FOUNDATION ENGINEERING REPORT

ELM PLACE DEVELOPMENT

SWAMPSCOTT, MASSACHUSETTS

SEPTEMBER 10, 2020

Prepared For:

Winn Companies
One Washington Mall, Suite 500
Boston, MA 02108

PROJECT NO. 7046.2.00

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September 10, 2020

Winn Companies
One Washington Mall, Suite 500
Boston, MA 02108

Attention: Mr. David Thunell

Reference: Elm Place Development; Swampscott, Massachusetts
Foundation Engineering Report

Ladies and Gentlemen:

This report documents the results of our subsurface exploration program and geotechnical design study for the proposed Elm Place Development project to be located in Swampscott, Massachusetts. Refer to the Project Location Plan (**Figure 1**) for the general site location.

This report was prepared in accordance with our proposal to Winn Companies for geotechnical engineering services dated August 4, 2020 and the subsequent authorization of Mr. Matthew Curtin. These services are subject to the limitations contained in **Appendix A**.

Purpose and Scope

The purposes of the subsurface exploration program and foundation design study are to assess the subsurface soil and groundwater conditions at the site as they relate to foundation design and construction and, based on this information, to provide safe and economic foundation design recommendations for the proposed building.

Foundation design includes foundation support of the proposed building and its lowest level slabs, treatment of lowest level slabs in consideration of groundwater, lateral earth pressures on foundation walls, and seismic design considerations in accordance with the provisions of the Ninth Edition of the Massachusetts State Building Code (Code). Foundation construction considerations relating to excavation, backfilling, dewatering and other geotechnical aspects of the proposed construction are also presented herein.

Available Information

Information provided to McPhail Associates, LLC (McPhail) included a 20-scale drawing entitled "Existing Conditions Plan of Land in Swampscott, MA" prepared by Hancock Associates dated July 10, 2020. Also provided was a set of conceptual building layout plans dated June 2, 2020 and a 40-scale drawing entitled "Proposed Slab Elevations" dated August 26, 2020, both prepared by The Architectural Team, Inc.

Elevations cited herein are in feet and are referenced to the North American Vertical Datum (NAVD) of 1988.

Existing Site Conditions

The project site is located on four (4) residential/commercial properties that occupy a total lot area of approximately 95,938 square feet. The development site occupies an approximate 68,580 square-foot plan area and is generally bounded by Pitman Road to the west, Essex Street to the North, Elm Place to the northeast and east, and the Massachusetts Bay Transit Authority (MBTA) commuter rail Newburyport/Rockport Line right-of-way to the south. The four (4) parcels which constitute the site are as follows:

- 21 Elm Place – The largest parcel at the site, which comprises the majority of the southeastern site perimeter where it is bounded by the MBTA right-of-way. This parcel contains two, warehouse style, 2-story metal commercial buildings as well as associated bituminous asphalt paved parking areas.

- 129 Essex Street – The northern most parcel at the site which fronts onto Essex Street and is occupied by a 2-1/2 story, wood-framed residential building, a 1 story, wood-framed garage, a wooden shed, and several landscaped elements.

- 25 Pitman Road – The southernmost parcel at the site, bounded by the existing 2-story metal structure to the east. This parcel is currently occupied by a 1-1/2 story wood framed building.

- 35 Pitman Road – A parcel on the western portion of the site which fronts onto Pitman Road to the northwest. This parcel is currently occupied by a 2-story, wood-framed residential structure and associated landscaped margins.

In general, the site is relatively level across the majority of the parcels, with ground surface generally varying from Elevation +32 to Elevation +34, however it is noted that grades slope upward to about Elevation +40 across the 129 Essex Street parcel towards Essex Street.

Proposed Construction

The proposed development includes the construction of a new, irregularly shaped, 5-story building with 128 residential units that is planned to occupy a footprint of approximately 28,000 square feet at the ground floor. The ground level will contain a 17,660 square-foot garage in the approximate location of the existing, westernmost 2-story metal building and 25 Pitman Street building (which are planned to be demolished). The remainder of the ground floor will contain residential units and common spaces. The residential structure will extend north onto the 129 Essex Street and 35 Pitman Road parcels, with the existing residential structures to be demolished prior to construction. The easternmost 2-story metal building located on the 21 Elm Place parcel will be left in place and is not part of the development site.

At this time, it is understood that the lowest level slab of the proposed building will consist of three different levels planned at Elevation +32, Elevation +34.5 and Elevation +39 and that the building will not occupy any below-grade space. The approximate boundaries of the three slab levels are indicated on the enclosed Subsurface Exploration Plan, **Figure 2.** Based upon the provided information, it is anticipated that up to 5 feet of fill may need to be placed within portions of the proposed building footprint to attain the proposed slab grades.

Subsurface Explorations

A subsurface exploration program consisting of eight (8) borings was completed at the site during the period of August 24 through 26, 2020. The borings were performed by Geologic Earth Exploration, Inc. of Norfolk, Massachusetts under contract to McPhail. The approximate locations of the boreholes are indicated on the enclosed Subsurface Exploration Plan, **Figure 2**. Logs of the borings are contained in **Appendix B**.

The borings were performed at accessible locations approximately within the proposed building footprint. The explorations were monitored by personnel of McPhail who prepared field logs, obtained and visually classified soil samples, monitored groundwater conditions in the completed explorations, and determined the required depth of the explorations based upon actual subsurface conditions encountered.

Field locations of the subsurface explorations and the existing ground surface at each exploration location were determined by a McPhail field representative by taping from existing site features identified on the referenced site drawings.

The borings were generally advanced with HW casing using portable, track-mounted drilling equipment in conjunction with the "drive and wash" or wet rotary drilling method. Standard 1-3/8-inch I.D. split-spoon samples and standard penetration tests were obtained in general accordance with the standard procedures described in ASTM D1586. In general, the depth of the recent explorations ranged from 12 to 41 feet below the existing ground surface.

Laboratory Testing

At the completion of the field work, the soil samples were transported to our laboratory for more detailed classification, analyses and testing. The laboratory testing consisted of sieve analyses of representative samples of the fill and marine deposits obtained from the borings. Laboratory test procedures were in general accordance with applicable ASTM Standards. Results of the grain size analyses appear in **Figures 3** and **4** of the report.

Subsurface Conditions

A description of the subsurface conditions encountered in the explorations is documented on the boring logs contained in **Appendix B**. Based on the explorations performed, the

following is a generalized description of the subsurface conditions encountered from ground surface downward.

Directly underlying the existing site surface treatments (either topsoil, crushed stone or bituminous asphalt), or present at ground surface, the borings encountered a layer of uncontrolled fill. The fill was observed to consist of a compact to dense, light gray to brown, sand and gravel with trace silt varying to a gravely, silty sand. Also observed in the fill deposit were varying quantities of asphalt fragments, brick, ash and cinders. The fill was observed to extend to depths ranging from 2 to 4 feet below existing ground surface. Grain size distributions of samples of the fill deposit are presented on the enclosed **Figure 3**. It is noted that boring B-2 was terminated within the fill at a depth of 4 feet below existing ground surface after encountering an abandoned gas utility line.

Underlying the fill, the borings generally encountered a variable, natural marine deposit. This deposit was generally observed to consist of interbedded layers of sand with trace gravel, silt and clay, silty clay with some sand and trace gravel, and silty, sandy clay. It should be noted that within boring B-7, the marine deposit was observed to transition to a more homogenous, firm to stiff blue clay with trace to some silt. The surface of this natural deposit was encountered at depths between 2 to 4 feet below existing ground surface corresponding to levels between Elevation +27 and Elevation +30.2. Refer to **Figure 2** for the elevation of the surface of the natural marine deposit at the boring locations, where encountered. Grain size distributions of samples of the upper portion of the marine deposit are presented on the enclosed **Figure 4**. With the exception of borings B-2 and B-3, the borings were terminated within the natural marine deposit at depths between 12 to 41 feet below existing ground surface.

It is noted that boring B-3 was advanced through the marine deposit and encountered the surface of underlying bedrock at a depth of 27 feet below existing ground surface. Boring B-3 was terminated upon roller bit refusal at a depth of 27.5 feet below existing ground surface.

Groundwater was observed within boreholes B-3, B-7, and B-4 following completion at depths ranging from 4 to 8.5 feet below existing ground surface, corresponding to levels ranging from Elevation +23.8 to Elevation +28.1. It is noted that the observation of groundwater within B-8 (a depth of 4 feet below existing ground surface corresponding to Elevation +28.1) was performed immediately following drilling utilizing the wet rotary method due to time constraints. As such, this level may not be indicative of groundwater levels at the site. However, due to the high fines content (i.e. silt and clay), groundwater may be seasonally perched on the surface of the relatively impervious zones of the marine deposit. It is anticipated that future groundwater levels across the site may vary from those reported herein due to factors such as normal seasonal changes, periods of heavy precipitation, and alterations of existing drainage patterns.

Foundation Design Recommendations

Based on the scope of the proposed construction and the subsurface conditions encountered at the site, it is recommended that foundation support for the proposed structure consist of conventional spread footing foundations in conjunction with slab-on-grade construction. Additional foundation design recommendations are contained below.

