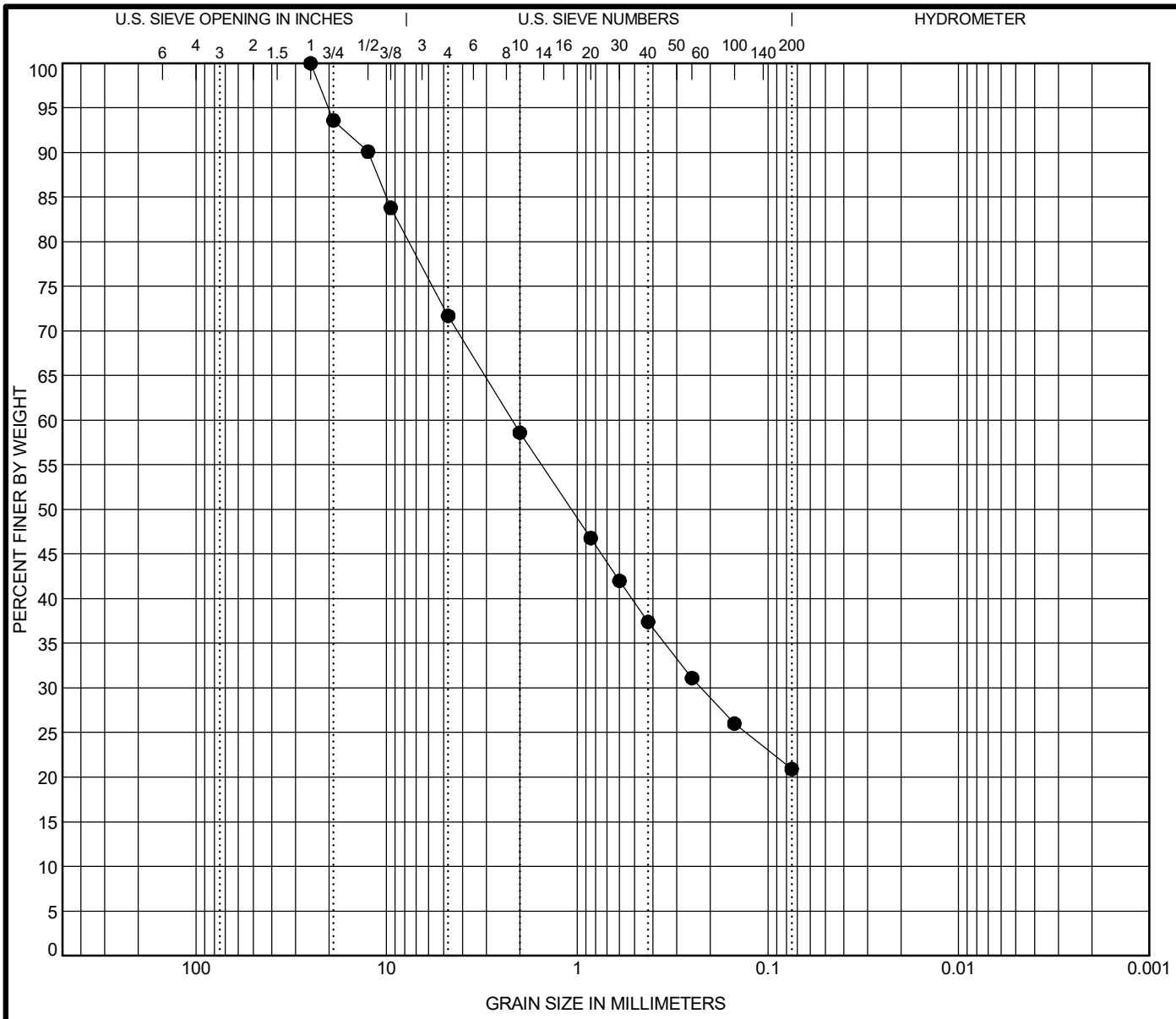
Schnabel ENGINEERING

GRADATION CURVE

Project: NP VIIS 100(3), 102(1), Etc. Subsurface Exploration in Virgin Islands National Park St. John, U.S. Virgin Islands

Contract: 21C12019.00

SIEVE 1/SHEET ST. JOHN EFL LOGS.GPJ TEST TEMPLATE.GDT 9/2/21



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen		Sample Description	LL	PL	PI	Test Method
●	PB21-05	0.0 - 2.0 ft	**SILTY SAND WITH GRAVEL (SM), light brown, (A-1-b)**	**20**	**18**	**2**	Atterberg ASTM D4318

Test Method	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
ASTM D6913	**25**	**2.194**	**0.224**		**28.3**	**50.8**	**20.9**	

Percent Finer

Sieve Size	200	100	60	40	30	20	10	4	3/8"	1/2"	3/4"	1.0"
% Finer	20.9	26.0	31.1	37.4	42.0	46.8	58.6	71.7	83.8	90.1	93.6	100.0

Tested By	Tested Date	Reviewed by	Calc by
MDE	8/5/21	SRH	MDE

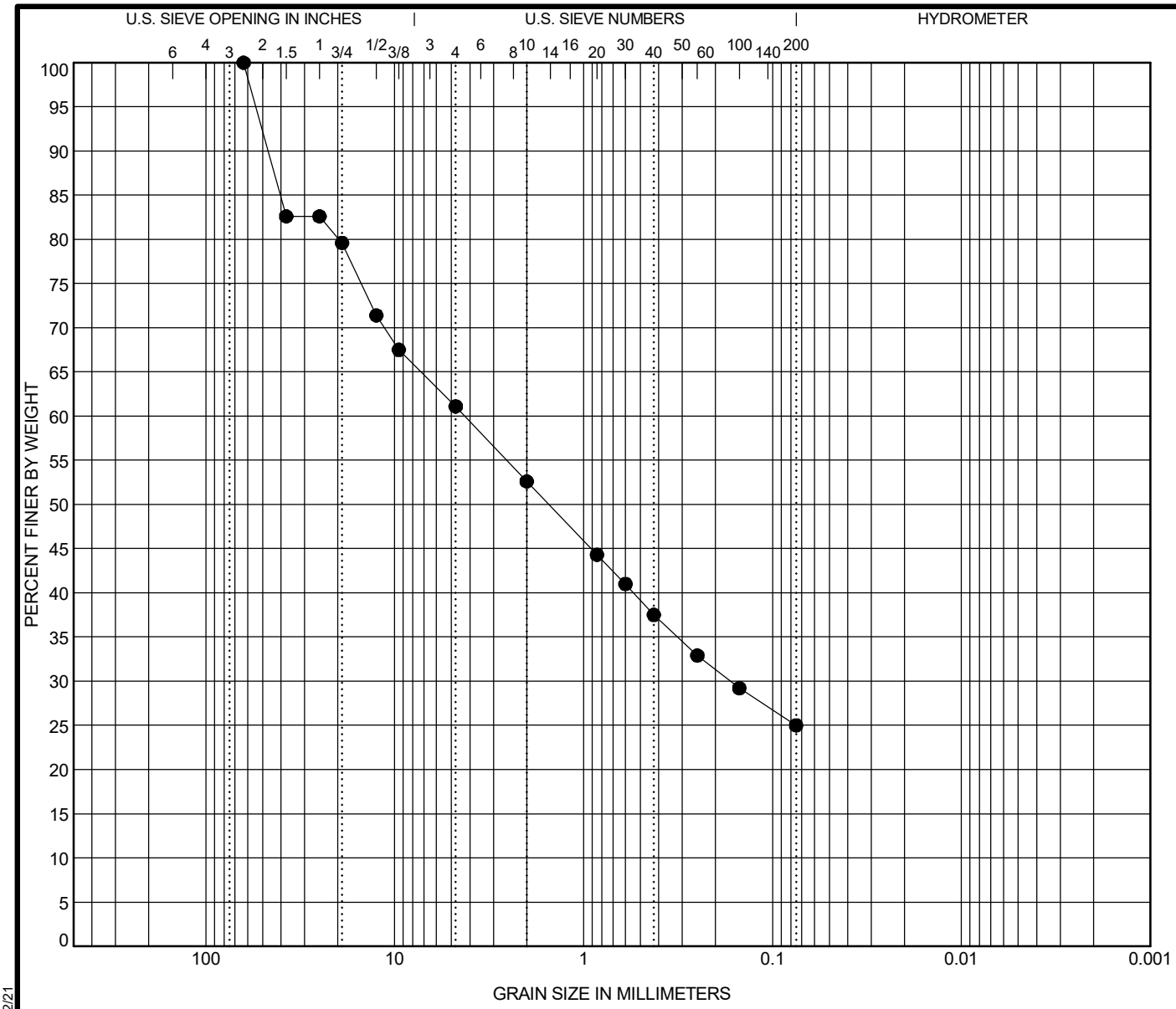
Schnabel ENGINEERING

GRADATION CURVE

Project: NP VIIS 100(3), 102(1), Etc. Subsurface Exploration in Virgin Islands National Park St. John, U.S. Virgin Islands

Contract: 21C12019.00

SIEVE 1/SHEET ST. JOHN EFL LOGS.GPJ TEST TEMPLATE.GDT 9/2/21



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen		Sample Description	LL	PL	PI	Test Method
●	PB21-06	0.0 - 2.0 ft	**CLAYEY GRAVEL WITH SAND (GC), brown, (A-2-4)**	**28**	**19**	**9**	Atterberg ASTM D4318

Test Method	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
ASTM D6913	**63**	**4.247**	**0.168**		**38.9**	**36.1**	**25.0**	

Percent Finer

Sieve Size	200	100	60	40	30	20	10	4	3/8"	1/2"	3/4"	1.0"	1.5"	2.5"
% Finer	25.0	29.2	32.9	37.5	41.0	44.3	52.6	61.1	67.5	71.4	79.6	82.6	82.6	100.0

Tested By	Tested Date	Reviewed By	Calc By
MDE	8/5/21	SRH	MDE

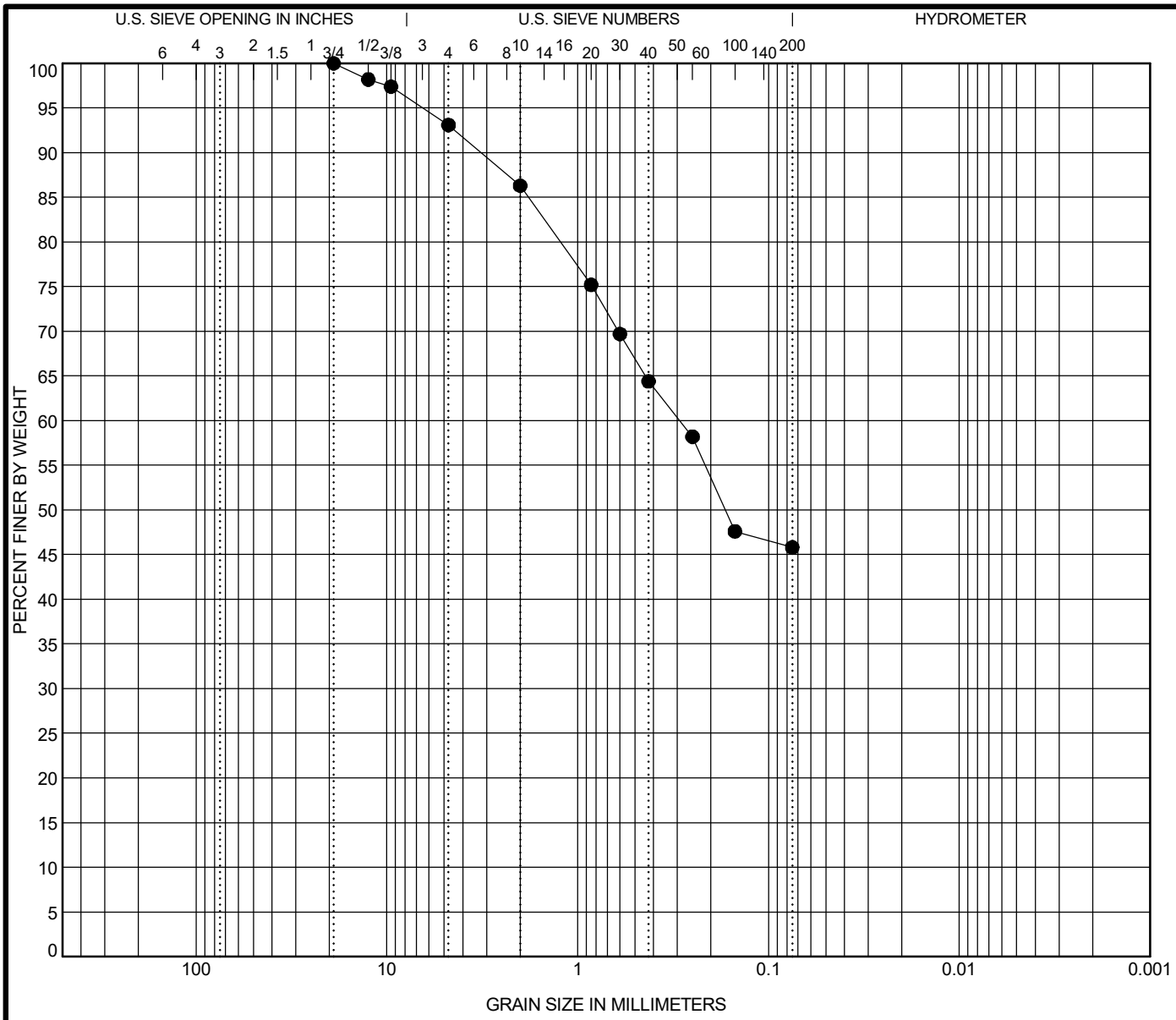
Schnabel ENGINEERING

GRADATION CURVE

Project: NP VIIS 100(3), 102(1), Etc. Subsurface Exploration in Virgin Islands National Park St. John, U.S. Virgin Islands

Contract: 21C12019.00

SIEVE 1/SHEET - 16 SIEVES ST. JOHN EFL LOGS.GPJ SCHNABEL DATA TEMPLATE DJE.GDT 9/2/21



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen		Sample Description	LL	PL	PI	Test Method
●	PB21-06	2.0 - 4.0 ft	**CLAYEY SAND (SC), trace gravel, brownish gray, (A-6)**	**32**	**17**	**15**	Atterberg ASTM D4318

Test Method	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
ASTM D6913	**19**	**0.292**			**6.9**	**47.3**	**45.8**	

Percent Finer

Sieve Size	200	100	60	40	30	20	10	4	3/8"	1/2"	3/4"
% Finer	45.8	47.6	58.2	64.4	69.7	75.2	86.3	93.1	97.4	98.2	100.0

