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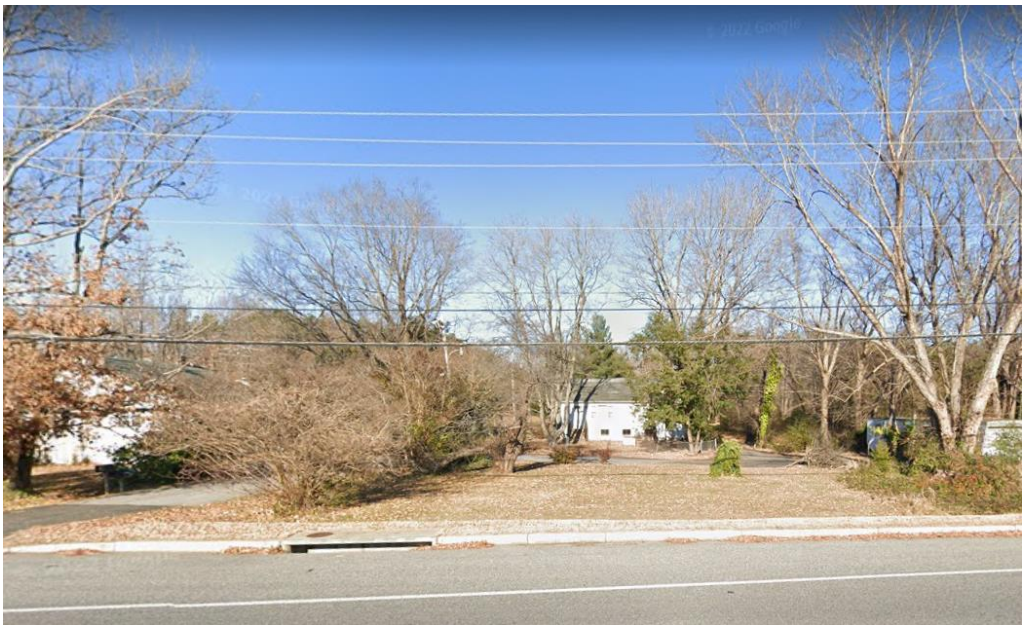
REPORT OF GEOTECHNICAL INVESTIGATION

PROPOSED TIDAL WAVE AUTO SPA SITE #101
23178 THREE NOTCH ROAD
CALIFORNIA, ST. MARY'S COUNTY, MARYLAND



Prepared for:

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Whitestone Project No.: GS2219707.000
December 16, 2022

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via email

BOHLER ENGINEERING NY, PLLC
275 Broadhollow Road
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Melville, New York 11747

Attention: Mr. Aleksandar Kociski
Project Manager

Regarding: REPORT OF GEOTECHNICAL INVESTIGATION
PROPOSED TIDAL WAVE AUTO SPA SITE #101
23178 THREE NOTCH ROAD
CALIFORNIA, ST. MARY'S COUNTY, MARYLAND
WHITESTONE PROJECT NO.: GS2219707.000

Dear Mr. Kociski:

Whitestone Associates, Inc. is pleased to submit the attached *Report of Geotechnical Investigation* for the above-referenced project. The attached report presents the results of Whitestone's subsurface exploration and recommendations for design of the proposed structural foundations, floor slab, and related earthwork associated with the proposed redevelopment.

Whitestone's Geotechnical Division appreciates the opportunity to be of continued service to Bohler Engineering NY, PLLC (Bohler). Please note that Whitestone has the capability to conduct the additional geotechnical engineering services recommended herein.

Please contact us at (908) 668-7777 with any questions regarding the enclosed report.

Sincerely,

WHITESTONE ASSOCIATES, INC.

Mudar Khantamr
Associate

Laurence W. Keller, P.E.
Vice President

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REPORT OF GEOTECHNICAL INVESTIGATION
Proposed Tidal Wave Auto Spa Site #101
23178 Three Notch Road
California, St. Mary's County, Maryland

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23178 Three Notch Road
California, St. Mary's County, Maryland

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SECTION 1.0
Summary of Findings and Recommendations

An exploration and evaluation of the subsurface conditions has been conducted on the site of the proposed Tidal Wave Auto Spa Site #101 located at 23178 Three Notch Road in California, St. Mary's County, Maryland. The site of the proposed construction is shown on the *Boring Location Plan* included as Figure 1.

At the time of Whitestone's investigation, the subject site was developed with multiple residential buildings with associated utilities, pavements, lawn and landscaped areas. A topographic survey was not available at the time of Whitestone's investigation, however, based on visual observation, the site appeared be generally flat lying with grade changes on the order of approximately two feet to three feet across the property.

Based on the October 7, 2022 *Site Sketch* prepared by Bohler, the proposed site development includes removal of the existing site structures and construction of an approximately 3,620-square feet (footprint) single-story, 146R cold tunnel carwash building, a kiosk with overhead canopy, trash enclosure, multiple vacuum units with an overhead canopy, associated pavements, landscaping, and utilities. Proposed site grading was not available at the time of this report, however, Whitestone anticipates less than three feet of earth cuts and fills to attain proposed subgrade elevations. The proposed redevelopment may or may not include stormwater management (SWM) facilities. No site retaining walls or subsurface building levels are anticipated at the time of this report.

The geotechnical investigation included conducting a reconnaissance of the project site, drilling five soil borings, and collecting soil samples for laboratory analysis. The data from this exploration were analyzed by Whitestone in light of the project information provided by Bohler.

A summary of Whitestone's findings and recommendations is presented below:

- **Subsurface Conditions:** The soil borings were conducted within existing lawn-covered and landscaped areas of the subject site and disclosed approximately one inch of topsoil at the surface. Beneath the surface cover, the soil borings encountered natural coastal plain deposits that generally consisted of lean clay with varying amounts of sand and silt (USCS: CL and CL-ML), clayey sand (USCS: SC), and/or silty sand with variable amounts of gravel (USCS: SM). The soil borings were terminated within the natural soils at approximate depths ranging from 20 feet below ground surface (fbgs) to 25 fbgs. Static groundwater was not encountered during the subsurface investigation to a maximum explored depth of approximately 25 fbgs. Groundwater conditions likely will fluctuate seasonally and following periods of precipitation.

Recommendations developed upon consideration of these findings are summarized below and presented in greater detail in the indicated sections of the report:

- **Shallow Foundations:** The results of the investigation indicate that the proposed structures may be supported on conventional shallow foundations bearing within the underlying improved natural soils and/or controlled structural fill soils that are properly inspected, placed, and compacted in accordance with Sections 5.2, 5.3, and 5.11 of this report.

- **Pavements and Floor Slabs:** Whitestone anticipates that proposed floor slabs and pavements may be supported on approved and improved natural site soils and/or controlled structural fill materials following subgrade preparation as described herein. Areas requiring overexcavation and replacement may be required due to moisture sensitivity of the cohesive soils. Any areas that become softened or disturbed as a result of wetting and/or repeated exposure to construction traffic or contain unsuitable materials should be removed and replaced with compacted structural fill. The upper 12 inches of all subgrades should be recompacted in-place under the observation of the owner's geotechnical engineer.

- **Soil Reusability/Moisture Sensitive Soils:** Whitestone anticipates that the majority of the upper on-site soils will be marginally suitable for selective reuse as structural fill and/or backfill below proposed foundations, floor slabs, and pavements provided moisture contents are controlled within two percent of the optimum moisture content. The majority of the site soils are highly moisture sensitive and re-use is anticipated to require a significant drying effort. These soils will require moisture conditioning, including stockpiling, aerating, and drying to achieve proper compaction. Immediate reuse of these materials is not expected. Imported materials may be required to expedite earthwork operations, especially if the construction schedule or the site area restricts moisture control operations, such as air drying. Materials that are, or become, exceedingly wet will require discing and aerating. Any stripped topsoil should not be used as general structural fill or backfill. Construction schedules and budgets should account for wet soils and soil exchange with imported soils to expedite schedules.

SECTION 2.0
Introduction

2.1 AUTHORIZATION

Mr. Aleksandar Kociski of Bohler issued authorization to Whitestone to conduct a geotechnical investigation on this site relevant to the construction of the proposed Tidal Wave Auto Spa Site #101 located at 23178 Three Notch Road in California, St. Mary's County, Maryland. The geotechnical services were conducted in accordance with Whitestone's December 3, 2021 proposal to Bohler.

