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REPORT OF GEOTECHNICAL INVESTIGATION

PROPOSED DAYCARE CENTER
BETWEEN 665 & 711 BLUE HILL AVENUE
PARCEL ID NO.: B 7 5
MILTON, NORFOLK COUNTY, MASSACHUSETTS

Prepared for:

THE GARDNER SCHOOL
302 Innovation Drive
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Franklin, Tennessee 37067

Prepared by:

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Richard W.M. McLaren
Senior Consultant

Ryan R. Roy, PE
Vice President

Whitestone Project No.: GM2422048.000
September 23, 2024

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September 23, 2024

via email

THE GARDNER SCHOOL
302 Innovation Drive
Suite 130
Franklin, Tennessee 37067

Attention: Mr. Christopher Fazendin
Vice President Real Estate Development

Regarding: REPORT OF GEOTECHNICAL INVESTIGATION
PROPOSED DAYCARE CENTER
BETWEEN 665 AND 711 BLUE HILL AVENUE
PARCEL ID NO.: B 7 5
MILTON, NORFOLK COUNTY, MASSACHUSETTS
WHITESTONE PROJECT NO.: GM2422048.000

Dear Mr. Fazendin:

Whitestone Associates, Inc. (Whitestone) is pleased to submit the attached *Report of Geotechnical Investigation* for the above-referenced project. The report presents the results of Whitestone's site visit and subsurface explorations, and includes design recommendations for the proposed foundations, floor slab, pavements, and related earthwork associated with the proposed daycare center.

Whitestone appreciates the opportunity to be of continued service to The Gardner School. Should you have questions regarding the attached report, please contact us at (508) 485-0755.

Sincerely,

WHITESTONE ASSOCIATES, INC.

Richard W.M. McLaren
Senior Consultant

Ryan R. Roy, PE
Vice President

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Enclosures
Copy: Laurence W. Keller, PE, Whitestone Associates, Inc.

REPORT OF GEOTECHNICAL INVESTIGATION
Proposed Daycare Center
Between 665 & 711 Blue Hill Avenue
Milton, Norfolk County, Massachusetts

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Proposed Daycare Center
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SECTION 1.0
Summary of Findings

Whitestone Associates, Inc. (Whitestone) has conducted an exploration and evaluation of the subsurface conditions at the site of the proposed daycare center to be located between 665 and 711 Blue Hill Avenue in Milton, Norfolk County, Massachusetts. Based on a June 14, 2024 *Grading & Drainage Plan* prepared by Bohler Engineering MA, LLC (Bohler), the proposed development will include the construction of a single-story childcare building with a footprint of 16,200 square feet with a finish floor elevation of 89.5 feet above North American Vertical Datum of 1988 (NAVD), an adjoining playground, and associated pavements, landscaping, and utilities. Up to about 18-19ft of fill will be required to establish the building pad. Two tiered retaining walls, up to about seven feet and nine feet in height, will be constructed on the northern, western, and southern sides of the building to accommodate this fill. A cut slope up to about 15 feet in height will be required on the western and a portion of the northern side of the site. This cut slope will also incorporate a retaining wall at the northwestern corner. There will be a short retaining wall, up to about seven feet in height, on either side of the entrance. A stormwater management basin will be constructed to the east of the building.

The geotechnical investigation included conducting a reconnaissance of the project site, advancing seven borings and six test pits, and collecting soil samples for laboratory testing and physical characterization. Preliminary infiltration testing was also conducted. Site subsurface conditions generally consisted of topsoil/subsoil overlying intermittent existing fill, which is underlain by glacial till, then bedrock. Bedrock should be expected to undulate significantly over short distances. An intermittent alluvial deposit was also encountered. Groundwater was encountered in two borings at depths of seven feet below ground surface (fbgs) and 15 fbgs, however, indications of estimated seasonal high groundwater (ESHGW) were noted as shallow as 2.3 fbgs within the glacial till. This likely represents a perched water condition.

The results of the investigation indicate that the proposed structure may be supported on conventional shallow foundations designed to bear on the natural glacial till or alluvial deposit, and/or structural fill placed over these materials. Existing fill and buried topsoil were encountered in the explorations up to a depth of 7.3 fbgs, however, deeper fill and buried topsoil could be encountered during construction between the widely spaced explorations. Any existing fill and buried topsoil below underside of footing level should be overexcavated within foundation influence zones and replaced with structural fill. Extensive existing fill is unusual on an undeveloped site, however, stump pits and other bury features are relatively common. A ground-supported floor slab may derive support from properly inspected, approved, improved glacial till or existing fill, and/or controlled structural fill placed over these materials. Additionally, the site conditions support the use of typical pavement sections using standard Commonwealth of Massachusetts Department of Transportation (MassDOT) specified materials.

The above summary is intended to provide an overview of the geotechnical findings and recommendations and is not fully developed. Greater detail is presented in the following sections. The entire report must be read for a comprehensive understanding of the information contained herein.

SECTION 2.0
Introduction

2.1 AUTHORIZATION

Mr. Christopher Fazendin, Vice President Real Estate Development at The Gardner School, issued authorization to Whitestone to conduct a geotechnical investigation on this site relevant to the construction of a proposed daycare center located at between 665 and 711 Blue Hill Avenue in Milton, Norfolk County, Massachusetts. The geotechnical investigation was conducted in general accordance with Whitestone's June 21, 2024 proposal.

2.2 PURPOSE

The purpose of this exploration and analysis was to:

- ascertain the various soil and bedrock profile components at test locations;
- conduct infiltration testing;
- 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;
- record groundwater or bedrock levels at the time of the investigation and discuss their potential impact on the proposed construction.

2.3 SCOPE

The scope of the exploration and analysis included the subsurface exploration, field testing and sampling, laboratory testing, and a geotechnical engineering analysis and evaluation of the subsurface materials. This *Report of Geotechnical Investigation* is limited to addressing the site conditions related to the physical support of the proposed construction.

2.3.1 Field Exploration

Field exploration of the project site was conducted by means of seven borings, identified as B-1 through B-7 advanced with all-terrain vehicle mounted Mobile B-57. The borings were advanced to termination depths that ranged from 13 fbgs to 20.7 fbgs. The explorations were backfilled with excavated materials

generated from the investigation. Boring locations are shown on the *Test Location Plan* included as Figure 1. The *Records of Subsurface Exploration* for the borings are provided in Appendix A.

Field exploration also consisted of excavating six test pits, identified as TP-1 and TP-6, with a Hitachi ZX60USB compact excavator to depths of seven fbgs and 11 fbgs. A Massachusetts Title 5 Licensed Soil Evaluator (SE #14233) observed the excavation of the test pits and groundwater conditions encountered. The test pits subsequently were backfilled to the surface with excavated soils from the investigation after observing soil conditions and conducting infiltration testing. The locations of the test pits are shown on the accompanying *Test Location Plan* included as Figure 1. *Records of Subsurface Exploration* for the test pits are provided in Appendix A.

Test locations were based on project information provided to Whitestone at the time of the investigation, including the June 14, 2024 *Grading & Drainage Plan*. The subsurface tests were conducted in the presence of a Whitestone representative, who conducted field tests, recorded visual classifications, and collected samples of the various strata encountered. The tests were located in the field using phone-based GPS and aerial images. These locations are presumed to be accurate to the degree implied by the method used (+/- 20 feet).

Borings and Standard Penetration Tests (SPTs) were conducted in general accordance with ASTM International (ASTM) designation D1586. The Standard Penetration 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, where encountered, were recorded during and immediately after the completion of field operations prior to backfilling test locations. Seasonal variations, temperature effects, and recent rainfall conditions may influence the levels of the groundwater and observed levels will depend on the permeability of the soils. Groundwater elevations derived from sources other than seasonally observed groundwater monitoring wells may not be representative of true groundwater levels.

2.3.2 Infiltration Testing

Field infiltration testing was conducted with a Guelph permeameter, which has an applicable permeability range of about 0.01 inches per hour (in/hr) to 15 in/hr. Hydraulic conductivities, k_{fs}, measured by the Guelph apparatus and tabulated below were well in excess of the applicable range for the Guelph permeameter. Indications of seasonal high groundwater level were not observed in TP-1, TP-2, TP-3, and TP-6. Indications of seasonal high groundwater level were observed at depths of three fbgs and 2.3 fbgs in test pits TP-4 and TP-5, respectively. The results are tabulated below.

SUMMARY OF INFILTRATION TESTING					
Guelph Permeameter Testing					
Location	**Approx. Ground Elevation (feet above NAVD)**	**Groundwater Depth/Elevation (fbgs/feet NAVD)**	**Test Depth/Elevation (fbgs/feet NAVD)**	**Soil Type (USCS)**	**Field Saturated Hydraulic Conductivity, k_{fs} (in/hr)**

I-1 (TP-1)	73	NE	4 / 69	SP	>10
I-2 (TP-3)	70	NE	4.7 / 65.3	GP	>10

NE: Not encountered; fbgs: feet below ground surface

The measured high infiltration rates do not wholly represent site soils and are considered to be appropriate only for portions of the intermittent alluvial deposit, the extent of which appears limited. The site is mapped as glacial till, which was encountered in most of the explorations. Characteristically, the infiltration rate for glacial till is about 0.5 inches per hour.

Whitestone considers the glacial till would be most consistent with a National Resources Conservation Service (NRCS) Hydrologic Soil Group (HSG) C, a United States Department of Agriculture (USDA) Soil Texture Class of Silt Loam or Clay Loam and have an estimated infiltration rate of 0.27 to 0.52 inches per hour. The alluvial deposit would be most consistent with NRCS HSG B, a USDA Soil Texture Class of Sandy Loam or Loamy Sand and have an estimated infiltration rate of 1.02 to 2.41 inches per hour.

Typically, a Factor of Safety (FoS) is applied to measured infiltration rates to account for siltation and consolidation of soil below the systems over time. of infiltration over time. Safety factors used should consider how critical the systems are to the development and the available storage. If the system is critical or storage limited, a higher FoS should be applied. Infiltration rates are variable and dependent on test depth and stratification.

2.3.3 Laboratory Testing

Laboratory testing was conducted to determine additional, pertinent engineering characteristics of representative samples of on-site soils. The laboratory testing was conducted in general accordance with applicable ASTM standard test methods and included physical testing of the existing fill, alluvial deposit, and glacial till.