Tested By	Tested Date	Reviewed by	Calc by
MDE	8/5/21	SRH	MDE

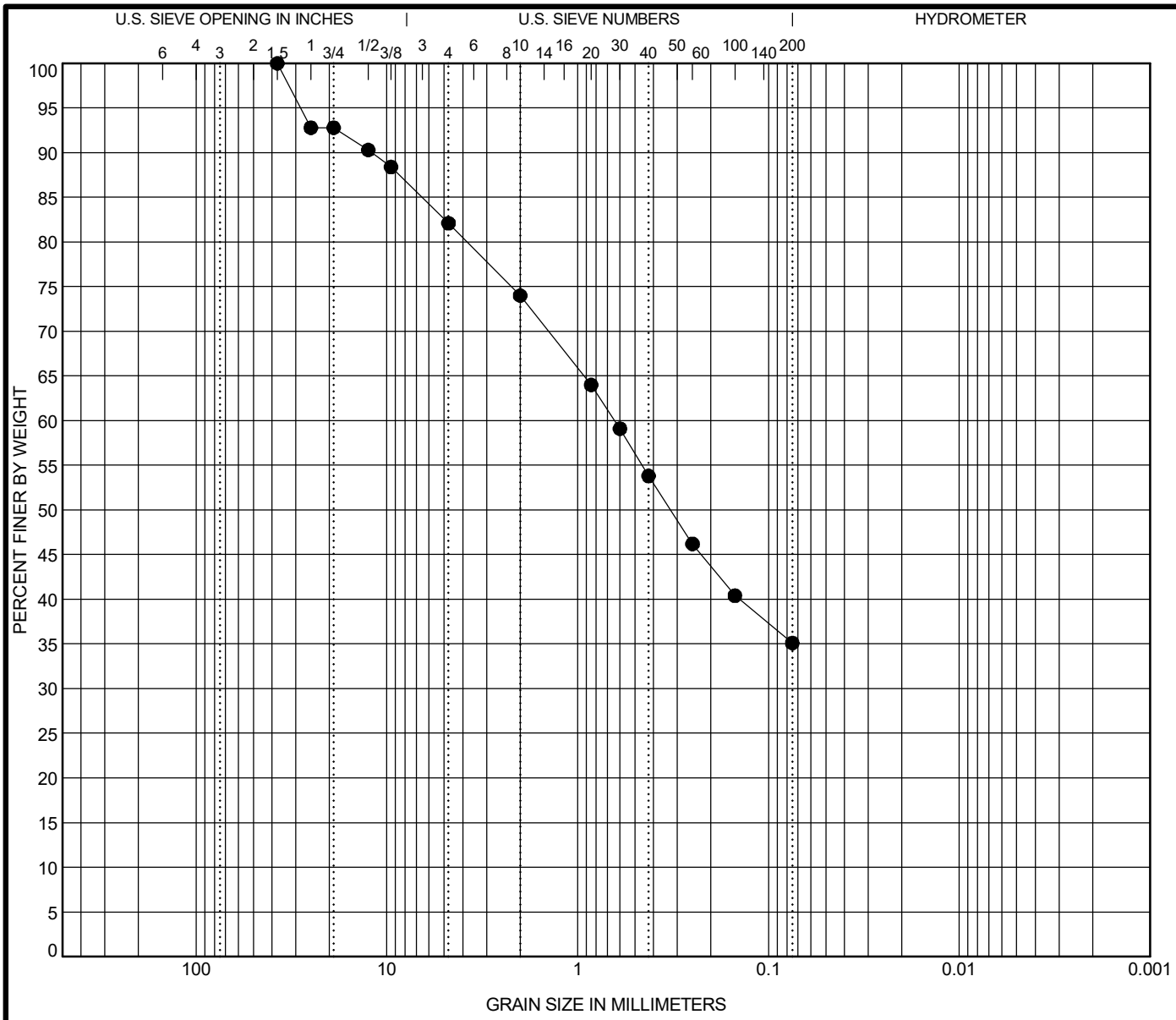
Schnabel ENGINEERING

GRADATION CURVE

Project: NP VIIS 100(3), 102(1), Etc. Subsurface Exploration in Virgin Islands National Park St. John, U.S. Virgin Islands

Contract: 21C12019.00

SIEVE 1/SHEET ST. JOHN EFL LOGS.GPJ TEST TEMPLATE.GDT 9/2/21



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen		Sample Description	LL	PL	PI	Test Method
● PB21-07	0.0 - 1.5 ft	**SILTY, CLAYEY SAND WITH GRAVEL (SC-SM), light brown, (A-2-4)**	**23**	**18**	**5**	Atterberg ASTM D4318

Test Method	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
ASTM D6913	**37.5**	**0.64**			**17.9**	**47.0**	**35.1**	

Percent Finer

Sieve Size	200	100	60	40	30	20	10	4	3/8"	1/2"	3/4"	1.0"	1.5"
% Finer	35.1	40.4	46.2	53.8	59.1	64.0	74.0	82.1	88.4	90.3	92.8	92.8	100.0

Tested By	Tested Date	Reviewed by	Calc by
LNG	8/11/21	SRH	EC

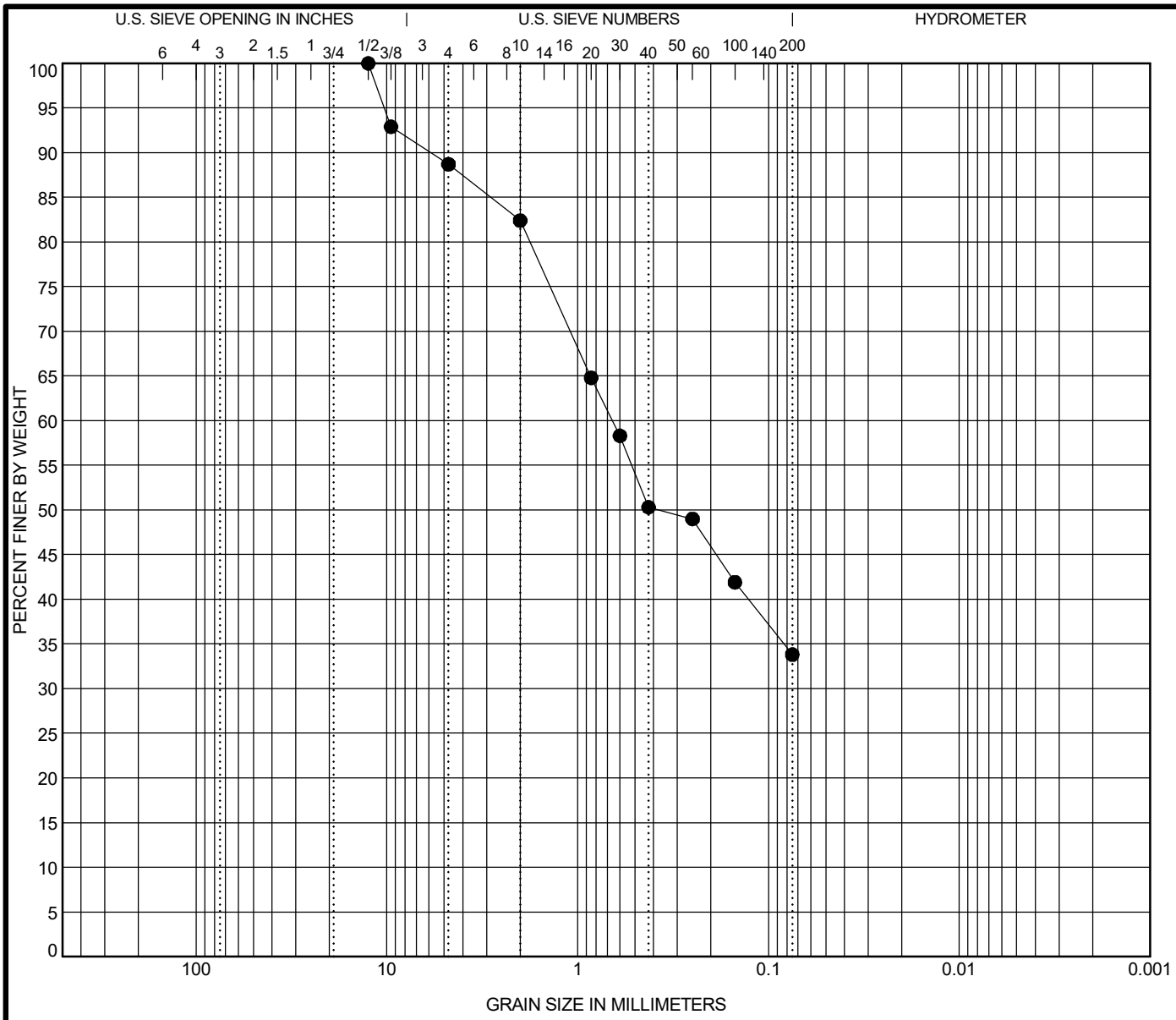
Schnabel ENGINEERING

GRADATION CURVE

Project: NP VIIS 100(3), 102(1), Etc. Subsurface Exploration in Virgin Islands National Park St. John, U.S. Virgin Islands

Contract: 21C12019.00

SIEVE 1/SHEET ST. JOHN EFL LOGS.GPJ TEST TEMPLATE.GDT 9/2/21



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen		Sample Description	LL	PL	PI	Test Method
●	PB21-07	2.0 - 4.0 ft	**CLAYEY SAND (SC), trace gravel, brown, (A-2-6)**	**36**	**23**	**13**	Atterberg ASTM D4318

Test Method	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
ASTM D6913	**12.5**	**0.657**			**11.3**	**54.9**	**33.8**	

Percent Finer

Sieve Size	200	100	60	40	30	20	10	4	3/8"	1/2"
% Finer	33.8	41.9	49.0	50.3	58.3	64.8	82.4	88.7	92.9	100.0

Tested By	Tested Date	Reviewed by	Calc by
MDE	8/5/21	SRH	MDE

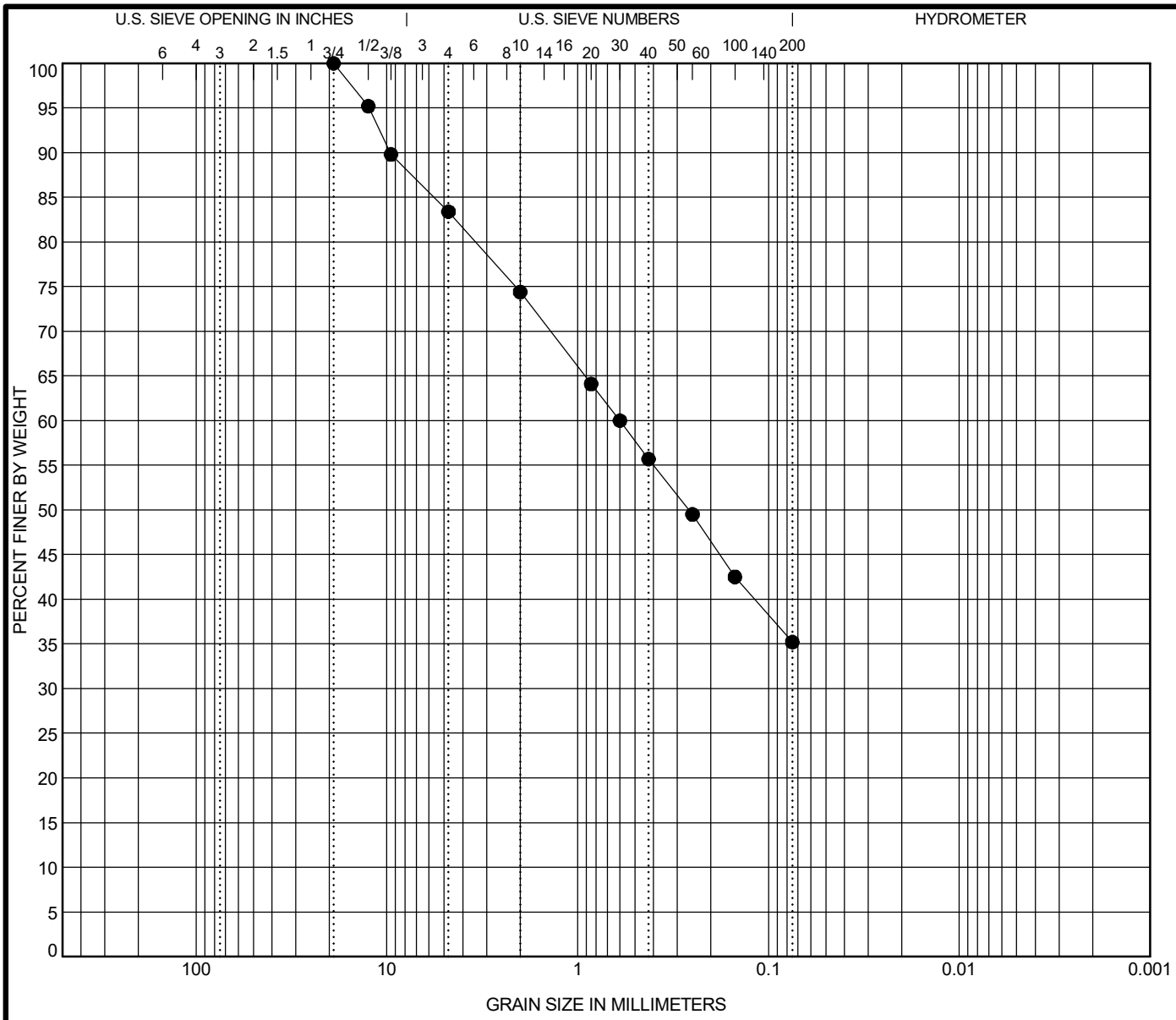
Schnabel ENGINEERING

GRADATION CURVE

Project: NP VIIS 100(3), 102(1), Etc. Subsurface Exploration in Virgin Islands National Park St. John, U.S. Virgin Islands

Contract: 21C12019.00

SIEVE 1/SHEET ST. JOHN EFL LOGS.GPJ TEST TEMPLATE.GDT 9/2/21



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen		Sample Description	LL	PL	PI	Test Method
● BH21-01	1.0 - 2.0 ft	**CLAYEY SAND WITH GRAVEL (SC), brown, (A-2-6)**	**27**	**19**	**8**	Atterberg ASTM D4318

Test Method	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
ASTM D6913	**19**	**0.6**			**16.6**	**48.2**	**35.2**	

Percent Finer

Sieve Size	200	100	60	40	30	20	10	4	3/8"	1/2"	3/4"
% Finer	35.2	42.5	49.5	55.7	60.0	64.1	74.4	83.4	89.8	95.2	100.0

Tested By	Tested Date	Reviewed by	Calc by
LNG	8/10/21	SRH	LNG

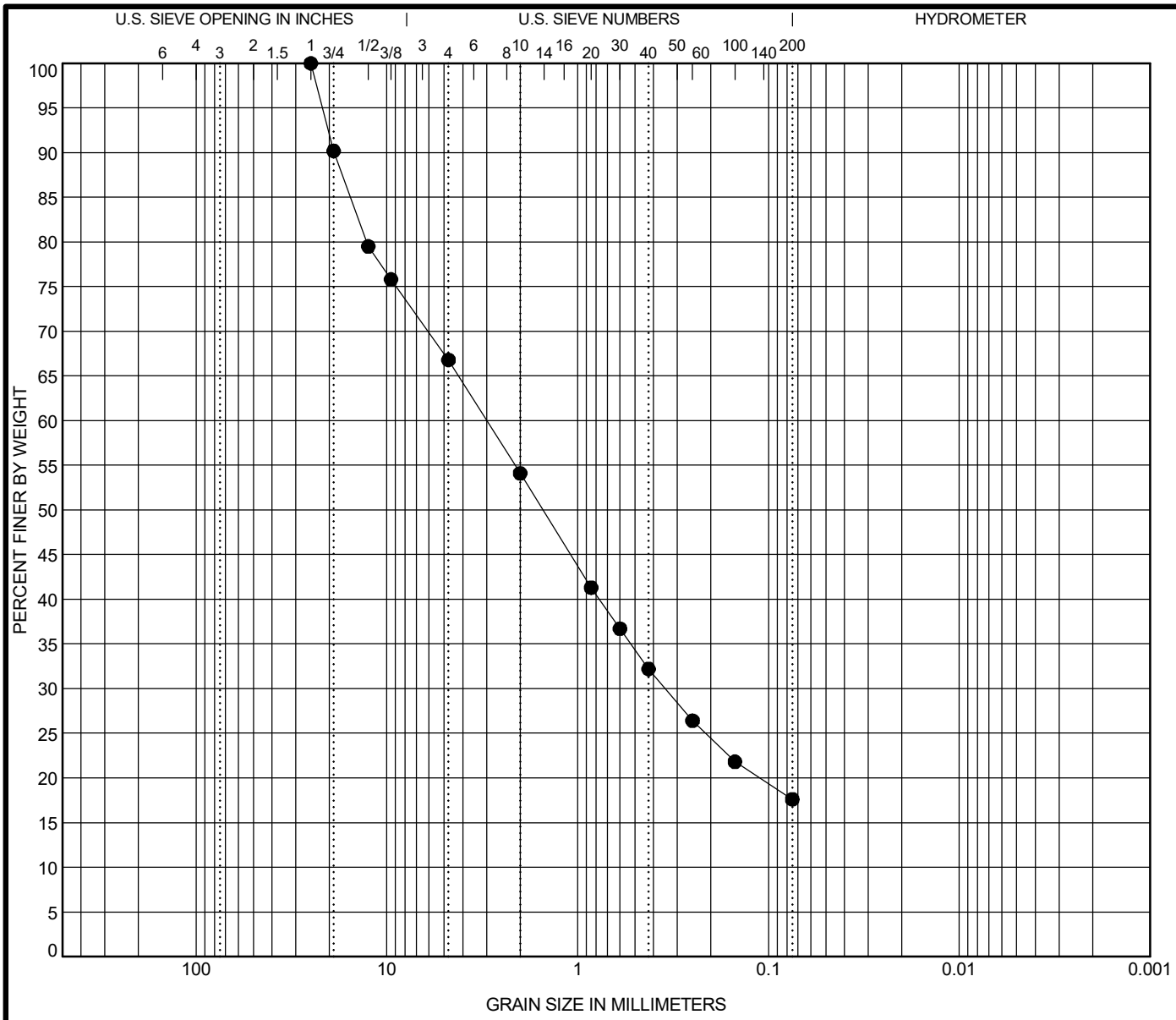
Schnabel ENGINEERING

GRADATION CURVE

Project: NP VIIS 100(3), 102(1), Etc. Subsurface Exploration in Virgin Islands National Park St. John, U.S. Virgin Islands

