DRAINAGE REPORT

For

PROPOSED

"EARLY EDUCATION CENTER"

0 Blue Hill Avenue
Milton, Massachusetts
Norfolk County

Prepared by:

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BOHLER

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I. EXECUTIVE SUMMARY

This report examines the changes in drainage that can be expected as the result of the development of a proposed early education childcare facility located on the westerly side of Blue Hill Avenue in the Town of Milton, Massachusetts. The site, which contains approximately 6.88 acres of land, is undeveloped consisting of wooded areas.

The proposed project includes the construction of a new 16,200± sf freestanding Gardener School early education childcare facility along with new paved parking areas, landscaping, stormwater management components, and associated utilities. This report addresses a comparative analysis of the pre- and post-development site runoff conditions. Additionally, this report provides calculations documenting the design of the proposed stormwater conveyance/management system as illustrated within the accompanying Site Development Plans prepared by Bohler. The project will also provide erosion and sedimentation controls during the demolition and construction periods, as well as long term stabilization of the site.

For the purposes of this analysis the pre- and post-development drainage conditions were analyzed at one (1) "design point" where stormwater runoff currently drains to under existing conditions. This design point is described in further detail in **Section II** below. A summary of the existing and proposed conditions peak runoff rates and volumes for the 2-, 10-, 25-, and 100-year storms can be found in **Table 1.1** below. In addition, the project has been designed to meet or exceed the Stormwater Management Standards as detailed herein.

Table 1.1: Design Point Peak Runoff Rate Summary

Point of Analysis	2-Year Storm			10-Year Storm			25-Year Storm			100-Year Storm		
	Pre	Post	Δ	Pre	Post	Δ	Pre	Post	Δ	Pre	Post	Δ
DP-1	0.00	0.00	**0.00**	0.00	0.00	**0.00**	0.00	0.00	**0.00**	2.53	2.21	**-0.32**

**Flows are represented in cubic feet per second (cfs)*

II. EXISTING SITE CONDITIONS

Existing Site Description

The site consists of approximately 6.88 acres of land located along the westerly side of Blue Hill Avenue in the Town of Milton, Massachusetts. The site is undeveloped consisting of wooded areas.

On-Site Soil Information

Soils within the analyzed area consist of the following as classified by the Natural Resource Conservation Service (NRCS):

Table 2.1: Existing Soil Information

Soil Unit Symbol	Soil Name / Description	Hydrologic Soil Group (HSG)
31A	Walpole sandy loam	D
253D	Hinckley loamy sand	A
254C	Merrimac fine sandy loam	A
305D	Paxton fine sandy loam	C
310B	Woodbridge fine sandy loam	C

Initial onsite soil testing was performed by Whitestone Associates, Inc. on June 26th, 2024 and additional testing was performed in August and will be performed in September but has not yet been summarized. Refer to **Appendix C** for additional information.

Existing Collection and Conveyance

The site generally drains west to east towards a drainage depression at the southeast property corner prior to discharging into the Blue Hill Avenue municipal drainage system. Elevations on the site range from 63 feet at the southeast property corner to 135 feet along the northern property boundary.

Existing Watersheds and Design Point Information

For the purposes of this analysis, the pre- and post-development drainage conditions were analyzed at one (1) “design point” as described below where stormwater runoff currently drains to under existing conditions. The existing site was subdivided into one (1) separate sub catchment, as described below, to analyze existing and proposed flow rates at each design point. The minimum time of concentration for all proposed areas is calculated as 6 minutes (0.1 hr).

Design Point #1 (DP-1) is the Blue Hill Avenue municipal drainage system. Under existing conditions, this design point receives stormwater flows from approximately 6.87 acres of land, designated as watershed “E-1”. Refer to Table 2.1 below for additional detail.

Table 2.2: Existing Sub-Catchment Summary

Sub-catchment Name	Total Area (acres)	Cover Description	Curve Number (CN)	Time of Concentration (Tc, minutes)
E-1	6.87±	Rooftops, paved parking, grass, woods, 2-acre lot coverage	54	10.0

Refer to **Table 1.1 and 6.1** for the existing conditions peak rates of runoff. Refer to **Appendix D** and the Drainage Area Maps in the appendices of this report for a graphical representation of the existing drainage areas.

III. PROPOSED SITE CONDITIONS

Proposed Development Description

The proposed project consists of the construction of a new 16,200± sf freestanding "The Gardner School" early education childcare facility including paved parking areas, landscaping, associated utilities, and a new stormwater management system. The site, including the proposed parking areas, has been designed to drain to deep-sump, hooded catch basins. The catch basins will capture and convey stormwater runoff, via an underground pipe system, to a proposed infiltration basin. Pretreatment of stormwater runoff will be provided by a combination of the deep-sump, hooded catch basins and a sediment forebay prior to discharge into the proposed infiltration basin. Rooftop runoff has been designed to flow to the basin as well.

Proposed Development Collection and Conveyance

Deep-sump, hooded catch basins are proposed to collect and route runoff from the paved parking areas to the proposed surface basin. Pipes have been designed for the 25-year storm using the Rational Method. Pipe sizing calculations are included in **Appendix F**.

The best management practices (BMPs) incorporated into the proposed stormwater management system have been designed to meets, or exceeds, the standards set forth in the Massachusetts Department of Environmental Protection Stormwater Handbook standards. Refer to **Section V** for additional information.

Proposed Watersheds and Design Point Information

The project has been designed to maintain existing drainage watersheds to the greatest extent possible, with the same design points described in **Section II** above. The site was subdivided into two (2) separate sub catchments for the proposed conditions as described below. The minimum time of concentration for all proposed areas is calculated as 6 minutes (0.1 hr).

Under proposed conditions DP-1 receives stormwater flows from approximately 6.87 acres of land, designated as watersheds "P-1" and "P-2". Refer to Table 3.1 below for additional detail.

Table 3.1: Proposed Sub-catchment Summary

Sub-catchment Name	Total Area (acres)	Cover Description	Curve Number (CN)	Time of Concentration (Tc, minutes)	Hydrologic Routing
P-1	2.17±	Rooftops, paved parking, grass	77	6.0	B-1 / DP-1
P-2	4.71±	Rooftops, paved parking, grass, woods, 2-acre lot coverage	62	10.0	DP-1

Refer to **Table 1.1 and 6.1** for the calculated proposed conditions peak rates of runoff. For additional hydrologic information, refer to **Appendix D** and the Drainage Area Maps in the appendices of this report for a graphical representation of the proposed drainage areas.