2.2 PURPOSE

The purpose of this subsurface exploration and analysis was to:

- ascertain the various soil profile components at test locations;
- estimate the engineering characteristics of the proposed foundation bearing and subgrade materials;
- provide geotechnical criteria for use by the design engineers in preparing the foundation, floor slab, and pavement design;
- provide recommendations for required earthwork and subgrade preparation including sinkhole mitigation;
- record groundwater and/or bedrock levels (although not encountered) at the time of the investigation and discuss the potential impact on the proposed construction; and
- recommend additional investigation and/or analysis (if warranted).

2.3 SCOPE

The scope of the exploration and analysis included the subsurface exploration, field testing and sampling; laboratory analysis, and an engineering analysis and evaluation of the foundation materials. This *Report of Geotechnical Investigation* is limited to addressing the site conditions related to the physical support of the proposed construction. Any references to suspicious odors, materials, or conditions are provided strictly for the client's information.

2.3.1 Field Exploration

Field exploration of the project site was conducted by means of five soil borings (identified as B-1 through B-5) conducted within accessible areas of the subject site. The subsurface tests were advanced with an ATV-mounted Diedrich D-70 drill rig equipped with hollow-stem augers and split-spoon

sampling techniques. The locations of the soil borings and are shown on the *Boring Location Plan* included as Figure 1. *Records of Subsurface Exploration* are provided in Appendix A. The test locations and termination depths are summarized in the following table.

TEST LOCATION/TERMINATION DEPTH SUMMARY TABLE		
Proposed Construction	**Boring No.**	**Termination Depth (fbgs)**
146R Cold Tunnel Building (±3,620-square feet)	B-1 and B-4	20
Vacuum Canopy	B-3 and B-5	20 to 25
Trash Enclosure	B-2	20

fbgs: feet below ground surface

The test locations were based on the project information available at the time of the investigation including the aforementioned *Site Sketch* prepared by Bohler. The soil borings were conducted in the presence of a Whitestone engineer who conducted field tests, recorded visual classifications, and collected samples of the various strata encountered. The test areas were located in the field using normal taping procedures and estimated right angles. These locations are presumed to be accurate within a few feet.

Soil borings and Standard Penetration Tests (SPTs) were conducted in general accordance with ASTM International (ASTM) designation D 1586. The SPT resistance value (N) can be used as an indicator of the consistency of fine-grained soils and the relative density of coarse-grained soils. The N-value for various soil types can be correlated with the engineering behavior of earthworks and foundations

Groundwater level observations, although not encountered, were recorded during and immediately after the completion of field operations prior to backfilling the test locations. Groundwater elevations derived from sources other than seasonally observed groundwater monitor wells may not be representative of true groundwater levels.

2.3.2 Laboratory Program

In addition to the field investigation, a laboratory program was conducted to determine additional, pertinent engineering characteristics of representative samples of on-site soils. The laboratory program was conducted in general accordance with applicable ASTM standard test methods and included physical testing of proposed building foundation bearing and pavement subgrade stratum.

Physical/Textural Analyses: Representative samples of selected strata encountered were subjected to a laboratory program that included Atterberg limits determinations (ASTM D-4318), moisture content determinations (ASTM D-2216), and washed gradation analyses (ASTM D-422) in order to conduct supplementary engineering soil classifications in general accordance with ASTM D-2487. The soil strata tested were classified by the Unified Soil Classification System (USCS) and results of the laboratory testing are summarized in the following table. Quantitative test results are provided in Appendix B.

PHYSICAL/TEXTURAL ANALYSES SUMMARY							
Boring No.	**Sample**	**Depth (fbgs)**	**% Passing No. 200 Sieve**	**Moisture Content (%)**	**Liquid Limit**	**Plastic Index**	**USCS Classification**
B-1	S-2/S-3	2.0 to 6.0	65.3	16.6	41	23	CL
B-3	S-3/S-4	4.0 to 8.0	54.0	13.3	24	7	CL-ML

fbgs: feet below ground surface

The engineering classifications are useful when considered in conjunction with the additional site data to estimate properties of the soil types encountered and to predict the soil's behavior under construction and service loads.

SECTION 3.0
Site Description

3.1 LOCATION AND DESCRIPTION

The approximately 1.72-acre subject property is located at 23178 Three Notch Road in California, St. Mary's County, Maryland. The site is bordered to the north by a moderately-wooded lot followed by a church, to the east by Patuxent Beach Road followed by residential properties, to the south by Three Notch Road followed by commercial development, and to the west by commercial development followed by residential properties. The location of the subject site is shown on the *Boring Location Plan* included as Figure 1.

3.2 EXISTING AND HISTORIC CONDITIONS

Surface Cover/Development: At the time of the investigation, the subject site was developed with multiple residential buildings with associated utilities, pavements, lawn and landscaped areas.

Topography: A topographic survey was not available at the time of Whitestone's investigation, however, based on visual observation, the site appeared be generally flat lying with grade changes on the order of approximately two feet to three feet across the property.

Utilities: Underground utilities traversed the site at the time of the investigation, including natural gas, sanitary sewer, water, stormwater, electric and telecommunications. Other utilities were not observed at the subject site by Whitestone but may be present. The utility information contained in this report is presented for general discussion only and is not intended for construction purposes.

Site Drainage: Surface run-off for the site generally follows existing topography draining towards inlets located within paved portions of the site and within Three Notch Road. The termini of the inlets are unknown.

3.3 SITE GEOLOGY

The subject site is located in the Atlantic Coastal Plain Physiographic Province. Specifically, the site is situated within the Quaternary-age, Western Shore Uplands Region of the Coastal Plain Physiographic Province and is underlain by the Upland Deposits. Specifically, the Upland Deposits consists of gravel and sand, commonly orange brown and locally limonite cemented. Minor amounts of silts and red, white and gray clays are present.

3.4 PROPOSED CONSTRUCTION

Based on the aforementioned *Site Sketch*, the proposed site development includes removal of the existing site structures and construction of an approximately 3,620-square feet (footprint) single-story, 146R cold tunnel carwash building, a kiosk with overhead canopy, trash enclosure, multiple vacuum units with an overhead canopy, associated pavements, landscaping, and utilities.

Proposed site grading was not available at the time of this report, however, Whitestone anticipates less than three feet of earth cuts and fills to attain proposed subgrade elevations. The proposed redevelopment may or may not include SWM facilities. No site retaining walls or subsurface building levels are anticipated at the time of this report.

Detailed structural information was not available at the time of this report, however, based on experience with similar projects, Whitestone anticipates that the proposed structures will be constructed with a combination of masonry, steel, and wood framing with ground-supported floor slabs. Final design loads have not been determined at this time, however, based on Whitestone's experience with similar projects, maximum design loads are assumed to be less than the following:

- column loads - 75 kips;
- wall loads - 2.0 kips/linear foot; and
- floor slab loads - 100 pounds per square foot (live load).

The scope of Whitestone's investigation and the professional advice contained in this report were generated based on the project details and loading noted herein. Any revisions or additions to the design details enumerated in this report should be brought to the attention of Whitestone for additional evaluation as warranted.

SECTION 4.0
Subsurface Conditions

Details of the subsurface materials encountered are presented on the *Records of Subsurface Exploration* presented in Appendix A of this report. The subsurface soil conditions encountered in the test locations consisted of the following generalized strata in order of increasing depth.

4.1 SUBSURFACE CONDITIONS

Surface Cover Materials: The subsurface tests were conducted within existing lawn-covered and landscaped areas of the subject site and disclosed approximately one inch of topsoil at the surface.

Coastal Plain Deposits: Underlying the surface cover materials, the soil borings disclosed natural coastal plain deposits that generally consisted of lean clay with varying amounts of sand and silt (USCS: CL and CL-ML), clayey sand (USCS: SC), and/or silty sand with variable amounts of gravel (USCS: SM). The soil borings were terminated within the natural soils at approximate depths ranging from 20 fbgs to 25 fbgs. SPT N-values recorded within the coarse-grained portions of this stratum ranged between 12 blows per foot (bpf) and 38 bpf, indicating medium dense to dense relative densities, and averaging 19 bpf. Pocket penetrometer tests conducted on the cohesive natural soils indicated unconfined compressive strengths (q_u) ranging between approximately one ton per square foot (tsf) and greater than 4.5 tsf, generally indicating stiff to hard soil consistencies.

