GEO DESIGN

UNDERGROUND INTELLIGENCE

GEOTECHNICAL EVALUATION REPORT

PROPOSED 9-STORY BUILDING
13-12 BEACH CHANNEL DRIVE
FAR ROCKAWAY, NY

Prepared for:
Camber Property Group LLC
419 Park Avenue South, Suite 401
New York, NY 10016

Prepared By:
GEODesign, Inc. P.C.
241West 30th Street, 5th Floor
New York, NY 10001

GEODesign File No. 3887-009
January 2021

GEO DESIGN

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(212) 221-6651

January 14, 2021
Project No.: 3887-009

Joanna Kandel
Camber Property Group LLC
419 Park Avenue South, Suite 401
New York, NY 10016

Re: Geotechnical Evaluation Report
13-12 Beach Channel Drive, Far Rockaway, New York

Dear Ms. Kandel:

GEODesign, Inc. P.C. (GEODesign) is pleased to submit this geotechnical evaluation report for the referenced project site.

We appreciate the opportunity to work with you. Please contact us if you have any questions or need additional information.

Sincerely,

GEODesign, Inc. P.C.

Emma Gretina, PE
Senior Project Engineer

Thomas G. Thomann, PhD, PE
Senior Principal / Reviewer

TABLE OF CONTENTS

TABLE OF CONTENTS

List of Figures

List of Appendices

1.0 – INTRODUCTION AND OBJECTIVES

1.1 GENERAL

This report provides geotechnical recommendations for the design and construction of a proposed building at 13-12 Beach Channel Drive, Far Rockaway, New York (see Figure 1). Authorization to proceed was obtained in the form of an agreement between Camber property Group LLC and GEODesign, Inc. P.C. (GEODesign) dated December 8, 2020.

The geotechnical evaluations and recommendations presented herein are in general accordance with the 2014 NYC Building Code (Code).

1.2 SITE CONDITIONS AND PROJECT UNDERSTANDING

The project site is located at 13-12 Beach Channel Drive (Block 15528, Lots 5, 6 and 9) in Far Rockaway, New York. The combined lot area is approximately 33,100 sq. ft. and the lots are currently occupied by asphalt surface parking, a concrete rear yard, and various one to two story buildings.

The site is bound by Beach Channel Drive to the west, various 1 to 3-story buildings with an asphalt parking lot to the north, Redfern Avenue to the east, and various 1 to 2-story buildings to the south. The site ground surface varies from approximately el. +16 to +23 feet[1].

The NYC Transit Authority (TA) "A" elevated subway line, which terminates on the south side of Mott Avenue at the Far Rockaway Mott Avenue Subway Station, is estimated to be more than 200 feet from the project site.

We understand that it is proposed to demolish the existing buildings and construct a new 9-story building that will encompass a portion of the site. The estimated new building footprint is approximately 19,500 sq. ft. Based on the architectural drawings dated December 9, 2020, the top of the first floor slabs are el. +17 and el. +23.5 feet along Beach Channel Drive and Redfern Avenue, respectively. We understand that a cellar level is being considered but is not finalized. For the purpose of this report, it is assumed that the building foundations with no cellar and one cellar level will be approximately 4 feet and 16 feet below the first floor slabs, respectively.

1.3 OBJECTIVES AND SCOPE OF SERVICES

The objectives of this investigation were to evaluate the subsurface conditions at the site and provide geotechnical recommendations for the design and construction of the proposed building. The following scope of services was performed to achieve these objectives:

1. Retained and managed subcontractors to perform test borings and laboratory testing;
2. Provided full time inspection of the test boring operations;
3. Performed engineering evaluations and prepared this geotechnical evaluation report that includes the following:

[1] All elevations in the report are referenced to NAVD88.

a. An Introductory Section presenting project background information and the scope of services;
b. A Subsurface Conditions section that includes the following:
   - A description of the test boring and laboratory testing procedures and results;
   - A plan showing the location of the as-drilled test borings;
   - A description of the subsurface conditions;
c. An Analyses and Recommendations section regarding the Foundation Design that includes the following:
   - Seismic site classification and liquefaction potential;
   - Foundation type, estimated capacity, and bearing elevation;
   - Ground floor slab support;
   - Permanent below grade wall lateral pressures;
   - Permanent groundwater control measures;
d. A Construction Recommendations section that includes the following:
   - Excavation and temporary support of excavation considerations;
   - Adjacent building support considerations;
   - Temporary groundwater control;
   - Subgrade preparation;
   - Backfill and compaction control recommendations;
   - Pre-construction condition surveys;
   - Construction inspection and monitoring considerations;
e. A Summary and Conclusions section;
f. Appendices that include test boring logs and laboratory test results.

1.4 REPORT ORGANIZATION

This report is divided into five sections. Section 1 presents an introduction and the objectives of the study. Section 2 includes a description of the subsurface investigation methods and results. Section 3 provides engineering evaluation results and the foundation design and construction recommendations. A summary and conclusions are included in Section 4. Limitations of the subsurface explorations, analyses, and recommendations are included in Section 5. Tables and Figures are provided at the end of the text.

2.0 – SUBSURFACE CONDITIONS

2.1 GENERAL

The subsurface investigation included laboratory testing and a field investigation, which included performing test borings and installing a groundwater observation well. Details of the subsurface investigation and the conditions encountered are described in the following sections.

2.2 SUBSURFACE INVESTIGATION

2.2.1 Test Boring Program

Eight test borings, designated B-1 through B-8, were performed between December 10 and 16, 2020, at the locations shown in Figure 2. Special inspection of the test borings was performed on a continuous basis by GEODesign personnel under the direction of Mr. Thomas Thomann, PE of GEODesign.

The test borings were performed by Craig Geotechnical Drilling Co., Inc. of Mays Landing, NJ using a rubber tired all-terrain vehicle (ATV) mounted CME-750x drilling rig. The boreholes were advanced using mud rotary drilling techniques with a 2-7/8 or 3-7/8 inch diameter tri-cone roller bit and a 4-inch diameter flush joint casing.

Soil samples were obtained using techniques and equipment in general accordance with the American Society for Testing and Materials (ASTM) Standard Specification D1586-Standard Penetration Test (SPT). The SPT consists of driving a 2 inch O.D. split spoon sampler for a distance of 24 inches, with repeated blows of a 140 lb. hammer free falling a distance of 30 inches. The standard penetration, or N-value, is determined as the number of blows required to advance the sampler 12 inches after the initial 6 inches of penetration. The recovered split-spoon samples were placed in jars, labeled with the project name and number, boring number, sample, depth, SPT blow counts and the amount of recovery.

When cohesive soils were encountered, tube samples were collected using techniques and equipment in general accordance with ASTM Standard Specification D1587-Thin-Walled Tube Sampling and ASTM Standard Specification D1587-Sampling of Soil with Piston Sampler. The tube samples were obtained for the performance of laboratory strength and consolidation testing.

Upon completion of boring B-4, a groundwater observation well was installed. The well was constructed of nominal 2-inch diameter Schedule 25 PVC pipe with a 10-foot screen between depths of approximately 20 and 30 feet, and 20 feet of riser pipe. The annulus between the pipe and the borehole wall was backfilled with filter sand to the top of the screen. The remainder of the annulus was backfilled with drill cuttings. A flush-mount cap was installed at the top of the completed borehole.

The test boring logs are included in Appendix A.

2.2.2 Laboratory Testing

Geotechnical laboratory testing was conducted on representative soil samples to verify the field classifications and assist in engineering evaluations. The laboratory tests, which include sieve analyses, percent fines, Atterberg Limits, consolidation, and consolidated undrained triaxial testing are included in Appendix B.

2.3 GENERALIZED SUBSURFACE CONDITIONS

The following generalized strata descriptions are based on interpretations of the subsurface investigation results:

Stratum 1 – Uncontrolled Fill [7][2]: This stratum consists of brown and black coarse to fine sand with varying amounts of silt, gravel, and miscellaneous fill such as asphalt and concrete. The N-values range from 17 to 19 blows per foot (bpf). The thickness of this stratum was less than approximately 5 feet and encountered in borings B-4 and B-7.

Stratum 2 – Upper Sand [6, 3b, 3a]: This stratum consists of brown and gray coarse to fine sand with varying amounts of gravel and silt. The N-values range from 3 to 65 bpf, with an average of 27 bpf, indicative of a medium dense material. The thickness of this stratum is approximately 30 to 35 feet.

Stratum 3 – Silt & Clay [6, 5b, 4c, 4b]: This stratum consists of brown and gray silt and clay with varying amounts of sand. The N-values range from 4 to 20 bpf, with an average of 10 bpf, indicative of a stiff material. The thickness of this stratum is approximately 25 to 30 feet.

Stratum 4 – Lower Sand [3b, 3a]: This stratum consists of gray fine sand with varying amounts of gravel and silt. The N-values typically range from 26 to 79 bpf, with an average of 41 bpf, indicative of a dense material. This stratum extends to a depth of at least 100 feet.

2.4 GROUNDWATER LEVEL

The groundwater was measured at a depth of approximately 17 feet (el. +5.3 feet) on December 14, 2020.

Groundwater measurements were not taken over an extended period of time; therefore, the measurements do not adequately reflect seasonal or other time dependent variations that may occur. See limitations in Section 5.

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[2] The numbers in parentheses refer to the 2014 NYC Building Code classification system.

3.0 – ANALYSES AND RECOMMENDATIONS

3.1 GENERAL

This section presents engineering analyses, evaluations, and recommendations related to the design and construction of the foundations and below grade structures. The evaluations and recommendations are based on the available subsurface information, our experience on other projects, and the design requirements provided herein for the proposed structure.

3.2 FOUNDATION DESIGN

3.2.1 Seismic Recommendations

Based on the soil profile, the recommended seismic site classification is Site Class "D". In accordance with the Code, if the Risk Category is I&II, or III, the Seismic Design Category is "B". The appropriate Risk Category should be determined by the Architect or Structural Engineer.

The Code requires that a liquefaction potential assessment be performed for non-cohesive soils located below the groundwater and to a maximum depth of 50 feet. The liquefaction potential at the site was initially evaluated using the Code based liquefaction assessment diagram, which as shown in Figure 3, indicates that a liquefaction evaluation is required.

A site-specific liquefaction analysis was performed using the methods developed by I.M. Idriss and R. W. Boulanger (2004). These analyses require a peak ground surface acceleration and an earthquake magnitude to estimate the seismic shear stresses. Based on Site Class D, the Code specified peak ground surface acceleration for liquefaction evaluation is 0.24g. An earthquake magnitude of 5.5 is used in the analyses and is primarily based on historical earthquake information in the northeast. The Code specifies that, for Risk Category II/III buildings, the minimum acceptable factor of safety against liquefaction is 1.0. The factors of safety, as shown in Figure 4, are greater than 1.0. Therefore, if the new building is in Risk Category II/III, liquefaction does not need to be considered in the foundation design.

3.2.2 Foundation Recommendations

A cellar level is being considered but is not finalized. Based on the assumed foundation depths, the bottom of the new building foundations will be between approximately el. +13 and +19 feet if no cellar is constructed and between el. +1 and +7 feet if one cellar level is constructed. It is anticipated that Stratum 2 (sand) will be encountered at most of the assumed foundation elevations.

We have not been provided with the building loads; however, based on the proposed building height, we recommend that shallow foundations (i.e., spread or mat foundations) be considered.

We recommend that consideration initially be given to supporting the new building on spread footings bearing on Stratum 2 with an allowable bearing capacity of 3 tons per square foot (tsf). For a building with no cellar, it may be necessary to excavate an additional 3 feet to reach Stratum 2, at some spread footing locations.

If the spread footing stresses exceed the allowable bearing capacity or the spread footing configuration is inefficient, we recommend that consideration be given to a mat foundation bearing on Stratum 2 with an allowable bearing capacity of 3 tsf.

The mat stresses and deformations are estimated by performing structural analyses, which require a modulus of subgrade reaction value. For a mat foundation bearing on Stratum 2, we recommend a modulus of subgrade reaction value of 100 pci. The structural engineer's plots of estimated mat stresses and settlements should be provided to us for review. If the mat stresses or settlements are greater than the recommended values, especially close to the adjacent buildings, settlement reducing elements (i.e., micropiles) may be required at specific locations.

If a mat foundation is structurally feasible, it may not be the most cost effective foundation because the building foundation area is relatively high, which will result in a large mat concrete volume. Therefore, before selecting a mat foundation, it may be prudent to perform a cost comparison between a mat foundation and a pile foundation. If necessary, we can provide pile foundation recommendations for cost estimating purposes.

All foundations should bear a minimum of 4 feet below final grade and be placed on the appropriate bearing stratum. If the appropriate bearing material is not encountered at the foundation elevation, the unsuitable material should be removed until the appropriate bearing material is encountered.

If the adjacent building foundations are lower than the proposed building foundations, the new foundations should be lowered so that they match the adjacent building foundation or be moved so that it is located outside the influence zone of the adjacent building. If the adjacent building foundations are higher than the new foundations and are located within the influence zone of the adjacent building foundations, appropriate adjacent building support (e.g., underpinning) will be required.

A soil influence line of 1H:1V above the groundwater level and 2H:1V below the groundwater level should be used for determining the placement of new foundations relative to new or existing foundations.

If the new building is supported on spread footings, the ground floor slab can be designed as a slab-on-grade. If the bottom of the slab is below the design groundwater elevation, the slab should be designed to resist hydrostatic pressures and be waterproofed.

3.2.3 Lateral Earth Pressures

The design lateral pressures for permanent below grade walls consist of static and seismic pressures that are influenced by the thickness and type of overburden material, and wall bracing conditions. We recommend that the below grade walls above and below the design groundwater level be designed for a static equivalent hydrostatic lateral soil pressure of 45 pcf and 85 pcf, respectively (i.e., soil wall pressure is a triangular pressure).

