FINAL FOUNDATION ENGINEERING REPORT

LEICESTER SCHOOL

LEICESTER, MASSACHUSETTS

JANUARY 8, 2020

Prepared For:

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PROJECT NO. 6743.2.01

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Finegold Alexander Architects
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Attention: Ms. Regan Shields Ives

Reference: Leicester School; Leicester, Massachusetts
Final Foundation Engineering Report

Ladies and Gentlemen:

This report documents the results of our subsurface exploration programs and final foundation design study for the Leicester School project to be located at 70 Winslow Avenue in Leicester, Massachusetts. Refer to the Project Location Plan (**Figure 1**) for the general site location.

This report was prepared in accordance with our proposal dated October 9, 2019, and the subsequent authorization of Finegold Alexander Architects (FAA). These services are subject to the limitations contained in **Appendix A**.

Purpose and Scope

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

Foundation design includes foundation support of the proposed structure and its lowest level slab, treatment of the lowest level slab 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). Construction considerations relating to geotechnical aspects of the proposed project are also presented herein.

Available Information

Information available to McPhail Associates, LLC (McPhail) for use in the preparation of this report included the following:

- An electronic version of the Site Civil plans prepared by Nitsch Engineering, Inc. (Nitsch) dated December 4, 2019, downloaded from the project SharePoint site;

- An electronic version of the Landscape plans prepared by Warner Larson Landscape Architects (WLLA) dated December 4, 2019, downloaded from the project SharePoint site; and

- Various architectural plans and layouts available on the project SharePoint site.

Elevations referenced herein are in feet and are referenced to the North American Vertical Datum of 1988 (NAVD 88).

Existing and Proposed Conditions

The proposed school building will be located in the area north of the existing Leicester Middle School, which fronts onto Winslow Avenue to the south, and south of the existing Leicester High School, which fronts onto Paxton Street to the west. The existing school buildings are generally surrounded by bituminous concrete paved parking lots and roadways with landscaped margins. Grassed athletic fields occupy the majority of the remaining site area and a pond is located at the southeast corner of the site. The remainder of the site is generally bordered by wooded areas and/or residential properties. The Leicester Senior Center borders the site to the southeast.

It is understood that the proposed project scope will include demolition of the existing middle school building and construction of a new pre-kindergarten to 8th grade school. The proposed building is understood to be an at-grade three-story, steel-framed structure with a plan area of approximately 69,000 square-feet (SF). The first floor slab will be at Elevation +994. The northwest and southwest portions of the proposed building will contain classroom wings. Between the two wings will be a landscaped outdoor learning area. The proposed grading within and around the building footprint will generally require cuts of about 1 to 3 feet, except within the southwest wing where fills of up to about 7 feet will be required to raise the grade for the proposed slab.

Ground surface across the project site generally slopes downward from north to south by approximately 20 to 60 feet in elevation. The proposed location of the new school building is primarily within a slightly sloping, existing grassed area on the northwestern portion of the site. Existing ground surface across the proposed building footprint generally slopes downward from north to south from about Elevation +995 to Elevation +992, and locally downward from east to west within the southwestern wing from about Elevation +991 to Elevation +987. To the north of the proposed building the grade continues to slope upward.

The northeast portion of the site is occupied by the existing football field and track which are generally level at about Elevation +1000. The southeast portion of the site is occupied by a baseball field which is generally level at approximately Elevation +967. The southwestern portion of the site, the area occupied by the existing school and surrounding parking areas, generally slopes downward from the north at about +990 to the south at about Elevation +970 to Elevation +980. West of the existing school the grade slopes downward from west to east to about Elevation +950.

Surrounding the proposed building, the site will be regraded to facilitate the construction of a perimeter access road, asphalt-paved parking areas and a courtyard area consisting of landscaped and hardscaped portions. It is understood that a proposed below-grade storage tank will be located north of the proposed building.

Additionally, the proposed construction will include renovation of the existing track and football field, enlargement and reconstruction of the baseball field, construction of tennis courts, and other site improvements such as construction of play equipment. Lastly, new stormwater infiltration systems will be built at the project site as well. The proposed site work will typically necessitate cuts and fills on the order of 1 to 3 feet except to the north of the enlarged baseball field where cuts of up to 16 feet will be required to construct a site retaining wall.

Subsurface Exploration Program

Two (2) phases of subsurface explorations consisting of a total of sixteen (16) borings, five (5) hand auger explorations, and nine (9) test pits were completed at the site. The borings were performed by Technical Drilling Services (TDS) of Sterling, Massachusetts, under contract to McPhail. The hand auger explorations were performed by McPhail. The test pits were performed by the Leicester Department of Public Works (LDPW), which were observed by McPhail.

Approximate plan locations of the borings, hand auger explorations, and test pits are as indicated on the enclosed Subsurface Exploration Plan, **Figure 2**. Boring and test pit logs prepared by McPhail are contained in **Appendix B** and **Appendix C**, respectively. These explorations included the following:

- Eight (8) borings, MA-1 through MA-8, conducted on March 5 and 6, 2019;
- Eight (8) borings, MA-101 through MA-108, conducted on December 5 and 6, 2019;
- Four (4) hand auger explorations, H-1 through H-4, conducted on December 6, 2019; and
- Nine (9) test pits, TP-1 through TP-9, conducted on December 5 and 6, 2019.

Borings were performed utilizing track-mounted drilling equipment. Each boring was advanced using 2.25-inch inner diameter hollow-stem augers. Standard 2-inch O.D. split-spoon samples and standard penetration tests (SPT) were generally obtained at 5-foot intervals of depth in accordance with the standard procedures in ASTM D1586. The borings were terminated at depths ranging from 10 to 27 feet below the existing ground surface.

Test pits were performed utilizing a rubber-tired backhoe with a toothed bucket. The test pit locations were provided by the project Site/Civil Engineer for the purposes of stormwater

infiltration design. The test pits were terminated at depths ranging from 4.5 to 14 feet below existing ground surface.

Hand auger explorations were performed in locations provided by the project Landscape Architect for the purposes of determining the thickness of and obtaining samples of the topsoil. Additionally, samples of the topsoil layer were obtained from select test pit locations. Samples of the topsoil layer were submitted for laboratory analysis, as described below.

To permit monitoring of groundwater levels in the general vicinity of the proposed building, groundwater observation wells were installed in completed boreholes MA-104 and MA-106. Installation details of the observation wells are indicated on the boring logs contained in **Appendix B**. Groundwater Monitoring Reports are presented in **Appendix D**.

The explorations were observed by a representative of McPhail who performed field layout, prepared field logs, obtained and visually classified soil samples, monitored groundwater conditions in the borings and groundwater observation wells, and made minor adjustments to the exploration locations and determined the required exploration depths based upon the actual subsurface conditions encountered.

Field locations of the borings and the ground surface elevation at each boring location completed during the initial subsurface exploration program were determined by survey by Nitsch Engineering. Field locations of the borings and test pits at each exploration location completed during the supplemental subsurface exploration program were determined by taping from existing site features identified on the existing site conditions plan. The existing ground surface elevation at each exploration location completed during the supplemental program determined by linear interpolation based on elevations indicated on the existing conditions plan prepared by Nitsch.

Laboratory Testing

At the completion of the subsurface exploration programs, soil samples were returned to our laboratory for more detailed classification, analysis, and testing. The laboratory testing consisted of sieve analyses to determine the grain size distribution and confirm the visual classifications of the fill and glacial till deposits. Laboratory test procedures were in general accordance with applicable ASTM Standards. Results of the gradation testing appear on **Figure 3** and **Figure 4** following the text of this report.

Nine (9) samples of topsoil were submitted to the UMass Extension Soil and Plant Nutrient Testing Laboratory for routine and organic matter analysis. Results of the testing are contained in **Appendix E**.

Subsurface Conditions

A detailed description of the subsurface conditions encountered within the borings and test pits is documented on the boring and test pit logs contained in **Appendix B** and **Appendix C**, respectively. Based on these explorations, the following is a description of the generalized subsurface conditions encountered across the site from ground surface downward.

Within the explorations, a surficial layer of topsoil was observed which ranged from 0.3- to 1-foot in thickness. The topsoil generally consists of a very loose, dark brown silt and sand with trace gravel and with root matter. Samples of the topsoil were taken from multiple exploration locations at the request of the Landscape Architect and sent to a laboratory for routine and organic matter analysis. A summary table of the observed thickness of the topsoil layer at each requested location is contained in **Appendix E**.

Underlying the surficial layer of topsoil, the borings encountered fill soil which extends to depths of about 2 to 7 feet below ground surface. The fill generally consists of a loose to dense, dark brown to orange-brown silt and sand with trace to some gravel varying to a gravelly sand with trace to some silt. The fill also contains trace amounts of root matter and clay and, as noted on the test pit logs, contains cobbles as well. Furthermore, the fill within boring MA-6 was also observed to contain a trace of brick and ash. Grain size distributions of samples of the fill are shown on **Figure 3**. Based on a comparison of the grain size distributions of the fill and underlying glacial till deposit, the fill observed in the borings appears to primarily consist of reworked natural glacial till.

A historic topsoil/subsoil layer was encountered underlying the fill within boring MA-1 at an approximate depth of 4 feet below the existing ground surface, extending to the glacial till deposit at a depth of approximately 6 feet. The historic topsoil/subsoil layer was generally observed to consist of a loose, black-brown sandy silt with trace gravel and some root matter.

Underlying the fill and/or historic topsoil/subsoil, a natural glacial till deposit was encountered within each test pit and boring, with the exception of test pit TP-1, at depths of 1.5 to 7 feet below grade. Furthermore, within the vicinity of the proposed building, the natural glacial till deposit was observed generally to vary from about Elevation +991.4 to about Elevation +985.8 except within the southwestern wing of the building where it was observed at Elevation +982. The glacial till deposit was observed to generally consist of a compact to very dense, brown to orange-brown to gray silt and sand with trace to some gravel and trace clay varying to a silty sand with some to trace gravel and trace clay. Additionally, the glacial till deposit was observed to contain cobbles and boulders. Grain size distributions of samples of the glacial till deposit are shown on **Figure 4**.

Borings MA-1, MA-2, MA-6 through MA-8, and MA-101 through MA-108 were terminated in the glacial till deposit at depths of 10 to 27 feet below ground surface. Borings MA-3 through MA-5 were terminated upon auger or split spoon refusal, which is generally assumed to be indicative of cobbles or boulders within the glacial till deposit or potentially

the underlying bedrock surface, at approximate depths varying from 11.5 to 14.7 feet below ground surface.

Groundwater was observed in borings MA-1, MA-3 through MA-6, MA-104, and MA-107 upon completion of drilling at approximate depths ranging from about 6 to 8 feet below ground surface. Groundwater was observed in test pits TP-1 through TP-9 upon completion of excavation at approximate depths ranging from about 4 to 14 feet. Groundwater was not encountered in borings MA-2, MA-101 through MA-103, MA-105, and MA-108 upon completion of drilling.

In addition, stabilized groundwater measurements recorded in the observation wells installed in completed borings MA-104 and MA-106, which are located in the proposed building footprint, indicate that the groundwater level ranges from 1 to 4.8 feet below existing ground surface, corresponding to between approximately Elevation +992.5 and Elevation +988.9. Groundwater Monitoring Reports are presented in **Appendix D**.

Due to the high fines content (i.e. silt and clay) of the fill and glacial till deposits, it is anticipated that groundwater is seasonally perched on the surface of the relatively impervious fill and glacial till deposits. Additionally, 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 to existing grading and drainage in the vicinity of the site.

Foundation Design Recommendations

Based on the scope of the proposed development 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

Footings are recommended to bear on the natural, undisturbed glacial till deposit, or on imported Gravel Borrow that is placed and compacted over the natural glacial till deposit. For design purposes, the footings should be proportioned utilizing a maximum design bearing pressure of two (2) tons per square-foot (tsf). All foundations should be designed in accordance with the Code. Recommended minimum footing widths for continuous and isolated spread footings are 24 and 36 inches, respectively. It is noted that "thickened slabs", which are designed to support interior walls, are considered to be footings for the purposes of the recommendations contained herein.

All footings in unheated areas should be provided with a minimum 4-foot thickness of soil cover as frost protection. Interior foundations should be located such that the top of the

foundation concrete is a minimum of six (6) inches below the underside of the lowest level slab.

All foundations should be located such that they bear below a theoretical line drawn upward and outward at 2 to 1 (horizontal to vertical) from the bottom exterior edge of all adjacent footings, structures and utilities.

Based on the results of the explorations, the surface of the natural glacial till deposit generally varies across the proposed building footprint from about Elevation +982 to Elevation +991. Where the surface of the natural glacial till deposit is located below the design bottom of footing elevation, the existing fill will need to be removed and Gravel Borrow will need to be placed and compacted for support of the footings. In consideration of the proposed lowest level slab elevation, the anticipated depth of the footings, and the elevation of the natural glacial till deposit encountered in the explorations, it is anticipated that up to four (4) feet of Gravel Borrow may be required for support of footings at various locations in the building, except at the southwestern wing, where up to ten (10) feet of Gravel Borrow may be required for support of interior footings.

Fill material should be removed at footing locations and within the lateral limits defined herein for the placement of Gravel Borrow. Where proposed footings are to be supported on Gravel Borrow, 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 glacial till deposit, plus two (2) feet in all plan directions. Gravel Borrow should consist of an off-site well-graded natural sand and gravel containing less than eight (8) percent passing the No. 200 sieve.

All Gravel Borrow placed within the footprint of the proposed building for support of the footings and slab-on-grade should be placed in lifts having a compacted thickness of six (6) inches and be compacted to a minimum of 95 percent of its maximum modified Proctor dry density. The placement and compaction of Gravel Borrow should be monitored by a Registered Professional Engineer or his designated representative in accordance with the provisions of the Code.

It is noted that depending on the time of the year when construction is performed, groundwater is anticipated to 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 the existing fill and glacial till soils in the building footprint, the exposed glacial till 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.

The on-site fill and glacial till are not recommended to be reused on-site for support of the proposed footings or slabs due to the high fines content and the perched groundwater level. It is anticipated that portions of the excavated soils may be re-used on-site as ordinary fill, provided they are maintained in a dry condition and can be properly compacted. Reuse of

the on-site soil as ordinary fill outside the building footprint is discussed in more detail in the "Geotechnical Construction Considerations" section of this report.

Slab Recommendations

The proposed lowest level slab at Elevation +994 should be designed as a conventional soil-supported slab-on-grade underlain by a polyethylene vapor barrier spread over a minimum 9-inch thickness of ¾-inch Crushed Stone overlying a single thickness of filter fabric such as Mirafi 140N or equivalent.

Preparation of the building pad should include the removal of all topsoil from the entire proposed building footprint. The soil below the Crushed Stone layer should consist of either proof-rolled existing fill material, the natural glacial till, or imported Gravel Borrow that is placed and compacted over the proof-rolled existing fill material or glacial till to raise the grade to the bottom of the Crushed Stone layer.

Groundwater Considerations

As indicated above, groundwater measurements recorded in the observation wells installed in completed borings MA-104 and MA-106, which are located in the proposed building footprint, indicate that the groundwater level ranges from approximately Elevation +992.5 to Elevation +988.9. The observed groundwater level is noted to be below the proposed lowest level slab. However, surface water runoff that infiltrates into the ground could become perched in the fill or glacial till deposits at a shallow depth below the proposed building.

Therefore, it is recommended that the proposed slab be provided with underslab foundation drainage to protect it against groundwater intrusion. The underslab drainage system should consist of 4-inch diameter perforated PVC pipes embedded within the 9-inch layer of ¾-inch crushed stone and have the highest invert a minimum of 12 inches below the underside of the lowest level slab. It is recommended that the pipes be surrounded by a minimum 6-inch thickness of ¾-inch crushed stone surrounded by a thickness of filter fabric such as Mirafi 140N, or equivalent. The underslab drains should drain by gravity to a storm drain line which is not subject to surcharge.

To minimize the amount of water that is introduced into the foundation drainage system, it is recommended that area drains, roof drains and down sprouts be tied into a dedicated solid pipe that has a separate connection with the storm drain system. No area drains or roof drains should be directly connected with the foundation drain pipe or tied into the surrounding crushed stone layer. Furthermore, the finished exterior grade should be pitched away from the proposed building to promote surface runoff away from the building.

Furthermore, in consideration of the existing slope located to the north of the proposed building, it is recommended that the site design incorporate provisions to collect and/or divert surface water run-off away from the proposed building. Specifically, it is recommended that the project Site/Civil Engineer design a drainage system along the north

side of the building to capture and divert groundwater and/or surface water runoff around the proposed building to a storm drain line that is not subject to surcharge. It is anticipated that the drainage system could potentially consist of a trench with Crushed Stone encapsulated in filter fabric with perforated piping.

All localized depressions in the lowest level slab (such as elevator pits, etc.) should be provided with properly tied continuous waterstops in all construction joints and membrane waterproofing to protect against groundwater intrusion. Furthermore, the perimeter below-grade foundation walls should receive a troweled-on bitumastic damp proofing.

General Foundation Recommendations

It is understood that the proposed site grade to the west of the southwestern wing of the building will be at approximately Elevation +987, sloping up to approximately Elevation +992 to the east. As such, it is recommended that the perimeter walls around the southwestern wing be designed as unrestrained or cantilevered, retaining walls to allow backfilling to occur within the proposed building footprint up to the proposed slab at Elevation +994. The cantilevered retaining walls should be backfilled with a minimum 12-inch wide layer of Crushed Stone surrounded by separation fabric in conjunction with a perimeter foundation drain located around the interior of the foundation wall to prevent hydrostatic pressures from acting on the walls. The perimeter drainage should consist of a 4-inch diameter perforated PVC pipe located within the 12-inch wide Crushed Stone layer with its invert located not more than 1-foot above the exterior finished ground surface. The perimeter drainage pipes and Crushed Stone surrounding the pipes should be contiguous with the 9-inch thick Crushed Stone drainage layer below the lowest level slab. The perimeter drain should be gravity-drained, with backflow protection, to a storm drain line that is not subject to surcharge.

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 for a level backfill condition. To these values must be added the pressures attributable to earthquake forces per Section 1610.2 of the Code.

Lateral forces can be considered to be transmitted from the structure to the soil by passive pressure against the foundation walls utilizing an equivalent fluid density of 120 pounds per cubic-foot providing that the walls are designed to resist these pressures. Lateral force can also be considered to be transmitted from the structures to the soil by friction on the base of footings using a coefficient of 0.35, to which a safety factor of 1.5 should be applied.

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.

Geotechnical Site Considerations

The major geotechnical site considerations are anticipated to include site grading, site retaining walls, preparation of hardscape subgrades, and installation of the proposed below-grade storage tank.

Site Grading

Due to the high fines content of the fill and glacial till deposits, it is anticipated that groundwater is seasonally perched at shallow depths below ground surface on the surface of the relatively impervious fill and glacial till deposits. As such, the proposed grading and site drainage should promote positive drainage.

Additionally, due to the high fines content of the fill and glacial till deposits, the site unreinforced slope surfaces may become unstable in the presence of water. Note that shallow surficial slope failures and/or surficial erosion could occur locally if sufficient vegetation (i.e. grass or other plantings) is not established on the proposed slopes. Erosion control material, such as Flexterra HP-FGM, should be applied to the slopes if they will be left unplanted for an extended period of time.

Furthermore, groundwater break-out through slopes may occur. Groundwater break-out through the slope or surface water runoff could also cause local areas of slope instability which should be addressed on a case-by-case basis. To reduce the impacts of surface water runoff on a slope, a collection trench could be constructed parallel to the top of the slope and consist of an approximately 1-foot wide trench that is encapsulated with filter fabric and backfilled with ¾-inch crushed stone. A 6-inch diameter perforated PVC pipe would be placed in the trench which would be directed to a storm drain.

Site Retaining Walls

Cantilevered site retaining walls should be backfilled with free-draining material and provided with weep holes spaced at maximum 10-foot centers. Crushed Stone surrounded by filter fabric should be provided at each weep hole. In conclusion, the results of the slope stability analyses indicate a minimum FOS of 1.5 for the proposed conditions which include a surcharge load from the proposed footings.

It is understood that the current design for the new baseball field will necessitate the construction of a site retaining wall that will retain up to approximately 16 feet of soil. Since the field will effectively be benched into the existing slope, the global stability of the slope and retaining wall should be analyzed during the design phase to confirm that the proposed construction does not result in an unacceptable factor of safety for slope failure. Furthermore, the temporary extents of the excavation required to construct the proposed retaining wall could also result in slope stability issues which should be analyzed.

