

APPENDIX H

Long Term Pollution Prevention,
Operations and Maintenance Plan

Stormwater Operation and Maintenance Plan Belmont Hill School, Belmont, MA

Long Term Pollution Prevention Operation and Maintenance Plan

The purpose of this Long Term Pollution Prevention Operation and Maintenance Plan ("O&M") is to provide project specific information related to the long term operation, maintenance, inspection, documentation, and performance of the structural and non-structural stormwater features. Regular inspection and maintenance of the stormwater management system is necessary to ensure proper operation of the system. The following O&M has been prepared to ensure the proposed system functions as intended. This O&M plan identifies maintenance procedures, schedules, and responsible parties.

The Long Term Pollution Prevention Operation and Maintenance Plan has been compiled in general accordance with Federal, State, and Local requirement in addition to stormwater best management practices ("BMPs").

Responsible Parties

Belmont Hill School, or any successor of, shall be the party responsible for implementing this O&M plan.

Belmont Hill School
350 Prospect Street
Belmont, MA 02478
617-484-4410

Name and Title: GREGORY SCHWEIDER HEAD OF SCHOOL

Signature: 

Date: 2/17/23

Stormwater Operation and Maintenance Procedures

Procedures are obtained from the Massachusetts Stormwater Handbook. These procedures are for all structural and non-structural BMPs and are intended to eliminate or reduce the long term soil erosion and degradation of stormwater features following construction completion. The inspection and successful implementation of all stormwater measures, shall be the Property Manager's responsibility. The Property Manager is responsible for training employees to perform O&M and to provide ongoing training as needed in response to staff changes. Implement employee training program and hold session at least once a year. The stormwater management system inspection and maintenance checklist and stormwater management system maintenance log form shall be submitted to the Belmont Office of Community Development annually.

Estimated Annual Costs

The estimated annual cost for the implementation of this plan is **\$5,000**.

Stormwater Operation and Maintenance Plan Belmont Hill School, Belmont, MA

Notification to Future Property Owners

Belmont Hill School, or any successor of, agrees to notify in writing all future property owners of the presence of the storm water management system and the requirements for proper operation and maintenance.

Stormwater Management Plan Overview

Stormwater runoff is managed on site through the use of an underground closed pipe network with deep sump catch basins, roof leaders, proprietary hydrodynamic separators, vegetated swales, underground infiltration/detention system, and permeable pavement.

Structural Pretreatment BMPs

Deep Sump Catch Basin and Manhole

Activity	Frequency
Inspect units	Four times per year
Clean units	Clean when the depth of deposits is greater than or equal to one half the depth from the bottom of the invert of the lowest pipe in the basin.

Proprietary Hydrodynamic Separator – Downstream Defender®

Activity	Frequency
Inspect every six months during the first year of installation to determine rate of sediment and floatables accumulation; inspect every 6 months after the first year of installation.	Biannually
Remove captured floatables and oil with a skimmer and pole; sump-vac if needed.	Annually; ASAP following a spill in drainage area
Remove accumulated sediment with a commercially or municipally owned sump-vac if clean-out is less than 18 inches upon inspection.	As needed, see manufacturer information

- **Refer to attached Downstream Defender® Operation and Maintenance Manual procedures for 4' diameter structure.**

Proprietary Hydrodynamic Separator – First Defense®

Activity	Frequency
Inspect every six months during the first year of installation to determine rate of sediment and floatables accumulation; inspect every 6 months after the first year of installation.	Biannually
Remove captured floatables and oil with a skimmer and pole; clean out sump with sump-vac to remove sediment and floatables.	Annually; ASAP following a spill in drainage area

- **Refer to attached First Defense® Operation and Maintenance Manual procedures for 3' diameter structure.**

Stormwater Operation and Maintenance Plan Belmont Hill School, Belmont, MA

Permeable Pavement

Activity	Frequency
Monitor to ensure that the paving surface drains properly after storms.	As needed
For porous asphalts and concretes, clean the surface using power washer to dislodge trapped particles and then vacuum sweep the area. For paving stones, add joint material (sand) to replace material that has been transported.	As needed
Inspect the surface annually for deterioration	Annually
Assess exfiltration capability at least once a year. When exfiltration capacity is found to decline, implement measures from the Operation and Maintenance Plan to restore original exfiltration capacity.	As needed, but at least once a year
Reseed pavers to fill in bare spots	As needed

- **No winter sanding shall be conducted on the porous asphalt surface. Salt use shall be minimized during winter months.**

Conveyance BMPs

Vegetated Swale

Activity	Frequency
Inspect swales to make sure vegetation is adequate and slopes are not eroding. Check for rilling and gullyng. Repair eroded areas and revegetate.	Monthly during the first six months after construction; biannually thereafter
Mow dry swales. Wet swales may not need to be mowed depending on type of vegetation. Grass clippings produced while mowing are to be removed from the swale and disposed of appropriately.	As needed
Remove sediment and debris manually.	Annually, at least
Reseed.	As needed

Roof Drain Leaders

Activity	Frequency
Ensure roof and roof drainage system is kept clean and free of debris.	Routinely, as needed.
Clean gutter and downspouts.	Annually

Trench Drains

Activity	Frequency
Inspect	Two times per year
Clean and remove debris and sediment	As needed

Stormwater Operation and Maintenance Plan Belmont Hill School, Belmont, MA

Underground Structural BMPs

Underground Infiltration/Detention Systems - RTank®

Activity	Frequency
Inspect tank and all stormwater pre-treatment features associated with tank function.	Biannually
Remove sediment, trash and other trapped pollutants.	As required.
Perform back-flushing of system once sediment accumulation has reached 6 inches, see manufacturer's manual.	As required

- **Refer to attached RTank® Operation and Maintenance manual procedures for R-Tank Triple Unit.**

Non-Structural Pretreatment BMPs

Street Sweeping

Activity	Frequency
Vacuum Sweeper	Quarterly Average, with sweeping scheduled primarily in spring and fall

Material and Equipment Storage

Material and equipment storage shall be done in a safe and orderly fashion. All debris and waste shall be collected and disposed of offsite in a legal manner in accordance with local and federal guidelines.

Snow Management

The temporary storage of snow may be permitted in accordance with the locally approved permit plans in the pre-determined locations. If the capacity of the delineated snow storage areas are exceeded, additional snow shall be moved to the athletic fields for storage. Snow may not be disposed of in or around wetland area. The wetlands, and wetlands buffer zones are shown in the attached permit drawings.

Deicing materials may be applied to areas such as sidewalks, access roads, and parking areas before a storm event. Alternative materials to salt, such as calcium chloride and calcium magnesium acetate should be considered. Use of salt for deicing should be minimized on site. Deicing materials should be used with discretion in accordance with standard practices and over application must be avoided. Deicing materials shall be stored inside the buildings. Sand shall not be used.

After the winter season, all parking areas and walkways shall be cleaned of sediment and debris.

Spill Control & Containment

The following measures must be implemented to minimize, control, and contain spills:

Stormwater Operation and Maintenance Plan Belmont Hill School, Belmont, MA

- Store chemicals inside, when applicable
- Pick up litter
- The spill shall be contained as close to the source as possible with a dike of absorbent materials from the spill cleanup equipment (such as socks, pads, pillows, or "pigs"). Additional dikes must be constructed to protect swales or other stormwater conveyances or streams. A cover or dike will shall protect any other stormwater structures such as catch basins.
- Implement employee training program and hold session at least once a year.
- Identify spill control team. The name(s) of the responsible spill personnel will be posted on-site.
- Each employee will be instructed that all spills are to be reported to the spill prevention and cleanup coordinator. The supervisor will assess the incident and initiate proper containment and response procedures immediately upon notification. Workers should avoid direct contact with spilled materials during the containment procedures.
- In the event of a release of oil or hazardous waste to the storm drainage system, the person shall immediately notify the Conservation Commission and the Town's Fire and Public Works Departments and the Board of Health.
- In the event of a release of a non-hazardous pollutant to the storm drainage system, the reporting person shall notify the Conservation Commission in person or by phone no later than 4:00 p.m. of the next business day.
- Notifications in person or by phone shall be confirmed by written notice addressed and mailed to the Conservation Commission within three business days of the phone notice.
- If the discharge of prohibited materials emanates from a commercial or industrial facility, the facility owner or operator of the facility shall retain on-site a written record of the discharge and the actions taken to prevent its recurrence. Such records shall be retained in accordance with the Massachusetts Public Records Law.

Pesticides and Fertilizers

- Pesticide/Herbicide Usage – No pesticides are to be used unless a single spot treatment is required for a specific control application.
- Fertilizer usage should be avoided. If deemed necessary, slow release fertilizer should be used. Fertilizer may be used to begin the establishment of vegetation in bare or damaged areas, but should not be applied on a regular basis unless necessary

**Stormwater Operation and Maintenance Plan
Belmont Hill School, Belmont, MA**

STORMWATER MANAGEMENT SYSTEM INSPECTION AND MAINTENANCE CHECKLIST

Belmont Hill School, Belmont, MA Date:					Time:		Inspector: Site Conditions:	
Structural Best Management Practice	Schedule	Action	Date Completed	Completed By	Satisfactory? Yes (Y) or No (N)		Comments or Corrective Measures Taken	
Deep Sump Catch Basin and Manhole								
Inspect Units	4x a year	Inspect			Y	N		
Clean Units	When sump is half full of sediment	Clean			Y	N		
Proprietary Hydrodynamic Separator (Downstream Defender WQS-101)								
Inspect per Manufacture Recommendations - See manufacturer maintenance guide	2x a year	Inspect			Y	N		
Remove Sediments and Pollutants	See manufacturer specifications	Inspect			Y	N		
Proprietary Hydrodynamic Separator (First Defense WQS-201, WQS-301)								
Inspect per Manufacture Recommendations - See manufacturer maintenance guide	2x a year	Inspect			Y	N		
Remove Sediments and Pollutants	See manufacturer specifications	Inspect			Y	N		

Checklist continued on next page

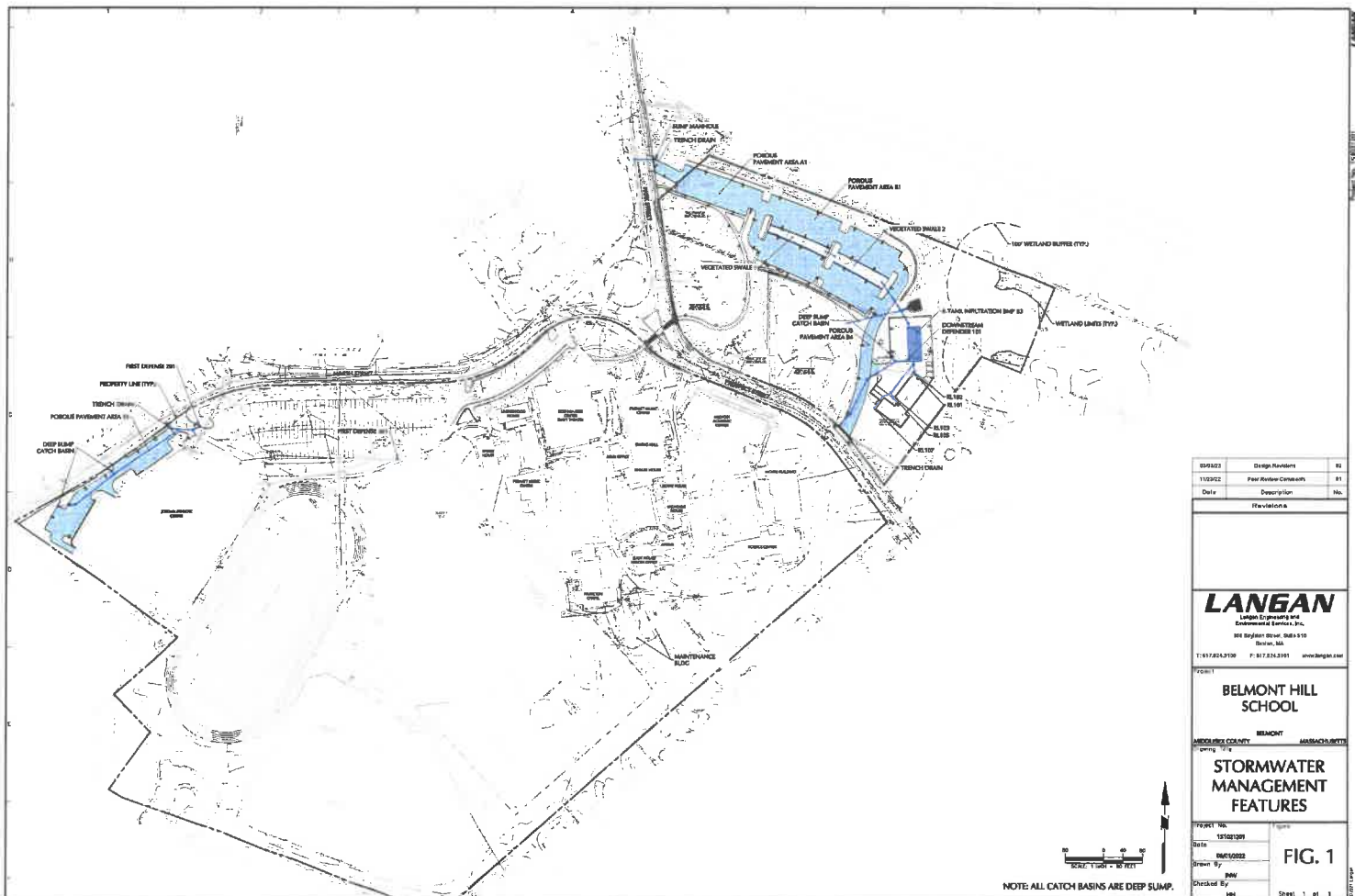
**Stormwater Operation and Maintenance Plan
Belmont Hill School, Belmont, MA**

Best Management Practice	Schedule	Action	Date Completed	Completed By	Satisfactory? Yes (Y) or No (N)	Comments or Corrective Measures Taken
Porous Pavement (Porous Pavement Area A1, B1, B4, E3)						
Monitor to ensure surface drains adequately after storms	As needed	Monitor			Y N	
Clean surface using power washer and vacuum sweep extents of pavement area	As needed	Clean			Y N	
Inspect surface for deterioration	Annually	Inspect			Y N	
Assess exfiltration capability	Annually, more frequently as needed	Inspect			Y N	
Roof Drain Leaders (RL101, RL102, RL103, RL105, RL107)						
Ensure roof and roof drainage system is kept clean and free of debris	Routinely, as needed	Inspect /Clean			Y N	
Clean gutter and downspouts	Annually	Clean			Y N	
Underground Detention/Infiltration System (RTank Infiltration BMP B3)						
Inspect inlet and outlet control structures	Annually	Inspect			Y N	
Remove sediment, trash and other pollutants	Annually	Clean			Y N	
Depth to Bottom: _____ Depth to Sediment: _____ Sediment Depth: _____						
Street Sweeping						
Vacuum Sweep	Quarterly	Clean			Y N	
Trench Drains						
Inspect	2x a year	Inspect			Y N	
Clean sediment and debris	As needed	Clean				

Stormwater Operation and Maintenance Plan Belmont Hill School, Belmont, MA

STORMWATER MANAGEMENT SYSTEM MAINTENANCE LOG FORM

[illegible]



09/05/03	Design Revision	01
11/03/02	Final Review Comments	01
Date	Description	No.

Revision 6

LANGAN

LANGAN ENGINEERING & ENVIRONMENTAL SERVICES, INC.
100 Bayshore Road, Suite 310
Beverly, MA

T: 978.683.1100 F: 978.683.2001 www.langan.com

PROJECT

BELMONT HILL SCHOOL

ANDOVER, MASSACHUSETTS

STORMWATER MANAGEMENT FEATURES

FIGURE 1

Date	09/01/2001	FIGURE 1
Drawn By	MM/0003	
Checked By	MM	
App		
Sheet	1 of 1	

FIG. 1

NOTE: ALL CATCH BASINS ARE DEEP SUMP.

APPENDIX I

Illicit Discharge Compliance Statement

ILLICIT DISCHARGE COMPLIANCE STATEMENT

RESPONSIBILITY:

The Owner is responsible for ultimate compliance with all provisions of the Massachusetts Stormwater Management Policy and responsible for identifying and eliminating illicit discharges (as defined by USEPA).

OWNER NAME: Belmont Hill School

ADDRESS: 350 Prospect Street, Belmont, MA 02478

TEL. NUMBER: (617) 484-4410

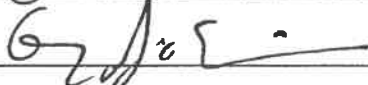
OWNER'S COMPLIANCE STATEMENT:

To the best of my knowledge, the attached plans, computations and specifications meet the requirements of Standard 10 of the Massachusetts Stormwater Handbook regarding illicit discharges to the stormwater management system and that no detectable illicit discharges exist on the site. All documents and attachments were prepared under my direction and qualified personnel gathered and evaluated the information submitted, to the best of my knowledge.

Included with this statement are site plans, drawn to scale, that identify the location of systems for conveying stormwater on the site and show that these systems do not allow the entry of any illicit discharges into the stormwater management system. The plans also show any systems for conveying wastewater and/or groundwater on the site and show that there are no connections between the stormwater and wastewater systems.

For a redevelopment project (if applicable), all actions taken to identify and remove illicit discharges, including without limitation, visual screening, dye or smoke testing, and the removal of any sources of illicit discharges to the stormwater management system are documented and included with this statement.

Name and Title: GREGORY SCHNEIDER HEAD OF SCHOOL

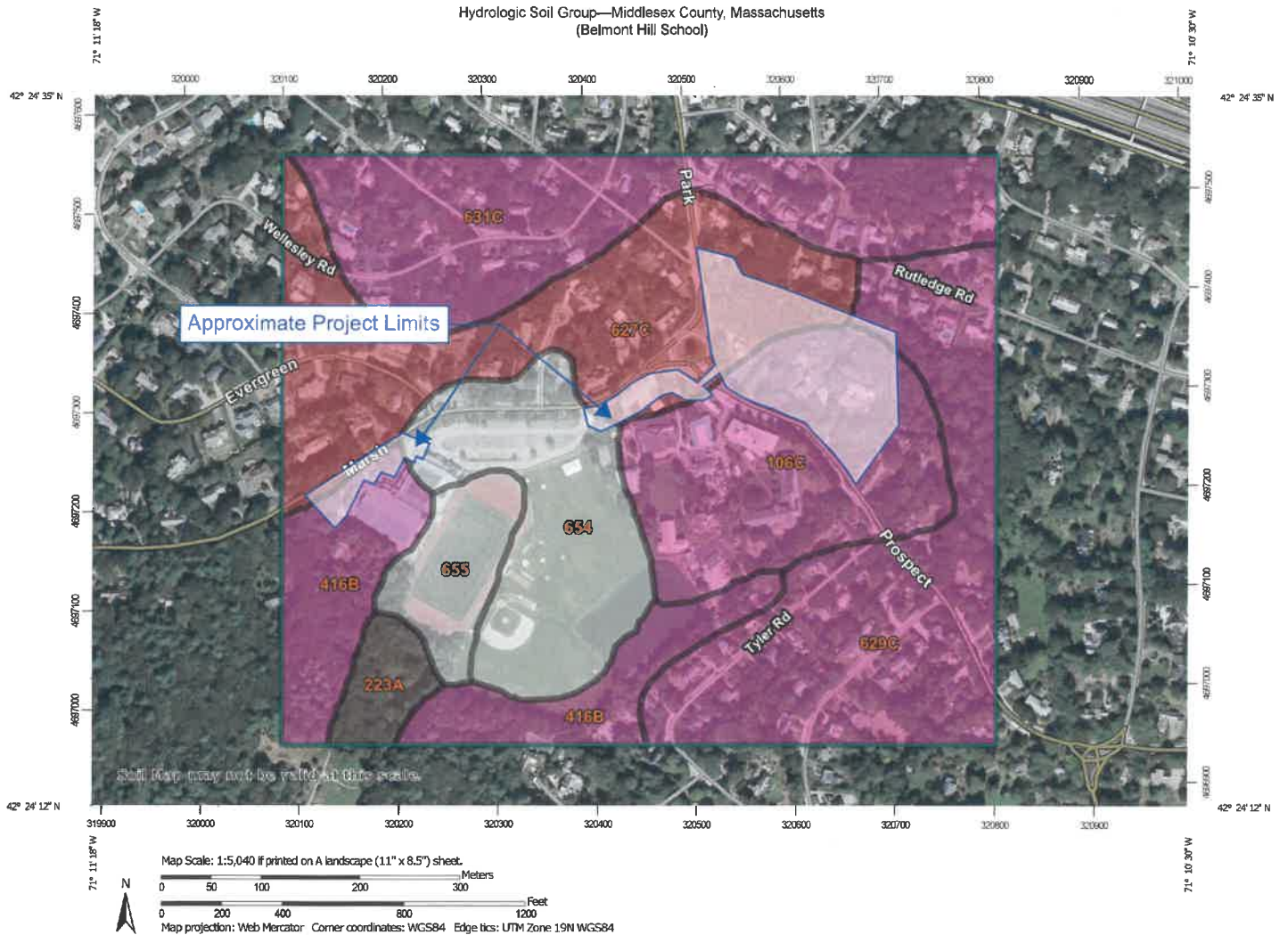
Signature: 

Date: 2/17/23

APPENDIX J

Geotechnical Evaluations


Hydrologic Soil Group—Middlesex County, Massachusetts (Belmont Hill School)



Hydrologic Soil Group—Middlesex County, Massachusetts
(Belmont Hill School)

MAP LEGEND

Area of Interest (AOI)









 Area of Interest (AOI)

Soils



Soil Rating Polygons





 A
 A/D
 B
 B/D
 C
 C/D
 D
 Not rated or not available

Soil Rating Lines

 A
 A/D
 B
 B/D
 C
 C/D
 D
 Not rated or not available

Soil Rating Points






 A
 A/D
 B
 B/D

 C
 C/D
 D
 Not rated or not available

Water Features

 Streams and Canals

Transportation

 Rails
 Interstate Highways
 US Routes
 Major Roads
 Local Roads

Background

 Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:25,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
 Web Soil Survey URL:
 Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Middlesex County, Massachusetts
 Survey Area Data: Version 21, Sep 2, 2021

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Aug 13, 2020—Sep 15, 2020

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.



Natural Resources
Conservation Service

Web Soil Survey
National Cooperative Soil Survey

10/25/2021
Page 2 of 4

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
106C	Narragansett-Hollis-Rock outcrop complex, 3 to 15 percent slopes	A	15.9	14.9%
223A	Scio very fine sandy loam, 0 to 3 percent slopes	B/D	2.4	2.2%
416B	Narragansett silt loam, 3 to 8 percent slopes, very stony	A	11.8	11.1%
627C	Newport-Urban land complex, 3 to 15 percent slopes	D	20.2	19.0%
629C	Canton-Charlton-Urban land complex, 3 to 15 percent slopes	A	20.8	19.5%
631C	Charlton-Urban land-Hollis complex, 3 to 15 percent slopes, rocky	A	18.5	17.4%
654	Udorthents, loamy		12.4	11.7%
655	Udorthents, wet substratum		4.3	4.1%
Totals for Area of Interest			106.3	100.0%

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

100 Cambridge Street, Suite 1310 Boston, MA 02114 T: 617.824.9100 F: 617.824.9101

To: Jay Bounty (Belmont Hill School)

From: Clay Patterson, Tim Light (Langan)

Info: Kelly Durfee Cardoza (Avalon); Frank Holmes, Hilary Holmes (Langan)

Date: 14 January 2022

Re: Geotechnical Exploration and Infiltration Test Results
Belmont Hill School
Belmont, Massachusetts
Langan Project No.: 151021202

Langan has prepared this memorandum to present the results of our geotechnical exploration and infiltration test results that were completed for the proposed master plan development at Belmont Hill School (BHS). The school address is 350 Prospect Street in Belmont, Massachusetts. Our geotechnical services were performed in general accordance with our authorized proposals dated 20 April, 13 October, and 2 December 2021.

PROJECT UNDERSTANDING

The BHS campus is in the northern part of Belmont, Massachusetts, near the intersection of Marsh Street, Park Avenue, and Prospect Street. The currently considered improvements involve three areas on the BHS campus:

“East Campus” – This area consists of several parcels of developed (residential) and undeveloped land north of Prospect Street that BHS owns.

“East Campus Maintenance Area” – This area consists of the 283 Prospect Street property that BHS owns. The property is also north of Prospect Street, and is at the east end of the East Campus area.

“Jordan Athletic Center (JAC) Parking Lot” – This area consists of the existing parking area near the JAC in the western part of the BHS campus

East Campus and East Campus Maintenance Area

Our understanding of the development plans for the East Campus, including the East Campus Maintenance Area, is based on our coordination with the project team, including designLAB architects and Reed Hilderbrand Landscape Architects, and the conceptual narrative for the maintenance building by RFS Engineering dated 19 November 2021. The development plan includes a surface parking lot and a Facilities Site with surface parking, material storage, vehicle storage, and a 2-story building with a 4,500 square-foot footprint located on the 283 Prospect Street property. The facilities building will include offices, a wood shop, and three garage bays.

MEMO

Geotechnical Exploration and Infiltration Test Results
Belmont Hill School
Belmont, Massachusetts
Langan Project No.: 151021202
14 January 2022 - Page 2 of 14

We understand that the project team is considering a partial basement for part of the facilities building. Associated improvements at the East Campus will include new utilities and stormwater management features.

JAC Parking Lot

Additional improvements associated with the master plan development are also proposed near the Jordan Athletic Center, in and around the existing parking lot area. These improvements include modified and expanded parking areas, stormwater management features, and pedestrian and vehicular access routes in and around the current parking area.

The proposed development must be in conformance with Belmont's Stormwater Management and Erosion Control Bylaw. One aspect of the Bylaw is a requirement to have no net increase in stormwater runoff volume. Infiltration of stormwater will be required in order to control the volume of runoff volume because the project will include replacing wooded areas (East Campus and Maintenance Area) and landscaped areas (JAC Parking Lot) with paved parking and access road areas.

SITE DESCRIPTION

Descriptions of the existing East Campus, East Campus Maintenance Area, and JAC Parking Lot sites are included in the following subsections.

East Campus

Our understanding of the East Campus site is based on a survey titled "Topographic Plan" prepared by Precision Land Surveying, Inc. dated 23 December 2020 and revised 16 December 2021, and our site visits on 1, 8, and 9 June 2021. The East Campus site is comprised of wooded areas and several residential structures with associated driveway and lawn areas. A driveway leading to the site of a demolished house enters the northern part of East Campus from Park Avenue. Limited wetland areas have been delineated in the southeastern part of the site.

Existing grades are typically from about elevation (el.) +265 to +275 feet; all elevations included herein reference the Town of Belmont Datum per the available topographic survey. Localized areas slope up as high as el. +280 feet, and the eastern part of the site slopes down to about el. +215 feet near the wetland area. The topographic survey identifies several rock outcrops at about el. +272 to +280 feet in the northern, undeveloped part of the site.

East Campus Maintenance Area

Our understanding of the East Campus Maintenance Area site is based on the available topographic survey, and our site visits on 4 through 6 January 2022. The East Campus

Maintenance Area site is comprised of wooded areas, a residential structure (#283 Prospect Street) with an associated driveway from Prospect Street, and lawn and garden areas. Existing grades are typically from about el. +260 to +264 feet around the 283 Prospect Street house and yard and garden areas. Beyond the house and yard areas, grades blend into the overall slope of East Campus, which slope down from the west to the east. A small hill, with maximum elevation of el. +272 feet is in the southern part of the property near Prospect Street. During our site visits, we observed bedrock outcrops at several parts of the hill.

JAC Parking Lot

Our understanding of the JAC Parking Lot site is based on the available topographic survey, and our site visits on 15, 16, and 17 October 2021. The JAC Parking Lot site is predominantly comprised of existing paved parking and driveway areas and associated landscaped areas. Other improvements include nearby athletic fields, the Jordan Athletics Center building, and paved or gravel walking paths. The JAC Parking Lot site is generally level with existing grades typically between about el. +249½ and +254½ feet, sloping up to about el. +257½ feet near the entrance on Marsh Street. Grades on the west side of Jordan Athletic Center building generally slope up from about el. +252 feet at the parking lot to about el. +262 feet at the southwest corner of the building. Several utility valves, poles, and manholes are also identified on the topographic survey in and around the JAC Parking Lot area.

SUBSURFACE EXPLORATION AND SUBSURFACE CONDITIONS

Langan performed subsurface explorations to evaluate subsurface soil, rock, and groundwater conditions at accessible locations within the proposed improvement areas at the East Campus, East Campus Maintenance Area, and the JAC Parking Lot sites. Our subsurface investigation program consisted of the following explorations:

- East Campus: eight test pits and seven infiltration tests
- East Campus Maintenance Area: nine test pits, five infiltration tests, and two borings
- JAC Parking Lot: nine test pits and eight infiltration tests

The approximate test pit, boring, and infiltration test locations are included on Figure 1 (Exploration Location Plan – East Campus and Maintenance Area) and Figure 2 (Exploration Location Plan – JAC Parking Lot), as appropriate.

Details about our subsurface exploration programs and the subsurface conditions encountered are described in the following subsections.

MEMO

Geotechnical Exploration and Infiltration Test Results
Belmont Hill School
Belmont, Massachusetts
Langan Project No.: 151021202
14 January 2022 - Page 4 of 14

Test Pits

East Campus

Eight test pits, designated TP-1 through TP-8, were excavated in the northern part of the East Campus site by F.E. French Construction, Inc., (FE French) of Belmont, Massachusetts, on 8 and 9 June 2021, under Langan's full-time observation. The test pits were excavated using a CAT 307C excavator to depths of about 3½ to 8 feet below the existing ground surface; the bottoms of the test pits were between about el. +256 and +271½ feet. Upon completion, the test pits were backfilled with excavated material that was placed in about 1- to 2-foot-thick loose lifts and compacted with the bucket of the excavator. Logs and photographs of the test pits are included in Appendix A and Appendix B, respectively.

East Campus Maintenance Building

Nine test pits, designated TP-301 through TP-309, were excavated in the East Campus Maintenance Area site by FE French, on 4 and 5 January 2022, under Langan's full-time observation. The test pits were excavated using a CAT 303.5E excavator to depths of about 2 to 8½ feet below the existing ground surface; the bottoms of the test pits were between about el. +249 and +270 feet. Upon completion, the test pits were backfilled with excavated material that was placed in about 1- to 2-foot-thick loose lifts and compacted with the bucket of the excavator. Logs and photographs of the test pits are included in Appendix C and Appendix D, respectively.