Physical/Textural Analysis: Representative samples of the site soils were subjected to laboratory testing that included moisture content determination (ASTM D2216) and washed gradation analyses (ASTM D422) in order to conduct supplementary engineering soil classifications and to assess possible re-use of the site soils as structural fill. The strata tested were classified by the Unified Soil Classification System (USCS). The results of the laboratory testing are summarized in the following table:

LABORATORY ANALYSIS SUMMARY					
Boring	**Sample Number**	**Depth (fbgs)**	**Moisture Content (%)**	**Passing No. 200 Sieve (%)**	**Classification**
B-1	S-3	5.0 - 7.0	10.4	31.3	FILL (SM)
B-2	S-2	2.0 - 4.0	7.7	32.3	SM
B-4	S-3	5.0 - 7.0	2.0	6.1	SP-SM

B-6	S-2	2.0 - 4.0	6.3	40.7	SM
TP-1	G-2	6.0	1.1	1.6	SP
TP-3	G-2	5.0	1.0	3.5	GP

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 soil behavior under construction and service loads. Laboratory test results are provided in Appendix B.

SECTION 3.0
Site Description

3.1 LOCATION & DESCRIPTION

The subject site is located between 665 and 711 Blue Hill Avenue, in the Town of Milton, Norfolk County, Massachusetts, Latitude 42.2433 North, Longitude 71.1066 West. The 6.85-acre site, further identified as Parcel ID B 7 5, is undeveloped and wooded.

The approximately rectangular site is bounded to the southeast by Blue Hill Avenue, and on the other sides by residences. Access to the site will be from Blue Hill Avenue. The site of the proposed construction is shown on the *Test Location Plan* included as Figure 1.

3.2 EXISTING CONDITIONS

Existing Development: The site is heavily wooded and appears to be undeveloped. However, historical aerial photography indicates that the site was partially cleared in the 1930s, with a possible small building constructed. This may explain the intermittent existing fill. Stump pits and other bury features are relatively common on such sites. Large surface boulders were observed around the site. There is a stone block retaining wall along Blue Hill Avenue.

Topography: Based on a review of the *USGS 7.5 Minute Series Blue Hills, Massachusetts* (2024) and the Bohler *Grading & Drainage Plan*, and on Whitestone's visual observations, the site slopes down to the southeast from approximately 105 feet above North American Vertical Datum of 1988 (NAVD) to 65 feet above NAVD. Significant grading will be required to develop the site.

Utilities: The site is not serviced by utilities. 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 will follow site topography, flowing to the southeast towards Blue Hill Avenue.

3.3 SITE GEOLOGY

Based on a review of the U.S. Geological Survey *Surficial Geologic Map of the Blue Hills Quadrangle, Massachusetts (2018)*, the site is underlain by glacial till. The *Geologic Map of Massachusetts*, prepared by U.S. Geological Survey, indicates that the subject property is underlain by Proterozoic Z- to earliest Paleozoic-age Roxbury Conglomerate, consisting of conglomerate, sandstone, and siltstone with minor mafic-volcanic rocks and argillite, part of the Medford-Dedham zone.

3.4 PROPOSED CONSTRUCTION

Based on the aforementioned Bohler *Grading & Drainage Plan*, the proposed development will include the construction of a single-story childcare building with a footprint of 16,200 square feet with a finish floor elevation of 89.5 feet above NAVD, an adjoining playground, and associated pavements, landscaping, and utilities. Up to about 17 feet of fill will be required to establish the building pad. Two tiered retaining walls, up to about seven feet and nine feet in height, will be constructed on the northern, western, and southern sides of the building to accommodate this fill. A cut slope up to about 15 feet in height will be required on the western and a portion of the northern side of the site. This cut slope will also incorporate a retaining wall at the northwestern corner. There will be a short retaining wall, up to about seven feet in height, on either side of the entrance. A stormwater management basin will be constructed to the east of the building.

Whitestone anticipates the proposed building will be a single-story, masonry and metal-framed structure constructed with a ground-supported concrete floor slab and no basement. Maximum column, wall, and floor loads are expected to be on the order of:

- interior columns - 100 kips;
- load bearing walls - 3.0 kips per linear foot; and
- floor slab - 125 pounds per square foot.

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

4.1 SUBSURFACE SOIL CONDITIONS

Surface Cover Materials: The explorations encountered three inches to 11 inches of topsoil at the ground surface, generally underlain by three inches to 24 inches of subsoil with roots. Large surface boulders were noted across the site.

Existing Fill (intermittent): Beneath the surface cover materials, borings B-1, B-3, B-5, B-6, and B-7 encountered existing fill, consisting of brown to gray, very loose to loose (occasionally dense), silty sand, in places with gravel, to poorly graded gravel with silt and sand, trace organics. The SPT N-values in the existing fill were variable ranging from three blows per foot (bpf) to 39 bpf. The existing fill extended to depths of three fbgs to seven fbgs. A three-inch thick layer of former topsoil was encountered directly beneath the existing fill in boring B-1. Although extensive fill is unusual, stump pits and other bury features are relatively common on such sites. The existing fill may be associated with previous use of the site, as discussed above.

Alluvial Deposit (intermittent): Beneath the surface cover materials, boring B-4 and test pits TP-1, TP-2, and TP-3 encountered an alluvial deposit, consisting of brown to gray, medium dense, poorly graded sand with silt and gravel (USCS: SP-SM) to poorly graded sand with gravel (USCS: SP) to poorly graded gravel with sand (USCS: GP). An SPT N-value in the alluvial deposit was 18 bpf. Where penetrated in the boring B-4 and test pit TP-1, the alluvial deposit extended to a depth of six fbgs. Test pits TP-2 and TP-3 terminated in the alluvial deposit at depths of 11 fbgs and 10 fbgs, respectively.

Glacial Till: Beneath the existing fill, alluvial deposit, or surface cover materials, the explorations encountered glacial till, consisting of brown to gray, dense to very dense (occasionally medium dense), silty sand with gravel (USCS: SM), cobbles, boulders. The SPT N-values in the glacial till were variable, ranging from 28 bpf to 89 bpf. Where penetrated, the glacial till extended to depths of seven fbgs and 18.5 fbgs. Boring B-2 terminated in the glacial till at a depth of 20.7 fbgs. Test pits TP-1 and TP-6 terminated in the glacial till at depths of 11 fbgs and 9.5 fbgs, respectively.

Apparent Bedrock: Borings B-1, and B-3 through B-7 encountered auger refusal on apparent bedrock at depths ranging between 13 fbgs and 18.5 fbgs. Test pits TP-4 and TP-5 encountered excavator bucket refusal on apparent bedrock at depths of seven fbgs and 7.3 fbgs, respectively. Bedrock was not sampled through rock coring efforts, but was inferred by auger or excavator bucket refusal. Rock coring techniques would be required to further characterize the nature and extent of the refusal materials.

4.2 GROUNDWATER

Groundwater was encountered in two borings (B-1 and B-4) at depths of seven fbgs and 15 fbgs during the exploration. Test pit TP-3 caved at a depth of 10 fbgs, which could be an indication of a groundwater level. In addition, groundwater could seasonally perch above the relatively impermeable glacial till or bedrock surface. Indications of ESHGW levels were observed in test pits TP-4 and TP-5 at depths of three fbgs and 2.3 fbgs, respectively. Static and perched/trapped water conditions generally will fluctuate seasonally and following periods of precipitation.

SECTION 5.0
Conclusions & Recommendations

5.1 GENERAL

The results of the investigation indicate that the proposed structure may be supported on conventional shallow foundations designed to bear on the natural glacial till or alluvial deposit, and/or structural fill placed over these materials. Existing fill and buried topsoil were encountered in the explorations up to a depth of 7.3 fbgs, however, deeper fill and buried topsoil could be encountered during construction between the widely spaced explorations. Any existing fill and buried topsoil below underside of footing level should be overexcavated within foundation influence zones and replaced with structural fill. Extensive existing fill is unusual on an undeveloped site, however, stump pits and other bury features are relatively common. A ground-supported floor slab may derive support from properly inspected, approved, improved glacial till or existing fill, and/or controlled structural fill placed over these materials. Should significant organic materials be identified below the slab during foundation excavation, overexcavation may be required. Additionally, the site conditions support the use of typical pavement sections using standard MassDOT specified materials.

5.2 SITE PREPARATION & EARTHWORK

Surface Cover Stripping: Prior to stripping operations, any underground utilities should be identified and secured. Trees, bushes, vegetation, topsoil, and organic matter should be removed from within and at least five feet beyond the limits of the proposed structure footprint, as well as any other area that will require controlled structural fill placement. Tree/shrub removal should include the removal of stumps and root material. Root structures will require removal in excess of the few inches of topsoil typically encountered at the ground surface. The contractor should be required to conduct earthwork in accordance with the recommendations in this report, including backfilling any excavation, etc. with structural fill. Fill or backfill placed within the proposed structural areas should be placed as structural fill in accordance with Section 5.2, 5.3, and 5.12 of this report.

Excavation Difficulties: Boulders within the very dense glacial till may present excavation difficulties during proposed site excavations. Excavation difficulties will be affected by excavation size and depth. The speed and ease of excavation also will depend on the type of equipment used and the skill of the operator. Larger boulders may need to be broken up with a “hoe-ram” or other mechanical device and removed with a large excavator. Similar equipment will be required if bedrock is exposed in site excavations.

Surface Preparation/Proofrolling: Prior to placing fill or subbase materials to raise or restore grades to the desired subgrade elevations, the existing exposed soils should be compacted to a firm surface with several passes in two perpendicular directions of a minimum 10-ton vibratory roller. The soil surface should

then 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 evaluation. Proofrolling should be conducted after a suitable period of dry and non-freezing weather to reduce the likelihood of degrading an otherwise stable subgrade. Should construction be started during the winter months, Whitestone should be contacted for alternate surface preparation procedures. Fill or backfill should be placed and compacted in accordance with Section 5.3.