Preparation of Hardscaped Areas

Preparation of subgrades for hardscape areas such as bituminous asphalt paved areas or concrete walkways should include the removal of all existing site improvements and the surficial deposit of topsoil. The exposed fill subgrade should be proof-rolled with at least four (4) passes of a 10,000-pound drum roller prior to the placement of any fill. All soft or compressible areas detected by the proof-rolling should be excavated and be replaced with compacted ordinary fill.

Specific recommendations regarding subbase materials below sidewalks, bituminous concrete, playing fields, and landscaped areas should be provided by the Project Site/Civil Engineer or Landscape Architect.

Below-Grade Storage Tank

It is recommended that the below-grade storage tank be designed to resist hydrostatic uplift pressure based on a recommended design groundwater level corresponding to the finished ground surface. This will likely require that a hold-down slab or mat be constructed below the proposed tank.

Geotechnical Construction Considerations

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

On-Site Reuse of Excavated Soils

As described above, grain size distributions of representative samples of the fill material indicate that the fines content (i.e. silt and clay) ranges from about 24 to 46 percent. In addition, grain size distributions of representative samples of the glacial till deposit indicate that the fines content ranges from about 34 to 51 percent. Due to the fines content of the on-site soils, excavated material may become unsuitable for re-use if it is not covered and becomes too wet to be properly compacted. Furthermore, when the on-site material is wet it is susceptible to freezing which may also prevent it from being acceptable for on-site reuse. 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 on-site fill and glacial till are not recommended to be reused on-site for support of the proposed footings or slabs due to the high fines content and shallow groundwater. It is anticipated that portions of the excavated soils may be re-used on-site as ordinary fill to raise site grades, provided they are maintained in a dry condition and can be properly compacted. It is possible that layers of Gravel Borrow or Crushed Stone may need interbedded in the fill to maintain its usability depending on the excavated soils moisture content.

It is emphasized that excavated material will become unsuitable for re-use if it becomes 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, due to any of the above conditions, the excavated material is unsuitable for reuse, an off-site Gravel Borrow should be used. Protection of excavated materials from increases in moisture content is considered to be the responsibility of the Contractor.

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 glacial till 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 fill and glacial till 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 is believed to be perched on the surface of the relatively impervious fill and glacial till deposits which will further exacerbate the disturbance of the glacial till 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.

Footing and Slab Subgrade Preparation and Protection

Prior to construction of the proposed building, it is recommended that the surficial layer of topsoil and all utilities within the footprint of the proposed structure be removed in their entirety. 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.
As indicated above, the proposed footings are recommended to bear directly on the natural glacial till deposit or on compacted Gravel Borrow placed over the natural glacial till deposit following the removal of the existing uncontrolled fill. The existing fill located below the footings, and within the zone of influence of the footings, will need to be excavated and imported Gravel Borrow placed and compacted for support of the footings. Where the depth from the design bottom of footing to the glacial till subgrade is 12 inches or less, ¾-inch Crushed Stone could be used in lieu of Gravel Borrow. Crushed Stone should be placed in lifts having a maximum compacted thickness of six (6) inches.

The glacial till subgrade and all footing bearing surfaces should be prepared utilizing a smooth-edged or "toothless" excavator bucket to avoid disturbance of the subgrade or should be hand-cleared of loose and disturbed material. It is noted that the exposed natural glacial till 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 prevent 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 glacial till subgrade if water is present. If excavation or subgrade preparation work is performed in below-freezing temperatures, the fill and glacial till 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. 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.

Off-Site Removal of Excess Soil

Worcester County has well documented levels of naturally occurring arsenic in soil and rock which can exceed DEP standards. 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.

Final Comments

It is recommended that McPhail be retained to provide final design assistance to the design team during the design phase of this project. The purpose of our involvement would be to prepare the foundation drainage plan; review the structural foundation drawings, landscape plans and civil drawings for conformance with the recommendations presented herein; and, to prepare the earthwork specification section for inclusion into the Contract Documents for construction.

Additionally, it is recommended that McPhail be retained during the construction period to observe preparation of the foundation bearing surfaces and slab subgrade, construction dewatering, and the placement and compaction of all building-related fill materials 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

Christopher P. Miller

Jonathan W. Patch, P.E.

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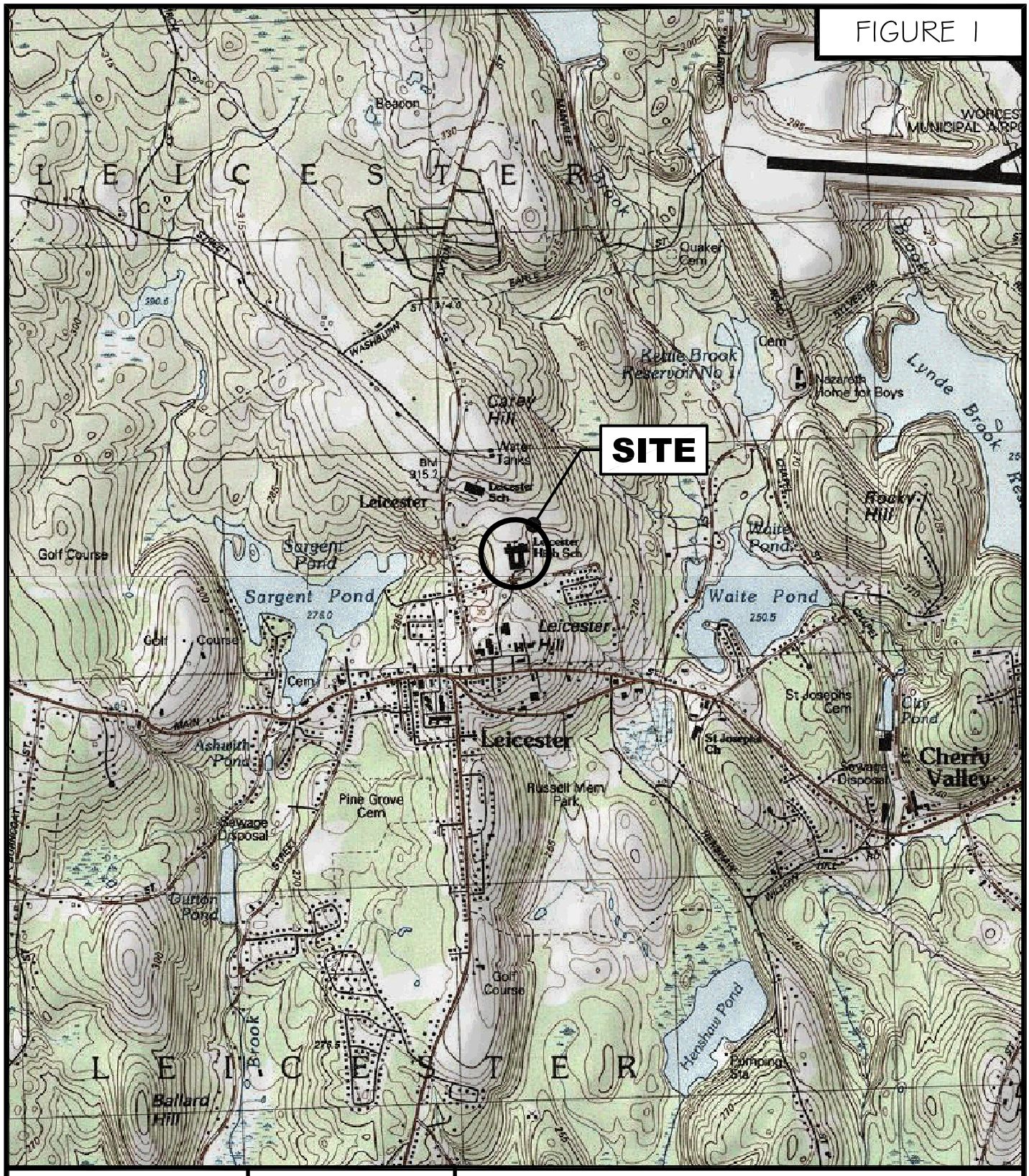
CPM/jwp

FIGURE 1



McPHAIL ASSOCIATES, LLC
Geotechnical and Geoenvironmental Engineers
2269 Massachusetts Avenue
Cambridge, MA 02140
617/868-1420
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www.mcphailgeo.com

N

SCALE 1:25,000

PROJECT LOCATION PLAN

LEICESTER SCHOOL

LEICESTER MASSACHUSETTS

LEICESTER HIGH SCHOOL

EXISTING LEICESTER MIDDLE SCHOOL

WINSLOW AVENUE

NORTH

TP-1

MA-4 (+984.6)

MA-101 (+986.7)

TP-2 (+991.4)

MA-5 (+991.3)

MA-102 (+991.0)

MA-103 (+991.2)

MA-105 (+990.2)

MA-6 (+988.2)

APPROXIMATE LIMITS OF PROPOSED BUILDING L.L.S. EL.,+994

MA-104 (OW) (+989.7)

TP-4 (+988.6)

MA-107 (+982.0)

TP-3 (+989.0)

MA-108 (+990.5)

MA-3 (+983.5)

MA-106 (OW) (+985.8)

MA-2 (+987.8)

TP-5

TP-6

TP-7

TP-8

TP-9

MA-1

MA-7

MA-8

H-1

H-2

H-3

H-4

#16 MAG N: 2917169.0989 E: 546680.4751 EL: 992.643

#12 MAG SET N: 2916991.2390 E: 546741.0506 EL: 982.086

#18 DH SET N: 2916828.2109 E: 546599.4862 EL: 989.023

#17 SPK N: 2916788.0980 E: 546474.7886 EL: 988.491

#9 MAG SET N: 2916586.4740 E: 546824.6603 EL: 979.302

#8 MAG N: 2916520.9160 E: 546528.8898 EL: 986.201

#10 MAG SET N: 2916821.9976 E: 546770.6031 EL: 987.462

#11 MAG N: 2916354.4824

#13 MAG SET N: 2917427.7958 E: 546727.9904 EL: 1006.475

1656.84' S76°47'27"W

#14 MAG SET N: 2916538.9009 E: 547251.7868 EL: 955.816

LEGEND

- — APPROXIMATE LOCATION TEST PIT PERFORMED BY LEICESTER DPW ON DECEMBER 5 AND 6, 2019 FOR OTHERS
- — APPROXIMATE LOCATION HAND AUGER PERFORMED BY McPHAIL ASSOCIATES, LLC ON DECEMBER 6, 2019
- — APPROXIMATE LOCATION BORING PERFORMED BY TECHNICAL DRILLING SERVICES, INC. ON DECEMBER 5 AND 6, 2019 FOR McPHAIL ASSOCIATES, LLC
- — APPROXIMATE LOCATION BORING PERFORMED BY TECHNICAL DRILLING SERVICES, INC. ON MARCH 5 AND 6, 2019 FOR McPHAIL ASSOCIATES, LLC

(+999.0) — INDICATES ELEVATION OF GLACIAL TILL ENCOUNTERED

REFERENCE: THIS PLAN WAS PREPARED FROM A 20-SCALE DRAWING ENTITLED, "EXISTING CONDITIONS PLAN" TRANSMITTED TO McPHAIL ASSOCIATES, LLC ON APRIL 1, 2019 BY NITSCH ENGINEERING, INC. AND A 50-SCALE DRAWING ENTITLED, "OVERALL LANDSCAPE SITE PLAN" DATED NOVEMBER 27, 2019 PREPARED BY FINEGOLD ALEXANDER ARCHITECTS

GRAPHIC SCALE

50 0 50 100 200

McPHAIL ASSOCIATES, LLC
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Cambridge, MA 02140
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617/868-1423 (Fax)
www.mcphailgeo.com

LEICESTER SCHOOL

LEICESTER MASSACHUSETTS

SUBSURFACE EXPLORATION PLAN

FOR

FINEGOLD ALEXANDER ARCHITECTS

BY

McPHAIL ASSOCIATES, LLC

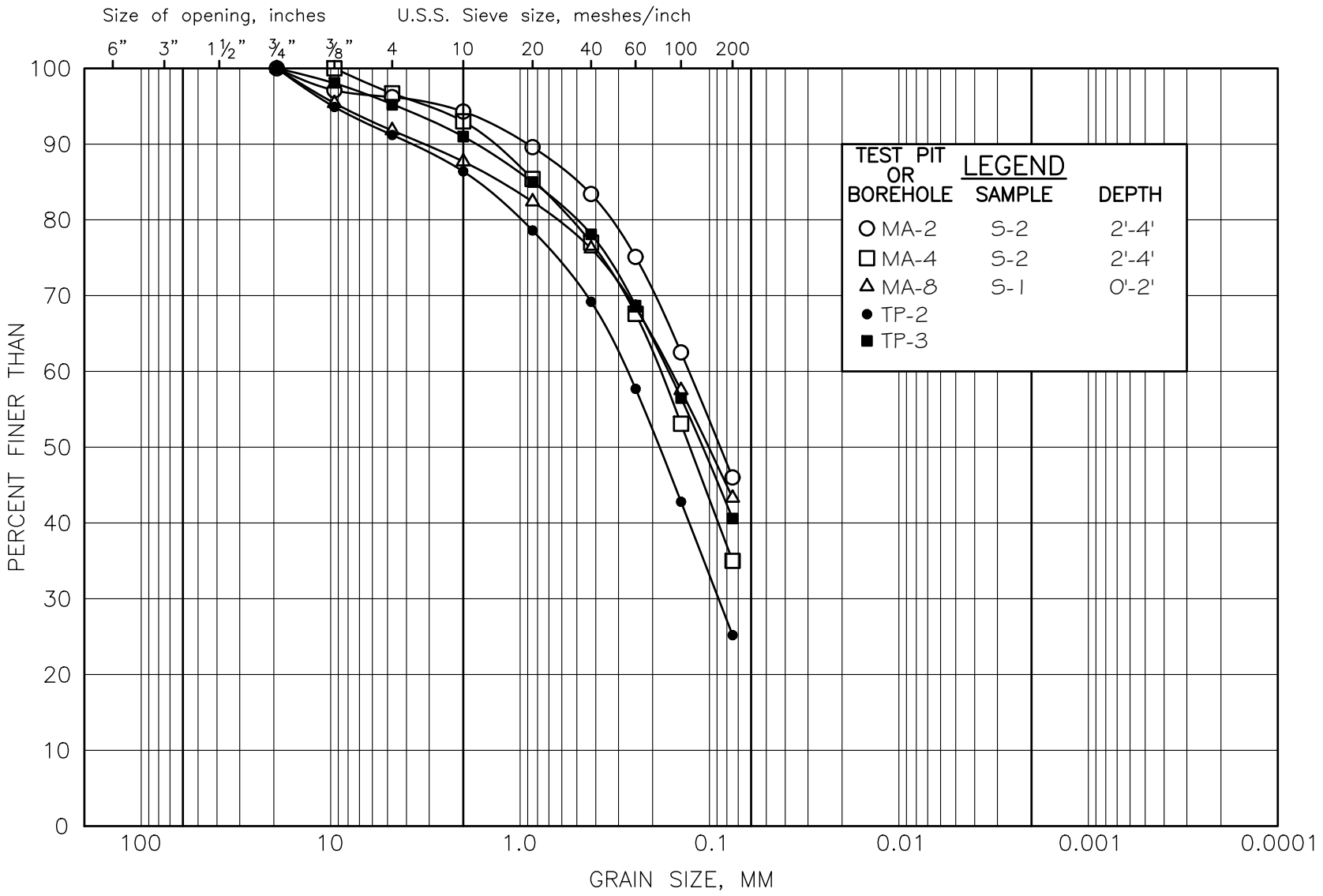
Date: JANUARY 2020	Dwn: F.G.P.	Chkd: C.P.M.	Scale: 1" = 50'
Project No: 6743			FIGURE 2

FILE NAME: N:\Acad\JOBS\6743\FIFERS\6743-FIG2rev1.dwg

FILE NAME: N:\Acad\JOBS\6743\FFER\6743-F03_Sieve.dwg

PROJECT No. 6743

M.I.T. GRAIN SIZE SCALE



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

McPHAIL ASSOCIATES, LLC

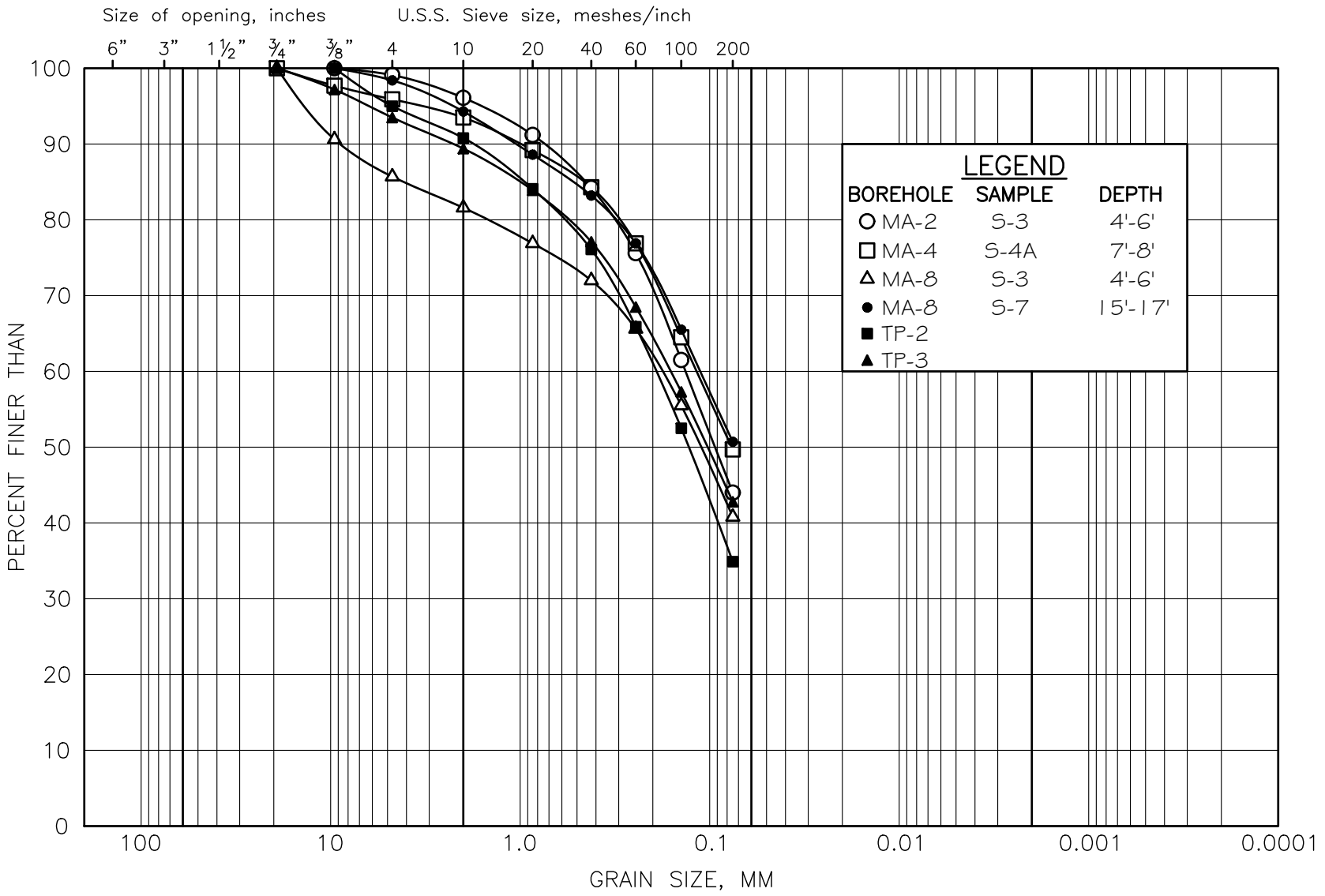
GRAIN SIZE DISTRIBUTION
FILL

FIGURE 3

FILE NAME: N:\Acad\JOBS\6743\FFER\6743-F04_Sieve.dwg

PROJECT No. 6743

M.I.T. GRAIN SIZE SCALE



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

McPHAIL ASSOCIATES, LLC

GRAIN SIZE DISTRIBUTION
GLACIAL TILL

FIGURE 4

APPENDIX A:

LIMITATIONS

LIMITATIONS

This report has been prepared on behalf of and for the exclusive use of Finegold Alexander Architects for specific application to the proposed new Leicester School in Leicester, 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 MA-1 THROUGH MA-8 AND MA-101 THROUGH MA-108 PREPARED BY MCPHAIL ASSOCIATES, LLC

Project: Leicester School
Location: 70 Winslow Avenue
City/State: Leicester, MA

Job #: 6743.2.00
Date Started: 3-6-19
Date Finished: 3-6-19

Boring No.