JAC Parking Lot

Nine test pits, designated TP-201 through TP-209, were excavated in the JAC Parking Lot site by FE French on 16 and 17 October 2021, under Langan's full-time observation. The test pits were excavated using a CAT 306 excavator to depths of about 5½ to 8½ feet below the existing site grades; the bottoms of the test pits were between about el. +241¼ and +254 feet. Upon completion, test pits TP-201 through TP-203, which were in the existing parking lot, were backfilled with the excavated material that was placed in about 1-foot-thick loose lifts and compacted with the bucket of the excavator to a depth of about 4 feet below the adjacent grades. These test pits were then backfilled with about 3 feet of excavated material and 1 foot of imported dense-graded aggregate base material that were placed in 1-foot-thick loose lifts and compacted with a large vibratory plate compactor. The compacted backfill material was observed to be firm and stable at the time of placement. Test pits TP-204 through TP-209, which were outside of the parking lot area, were backfilled with the excavated material that was placed in about 1-foot-thick loose lifts and compacted with the bucket of the excavator. Logs and photographs of the test pits are included in Appendix E and Appendix F, respectively.

Note, additional compaction efforts will be required at the backfilled test pit areas (except for TP-201 through TP-203, which were backfilled with compacted fill) during grading for the proposed parking areas.

Borings

Two borings, designated LB-01 and LB-02, were completed on 6 January 2022 by Geologic Subsurface Exploration, Inc., of Norfolk, Massachusetts under Langan's full-time observation in the East Campus Maintenance Area. The borings were advanced using an Acker Scout track-mounted drill rig using mud rotary, roller bit, and rock coring techniques. The borings were advanced to depths of about 10½ to 16 feet below the existing grades, with bottom of both borings at about el. +245 feet.

During drilling, standard penetration test (SPT) N-values¹ were recorded and soil samples were typically obtained continuously to a depth of about 12 feet. Disturbed soil samples were obtained using a standard 2-inch-outer-diameter split-spoon sampler driven by a 140-pound donut hammer in accordance with ASTM D1586, Standard Penetration Test. Continuous rock cores were advanced through boulders or bedrock at both borings using an NX-size core barrel.

Recovered soil samples were visually examined and classified in the field in general accordance with the Unified Soil Classification System (USCS). Soil and rock classifications, N-values, and other field observations were recorded on our boring logs included in Appendix G.

Groundwater Observation Well

One of the borings completed in the East Campus Maintenance Area was converted to temporary groundwater observation well, designated LB-02(OW). The bottom of the well screen extends about 16 feet below the existing site grades, corresponding to about el. +245 feet. The groundwater observation well construction log is provided in Appendix H.

Laboratory Testing

Selected soil samples obtained from test pits TP-05, TP-202, TP-206, TP-207, and TP-301 through TP-305 were submitted to a geotechnical laboratory to confirm the visual classification and to determine index properties (physical and mechanical). Laboratory tests including grain-size analyses, with hydrometer testing, USDA textural classification, California Bearing Ratio (CBR), and moisture content were performed to assist with the geotechnical and stormwater

¹ The SPT is an in situ testing technique used to infer soil relative density and consistency. The SPT N-value is defined as the number of blows required to drive a 2-inch-diameter split-barrel sampler 12 inches after an initial penetration of 6 inches using a 140-pound hammer falling freely from a height of 30 inches.

MEMO

Geotechnical Exploration and Infiltration Test Results
Belmont Hill School
Belmont, Massachusetts
Langan Project No.: 151021202
14 January 2022 - Page 6 of 14

evaluations for the site; the lab test results from test pits TP-05, TP-202, TP-206, and TP-207 are included in Appendix I. The lab test result from test pits TP-301 through TP-305 are still pending.

Subsurface Conditions – East Campus

The East Campus site is generally blanketed by a layer of topsoil or fill. Where fill was encountered, it is underlain by a layer of buried topsoil. A layer of sandy silt was encountered below the surficial material at all test pits, and is underlain by sand. Bedrock was encountered below the sand at several of the test pits. Groundwater was not encountered during our subsurface exploration. Additional details about the subsurface materials encountered is included below in general order of increasing depth.

Surficial Topsoil – An about 6- to 10-inch-thick layer of topsoil was encountered across the site at every test pit except TP-05. The topsoil layer generally consists of dark brown silt with varying amounts and gradations of sand and organic material.

Fill – A localized, about 2½-foot-thick layer of fill was encountered at the ground surface in test pit TP-05. The bottom of the fill corresponds to about el. +262½ feet, where encountered. The fill generally consists of re-worked sand that is greyish brown to tan fine sand with varying amounts of silt, coarse to fine gravel, cobbles, boulders, bricks, concrete fragments, tile fragments, and roots.

Buried Topsoil – A discontinuous, about 6-inch-thick layer of buried topsoil was encountered below the fill in test pit TP-05. The bottom of the top soil corresponds to about el. +262 feet. The buried topsoil layer generally consists of dark brown silt with trace amounts of fine sand and organic debris.

Sandy Silt – An about 8-inch-thick to 3½-foot-thick layer of sandy silt was encountered below the topsoil in all test pits. The bottom of the sandy silt corresponds to about el. +258½ to +275 feet. The sandy silt layer generally consists of brown sandy silt with varying amounts of gravel and trace amounts of cobbles, boulders, and roots.

Sand – An about 6-inch-thick to 5½-foot-thick layer of sand was encountered in all test pits. The bottom of the sand layer corresponds to about el. +256 to +271½ feet. Most of the test pits were terminated within the sand layer; therefore, the bottom of this layer may be deeper than reported herein and on the logs. The sand generally consists of gray coarse to fine sand with varying amounts of silt, gravel, cobbles, and boulders.

MEMO

Geotechnical Exploration and Infiltration Test Results

Belmont Hill School

Belmont, Massachusetts

Langan Project No.: 151021202

14 January 2022 - Page 7 of 14

Bedrock – Bedrock was encountered about 3½ to 7½ feet below existing site grades (i.e., about el. + 256 to +258 feet) in test pits TP-2 through TP-4. These test pits were terminated upon encountering bedrock.

Groundwater – Groundwater was not encountered to the maximum depths explored (8 feet), but should be expected to fluctuate with seasonal activity, precipitation, etc.

See the logs of the East Campus test pits in Appendix A and corresponding photos in Appendix B for additional details about the encountered subsurface conditions.

Subsurface Conditions – East Campus Maintenance Area

The East Campus Maintenance Area site is generally blanketed by a layer of topsoil or fill. Where fill was encountered at test pit TP-303, it is underlain by a layer of buried topsoil. A layer of sandy silt or silty sand was typically encountered below the surficial material, and is underlain by glacial till (predominantly sand with varying amounts of gravel). Weathered rock and bedrock were encountered below the glacial till at several of the test pits. Groundwater was not encountered to the maximum depths explored during our subsurface investigation. Additional details about the subsurface materials encountered is included below in general order of increasing depth.

Surficial Topsoil – An about 6- to 12-inch-thick layer of topsoil was encountered across the site at every test pit except TP-304. The topsoil layer generally consists of dark brown fine to medium sand with varying amounts of silt, clay, and organic material, and trace amounts of wood chips and fine gravel.

Fill – Localized, about 6-inch-thick to 5-foot-thick layers of fill were encountered at or near the ground surface in test pits TP-303 and TP-304, and in boring LB-02(OW) in the eastern part of the site. The bottom of the fill corresponds to about el. +255 to +257 feet, where encountered. The fill generally consists of re-worked sand that is gray to brown fine sand with varying amounts of silt, coarse to fine gravel, roots, wood chips, concrete debris, brick debris, glass debris, wire debris, and fabric debris.

Buried Topsoil – An about 6-inch-thick layer of buried topsoil was encountered below the fill in test pit TP-303. The bottom of the top soil corresponds to about el. +256½ feet. The buried topsoil layer generally consists of brown silty fine sand roots.

Silty Sand – An about 1¼- to 2½-foot-thick layer of silty sand was encountered below the topsoil or fill in all borings and test pits except test pit TP-303. The bottom of the silty sand layer corresponds to about el. +253 to +270 feet. The silty sand layer generally consists of light brown

MEMO

Geotechnical Exploration and Infiltration Test Results
Belmont Hill School
Belmont, Massachusetts
Langan Project No.: 151021202
14 January 2022 - Page 8 of 14

to brown sand with varying amounts of silt, fine to coarse gravel, and trace amounts of cobbles, boulders, and roots.

Glacial Till – An about 1½-foot-thick to greater than 8½-foot-thick layer of glacial till sand was encountered in all borings and test pits except test pit TP-306. The bottom of the sand layer corresponds to about el. +245 to +259 feet. Some of the borings and test pits were terminated within the glacial till layer; therefore, the bottom of this layer may be deeper than reported herein and on the logs. The glacial till generally consists of gray to brown coarse to fine sand with varying amounts of silt, coarse to fine gravel, cobbles, and boulders.

Weathered Rock – An about 6-inch-thick to 1½-foot-thick layer of weathered rock was encountered about 7 to 7½ feet below existing site grades (i.e., about el. + 249½ to +256 feet) in test pits TP-301 and TP-304. These test pits were both terminated within the weathered rock layer, so the layer may be thicker than reported herein. The weathered rock generally consists of gray coarse to fine sand with coarse to fine gravel and varying amounts of silt, cobbles, and boulders.

Bedrock – Bedrock was encountered about 2 inches to 11½ feet below existing site grades (i.e., about el. + 249½ to +272 feet) in test pits TP-302, TP-305, TP-306, TP-307, TP-309, and boring LB-02(OW). The test pits were terminated upon encountering bedrock. An about 3-foot-long rock core was recovered from boring LB-02 from depths of about 13 to 16 feet below existing site grades. The recovered bedrock core sample appears to consist of brown granodiorite from the Avalon Belt formation with a recovery (REC) of 97% and rock quality designation (RQD) of 44%. The sample of granodiorite has poor rock quality, with close fracture spacing, and moderate weathering.

Groundwater – Groundwater was not encountered to the maximum depths explored in the test pits (8½ feet) or borings (16 feet), but should be expected to fluctuate with seasonal activity, precipitation, etc.

See the logs of the East Campus Maintenance Area test pits in Appendix C and corresponding photos in Appendix D, and logs of the borings in Appendix G for additional details about the encountered subsurface conditions.

Subsurface Conditions – JAC Parking Lot

The JAC Parking Lot site is generally blanketed by a layer of topsoil or fill. Fill was encountered at the ground surface or below the topsoil in all test pits. Where encountered, the fill is underlain by either a layer of buried topsoil, silt, or sand. Bedrock was not encountered in any of the test pits at the JAC Parking Lot site. Groundwater was only encountered in test pit TP-201. Additional

MEMO

Geotechnical Exploration and Infiltration Test Results
Belmont Hill School
Belmont, Massachusetts
Langan Project No.: 151021202
14 January 2022 - Page 9 of 14

details about the subsurface materials encountered is included below in general order of increasing depth.

Surficial Topsoil – A surficial, about 3-inch-thick layer of topsoil was encountered in test pits TP-204, TP-205, TP-206, and TP-207. The topsoil generally consists of dark brown coarse to fine sand or silt with varying proportions of sand, silt, and roots, and a trace amount of clay.

Woodchip Fill – A layer of fill primarily composed of brown to dark brown woodchips with trace amounts of silt was encountered in test pit TP-209 at the ground surface. The woodchip fill was observed to be about 2½ feet thick. The bottom of the woodchip fill corresponds to about el. +259½ feet. The woodchips were observed in varying stages of decomposition.

Fill – A layer of sandy fill was encountered in all test pits below the topsoil, woodchips, or at the ground surface. The fill was observed to be about 16 inches to 8½ feet thick. The bottom of the fill corresponds to about el. +241¼ to +258½ feet. Test pits TP-202 and TP-207 were terminated within the fill layer; therefore, the bottom of the layer may be deeper than reported herein or on the logs. The fill generally consists of light brown to brown or grayish brown to gray coarse to fine sand with varying amounts of silt and coarse to fine gravel, and trace amounts of clay, cobbles, boulders, roots, and asphalt, brick, concrete, tile, ceramic, metal, wire, plastic, glass, and wood fragments and debris.

A discontinuous layer of fill containing coal ash was encountered in test pit TP-203. This about 6-inch-thick fill layer typically consisted of tan to white medium to fine sand with some silt and coal ash, and trace fine gravel and coal fragments.

The presence of assorted debris, such as asphalt, concrete, metal, and coal ash, potentially pose environmental considerations beyond the scope of this geotechnical study and should be further reviewed.

Buried Topsoil – A discontinuous, about 6- to 9-inch-thick layer of buried topsoil was encountered below the fill in test pits TP-201, TP-203, TP-208, and TP-209. The bottom of the buried top soil corresponds to about el. +243½ to +258 feet. The buried topsoil layer generally consists of dark brown silt with varying amounts and gradations of sand, some clay and organics, and trace amounts of wood fragments and roots.

Silt – A layer of silt was encountered below the fill or buried topsoil in test pits TP-201, TP-203, TP-206, and TP-209. The silt layer was observed to be about 1 to 3½ feet thick, and the bottom of the silt corresponds to about el. +242 to +256½ feet. Test pits TP-201 and TP-203 were terminated within the silt layer; therefore, the bottom of this layer may be deeper than reported

MEMO

Geotechnical Exploration and Infiltration Test Results
Belmont Hill School
Belmont, Massachusetts
Langan Project No.: 151021202
14 January 2022 - Page 10 of 14

herein and on the logs. The silt layer generally consists of light brown to brown silt with varying amounts and gradation of sand, and trace amounts of clay, gravel, and roots.

Sand – A layer of coarse to fine sand was encountered below the fill or silt in test pits TP-204, TP-205, TP-206, TP-208, and TP-209. The sand layer was observed to be about 2½ to 6 feet thick, and the bottom of the layer corresponds to about el. +244 to +254 feet. Test pits TP-204, TP-205, TP-206, TP-208, and TP-209 were terminated within the sand layer; therefore, the bottom of the layer may be deeper than reported herein and on the logs. The sand generally consists of light brown or grayish brown to gray coarse to fine sand with varying amounts of silt and cobbles, and trace amounts of clay, boulders, and roots.

Bedrock – Bedrock was not encountered at the exploration locations to depths of about 5½ to 8½ feet below the existing site grades.

Groundwater – Groundwater was encountered in test pit TP-201 at a depth of about 8 feet below existing grades (i.e., about el. +242½ feet). Groundwater should be expected to fluctuate with seasonal activity, precipitation, etc.

See the logs of the JAC Parking Lot test pits in Appendix E and corresponding photos in Appendix F for additional details about the encountered subsurface conditions.

INFILTRATION TEST RESULTS

Infiltration tests performed at the East Campus, East Campus Maintenance Area, and JAC Parking Lot sites are summarized below. Field infiltration tests were performed with constant head infiltration testing methods using the Guelph Permeameter in general accordance with ASTM D 5126. A summary of the observed stabilized infiltration rates and the estimated field-saturated hydraulic conductivity values are presented in Tables 1 through 3. Detailed summaries of each infiltration test are included in Appendix J (East Campus), Appendix K (East Campus Maintenance Area), and Appendix L (JAC Parking Lot). Where available, the USDA textural classification and corresponding Rawl's rate is also included in Tables 1 through 3; see Appendix I for additional details about the laboratory test results.

MEMO

Geotechnical Exploration and Infiltration Test Results
Belmont Hill School
Belmont, Massachusetts
Langan Project No.: 151021202
14 January 2022 - Page 11 of 14

Table 1: Infiltration Test Results Summary for the East Campus

Location (Test ID)	Approx. Surface El. (feet) ¹	Test Depth (feet)	Approx. Test El. (feet) ¹	Steady State Rate (A) ⁴ (in/hr)	Steady State Rate (B) ⁴ (in/hr)	Field Saturated Hydraulic Conductivity K _{sat} (in/hr)	USDA Textural Classification [Rawls Rate]	Material Type
TP-2 (IT-2)	261.5	3 to 3.5 ³	258	64.4 ²	14.2	Invalid Test ^{2,3}	Not Tested	Gray coarse to fine SAND, some silt, trace coarse to fine gravel, trace cobbles, trace boulders (moist)
TP-3 (IT-3)	261	4 to 4.6	256.4	26.0	37.8	0.80	Not Tested	Gray coarse to fine SAND, some silt, trace coarse to fine gravel, trace cobbles, trace boulders (moist)
TP-4 (IT-4)	265.5	1.5 to 2.2	263.3	16.5	35.5	0.61	Not Tested	Brown fine sandy SILT, some medium sand, trace coarse to fine gravel, trace cobbles, trace boulders, trace roots (moist)
TP-5 (IT-5)	265	5.5 to 6	259	7.1	21.3	0.63	Sandy Loam (Group B) [1.02 in/hr]	Gray coarse to fine SAND, some silt, trace coarse to fine gravel, trace cobbles, trace boulders (moist)
TP-6 (IT-6)	272	3 to 3.5	268.5	18.9	40.2	1.37	Not Tested	Gray coarse to fine SAND, some silt, trace coarse to fine gravel, trace cobbles, trace boulders (moist)
TP-7 (IT-7)	272.5	4 to 4.5	268	5.9	11.8	0.59	Not Tested	Gray coarse to fine SAND, some silt, some coarse to fine gravel, trace cobbles, trace boulders (moist)
TP-8 (IT-8)	277.5	4 to 4.5	273	11.8	16.5	0.39	Not Tested	Gray coarse to fine SAND, some silt, some coarse to fine gravel, trace cobbles, trace boulders (moist)

Notes:

1. All elevations refer to the Town of Belmont Datum.
2. This test did not properly equilibrate; therefore, the reported data likely does not accurately represent the infiltration rate of the tested soil.
3. Note post infiltration test, test pit was excavated further and encountered bedrock within several inches of test elevation. Results may not be indicative of anticipated infiltration rates at this location.
4. See infiltration testing data sheets in Appendix J for additional details.

MEMO

Geotechnical Exploration and Infiltration Test Results
Belmont Hill School
Belmont, Massachusetts
Langan Project No.: 151021202
14 January 2022 - Page 12 of 14

Table 2: Infiltration Test Results Summary for the East Campus Maintenance Area

Location (Test ID)	Approx. Surface El. (feet) ¹	Test Depth (feet)	Approx. Test El. (feet) ¹	Steady State Rate (A) ⁴ (in/hr)	Steady State Rate (B) ⁴ (in/hr)	Field Saturated Hydraulic Conductivity K _{sat} (in/hr)	USDA Textural Classification [Rawls Rate]	Material Type
TP-301 (IT-2)	263	1.5 to 2	261	18.9	153.7	3.53	Laboratory Test Pending	Brown silty fine SAND, trace coarse-fine gravel, trace cobbles, trace roots (moist)
TP-302 (IT-3)	262	2 to 2.5	259.5	16.5	26.0	0.80	Laboratory Test Pending	Brown silty coarse-fine SAND, some coarse-fine gravel, trace cobbles, trace clay, trace organics, trace roots (moist)
TP-303	260.5	6.5 to 7.5	253 to 254	Not Tested ²	Not Tested ²	Not Tested ²	Laboratory Test Pending	Gray coarse-fine SAND with coarse-fine gravel, some silt (moist)
TP-304 (IT-4)	257	2.5 to 3	254	11.8	23.6	1.28	Laboratory Test Pending	Brown to tan fine sandy SILT, trace coarse-fine gravel, trace cobbles (moist)
TP-305 (IT-305a)	263.5	1.75 to 2.25	261.25	7.1	28.4	0.74	Not Tested	Brown coarse-fine SAND, some silt, trace coarse-fine gravel, trace cobbles (moist)
TP-305 (IT-305b)	263.5	2.5 to 3	260.5	14.2	52.0	2.15	Laboratory Test Pending	Gray coarse-fine SAND, some silt, some coarse-fine gravel, trace cobbles, trace boulders, trace weathered rock fragments (moist)

Notes:

1. All elevations refer to the Town of Belmont Datum.
2. Field infiltration test not performed in test pit TP-303, but sample was submitted to laboratory for testing.
3. See infiltration testing data sheets in Appendix K for additional details.

MEMO

Geotechnical Exploration and Infiltration Test Results
Belmont Hill School
Belmont, Massachusetts
Langan Project No.: 151021202
14 January 2022 - Page 13 of 14

Table 3: Infiltration Test Results Summary for the JAC Parking Lot

Location (Test ID)	Approx. Surface El. (feet) ¹	Test Depth (feet)	Approx. Test El. (feet) ¹	Steady State Rate (A) ⁴ (in/hr)	Steady State Rate (B) ⁴ (in/hr)	Field Saturated Hydraulic Conductivity K _{sat} (in/hr)	USDA Textural Classification [Rawls Rate]	Material Type
TP-201 (IT-201)	250.5	4.75 to 5.25	245.3	29.9	64.6	0.07	Not Tested	Brownish tan SILT, trace clay, trace fine sand, trace roots (moist)
TP-202 (IT-202)	249.8	4 to 4.5	245.3	37.8	70.9	0.17	Loamy Sand (Group A) [2.41 in/hr]	Light brown to brown coarse to fine SAND, some coarse gravel, some silt, trace cobbles, trace boulders, trace brick fragments, trace wire fragments, trace concrete fragments, trace asphalt fragments, trace tile fragments (moist) [FILL]
TP-204 (IT-204)	253.5	5 to 5.5	248	283.7	331.0	14.46	Not Tested	Grayish brown coarse to fine SAND, some silt, some coarse to fine gravel, trace cobbles, trace boulders (moist)
TP-205 (IT-205)	251.4	2 to 2.5	248.9	18.9	23.6	1.64	Not Tested	Gray coarse to fine SAND, some coarse to fine gravel, some silt, trace cobbles, trace boulders (moist)
TP-206 (IT-206)	251.9	1.5 to 2	249.9	14.2	18.9	0.41	Silt Loam (Group C) [0.27 in/hr]	Light brown coarse to fine sandy SILT, trace coarse to fine gravel, trace roots (moist)
TP-207 (IT-207)	256.5	1 to 1.5	255	4.7	7.1	0.18	Silt Loam (Group C) [0.27 in/hr]	Brown coarse to fine SAND, some silt, some coarse to fine gravel, trace cobbles, trace boulders, trace ceramic fragments, trace plastic fragments, trace roots (moist) [FILL]
TP-208 (IT-208)	259.4	3 to 3.5	255.9	7.1	11.8	0.94	Not Tested	Light brown coarse to fine SAND, some silt, some fine gravel (moist)
TP-209 (IT-209)	262	4.5 to 5	257	7.1	11.8	0.38	Not Tested	Light brown sandy SILT, trace coarse to fine gravel, trace roots (moist)

Notes:

1. All elevations refer to the Town of Belmont Datum.
2. See infiltration testing data sheets in Appendix L for additional details.

MEMO

Geotechnical Exploration and Infiltration Test Results
Belmont Hill School
Belmont, Massachusetts
Langan Project No.: 151021202
14 January 2022 - Page 14 of 14

Final design infiltration rates and saturated hydraulic conductivity values should be selected based on the stormwater design and allowable infiltration rates.

LIMITATIONS

The findings and conclusions provided in this memorandum result from our interpretation of the geotechnical conditions existing at the site inferred from a limited number of borings and test pits. Actual subsurface conditions may vary.

This memorandum has been prepared to assist the owner, architect, and site civil engineer in the design process and is only applicable to the design of the specific project identified. The information in this memorandum cannot be used or depended on by engineers or contractors involved in evaluations or designs of facilities on adjacent properties beyond the limits of that which is the specific subject of this memorandum.

Environmental issues (such as permitting or potentially contaminated soil and groundwater) were outside the scope of this geotechnical study.

Enclosure(s):	Figure 1	Exploration Location Plan – East Campus and Maintenance Area
	Figure 2	Exploration Location Plan – JAC Parking Lot
Appendix A	Langan Test Pit Logs - East Campus	
Appendix B	Langan Test Pit Photographs - East Campus	
Appendix C	Langan Test Pit Logs - East Campus Maintenance Area	
Appendix D	Langan Test Pit Photographs - East Campus Maintenance Area	
Appendix E	Langan Test Pit Logs - JAC Parking Lot	
Appendix F	Langan Test Pit Photographs - JAC Parking Lot	
Appendix G	Langan Boring Logs - East Campus Maintenance Area	
Appendix H	Langan Groundwater Observation Well Log - East Campus Maintenance Area	
Appendix I	Laboratory Test Results	
Appendix J	Infiltration Test Results - East Campus	
Appendix K	Infiltration Test Results - East Campus Maintenance Area	
Appendix L	Infiltration Test Results - JAC Parking Lot	

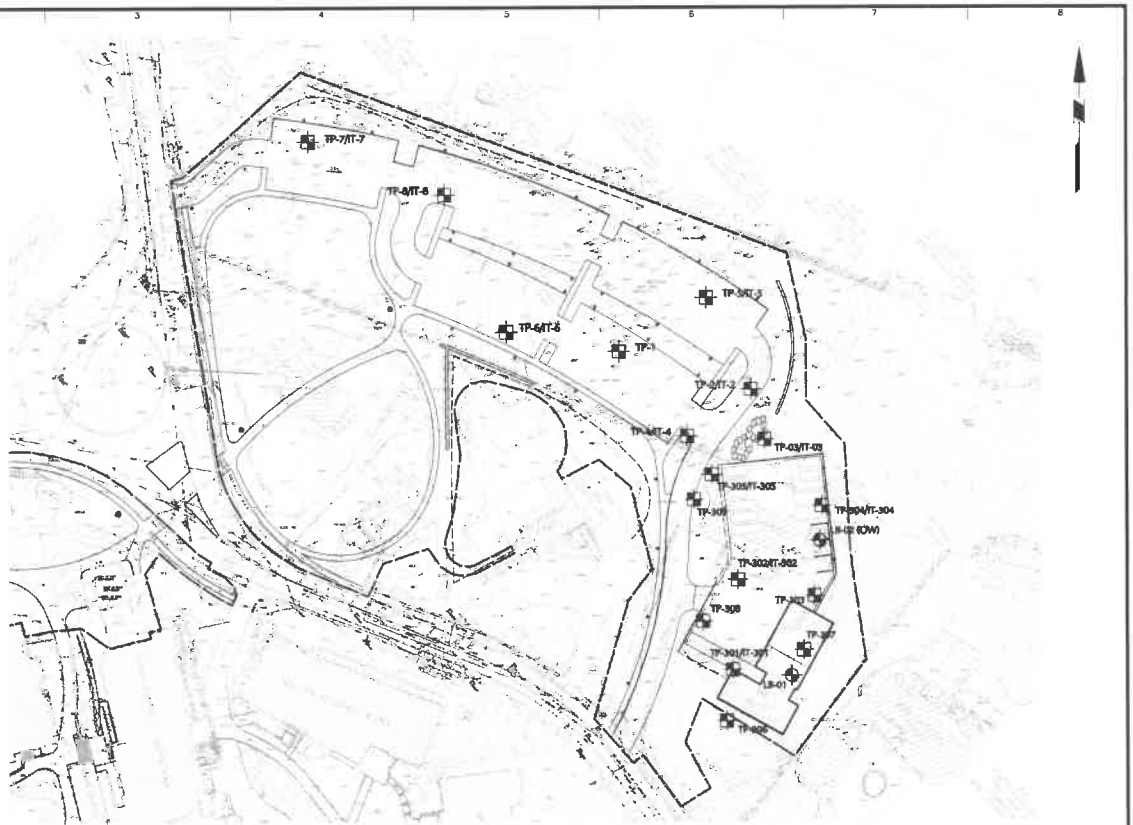
FIGURES

NOTES

1. ALL TEST PIT AND BORING LOCATIONS ARE APPROXIMATE.
2. ELEVATIONS REFERENCE TOWN OF BELMONT DATUM.
3. TOPOGRAPHIC INFORMATION AND EXISTING CONDITIONS OBTAINED FROM A SURVEY TITLES "TOPOGRAPHIC PLAN" PREPARED BY PRECISION LAND SURVEYING, INC., DATED 23 DECEMBER 2020 AND REVISED 15 DECEMBER 2021.
4. PROPOSED PARKING LOT AND BUILDING CONCEPTUAL INFORMATION OBTAINED FROM CAD FILES BY REED HILDEBRAND LANDSCAPE ARCHITECTS PROVIDED 13 JANUARY 2022.
5. TEST PITS WERE PERFORMED BY FE FRENCH CONSTRUCTION, INC., ON 8 AND 9 JUNE 2021 AND 4 AND 5 JANUARY 2022 UNDER THE FULL-TIME OBSERVATION OF A LANGAN FIELD ENGINEER.
6. BORINGS WERE PERFORMED BY GEOLOGIC EARTH EXPLORATION INC., ON 6 JANUARY 2022 UNDER THE FULL-TIME OBSERVATION OF A LANGAN FIELD ENGINEER.

LEGEND

TEST PIT	
TEST PIT AND INFILTRATION TEST	
BORING	
PROPOSED PARKING LOT BOUNDARY	



LANGAN

Langan Engineering and
Environmental Services, Inc.
100 Cambridge Street, Suite 1200
Boston, MA
T: 617.824.9100 F: 617.824.9101 www.langan.com

Project: BELMONT HILL
SCHOOL

BELMONT
SCHOOL DISTRICT
BURLINGTON

Drawing Title

BORING LOCATION
PLAN

Project No.