Footing Recommendations

Footing foundations are recommended to bear directly on the undisturbed, natural marine deposit or on compacted structural fill that is placed directly on the undisturbed natural marine deposit. Footings should be proportioned utilizing an allowable design bearing pressure of two (2) tons per square-foot (tsf). The minimum footing width for perimeter footings and isolated footings should be 24 inches and 36 inches, respectively. All foundations should be designed in accordance with the Code. It is noted that "thickened slabs" or "haunched slabs", which are designed to support interior walls, are considered to be footings for the purposes of the recommendations contained herein.

Perimeter foundations and interior foundations below unheated areas (i.e. open-air parking levels) should be provided with a minimum 4-foot thickness of soil cover as frost protection. Interior foundations below heated areas should be located such that the top of foundation concrete is a minimum of 6 inches below the underside of the lowest level slab.

All foundations should be located such that they are below a theoretical line drawn upward and outward at a 2 to 1 (horizontal to vertical) angle from the bottom exterior edge of all adjacent footings, structures and utilities. Proposed foundations located immediately adjacent to existing foundations, such as for the adjacent existing 2-story metal building which will remain in place, should be founded at the same level as the existing foundation.

Based on the results of the explorations, the surface of the natural marine deposit generally varies across the proposed building footprint from about Elevation +27 to Elevation +32. Where the surface of the natural marine deposit is located below the design bottom of footing elevation, the existing uncontrolled fill will need to be removed and structural fill will need to be placed and compacted for support of the footings. In consideration of the proposed lowest level slab elevations, the anticipated depth of the footings, and the elevation of the natural marine deposit encountered in the explorations, it is anticipated that up to four (4) feet of structural fill may be required for support of footings at various locations within the proposed building footprint.

The existing uncontrolled fill material should be removed at footing locations and to the lateral limits defined herein for the placement of structural fill. Where proposed footings are to be supported on structural fill, the lateral limits of the excavation should extend beyond the outside edge of the footing for a horizontal distance equal to the depth from the bottom of the proposed footing to the surface of the natural, undisturbed marine deposit, plus two (2) feet in all plan directions.

Structural fill should consist of suitable portions of the excavated on-site granular fill containing less than twenty (20) percent passing the no. 200 sieve or gravel borrow consisting of an off-site well-graded, natural sand and gravel containing less than eight (8) percent passing the no. 200 sieve. Reuse of the on-site soil as structural fill or ordinary fill is discussed in more detail in the "Foundation Construction Considerations" section of this report.

It is noted that depending on the time of the year when construction is performed, groundwater may be encountered at shallow depths across the site and will need to be controlled during the building excavation and a portion of the excavated material may be saturated due to its presence below the groundwater level. Due to the high fines content of portions of the existing soils, the exposed marine deposit will be highly susceptible to disturbance in the presence of groundwater and will become unsuitable as a bearing surface, if it is allowed to become saturated or is saturated when excavated.

Slab Recommendations

The proposed lowest level slabs should be designed as conventional soil-supported slabs-on-grade bearing on proof-compacted existing fill material and/or on compacted structural fill.

Since the proposed lowest level slabs are understood to be located at or above the proposed finished grade, perimeter and underslab foundation drainage are not considered necessary. All pits and depressions extending below the lowest level slabs (i.e. elevator pits, etc.) should be waterproofed and provided with properly tied continuous waterstops at all construction joints.

For the proposed at-grade parking area, the pavement section should be underlain by a minimum 12-inch thickness of off-site gravel borrow consisting of well-graded sand and gravel with less than 8 percent by weight passing the Number 200 sieve.

The proposed lowest level slabs within the residential units and common space areas should be designed as conventional soil supported slabs-on-grade underlain by a polyethylene vapor barrier spread over a minimum 10-inch thickness of ¾-inch Crushed Stone overlying a single thickness of filter fabric such as Mirafi 140N or equivalent. See below "Radon Ventilation System" section of this report for additional recommendations.

Preparation of the building pad for footing and slab subgrades should include the removal of all topsoil and site improvements from the entire proposed building footprint. The soil below the sub-slab crushed stone layer should consist of either proof-compacted existing fill material or structural fill that is placed and compacted over the proof-compacted existing fill material to raise the grade to the bottom of the crushed stone layer. Requirements for proof-compaction are contained below in the "Foundation Construction Considerations" section. Compacted structural fill or gravel borrow should be placed as required to raise the grade to the crushed stone subgrade below the slab.

Since portions of the slabs-on-grade may be supported over the existing fill, some minor cosmetic cracking and settling of the floor slab may occur over the time. The magnitude of the settlement is likely to be less than ½-inch, however specific floor finishes and uses should be considered given the potential for the future settlement.

General Foundation Recommendations

All structural fill and/or gravel borrow placed within the footprint of the proposed building for support of the footings and slabs-on-grade should be placed in lifts having a compacted thickness of 6 inches and be compacted to a minimum of 95 percent of its maximum modified Proctor dry density. The placement and compaction of structural fill should be monitored by a Registered Professional Engineer or their designated representative in accordance with the provisions of the Code.

Below-grade foundation walls receiving lateral support at the top and bottom (i.e. restrained walls) should be designed for a lateral earth pressure corresponding to an equivalent fluid density of 60 pounds per cubic-foot. Similarly, drained cantilevered retaining walls, (i.e. receiving no lateral support at the top) should be designed for a lateral earth pressure corresponding to an equivalent fluid density of 40 pounds per cubic-foot. To these values must be added the pressures attributable to earthquake forces per Section 1610.2 of the Code.

Lateral forces can be transmitted from the structure to the soil by passive pressure on the footings utilizing an equivalent fluid density of 120 pounds per cubic foot providing that these structural elements are designed to resist these pressures. Lateral forces can also be considered to be transmitted from the structure to the soil by friction on the base of the footings using a frictional coefficient of 0.4 to which a factor of safety of 1.5 should be applied.

Radon Ventilation System

We recommend the installation of a sub-slab radon ventilation system within the enclosed areas of the proposed building proposed for residential and/or common use (not including the open-air parking areas). The radon ventilation system should consist of 4-inch diameter perforated PVC pipe laid flat within the 10-inch thick layer of crushed stone that underlies the proposed slabs. The radon system should include vertical riser pipe(s), consisting of solid PVC pipe within the interior of the building. It is anticipated that this system could be designed as a passive radon mitigation system which could be converted to an active mitigation system in the future, if required.

Seismic Design Considerations

For the purposes of determining parameters for structural seismic design, this site is considered to be a Site Class D as defined in Chapter 20 of American Society of Civil

Engineers (ASCE) Standard 7-10 "Minimum Design Loads for Buildings and Other Structures". The bearing strata on the proposed site are not considered to be subject to liquefaction during an earthquake based on the criterion of Section 1806.4 of the Code.

Foundation Construction Considerations

The primary construction considerations include building pad preparation, footing and slab subgrade preparation and protection, on-site reuse of excavated soils, groundwater control and dewatering, and off-site removal of excess excavated soil.

Building Pad Preparation

Preparation of the building pad should include the removal of all existing site improvements, below-grade remains of former structures, and the surficial deposit of topsoil. Where existing utilities and structures are located within the footprint of the proposed building, they should be relocated prior to construction. Outside the proposed building footprint, abandoned structures and utilities may be cut off and removed to a depth of at least two (2) feet below finished grades. If voids resulting from foundation removal are present within the proposed building footprint, it is recommended that they be backfilled utilizing structural fill or gravel borrow.

Footing and Slab Subgrade Preparation and Protection

As indicated above, the proposed footings are recommended to bear directly on the natural marine deposit or on compacted structural fill placed over the surface of the natural marine deposit following the removal of the existing uncontrolled fill. In locations where fill soil is present at proposed foundation grades, the existing fill located below the footings and within the zone of influence of the footings will need to be excavated and replaced with compacted structural fill for support of the footings. Depending on the required excavation depth and geometry of the proposed foundations, complete removal of the existing uncontrolled fill to the surface of the marine deposit across the building footprint may be more efficient than isolated excavation of existing fill at footing locations and within the zone of influence defined herein.

Where the depth from the design bottom of footing to the marine deposit subgrade is 12 inches or less, ¾-inch crushed stone may be used in lieu of structural fill. Crushed stone should be placed in lifts having a maximum compacted thickness of six (6) inches.
The marine deposit subgrades and all footing bearing surfaces should be prepared utilizing a smooth-edged or "toothless" excavator bucket to avoid disturbance of the subgrade. Alternatively, excavated subgrades could be hand-cleared of loose and disturbed material. It is noted that the exposed natural marine deposit subgrade will be highly susceptible to disturbance due to construction activities and should be protected immediately following excavation. A minimum 3-inch thickness of ¾-inch Crushed Stone should be placed over a layer of filter fabric, such as Mirafi 140N or equivalent, laid across the footing subgrade

immediately following excavation to the final bearing surface as protection to mitigate disturbance of the footing subgrades during subsequent forming operations.

The existing fill, where encountered, may remain in place below the lowest level slab provided it is proof-rolled with a minimum of six (6) passes of a large walk-behind double drum roller. All soft, spongy or "weaving" areas observed during the proof compaction should be removed and replaced with compacted gravel borrow.

Further, it is recommended that excavation equipment not work within the proposed building footprint on the exposed fill or marine deposit subgrade if water is present. If excavation or subgrade preparation work is performed in below-freezing temperatures, the marine deposit should be considered highly susceptible to frost penetration and will become unsuitable if left unprotected. The Contractor will need to be prepared to protect foundations, slabs and exposed subgrades from frost intrusion through the use of frost blankets or heating coils. Soil within the building footprint which becomes frozen will need to be removed prior to placement of fill materials or concrete.