In addition, a seismic lateral soil force of $6H^2$ (lb/ft. of wall), where H is the total vertical height of the wall, in feet, should be included. This force should be applied at a distance of H/3 from the top of the wall (i.e., seismic wall pressure is an inverted triangle).

The recommended lateral pressures do not include any surcharge loads adjacent to the walls or at the ground surface. We recommend that a uniform (i.e., rectangular) lateral pressure distribution of 0.40 times the design surcharge be added to the lateral soil pressure distribution. The structural engineer should determine the magnitude of the design surcharge loads (i.e., live loads).

3.2.4 Permanent Groundwater Control

Based on the measured groundwater level and taking into consideration that the groundwater level may fluctuate due to seasonal conditions, we recommend a design groundwater elevation of +8.5 feet.

If the bottom of the foundation elements (i.e., slab, elevator pits, ejector pits, etc.) will be above the design groundwater elevation, the below grade walls and the foundation should, at a minimum, be damproofed. Damproofing should be performed at the bottom of the foundation by installing a membrane, such as Grace Construction Products Florprufe, or approved equal. Damproofing of the below grade walls should be performed with a liquid applied membrane (LAM), such as Grace Construction Products Procor, or approved equal, for 2-sided forms, or a membrane, such as Grace Construction Products Preprufe, or approved equal, for blind-sided forms.

If the bottom of the foundation elements will be below the design groundwater elevation, the below grade walls and foundation should be designed to resist groundwater pressures and be waterproofed. Waterproofing materials should be installed on the outside of the perimeter walls (Grace Construction Products Bituthene 3000 for two-sided form applications and Preprufe 160R for blind side applications, or approved equivalent) and directly beneath the foundation (Grace Construction Products Preprufe 300R, or equivalent). The waterproofing on the perimeter walls is typically installed to the ground surface. Waterstops should be installed at applicable locations.

The waterproofing installation should be inspected on a full-time basis to confirm that the waterproofing is being applied as per the manufacturer's specifications and details.

3.3 CONSTRUCTION RECOMMENDATIONS

3.3.1 Excavation Considerations

Local temporary soil excavations above the natural groundwater level can have cut slopes as steep as 1H:1V (horizontal to vertical). Temporary soil excavations below the natural groundwater should be no steeper than 2H:1V. The slopes of any excavations adjacent to any existing structures should be no steeper than 2H:1V, unless approved by the SOE engineer.

All vertical soil faces will require temporary support until the new foundation walls and foundations are constructed and the area is properly backfilled. Considering the subsurface conditions and the proposed excavation depths, a feasible support system could consist of soldier piles and timber lagging with lateral restraint (e.g., tiebacks, rakers, bracing, etc.), as required. Design of the excavation support system and lateral bracing must also consider the protection of surrounding subsurface utilities and other adjacent improvements.

Considering the proximity of the adjacent buildings, the vibrations from driving the soldier piles may cause damage to the adjacent buildings. Therefore, it may be necessary to install some of the soldier piles using drilling methods. At locations where driven piles are acceptable, the continuous vibrations from a vibratory hammer could increase the potential for settlement of adjacent structures; therefore, we recommend that a hydraulic impact hammer be used because the stroke of the hammer can be varied thereby providing some vibration control.

Measurements of vibration should be made at selected adjacent structures (preferably on the ground surface next to the building) during the installation of the support system and during excavation operations. The maximum allowable vibration levels should be established as part of the pre-construction condition survey of the adjacent structures. If the threshold levels are exceeded, it may be necessary to install the soldier piles using drilling methods.

The design and construction of any slopes and/or temporary excavation support systems should be the responsibility of a licensed New York Professional Engineer. All excavations and temporary support systems should conform to pertinent OSHA and local safety regulations.

3.3.2 Adjacent Building Support

Adjacent building support, typically underpinning, will be required at locations where the new foundations will be placed below and within the influence zone of adjacent building foundations. Based on a review of the site conditions, it does not appear that any excavation will be performed within the influence zone of any adjacent buildings if no cellar is constructed. However, if the new building will have a cellar level, adjacent building support may be required at some locations.

Underpinning typically consists of installing a series of interconnected concrete panels which create a continuous concrete wall that transfers the foundation loads from the present bearing level to a level that results in the new foundations being outside the influence zone of the existing adjacent foundations. Underpinning requires permission of the adjacent building owner and is typically difficult to perform below the groundwater. The underpinning designer should review all subsurface investigation results and adjacent building information and select and design appropriate underpinning methods.

The foundation type and depth of the adjacent buildings are currently unknown. We recommend that the adjacent structures be visited to determine the extent and depth of any cellar levels and any other features (e.g., elevator pits, ejector pits, etc.) that may affect the design and construction of the new building foundation. This information should then be used to develop a test pit plan. The purpose of test pits is to document the size, depth, and type of adjacent building foundations, and below grade encroachments that may be present. This information should then be used to develop methods and procedures for performing construction close to the adjacent buildings

If adjacent building support is required, the analysis and design should be performed by a licensed New York Professional Engineer. Adjacent building support installation should be inspected full time by a qualified engineer acting under the direction of the design engineer.

3.3.3 Temporary Groundwater Control

The groundwater level should be maintained sufficiently below the bottom of the excavation so that the foundation bearing surface can be adequately prepared. The need for temporary groundwater control will depend on the groundwater level at the time of construction and the proposed excavation depths.

Considering that groundwater was measured at approximately el. +5.5 feet and that excavations for the cellar foundations, elevator pits, and ejector pits will be close to or possibly lower than this elevation, it should be anticipated that temporary dewatering will be required.

If a cellar level is not constructed, the contractor should be prepared to collect and discharge groundwater, rain water, and surface runoff so that the subgrade can be properly prepared and concrete for the foundations can be poured. At a minimum, sump pits and pumps will be needed for dewatering.

A NYCDEP permit will be required to temporarily discharge groundwater into the sewer system.

3.3.4 Subgrade Preparation

Subgrade surfaces for the foundations and slabs should be level and cleaned of loose soil, mud, and other material (e.g., concrete, brick, wood, debris, etc.) that can have a negative impact on the performance of the foundation or slab and bear on the recommended material. Excavations to reach final subgrades should use a smooth edged bucket and/or hand tools.

If necessary, the soil subgrade should be proof-rolled with a minimum of 6 passes of a smooth drum roller with a minimum 1,500 lb. static weight and minimum centrifugal force of 4,000 lbs. or similar approved equipment. The proof-rolling should not be performed when the subgrade is wet, muddy, or frozen.

Any unstable areas which cannot be stabilized by additional compaction should be excavated to competent material and the area backfilled with compacted structural fill or 3/4" stone. If the foundation is constructed in the winter, the subgrade should be protected from frost to limit possible subgrade deterioration resulting from freezing and thawing cycles. Concrete should not be poured if the subgrade is wet, muddy, or frozen.

A minimum 6-inch thick layer of compacted coarse aggregate, commonly known as 3/4" gravel or crushed stone, or a “mud-slab” (i.e., 2 inches of lean concrete) should be placed below any slabs on grade and the approved building foundation subgrade to protect the subgrade from disturbance.

3.3.5 Backfill and Compaction Requirements

Select backfill or structural backfill should consist of granular soils free of cinder, brick, asphalt, ash, and other unsuitable materials. Such material should not contain any boulders or cobbles larger than about 4 inches across, and should have a fines content (material passing the No. 200 sieve) between 5 and 15 percent. The subgrade underneath the backfill should be properly prepared and inspected (building foundations only) prior to placement of backfill.

All backfill should be placed in lifts not exceeding 8 inches in loose thickness. Backfill placed beneath shallow foundations should be compacted to a minimum of 95% of the maximum dry density and in-situ density tests should be performed to confirm that the required compaction has been achieved. Backfill placed beneath slabs-on-grade, behind below grade walls, and underneath sidewalks should be compacted to a minimum of 90% of the maximum dry density.

3.3.6 Pre-construction Condition Survey and Monitoring

A pre-construction condition survey of any adjacent structures that may be affected by the construction should be performed for the protection of the new building owner in the event of a future damage claim. It is also required by the New York City Department of Buildings. The report should include detailed documentation and photographs of the existing condition of the structures.

Based on the survey results, a program should be developed for the purpose of monitoring the performance of the adjacent structures and construction procedures. The monitoring program should include, at a minimum, recommendations for the location of survey points to monitor vertical and horizontal movements, locations for crack gauges, and locations for monitoring vibrations during key construction activities. The monitoring program should also include threshold levels for allowable movements and vibrations, and the procedures to be implemented if the threshold levels are exceeded during construction.

3.3.7 Construction Monitoring

We recommend that a geotechnical engineer familiar with the subsurface conditions and foundation design criteria, review and approve the foundation contractors procedures and provide inspection services during excavation and foundation construction. Geotechnical related inspection services should include the following:

- Review and approval of contractor submittals related to foundation construction;
- Special inspection of the support of excavation;
- Special inspection of adjacent building support, if applicable;
- Special inspection of foundation subgrades, if applicable;
- Special inspection of structural fill placement and compaction;
- Monitoring of adjacent structures and interpretation of the monitoring data.

4.0 – SUMMARY AND CONCLUSIONS

This report provides geotechnical recommendations for the design and construction of a new 9-story building located at 13-12 Beach Channel Drive in Far Rockaway, New York.

Based on eight test borings, the subsurface conditions generally consist of approximately less than 5 feet of uncontrolled fill (Stratum 1), 30 to 35 feet of medium dense sand (Stratum 2), 25 to 30 feet of stiff silt and clay (Stratum 3), and dense sand (Stratum 4) that extends to a depth of at least 100 feet.

The recommended seismic site classification is Site Class "D". If the new building is in Risk Category I&II, or III, the Seismic Design Category is "B". Liquefaction does not need to be considered in the foundation design.

A cellar level is being considered but is not finalized. Based on the assumed foundation depths, the bottom of the new building foundations will be between approximately el. +13 and +19 feet if no cellar is constructed and between el. +1 and +7 feet if one cellar level is constructed. It is anticipated that Stratum 2 (sand) will be encountered at most of the assumed foundation elevations.

We recommend that consideration initially be given to supporting the new building on spread footings bearing on Stratum 2 with an allowable bearing capacity of 3 tsf. For a building with no cellar, it may be necessary to excavate an additional 3 feet to reach Stratum 2, at some spread footing locations.

If it is determined that spread footings are not feasible or are inefficient, we recommend that consideration be given to a mat foundation bearing on Stratum 2 with an allowable bearing capacity of 3 tsf and a modulus of subgrade reaction value of 100 pci. If the mat stresses or settlements calculated by the structural engineer are greater than the recommended values, settlement reducing elements (i.e., micropiles) may be required at specific locations. Before selecting a mat foundation, it may be prudent to perform a cost comparison between a mat foundation and a pile foundation. If necessary, we can provide pile foundation recommendations for cost estimating purposes.

We recommend a design groundwater elevation of +8.5 feet. If the bottom of the foundation and foundation elements (i.e., slab, elevator pits, ejector pits, etc.) will be above the design groundwater elevation, the below grade walls and foundation should, at a minimum, be damproofed. If the bottom of the foundation elements will be below the design groundwater elevation, the below grade walls and foundation should be designed to resist groundwater pressures and be waterproofed.

The report includes additional information regarding the subsurface conditions and foundation design recommendations and additional recommendations regarding excavation considerations, adjacent building support, temporary groundwater control, subgrade preparation, backfill and compaction requirements, pre-construction condition surveys and monitoring, and construction inspection and monitoring.

5.0 – LIMITATIONS

Explorations

1. The analysis and recommendations submitted in this report are based in part upon the data obtained from widely spaced subsurface explorations. The nature and extent of variations between these explorations may not become evident until construction. If variations then appear evident, it will be necessary to reevaluate the recommendations of this report.
2. The generalized soil profile described in the text is intended to convey trends in subsurface conditions. The boundaries between strata are approximate and idealized and have been developed by interpretations of widely spaced explorations and samples; actual soil transitions are probably more erratic. For specific information, refer to the boring logs.
3. Water level readings have been made in the drill holes at times and under conditions stated on the logs. These data have been reviewed and interpretations made in the text of this report. However, it must be noted that fluctuations in the level of the groundwater may occur due to variations in rainfall, temperature and other factors occurring since the time measurements were made.

Review

4. In the event that any changes in the nature, design, or location of the proposed structures are planned, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and conclusions of this report modified or verified in writing by GEODesign. It is recommended that this firm be provided the opportunity for a general review of final design and specifications in order that earthwork and foundation recommendations may be properly interpreted and implemented in the design and specifications.