IV. METHODOLOGY

Peak Flow Calculations

Methodology utilized to design the proposed stormwater management system includes compliance with the guidelines set forth in the latest edition of the Massachusetts DEP Stormwater Handbook. The pre- and post-development runoff rates being discharged from the site were computed using the HydroCAD computer program. The drainage area and outlet information were entered into the program, which routes storm flows based on NRCS TR-20 and TR-55 methods. The other components of the model were determined following standard NRCS procedures for Curve Numbers (CNs) and times of concentrations documented in the appendices of this report. The rainfall data utilized and listed below in table 4.1 below for stormwater calculations is based on NOAA. Refer to **Appendix F** for more information.

Table 4.1: NOAA Rainfall Intensities

Frequency	2 year	10 year	25 year	100 year
Rainfall* (inches)	3.42	5.34	6.53	8.38

*Values derived from NOAA ATLAS on 08/16/2024

The proposed stormwater management as designed will provide a decrease in peak rates of runoff from the proposed facility for the 2-, 10-, 25- and 100-year design storm events. Additionally, the proposed project meets, or exceeds, the MADEP Stormwater Management standards. Compliance with these standards is described further below.

V. STORMWATER MANAGEMENT STANDARDS

Standard #1: No New Untreated Discharges

The project has been designed so that proposed impervious areas (including the building roof and paved parking/driveway areas) shall be collected and passed through the proposed drainage system for treatment prior to discharge.

Standard #2: Peak Rate Attenuation

As outlined in **Table 1.1** and **Table 6.1**, the development of the site and the proposed stormwater management system, have been designed so that post-development peak rates of runoff are below pre-development conditions for the 2-, 10-, 25- and 100-year storm events at the design point of analysis.

Standard #3: Recharge

The stormwater runoff from the project will be collected and diverted to a proposed infiltration basin. The project as proposed will involve the creation of 58,081 square feet of new impervious area and is required to infiltrate 3,102 cubic feet of stormwater as defined in Stormwater Standard 3. The proposed infiltration basin will provide 23,566 cubic feet of volume below the lowest outlet for groundwater recharge. Refer to **Appendix F** of this report for calculations documenting required and provided recharge volumes.

The DEP Stormwater Standards require that the infiltration BMP drains completely within 72 hours of the end of the storm event. Calculations showing that the proposed infiltration basin will drain within 33.7 hours are included in **Appendix F** of this report.

A four (4) foot separation to estimated seasonal high groundwater is provided and a groundwater mounding analysis is not required.

Standard #4: Water Quality

Water quality treatment is provided via deep-sump, hooded catch basins, a sediment forebay, and an infiltration basin. TSS removal calculations are included in **Appendix F** of this report. The project as proposed will involve the creation of 58,081 square feet of new impervious area and is required to treat 5,363 cubic feet of water quality volume as defined in Stormwater Standard 4. The proposed infiltration basin provides 23,566 cubic feet of water quality volume below the

lowest outlet for water quality treatment. Refer to **Appendix F** of this report for calculations documenting required and provided water quality volumes.

Standard #5: Land Use with Higher Potential Pollutant Loads

Not Applicable for this project.

Standard #6: Critical Areas

Not Applicable for this project.

Standard #7: Redevelopment

Not Applicable for this project.

Standard #8: Construction Period Pollution Prevention and Erosion and Sedimentation Control

The proposed project will provide construction period erosion and sedimentation controls as indicated within the site plan set provided for this project. This includes a proposed construction exit, protection for stormwater inlets, protection around temporary material stock piles and various other techniques as outlined on the erosion and sediment control sheets. Additionally, the project is required to file a Notice of Intent with the US EPA and implement a Stormwater Pollution Prevention Plan (SWPPP) during the construction period. The SWPPP will be prepared prior to the start of construction and will be implemented by the site contractor under the guidance and responsibility of the project's proponent. Refer to **Appendix H**.

Standard #9: Operation and Maintenance Plan (O&M Plan)

An Operation and Maintenance (O&M) Plan for this site has been prepared and is included in **Appendix G** of this report. The O&M Plan outlines procedures and time tables for the long term operation and maintenance of the proposed site stormwater management system, including initial inspections upon completion of construction, and periodic monitoring of the system components, in accordance with established practices and the manufacturer's recommendations. The O&M Plan includes a list of responsible parties and an estimated budget for inspections and maintenance.

Standard #10: Prohibition of Illicit Discharges

The proposed stormwater system will only convey allowable non-stormwater discharges (firefighting waters, irrigation, air conditioning condensates, etc.) and will not contain any illicit

discharges from prohibited sources. An Illicit Discharge Statement is included in **Appendix G** of this report.

VI. SUMMARY

In summary, the proposed stormwater management system illustrated on the drawings prepared by Bohler results in a reduction in peak rates of runoff from the subject site when compared to pre-development conditions for the 2-, 10-, 25- and 100-year storm frequencies. In addition, the proposed best management practices will result in an effective removal of total suspended solids from the post-development runoff. The pre-development versus post-development stormwater discharge comparisons are contained in **Table 6.1** below:

Table 6.1: Design Point Peak Runoff Rate Summary

Point of Analysis	2-Year Storm			10-Year Storm			25-Year Storm			100-Year Storm		
	Pre	Post	Δ	Pre	Post	Δ	Pre	Post	Δ	Pre	Post	Δ
DP-1	0.00	0.00	**0.00**	0.00	0.00	**0.00**	0.00	0.00	**0.00**	2.53	2.21	**-0.32**

**Flows are represented in cubic feet per second (cfs)*

As outlined in the table above, the proposed stormwater management system as designed will provide a decrease in peak rates of runoff from the proposed facility for the 2-, 10-, 25- and 100-year storm events. Additionally, the project meets or exceeds the MADEP Stormwater Management Standards as described further herein.

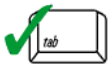
APPENDIX A: MASSACHUSETTS STORMWATER MANAGEMENT CHECKLIST

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

A. Introduction

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



A Stormwater Report must be submitted with the Notice of Intent permit application to document compliance with the Stormwater Management Standards. The following checklist is NOT a substitute for the Stormwater Report (which should provide more substantive and detailed information) but is offered here as a tool to help the applicant organize their Stormwater Management documentation for their Report and for the reviewer to assess this information in a consistent format. As noted in the Checklist, the Stormwater Report must contain the engineering computations and supporting information set forth in Volume 3 of the Massachusetts Stormwater Handbook. The Stormwater Report must be prepared and certified by a Registered Professional Engineer (RPE) licensed in the Commonwealth.

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.[1] This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8[2]
- Operation and Maintenance Plan required by Standard 9

In addition to all plans and supporting information, the Stormwater Report must include a brief narrative describing stormwater management practices, including environmentally sensitive site design and LID techniques, along with a diagram depicting runoff through the proposed BMP treatment train. Plans are required to show existing and proposed conditions, identify all wetland resource areas, NRCS soil types, critical areas, Land Uses with Higher Potential Pollutant Loads (LUHPPL), and any areas on the site where infiltration rate is greater than 2.4 inches per hour. The Plans shall identify the drainage areas for both existing and proposed conditions at a scale that enables verification of supporting calculations.