Contract: 21C12019.00

SIEVE 1/SHEET ST. JOHN EFL LOGS.GPJ TEST TEMPLATE.GDT 9/2/21



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen		Sample Description	LL	PL	PI	Test Method
● BH21-02	0.5 - 1.0 ft	**SILTY, CLAYEY SAND WITH GRAVEL (SC-SM), brown, (A-1-b)**	**24**	**19**	**5**	Atterberg ASTM D4318

Test Method	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
ASTM D6913	**25**	**2.989**	**0.348**		**33.2**	**49.2**	**17.6**	

Percent Finer

Sieve Size	200	100	60	40	30	20	10	4	3/8"	1/2"	3/4"	1.0"
% Finer	17.6	21.8	26.4	32.2	36.7	41.3	54.1	66.8	75.8	79.5	90.2	100.0

Tested By	Tested Date	Reviewed by	Calc by
MDE	8/5/21	SRH	MDE

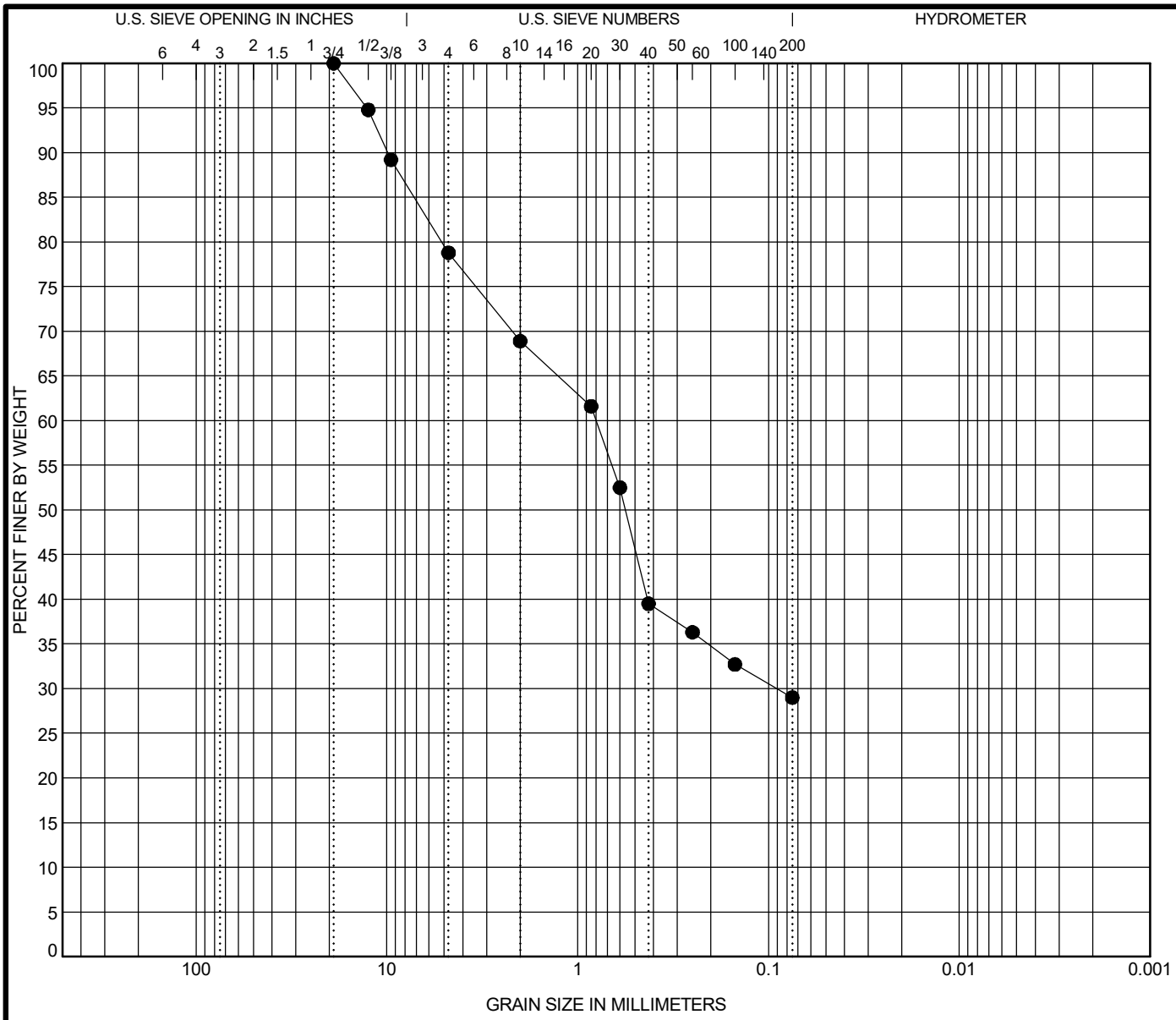
Schnabel ENGINEERING

GRADATION CURVE

Project: NP VIIS 100(3), 102(1), Etc. Subsurface Exploration in Virgin Islands National Park St. John, U.S. Virgin Islands

Contract: 21C12019.00

SIEVE 1/SHEET ST. JOHN EFL LOGS.GPJ TEST TEMPLATE.GDT 9/2/21



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen		Sample Description	LL	PL	PI	Test Method
●	BH21-03	0.0 - 2.0 ft	**CLAYEY SAND WITH GRAVEL (SC), brown, (A-2-7)**	**48**	**20**	**28**	Atterberg ASTM D4318

Test Method	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
ASTM D6913	**19**	**0.8**	**0.09**		**21.2**	**49.8**	**29.0**	

Percent Finer

Sieve Size	200	100	60	40	30	20	10	4	3/8"	1/2"	3/4"
% Finer	29.0	32.7	36.3	39.5	52.5	61.6	68.9	78.8	89.2	94.8	100.0

Tested By	Tested Date	Reviewed by	Calc by
MDE	8/5/21	SRH	MDE

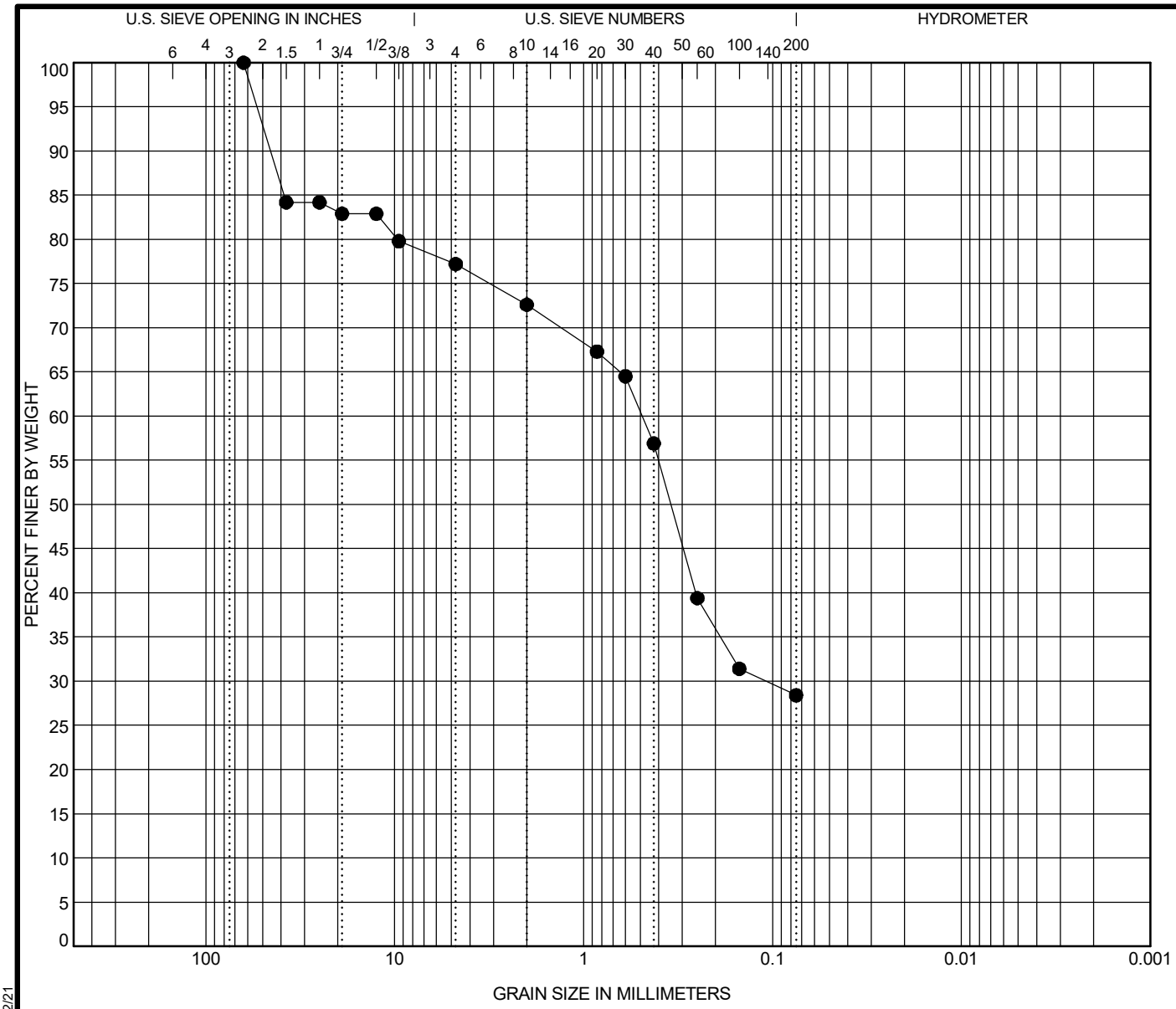
Schnabel ENGINEERING

GRADATION CURVE

Project: NP VIIS 100(3), 102(1), Etc. Subsurface Exploration in Virgin Islands National Park St. John, U.S. Virgin Islands

Contract: 21C12019.00

SIEVE 1/SHEET ST. JOHN EFL LOGS.GPJ TEST TEMPLATE.GDT 9/2/21



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen		Sample Description	LL	PL	PI	Test Method
● BH21-03	2.0 - 4.0 ft	**CLAYEY SAND WITH GRAVEL (SC), light brown, (A-2-7)**	**42**	**21**	**21**	Atterberg ASTM D4318

Test Method	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
ASTM D6913	**63**	**0.489**	**0.109**		**22.8**	**48.8**	**28.4**	

Percent Finer

Sieve Size	200	100	60	40	30	20	10	4	3/8"	1/2"	3/4"	1.0"	1.5"	2.5"
% Finer	28.4	31.4	39.4	56.9	64.5	67.3	72.6	77.2	79.8	82.9	82.9	84.2	84.2	100.0

Tested By	Tested Date	Reviewed By	Calc By
MDE	8/5/21	SRH	MDE

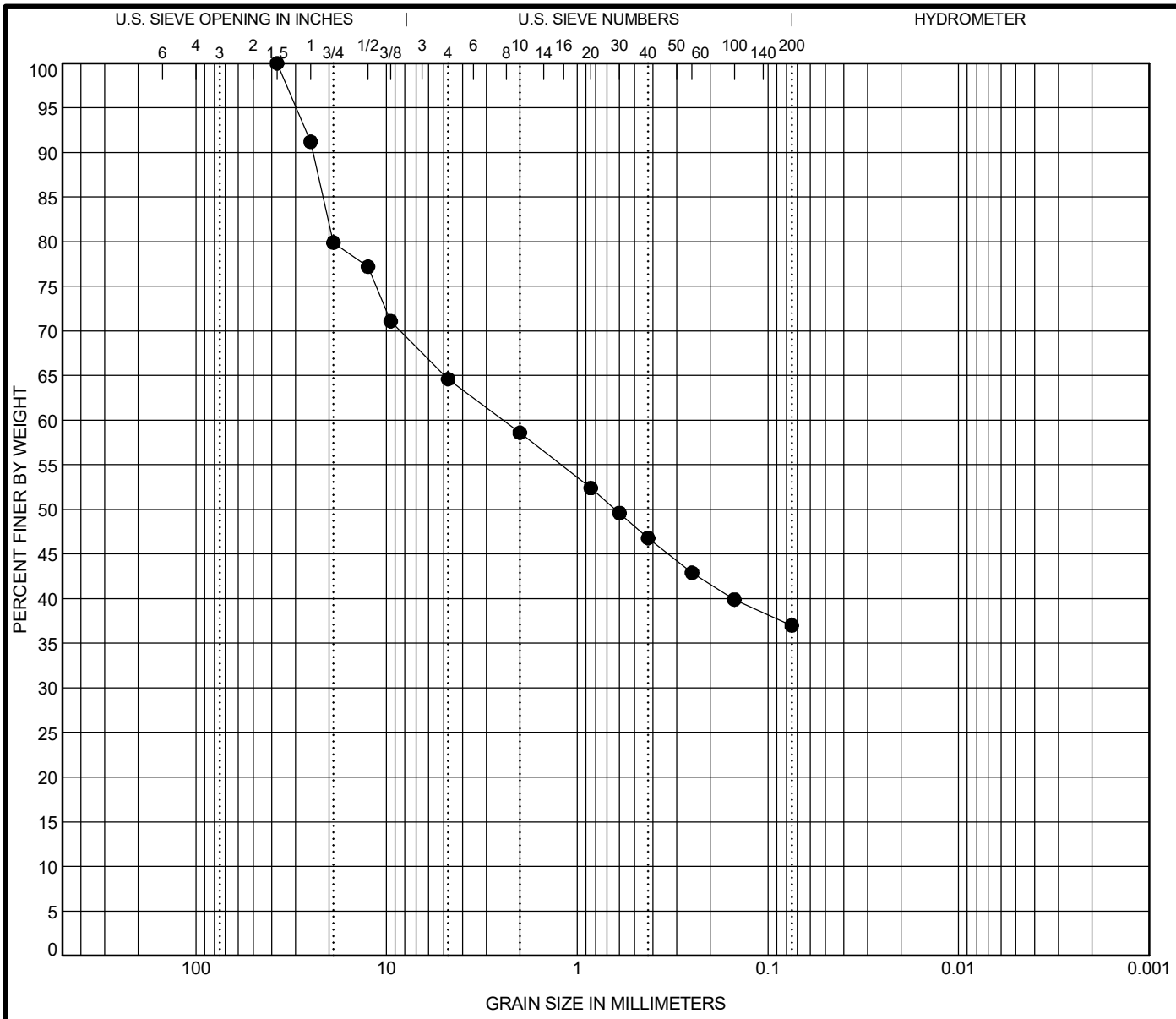
Schnabel ENGINEERING

GRADATION CURVE

Project: NP VIIS 100(3), 102(1), Etc. Subsurface Exploration in Virgin Islands National Park St. John, U.S. Virgin Islands

Contract: 21C12019.00

SIEVE 1/SHEET - 16 SIEVES ST. JOHN EFL LOGS.GPJ SCHNABEL DATA TEMPLATE DJE.GDT 9/2/21



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen		Sample Description	LL	PL	PI	Test Method
●	BH21-03	4.5 - 6.0 ft	**SILTY GRAVEL WITH SAND (GM), brown, (A-7-6)**	**47**	**28**	**19**	Atterberg ASTM D4318

Test Method	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
ASTM D6913	**37.5**	**2.447**			**35.4**	**27.6**	**37.0**	