Settlement Monitoring Plates: Where fill placement exceeds about 10 feet, consolidation of fill and the underlying native deposits may occur. Whitestone recommends that the following geotechnical instrumentation be used to monitor the consolidation and to determine when building construction may start:

- Settlement monitoring plates, consisting of a vertical bar encased within a PVC sleeve affixed to a plywood base, should be installed. The base of the monitoring plate is placed on the existing subgrade prior to new fill placement. The vertical bar extends several feet above proposed fill height. A detail depicting a typical settlement monitoring plate has been provided as Figure 3.
- Survey points, such as PK nails or steel stakes, should be established prior to commencing filling to assess areal subsidence. Several points should be placed near the perimeter of the site in areas not to be disturbed by proposed construction. Several stakes should also be placed in the completed fill. Additional monitoring points may be established at other areas of concern, such as adjacent structures, manholes, and utilities.

The settlement plates and selected survey points should be installed prior to any fill placement at the site. The settlement plates and survey points should be read daily during fill placement and weekly thereafter. During this time, the owner's geotechnical engineer may evaluate actual site settlements and recommend the required length of the proposed waiting period. Building construction should be delayed until the geotechnical engineer has determined that the appropriate level of soil consolidation has been completed, likely a few weeks.

Weather Performance Criteria: The glacial till is generally moisture sensitive. Every effort should 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 wet or disturbed soils and replacement with controlled structural fill per Section 5.3 of this report may be required prior to resuming work on subgrade soils.

Subgrade Protection and Maintenance: The glacial till is generally moisture sensitive and may degrade if 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:

- 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.

5.3 STRUCTURAL FILL & BACKFILL

Imported Fill Material: 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 three inches and up to 15 percent, by weight, of material finer than a #200 sieve. Imported material should be free of silt, clay, organics, and deleterious material. Imported material should be approved by a qualified geotechnical engineer prior to delivery to the site. Should bedrock be exposed, only minus 0.375-inch crushed stone should be placed directly over bedrock.

On-Site Material Reuse: Whitestone anticipates that portions of the site soils will be structurally suitable for selective reuse as fill/backfill material, provided that soil moisture contents are controlled within three percent of optimum moisture level, particles larger than three inches in diameter are either removed or crushed, and objectionable portions, such as organics and/or debris, are segregated. The glacial till has a relatively high fines content. Prior to reuse, drying may be necessary for the glacial till or mixing with more granular materials, such as the alluvial deposit. In addition, reuse of on-site soil with a higher fines content should not be attempted during inclement weather or in damp conditions. The glacial till contains cobbles and boulders that would require crushing before being reused as fill. Reuse of the on-site soils will be contingent on careful inspection by the owner's geotechnical engineer during construction.

Compaction and Placement Requirements: Fill and backfill should be placed in loose lifts no more than 12 inches thick when compacted with a vibratory roller compactor weighing at least one ton, and eight inches when compacted with a plate compactor. Fill and backfill should be compacted to 95 percent of the maximum dry density within three percent of the optimum moisture content, as determined by ASTM D1557 (Modified Proctor).

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

5.4 GROUNDWATER CONTROL

Groundwater was encountered during the exploration at a depth of seven fbgs in one boring. However, shallower perched water may be encountered elsewhere on the site during construction above impermeable material, such as at the interface between existing fill and natural soils and/or at the surface of the glacial till. As such, construction phase dewatering will likely consist of removing surface water runoff, infiltrating water, or trapped water at this site. Whitestone anticipates that such construction phase dewatering would typically include installing temporary sump pits and filtered pumps within trenches and excavations.

Proper grading and drainage should be incorporated into the site design and construction phase grading to discourage ponding of surface runoff. Every effort should be made to maintain drainage of surface run-off away from construction areas by grading. The contractor should limit exposure of excavations and prepared subgrades to rainfall. Overexcavation of wet 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.

5.5 FOUNDATIONS

Shallow Foundation Design Criteria: Whitestone recommends supporting the proposed structure on conventional spread and continuous wall footings designed to bear on the natural glacial till or alluvial deposit, and/or structural fill placed over these materials, provided the subgrade is properly evaluated and compacted in accordance with Sections 5.2, 5.3, and 5.12 of this report. Existing fill and buried topsoil were encountered in the explorations up to a depth of 7.3 fbgs, however, deeper fill could be encountered between the widely spaced explorations. Any existing fill and buried topsoil below underside of footing level should be overexcavated and replaced with structural fill. Following in-trench compaction of foundation soil subgrades, foundations bearing within these materials may be designed to impart a maximum net allowable bearing pressure of 3,000 pounds per square foot (psf).

Foundation subgrades should be reviewed by the geotechnical engineer. Regardless of loading conditions, new foundations should be sized no less than minimum dimensions of 24 inches for continuous wall footings and 36 inches for isolated column footings.

Footings should be designed such that the maximum toe pressure due to the combined effect of vertical loads (including soil weight) and overturning moment does not exceed the recommended maximum allowable 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 footing. Side friction should be neglected when proportioning the footings, and lateral resistance should be provided by friction resistance at the base of the footings. A coefficient of friction (ultimate) against sliding of 0.4 is recommended for use in the design of concrete foundations bearing within the site soils or imported structural fill.

Foundation Inspection/Overexcavation Criteria: Whitestone recommends that the suitability of the bearing materials within the building footprint and foundation bearing zone be reviewed by a geotechnical engineer prior to placing concrete for the footings. Special attention should be given to any areas of the site underlain by soft/loose conditions. In the event that isolated areas of unsuitable materials such as existing fill or soil containing organic 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. Overexcavation to be restored with structural fill should 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.

Settlement: Whitestone estimates post construction settlements of new building foundations will be on the order of less than one inch, if the recommendations outlined in this report are properly implemented. Differential settlements of new building foundations should be less than about one half inch.

Frost Coverage: Footings subject to frost action (including during construction) should be placed at least 48 inches below adjacent exterior grades in accordance with the Commonwealth of Massachusetts *State Building Code (Ninth Edition)* to provide protection from frost penetration. Interior footings not subject to frost action (including during construction) may be placed at a minimum depth of 18 inches below the slab subgrade, but should not be placed on existing fill.

5.6 FLOOR SLAB

Whitestone anticipates that a ground-supported concrete floor slab may derive support from properly inspected, approved, and improved glacial till or existing fill, or structural fill placed over these materials, provided these materials are properly evaluated, compacted, and proofrolled in accordance with Sections 5.2, 5.3, and 5.12 of this report during favorable weather conditions. In the event that isolated areas of unsuitable materials such as existing fill or soil containing organic materials are encountered during footing excavations they should be chased out below the slab. Areas of soil subgrade that are, or become, softened or disturbed as a result of wetting and/or repeated exposure to construction traffic or contain objectionable materials, such as organic soils, should be removed and replaced with compacted structural fill. The properly prepared on-site soils are expected to yield a minimum subgrade modulus (k) of 150 psi/in.

A minimum 12-inch layer of MassDOT *M1.03.01 Processed Gravel for Sub-base* (or approved equivalent) should be placed below the floor slab to provide a uniform granular base. If the floor supports moisture-sensitive covering or equipment, a moisture vapor barrier should also be installed beneath the floor slab in accordance with flooring manufacturer's recommendations.

5.7 PAVEMENT DESIGN CRITERIA

General: Whitestone anticipates that the properly inspected, approved, and improved glacial till or existing fill, and/or compacted structural fill and/or 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 5.12 of this report during favorable weather conditions. The bedrock, if exposed within the western portion of the site, will also be suitable for support of the proposed pavements.

Design Criteria: A California Bearing Ratio value of 8.0 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. Estimated maximum pavement loads of 30,000 ESALs and 75,000 ESALs were used for the standard-duty and heavy-duty pavement areas, respectively. These values assume the pavements primarily will accommodate both automobile and limited heavier truck traffic, with the heavier truck traffic designated to the main drive lanes. Actual loading experienced is anticipated to be less than these values.

Pavement Sections: Pavement components should meet material specifications from MassDOT *Standard Specifications* specified below. The recommended flexible pavement sections are tabulated below:

FLEXIBLE PAVEMENT SECTION			
Layer	**Material**	**Standard-Duty Thickness (Inches)**	**Heavy-Duty Thickness (Inches)**
Asphalt Surface Course	MassDOT Table M3.11.4-1 "½ inch"	1.5	1.5
Asphalt Binder Course	MassDOT Table M3.11.4-1 "¾ inch"	1.5	2.5
Granular Subbase	MassDOT M2.01.07 Dense-graded Crushed Stone for Subbase	12.0	12.0

A rigid concrete pavement should be used to provide suitable support at areas of high traffic or severe turns, such as at the trash enclosure and ingress/egress location. The recommended rigid pavement is tabulated below:

RIGID PAVEMENT SECTION		
Layer	**Material**	**Thickness (inches)**
Surface	4,000 psi air-entrained concrete	6.0 [1]
Granular Subbase	MassDOT M2.01.07 Dense-graded Crushed Stone for Subbase	12.0

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 2 feet of the rigid concrete pavement should be 12 inches. The concrete should be reinforced with at least one layer of six-inch by six-inch W5.4/W5.4 welded wire fabric (ASTM A185).

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, subgrade soil and supporting fill or backfill must be placed, compacted, and evaluated in accordance with Sections 5.2, 5.3, and 5.12 of this report. Proper drainage should be provided for the pavement structure, including appropriate grading and surface water control, and an edge/interceptor drain where the pavement abuts higher ground.

The performance of the pavement also will depend on the quality of materials and workmanship. Whitestone recommends that MassDOT 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. Rigid concrete pavements should be suitably air-entrained, jointed, and reinforced in general accordance with ACI 330R-08 *Guide for the Design and Construction of Concrete Parking Lots*.

5.8 RETAINING WALLS/LATERAL EARTH PRESSURES

Two, tiered, retaining walls, up to about seven feet and nine feet in height, will be constructed on the northern, western, and southern sides of the building to accommodate fill placed for the building pad. The cut slope on the western and a portion of the northern side of the site will incorporate a retaining wall at the northwestern corner. There will be a short retaining wall, up to about seven feet in height, on either side of the entrance.

The following recommendations are provided for the retaining walls, any below-grade walls, and other structures reliant on granular materials to provide adequate drainage. However, the parameters are not directly applicable to the design of mechanically stabilized earth (MSE) retaining walls, which require proprietary design methods for the selected earth retention system.

Lateral Earth Pressures: Retaining/below-grade walls should be capable of withstanding active and at-rest earth pressures. Backfill soils adjacent to these structures should consist of freely draining granular fill composed primarily of coarse to fine sand. With an active earth pressure coefficient (K_a) of 0.33, level backfill, and an assumed maximum backfill soil unit weight of 140 pounds per cubic foot (pcf), an equivalent fluid pressure of 46 psf per foot of wall height should be used in design of retaining/below-grade walls which are free to rotate.