181621201

Date

01/13/2022

Drawn By

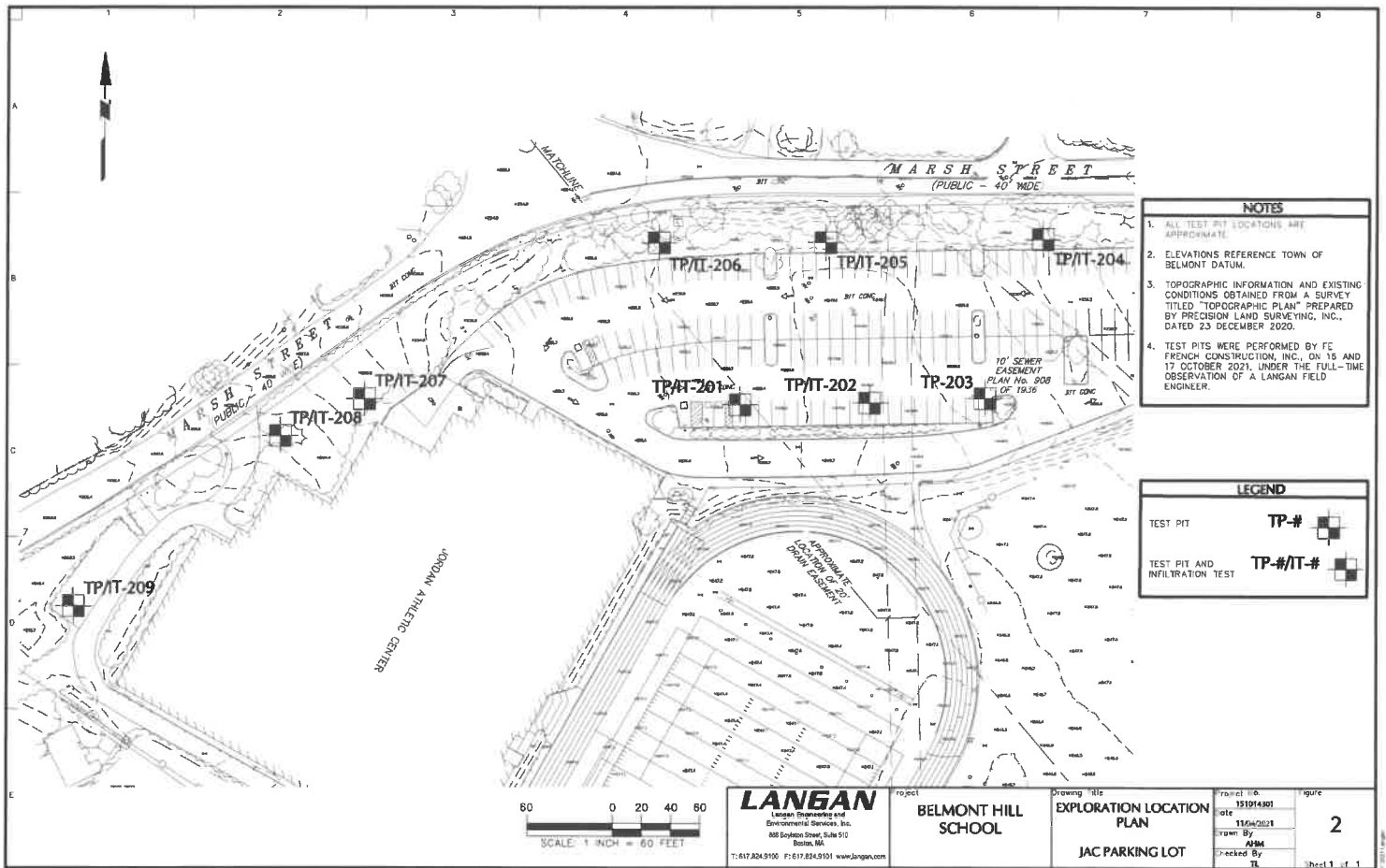
REP

Checked By

TL

Figure

1





APPENDIX A












Langan Test Pit Logs – East Campus

LOG OF TEST PIT TP-1

Sheet 1 of 1

PROJECT NAME Belmont Hill School		PROJECT NUMBER 151014301		DATE 06/08/2021	
LOCATION 350 Prospect Street		ELEVATION Approx. 266.5 ft (Town of Belmont Datum)			
EXCAVATION CONTRACTOR F.E. French Construction, Inc.		DEPTH 7.5 ft		WATER LEVEL - First N/E 	
EQUIPMENT CAT 307C Excavator		FOREMAN Justin Kittle		WATER LEVEL - Completion N/A 	
				LANGAN PERSONNEL Alexander Macon	



I:\LANGAN.COM\DATA\BOS\DATA3\151014301\PROJECT DATA\DISCIPLINE\GEOTECHNICAL\LOGS\151014301_ENTERPRISE.GPJ ... 6/18/2021 1:33:19 PM ... Report Log - LANGANTP




Symbol	ELEV (feet)	DESCRIPTION	Depth Scale	SAMPLE		REMARKS
				Number	Type	
	+266.5	8 inches Dark brown SILT, some medium to fine sand, trace roots (dry) [TOPSOIL]	0	S-1	GRAB	Grab sample S-1 at 0.0ft to 0.67ft
	+265.8	Brown fine sandy SILT, some medium sand, trace coarse to fine gravel, trace cobbles, trace boulders, trace roots (dry)	1	S-2	GRAB	
	+265.0	Tan SILT, some fine sand, trace coarse to fine gravel, trace cobbles, trace boulders (dry)	2			Grab sample S-2 at 1.0ft to 1.5ft
			3	S-3	GRAB	Grab sample S-3 at 2.5ft to 3.0ft
	+263.5	Gray coarse to fine SAND, some silt, some coarse to fine gravel, trace cobbles, trace boulders (moist)	4	S-4	GRAB	
			5			Infiltration test attempted at about 5ft. Water did not infiltrate because the test was attempted on top of large boulders.
			6	S-5	GRAB	
			7			Grab sample S-5 at 6.0ft to 6.5ft
			8			
			9			Test pit backfilled with excavated soils in lifts and compacted with excavator bucket.
			10			
	+259.0	End of test pit				

LANGAN

LOG OF TEST PIT TP-2/IT-2

Sheet 1 of 1

PROJECT NAME Belmont Hill School		PROJECT NUMBER 151014301		DATE 06/08/2021	
LOCATION 350 Prospect Street		ELEVATION Approx. 261.5 ft (Town of Belmont Datum)			
EXCAVATION CONTRACTOR F.E. French Construction, Inc.		DEPTH 3.5 ft		WATER LEVEL - First N/E 	
EQUIPMENT CAT 307C Excavator		FOREMAN Justin Kittle		WATER LEVEL - Completion N/A 	
LANGAN PERSONNEL Alexander Macon					



Symbol	ELEV (feet)	DESCRIPTION	Depth Scale	SAMPLE		REMARKS
				Number	Type	
	+261.5	6 inches Dark brown SILT, trace fine sand, trace roots (dry) [TOPSOIL]	0			Grab sample S-1 at 1.5ft to 2.0ft
	+261.0	Brown fine sandy SILT, some medium sand, trace coarse to fine gravel, trace cobbles, trace boulders, trace roots (dry)	1			
			2	S-1	GRAB	
	+258.5	Gray coarse to fine SAND, some silt, trace coarse to fine gravel, trace cobbles, trace boulders (moist)	3	S-2	GRAB	Infiltration test IT-2 performed at about 3ft. Grab sample S-2 at 3.0ft to 3.5ft
	+258.0	End of test pit	4			Top of rock at 3.5ft. Test pit backfilled with excavated soils in lifts and compacted with excavator bucket.
			5			
			6			
			7			
			8			
			9			
			10			

I:\LANGAN\COM\DATA\BOS\DATA\3151014301\PROJECT DATA\DISCIPLINE\GEOTECHNICAL\GINT\LOGS\151014301_ENTERPRISE.GPJ ... 6/18/2021 1:33:21 PM ... Report: Log - LANGANTP

LANGAN

LOG OF TEST PIT TP-3/IT-3

Sheet 1 of 1

PROJECT NAME Belmont Hill School		PROJECT NUMBER 151014301		DATE 06/08/2021	
LOCATION 350 Prospect Street		ELEVATION Approx. 261 ft (Town of Belmont Datum)			
EXCAVATION CONTRACTOR F.E. French Construction, Inc.		DEPTH 5 ft		WATER LEVEL - First N/E 	
EQUIPMENT CAT 307C Excavator		FOREMAN Justin Kittle		WATER LEVEL - Completion N/A 	
				LANGAN PERSONNEL Alexander Macon	



\\LANGAN.COM\DATA\BOS\DATA\3\151014301\PROJECT DATA\DISCIPLINE\GEOTECHNICAL\LOGS\151014301 ENTERPRISE.GPJ ... 6/18/2021 1:33:22 PM ... Report Log - LANGANTP


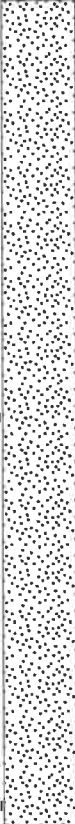
Symbol	ELEV (feet)	DESCRIPTION	Depth Scale	SAMPLE		REMARKS
				Number	Type	
	+261.0	10 inches Dark brown SILT, some medium to fine sand, trace roots (dry) [TOPSOIL]	0			
	+260.2	Brown fine sandy SILT, trace coarse to fine gravel, trace cobbles, trace roots (dry)	1			
	+259.5	Gray coarse to fine SAND, some silt, trace coarse to fine gravel, trace cobbles, trace boulders (moist)	2			
			3			
			4	S-1	GRAB	Infiltration test IT-3 performed at about 4ft. Grab sample S-1 at 4.0ft to 4.5ft
	+258.0	End of test pit	5			Top of rock at 5.0ft. Test pit backfilled with excavated soils in lifts and compacted with excavator bucket.
			6			
			7			
			8			
			9			
			10			

LANGAN

LOG OF TEST PIT TP-4/IT-4

Sheet 1 of 1

PROJECT NAME Belmont Hill School	PROJECT NUMBER 151014301	DATE 06/08/2021
LOCATION 350 Prospect Street	ELEVATION Approx. 265.5 ft (Town of Belmont Datum)	
EXCAVATION CONTRACTOR F.E. French Construction, Inc.	DEPTH 7.5 ft	WATER LEVEL - First N/E 
EQUIPMENT CAT 307C Excavator	FOREMAN Justin Kittle	WATER LEVEL - Completion N/A 
		LANGAN PERSONNEL Alexander Macon



Symbol	ELEV (feet)	DESCRIPTION	Depth Scale	SAMPLE		REMARKS
				Number	Type	
	+265.5	8 inches Dark brown SILT, some coarse to fine sand, trace coarse to fine gravel, trace bricks, trace roots (dry) [TOPSOIL]	0			Infiltration test IT-4 performed at about 1.5ft.
	+264.8	Brown fine sandy SILT, some medium sand, trace coarse to fine gravel, trace cobbles, trace boulders, trace roots (dry)	1			
	+263.5	Gray coarse to fine SAND, some silt, trace coarse to fine gravel, trace cobbles, trace boulders (moist)	2			
			3			
			4			
			5			
			6			
			7			
			8			
	+258.0	End of test pit	8			Top of rock at 7.5ft. Test pit backfilled with excavated soils in lifts and compacted with excavator bucket.
			9			
			10			



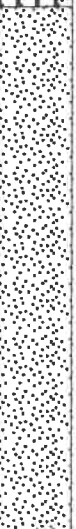

LANGAN

\\LANGAN.COM\DATA\BOS\DATA\3151014301\PROJECT DATA\DISCIPLINE\GEO\TECHNICAL\GINT\LOGS\151014301 ENTERPRISE.GPJ ... 6/18/2021 1:33:23 PM ... Report Log - LANGANTP

LOG OF TEST PIT TP-5/IT-5

Sheet 1 of 1

PROJECT NAME Belmont Hill School	PROJECT NUMBER 151014301	DATE 06/09/2021
LOCATION 350 Prospect Street	ELEVATION Approx. 265 ft (Town of Belmont Datum)	
EXCAVATION CONTRACTOR F.E. French Construction, Inc.	DEPTH 8 ft	WATER LEVEL - First N/E 
EQUIPMENT CAT 307C Excavator	FOREMAN Justin Kittle	WATER LEVEL - Completion N/A 
		LANGAN PERSONNEL Alexander Macon



Symbol	ELEV (feet)	DESCRIPTION	Depth Scale	SAMPLE		REMARKS
				Number	Type	
	+265.0	Greyish brown to tan coarse to fine SAND, some silt, trace coarse to fine gravel, trace cobbles, with tile fragments, with concrete fragments, with bricks, with glass, trace roots (dry) [FILL]	0			
			1	S-1	GRAB	Grab sample S-1 at 1.0ft to 1.5ft
			2			
	+262.5	Dark brown SILT, trace fine sand, trace roots (dry)				
	+262.0	Brown fine sandy SILT, trace coarse to medium sand, trace coarse to fine gravel, trace cobbles, trace boulders, trace roots (dry)	3	S-2	GRAB	Grab sample S-2 at 3.0ft to 3.5ft
			4			
	+260.5	Gray coarse to fine SAND, some silt, trace coarse to fine gravel, trace cobbles, trace boulders (moist)	5	S-3	GRAB	Grab sample S-3 at 4.5ft to 5.0ft
			6			
			7			
	+257.0	End of test pit	8			Test pit backfilled with excavated soils in lifts and compacted with excavator bucket.
			9			
			10			




LANGAN

\\LANGAN.COM\DATA\BOS\DATA\3151014301\PROJECT DATA\ DISCIPLINE\GEOTECHNICAL\GINT\LOGS\151014301 ENTERPRISE.GPJ ... 6/18/2021 1:33:24 PM ... Report Log - LANGANTP

LOG OF TEST PIT TP-6/IT-6

Sheet 1 of 1

PROJECT NAME Belmont Hill School	PROJECT NUMBER 151014301	DATE 06/09/2021
LOCATION 350 Prospect Street	ELEVATION Approx. 272 ft (Town of Belmont Datum)	
EXCAVATION CONTRACTOR F.E. French Construction, Inc.	DEPTH 8 ft	WATER LEVEL - First N/E 
EQUIPMENT CAT 307C Excavator	FOREMAN Justin Kittle	WATER LEVEL - Completion N/A 
		LANGAN PERSONNEL Alexander Macon



Symbol	ELEV (feet)	DESCRIPTION	Depth Scale	SAMPLE		REMARKS
				Number	Type	
	+272.0	9 inches Dark brown SILT, trace fine sand, trace coarse to fine gravel, trace roots (dry) [TOPSOIL]	0			
	+271.3	Brown fine sandy SILT, trace coarse to fine gravel, trace cobbles, trace boulders, trace roots (dry)	1	S-1	GRAB	Grab sample S-1 at 1.0ft to 1.5ft
	+269.0	Gray coarse to fine SAND, some silt, trace coarse to fine gravel, trace cobbles, trace boulders (moist)	3	S-2	GRAB	Infiltration test IT-6 performed at about 3.0ft. Grab sample S-2 at 3.0ft to 3.5ft
			4			
			5			
			6			
			7			
			8			Test pit backfilled with excavated soils in lifts and compacted with excavator bucket.
			9			
			10			
	+264.0	End of test pit				



\\LANGAN.COM\DATA\BOS\DATA\3151014301\PROJECT DATA\DISCIPLINE\GEOTECHNICAL\GINT\LOGS\151014301_ENTERPRISE.GPJ ... 6/18/2021 1:33:25 PM ... Report: Log - LANGANTP

LANGAN

LOG OF TEST PIT TP-7/IT-7

Sheet 1 of 1

PROJECT NAME Belmont Hill School	PROJECT NUMBER 151014301	DATE 06/09/2021
LOCATION 350 Prospect Street	ELEVATION Approx. 272.5 ft (Town of Belmont Datum)	
EXCAVATION CONTRACTOR F.E. French Construction, Inc.	DEPTH 8 ft	WATER LEVEL - First N/E 
EQUIPMENT CAT 307C Excavator	FOREMAN Justin Kittle	WATER LEVEL - Completion N/A 
		LANGAN PERSONNEL Alexander Macon


Symbol	ELEV (feet)	DESCRIPTION	Depth Scale	SAMPLE		REMARKS
				Number	Type	
	+272.5	8 inches Dark brown SILT, trace coarse to fine sand, trace roots (dry) [TOPSOIL]	0			
	+271.8	Brown fine sandy SILT, some coarse to medium sand, trace coarse to fine gravel, trace cobbles, trace boulders, trace roots (dry)	1			
			2			
			3			
			4			Infiltration test IT-7 performed at about 4.0ft.
	+268.5	Gray coarse to fine SAND, some silt, some coarse to fine gravel, trace cobbles, trace boulders (moist)	5			
			6			
			7			
			8			Test pit backfilled with excavated soils in lifts and compacted with excavator bucket.
	+264.5	End of test pit	9			
			10			



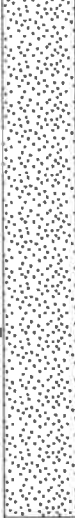
LANGAN

\\LANGAN.COM\DATA\BOS\DATA\3151014301\PROJECT DATA\DISCIPLINE\GEO\TECHNICAL\GINT\LOGS\151014301 ENTERPRISE.GPJ ... 6/18/2021 1:33:27 PM ... Report Log - LANGANTP

LOG OF TEST PIT TP-8/IT-8

Sheet 1 of 1

PROJECT NAME Belmont Hill School		PROJECT NUMBER 151014301		DATE 06/09/2021	
LOCATION 350 Prospect Street		ELEVATION Approx. 277.5 ft (Town of Belmont Datum)			
EXCAVATION CONTRACTOR F.E. French Construction, Inc.		DEPTH 6 ft		WATER LEVEL - First N/E 	
EQUIPMENT CAT 307C Excavator		FOREMAN Justin Kittle		WATER LEVEL - Completion N/A 	
		LANGAN PERSONNEL Alexander Macon			

Symbol	ELEV (feet)	DESCRIPTION	Depth Scale	SAMPLE		REMARKS
				Number	Type	
	+277.5	6 inches Dark brown SILT, trace coarse to fine sand, trace roots (dry) [TOPSOIL]	0			
	+277.0	Brown fine sandy SILT, some coarse to medium sand, trace coarse to fine gravel, trace cobbles, trace boulders (dry)	1			
			2			
	+275.0	Gray coarse to fine SAND, some silt, some coarse to fine gravel, trace cobbles, trace boulders (moist)	3			
			4			Infiltration test IT-8 performed at about 4.0ft.
			5	S-1	GRAB	Grab sample S-1 at 5.0ft to 5.5ft
	+271.5	End of test pit	6			Refusal encountered from a boulder at 6.0ft. Test pit backfilled with excavated soils in lifts and compacted with excavator bucket.
			7			
			8			
			9			
			10			

LANGAN

\\LANGAN.COM\DATA\BOS\DATA\3151014301\PROJECT DATA\DISCIPLINE\GEOTECHNICAL\GINT\LOGS\151014301 ENTERPRISE.GPJ ... 6/18/2021 1:33:28 PM ... Report Log - LANGANTP

APPENDIX B

Langan Test Pit Photographs – East Campus



Test Pit TP-1 - Photo 1



Test Pit TP-1 - Photo 2



Test Pit TP-1 - Photo 3



Test Pit TP-1 - Photo 4



Test Pit TP-1 - Photo 5



Test Pit TP-1 - Photo 6



Test Pit TP-1 - Photo 7



Test Pit TP-2 - Photo 1



Test Pit TP-2 - Photo 2



Test Pit TP-2 - Photo 3



Test Pit TP-2 - Photo 4



Test Pit TP-2 - Photo 5



Test Pit TP-2 - Photo 6



Test Pit TP-3 - Photo 1



Test Pit TP-3 - Photo 2



Test Pit TP-3 - Photo 3



Test Pit TP-3 - Photo 4



Test Pit TP-3 - Photo 5



Test Pit TP-4 - Photo 1



Test Pit TP-4 - Photo 2



Test Pit TP-4 - Photo 3



Test Pit TP-4 - Photo 4



Test Pit TP-4 - Photo 5



Test Pit TP-4 - Photo 6



Test Pit TP-5 - Photo 1



Test Pit TP-5 - Photo 2



Test Pit TP-5 - Photo 3



Test Pit TP-5 - Photo 4



Test Pit TP-5 - Photo 5



Test Pit TP-5 - Photo 6



Test Pit TP-5 - Photo 7



Test Pit TP-5 - Photo 8



Test Pit TP-6 - Photo 1



Test Pit TP-6 - Photo 2



Test Pit TP-6 - Photo 3



Test Pit TP-6 - Photo 4



Test Pit TP-6 - Photo 5



Test Pit TP-6 - Photo 6



Test Pit TP-7 - Photo 1



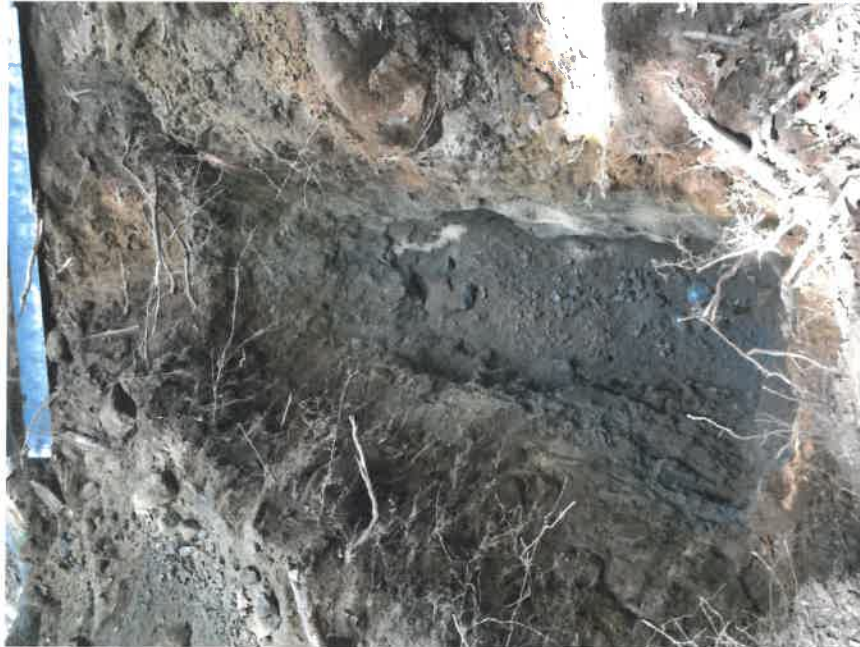
Test Pit TP-7 - Photo 2



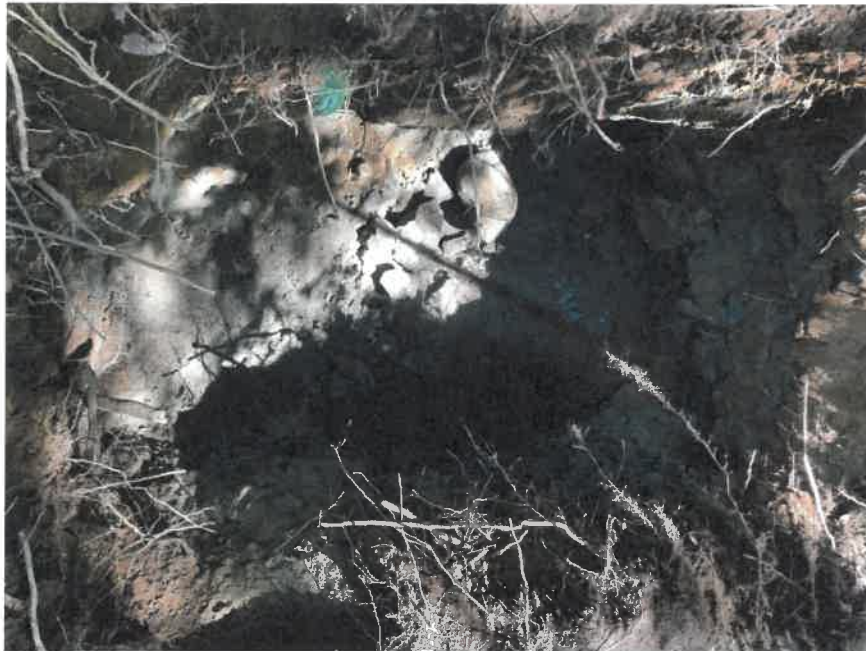
Test Pit TP-7 - Photo 3



Test Pit TP-7 - Photo 4



Test Pit TP-7 - Photo 5



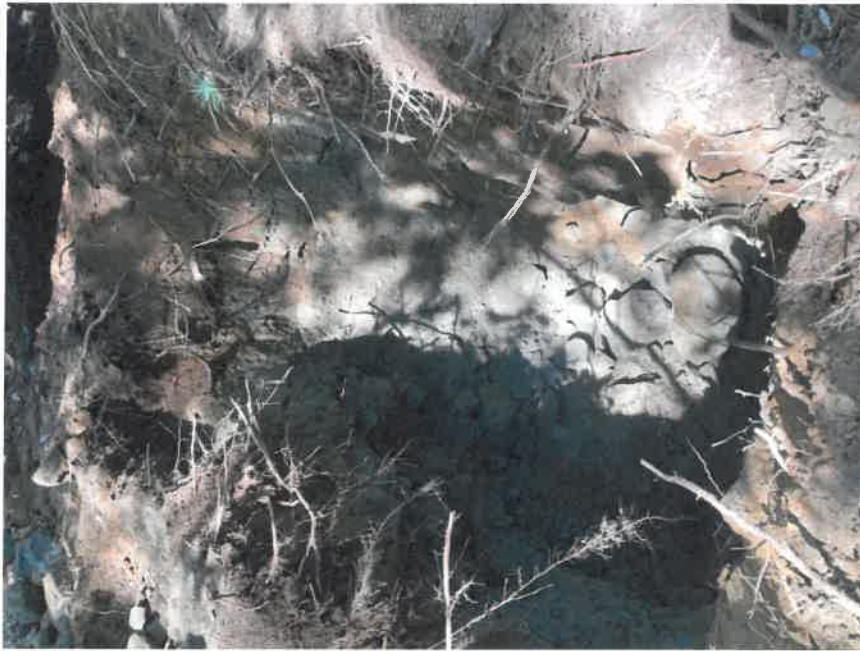
Test Pit TP-8 - Photo 1



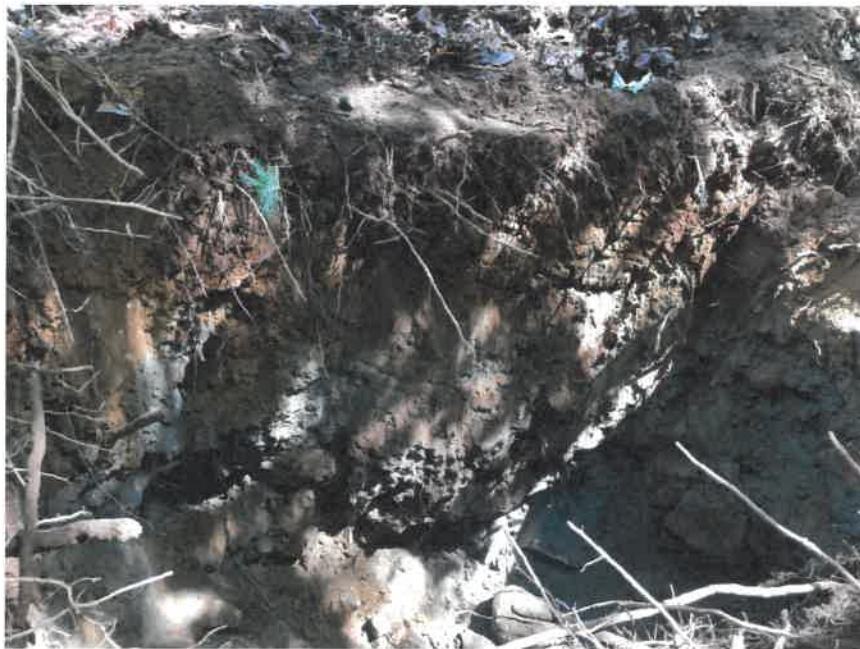
Test Pit TP-8 - Photo 2



Test Pit TP-8 - Photo 3



Test Pit TP-8 - Photo 4





Test Pit TP-8 - Photo 5



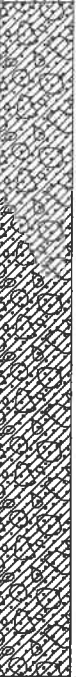

APPENDIX C

Langan Test Pit Logs – East Campus Maintenance Area

LOG OF TEST PIT TP-301/IT-301

Sheet 1 of 1

PROJECT NAME Belmont Hill School	PROJECT NUMBER 151014301	DATE 1/4/2022
LOCATION 350 Prospect Street, Belmont, MA	ELEVATION Approx. 263 ft (Town of Belmont Datum)	
EXCAVATION CONTRACTOR F.E. French Construction, Inc.	DEPTH 8.5 ft	WATER LEVEL - First N/E  WATER LEVEL - Completion N/A 
EQUIPMENT CAT 303.5E Excavator	FOREMAN Steve Blackburn	LANGAN PERSONNEL Timothy Light



Symbol	ELEV (feet)	DESCRIPTION	Depth Scale	SAMPLE		REMARKS
				Number	Type	
	+263.0	Dark brown silty fine SAND, trace fine gravel, trace clay, some roots, trace organics (moist)[TOPSOIL]	0			
	+262.0	Brown fine SAND with fine gravel, some silt, trace cobbles, trace roots (moist)[SUBSOIL]	1			
			2	S-1	GRAB	S-1 from 1.5ft to 2.0ft. Infiltration test IT-301 performed at 2.0ft. Particle size and USDA classification
	+260.5	Gray coarse-fine SAND, some coarse-fine gravel, some silt (moist)[TILL]	3			
			4			
			5	S-2	GRAB	S-2 from 4.0ft to 5.5ft.
			6			
			7			
	+256.0	Gray coarse-fine SAND with coarse-fine gravel, some silt, some cobbles, trace boulders (moist)[WEATHERED ROCK]	7			Difficult excavation starting at about 7.0ft.
			8	S-3	GRAB	S-3 from 7.5ft to 8.5ft.
			9			
			10			
	+254.5	Bottom of test pit				Maximum depth for equipment at 8.5ft. Test pit backfilled to grade with excavated material tamped with the excavator bucket.