Percent Finer

Sieve Size	200	100	60	40	30	20	10	4	3/8"	1/2"	3/4"	1.0"	1.5"
% Finer	37.0	39.9	42.9	46.8	49.6	52.4	58.6	64.6	71.1	77.2	79.9	91.2	100.0

Tested By	Tested Date	Reviewed by	Calc by
MDE	8/5/21	SRH	MDE

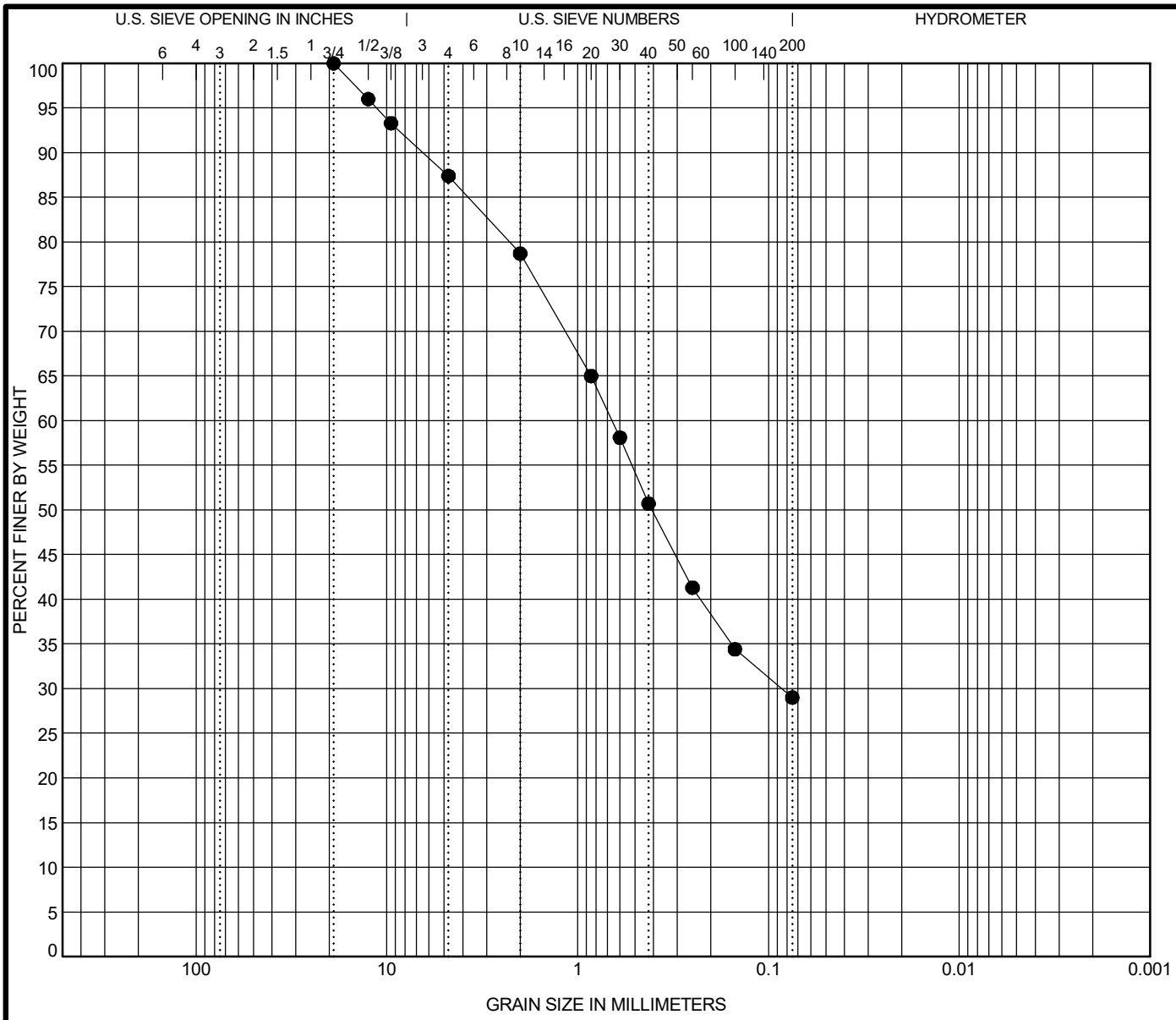
Schnabel ENGINEERING

GRADATION CURVE

Project: NP VIIS 100(3), 102(1), Etc. Subsurface Exploration in Virgin Islands National Park St. John, U.S. Virgin Islands

Contract: 21C12019.00

SIEVE 1/SHEET ST. JOHN EFL LOGS.GPJ TEST TEMPLATE.GDT 9/2/21



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen		Sample Description	LL	PL	PI	Test Method
● BH21-04	0.5 - 2.0 ft	**CLAYEY SAND (SC), trace gravel, brown, (A-2-4)**	**26**	**16**	**10**	Atterberg ASTM D4318

Test Method	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
ASTM D6913	**19**	**0.66**	**0.085**		**12.6**	**58.4**	**29.0**	

Percent Finer

Sieve Size	200	100	60	40	30	20	10	4	3/8"	1/2"	3/4"
% Finer	29.0	34.4	41.3	50.7	58.1	65.0	78.7	87.4	93.3	96.0	100.0

Tested By	Tested Date	Reviewed by	Calc by
LNG	8/11/21	SRH	EC

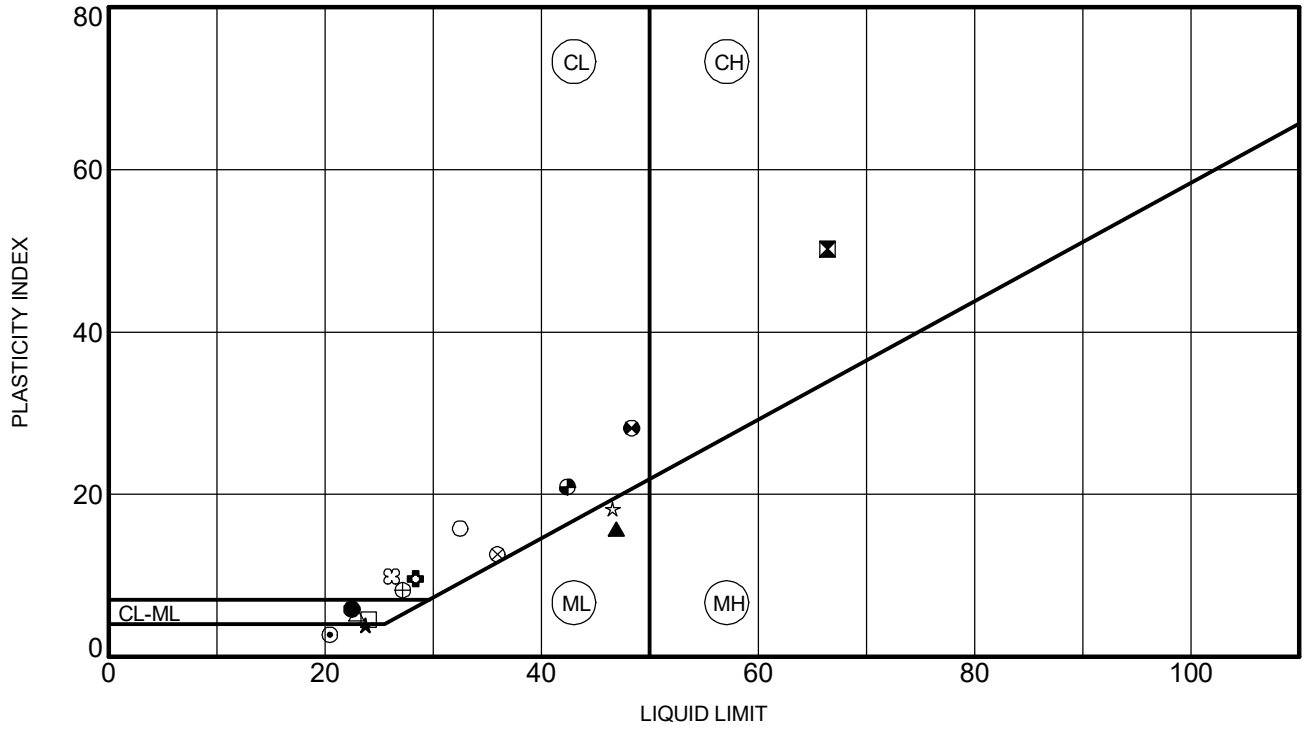
Schnabel ENGINEERING

GRADATION CURVE

Project: NP VIIS 100(3), 102(1), Etc. Subsurface Exploration in Virgin Islands National Park St. John, U.S. Virgin Islands

Contract: 21C12019.00

SIEVE 1/SHEET ST. JOHN EFL LOGS.GPJ TEST TEMPLATE.GDT 9/2/21



PLOTTED DATA REPRESENTS SOIL PASSING NO. 40 SIEVE

	Specimen		LL	PL	PI	Fines	Description
●	PB21-01	0.0 - 3.0 ft	22	17	5	27	SILTY, CLAYEY SAND WITH GRAVEL (SC-SM), brown, (A-2-4)
⊠	PB21-02	0.0 - 2.0 ft	66	16	50	14	CLAYEY SAND (SC), trace gravel, dark brown, (A-2-7)
▲	PB21-03	0.0 - 2.0 ft	47	31	16	54	SANDY SILT WITH GRAVEL (ML), brown, (A-7-5)
★	PB21-04	0.0 - 2.0 ft	24	20	4	19	SILTY, CLAYEY SAND WITH GRAVEL (SC-SM), light brown, (A-1-b)
⊙	PB21-05	0.0 - 2.0 ft	20	18	2	21	SILTY SAND WITH GRAVEL (SM), light brown, (A-1-b)
✿	PB21-06	0.0 - 2.0 ft	28	19	9	25	CLAYEY GRAVEL WITH SAND (GC), brown, (A-2-4)
○	PB21-06	2.0 - 4.0 ft	32	17	15	46	CLAYEY SAND (SC), trace gravel, brownish gray, (A-6)
△	PB21-07	0.0 - 1.5 ft	23	18	5	35	SILTY, CLAYEY SAND WITH GRAVEL (SC-SM), light brown, (A-2-4)
⊗	PB21-07	2.0 - 4.0 ft	36	23	13	34	CLAYEY SAND (SC), trace gravel, brown, (A-2-6)
⊕	BH21-01	1.0 - 2.0 ft	27	19	8	35	CLAYEY SAND WITH GRAVEL (SC), brown, (A-2-6)
□	BH21-02	0.5 - 1.0 ft	24	19	5	18	SILTY, CLAYEY SAND WITH GRAVEL (SC-SM), brown, (A-1-b)
◕	BH21-03	0.0 - 2.0 ft	48	20	28	29	CLAYEY SAND WITH GRAVEL (SC), brown, (A-2-7)
◔	BH21-03	2.0 - 4.0 ft	42	21	21	28	CLAYEY SAND WITH GRAVEL (SC), light brown, (A-2-7)
☆	BH21-03	4.5 - 6.0 ft	47	28	19	37	SILTY GRAVEL WITH SAND (GM), brown, (A-7-6)
✿	BH21-04	0.5 - 2.0 ft	26	16	10	29	CLAYEY SAND (SC), trace gravel, brown, (A-2-4)

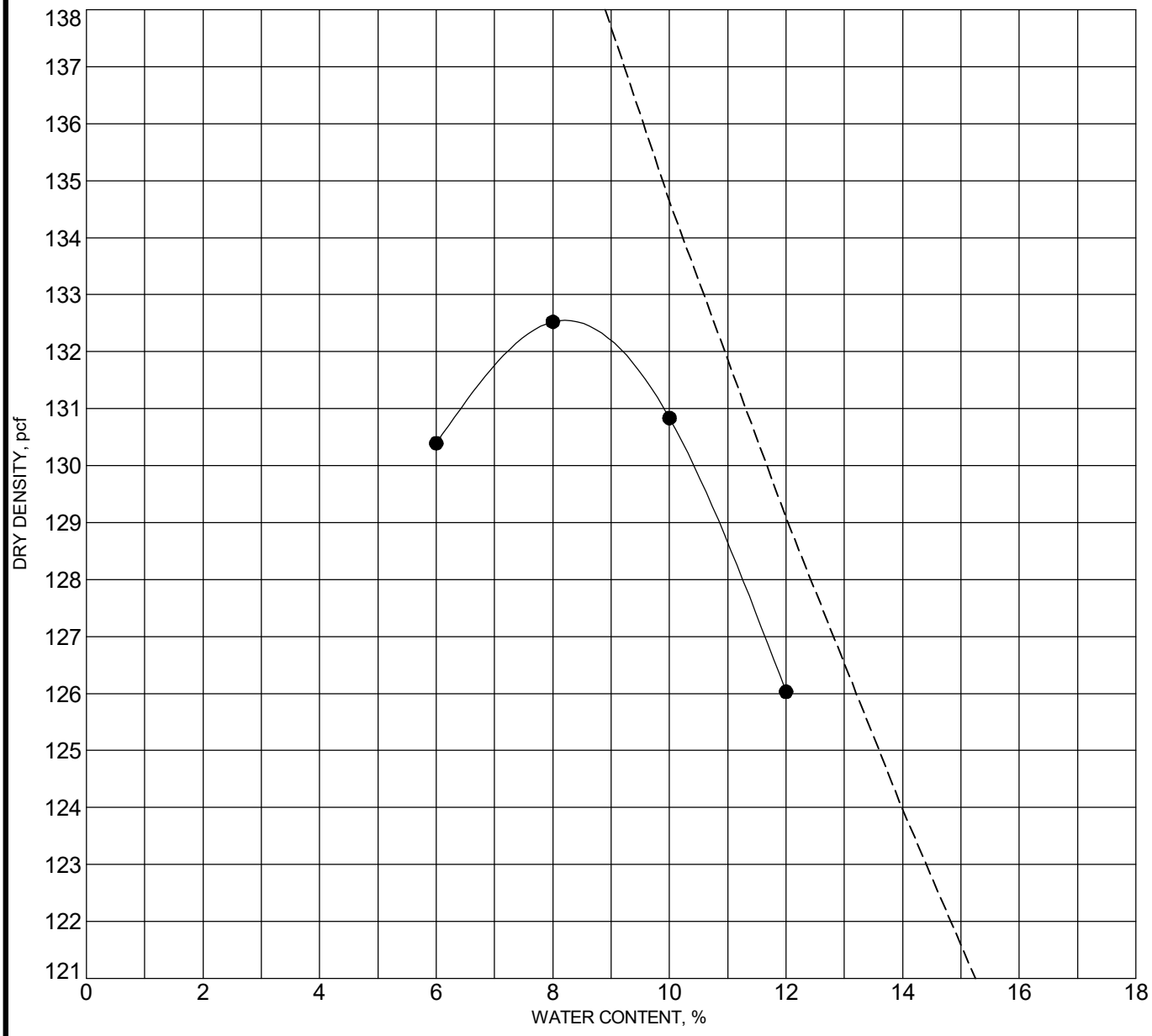
Schnabel ENGINEERING

ATTERBERG LIMITS

Project: NP VIIS 100(3), 102(1), Etc. Subsurface Exploration in Virgin Islands National Park St. John, U.S. Virgin Islands

Contract: 21C12019.00

ATTERBERG_LIMITS_ST. JOHN EFL LOGS.GPJ TEST TEMPLATE.GDT 9/2/21



Sample Description:	SILTY, CLAYEY SAND WITH GRAVEL (SC-SM), brown, (A-2-4)
Sample Source:	PB21-01
Sample Depth (ft):	0.0 - 3.0
Test Method:	ASTM D698 Method C
Oversize Fraction Sieve Size:	3/4 in.
Percent Oversized Retained:	4.2%

Assumed Specific Gravity:	2.66
Uncorrected Max. Dry Density (pcf):	132.6
Uncorrected Opt. Moisture (%):	8.2
Assumed Oversize Specific Gravity:	2.65
Corrected Max. Dry Density (pcf):	133.9
Corrected Opt. Moisture (%):	7.9

Liquid Limit (LL):	22
Plasticity Index (PI):	5
% Retained #4 Sieve:	29.5
% Passing # 200 Sieve:	27.1