MA-1

Contractor: Technical Drilling Services
Driller/Helper: Brett/Donnie
Logged By/Reviewed By: K. Seaman
Surface Elevation (ft): 967.5

Casing Type: 4 1/2" HSA
Casing Hammer (lbs)/Drop (in): N/A
Sampler Size/Type: 24" Split Spoon
Sampler Hammer (lbs)/Drop (in): 140LB/30"

Groundwater Observations

Date	Depth	Elev.	Notes
3-6-19	6.0	961.5	

Depth (ft)	Elev. (ft)	Symbol	Depth/EL to Strata Change (ft)	Stratum	Sample N-Value / RQD	Sample No.	Sample Pen./Rec. (in)	Sample Depth (ft)	Sample Blows/6" / Min/ft	Sample Description and Boring Notes
1	967			FILL	46	S1	12/11	0.0-1.0	21 25	Dense, light brown to orange, SAND, trace silt. (Fill)
2	966				76	S1A	12/11	1.0-2.0	41 35	Very dense, orange to gray, GRAVELLY SAND, some silt. (Fill)
3	965				40	S2	24/8	2.0-4.0	17 22 18 19	Dense, brown to gray, SILTY SAND and GRAVEL. (Fill)
4	964		4.0 / 963.5							
5	963			HISTORIC TOPSOIL/SUBSOIL	9	S3	24/10	4.0-6.0	3 3 6 15	Loose, black-brown, SAND SILT, trace gravel, with some root matter. (Historic Topsoil/Subsoil)
6	962		6.0 / 961.5							
7	961			GLACIAL TILL	33	S4	24/4	6.0-8.0	22 18 15 17	Dense, gray, SILTY SAND, some gravel. (Glacial Till)
8	960				10	S5	24/10	8.0-10.0	10 5 5 9	Compact, brown to gray-brown, SILT and SAND, some gravel. (Glacial Till)
9	959				16	S6	24/12	10.0-12.0	10 10 6 5	Compact, brown to gray-brown, SILT and SAND, some gravel. (Glacial Till)
10	958				18	S7	24/12	12.0-14.0	7 7 11 14	Compact, brown to gray-brown, SILT and SAND, some gravel. (Glacial Till)
11	957									
12	956									
13	955									
14	954									
15	953									
16	952									
17	951									
18	950									
19	949									
20	948		20.0 / 947.5							
21	947			GLACIAL TILL	28	S8	24/6	20.0-22.0	9 12 16 18	Compact, gray, SILT and SAND, some gravel. (Glacial Till)
22	946									
	945									

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:

Weather: Partly Cloudy

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

Project: Leicester School
Location: 70 Winslow Avenue
City/State: Leicester, MA

Job #: 6743.2.00
Date Started: 3-6-19
Date Finished: 3-6-19

Boring No.

MA-1

Contractor: Technical Drilling Services
Driller/Helper: Brett/Donnie
Logged By/Reviewed By: K. Seaman
Surface Elevation (ft): 967.5

Casing Type: 4 1/2" HSA
Casing Hammer (lbs)/Drop (in): N/A
Sampler Size/Type: 24" Split Spoon
Sampler Hammer (lbs)/Drop (in): 140LB/30"

Groundwater Observations

Date	Depth	Elev.	Notes
3-6-19	6.0	961.5	

Depth (ft)	Elev. (ft)	Symbol	Depth/EL to Strata Change (ft)	Stratum	Sample N-Value / RQD	Sample No.	Sample Pen./Rec. (in)	Sample Depth (ft)	Sample Blows/6" / Min/ft	Sample Description and Boring Notes
24	944									
25	943			GLACIAL TILL						
26	942				18	S9	24/2	25.0-27.0	5 9 9 9	Compact, gray, SILT and SAND, trace gravel. (Glacial Till)
27	941		27.0 / 940.5							
28	940			Bottom of boring at 27 feet below ground surface.						
29	939									
30	938									
31	937									
32	936									
33	935									
34	934									
35	933									
36	932									
37	931									
38	930									
39	929									
40	928									
41	927									
42	926									
43	925									
44	924									
45	923									
	922									

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:

Weather: Partly Cloudy

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

Project: Leicester School
Location: 70 Winslow Avenue
City/State: Leicester, MA

Job #: 6743.2.00
Date Started: 3-6-19
Date Finished: 3-6-19

Boring No.

MA-2

Contractor: Technical Drilling Services
Driller/Helper: Brett/Donnie
Logged By/Reviewed By: K. Seaman
Surface Elevation (ft): 991.8

Casing Type: 4 1/2" HSA
Casing Hammer (lbs)/Drop (in): N/A
Sampler Size/Type: 24" Split Spoon
Sampler Hammer (lbs)/Drop (in): 140LB/30"

Groundwater Observations

Date	Depth	Elev.	Notes

Depth (ft)	Elev. (ft)	Symbol	Depth/EL to Strata Change (ft)	Stratum	Sample N-Value / RQD	Sample No.	Sample Pen./Rec. (in)	Sample Depth (ft)	Sample Blows/6" / Min/ft	Sample Description and Boring Notes
1	991			FILL	17	S1	24/20	0.0-2.0	15 11 6 9	Compact, brown, SAND, some silt, trace root matter and gravel. (Fill)
2	990									
3	989				28	S2	24/22	2.0-4.0	14 13 15 15	Compact, brown, SILT and SAND, trace gravel. (Fill)
4	988		4.0 / 987.8							
5	987			GLACIAL TILL	14	S3	24/18	4.0-6.0	4 6 8 12	Compact, brown to tan, SILT and SAND, some gravel. (Glacial Till)
6	986									
7	985				20	S4	24/16	6.0-8.0	7 9 11 10	Compact, brown to tan, SAND, some silt, trace gravel (Glacial Till)
8	984									
9	983				20	S5	24/20	8.0-10.0	6 7 13 20	Compact, brown to tan, SAND, some silt and gravel. (Glacial Till)
10	982									
11	981									
12	980									
13	979				51	S6	24/10	12.0-14.0	16 25 26 32	Very dense, gray, SILTY SAND, some gravel. (Glacial Till)
14	978		14.0 / 977.8							
15	977			Bottom fo borehole 14' below ground surface.						
16	976									
17	975									
18	974									
19	973									
20	972									
21	971									
22	970									
	969									

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:
No groundwater observed.

Weather: Clear

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

Project: Leicester School
Location: 70 Winslow Avenue
City/State: Leicester, MA

Job #: 6743.2.00
Date Started: 3-5-19
Date Finished: 3-5-19

Boring No.

MA-3

Contractor: Technical Drilling Services
Driller/Helper: Brett/Donnie
Logged By/Reviewed By: C. Miller
Surface Elevation (ft): 987.5

Casing Type: 4 1/2" HSA
Casing Hammer (lbs)/Drop (in): N/A
Sampler Size/Type: 24" Split Spoon
Sampler Hammer (lbs)/Drop (in): 140LB/30"

Groundwater Observations

Date	Depth	Elev.	Notes
3-5-19	6.0	981.5	

Depth (ft)	Elev. (ft)	Symbol	Depth/EL to Strata Change (ft)	Stratum	Sample N-Value / RQD	Sample No.	Sample Pen./Rec. (in)	Sample Depth (ft)	Sample Blows/6" / Min/ft	Sample Description and Boring Notes
1	987			FILL	24	S1	18/16	0.0-1.5	13 13 11	Compact, dark brown, SILT and SAND, trace gravel. (Fill)
2	986				20	S1A	6/6	1.5-2.0	10	Compact, light brown, SAND and GRAVEL, some silt. (Fill)
3	985				19	S2	24/23	2.0-4.0	5 9 10 14	Compact, light brown/orange-brown, SILTY SAND, trace gravel. (Fill)
4	984		4.0 / 983.5							
5	983			GLACIAL TILL	18	S3	24/24	4.0-6.0	6 8 10 12	Compact, light brown, SILTY SAND, some gravel. (Glacial Till)
6	982									
7	981				28	S4	24/16	6.0-8.0	10 13 15 17	Compact, light brown/orange-brown, SILTY SAND, some gravel. (Glacial Till)
8	980									
9	979				30	S5	24/20	8.0-10.0	5 12 18 22	Dense, orange-brown, SILTY SAND, some gravel, occasional cobbles. (Glacial Till)
10	978									
11	977									
12	976									
13	975									
14	974				24	S6	20/11	13.0-14.7	8 16 8 100/2"	Dense, orange-brown, SILTY SAND, some gravel, occasional cobbles. (Glacial Till) Split spoon refusal at 14.7' below ground surface.
15	973		14.7 / 972.8							
16	972			Bottom of borehole 14.7' below ground surface.						
17	971									
18	970									
19	969									
20	968									
21	967									
22	966									
	965									

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:
Frost from 0'-1.25' below ground surface.

Weather: Clear

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

Project: Leicester School
Location: 70 Winslow Avenue
City/State: Leicester, MA

Job #: 6743.2.00
Date Started: 3-5-19
Date Finished: 3-5-19

Boring No. MA-4

Contractor: Technical Drilling Services
Driller/Helper: Brett/Donnie
Logged By/Reviewed By: C. Miller
Surface Elevation (ft): 991.6

Casing Type: 4 1/2" HSA
Casing Hammer (lbs)/Drop (in): N/A
Sampler Size/Type: 24" Split Spoon
Sampler Hammer (lbs)/Drop (in): 140LB/30"

Groundwater Observations			
Date	Depth	Elev.	Notes
3-5-19	8.0	983.6	

Depth (ft)	Elev. (ft)	Symbol	Depth/EL to Strata Change (ft)	Stratum	Sample N-Value / RQD	Sample No.	Sample Pen./Rec. (in)	Sample Depth (ft)	Sample Blows/6" / Min/ft	Sample Description and Boring Notes
1	991			FILL	25	S1	24/22	0.0-2.0	13 13 12 12	Compact, gray brown/brown SILTY SAND, some gravel. (Fill)
2	990									
3	989				16	S2	24/17	2.0-4.0	7 9 7 5	Compact, light brown, SILTY SAND, trace gravel. (Fill)
4	988									
5	987				5	S3	24/16	4.0-6.0	4 3 2 2	Loose, brown, SILTY SAND, trace gravel. (Fill)
6	986									
7	985		7.0 / 984.6		7	S4	12/8	6.0-7.0	2 5	Loose, brown, SILTY SAND, trace gravel. (Fill)
8	984			GLACIAL TILL	53	S4A	12/11	7.0-8.0	12 41	Very dense, orange brown, SILT and SAND, trace gravel. (Glacial Till) Mottling at approximately 7' below ground surface.
9	983				70	S5	24/18	8.0-10.0	11 35 35 59	Very dense, orange brown, SILT and SAND, trace gravel. (Glacial Till)
10	982									
11	981									
12	980				122	S6	19/12	11.0-12.6	90 71 51 100/1"	Very dense, orange brown, SILTY SAND, some gravel, with occasional cobbles. (Glacial Till) Auger refusal 11' below ground surface. Split spoon refusal 12.6' below ground surface.
13	979		12.6 / 979.0	Bottom of borehole 12.6' below ground surface.						
14	978									
15	977									
16	976									
17	975									
18	974									
19	973									
20	972									
21	971									
22	970									
	969									

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:

Weather: Clear

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

Project: Leicester School
Location: 70 Winslow Avenue
City/State: Leicester, MA

Job #: 6743.2.00
Date Started: 3-5-19
Date Finished: 3-5-19

Boring No.

MA-5

Contractor: Technical Drilling Services
Driller/Helper: Brett/Donnie
Logged By/Reviewed By: C. Miller
Surface Elevation (ft): 996.3

Casing Type: 4 1/2" HSA
Casing Hammer (lbs)/Drop (in): N/A
Sampler Size/Type: 24" Split Spoon
Sampler Hammer (lbs)/Drop (in): 140LB/30"

Groundwater Observations

Date	Depth	Elev.	Notes
3-5-19	8.0	988.3	

Depth (ft)	Elev. (ft)	Symbol	Depth/EL to Strata Change (ft)	Stratum	Sample N-Value / RQD	Sample No.	Sample Pen./Rec. (in)	Sample Depth (ft)	Sample Blows/6" / Min/ft	Sample Description and Boring Notes
0	996									
1	995			FILL	19	S1	24/24	0.0-2.0	13 12 7 8	Compact, brown, SILTY SAND, some gravel, trace root matter. (Fill)
2	994									
3	993				18	S2	24/22	2.0-4.0	7 7 11 9	Compact, gray brown/orange brown, SILTY SAND, trace gravel. (Fill)
4	992									
5	991		5.0 / 991.3		20	S3	24/24	4.0-6.0	8 9 11 14	Compact, gray brown, SILTY SAND, some gravel. (Fill)
6	990			GLACIAL TILL	39	S4	24/24	6.0-8.0	19 19 20 22	Dense, gray brown, SILTY SAND, some gravel. (Glacial Till)
7	989									
8	988				30	S5	24/24	8.0-10.0	11 12 18 26	Dense, gray brown, SILTY SAND, some gravel. (Glacial Till)
9	987									
10	986				114/11"	S6	17/12	10.0-11.4	11 14 100/5"	Very dense, gray/orange brown, SILTY SAND, some gravel, with occasional cobbles. (Glacial Till) Auger refusal 11.5' below ground surface.
11	985		11.5 / 984.8							
12	984			Bottom of borehole 11.5' below ground surface.						
13	983									
14	982									
15	981									
16	980									
17	979									
18	978									
19	977									
20	976									
21	975									
22	974									

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:

Weather: Clear

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

Project: Leicester School
Location: 70 Winslow Avenue
City/State: Leicester, MA

Job #: 6743.2.00
Date Started: 3-6-19
Date Finished: 3-6-19

Boring No.

MA-6

Contractor: Technical Drilling Services
Driller/Helper: Brett/Donnie
Logged By/Reviewed By: K. Seaman
Surface Elevation (ft): 993.2

Casing Type: 4 1/2" HSA
Casing Hammer (lbs)/Drop (in): N/A
Sampler Size/Type: 24" Split Spoon
Sampler Hammer (lbs)/Drop (in): 140LB/30"

Groundwater Observations

Date	Depth	Elev.	Notes
3-6-19	6.0	987.2	

Depth (ft)	Elev. (ft)	Symbol	Depth/EL to Strata Change (ft)	Stratum	Sample N-Value / RQD	Sample No.	Sample Pen./Rec. (in)	Sample Depth (ft)	Sample Blows/6" / Min/ft	Sample Description and Boring Notes
0	993									
1	992			FILL	14	S1	24/14	0.0-2.0	12 7 7 6	Compact, brown, SAND, some silt, trace gravel, brick and ash. (Fill)
2	991									
3	990				17	S2	24/12	2.0-4.0	5 8 9 21	Compact, gray, SAND, some clay, silt, and gravel. (Fill)
4	989									
5	988		5.0 / 988.2		34	S3	24/14	4.0-6.0	10 10 24 23	Dense, gray, SILTY SAND, some clay and gravel. (Fill)
6	987			GLACIAL TILL						
7	986				41	S4	24/12	6.0-8.0	18 18 23 23	Dense, gray, SILTY SAND, some clay and gravel. (Glacial Till)
8	985									
9	984									
10	983									
11	982				55	S5	24/6	10.0-12.0	29 30 25 29	Very dense, gray, SILTY SAND, some clay and gravel. (Glacial Till)
12	981		12.0 / 981.2	Bottom of borehole 12' below ground surface.						
13	980									
14	979									
15	978									
16	977									
17	976									
18	975									
19	974									
20	973									
21	972									
22	971									

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:

Weather: Clear

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

Project: Leicester School
Location: 70 Winslow Avenue
City/State: Leicester, MA

Job #: 6743.2.00
Date Started: 3-6-19
Date Finished: 3-6-19

Boring No.

MA-7

Contractor: Technical Drilling Services
Driller/Helper: Brett/Donnie
Logged By/Reviewed By: K. Seaman
Surface Elevation (ft): 1000.6

Casing Type: 4 1/2" HSA
Casing Hammer (lbs)/Drop (in): N/A
Sampler Size/Type: 24" Split Spoon
Sampler Hammer (lbs)/Drop (in): 140LB/30"

Groundwater Observations

Date	Depth	Elev.	Notes
3-6-19	8.0	992.6	

Depth (ft)	Elev. (ft)	Symbol	Depth/EL to Strata Change (ft)	Stratum	Sample N-Value / RQD	Sample No.	Sample Pen./Rec. (in)	Sample Depth (ft)	Sample Blows/6" / Min/ft	Sample Description and Boring Notes
1	1000								15	
				FILL	33	S1	24/20	0.0-2.0	16	Dense, brown, SILT and SAND, some gravel, trace root matter. (Fill)
2	999		2.0 / 998.6						17	
									12	
3	998								7	
					20	S2	24/20	2.0-4.0	9	Compact, brown to gray, SILTY SAND, some gravel. (Glacial Till)
4	997								11	
									11	
5	996									
6	995									
7	994			GLACIAL TILL						
8	993									
									19	
9	992				51	S3	24/4	8.0-10.0	24	Very dense, gray, SILTY SAND, some gravel, trace clay. (Glacial Till)
10	991								27	
									30	
11	990		11.0 / 989.6							
12	989									
13	988									
									10	
14	987				35	S4	24/14	13.0-15.0	16	Dense, gray, SILT and SAND, trace clay and gravel. (Glacial Till)
15	986			GLACIAL TILL					19	
									20	
16	985								8	
					22	S5	24/8	15.0-17.0	10	Compact, gray, SILT and SAND, trace clay and gravel. (Glacial Till)
17	984								12	
									16	
18	983								16	
					41	S6	24/20	17.0-19.0	19	Dense, gray, SILT and SAND, trace clay and gravel. (Glacial Till)
19	982		19.0 / 981.6						22	
									23	
20	981			Bottom of borehole 19' below ground surface.						
21	980									
22	979									
	978									

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:

Weather: Clear

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

Project: Leicester School
Location: 70 Winslow Avenue
City/State: Leicester, MA

Job #: 6743.2.00
Date Started: 3-6-19
Date Finished: 3-6-19

Boring No.

MA-8

Contractor: Technical Drilling Services
Driller/Helper: Brett/Donnie
Logged By/Reviewed By: K. Seaman
Surface Elevation (ft): 1001.0

Casing Type: 4 1/2" HSA
Casing Hammer (lbs)/Drop (in): N/A
Sampler Size/Type: 24" Split Spoon
Sampler Hammer (lbs)/Drop (in): 140LB/30"

Groundwater Observations

Date	Depth	Elev.	Notes

Depth (ft)	Elev. (ft)	Symbol	Depth/EL to Strata Change (ft)	Stratum	Sample N-Value / RQD	Sample No.	Sample Pen./Rec. (in)	Sample Depth (ft)	Sample Blows/6" / Min/ft	Sample Description and Boring Notes
1	1000			FILL	25	S1	24/20	0.0-2.0	13 13 12 10	Compact, brown, SILT and SAND, some gravel. (Fill)
2	999									
3	998				31	S2	24/14	2.0-4.0	13 14 17 37	Dense, brown, SAND, some silt and gravel. (Fill) Auger refusal at 4.3' below ground surface.
4	997		4.0 / 997.0							
5	996			GLACIAL TILL	26	S3	24/10	4.0-6.0	10 12 14 12	Compact, brown to gray, SILT and SAND, some gravel, trace clay. (Glacial Till)
6	995									
7	994				30	S4	24/20	6.0-8.0	25 14 16 17	Compact to dense, gray, SILT and SAND, some gravel, trace clay. (Glacial Till)
8	993									
9	992									
10	991									
11	990									
12	989				28	S5	24/14	11.0-13.0	7 11 17 17	Compact, gray-brown, SILT and SAND, trace clay and gravel. (Glacial Till)
13	988		13.0 / 988.0							
14	987			GLACIAL TILL	43	S6	24/12	13.0-15.0	15 16 27 12	Dense, gray, SILT and SAND, trace clay and gravel. (Glacial Till)
15	986									
16	985				34	S7	24/20	15.0-17.0	13 15 19 21	Dense, gray, SILT and SAND, trace clay and gravel. (Glacial Till)
17	984		17.0 / 984.0							
18	983			Bottom of borehole 17' below ground surface.						
19	982									
20	981									
21	980									
22	979									

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:
No groundwater observed.