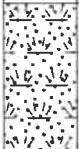
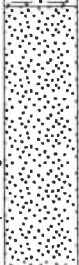

LANGAN

I:\LANGAN.COM\DATA\BOS\DATA\3151014301\PROJECT DATA\DISCIPLINE\GEO\TECHNICAL\GINT\LOGS\151014301 ENTERPRISE GPJ ... 2/23/2022 5:43:23 PM Report Log - LANGANTP

LOG OF TEST PIT TP-302/IT-302

Sheet 1 of 1

PROJECT NAME Belmont Hill School	PROJECT NUMBER 151014301	DATE 1/4/2022
LOCATION 350 Prospect Street, Belmont, MA	ELEVATION Approx. 262 ft (Town of Belmont Datum)	
EXCAVATION CONTRACTOR F.E. French Construction, Inc.	DEPTH 6 ft	WATER LEVEL - First N/E  WATER LEVEL - Completion N/A 
EQUIPMENT CAT 303.5E Excavator	FOREMAN Steve Blackburn	LANGAN PERSONNEL Timothy Light



Symbol	ELEV (feet)	DESCRIPTION	Depth Scale	SAMPLE		REMARKS
				Number	Type	
	+262.0	Dark brown silty fine SAND, some clay, trace fine gravel, some roots, trace organics (moist)[TOPSOIL]	0			
	+261.0	Brown silty coarse-fine SAND with coarse-fine gravel, trace cobbles, trace clay, trace organics, trace roots (moist)[SUBSOIL]	1			
			2	S-1	GRAB	S-1 from 2.0ft to 2.5ft. Infiltration test IT-302 performed at 2.5ft. Particle size and USDA classification.
	+259.3	Gray coarse-fine SAND with coarse-fine gravel, some silt, trace cobbles (moist)[TILL]	3			
			4			
			5	S-2	GRAB	S-2 from 4.0ft to 5.5ft.
			6			
	+256.0	Bottom of test pit	7			Refusal on bedrock or boulders at 6.0ft. Test pit backfilled to grade with excavated material tamped with the excavator bucket.
			8			
			9			
			10			

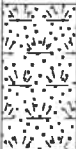



\\LANGAN.COM\DATA\BOS\DATA\3151014301\PROJECT DATA\DISCIPLINE\GEO\TECH\GINTLOGS\151014301 ENTERPRISE GPJ ... 2/23/2022 5:43:24 PM ... Report Log - LANGANTP

LANGAN

LOG OF TEST PIT TP-303

Sheet 1 of 1

PROJECT NAME Belmont Hill School	PROJECT NUMBER 151014301	DATE 1/4/2022
LOCATION 350 Prospect Street, Belmont, MA	ELEVATION Approx. 260.5 ft (Town of Belmont Datum)	
EXCAVATION CONTRACTOR F.E. French Construction, Inc.	DEPTH 8 ft	WATER LEVEL - First N/E 
EQUIPMENT CAT 303.5E Excavator	FOREMAN Steve Blackburn	WATER LEVEL - Completion N/A 
		LANGAN PERSONNEL Timothy Light



Symbol	ELEV (feet)	DESCRIPTION	Depth Scale	SAMPLE		REMARKS
				Number	Type	
	+260.5	Dark brown silty fine SAND, trace fine gravel, trace clay, trace roots, trace organics (moist)[TOPSOIL]	0			
	+259.5	Grayish brown coarse-fine SAND with coarse-fine gravel, some silt, trace roots (moist)[FILL]	1			
			2	S-1	GRAB	S-1 from 2.0ft to 3.0ft.
			3			
	+257.0	Brown silty fine SAND, some fine gravel, some roots (moist)[BURIED TOPSOIL]				
	+256.5	Gray coarse-fine SAND with coarse-fine gravel, some silt (moist)[TILL]	4			
			5			
			6			
			7	S-2	GRAB	S-2 from 6.5ft to 7.5ft. Particle size and USDA classification
			8			
	+252.5	Bottom of test pit				Maximum depth for equipment at 8.0ft. Test pit backfilled to grade with excavated material tamped with the excavator bucket.
			9			
			10			











LANGAN

\\LANGAN.COM\DATA\BOS\DATA\3151014301\PROJECT DATA\DISCIPLINE\GEO\TECHNICAL\GINTLOGS\151014301 ENTERPRISE.GPJ ... 2/23/2022 5:43:25 PM ... Report Log - LANGANTP

LOG OF TEST PIT TP-304/IT-304

Sheet 1 of 1

PROJECT NAME Belmont Hill School	PROJECT NUMBER 151014301	DATE 1/4/2022
LOCATION 350 Prospect Street, Belmont, MA	ELEVATION Approx. 257 ft (Town of Belmont Datum)	
EXCAVATION CONTRACTOR F.E. French Construction, Inc.	DEPTH 8 ft	WATER LEVEL - First N/E 
EQUIPMENT CAT 303.5E Excavator	FOREMAN Steve Blackburn	WATER LEVEL - Completion N/A 
		LANGAN PERSONNEL Timothy Light



Symbol	ELEV (feet)	DESCRIPTION	Depth Scale	SAMPLE		REMARKS
				Number	Type	
	+257.0	Light brown to brown silty coarse-fine SAND, some coarse-fine gravel, some concrete debris, some brick debris, trace glass debris, trace wire debris, trace fabric fragments, trace roots (moist)[FILL]	0			Fill at ground surface.
	+256.5	Dark brown fine sandy SILT, some fine gravel, some clay, trace roots, trace concrete debris (moist)[TOPSOIL]	1	S-1	GRAB	S-1 from 0.5ft to 1.5ft.
	+255.5	Brown to tan fine-coarse SAND with fine-coarse gravel, some silt, trace cobbles (moist)[SUBSOIL]	2			
			3	S-2	GRAB	S-2 from 2.5ft to 3.0ft. Infiltration test IT-304 performed at 3.0ft. Particle size and USDA classification
			4			
	+253.3	Gray coarse-fine SAND with coarse-fine gravel, some silt, some cobbles, trace boulders (moist)[TILL]	5	S-3	GRAB	S-3 from 4.5ft to 6.5ft.
			6			
			7			
	+249.5	Gray coarse-fine SAND with coarse-fine gravel, trace silt (moist)[WEATHERED ROCK]	8	S-4	GRAB	S-4 from 7.7ft to 8.0ft.
	+249.0	Bottom of test pit	9			Maximum depth for equipment at 8.0ft. Test pit backfilled to grade with excavated material tamped with the excavator bucket.
			10			




I:\LANGAN\COMDATA\BOS\DATA\3151014301\PROJECT DATA\DISCIPLINE\GEOTECHNICAL\GINT\LOGS\151014301 ENTERPRISE.GPJ ... 2/23/2022 5:43:26 PM ... Report: Log - LANGANTP

LANGAN

LOG OF TEST PIT TP-305/IT-305

Sheet 1 of 1

PROJECT NAME Belmont Hill School	PROJECT NUMBER 151014301	DATE 1/5/2022
LOCATION 350 Prospect Street, Belmont, MA	ELEVATION Approx. 263.5 ft (Town of Belmont Datum)	
EXCAVATION CONTRACTOR F.E. French Construction, Inc.	DEPTH 5.5 ft	WATER LEVEL - First N/E 
EQUIPMENT CAT 303.5E Excavator	FOREMAN Steve Blackburn	WATER LEVEL - Completion N/A 
		LANGAN PERSONNEL Alexander Macon


Symbol	ELEV (feet)	DESCRIPTION	Depth Scale	SAMPLE		REMARKS
				Number	Type	
	+263.5	Dark brown silty medium-fine SAND, trace coarse sand, trace fine gravel, trace roots (moist)[TOPSOIL]	0			
	+262.8	Brown coarse-fine SAND, some silt, some coarse-fine gravel, trace cobbles (moist)[SUBSOIL]	1			
	+261.3	Gray coarse-fine SAND with coarse-fine gravel, some silt, trace cobbles, trace boulders, trace weathered rock fragments (moist)[TILL]	2	S-1	GRAB	S-1 from 1.75ft to 2.25ft. Grab sample of three 5-gallon buckets from 1.75ft to 2.25ft. Compaction curve and CBR value Infiltration test IT-305A performed at 2.25ft.
			3	S-2	GRAB	S-2 from 2.5ft to 3.0ft. Infiltration test IT-305B performed at 3.0ft. Particle size and USDA classification
			4			Roots to 4.0ft.
			5			
	+258.0	Bottom of test pit	6			Refusal on bedrock or boulders at 5.5ft. Test pit backfilled to grade with excavated material tamped with the excavator bucket.
			7			
			8			
			9			
			10			


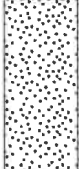
LANGAN

\\LANGAN.COM\DATA\BOS\DATA\3151014301\PROJECT DATA\DISCIPLINE\GEOTECHNICAL\GINT\LOGS\151014301 ENTERPRISE GPJ ... 2/23/2022 5:43:26 PM ... Report Log - LANGANTP

LOG OF TEST PIT TP-306

Sheet 1 of 1

PROJECT NAME Belmont Hill School	PROJECT NUMBER 151014301	DATE 1/5/2022
LOCATION 350 Prospect Street, Belmont, MA	ELEVATION Approx. 272 ft (Town of Belmont Datum)	
EXCAVATION CONTRACTOR F.E. French Construction, Inc.	DEPTH 2 ft	WATER LEVEL - First N/E  WATER LEVEL - Completion N/A 
EQUIPMENT CAT 303.5E Excavator	FOREMAN Steve Blackburn	LANGAN PERSONNEL Alexander Macon

Symbol	ELEV (feet)	DESCRIPTION	Depth Scale	SAMPLE		REMARKS
				Number	Type	
	+272.0	Dark brown silty medium-fine SAND, trace fine gravel, some roots (moist)[TOPSOIL]	0			Roots to 1.5ft.
	+271.2	Brown coarse-fine SAND, some silt, trace coarse-fine gravel, trace cobbles, trace roots (moist)[SUBSOIL]	1			
	+270.0	Bottom of test pit	2			
			3			Refusal on bedrock at 2.0ft. Bedrock sloping from 0.16ft at the north side of the test pit to 2.0ft at the south south side. Test pit backfilled to grade with excavated material tamped with the excavator bucket.
			4			
			5			
			6			
			7			
			8			
			9			
			10			

LANGAN

LOG OF TEST PIT TP-307

Sheet 1 of 1

PROJECT NAME Belmont Hill School		PROJECT NUMBER 151014301		DATE 1/5/2022	
LOCATION 350 Prospect Street, Belmont, MA		ELEVATION Approx. 256 ft (Town of Belmont Datum)			
EXCAVATION CONTRACTOR F.E. French Construction, Inc.		DEPTH 4 ft		WATER LEVEL - First N/E	
EQUIPMENT CAT 303.5E Excavator		FOREMAN Steve Blackburn		WATER LEVEL - Completion N/A	
				LANGAN PERSONNEL Alexander Macon	



Symbol	ELEV (feet)	DESCRIPTION	Depth Scale	SAMPLE		REMARKS
				Number	Type	
	+256.0	Dark brown silty medium-fine SAND, trace coarse sand, some roots (moist)[TOPSOIL]	0			
	+255.3	Brown to light brown medium-fine SAND, trace coarse sand, trace coarse-fine gravel, trace cobbles, trace roots (moist)[SUBSOIL]	1			
	+253.8	Gray coarse-fine SAND, some silt, trace coarse-fine gravel, trace cobbles (moist)[TILL]	2	S-1	GRAB	S-1 from 1.5ft to 2.0ft.
	+252.0	Bottom of test pit	4			Refusal on bedrock at 4.0ft. Bedrock at 4.0ft on west side (higher adjacent ground surface) and at 3.0ft on east side (lower adjacent ground surface). Test pit backfilled to grade with excavated material tamped with the excavator bucket.
			5			
			6			
			7			
			8			
			9			
			10			

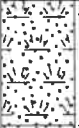
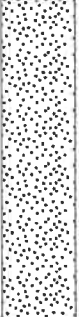


LANGAN

\\LANGAN.COM\DATA\BOS\DATA\3151014301\PROJECT DATA\DISCIPLINE\GEOTECHNICAL\GINTLOGS\151014301_ENTERPRISE.GPJ ... 2/23/2022 5:43:28 PM ... Report Log - LANGANTP

LOG OF TEST PIT TP-308

Sheet 1 of 1

PROJECT NAME Belmont Hill School	PROJECT NUMBER 151014301	DATE 1/5/2022
LOCATION 350 Prospect Street, Belmont, MA	ELEVATION Approx. 262.5 ft (Town of Belmont Datum)	
EXCAVATION CONTRACTOR F.E. French Construction, Inc.	DEPTH 7 ft	WATER LEVEL - First N/E  WATER LEVEL - Completion N/A 
EQUIPMENT CAT 303.5E Excavator	FOREMAN Steve Blackburn	LANGAN PERSONNEL Alexander Macon

Symbol	ELEV (feet)	DESCRIPTION	Depth Scale	SAMPLE		REMARKS
				Number	Type	
	+262.5	Dark brown silty medium-fine SAND, trace coarse sand, trace roots (moist)[TOPSOIL]	0			
	+261.7	Brown to light brown silty medium-fine SAND, some coarse sand, trace coarse-fine gravel, trace roots (moist)[SUBSOIL]	1			
			2			
	+259.5	Gray coarse-fine SAND, some silt, trace coarse-fine gravel, trace cobbles, trace roots (moist)[TILL]	3			
			4			Roots to 4.0ft.
			5	S-1	GRAB	S-1 from 4.5ft to 5.0ft.
	+257.0	Gray coarse-fine SAND, some silt, some coarse-fine gravel, trace cobbles, some weathered rock fragments (moist)[TILL]	6			
			7	S-2	GRAB	S-2 from 6.5ft to 7.0ft.
	+255.5	Bottom of test pit	7			Test pit terminated at 7.0ft. Test pit backfilled to grade with excavated material tamped with the excavator bucket.
			8			
			9			
			10			

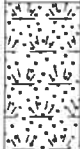
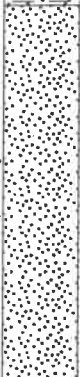

I:\LANGAN\COMDATA\BOSDATA\3151014301\PROJECT DATA\DISCIPLINE\GEO\TECHNICAL\LOGS\151014301 ENTERPRISE GPJ ... 2/23/2022 5:43:28 PM ... Report Log - LANGANTP

LANGAN

LOG OF TEST PIT TP-309

Sheet 1 of 1

PROJECT NAME Belmont Hill School	PROJECT NUMBER 151014301	DATE 1/5/2022
LOCATION 350 Prospect Street, Belmont, MA	ELEVATION Approx. 264 ft (Town of Belmont Datum)	
EXCAVATION CONTRACTOR F.E. French Construction, Inc.	DEPTH 5 ft	WATER LEVEL - First N/E ▽
EQUIPMENT CAT 303.5E Excavator	FOREMAN Steve Blackburn	WATER LEVEL - Completion N/A ▽
		LANGAN PERSONNEL Alexander Macon

Symbol	ELEV (feet)	DESCRIPTION	Depth Scale	SAMPLE		REMARKS
				Number	Type	
	+264.0	Dark brown silty medium-fine SAND, trace coarse sand, trace roots (moist)[TOPSOIL]	0	S-1	GRAB	S-1 from 0.0ft to 0.5ft.
	+263.0	Brown to tan fine-coarse SAND, some silt, trace coarse-fine gravel, trace cobbles, trace boulders, trace roots (moist)[SUBSOIL]	1			
			2	S-2	GRAB	S-2 from 2.0ft to 2.5ft.
			3			Roots to 3.0ft.
	+260.5	Gray coarse-fine SAND, some silt, trace coarse-fine gravel, trace cobbles, trace weathered rock fragments (moist)[TILL]	4			
			5			Refusal on bedrock or boulder at 5.0ft. Test pit backfilled to grade with excavated material tamped with the excavator bucket.
	+259.0	Bottom of test pit	6			
			7			
			8			
			9			
			10			

LANGAN

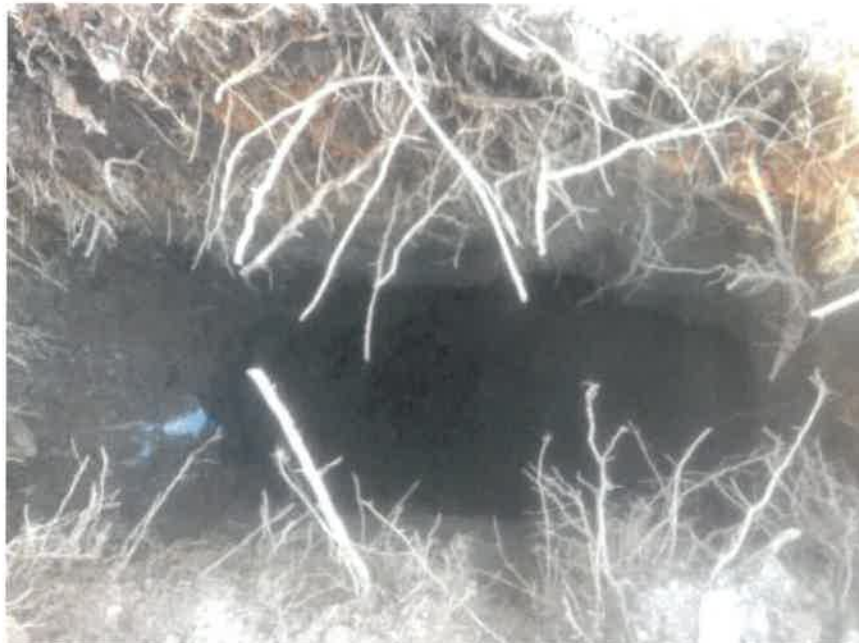
I:\LANGAN\COM\DATA\BOS\DATA3151014301\PROJECT DATA\DISCIPLINE\GEOTECHNICAL\GINT\LOGS\151014301 ENTERPRISE.GPJ ... 2/23/2022 5:43:29 PM ... Report Log - LANGANTP

APPENDIX D

Langan Test Pit Photographs – East Campus Maintenance Area



Test Pit TP-301 - Photo 1



Test Pit TP-301 - Photo 2



Test Pit TP-301 - Photo 3



Test Pit TP-301 - Photo 4



Test Pit TP-301 - Photo 5



Test Pit TP-301 - Photo 6



Test Pit TP-301 - Photo 7



Test Pit TP-302 - Photo 1



Test Pit TP-302 - Photo 2



Test Pit TP-302 - Photo 3



Test Pit TP-302 - Photo 4



Test Pit TP-302 - Photo 5



Test Pit TP-302 - Photo 6



Test Pit TP-302 - Photo 7



Test Pit TP-303 - Photo 1



Test Pit TP-303 - Photo 2



Test Pit TP-303 - Photo 3



Test Pit TP-303 - Photo 4



Test Pit TP-303 - Photo 5



Test Pit TP-303 - Photo 6



Test Pit TP-304 - Photo 1



Test Pit TP-304 - Photo 2



Test Pit TP-304 - Photo 3



Test Pit TP-304 - Photo 4



Test Pit TP-304 - Photo 5



Test Pit TP-305 - Photo 1



Test Pit TP-305 - Photo 2



Test Pit TP-305 - Photo 3



Test Pit TP-305 - Photo 4



Test Pit TP-305 - Photo 5



Test Pit TP-305 - Photo 6



Test Pit TP-305 - Photo 7



Test Pit TP-305 - Photo 8



Test Pit TP-306 - Photo 1



Test Pit TP-306 - Photo 2



Test Pit TP-306 - Photo 3



Test Pit TP-306 - Photo 4



Test Pit TP-306 - Photo 5



Test Pit TP-306 - Photo 6



Test Pit TP-306 - Photo 7



Test Pit TP-306 - Photo 8



Test Pit TP-307 - Photo 1



Test Pit TP-307 - Photo 2



Test Pit TP-307 - Photo 3



Test Pit TP-307 - Photo 4



Test Pit TP-307 - Photo 5



Test Pit TP-307 - Photo 6



Test Pit TP-307 - Photo 7



Test Pit TP-307 - Photo 8



Test Pit TP-308 - Photo 1



Test Pit TP-308 - Photo 2



Test Pit TP-308 - Photo 3



Test Pit TP-308 - Photo 4



Test Pit TP-308 - Photo 5



Test Pit TP-308 - Photo 6



Test Pit TP-308 - Photo 7



Test Pit TP-308 - Photo 8



Test Pit TP-308 - Photo 9



Test Pit TP-308 - Photo 10



Test Pit TP-308 - Photo 11



Test Pit TP-309 - Photo 1



Test Pit TP-309 - Photo 2



Test Pit TP-309 - Photo 3



Test Pit TP-309 - Photo 4



Test Pit TP-309 - Photo 5



Test Pit TP-309 - Photo 6



Test Pit TP-309 - Photo 7



Test Pit TP-309 - Photo 8



Test Pit TP-309 - Photo 9





Test Pit TP-309 - Photo 10


APPENDIX E

Langan Test Pit Logs – JAC Parking Lot

LOG OF TEST PIT TP-201

Sheet 1 of 1

PROJECT NAME Belmont Hill School - Jordan Athletic Center	PROJECT NUMBER 151014301	DATE 10/17/2021
LOCATION 350 Prospect Street, Belmont, MA	ELEVATION Approx. 250.5 ft (Town of Belmont Datum)	
EXCAVATION CONTRACTOR F.E. French Construction, Inc.	DEPTH 8.5 ft	WATER LEVEL - First 8 ft 
EQUIPMENT CAT 306 Excavator	FOREMAN Scott Perachi	WATER LEVEL - Completion N/A 
		LANGAN PERSONNEL Alexander Macon



Symbol	ELEV (feet)	DESCRIPTION	Depth Scale	SAMPLE		REMARKS
				Number	Type	
	+250.5	Black ASPHALT	0			
	+250.2	(moist)[ASPHALT]				
		Grayish brown coarse to fine SAND, some coarse to fine gravel, trace silt, trace asphalt fragments, trace brick fragments (moist)[FILL]	1	S-1	GRAB	S-1 from 0.5ft to 1.0ft Dense graded base material
	+249.2	Light brown coarse to fine SAND, trace medium to fine gravel (moist)[FILL]	2	S-2	GRAB	S-2 from 1.5ft to 2.0ft
	+248.0	Brown coarse to fine SAND, some silt, some coarse to fine gravel, trace cobbles, trace boulders, trace brick fragments, trace asphalt fragments (moist)[FILL]	3	S-3	GRAB	S-3 from 3.0ft to 3.5ft
	+246.0	Dark brown SILT, some clay, some organics, trace medium to fine sand, trace roots, trace wood fragments (moist)[TOPSOIL]	5	S-4/6	GRAB	S-4 and S-6 from 4.5ft to 5.0ft S-5 from 4.75ft to 5.25ft
	+245.3	Light brownish SILT, trace clay, trace fine sand, trace roots (moist)	6	S-7	GRAB	Guelph Permeameter infiltration test at 5.25ft S-7 from 5.25ft to 6.25ft
		Brown SILT, trace clay, trace coarse to fine sand, trace fine gravel (moist)	7			
			8	S-8	GRAB	S-8 from 7.5ft to 8.0ft
						Groundwater at 8.0ft
	+242.0	Bottom of test pit	9			Bottom of test pit at 8.5ft. Test pit backfilled to 4.0ft with lifts of excavated material that was tamped with the excavator bucket. Test pit backfilled to 1.0ft with lifts of excavated material that was compacted with a plate compactor. Test pit backfilled to grade with dense graded material that was compacted with a plate compactor
			10			
			11			


LANGAN

I:\LANGAN.COM\DATA\BOS\DATA\3\151014301\PROJECT DATA\DISCIPLINE\GEOTECHNICAL\GINT\LOGS\151014301 ENTERPRISE GPJ ... 11/23/2021 7:08:32 PM ... Report Log - LANGANTP

LOG OF TEST PIT TP-202

Sheet 1 of 1

PROJECT NAME Belmont Hill School - Jordan Athletic Center	PROJECT NUMBER 151014301	DATE 10/16/2021
LOCATION 350 Prospect Street, Belmont, MA	ELEVATION Approx. 249.8 ft (Town of Belmont Datum)	
EXCAVATION CONTRACTOR F.E. French Construction, Inc.	DEPTH 8.5 ft	WATER LEVEL - First N/E  WATER LEVEL - Completion N/A 
EQUIPMENT CAT 306 Excavator	FOREMAN Scott Perachi	LANGAN PERSONNEL Alexander Macon



Symbol	ELEV (feet)	DESCRIPTION	Depth Scale	SAMPLE		REMARKS
				Number	Type	
	+249.8	Black ASPHALT (moist)[ASPHALT]	0			
	+249.5	Grayish brown coarse to fine SAND, some coarse to fine gravel, trace silt (moist)[FILL]	1			Dense graded base material
	+248.5	Brown silty coarse to fine SAND, some coarse to fine gravel, trace cobbles, trace boulders, trace asphalt fragments, trace brick fragments (moist)[FILL]	2			
	+247.3	Light brown to brown coarse to fine SAND, some coarse gravel, some silt, trace cobbles, trace boulders, trace brick fragments, trace wire fragments, trace concrete fragments, trace asphalt fragments, trace tile fragments (moist)[FILL]	3			
			4	S-1	GRAB	S-1 from 4.0ft to 4.5ft USDA textural classification performed Guelph Permeameter infiltration test at 4.5ft
			5			
		Light brown to dark brown coarse to fine SAND, some coarse to fine gravel, some silt, trace clay, trace cobbles, trace boulders, trace concrete fragments, trace glass fragments, trace asphalt fragments, trace brick fragments (moist)[FILL]	6			
			7	S-2	GRAB	S-2 from 7.0ft to 7.5ft
			8			
	+241.3	Bottom of test pit	9			Bottom of test pit at 8.5ft. Test pit backfilled to 4.0ft with lifts of excavated material that was tamped with the excavator bucket. Test pit backfilled to 1.0ft with lifts of excavated material that was compacted with a plate compactor. Test pit backfilled to grade with dense graded material that was compacted with a plate compactor
			10			
			11			


















LANGAN

\\LANGAN.COM\DATA\BOS\DATA\3\151014301\PROJECT DATA\DISCIPLINE\GEO\TECHNICAL\GINTLOGS\151014301_ENTERPRISE.GPJ ... 11/23/2021 7:08:34 PM Report Log - LANGANTP

LOG OF TEST PIT TP-203

Sheet 1 of 1

PROJECT NAME Belmont Hill School - Jordan Athletic Center	PROJECT NUMBER 151014301	DATE 10/16/2021
LOCATION 350 Prospect Street, Belmont, MA	ELEVATION Approx. 250.4 ft (Town of Belmont Datum)	
EXCAVATION CONTRACTOR FE French	DEPTH 8 ft	WATER LEVEL - First N/E  WATER LEVEL - Completion N/A 
EQUIPMENT CAT 306 Excavator	FOREMAN Scott Perachi	LANGAN PERSONNEL Alexander Macon



Symbol	ELEV (feet)	DESCRIPTION	Depth Scale	SAMPLE		REMARKS
				Number	Type	
	+250.4	Black ASPHALT	0			
	+250.1	(moist)[ASPHALT]				
		Grayish brown coarse to fine SAND, some coarse to fine gravel, trace silt	1			Dense graded base material
		(moist)[FILL]				
	+248.4	Brown silty coarse to fine SAND, some coarse to fine gravel, trace cobbles, trace boulders, trace asphalt fragments, trace brick fragments, trace wood fragments, trace roots	2			
		(moist)[FILL]				
			3	S-1	GRAB	S-1 from 2.5ft to 3.0ft
			4	S-2	GRAB	S-2 from 4.0ft to 4.5ft. Roots to 4.0ft
	+245.4	Tan to white medium to fine SAND, some silt, trace fine gravel, some ash, trace coal fragments	5			
	+245.1	(moist)[FILL]				
		Brown coarse to fine SAND, some silt, trace coarse to fine gravel, trace cobbles, trace brick fragments, trace ceramic fragments, trace asphalt fragments.	6			
		(moist)[FILL]				
	+243.9	Dark brown SILT, some clay, trace medium to fine sand	7			
	+243.4	(moist)[TOPSOIL]				
		Light brown SILT, trace coarse sand, trace fine gravel	7	S-4	GRAB	S-4 from 7.0ft to 7.5ft
		(moist)				
	+242.4	Bottom of test pit	8			Bottom of test pit at 8.0ft. Test pit backfilled to 4.0ft with lifts of excavated material that was tamped with the excavator bucket.
			9			Test pit backfilled to 1.0ft with lifts of excavated material that was compacted with a plate compactor. Test pit backfilled to grade with dense graded material that was compacted with a plate compactor
			10			
			11			



LANGAN

\\LANGAN.COM\DATA\BOS\DATA\3\151014301\PROJECT DATA\DISCIPLINE\GEOTECHNICAL\TLOGS\151014301 ENTERPRISE.GPJ ... 11/23/2021 7:08:35 PM ... Report: Log - LANGANTP

LOG OF TEST PIT TP-204

Sheet 1 of 1

PROJECT NAME Belmont Hill School - Jordan Athletic Center	PROJECT NUMBER 151014301	DATE 10/16/2021
LOCATION 350 Prospect Street, Belmont, MA	ELEVATION Approx. 253.5 ft (Town of Belmont Datum)	
EXCAVATION CONTRACTOR F.E. French Construction, Inc.	DEPTH 8 ft	WATER LEVEL - First N/E 
EQUIPMENT CAT 306 Excavator	FOREMAN Scott Perachi	WATER LEVEL - Completion N/A 
		LANGAN PERSONNEL Alexander Macon



Symbol	ELEV (feet)	DESCRIPTION	Depth Scale	SAMPLE		REMARKS
				Number	Type	
	+253.5	Dark brown silty medium to fine SAND, some roots	0			
	+253.3	(moist)[TOPSOIL]				
		Light brown silty coarse to fine SAND, trace medium to fine gravel, trace asphalt fragments, trace plastic fragments, trace roots (moist)[FILL]	1			
			2			
	+251.5	Grayish brown coarse to fine SAND, some silt, some coarse to fine gravel, trace cobbles, trace boulders (moist)	3			
			4			
			5	S-1	GRAB	S-1 from 5.0ft to 5.5ft
			6			Guelph Permeameter infiltration test at 5.5ft
			7			Roots to 6.0ft
			8			
	+245.5	Bottom of test pit	9			Bottom of test pit at 8.0ft. Test pit backfilled to grade with lifts of excavated material that was tamped with the excavator bucket
			10			
			11			



LANGAN

\\LANGAN.COM\DATA\BOS\DATA\3151014301\PROJECT DATA\DISCIPLINE\GEO\TECHNICAL\GINTLOGSV151014301_ENTERPRISE.GPJ ... 11/23/2021 7:08:36 PM ... Report Log - LANGANTP

LOG OF TEST PIT TP-205

Sheet 1 of 1

PROJECT NAME Belmont Hill School - Jordan Athletic Center	PROJECT NUMBER 151014301	DATE 10/16/2021
LOCATION 350 Prospect Street, Belmont, MA	ELEVATION Approx. 251.4 ft (Town of Belmont Datum)	
EXCAVATION CONTRACTOR F.E. French Construction, Inc.	DEPTH 5.5 ft	WATER LEVEL - First N/E 
EQUIPMENT CAT 306 Excavator	FOREMAN Scott Perachi	WATER LEVEL - Completion N/A 
		LANGAN PERSONNEL Alexander Macon



Symbol	ELEV (feet)	DESCRIPTION	Depth Scale	SAMPLE		REMARKS
				Number	Type	
	+251.4	Dark brown medium to fine SAND, some silt, trace coarse sand, some roots (moist)[TOPSOIL] Brown medium to fine SAND, some silt, trace medium to fine gravel, trace metal fragments, trace plastic pipe fragments (moist)[FILL]	0			
	+251.2		1			
	+249.4	Gray coarse to fine SAND, some coarse to fine gravel, some silt, trace cobbles, trace boulders (moist)	2	S-1	GRAB	S-1 from 2.0ft to 2.5ft
			3			Guelph Permeameter infiltration test at 2.5ft
			4	S-2	GRAB	S-2 from 4.0ft to 4.5ft Roots to 4.0ft
			5			
	+245.9	Bottom of test pit	6			Refusal on large boulder at 5.5ft. Test pit backfilled to grade with lifts of excavated material that was tamped with the excavator bucket.
			7			
			8			
			9			
			10			
			11			