The excavation subgrade is likely to become disturbed and unsuitable due to construction equipment traffic, especially during precipitation events. The Contractor may need to place crushed stone or other material over the exposed subgrades to make the site trafficable and protect it from disturbance due to equipment operation.

On-Site Reuse of Excavated Soils and Gravel Borrow Requirements

It is anticipated that limited portions of the excavated fill may be re-used on-site as ordinary fill and structural fill, provided they are maintained in a dry condition and can be properly compacted. Excavated fill material to be reused on-site as structural fill should typically contain less than 20% by weight passing the No. 200 sieve. Excavated soil with greater than 20% by weight passing the No. 200 sieve should be segregated and can be reused on-site as ordinary fill subject to the provisions contained herein.

Structural fill should consist of inorganic excavated on-site fill material and should conform to the following gradation requirements:

U.S. Sieve No.	Percent Passing by Weight
4"	100
1"	60 – 100
#4	25 – 95
#40	5 – 50
#200	0 – 20

As described above, the results of our subsurface exploration indicate portions of the on-site existing fill material and the marine deposit contain a high silt content. Hence, these materials are considered to be extremely sensitive to disturbance in the presence of water. It is emphasized that excavated materials will become unsuitable for re-use if they become too wet. Therefore, it is recommended that stockpiles of excavated material intended for

reuse be protected against increases in moisture content by securely covering the stockpiles at all times with 6-mil polyethylene for protection from precipitation and also as a dust mitigation measure. The placement and compaction of on-site material should be completed during relatively dry and non-freezing conditions. If the earthwork operations are performed during a wet and/or cold period, it is anticipated that significant portions of the on-site soil may become unsuitable for re-use on-site. As such, at the present time the marine deposit soils are not recommended to be reused on-site for support of the proposed footings or slabs due to the high fines content. If, due to any of the above conditions, the excavated material is unsuitable for reuse, an off-site gravel borrow should be used.

Gravel borrow should consist of a well-graded off-site sand and gravel conforming to the following gradation requirements:

U.S. Sieve No.	Percent Passing by Weight
3"	100
½"	50 – 85
#4	40 – 75
#50	8 – 28
#200	0 – 8

Due to the presence of organic material (roots) in the existing topsoil, we do not recommend reusing this material as structural fill beneath footings or the slabs-on-grade. The on-site existing topsoil may be reused as ordinary fill in landscaped areas, provided it is protected from wet and freezing environments and can be compacted to the recommended densities.

Groundwater Control and Dewatering

Proper control of groundwater and surface water will be necessary to maintain a firm subgrade to support construction traffic. In consideration of the observed depth of the groundwater below the existing ground surface, during excavation to the bearing stratum at the footing locations groundwater perched in the fill or on the surface of the marine deposit may be encountered. As such, the volume of groundwater to be accommodated should be able to be controlled by use of sumping and strategically located trenches to direct groundwater away from construction activities. Additionally, runoff may periodically accumulate on the site subgrade during precipitation events. It is recommended that all pumped groundwater be recharged on-site. If pumped groundwater cannot be recharged on-site, it would be necessary to dispose of pumped groundwater into a nearby storm drain or combined sewer which would require the need for a temporary construction dewatering discharge permit.

As discussed above, the fine-grained nature of the marine deposit soils that underlie the project site make them highly susceptible to disturbance during the construction period in the presence of moisture. Furthermore, the groundwater table at the site may be perched on the surface of the relatively impervious zones of the marine deposit which will further exacerbate the disturbance of the bearing surfaces. It is considered imperative that the

groundwater be cut-off and/or diverted at the perimeter of the proposed excavations to minimize the disturbance of the bearing surfaces and to maximize the reusability of the excavated on-site soils. Therefore, attention should be given to providing positive drainage to direct surface water away from the excavations at all times.

Off-Site Removal of Excess Soil

Should excess excavated soil generated from the proposed construction require off-site removal, current Department of Environmental Protection (DEP) policies and regulations for off-site reuse of excess excavated soil require environmental characterization of the excavated soil prior to its off-site reuse. Based on the premium cost that may be associated with chemical testing and off-site disposal of soil, it is recommended that excess soil be reused on-site to the fullest extent possible.

Final Comments

McPhail has been retained to provide design assistance to the design team during the final design phase of this project. The purpose of this involvement is to review the structural foundation drawings and foundation notes for conformance with the recommendations presented herein and to prepare the earthwork specification section for inclusion into the Contract Documents for construction.

McPhail has also been retained for the construction phase of the project to observe final preparation of the foundation bearing surfaces and to monitor placement and compaction of fill materials, as required, in accordance with the provisions of the Code and the provisions of the Contract Documents. Our involvement during the construction phase of the work should minimize costly delays due to unanticipated field problems since our field engineer would be under the direct supervision of our project manager who was responsible for the subsurface exploration program and foundation design recommendations documented herein.

We trust that the above is sufficient for your present requirements. Should you have any questions concerning the foundation design recommendations presented herein, please do not hesitate to call us.

Very truly yours,

McPHAIL ASSOCIATES, LLC

John A. Erikson, P.E.

Jonathan W. Patch, P.E.

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JAE/jwp

FIGURE 1

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617/868-1423 (Fax)
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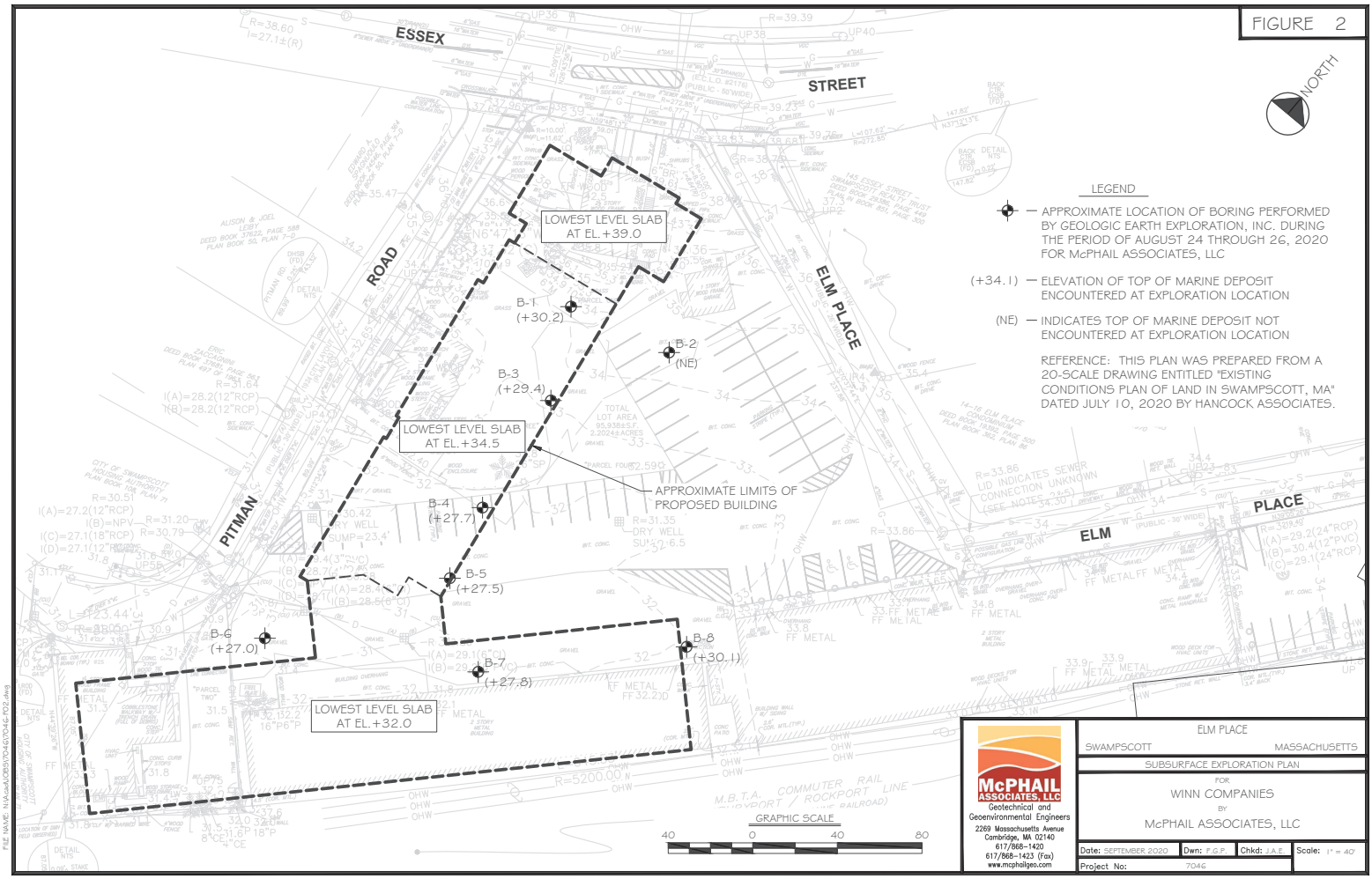
PROJECT LOCATION PLAN