4.2 GROUNDWATER

Static groundwater was not encountered during the subsurface investigation to a maximum explored depth of approximately 25 fbgs. Static and perched/trapped water conditions are expected to fluctuate seasonally and following periods of precipitation.

SECTION 5.0
Conclusions and Recommendations

5.1 GENERAL

Whitestone anticipates that the proposed foundations, floor slab, and pavements may be supported on approved underlying natural soils, and/or controlled structural fill materials provided these materials are properly evaluated, compacted, and proofrolled as recommended herein. Whitestone anticipates that portions of the upper natural site soils will be marginally suitable for selective reuse as structural fill/backfill, provided that soil moisture contents are controlled within two percent of optimum moisture level.

The upper on-site soils are especially moisture sensitive and must be properly protected, compacted, proofrolled, and evaluated during construction as described herein. Immediate reuse of the site soils is not expected, especially if construction occurs between late fall and early spring or following inclement weather. Additionally, re-use of the on-site materials is anticipated to require a significant drying effort, especially if construction occurs during winter or early spring months. Limited areas requiring overexcavation and replacement or mechanical stabilization may be required due to moisture sensitivity of the upper fine-grained site soils. Proposed site grading plans were not completed at the time of this report.

5.2 SITE PREPARATION AND EARTHWORK

Surface Cover Stripping and Demolition: Prior to stripping operations, all utilities should be identified and secured. The surficial vegetation, existing structures, and pavements should be stripped at least 10 feet beyond the limits of the proposed building and associated pavement areas, where possible. Existing structural elements, such as foundation walls, or any concrete foundations, walls or slabs encountered during excavations, should be removed entirely from below proposed foundations and their zones of influence (as determined by lines extending at least one foot laterally beyond footing edges for each vertical foot of depth) and excavated to at least two feet below proposed construction subgrade levels elsewhere.

Foundations and slabs may remain in place below these depths below proposed ground-supported slabs, pavements, and landscaped areas provided interference with future construction is avoided. Any existing slab to remain should be thoroughly broken such that maximum particle size is 12 inches to allow vertical drainage of water. The demolition contractor should be required to conduct all earthwork in accordance with the recommendations in this report including backfilling any excavation, utility, etc. with structural fill. All fill or backfill placed in structural areas during any demolition operations should be placed as structural fill in accordance with Section 5.2, 5.3, and 5.11 of this report.

Surface Preparation/Proofrolling: Prior to placing any fill, backfill or subbase materials to raise or restore grades to the desired building or pavement subgrade elevations, the exposed soils should be compacted to a firm and unyielding surface with a minimum of two passes in two perpendicular directions of a minimum 10-ton smooth drum roller operated in static mode. The surface should be proofrolled with a loaded tandem axle truck in the presence of the geotechnical engineer to help identify soft or loose pockets that may require removal and replacement or further investigation. Any fill or backfill should be placed and compacted in accordance with Section 5.3.

Weather Performance Criteria: Because a majority of the site soils are highly moisture sensitive and will soften when exposed to water, every effort must be made to maintain drainage of surface water runoff away from construction areas by grading and limiting the exposure of excavations and prepared subgrades to rainfall. Accordingly, excavation and fill placement procedures should be conducted during favorable weather conditions. Overexcavation of saturated soils and replacement with controlled structural fill per Section 5.3 of this report may be required prior to resuming work on disturbed subgrade soils.

On-Site Soil Protection and Maintenance: The site soils are highly moisture sensitive and will degrade where exposed to inclement weather, freeze-thaw cycles, or repeated construction traffic. However, if properly protected and maintained as recommended herein, the site soils will provide adequate support for the proposed construction. The site contractors should employ appropriate means and methods to protect the subgrade including, but not limited to the following:

- leaving the existing pavement in place as long as practical to protect the subgrade from freeze-thaw cycles and exposure to inclement weather;
- sealing exposed subgrade soils on a daily basis with a smooth drum roller operated in static mode;
- regrading the site as needed to maintain positive drainage away from open earthwork construction areas and to prevent standing water;
- removing wet surficial soils and ruts immediately; and
- limiting exposure to construction traffic and precipitation especially following inclement weather and subgrade thawing.

Pavement Subgrade Stabilization and Inspection: Pavement subgrade soils which are exposed to inclement weather and heavy construction traffic will degrade and require either extensive drying time or overexcavation and replacement in order to provide a suitable subgrade for pavements. Overexcavation of unstable soils within pavement areas typically should be limited to approximately 1.5 feet below planned subgrade unless directed otherwise by the owner's geotechnical engineer, provided that a reinforcing geogrid approved by the owner's geotechnical engineer is used. Alternatively, unstable materials may be completely overexcavated and either aerated and recompacted or replaced with imported structural fill per Section 5.3. However, this option is likely least economical.

Geogrids typically are economical when proposed undercut depths exceed approximately 16 inches. The geogrid (Tensar TriAx TX130S, or similar) should be placed directly on the exposed subgrade and backfill should consist of a well-graded gravel and sand blend. The services of the geotechnical engineer should be retained to inspect soil conditions during construction and to provide specific recommendations for stabilizing subgrades. Additionally, a geotechnical engineer should be retained to verify the suitability of prepared foundation, floor slab and pavement subgrades for support of design loads.

5.3 STRUCTURAL FILL AND BACKFILL

Imported Fill Material: Any imported material placed as structural fill or backfill to raise elevations or restore design grades should consist of clean, relatively well-graded sand or gravel with a maximum particle size of two inches and five percent to 15 percent of material finer than a #200 sieve. Silts, clays, and silty or clayey sands and gravels with higher percentage of fines and with a liquid limit less than 40 and a plasticity index less than 20 may be considered subject to the owner's approval, provided that the required moisture content and compaction controls are met during favorable weather conditions. The material should be free of clay lumps, organics, and deleterious material. Imported structural fill material should be approved by a qualified geotechnical engineer prior to delivery to the site.

On-Site Materials: Based on the conditions disclosed by the soil borings, Whitestone anticipates that the natural on-site soils will be marginally suitable for selective reuse as structural fill/backfill material provided that soil moisture contents are controlled within two percent of optimum moisture level. Laboratory results indicate that the upper portions of the existing site soils (USCS: CL and CL-ML) are extremely moisture sensitive. Areas requiring overexcavation and replacement may be required due to moisture sensitivity of the cohesive soils. Reuse of on-site natural soils with more than 12 percent fines (USCS: SM and SC) typically is possible only during extended periods of ideal weather conditions. The reuse of these fine-grained soils typically is possible only during ideal weather conditions. Reuse of these soils may require mixing with a granular material, extensive moisture conditioning, and/or drying to facilitate their reuse, workability, and compaction in fill areas. These materials will become increasingly difficult to reuse and compact if they become wetted beyond the optimum moisture content.

These materials will become increasingly difficult to reuse and compact if they become wetted beyond the optimum moisture content. Materials that become exceedingly wet will likely require discing and aerating. Alternatively, imported fill materials may be used to attain the desired grades and expedite earthwork operations during wet weather periods. The contractor should be required to cover stockpiled soils, seal subgrades, and provide proper surface drainage during forecasted wet weather.

Compaction and Placement Requirements: All fill and backfill should be placed in maximum nine-inch loose lifts and compacted to 95 percent of the maximum dry density within two percent of the optimum moisture content as determined by ASTM D 1557 (Modified Proctor). Whitestone recommends using a vibratory drum roller to compact the on-site soils or a small handheld vibratory compactor within excavations. Particular attention should be brought to backfilling the existing drywells located within or near the proposed building and pavement areas.

Structural Fill Testing: A sample of the imported fill material or any on-site material proposed for reuse as structural fill or backfill should be submitted to the geotechnical engineer for analysis and approval at least one week prior to its use. The placement of all fill and backfill should be monitored by a qualified engineering technician to ensure that the specified material and lift thicknesses are properly installed. A sufficient number of in-place density tests should be conducted to ensure that the specified compaction is achieved throughout the height of the fill or backfill.