Comments:

ASTM Test Methods: Atterberg D4318, Gradation D6913

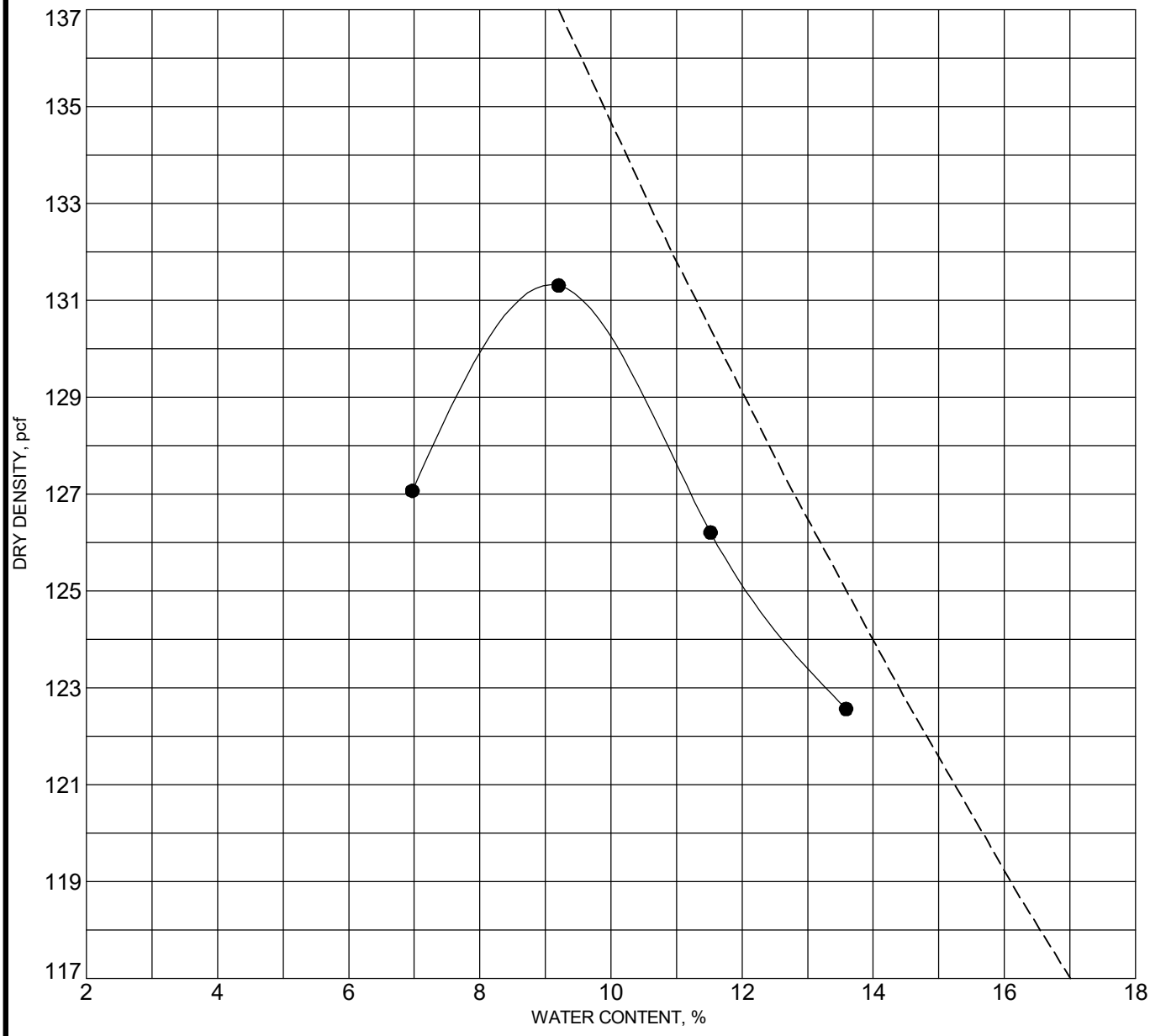
Schnabel ENGINEERING

MOISTURE DENSITY RELATIONSHIP

Project: NP VIIS 100(3), 102(1), Etc. Subsurface Exploration in Virgin Islands National Park St. John, U.S. Virgin Islands

Contract: 21C12019.00

COMPACTION ST. JOHN EFL LOGS.GPJ TEST TEMPLATE.GDT 9/2/21



Sample Description:	SILTY, CLAYEY SAND WITH GRAVEL (SC-SM), light brown, (A-1-b)	Assumed Specific Gravity:	2.66
Sample Source:	PB21-04	Uncorrected Max. Dry Density (pcf):	131.3
Sample Depth (ft):	0.0 - 2.0	Uncorrected Opt. Moisture (%):	9.1
Test Method:	ASTM D698 Method C	Assumed Oversize Specific Gravity:	2.65
Oversize Fraction Sieve Size:	3/4 in.	Corrected Max. Dry Density (pcf):	131.3
Percent Oversized Retained:	0%	Corrected Opt. Moisture (%):	9.1

Liquid Limit (LL):	24
Plasticity Index (PI):	4
% Retained #4 Sieve:	30.8
% Passing # 200 Sieve:	19.4

Comments:

ASTM Test Methods: Atterberg D4318, Gradation D6913

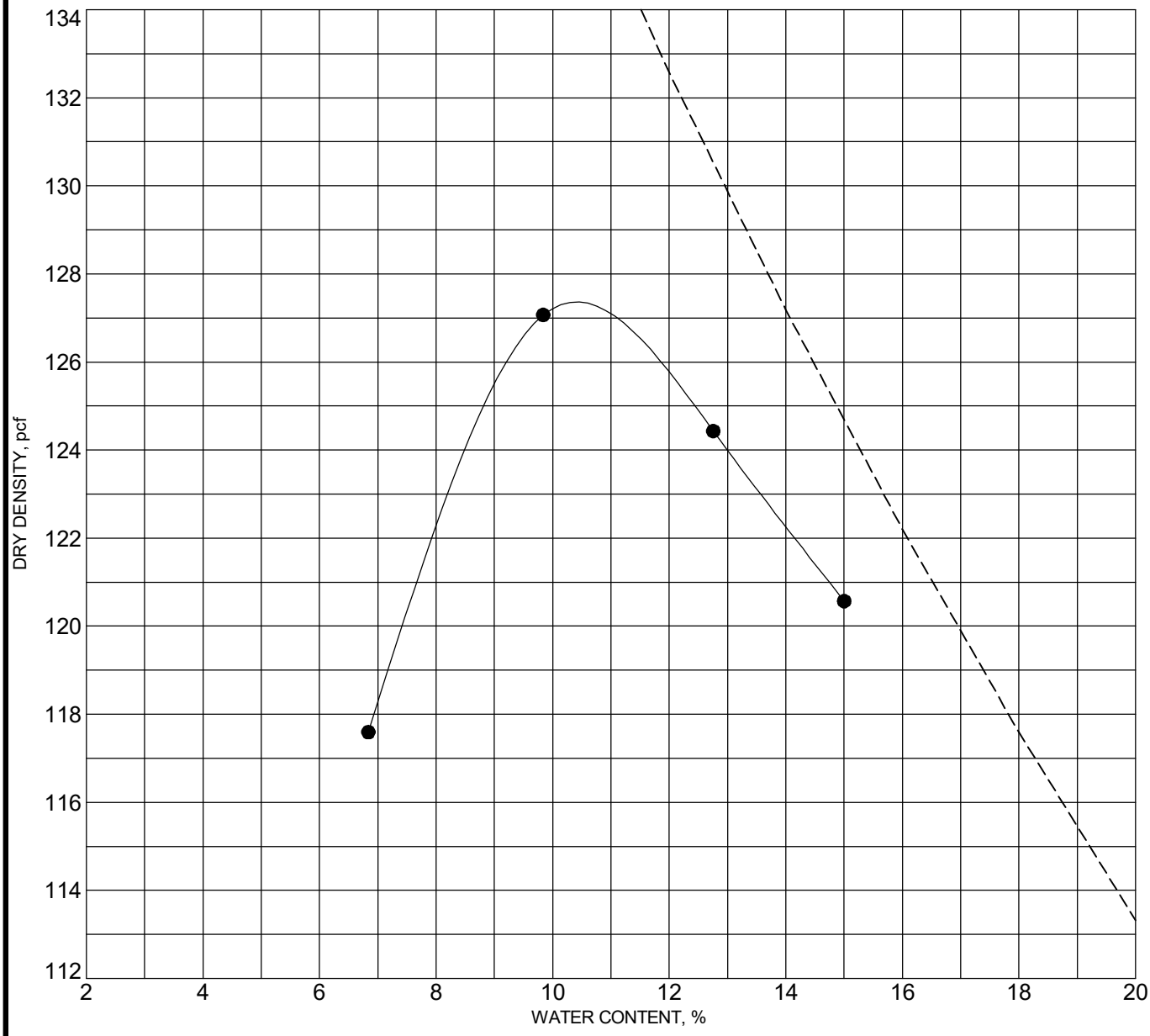
Schnabel ENGINEERING

MOISTURE DENSITY RELATIONSHIP

Project: NP VIIS 100(3), 102(1), Etc. Subsurface Exploration in Virgin Islands National Park St. John, U.S. Virgin Islands

Contract: 21C12019.00

COMPACTION ST. JOHN EFL LOGS.GPJ TEST TEMPLATE.GDT 9/2/21



Sample Description:	SILTY, CLAYEY SAND WITH GRAVEL (SC-SM), light brown, (A-2-4)	Assumed Specific Gravity:	2.66
Sample Source:	PB21-07	Uncorrected Max. Dry Density (pcf):	127.4
Sample Depth (ft):	0.0 - 1.5	Uncorrected Opt. Moisture (%):	10.4
Test Method:	ASTM D698 Method C	Assumed Oversize Specific Gravity:	2.65
Oversize Fraction Sieve Size:	3/4 in.	Corrected Max. Dry Density (pcf):	130.1
Percent Oversized Retained:	7.2%	Corrected Opt. Moisture (%):	9.7

Liquid Limit (LL):	23
Plasticity Index (PI):	5
% Retained #4 Sieve:	17.9
% Passing # 200 Sieve:	35.1

Comments:

ASTM Test Methods: Atterberg D4318, Gradation D6913

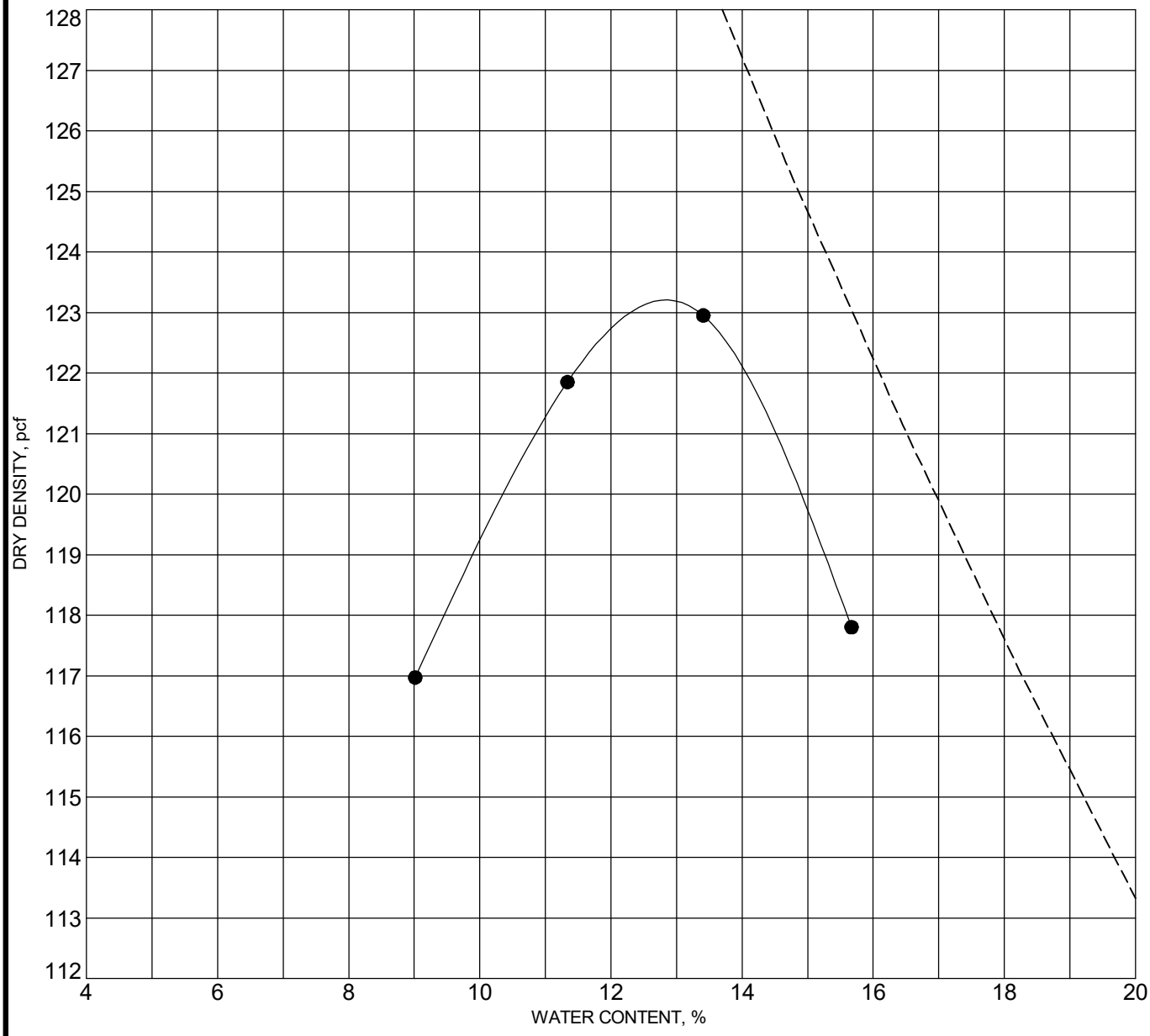
Schnabel ENGINEERING

MOISTURE DENSITY RELATIONSHIP

Project: NP VIIS 100(3), 102(1), Etc. Subsurface Exploration in Virgin Islands National Park St. John, U.S. Virgin Islands

Contract: 21C12019.00

COMPACTION ST. JOHN EFL LOGS.GPJ TEST TEMPLATE.GDT 9/2/21



Sample Description:	CLAYEY SAND WITH GRAVEL (SC), brown, (A-2-6)	Assumed Specific Gravity:	2.65
Sample Source:	BH21-01	Max. Dry Density (pcf):	123.2
Sample Depth (ft):	1.0 - 2.0	Opt. Moisture (%):	12.8
Test Method:	ASTM D698 Method A		

Liquid Limit (LL):	27	Comments:
Plasticity Index (PI):	8	
% Retained #4 Sieve:	16.6	
% Passing # 200 Sieve:	35.2	ASTM Test Methods: Atterberg D4318, Gradation D6913