Weather: Clear

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

Project: Leicester School
Location: 70 Winslow Avenue
City/State: Leicester, MA

Job #: 6743.2.01
Date Started: 12-6-19
Date Finished: 12-6-19

Boring No.

MA-101

Contractor: TDS
Driller/Helper:
Logged By/Reviewed By: M.WHITE
Surface Elevation (ft): 994.7

Casing Type: 4 1/2" HSA
Casing Hammer (lbs)/Drop (in): N/A
Sampler Size/Type: 24" Split Spoon
Sampler Hammer (lbs)/Drop (in): 140LB/30"

Groundwater Observations

Date	Depth	Elev.	Notes

Depth (ft)	Elev. (ft)	Symbol	Depth/EL to Strata Change (ft)	Stratum	Sample N-Value / RQD	Sample No.	Sample Pen./Rec. (in)	Sample Depth (ft)	Sample Blows/6" / Min/ft	Sample Description and Boring Notes
1	994		0.8 / 993.9	TOPSOIL	34	S1	24/18	0.0-2.0	2 21 13 9	Dense, brown, SAND, some silt, trace gravel. (Fill)
2	993									
3	992				12	S2	24/16	2.0-4.0	5 6 6 6	Compact, brown, SILTY SAND, trace gravel. (Fill)
4	991									
5	990			FILL	2	S3	24/10	4.0-6.0	1 1 1 1	Very loose, brown, SILTY SAND, trace gravel. (Fill)
6	989									
7	988				4	S4	24/20	6.0-8.0	2 2 2 10	Very loose, brown/dark brown, SAND, some silt, trace gravel. (Fill)
8	987		8.0 / 986.7							
9	986				39	S5	24/20	8.0-10.0	10 11 28 33	Dense, brown/gray/red, SILT and SAND, some gravel. (Glacial Till)
10	985			GLACIAL TILL						
11	984				53	S6	24/24	10.0-12.0	21 24 29 37	Very dense, brown, SILT and SAND, some gravel. (Glacial Till)
12	983		12.0 / 982.7							
13	982			Bottom of borehole 12 feet below ground surface.						
14	981									
15	980									
16	979									
17	978									
18	977									
19	976									
20	975									
21	974									
22	973									
	972									

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:

Weather: Cloudy

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

Project: Leicester School
Location: 70 Winslow Avenue
City/State: Leicester, MA

Job #: 6743.2.01
Date Started: 12-5-19
Date Finished: 12-5-19

Boring No.

MA-102

Contractor: TDS
Driller/Helper:
Logged By/Reviewed By: M.WHITE
Surface Elevation (ft): 995.0

Casing Type: 4 1/2" HSA
Casing Hammer (lbs)/Drop (in): N/A
Sampler Size/Type: 24" Split Spoon
Sampler Hammer (lbs)/Drop (in): 140LB/30"

Groundwater Observations

Date	Depth	Elev.	Notes

Depth (ft)	Elev. (ft)	Symbol	Depth/EL to Strata Change (ft)	Stratum	Sample N-Value / RQD	Sample No.	Sample Pen./Rec. (in)	Sample Depth (ft)	Sample Blows/6" / Min/ft	Sample Description and Boring Notes
1	994		0.8 / 994.2	TOPSOIL	8	S1	24/22	0.0-2.0	2 3 5 8	Loose, brown, SILTY SAND, some gravel, with trace roots. (Fill)
2	993			FILL						
3	992				19	S2	24/24	2.0-4.0	6 8 11 15	Compact, brown, SILT and SAND, trace gravel. (Fill)
4	991		4.0 / 991.0							
5	990			GLACIAL TILL	16	S3	24/16	4.0-6.0	5 6 10 14	Compact, brown, SILT and SAND, trace gravel. (Glacial Till)
6	989									
7	988				58	S4	24/24	6.0-8.0	19 27 31 35	Very dense, brown/gray, SILT and SAND, trace gravel. (Glacial Till)
8	987									
9	986				62	S5	24/24	8.0-10.0	24 29 33 32	Very dense, brown/dark brown, SILTY SAND, trace gravel. (Glacial Till)
10	985		10.0 / 985.0							
11	984			Bottom of borehole 10 feet below ground surface.						
12	983									
13	982									
14	981									
15	980									
16	979									
17	978									
18	977									
19	976									
20	975									
21	974									
22	973									

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:

Weather: Cloudy

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

Project: Leicester School
Location: 70 Winslow Avenue
City/State: Leicester, MA

Job #: 6743.2.01
Date Started: 12-5-19
Date Finished: 12-5-19

Boring No.

MA-103

Contractor: TDS
Driller/Helper:
Logged By/Reviewed By: M.WHITE
Surface Elevation (ft): 995.2

Casing Type: 4 1/2" HSA
Casing Hammer (lbs)/Drop (in): N/A
Sampler Size/Type: 24" Split Spoon
Sampler Hammer (lbs)/Drop (in): 140LB/30"

Groundwater Observations

Date	Depth	Elev.	Notes

Depth (ft)	Elev. (ft)	Symbol	Depth/EL to Strata Change (ft)	Stratum	Sample N-Value / RQD	Sample No.	Sample Pen./Rec. (in)	Sample Depth (ft)	Sample Blows/6" / Min/ft	Sample Description and Boring Notes
	995		0.5 / 994.7	TOPSOIL					1	
1	994				9	S1	24/24	0.0-2.0	3 6 7	Loose, brown, SILTY SAND, trace gravel. (Fill)
2	993			FILL					6	
3	992				19	S2	24/16	2.0-4.0	10 9 11	Compact, gray/brown, SILT and SAND, some gravel. (Fill)
4	991		4.0 / 991.2						8	
5	990				26	S3	24/18	4.0-6.0	12 14 14	Compact, brown, SILT and SAND, some gravel. (Glacial Till)
6	989								16	
7	988			GLACIAL TILL	36	S4	24/16	6.0-8.0	17 19 23	Dense, brown/red, SILTY SAND, some gravel. (Glacial Till)
8	987								25	
9	986				59	S5	24/24	8.0-10.0	29 30 35	Very dense, brown/red, SILT and SAND, trace gravel. (Glacial Till)
10	985		10.0 / 985.2	Bottom of borehole 10 feet below ground surface.						
11	984									
12	983									
13	982									
14	981									
15	980									
16	979									
17	978									
18	977									
19	976									
20	975									
21	974									
22	973									

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:

Weather: Partly Cloudy

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

Project: Leicester School
Location: 70 Winslow Avenue
City/State: Leicester, MA

Job #: 6743.2.01
Date Started: 12-6-19
Date Finished: 12-6-19

Boring No. MA-104(OW)

Contractor: TDS
Driller/Helper:
Logged By/Reviewed By: M.WHITE
Surface Elevation (ft): 993.7

Casing Type: 4 1/2" HSA
Casing Hammer (lbs)/Drop (in): N/A
Sampler Size/Type: 24" Split Spoon
Sampler Hammer (lbs)/Drop (in): 140LB/30"

Groundwater Observations			
Date	Depth	Elev.	Notes
12-6-19	6.0	987.7	
1-2-20	4.8	988.9	
1-6-20	1.2	992.5	

Depth (ft)	Elev. (ft)	Symbol	Depth/EL to Strata Change (ft)	Stratum	Sample N-Value / RQD	Sample No.	Sample Pen./Rec. (in)	Sample Depth (ft)	Sample Blows/6" / Min/ft	Sample Description and Boring Notes
1	993		0.5 / 993.2	TOPSOIL	18	S1	24/18	0.0-2.0	3 4 14 15	Compact, brown, SILTY SAND, some gravel. (Fill)
2	992			FILL						
3	991				13	S2	24/14	2.0-4.0	6 6 7 10	Compact, brown, SILTY SAND, trace gravel. (Fill)
4	990		4.0 / 989.7							
5	989			GLACIAL TILL	18	S3	24/20	4.0-6.0	3 7 11 12	Compact, brown, SILT and SAND, some gravel. (Glacial Till)
6	988									
7	987				38	S4	24/24	6.0-8.0	16 17 21 23	Dense, brown, SAND, some silt, trace gravel. (Glacial Till)
8	986									
9	985				43	S5	24/14	8.0-10.0	14 21 22 23	Dense, brown/red, SILT and SAND, trace gravel. (Glacial Till)
10	984									
11	983				31	S6	24/20	10.0-12.0	5 12 19 28	Dense, brown/red, SILT and SAND, some gravel. (Glacial Till)
12	982									
13	981				57	S7	24/24	12.0-14.0	23 27 30 34	Very dense, gray, SANDY SILT, trace gravel. (Glacial Till)
14	980									
15	979				44	S8	24/24	14.0-16.0	12 23 21 25	Dense, gray, SILTY SAND, trace gravel. (Glacial Till)
16	978		16.0 / 977.7							
17	977			Bottom of borehole 16 feet below ground surface.						
18	976									
19	975									
20	974									
21	973									
22	972									
	971									

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:
Installed groundwater observation well with 10' of screen and 5' of solid.

Weather: Cloudy

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

Project: Leicester School
Location: 70 Winslow Avenue
City/State: Leicester, MA

Job #: 6743.2.01
Date Started: 12-5-19
Date Finished: 12-5-19

Boring No.
MA-105

Contractor: TDS
Driller/Helper:
Logged By/Reviewed By: M.WHITE
Surface Elevation (ft): 994.2

Casing Type: 4 1/2" HSA
Casing Hammer (lbs)/Drop (in): N/A
Sampler Size/Type: 24" Split Spoon
Sampler Hammer (lbs)/Drop (in): 140LB/30"

Groundwater Observations

Date	Depth	Elev.	Notes

Depth (ft)	Elev. (ft)	Symbol	Depth/EL to Strata Change (ft)	Stratum	Sample N-Value / RQD	Sample No.	Sample Pen./Rec. (in)	Sample Depth (ft)	Sample Blows/6" / Min/ft	Sample Description and Boring Notes
	994		0.4 / 993.8	TOPSOIL					2	Loose, brown, SILTY SAND, trace gravel. (Fill)
1	993				6	S1	24/18	0.0-2.0	2 4 5	
2	992			FILL					4	Compact, brown, SILTY SAND, trace gravel. (Fill)
3	991				17	S2	24/16	2.0-4.0	7 10 10	
4	990		4.0 / 990.2						6	Dense, brown, SILTY SAND, some gravel. (Glacial Till)
5	989				21	S3	24/12	4.0-6.0	9 12 15	
6	988								18	Dense, brown, SILT and SAND, some gravel. (Glacial Till)
7	987				45	S4	24/24	6.0-8.0	20 25 29	
8	986								10	Dense, brown, SILT and SAND, some gravel. (Glacial Till)
9	985				40	S5	24/14	8.0-10.0	17 23 37	
10	984								17	Very dense, brown, SILTY SAND, trace gravel. (Glacial Till)
11	983				54	S6	24/12	10.0-12.0	23 31 32	
12	982			GLACIAL TILL					43	Very dense, brown./red, SILT and SAND, some gravel. (Glacial Till)
13	981				156	S7	24/10	12.0-14.0	56 100/2"	
14	980								32	Very dense, brown/gray, SILTY SAND, trace gravel. (Glacial Till)
15	979				59	S8	24/24	14.0-16.0	26 33 45	
16	978								28	Very dense, brown/dark brown, SILTY SAND, trace gravel. (Glacial Till)
17	977				75	S9	24/24	16.0-18.0	33 42 50	
18	976								52	Very dense, brown/dark brown, SILTY SAND, trace gravel. (Glacial Till)
19	975				111	S10	24/24	18.0-20.0	50 61 83	
20	974		20.0 / 974.2							
				Bottom of borehole 20 feet below ground surface.						
21	973									
22	972									

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:

Weather: Sunny

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

Project: Leicester School
Location: 70 Winslow Avenue
City/State: Leicester, MA

Job #: 6743.2.01
Date Started: 12-6-19
Date Finished: 12-6-19

Boring No. MA-106(OW)

Contractor: TDS
Driller/Helper:
Logged By/Reviewed By: M.WHITE
Surface Elevation (ft): 991.8

Casing Type: 4 1/2" HSA
Casing Hammer (lbs)/Drop (in): N/A
Sampler Size/Type: 24" Split Spoon
Sampler Hammer (lbs)/Drop (in): 140LB/30"

Groundwater Observations

Date	Depth	Elev.	Notes
12-6-19	5.0	986.8	
1-2-20	1.9	989.9	
1-6-20	1.0	990.8	

Depth (ft)	Elev. (ft)	Symbol	Depth/EL to Strata Change (ft)	Stratum	Sample N-Value / RQD	Sample No.	Sample Pen./Rec. (in)	Sample Depth (ft)	Sample Blows/6" / Min/ft	Sample Description and Boring Notes
			0.5 / 991.3	TOPSOIL						
1	991				18	S1	24/18	0.0-2.0	3 7 11 11	Compact, brown, SAND, some silt, trace gravel. (Fill)
2	990									
3	989			FILL	30	S2	24/10	2.0-4.0	8 18 12 11	Compact, brown, SILTY SAND, some gravel. (Fill)
4	988									
5	987				19	S3	24/4	4.0-6.0	8 10 9 10	Compact, brown, SAND and GRAVEL, some silt. (Fill)
6	986		6.0 / 985.8							
7	985				33	S4	24/12	6.0-8.0	13 15 18 18	Dense, brown, SILTY SAND and GRAVEL. (Glacial Till)
8	984									
9	983			GLACIAL TILL	21	S5	24/24	8.0-10.0	8 9 12 24	Compact, brown, SILTY SAND, trace gravel. (Glacial Till)
10	982									
11	981				60	S6	24/24	10.0-12.0	24 28 32 42	Very dense, gray, SILTY SAND, trace gravel. (Glacial Till)
12	980		12.0 / 979.8							
13	979			Bottom of borehole 12 feet below ground surface.						
14	978									
15	977									
16	976									
17	975									
18	974									
19	973									
20	972									
21	971									
22	970									
	969									

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:
Installed groundwater observation well with 10' of screen and 2' of solid.

Weather: Cloudy

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

Project: Leicester School
Location: 70 Winslow Avenue
City/State: Leicester, MA

Job #: 6743.2.01
Date Started: 12-6-19
Date Finished: 12-6-19

Boring No. MA-107

Contractor: TDS
Driller/Helper:
Logged By/Reviewed By: M.WHITE
Surface Elevation (ft): 988.0

Casing Type: 4 1/2" HSA
Casing Hammer (lbs)/Drop (in): N/A
Sampler Size/Type: 24" Split Spoon
Sampler Hammer (lbs)/Drop (in): 140LB/30"

Groundwater Observations			
Date	Depth	Elev.	Notes
12-6-19	8.0	980.0	

Depth (ft)	Elev. (ft)	Symbol	Depth/EL to Strata Change (ft)	Stratum	Sample N-Value / RQD	Sample No.	Sample Pen./Rec. (in)	Sample Depth (ft)	Sample Blows/6" / Min/ft	Sample Description and Boring Notes
			0.6 / 987.4	TOPSOIL						
1	987				10	S1	24/16	0.0-2.0	2 5 5 4	Loose, brown, SILTY SAND, trace gravel. (Fill)
2	986									
3	985			FILL	7	S2	24/12	2.0-4.0	2 3 4 5	Loose, brown/gray, SILTY SAND, trace gravel. (Fill)
4	984									
5	983				4	S3	24/4	4.0-6.0	2 2 2 2	Loose, brown, SILT and SAND, trace gravel. (Glacial Till)
6	982		6.0 / 982.0							
7	981				4	S4	24/16	6.0-8.0	2 2 2 6	Loose, brown, SILTY SAND, trace gravel. (Glacial Till)
8	980									
9	979			GLACIAL TILL	19	S5	24/18	8.0-10.0	8 8 11 14	Compact, gray/brown, SAND and GRAVEL, some silt. (Glacial Till)
10	978									
11	977				48	S6	24/24	10.0-12.0	30 23 25 25	Dense, gray/brown, SAND, some silt and gravel. (Glacial Till)
12	976		12.0 / 976.0							
				Bottom of borehole 12 feet below ground surface.						
13	975									
14	974									
15	973									
16	972									
17	971									
18	970									
19	969									
20	968									
21	967									
22	966									

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:

Weather: Cloudy

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

Project:	Leicester School	**Job #:**	6743.2.01
Location:	70 Winslow Avenue	**Date Started:**	12-5-19
City/State:	Leicester, MA	**Date Finished:**	12-5-19

Boring No.

MA-108

Contractor: TDS
Driller/Helper:
Logged By/Reviewed By: M.WHITE
Surface Elevation (ft): 992.5

Casing Type: 4 1/2" HSA
Casing Hammer (lbs)/Drop (in): N/A
Sampler Size/Type: 24" Split Spoon
Sampler Hammer (lbs)/Drop (in): 140LB/30"

Groundwater Observations

Date	Depth	Elev.	Notes

Depth (ft)	Elev. (ft)	Symbol	Depth/EL to Strata Change (ft)	Stratum	Sample N-Value / RQD	Sample No.	Sample Pen./Rec. (in)	Sample Depth (ft)	Sample Blows/6" / Min/ft	Sample Description and Boring Notes
0	992		0.6 / 991.9	TOPSOIL					2	Compact, brown, SILT and SAND, some gravel. (Fill)
1	991		2.0 / 990.5	FILL	10	S1	24/22	0.0-2.0	5 5 7	
2	990			GLACIAL TILL	11	S2	24/18	2.0-4.0	5 7 9 10	Compact, brown, SILTY SAND, trace gravel. (Glacial Till)
3	989									
4	988				19	S3	24/24	4.0-6.0	5 8 11 14	Compact, brown, SILTY SAND, trace gravel. (Glacial Till)
5	987									
6	986				56	S4	24/24	6.0-8.0	17 20 36 30	Very dense, brown, SILTY SAND, some gravel. (Glacial Till)
7	985									
8	984				78	S5	24/24	8.0-10.0	30 33 45 47	Very dense, brown, SILT & SAND, trace gravel. (Glacial Till) Slight mottling observed in soil sample.
9	983		10.0 / 982.5							
10	982			Bottom of borehole 10 feet below ground surface.						
11	981									
12	980									
13	979									
14	978									
15	977									
16	976									
17	975									
18	974									
19	973									
20	972									
21	971									
22	970									

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:

Weather: Sunny

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

APPENDIX C:

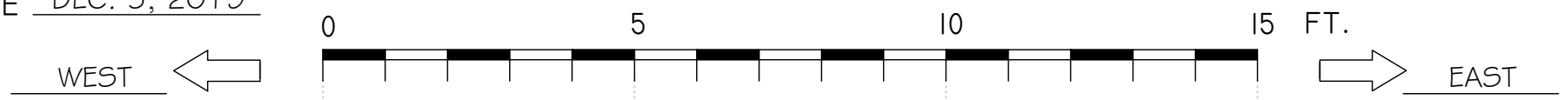
TEST PIT LOGS TP-1 THROUGH TP-9
PREPARED BY MCPHAIL ASSOCIATES, LLC

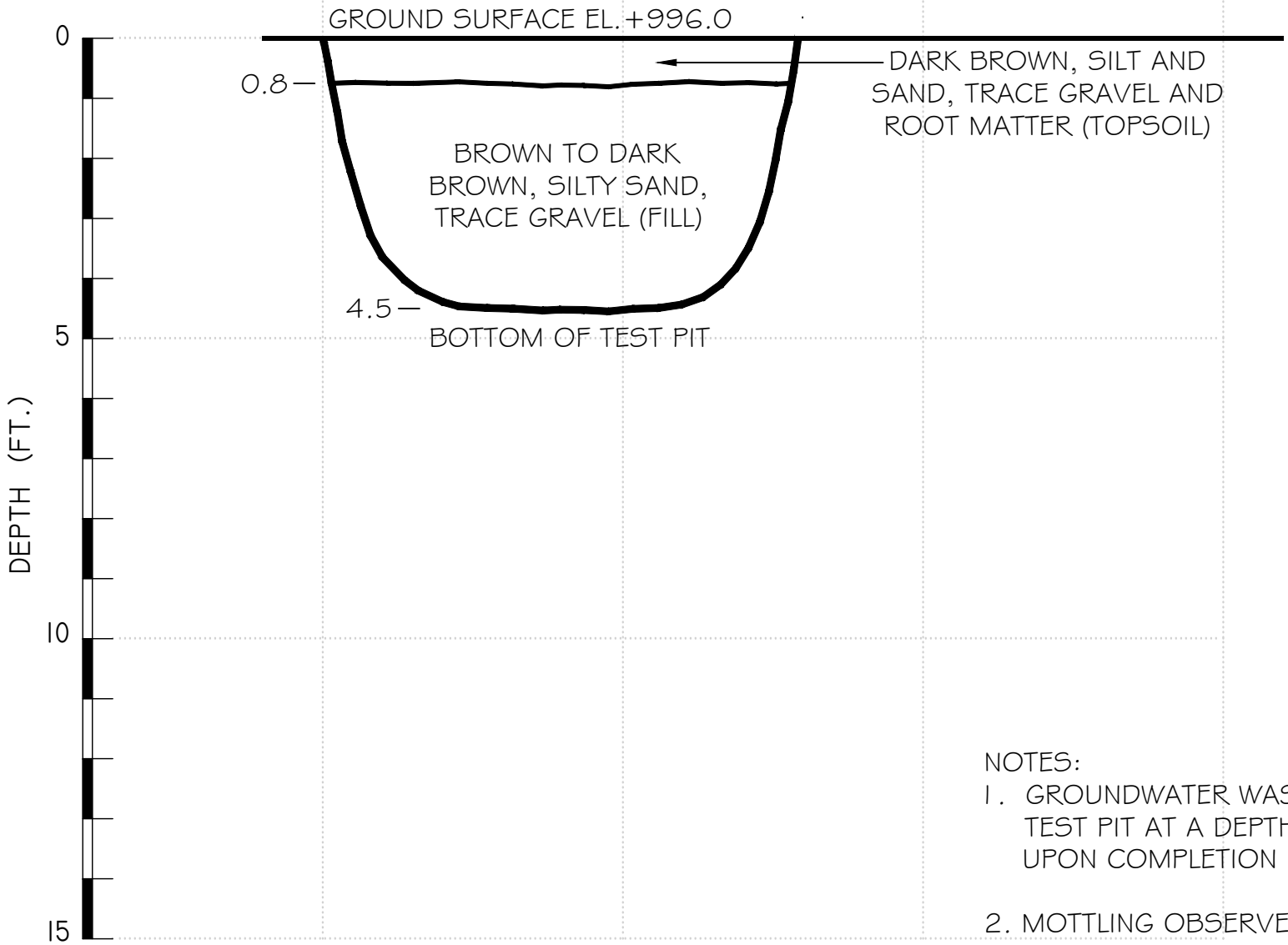
JOB NO. 6743

DATE DEC. 5, 2019

TEST PIT LOG

TEST PIT NO. 1





McPHAIL ASSOCIATES, LLC

NOTES:

1. GROUNDWATER WAS OBSERVED IN TEST PIT AT A DEPTH OF 4.0 FEET UPON COMPLETION OF EXCAVATION.

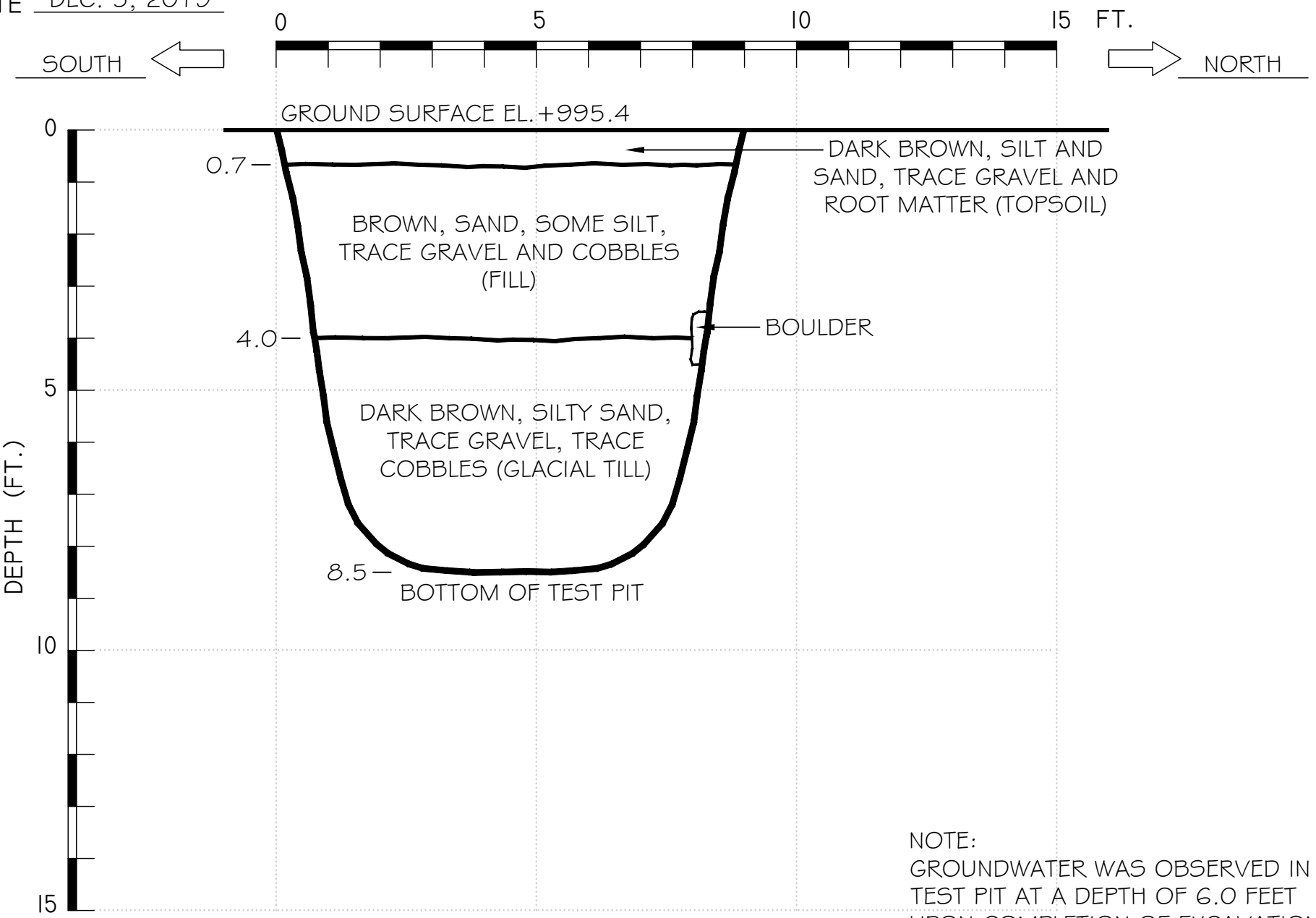
2. MOTTLING OBSERVED IN SOIL AT A DEPTH OF APPROXIMATELY 1.0 FOOT.

JOB NO. 6743

DATE DEC. 5, 2019

TEST PIT LOG

TEST PIT NO. 2



McPHAIL ASSOCIATES, LLC

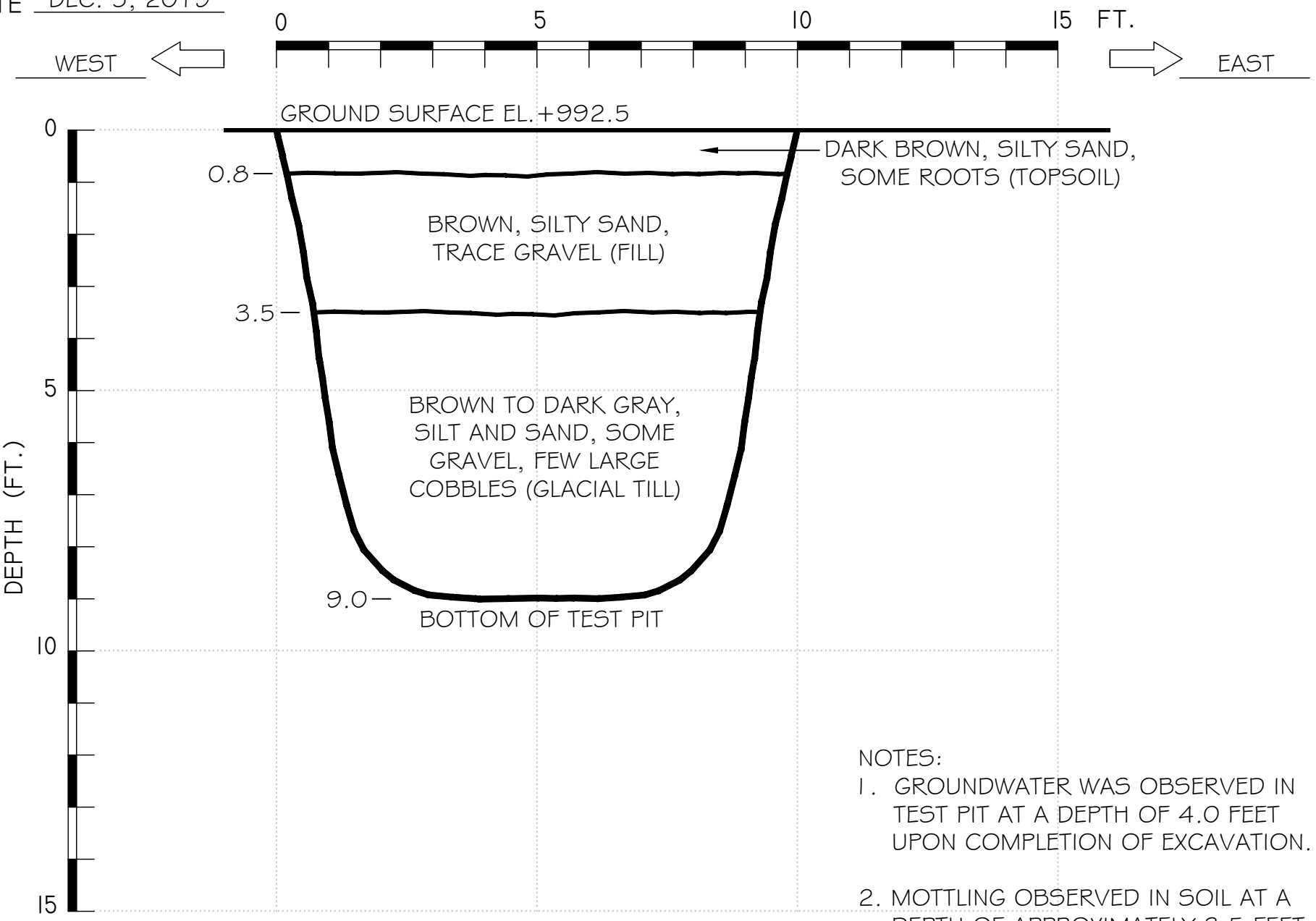
NOTE:
GROUNDWATER WAS OBSERVED IN TEST PIT AT A DEPTH OF 6.0 FEET UPON COMPLETION OF EXCAVATION

JOB NO. 6743

DATE DEC. 5, 2019

TEST PIT LOG

TEST PIT NO. 3



McPHAIL ASSOCIATES, LLC

NOTES:

1. GROUNDWATER WAS OBSERVED IN TEST PIT AT A DEPTH OF 4.0 FEET UPON COMPLETION OF EXCAVATION.

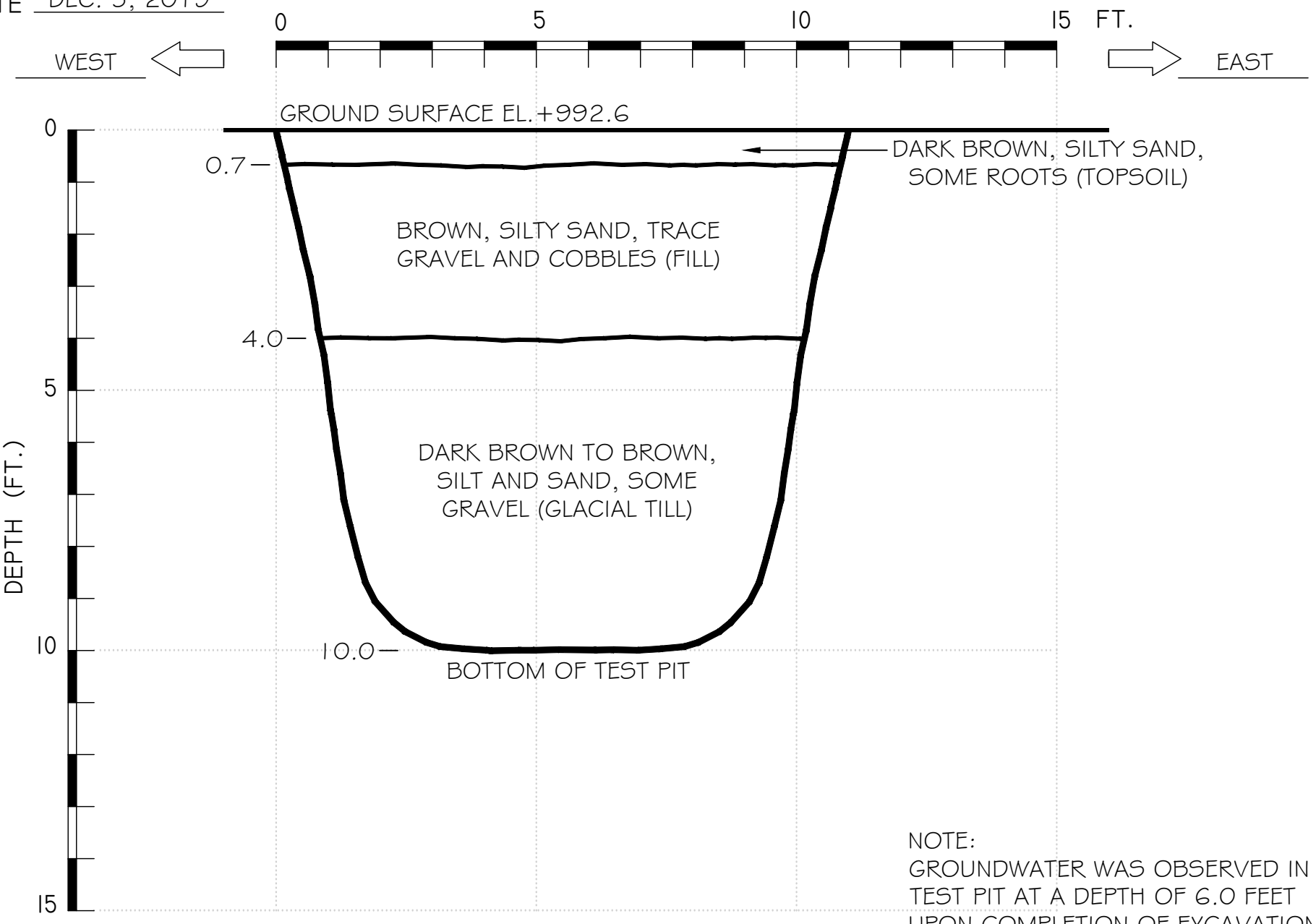
2. MOTTLING OBSERVED IN SOIL AT A DEPTH OF APPROXIMATELY 3.5 FEET.

JOB NO. 6743

DATE DEC. 5, 2019

TEST PIT LOG

TEST PIT NO. 4



McPHAIL ASSOCIATES, LLC

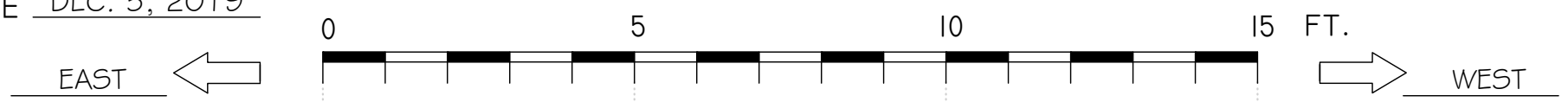
NOTE:
GROUNDWATER WAS OBSERVED IN TEST PIT AT A DEPTH OF 6.0 FEET UPON COMPLETION OF EXCAVATION

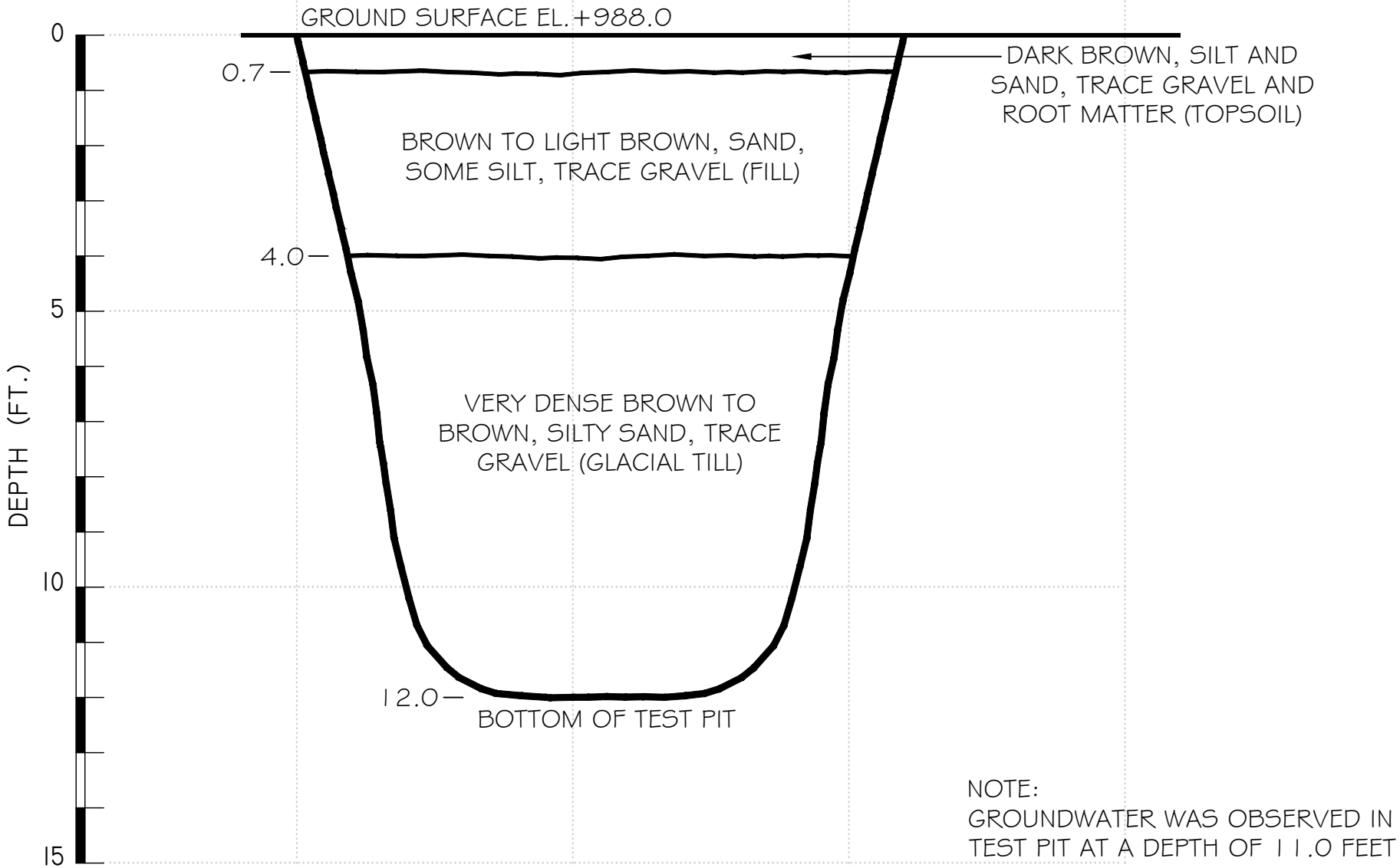
JOB NO. 6743

DATE DEC. 5, 2019

TEST PIT LOG

TEST PIT NO. 5





McPHAIL ASSOCIATES, LLC

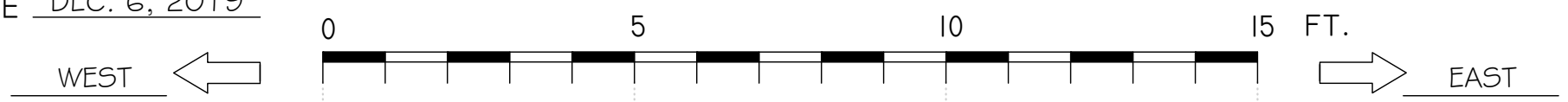
NOTE:
GROUNDWATER WAS OBSERVED IN TEST PIT AT A DEPTH OF 11.0 FEET UPON COMPLETION OF EXCAVATION