ELM PLACE

SWAMPSCOTT MASSACHUSETTS

FIGURE 2



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ELM PLACE
SWAMPSCOTT MASSACHUSETTS
SUBSURFACE EXPLORATION PLAN
FOR
WINN COMPANIES
BY
McPHAIL ASSOCIATES, LLC

Date: SEPTEMBER 2020	Dwn: F.G.F.	Chkd: J.A.E.	Scale: 1" = 40'
Project No: 7046			

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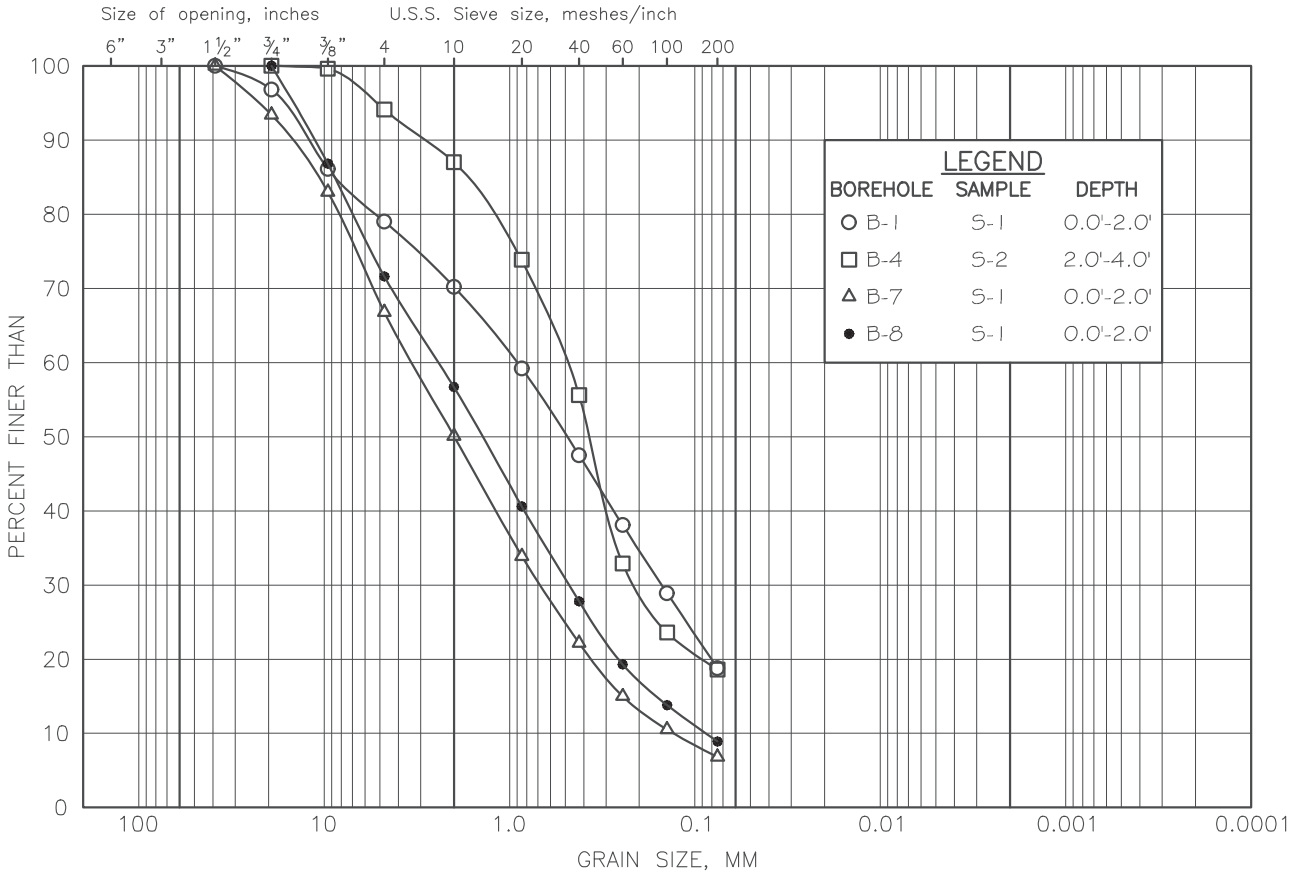
PROJECT No. 7046

M.I.T. GRAIN SIZE SCALE



COBBLE SIZE	GRAVEL SIZE			SAND SIZE			FINE GRAINED	
	COARSE	MEDIUM	FINE	COARSE	MEDIUM	FINE	SILT SIZE	CLAY SIZE

McPHAIL ASSOCIATES, LLC

GRAIN SIZE DISTRIBUTION
FILL

FIGURE 3

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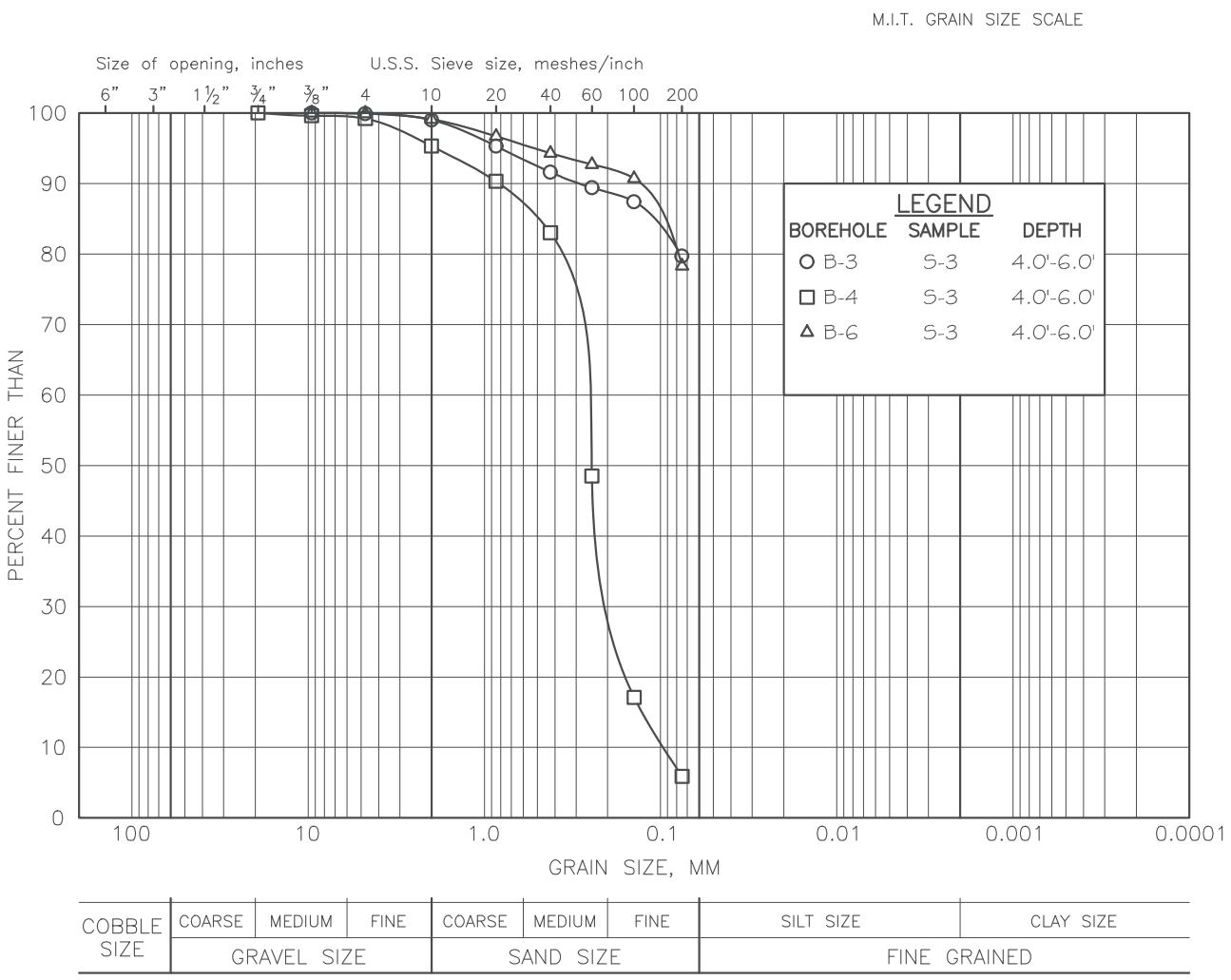
PROJECT No. 7046

McPHAIL ASSOCIATES, LLC

GRAIN SIZE DISTRIBUTION
MARINE DEPOSIT

FIGURE 4



APPENDIX A:

LIMITATIONS

LIMITATIONS

This report has been prepared on behalf of and for the exclusive use of Winn Companies for specific application to the proposed Elm Place development to be located in Swampscott, Massachusetts in accordance with generally accepted soil and geotechnical engineering practices. No other warranty, expressed or implied, is made.

In the event that any changes in nature or design of the proposed construction are planned, the conclusions and recommendations contained in this report should not be considered valid unless the changes are reviewed and conclusions of this report modified or verified in writing by McPhail Associates.

The analyses and recommendations presented in this report are based upon the data obtained from the subsurface explorations performed at the approximate locations indicated on the enclosed plan. If variations in the nature and extent of subsurface conditions between the widely spaced explorations become evident during the course of construction, it will be necessary for a re-evaluation of the recommendations of this report to be made after performing on-site observations during the construction period and noting the characteristics of any variations.