5.4 GROUNDWATER CONTROL

Static groundwater was not encountered during the subsurface investigation to a maximum explored depth of approximately 25 fbgs. Therefore, based on anticipated redevelopment grades, static groundwater is expected to be deeper than anticipated excavation depths for foundation and typical utilities. However, perched/trapped water may be encountered above the relatively impermeable fine-grained soils. As such, construction phase dewatering primarily is anticipated to consist of removing perched/trapped water at this site. Whitestone anticipates that construction phase dewatering typically would include installing temporary placing sump pits and pumps within trenches and excavations.

Because the subsurface soils will soften when exposed to water, every effort must be made to maintain drainage of surface water runoff away from construction areas by grading and limiting the exposure of excavations to precipitation.

5.5 FOUNDATIONS

Shallow Foundation Design Criteria: Whitestone recommends supporting the proposed structures on shallow spread and continuous footings designed to bear within approved natural soils and structural fill material provided these materials are properly evaluated, placed, and compacted in accordance with Sections 5.2, 5.3, and 5.11 of this report. Foundations bearing within these materials may be designed using a maximum allowable net bearing pressure of 3,000 pounds per square foot.

All footing bottoms should be improved by in-trench compaction in the presence of the geotechnical engineer. Regardless of loading conditions, proposed foundations should be sized no less than minimum dimensions of 24 inches for continuous wall footings and 36 inches for isolated column footings.

Footings subject to overturning should be designed such that the maximum toe pressure due to the combined effect of vertical loads and overturning moment does not exceed the recommended maximum allowable net bearing pressure. In addition, positive contact pressure should be maintained throughout the base of the footings such that no uplift or tension exists between the base of the footings and the supporting soil. Uplift loads should be resisted by the weight of the concrete. Side friction should be neglected when proportioning the footings so that lateral resistance should be provided by friction resistance at the base of the footings. A coefficient of friction against sliding of 0.35 is recommended for use in the design of the foundations bearing within the existing site soils or imported structural fill soils.

Inspection Criteria: Whitestone recommends that the suitability of the bearing soils along the footing bottoms be verified by a geotechnical engineer prior to placing concrete for the footings. Special attention should be given to areas underlain by soft materials. In the event that isolated areas of unsuitable materials are encountered in footing excavations, overexcavation and replacement of the materials or deeper foundation embedment may be necessary to provide a suitable footing subgrade. Any overexcavation to be restored with structural fill will need to extend at least one foot laterally beyond footing edges for each vertical foot of overexcavation. Lateral overexcavation may be eliminated if grade is restored with lean concrete. The bottoms of overexcavated areas should be compacted with vibratory smooth drum rollers, walk-behind compactors, vibrating plates or plate tampers ("jumping jacks") to compact locally disturbed materials and densify any underlying loose zones. Any standing water within the footing excavation should be removed with a mechanical pump prior to concrete placement.

Settlement: Whitestone estimates post construction settlements of new structure foundations will be on the order of less than one inch if the recommendations outlined in this report are properly implemented. Differential settlement between individual footings should be less than one-half inch.

Frost Coverage: Footings subject to frost action should be placed at least 30 inches below adjacent exterior grades or the depth required by local building codes to provide protection from frost penetration. Interior footings not subject to frost action may be placed at a minimum depth of 18 inches below the slab subgrade.

5.6 FLOOR SLAB

Whitestone anticipates that the site soils and new fill materials placed to raise grades, if required, will provide suitable support for the floor slab. The exposed subgrade should be inspected and compacted in accordance with Sections 5.2, 5.3, and 5.11 of this report. Any areas that become softened or disturbed as a result of wetting and/or repeated exposure to construction traffic should be removed and replaced with compacted structural fill. The properly prepared site soils and structural backfill materials are expected to yield a minimum subgrade modulus (k) of 150 psi/in.

A minimum four-inch layer of three-quarter inch crushed stone (AASHTO No. 57 stone or similar) should be installed below the floor slab to provide a uniform subgrade and capillary break. A moisture vapor barrier should be implemented beneath the floor slab where recommended by the flooring manufacturer.

5.7 PAVEMENT DESIGN CRITERIA

General: Whitestone anticipates that the site soils and/or compacted structural fill/backfill placed to raise or restore design elevations will be suitable for support of the proposed pavements provided these materials are properly evaluated, compacted, and proofrolled in accordance with Sections 5.2, 5.3, and 5.11 of this report during favorable weather conditions. Localized overexcavation and replacement of site

soils may be required due to the presence of moisture sensitive soils. Subgrade stabilization with a triaxial geogrid, approved by the owner's geotechnical engineer, may be used to minimize depths of overexcavation as discussed further in Section 5.2.

Design Criteria: An estimated California Bearing Ratio value of 4.0 has been assigned to the properly prepared subgrade soils for pavement design purposes. This value was correlated with pertinent soil support values and assumed traffic loads to prepare flexible and rigid pavement designs per the AASHTO *Guide for the Design of Pavement Structures*.

Design traffic loads were assumed based on typical volumes for similar facilities and correlated with 18-kip equivalent single axle loads (ESAL) for a 20-year life. An estimated maximum load of 25,000 ESAL was used for all pavement areas assuming the pavement primarily will accommodate both automobile and limited heavier truck traffic. Actual pavement loads should be less than this value.

Pavement Sections: The recommended flexible pavement sections are presented below:

FLEXIBLE PAVEMENT SECTION DESIGN		
Layer	**Material**	**Thickness (Inches)**
Asphalt Surface	MDSHA 904.04 – HMA Superpave 12.5 mm (PG 64-22)	1.5
Asphalt Base	MDSHA 904.04 – HMA Superpave 25.0 mm (PG 64-22)	2.5
Granular Subbase	MDSHA 901.01 – Graded Aggregate	6.0

MDSHA - Maryland State Highway Administration.

A rigid concrete pavement should be used to provide suitable support at areas of high traffic or severe turns (such as at the drive-thru area, trash enclosure, and ingress/egress locations). The recommended rigid pavement is presented below in tabular format:

RIGID PAVEMENT SECTION		
Layer	**Material**	**Thickness (Inches)**
Surface	4,000 psi air-entrained concrete	5.0[1]
Base	MDSHA 901.01 – Graded Aggregate	6.0

Note[1]: The outer edges of concrete pavements are susceptible to damage as trucks move from rigid pavement to adjacent flexible pavement. Therefore, the thickness at the outer two feet of the rigid concrete pavement should be 12 inches.

Additional Design Considerations: The pavement section thickness designs presented in this report are based on the design parameters detailed herein and are contingent on proper construction, inspection, and maintenance. Additional pavement thickness may be required by local code. The designs are contingent on achieving the minimum soil support value in the field. To accomplish this requirement, all subgrade soil and supporting fill or backfill must be properly evaluated, placed, and prepared as detailed in Sections 5.2, 5.3, and 5.11 of this report. Proper drainage must be provided for the pavement structure including appropriate grading and surface water control, as well as measures to drain water from the subgrade.

The performance of the pavement also will depend on the quality of materials and workmanship. Whitestone recommends that MDSHA standards for materials, workmanship, and maintenance be applied to this site. Project specifications should include verifying that the installed asphaltic concrete material composition is within tolerance for the specified materials and that the percentage of air voids of the installed pavement is within specified ranges for the respective materials. All rigid concrete pavements should be suitably air-entrained, jointed, and reinforced.

5.8 RETAINING WALL/LATERAL EARTH PRESSURES

No new retaining walls/below-grade walls are anticipated for the site redevelopment. Whitestone should be notified if any retaining structures or design considerations requiring lateral earth pressure estimations are proposed.

5.9 SEISMIC AND LIQUEFACTION CONSIDERATIONS

The subsurface conditions are most consistent with a Site Class D as defined by the *International Building Code* (IBC) *2018*. Based on the seismic zone and soil profile, liquefaction considerations are not expected to have a substantial impact on design.

5.10 EXCAVATIONS

The site soils encountered during this investigation typically are, at a minimum, consistent with Type C Soil Conditions as defined by 29 CFR Part 1926 (OSHA) which require a maximum unbraced excavation angle of 1.5:1 (horizontal: vertical). Actual conditions encountered during construction should be evaluated by a competent person (as defined by OSHA) to ensure that safe excavation methods and/or shoring and bracing requirements are implemented.