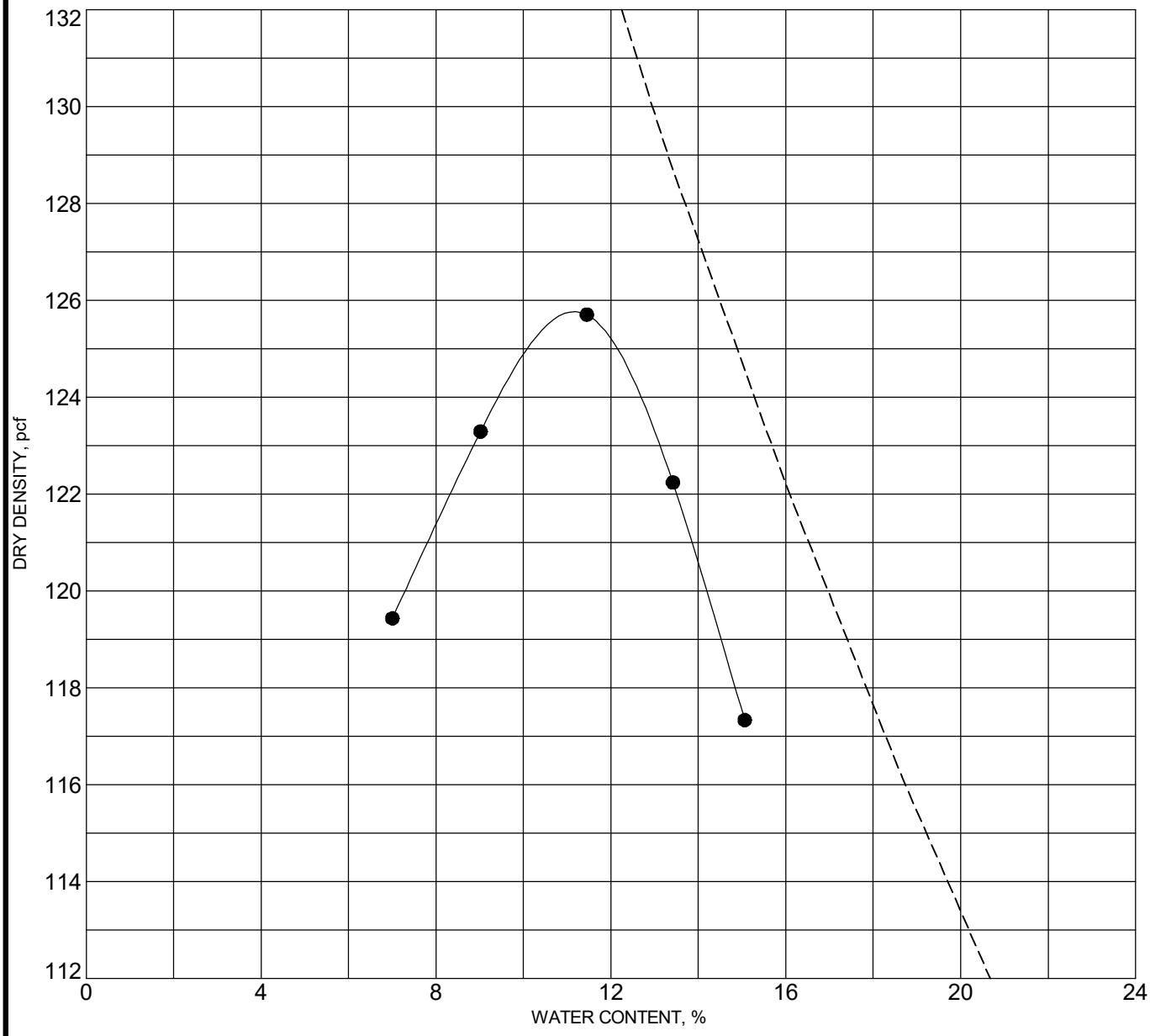
Schnabel ENGINEERING

MOISTURE DENSITY RELATIONSHIP

Project: NP VIIS 100(3), 102(1), Etc. Subsurface Exploration in Virgin Islands National Park St. John, U.S. Virgin Islands

Contract: 21C12019.00

COMPACTION ST. JOHN EFL LOGS.GPJ TEST TEMPLATE.GDT 9/2/21



Sample Description:	CLAYEY SAND (SC), trace gravel, brown, (A-2-4)	Assumed Specific Gravity:	2.65
Sample Source:	BH21-04	Max. Dry Density (pcf):	125.8
Sample Depth (ft):	0.5 - 2.0	Opt. Moisture (%):	11.2
Test Method:	ASTM D698 Method A		

Liquid Limit (LL):	26
Plasticity Index (PI):	10
% Retained #4 Sieve:	12.6
% Passing # 200 Sieve:	29.0

Comments:

ASTM Test Methods: Atterberg D4318, Gradation D6913

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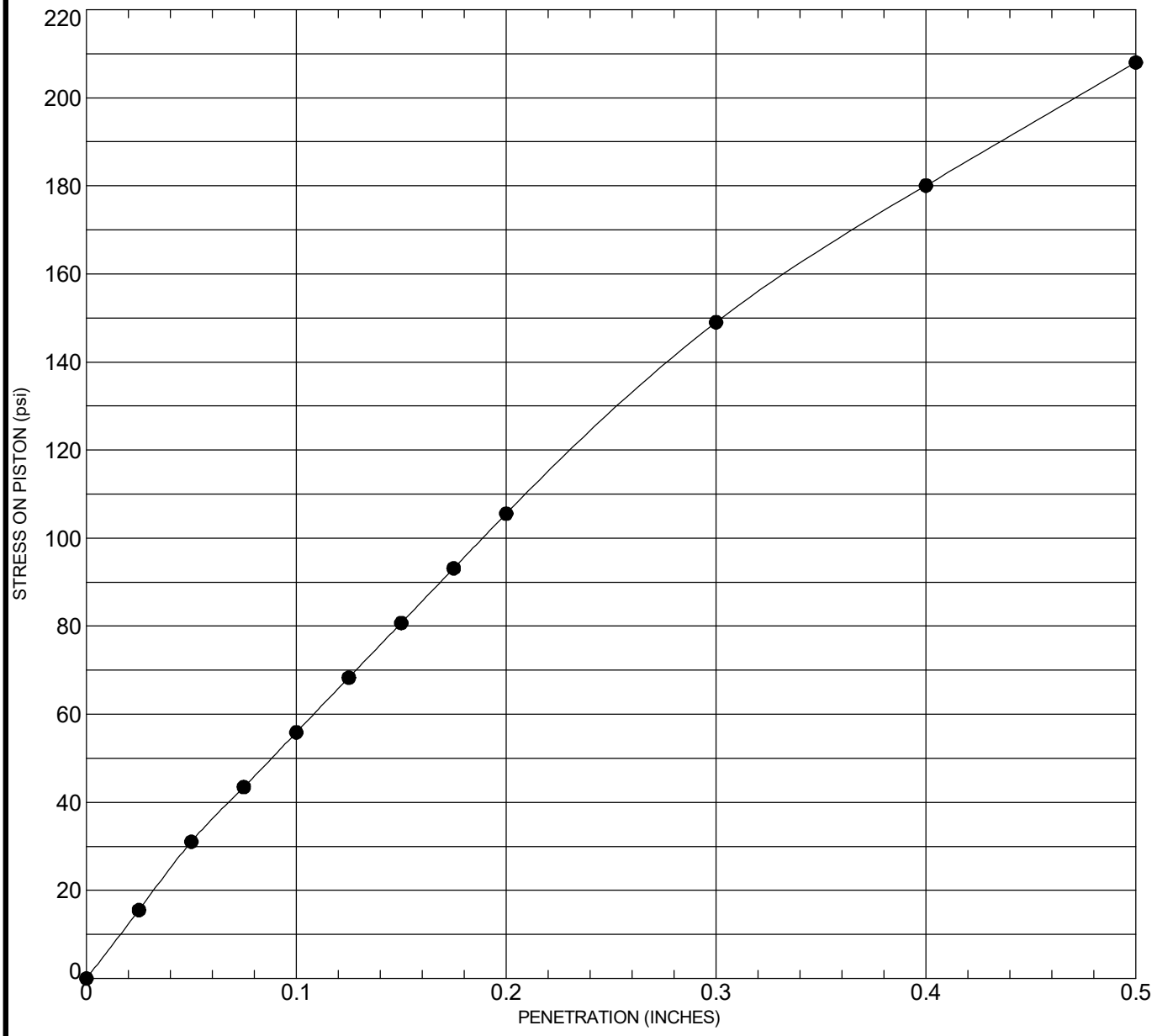
MOISTURE DENSITY RELATIONSHIP

Project: NP VIIS 100(3), 102(1), Etc. Subsurface Exploration in Virgin Islands National Park St. John, U.S. Virgin Islands

Contract: 21C12019.00

COMPACTION ST. JOHN EFL LOGS.GPJ TEST TEMPLATE.GDT 9/2/21



Sample Description:	SILTY, CLAYEY SAND WITH GRAVEL (SC-SM), brown, (A-2-4)
Sample Source:	PB21-01
Sample Depth (ft):	0.0 - 3.0
Test Method:	ASTM D1883

Dry Density Before Soaking (pcf):	126.7
Dry Density After Soaking (pcf):	126.6
Maximum Dry Density (pcf):	132.6
Moisture Content Before Soaking (%):	8.4
Moisture Content After Soaking (Avg) (%):	9.7
Moisture Content Top Inch After Soak (%):	11.2
Optimum Moisture Content (%):	8.2

Liquid Limit (LL):	22
Plasticity Index (PI):	5
% Retained #4 Sieve:	29.5
% Passing # 200 Sieve:	27.1

ASTM Test Methods:
Atterberg D4318
Gradation D6913

CBR:	5.6, Soaked
Surcharge (psf):	50
Swell (%):	0.1

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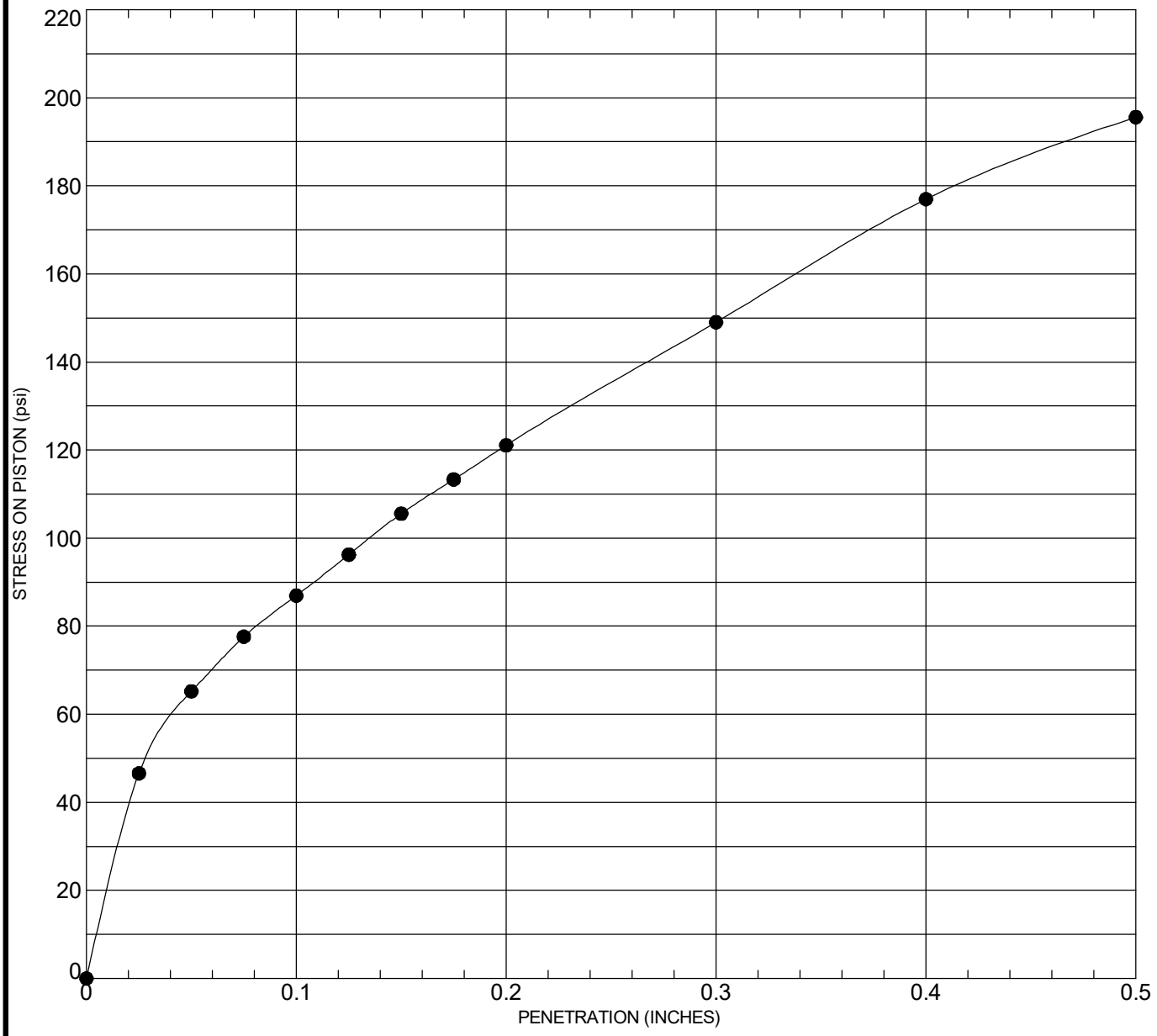
CALIFORNIA BEARING RATIO TEST

Project: NP VIIS 100(3), 102(1), Etc. Subsurface Exploration in Virgin Islands National Park St. John, U.S. Virgin Islands

Contract: 21C12019.00

CBR SINGLE POINT ST. JOHN EFL LOGS.GPJ TEST TEMPLATE.GDT 9/2/21



Sample Description:	SILTY, CLAYEY SAND WITH GRAVEL (SC-SM), light brown, (A-1-b)
Sample Source:	PB21-04
Sample Depth (ft):	0.0 - 2.0
Test Method:	ASTM D1883

Dry Density Before Soaking (pcf):	126.7
Dry Density After Soaking (pcf):	126.7
Maximum Dry Density (pcf):	131.3
Moisture Content Before Soaking (%):	8.3
Moisture Content After Soaking (Avg) (%):	9.1
Moisture Content Top Inch After Soak (%):	9.1
Optimum Moisture Content (%):	9.1

Liquid Limit (LL):	24
Plasticity Index (PI):	4
% Retained #4 Sieve:	30.8
% Passing # 200 Sieve:	19.4

ASTM Test Methods:
Atterberg D4318
Gradation D6913

CBR:	8.1, Soaked
Surcharge (psf):	50
Swell (%):	0.0

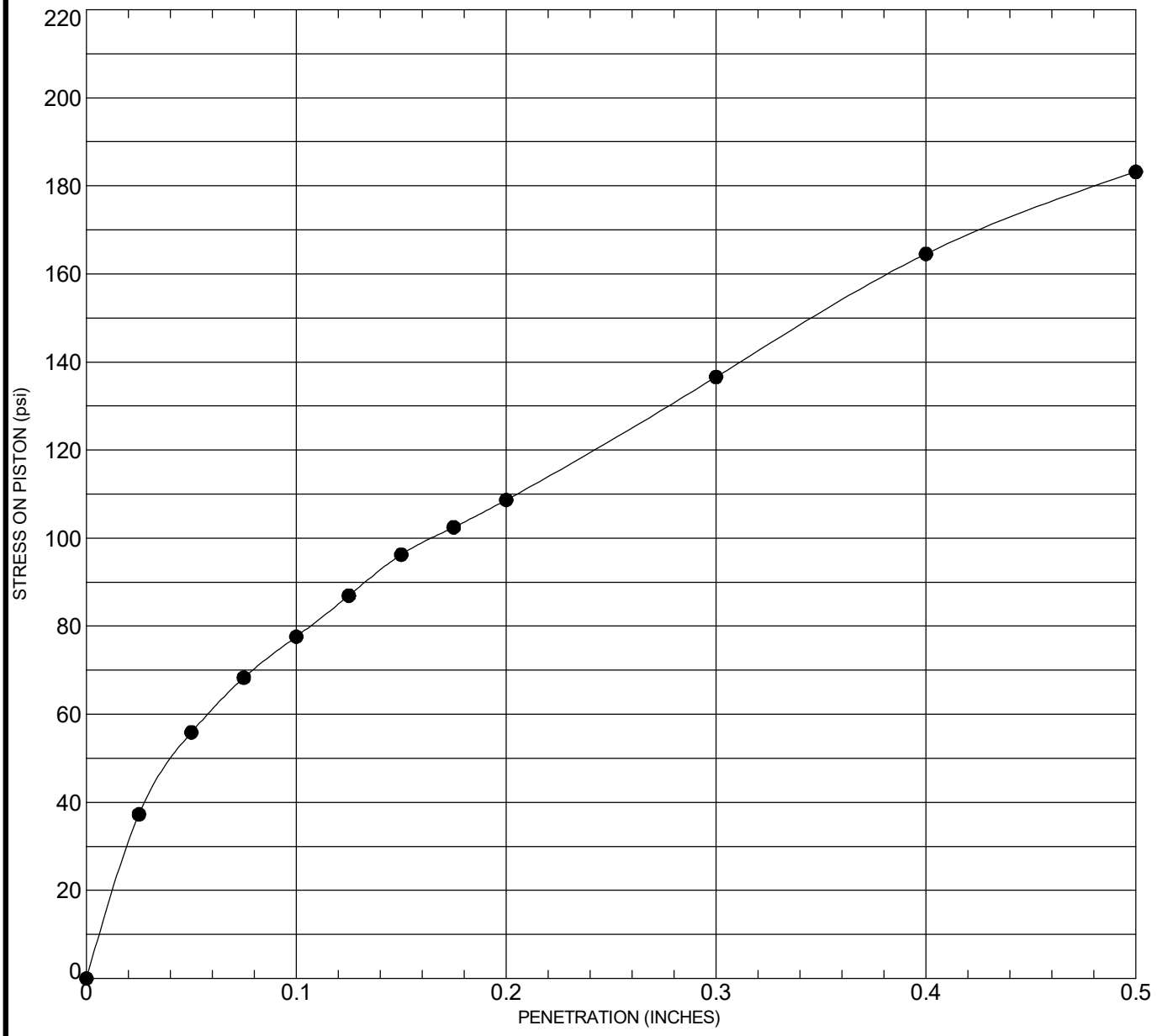
Schnabel ENGINEERING

CALIFORNIA BEARING RATIO TEST

Project: NP VIIS 100(3), 102(1), Etc. Subsurface Exploration in Virgin Islands National Park St. John, U.S. Virgin Islands