LANGAN

\\LANGAN.COM\DATA\BOS\DATA\3151014301\PROJECT DATA\DISCIPLINE\GEOTECHNICAL\GINTLOGS\151014301 ENTERPRISE.GPJ ... 11/23/2021 7:08:39 PM ... Report: Log - LANGANTP

LOG OF TEST PIT TP-206

Sheet 1 of 1

PROJECT NAME Belmont Hill School - Jordan Athletic Center	PROJECT NUMBER 151014301	DATE 10/17/2021
LOCATION 350 Prospect Street, Belmont, MA	ELEVATION Approx. 251.9 ft (Town of Belmont Datum)	
EXCAVATION CONTRACTOR F.E. French Construction, Inc.	DEPTH 8 ft	WATER LEVEL - First N/E  WATER LEVEL - Completion N/A 
EQUIPMENT CAT 306 Excavator	FOREMAN Matt Ragone	LANGAN PERSONNEL Alexander Macon

Symbol	ELEV (feet)	DESCRIPTION	Depth Scale	SAMPLE		REMARKS
				Number	Type	
	+251.9	Dark brown SILT, some coarse to fine sand, trace fine gravel, some roots (moist) [TOPSOIL]	0			
	+251.7	Brown silty coarse to fine SAND, some coarse to fine gravel, trace asphalt fragments, trace roots (moist) [FILL]	1			
	+250.4	Light brown coarse to fine sandy SILT, trace coarse to fine gravel, trace roots (moist)	2	S-1	GRAB	S-1 from 1.5ft to 2.0ft. USDA textural classification performed Guelph Permeameter infiltration test at 2.0ft
			3			
	+248.4	Gray coarse to fine SAND, some coarse to fine gravel, trace silt, some cobbles, trace boulders (moist)	4			Roots to 4.0ft
			5			
			6			
			7			
			8			Bottom of test pit at 8.0ft. Test pit backfilled to grade with lifts of excavated material that was tamped with the excavator bucket
			9			
			10			
			11			

LANGAN

\\LANGAN.COM\DATA\BOS\DATA\3151014301\PROJECT DATA\DISCIPLINE\GEO\TECHNICAL\GINTLOGS\151014301 ENTERPRISE.GPJ ... 11/23/2021 7:08:41 PM ... Report Log - LANGANTP

LOG OF TEST PIT TP-207

Sheet 1 of 1

PROJECT NAME Belmont Hill School - Jordan Athletic Center	PROJECT NUMBER 151014301	DATE 10/17/2021
LOCATION 350 Prospect Street, Belmont, MA	ELEVATION Approx. 256.5 ft (Town of Belmont Datum)	
EXCAVATION CONTRACTOR F.E. French Construction, Inc.	DEPTH 7.5 ft	WATER LEVEL - First N/E ∇
EQUIPMENT CAT 306 Excavator	FOREMAN Matt Ragone	WATER LEVEL - Completion N/A ∇
		LANGAN PERSONNEL Alexander Macon



Symbol	ELEV (feet)	DESCRIPTION	Depth Scale	SAMPLE		REMARKS
				Number	Type	
	+256.5	Dark brown medium to fine sandy SILT, trace clay, some roots	0			
	+256.3	(moist)[TOPSOIL]				
		Light brown to light gray SILT, some clay, trace medium to fine sand, trace roots				
	+255.5	(moist)[FILL]	1	S-1	GRAB	S-1 from 0.5ft to 1.0ft
		Brown coarse to fine SAND, some silt, some coarse to fine gravel, trace cobbles, trace boulders, trace ceramic fragments, trace plastic fragments, trace roots				
		(moist)[FILL]	2	S-2	GRAB	S-2 from 1.0ft to 1.5ft USDA textural classification performed Guelph Permeameter infiltration test at 1.5ft
			3			
			4			
	+252.5	Gray coarse to fine SAND, some coarse to fine gravel, trace silt, trace cobbles, trace boulders, trace wood fragments, trace ceramic fragments				
		(moist)[FILL]	5			Roots to 5.0ft
			6			
			7			
	+249.0	Bottom of test pit	8			Bottom of test pit at 7.5ft. Test pit backfilled to grade with lifts of excavated material that was tamped with the excavator bucket
			9			
			10			
			11			


LANGAN

I:\LANGAN.COM\DATA\BOS\DATA3\151014301\PROJECT DATA\DISCIPLINE\GEOTECHNICAL\GINTLOGS\151014301 ENTERPRISE.GPJ ... 11/23/2021 7:08:44 PM ... Report: Log - LANGANTP

LOG OF TEST PIT TP-208

Sheet 1 of 1

PROJECT NAME Belmont Hill School - Jordan Athletic Center	PROJECT NUMBER 151014301	DATE 10/17/2021
LOCATION 350 Prospect Street, Belmont, MA	ELEVATION Approx. 259.4 ft (Town of Belmont Datum)	
EXCAVATION CONTRACTOR F.E. French Construction, Inc.	DEPTH 8 ft	WATER LEVEL - First N/E  WATER LEVEL - Completion N/A 
EQUIPMENT CAT 306 Excavator	FOREMAN Matt Ragone	LANGAN PERSONNEL Alexander Macon



Symbol	ELEV (feet)	DESCRIPTION	Depth Scale	SAMPLE		REMARKS
				Number	Type	
	+259.4	Brown coarse to fine SAND, some coarse to fine gravel, trace silt, trace cobbles, trace asphalt fragments, trace plastic fragments (moist)[FILL]	0			
			1			
		Light brown coarse to fine SAND, some silt, trace medium to fine gravel, trace brick fragments (moist)[FILL]	2			
	+257.2	Dark brown silty coarse to fine SAND (moist)[TOPSOIL]		S-1	GRAB	S-1 from 2.25 to 2.5ft
	+256.9					
	+256.7	Black ASPHALT (moist)[ASPHALT]	3			
		Light brown coarse to fine SAND, some silt, some fine gravel (moist)		S-2	GRAB	S-2 from 3.0ft to 3.5ft
						Guelph Permeameter infiltration test at 3.5ft
	+255.4	Gray coarse to fine SAND, some silt, some coarse to fine gravel, trace cobbles, trace boulders, trace roots (moist)	4	S-3	GRAB	S-3 from 4.0ft to 4.5ft
			5			
			6			Roots to 6.0ft
			7			
	+251.4	Bottom of test pit	8			Bottom of test pit at 8.0ft. Test pit backfilled to grade with lifts of excavated material that was tamped with the excavator bucket
			9			
			10			
			11			






I:\LANGAN\COMIDATA\BOS\DATA\3151014301\PROJECT DATA\DISCIPLINE\GEO\TECH\GINT\LOGS\151014301_ENTERPRISE.GPJ ... 11/23/2021 7:08:45 PM ... Report Log - LANGANTP

LANGAN

LOG OF TEST PIT TP-209

Sheet 1 of 1

PROJECT NAME Belmont Hill School - Jordan Athletic Center	PROJECT NUMBER 151014301	DATE 10/17/2021
LOCATION 350 Prospect Street, Belmont, MA	ELEVATION Approx. 262 ft (Town of Belmont Datum)	
EXCAVATION CONTRACTOR F.E. French Construction, Inc.	DEPTH 8 ft	WATER LEVEL - First N/E 
EQUIPMENT CAT 306 Excavator	FOREMAN Matt Ragone	WATER LEVEL - Completion N/A 
		LANGAN PERSONNEL Alexander Macon

Symbol	ELEV (feet)	DESCRIPTION	Depth Scale	SAMPLE		REMARKS
				Number	Type	
	+262.0	Brown to dark brown WOOD CHIPS, trace silt (moist)[FILL]	0			
			1			
	+259.5	Reddish brown medium to fine SAND, some silt, trace medium to fine gravel, trace wood fragments, trace glass fragments, trace brick fragments (moist)[FILL]	2	S-1	GRAB	S-1 from 1.5ft to 2.0ft
			3	S-2	GRAB	S-2 from 2.75ft to 3.25ft
	+258.5	Dark brown SILT, trace medium to fine sand, trace roots (moist)[TOPSOIL]	4	S-3	GRAB	S-3 from 3.5ft to 4.0ft
	+258.0	Light brown sandy SILT, trace coarse to fine gravel, trace roots (moist)	5	S-4	GRAB	S-4 from 4.5ft to 5.0ft
	+256.5	Gray silty coarse to fine SAND, some coarse to fine gravel, trace clay, trace cobbles, trace boulders (moist)	6			Guelph Permeameter infiltration test at 5.0ft
			7	S-5	GRAB	S-5 from 6.5ft to 7.0ft
	+254.0	Bottom of test pit	8			Roots to 7.0ft
			9			Bottom of test pit at 8.0ft. Test pit backfilled to grade with lifts of excavated material that was tamped with the excavator bucket
			10			
			11			

LANGAN

\\LANGAN.COM\DATA\BOS\DATA\3151014301\PROJECT DATA\DISCIPLINE\GEOTECHNICAL\GINTLOGS\151014301_ENTERPRISE.GPJ ... 11/23/2021 7:08:48 PM ... Report: Log - LANGANTP

APPENDIX F

Langan Test Pit Photographs – JAC Parking Lot



Test Pit TP-201 - Photo 1



Test Pit TP-201 - Photo 2



Test Pit TP-201 - Photo 3



Test Pit TP-201 - Photo 4



Test Pit TP-201 - Photo 5



Test Pit TP-201 - Photo 6



Test Pit TP-201 - Photo 7



Test Pit TP-202 - Photo 1



Test Pit TP-202 - Photo 2



Test Pit TP-202 - Photo 3



Test Pit TP-202 - Photo 4



Test Pit TP-202 - Photo 5



Test Pit TP-202 - Photo 6



Test Pit TP-202 - Photo 7



Test Pit TP-203 - Photo 1



Test Pit TP-203 - Photo 2



Test Pit TP-203 - Photo 3



Test Pit TP-203 - Photo 4



Test Pit TP-203 - Photo 5



Test Pit TP-203 - Photo 6



Test Pit TP-204 - Photo 1



Test Pit TP-204 - Photo 2



Test Pit TP-204 - Photo 3



Test Pit TP-204 - Photo 4



Test Pit TP-204 - Photo 5



Test Pit TP-205 - Photo 1



Test Pit TP-205 - Photo 2



Test Pit TP-205 - Photo 3



Test Pit TP-205 - Photo 4



Test Pit TP-205 - Photo 5



Test Pit TP-206 - Photo 1



Test Pit TP-206 - Photo 2



Test Pit TP-206 - Photo 3



Test Pit TP-206 - Photo 4



Test Pit TP-206 - Photo 5



Test Pit TP-206 - Photo 6



Test Pit TP-207 - Photo 1



Test Pit TP-207 - Photo 2



Test Pit TP-207 - Photo 3



Test Pit TP-207 - Photo 4



Test Pit TP-207 - Photo 5



Test Pit TP-207 - Photo 6



Test Pit TP-208 - Photo 1



Test Pit TP-208 - Photo 2



Test Pit TP-208 - Photo 3



Test Pit TP-208 - Photo 4



Test Pit TP-208 - Photo 5



Test Pit TP-208 - Photo 6



Test Pit TP-209 - Photo 1



Test Pit TP-209 - Photo 2



Test Pit TP-209 - Photo 3



Test Pit TP-209 - Photo 4



Test Pit TP-209 - Photo 5



Test Pit TP-209 - Photo 6



Test Pit TP-209 - Photo 7

APPENDIX G

Langan Boring Logs – East Campus Maintenance Area

Project Belmont Hill School				Project No. 151014301			
Location 350 Prospect Street, Belmont, MA				Elevation and Datum Approx. 255.5 ft (Town of Belmont Datum)			
Drilling Company Geologic Earth Exploration Inc.				Date Started 01/06/2022		Date Finished 01/06/2022	
Drilling Equipment Acker Scout				Completion Depth 10.5 ft		Rock Depth 7.5 ft	
Size and Type of Bit 3-7/8in Tricone Roller Bit				Number of Samples 4		Undisturbed N/A	
Casing Diameter (in) 4		Casing Depth (ft) 7.5		Water Level (ft.) First N/E		Completion N/A	
Casing Hammer Donut		Weight (lbs) 300		Drop (in) 30		Drilling Foreman Dave Sheldon	
Sampler 2-inch-diameter split spoon				Field Engineer Alexander Macon			
Sampler Hammer Donut		Weight (lbs) 140		Drop (in) 30			

MATERIAL SYMBOL	Elev. (ft)	Sample Description	Casing blws/ft Coring (min)	Depth Scale	Sample Data					Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
					Number	Type	Recov. (in)	Penetr. resist BL/ft	N-Value (Blows/ft)	
	255.5			0						
	255.0	Dark brown silty medium-fine SAND, trace coarse sand, trace roots (moist)[TOPSOIL]		1	S-1A	SS	2	11	32	<p>Attempted to sample and the sampler deflected laterally. Drill to 2.0ft. Moderate drilling. Some rig chatter from 1.0ft to 1.5ft. Inferred cobble from 1.0ft to 1.5ft. S-2 at 2ft. Switch to 3-inch-diameter casing. Switch to 2 3/4-inch roller bit. Spin casing to 3.0ft. Drive casing to 4.0ft. Drill to 4.0ft. Moderate drilling. Some rig chatter from 3.5ft to 4.0ft. Gray wash. S-3 at 4ft. Drill to 6.0ft. Moderate to hard drilling. Some rig chatter from 5.5ft to 6.0ft. Gray wash. Drive casing to 6.0ft. Clean out casing. S-4 at 6ft. Drill to 7.5ft. Moderate to hard drilling to 7.0ft. Very hard drilling from 7.0ft to 7.5ft. Gray wash. Spin casing to 7.5ft. Clean out casing. C-1 at 7.5ft Advanced through hard material at 9.0ft.</p> <p>Boring terminated at 10.5ft. Boring backfilled to grade with soil cuttings and #2 sand.</p>
	253.5	Brown medium-fine SAND, some silt, some coarse sand, trace fine gravel, trace roots (moist)[SUBSOIL]	Spin	S-1B	SS	10	21			
		Gray coarse-fine SAND, some silt, trace fine gravel (moist)[TILL]		2	S-2	SS	11	17		
			90	3			50	50/1		
		Gray coarse-fine SAND, some silt, trace fine gravel (moist)[TILL]		4	S-3	SS	8	59		
			115	5			54	50/2		
		Gray coarse-fine SAND, some silt, some fine gravel (moist)[TILL]		6	S-4	SS	4	44		
			Spin	7			39	50/1		
	248.0	Brown GRANODIORITE [BOULDER]	3:00	8						
	246.5	Inferred gray coarse-fine SAND, some silt, some fine gravel (moist)[TILL]	1:36	9	C-1	NX Core	15			
	245.0	Bottom of boring	2:01	10						
				11						
				12						
				13						
				14						
				15						

Project Belmont Hill School				Project No. 151014301			
Location 350 Prospect Street, Belmont, MA				Elevation and Datum Approx. 261 ft (Town of Belmont Datum)			
Drilling Company Geologic Earth Exploration Inc.				Date Started 01/06/2022		Date Finished 01/06/2022	
Drilling Equipment Acker Scout				Completion Depth 16 ft		Rock Depth N/E	
Size and Type of Bit 3-7/8in Tricone Roller Bit				Number of Samples 6		Undisturbed N/A	
Casing Diameter (in) 4				Casing Depth (ft) 13		Core 1	
Casing Hammer Donut		Weight (lbs) 300		Drop (in) 30		Water Level (ft.) N/E	
Sampler 2-inch-diameter split spoon				Drilling Foreman Dave Sheldon			
Sampler Hammer Donut				Weight (lbs) 140		Drop (in) 30	
				Field Engineer Alexander Macon			

Elev. (ft)	Sample Description	Casing blws/ft Coring (min)	Depth Scale	Sample Data					Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)	
				Number	Type	Recov. (in)	Penetr. resist. BLU/in	N-Value (Blows/ft)		
261.0			0							
260.6	Dark brown silty medium-fine SAND, trace wood chips, trace roots (moist)[TOPSOIL]		1	S-1A			4			S-1 at 0ft.
	Dark brown silty medium-fine SAND, some coarse sand, trace fine gravel, trace roots (moist)[FILL]		1	S-1B	SS		8		18	
			2	S-2A			10			S-2 at 2ft.
258.8	Grayish brown coarse-fine SAND, some silt (moist)[FILL]		2	S-2B	SS		7			
	Dark brown silty medium-fine SAND, some coarse sand, trace fine gravel, trace wood chips (moist)[FILL]		3	S-3	SS		6		15	
	Gray coarse-fine SAND, some silt, trace fine gravel (moist)[FILL]		4	S-4A			28			
			5	S-4B	SS		16		25	
255.0	Brown medium-fine SAND, trace silt (moist)[SUBSOIL]	61	6	S-5	SS		5		10	
254.0	Gray coarse-fine SAND, some silt, trace fine gravel (moist)[TILL]		7	S-6	SS		12		12	
	Gray coarse-fine SAND, some silt, trace fine gravel (moist)[TILL]		8	S-7	SS		7			
		42	9	S-8	SS		30		74	
			10	S-9	SS		7		50/3	
	Gray coarse-fine SAND, some silt, trace fine gravel (moist)[TILL]		11	S-10	SS		5		100/5	
249.5			12							
			13							
			14							
			15							

Brown GRANODIORITE; medium to coarse grained; moderately weathered; close fracture spacing; fractures near horizontal; poor rock quality [BEDROCK]		3:14	C-1	NX Core	REC=97%	RQD=44%
		3:19				

\\LANGAN.COM\DATA\BOS\DATA\151014301\PROJECT DATA\DISCIPLINE\GEOTECHNICAL\GINT\LOGS\151014301 ENTERPRISE.GPJ ... 2/23/2022 5:35:48 PM ... Report: Log - LANGAN

Project Belmont Hill School		Project No. 151014301	
Location 350 Prospect Street, Belmont, MA		Elevation and Datum Approx. 261 ft (Town of Belmont Datum)	

MATERIAL SYMBOL	Elev. (ft)	Sample Description	Casing blw/ft Coring (min)	Depth Scale	Sample Data				Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)	
					Number	Type	Recov. (in)	Penetr. resist. BL/6in		N-Value (Blows/ft)
	246.0			15						
	245.0	Bottom of boring	3.54	16	C-1	NX Core				
				17						
				18						
				19						
				20						
				21						
				22						
				23						
				24						
				25						
				26						
				27						
				28						
				29						
				30						
				31						
				32						
				33						

Boring terminated at 16.0ft.
Boring converted to observation well and finished with a flush-mounted well box.

APPENDIX H

Langan Boring Groundwater Observation Well Log – East Campus Maintenance Area

WELL CONSTRUCTION SUMMARY Well No. LB-02(OW)						
PROJECT Belmont Hill School		PROJECT NO. 151014301				
LOCATION 350 Prospect Street, Belmont, MA		ELEVATION AND DATUM Approx. 261 Town of Belmont Datum				
DRILLING AGENCY Geologic Earth Exploration, Inc		DATE STARTED 01/06/2022 DATE FINISHED 01/06/2022				
DRILLING EQUIPMENT CME Truck-Mounted Drill Rig		DRILLER Dave Sheldon				
SIZE AND TYPE OF BIT 3-7/8" Tri-Cone Roller Bit		INSPECTOR Alexander Macon				
METHOD OF INSTALLATION Boring LB-2(OW) was advanced to a depth of about 16ft with mud rotary drilling and rock coring techniques. The screen and riser for the well were placed into the borehole and set to the bottom of the hole. #2 sand was poured around the pipe to 1ft. above the screen. A 1-foot-thick seal of 3/8" Bentonite Chips was placed above the sand. The rest of the borehole was backfilled with #2 sand.						
METHOD OF WELL DEVELOPMENT N/A						
TYPE OF CASING PVC DIAMETER 2in.		TYPE OF BACKFILL MATERIAL #2 Sand				
TYPE OF SCREEN PVC DIAMETER 2in.		TYPE OF SEAL MATERIAL 3/8" Bentonite Chips				
BOREHOLE DIAMETER 4-1/4"		TYPE OF FILTER MATERIAL #2 sand				
TOP OF CASING ELEVATION DEPTH (ft) el. 261 0		WELL DETAILS 		SUMMARY SOIL CLASSIFICATION	DEPTH (FT)	
TOP OF BACKFILL ELEVATION DEPTH (ft) el. 261 0				Topsoil	0.5	
TOP OF SEAL ELEVATION DEPTH (ft) el. 257 4				Fill	6.0	
TOP OF FILTER ELEVATION DEPTH (ft) el. 256 5				Sand	7.0	
TOP OF SCREEN ELEVATION DEPTH (ft) el. 255 6				Glacial Till	11.5	
BOTTOM OF BORING ELEVATION DEPTH (ft) el. 245 16				Bedrock	16.0	
SCREEN LENGTH 10ft.						
SLOT SIZE .1in.						
GROUNDWATER ELEVATIONS						
DATE	ELEVATION			DEPTH TO WATER (ft)	NOTE(s)	
NOTES:						
LANGAN MA, Inc.						

APPENDIX I
Laboratory Test Results

Client:	Langan Engineering	Project No:	GTX-314519
Project:	Belmont High School	Tested By:	ckg
Location:	Belmont, MA	Checked By:	bfs
Boring ID:	TP-5	Sample Type:	bag
Sample ID:	S-3	Test Date:	10/28/21
Depth :	4.5-5.0 ft	Test Id:	636906
Test Comment:	---		
Visual Description:	Moist, gray silty sand with gravel		
Sample Comment:	---		

USDA Textural Classification

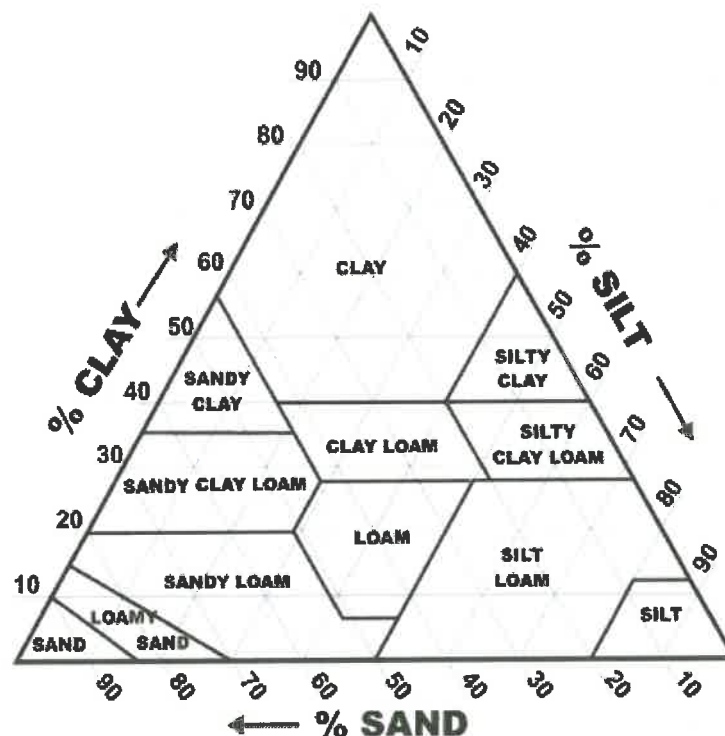
Boring ID	Sample ID	Depth	Sand, %	Silt, %	Clay, %	Classification
TP-5	S-3	4.5-5.0 ft	66	33	1	Sandy Loam

Classifications based only on material passing the #10 sieve

Sand: material passing 2.0 mm and retained on 0.05 mm diameter

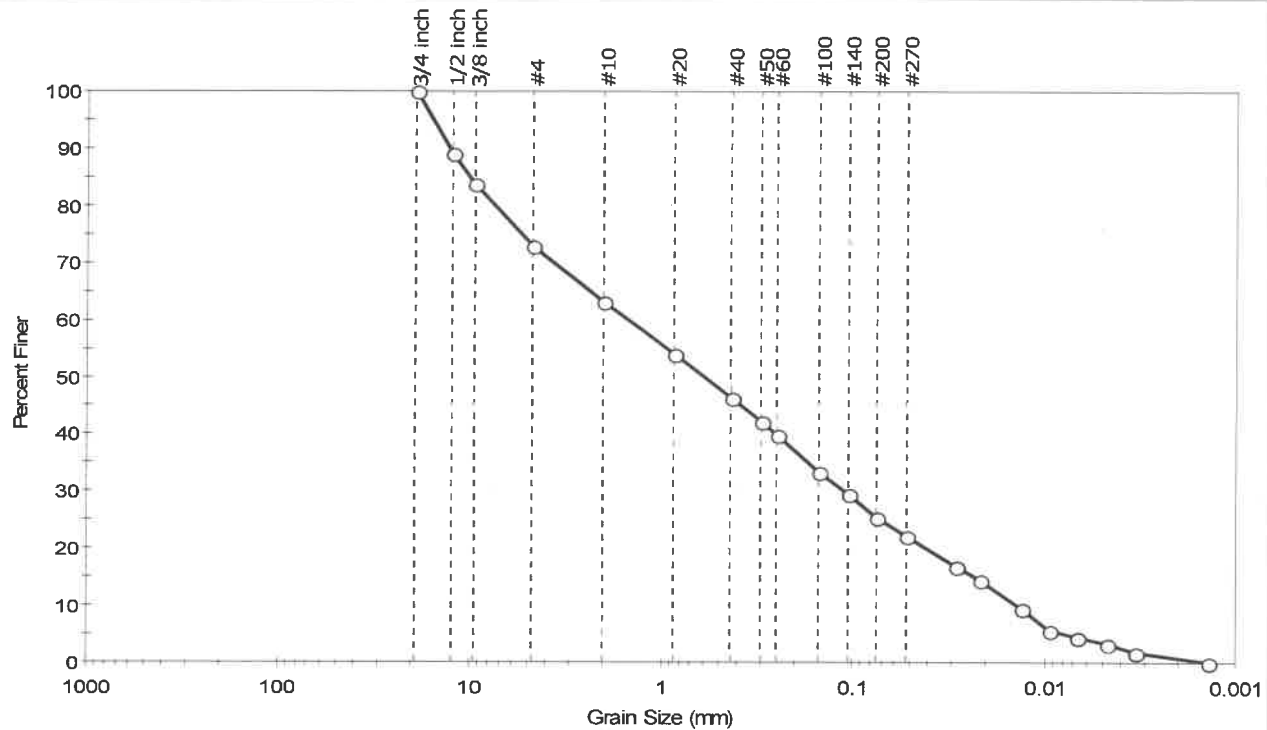
Silt: material passing 0.05 mm and retained on 0.002 mm diameter

Clay: material passing 0.002 mm diameter



Client:	Langan Engineering	Project No:	GTX-314519
Project:	Belmont High School	Tested By:	ckg
Location:	Belmont, MA	Checked By:	bfs
Boring ID:	TP-5	Sample Type:	bag
Sample ID:	S-3	Test Date:	10/28/21
Depth:	4.5-5.0 ft	Test Id:	636902
Test Comment:	---		
Visual Description:	Moist, gray silty sand with gravel		
Sample Comment:	---		

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	27.2	47.4	25.4

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
3/4 inch	19.00	100		
1/2 inch	12.50	89		
3/8 inch	9.50	84		
#4	4.75	73		
#10	2.00	63		
#20	0.85	54		
#40	0.42	46		
#50	0.30	42		
#60	0.25	40		
#100	0.15	33		
#140	0.11	30		
#200	0.075	25		
#270	0.053	22		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0290	17		
---	0.0216	14		
---	0.0131	9		
---	0.0093	6		
---	0.0067	4		
---	0.0048	3		
---	0.0034	2		
---	0.0014	0		

Coefficients

D ₈₅ = 10.1511 mm	D ₃₀ = 0.1104 mm
D ₆₀ = 1.4787 mm	D ₁₅ = 0.0232 mm
D ₅₀ = 0.5900 mm	D ₁₀ = 0.0140 mm
C _u = 105.621	C _c = 0.589

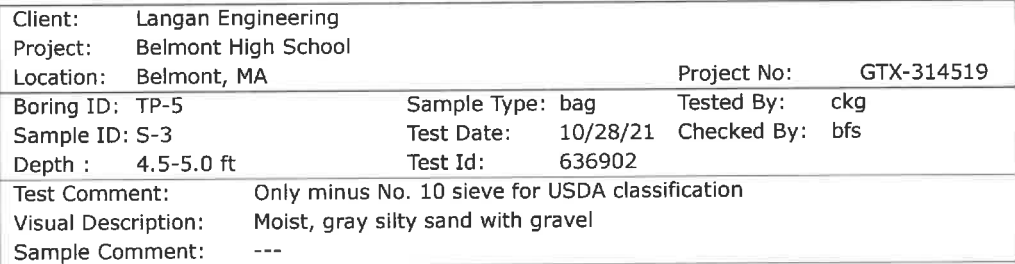
Classification

ASTM N/A

AASHTO Silty Gravel and Sand (A-2-4 (0))

Sample / Test Description

Sand/Gravel Particle Shape : ANGULAR
 Sand/Gravel Hardness : HARD
 Dispersion Device : Apparatus A - Mech Mixer
 Dispersion Period : 1 minute
 Est. Specific Gravity : 2.65
 Separation of Sample: #270 Sieve



Grain size distribution curve for a sample of sand. The graph plots Percent Finer (0 to 100) against Grain Size (mm) on a logarithmic scale (1000 to 0.001). The curve shows that approximately 100% of the sand is finer than 4.75 mm, and about 1% is finer than 0.075 mm.