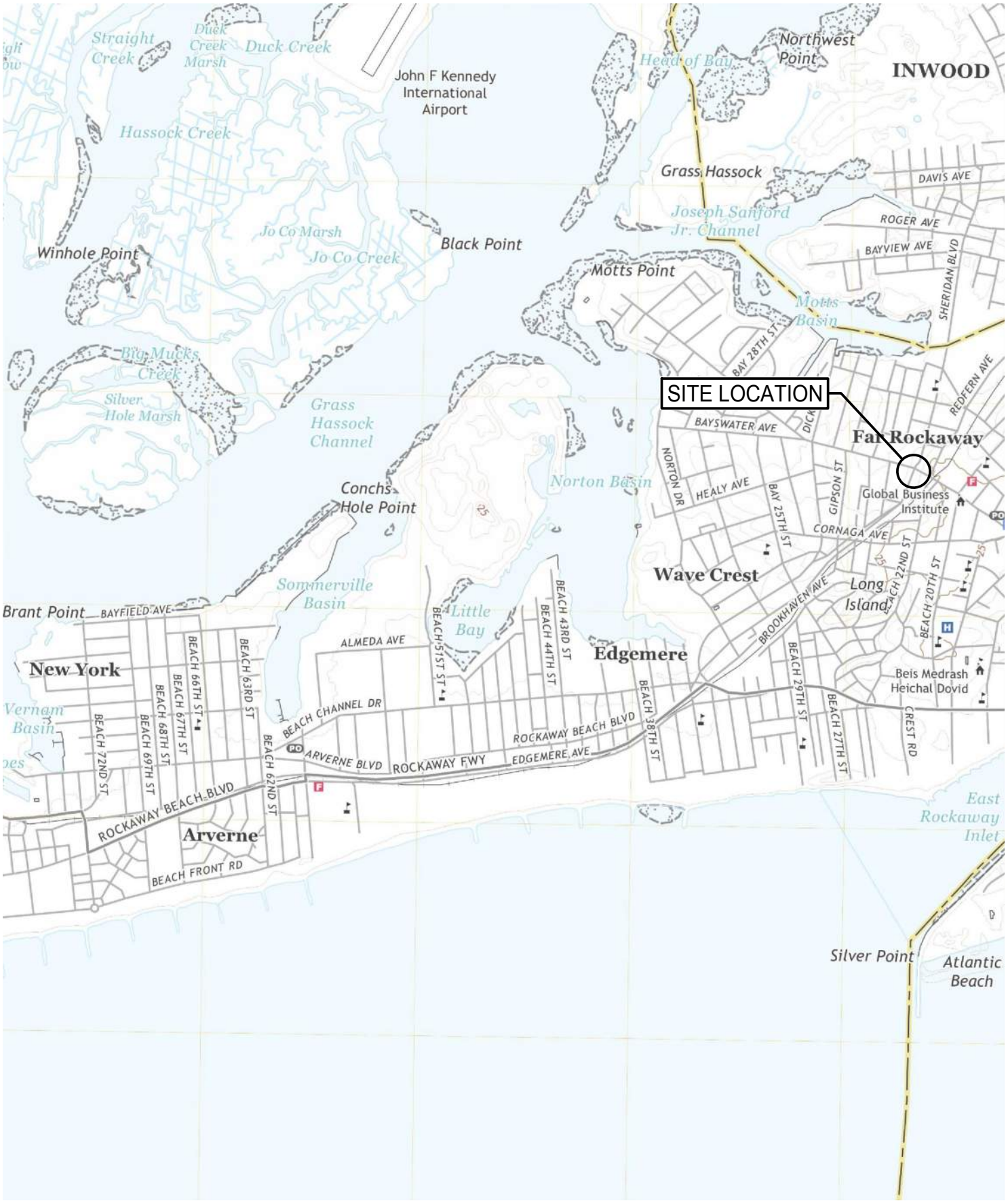
Construction

5. It is recommended that this firm be retained to provide soil engineering services during construction of the excavation and foundation phases of the work. This is to observe compliance with the design concepts, specifications, and recommendations and to allow design changes in the event that subsurface conditions differ from those anticipated prior to start of construction.

Uses of Report

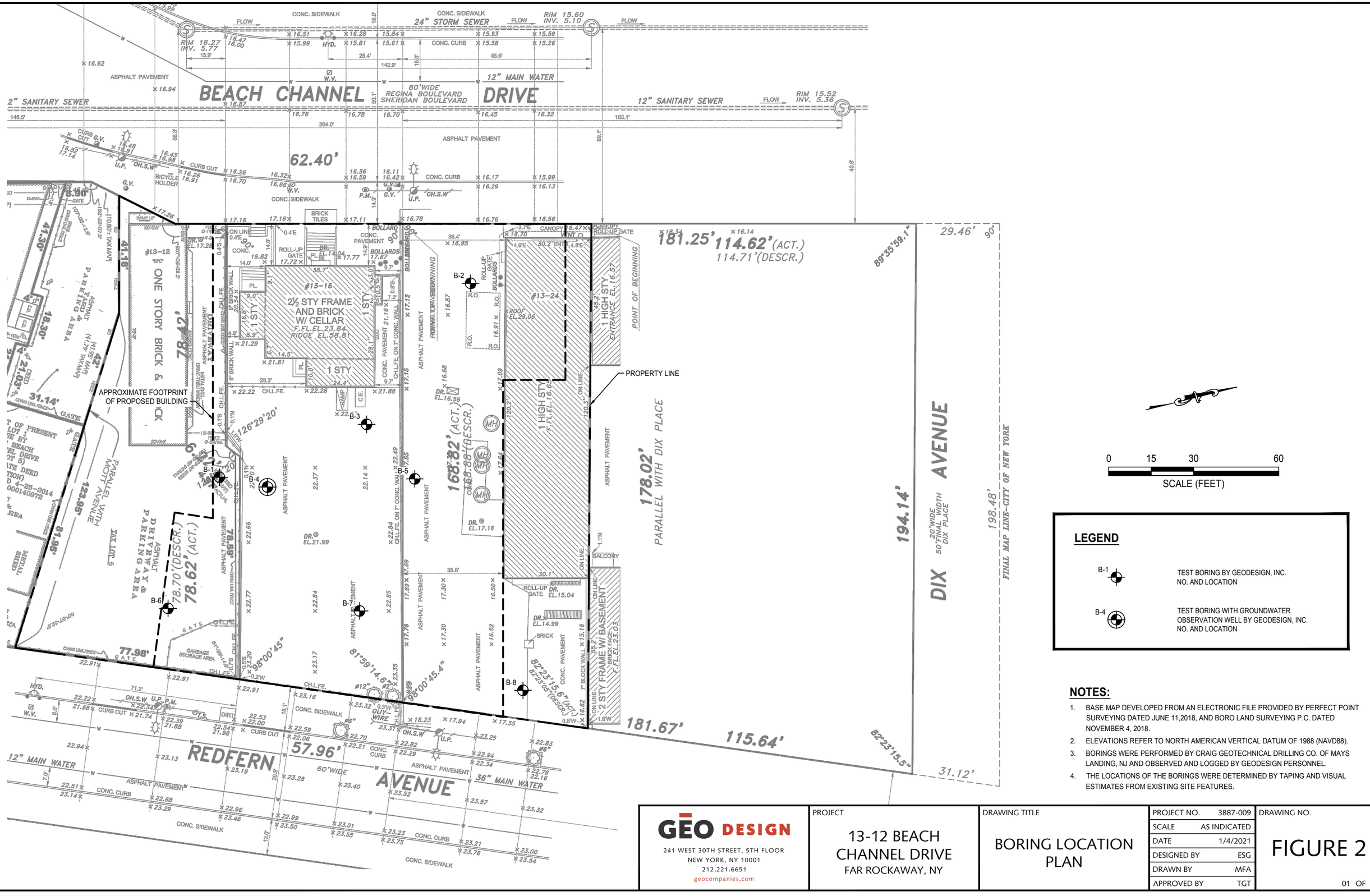
6. This report has been prepared for the exclusive use of Camber Property Group LLC for specific application to the proposed structure located at 13-12 Beach Channel Drive, Far Rockaway, NY in accordance with generally accepted soil and foundation engineering practices. No other warranty, express or implied, is made.

FIGURES



GEO DESIGN 60 PARK PLACE, SUITE 302 NEWARK, NJ 07102 973.803.4515 geocompanies.com	PROJECT 13-12 BEACH CHANNEL DRIVE FAR ROCKAWAY, NY	DRAWING TITLE SITE LOCATION PLAN	PROJECT NO. 3887-009 SCALE 1" = 2000' DATE 1/4/2021 DESIGNED BY ESG DRAWN BY MFA APPROVED BY TGT	DRAWING NO. FIGURE 1 01 OF 01

M:\CL\3887 Camber Property Group\009_13-12BeachChannelDrive\Drawings\SiteLocationPlan\Figure1_SiteLocationPlan.dwg 1/4/2021 4:16 PM GD-STD_3.0.ctb



LEGEND

B-1	TEST BORING BY GEODESIGN, INC. NO. AND LOCATION
B-4	TEST BORING WITH GROUNDWATER OBSERVATION WELL BY GEODESIGN, INC. NO. AND LOCATION

NOTES:

1. BASE MAP DEVELOPED FROM AN ELECTRONIC FILE PROVIDED BY PERFECT POINT SURVEYING DATED JUNE 11,2018, AND BORO LAND SURVEYING P.C. DATED NOVEMBER 4, 2018.
2. ELEVATIONS REFER TO NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).
3. BORINGS WERE PERFORMED BY CRAIG GEOTECHNICAL DRILLING CO. OF MAYS LANDING, NJ AND OBSERVED AND LOGGED BY GEODESIGN PERSONNEL.
4. THE LOCATIONS OF THE BORINGS WERE DETERMINED BY TAPING AND VISUAL ESTIMATES FROM EXISTING SITE FEATURES.

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PROJECT
13-12 BEACH CHANNEL DRIVE
FAR ROCKAWAY, NY

DRAWING TITLE
BORING LOCATION PLAN

PROJECT NO.	3887-009
SCALE	AS INDICATED
DATE	1/4/2021
DESIGNED BY	ESG
DRAWN BY	MFA
APPROVED BY	TGT

DRAWING NO.
FIGURE 2
01 OF 01

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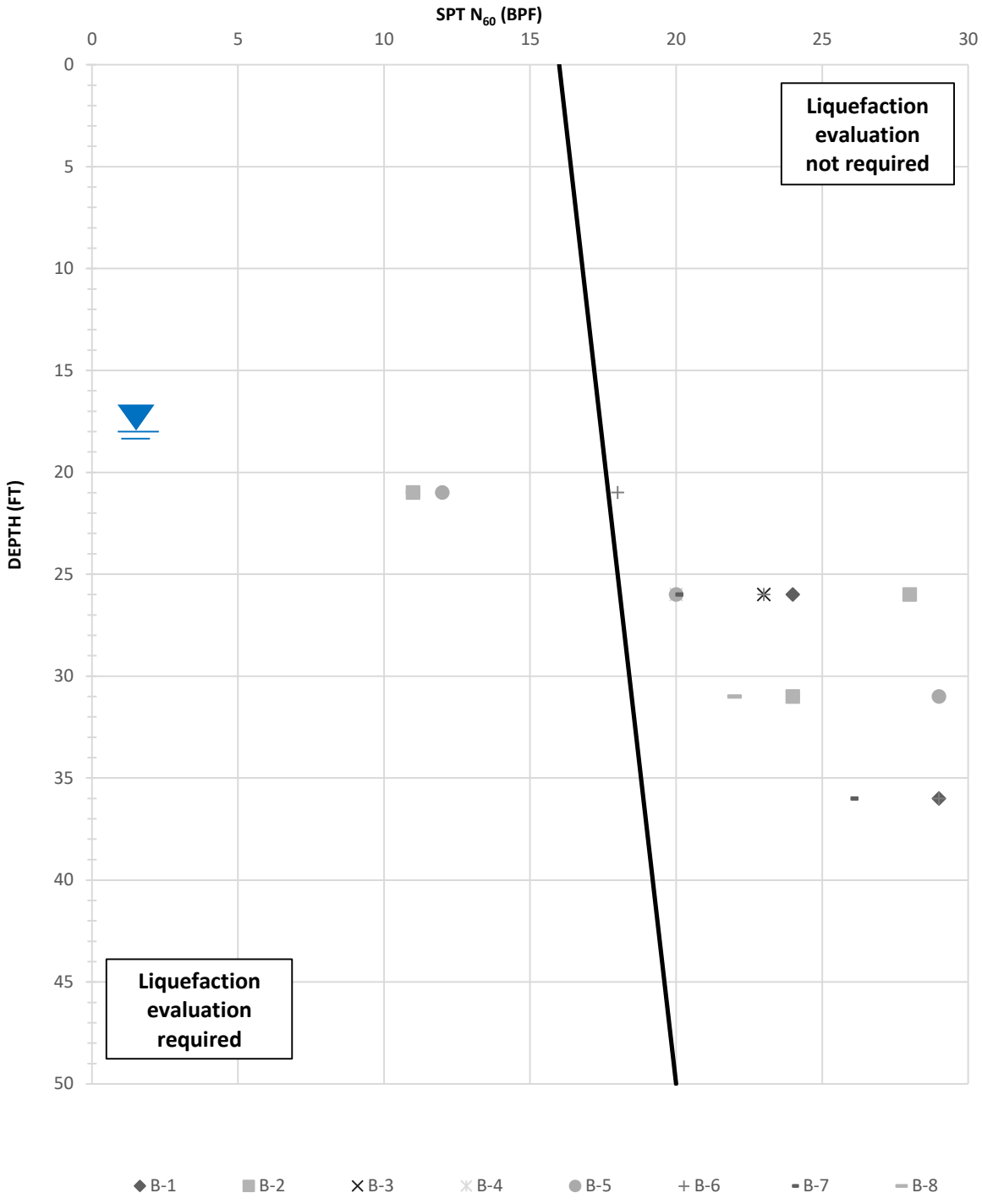