APPENDIX B:

BORING LOGS B-1 TO B-8
PREPARED BY MCPHAIL ASSOCIATES, LLC

Project: Elm Place
Location: 21 Elm Place
City/State: Swampscott, MA

Job #: 7046
Date Started: 8-24-20
Date Finished: 8-24-20

Boring No. B-1

Contractor: Geologic
Driller/Helper: Paul/Jay
Logged By/Reviewed By: J. Finney
Surface Elevation (ft): 34.2

Casing Type/Depth (ft): 4" Casing
Casing Hammer (lbs)/Drop (in): 300lb/24in
Sampler Size/Type: 2' Split Spoon
Sampler Hammer (lbs)/Drop (in): 140lb/30in

Groundwater Observations			
Date	Depth	Elev.	Notes

Depth (ft)	Elev. (ft)	Symbol	Depth/EL to Strata Change (ft)	Stratum	Sample N-Value	Sample TVOC (ppm)	Sample No.	Sample Pen./Rec. (in)	Sample Depth (ft)	Sample Blows Per 6"	Sample Description and Boring Notes
0	34		0.5 / 33.7	TOPSOIL							
1	33			FILL	20		S1	24/16	0.0-2.0	18 13 7 7	Compact, light-gray to brown, gravelly SAND, some silt w/ asphalt, ash & cinders (FILL).
2	32				40		S2	24/12	2.0-4.0	10 18 22 25	Dense, light-brown to tan, SILT and SAND, trace gravel (FILL).
3	31										
4	30		4.0 / 30.2	MARINE DEPOSIT	39		S3	24/24	4.0-6.0	22 18 21 28	Dense, interbedded layers of orange-brown, SAND, some silt, trace gravel and gray-brown, CLAY and SILT, some sand (MARINE DEPOSIT).
5	29										
6	28				44		S4	24/24	6.0-8.0	23 21 23 26	Dense, gray-brown, CLAYEY SILT, trace sand (MARINE DEPOSIT).
7	27										
8	26				19		S5	24/24	8.0-10.0	8 10 9 10	Compact, gray-brown, interbedded layers of SAND, some silt, trace gravel and SANDY SILT, trace clay, trace gravel (MARINE DEPOSIT). Roller bit refusal at 12 ft. Bedrock in wash water.
9	25										
10	24										
11	23										
12	22		12.0 / 22.2	Bottom of borehole 12 feet below ground surface.							
13	21										
14	20										
15	19										
16	18										
17	17										
18	16										
19	15										
20	14										
21	13										
22	12										

GRANULAR SOILS	
BLOWS/FT.	DENSITY
0-4	V.LOOSE
4-10	LOOSE
10-30	COMPACT
30-50	DENSE
>50	V.DENSE

COHESIVE SOILS	
BLOWS/FT.	CONSISTENCY
<2	V.SOFT
2-4	SOFT
4-8	FIRM
8-15	STIFF
15-30	V.STIFF
>30	HARD

SOIL COMPONENT

DESCRIPTIVE TERM	PROPORTION OF TOTAL
"TRACE"	0-10%
"SOME"	10-20%
"ADJECTIVE" (eg SANDY, SILTY)	20-35%
"AND"	35-50%

SOIL CONTAINING THREE COMPONENTS EACH OF WHICH COMPRISE AT LEAST 25% OF THE TOTAL ARE CLASSIFIED AS "A WELL-GRADED MIXTURE OF"

Notes:

Total Volatile Organic Compounds (TVOC) measured w/ PID Model:
TVOC Background: ppm
Weather: Sunny
Temperature:

McPHAIL ASSOCIATES, LLC
2269 MASSACHUSETTS AVENUE
CAMBRIDGE, MA 02140
TEL: 617-868-1420
FAX: 617-868-1423

Project: Elm Place
Location: 21 Elm Place
City/State: Swampscott, MA

Job #: 7046
Date Started: 8-25-20
Date Finished: 8-25-20

Boring No.

B-2

Contractor: Geologic
Driller/Helper: Paul/Jay
Logged By/Reviewed By: J. Finney
Surface Elevation (ft): 34.4

Casing Type/Depth (ft): 4" Casing
Casing Hammer (lbs)/Drop (in): 300lb/24in
Sampler Size/Type: 2' Split Spoon
Sampler Hammer (lbs)/Drop (in): 140lb/30in

Groundwater Observations

Date	Depth	Elev.	Notes

Depth (ft)	Elev. (ft)	Symbol	Depth/EL to Strata Change (ft)	Stratum	Sample N-Value	Sample TVOC (ppm)	Sample No.	Sample Pen./Rec. (in)	Sample Depth (ft)	Sample Blows Per 6"	Sample Description and Boring Notes
	34		0.4 / 34.0	ASPHALT							
1	33				40		S1	18/12	0.5-2.0	25 26 14	Dense, black to brown, SANDY GRAVEL, w/ brick (FILL).
2	32			FILL							
3	31				18		S2	24/16	2.0-4.0	10 7 11 9	Compact, black to brown, SANDY GRAVEL, w/ brick to light-brown, SILTY SAND, w/ brick (FILL). Petrol odor coming from casing at 4 ft. Called National Grid emergency line and they determined it was an abandoned gas line from a previous building in the area. Hole was backfilled and patched with 0.0 ppm PID readings the next day.
4	30		4.0 / 30.4	Bottom of borehole 4 feet below ground surface.							
5	29										
6	28										
7	27										
8	26										
9	25										
10	24										
11	23										
12	22										
13	21										
14	20										
15	19										
16	18										
17	17										
18	16										
19	15										
20	14										
21	13										
22	12										

GRANULAR SOILS	
BLOWS/FT.	DENSITY
0-4	V.LOOSE
4-10	LOOSE
10-30	COMPACT
30-50	DENSE
>50	V.DENSE

COHESIVE SOILS	
BLOWS/FT.	CONSISTENCY
<2	V.SOFT
2-4	SOFT
4-8	FIRM
8-15	STIFF
15-30	V.STIFF
>30	HARD

SOIL COMPONENT

DESCRIPTIVE TERM	PROPORTION OF TOTAL
"TRACE"	0-10%
"SOME"	10-20%
"ADJECTIVE" (eg SANDY, SILTY)	20-35%
"AND"	35-50%

SOIL CONTAINING THREE COMPONENTS EACH OF WHICH COMPRISE AT LEAST 25% OF THE TOTAL ARE CLASSIFIED AS "A WELL-GRADED MIXTURE OF"

Notes:

Total Volatile Organic Compounds (TVOC) measured w/ PID Model:
TVOC Background: ppm
Weather: Sunny
Temperature:

McPHAIL ASSOCIATES, LLC
2269 MASSACHUSETTS AVENUE
CAMBRIDGE, MA 02140
TEL: 617-868-1420
FAX: 617-868-1423

Project:	Elm Place	**Job #:**	7046
Location:	21 Elm Place	**Date Started:**	8-24-20
City/State:	Swampscott, MA	**Date Finished:**	8-24-20

Boring No.

B-3

Contractor: Geologic
Driller/Helper: Paul/Jay
Logged By/Reviewed By: J. Finney
Surface Elevation (ft): 33.4

Casing Type/Depth (ft): 4" Casing
Casing Hammer (lbs)/Drop (in): 300lb/24in
Sampler Size/Type: 2' Split Spoon
Sampler Hammer (lbs)/Drop (in): 140lb/30in

Groundwater Observations

Date	Depth	Elev.	Notes
8-26-20	8.5	24.9	

Depth (ft)	Elev. (ft)	Symbol	Depth/EL to Strata Change (ft)	Stratum	Sample N-Value	Sample TVOC (ppm)	Sample No.	Sample Pen./Rec. (in)	Sample Depth (ft)	Sample Blows Per 6"	Sample Description and Boring Notes
0	33		0.1 / 33.3	CRUSHED STONE							
1	32			FILL	13		S1	24/12	0.0-2.0	6 6 7 3	Compact, black to brown, SAND, some silt, some gravel, w/ brick, ash & cinders (FILL).
2	31										
3	30				8		S2	24/10	2.0-4.0	3 4 4 11	Loose, brown to tan, SILT and SAND, some gravel (FILL).
4	29		4.0 / 29.4		36		S3	24/20	4.0-6.0	10 15 21 20	Dense, light-brown and gray, interbedded layers of SAND and SILT and SILT, some sand, trace gravel (MARINE DEPOSIT).
5	28										
6	27				50		S4	24/16	6.0-8.0	18 26 24 23	Dense to very dense, brown and gray, interbedded layers of SILT, some sand, trace gravel and SILT and CLAY, some sand, trace gravel (MARINE DEPOSIT).
7	26										
8	25										
9	24				32		S5	24/16	9.0-11.0	12 14 18 18	Dense, interbedded layers of brown, SAND, some silt and blue-gray, SILT, some clay, some sand (MARINE DEPOSIT).
10	23										
11	22										
12	21										
13	20			MARINE DEPOSIT							
14	19				10		S6	24/24	14.0-16.0	4 4 6 6	Stiff, blue-gray, CLAY, some silt, trace sand (MARINE DEPOSIT).
15	18										
16	17										
17	16										
18	15										
19	14				8		S7	12/12	19.0-20.0	3 5	Firm to stiff, blue-gray, CLAY, some silt (MARINE DEPOSIT).
20	13				23		S7A	12/6	20.0-21.0	11 12	Compact, brown to tan, SILTY SAND (MARINE DEPOSIT).
21	12										
22	11										