Grain Size (mm)	Percent Finer (%)
4.75	100
2.0	86
0.85	74
0.6	68
0.425	64
0.25	54
0.15	48
0.106	41
0.075	36
0.05	27
0.035	23
0.025	16
0.015	10
0.0106	8
0.0075	6
0.005	4
0.0025	1

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#10	2.00	100		
#20	0.85	85		
#40	0.42	73		
#50	0.30	67		
#60	0.25	63		
#100	0.15	53		
#140	0.11	47		
#200	0.075	40		
#270	0.053	35		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0290	26		
---	0.0216	22		
---	0.0131	15		
---	0.0093	9		
---	0.0067	7		
---	0.0048	5		
---	0.0034	3		
---	0.0014	0		

Sample Test Description
 Sand/Gravel Particle Shape : ANGULAR
 Sand/Gravel Hardness : HARD
 Dispersion Device : Apparatus A - Mech Mixer
 Dispersion Period : 1 minute
 Est. Specific Gravity : 2.65
 Separation of Sample: #270 Sieve

Client:	Langan Engineering	Project No:	GTX-314519
Project:	Belmont High School	Tested By:	ckg
Location:	Belmont, MA	Checked By:	bfs
Boring ID:	TP-202	Sample Type:	bag
Sample ID:	S-1	Test Date:	10/28/21
Depth :	4.0-4.5 ft	Test Id:	636907
Test Comment:	---		
Visual Description:	Moist, dark brown silty sand with gravel		
Sample Comment:	Removed one unrepresentative 2 inch rock		

USDA Textural Classification

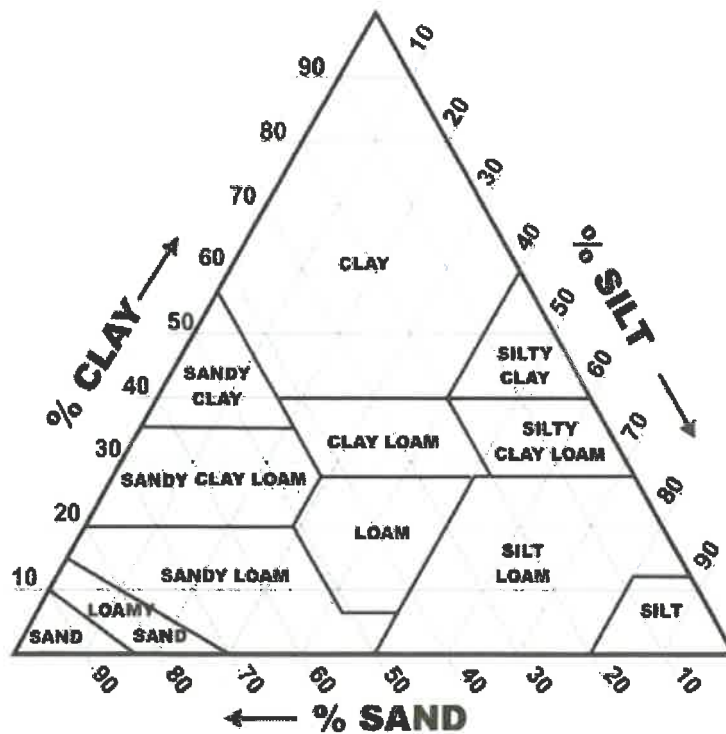
Boring ID	Sample ID	Depth	Sand, %	Silt, %	Clay, %	Classification
TP-202	S-1	4.0-4.5 ft	75	25	0	Loamy Sand

Classifications based only on material passing the #10 sieve

Sand: material passing 2.0 mm and retained on 0.05 mm diameter

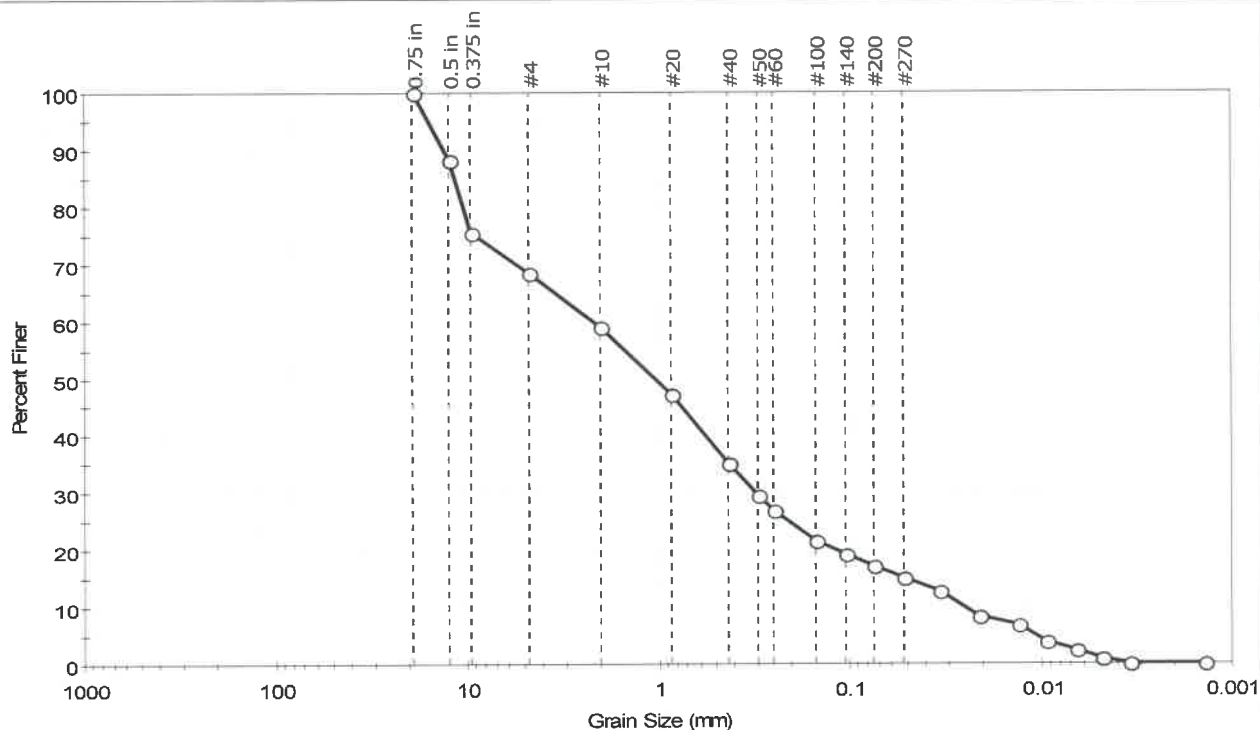
Silt: material passing 0.05 mm and retained on 0.002 mm diameter

Clay: material passing 0.002 mm diameter



Client:	Langan Engineering		
Project:	Belmont High School		
Location:	Belmont, MA	Project No:	GTX-314519
Boring ID:	TP-202	Sample Type:	bag
Sample ID:	S-1	Test Date:	10/28/21
Depth :	4.0-4.5 ft	Test Id:	636903
Test Comment:	---		
Visual Description:	Moist, dark brown silty sand with gravel		
Sample Comment:	Removed one unrepresentative 2 inch rock		

Particle Size Analysis - ASTM D6913/D7928



%Cobble	%Gravel	%Sand	%Silt & Clay Size
—	31.5	51.4	17.1

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.75 in	19.00	100		
0.5 in	12.50	88		
0.375 in	9.50	76		
#4	4.75	68		
#10	2.00	59		
#20	0.85	47		
#40	0.42	35		
#50	0.30	30		
#60	0.25	27		
#100	0.15	22		
#140	0.11	19		
#200	0.075	17		
#270	0.053	15		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0343	13		
---	0.0211	8		
---	0.0131	7		
---	0.0094	4		
---	0.0066	2		
---	0.0048	1		
---	0.0034	0		
---	0.0014	0		

Coefficients

D ₈₅ = 11.6728 mm	D ₃₀ = 0.3078 mm
D ₆₀ = 2.1889 mm	D ₁₅ = 0.0515 mm
D ₅₀ = 1.0430 mm	D ₁₀ = 0.0257 mm
C _u = 85.171	C _c = 1.684

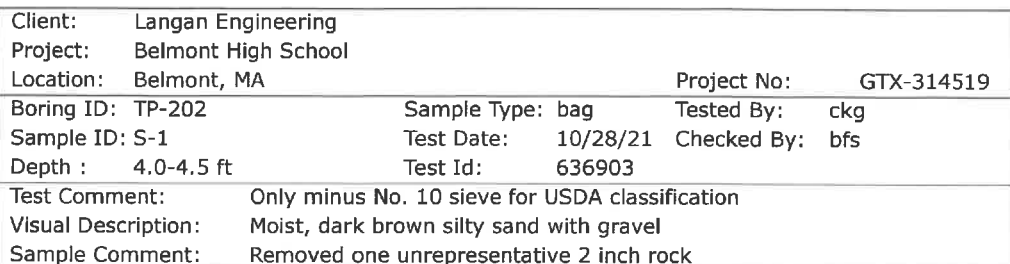
Classification

ASTM N/A

AASHTO Stone Fragments, Gravel and Sand (A-1-b (0))

Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR
 Sand/Gravel Hardness : HARD
 Dispersion Device : Apparatus A - Mech Mixer
 Dispersion Period : 1 minute
 Est. Specific Gravity : 2.65
 Separation of Sample: #270 Sieve



Grain size distribution curve for a sample of fine sand. The graph plots Percent Finer (0 to 100) against Grain Size (mm) on a logarithmic scale (1000 to 0.001). The curve shows a well-sorted sand with a median grain size (D_{50}) of approximately 0.425 mm. Vertical dashed lines indicate standard sieve sizes: 0.75 in, 0.5 in, 0.375 in, #4, #10, #20, #40, #50, #60, #100, #140, #200, and #270.

Grain Size (mm)	Percent Finer (%)
2.0	100
1.0	80
0.6	60
0.425	50
0.3	45
0.25	36
0.2	32
0.15	28
0.125	25
0.1	21
0.075	13
0.06	10
0.05	5
0.04	3
0.03	1
0.025	0
0.0075	0

% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	0.0	71.1	28.9

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#10	2.00	100		
#20	0.85	80		
#40	0.42	60		
#50	0.30	50		
#60	0.25	46		
#100	0.15	37		
#140	0.11	32		
#200	0.075	29		
#270	0.053	26		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0343	21		
---	0.0211	14		
---	0.0131	11		
---	0.0094	6		
---	0.0066	4		
---	0.0048	1		
---	0.0034	0		
---	0.0014	0		

$D_{85}=1.0551 \text{ mm}$	$D_{30}=0.0834 \text{ mm}$
$D_{60}=0.4303 \text{ mm}$	$D_{15}=0.0231 \text{ mm}$
$D_{50}=0.2983 \text{ mm}$	$D_{10}=0.0121 \text{ mm}$
$C_u = 35.562$	$C_c = 1.336$

ASTM N/A

AASHTO Silty Gravel and Sand (A-2-4 (0))

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #270 Sieve

Client:	Langan Engineering	Project No:	GTX-314519
Project:	Belmont High School	Tested By:	ckg
Location:	Belmont, MA	Checked By:	bfs
Boring ID:	TP-206	Sample Type:	bag
Sample ID:	S-1	Test Date:	10/28/21
Depth :	1.5-2.0 ft	Test Id:	636908
Test Comment:	---		
Visual Description:	Moist, dark yellowish brown sandy silt		
Sample Comment:	---		

USDA Textural Classification

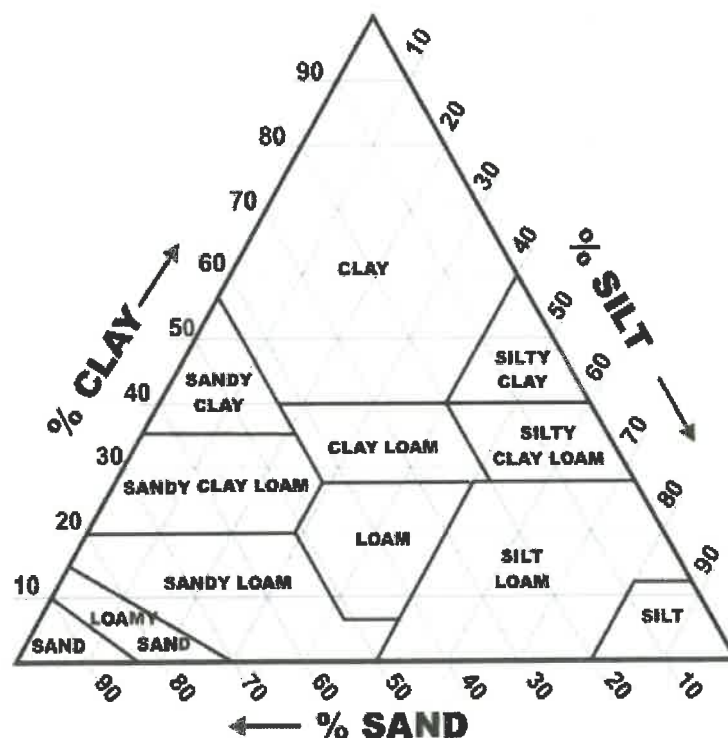
Boring ID	Sample ID	Depth	Sand, %	Silt, %	Clay, %	Classification
TP-206	S-1	1.5-2.0 ft	36	64	0	Silt Loam

Classifications based only on material passing the #10 sieve

Sand: material passing 2.0 mm and retained on 0.05 mm diameter

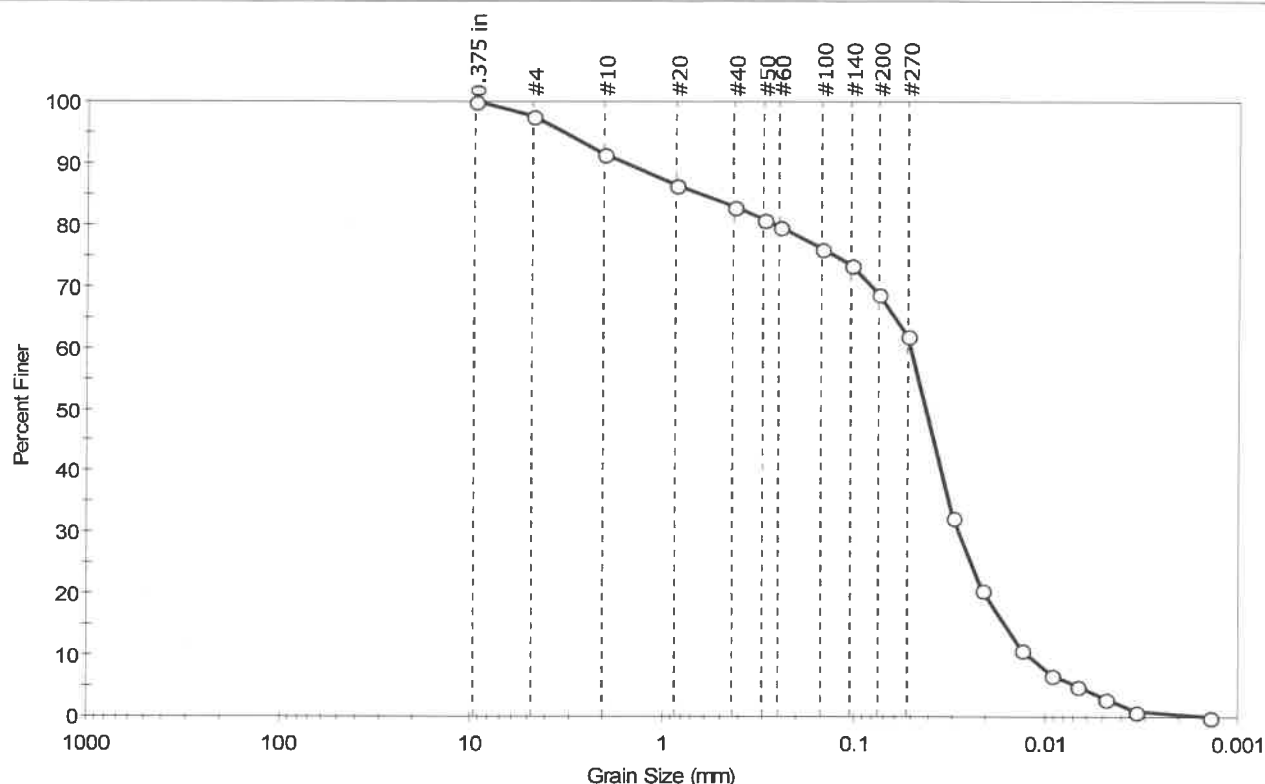
Silt: material passing 0.05 mm and retained on 0.002 mm diameter

Clay: material passing 0.002 mm diameter



Client:	Langan Engineering	Project No:	GTX-314519
Project:	Belmont High School	Tested By:	ckg
Location:	Belmont, MA	Checked By:	bfs
Boring ID:	TP-206	Sample Type:	bag
Sample ID:	S-1	Test Date:	10/28/21
Depth:	1.5-2.0 ft	Test Id:	636904
Test Comment:	---		
Visual Description:	Moist, dark yellowish brown sandy silt		
Sample Comment:	---		

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	2.5	28.8	68.7

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.375 in	9.50	100		
#4	4.75	98		
#10	2.00	91		
#20	0.85	87		
#40	0.425	83		
#50	0.30	81		
#60	0.25	80		
#100	0.15	76		
#140	0.11	73		
#200	0.075	69		
#270	0.053	62		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0306	32		
---	0.0214	21		
---	0.0132	11		
---	0.0092	7		
---	0.0067	5		
---	0.0048	3		
---	0.0034	1		
---	0.0014	0		

Coefficients

D ₈₅ = 0.6288 mm	D ₃₀ = 0.0285 mm
D ₆₀ = 0.0511 mm	D ₁₅ = 0.0163 mm
D ₅₀ = 0.0425 mm	D ₁₀ = 0.0123 mm
C _u = 4.154	C _c = 1.292

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

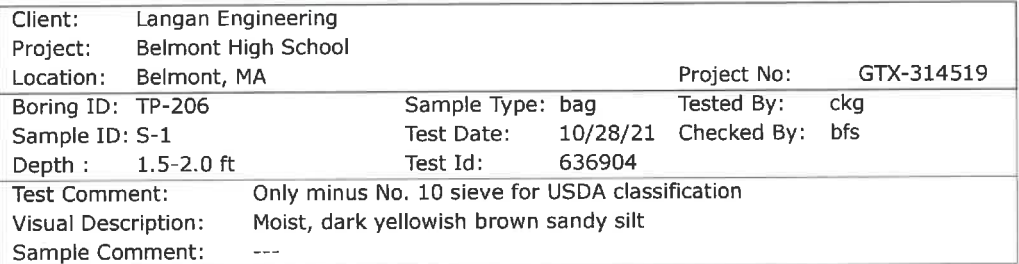
Sand/Gravel Hardness : HARD

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample : #270 Sieve



Grain size distribution curve for a sample of sand. The graph plots Percent Finer (Y-axis, 0 to 100) against Grain Size (mm) on a logarithmic scale (X-axis, 1000 to 0.001). The curve shows a well-graded sand with a maximum grain size of approximately 4.75 mm and a minimum grain size of approximately 0.075 mm. Vertical dashed lines indicate standard sieve sizes: 0.375 in, #4, #10, #20, #40, #50, #60, #100, #140, #200, and #270.

Grain Size (mm)	Percent Finer (%)
4.75	100
2.0	95
0.85	92
0.425	88
0.25	85
0.15	81
0.075	76
0.0475	68
0.025	33
0.015	21
0.0075	12
0.00475	8
0.0025	6
0.0015	4
0.00075	2

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#10	2.00	100		
#20	0.85	95		
#40	0.42	91		
#50	0.30	89		
#60	0.25	87		
#100	0.15	83		
#140	0.11	80		
#200	0.075	75		
#270	0.053	68		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0306	32		
---	0.0214	21		
---	0.0132	11		
---	0.0092	7		
---	0.0067	5		
---	0.0048	3		
---	0.0034	1		
---	0.0014	0		

Sand/Gravel Particle Shape : ANGULAR
Sand/Gravel Hardness : HARD
Dispersion Device : Apparatus A - Mech Mixer
Dispersion Period : 1 minute
Est. Specific Gravity : 2.65
Separation of Sample: #270 Sieve

Client:	Langan Engineering	Project No:	GTX-314519
Project:	Belmont High School	Tested By:	ckg
Location:	Belmont, MA	Checked By:	bfs
Boring ID:	TP-207	Sample Type:	bag
Sample ID:	S-2	Test Date:	10/28/21
Depth :	1.0-1.5 ft	Test Id:	636909
Test Comment:	---		
Visual Description:	Moist, dark brown silty sand with gravel		
Sample Comment:	---		

USDA Textural Classification

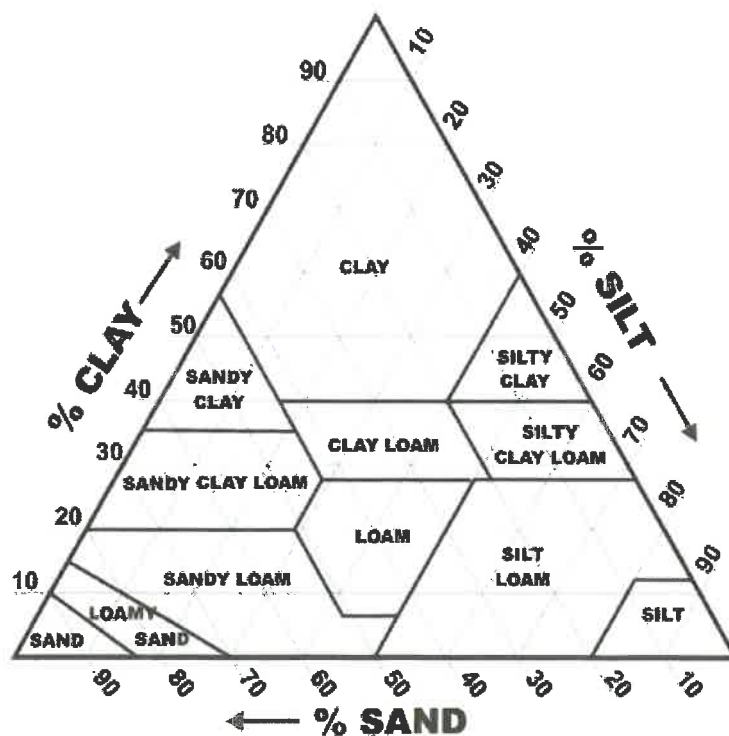
Boring ID	Sample ID	Depth	Sand, %	Silt, %	Clay, %	Classification
TP-207	S-2	1.0-1.5 ft	75	24	1	Silt Loam

Classifications based only on material passing the #10 sieve

Sand: material passing 2.0 mm and retained on 0.05 mm diameter

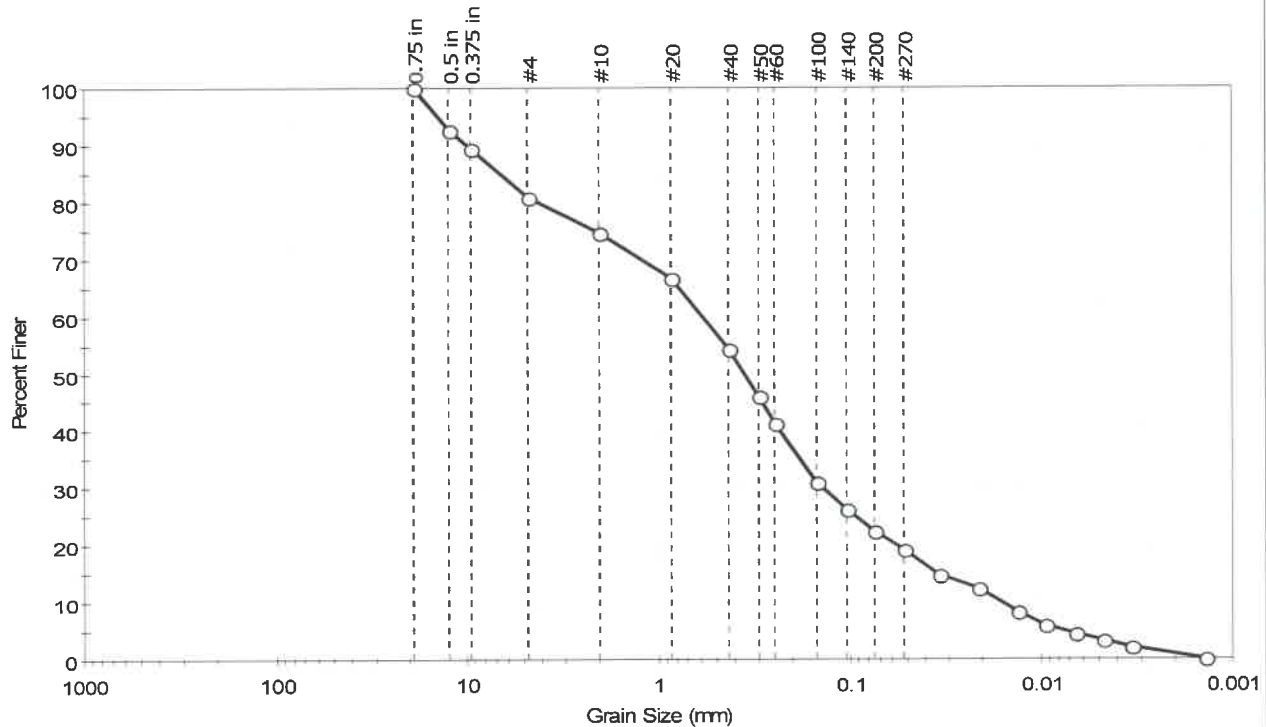
Silt: material passing 0.05 mm and retained on 0.002 mm diameter

Clay: material passing 0.002 mm diameter



Client: Langan Engineering	Project No: GTX-314519
Project: Belmont High School	
Location: Belmont, MA	
Boring ID: TP-207	Sample Type: bag
Sample ID: S-2	Tested By: ckg
Depth: 1.0-1.5 ft	Test Date: 10/28/21
	Checked By: bfs
	Test Id: 636905
Test Comment: ---	
Visual Description: Moist, dark brown silty sand with gravel	
Sample Comment: ---	

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	19.1	58.6	22.3

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
0.75 in	19.00	100		
0.5 in	12.50	93		
0.375 in	9.50	89		
#4	4.75	81		
#10	2.00	75		
#20	0.85	67		
#40	0.42	54		
#50	0.30	46		
#60	0.25	41		
#100	0.15	31		
#140	0.11	26		
#200	0.075	22		
#270	0.053	19		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0343	15		
---	0.0210	12		
---	0.0132	8		
---	0.0095	6		
---	0.0066	5		
---	0.0047	3		
---	0.0034	2		
---	0.0014	0		

Coefficients

D ₈₅ = 6.6167 mm	D ₃₀ = 0.1396 mm
D ₆₀ = 0.5893 mm	D ₁₅ = 0.0349 mm
D ₅₀ = 0.3565 mm	D ₁₀ = 0.0160 mm
C _u = 36.831	C _c = 2.067

Classification

ASTM N/A

AASHTO Silty Gravel and Sand (A-2-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

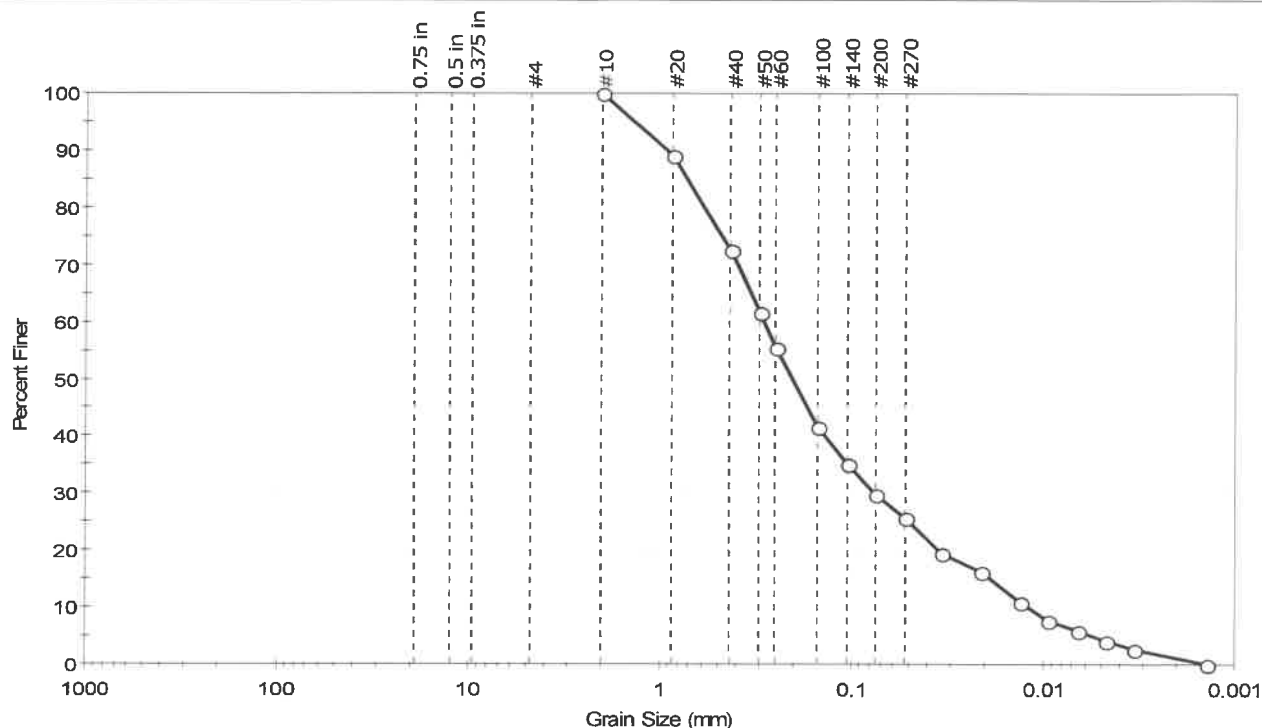
Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #270 Sieve

Client:	Langan Engineering	Project No:	GTX-314519
Project:	Belmont High School	Tested By:	ckg
Location:	Belmont, MA	Checked By:	bfs
Boring ID:	TP-207	Sample Type:	bag
Sample ID:	S-2	Test Date:	10/28/21
Depth:	1.0-1.5 ft	Test Id:	636905
Test Comment:	Only minus No. 10 sieve for USDA classification		
Visual Description:	Moist, dark brown silty sand with gravel		
Sample Comment:	---		

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	0.0	70.1	29.9

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
#10	2.00	100		
#20	0.85	89		
#40	0.42	73		
#50	0.30	62		
#60	0.25	55		
#100	0.15	42		
#140	0.11	35		
#200	0.075	30		
#270	0.053	26		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0343	20		
---	0.0210	16		
---	0.0132	11		
---	0.0095	8		
---	0.0066	6		
---	0.0047	4		
---	0.0034	3		
---	0.0014	0		

Coefficients

D ₈₅ = 0.7134 mm	D ₃₀ = 0.0755 mm
D ₆₀ = 0.2864 mm	D ₁₅ = 0.0189 mm
D ₅₀ = 0.2046 mm	D ₁₀ = 0.0119 mm
C _u = 24.067	C _c = 1.673

Classification

ASTM N/A

AASHTO Silty Gravel and Sand (A-2-4 (0))

Sample / Test Description

Sand/Gravel Particle Shape : ---
 Sand/Gravel Hardness : ---
 Dispersion Device : Apparatus A - Mech Mixer
 Dispersion Period : 1 minute
 Est. Specific Gravity : 2.65
 Separation of Sample : #270 Sieve

APPENDIX J

Infiltration Testing Results – East Campus

LANGAN

INFILTRATION TESTS

IT-2 performed in TP-2

PROJECT	Belmont Hill School	PROJECT NO.	151014301
LOCATION	Belmont, MA	DATE	June 8th, 2021
INSPECTOR	Alex Macon	WEATHER	Sunny, 75-85 degrees
TEST NUMBER	STATIC HEAD (CM)	ELEVATION AND DATUM	
1	3	Surface Elevation	Approx. 261.5 Town of Belmont Datum
2	7	Top of Hole Elevation	Approx. 258.5 Town of Belmont Datum
		Bottom of Hole Elevation	Approx. 258.0 Town of Belmont Datum

METHOD OF INFILTRATION TEST

TP-2 was excavated to a depth of about 36 inches below existing grades. An 6-inch-deep and 6-centimeter-diameter hole was then advanced using a hand auger. The hole was cleaned using a well prep brush and a sizing auger. The infiltration test was performed using a Guelph Permeameter with the two head method. H1 = 3 cm and H2 = 7 cm for these tests. After every 60 seconds, the height of the water was measured to calculate the total drop of water over the time period. Test 1 (A) was measured using the inner reservoir cylinder only. Test 2 (B) was measured using the inner and outer reservoir cylinders. The table below summarizes the field data and the calculations for determining the rates in which the water infiltrated.