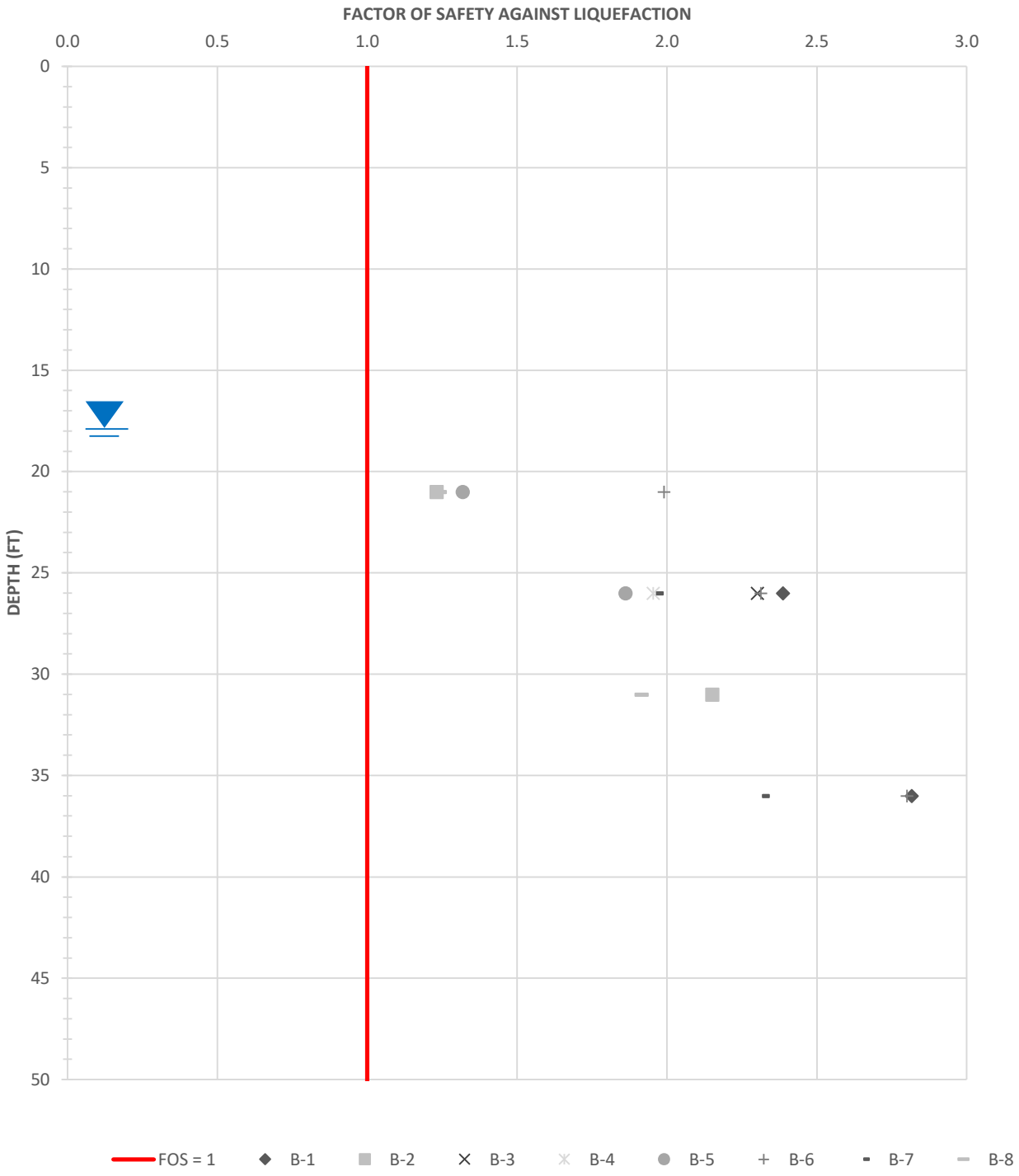
Notes:

1. Structural Occupancy Category II/III is assumed.
2. N-Values greater than 30 bpf not shown.

CODE BASED SOIL LIQUEFACTION POTENTIAL
13-12 Beach Channel Drive
Far Rockaway, NY

GEO DESIGN
241 W 30th Street, New York, NY

DR. BY:	SO/MFA	**SCALE:**	NTS	**PROJ NO.:**	3887-009
CHK'D. BY:	ESG	**DATE:**	Dec-2020	**FIG. NO:**	3



Notes:

1. Factors of Safety greater than 3.0 are not shown.

SITE SPECIFIC LIQUEFACTION EVALUATION
13-12 Beach Channel Drive
Far Rockaway, NY

GEO DESIGN
241 West 30th Street, New York, NY

DR. BY:	MFA	**SCALE:**	AS SHOWN	**PROJ NO.:**	3887-009
CHK'D. BY:	ESG	**DATE:**	Dec-20	**FIG. NO:**	4

APPENDIX A
TEST BORING LOGS

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BORING LOG

PROJECT NAME

13-12 Beach Channel Drive

Far Rockaway, NY

Boring No.: B-1
Page No.: 1 of 2
File No.: 3887-009

Boring Company:	Craig Geotechnical Drilling, Co.	Date Started:	12/14/2020
Foreman:	Paul Baronovski	Date Completed:	12/14/2020
GeoDesign Rep.:	Hesham Abbas	Surface El. (ft):	17.3 (NAVD88)
Rig Type:	CME 750X ATV	Total Depth (ft):	42
Coordinates:		Rock Depth (ft):	

	Barrel	Casing	Sampler
Type:		FJ	SS
I.D.:		4.0 in.	1.38 in.
Hammer Wt.:		140 lbs	140 lbs
Hammer Fall:		30 in.	30 in.
Hammer Type:		Safety - Cathead	

GROUNDWATER OBSERVATIONS

DATE	DEPTH (ft)	ELEV. (ft)	NOTES
▼			
▼			
▼			

Depth (ft)	Type	Number	Recovery (inches)	Pen. Resist (blows/6 in.)	Coring Time (min./ft)	Recovery (%)	RQD (%)	Liquid Limit	Plastic Limit	Moisture Content (%)	Percent Fines	Depth & Elevation (ft)	SYMBOL	SAMPLE DESCRIPTION	REMARKS/ OTHER TESTS
0												ASPHALT 1.0 16.3			
	SS	1	10	10 8 6 4								SAND		(SP) Brown m-f SAND, trace silt [3b]	
5	SS	2	13	5 9 9 14										(SP) Light brown fine SAND, trace silt [3b]	
10	SS	3	12	8 8 9 14						9.2	3			(SP) Light brown c-f SAND, little gravel, trace silt [3b]	Installed 10' of casing.
15	SS	4	14	14 23 42 39										(SP) Light gray and brown fine SAND, little gravel, trace silt [3a]	
20	SS	5	10	12 15 16 11										(SP) Brown m-f SAND, little gravel [3a]	
25															

NOTES:
1) Stratification lines represent approximate boundary between material types, transitions may be gradual.
2) Water level readings have been made at times and under conditions stated, fluctuations of groundwater may occur due to other factors than those present at the time measurements were made. AC = After coring; NR = Not Recorded.
3) Abbreviations: A = Auger; C = Core; MC=Macrocore; D = Driven; G = Grab; PS = Piston Sample; SS = Split Spoon; SSL = 3.5 Inch ID Split Spoon; ST = Shelby Tube; V = Vane; WOR/H = Weight of Rod/Hammer
4) Proportions Used: Trace = 1-10%; Little = 10-20%; Some = 20-35%; And = 35-50%
5) (SP) = Unified Soil Classification System symbol; [3a] = NYC Building Code Classification

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BORING LOG

PROJECT NAME

13-12 Beach Channel Drive

Far Rockaway, NY

Boring No.: B-1
Page No.: 2 of 2
File No.: 3887-009

Depth (ft)	SAMPLE INFORMATION: GENERAL Type	Number	Recovery (inches)	SOIL Pen. Resist (blows/6 in.)	ROCK Coring Time (min./ft)	Recovery (%)	RQD (%)	LAB Liquid Limit	Plastic Limit	Moisture Content (%)	Percent Fines	STRATA Depth & Elevation (ft)	SYMBOL	SAMPLE DESCRIPTION	REMARKS/ OTHER TESTS
25	SS	6	13	13 11 13 18								SAND *(Continued)*		(SP) Brown fine SAND, trace gravel and silt [3b]	
30	SS	7	14	6 14 22 20										(SP) Brown fine SAND, little gravel, trace silt [3a]	
35	SS	8	13	8 10 19 17										(SP) Brown fine SAND, trace silt [3b]	
												38.5 -21.2 SILT			
40	SS	9	16	8 8 10 9								42.0 -24.7		(ML) Brown SILT, little fine sand [5b]	
														Bottom of Exploration at 42.0 ft	
45															
50															
55															

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BORING LOG

PROJECT NAME

13-12 Beach Channel Drive

Far Rockaway, NY

Boring No.: B-2
Page No.: 1 of 2
File No.: 3887-009

Boring Company:	Craig Geotechnical Drilling, Co.	Date Started:	12/16/2020
Foreman:	Paul Baronovski	Date Completed:	12/16/2020
GeoDesign Rep.:	Hesham Abbas	Surface El. (ft):	17 (NAVD88)
Rig Type:	CME 750X ATV	Total Depth (ft):	42
Coordinates:		Rock Depth (ft):	

	Barrel	Casing	Sampler
Type:		FJ	SS
I.D.:		4.0 in.	1.38 in.
Hammer Wt.:		140 lbs	140 lbs
Hammer Fall:		30 in.	30 in.
Hammer Type:		Safety - Cathead	

GROUNDWATER OBSERVATIONS

DATE	DEPTH (ft)	ELEV. (ft)	NOTES
▼			
▼			
▼			

Depth (ft)	SAMPLE INFORMATION: GENERAL Type	Number	Recovery (inches)	SOIL Pen. Resist (blows/6 in.)	ROCK Coring Time (min./ft)	Recovery (%)	RQD (%)	LAB Liquid Limit	Plastic Limit	Moisture Content (%)	Percent Fines	STRATA Depth & Elevation (ft)	SYMBOL	SAMPLE DESCRIPTION	REMARKS/ OTHER TESTS
0												ASPHALT 1.0 16.0			
	SS	1	17	17 14 7 6								SAND		(SP) Brown and black m-f SAND, little gravel, trace silt [3b]	
5	SS	2	13	4 5 10 12										(SP) Brown fine SAND, little gravel, trace silt [3b]	
10	SS	3	13	13 14 19 24										(SP) Light brown c-f SAND, some gravel, trace silt [3a]	Install 10' of casing
15	SS	4	13	16 15 16 16										(SP) Light brown fine SAND, trace gravel and silt [3a]	
20	SS	5	15	4 6 5 4						12.2	3			(SP) Brown c-f SAND, some gravel, trace silt [3b]	
25															

NOTES:
1) Stratification lines represent approximate boundary between material types, transitions may be gradual.
2) Water level readings have been made at times and under conditions stated, fluctuations of groundwater may occur due to other factors than those present at the time measurements were made. AC = After coring; NR = Not Recorded.
3) Abbreviations: A = Auger; C = Core; MC=Macrocore; D = Driven; G = Grab; PS = Piston Sample; SS = Split Spoon; SSL = 3.5 Inch ID Split Spoon; ST = Shelby Tube; V = Vane; WOR/H = Weight of Rod/Hammer
4) Proportions Used: Trace = 1-10%; Little = 10-20%; Some = 20-35%; And = 35-50%
5) (SP) = Unified Soil Classification System symbol; [3a] = NYC Building Code Classification

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BORING LOG

PROJECT NAME

13-12 Beach Channel Drive

Far Rockaway, NY

Boring No.: B-2
Page No.: 2 of 2
File No.: 3887-009

Depth (ft)	SAMPLE INFORMATION: GENERAL Type	Number	Recovery (inches)	SOIL Pen. Resist (blows/6 in.)	ROCK Coring Time (min./ft)	Recovery (%)	RQD (%)	LAB Liquid Limit	Plastic Limit	Moisture Content (%)	Percent Fines	STRATA Depth & Elevation (ft)	SYMBOL	SAMPLE DESCRIPTION	REMARKS/ OTHER TESTS
25	SS	6	14	12 14 14 19								SAND *(Continued)*		(SP) Light brown m-f SAND, little gravel, trace silt [3b]	
30	SS	7	13	9 11 13 16								33.5 -16.5		(SP) Gray and brown, fine SAND, trace silt [3b]	
35	SS	8	16	4 3 3 3				26	19	27.6		SILT & CLAY		(CL/ML) Brown CLAY and SILT [6]	
40	SS	9	17	3 6 5 6								38.5 -21.5 42.0 -25.0		(ML) Brown SILT, trace clay [5b]	
														Bottom of Exploration at 42.0 ft	
45															
50															
55															

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BORING LOG

PROJECT NAME

13-12 Beach Channel Drive

Far Rockaway, NY

Boring No.: B-3

File No.: 3887-009

Boring Company:	Craig Geotechnical Drilling, Co.	Date Started:	12/10/2020
Foreman:	Paul Baronovski	Date Completed:	12/10/2020
GeoDesign Rep.:	Hesham Abbas	Surface El. (ft):	22.3 (NAVD88)
Rig Type:	CME 750X ATV	Total Depth (ft):	102
Coordinates:		Rock Depth (ft):	

	Barrel	Casing	Sampler
Type:		FJ	SS
I.D.:		4.0 in.	1.38 in.
Hammer Wt.:		140 lbs	140 lbs
Hammer Fall:		30 in.	30 in.
Hammer Type:		Safety - Cathead	

GROUNDWATER OBSERVATIONS

DATE	DEPTH (ft)	ELEV. (ft)	NOTES
▼			
▼			
▼			

Depth (ft)	SAMPLE INFORMATION: Type	Number	Recovery (inches)	Pen. Resist (blows/6 in.)	Coring Time (min./ft)	Recovery (%)	RQD (%)	Liquid Limit	Plastic Limit	Moisture Content (%)	Percent Fines	STRATA: Depth & Elevation (ft)	SYMBOL	SAMPLE DESCRIPTION	REMARKS/ OTHER TESTS
0												0.2 ASPHALT 22.1 0.7 CONCRETE SAND 21.6			
	SS	1	6	1 1 2 2										(SP) Brown fine SAND, trace gravel and silt [6]	
5	SS	2	10	7 13 15 20										(SP) Light brown m-f SAND, some gravel, trace silt [3b]	
10	SS	3	13	7 9 10 18										(SP)Light brown m-f SAND, little gravel, trace silt [3b]	
15	SS	4	16	18 28 29 39										(SP) Light brown m-f SAND, trace gravel and silt [3a]	
20	SS	5	1	30 38/0"										(SP) Light brown m-f SAND, trace gravel and silt [3a]	20 feet of casing installed. Spoon refusal at 20.5 feet. Inferred cobbles.
25															