5.11 SUPPLEMENTAL POST INVESTIGATION SERVICES

Construction Inspection and Monitoring: The owner's geotechnical engineer should conduct inspection, testing, and consultation during construction as described in previous sections of this report. Monitoring and testing should also be conducted to verify that the existing surface cover materials and remnant foundations and slabs are removed as recommended herein, suitable materials, used for controlled fill, are properly placed and compacted over suitable subgrade soils. The proofrolling of all subgrades prior to foundation, floor slab, and pavement support should be witnessed and documented by the owner's geotechnical engineer.

SECTION 6.0
General Comments

Supplemental recommendations may be required upon finalization of construction plans or if significant changes are made in the characteristics or location of the proposed structure. Soil bearing conditions should be checked at the appropriate time for consistency with those conditions encountered during Whitestone's geotechnical investigation.

The recommendations presented herein should be utilized by a qualified engineer in preparing the project plans and specifications. The engineer should consider these recommendations as minimum physical standards which may be superseded by local and regional building codes and structural considerations. These recommendations are prepared for the sole use of Bohler Engineering NY, PLLC for the specific project detailed and should not be used by any third party. These recommendations are relevant to the design phase and should not be substituted for construction specifications.

The possibility exists that conditions between borings may differ from those at specific boring locations, and conditions may not be as anticipated by the designers or contractors. In addition, the construction process may alter soil and rock conditions. Therefore, experienced geotechnical personnel should observe and document the construction procedures used and the conditions encountered.

Whitestone assumes that a qualified contractor will be employed to conduct the construction work, and that the contractor will be required to exercise care to ensure all excavations are conducted in accordance with applicable regulations and good practice. Particular attention should be paid to avoiding damaging or undermining adjacent properties and maintaining slope stability.

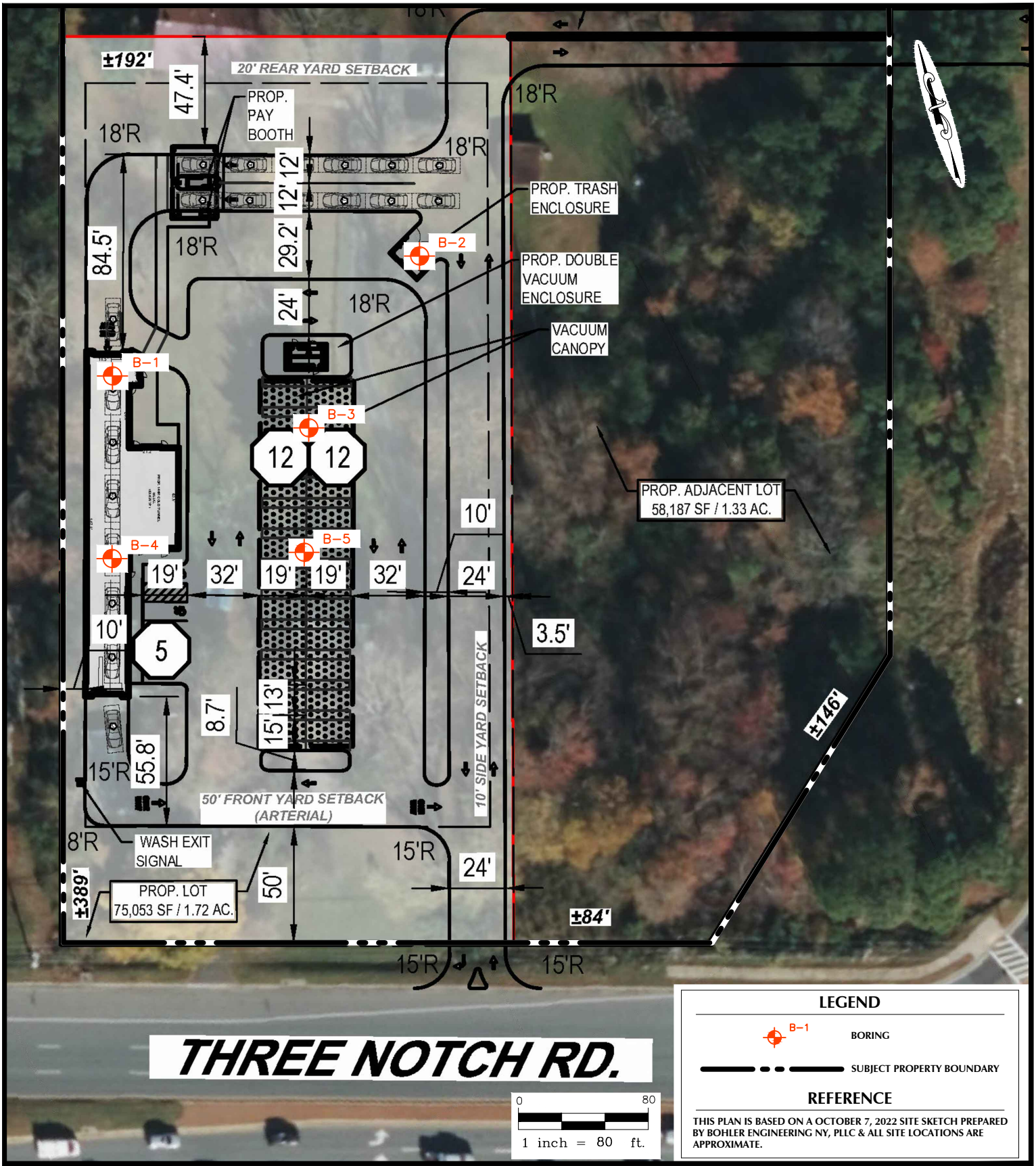
Whitestone recommends that the services of the geotechnical engineer be engaged to test and evaluate the soils in the footing excavations prior to concreting in order to determine that the soils will support the bearing capacities. Monitoring and testing also should be conducted to verify that suitable materials are used for controlled fills and that they are properly placed and compacted over suitable subgrade soils.

The exploration and analysis of the foundation conditions reported herein are considered sufficient in detail and scope to form a reasonable basis for the foundation design. The recommendations submitted for the proposed construction are based on the available soil information and the design details furnished by Bohler Engineering NY, PLLC. Deviations from the noted subsurface conditions encountered during construction should be brought to the attention of the geotechnical engineer.

The geotechnical engineer warrants that the findings, recommendations, specifications, or professional advice contained herein have been promulgated after being prepared in accordance with generally accepted professional engineering practice in the fields of foundation engineering, soil mechanics, and engineering geology. No other warranties are implied or expressed.

WHITESTONE

FIGURE 1
Boring Location Plan



LEGEND

B–1 BORING

SUBJECT PROPERTY BOUNDARY

REFERENCE

THIS PLAN IS BASED ON A OCTOBER 7, 2022 SITE SKETCH PREPARED BY BOHLER ENGINEERING NY, PLLC & ALL SITE LOCATIONS ARE APPROXIMATE.

PROJECT #:	GS2219707.000
DESIGNED BY:	GR
PROJ. MGR.:	MK
DATE:	12/14/22
FIGURE:	1
SCALE:	1" = 80'

DRAWING TITLE: **BORING LOCATION PLAN**

CLIENT: **BOHLER ENGINEERING NY, PLLC**

PROJECT:
PROPOSED TIDAL WAVE AUTO SPA SITE #101
23178 THREE NOTCH ROAD
CALIFORNIA, ST. MARY'S COUNTY, MD

WHITESTONE
An Employee-Owned Company

1959 HIGHWAY 34 BUILDING A, SUITE 102 WALL, NJ 07719
732-592-2101 WHITESTONEASSOC.COM

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APPENDIX A
Records of Subsurface Exploration

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-1

Project:	Proposed Tidal Wave Auto Spa Site #101	**WAI Project No.:**	GS2219707.000
Location:	23178 Three Notch Road; California, St. Mary's County, Maryland	**Client:**	Bohler Engineering NY, PLLC

				Water Depth | Elevation (feet bgs) | (feet)	Cave-In Depth | Elevation (feet bgs) | (feet)
Surface Elevation:	± NS feet	**Date Started:**	11/17/2022		
Termination Depth:	20.0 feet bgs	**Date Completed:**	11/17/2022		
Proposed Location:	Building	**Logged By:**	KRP	**During:** NE | ---	
Drill / Test Method:	HSA / SPT	**Contractor:**	AAG	**At Completion:** NE | ---	**At Completion:** 10.0 | ---
		Equipment:	D-70	**24 Hours:** --- | ---	**24 Hours:** --- | ---