	TIME (MIN)	HEIGHT OF WATER (CM)	DROP (CM)	RATE (IN/MIN)	RATE (IN/HOUR)	SOIL CONDITIONS
TEST 1 (A)	0	43.5	-	-	-	Gray coarse to fine SAND, some silt, trace coarse to fine gravel, trace cobbles, trace boulders (moist)
	1	51.6	8.1	3.2	191.5	
	2	55.3	3.7	1.5	87.5	
	3	59.6	4.3	1.7	101.7	
	4	62.5	2.9	1.1	68.6	
	5	65.3	2.8	1.1	66.2	
	6	69.6	4.3	1.7	101.7	
	7	72.1	2.5	1.0	59.1	
	8	74.8	2.7	1.1	63.8	
	Steady State Rate:				64.4	inches/hour
TEST 2 (B)	TIME (MIN)	HEIGHT OF WATER (CM)	DROP (CM)	RATE (IN/MIN)	RATE (IN/HOUR)	Field Saturated Hydraulic Conductivity, Ksat: N/A
	0	5.5	-	-	-	
	1	5.9	0.4	0.2	9.5	
	2	6.5	0.6	0.2	14.2	
	3	7.1	0.6	0.2	14.2	
	4	7.8	0.7	0.3	16.5	
	5	8.4	0.6	0.2	14.2	
	6	9.0	0.6	0.2	14.2	
	7	9.5	0.5	0.2	11.8	
	8	10.1	0.6	0.2	14.2	
	9	10.7	0.6	0.2	14.2	
	10	11.3	0.6	0.2	14.2	
	Steady State Rate:				14.2	inches/hour

LANGAN

INFILTRATION TESTS

IT-3 performed in TP-3

PROJECT Belmont Hill School		PROJECT NO. 151014301	
LOCATION Belmont, MA		DATE June 8th, 2021	
INSPECTOR Alex Macon		WEATHER Sunny, 75-85 degrees	
TEST NUMBER	STATIC HEAD (CM)	ELEVATION AND DATUM	
1	5	Surface Elevation	Approx. 261.0 Town of Belmont Datum
2	10	Top of Hole Elevation	Approx. 257.0 Town of Belmont Datum
		Bottom of Hole Elevation	Approx. 256.4 Town of Belmont Datum

METHOD OF INFILTRATION TEST

TP-3 was excavated to a depth of about 48 inches below existing grades. An 7-inch-deep and 6-centimeter-diameter hole was then advanced using a hand auger. The hole was cleaned using a well prep brush and a sizing auger. The infiltration test was performed using a Guelph Permeameter with the two head method. H1 = 5 cm and H2 = 10 cm for these tests. After every 60 seconds, the height of the water was measured to calculate the total drop of water over the time period. Test 1 (A) and Test 2 (B) were measured using the inner and outer reservoir cylinders. The table below summarizes the field data and the calculations for determining the rates in which the water infiltrated.

	TIME (MIN)	HEIGHT OF WATER (CM)	DROP (CM)	RATE (IN/MIN)	RATE (IN/HOUR)	SOIL CONDITIONS
TEST 1 (A)	0	3.5	-	-	-	Gray coarse to fine SAND, some silt, trace coarse to fine gravel, trace cobbles, trace boulders (moist)
	1	5.1	1.6	0.6	37.8	
	2	6.4	1.3	0.5	30.7	
	3	7.6	1.2	0.5	28.4	
	4	8.8	1.2	0.5	28.4	
	5	9.9	1.1	0.4	26.0	
	6	11.0	1.1	0.4	26.0	
	7	12.1	1.1	0.4	26.0	
	8	13.2	1.1	0.4	26.0	
	Steady State Rate:				26.0	inches/hour
TEST 2 (B)	TIME (MIN)	HEIGHT OF WATER (CM)	DROP (CM)	RATE (IN/MIN)	RATE (IN/HOUR)	Field Saturated Hydraulic Conductivity, Ksat: 0.80 in/hr
	0	4.0	-	-	-	
	1	10.6	6.6	2.6	156.0	
	2	12.4	1.8	0.7	42.6	
	3	14.0	1.6	0.6	37.8	
	4	15.5	1.5	0.6	35.5	
	5	17.0	1.5	0.6	35.5	
	6	18.6	1.6	0.6	37.8	
	7	20.2	1.6	0.6	37.8	
	8	21.8	1.6	0.6	37.8	
	9	22.4	0.6	0.2	14.2	
	Steady State Rate:				37.8	inches/hour

LANGAN

INFILTRATION TESTS

IT-4 performed in TP-4

PROJECT	Belmont Hill School	PROJECT NO.	151014301
LOCATION	Belmont, MA	DATE	June 9th, 2021
INSPECTOR	Alex Macon	WEATHER	Sunny, 75-85 degrees
TEST NUMBER	STATIC HEAD (CM)	ELEVATION AND DATUM	
1	5	Surface Elevation	Approx. 265.5 Town of Belmont Datum
2	15	Top of Hole Elevation	Approx. 264.0 Town of Belmont Datum
		Bottom of Hole Elevation	Approx. 263.3 Town of Belmont Datum

METHOD OF INFILTRATION TEST

TP-4 was excavated to a depth of about 18 inches below existing grades. An 9-inch-deep and 6-centimeter-diameter hole was then advanced using a hand auger. The hole was cleaned using a well prep brush and a sizing auger. The infiltration test was performed using a Guelph Permeameter with the two head method. H1 = 5 cm and H2 = 15 cm for these tests. After every 60 seconds, the height of the water was measured to calculate the total drop of water over the time period. Test 1 (A) and Test 2 (B) were measured using the inner and outer reservoir cylinders. The table below summarizes the field data and the calculations for determining the rates in which the water infiltrated.

	TIME (MIN)	HEIGHT OF WATER (CM)	DROP (CM)	RATE (IN/MIN)	RATE (IN/HOUR)	SOIL CONDITIONS
TEST 1 (A)	0	2.3	-	-	-	Brown fine sandy SILT, some medium sand, trace coarse to fine gravel, trace cobbles, trace boulders, trace roots (dry)
	1	2.9	0.6	0.2	14.2	
	2	3.6	0.7	0.3	16.5	
	3	4.5	0.9	0.4	21.3	
	4	5.2	0.7	0.3	16.5	
	5	6.0	0.8	0.3	18.9	
	6	6.7	0.7	0.3	16.5	
	7	7.4	0.7	0.3	16.5	
	8	8.1	0.7	0.3	16.5	
	9	8.8	0.7	0.3	16.5	
Steady State Rate:					16.5	inches/hour
TEST 2 (B)	TIME (MIN)	HEIGHT OF WATER (CM)	DROP (CM)	RATE (IN/MIN)	RATE (IN/HOUR)	Field Saturated Hydraulic Conductivity, Ksat: 0.61 in/hr
	0	9.8	-	-	-	
	1	12.0	2.2	0.9	52.0	
	2	13.0	1	0.4	23.6	
	3	14.7	1.7	0.7	40.2	
	4	16.5	1.8	0.7	42.6	
	5	18.3	1.8	0.7	42.6	
	6	19.9	1.6	0.6	37.8	
	7	21.4	1.5	0.6	35.5	
	8	22.9	1.5	0.6	35.5	
	9	24.4	1.5	0.6	35.5	
	10	25.9	1.5	0.6	35.5	
Steady State Rate:					35.5	inches/hour

LANGAN

INFILTRATION TESTS						
IT-5 performed in TP-5						
PROJECT Belmont Hill School			PROJECT NO. 151014301			
LOCATION Belmont, MA			DATE June 9th, 2021			
INSPECTOR Alex Macon			WEATHER Sunny, 75-85 degrees			
TEST NUMBER		STATIC HEAD (CM)		ELEVATION AND DATUM		
1		5		Surface Elevation Approx. 265.0 Town of Belmont Datum		
2		10		Top of Hole Elevation Approx. 259.5 Town of Belmont Datum		
				Bottom of Hole Elevation Approx. 259.0 Town of Belmont Datum		
METHOD OF INFILTRATION TEST						
TP-5 was excavated to a depth of about 66 inches below existing grades. An 6-inch-deep and 6-centimeter-diameter hole was then advanced using a hand auger. The hole was cleaned using a well prep brush and a sizing auger. The infiltration test was performed using a Guelph Permeameter with the two head method. H1 = 5 cm and H2 = 10 cm for these tests. After every 60 seconds, the height of the water was measured to calculate the total drop of water over the time period. Test 1 (A) and Test 2 (B) were measured using the inner and outer reservoir cylinders. The table below summarizes the field data and the calculations for determining the rates in which the water infiltrated.						
	TIME (MIN)	HEIGHT OF WATER (CM)	DROP (CM)	RATE (IN/MIN)	RATE (IN/HOUR)	SOIL CONDITIONS
TEST 1 (A)	0	2.5	-	-	-	Gray coarse to fine SAND, some silt, trace coarse to fine gravel, trace cobbles, trace boulders (moist)
	1	3.1	0.6	0.2	14.2	
	2	3.7	0.6	0.2	14.2	
	3	4.2	0.5	0.2	11.8	
	4	4.6	0.4	0.2	9.5	
	5	5.0	0.4	0.2	9.5	
	6	5.5	0.5	0.2	11.8	
	7	5.9	0.4	0.2	9.5	
	8	6.2	0.3	0.1	7.1	
	9	6.6	0.4	0.2	9.5	
	10	7.0	0.4	0.2	9.5	
	11	7.3	0.3	0.1	7.1	
	12	7.6	0.3	0.1	7.1	
	13	8.1	0.5	0.2	11.8	
	14	8.4	0.3	0.1	7.1	
	15	8.7	0.3	0.1	7.1	
	16	9.1	0.4	0.2	9.5	
	17	9.5	0.4	0.2	9.5	
	18	9.8	0.3	0.1	7.1	
	19	10.2	0.4	0.2	9.5	
	20	10.4	0.2	0.1	4.7	
	21	10.8	0.4	0.2	9.5	
	22	11.1	0.3	0.1	7.1	
	23	11.5	0.4	0.2	9.5	
	24	11.8	0.3	0.1	7.1	
	25	12.1	0.3	0.1	7.1	
	26	12.4	0.3	0.1	7.1	
	Steady State Rate:				7.1	inches/hour
TEST 2 (B)	TIME (MIN)	HEIGHT OF WATER (CM)	DROP (CM)	RATE (IN/MIN)	RATE (IN/HOUR)	Field Saturated Hydraulic Conductivity, Ksat: 0.63 in/hr
	0	5.8	-	-	-	
	1	6.4	0.6	0.2	14.2	
	2	6.6	0.2	0.1	4.7	
	3	7.1	0.5	0.2	11.8	
	4	8.0	0.9	0.4	21.3	
	5	9.1	1.1	0.4	26.0	
	6	9.9	0.8	0.3	18.9	
	7	10.6	0.7	0.3	16.5	
	8	11.5	0.9	0.4	21.3	
	9	12.3	0.8	0.3	18.9	
	10	13.2	0.9	0.4	21.3	
	11	14.1	0.9	0.4	21.3	
	12	15.0	0.9	0.4	21.3	
	13	15.9	0.9	0.4	21.3	
	Steady State Rate:				21.3	inches/hour

LANGAN

INFILTRATION TESTS						
IT-6 performed in TP-6						
PROJECT Belmont Hill School			PROJECT NO. 151014301			
LOCATION Belmont, MA			DATE June 9th, 2021			
INSPECTOR Alex Macon			WEATHER Sunny, 75-85 degrees			
TEST NUMBER	STATIC HEAD (CM)		ELEVATION AND DATUM			
1	5		Surface Elevation	Approx.	272.0	Town of Belmont Datum
2	10		Top of Hole Elevation	Approx.	269.0	Town of Belmont Datum
			Bottom of Hole Elevation	Approx.	268.5	Town of Belmont Datum
METHOD OF INFILTRATION TEST						
TP-6 was excavated to a depth of about 36 inches below existing grades. An 6-inch-deep and 6-centimeter-diameter hole was then advanced using a hand auger. The hole was cleaned using a well prep brush and a sizing auger. The infiltration test was performed using a Guelph Permeameter with the two head method. H1 = 5 cm and H2 = 10 cm for these tests. After every 60 seconds, the height of the water was measured to calculate the total drop of water over the time period. Test 1 (A) and Test 2 (B) were measured using the inner and outer reservoir cylinders. The table below summarizes the field data and the calculations for determining the rates in which the water infiltrated.						
	TIME (MIN)	HEIGHT OF WATER (CM)	DROP (CM)	RATE (IN/MIN)	RATE (IN/HOUR)	SOIL CONDITIONS
TEST 1 (A)	0	4.9	-	-	-	Gray coarse to fine SAND, some silt, trace coarse to fine gravel, trace cobbles, trace boulders (moist)
	1	7.2	2.3	0.9	54.4	
	2	7.6	0.4	0.2	9.5	
	3	8.9	1.3	0.5	30.7	
	4	9.9	1	0.4	23.6	
	5	10.9	1	0.4	23.6	
	6	11.9	1	0.4	23.6	
	7	12.8	0.9	0.4	21.3	
	8	13.7	0.9	0.4	21.3	
	9	14.5	0.8	0.3	18.9	
	10	15.4	0.9	0.4	21.3	
	11	16.3	0.9	0.4	21.3	
	12	17.2	0.9	0.4	21.3	
	13	18.0	0.8	0.3	18.9	
	14	18.9	0.9	0.4	21.3	
	15	19.7	0.8	0.3	18.9	
	16	20.5	0.8	0.3	18.9	
	17	21.3	0.8	0.3	18.9	
	18	22.1	0.8	0.3	18.9	
	Steady State Rate:				18.9	inches/hour
TEST 2 (B)	TIME (MIN)	HEIGHT OF WATER (CM)	DROP (CM)	RATE (IN/MIN)	RATE (IN/HOUR)	Field Saturated Hydraulic Conductivity, Ksat: 1.37 in/hr
	0	9.4	-	-	-	
	1	11.1	1.7	0.7	40.2	
	2	13.1	2	0.8	47.3	
	3	14.9	1.8	0.7	42.6	
	4	16.6	1.7	0.7	40.2	
	5	18.5	1.9	0.7	44.9	
	6	20.2	1.7	0.7	40.2	
	7	22.0	1.8	0.7	42.6	
	8	23.8	1.8	0.7	42.6	
	9	25.6	1.8	0.7	42.6	
	10	27.2	1.6	0.6	37.8	
	11	29.0	1.8	0.7	42.6	
	12	30.8	1.8	0.7	42.6	
	13	32.4	1.6	0.6	37.8	
	14	34.1	1.7	0.7	40.2	
	15	35.8	1.7	0.7	40.2	
	16	37.5	1.7	0.7	40.2	
17	39.2	1.7	0.7	40.2		
	Steady State Rate:				40.2	inches/hour

LANGAN

INFILTRATION TESTS

IT-7 performed in TP-7

PROJECT	Belmont Hill School	PROJECT NO.	151014301
LOCATION	Belmont, MA	DATE	June 9th, 2021
INSPECTOR	Alex Macon	WEATHER	Sunny, 75-85 degrees
TEST NUMBER	STATIC HEAD (CM)	ELEVATION AND DATUM	
1	3	Surface Elevation	Approx. 272.5 Town of Belmont Datum
2	6	Top of Hole Elevation	Approx. 268.5 Town of Belmont Datum
		Bottom of Hole Elevation	Approx. 268.0 Town of Belmont Datum

METHOD OF INFILTRATION TEST

TP-7 was excavated to a depth of about 48 inches below existing grades. An 6-inch-deep and 6-centimeter-diameter hole was then advanced using a hand auger. The hole was cleaned using a well prep brush and a sizing auger. The infiltration test was performed using a Guelph Permeameter with the two head method. H1 = 3 cm and H2 = 6 cm for these tests. After every 60 seconds, the height of the water was measured to calculate the total drop of water over the time period. Test 1 (A) and Test 2 (B) were measured using the inner and outer reservoir cylinders. The table below summarizes the field data and the calculations for determining the rates in which the water infiltrated.

	TIME (MIN)	HEIGHT OF WATER (CM)	DROP (CM)	RATE (IN/MIN)	RATE (IN/HOUR)	SOIL CONDITIONS
TEST 1 (A)	0	1.0	-	-	-	Gray coarse to fine SAND, some silt, some coarse to fine gravel, trace cobbles, trace boulders (moist)
	1	1.2	0.2	0.1	4.7	
	2	1.5	0.3	0.1	7.1	
	3	1.9	0.4	0.2	9.5	
	4	2.1	0.2	0.1	4.7	
	5	2.5	0.4	0.2	9.5	
	6	2.7	0.2	0.1	4.7	
	7	2.9	0.2	0.1	4.7	
	8	3.1	0.2	0.1	4.7	
	9	3.4	0.3	0.1	7.1	
	10	3.6	0.2	0.1	4.7	
	11	3.9	0.3	0.1	7.1	
	12	4.2	0.3	0.1	7.1	
	13	4.4	0.2	0.1	4.7	
	14	4.6	0.2	0.1	4.7	
	15	4.9	0.3	0.1	7.1	
Steady State Rate:					5.9	inches/hour
TEST 2 (B)	TIME (MIN)	HEIGHT OF WATER (CM)	DROP (CM)	RATE (IN/MIN)	RATE (IN/HOUR)	Field Saturated Hydraulic Conductivity, Ksat: 0.59 in/hr
	0	1.4	-	-	-	
	1	1.6	0.2	0.1	4.7	
	2	2.3	0.7	0.3	16.5	
	3	3.0	0.7	0.3	16.5	
	4	3.5	0.5	0.2	11.8	
	5	3.8	0.3	0.1	7.1	
	6	3.9	0.1	0.0	2.4	
	7	4.4	0.5	0.2	11.8	
	8	4.9	0.5	0.2	11.8	
	9	5.4	0.5	0.2	11.8	
	10	5.9	0.5	0.2	11.8	
Steady State Rate:					11.8	inches/hour

LANGAN

INFILTRATION TESTS

IT-8 performed in TP-8

PROJECT	Belmont Hill School	PROJECT NO.	151014301
LOCATION	Belmont, MA	DATE	June 9th, 2021
INSPECTOR	Alex Macon	WEATHER	Sunny, 75-85 degrees
TEST NUMBER	STATIC HEAD (CM)	ELEVATION AND DATUM	
1	4	Surface Elevation	Approx. 277.5 Town of Belmont Datum
2	8	Top of Hole Elevation	Approx. 273.5 Town of Belmont Datum
		Bottom of Hole Elevation	Approx. 273.0 Town of Belmont Datum

METHOD OF INFILTRATION TEST

TP-8 was excavated to a depth of about 48 inches below existing grades. An 6-inch-deep and 6-centimeter-diameter hole was then advanced using a hand auger. The hole was cleaned using a well prep brush and a sizing auger. The infiltration test was performed using a Guelph Permeameter with the two head method. H1 = 4 cm and H2 = 8 cm for these tests. After every 60 seconds, the height of the water was measured to calculate the total drop of water over the time period. Test 1 (A) and Test 2 (B) were measured using the inner and outer reservoir cylinders. The table below summarizes the field data and the calculations for determining the rates in which the water infiltrated.

	TIME (MIN)	HEIGHT OF WATER (CM)	DROP (CM)	RATE (IN/MIN)	RATE (IN/HOUR)	SOIL CONDITIONS
TEST 1 (A)	0	1.4	-	-	-	Gray coarse to fine SAND, some silt, some coarse to fine gravel, trace cobbles, trace boulders (moist)
	1	2.5	1.1	0.4	26.0	
	2	3.1	0.6	0.2	14.2	
	3	3.6	0.5	0.2	11.8	
	4	4.2	0.6	0.2	14.2	
	5	4.7	0.5	0.2	11.8	
	6	5.2	0.5	0.2	11.8	
	7	5.7	0.5	0.2	11.8	
	8	6.2	0.5	0.2	11.8	
	Steady State Rate:				11.8	inches/hour
TEST 2 (B)	TIME (MIN)	HEIGHT OF WATER (CM)	DROP (CM)	RATE (IN/MIN)	RATE (IN/HOUR)	Field Saturated Hydraulic Conductivity, Ksat: 0.39 in/hr
	0	2.5	-	-	-	
	1	2.6	0.1	0.0	2.4	
	2	2.8	0.2	0.1	4.7	
	3	3.5	0.7	0.3	16.5	
	4	4.4	0.9	0.4	21.3	
	5	5.1	0.7	0.3	16.5	
	6	5.8	0.7	0.3	16.5	
	7	6.4	0.6	0.2	14.2	
	8	7.1	0.7	0.3	16.5	
	9	7.8	0.7	0.3	16.5	
	10	8.5	0.7	0.3	16.5	
	11	9.2	0.7	0.3	16.5	
	Steady State Rate:				16.5	inches/hour

APPENDIX K

Infiltration Testing Results – East Campus Maintenance Area



INFILTRATION TESTS

IT-301 performed in TP-301

PROJECT Belmont Hill School		PROJECT NO. 151021201	
LOCATION Belmont, MA		DATE January 4th, 2022	
INSPECTOR Tim Light		WEATHER Sunny, 25-30 degrees	
TEST NUMBER	STATIC HEAD (CM)	ELEVATION AND DATUM	
1	5	Surface Elevation	Approx. 263.0 Town of Belmont Datum
2	10	Top of Hole Elevation	Approx. 261.5 Town of Belmont Datum
		Bottom of Hole Elevation	Approx. 261.0 Town of Belmont Datum

METHOD OF INFILTRATION TEST

TP-302 was excavated to a depth of about 18 inches below existing grades. A 6-inch-deep and 6-centimeter-diameter hole was then advanced using a hand auger. The hole was cleaned using a well prep brush and a sizing auger. The infiltration test was performed using a Guelph Permeameter with the two head method. H1 = 5 cm and H2 = 10 cm for these tests. After every 15 to 60 seconds, the height of the water was measured to calculate the total drop of water over the time period. Test 1 (A) and Test 2 (B) were measured using both the inner and outer reservoir cylinders. The table below summarizes the field data and the calculations for determining the rates in which the water infiltrated.

	TIME (MIN)	HEIGHT OF WATER (CM)	DROP (CM)	RATE (IN/MIN)	RATE (IN/HOUR)	SOIL CONDITIONS
TEST 1 (A)	0	-	-	-	-	Brown fine SAND with trace coarse-fine gravel, some silt, trace cobbles, trace roots (moist)
	1	4.9	-	-	-	
	2	5.9	1.0	0.4	23.6	
	3	6.9	1.0	0.4	23.6	
	4	7.9	1.0	0.4	23.6	
	5	8.9	1.0	0.4	23.6	
	6	9.6	0.7	0.3	16.5	
	7	10.3	0.7	0.3	16.5	
	8	11.0	0.7	0.3	16.5	
	9	12.0	1.0	0.4	23.6	
	10	12.8	0.8	0.3	18.9	
	11	13.6	0.8	0.3	18.9	
	12	14.4	0.8	0.3	18.9	
	13	15.2	0.8	0.3	18.9	
Steady State Rate:					18.9	inches/hour
TEST 2 (B)	TIME (MIN)	HEIGHT OF WATER (CM)	DROP (CM)	RATE (IN/MIN)	RATE (IN/HOUR)	Field Saturated Hydraulic Conductivity, Ksat: 3.53 in/hr
	0	-	-	-	-	
	0.25	6.0	-	-	-	
	0.5	9.1	3.1	4.9	293.1	
	0.75	12.1	3	4.7	283.7	
	1	15.1	3	4.7	283.7	
	1.25	18.1	3	4.7	283.7	
	1.5	21.1	3	4.7	283.7	
	1.75	24.1	3	4.7	283.7	
	2	27.1	3	4.7	283.7	
	2.25	30.1	3	4.7	283.7	
	3	36.1	6	3.2	189.1	
	4	43.2	7.1	2.8	167.8	
	5	50.5	7.3	2.9	172.6	
	6	57.0	6.5	2.6	153.7	
	7	63.5	6.5	2.6	153.7	
	8	70.0	6.5	2.6	153.7	
	9	76.5	6.5	2.6	153.7	
Steady State Rate:					153.7	inches/hour

LANGAN

INFILTRATION TESTS IT-302 performed in TP-302

PROJECT	Belmont Hill School	PROJECT NO.	151021201
LOCATION	Belmont, MA	DATE	January 4th, 2022
INSPECTOR	Tim Light	WEATHER	Sunny, 25-30 degrees
TEST NUMBER	STATIC HEAD (CM)	ELEVATION AND DATUM	
1	5	Surface Elevation	Approx. 262.0 Town of Belmont Datum
2	10	Top of Hole Elevation	Approx. 260.0 Town of Belmont Datum
		Bottom of Hole Elevation	Approx. 259.5 Town of Belmont Datum

METHOD OF INFILTRATION TEST

TP-301 was excavated to a depth of about 24 inches below existing grades. A 6-inch-deep and 6-centimeter-diameter hole was then advanced using a hand auger. The hole was cleaned using a well prep brush and a sizing auger. The infiltration test was performed using a Guelph Permeameter with the two head method. H1 = 5 cm and H2 = 10 cm for these tests. After every 30 to 60 seconds, the height of the water was measured to calculate the total drop of water over the time period. Test 1 (A) and Test 2 (B) were measured using both the inner and outer reservoir cylinders. The table below summarizes the field data and the calculations for determining the rates in which the water infiltrated.

	TIME (MIN)	HEIGHT OF WATER (CM)	DROP (CM)	RATE (IN/MIN)	RATE (IN/HOUR)	SOIL CONDITIONS
TEST 1 (A)	0	-	-	-	-	Brown silty coarse-fine SAND with coarse-fine gravel, trace cobbles, trace clay, trace organics, trace roots (moist)
	1	1.2	-	-	-	
	2	2.0	0.8	0.3	18.9	
	3	2.8	0.8	0.3	18.9	
	4	3.5	0.7	0.3	16.5	
	5	4.1	0.6	0.2	14.2	
	6	4.8	0.7	0.3	16.5	
	7	5.5	0.7	0.3	16.5	
	8	6.2	0.7	0.3	16.5	
	9	6.9	0.7	0.3	16.5	
	10	7.6	0.7	0.3	16.5	
Steady State Rate:					16.5	inches/hour
TEST 2 (B)	TIME (MIN)	HEIGHT OF WATER (CM)	DROP (CM)	RATE (IN/MIN)	RATE (IN/HOUR)	Field Saturated Hydraulic Conductivity, Ksat: 0.80 in/hr
	0	-	-	-	-	
	0.5	5.1	-	-	-	
	1	5.5	0.4	0.3	18.9	
	1.5	5.8	0.3	0.2	14.2	
	2	6.0	0.2	0.2	9.5	
	3	6.6	0.6	0.2	14.2	
	4	8.3	1.7	0.7	40.2	
	5	9.6	1.3	0.5	30.7	
	6	10.9	1.3	0.5	30.7	
	7	12.1	1.2	0.5	28.4	
	8	13.2	1.1	0.4	26.0	
	9	14.3	1.1	0.4	26.0	
	10	15.4	1.1	0.4	26.0	
	11	16.5	1.1	0.4	26.0	
	12	17.6	1.1	0.4	26.0	
	13	18.7	1.1	0.4	26.0	
Steady State Rate:					26.0	inches/hour

LANGAN

INFILTRATION TESTS IT-304 performed in TP-304

PROJECT	Belmont Hill School	PROJECT NO.	151021201
LOCATION	Belmont, MA	DATE	January 4th, 2022
INSPECTOR	Tim Light	WEATHER	Sunny, 25-30 degrees
TEST NUMBER	STATIC HEAD (CM)	ELEVATION AND DATUM	
1	4.9	Surface Elevation	Approx. 257.0 Town of Belmont Datum
2	10	Top of Hole Elevation	Approx. 254.5 Town of Belmont Datum
		Bottom of Hole Elevation	Approx. 254.0 Town of Belmont Datum

METHOD OF INFILTRATION TEST

TP-304 was excavated to a depth of about 30 inches below existing grades. A 6-inch-deep and 6-centimeter-diameter hole was then advanced using a hand auger. The hole was cleaned using a well prep brush and a sizing auger. The infiltration test was performed using a Guelph Permeameter with the two head method. H1 = 4.9 cm and H2 = 10 cm for these tests. After every 60 seconds, the height of the water was measured to calculate the total drop of water over the time period. Test 1 (A) and Test 2 (B) were measured using both the inner and outer reservoir cylinders. The table below summarizes the field data and the calculations for determining the rates in which the water infiltrated.