NOTES:
1) Stratification lines represent approximate boundary between material types, transitions may be gradual.
2) Water level readings have been made at times and under conditions stated, fluctuations of groundwater may occur due to other factors than those present at the time measurements were made. AC = After coring; NR = Not Recorded.
3) Abbreviations: A = Auger; C = Core; MC=Macrocore; D = Driven; G = Grab; PS = Piston Sample; SS = Split Spoon; SSL = 3.5 Inch ID Split Spoon; ST = Shelby Tube; V = Vane; WOR/H = Weight of Rod/Hammer
4) Proportions Used: Trace = 1-10%; Little = 10-20%; Some = 20-35%; And = 35-50%
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BORING LOG

PROJECT NAME

13-12 Beach Channel Drive

Far Rockaway, NY

Boring No.: B-3
Page No.: 2 of 4
File No.: 3887-009

Depth (ft)	SAMPLE INFORMATION: GENERAL Type	Number	Recovery (inches)	SOIL Pen. Resist (blows/6 in.)	ROCK Coring Time (min./ft)	Recovery (%)	RQD (%)	LAB Liquid Limit	Plastic Limit	Moisture Content (%)	Percent Fines	STRATA Depth & Elevation (ft)	SYMBOL	SAMPLE DESCRIPTION	REMARKS/ OTHER TESTS
25	SS	6	16	8 10 13 13						14.7	2	SAND *(Continued)*		(SP) Light brown c-f SAND, little gravel, trace silt [3b]	
30	SS	7	20	23 26 39 39										(SP) Light brown c-f SAND, little gravel, trace silt [3a]	
35	SS	8	20	20 21 24 36										(SP) Gray m-f SAND, little silt [3a]	
40	SS	9-1	2	10 7								40.1 -17.8 SILT & CLAY		Top 2": (SP) Gray m-f SAND, little silt [3b]	
	SS	9-2	12	5 7										Bottom 12": (ML) Brown SILT, trace fine sand and clay [5b]	
45	SS	10	18	8 8 7 9				20	18	27.3				(ML) Brown SILT, trace fine sand and clay [5b]	
50	SS	11	3	7 8 8 9										(ML) Dark gray SILT, some shells, trace clay [5b]	
55												53.5 -31.2			

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BORING LOG

PROJECT NAME

13-12 Beach Channel Drive

Far Rockaway, NY

Boring No.: B-3
Page No.: 3 of 4
File No.: 3887-009

Depth (ft)	SAMPLE INFORMATION: GENERAL Type	Number	Recovery (inches)	SOIL Pen. Resist (blows/6 in.)	ROCK Coring Time (min./ft)	Recovery (%)	RQD (%)	LAB Liquid Limit	Plastic Limit	Moisture Content (%)	Percent Fines	STRATA Depth & Elevation (ft)	SYMBOL	SAMPLE DESCRIPTION	REMARKS/ OTHER TESTS
55	SS	12	24	1 3 3 4								57.0 -34.7		(CL) Olive green CLAY [4c]	PP= 1.25 TSF.
	ST	1	24	P U S H				58	28	50.8		59.0 -36.7		(CH) Olive green CLAY	
60	SS	13	24	4 5 7 14										(CL) Olive green CLAY [4b]	PP= 1.75 TSF.
65	SS	14-1	1	8								65.1 -42.8 SAND		Top 1": (CL) Olive green CLAY [4a]	
	SS	14-2	17	14 24 24										Bottom 17": (SM) Dark gray fine SAND and SILT, trace clay [3a]	
70	SS	15	15	34 43 29 27								68.5 -46.2		(SP) Gray fine SAND, trace gravel and silt [3a]	Auto Hammer used from 71 feet to 102 feet.
75	SS	16	11	12 16 23 22										(SP) Gray fine SAND, trace silt [3a]	
80	SS	17	14	17 26 26 29										(SP) Gray fine SAND, trace silt [3a]	
85															

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BORING LOG

PROJECT NAME

13-12 Beach Channel Drive

Far Rockaway, NY

Boring No.: B-3

File No.: 3887-009

Depth (ft)	SAMPLE INFORMATION: GENERAL Type	Number	Recovery (inches)	SOIL Pen. Resist (blows/6 in.)	ROCK Coring Time (min./ft)	Recovery (%)	RQD (%)	LAB Liquid Limit	Plastic Limit	Moisture Content (%)	Percent Fines	STRATA Depth & Elevation (ft)	SYMBOL	SAMPLE DESCRIPTION	REMARKS/ OTHER TESTS
85	SS	18	12	16 20 22 26										(SP) Gray fine SAND, trace gravel and silt [3a]	
90	SS	19	11	10 14 17 16										(SP) Gray fine SAND, trace silt [3a]	
95	SS	20	13	19 17 20 21										(SP) Gray fine SAND, trace silt [3a]	
100	SS	21	17	12 14 27 39								102.0 -79.7		(SP) Gray fine SAND, trace silt [3a]	
														Bottom of Exploration at 102.0 ft	
105															
110															
115															

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BORING LOG

PROJECT NAME

13-12 Beach Channel Drive

Far Rockaway, NY

Boring No.: B-4
Page No.: 1 of 2
File No.: 3887-009

Boring Company:	Craig Geotechnical Drilling, Co.	Date Started:	12/11/2020
Foreman:	Paul Baronovski	Date Completed:	12/11/2020
GeoDesign Rep.:	Hesham Abbas	Surface El. (ft):	22.3 (NAVD88)
Rig Type:	CME 750X ATV	Total Depth (ft):	42
Coordinates:		Rock Depth (ft):	

	Barrel	Casing	Sampler
Type:		FJ	SS
I.D.:		4.0 in.	1.38 in.
Hammer Wt.:		140 lbs	140 lbs
Hammer Fall:		30 in.	30 in.
Hammer Type:		Safety - Cathead	

GROUNDWATER OBSERVATIONS

DATE	DEPTH (ft)	ELEV. (ft)	NOTES
▼ 12/14/20	18.0	4.3	post-flush
▼ 12/14/20	17.0	5.3	EOD
▼			

Depth (ft)	Type	Number	Recovery (inches)	Pen. Resist (blows/6 in.)	Coring Time (min./ft)	Recovery (%)	RQD (%)	Liquid Limit	Plastic Limit	Moisture Content (%)	Percent Fines	Depth & Elevation (ft)	SYMBOL	SAMPLE DESCRIPTION	WELL LOG	REMARKS/ OTHER TESTS
0												0.2 ASPHALT 22.1 0.7 CONCRETE 21.6				
	SS	1	7	7 9 8 6						11.7	8	FILL		(FILL) Black and brown c-f SAND, some gravel, little asphalt, trace silt [7]		
												3.5 18.8 SAND				Fine sand in spoon tip.
5	SS	2	14	13 19 23 20										(SP) Brown c-f SAND, some gravel, trace silt [3a]		
10	SS	3	10	5 5 7 11										(SP) Brown fine SAND, trace gravel and silt [3b]		Installed 10 feet of casing.
15	SS	4	12	12 16 22 23										(SP) Brown c-f SAND, little gravel, trace silt [3a]	▼ ▼	
20	SS	5	13	19 20 23 26										(SP) Brown c-f SAND, little gravel, trace silt [3a]		
25																

NOTES:
1) Stratification lines represent approximate boundary between material types, transitions may be gradual.
2) Water level readings have been made at times and under conditions stated, fluctuations of groundwater may occur due to other factors than those present at the time measurements were made. AC = After coring; NR = Not Recorded.
3) Abbreviations: A = Auger; C = Core; MC=Macrocore; D = Driven; G = Grab; PS = Piston Sample; SS = Split Spoon; SSL = 3.5 Inch ID Split Spoon; ST = Shelby Tube; V = Vane; WOR/H = Weight of Rod/Hammer
4) Proportions Used: Trace = 1-10%; Little = 10-20%; Some = 20-35%; And = 35-50%
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BORING LOG

PROJECT NAME

13-12 Beach Channel Drive

Far Rockaway, NY

Boring No.: B-4
Page No.: 2 of 2
File No.: 3887-009

Depth (ft)	SAMPLE INFORMATION: GENERAL Type	Number	Recovery (inches)	SOIL Pen. Resist (blows/6 in.)	ROCK Coring Time (min./ft)	Recovery (%)	RQD (%)	LAB Liquid Limit	Plastic Limit	Moisture Content (%)	Percent Fines	STRATA Depth & Elevation (ft)	SYMBOL	SAMPLE DESCRIPTION	WELL LOG	REMARKS/ OTHER TESTS
25	SS	6	14	10 7 13 15								SAND *(Continued)*		(SP) Brown c-f SAND, little gravel, trace silt [3b]		
30	SS	7	16	17 17 17 15										(SP) Brown c-f SAND, little gravel, trace silt [3a]		Installed 30 feet well, 20 feet of riser and 10 feet of screen.
35	SS	8	18	16 17 25 23										(SP) Brown fine SAND, trace gravel and silt [3a]		
40	SS	9-1	6	8								40.5 -18.2		Top 6": (SP) Brown fine SAND, trace gravel and silt [3b]		
	SS	9-2	13	6 5 4								SILT 42.0 -19.7		Bottom 13": (ML) Brown SILT, trace fine sand and clay [5b]		
														Bottom of Exploration at 42.0 ft		
45																
50																
55																

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BORING LOG

PROJECT NAME

13-12 Beach Channel Drive

Far Rockaway, NY

Boring No.: **B-5**

Page No.: 1 of 2

File No.: 3887-009

Boring Company:	Craig Geotechnical Drilling, Co.	Date Started:	12/15/2020
Foreman:	Paul Baronovski	Date Completed:	12/15/2020
GeoDesign Rep.:	Hesham Abbas	Surface El. (ft):	17.5 (NAVD88)
Rig Type:	CME 750X ATV	Total Depth (ft):	42
Coordinates:		Rock Depth (ft):	

	Barrel	Casing	Sampler
Type:		FJ	SS
I.D.:		4.0 in.	1.38 in.
Hammer Wt.:		140 lbs	140 lbs
Hammer Fall:		30 in.	30 in.
Hammer Type:		Safety - Cathead	

GROUNDWATER OBSERVATIONS

DATE	DEPTH (ft)	ELEV. (ft)	NOTES
▼			
▼			
▼			

Depth (ft)	Type	Number	Recovery (inches)	Pen. Resist (blows/6 in.)	Coring Time (min./ft)	Recovery (%)	RQD (%)	Liquid Limit	Plastic Limit	Moisture Content (%)	Percent Fines	Depth & Elevation (ft)	SYMBOL	SAMPLE DESCRIPTION	REMARKS/ OTHER TESTS
0												ASPHALT 1.0 16.5			
	SS	1	13	12 11 11 11								SAND		(SP) Light brown c-f SAND, little gravel, trace silt [3b]	
5	SS	2	10	7 8 10 12										(SP) Brown and gray fine SAND, trace silt [3b]	
10	SS	3	12	8 14 12 16										(SP) Light brown m-f SAND, little gravel, trace silt [3b]	Installed 10' casing.
15	SS	4	13	10 15 18 22										(SP) Light brown m-f SAND, little gravel, trace silt [3a]	
20	SS	5	7	5 7 5 6						13.6	2			(SP) Light brown c-f SAND, little gravel, trace silt [3b]	
25															

NOTES:
1) Stratification lines represent approximate boundary between material types, transitions may be gradual.
2) Water level readings have been made at times and under conditions stated, fluctuations of groundwater may occur due to other factors than those present at the time measurements were made. AC = After coring; NR = Not Recorded.
3) Abbreviations: A = Auger; C = Core; MC=Macrocore; D = Driven; G = Grab; PS = Piston Sample; SS = Split Spoon; SSL = 3.5 Inch ID Split Spoon; ST = Shelby Tube; V = Vane; WOR/H = Weight of Rod/Hammer
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BORING LOG

PROJECT NAME

13-12 Beach Channel Drive

Far Rockaway, NY

Boring No.: **B-5**

File No.: 3887-009

Depth (ft)	SAMPLE INFORMATION: GENERAL Type	Number	Recovery (inches)	SOIL Pen. Resist (blows/6 in.)	ROCK Coring Time (min./ft)	Recovery (%)	RQD (%)	LAB Liquid Limit	Plastic Limit	Moisture Content (%)	Percent Fines	STRATA Depth & Elevation (ft)	SYMBOL	SAMPLE DESCRIPTION	REMARKS/ OTHER TESTS
25	SS	6	10	9 9 11 13								SAND *(Continued)*		(SP) Brown c-f SAND, little gravel, trace silt [3b]	
30	SS	7	13	13 13 16 15										(SP) Brown fine SAND, trace silt [3b]	
												33.5 -16.0			
												SILT & CLAY			
35	SS	8	18	4 4 3 4										(ML) Brown SILT, trace fine sand and clay [6]	
40	SS	9-1	23	3 4 3										Top 23": (ML) Brown SILT, trace fine sand and clay [6]	
	SS	9-2	1	3								41.5 -24.0 42.0 -24.5		Bottom 1": (CL) Dark gray CLAY [4c]	
														Bottom of Exploration at 42.0 ft	
45															
50															
55															

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BORING LOG

PROJECT NAME

13-12 Beach Channel Drive

Far Rockaway, NY

Boring No.: B-6

Page No.: 1 of 2

File No.: 3887-009

Boring Company:	Craig Geotechnical Drilling, Co.	Date Started:	12/14/2020
Foreman:	Paul Baronovski	Date Completed:	12/14/2020
GeoDesign Rep.:	Hesham Abbas	Surface El. (ft):	23 (NAVD88)
Rig Type:	CME 750X ATV	Total Depth (ft):	42
Coordinates:		Rock Depth (ft):	

	Barrel	Casing	Sampler
Type:		FJ	SS
I.D.:		4.0 in.	1.38 in.
Hammer Wt.:		140 lbs	140 lbs
Hammer Fall:		30 in.	30 in.
Hammer Type:		Safety - Cathead	