As noted in the Checklist, the Stormwater Management Report shall document compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook. The soils evaluation and calculations shall be done using the methodologies set forth in Volume 3 of the Massachusetts Stormwater Handbook.

To ensure that the Stormwater Report is complete, applicants are required to fill in the Stormwater Report Checklist by checking the box to indicate that the specified information has been included in the Stormwater Report. If any of the information specified in the checklist has not been submitted, the applicant must provide an explanation. The completed Stormwater Report Checklist and Certification must be submitted with the Stormwater Report.

[1] The Stormwater Report may also include the Illicit Discharge Compliance Statement required by Standard 10. If not included in the Stormwater Report, the Illicit Discharge Compliance Statement must be submitted prior to the discharge of stormwater runoff to the post-construction best management practices.

[2] For some complex projects, it may not be possible to include the Construction Period Erosion and Sedimentation Control Plan in the Stormwater Report. In that event, the issuing authority has the discretion to issue an Order of Conditions that approves the project and includes a condition requiring the proponent to submit the Construction Period Erosion and Sedimentation Control Plan before commencing any land disturbance activity on the site.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

The following checklist is intended to serve as a guide for applicants as to the elements that ordinarily need to be addressed in a complete Stormwater Report. The checklist is also intended to provide conservation commissions and other reviewing authorities with a summary of the components necessary for a comprehensive Stormwater Report that addresses the ten Stormwater Standards.

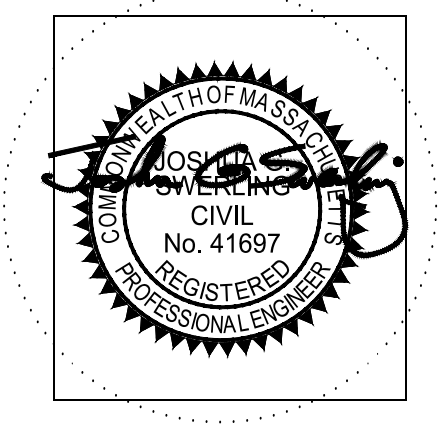
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the item is not applicable (N.A.) and provide the reasons for that determination.

A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including the soil evaluation, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan (if included), the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement (if included) and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature



August 28, 2024

Signature and Date

Checklist

Project Type: Is the application for new development, redevelopment, or a mix of new and redevelopment?

☒ New development

☐ Redevelopment

☐ Mix of New Development and Redevelopment

Checklist for Stormwater Report

Checklist (continued)

LID Measures: Stormwater Standards require LID measures to be considered. Document what environmentally sensitive design and LID Techniques were considered during the planning and design of the project:

☐ No disturbance to any Wetland Resource Areas

☐ Site Design Practices (e.g. clustered development, reduced frontage setbacks)

☐ Reduced Impervious Area (Redevelopment Only)

☐ Minimizing disturbance to existing trees and shrubs

☐ LID Site Design Credit Requested:

- ☐ Credit 1
- ☐ Credit 2
- ☐ Credit 3

☐ Use of "country drainage" versus curb and gutter conveyance and pipe

☐ Bioretention Cells (includes Rain Gardens)

☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)

☐ Treebox Filter

☐ Water Quality Swale

☐ Grass Channel

☐ Green Roof

☐ Other (describe): Infiltration Basin

Standard 1: No New Untreated Discharges

☒ No new untreated discharges

☒ Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth

☒ Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.

Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

☐ Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.

☐ Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.

☒ Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge

☒ Soil Analysis provided.

☒ Required Recharge Volume calculation provided.

☐ Required Recharge volume reduced through use of the LID site Design Credits.

☒ Sizing the infiltration, BMPs is based on the following method: Check the method used.

☒ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

☒ Runoff from all impervious areas at the site discharging to the infiltration BMP.

☐ Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.

☒ Recharge BMPs have been sized to infiltrate the Required Recharge Volume.

☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:

- ☐ Site is comprised solely of C and D soils and/or bedrock at the land surface
- ☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
- ☐ Solid Waste Landfill pursuant to 310 CMR 19.000
- ☐ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.

☒ Calculations showing that the infiltration BMPs will drain in 72 hours are provided.

☐ Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

[1] 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.

Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

☐ The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.

☐ Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

Standard 4: Water Quality

The Long-Term Pollution Prevention Plan typically includes the following:

- Good housekeeping practices;
- Provisions for storing materials and waste products inside or under cover;
- Vehicle washing controls;
- Requirements for routine inspections and maintenance of stormwater BMPs;
- Spill prevention and response plans;
- Provisions for maintenance of lawns, gardens, and other landscaped areas;
- Requirements for storage and use of fertilizers, herbicides, and pesticides;
- Pet waste management provisions;
- Provisions for operation and management of septic systems;
- Provisions for solid waste management;
- Snow disposal and plowing plans relative to Wetland Resource Areas;
- Winter Road Salt and/or Sand Use and Storage restrictions;
- Street sweeping schedules;
- Provisions for prevention of illicit discharges to the stormwater management system;
- Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
- Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
- List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.

☒ A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.

☒ Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:

- ☐ is within the Zone II or Interim Wellhead Protection Area
- ☐ is near or to other critical areas
- ☐ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
- ☐ involves runoff from land uses with higher potential pollutant loads.

☐ The Required Water Quality Volume is reduced through use of the LID site Design Credits.

☒ Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.

Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

☒ The BMP is sized (and calculations provided) based on:

- ☒ The ½" or 1" Water Quality Volume or
- ☐ The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.

☐ The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.

☐ A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

Standard 5: Land Uses With Higher Potential Pollutant Loads (LUHPPLs)

☐ The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.

☐ The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted ***prior to*** the discharge of stormwater to the post-construction stormwater BMPs.

☐ The NPDES Multi-Sector General Permit does ***not*** cover the land use.

☐ LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.

☐ All exposure has been eliminated.

☐ All exposure has ***not*** been eliminated and all BMPs selected are on MassDEP LUHPPL list.

☐ The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas

☐ The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.

☐ Critical areas and BMPs are identified in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable

☐ The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:

- ☐ Limited Project
- ☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
- ☐ Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
- ☐ Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
- ☐ Bike Path and/or Foot Path
- ☐ Redevelopment Project
- ☐ Redevelopment portion of mix of new and redevelopment.

☐ Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.

☐ The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
- Construction Period Operation and Maintenance Plan;
- Names of Persons or Entity Responsible for Plan Compliance;
- Construction Period Pollution Prevention Measures;
- Erosion and Sedimentation Control Plan Drawings;
- Detail drawings and specifications for erosion control BMPs, including sizing calculations;
- Vegetation Planning;
- Site Development Plan;
- Construction Sequencing Plan;
- Sequencing of Erosion and Sedimentation Controls;
- Operation and Maintenance of Erosion and Sedimentation Controls;
- Inspection Schedule;
- Maintenance Schedule;
- Inspection and Maintenance Log Form.