Retaining/below-grade walls and wall corners typically are restrained from lateral movement and should be designed using at-rest earth pressures. A coefficient of at-rest earth pressure (K_o) of 0.5, for a level

backfill, is recommended for retaining/below-grade walls designed to resist at-rest earth pressures, which assume no lateral movement. With an assumed maximum total unit weight of backfill of approximately 140 pcf, an equivalent fluid pressure of 70 pounds per square foot per foot of wall height should be used in design of restrained retaining/below-grade wall and wall corners. A coefficient of friction of 0.4 against sliding can be used for concrete on the existing site soils. Additional lateral earth pressures from a sloped backfill or any temporary or long-term surcharge loads, such as from the building, also should be included in the design. Retaining wall design should include a global stability analysis.

Backfill Criteria: Whitestone recommends that granular soils be used to backfill behind retaining walls. The granular backfill materials should consist of clean, relatively well-graded sand or gravel with a maximum particle size of three inches and up to 15 percent of material finer than a #200 U.S. Standard sieve.

Whitestone recommends that backfill directly behind any walls be compacted with light, hand-held compactors. Heavy compactors and grading equipment should not be allowed to operate within a zone of influence measured at a 45-degree angle from the base of the walls during backfilling to avoid developing excessive temporary or long-term lateral soil pressures.

Wall Drainage: Positive drainage should be provided at the base of the below-grade walls. Where wall drainage is not provided, the wall should be designed to withstand full hydrostatic pressure.

Whitestone should be notified if any other retaining structures or design considerations requiring lateral earth pressure estimations are proposed. Specific recommendations for temporary retaining structures are beyond Whitestone's scope of work.

5.9 SEISMIC & LIQUEFACTION CONSIDERATIONS

The subsurface conditions are most consistent with a Site Class C, as defined by the Commonwealth of Massachusetts *State Building Code (Ninth Edition)*. The site soils are not susceptible to earthquake induced liquefaction.

5.10 SLOPES

Whitestone's exploration did not include a detailed analysis of slope stability for any temporary or permanent condition. Based upon common local practice and our experience with stable soil slopes, permanent soil slopes no steeper than 3:1 (horizontal:vertical) are recommended. For steeper slopes, riprap covering would likely be required for long-term stability and erosion control. For slopes higher than about 15 feet, a mid-slope bench is recommended to facilitate runoff control and slope maintenance.

Excavation may expose bedrock in limited areas. Competent bedrock should be stable at an angle of 1:6 (horizontal:vertical). A steeper angle in the bedrock may be feasible, if the exposed bedrock is reviewed

by a professional engineer or geologist. If required, the design of rock slopes and appropriate rock fall/catchment zones should be reviewed by the geotechnical engineer prior to excavation.

Temporary slopes should be regularly evaluated for signs of movement or unsafe conditions. The site soils are prone to erosion by precipitation and runoff. Soil slopes should be covered for protection from rain. Surface runoff should be diverted away from the slopes. For erosion protection, a protective cover of grass or other vegetation should be established on permanent soil slopes as soon as possible. Erosion control matting would provide protection until vegetation is fully established.

5.11 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, including the organic layer, should be evaluated by a competent person (as defined by OSHA), so that safe excavation methods and/or shoring and bracing requirements are implemented. If required, competent bedrock may be excavated at an angle of 1:6 (horizontal:vertical). A steeper temporary excavation angle in the bedrock may be feasible, if the exposed bedrock is reviewed by a professional engineer or geologist.

5.12 SUPPLEMENTAL POST INVESTIGATION SERVICES

Construction Inspection and Monitoring: The owner's geotechnical engineer with specific knowledge of the site subsurface conditions and design intent should conduct inspection, testing, and consultation during construction as described in previous sections of this report. Monitoring and testing should also be conducted to confirm that any encountered underground structures are properly backfilled, the existing surface cover materials are properly removed, and 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 The Gardner School 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 test 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 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 materials in the footing excavations prior to concreting in order to determine that the materials will support the bearing pressures. Monitoring and testing also should be conducted to check that suitable materials are used for controlled fills and that they are properly placed and compacted over suitable subgrade.

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 The Gardner School and Bohler Engineering MA, LLC. 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, express or implied, are made.

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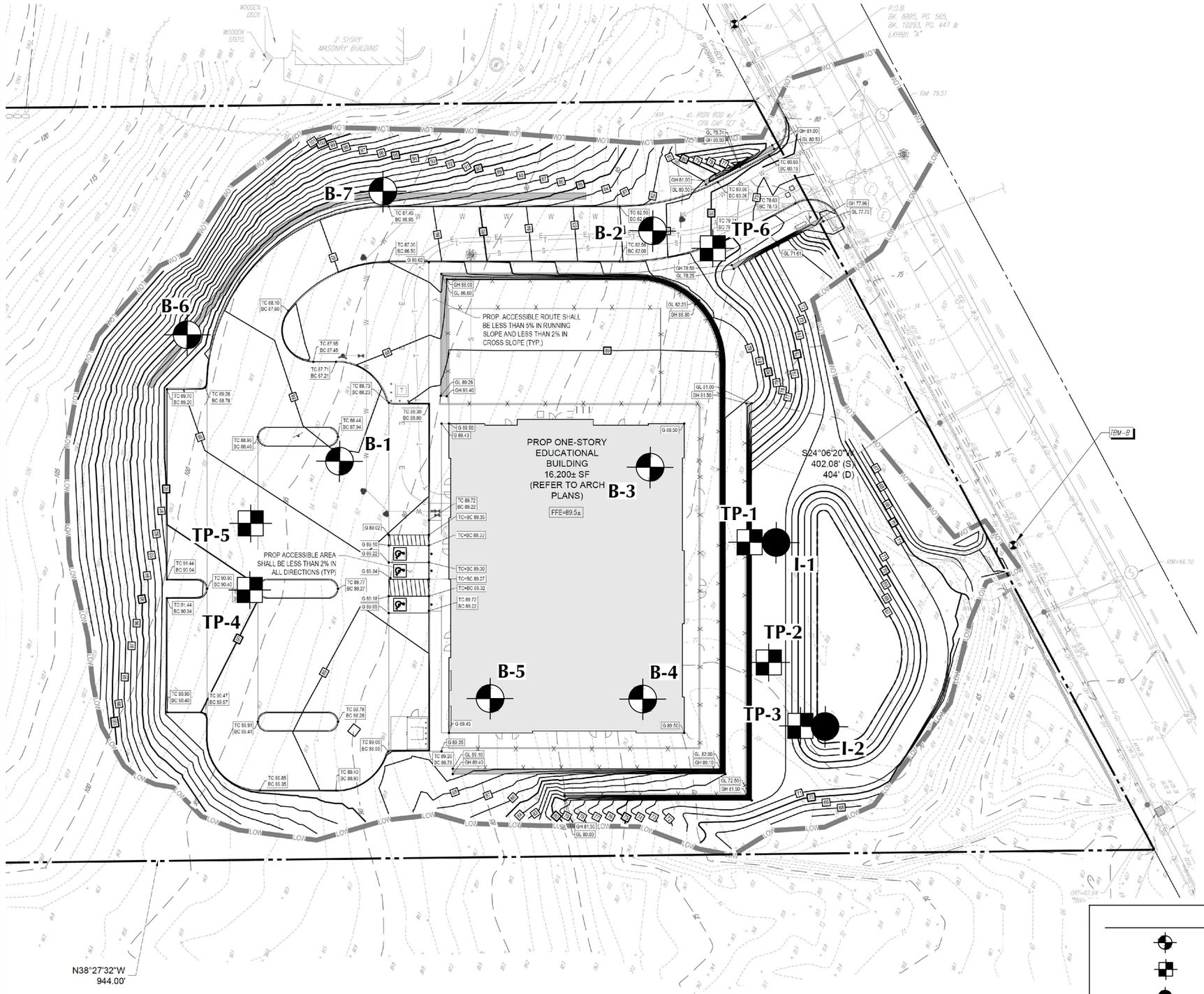
FIGURE 1
Test Location Plan



LEGEND

- BORING LOCATION
- TEST PIT LOCATION
- INFILTRATION TEST
- SUBJECT PROPERTY BOUNDARY

NOTE: ALL LOCATIONS ARE APPROXIMATE.

REFERENCE

THIS PLAN IS BASED ON A 6/14/24 GRADING & DRAINAGE PLAN PREPARED BY BOHLER.

WHITESTONE
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508.485.0755 WHITESTONEASSOC.COM

DRAWING TITLE: **TEST LOCATION PLAN**

CLIENT: **THE GARDNER SCHOOL**

PROJECT: PROPOSED DAYCARE CENTER
BETWEEN 665 AND 711 BLUE HILL AVENUE
MILTON, NORFOLK COUNTY, MASSACHUSETTS

PROJECT #: **GM2422048.000**

DESIGNED BY:	PROJ. MGR.:
MR	RR
DATE: 9/19/24	FIGURE: 1
SCALE: 1" = 50'	

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APPENDIX A
Records of Subsurface Exploration

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-1

Page 1 of 1

Project:	Proposed Daycare Center	**WAI Project No.:**	GM2422048.000
Location:	Between 665 and 711, Blue Hill Avenue, Milton, Norfolk County, Massachusetts	**Client:**	The Gardner School
Surface Elevation:	± 94.0 feet Above NAVD88	**Date Started:**	6/26/2024
Termination Depth:	18.5 feet bgs	**Date Completed:**	6/26/2024
Proposed Location:	Building	**Logged By:**	ZH
Drill / Test Method:	HSA / SPT (Autohammer)	**Contractor:**	DE
		Equipment:	Mobile B-57