	TIME (MIN)	HEIGHT OF WATER (CM)	DROP (CM)	RATE (IN/MIN)	RATE (IN/HOUR)	SOIL CONDITIONS
TEST 1 (A)	0	-	-	-	-	Brown to tan fine to coarse SAND with coarse-fine gravel, some silt, trace cobbles (moist)
	1	2.8	-	-	-	
	2	3.3	0.5	0.2	11.8	
	3	3.8	0.5	0.2	11.8	
	4	4.3	0.5	0.2	11.8	
	5	4.8	0.5	0.2	11.8	
	6	5.3	0.5	0.2	11.8	
	7	5.8	0.5	0.2	11.8	
	8	6.3	0.5	0.2	11.8	
	Steady State Rate:				11.8	inches/hour
TEST 2 (B)	TIME (MIN)	HEIGHT OF WATER (CM)	DROP (CM)	RATE (IN/MIN)	RATE (IN/HOUR)	Field Saturated Hydraulic Conductivity, Ksat: 1.28 in/hr
	0	-	-	-	-	
	1	3.7	-	-	-	
	2	4.8	1.1	0.4	26.0	
	3	6.0	1.2	0.5	28.4	
	4	7.0	1	0.4	23.6	
	5	8.0	1	0.4	23.6	
	6	9.0	1	0.4	23.6	
	7	10.0	1	0.4	23.6	
	8	11.0	1	0.4	23.6	
	Steady State Rate:				23.6	inches/hour

LANGAN

INFILTRATION TESTS IT-305a performed in TP-305

PROJECT	Belmont Hill School	PROJECT NO.	151021201
LOCATION	Belmont, MA	DATE	January 5th, 2022
INSPECTOR	Alex Macon	WEATHER	Sunny, 25-30 degrees
TEST NUMBER	STATIC HEAD (CM)	ELEVATION AND DATUM	
1	5	Surface Elevation	Approx. 263.5 Town of Belmont Datum
2	10	Top of Hole Elevation	Approx. 261.8 Town of Belmont Datum
		Bottom of Hole Elevation	Approx. 261.3 Town of Belmont Datum

METHOD OF INFILTRATION TEST

TP-305 was excavated to a depth of about 21 inches below existing grades. A 6-inch-deep and 6-centimeter-diameter hole was then advanced using a hand auger. The hole was cleaned using a well prep brush and a sizing auger. The infiltration test was performed using a Guelph Permeameter with the two head method. H1 = 5 cm and H2 = 10 cm for these tests. After every 30 to 60 seconds, the height of the water was measured to calculate the total drop of water over the time period. Test 1 (A) and Test 2 (B) were measured using both the inner and outer reservoir cylinders. The table below summarizes the field data and the calculations for determining the rates in which the water infiltrated.

	TIME (MIN)	HEIGHT OF WATER (CM)	DROP (CM)	RATE (IN/MIN)	RATE (IN/HOUR)	SOIL CONDITIONS
TEST 1 (A)	0	0.0	-	-	-	Brown coarse-fine SAND, some silt, some coarse-fine gravel, trace cobbles (moist)
	1	0.4	0.4	0.2	9.5	
	2	0.6	0.2	0.1	4.7	
	3	1.0	0.4	0.2	9.5	
	4	1.3	0.3	0.1	7.1	
	5	1.6	0.3	0.1	7.1	
	6	1.9	0.3	0.1	7.1	
	7	2.2	0.3	0.1	7.1	
	Steady State Rate:				7.1	inches/hour
TEST 2 (B)	TIME (MIN)	HEIGHT OF WATER (CM)	DROP (CM)	RATE (IN/MIN)	RATE (IN/HOUR)	Field Saturated Hydraulic Conductivity, Ksat: 0.74 in/hr
	0	3.5	-	-	-	
	0.5	7.7	4.2	3.3	198.6	
	1	9.0	1.3	1.0	61.5	
	1.5	9.8	0.8	0.6	37.8	
	2	10.5	0.7	0.6	33.1	
	2.5	11.1	0.6	0.5	28.4	
	3	11.7	0.6	0.5	28.4	
	3.5	12.3	0.6	0.5	28.4	
	4	12.9	0.6	0.5	28.4	
	Steady State Rate:				28.4	inches/hour



INFILTRATION TESTS

IT-305b performed in TP-305

PROJECT	Belmont Hill School	PROJECT NO.	151021201
LOCATION	Belmont, MA	DATE	January 5th, 2022
INSPECTOR	Alex Macon	WEATHER	Sunny, 25-30 degrees
TEST NUMBER	STATIC HEAD (CM)	ELEVATION AND DATUM	
1	5	Surface Elevation	Approx. 263.5 Town of Belmont Datum
2	10	Top of Hole Elevation	Approx. 261.0 Town of Belmont Datum
		Bottom of Hole Elevation	Approx. 260.5 Town of Belmont Datum

METHOD OF INFILTRATION TEST

TP-305 was excavated to a depth of about 30 inches below existing grades. A 6-inch-deep and 6-centimeter-diameter hole was then advanced using a hand auger. The hole was cleaned using a well prep brush and a sizing auger. The infiltration test was performed using a Guelph Permeameter with the two head method. H1 = 5 cm and H2 = 10 cm for these tests. After every 30 to 60 seconds, the height of the water was measured to calculate the total drop of water over the time period. Test 1 (A) and Test 2 (B) were measured using both the inner and outer reservoir cylinders. The table below summarizes the field data and the calculations for determining the rates in which the water infiltrated.

	TIME (MIN)	HEIGHT OF WATER (CM)	DROP (CM)	RATE (IN/MIN)	RATE (IN/HOUR)	SOIL CONDITIONS
TEST 1 (A)	0	2.5	-	-	-	Gray coarse-fine SAND with coarse-fine gravel, some silt, trace cobbles, trace boulders, trace weathered rock fragments (moist)
	0.5	2.7	0.2	0.2	9.5	
	1	3.2	0.5	0.4	23.6	
	1.5	3.5	0.3	0.2	14.2	
	2	3.9	0.4	0.3	18.9	
	2.5	4.2	0.3	0.2	14.2	
	3	4.6	0.4	0.3	18.9	
	3.5	5.0	0.4	0.3	18.9	
	4	5.3	0.3	0.2	14.2	
	4.5	5.7	0.4	0.3	18.9	
	5	6.1	0.4	0.3	18.9	
	5.5	6.3	0.2	0.2	9.5	
	6	6.5	0.2	0.2	9.5	
	6.5	6.9	0.4	0.3	18.9	
	7	7.2	0.3	0.2	14.2	
	7.5	7.5	0.3	0.2	14.2	
	8	7.8	0.3	0.2	14.2	
	8.5	8.1	0.3	0.2	14.2	
	Steady State Rate:				14.2	inches/hour
TEST 2 (B)	TIME (MIN)	HEIGHT OF WATER (CM)	DROP (CM)	RATE (IN/MIN)	RATE (IN/HOUR)	Field Saturated Hydraulic Conductivity, Ksat: 2.15 in/hr
	0	6.9	-	-	-	
	0.5	9.2	2.3	1.8	108.7	
	1.5	10.6	1.4	0.6	33.1	
	2	14.0	3.4	2.7	160.8	
	2.5	15.4	1.4	1.1	66.2	
	3	16.8	1.4	1.1	66.2	
	3.5	17.8	1	0.8	47.3	
	4	18.9	1.1	0.9	52.0	
	4.5	20.1	1.2	0.9	56.7	
	5	21.2	1.1	0.9	52.0	
	5.5	22.3	1.1	0.9	52.0	
	6	23.4	1.1	0.9	52.0	
	6.5	24.5	1.1	0.9	52.0	
	7	25.6	1.1	0.9	52.0	
	Steady State Rate:				52.0	inches/hour

APPENDIX L

Infiltration Testing Results – JAC Parking Lot

LANGAN

INFILTRATION TESTS IT-201 performed in TP-201

PROJECT	Belmont Hill School	PROJECT NO.	151014301
LOCATION	Belmont, MA	DATE	October 16th, 2021
INSPECTOR	Alex Macon / Tim Light	WEATHER	Sunny, 65-70 degrees
TEST NUMBER	STATIC HEAD (CM)	ELEVATION AND DATUM	
1	5	Surface Elevation	Approx. 250.5 Town of Belmont Datum
2	10	Top of Hole Elevation	Approx. 245.8 Town of Belmont Datum
		Bottom of Hole Elevation	Approx. 245.3 Town of Belmont Datum

METHOD OF INFILTRATION TEST

TP-201 was excavated to a depth of about 57 inches below existing grades. A 6-inch-deep and 6-centimeter-diameter hole was then advanced using a hand auger. The hole was cleaned using a well prep brush and a sizing auger. The infiltration test was performed using a Guelph Permeameter with the two head method. H1 = 5 cm and H2 = 10 cm for these tests. After every 3 minutes, the height of the water was measured to calculate the total drop of water over the time period. Test 1 (A) and Test 2 (B) were measured using the inner reservoir cylinder only. The table below summarizes the field data and the calculations for determining the rates in which the water infiltrated.

	TIME (MIN)	HEIGHT OF WATER (CM)	DROP (CM)	RATE (IN/MIN)	RATE (IN/HOUR)	SOIL CONDITIONS
TEST 1 (A)	0	-	-	-	-	Light brownish tan SILT, trace clay, trace fine sand, trace roots (moist)
	1	0.4	-	-	-	
	3	0.5	0.1	0.0	1.2	
	6	2.0	1.5	0.2	11.8	
	9	6.6	4.6	0.6	36.2	
	12	10.4	3.8	0.5	29.9	
	15	14.6	4.2	0.6	33.1	
	18	17.8	3.2	0.4	25.2	
	21	21.6	3.8	0.5	29.9	
	24	25.4	3.8	0.5	29.9	
	27	29.2	3.8	0.5	29.9	
Steady State Rate:				29.9	inches/hour	
TEST 2 (B)	TIME (MIN)	HEIGHT OF WATER (CM)	DROP (CM)	RATE (IN/MIN)	RATE (IN/HOUR)	Field Saturated Hydraulic Conductivity, Ksat: 0.07 in/hr
	0	-	-	-	-	
	3	2.5	-	-	-	
	6	16.4	13.9	1.8	109.5	
	9	24.9	8.5	1.1	67.0	
	12	33.1	8.2	1.1	64.6	
	15	41.3	8.2	1.1	64.6	
	18	49.5	8.2	1.1	64.6	
Steady State Rate:				64.6	inches/hour	

LANGAN

INFILTRATION TESTS						
IT-202 performed in TP-202						
PROJECT Belmont Hill School			PROJECT NO. 151014301			
LOCATION Belmont, MA			DATE October 16th, 2021			
INSPECTOR Alex Macon / Tim Light			WEATHER Sunny, 65-70 degrees			
TEST NUMBER	STATIC HEAD (CM)	ELEVATION AND DATUM				
1	8	Surface Elevation	Approx.	249.8	Town of Belmont Datum	
2	14	Top of Hole Elevation	Approx.	245.8	Town of Belmont Datum	
		Bottom of Hole Elevation	Approx.	245.3	Town of Belmont Datum	
METHOD OF INFILTRATION TEST TP-202 was excavated to a depth of about 48 inches below existing grades. A 6-inch-deep and 6-centimeter-diameter hole was then advanced using a hand auger. The hole was cleaned using a well prep brush and a sizing auger. The infiltration test was performed using a Guelph Permeameter with the two head method. H1 = 8 cm and H2 = 14 cm for these tests. After every 60 seconds, the height of the water was measured to calculate the total drop of water over the time period. Test 1 (A) and Test 2 (B) were measured using the inner reservoir cylinder only. The table below summarizes the field data and the calculations for determining the rates in which the water infiltrated.						
	TIME (MIN)	HEIGHT OF WATER (CM)	DROP (CM)	RATE (IN/MIN)	RATE (IN/HOUR)	SOIL CONDITIONS
TEST 1 (A)	0	-	-	-	-	Light brown to brown coarse to fine SAND, some coarse gravel, some silt, trace cobbles, trace boulders, trace brick fragments, trace wire fragments, trace concrete fragments, trace asphalt fragments, trace tile fragments (moist) [FILL]
	0.5	27.0	-	-	-	
	1.5	28.5	1.5	0.6	35.5	
	2	29.5	1	0.8	47.3	
	3	30.8	1.3	0.5	30.7	
	4	31.9	1.1	0.4	26.0	
	5	33.2	1.3	0.5	30.7	
	6	34.5	1.3	0.5	30.7	
	7	36.2	1.7	0.7	40.2	
	8	38.2	2	0.8	47.3	
	9	39.8	1.6	0.6	37.8	
	10	41.4	1.6	0.6	37.8	
	11	43.0	1.6	0.6	37.8	
	12	44.6	1.6	0.6	37.8	
	Steady State Rate:				37.8	inches/hour
TEST 2 (B)	TIME (MIN)	HEIGHT OF WATER (CM)	DROP (CM)	RATE (IN/MIN)	RATE (IN/HOUR)	Field Saturated Hydraulic Conductivity, Ksat: 0.17 in/hr
	0	-	-	-	-	
	1	4.2	-	-	-	
	2	6.6	2.4	0.9	56.7	
	3	9.8	3.2	1.3	75.6	
	4	12.8	3	1.2	70.9	
	5	15.8	3	1.2	70.9	
	6	18.8	3	1.2	70.9	
7	21.8	3	1.2	70.9		
	Steady State Rate:				70.9	inches/hour

LANGAN

INFILTRATION TESTS							
IT-204 performed in TP-204							
PROJECT Belmont Hill School			PROJECT NO. 151014301				
LOCATION Belmont, MA			DATE October 16th, 2021				
INSPECTOR Alex Macon / Tim Light			WEATHER Sunny, 65-70 degrees				
TEST NUMBER		STATIC HEAD (CM)		ELEVATION AND DATUM			
1		5		Surface Elevation			
2		10		Top of Hole Elevation			
				Bottom of Hole Elevation			
				Approx.	253.5	Town of Belmont Datum	
				Approx.	248.5	Town of Belmont Datum	
				Approx.	248.0	Town of Belmont Datum	
METHOD OF INFILTRATION TEST							
TP-204 was excavated to a depth of about 60 inches below existing grades. A 6-inch-deep and 11-centimeter-diameter hole was then advanced using a hand auger. The hole was cleaned using a well prep brush and a sizing auger. The infiltration test was performed using a Guelph Permeameter with the two head method. H1 = 5 cm and H2 = 10 cm for these tests. After every 15 seconds, the height of the water was measured to calculate the total drop of water over the time period. Test 1 (A) and Test 2 (B) were measured using both the inner and outer reservoir cylinders. The table below summarizes the field data and the calculations for determining the rates in which the water infiltrated.							
		TIME (MIN)	HEIGHT OF WATER (CM)	DROP (CM)	RATE (IN/MIN)	RATE (IN/HOUR)	SOIL CONDITIONS
TEST 1 (A)	0		-	-	-	-	Grayish brown coarse to fine SAND, some silt, some coarse to fine gravel, trace cobbles, trace boulders (moist)
	0.5		14.8	-	-	-	
	1		20.0	5.2	4.1	245.9	
	1.5		24.9	4.9	3.9	231.7	
	2		30.6	5.7	4.5	269.5	
	2.5		36.0	5.4	4.3	255.3	
	3		41.3	5.3	4.2	250.6	
	3.5		46.9	5.6	4.4	264.8	
	4		52.9	6	4.7	283.7	
	4.25		55.5	2.6	4.1	245.9	
	4.5		58.1	2.6	4.1	245.9	
	4.75		60.8	2.7	4.3	255.3	
	5		63.8	3	4.7	283.7	
	5.25		66.8	3	4.7	283.7	
	5.5		69.8	3	4.7	283.7	
	5.75		72.8	3	4.7	283.7	
	6		75.8	3	4.7	283.7	
	Steady State Rate:					283.7	
TEST 2 (B)	TIME (MIN)		HEIGHT OF WATER (CM)	DROP (CM)	RATE (IN/MIN)	RATE (IN/HOUR)	Field Saturated Hydraulic Conductivity, Ksat: 14.46 in/hr
	0		-	-	-	-	
	0.25		13.5	-	-	-	
	0.5		17.7	4.2	6.6	397.2	
	0.75		21.6	3.9	6.1	368.8	
	1		24.6	3	4.7	283.7	
	1.25		28.1	3.5	5.5	331.0	
	1.5		31.5	3.4	5.4	321.5	
	1.75		35.0	3.5	5.5	331.0	
	2		38.5	3.5	5.5	331.0	
	2.25		42.0	3.5	5.5	331.0	
	2.5		45.5	3.5	5.5	331.0	
	2.75		49.0	3.5	5.5	331.0	
	3		52.5	3.5	5.5	331.0	
	3.25		56.0	3.5	5.5	331.0	
	3.5		59.5	3.5	5.5	331.0	
	3.75		63.0	3.5	5.5	331.0	
	4		66.5	3.5	5.5	331.0	
4.25		70.0	3.5	5.5	331.0		
4.5		73.5	3.5	5.5	331.0		
Steady State Rate:					331.0	inches/hour	

LANGAN

INFILTRATION TESTS IT-205 performed in TP-205

PROJECT	Belmont Hill School	PROJECT NO.	151014301
LOCATION	Belmont, MA	DATE	October 16th, 2021
INSPECTOR	Alex Macon	WEATHER	Sunny, 65-70 degrees

TEST NUMBER	STATIC HEAD (CM)	ELEVATION AND DATUM			
1	5	Surface Elevation	Approx.	251.4	Town of Belmont Datum
2	10	Top of Hole Elevation	Approx.	249.4	Town of Belmont Datum
		Bottom of Hole Elevation	Approx.	248.9	Town of Belmont Datum

METHOD OF INFILTRATION TEST

TP-205 was excavated to a depth of about 24 inches below existing grades. A 6-inch-deep and 6-centimeter-diameter hole was then advanced using a hand auger. The hole was cleaned using a well prep brush and a sizing auger. The infiltration test was performed using a Guelph Permeameter with the two head method. H1 = 5 cm and H2 = 10 cm for these tests. After every 30 seconds, the height of the water was measured to calculate the total drop of water over the time period. Test 1 (A) and Test 2 (B) were measured using both the inner and outer reservoir cylinders. The table below summarizes the field data and the calculations for determining the rates in which the water infiltrated.

	TIME (MIN)	HEIGHT OF WATER (CM)	DROP (CM)	RATE (IN/MIN)	RATE (IN/HOUR)	SOIL CONDITIONS
TEST 1 (A)	0	-	-	-	-	Gray coarse to fine SAND, some coarse to fine gravel, trace silt, trace cobbles, trace boulders (moist)
	0.5	3.4	-	-	-	
	1	3.9	0.5	0.4	23.6	
	1.5	4.3	0.4	0.3	18.9	
	2	4.7	0.4	0.3	18.9	
	2.5	5.1	0.4	0.3	18.9	
	3	5.5	0.4	0.3	18.9	
	3.5	5.9	0.4	0.3	18.9	
	Steady State Rate:				18.9	inches/hour
TEST 2 (B)	TIME (MIN)	HEIGHT OF WATER (CM)	DROP (CM)	RATE (IN/MIN)	RATE (IN/HOUR)	Field Saturated Hydraulic Conductivity, Ksat: 1.64 in/hr
	0	-	-	-	-	
	0.5	3.4	-	-	-	
	1	3.9	0.5	0.4	23.6	
	1.5	4.4	0.5	0.4	23.6	
	2	4.7	0.3	0.2	14.2	
	2.5	5.2	0.5	0.4	23.6	
	3	5.7	0.5	0.4	23.6	
	3.5	6.2	0.5	0.4	23.6	
	4	6.7	0.5	0.4	23.6	
	4.5	7.2	0.5	0.4	23.6	
	Steady State Rate:				23.6	inches/hour



INFILTRATION TESTS
IT-206 performed in TP-206

PROJECT Belmont Hill School		PROJECT NO. 151014301	
LOCATION Belmont, MA		DATE October 16th, 2021	
INSPECTOR Alex Macon		WEATHER Sunny, 65-70 degrees	
TEST NUMBER	STATIC HEAD (CM)	ELEVATION AND DATUM	
1	5	Surface Elevation	Approx. 251.9 Town of Belmont Datum
2	10	Top of Hole Elevation	Approx. 250.4 Town of Belmont Datum
		Bottom of Hole Elevation	Approx. 249.9 Town of Belmont Datum

METHOD OF INFILTRATION TEST

TP-206 was excavated to a depth of about 18 inches below existing grades. A 6-inch-deep and 6-centimeter-diameter hole was then advanced using a hand auger. The hole was cleaned using a well prep brush and a sizing auger. The infiltration test was performed using a Guelph Permeameter with the two head method. H1 = 5 cm and H2 = 10 cm for these tests. After every 30 seconds, the height of the water was measured to calculate the total drop of water over the time period. Test 1 (A) and Test 2 (B) were measured using both the inner and outer reservoir cylinders. The table below summarizes the field data and the calculations for determining the rates in which the water infiltrated.

	TIME (MIN)	HEIGHT OF WATER (CM)	DROP (CM)	RATE (IN/MIN)	RATE (IN/HOUR)	SOIL CONDITIONS
TEST 1 (A)	0	1.8	-	-	-	Light brown coarse to fine sandy SILT, trace coarse to fine gravel, trace roots (moist)
	0.5	1.9	-	-	-	
	1	2.4	0.5	0.4	23.6	
	1.5	2.7	0.3	0.2	14.2	
	2	2.9	0.2	0.2	9.5	
	2.5	3.2	0.3	0.2	14.2	
	3	3.5	0.3	0.2	14.2	
	3.5	3.7	0.2	0.2	9.5	
	4	3.9	0.2	0.2	9.5	
	4.5	4.2	0.3	0.2	14.2	
	5	4.5	0.3	0.2	14.2	
	5.5	4.8	0.3	0.2	14.2	
	6	5.1	0.3	0.2	14.2	
Steady State Rate:					14.2	inches/hour
TEST 2 (B)	TIME (MIN)	HEIGHT OF WATER (CM)	DROP (CM)	RATE (IN/MIN)	RATE (IN/HOUR)	Field Saturated Hydraulic Conductivity, Ksat: 0.41 in/hr
	0	9.7	-	-	-	
	0.5	9.9	-	-	-	
	1	10.3	0.4	0.3	18.9	
	1.5	10.9	0.6	0.5	28.4	
	2	11.4	0.5	0.4	23.6	
	2.5	11.8	0.4	0.3	18.9	
	3	12.2	0.4	0.3	18.9	
	3.5	12.7	0.5	0.4	23.6	
	4	13.2	0.5	0.4	23.6	
	4.5	13.5	0.3	0.2	14.2	
	5	13.9	0.4	0.3	18.9	
	5.5	14.3	0.4	0.3	18.9	
	6	14.7	0.4	0.3	18.9	
Steady State Rate:					18.9	inches/hour

LANGAN

INFILTRATION TESTS IT-207 performed in TP-207

PROJECT	Belmont Hill School	PROJECT NO.	151014301
LOCATION	Belmont, MA	DATE	October 16th, 2021
INSPECTOR	Alex Macon	WEATHER	Sunny, 65-70 degrees
TEST NUMBER	STATIC HEAD (CM)	ELEVATION AND DATUM	
1	5	Surface Elevation	Approx. 256.5 Town of Belmont Datum
2	10	Top of Hole Elevation	Approx. 255.5 Town of Belmont Datum
		Bottom of Hole Elevation	Approx. 255.0 Town of Belmont Datum

METHOD OF INFILTRATION TEST

TP-207 was excavated to a depth of about 12 inches below existing grades. A 6-inch-deep and 6-centimeter-diameter hole was then advanced using a hand auger. The hole was cleaned using a well prep brush and a sizing auger. The infiltration test was performed using a Guelph Permeameter with the two head method. H1 = 5 cm and H2 = 10 cm for these tests. After every 60 seconds, the height of the water was measured to calculate the total drop of water over the time period. Test 1 (A) and Test 2 (B) were measured using both the inner and outer reservoir cylinders. The table below summarizes the field data and the calculations for determining the rates in which the water infiltrated.

	TIME (MIN)	HEIGHT OF WATER (CM)	DROP (CM)	RATE (IN/MIN)	RATE (IN/HOUR)	SOIL CONDITIONS
TEST 1 (A)	0	1.9	-	-	-	Brown coarse to fine SAND, some silt, some coarse to fine gravel, trace cobbles, trace boulders, trace ceramic fragments, trace plastic fragments, trace roots (moist) [FILL]
	1	2.1	-	-	-	
	2	2.5	0.4	0.2	9.5	
	3	2.7	0.2	0.1	4.7	
	4	3.1	0.4	0.2	9.5	
	5	3.2	0.1	0.0	2.4	
	6	3.4	0.2	0.1	4.7	
	7	3.6	0.2	0.1	4.7	
	8	3.8	0.2	0.1	4.7	
	9	4.0	0.2	0.1	4.7	
Steady State Rate:					4.7	inches/hour
TEST 2 (B)	TIME (MIN)	HEIGHT OF WATER (CM)	DROP (CM)	RATE (IN/MIN)	RATE (IN/HOUR)	Field Saturated Hydraulic Conductivity, Ksat: 0.18 in/hr
	0	3.6	-	-	-	
	1	3.8	-	-	-	
	2	4.3	0.5	0.2	11.8	
	3	4.6	0.3	0.1	7.1	
	4	5.0	0.4	0.2	9.5	
	5	5.3	0.3	0.1	7.1	
	6	5.6	0.3	0.1	7.1	
	7	5.9	0.3	0.1	7.1	
	8	6.2	0.3	0.1	7.1	
Steady State Rate:					7.1	inches/hour

LANGAN

INFILTRATION TESTS IT-208 performed in TP-208

PROJECT Belmont Hill School		PROJECT NO. 151014301	
LOCATION Belmont, MA		DATE October 16th, 2021	
INSPECTOR Alex Macon		WEATHER Sunny, 65-70 degrees	
TEST NUMBER	STATIC HEAD (CM)	ELEVATION AND DATUM	
1	3	Surface Elevation	Approx. 259.4 Town of Belmont Datum
2	6	Top of Hole Elevation	Approx. 256.4 Town of Belmont Datum
		Bottom of Hole Elevation	Approx. 255.9 Town of Belmont Datum

METHOD OF INFILTRATION TEST

TP-208 was excavated to a depth of about 36 inches below existing grades. A 6-inch-deep and 6-centimeter-diameter hole was then advanced using a hand auger. The hole was cleaned using a well prep brush and a sizing auger. The infiltration test was performed using a Guelph Permeameter with the two head method. H1 = 3 cm and H2 = 6 cm for these tests. After every 60 seconds, the height of the water was measured to calculate the total drop of water over the time period. Test 1 (A) and Test 2 (B) were measured using both the inner and outer reservoir cylinders. The table below summarizes the field data and the calculations for determining the rates in which the water infiltrated.

	TIME (MIN)	HEIGHT OF WATER (CM)	DROP (CM)	RATE (IN/MIN)	RATE (IN/HOUR)	SOIL CONDITIONS
TEST 1 (A)	0	0.4	-	-	-	Light brown coarse to fine SAND, some silt, some fine gravel (moist)
	1	0.6	-	-	-	
	2	1.2	0.6	0.2	14.2	
	3	1.6	0.4	0.2	9.5	
	4	2.0	0.4	0.2	9.5	
	5	2.1	0.1	0.0	2.4	
	6	2.4	0.3	0.1	7.1	
	7	2.7	0.3	0.1	7.1	
	8	3.0	0.3	0.1	7.1	
	9	3.3	0.3	0.1	7.1	
Steady State Rate:					7.1	inches/hour
TEST 2 (B)	TIME (MIN)	HEIGHT OF WATER (CM)	DROP (CM)	RATE (IN/MIN)	RATE (IN/HOUR)	Field Saturated Hydraulic Conductivity, Ksat: 0.94 in/hr
	0	1.3	-	-	-	
	1	2.4	-	-	-	
	2	3.1	0.7	0.3	16.5	
	3	4.0	0.9	0.4	21.3	
	4	4.2	0.2	0.1	4.7	
	5	4.5	0.3	0.1	7.1	
	6	4.9	0.4	0.2	9.5	
	7	5.4	0.5	0.2	11.8	
	8	6.0	0.6	0.2	14.2	
	9	6.5	0.5	0.2	11.8	
	10	7.0	0.5	0.2	11.8	
	11	7.5	0.5	0.2	11.8	
Steady State Rate:					11.8	inches/hour

LANGAN

INFILTRATION TESTS IT-209 performed in TP-209

PROJECT	Belmont Hill School	PROJECT NO.	151014301
LOCATION	Belmont, MA	DATE	October 16th, 2021
INSPECTOR	Alex Macon	WEATHER	Sunny, 65-70 degrees
TEST NUMBER	STATIC HEAD (CM)	ELEVATION AND DATUM	
1	5	Surface Elevation	Approx. 262.0 Town of Belmont Datum
2	10	Top of Hole Elevation	Approx. 257.5 Town of Belmont Datum
		Bottom of Hole Elevation	Approx. 257.0 Town of Belmont Datum

METHOD OF INFILTRATION TEST

TP-209 was excavated to a depth of about 54 inches below existing grades. A 6-inch-deep and 6-centimeter-diameter hole was then advanced using a hand auger. The hole was cleaned using a well prep brush and a sizing auger. The infiltration test was performed using a Guelph Permeameter with the two head method. H1 = 5 cm and H2 = 10 cm for these tests. After every 60 seconds, the height of the water was measured to calculate the total drop of water over the time period. Test 1 (A) and Test 2 (B) were measured using both the inner and outer reservoir cylinders. The table below summarizes the field data and the calculations for determining the rates in which the water infiltrated.

	TIME (MIN)	HEIGHT OF WATER (CM)	DROP (CM)	RATE (IN/MIN)	RATE (IN/HOUR)	SOIL CONDITIONS
TEST 1 (A)	0	1.4	-	-	-	Light brown sandy SILT, trace coarse to fine gravel, trace roots (moist)
	1	1.8	-	-	-	
	2	2.1	0.3	0.1	7.1	
	3	2.6	0.5	0.2	11.8	
	4	2.8	0.2	0.1	4.7	
	5	3.2	0.4	0.2	9.5	
	6	3.5	0.3	0.1	7.1	
	7	3.7	0.2	0.1	4.7	
	8	4.0	0.3	0.1	7.1	
	9	4.2	0.2	0.1	4.7	
	10	4.4	0.2	0.1	4.7	
	11	4.7	0.3	0.1	7.1	
	12	5.0	0.3	0.1	7.1	
	13	5.3	0.3	0.1	7.1	
Steady State Rate:					7.1	inches/hour
TEST 2 (B)	TIME (MIN)	HEIGHT OF WATER (CM)	DROP (CM)	RATE (IN/MIN)	RATE (IN/HOUR)	Field Saturated Hydraulic Conductivity, Ksat: 0.38 in/hr
	0	2.9	-	-	-	
	1	3.1	-	-	-	
	2	3.8	0.7	0.3	16.5	
	3	4.4	0.6	0.2	14.2	
	4	5.1	0.7	0.3	16.5	
	5	5.6	0.5	0.2	11.8	
	6	6.1	0.5	0.2	11.8	
	7	6.6	0.5	0.2	11.8	
	8	7.1	0.5	0.2	11.8	
Steady State Rate:					11.8	inches/hour