GROUNDWATER OBSERVATIONS

DATE	DEPTH (ft)	ELEV. (ft)	NOTES
▼			
▼			
▼			

Depth (ft)	SAMPLE INFORMATION: Type	Number	Recovery (inches)	Pen. Resist (blows/6 in.)	Coring Time (min./ft)	Recovery (%)	RQD (%)	Liquid Limit	Plastic Limit	Moisture Content (%)	Percent Fines	STRATA: Depth & Elevation (ft)	SYMBOL	SAMPLE DESCRIPTION	REMARKS/ OTHER TESTS
0												ASPHALT 1.0 22.0			
	SS	1	16	12 10 7 7								SAND		(SP) Brown and black m-f SAND, trace gravel and silt [3b]	
5	SS	2	12	8 9 17 15										(SP) Brown fine SAND, trace gravel and silt [3b]	
10	SS	3	10	6 5 6 9										(SP) Brown fine SAND, trace silt [3b]	Installed 10' of casing.
15	SS	4	9	13 16 22 27										(SP) Light brown c-f SAND, some gravel [3a]	
20	SS	5	17	19 20 18 21										(SP) Brown c-f SAND, little gravel [3a]	
25															

NOTES:
1) Stratification lines represent approximate boundary between material types, transitions may be gradual.
2) Water level readings have been made at times and under conditions stated, fluctuations of groundwater may occur due to other factors than those present at the time measurements were made. AC = After coring; NR = Not Recorded.
3) Abbreviations: A = Auger; C = Core; MC=Macrocore; D = Driven; G = Grab; PS = Piston Sample; SS = Split Spoon; SSL = 3.5 Inch ID Split Spoon; ST = Shelby Tube; V = Vane; WOR/H = Weight of Rod/Hammer
4) Proportions Used: Trace = 1-10%; Little = 10-20%; Some = 20-35%; And = 35-50%
5) (SP) = Unified Soil Classification System symbol; [3a] = NYC Building Code Classification

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BORING LOG

PROJECT NAME

13-12 Beach Channel Drive

Far Rockaway, NY

Boring No.: **B-6**

File No.: 3887-009

Depth (ft)	SAMPLE INFORMATION: GENERAL Type	Number	Recovery (inches)	SOIL Pen. Resist (blows/6 in.)	ROCK Coring Time (min./ft)	Recovery (%)	RQD (%)	LAB Liquid Limit	Plastic Limit	Moisture Content (%)	Percent Fines	STRATA Depth & Elevation (ft)	SYMBOL	SAMPLE DESCRIPTION	REMARKS/ OTHER TESTS
25	SS	6	11	11 12 11 13								SAND *(Continued)*		(SP) Brown c-f SAND, little gravel [3b]	
30	SS	7	15	15 15 16 15										(SP) Gray and brown m-f SAND, little gravel [3a]	
35	SS	8	15	9 13 16 20										(SP) Gray fine SAND, trace silt [3b]	
												38.5 -15.5			
												SILT			
40	SS	9	22	2 2 2 5				26	19	29.7				(CL/ML) Brown CLAY and SILT, little fine sand [6]	Autohammer used for S-9 due to rain.
												42.0 -19.0		Bottom of Exploration at 42.0 ft	
45															
50															
55															

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BORING LOG

PROJECT NAME

13-12 Beach Channel Drive

Far Rockaway, NY

Boring No.: B-7
Page No.: 1 of 2
File No.: 3887-009

Boring Company:	Craig Geotechnical Drilling, Co.	Date Started:	12/11/2020
Foreman:	Paul Baronovski	Date Completed:	12/11/2020
GeoDesign Rep.:	Hesham Abbas	Surface El. (ft):	22.9 (NAVD88)
Rig Type:	CME 750X ATV	Total Depth (ft):	42
Coordinates:		Rock Depth (ft):	

	Barrel	Casing	Sampler
Type:		FJ	SS
I.D.:		4.0 in.	1.38 in.
Hammer Wt.:		140 lbs	140 lbs
Hammer Fall:		30 in.	30 in.
Hammer Type:		Safety - Cathead	

GROUNDWATER OBSERVATIONS

DATE	DEPTH (ft)	ELEV. (ft)	NOTES
▼			
▼			
▼			

Depth (ft)	Type	Number	Recovery (inches)	Pen. Resist (blows/6 in.)	Coring Time (min./ft)	Recovery (%)	RQD (%)	Liquid Limit	Plastic Limit	Moisture Content (%)	Percent Fines	Depth & Elevation (ft)	SYMBOL	SAMPLE DESCRIPTION	REMARKS/ OTHER TESTS
0												0.2 / 22.7 ASPHALT 0.7 / 22.2 CONCRETE FILL			
	SS	1	16	6 7 12 9										(FILL) Black and brown m-f SAND, little gravel and asphalt [7]	
												3.5 / 19.4 SAND			
5	SS	2	7	8 7 8 9						7.2	7			(SP/SM) Dark brown fine SAND, trace silt and gravel [3b]	
10	SS	3	9	8 11 11 11										(SP) Light brown m-f SAND, little gravel, trace silt [3b]	10 feet of casing installed.
15	SS	4	14	8 9 16 21										(SP) Light brown c-f SAND, some gravel, trace silt [3b]	
20	SS	5	14	16 16 22 22										(SP) Brown c-f SAND, little gravel, trace silt [3a]	
25															

NOTES:
1) Stratification lines represent approximate boundary between material types, transitions may be gradual.
2) Water level readings have been made at times and under conditions stated, fluctuations of groundwater may occur due to other factors than those present at the time measurements were made. AC = After coring; NR = Not Recorded.
3) Abbreviations: A = Auger; C = Core; MC=Macrocore; D = Driven; G = Grab; PS = Piston Sample; SS = Split Spoon; SSL = 3.5 Inch ID Split Spoon; ST = Shelby Tube; V = Vane; WOR/H = Weight of Rod/Hammer
4) Proportions Used: Trace = 1-10%; Little = 10-20%; Some = 20-35%; And = 35-50%
5) (SP) = Unified Soil Classification System symbol; [3a] = NYC Building Code Classification

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BORING LOG

PROJECT NAME

13-12 Beach Channel Drive

Far Rockaway, NY

Boring No.: B-7
Page No.: 2 of 2
File No.: 3887-009

Depth (ft)	SAMPLE INFORMATION: GENERAL Type	Number	Recovery (inches)	SOIL Pen. Resist (blows/6 in.)	ROCK Coring Time (min./ft)	Recovery (%)	RQD (%)	LAB Liquid Limit	Plastic Limit	Moisture Content (%)	Percent Fines	STRATA Depth & Elevation (ft)	SYMBOL	SAMPLE DESCRIPTION	REMARKS/ OTHER TESTS
25	SS	6	13	10 12 8 9								SAND *(Continued)*		(SP) Brown c-f SAND, little gravel, trace silt [3b]	
30	SS	7	18	14 16 20 18										(SP) Brown c-f SAND, little gravel, trace silt [3a]	
35	SS	8	14	10 13 13 12										(SP) Brown fine SAND, trace silt [3b]	
40	SS	9-1	4	4								40.3 -17.4		Top 4": (SP) Brown fine SAND, some gravel , trace silt [6]	
	SS	9-2	17	3 3 4								SILT 42.0 -19.1		Bottom 17": (ML) Brown SILT, trace fine sand and clay [6]	
														Bottom of Exploration at 42.0 ft	
45															
50															
55															

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BORING LOG

PROJECT NAME

13-12 Beach Channel Drive

Far Rockaway, NY

Boring No.: B-8

File No.: 3887-009

Boring Company:	Craig Geotechnical Drilling, Co.	Date Started:	12/15/2020
Foreman:	Paul Baronovski	Date Completed:	12/15/2020
GeoDesign Rep.:	Hesham Abbas	Surface El. (ft):	17.4 (NAVD88)
Rig Type:	CME 750X ATV	Total Depth (ft):	102
Coordinates:		Rock Depth (ft):	

	Barrel	Casing	Sampler
Type:		FJ	SS
I.D.:		4.0 in.	1.38 in.
Hammer Wt.:		140 lbs	140 lbs
Hammer Fall:		30 in.	30 in.
Hammer Type:		Safety - Cathead	

GROUNDWATER OBSERVATIONS

DATE	DEPTH (ft)	ELEV. (ft)	NOTES
▼			
▼			
▼			

Depth (ft)	Type	Number	Recovery (inches)	Pen. Resist (blows/6 in.)	Coring Time (min./ft)	Recovery (%)	RQD (%)	Liquid Limit	Plastic Limit	Moisture Content (%)	Percent Fines	Depth & Elevation (ft)	SYMBOL	SAMPLE DESCRIPTION	REMARKS/ OTHER TESTS
0												ASPHALT 1.0 16.4			
	SS	1	10	10 12 10 7								SAND		(SP) Brown and black m-f SAND, little gravel, trace silt [3b]	
												3.5 13.9			
5	SS	2	9	2 2 4 10										(SM) Brown fine SAND, little silt, trace gravel [6]	
												8.5 8.9			
10	SS	3	16	17 18 27 25										(SP) Brown m-f SAND, some gravel, trace silt [3a]	
15	SS	4	20	16 17 20 23										(SP) Brown m-f SAND, some gravel, trace silt [3a]	
20	SS	5	7	7 6 5 7						13.4	2			(SP) Brown c-m SAND, little gravel, trace silt [3b]	
25															

NOTES:
1) Stratification lines represent approximate boundary between material types, transitions may be gradual.
2) Water level readings have been made at times and under conditions stated, fluctuations of groundwater may occur due to other factors than those present at the time measurements were made. AC = After coring; NR = Not Recorded.
3) Abbreviations: A = Auger; C = Core; MC=Macrocore; D = Driven; G = Grab; PS = Piston Sample; SS = Split Spoon; SSL = 3.5 Inch ID Split Spoon; ST = Shelby Tube; V = Vane; WOR/H = Weight of Rod/Hammer
4) Proportions Used: Trace = 1-10%; Little = 10-20%; Some = 20-35%; And = 35-50%
5) (SP) = Unified Soil Classification System symbol; [3a] = NYC Building Code Classification

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BORING LOG

PROJECT NAME

13-12 Beach Channel Drive

Far Rockaway, NY

Boring No.: B-8
Page No.: 2 of 4
File No.: 3887-009

Depth (ft)	SAMPLE INFORMATION: GENERAL Type	Number	Recovery (inches)	SOIL Pen. Resist (blows/6 in.)	ROCK Coring Time (min./ft)	Recovery (%)	RQD (%)	LAB Liquid Limit	Plastic Limit	Moisture Content (%)	Percent Fines	STRATA Depth & Elevation (ft)	SYMBOL	SAMPLE DESCRIPTION	REMARKS/ OTHER TESTS
25	SS	6	20	14 18 18 30										(SP) Brown m-f SAND, some gravel, trace silt [3a]	
30	SS	7	14	10 11 11 11										(SP) Brown fine SAND, little gravel, trace silt [3b]	Installed 30' casing.
35	SS	8-1	1	3								35.1 -17.7		Top 1": (SP) Brown fine SAND, little gravel, trace silt [6]	Top 1" is SS8-1.
	SS	8-2	23	3 3 3				28	17	29		CLAY & SILT		Bottom 23": (CL) Black varved CLAY, little fine sand [4c]	Bottom 23" is SS8-2.
40	SS	9	14	10 4 2 5								38.5 -21.1		(ML/CL) Black varved SILT and CLAY, little fine sand [6/4c]	
45	SS	10-1	12	4 3								46.0 -28.6		Top 12": (ML/CL) Black varved SILT and CLAY, little fine sand [6/4c]	Top 12" is SS10-1. Bottom 12" is SS10-2.
	SS	10-2	12	5 5										Bottom 12": (CL) Black CLAY, trace silt [4c]	PP = 1.0 TSF.
50	SS	11	24	2 3 4 3				57	28	53		48.5 -31.1		(CH) Black CLAY [4c]	PP = 1.25 TSF.
55												53.5 -36.1			

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BORING LOG

PROJECT NAME

13-12 Beach Channel Drive

Far Rockaway, NY

Boring No.: B-8
Page No.: 3 of 4
File No.: 3887-009

Depth (ft)	SAMPLE INFORMATION: GENERAL Type	Number	Recovery (inches)	SOIL Pen. Resist (blows/6 in.)	ROCK Coring Time (min./ft)	Recovery (%)	RQD (%)	LAB Liquid Limit	Plastic Limit	Moisture Content (%)	Percent Fines	STRATA Depth & Elevation (ft)	SYMBOL	SAMPLE DESCRIPTION	REMARKS/ OTHER TESTS
55	SS	12	24	10 9 11 14										(CL) Olive green CLAY [4b]	PP = 1.75 TSF.
												58.5 -41.1 SAND			
60	SS	13	22	8 13 18 29										(SP) Dark gray fine SAND, trace silt and clay [3a]	
65	SS	14	13	16 28 31 37										(SP Light gray fine SAND, trace silt [3a]	Autohammer used from SS-14 to E.O.B.
70	SS	15	15	12 16 24 37										(SP) Gray fine SAND, trace silt [3a]	
75	SS	16	13	6 8 18 27										(SP) Gray fine SAND, trace silt [3b]	
80	SS	17	12	9 12 16 20										(SP) Gray fine SAND, trace silt [3b]	
85															