Contract: 21C12019.00

CBR SINGLE POINT ST. JOHN EFL LOGS.GPJ TEST TEMPLATE.GDT 9/2/21



Sample Description:	SILTY, CLAYEY SAND WITH GRAVEL (SC-SM), light brown, (A-2-4)
Sample Source:	PB21-07
Sample Depth (ft):	0.0 - 1.5
Test Method:	ASTM D1883

Dry Density Before Soaking (pcf):	121.5
Dry Density After Soaking (pcf):	121.3
Maximum Dry Density (pcf):	127.4
Moisture Content Before Soaking (%):	10.5
Moisture Content After Soaking (Avg) (%):	12.4
Moisture Content Top Inch After Soak (%):	17.8
Optimum Moisture Content (%):	10.4

Liquid Limit (LL):	23
Plasticity Index (PI):	5
% Retained #4 Sieve:	17.9
% Passing # 200 Sieve:	35.1

ASTM Test Methods:
Atterberg D4318
Gradation D6913

CBR:	7.2, Soaked
Surcharge (psf):	50
Swell (%):	0.1

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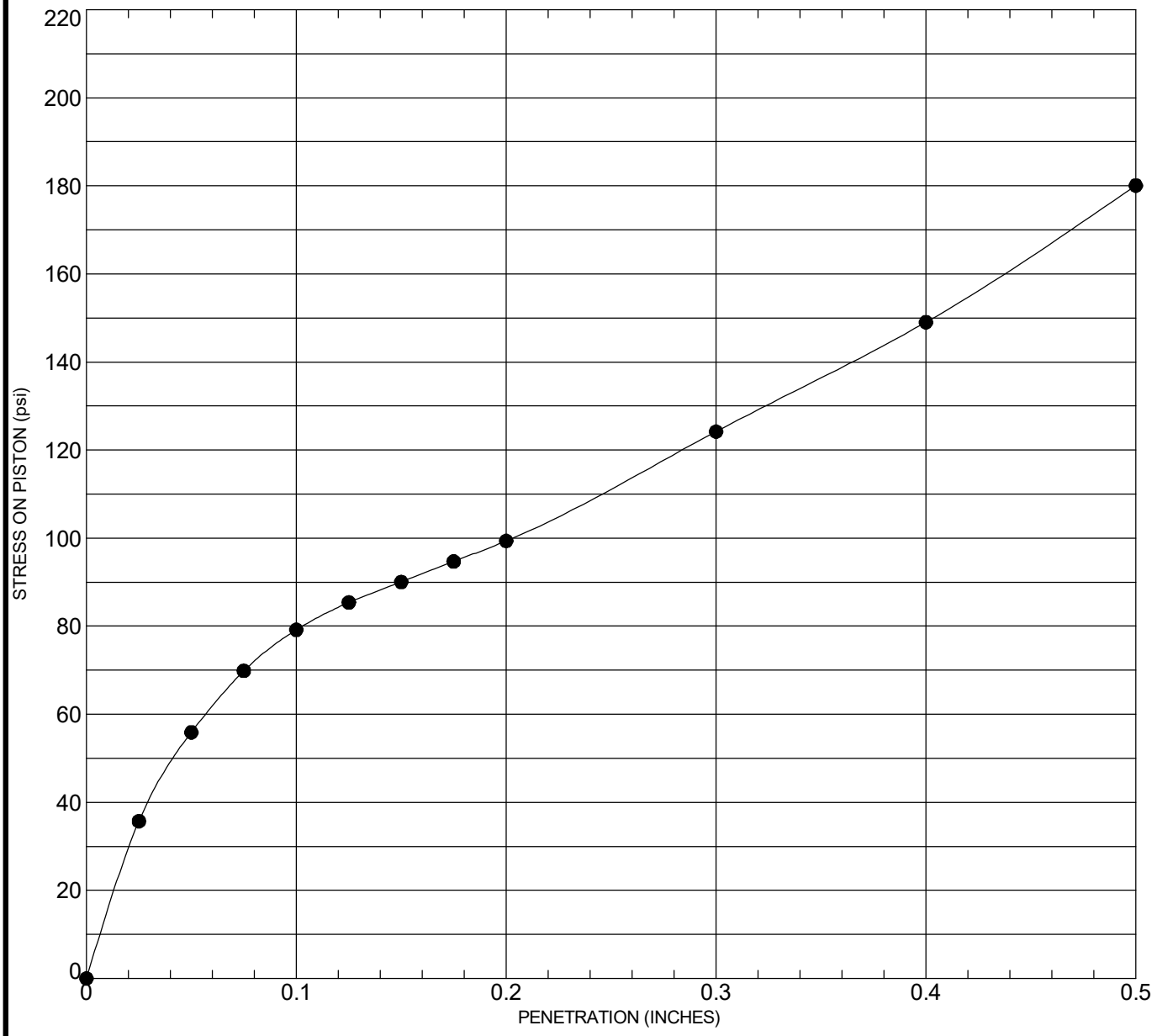
CALIFORNIA BEARING RATIO TEST

Project: NP VIIS 100(3), 102(1), Etc. Subsurface Exploration in Virgin Islands National Park St. John, U.S. Virgin Islands

Contract: 21C12019.00

CBR SINGLE POINT ST. JOHN EFL LOGS.GPJ TEST TEMPLATE.GDT 9/2/21



Sample Description:	CLAYEY SAND WITH GRAVEL (SC), brown, (A-2-6)
Sample Source:	BH21-01
Sample Depth (ft):	1.0 - 2.0
Test Method:	ASTM D1883

Dry Density Before Soaking (pcf):	117.0
Dry Density After Soaking (pcf):	116.5
Maximum Dry Density (pcf):	123.2
Moisture Content Before Soaking (%):	12.6
Moisture Content After Soaking (Avg) (%):	16.6
Moisture Content Top Inch After Soak (%):	16.9
Optimum Moisture Content (%):	12.8

Liquid Limit (LL):	27
Plasticity Index (PI):	8
% Retained #4 Sieve:	16.6
% Passing # 200 Sieve:	35.2

ASTM Test Methods:
Atterberg D4318
Gradation D6913

CBR:	6.6, Soaked
Surcharge (psf):	50
Swell (%):	0.4

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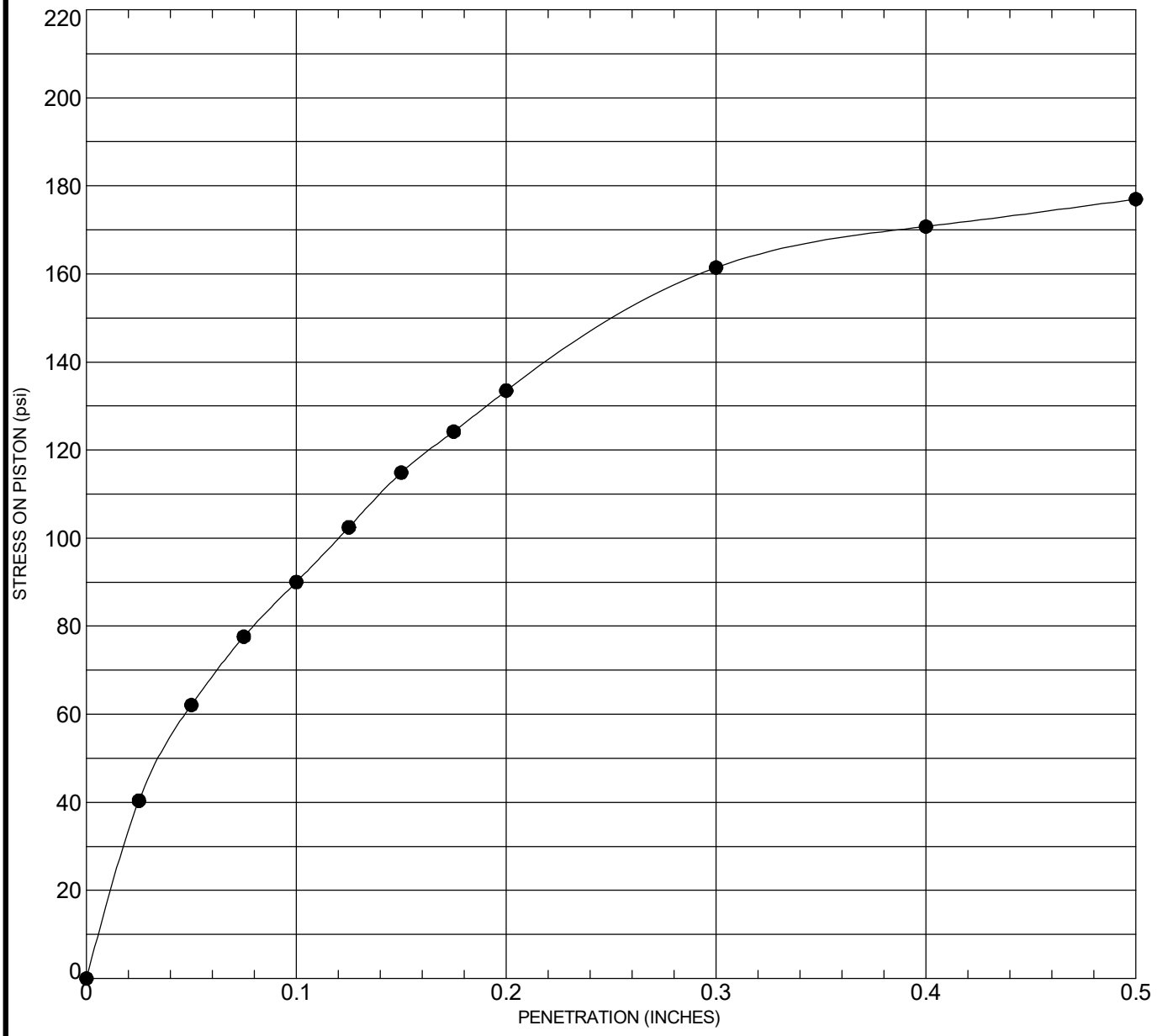
CALIFORNIA BEARING RATIO TEST

Project: NP VIIS 100(3), 102(1), Etc. Subsurface Exploration in Virgin Islands National Park
St. John, U.S. Virgin Islands

Contract: 21C12019.00

CBR SINGLE POINT ST. JOHN EFL LOGS.GPJ TEST TEMPLATE.GDT 9/2/21



Sample Description:	CLAYEY SAND (SC), trace gravel, brown, (A-2-4)
Sample Source:	BH21-04
Sample Depth (ft):	0.5 - 2.0
Test Method:	ASTM D1883

Dry Density Before Soaking (pcf):	118.8
Dry Density After Soaking (pcf):	118.6
Maximum Dry Density (pcf):	125.8
Moisture Content Before Soaking (%):	11.1
Moisture Content After Soaking (Avg) (%):	14.0
Moisture Content Top Inch After Soak (%):	13.5
Optimum Moisture Content (%):	11.2

Liquid Limit (LL):	26
Plasticity Index (PI):	10
% Retained #4 Sieve:	12.6
% Passing # 200 Sieve:	29.0

ASTM Test Methods:
Atterberg D4318
Gradation D6913

CBR:	8.9, Soaked
Surcharge (psf):	50
Swell (%):	0.2

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CALIFORNIA BEARING RATIO TEST

Project: NP VIIS 100(3), 102(1), Etc. Subsurface Exploration in Virgin Islands National Park St. John, U.S. Virgin Islands

Contract: 21C12019.00

CBR SINGLE POINT ST. JOHN EFL LOGS.GPJ TEST TEMPLATE.GDT 9/2/21

APPENDIX C

PHOTO LOG

Site Photos

Schnabel Engineering, LLC
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PHOTO 1

DATE TAKEN: 7/30/21

BORING NUMBER PB21-01

LOCATION:

See Boring Location Plan

COMMENTS:

PHOTO 2

DATE TAKEN: 7/30/21

BORING NUMBER PB21-01

LOCATION:

See Boring Location Plan

COMMENTS:

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PHOTO 3

DATE TAKEN: 7/30/21

BORING NUMBER PB21-02

LOCATION:

See Boring Location Plan

COMMENTS:

PHOTO 4

DATE TAKEN: 7/30/21

BORING NUMBER PB21-02

LOCATION:

See Boring Location Plan

COMMENTS:

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PHOTO 5

DATE TAKEN: 7/30/21

BORING NUMBER PB21-03

LOCATION:

See Boring Location Plan

COMMENTS:

PHOTO 6

DATE TAKEN: 7/30/21

BORING NUMBER PB21-03

LOCATION:

See Boring Location Plan

COMMENTS:

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PHOTO 7

DATE TAKEN: 7/30/21

BORING NUMBER PB21-04

LOCATION:

See Boring Location Plan

COMMENTS:

PHOTO 8

DATE TAKEN: 7/30/21

BORING NUMBER PB21-04

LOCATION:

See Boring Location Plan

COMMENTS:

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PHOTO 9

DATE TAKEN: 7/30/21

BORING NUMBER PB21-05

LOCATION:

See Boring Location Plan

COMMENTS:

PHOTO 10

DATE TAKEN: 7/30/21

BORING NUMBER PB21-05

LOCATION:

See Boring Location Plan

COMMENTS:

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PHOTO 11

DATE TAKEN: 7/30/21

BORING NUMBER PB21-06

LOCATION:

See Boring Location Plan

COMMENTS:

PHOTO 12

DATE TAKEN: 7/30/21

BORING NUMBER PB21-06

LOCATION:

See Boring Location Plan

COMMENTS:

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PHOTO 13

DATE TAKEN: 7/30/21

BORING NUMBER PB21-07

LOCATION:

See Boring Location Plan

COMMENTS:

PHOTO 14

DATE TAKEN: 7/30/21

BORING NUMBER PB21-07

LOCATION:

See Boring Location Plan

COMMENTS:

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PHOTO 15

DATE TAKEN: 8/2/21

BORING NUMBERS:
BH21-01, BH21-02

LOCATION:

See Boring Location Plan

COMMENTS:

Erosion/slope failure below metal plate between BH21-01 and BH21-02

PHOTO 16

DATE TAKEN: 8/2/21

BORING NUMBERS
BH21-01, BH21-02

LOCATION:

See Boring Location Plan

COMMENTS:

Exposed Bedrock within Slope below BH21-01 and BH21-02

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PHOTO 17

DATE TAKEN: 8/2/21
BORING NUMBER BH21-01

LOCATION:

See Boring Location Plan

COMMENTS:

PHOTO 18

DATE TAKEN: 8/2/21

BORING NUMBER BH21-01

LOCATION:

See Boring Location Plan

COMMENTS:

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PHOTO 19

DATE TAKEN: 8/2/21
BORING NUMBER BH21-02

LOCATION:

See Boring Location Plan

COMMENTS:

PHOTO 20

DATE TAKEN: 8/2/21

BORING NUMBER BH21-02

LOCATION:

See Boring Location Plan

COMMENTS:

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PHOTO 21

DATE TAKEN: 7/31/21
BORING NUMBER BH21-03

LOCATION:

See Boring Location Plan

COMMENTS:

PHOTO 22

DATE TAKEN: 7/31/21

BORING NUMBER BH21-03

LOCATION:

See Boring Location Plan

COMMENTS:

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PHOTO 23

DATE TAKEN: 7/31/21
BORING NUMBER BH21-04

LOCATION:

See Boring Location Plan

COMMENTS:

PHOTO 24

DATE TAKEN: 7/31/21

BORING NUMBER BH21-04

LOCATION:

See Boring Location Plan

COMMENTS:

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APPENDIX D

GEOLOGICAL MAP

USGS Geologic Map of St. John, U.S. Virgin Islands

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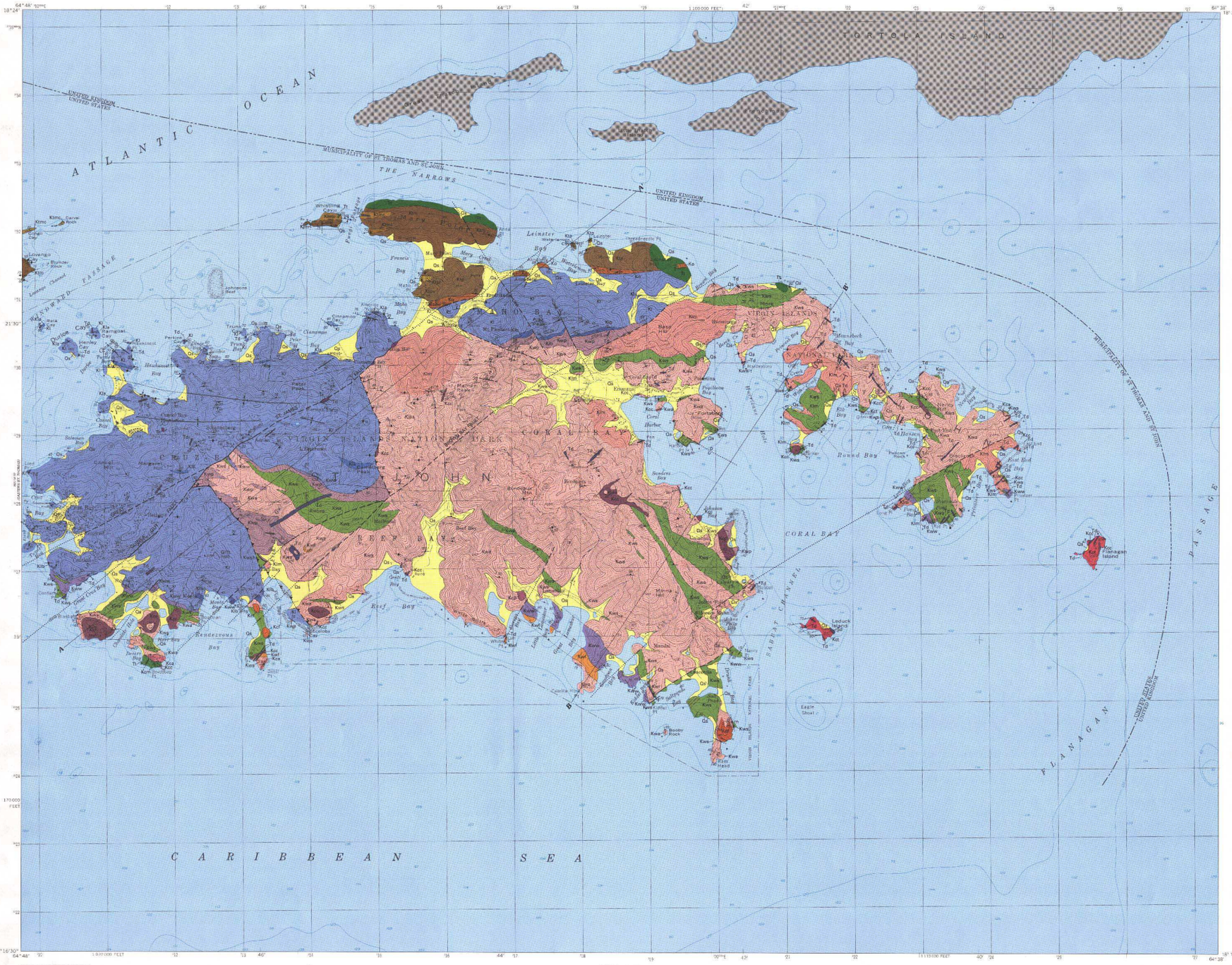


Base from U.S. Geological Survey
Western St. John, 1958 (photorevised 1982) and Eastern St. John, 1958 (photorevised 1982)

Polyconic projection. Puerto Rico Datum, 1940 adjustment
10,000-foot grids based on Puerto Rico coordinate system, Virgin Islands extension, 1000-meter Universal Transverse Mercator grid, zone 20

APPROXIMATE MEAN DECLINATION, 2001

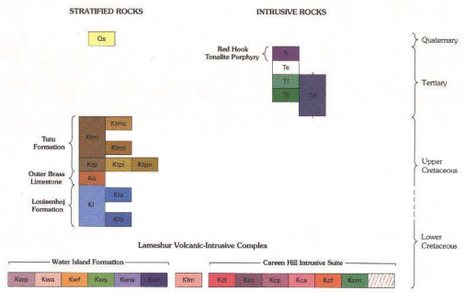
SCALE 1:24 000

CONTOUR INTERVAL 40 FEET
DOTTED LINES REPRESENT 20-FOOT CONTOURS
DATUM IS MEAN SEA LEVEL
DEPTH CURVES AND SOUNDINGS IN FEET—DATUM IS MEAN LOW WATER
RED LINES REPRESENT 3-MILE LIMIT AND 12-MILE LIMIT
SHORELINE SHOWN REPRESENTS THE APPROXIMATE LINE OF MEAN HIGH WATER
THE MEAN RANGE OF TIDE IS APPROXIMATELY 0.8 FEET

VIRGIN ISLANDS QUADRANGLE LOCATION

Geology mapped in 1985–1988 and 1995; assisted by M.L. Rankin
Manuscript approved for publication March 26, 1998

CORRELATION OF MAP UNITS



LIST OF MAP UNITS

[Dikes 3 m or more in width are shown where space permits. Unit Te is not shown on geologic map; see "Map showing distribution and attitude of dikes on St. John" for location. For complete Description of Map Units, see Appendix A, this report.]

- Qs — **Surficial deposits (Quaternary)**
- Rh — **Red Hook Tonalite Porphyry (new name) (Tertiary)**
- Te — **Explosion breccia (Tertiary?)**—Shown only on inset map
- Tl — **Hornblende lamprophyre (Tertiary)**
- Tt — **Biotite-hornblende tonalite (Tertiary, late Eocene)**
- Td — **Diabase, gabbro, and diorite (Tertiary)**

Tutu Formation (Upper Cretaceous; upper Turonian, upper Santonian, or younger)

- Ktm — Mandal Member (new name)
- Ktmc — Congo Cay Limestone Lens
- Ktmr — Marble, calc-silicate rock, and marble conglomerate
- Ktp — Picara Member (new name)
- Ktpl — Marble conglomerate and calc-silicate-rich beds north of Maho Point
- Ktpu — Medium-dark-gray, porphyritic meta-andesite south of Maho Point
- Ko — **Outer Brass Limestone (Upper Cretaceous; upper Turonian to upper Santonian)**
- Kl — **Louisenhoj Formation (Cretaceous, Albian to Turonian or Santonian)**
- Klu — Porphyritic, locally vesicular andesite lava
- Klp — Porphyritic, locally amygdaloidal basalt and pillow basalt

Lameshur Volcanic-Intrusive Complex (new name) (Lower Cretaceous; Aptian to lowermost Albian)—Includes Careen Hill Intrusive Suite and Water Island Formation

- Klm — **Undivided**

Careen Hill Intrusive Suite (new name) (Early Cretaceous)

- Kct — Trondhjemite
- Kcc — Coarsely porphyritic keratophyre
- Kcp — Porphyritic keratophyre
- Kca — Phenocryst-poor keratophyre
- Kcf — Plagioclase-phyric keratophyre
- Kcm — Gabbro
- Sheeted dike complex

Water Island Formation (Lower Cretaceous)

- Kwp — Porphyritic keratophyre
- Kwa — Phenocryst-poor keratophyre
- Kwf — Plagioclase-phyric keratophyre
- Kwg — Basalt and basaltic andesite
- Kwv — Volcanic wacke and bedded tuff
- Kwr — Radiolarian chert

EXPLANATION OF MAP SYMBOLS

[Where two or more symbols for planar or linear features are combined, their intersection marks the point of observation. Where a single planar feature and a single linear feature are combined, the center of the planar feature marks the point of observation. For a linear symbol alone, the base of the arrow marks the point of observation.]

Contact—Dashed where approximately located; dotted where concealed

Faults—Tick shows dip where known. Dashed where approximately located; dotted where concealed

Ductile fault or local shear zone

Brittle fault—Sense of movement shown if known. Strike-slip motion shown by arrows, or T (toward) and A (away) in cross section. For dip-slip motion: U (up) and D (down)

High-angle reverse fault—Teeth on upper plate

FOLDS

Anticline—Showing trace of axial surface

Syncline—Showing trace of axial surface

MINOR FOLDS

[May be combined with planar features]

Bearing and plunge of fold axis

Bearing and plunge of sinistral fold

Bearing and plunge of dextral fold

PLANAR FEATURES

Strike and dip of bedding—Ball indicates youngest direction of beds known from sedimentary features; graded bedding; crossbedding; channelling

- Inclined
- Vertical
- Overturned
- Horizontal
- Generalized strike of vertical bedding

Strike and dip of foliation

- Inclined
- Vertical

Strike and dip of generalized foliation

Strike and dip of foliation parallel to bedding

- Coplanar, inclined
- Coplanar, vertical
- Coplanar, overturned
- Parallel strike, different dip—Number closest to strike is dip value for foliation

Strike and dip of spaced cleavage

Strike and dip of joint set

- Inclined
- Vertical

Strike and dip of flow layering, layering of amygdules, or layering of pillows—Ball indicates tops of pillow layering known from asymmetry of pillows

Strike and dip of dike 3 m or more in thickness—Shown on geologic map where space permits; otherwise, see map showing distribution of dikes

- Inclined
- Vertical
- Trend only—Dip unknown

LINEAR FEATURES

[May be combined with planar features]

Bearing and plunge of axis of columnar joints

Bearing and plunge of axes of boudinage

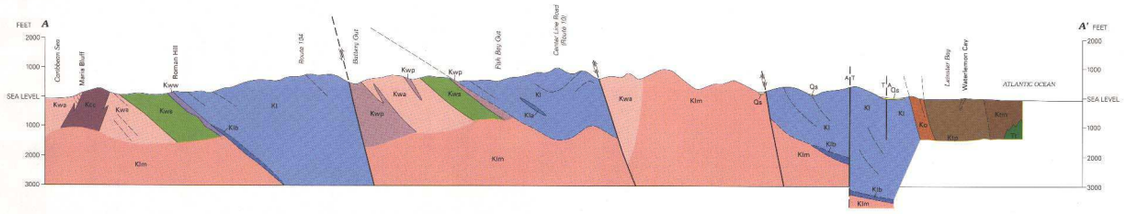
OTHER FEATURES

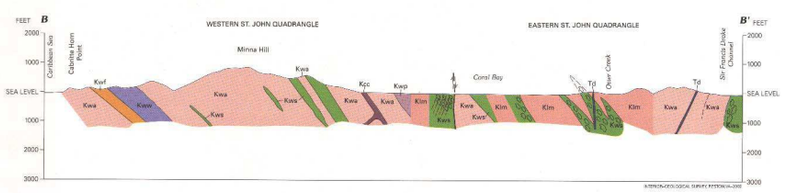
Fossil locality

Inactive quarry

Area of hydrothermal alteration

Pillow lava—Right-side up. Shown only on cross section *B-B'*





EXPLANATION

Strike and dip of dikes—For some dikes, only strike is shown because dip cannot be measured. For unit name, see classification of dikes

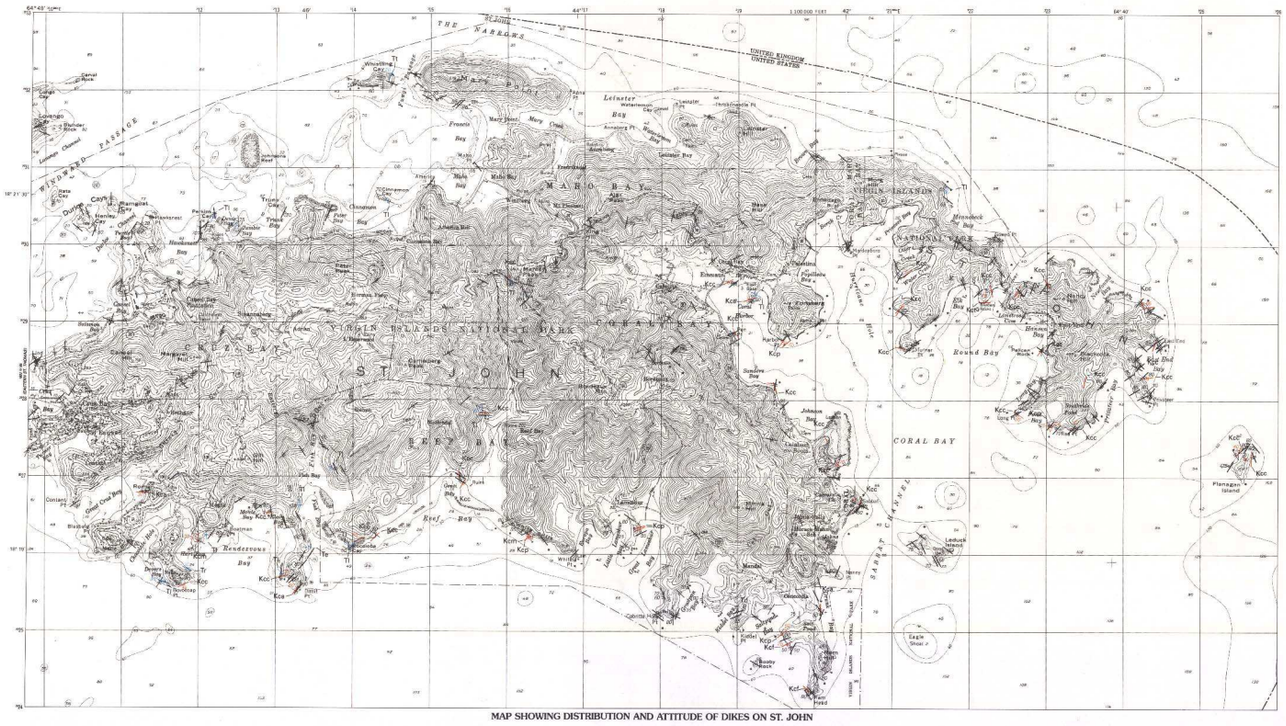
- Strike and dip of inclined dike 3 m or more thick
- Strike and dip of vertical dike 3 m or more thick
- Strike and dip of inclined dike less than 3 m thick
- Strike and dip of vertical dike less than 3 m thick

Classification of dikes

- Tl — Red Hook Tonalite Porphyry
- Te — Explosion breccia
- Tl — Hornblende lamprophyre
- Tt — Tonalite
- Td — Diabase, gabbro, and diorite—Mapped as Td on geologic map

Careen Hill Intrusive Suite (no sequence of intrusion implied)

- Kct — Trondhjemite
- Kcc — Coarsely porphyritic keratophyre
- Kcp — Phenocryst-poor keratophyre
- Kcf — Plagioclase-phyric keratophyre
- Kcm — Diabase



MAP SHOWING DISTRIBUTION AND ATTITUDE OF DIKES ON ST. JOHN

GEOLOGIC MAP OF ST. JOHN, U.S. VIRGIN ISLANDS

By
Douglas W. Rankin

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