SAMPLE INFORMATION						DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)				
						0.0	TOPSOIL		~1" Topsoil	
0 - 2	S-1		3 - 5 - 10 - 12	21	15	0.1	COASTAL PLAIN DEPOSITS		Brown/Light Brown Clayey Sand, Moist, Medium Dense (SC)	
2 - 4	S-2		10 - 11 - 17 - 19	22	28	2.0			Brown Sandy Lean Clay, Moist, Hard (CL)	Qu = 4.5+ tsf
4 - 6	S-3		6 - 9 - 14 - 17	23	23	5.0			As Above (CL)	Qu = 4.5+ tsf
6 - 8	S-4		7 - 12 - 12 - 16	20	24	8.0			As Above (CL)	Qu = 4.5+ tsf
8 - 10	S-5		7 - 9 - 12 - 18	24	21	10.0			Light Reddish/Grayish-Brown Clayey Sand, Moist, Medium Dense (SC)	
13 - 15	S-6		5 - 6 - 8 - 11	24	14	14.0			As Above (SC)	
						15.0			Grayish-Brown Lean Clay, Moist, Very Stiff (CL)	Qu = 4.0 tsf
						18.0				
18 - 20	S-7		9 - 9 - 11 - 12	20	20	20.0			Orangish-Brown Silty Sand, Moist, Medium Dense (SM)	
						25.0			Boring Log B-1 Terminated at a Depth of 20.0 Feet Below Ground Surface	

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-2

Project:	Proposed Tidal Wave Auto Spa Site #101	**WAI Project No.:**	GS2219707.000
Location:	23178 Three Notch Road; California, St. Mary's County, Maryland	**Client:**	Bohler Engineering NY, PLLC

				Water Depth | Elevation (feet bgs) | (feet)	Cave-In Depth | Elevation (feet bgs) | (feet)
Surface Elevation:	± NS feet	**Date Started:**	11/17/2022		
Termination Depth:	20.0 feet bgs	**Date Completed:**	11/17/2022		
Proposed Location:	Trash Enclosure	**Logged By:**	KRP	**During:** NE | ---	
Drill / Test Method:	HSA / SPT	**Contractor:**	AAG	**At Completion:** NE | ---	**At Completion:** 16.0 | ---
		Equipment:	D-70	**24 Hours:** --- | ---	**24 Hours:** --- | ---

SAMPLE INFORMATION						DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)				
						0.0	TOPSOIL		~1" Topsoil	
0 - 2	S-1		3 - 3 - 5 - 4	21	8	0.1	COASTAL PLAIN DEPOSITS		Brown Sandy Lean Clay, Moist, Very Stiff (CL)	Qu = 3.5 tsf
2 - 4	S-2		6 - 12 - 13 - 19	20	25				As Above, Hard (CL)	Qu = 4.5+ tsf
4 - 6	S-3		4 - 7 - 11 - 11	22	18	5.0			As Above (CL)	Qu = 4.5+ tsf
6 - 8	S-4		8 - 10 - 11 - 16	24	21				As Above (CL)	Qu = 4.5+ tsf
8 - 10	S-5		10 - 11 - 11 - 13	24	22	8.0			Reddish-Brown Clayey Sand, Moist, Medium Dense (SC)	
						10.0				
13 - 15	S-6		6 - 8 - 9 - 9	20	17				As Above (SC)	
						15.0				
						18.0				
18 - 20	S-7		5 - 7 - 8 - 9	19	15				Light Brown Silty Sand, Moist, Medium Dense (SM)	
						20.0			Boring Log B-2 Terminated at a Depth of 20.0 Feet Below Ground Surface	
						25.0				

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-3

Page 1 of 1

Project:	Proposed Tidal Wave Auto Spa Site #101	**WAI Project No.:**	GS2219707.000
Location:	23178 Three Notch Road; California, St. Mary's County, Maryland	**Client:**	Bohler Engineering NY, PLLC

				Water Depth | Elevation (feet bgs) | (feet)	Cave-In Depth | Elevation (feet bgs) | (feet)
Surface Elevation:	± NS feet	**Date Started:**	11/17/2022		
Termination Depth:	25.0 feet bgs	**Date Completed:**	11/17/2022		
Proposed Location:	Canopy	**Logged By:**	KRP	**During:** NE | ---	
Drill / Test Method:	HSA / SPT	**Contractor:**	AAG	**At Completion:** NE | ---	**At Completion:** 14.0 | ---
		Equipment:	D-70	**24 Hours:** --- | ---	**24 Hours:** --- | ---

SAMPLE INFORMATION						DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)				
						0.0	TOPSOIL		~1" Topsoil	
0 - 2	S-1		4 - 5 - 7 - 7	21	12	0.1	COASTAL PLAIN DEPOSITS		Brown Sandy Lean Clay, Moist, Stiff (CL)	Qu = 4.0 tsf
2 - 4	S-2		4 - 6 - 9 - 11	17	15	4.0			As Above, Moist, Very Stiff (CL)	Qu = 4.5+ tsf
4 - 6	S-3		5 - 7 - 10 - 11	20	17	5.0			Brown Sandy Silty Clay, Moist, Very Stiff (CL-ML)	
6 - 8	S-4		5 - 6 - 8 - 10	18	14				As Above, Stiff (CL-ML)	
8 - 10	S-5		6 - 8 - 11 - 14	20	19	10.0			As Above, Light Reddish/Grayish-Brown, Very Stiff (CL-ML)	
						13.0				
13 - 15	S-6		6 - 8 - 8 - 10	19	18	15.0			Brown Silty Sand, Moist, Medium Dense (SM)	
18 - 20	S-7		6 - 8 - 8 - 10	21	16	20.0			As Above, Reddish/Orangish-Brown (SM)	
23 - 25	S-8		5 - 12 - 26 - 29	17	38	23.0			As Above, with Gravel, Dense (SM)	
						25.0			Boring Log B-3 Terminated at a Depth of 25.0 Feet Below Ground Surface	

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-4

Project:	Proposed Tidal Wave Auto Spa Site #101	**WAI Project No.:**	GS2219707.000
Location:	23178 Three Notch Road; California, St. Mary's County, Maryland	**Client:**	Bohler Engineering NY, PLLC

				Water Depth | Elevation (feet bgs) | (feet)	Cave-In Depth | Elevation (feet bgs) | (feet)
Surface Elevation:	± NS feet	**Date Started:**	11/17/2022		
Termination Depth:	20.0 feet bgs	**Date Completed:**	11/17/2022		
Proposed Location:	Building	**Logged By:**	KRP	**During:** NE | ---	
Drill / Test Method:	HSA / SPT	**Contractor:**	AAG	**At Completion:** NE | ---	**At Completion:** 10.0 | ---
		Equipment:	D-70	**24 Hours:** --- | ---	**24 Hours:** --- | ---

SAMPLE INFORMATION						DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)				
						0.0	TOPSOIL		~1" Topsoil	
0 - 2	S-1		2 - 2 - 3 - 7	18	5	0.1	COASTAL PLAIN DEPOSITS		Brown Sandy Lean Clay, Moist, Medium Stiff (CL)	Qu = 1.75 tsf
2 - 4	S-2		4 - 6 - 8 - 13	20	14				As Above, Hard (CL)	Qu = 4.5+ tsf
4 - 6	S-3		5 - 6 - 9 - 12	21	15	5.0			As Above (CL)	Qu = 4.5+ tsf
6 - 8	S-4		10 - 12 - 14 - 14	20	26	6.0			Light Brown Clayey Sand, Moist, Medium Dense (SC)	
8 - 10	S-5		6 - 8 - 11 - 13	24	19				As Above, Light Grayish/Reddish-Brown (SC)	
						10.0				
						13.0				
13 - 15	S-6		8 - 10 - 12 - 15	24	22				Gray Lean Clay, Moist, Very Stiff (CL)	Qu = 4.25 tsf
						15.0				
						18.0				
18 - 20	S-7		5 - 7 - 8 - 10	18	15				Brown Silty Sand, Moist, Medium Dense (SM)	
						20.0			Boring Log B-4 Terminated at a Depth of 20.0 Feet Below Ground Surface	
						25.0				