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BORING LOG

PROJECT NAME

13-12 Beach Channel Drive

Far Rockaway, NY

Boring No.: B-8
Page No.: 4 of 4
File No.: 3887-009

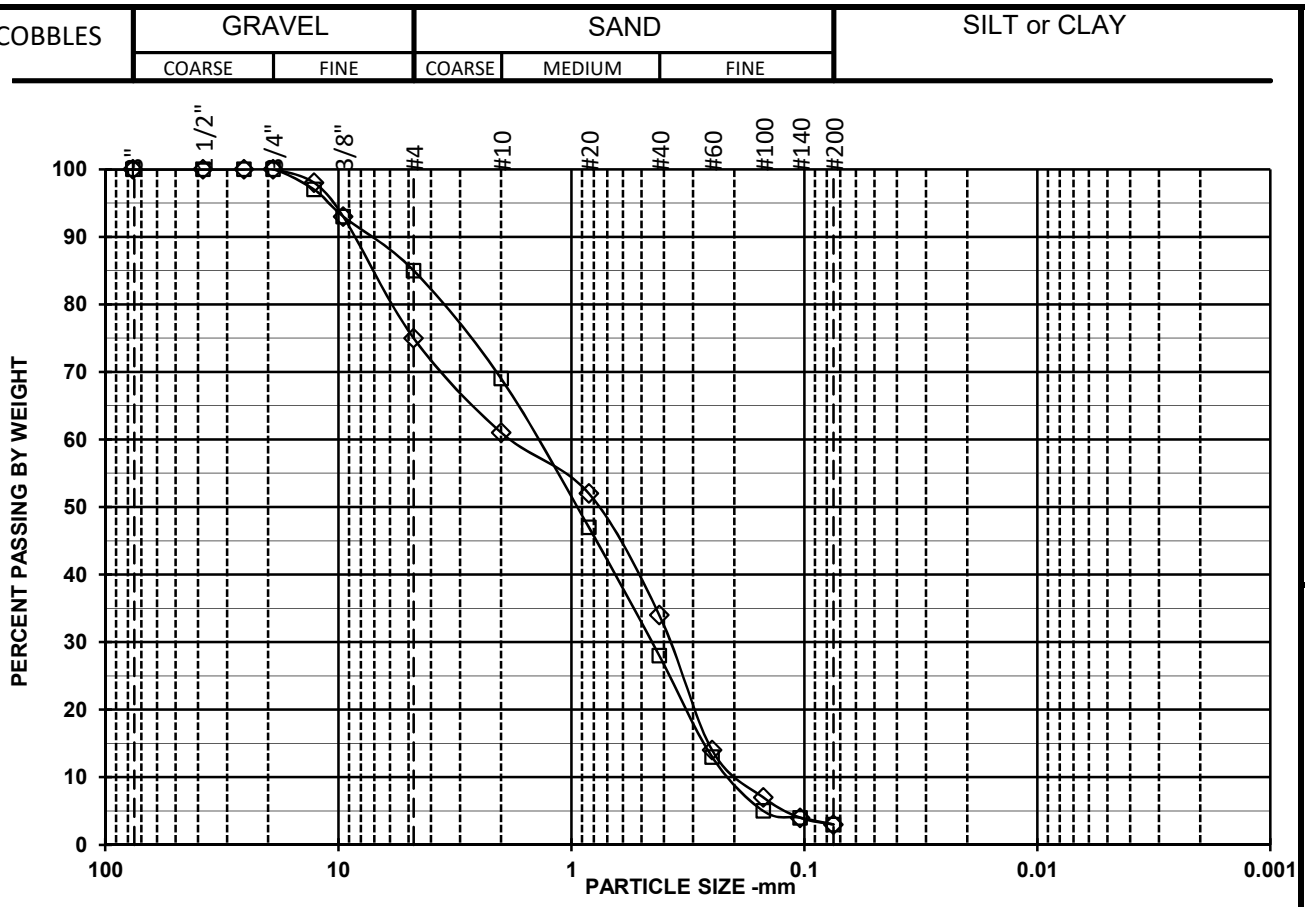
Depth (ft)	SAMPLE INFORMATION: GENERAL Type	Number	Recovery (inches)	SOIL Pen. Resist (blows/6 in.)	ROCK Coring Time (min./ft)	Recovery (%)	RQD (%)	LAB Liquid Limit	Plastic Limit	Moisture Content (%)	Percent Fines	STRATA Depth & Elevation (ft)	SYMBOL	SAMPLE DESCRIPTION	REMARKS/ OTHER TESTS
85	SS	18	15	9 11 22 21								SAND *(Continued)*		(SP) Gray fine SAND, trace silt [3a]	
90	SS	19	24	13 13 15 22										(SP) Gray fine SAND, trace silt [3b]	
95	SS	20	18	16 21 30 36										(SP) Gray fine SAND, trace silt [3a]	
100	SS	21	15	12 17 28 31								102.0 -84.6		(SP) Gray fine SAND, trace silt [3a]	
														Bottom of Exploration at 102.0 ft	
105															
110															
115															

APPENDIX B
LABORATORY TEST RESULTS

GeoDesign #3887-009
13-12 Beach Channel Drive
LABORATORY TESTING DATA SUMMARY

BORING NO.	SAMPLE NO.	DEPTH (ft)	IDENTIFICATION TESTS						REMARKS
			WATER CONTENT (%)	LIQUID LIMIT (-)	PLASTIC LIMIT (-)	PLAS. INDEX (-)	USCS SYMB. (1)	SIEVE MINUS NO. 200 (%)	
B-1	S-3	10-12	9.2				SP	3	
B-2	S-5	20-22	12.2				SP	3	
B-2	S-8	35-37	27.6	26	19	7	CL-ML		
B-3	S-6	25-27	14.7				SP	2	
B-3	S-10	45-47	27.3	20	18	2	ML		
B-4	S-1	0-2	11.7				SP-SM	8	
B-5	S-5	20-22	13.6				SP	2	
B-6	S-9	40-42	29.7	26	19	7	CL-ML		
B-7	S-2	5-7	7.2				SP-SM	7	
B-8	S-5	20-22	13.4				SP	2	
B-8	S-8-2	35-37	29.0	28	17	11	CL		
B-8	S-11	50-52	53.0	57	28	29	CH		

Note: (1) USCS symbol based on visual observation and Sieve and Atterberg limits reported.



Open Symbols: Sieve analysis by ASTM D6913
Filled symbols: Hydrometer analysis by ASTM D7928 corrected for complete sample

SYMBOL	w (%)	LL	PL	PI	USCS	AASHTO	USCS DESCRIPTION AND REMARKS	DATE
□	9.2				SP		Brown, Poorly graded sand with gravel, Insufficient sample size	12/18/20
◇	12.2				SP		Brown, Poorly graded sand with gravel, Insufficient sample size	12/18/20
○								

Symbol	□	◇	○
Boring	B-1	B-2	
Sample	S-3	S-5	
Depth	10-12	20-22	
% +3"	0	0	
% Gravel	15	25	
% SAND	82	72	
%C SAND	16	14	
%M SAND	41	27	
%F SAND	25	31	
% FINES	3	3	
D_{100} (mm)	19.1	19.1	
D_{60} (mm)	1.4	1.82	
D_{30} (mm)	0.45	0.38	
D_{10} (mm)	0.21	0.19	
Cc	0.7	0.4	
Cu	6.7	9.6	

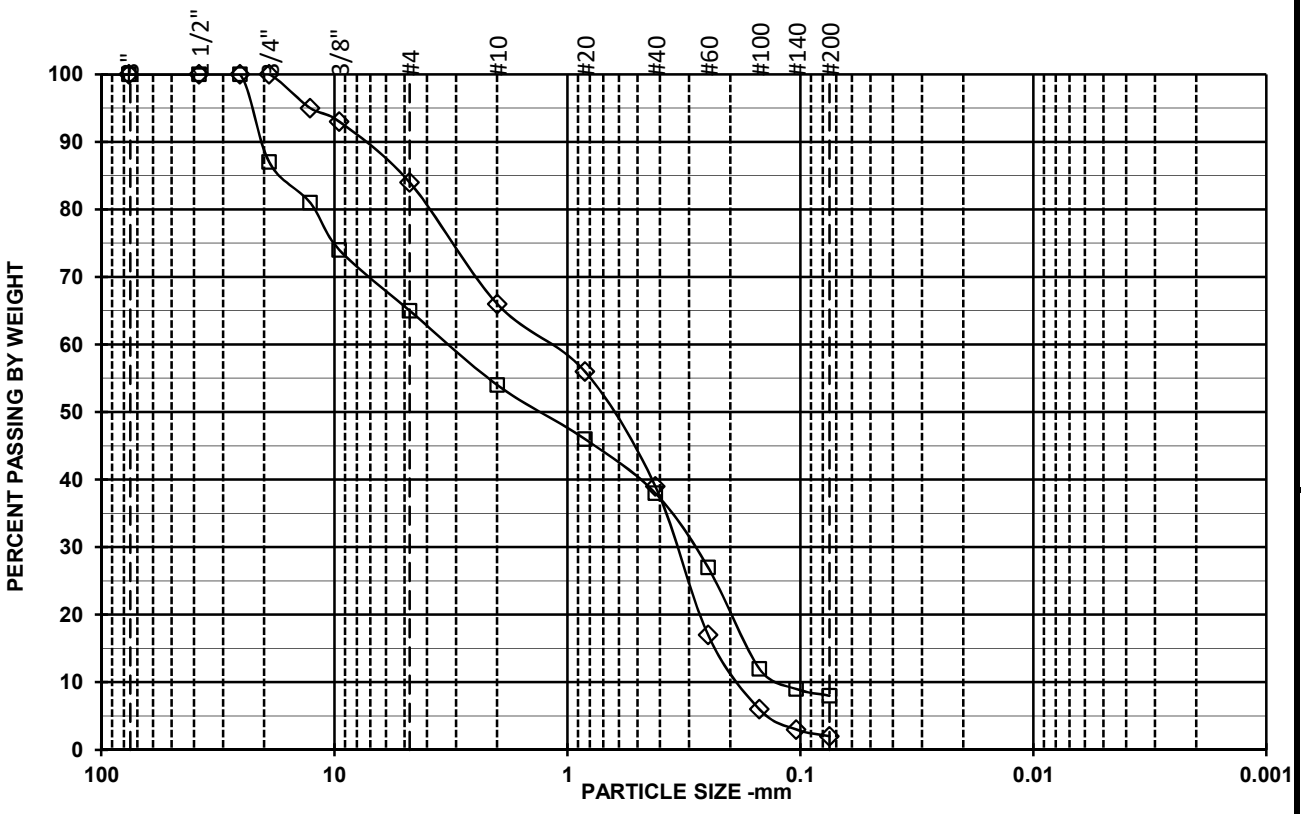
Sieve Size/ID #	Percent Finer Data		
6"	100	100	
4"	100	100	
3"	100	100	
1 1/2"	100	100	
1"	100	100	
3/4"	100	100	
1/2"	97	98	
3/8"	93	93	
#4	85	75	
#10	69	61	
#20	47	52	
#40	28	34	
#60	13	14	
#100	5	7	
#140	4	4	
#200	3	3	
5μ m			
2μ m			
1μ m			

GeoDesign #3887-009

TerraSense, LLC #8110-20021

13-12 Beach Channel Drive

PARTICLE SIZE DISTRIBUTION
ASTM D6913 & ASTM D7928



Open Symbols: Sieve analysis by ASTM D6913
Filled symbols: Hydrometer analysis by ASTM D7928 corrected for complete sample

SYMBOL	w (%)	LL	PL	PI	USCS	AASHTO	USCS DESCRIPTION AND REMARKS	DATE
□	11.7				SP-SM		Gray, Poorly graded sand with silt and gravel, Insufficient sample size	12/18/20
◇	13.6				SP		Brown, Poorly graded sand with gravel, Insufficient sample size	12/18/20
○								

Symbol	□	◇	○
Boring	B-4	B-5	
Sample	S-1	S-5	
Depth	0-2	20-22	
% +3"	0	0	
% Gravel	35	16	
% SAND	57	82	
%C SAND	11	18	
%M SAND	16	27	
%F SAND	30	37	
% FINES	8	2	
D_{100} (mm)	25.4	19.1	
D_{60} (mm)	3.2	1.19	
D_{30} (mm)	0.29	0.34	
D_{10} (mm)	0.12	0.18	
Cc	0.2	0.5	
Cu	26.7	6.6	

Sieve Size/ID #	Percent Finer Data		
6"	100	100	
4"	100	100	
3"	100	100	
1 1/2"	100	100	
1"	100	100	
3/4"	87	100	
1/2"	81	95	
3/8"	74	93	
#4	65	84	
#10	54	66	
#20	46	56	
#40	38	39	
#60	27	17	
#100	12	6	
#140	9	3	
#200	8	2	
5μ m			
2μ m			
1μ m			