GRANULAR SOILS	
BLOWS/FT.	DENSITY
0-4	V.LOOSE
4-10	LOOSE
10-30	COMPACT
30-50	DENSE
>50	V.DENSE

COHESIVE SOILS	
BLOWS/FT.	CONSISTENCY
<2	V.SOFT
2-4	SOFT
4-8	FIRM
8-15	STIFF
15-30	V.STIFF
>30	HARD

SOIL COMPONENT

DESCRIPTIVE TERM	PROPORTION OF TOTAL
"TRACE"	0-10%
"SOME"	10-20%
"ADJECTIVE" (eg SANDY, SILTY)	20-35%
"AND"	35-50%

SOIL CONTAINING THREE COMPONENTS EACH OF WHICH COMPRISE AT LEAST 25% OF THE TOTAL ARE CLASSIFIED AS "A WELL-GRADED MIXTURE OF"

Notes:

Total Volatile Organic Compounds (TVOC) measured w/ PID Model:
TVOC Background: ppm
Weather: Sunny
Temperature:

McPHAIL ASSOCIATES, LLC
2269 MASSACHUSETTS AVENUE
CAMBRIDGE, MA 02140
TEL: 617-868-1420
FAX: 617-868-1423

Project:	Elm Place	**Job #:**	7046
Location:	21 Elm Place	**Date Started:**	8-24-20
City/State:	Swampscott, MA	**Date Finished:**	8-24-20

Boring No.

B-3

Contractor: Geologic
Driller/Helper: Paul/Jay
Logged By/Reviewed By: J. Finney
Surface Elevation (ft): 33.4

Casing Type/Depth (ft): 4" Casing
Casing Hammer (lbs)/Drop (in): 300lb/24in
Sampler Size/Type: 2' Split Spoon
Sampler Hammer (lbs)/Drop (in): 140lb/30in

Groundwater Observations

Date	Depth	Elev.	Notes
8-26-20	8.5	24.9	

Depth (ft)	Elev. (ft)	Symbol	Depth/EL to Strata Change (ft)	Stratum	Sample N-Value	Sample TVOC (ppm)	Sample No.	Sample Pen./Rec. (in)	Sample Depth (ft)	Sample Blows Per 6"	Sample Description and Boring Notes
24	10										
25	9			MARINE DEPOSIT	21		S8	24/20	24.0-26.0	10 12 9 13	Compact, brown to tan, interbedded layers of SAND, trace silt to SILTY SAND (MARINE DEPOSIT). Roller bit refusal at 27.5 ft.
26	8										
27	7		27.0 / 6.4								
28	6		27.5 / 5.9	BEDROCK Bottom of borehole 27.5 feet below ground surface.							
29	5										
30	4										
31	3										
32	2										
33	1										
34	0										
35	-1										
36	-2										
37	-3										
38	-4										
39	-5										
40	-6										
41	-7										
42	-8										
43	-9										
44	-10										
45	-11										
	-12										

GRANULAR SOILS	
BLOWS/FT.	DENSITY
0-4	V.LOOSE
4-10	LOOSE
10-30	COMPACT
30-50	DENSE
>50	V.DENSE

COHESIVE SOILS	
BLOWS/FT.	CONSISTENCY
<2	V.SOFT
2-4	SOFT
4-8	FIRM
8-15	STIFF
15-30	V.STIFF
>30	HARD

SOIL COMPONENT

DESCRIPTIVE TERM	PROPORTION OF TOTAL
"TRACE"	0-10%
"SOME"	10-20%
"ADJECTIVE" (eg SANDY, SILTY)	20-35%
"AND"	35-50%

SOIL CONTAINING THREE COMPONENTS EACH OF WHICH COMPRISE AT LEAST 25% OF THE TOTAL ARE CLASSIFIED AS "A WELL-GRADED MIXTURE OF"

Notes:

Total Volatile Organic Compounds (TVOC) measured w/ PID Model:
TVOC Background: ppm
Weather: Sunny
Temperature:

McPHAIL ASSOCIATES, LLC
2269 MASSACHUSETTS AVENUE
CAMBRIDGE, MA 02140
TEL: 617-868-1420
FAX: 617-868-1423

Project:	Elm Place	**Job #:**	7046
Location:	21 Elm Place	**Date Started:**	8-26-20
City/State:	Swampscott, MA	**Date Finished:**	8-26-20

Boring No.

B-4

Contractor: Geologic
Driller/Helper: Paul/Jay
Logged By/Reviewed By: J. Finney
Surface Elevation (ft): 31.7

Casing Type/Depth (ft): 4" Casing
Casing Hammer (lbs)/Drop (in): 300lb/24in
Sampler Size/Type: 2' Split Spoon
Sampler Hammer (lbs)/Drop (in): 140lb/30in

Groundwater Observations

Date	Depth	Elev.	Notes

Depth (ft)	Elev. (ft)	Symbol	Depth/EL to Strata Change (ft)	Stratum	Sample N-Value	Sample TVOC (ppm)	Sample No.	Sample Pen./Rec. (in)	Sample Depth (ft)	Sample Blows Per 6"	Sample Description and Boring Notes
			0.4 / 31.3	ASPHALT							
1	31			FILL	18		S1	18/6	0.5-2.0	16 9 10	Compact, black to dark-brown, SILTY SAND, some gravel, w/ brick, ash & cinders (FILL).
2	30										
3	29				45		S2	24/8	2.0-4.0	6 19 26 18	Dense, dark-brown to tan, gravelly SILTY SAND (FILL).
4	28		4.0 / 27.7								
5	27			MARINE DEPOSIT	32		S3	24/12	4.0-6.0	10 15 17 18	Dense, dark-brown, SAND, trace gravel, trace silt (MARINE DEPOSIT).
6	26										
7	25										
8	24										
9	23				21		S4	24/6	9.0-11.0	11 10 11 11	Compact, dark-brown, GRAVELLY SAND, trace silt (MARINE DEPOSIT).
10	22										
11	21										
12	20										
13	19										
14	18										
15	17				21		S5	24/6	14.0-16.0	12 10 11 12	Compact, dark-brown to rust-brown, GRAVELLY SAND, trace silt (MARINE DEPOSIT).
16	16										
17	15										
18	14										
19	13										
20	12				26		S6	24/24	19.0-21.0	12 13 13 13	Compact, blue-gray, SAND and SILT, some clay (MARINE DEPOSIT).
21	11		21.0 / 10.7								
22	10			Bottom of borehole 21 feet below ground surface.							
	9										

GRANULAR SOILS	
BLOWS/FT.	DENSITY
0-4	V.LOOSE
4-10	LOOSE
10-30	COMPACT
30-50	DENSE
>50	V.DENSE

COHESIVE SOILS	
BLOWS/FT.	CONSISTENCY
<2	V.SOFT
2-4	SOFT
4-8	FIRM
8-15	STIFF
15-30	V.STIFF
>30	HARD

SOIL COMPONENT

DESCRIPTIVE TERM	PROPORTION OF TOTAL
"TRACE"	0-10%
"SOME"	10-20%
"ADJECTIVE" (eg SANDY, SILTY)	20-35%
"AND"	35-50%

SOIL CONTAINING THREE COMPONENTS EACH OF WHICH COMPRISE AT LEAST 25% OF THE TOTAL ARE CLASSIFIED AS "A WELL-GRADED MIXTURE OF"

Notes:

Total Volatile Organic Compounds (TVOC) measured w/ PID Model:
TVOC Background: ppm
Weather: Sunny
Temperature:

McPHAIL ASSOCIATES, LLC
2269 MASSACHUSETTS AVENUE
CAMBRIDGE, MA 02140
TEL: 617-868-1420
FAX: 617-868-1423

Project: Elm Place
Location: 21 Elm Place
City/State: Swampscott, MA

Job #: 7046
Date Started: 6-26-20
Date Finished: 6-26-20

Boring No.
B-5

Contractor: Geologic
Driller/Helper: Paul/Jay
Logged By/Reviewed By: J. Finney
Surface Elevation (ft): 31.5

Casing Type/Depth (ft): 3" Casing
Casing Hammer (lbs)/Drop (in): 300lb/24in
Sampler Size/Type: 2' Split Spoon
Sampler Hammer (lbs)/Drop (in): 140lb/30in

Groundwater Observations

Date	Depth	Elev.	Notes

Depth (ft)	Elev. (ft)	Symbol	Depth/EL to Strata Change (ft)	Stratum	Sample N-Value	Sample TVOC (ppm)	Sample No.	Sample Pen./Rec. (in)	Sample Depth (ft)	Sample Blows Per 6"	Sample Description and Boring Notes
	31		0.4 / 31.1	ASPHALT							
1	30			FILL	32		S1	18/8	0.5-2.0	17 16 32	Dense, black to brown, SANDY GRAVEL varying to SAND, some gravel, trace silt (FILL).
2	29				12		S2	24/8	2.0-4.0	6 7 5 3	Compact, black to brown, SANDY GRAVEL varying to SAND, some gravel, some silt w/ brick, ash & cinders (FILL).
3	28										
4	27		4.0 / 27.5	MARINE DEPOSIT	27		S3	24/3	4.0-6.0	16 13 14 14	Compact, brown to tan, SAND, some silt, trace gravel (MARINE DEPOSIT).
5	26										
6	25										
7	24										
8	23										
9	22				19		S4	24/12	9.0-11.0	6 10 9 9	Compact, brown to tan, SAND, some silt, trace gravel (MARINE DEPOSIT).
10	21										
11	20										
12	19										
13	18										
14	17				21		S5	24/10	14.0-16.0	8 10 11 11	Compact, brown to tan, SAND and GRAVEL, some silt (MARINE DEPOSIT).
15	16										
16	15										
17	14										
18	13										
19	12				25		S6	24/14	19.0-21.0	11 7 18 23	Compact, brown, SANDY GRAVEL varying to very stiff, blue-gray, SILT, trace clay, trace sand (MARINE DEPOSIT).
20	11										
21	10										
22	9										