Water Depth | Elevation (feet bgs) | (ft NAVD88)			Cave-In Depth | Elevation (feet bgs) | (ft NAVD88)	
During:	7.0	87.0		
At Completion:	--	--	**At Completion:**	-- | --
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				
							TS		8" Topsoil	
0 - 2	S-1		2 - 1 - 2 - 3	11	3		EXISTING FILL		Brown, Very Loose, Silty Sand (FILL)	
2 - 4	S-2		9 - 19 - 20 - 31	2	39				Brown, Dense, Poorly Graded Gravel with Silt and Sand (FILL)	
						5.0				
5 - 7	S-3		3 - 11 - 15 - 19	13	26				Gray, Medium Dense, Silty Sand (FILL)	
						7.0				
						7.3	TS		3" Former Topsoil	
7 - 9	S-4		18 - 21 - 22 - 21	23	43		GLACIAL TILL		Gray, Dense, Silty Sand with Gravel (SM)	
						10.0				
10 - 11.3	S-5		15 - 29 - 50/4"	14	58				As Above, Very Dense (SM)	Cobbles & Boulders
						15.0				
15 - 16.4	S-6		23 - 44 - 50/5"	16	88				As Above (SM)	Cobbles & Boulders
						20.0			Boring Log B-1 Terminated upon Auger Refusal at Depth of 18.5 fbgs.	
						25.0				

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

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-2

Page 1 of 1

Project:	Proposed Daycare Center	**WAI Project No.:**	GM2422048.000
Location:	Between 665 and 711, Blue Hill Avenue, Milton, Norfolk County, Massachusetts	**Client:**	The Gardner School
Surface Elevation:	± 83.0 feet Above NAVD88	**Date Started:**	6/26/2024
Termination Depth:	20.7 feet bgs	**Date Completed:**	6/26/2024
Proposed Location:	Building	**Logged By:**	ZH
Drill / Test Method:	HSA / SPT (Autohammer)	**Contractor:**	DE
		Equipment:	Mobile B-57

Water Depth | Elevation (feet bgs) | (ft NAVD88)		Cave-In Depth | Elevation (feet bgs) | (ft NAVD88)	
During:	-- | --		
At Completion:	-- | --	**At Completion:**	-- | --
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				
0 - 2	S-1		1 - 1 - 1 - 3	20	2		TS		11" Topsoil	
							SUBSOIL		13" Subsoil	
2 - 4	S-2		5 - 18 - 29 - 34	20	47				Gray, Dense, Silty Sand with Gravel (SM)	
						5.0				
5 - 7	S-3		19 - 23 - 24 - 20	18	47				As Above (SM)	
7 - 9	S-4		21 - 21 - 22 - 26	20	43				As Above (SM)	
						10.0				
10 - 12	S-5		10 - 19 - 20 - 42	18	39		GLACIAL TILL		As Above (SM)	
						15.0				
15 - 15.2	S-6		50/2"	0	-				No Recovery	Cobbles & Boulders
						20.0				
20 - 20.7	S-7		24 - 50/2"	6	-				Gray, Very Dense, Silty Sand with Gravel (SM)	
									Boring Log B-2 Terminated at Depth of 20.7 Feet Below Ground Surface.	
						25.0				

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

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-3

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Project:	Proposed Daycare Center	**WAI Project No.:**	GM2422048.000
Location:	Between 665 and 711, Blue Hill Avenue, Milton, Norfolk County, Massachusetts	**Client:**	The Gardner School
Surface Elevation:	± 78.0 feet Above NAVD88	**Date Started:**	6/26/2024
Termination Depth:	13.0 feet bgs	**Date Completed:**	6/26/2024
Proposed Location:	Building	**Logged By:**	ZH
Drill / Test Method:	HSA / SPT (Autohammer)	**Contractor:**	DE
		Equipment:	Mobile B-57

	Water Depth (feet bgs)	Elevation (ft NAVD88)	Cave-In Depth (feet bgs)	Elevation (ft NAVD88)
During:	--	--		
At Completion:	--	--	**At Completion:**	-- / --
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				
							TS		6" Topsoil	
0 - 2	S-1		1 - 2 - 1 - 3	11	3		EXISTING FILL		Brown, Very Loose, Silty Sand (FILL)	
						2.0				
2 - 4	S-2		5 - 5 - 5 - 6	0	10				No Recovery, Loose to Medium Dense	
						5.0				
						5.5			Brown, Very Loose, Silty Sand (FILL)	
5 - 7	S-3		WOH - 16 - 15 - 15	13	31		GLACIAL TILL		Gray, Dense, Silty Sand with Gravel (SM)	
7 - 9	S-4		14 - 13 - 15 - 20	23	28				As Above, Medium Dense (SM)	
						10.0				
10 - 12	S-5		6 - 15 - 16 - 24	16	31				As Above, Dense (SM)	
									Boring Log B-3 Terminated upon Auger Refusal at Depth of 13.0 fbgs.	
						15.0				
						20.0				
						25.0				

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

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-4

Page 1 of 1

Project:	Proposed Daycare Center	**WAI Project No.:**	GM2422048.000
Location:	Between 665 and 711, Blue Hill Avenue, Milton, Norfolk County, Massachusetts	**Client:**	The Gardner School
Surface Elevation:	± 73.0 feet Above NAVD88	**Date Started:**	8/22/2024
Termination Depth:	17.6 feet bgs	**Date Completed:**	8/22/2024
Proposed Location:	Building	**Logged By:**	ZH
Drill / Test Method:	HSA / SPT (Autohammer)	**Contractor:**	DE
		Equipment:	Mobile B-57

Water Depth | Elevation (feet bgs) | (ft NAVD88)		Cave-In Depth | Elevation (feet bgs) | (ft NAVD88)	
During:	15.0 | 58.0		
At Completion:	-- | --	**At Completion:**	-- | --
24 Hours:	-- | --	**24 Hours:**	-- | --

Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	DEPTH (feet)	STRATA	DESCRIPTION OF MATERIALS (Classification)	REMARKS
						0.0			
0 - 2	S-1		2 - 3 - 5 - 4	20	8		TS	4" Topsoil	
							SUBSOIL	13" Subsoil, Roots	
2 - 2.6	S-2		9 - 50/1"	0	-		ALLUVIAL DEPOSIT	No Recovery	Cobbles
						5.0			
5 - 7	S-3		4 - 9 - 18 - 23	16	27	6.0		Brown, Medium Dense, Poorly Graded Sand with Silt and Gravel (SP-SM)	
								Brown, Dense, Silty Sand with Gravel (SM)	
7 - 9	S-4		29 - 28 - 29 - 30	23	57			As Above, Gray, Very Dense (SM)	
						10.0			
10 - 12	S-5		9 - 9 - 23 - 34	18	32		GLACIAL TILL	As Above, Dense (SM)	
						15.0			
15 - 17	S-6		19 - 31 - 30 - 29	21	61			As Above, Gray-Brown, Very Dense (SM)	
17 - 17.6	S-7		23 - 50/2"	4	-			As Above (SM)	
						20.0		Boring Log B-4 Terminated Upon Auger Refusal at Depth of 17.7 fbgs.	
						25.0			

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

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-5

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Project:	Proposed Daycare Center	**WAI Project No.:**	GM2422048.000
Location:	Between 665 and 711, Blue Hill Avenue, Milton, Norfolk County, Massachusetts	**Client:**	The Gardner School
Surface Elevation:	± 85.0 feet Above NAVD88	**Date Started:**	8/22/2024
Termination Depth:	13.0 feet bgs	**Date Completed:**	8/22/2024
Proposed Location:	Building	**Logged By:**	ZH
Drill / Test Method:	HSA / SPT (Autohammer)	**Contractor:**	DE
		Equipment:	Mobile B-57

Water Depth | Elevation (feet bgs) | (ft NAVD88)		Cave-In Depth | Elevation (feet bgs) | (ft NAVD88)	
During:	-- | --		
At Completion:	-- | --	**At Completion:**	-- | --
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				
							TS		3" Topsoil; 3" Subsoil, Roots	
0 - 2	S-1		1 - 2 - 2 - 2	16	4		EXISTING FILL		Brown, Very Loose to Loose, Silty Sand with Gravel, Trace Organics (FILL)	
2 - 4	S-2		4 - 4 - 6 - 10	16	10				As Above, Loose to Medium Dense (FILL)	
						5.0				
5 - 7	S-3		13 - 20 - 25 - 25	19	45		GLACIAL TILL		Brown, Dense, Silty Sand with Gravel (SM)	
7 - 9	S-4		19 - 21 - 26 - 26	24	47				As Above, Gray (SM)	
						10.0				
10 - 12	S-5		9 - 18 - 21 - 22	19	39				As Above (SM)	
									Boring Log B-5 Terminated Upon Auger Refusal at Depth of 13.0 fbgs.	
						15.0				
						20.0				
						25.0				

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

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-6

Project:	Proposed Daycare Center	**WAI Project No.:**	GM2422048.000
Location:	Between 665 and 711, Blue Hill Avenue, Milton, Norfolk County, Massachusetts	**Client:**	The Gardner School
Surface Elevation:	± 101.0 feet Above NAVD88	**Date Started:**	8/22/2024
Termination Depth:	13.0 feet bgs	**Date Completed:**	8/22/2024
Proposed Location:	Retaining Wall	**Logged By:**	ZH
Drill / Test Method:	HSA / SPT (Autohammer)	**Contractor:**	DE
		Equipment:	Mobile B-57

	Water Depth (feet bgs)	Elevation (ft NAVD88)	Cave-In Depth (feet bgs)	Elevation (ft NAVD88)
During:	--	--		
At Completion:	--	--	**At Completion:**	-- / --
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				
							TS		5" Topsoil	
							SUBSOIL		5" Subsoil, Roots	
0 - 2	S-1	X	2 - 2 - 2 - 3	12	4		EXISTING FILL		Brown, Very Loose to Loose, Silty Sand (FILL)	
2 - 4	S-2	X	3 - 8 - 23 - 18	13	31	3.0			As Above, Medium Dense (FILL)	
						5.0	GLACIAL TILL		Brown, Dense, Silty Sand with Gravel (SM)	
5 - 7	S-3	X	13 - 21 - 29 - 30	21	50				As Above, Dense to Very Dense (SM)	
7 - 9	S-4	X	35 - 34 - 40 - 50/3"	18	74				As Above, Gray, Very Dense (SM)	
						10.0				
10 - 12	S-5	X	10 - 17 - 19 - 19	13	36				As Above, Dense (SM)	
									Boring Log B-6 Terminated Upon Auger Refusal at Depth of 13.0 fbgs.	
						15.0				
						20.0				
						25.0				