☒ A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control (continued)

☐ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has ***not*** been included in the Stormwater Report but will be submitted ***before*** land disturbance begins.

☐ The project is ***not*** covered by a NPDES Construction General Permit.

☐ The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.

☒ The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

Standard 9: Operation and Maintenance Plan

☒ The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:

- ☒ Name of the stormwater management system owners;
- ☒ Party responsible for operation and maintenance;
- ☒ Schedule for implementation of routine and non-routine maintenance tasks;
- ☒ Plan showing the location of all stormwater BMPs maintenance access areas;
- ☐ Description and delineation of public safety features;
- ☒ Estimated operation and maintenance budget; and
- ☒ Operation and Maintenance Log Form.

☐ The responsible party is ***not*** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:

- ☐ A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
- ☐ A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

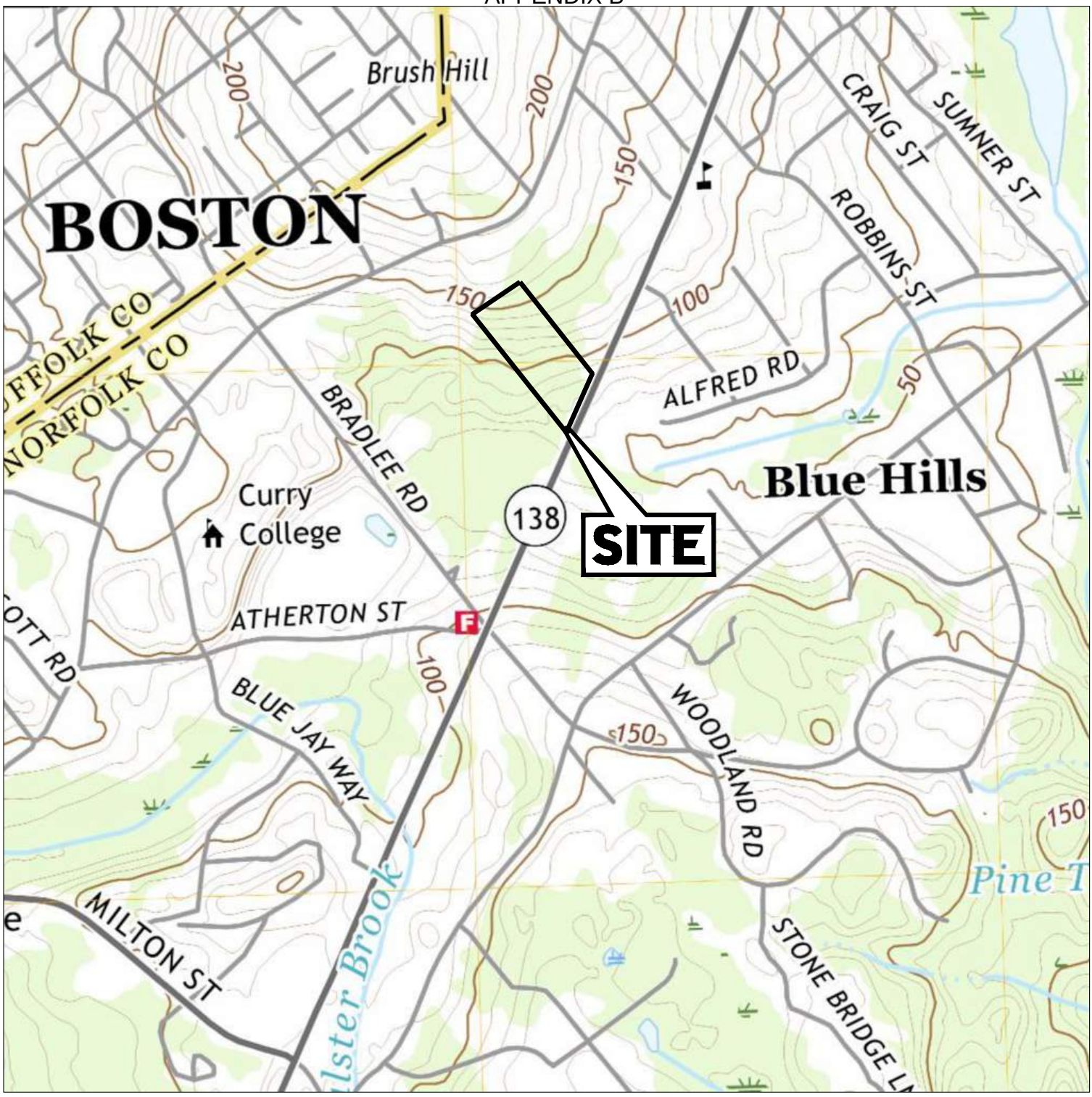
☒ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;

☒ An Illicit Discharge Compliance Statement is attached;

☐ NO Illicit Discharge Compliance Statement is attached but will be submitted ***prior to*** the discharge of any stormwater to post-construction BMPs.