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

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RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-5

Project:	Proposed Tidal Wave Auto Spa Site #101	**WAI Project No.:**	GS2219707.000
Location:	23178 Three Notch Road; California, St. Mary's County, Maryland	**Client:**	Bohler Engineering NY, PLLC

				Water Depth | Elevation (feet bgs) | (feet)	Cave-In Depth | Elevation (feet bgs) | (feet)
Surface Elevation:	± NS feet	**Date Started:**	11/17/2022		
Termination Depth:	20.0 feet bgs	**Date Completed:**	11/17/2022		
Proposed Location:	Canopy	**Logged By:**	KRP	**During:** NE | ---	
Drill / Test Method:	HSA / SPT	**Contractor:**	AAG	**At Completion:** NE | ---	**At Completion:** 10.0 | ---
		Equipment:	D-70	**24 Hours:** --- | ---	**24 Hours:** --- | ---

SAMPLE INFORMATION						DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)				
						0.0	TOPSOIL		~1" Topsoil	
0 - 2	S-1		2 - 3 - 4 - 6	20	7	0.1	COASTAL PLAIN DEPOSITS		Brown Lean Clay, Moist, Medium Stiff (CL)	Qu = 1.0 tsf to 2.0 tsf
2 - 4	S-2		6 - 8 - 11 - 14	24	19				As Above, Hard (CL)	Qu = 4.5+ tsf
4 - 6	S-3		6 - 9 - 12 - 16	24	21	5.0			As Above (CL)	Qu = 4.5+ tsf
6 - 8	S-4		8 - 11 - 12 - 13	19	23	6.0			Reddish/Grayish-Brown Clayey Sand, Moist, Medium Dense (SC)	
8 - 10	S-5		7 - 10 - 12 - 14	24	22				As Above (SC)	
						10.0				
						13.0				
13 - 15	S-6		4 - 6 - 9 - 10	24	15				Brown Lean Clay, Moist, Very Stiff (CL)	Qu = 3.5 tsf
						15.0				
						18.0				
18 - 20	S-7		4 - 6 - 6 - 5	24	12				Light Brown Silty Sand, Moist, Medium Dense (SM)	
						20.0			Boring Log B-5 Terminated at a Depth of 20.0 Feet Below Ground Surface	
						25.0				

NOTES: bgs = below ground surface, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

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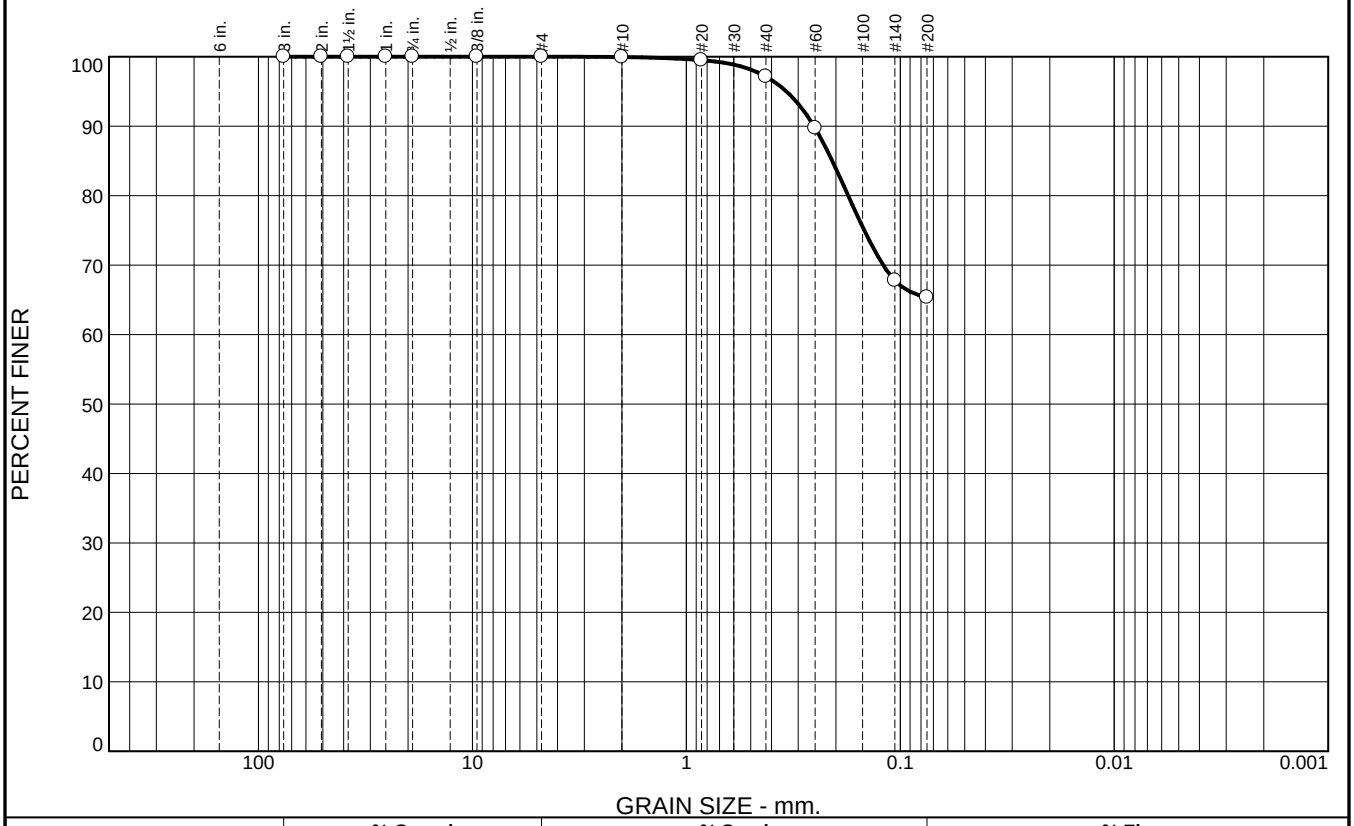
APPENDIX B
Laboratory Test Results

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	2.8	31.8	65.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100.0		
2	100.0		
1.5	100.0		
1	100.0		
.75	100.0		
.375	100.0		
#4	100.0		
#10	99.9		
#20	99.5		
#40	97.1		
#60	89.7		
#140	67.8		
#200	65.3		

* (no specification provided)

Material Description

Sandy Lean Clay

Atterberg Limits

PL= 18 LL= 41 PI= 23

Coefficients

D_{90}= 0.2533 D_{85}= 0.2081 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-7-6(13)