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

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-7

Page 1 of 1

Project:	Proposed Daycare Center	**WAI Project No.:**	GM2422048.000
Location:	Between 665 and 711, Blue Hill Avenue, Milton, Norfolk County, Massachusetts	**Client:**	The Gardner School
Surface Elevation:	± 96.0 feet Above NAVD88	**Date Started:**	8/22/2024
Termination Depth:	15.3 feet bgs	**Date Completed:**	8/22/2024
Proposed Location:	Retaining Wall	**Logged By:**	ZH
Drill / Test Method:	HSA / SPT (Autohammer)	**Contractor:**	DE
		Equipment:	Mobile B-57

Water Depth | Elevation (feet bgs) | (ft NAVD88)		Cave-In Depth | Elevation (feet bgs) | (ft NAVD88)	
During:	-- | --		
At Completion:	-- | --	**At Completion:**	-- | --
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				
							TS		3" Topsoil	
							SUBSOIL		5" Subsoil, Roots	
0 - 2	S-1	X	2 - 3 - 3 - 4	11	6		EXISTING FILL		Brown, Loose, Silty Sand (FILL)	
2 - 4	S-2	X	4 - 4 - 9 - 22	16	13	3.0			As Above (FILL)	
									Gray, Very Dense, Silty Sand with Gravel (SM)	
						5.0				
5 - 7	S-3	X	12 - 26 - 31 - 36	17	57				As Above, Very Dense (SM)	
7 - 9	S-4	X	42 - 46 - 43 - 40	23	89				As Above (SM)	
							GLACIAL TILL			
						10.0				
10 - 12	S-5	X	18 - 23 - 25 - 46	20	48				As Above, Dense (SM)	
						15.0				
15 - 15.3	S-6	X	50/3"	3	-				As Above (SM)	
									Boring Log B-7 Terminated Upon Auger Refusal at Depth of 15.3 fbgs.	
						20.0				
						25.0				

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

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Test Pit No.: TP-1

Page 1 of 1

Project:	Proposed Daycare Center	**WAI Project No.:**	GM2422048.000
Location:	Between 665 and 711 Blue Hill Avenue, Milton, Norfolk County, Massachusetts	**Client:**	The Gardner School

Surface Elevation:	± 73.0 feet NAVD88	**Date Started:**	9/3/2024		**Water Depth (feet bgs) | Elevation (ft NAVD88)**	**Cave-In Depth (feet bgs) | Elevation (ft NAVD88)**	
Termination Depth:	11.0 feet bgs	**Date Completed:**	9/3/2024				
Proposed Location:	SWM Area	**Logged By:**	TG	**During:**	-- | --		
Excavating Method:	Compact Excavator	**Contractor:**	RO	**At Completion:**	-- | --	**At Completion:**	-- | --
Test Method:	Visual Observation	**Rig Type:**	Hitachi ZX60USB	**24 Hours:**	-- | --		

SAMPLE INFORMATION			DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (ft.)	Number	Type	(feet)				
			0.0				No indications of ESHGW
				TOPSOIL		8" Topsoil	
				SUBSOIL		22" Subsoil, Roots	
2	1	Grab					
				ALLUVIAL DEPOSIT		Gray to Brown, Poorly Graded Sand with Gravel (SP)	Infiltration test @ 4.0 fbgs.
			5.0				
6	2	Grab	6.0				
				GLACIAL TILL		Gray, Silty Sand with Gravel (SM)	
10	3	Grab	10.0				
10.5	4	Grab					
						Test Pit TP-1 Terminated at Depth of 11 feet below ground surface.	
			15.0				

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

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Test Pit No.: TP-2

Page 1 of 1

Project:	Proposed Daycare Center	**WAI Project No.:**	GM2422048.000
Location:	Between 665 and 711 Blue Hill Avenue, Milton, Norfolk County, Massachusetts	**Client:**	The Gardner School

				Water Depth | Elevation (feet bgs) | (ft NAVD88)	Cave-In Depth | Elevation (feet bgs) | (ft NAVD88)
Surface Elevation:	± 72.0 feet NAVD88	**Date Started:**	9/3/2024		
Termination Depth:	11.0 feet bgs	**Date Completed:**	9/3/2024		
Proposed Location:	SWM Area	**Logged By:**	TG	**During:** -- | --	
Excavating Method:	Compact Excavator	**Contractor:**	RO	**At Completion:** -- | --	**At Completion:** -- | --
Test Method:	Visual Observation	**Rig Type:**	Hitachi ZX60USB	**24 Hours:** -- | --	

SAMPLE INFORMATION			DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (ft.)	Number	Type	(feet)				
			0.0				No indications of ESHGW
				TOPSOIL		6" Topsoil	
				SUBSOIL		24" Subsoil, Roots	
2	1	Grab					
			5.0	ALLUVIAL DEPOSIT		Gray, Poorly Graded Sand with Silt and Gravel (SP-SM)	
10	2	Grab	10.0				
						Test Pit TP-2 Terminated at Depth of 11.0 feet below ground surface.	
			15.0				

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

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Test Pit No.: TP-3

Page 1 of 1

Project:	Proposed Daycare Center	**WAI Project No.:**	GM2422048.000
Location:	Between 665 and 711 Blue Hill Avenue, Milton, Norfolk County, Massachusetts	**Client:**	The Gardner School

				Water Depth | Elevation (feet bgs) | (ft NAVD88)	Cave-In Depth | Elevation (feet bgs) | (ft NAVD88)
Surface Elevation:	± 70.0 feet NAVD88	**Date Started:**	9/3/2024		
Termination Depth:	10.0 feet bgs	**Date Completed:**	9/3/2024		
Proposed Location:	SWM Area	**Logged By:**	TG	**During:** -- | --	
Excavating Method:	Compact Excavator	**Contractor:**	RO	**At Completion:** -- | --	**At Completion:** 10.0 | --
Test Method:	Visual Observation	**Rig Type:**	Hitachi ZX60USB	**24 Hours:** -- | --	

SAMPLE INFORMATION			DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (ft.)	Number	Type	(feet)				
			0.0				No indications of ESHGW
				TOPSOIL		9" Topsoil	
1.5	1	Grab		SUBSOIL		15" Subsoil, Roots	
5	2	Grab	5.0				Infiltration test @ 4.7 fbgs.
				ALLUVIAL DEPOSIT		Brown, Poorly Graded Gravel with Sand (GP)	
			10.0				
						Test Pit TP-3 Terminated at Depth of 10.0 feet below ground surface.	
			15.0				

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

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Test Pit No.: TP-4

Page 1 of 1

Project:	Proposed Daycare Center	**WAI Project No.:**	GM2422048.000
Location:	Between 665 and 711 Blue Hill Avenue, Milton, Norfolk County, Massachusetts	**Client:**	The Gardner School

Surface Elevation:	± 96.0 feet NAVD88	**Date Started:**	9/3/2024		**Water Depth (feet bgs) | Elevation (ft NAVD88)**	**Cave-In Depth (feet bgs) | Elevation (ft NAVD88)**
Termination Depth:	7.0 feet bgs	**Date Completed:**	9/3/2024			
Proposed Location:	Parking	**Logged By:**	TG	**During:**	-- | --	
Excavating Method:	Compact Excavator	**Contractor:**	RO	**At Completion:**	-- | --	**At Completion:** -- | --
Test Method:	Visual Observation	**Rig Type:**	Hitachi ZX60USB	**24 Hours:**	-- | --	

SAMPLE INFORMATION			DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (ft.)	Number	Type	(feet)				
			0.0				
				TOPSOIL		8" Topsoil	
1.5	1	Grab		SUBSOIL		20" Subsoil, Roots	
3	2	Grab		GLACIAL TILL		Gray, Silty Sand with Gravel (SM)	Estimated Seasonal Groundwater High @ 3 fbgs
			5.0				
			10.0			Test Pit TP-4 Terminated Upon Refusal at Depth of 7.0 feet below ground surface.	
			15.0				

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

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Test Pit No.: TP-5

Page 1 of 1

Project:	Proposed Daycare Center	**WAI Project No.:**	GM2422048.000
Location:	Between 665 and 711 Blue Hill Avenue, Milton, Norfolk County, Massachusetts	**Client:**	The Gardner School

Surface Elevation:	± NS feet NAVD88	**Date Started:**	9/3/2024		**Water Depth (feet bgs) | Elevation (ft NAVD88)**	**Cave-In Depth (feet bgs) | Elevation (ft NAVD88)**
Termination Depth:	96.0 feet bgs	**Date Completed:**	9/3/2024			
Proposed Location:	Parking	**Logged By:**	TG	**During:**	-- | --	
Excavating Method:	Compact Excavator	**Contractor:**	RO	**At Completion:**	-- | --	**At Completion:** -- | --
Test Method:	Visual Observation	**Rig Type:**	Hitachi ZX60USB	**24 Hours:**	-- | --	

SAMPLE INFORMATION			DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (ft.)	Number	Type	(feet)				
			0.0				
				TOPSOIL		10" Topsoil	
1.5	1	Grab		SUBSOIL		12" Subsoil, Roots	Estimated Seasonal Groundwater High @ 2.3 fbgs
				GLACIAL TILL		Gray, Silty Sand with Gravel (SM)	
			5.0				
6.5	2	Grab					
						Test Pit TP-5 Terminated Upoon Excavator Refusal at Depth of 7.3 fbgs.	
			10.0				
			15.0				

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

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Test Pit No.: TP-6

Page 1 of 1

Project:	Proposed Daycare Center	**WAI Project No.:**	GM2422048.000
Location:	Between 665 and 711 Blue Hill Avenue, Milton, Norfolk County, Massachusetts	**Client:**	The Gardner School

Surface Elevation:	± 77.0 feet NAVD88	**Date Started:**	9/3/2024		**Water Depth (feet bgs) | Elevation (ft NAVD88)**		**Cave-In Depth (feet bgs) | Elevation (ft NAVD88)**
Termination Depth:	9.5 feet bgs	**Date Completed:**	9/3/2024				
Proposed Location:	Access	**Logged By:**	TG	**During:**	-- | --		
Excavating Method:	Compact Excavator	**Contractor:**	RO	**At Completion:**	-- | --	**At Completion:**	-- | --
Test Method:	Visual Observation	**Rig Type:**	Hitachi ZX60USB	**24 Hours:**	-- | --		