APPENDIX B: PROJECT LOCATION MAPS

- *USGS MAP*
- *FEMA FIRMETTE*

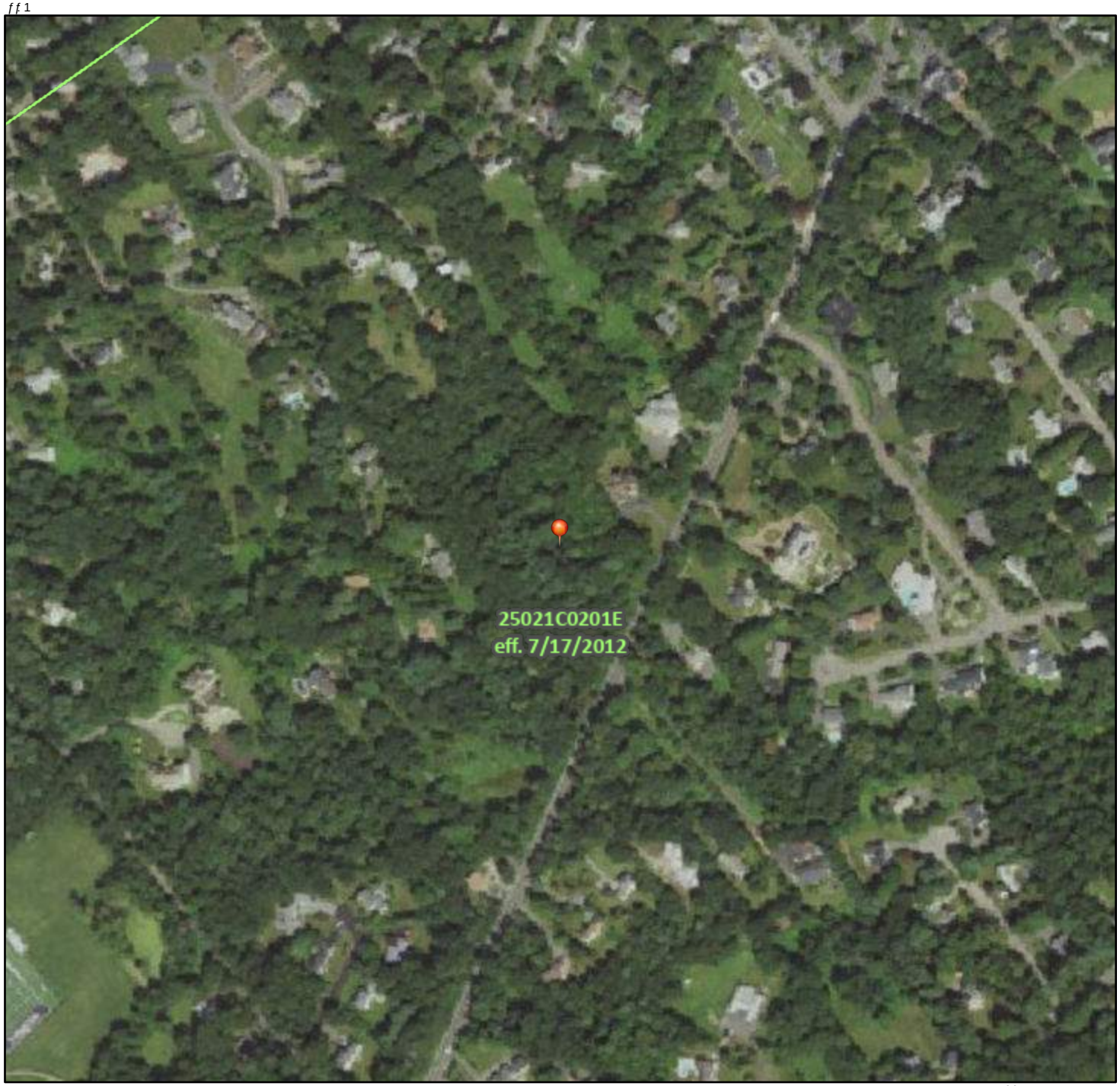


USGS MAP

SCALE: 1" = 1,000'
SOURCE: USGS BLUE HILLS, MA
QUADRANGLE, 2021

1DWLRQDO)ORRG%DUGDHU)6WWH

FEMA



)HHW

/HJHQG

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/:KRXW %DVH)ORRG(OHYDWLRQ %)(
=RQH$ 9 $
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5LYHUDWRU\)ORRGZD

$QQXDO &KDQFH)ORRG+D]DUG $UHDV
R DQQXDO FKDQFHIORRGZDWHUDH
GHSWKOHVV WKDQRQHIRRW RU ZKGUDLQDJH
DUHDV R OHVV WKDQRQHVTXDUHPLOH=RQH;

)WXUH&RQGLWLRQV $QQXDO
&KDQFH)ORRG+D]DUG =RQH;

$UHDZK5HGXFHG)ORRG5LVNGXHWR
/HYHH 6HH1RWHV =RQH;

$UHDZK)ORRG5LVNGXHWR/HYHH =RQH'

$UHDR1RQLBO)ORRG+D]DUG =RQH;
(IIHFWLYH/LQH
$UHDR 8QHWHUPLQHG)ORRG+D]DUG =RQH'

&KDQQHO &OYHUW RU 6WUXFWXUH
/HYHH L'LNH RU)ORRGZDOO

&URVV6HFWLRQ ZLWK$QQXDO &KDQFH
DWHU 6XUIDFH(OHYDWLRQ
&RDVWDO 7UDQVHFW
%DVH)ORRG(OHYDWLRQL LQH %)(
/LPW R 6WUXG
-XULVGLFWLRQ%RXQGDU\
&RDVWDO 7UDQVHFW %DVHOLQH
3URWHFWHG%DVHOLQH
+GURJUDSKLF)HDWXUH

L'LWDO DWD$YDLODEOH
1R'LWDO DWD$YDLODEOH
8QPDSSHG

7KHSLQGLVSODHGRQWKHPDSLV DQDSSURSULDWH
SRQW VHOHFWHGE\WKHXVHU DQGGRHV QRW UHSUHV
DQDWKRUL WDWLYHSURFHVVRU\ORFDWLRQ

7KLV PSFRPSOLHVZLWK)(0$V VWDQGDUGV/IRU WKHXVHR
GL.LWDO IORRGPS/LI LW LV QRW YRLGDV/GHVFULEHGEHORZ
7KHEDVHPDS VKRZQFRPSOLHVZLWK)(0$V EDVHPDS
DFFXUDF VWDQGDUGV/

7KHIORRGKD]DUGLQIRUPDWLRQLV GHULYHGLUHFWO\IURPWKH
DWKRUL WDWLYH)(0$EE VHUYLFHV/SURYLGHGE\)(7KLV PS
ZV HSRUWHGRQ DW $ DQGGRHV QW
UHOHFW FKDQHV RU DPGPQWV VXEVHXHQW WR WKLV GDWH DQG
WLFH 7KHUHDQGHIHFWLYHLQRUPDWLRQPFKDQHRU
EHFRPVXSHUVHGE\QHZGDWDRYHU WLFH

7KLV PSLBHLV YRLGLI WKHRQHRU RUHR WKHIROORZLQPS
HOHPQWV GR QRW DSSHDU EDVHPSLBHU\ IORRGRQHODEHOV
OHHQG VFDOHEDU PSFRHDWLRQGDWH FRRL W\LGHQWLILHUV
)5$DQG QXEU DQG)5$IIHFWLYHGDWH DSLBHV/IRU
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UHDODWRU\SUSRVHV

%DVHPS,BHU\6RXUH 86DWLRQDO DS

APPENDIX C: SOIL AND WETLAND INFORMATION

- *NCRS CUSTOM SOIL RESOURCE REPORT*
- *GEOTECHNICAL INVESTIGATION REPORT*

Map Scale: 1:3,390 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 150 300 600 900

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

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: Norfolk and Suffolk Counties, Massachusetts
Survey Area Data: Version 19, Sep 10, 2023