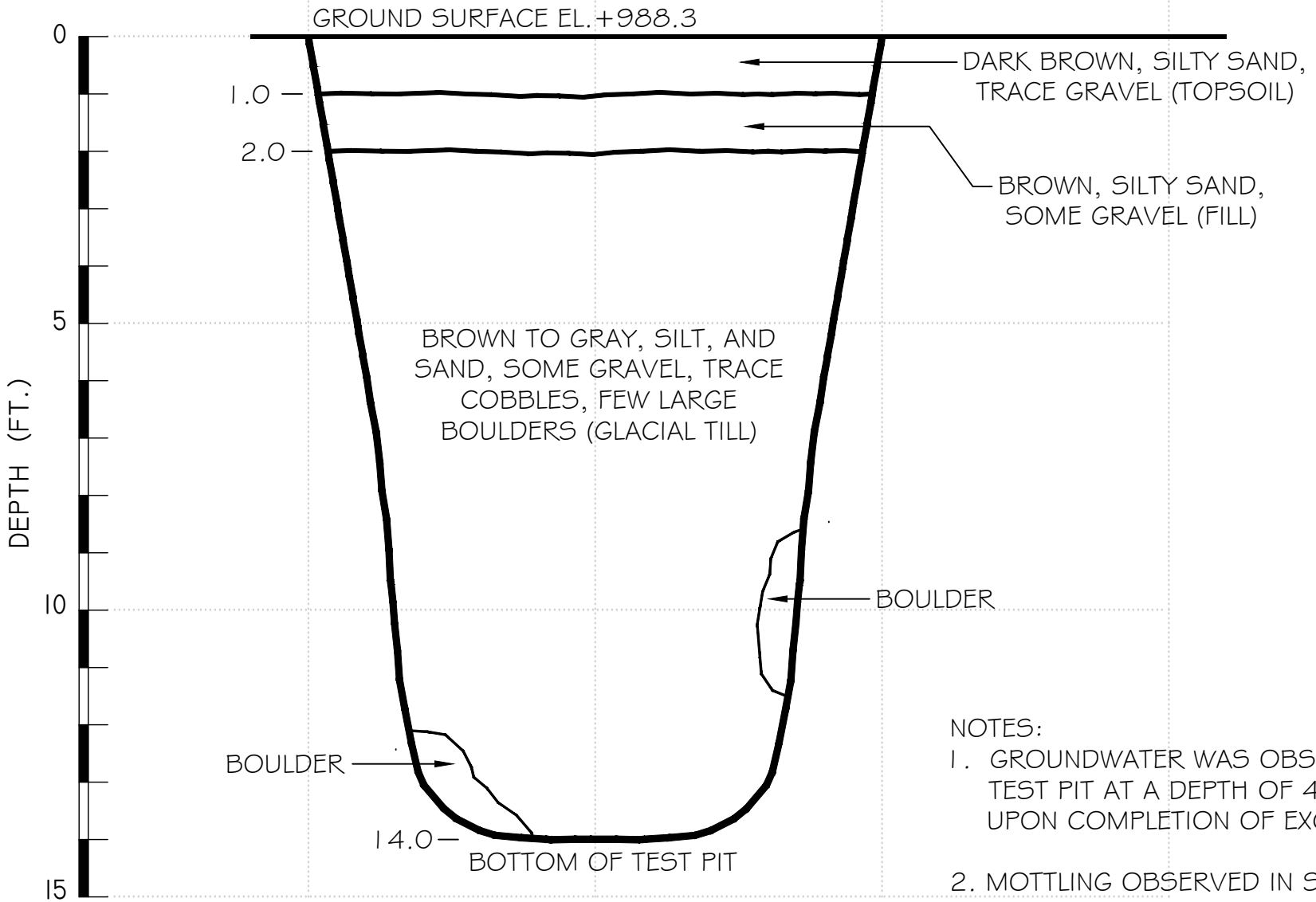
JOB NO. 6743

DATE DEC. 6, 2019

TEST PIT LOG

TEST PIT NO. 6





NOTES:

1. GROUNDWATER WAS OBSERVED IN TEST PIT AT A DEPTH OF 4.0 FEET UPON COMPLETION OF EXCAVATION.

2. MOTTLING OBSERVED IN SOIL AT A DEPTH OF APPROXIMATELY 4.0 FEET.

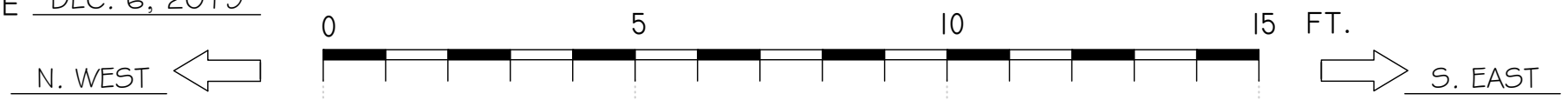
McPHAIL ASSOCIATES, LLC

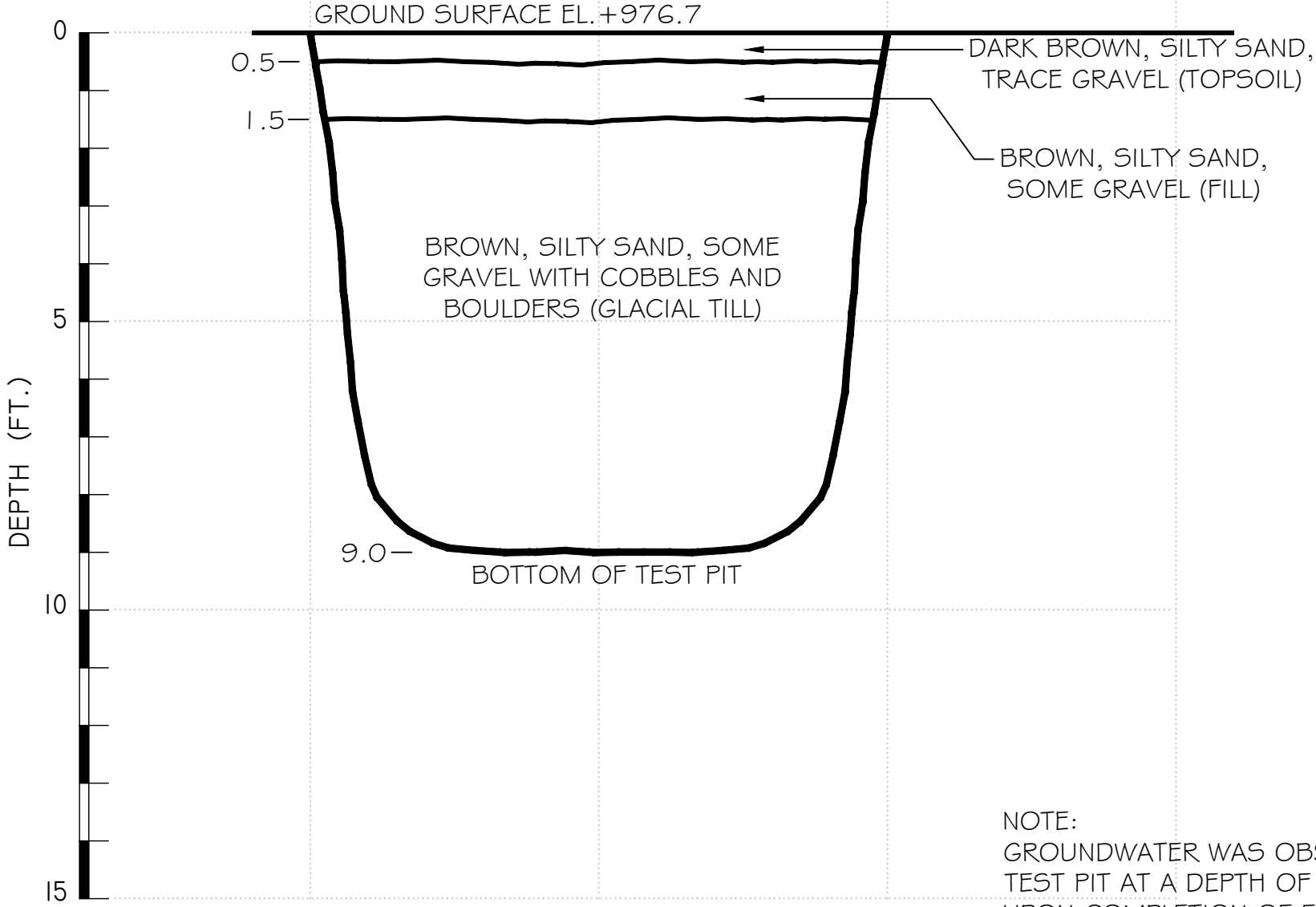
JOB NO. 6743

DATE DEC. 6, 2019

TEST PIT LOG

TEST PIT NO. 7





NOTE:
GROUNDWATER WAS OBSERVED IN TEST PIT AT A DEPTH OF 9.0 FEET UPON COMPLETION OF EXCAVATION

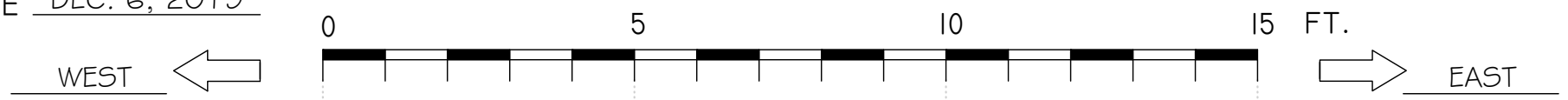
McPHAIL ASSOCIATES, LLC

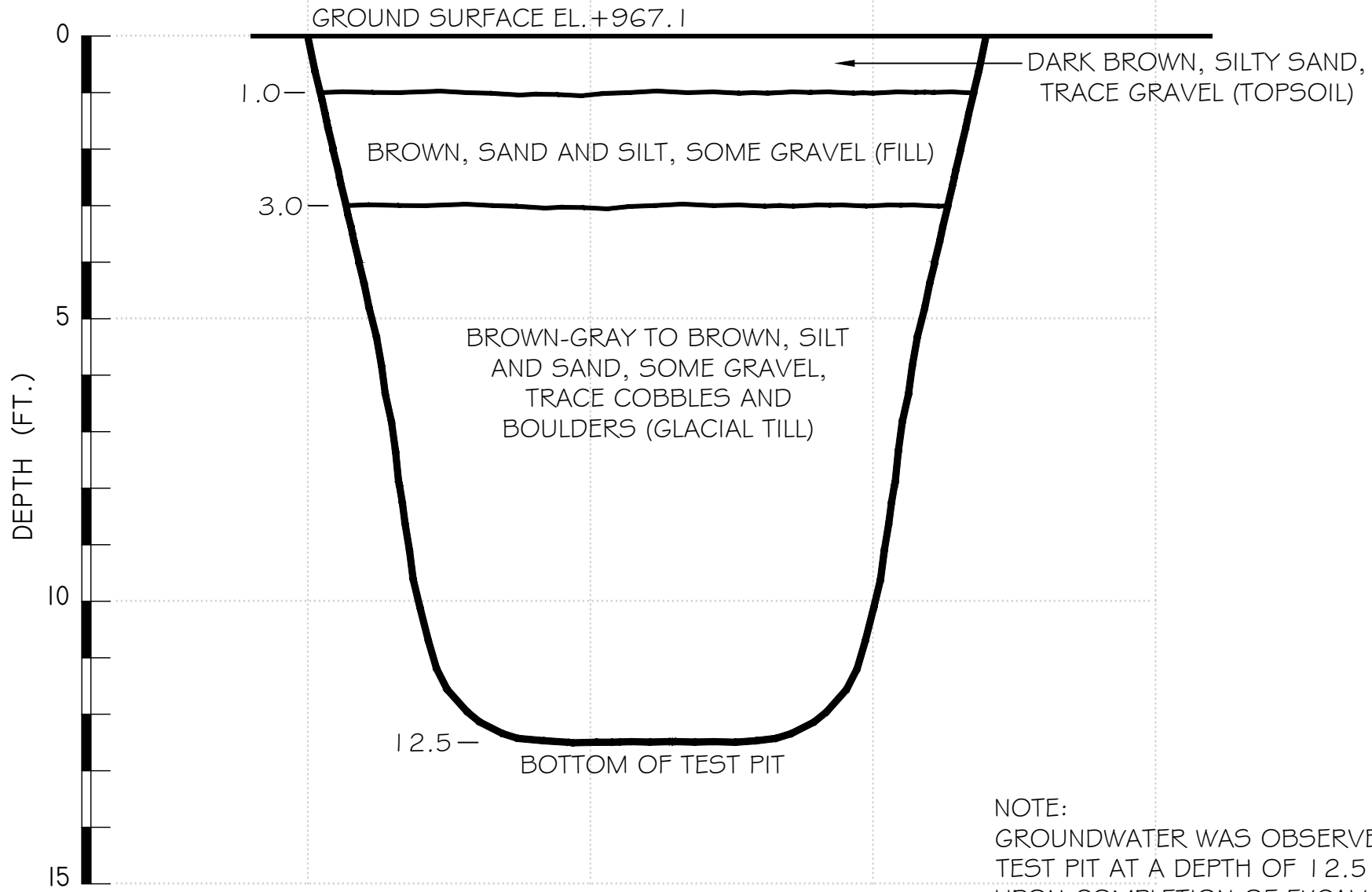
JOB NO. 6743

DATE DEC. 6, 2019

TEST PIT LOG

TEST PIT NO. 8





NOTE:
GROUNDWATER WAS OBSERVED IN TEST PIT AT A DEPTH OF 12.5 FEET UPON COMPLETION OF EXCAVATION

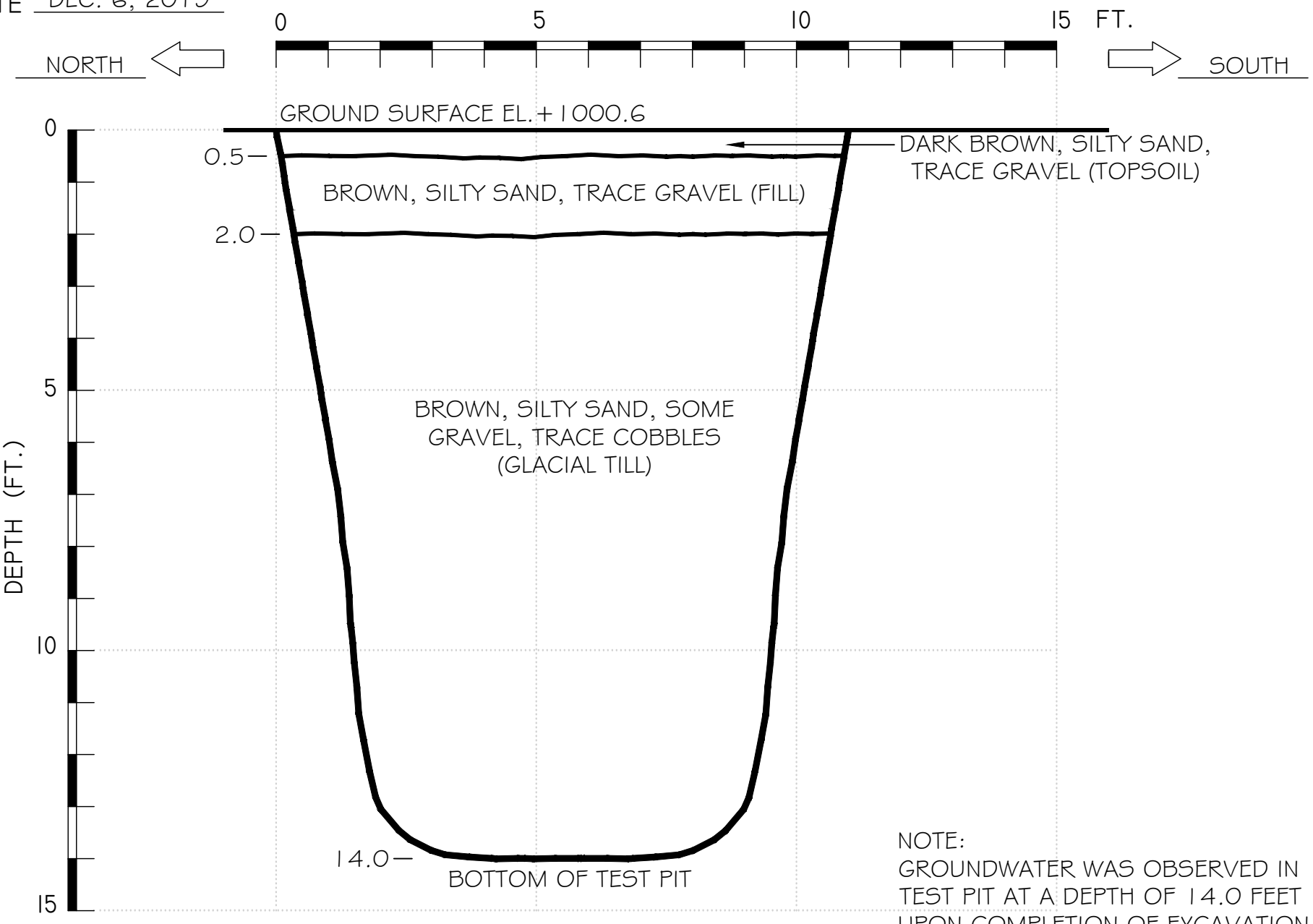
McPHAIL ASSOCIATES, LLC

JOB NO. 6743

DATE DEC. 6, 2019

TEST PIT LOG

TEST PIT NO. 9



McPHAIL ASSOCIATES, LLC

NOTE:
GROUNDWATER WAS OBSERVED IN TEST PIT AT A DEPTH OF 14.0 FEET UPON COMPLETION OF EXCAVATION

APPENDIX D:

GROUNDWATER MONITORING REPORTS

Groundwater Monitoring Report

Well I.D.: MA-104 (OW)
Project Name: Leicester School
Project No.: 6743
Location: Leicester, MA
Road Box EL.: +993.7

Date	Time	Elapsed Time	Depth from Road Box (feet)	Groundwater EL. (feet)	McPhail Rep	Comments
12/06/19	1:30 PM	Initial	6.0	+987.7	M. White	Well Installed @ 15' w/ 10' of screen
01/02/20	4:45 PM	27 Day(s)	4.8	+988.9	M. White	
01/06/20	4:20 PM	31 Day(s)	1.2	+992.5	M. White	

Groundwater Monitoring Report

Well I.D.: MA-106 (OW)
Project Name: Leicester School
Project No.: 6743
Location: Leicester, MA
Road Box EL.: +991.8

Date	Time	Elapsed Time	Depth from Road Box (feet)	Groundwater EL. (feet)	McPhail Rep	Comments
12/06/19	2:30 PM	Initial	5.0	+986.8	M. White	Well Installed @ 12' w/ 10' of screen
01/02/20	5:05 PM	27 Day(s)	1.9	+989.9	M. White	
01/06/20	4:30 PM	31 Day(s)	1.0	+990.8	M. White	

APPENDIX E:

TOPSOIL THICKNESS TABLE AND CHEMICAL TEST RESULTS PREPARED BY UMASS EXTENSION SOIL AND PLANT NUTRIENT TESTING LABORATORY

Topsoil Thickness Summary Table

Exploration No.	Observed Thickness in Feet
MA-101	0.7
MA-105	0.3
TP-6	1.0
TP-7	0.5
TP-8	1.0
H-1	0.5
H-2	0.5
H-3	1.0
H-4	1.0

**Exploration Locations Requested by Warner Larson Landscape Architects*

Soil and Plant Nutrient Testing Laboratory
203 Paige Laboratory
161 Holdsworth Way
University of Massachusetts
Amherst, MA 01003
Phone: (413) 545-2311
e-mail: soiltest@umass.edu
website: soiltest.umass.edu

Soil Test Report

Prepared For:

Christopher Miller
McPhail Associates, LLC
2269 Massachusetts Ave
Cambridge, MA 02140

cmiller@mcphailgeo.com
617-686-1420

Sample Information:

Sample ID: LMS_MA-101

Order Number: 48506
Lab Number: S191219-202
Area Sampled: 1000 sq ft
Received: 12/19/2019
Reported: 12/26/2019

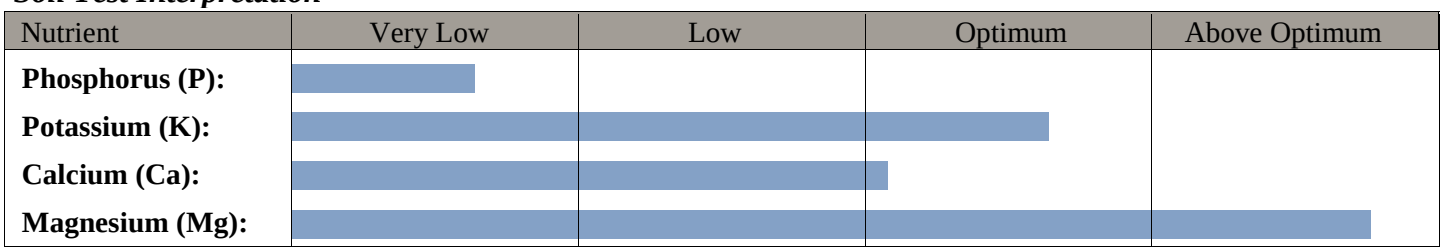
Results

Analysis	*Value Found*	*Optimum Range*
Soil pH (1:1, H2O)	5.6	
Modified Morgan extractable, ppm		
Macronutrients		
Phosphorus (P)	1.3	4-14
Potassium (K)	133	100-160
Calcium (Ca)	1035	1000-1500
Magnesium (Mg)	181	50-120
Sulfur (S)	20.4	>10
Micronutrients *		
Boron (B)	0.0	0.1-0.5
Manganese (Mn)	8.8	1.1-6.3
Zinc (Zn)	0.9	1.0-7.6
Copper (Cu)	0.3	0.3-0.6
Iron (Fe)	14.9	2.7-9.4
Aluminum (Al)	277	<75
Lead (Pb)	2.2	<22

Analysis	*Value Found*	*Optimum Range*
Cation Exch. Capacity, meq/100g	16.4	
Exch. Acidity, meq/100g	9.4	
Base Saturation, %		
Calcium Base Saturation	31	50-80
Magnesium Base Saturation	9	10-30
Potassium Base Saturation	2	2.0-7.0
Scoop Density, g/cc	0.86	
Optional tests		
Soil Organic Matter (LOI), %	10.4	

* *Micronutrient deficiencies rarely occur in New England soils; therefore, an Optimum Range has never been defined. Values provided represent the normal range found in soils and are for reference only.*

Soil Test Interpretation



Soil and Plant Nutrient Testing Laboratory
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website: soiltest.umass.edu

Recommendations for Nursery Trees & Shrubs, Deciduous-Establishment

Limestone (Target pH of 6.0)	Nitrogen, N	Phosphorus, P2O5	Potassium, K2O
	lbs / 1000 sq ft		
125	1 - 1.5	3	1

Comments:

-The lead level in this soil is below the optimum range of <22 ppm listed on your test results. However, many variables affect this result, and safety thresholds vary by location and soil use. There may still be a potential risk of lead exposure for soils used for growing food or as play areas for children. Our Total Sorbed Metals test provides an accurate measurement of soil lead. For more information about lead levels in soil, see the fact sheet entitled "Soil Lead: Testing, Interpretation, & Recommendations," listed under General References at the end of this report.