GRANULAR SOILS	
BLOWS/FT.	DENSITY
0-4	V.LOOSE
4-10	LOOSE
10-30	COMPACT
30-50	DENSE
>50	V.DENSE

COHESIVE SOILS	
BLOWS/FT.	CONSISTENCY
<2	V.SOFT
2-4	SOFT
4-8	FIRM
8-15	STIFF
15-30	V.STIFF
>30	HARD

SOIL COMPONENT

DESCRIPTIVE TERM	PROPORTION OF TOTAL
"TRACE"	0-10%
"SOME"	10-20%
"ADJECTIVE" (eg SANDY, SILTY)	20-35%
"AND"	35-50%

SOIL CONTAINING THREE COMPONENTS EACH OF WHICH COMPRISE AT LEAST 25% OF THE TOTAL ARE CLASSIFIED AS "A WELL-GRADED MIXTURE OF"

Notes:

Total Volatile Organic Compounds (TVOC) measured w/ PID Model:
TVOC Background: ppm
Weather: Sunny
Temperature:

McPHAIL ASSOCIATES, LLC
2269 MASSACHUSETTS AVENUE
CAMBRIDGE, MA 02140
TEL: 617-868-1420
FAX: 617-868-1423

Project:	Elm Place	**Job #:**	7046
Location:	21 Elm Place	**Date Started:**	6-26-20
City/State:	Swampscott, MA	**Date Finished:**	6-26-20

Boring No.

B-5

Contractor: Geologic
Driller/Helper: Paul/Jay
Logged By/Reviewed By: J. Finney
Surface Elevation (ft): 31.5

Casing Type/Depth (ft): 3" Casing
Casing Hammer (lbs)/Drop (in): 300lb/24in
Sampler Size/Type: 2' Split Spoon
Sampler Hammer (lbs)/Drop (in): 140lb/30in

Groundwater Observations

Date	Depth	Elev.	Notes

Depth (ft)	Elev. (ft)	Symbol	Depth/EL to Strata Change (ft)	Stratum	Sample N-Value	Sample TVOC (ppm)	Sample No.	Sample Pen./Rec. (in)	Sample Depth (ft)	Sample Blows Per 6"	Sample Description and Boring Notes
24	8										
25	7				16		S7	24/20	24.0-26.0	8 9 7 7	Compact, blue-brown, SILTY SAND, trace clay varying to stiff, blue, SILTY CLAY (MARINE DEPOSIT).
26	6										
27	5										
28	4										
29	3										
30	2			MARINE DEPOSIT	11		S8	24/20	29.0-31.0	4 5 6 8	Stiff, blue, CLAY, trace silt, trace gravel (MARINE DEPOSIT).
31	1										
32	0										
33	-1										
34	-2										
35	-3				22		S9	24/24	34.0-36.0	6 9 13 17	Interbedded layers of very stiff, blue-brown, CLAY, some silt, trace sand and compact, brown to tan, SILT and SAND (MARINE DEPOSIT).
36	-4		36.0 / -4.5								
37	-5			Bottom of borehole 36 feet below ground surface.							
38	-6										
39	-7										
40	-8										
41	-9										
42	-10										
43	-11										
44	-12										
45	-13										
	-14										

GRANULAR SOILS	
BLOWS/FT.	DENSITY
0-4	V.LOOSE
4-10	LOOSE
10-30	COMPACT
30-50	DENSE
>50	V.DENSE

COHESIVE SOILS	
BLOWS/FT.	CONSISTENCY
<2	V.SOFT
2-4	SOFT
4-8	FIRM
8-15	STIFF
15-30	V.STIFF
>30	HARD

SOIL COMPONENT

DESCRIPTIVE TERM	PROPORTION OF TOTAL
"TRACE"	0-10%
"SOME"	10-20%
"ADJECTIVE" (eg SANDY, SILTY)	20-35%
"AND"	35-50%

SOIL CONTAINING THREE COMPONENTS EACH OF WHICH COMPRISE AT LEAST 25% OF THE TOTAL ARE CLASSIFIED AS "A WELL-GRADED MIXTURE OF"

Notes:

Total Volatile Organic Compounds (TVOC) measured w/ PID Model:
TVOC Background: ppm
Weather: Sunny
Temperature:

McPHAIL ASSOCIATES, LLC
2269 MASSACHUSETTS AVENUE
CAMBRIDGE, MA 02140
TEL: 617-868-1420
FAX: 617-868-1423

Project: Elm Place
Location: 21 Elm Place
City/State: Swampscott, MA

Job #: 7046
Date Started: 8-24-20
Date Finished: 8-24-20

Boring No.
B-6

Contractor: Geologic
Driller/Helper: Paul/Jay
Logged By/Reviewed By: J. Finney
Surface Elevation (ft): 31.0

Casing Type/Depth (ft): 4" Casing
Casing Hammer (lbs)/Drop (in): 300lb/24in
Sampler Size/Type: 2' Split Spoon
Sampler Hammer (lbs)/Drop (in): 140lb/30in

Groundwater Observations

Date	Depth	Elev.	Notes

Depth (ft)	Elev. (ft)	Symbol	Depth/EL to Strata Change (ft)	Stratum	Sample N-Value	Sample TVOC (ppm)	Sample No.	Sample Pen./Rec. (in)	Sample Depth (ft)	Sample Blows Per 6"	Sample Description and Boring Notes
			0.1 / 30.9	CRUSHED STONE							
1	30			FILL	20		S1	24/18	0.0-2.0	12 12 8 6	Compact, black, SAND and GRAVEL, w/ brick, asphalt, ash & cinders (FILL).
2	29										
3	28				42		S2	24/10	2.0-4.0	3 10 32 16	Dense, black to brown, SAND, some gravel, some silt, w/ asphalt, ash & cinders (FILL).
4	27		4.0 / 27.0								
5	26			MARINE DEPOSIT	14		S3	24/10	4.0-6.0	11 8 6 8	Compact, gray to brown, interbedded layers of SAND, trace silt, trace gravel and sandy SILT, trace gravel (MARINE DEPOSIT).
6	25										
7	24				21		S4	24/18	6.0-8.0	9 9 12 13	Compact, gray to -brown, SAND and GRAVEL to SAND, some silt (MARINE DEPOSIT).
8	23										
9	22				20		S5	24/16	9.0-11.0	6 10 10 11	Compact, gray to brown, interbedded layers of SAND, trace silt, trace gravel and SAND and SILT (MARINE DEPOSIT.
10	21										
11	20										
12	19										
13	18										
14	17				24		S6	24/14	14.0-16.0	8 10 12 12	Compact, gray-brown to tan, SILTY SAND (MARINE DEPOSIT).
15	16										
16	15										
17	14										
18	13										
19	12				23		S7	24/12	19.0-21.0	7 10 13 16	Compact, brown, GRAVELLY SAND (MARINE DEPOSIT).
20	11										
21	10		21.0 / 10.0								
22	9			Bottom of borehole 21 feet below ground surface.							

GRANULAR SOILS	
BLOWS/FT.	DENSITY
0-4	V.LOOSE
4-10	LOOSE
10-30	COMPACT
30-50	DENSE
>50	V.DENSE

COHESIVE SOILS	
BLOWS/FT.	CONSISTENCY
<2	V.SOFT
2-4	SOFT
4-8	FIRM
8-15	STIFF
15-30	V.STIFF
>30	HARD

SOIL COMPONENT

DESCRIPTIVE TERM	PROPORTION OF TOTAL
"TRACE"	0-10%
"SOME"	10-20%
"ADJECTIVE" (eg SANDY, SILTY)	20-35%
"AND"	35-50%

SOIL CONTAINING THREE COMPONENTS EACH OF WHICH COMPRISE AT LEAST 25% OF THE TOTAL ARE CLASSIFIED AS "A WELL-GRADED MIXTURE OF"

Notes:

Total Volatile Organic Compounds (TVOC) measured w/ PID Model:
TVOC Background: ppm
Weather: Sunny
Temperature:

McPHAIL ASSOCIATES, LLC
2269 MASSACHUSETTS AVENUE
CAMBRIDGE, MA 02140
TEL: 617-868-1420
FAX: 617-868-1423

Project:	Elm Place	**Job #:**	7046
Location:	21 Elm Place	**Date Started:**	8-25-20
City/State:	Swampscott, MA	**Date Finished:**	8-25-20

Boring No.