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

Date(s) aerial images were photographed: May 22, 2022—Jun 5, 2022

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.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
10	Scarboro and Birdsall soils, 0 to 3 percent slopes	2.0	3.8%
31A	Walpole sandy loam, 0 to 3 percent slopes	2.7	5.3%
253D	Hinckley loamy sand, 15 to 35 percent slopes	6.0	11.6%
254B	Merrimac fine sandy loam, 3 to 8 percent slopes	5.7	11.0%
254C	Merrimac fine sandy loam, 8 to 15 percent slopes	8.9	17.3%
256A	Deerfield loamy fine sand, 0 to 3 percent slopes	0.6	1.1%
260B	Sudbury fine sandy loam, 2 to 8 percent slopes	0.8	1.6%
305C	Paxton fine sandy loam, 8 to 15 percent slopes	7.3	14.1%
305D	Paxton fine sandy loam, 15 to 25 percent slopes	13.6	26.3%
310B	Woodbridge fine sandy loam, 3 to 8 percent slopes	4.1	7.9%
Totals for Area of Interest		**51.6**	**100.0%**

WHITESTONE
An Employee-Owned Company

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SUITE 105
SOUTHBOROUGH, MA 01772
508.485.0755
whitestoneassoc.com

REPORT OF GEOTECHNICAL INVESTIGATION

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

Prepared for:

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

Prepared by:

WHITESTONE ASSOCIATES, INC.
352 Turnpike Road
Suite 105
Southborough, Massachusetts 01772

Richard W.M. McLaren
Senior Consultant

Ryan R. Roy, PE
Vice President

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

WHITESTONE
An Employee-Owned Company

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SOUTHBOROUGH, MA 01772
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whitestoneassoc.com

September 23, 2024

via email

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

Attention: Mr. Christopher Fazendin
Vice President Real Estate Development

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

Dear Mr. Fazendin:

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

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

Sincerely,

WHITESTONE ASSOCIATES, INC.

Richard W.M. McLaren
Senior Consultant

Ryan R. Roy, PE
Vice President

RWM/th N:\Job Folders\2024\2422048GM\Reports and Submittals\Gardner Daycare Milton MA GM2422048 ROGI 9-23-24.docx
Enclosures
Copy: Laurence W. Keller, PE, Whitestone Associates, Inc.

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

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

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(Continued)

FIGURES

APPENDICES

SECTION 1.0
Summary of Findings

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

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

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

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

SECTION 2.0
Introduction

2.1 AUTHORIZATION

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

2.2 PURPOSE

The purpose of this exploration and analysis was to:

- ascertain the various soil and bedrock profile components at test locations;
- conduct infiltration testing;
- estimate the engineering characteristics of the proposed foundation bearing and subgrade materials;
- provide geotechnical criteria for use by the design engineers in preparing the foundation, floor slab, and pavement design;
- provide recommendations for required earthwork and subgrade preparation;
- record groundwater or bedrock levels at the time of the investigation and discuss their potential impact on the proposed construction.

2.3 SCOPE

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

2.3.1 Field Exploration

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

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

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

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

Borings and Standard Penetration Tests (SPTs) were conducted in general accordance with ASTM International (ASTM) designation D1586. The Standard Penetration Resistance value (N) can be used as an indicator of the consistency of fine-grained soils and the relative density of coarse-grained soils. The N-value for various soil types can be correlated with the engineering behavior of earthworks and foundations.

Groundwater level observations, where encountered, were recorded during and immediately after the completion of field operations prior to backfilling test locations. Seasonal variations, temperature effects, and recent rainfall conditions may influence the levels of the groundwater and observed levels will depend on the permeability of the soils. Groundwater elevations derived from sources other than seasonally observed groundwater monitoring wells may not be representative of true groundwater levels.

2.3.2 Infiltration Testing

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

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

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

NE: Not encountered; fbgs: feet below ground surface

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

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

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

2.3.3 Laboratory Testing

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

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

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

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

The engineering classifications are useful when considered in conjunction with the additional site data to estimate properties of the soil types encountered and to predict soil behavior under construction and service loads. Laboratory test results are provided in Appendix B.

SECTION 3.0
Site Description

3.1 LOCATION & DESCRIPTION

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

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

3.2 EXISTING CONDITIONS

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

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

Utilities: The site is not serviced by utilities. The utility information contained in this report is presented for general discussion only and is not intended for construction purposes.

Site Drainage: Surface run-off will follow site topography, flowing to the southeast towards Blue Hill Avenue.

3.3 SITE GEOLOGY

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

3.4 PROPOSED CONSTRUCTION

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

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

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

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

SECTION 4.0
Subsurface Conditions

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

4.1 SUBSURFACE SOIL CONDITIONS

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

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

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

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

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

4.2 GROUNDWATER

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

SECTION 5.0
Conclusions & Recommendations

5.1 GENERAL

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

5.2 SITE PREPARATION & EARTHWORK

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

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

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

then be proofrolled with a loaded tandem axle truck in the presence of the geotechnical engineer to help identify soft or loose pockets that may require removal and replacement, or further evaluation. Proofrolling should be conducted after a suitable period of dry and non-freezing weather to reduce the likelihood of degrading an otherwise stable subgrade. Should construction be started during the winter months, Whitestone should be contacted for alternate surface preparation procedures. Fill or backfill should be placed and compacted in accordance with Section 5.3.

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

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

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

Weather Performance Criteria: The glacial till is generally moisture sensitive. Every effort should be made to maintain drainage of surface water runoff away from construction areas by grading and limiting the exposure of excavations and prepared subgrades to rainfall. Accordingly, excavation and fill placement procedures should be conducted during favorable weather conditions. Overexcavation of wet or disturbed soils and replacement with controlled structural fill per Section 5.3 of this report may be required prior to resuming work on subgrade soils.

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

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

5.3 STRUCTURAL FILL & BACKFILL

Imported Fill Material: Imported material placed as structural fill or backfill to raise elevations or restore design grades should consist of clean, relatively well-graded sand or gravel with a maximum particle size of three inches and up to 15 percent, by weight, of material finer than a #200 sieve. Imported material should be free of silt, clay, organics, and deleterious material. Imported material should be approved by a qualified geotechnical engineer prior to delivery to the site. Should bedrock be exposed, only minus 0.375-inch crushed stone should be placed directly over bedrock.

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

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

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

5.4 GROUNDWATER CONTROL

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

Proper grading and drainage should be incorporated into the site design and construction phase grading to discourage ponding of surface runoff. Every effort should be made to maintain drainage of surface run-off away from construction areas by grading. The contractor should limit exposure of excavations and prepared subgrades to rainfall. Overexcavation of wet soils and replacement with controlled structural fill per Section 5.3 of this report may be required prior to resuming work on disturbed subgrade soils.