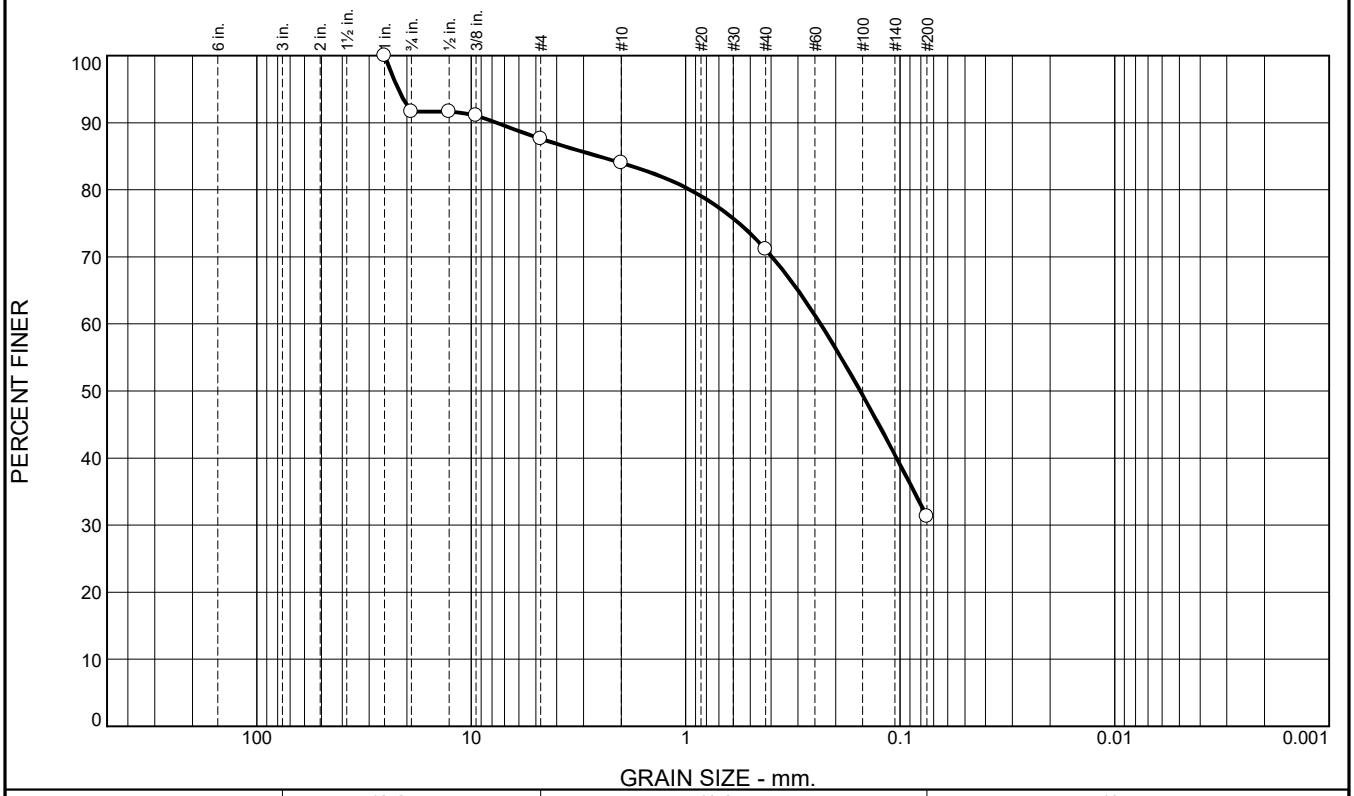
SAMPLE INFORMATION			DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (ft.)	Number	Type	(feet)				
			0.0				No indications of ESHGW
				TOPSOIL		8" Topsoil	
1.5	1	Grab		SUBSOIL		20" Subsoil, Roots	
			5.0	GLACIAL TILL		Brown, Silty Sand with Gravel (SM)	
9	2	Grab					
			10.0			Test Pit TP-6 Terminated at Depth of 9.5 feet below ground surface.	
			15.0				

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

WHITESTONE

APPENDIX B
Laboratory Test Results

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	8.3	4.1	3.6	12.9	39.8	31.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1"	100.0		
3/4"	91.7		
1/2"	91.7		
3/8"	91.1		
#4	87.6		
#10	84.0		
#40	71.1		
#200	31.3		

* (no specification provided)

Material Description

Silty Sand

Atterberg Limits

PL= NP LL= NV PI= NV

Coefficients

D_{90}= 7.6534 D_{85}= 2.5588 D_{60}= 0.2356
D_{50}= 0.1537 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

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

Remarks

Moisture Content: 10.4%

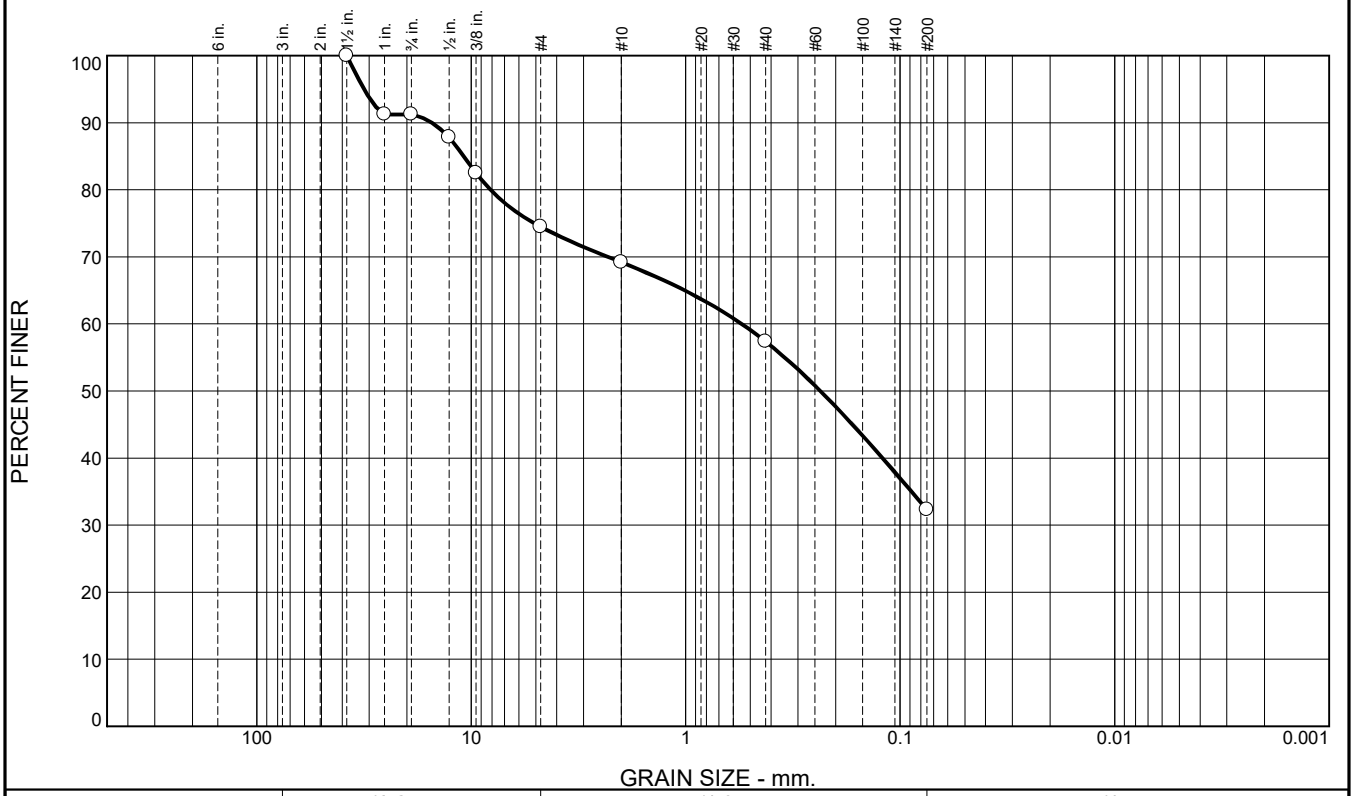
Location: B-1
Sample Number: S-3 **Depth:** 5' - 7' **Date:** 7/15/24

WHITESTONE

Client: The Gardner School
Project: Proposed Daycare Center
Between 665 and 711 Blue Hill Avenue, Milton, Norfolk County, MA
Project No: GM2422048.000 **Figure** S-1

Tested By: MM **Checked By:** RWM

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	8.8	16.7	5.3	11.8	25.1	32.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5"	100.0		
1"	91.2		
3/4"	91.2		
1/2"	87.8		
3/8"	82.5		
#4	74.5		
#10	69.2		
#40	57.4		
#200	32.3		

* (no specification provided)

Material Description

Silty Sand with Gravel

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 15.3116 D_{85}= 10.8712 D_{60}= 0.5491
D_{50}= 0.2360 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

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

Remarks

Moisture Content: 7.7%

Location: B-2
Sample Number: S-2 **Depth:** 2' - 4' **Date:** 7/15/24

WHITESTONE

Client: The Gardner School
Project: Proposed Daycare Center
Between 665 and 711 Blue Hill Avenue, Milton, Norfolk County, MA
Project No: GM2422048.000 **Figure** S-2

Tested By: MM **Checked By:** RWM

Particle Size Distribution Report

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	2.9	31.1	11.4	16.4	32.1	6.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1"	100.0		
3/4"	97.1		
1/2"	83.3		
3/8"	75.7		
#4	66.0		
#10	54.6		
#40	38.2		
#200	6.1		

* (no specification provided)

Material Description

Poorly Graded Sand with Silt and Gravel

Atterberg Limits

PL= NP LL= NV PI= NV

Coefficients

D_{90}= 15.2334 D_{85}= 13.3436 D_{60}= 3.0089
D_{50}= 1.3078 D_{30}= 0.2504 D_{15}= 0.1148
D_{10}= 0.0903 C_u= 33.32 C_c= 0.23