B-7

Contractor: Geologic
Driller/Helper: Paul/Jay
Logged By/Reviewed By: J. Finney
Surface Elevation (ft): 31.8

Casing Type/Depth (ft): 4" Casing
Casing Hammer (lbs)/Drop (in): 300lb/24in
Sampler Size/Type: 2' Split Spoon
Sampler Hammer (lbs)/Drop (in): 140lb/30in

Groundwater Observations

Date	Depth	Elev.	Notes
8-24-20	8	23.8	

Depth (ft)	Elev. (ft)	Symbol	Depth/EL to Strata Change (ft)	Stratum	Sample N-Value	Sample TVOC (ppm)	Sample No.	Sample Pen./Rec. (in)	Sample Depth (ft)	Sample Blows Per 6"	Sample Description and Boring Notes
1	31		0.1 / 31.7	CRUSHED STONE	29		S1	24/10	0.0-2.0	11 15 14 7	Compact, black to brown, SAND and GRAVEL, trace silt, w/ brick, ash & cinders (FILL).
2	30			FILL							
3	29				9		S2	24/2	2.0-4.0	6 5 4 7	Loose, black to brown, SAND, some silt, some gravel, w/ ash & cinders (FILL).
4	28		4.0 / 27.8								
5	27				40		S3	24/12	4.0-6.0	9 16 24 26	Dense, dark-brown to tan-brown, GRAVELLY SAND, trace silt (MARINE DEPOSIT).
6	26										
7	25										
8	24										
9	23				20		S4	24/10	9.0-11.0	9 9 11 8	Compact, brown, interbedded layers of SAND and GRAVEL varying to SAND, some silt (MARINE DEPOSIT).
10	22										
11	21										
12	20										
13	19			MARINE DEPOSIT							
14	18										
15	17				18		S5	24/16	14.0-16.0	6 4 6 9	Stiff, light-brown to tan, interbedded layers of SANDY SILT and SILTY SAND (MARINE DEPOSIT).
16	16										
17	15										
18	14										
19	13										
20	12				18		S6	24/8	19.0-21.0	7 8 10 9	Compact, light-brown to tan, interbedded layers of SILTY SAND and GRAVELLY SAND (MARINE DEPOSIT).
21	11										
22	10										
	9										

GRANULAR SOILS	
BLOWS/FT.	DENSITY
0-4	V.LOOSE
4-10	LOOSE
10-30	COMPACT
30-50	DENSE
>50	V.DENSE

COHESIVE SOILS	
BLOWS/FT.	CONSISTENCY
<2	V.SOFT
2-4	SOFT
4-8	FIRM
8-15	STIFF
15-30	V.STIFF
>30	HARD

SOIL COMPONENT

DESCRIPTIVE TERM	PROPORTION OF TOTAL
"TRACE"	0-10%
"SOME"	10-20%
"ADJECTIVE" (eg SANDY, SILTY)	20-35%
"AND"	35-50%

SOIL CONTAINING THREE COMPONENTS EACH OF WHICH COMPRISE AT LEAST 25% OF THE TOTAL ARE CLASSIFIED AS "A WELL-GRADED MIXTURE OF"

Notes:

Total Volatile Organic Compounds (TVOC) measured w/ PID Model:
TVOC Background: ppm
Weather: Sunny
Temperature:

McPHAIL ASSOCIATES, LLC
2269 MASSACHUSETTS AVENUE
CAMBRIDGE, MA 02140
TEL: 617-868-1420
FAX: 617-868-1423

Project:	Elm Place	**Job #:**	7046
Location:	21 Elm Place	**Date Started:**	8-25-20
City/State:	Swampscott, MA	**Date Finished:**	8-25-20

Boring No.

B-7

Contractor: Geologic
Driller/Helper: Paul/Jay
Logged By/Reviewed By: J. Finney
Surface Elevation (ft): 31.8

Casing Type/Depth (ft): 4" Casing
Casing Hammer (lbs)/Drop (in): 300lb/24in
Sampler Size/Type: 2' Split Spoon
Sampler Hammer (lbs)/Drop (in): 140lb/30in

Groundwater Observations

Date	Depth	Elev.	Notes
8-24-20	8	23.8	

Depth (ft)	Elev. (ft)	Symbol	Depth/EL to Strata Change (ft)	Stratum	Sample N-Value	Sample TVOC (ppm)	Sample No.	Sample Pen./Rec. (in)	Sample Depth (ft)	Sample Blows Per 6"	Sample Description and Boring Notes
24	8										
25	7				6		S7	24/10	24.0-26.0	3 3 3 3	Firm, blue, CLAY, some silt (MARINE DEPOSIT).
26	6										
27	5										
28	4										
29	3										
30	2				10		S8	24/16	29.0-31.0	6 7 3 6	Stiff, blue, CLAY, some silt (MARINE DEPOSIT).
31	1										
32	0			MARINE DEPOSIT							
33	-1										
34	-2										
35	-3				14		S9	24/16	34.0-36.0	5 4 10 5	Stiff, blue, CLAY, some silt (MARINE DEPOSIT).
36	-4										
37	-5										
38	-6										
39	-7										
40	-8				7		S10	24/24	39.0-41.0	3 4 3 5	Firm, blue, CLAY, trace silt (MARINE DEPOSIT).
41	-9		41.0 / -9.2								
42	-10			Bottom of borehole 41 feet below ground surface.							
43	-11										
44	-12										
45	-13										
	-14										

GRANULAR SOILS	
BLOWS/FT.	DENSITY
0-4	V.LOOSE
4-10	LOOSE
10-30	COMPACT
30-50	DENSE
>50	V.DENSE

COHESIVE SOILS	
BLOWS/FT.	CONSISTENCY
<2	V.SOFT
2-4	SOFT
4-8	FIRM
8-15	STIFF
15-30	V.STIFF
>30	HARD

SOIL COMPONENT

DESCRIPTIVE TERM	PROPORTION OF TOTAL
"TRACE"	0-10%
"SOME"	10-20%
"ADJECTIVE" (eg SANDY, SILTY)	20-35%
"AND"	35-50%

SOIL CONTAINING THREE COMPONENTS EACH OF WHICH COMPRISE AT LEAST 25% OF THE TOTAL ARE CLASSIFIED AS "A WELL-GRADED MIXTURE OF"

Notes:

Total Volatile Organic Compounds (TVOC) measured w/ PID Model:
TVOC Background: ppm
Weather: Sunny
Temperature:

McPHAIL ASSOCIATES, LLC
2269 MASSACHUSETTS AVENUE
CAMBRIDGE, MA 02140
TEL: 617-868-1420
FAX: 617-868-1423

Project: Elm Place
Location: 21 Elm Place
City/State: Swampscott, MA

Job #: 7046
Date Started: 8-25-20
Date Finished: 8-25-20

Boring No.
B-8

Contractor: Geologic
Driller/Helper: Paul/Jay
Logged By/Reviewed By: J. Finney
Surface Elevation (ft): 32.1

Casing Type/Depth (ft): 4" Casing
Casing Hammer (lbs)/Drop (in): 300lb/24in
Sampler Size/Type: 2' Split Spoon
Sampler Hammer (lbs)/Drop (in): 140lb/30in

Groundwater Observations

Date	Depth	Elev.	Notes
8-26-20	4	28.1	

Depth (ft)	Elev. (ft)	Symbol	Depth/EL to Strata Change (ft)	Stratum	Sample N-Value	Sample TVOC (ppm)	Sample No.	Sample Pen./Rec. (in)	Sample Depth (ft)	Sample Blows Per 6"	Sample Description and Boring Notes
1	31			FILL	9		S1	24/8	0.0-2.0	6 5 3 3	Loose, black to orange-brown, SAND and GRAVEL, trace silt, w/ brick (FILL).
2	30		2.0 / 30.1								
3	29				9		S2	24/12	2.0-4.0	4 4 5 8	Loose, light-brown to tan-brown, interbedded layers of SAND, trace silt, trace gravel varying to SILTY SAND (MARINE DEPOSIT).
4	28										
5	27				31		S3	24/10	4.0-6.0	14 14 17 18	Dense, brown, SAND and GRAVEL, trace silt (MARINE DEPOSIT).
6	26										
7	25										
8	24										
9	23				32		S4	24/12	9.0-11.0	11 13 19 13	Dense, brown to tan-brown, SAND, some gravel, trace silt (MARINE DEPOSIT).
10	22										
11	21			MARINE DEPOSIT							
12	20										
13	19										
14	18				19		S5	24/16	14.0-16.0	7 9 10 10	Compact, light-brown to dark-brown, SILTY SAND varying to SAND, some silt, trace gravel (MARINE DEPOSIT).
15	17										
16	16										
17	15										
18	14										
19	13				19		S6	24/22	19.0-21.0	7 7 12 15	Stiff, blue, CLAY and SILT varying to compact, brown to tan-brown, SILTY SAND (MARINE DEPOSIT).
20	12										
21	11		21.0 / 11.1	Bottom of borehole 21 feet below ground surface.							
22	10										

GRANULAR SOILS	
BLOWS/FT.	DENSITY
0-4	V.LOOSE
4-10	LOOSE
10-30	COMPACT
30-50	DENSE
>50	V.DENSE

COHESIVE SOILS	
BLOWS/FT.	CONSISTENCY
<2	V.SOFT
2-4	SOFT
4-8	FIRM
8-15	STIFF
15-30	V.STIFF
>30	HARD

SOIL COMPONENT

DESCRIPTIVE TERM	PROPORTION OF TOTAL
"TRACE"	0-10%
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Notes:

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