5.5 FOUNDATIONS

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

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

Footings should be designed such that the maximum toe pressure due to the combined effect of vertical loads (including soil weight) and overturning moment does not exceed the recommended maximum allowable bearing pressure. In addition, positive contact pressure should be maintained throughout the base of the footings such that no uplift or tension exists between the base of the footings and the supporting soil. Uplift loads should be resisted by the weight of the concrete footing. Side friction should be neglected when proportioning the footings, and lateral resistance should be provided by friction resistance at the base of the footings. A coefficient of friction (ultimate) against sliding of 0.4 is recommended for use in the design of concrete foundations bearing within the site soils or imported structural fill.

Foundation Inspection/Overexcavation Criteria: Whitestone recommends that the suitability of the bearing materials within the building footprint and foundation bearing zone be reviewed by a geotechnical engineer prior to placing concrete for the footings. Special attention should be given to any areas of the site underlain by soft/loose conditions. In the event that isolated areas of unsuitable materials such as existing fill or soil containing organic materials are encountered in footing excavations, overexcavation and replacement of the materials or deeper foundation embedment may be necessary to provide a suitable footing subgrade. Overexcavation to be restored with structural fill should extend at least one foot laterally beyond footing edges for each vertical foot of overexcavation. Lateral overexcavation may be eliminated if grade is restored with lean concrete.

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

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

5.6 FLOOR SLAB

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

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

5.7 PAVEMENT DESIGN CRITERIA

General: Whitestone anticipates that the properly inspected, approved, and improved glacial till or existing fill, and/or compacted structural fill and/or backfill placed to raise or restore design elevations will be suitable for support of the proposed pavements, provided these materials are properly evaluated, compacted, and proofrolled in accordance with Sections 5.2, 5.3, and 5.12 of this report during favorable weather conditions. The bedrock, if exposed within the western portion of the site, will also be suitable for support of the proposed pavements.

Design Criteria: A California Bearing Ratio value of 8.0 has been assigned to the properly prepared subgrade soils for pavement design purposes. This value was correlated with pertinent soil support values and assumed traffic loads to prepare flexible and rigid pavement designs per the AASHTO *Guide for the Design of Pavement Structures*.

Design traffic loads were assumed based on typical volumes for similar facilities and correlated with 18-kip equivalent single axle loads (ESAL) for a 20-year life. Estimated maximum pavement loads of 30,000 ESALs and 75,000 ESALs were used for the standard-duty and heavy-duty pavement areas, respectively. These values assume the pavements primarily will accommodate both automobile and limited heavier truck traffic, with the heavier truck traffic designated to the main drive lanes. Actual loading experienced is anticipated to be less than these values.

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

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

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

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

Note [1]: The outer edges of concrete pavements are susceptible to damage as trucks move from rigid pavement to adjacent flexible pavement. Therefore, the thickness at the outer 2 feet of the rigid concrete pavement should be 12 inches. The concrete should be reinforced with at least one layer of six-inch by six-inch W5.4/W5.4 welded wire fabric (ASTM A185).

Additional Design Considerations: The pavement section thickness designs presented in this report are based on the design parameters detailed herein and are contingent on proper construction, inspection, and maintenance. Additional pavement thickness may be required by local code. The designs are contingent on achieving the minimum soil support value in the field. To accomplish this requirement, subgrade soil and supporting fill or backfill must be placed, compacted, and evaluated in accordance with Sections 5.2, 5.3, and 5.12 of this report. Proper drainage should be provided for the pavement structure, including appropriate grading and surface water control, and an edge/interceptor drain where the pavement abuts higher ground.

The performance of the pavement also will depend on the quality of materials and workmanship. Whitestone recommends that MassDOT standards for materials, workmanship, and maintenance be applied to this site. Project specifications should include verifying that the installed asphaltic concrete material composition is within tolerance for the specified materials and that the percentage of air voids of the installed pavement is within specified ranges for the respective materials. Rigid concrete pavements should be suitably air-entrained, jointed, and reinforced in general accordance with ACI 330R-08 *Guide for the Design and Construction of Concrete Parking Lots*.

5.8 RETAINING WALLS/LATERAL EARTH PRESSURES

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

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

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

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

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

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

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

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

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

5.9 SEISMIC & LIQUEFACTION CONSIDERATIONS

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

5.10 SLOPES

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

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

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

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

5.11 EXCAVATIONS

The site soils encountered during this investigation typically are, at a minimum, consistent with Type C Soil Conditions as defined by 29 CFR Part 1926 (OSHA), which require a maximum unbraced excavation angle of 1.5:1 (horizontal:vertical). Actual conditions encountered during construction, including the organic layer, should be evaluated by a competent person (as defined by OSHA), so that safe excavation methods and/or shoring and bracing requirements are implemented. If required, competent bedrock may be excavated at an angle of 1:6 (horizontal:vertical). A steeper temporary excavation angle in the bedrock may be feasible, if the exposed bedrock is reviewed by a professional engineer or geologist.

5.12 SUPPLEMENTAL POST INVESTIGATION SERVICES

Construction Inspection and Monitoring: The owner's geotechnical engineer with specific knowledge of the site subsurface conditions and design intent should conduct inspection, testing, and consultation during construction as described in previous sections of this report. Monitoring and testing should also be conducted to confirm that any encountered underground structures are properly backfilled, the existing surface cover materials are properly removed, and suitable materials, used for controlled fill, are properly placed and compacted over suitable subgrade soils. The proofrolling of all subgrades prior to foundation, floor slab, and pavement support should be witnessed and documented by the owner's geotechnical engineer.