Recommendations for Nursery Trees & Shrubs, Deciduous-Maintenance

Limestone (Target pH of 6.0)	Nitrogen, N	Phosphorus, P2O5	Potassium, K2O
	lbs / 1000 sq ft		
125	1.5 - 2.5	2	1

Comments:

-Do not topdress with more than 50 lb limestone per 1000 sq ft at one time. Split the above application between early spring and mid-autumn.
-The lead level in this soil is below the optimum range of <22 ppm listed on your test results. However, many variables affect this result, and safety thresholds vary by location and soil use. There may still be a potential risk of lead exposure for soils used for growing food or as play areas for children. Our Total Sorbed Metals test provides an accurate measurement of soil lead. For more information about lead levels in soil, see the fact sheet entitled "Soil Lead: Testing, Interpretation, & Recommendations," listed under General References at the end of this report.

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Recommendations for Sports Turf/Golf Fairway-Establishment

Limestone (Target pH of 6.5)	Nitrogen, N	Phosphorus, P2O5	Potassium, K2O
	lbs / 1000 sq ft		
175	2 - 4	2.5	1

Comments:

-For instructions on converting nutrient recommendations to fertilizer applications in lawns, see Reference "Step-by-Step Fertilizer Guide for Lawns" (listed below).
-For best results, split the N, P2O5, and K2O recommendations above into three to four applications over the course of the growing season at six to eight week intervals, beginning in mid- to late-April.
-Many fertilizer sources and rates may be combined to provide acceptable turfgrass fertilty.
-The lead level in this soil is below the optimum range of <22 ppm listed on your test results. However, many variables affect this result, and safety thresholds vary by location and soil use. There may still be a potential risk of lead exposure for soils used for growing food or as play areas for children. Our Total Sorbed Metals test provides an accurate measurement of soil lead. For more information about lead levels in soil, see the fact sheet entitled "Soil Lead: Testing, Interpretation, & Recommendations," listed under General References at the end of this report.

References:

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Step-by-Step Fertilizer Guide for Lawns	http://ag.umass.edu/soil-plant-nutrient-testing-laboratory/fact-sheets/fertilizer-guide-for-lawns

General References:

Interpreting Your Soil Test Results	http://soiltest.umass.edu/fact-sheets/interpreting-your-soil-test-results
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UMass Extension Nutrient Management	http://ag.umass.edu/agriculture-resources/nutrient-management

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Soil Test Report

Prepared For:

Christopher Miller
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617-686-1420

Sample Information:

Sample ID: LMS_MA-105

Order Number: 48506
Lab Number: S191219-203
Area Sampled: 1000 sq ft
Received: 12/19/2019
Reported: 12/26/2019

Results

Analysis	*Value Found*	*Optimum Range*
Soil pH (1:1, H2O)	6.0	
Modified Morgan extractable, ppm		
Macronutrients		
Phosphorus (P)	1.0	4-14
Potassium (K)	93	100-160
Calcium (Ca)	822	1000-1500
Magnesium (Mg)	119	50-120
Sulfur (S)	15.5	>10
Micronutrients *		
Boron (B)	0.0	0.1-0.5
Manganese (Mn)	8.4	1.1-6.3
Zinc (Zn)	0.5	1.0-7.6
Copper (Cu)	0.1	0.3-0.6
Iron (Fe)	23.4	2.7-9.4
Aluminum (Al)	114	<75
Lead (Pb)	1.2	<22

Analysis	*Value Found*	*Optimum Range*
Cation Exch. Capacity, meq/100g	10.6	
Exch. Acidity, meq/100g	5.3	
Base Saturation, %		
Calcium Base Saturation	39	50-80
Magnesium Base Saturation	9	10-30
Potassium Base Saturation	2	2.0-7.0
Scoop Density, g/cc	1.10	
Optional tests		
Soil Organic Matter (LOI), %	4.3	

* *Micronutrient deficiencies rarely occur in New England soils; therefore, an Optimum Range has never been defined. Values provided represent the normal range found in soils and are for reference only.*

Soil Test Interpretation

Nutrient	Very Low	Low	Optimum	Above Optimum
Phosphorus (P):				
Potassium (K):				
Calcium (Ca):				
Magnesium (Mg):				

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Recommendations for Nursery Trees & Shrubs, Deciduous-Establishment

Limestone (Target pH of 6.0)	Nitrogen, N	Phosphorus, P2O5	Potassium, K2O
	lbs / 1000 sq ft		
0	1 - 1.5	3	2

Comments:

-The lead level in this soil is below the optimum range of <22 ppm listed on your test results. However, many variables affect this result, and safety thresholds vary by location and soil use. There may still be a potential risk of lead exposure for soils used for growing food or as play areas for children. Our Total Sorbed Metals test provides an accurate measurement of soil lead. For more information about lead levels in soil, see the fact sheet entitled "Soil Lead: Testing, Interpretation, & Recommendations," listed under General References at the end of this report.

Recommendations for Nursery Trees & Shrubs, Deciduous-Maintenance

Limestone (Target pH of 6.0)	Nitrogen, N	Phosphorus, P2O5	Potassium, K2O
	lbs / 1000 sq ft		
0	1.5 - 2.5	2	1

Comments:

-The lead level in this soil is below the optimum range of <22 ppm listed on your test results. However, many variables affect this result, and safety thresholds vary by location and soil use. There may still be a potential risk of lead exposure for soils used for growing food or as play areas for children. Our Total Sorbed Metals test provides an accurate measurement of soil lead. For more information about lead levels in soil, see the fact sheet entitled "Soil Lead: Testing, Interpretation, & Recommendations," listed under General References at the end of this report.

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Recommendations for Sports Turf/Golf Fairway-Establishment

Limestone (Target pH of 6.5)	Nitrogen, N	Phosphorus, P2O5	Potassium, K2O
	lbs / 1000 sq ft		
100	2 - 4	2.5	2

Comments:

-For instructions on converting nutrient recommendations to fertilizer applications in lawns, see Reference "Step-by-Step Fertilizer Guide for Lawns" (listed below).
-For best results, split the N, P2O5, and K2O recommendations above into three to four applications over the course of the growing season at six to eight week intervals, beginning in mid- to late-April.
-Many fertilizer sources and rates may be combined to provide acceptable turfgrass fertilty.
-The lead level in this soil is below the optimum range of <22 ppm listed on your test results. However, many variables affect this result, and safety thresholds vary by location and soil use. There may still be a potential risk of lead exposure for soils used for growing food or as play areas for children. Our Total Sorbed Metals test provides an accurate measurement of soil lead. For more information about lead levels in soil, see the fact sheet entitled "Soil Lead: Testing, Interpretation, & Recommendations," listed under General References at the end of this report.

References:

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Soil Test Report

Prepared For:

Christopher Miller
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cmiller@mcphailgeo.com
617-686-1420

Sample Information:

Sample ID: LMS_TP-6

Order Number: 48506
Lab Number: S191219-204
Area Sampled: 1000 sq ft
Received: 12/19/2019
Reported: 12/26/2019

Results

Analysis	*Value Found*	*Optimum Range*	*Analysis*	*Value Found*	*Optimum Range*
Soil pH (1:1, H2O)	5.3		**Cation Exch. Capacity, meq/100g**	13.3	
Modified Morgan extractable, ppm			**Exch. Acidity, meq/100g**	10.1	
Macronutrients			**Base Saturation, %**		
Phosphorus (P)	0.9	4-14	Calcium Base Saturation	20	50-80
Potassium (K)	55	100-160	Magnesium Base Saturation	3	10-30
Calcium (Ca)	519	1000-1500	Potassium Base Saturation	1	2.0-7.0
Magnesium (Mg)	55	50-120	**Scoop Density, g/cc**	0.79	
Sulfur (S)	17.1	>10	**Optional tests**		
Micronutrients *			Soil Organic Matter (LOI), %	8.3	
Boron (B)	0.0	0.1-0.5			
Manganese (Mn)	7.0	1.1-6.3			
Zinc (Zn)	0.9	1.0-7.6			
Copper (Cu)	0.2	0.3-0.6			
Iron (Fe)	11.5	2.7-9.4			
Aluminum (Al)	354	<75			
Lead (Pb)	3.8	<22			

* *Micronutrient deficiencies rarely occur in New England soils; therefore, an Optimum Range has never been defined. Values provided represent the normal range found in soils and are for reference only.*

Soil Test Interpretation

Nutrient	Very Low	Low	Optimum	Above Optimum
Phosphorus (P):				
Potassium (K):				
Calcium (Ca):				
Magnesium (Mg):				

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Recommendations for Nursery Trees & Shrubs, Deciduous-Establishment

Limestone (Target pH of 6.0)	Nitrogen, N	Phosphorus, P2O5	Potassium, K2O
	lbs / 1000 sq ft		
150	1 - 1.5	3	2.5

Comments:

-The lead level in this soil is below the optimum range of <22 ppm listed on your test results. However, many variables affect this result, and safety thresholds vary by location and soil use. There may still be a potential risk of lead exposure for soils used for growing food or as play areas for children. Our Total Sorbed Metals test provides an accurate measurement of soil lead. For more information about lead levels in soil, see the fact sheet entitled "Soil Lead: Testing, Interpretation, & Recommendations," listed under General References at the end of this report.

Recommendations for Nursery Trees & Shrubs, Deciduous-Maintenance

Limestone (Target pH of 6.0)	Nitrogen, N	Phosphorus, P2O5	Potassium, K2O
	lbs / 1000 sq ft		
150	1.5 - 2.5	2	2

Comments:

-Do not topdress with more than 50 lb limestone per 1000 sq ft at one time. Split the above application between early spring and mid-autumn.
-The lead level in this soil is below the optimum range of <22 ppm listed on your test results. However, many variables affect this result, and safety thresholds vary by location and soil use. There may still be a potential risk of lead exposure for soils used for growing food or as play areas for children. Our Total Sorbed Metals test provides an accurate measurement of soil lead. For more information about lead levels in soil, see the fact sheet entitled "Soil Lead: Testing, Interpretation, & Recommendations," listed under General References at the end of this report.

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Recommendations for Sports Turf/Golf Fairway-Establishment

Limestone (Target pH of 6.5)	Nitrogen, N	Phosphorus, P2O5	Potassium, K2O
	lbs / 1000 sq ft		
200	2 - 4	2.5	4

Comments:

-For instructions on converting nutrient recommendations to fertilizer applications in lawns, see Reference "Step-by-Step Fertilizer Guide for Lawns" (listed below).
-For best results, split the N, P2O5, and K2O recommendations above into three to four applications over the course of the growing season at six to eight week intervals, beginning in mid- to late-April.
-Many fertilizer sources and rates may be combined to provide acceptable turfgrass fertilty.
-The lead level in this soil is below the optimum range of <22 ppm listed on your test results. However, many variables affect this result, and safety thresholds vary by location and soil use. There may still be a potential risk of lead exposure for soils used for growing food or as play areas for children. Our Total Sorbed Metals test provides an accurate measurement of soil lead. For more information about lead levels in soil, see the fact sheet entitled "Soil Lead: Testing, Interpretation, & Recommendations," listed under General References at the end of this report.

References:

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General References:

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Soil Test Report

Prepared For:

Christopher Miller
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617-686-1420

Sample Information:

Sample ID: LMS_TP-7

Order Number: 48506
Lab Number: S191219-205
Area Sampled: 1000 sq ft
Received: 12/19/2019
Reported: 12/26/2019

Results

Analysis	*Value Found*	*Optimum Range*
Soil pH (1:1, H2O)	5.6	
Modified Morgan extractable, ppm		
Macronutrients		
Phosphorus (P)	0.9	4-14
Potassium (K)	78	100-160
Calcium (Ca)	467	1000-1500
Magnesium (Mg)	40	50-120
Sulfur (S)	15.4	>10
Micronutrients *		
Boron (B)	0.0	0.1-0.5
Manganese (Mn)	6.0	1.1-6.3
Zinc (Zn)	0.9	1.0-7.6
Copper (Cu)	0.2	0.3-0.6
Iron (Fe)	8.9	2.7-9.4
Aluminum (Al)	407	<75
Lead (Pb)	1.9	<22

Analysis	*Value Found*	*Optimum Range*
Cation Exch. Capacity, meq/100g	10.8	
Exch. Acidity, meq/100g	7.9	
Base Saturation, %		
Calcium Base Saturation	22	50-80
Magnesium Base Saturation	3	10-30
Potassium Base Saturation	2	2.0-7.0
Scoop Density, g/cc	0.79	
Optional tests		
Soil Organic Matter (LOI), %	7.5	

* *Micronutrient deficiencies rarely occur in New England soils; therefore, an Optimum Range has never been defined. Values provided represent the normal range found in soils and are for reference only.*

Soil Test Interpretation

Nutrient	Very Low	Low	Optimum	Above Optimum
Phosphorus (P):				
Potassium (K):				
Calcium (Ca):				
Magnesium (Mg):				

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Recommendations for Nursery Trees & Shrubs, Deciduous-Establishment

Limestone (Target pH of 6.0)	Nitrogen, N	Phosphorus, P2O5	Potassium, K2O
	lbs / 1000 sq ft		
100	1 - 1.5	3	2

Comments:

-The lead level in this soil is below the optimum range of <22 ppm listed on your test results. However, many variables affect this result, and safety thresholds vary by location and soil use. There may still be a potential risk of lead exposure for soils used for growing food or as play areas for children. Our Total Sorbed Metals test provides an accurate measurement of soil lead. For more information about lead levels in soil, see the fact sheet entitled "Soil Lead: Testing, Interpretation, & Recommendations," listed under General References at the end of this report.

Recommendations for Nursery Trees & Shrubs, Deciduous-Maintenance

Limestone (Target pH of 6.0)	Nitrogen, N	Phosphorus, P2O5	Potassium, K2O
	lbs / 1000 sq ft		
100	1.5 - 2.5	2	1

Comments:

-Do not topdress with more than 50 lb limestone per 1000 sq ft at one time. Split the above application between early spring and mid-autumn.
-The lead level in this soil is below the optimum range of <22 ppm listed on your test results. However, many variables affect this result, and safety thresholds vary by location and soil use. There may still be a potential risk of lead exposure for soils used for growing food or as play areas for children. Our Total Sorbed Metals test provides an accurate measurement of soil lead. For more information about lead levels in soil, see the fact sheet entitled "Soil Lead: Testing, Interpretation, & Recommendations," listed under General References at the end of this report.

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Recommendations for Sports Turf/Golf Fairway-Establishment

Limestone (Target pH of 6.5)	Nitrogen, N	Phosphorus, P2O5	Potassium, K2O
lbs / 1000 sq ft			
150	2 - 4	2.5	2

Comments:

-Your magnesium level is low. Dolomitic limestone is recommended.
-For instructions on converting nutrient recommendations to fertilizer applications in lawns, see Reference "Step-by-Step Fertilizer Guide for Lawns" (listed below).
-For best results, split the N, P2O5, and K2O recommendations above into three to four applications over the course of the growing season at six to eight week intervals, beginning in mid- to late-April.
-Many fertilizer sources and rates may be combined to provide acceptable turfgrass fertilty.
-The lead level in this soil is below the optimum range of <22 ppm listed on your test results. However, many variables affect this result, and safety thresholds vary by location and soil use. There may still be a potential risk of lead exposure for soils used for growing food or as play areas for children. Our Total Sorbed Metals test provides an accurate measurement of soil lead. For more information about lead levels in soil, see the fact sheet entitled "Soil Lead: Testing, Interpretation, & Recommendations," listed under General References at the end of this report.

References:

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Soil Test Report

Prepared For:

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Sample Information:

Sample ID: LMS_TP-8

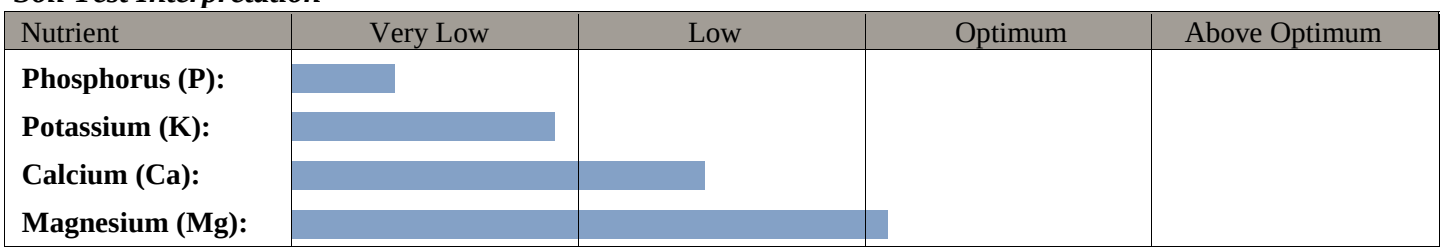
Order Number: 48506
Lab Number: S191219-206
Area Sampled: 1000 sq ft
Received: 12/19/2019
Reported: 12/26/2019

Results

Analysis	*Value Found*	*Optimum Range*	*Analysis*	*Value Found*	*Optimum Range*
Soil pH (1:1, H2O)	5.8		**Cation Exch. Capacity, meq/100g**	10.1	
Modified Morgan extractable, ppm			**Exch. Acidity, meq/100g**	6.0	
Macronutrients			**Base Saturation, %**		
Phosphorus (P)	0.8	4-14	Calcium Base Saturation	35	50-80
Potassium (K)	46	100-160	Magnesium Base Saturation	5	10-30
Calcium (Ca)	717	1000-1500	Potassium Base Saturation	1	2.0-7.0
Magnesium (Mg)	56	50-120	**Scoop Density, g/cc**	0.94	
Sulfur (S)	52.7	>10	**Optional tests**		
Micronutrients *			Soil Organic Matter (LOI), %	5.6	
Boron (B)	0.0	0.1-0.5			
Manganese (Mn)	5.0	1.1-6.3			
Zinc (Zn)	0.4	1.0-7.6			
Copper (Cu)	0.2	0.3-0.6			
Iron (Fe)	29.4	2.7-9.4			
Aluminum (Al)	270	<75			
Lead (Pb)	1.4	<22			

* *Micronutrient deficiencies rarely occur in New England soils; therefore, an Optimum Range has never been defined. Values provided represent the normal range found in soils and are for reference only.*

Soil Test Interpretation



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Recommendations for Nursery Trees & Shrubs, Deciduous-Establishment

Limestone (Target pH of 6.0)	Nitrogen, N	Phosphorus, P2O5	Potassium, K2O
	lbs / 1000 sq ft		
0	1 - 1.5	3	3

Comments:

-The lead level in this soil is below the optimum range of <22 ppm listed on your test results. However, many variables affect this result, and safety thresholds vary by location and soil use. There may still be a potential risk of lead exposure for soils used for growing food or as play areas for children. Our Total Sorbed Metals test provides an accurate measurement of soil lead. For more information about lead levels in soil, see the fact sheet entitled "Soil Lead: Testing, Interpretation, & Recommendations," listed under General References at the end of this report.