Remarks

W_n = 16.6 %

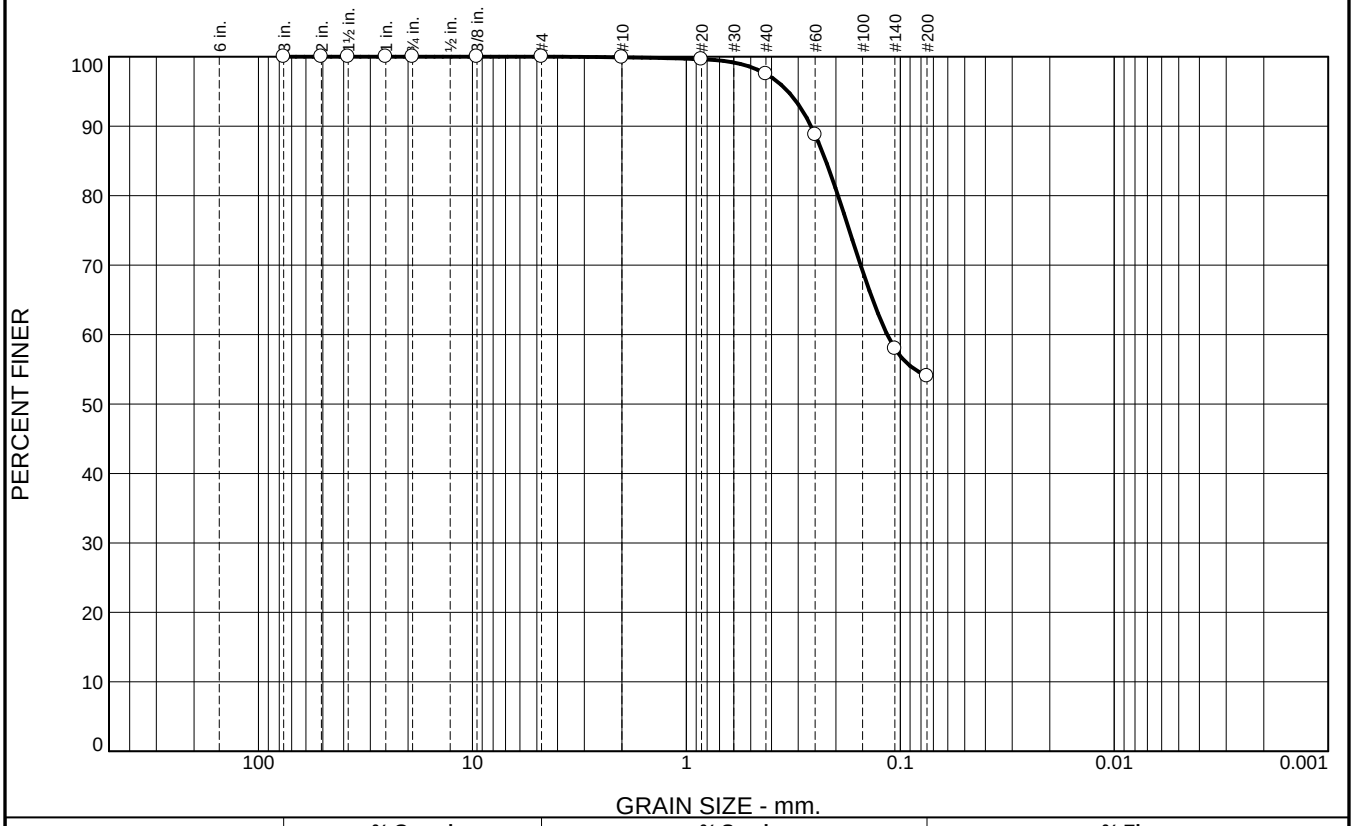
Source of Sample: B-1 **Depth:** 2.0' - 6.0'
Sample Number: S-2/S-3

Date: 12/13/2022

WHITESTONE ASSOCIATES, INC.
Warren, New Jersey

Client: Bohler Engineering NY, PLLC
Project: Proposed Tidal Wave Auto Spa Site #101
23178 Three Notch Road, California, St. Mary's County, MD
Project No: GS2219707.000 **Figure**

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	2.4	43.5	54.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100.0		
2	100.0		
1.5	100.0		
1	100.0		
.75	100.0		
.375	100.0		
#4	100.0		
#10	99.9		
#20	99.6		
#40	97.5		
#60	88.7		
#140	58.0		
#200	54.0		

* (no specification provided)

Material Description

Sandy Silty Clay

Atterberg Limits

PL= 17 LL= 24 PI= 7

Coefficients

D_{90}= 0.2614 D_{85}= 0.2230 D_{60}= 0.1152
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL-ML AASHTO= A-4(1)

Remarks

W_n = 13.3 %

Source of Sample: B-3 **Depth:** 4.0 - 8.0
Sample Number: S-3/S-4

Date: 12/13/2022

WHITESTONE ASSOCIATES, INC.
Warren, New Jersey

Client: Bohler Engineering NY, PLLC
Project: Proposed Tidal Wave Auto Spa Site #101
23178 Three Notch Road, California, St. Mary's County, MD
Project No: GS2219707.000 **Figure**

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APPENDIX C
Supplemental Information (USCS, Terms & Symbols)

WHITESTONE
An Employee-Owned Company

1959 HIGHWAY 34
BUILDING A, SUITE 102
WALL, NJ 07719
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UNIFIED SOIL CLASSIFICATION SYSTEM

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			LETTER SYMBOL	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS (LITTLE OR NO FINES)	GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
			GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
			GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
	SAND AND SANDY SOILS	CLEAN SAND (LITTLE OR NO FINES)	SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
			SP	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	MORE THAN 50% OF COARSE FRACTION PASSING NO. 4 SIEVE	SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)	SM	SILTY SANDS, SAND-SILT MIXTURES
			SC	CLAYEY SANDS, SAND-CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMITS LESS THAN 50	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
			OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMITS GREATER THAN 50	MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
			CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS			PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS FOR SAMPLES WITH 5% TO 12% FINES

GRADATION*

% FINER BY WEIGHT	
TRACE	1% TO 10%
LITTLE	10% TO 20%
SOME	20% TO 35%
AND	35% TO 50%

COMPACTNESS*
Sand and/or Gravel

RELATIVE DENSITY	
LOOSE	0% TO 40%
MEDIUM DENSE	40% TO 70%
DENSE	70% TO 90%
VERY DENSE	90% TO 100%

CONSISTENCY*
Clay and/or Silt

RANGE OF SHEARING STRENGTH IN POUNDS PER SQUARE FOOT	
VERY SOFT	LESS THAN 250
SOFT	250 TO 500
MEDIUM	500 TO 1000
STIFF	1000 TO 2000
VERY STIFF	2000 TO 4000
HARD	GREATER THAN 4000

** VALUES ARE FROM LABORATORY OR FIELD TEST DATA, WHERE APPLICABLE. WHEN NO TESTING WAS PERFORMED, VALUES ARE ESTIMATED.*

Other Office Locations:

WARREN, NJ 908.668.7777 | CHALFONT, PA 215.712.2700 | SOUTHBOROUGH, MA 508.485.0755 | ROCKY HILL, CT 860.726.7889 | PHILADELPHIA, PA 215.848.2323 | BEDFORD, NH 603.514.2230 | TAMPA, FL 813.851.0690 | MIAMI, FL 786.783.6966

Environmental & Geotechnical Engineers & Consultants

WHITESTONE
An Employee-Owned Company

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WALL, NJ 07719
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GEOTECHNICAL TERMS AND SYMBOLS

SAMPLE IDENTIFICATION

The Unified Soil Classification System is used to identify the soil unless otherwise noted.

SOIL PROPERTY SYMBOLS

N: Standard Penetration Value: Blows per ft. of a 140 lb. hammer falling 30" on a 2" O.D. split-spoon.
Qu: Unconfined compressive strength, TSF.
Qp: Penetrometer value, unconfined compressive strength, TSF.
Mc: Moisture content, %.
LL: Liquid limit, %.
PI: Plasticity index, %.
δd: Natural dry density, PCF.
▼: Apparent groundwater level at time noted after completion of boring.

DRILLING AND SAMPLING SYMBOLS

NE: Not Encountered (Groundwater was not encountered).
SS: Split-Spoon - 1 ⅜" I.D., 2" O.D., except where noted.
ST: Shelby Tube - 3" O.D., except where noted.
AU: Auger Sample.
OB: Diamond Bit.
CB: Carbide Bit
WS: Washed Sample.

RELATIVE DENSITY AND CONSISTENCY CLASSIFICATION

Term (Non-Cohesive Soils)	Standard Penetration Resistance
Very Loose	0-4
Loose	4-10
Medium Dense	10-30
Dense	30-50
Very Dense	Over 50

Term (Cohesive Soils)	Qu (TSF)
Very Soft	0 - 0.25
Soft	0.25 - 0.50
Firm (Medium)	0.50 - 1.00
Stiff	1.00 - 2.00
Very Stiff	2.00 - 4.00
Hard	4.00+

PARTICLE SIZE

Boulders	8 in.+	Coarse Sand	5mm-0.6mm	Silt	0.074mm-0.005mm
Cobbles	8 in.-3 in.	Medium Sand	0.6mm-0.2mm	Clay	-0.005mm
Gravel	3 in.-5mm	Fine Sand	0.2mm-0.074mm		

Other Office Locations:

WARREN, NJ 908.668.7777 | CHALFONT, PA 215.712.2700 | SOUTHBOROUGH, MA 508.485.0755 | ROCKY HILL, CT 860.726.7889 | PHILADELPHIA, PA 215.848.2323 | BEDFORD, NH 603.514.2230 | TAMPA, FL 813.851.0690 | MIAMI, FL 786.783.6966