GeoDesign #3887-009

TerraSense, LLC #8110-20021

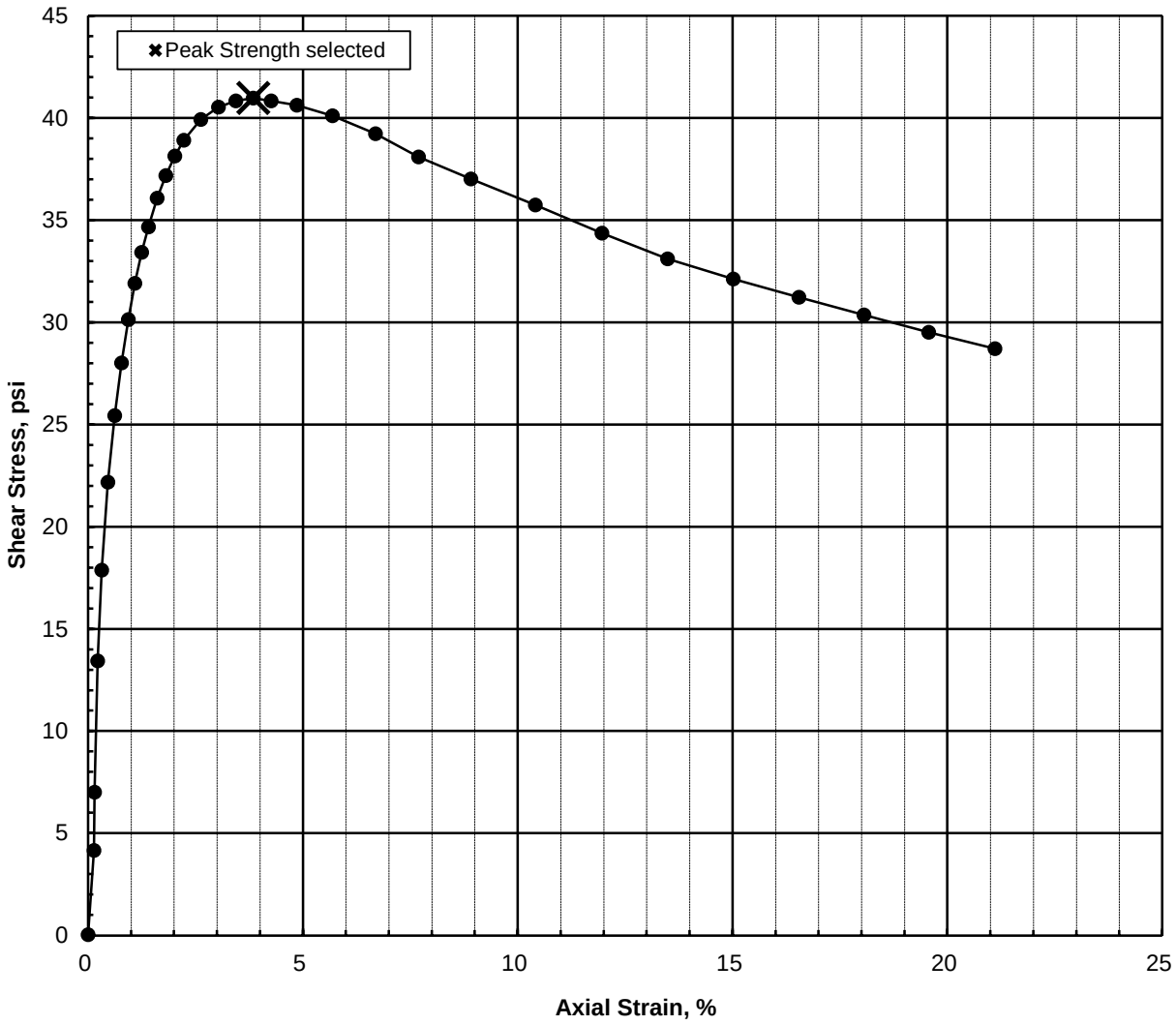
13-12 Beach Channel Drive

PARTICLE SIZE DISTRIBUTION
ASTM D6913 & ASTM D7928

GeoDesign #3887-009
13-12 Beach Channel Drive
LABORATORY TESTING DATA SUMMARY

BORING	SAMPLE	DEPTH	IDENTIFICATION TESTS							STRENGTH			CONSOLIDATION			REMARKS
			WATER	LIQUID	PLASTIC	PLAS.	USCS	TOTAL	DRY	Type Test	PEAK	AXIAL STRAIN	Method	INITIAL CONDITIONS		/
NO.	NO.		CONTENT	LIMIT	LIMIT	INDEX	SYMB. (1)	UNIT WEIGHT	UNIT WEIGHT		SHEAR STRENGTH	@ PEAK STRESS		VOID RATIO	SATUR-ATION	TEST ID
		(ft)	(%)	(-)	(-)	(-)		(pcf)	(pcf)		(psi)	(%)		(-)	(%)	
B-3	ST-1	58-60						108.8								
B-3	ST-1	58.2	45.5													
B-3	ST-1	58.75	51.4													
B-3	ST-1B	59	50.8	58	28	30	CH	105.5	70.0				D2435	1.472	96	C20307
B-3	ST-1	59.3	50.5													
B-3	ST-1C	59.6	45.7				CH	109.4	75.1	CU@70	41.0	3.8				TRS4775

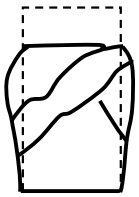
Note: (1) USCS symbol based on visual observation and Atterberg limits reported.



Specimen Information

	Water Content (%)	LL	PI	Length (inch)	Diameter (inch)	Wet Unit Weight (pcf)	Dry Unit Weight (pcf)
Initial	45.7			6.012	2.867	109.4	75.1
Final	43.1			5.891	2.831	112.4	78.6

CH, Gray, Fat clay. Silt seams noted.



FAILURE SKETCH

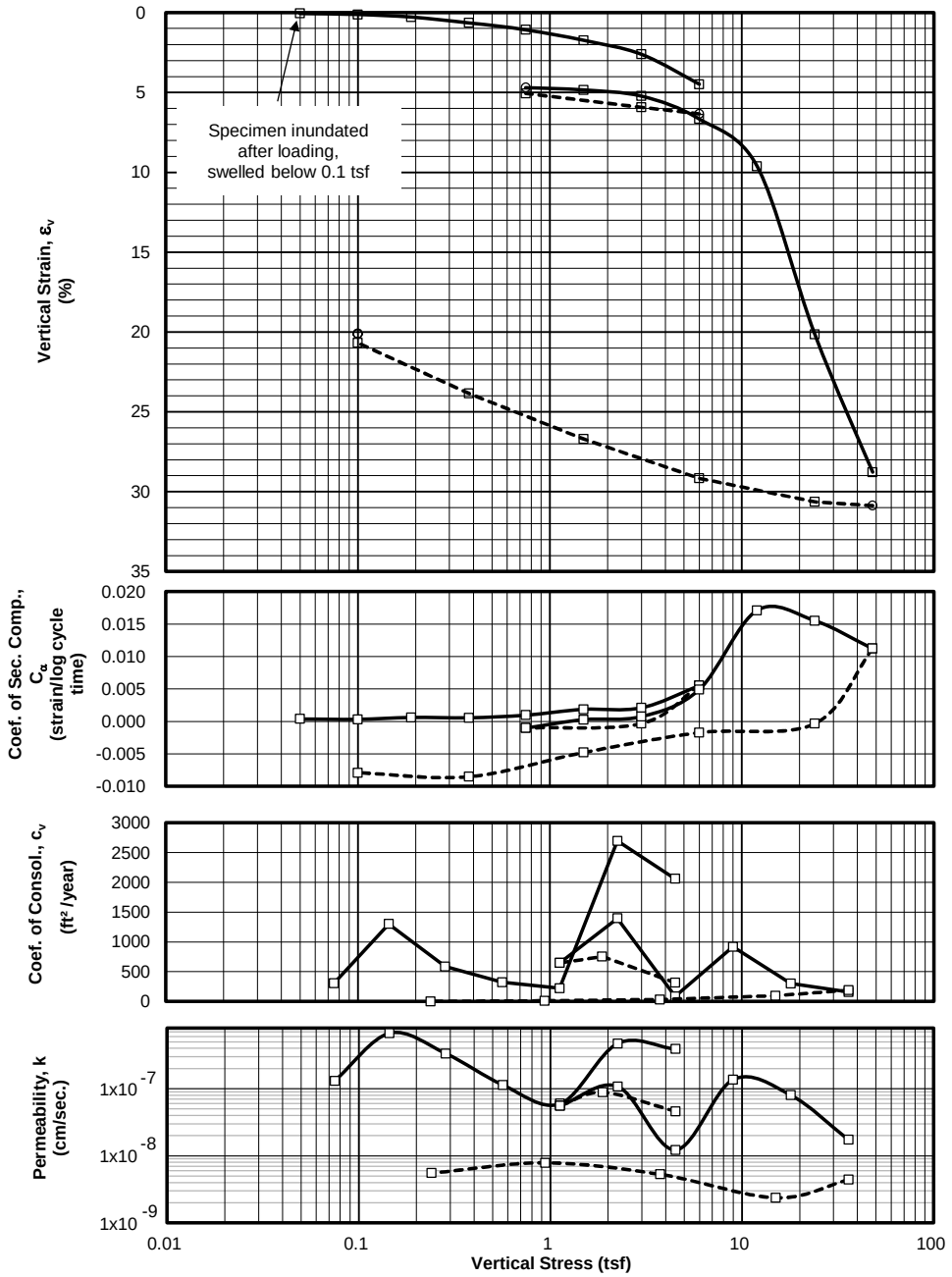
Test Summary

Cell Pressure (psi)	Axial Strain during confinement (%)	Peak Shear Strength (psi)	Strain to Peak (%)	Strain Rate (%/min)
70.0	2.01	40.97	3.8	0.50

Tested by: BB Reviewed by: GET

Test Date: 12/22/2020 Review Date: 1/12/2021

GeoDesign **Project # 3887-009**	**13-12 Beach Channel Drive**	**CONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST**
TerraSense, LLC **Project # 8110-20021**		**Boring: B-3 Sample: ST-1** **Section: C Depth: 59.6 ft.**



SAMPLE INFORMATION

Boring:	B-3
Sample:	ST-1
Depth:	59.00 feet
Elevation:	
Type:	3-inch thin wall tube
Description:	CH, green-gray fat clay

LL = 58, PL = 28, PI = 30

SPECIMEN INFORMATION

(NOTE: Initial and final states refer to beginning and end of test)

Initial height:	0.60	inch
Diameter:	2.50	inch

Initial water content:	50.8	%
Initial total unit weight:	105.5	pcf
Initial dry unit weight:	70.0	pcf
Initial void ratio:	1.472	
Initial degree of saturation:	96	%
Final water content:	36.8	%
Final total unit weight:	117.1	pcf
Final dry unit weight:	85.6	pcf
Final void ratio:	1.020	
Final degree of saturation:	100	% (assumed specific gravity = 2.77)

TEST SUMMARY

Construction Method:	Casagrande (Log)
Estimated preconsolidation stress (tsf):	8.5 (Range: 8.3 to 10.8)
Estimated in situ effective overburden stress (tsf):	
Compression Ratio (strain per log cycle stress):	0.350
Compression Index (void ratio per log cycle stress):	0.865
Swell Ratio (strain per log cycle stress):	0.014
Swell Index (void ratio per log cycle stress):	0.035
Recompression Ratio (strain per log cycle stress):	0.030
Recompression Index (void ratio per log cycle stress):	0.074
Remarks:	

LEGEND: □ End of primary o End of Stage ——— Loading - - - - - - - Unloading

Test Date: 12/29/20 Tested By: GT Checked By: GET

GeoDesign Project No. 3887-009	13-12 Beach Channel Drive	ONE DIMENSIONAL CONSOLIDATION TEST Boring: B-3 Depth: 59.00 feet
TerraSense, LLC	Project No. 8110-20021	January 2021

PROJECT:	13-12 Beach Channel Drive					
PROJECT NO.:	8110-20021	Initial height:	0.604 inch	Final height:	0.493 inch	
BORING:	B-3	Initial water content:	50.8 %	Final water content:	36.8 %	
SAMPLE:	ST-1	Initial dry density:	70.0 pcf	Final dry density:	85.6 pcf	
TEST:	C20307	Initial total density:	105.5 pcf	Final total density:	117.1 pcf	
DEPTH, feet:	59	Initial saturation:	96 %	Final saturation:	100 %	
BY:	GT	Initial void ratio:	1.472	Final void ratio:	1.020	
TEST DATE:	12/29/2020			Final strain:	18.3 %	

EQUIPMENT: SPECIMEN DESCRIPTION: CH, green-gray fat clay

Load Frame No.: 3

Ring Diameter: 2.5 inch

G	LL	PL	PI
2.77	58	28	30

Load No.	Load (tsf)	d_{100} (inch)	t_{100} Strain (%)	t_{100} Void Ratio (-)	Final Strain (%)	Final Void Ratio (-)	c_v (ft^2/year)	C_α (strain/logt)	Constrained Modulus (tsf)	Permeability (cm/sec)
1	0.050	0.0004	0.060	1.470	0.007	1.472	400	0.0004	83	1E-07
2	0.100	0.0008	0.132	1.468	0.188	1.467	302	0.0003	70	1E-07
3	0.190	0.0017	0.286	1.465	0.507	1.459	1300	0.0006	58	7E-07
4	0.380	0.0039	0.645	1.456	0.824	1.451	585	0.0005	53	3E-07
5	0.750	0.0065	1.078	1.445	1.271	1.440	322	0.0010	86	1E-07
6	1.50	0.0105	1.746	1.429	2.084	1.420	223	0.0018	112	6E-08
7	3.00	0.0158	2.613	1.407	3.562	1.384	2695	0.0021	173	5E-07
8	6.00	0.0271	4.491	1.361	6.342	1.315	2060	0.0055	160	4E-07
9	3.00	0.0358	5.937	1.325	5.876	1.326	316	-0.0003	207	5E-08
10	0.750	0.0306	5.067	1.346	4.700	1.356	755	-0.0010	259	9E-08
11	1.50	0.0293	4.853	1.352	4.910	1.350	646	0.0003	350	6E-08
12	3.00	0.0316	5.236	1.342	5.493	1.336	1395	0.0007	391	1E-07
13	6.00	0.0402	6.666	1.307	7.373	1.289	85	0.0049	210	1E-08
14	12.0	0.0581	9.626	1.234	14.317	1.118	917	0.0171	203	1E-07
15	24.0	0.1217	20.156	0.974	23.402	0.893	302	0.0155	114	8E-08
16	48.0	0.1737	28.782	0.760	30.880	0.708	160	0.0112	278	2E-08
17	24.0	0.1849	30.635	0.715	30.519	0.717	189	-0.0003	1295	4E-09
18	6.00	0.1760	29.160	0.751	28.854	0.759	96	-0.0017	1220	2E-09
19	1.50	0.1612	26.709	0.812	26.208	0.824	32	-0.0048	184	5E-09
20	0.380	0.1440	23.853	0.882	23.108	0.901	10	-0.0085	39	8E-09
21	0.100	0.1248	20.683	0.961	20.115	0.975	2	-0.0079	8.83	6E-09