Recommendations for Nursery Trees & Shrubs, Deciduous-Maintenance

Limestone (Target pH of 6.0)	Nitrogen, N	Phosphorus, P2O5	Potassium, K2O
	lbs / 1000 sq ft		
0	1.5 - 2.5	2	2.5

Comments:

-The lead level in this soil is below the optimum range of <22 ppm listed on your test results. However, many variables affect this result, and safety thresholds vary by location and soil use. There may still be a potential risk of lead exposure for soils used for growing food or as play areas for children. Our Total Sorbed Metals test provides an accurate measurement of soil lead. For more information about lead levels in soil, see the fact sheet entitled "Soil Lead: Testing, Interpretation, & Recommendations," listed under General References at the end of this report.

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website: soiltest.umass.edu

Recommendations for Sports Turf/Golf Fairway-Establishment

Limestone (Target pH of 6.5)	Nitrogen, N	Phosphorus, P2O5	Potassium, K2O
	lbs / 1000 sq ft		
100	2 - 4	2.5	5

Comments:

-For instructions on converting nutrient recommendations to fertilizer applications in lawns, see Reference "Step-by-Step Fertilizer Guide for Lawns" (listed below).
-For best results, split the N, P2O5, and K2O recommendations above into three to four applications over the course of the growing season at six to eight week intervals, beginning in mid- to late-April.
-Many fertilizer sources and rates may be combined to provide acceptable turfgrass fertilty.
-The lead level in this soil is below the optimum range of <22 ppm listed on your test results. However, many variables affect this result, and safety thresholds vary by location and soil use. There may still be a potential risk of lead exposure for soils used for growing food or as play areas for children. Our Total Sorbed Metals test provides an accurate measurement of soil lead. For more information about lead levels in soil, see the fact sheet entitled "Soil Lead: Testing, Interpretation, & Recommendations," listed under General References at the end of this report.

References:

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General References:

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Soil Test Report

Prepared For:

Christopher Miller
McPhail Associates, LLC
2269 Massachusetts Ave
Cambridge, MA 02140

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617-686-1420

Sample Information:

Sample ID: LMS_H-1

Order Number: 48506
Lab Number: S191219-207
Area Sampled: 1000 sq ft
Received: 12/19/2019
Reported: 12/26/2019

Results

Analysis	*Value Found*	*Optimum Range*
Soil pH (1:1, H2O)	6.2	
Modified Morgan extractable, ppm		
Macronutrients		
Phosphorus (P)	1.7	4-14
Potassium (K)	59	100-160
Calcium (Ca)	729	1000-1500
Magnesium (Mg)	81	50-120
Sulfur (S)	9.0	>10
Micronutrients *		
Boron (B)	0.1	0.1-0.5
Manganese (Mn)	3.6	1.1-6.3
Zinc (Zn)	0.7	1.0-7.6
Copper (Cu)	0.1	0.3-0.6
Iron (Fe)	16.9	2.7-9.4
Aluminum (Al)	73	<75
Lead (Pb)	1.1	<22

Analysis	*Value Found*	*Optimum Range*
Cation Exch. Capacity, meq/100g	8.1	
Exch. Acidity, meq/100g	3.7	
Base Saturation, %		
Calcium Base Saturation	45	50-80
Magnesium Base Saturation	8	10-30
Potassium Base Saturation	2	2.0-7.0
Scoop Density, g/cc	1.23	
Optional tests		
Soil Organic Matter (LOI), %	4.0	

* *Micronutrient deficiencies rarely occur in New England soils; therefore, an Optimum Range has never been defined. Values provided represent the normal range found in soils and are for reference only.*

Soil Test Interpretation

Nutrient	Very Low	Low	Optimum	Above Optimum
Phosphorus (P):				
Potassium (K):				
Calcium (Ca):				
Magnesium (Mg):				

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Recommendations for Nursery Trees & Shrubs, Deciduous-Establishment

Limestone (Target pH of 6.0)	Nitrogen, N	Phosphorus, P2O5	Potassium, K2O
	lbs / 1000 sq ft		
0	1 - 1.5	3	2.5

Comments:

-The lead level in this soil is below the optimum range of <22 ppm listed on your test results. However, many variables affect this result, and safety thresholds vary by location and soil use. There may still be a potential risk of lead exposure for soils used for growing food or as play areas for children. Our Total Sorbed Metals test provides an accurate measurement of soil lead. For more information about lead levels in soil, see the fact sheet entitled "Soil Lead: Testing, Interpretation, & Recommendations," listed under General References at the end of this report.

Recommendations for Nursery Trees & Shrubs, Deciduous-Maintenance

Limestone (Target pH of 6.0)	Nitrogen, N	Phosphorus, P2O5	Potassium, K2O
	lbs / 1000 sq ft		
0	1.5 - 2.5	2	2

Comments:

-The lead level in this soil is below the optimum range of <22 ppm listed on your test results. However, many variables affect this result, and safety thresholds vary by location and soil use. There may still be a potential risk of lead exposure for soils used for growing food or as play areas for children. Our Total Sorbed Metals test provides an accurate measurement of soil lead. For more information about lead levels in soil, see the fact sheet entitled "Soil Lead: Testing, Interpretation, & Recommendations," listed under General References at the end of this report.

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Recommendations for Sports Turf/Golf Fairway-Establishment

Limestone (Target pH of 6.5)	Nitrogen, N	Phosphorus, P2O5	Potassium, K2O
lbs / 1000 sq ft			
50	2 - 4	2.5	4

Comments:

-For instructions on converting nutrient recommendations to fertilizer applications in lawns, see Reference "Step-by-Step Fertilizer Guide for Lawns" (listed below).
-For best results, split the N, P2O5, and K2O recommendations above into three to four applications over the course of the growing season at six to eight week intervals, beginning in mid- to late-April.
-Many fertilizer sources and rates may be combined to provide acceptable turfgrass fertilty.
-The lead level in this soil is below the optimum range of <22 ppm listed on your test results. However, many variables affect this result, and safety thresholds vary by location and soil use. There may still be a potential risk of lead exposure for soils used for growing food or as play areas for children. Our Total Sorbed Metals test provides an accurate measurement of soil lead. For more information about lead levels in soil, see the fact sheet entitled "Soil Lead: Testing, Interpretation, & Recommendations," listed under General References at the end of this report.

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Soil Test Report

Prepared For:

Christopher Miller
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617-686-1420

Sample Information:

Sample ID: LMS_H-2

Order Number: 48506
Lab Number: S191219-208
Area Sampled: 1000 sq ft
Received: 12/19/2019
Reported: 12/26/2019

Results

Analysis	*Value Found*	*Optimum Range*
Soil pH (1:1, H2O)	6.3	
Modified Morgan extractable, ppm		
Macronutrients		
Phosphorus (P)	1.3	4-14
Potassium (K)	127	100-160
Calcium (Ca)	1029	1000-1500
Magnesium (Mg)	136	50-120
Sulfur (S)	14.4	>10
Micronutrients *		
Boron (B)	0.1	0.1-0.5
Manganese (Mn)	7.5	1.1-6.3
Zinc (Zn)	0.5	1.0-7.6
Copper (Cu)	0.2	0.3-0.6
Iron (Fe)	11.8	2.7-9.4
Aluminum (Al)	105	<75
Lead (Pb)	0.9	<22

Analysis	*Value Found*	*Optimum Range*
Cation Exch. Capacity, meq/100g	10.9	
Exch. Acidity, meq/100g	4.3	
Base Saturation, %		
Calcium Base Saturation	47	50-80
Magnesium Base Saturation	10	10-30
Potassium Base Saturation	3	2.0-7.0
Scoop Density, g/cc	1.01	
Optional tests		
Soil Organic Matter (LOI), %	5.3	

* *Micronutrient deficiencies rarely occur in New England soils; therefore, an Optimum Range has never been defined. Values provided represent the normal range found in soils and are for reference only.*

Soil Test Interpretation

Nutrient	Very Low	Low	Optimum	Above Optimum
Phosphorus (P):				
Potassium (K):				
Calcium (Ca):				
Magnesium (Mg):				

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Recommendations for Nursery Trees & Shrubs, Deciduous-Establishment

Limestone (Target pH of 6.0)	Nitrogen, N	Phosphorus, P2O5	Potassium, K2O
	lbs / 1000 sq ft		
0	1 - 1.5	3	1

Comments:

-The lead level in this soil is below the optimum range of <22 ppm listed on your test results. However, many variables affect this result, and safety thresholds vary by location and soil use. There may still be a potential risk of lead exposure for soils used for growing food or as play areas for children. Our Total Sorbed Metals test provides an accurate measurement of soil lead. For more information about lead levels in soil, see the fact sheet entitled "Soil Lead: Testing, Interpretation, & Recommendations," listed under General References at the end of this report.

Recommendations for Nursery Trees & Shrubs, Deciduous-Maintenance

Limestone (Target pH of 6.0)	Nitrogen, N	Phosphorus, P2O5	Potassium, K2O
	lbs / 1000 sq ft		
0	1.5 - 2.5	2	1

Comments:

-The lead level in this soil is below the optimum range of <22 ppm listed on your test results. However, many variables affect this result, and safety thresholds vary by location and soil use. There may still be a potential risk of lead exposure for soils used for growing food or as play areas for children. Our Total Sorbed Metals test provides an accurate measurement of soil lead. For more information about lead levels in soil, see the fact sheet entitled "Soil Lead: Testing, Interpretation, & Recommendations," listed under General References at the end of this report.

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Recommendations for Sports Turf/Golf Fairway-Establishment

Limestone (Target pH of 6.5)	Nitrogen, N	Phosphorus, P2O5	Potassium, K2O
	lbs / 1000 sq ft		
75	2 - 4	2.5	1

Comments:

-For instructions on converting nutrient recommendations to fertilizer applications in lawns, see Reference "Step-by-Step Fertilizer Guide for Lawns" (listed below).
-For best results, split the N, P2O5, and K2O recommendations above into three to four applications over the course of the growing season at six to eight week intervals, beginning in mid- to late-April.
-Many fertilizer sources and rates may be combined to provide acceptable turfgrass fertilty.
-The lead level in this soil is below the optimum range of <22 ppm listed on your test results. However, many variables affect this result, and safety thresholds vary by location and soil use. There may still be a potential risk of lead exposure for soils used for growing food or as play areas for children. Our Total Sorbed Metals test provides an accurate measurement of soil lead. For more information about lead levels in soil, see the fact sheet entitled "Soil Lead: Testing, Interpretation, & Recommendations," listed under General References at the end of this report.

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Soil Test Report

Prepared For:

Christopher Miller
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2269 Massachusetts Ave
Cambridge, MA 02140

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617-686-1420

Sample Information:

Sample ID: LMS_H-3

Order Number: 48506
Lab Number: S191219-209
Area Sampled: 1000 sq ft
Received: 12/19/2019
Reported: 12/26/2019

Results

Analysis	*Value Found*	*Optimum Range*	*Analysis*	*Value Found*	*Optimum Range*
Soil pH (1:1, H2O)	5.6		**Cation Exch. Capacity, meq/100g**	13.4	
Modified Morgan extractable, ppm			**Exch. Acidity, meq/100g**	7.8	
Macronutrients			**Base Saturation, %**		
Phosphorus (P)	0.8	4-14	Calcium Base Saturation	37	50-80
Potassium (K)	72	100-160	Magnesium Base Saturation	4	10-30
Calcium (Ca)	982	1000-1500	Potassium Base Saturation	1	2.0-7.0
Magnesium (Mg)	62	50-120	**Scoop Density, g/cc**	0.87	
Sulfur (S)	23.7	>10	**Optional tests**		
Micronutrients *			Soil Organic Matter (LOI), %	7.2	
Boron (B)	0.1	0.1-0.5			
Manganese (Mn)	18.0	1.1-6.3			
Zinc (Zn)	1.0	1.0-7.6			
Copper (Cu)	0.2	0.3-0.6			
Iron (Fe)	21.5	2.7-9.4			
Aluminum (Al)	173	<75			
Lead (Pb)	1.6	<22			

* *Micronutrient deficiencies rarely occur in New England soils; therefore, an Optimum Range has never been defined. Values provided represent the normal range found in soils and are for reference only.*

Soil Test Interpretation

Nutrient	Very Low	Low	Optimum	Above Optimum
Phosphorus (P):				
Potassium (K):				
Calcium (Ca):				
Magnesium (Mg):				

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Recommendations for Nursery Trees & Shrubs, Deciduous-Establishment

Limestone (Target pH of 6.0)	Nitrogen, N	Phosphorus, P2O5	Potassium, K2O
	lbs / 1000 sq ft		
100	1 - 1.5	3	2.5

Comments:

-The lead level in this soil is below the optimum range of <22 ppm listed on your test results. However, many variables affect this result, and safety thresholds vary by location and soil use. There may still be a potential risk of lead exposure for soils used for growing food or as play areas for children. Our Total Sorbed Metals test provides an accurate measurement of soil lead. For more information about lead levels in soil, see the fact sheet entitled "Soil Lead: Testing, Interpretation, & Recommendations," listed under General References at the end of this report.

Recommendations for Nursery Trees & Shrubs, Deciduous-Maintenance

Limestone (Target pH of 6.0)	Nitrogen, N	Phosphorus, P2O5	Potassium, K2O
	lbs / 1000 sq ft		
100	1.5 - 2.5	2	2

Comments:

-Do not topdress with more than 50 lb limestone per 1000 sq ft at one time. Split the above application between early spring and mid-autumn.
-The lead level in this soil is below the optimum range of <22 ppm listed on your test results. However, many variables affect this result, and safety thresholds vary by location and soil use. There may still be a potential risk of lead exposure for soils used for growing food or as play areas for children. Our Total Sorbed Metals test provides an accurate measurement of soil lead. For more information about lead levels in soil, see the fact sheet entitled "Soil Lead: Testing, Interpretation, & Recommendations," listed under General References at the end of this report.

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Recommendations for Sports Turf/Golf Fairway-Establishment

Limestone (Target pH of 6.5)	Nitrogen, N	Phosphorus, P2O5	Potassium, K2O
lbs / 1000 sq ft			
150	2 - 4	2.5	4

Comments:

-For instructions on converting nutrient recommendations to fertilizer applications in lawns, see Reference "Step-by-Step Fertilizer Guide for Lawns" (listed below).
-For best results, split the N, P2O5, and K2O recommendations above into three to four applications over the course of the growing season at six to eight week intervals, beginning in mid- to late-April.
-Many fertilizer sources and rates may be combined to provide acceptable turfgrass fertilty.
-The lead level in this soil is below the optimum range of <22 ppm listed on your test results. However, many variables affect this result, and safety thresholds vary by location and soil use. There may still be a potential risk of lead exposure for soils used for growing food or as play areas for children. Our Total Sorbed Metals test provides an accurate measurement of soil lead. For more information about lead levels in soil, see the fact sheet entitled "Soil Lead: Testing, Interpretation, & Recommendations," listed under General References at the end of this report.

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General References:

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Soil Test Report

Prepared For:

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Sample Information:

Sample ID: LMS_H-4

Order Number: 48506
Lab Number: S191219-210
Area Sampled: 1000 sq ft
Received: 12/19/2019
Reported: 12/26/2019

Results

Analysis	*Value Found*	*Optimum Range*
Soil pH (1:1, H2O)	5.9	
Modified Morgan extractable, ppm		
Macronutrients		
Phosphorus (P)	0.8	4-14
Potassium (K)	145	100-160
Calcium (Ca)	975	1000-1500
Magnesium (Mg)	193	50-120
Sulfur (S)	19.5	>10
Micronutrients *		
Boron (B)	0.1	0.1-0.5
Manganese (Mn)	9.0	1.1-6.3
Zinc (Zn)	0.4	1.0-7.6
Copper (Cu)	0.2	0.3-0.6
Iron (Fe)	14.8	2.7-9.4
Aluminum (Al)	154	<75
Lead (Pb)	2.0	<22

Analysis	*Value Found*	*Optimum Range*
Cation Exch. Capacity, meq/100g	13.3	
Exch. Acidity, meq/100g	6.5	
Base Saturation, %		
Calcium Base Saturation	37	50-80
Magnesium Base Saturation	12	10-30
Potassium Base Saturation	3	2.0-7.0
Scoop Density, g/cc	0.98	
Optional tests		
Soil Organic Matter (LOI), %	7.1	

* *Micronutrient deficiencies rarely occur in New England soils; therefore, an Optimum Range has never been defined. Values provided represent the normal range found in soils and are for reference only.*

Soil Test Interpretation

Nutrient	Very Low	Low	Optimum	Above Optimum
Phosphorus (P):	■			
Potassium (K):	■	■	■	
Calcium (Ca):	■	■		
Magnesium (Mg):	■	■	■	■

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Recommendations for Nursery Trees & Shrubs, Deciduous-Establishment

Limestone (Target pH of 6.0)	Nitrogen, N	Phosphorus, P2O5	Potassium, K2O
	lbs / 1000 sq ft		
0	1 - 1.5	3	1

Comments:

-The lead level in this soil is below the optimum range of <22 ppm listed on your test results. However, many variables affect this result, and safety thresholds vary by location and soil use. There may still be a potential risk of lead exposure for soils used for growing food or as play areas for children. Our Total Sorbed Metals test provides an accurate measurement of soil lead. For more information about lead levels in soil, see the fact sheet entitled "Soil Lead: Testing, Interpretation, & Recommendations," listed under General References at the end of this report.

Recommendations for Nursery Trees & Shrubs, Deciduous-Maintenance

Limestone (Target pH of 6.0)	Nitrogen, N	Phosphorus, P2O5	Potassium, K2O
	lbs / 1000 sq ft		
0	1.5 - 2.5	2	1

Comments:

-The lead level in this soil is below the optimum range of <22 ppm listed on your test results. However, many variables affect this result, and safety thresholds vary by location and soil use. There may still be a potential risk of lead exposure for soils used for growing food or as play areas for children. Our Total Sorbed Metals test provides an accurate measurement of soil lead. For more information about lead levels in soil, see the fact sheet entitled "Soil Lead: Testing, Interpretation, & Recommendations," listed under General References at the end of this report.

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Recommendations for Sports Turf/Golf Fairway-Establishment

Limestone (Target pH of 6.5)	Nitrogen, N	Phosphorus, P2O5	Potassium, K2O
	lbs / 1000 sq ft		
125	2 - 4	2.5	1

Comments:

-For instructions on converting nutrient recommendations to fertilizer applications in lawns, see Reference "Step-by-Step Fertilizer Guide for Lawns" (listed below).
-For best results, split the N, P2O5, and K2O recommendations above into three to four applications over the course of the growing season at six to eight week intervals, beginning in mid- to late-April.
-Many fertilizer sources and rates may be combined to provide acceptable turfgrass fertilty.
-The lead level in this soil is below the optimum range of <22 ppm listed on your test results. However, many variables affect this result, and safety thresholds vary by location and soil use. There may still be a potential risk of lead exposure for soils used for growing food or as play areas for children. Our Total Sorbed Metals test provides an accurate measurement of soil lead. For more information about lead levels in soil, see the fact sheet entitled "Soil Lead: Testing, Interpretation, & Recommendations," listed under General References at the end of this report.

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