Classification

USCS= SP-SM AASHTO= A-1-b

Remarks

Moisture Content: 2.0%

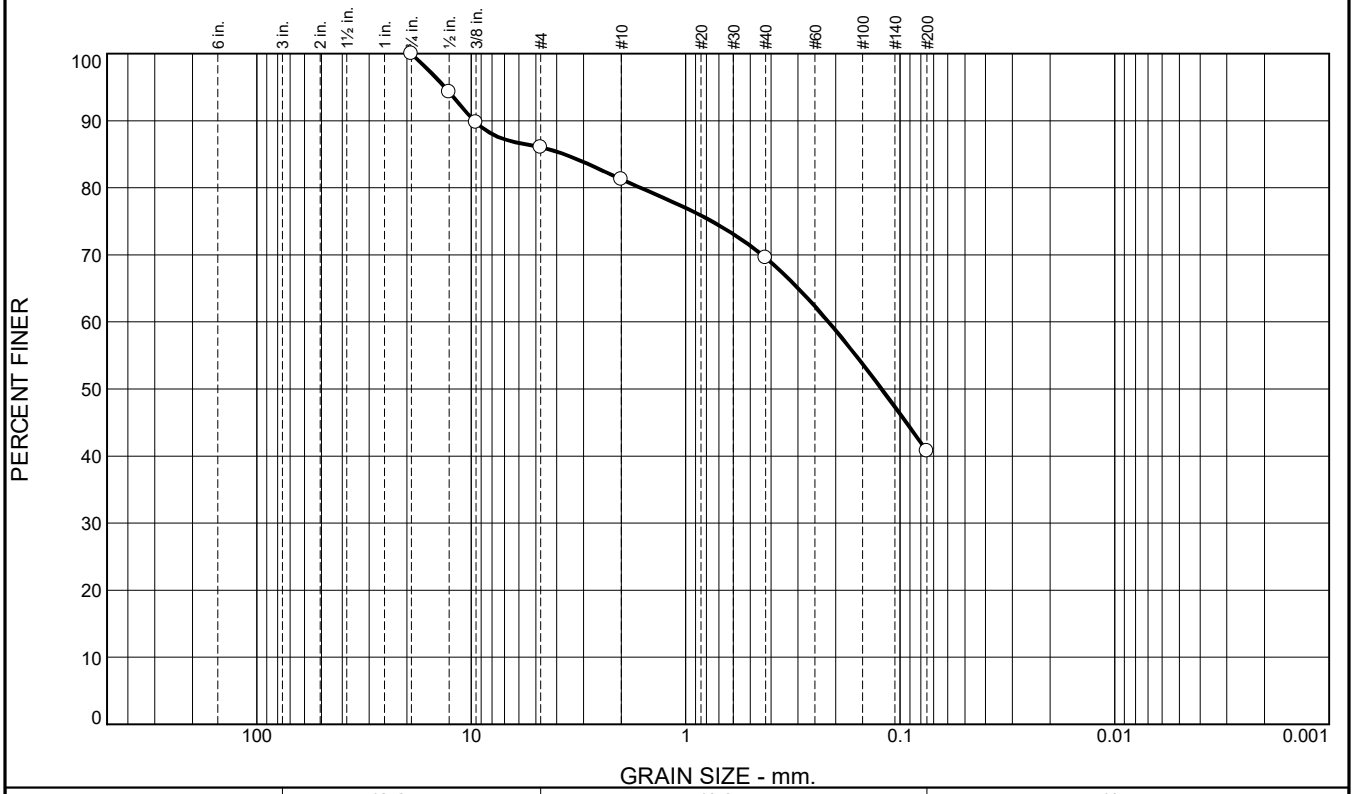
Location: B-4
Sample Number: S-3 **Depth:** 5' - 7' **Date:** 8/30/24

WHITESTONE

Client: The Gardner School
Project: Proposed Daycare Center
Between 665 and 711 Blue Hill Avenue, Milton, Norfolk County, MA
Project No: GM2422048.000 **Figure** S-3

Tested By: MM **Checked By:** RWM

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	14.0	4.7	11.7	28.9	40.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4"	100.0		
1/2"	94.3		
3/8"	89.8		
#4	86.0		
#10	81.3		
#40	69.6		
#200	40.7		

* (no specification provided)

Material Description

Silty Sand

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 9.7049 D_{85}= 3.7022 D_{60}= 0.2161
D_{50}= 0.1223 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-4(0)

Remarks

Moisture Content: 6.3%

Location: B-6
Sample Number: S-2 **Depth:** 2' - 4' **Date:** 8/30/24

WHITESTONE

Client: The Gardner School
Project: Proposed Daycare Center
Between 665 and 711 Blue Hill Avenue, Milton, Norfolk County, MA
Project No: GM2422048.000 **Figure** S-4

Tested By: MM **Checked By:** RWM

Particle Size Distribution Report

% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	4.1	21.3	16.9	48.4	7.7	1.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1.5"	100.0		
1"	97.8		
3/4"	95.9		
1/2"	91.2		
3/8"	86.8		
#4	74.6		
#10	57.7		
#40	9.3		
#200	1.6		

* (no specification provided)

Material Description

Poorly Graded Sand with Gravel

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 11.7129 D_{85}= 8.5752 D_{60}= 2.1882
D_{50}= 1.5317 D_{30}= 0.8521 D_{15}= 0.5329
D_{10}= 0.4385 C_u= 4.99 C_c= 0.76

Classification

USCS= SP AASHTO= A-1-b

Remarks

Moisture Content: 1.1%

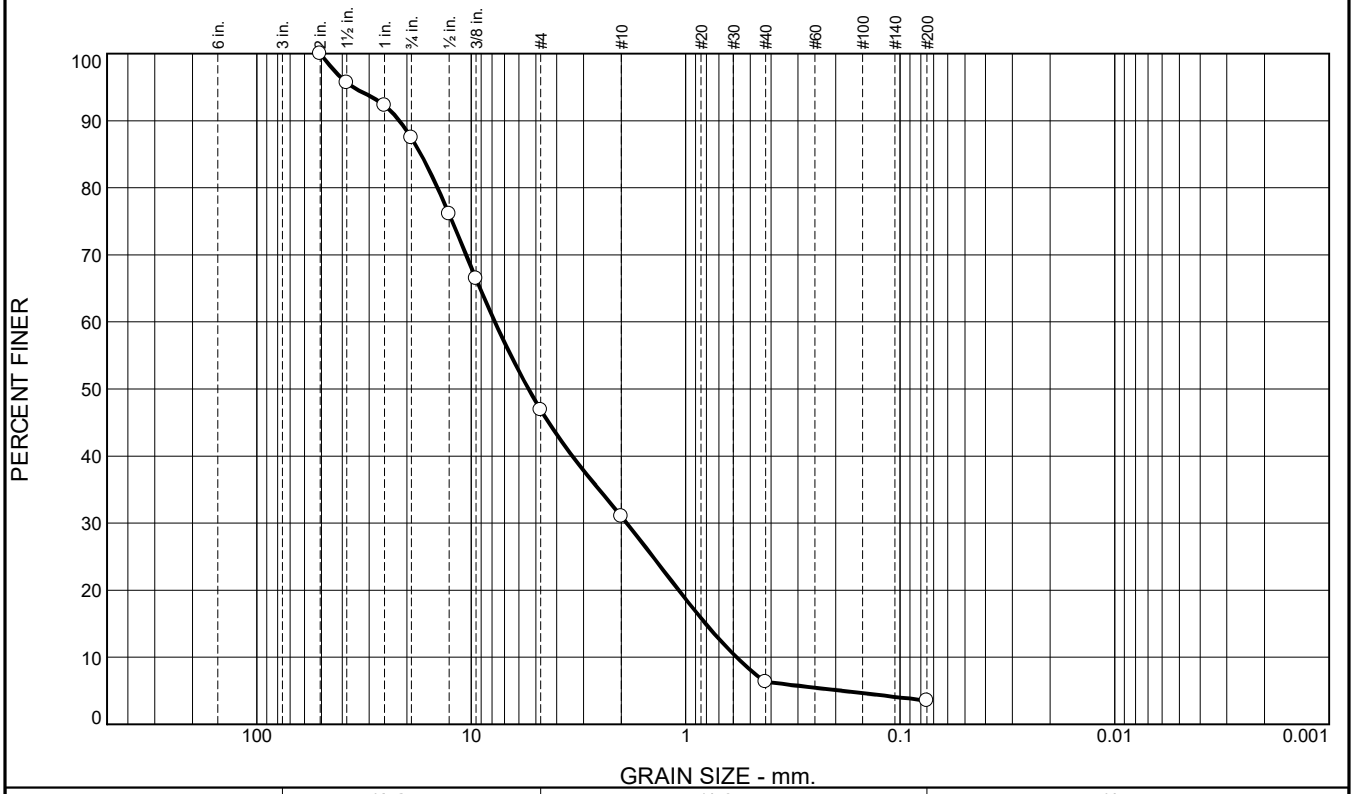
Location: TP-1
Sample Number: S-2 **Depth:** 6' **Date:** 9/19/24

WHITESTONE

Client: The Gardner School
Project: Proposed Daycare Center
Between 665 and 711 Blue Hill Avenue, Milton, Norfolk County, MA
Project No: GM2422048.000 **Figure** S-5

Tested By: MM **Checked By:** RWM

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	12.6	40.5	15.9	24.7	2.8	3.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
2"	100.0		
1.5"	95.7		
1"	92.3		
3/4"	87.4		
1/2"	76.1		
3/8"	66.5		
#4	46.9		
#10	31.0		
#40	6.3		
#200	3.5		

* (no specification provided)

Material Description

Poorly Graded Gravel with Sand

Atterberg Limits

PL= NP LL= NV PI= NV

Coefficients

D_{90}= 21.6601 D_{85}= 17.1974 D_{60}= 7.7668
D_{50}= 5.4166 D_{30}= 1.8875 D_{15}= 0.8070
D_{10}= 0.5800 C_u= 13.39 C_c= 0.79

Classification

USCS= GP AASHTO= A-1-a

Remarks

Moisture Content: 1.0%

Location: TP-3
Sample Number: S-2 **Depth:** 5' **Date:** 9/19/24

WHITESTONE

Client: The Gardner School
Project: Proposed Daycare Center
Between 665 and 711 Blue Hill Avenue, Milton, Norfolk County, MA
Project No: GM2422048.000 **Figure** S-6

Tested By: MM **Checked By:** RWM

WHITESTONE

APPENDIX C
Supplemental Information (USCS, Terms & Symbols)

WHITESTONE
An Employee-Owned Company

352 TURNPIKE ROAD
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508.485.0755
whitestoneassoc.com

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.*

L:\Geotechnical Forms and References\Reports\USCSTRMSSYM MA.docx

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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		