SECTION 6.0
General Comments

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

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

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

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

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

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

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

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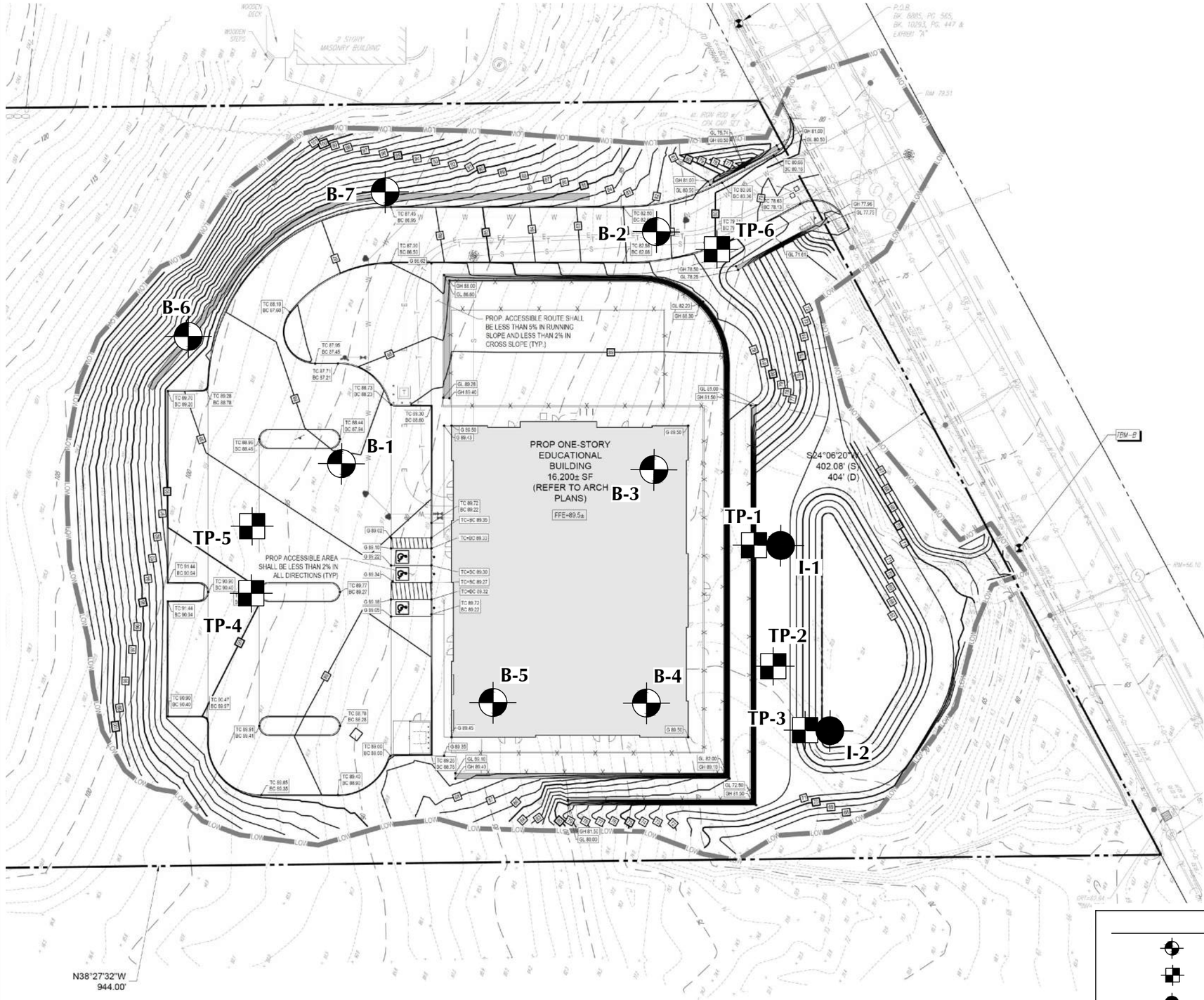
FIGURE 1
Test Location Plan



0 50

1 inch = 50 ft.

LEGEND

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

NOTE: ALL LOCATIONS ARE APPROXIMATE.

REFERENCE

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

WHITESTONE
An Employee-Owned Company
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508.485.0755 WHITESTONEASSOC.COM

DRAWING TITLE: **TEST LOCATION PLAN**

CLIENT: **THE GARDNER SCHOOL**

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

PROJECT #: **GM2422048.000**

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

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APPENDIX A
Records of Subsurface Exploration

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-1

Page 1 of 1

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

Water Depth | Elevation (feet bgs) | (ft NAVD88)		Cave-In Depth | Elevation (feet bgs) | (ft NAVD88)	
During:	7.0 | 87.0		
At Completion:	-- | --	**At Completion:**	-- | --
24 Hours:	-- | --	**24 Hours:**	-- | --

SAMPLE INFORMATION						DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)				
						0.0				
							TS		8" Topsoil	
0 - 2	S-1		2 - 1 - 2 - 3	11	3		EXISTING FILL		Brown, Very Loose, Silty Sand (FILL)	
2 - 4	S-2		9 - 19 - 20 - 31	2	39				Brown, Dense, Poorly Graded Gravel with Silt and Sand (FILL)	
						5.0				
5 - 7	S-3		3 - 11 - 15 - 19	13	26				Gray, Medium Dense, Silty Sand (FILL)	
						7.0				
						7.3	TS		3" Former Topsoil	
7 - 9	S-4		18 - 21 - 22 - 21	23	43		GLACIAL TILL		Gray, Dense, Silty Sand with Gravel (SM)	
						10.0				
10 - 11.3	S-5		15 - 29 - 50/4"	14	58				As Above, Very Dense (SM)	Cobbles & Boulders
						15.0				
15 - 16.4	S-6		23 - 44 - 50/5"	16	88				As Above (SM)	Cobbles & Boulders
						20.0			Boring Log B-1 Terminated upon Auger Refusal at Depth of 18.5 fbgs.	
						25.0				

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

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-2

Page 1 of 1

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

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

SAMPLE INFORMATION						DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)				
						0.0				
0 - 2	S-1		1 - 1 - 1 - 3	20	2		TS		11" Topsoil	
							SUBSOIL		13" Subsoil	
2 - 4	S-2		5 - 18 - 29 - 34	20	47				Gray, Dense, Silty Sand with Gravel (SM)	
						5.0				
5 - 7	S-3		19 - 23 - 24 - 20	18	47				As Above (SM)	
7 - 9	S-4		21 - 21 - 22 - 26	20	43				As Above (SM)	
						10.0				
10 - 12	S-5		10 - 19 - 20 - 42	18	39		GLACIAL TILL		As Above (SM)	
						15.0				
15 - 15.2	S-6		50/2"	0	-				No Recovery	Cobbles & Boulders
						20.0				
20 - 20.7	S-7		24 - 50/2"	6	-				Gray, Very Dense, Silty Sand with Gravel (SM)	
									Boring Log B-2 Terminated at Depth of 20.7 Feet Below Ground Surface.	
						25.0				

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

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-3

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

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

SAMPLE INFORMATION						DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)				
						0.0				
							TS		6" Topsoil	
0 - 2	S-1		1 - 2 - 1 - 3	11	3		EXISTING FILL		Brown, Very Loose, Silty Sand (FILL)	
						2.0				
2 - 4	S-2		5 - 5 - 5 - 6	0	10				No Recovery, Loose to Medium Dense	
						5.0				
						5.5			Brown, Very Loose, Silty Sand (FILL)	
5 - 7	S-3		WOH - 16 - 15 - 15	13	31		GLACIAL TILL		Gray, Dense, Silty Sand with Gravel (SM)	
7 - 9	S-4		14 - 13 - 15 - 20	23	28				As Above, Medium Dense (SM)	
						10.0				
10 - 12	S-5		6 - 15 - 16 - 24	16	31				As Above, Dense (SM)	
									Boring Log B-3 Terminated upon Auger Refusal at Depth of 13.0 fbgs.	
						15.0				
						20.0				
						25.0				

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

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-4

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

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

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

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

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-5

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

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

SAMPLE INFORMATION						DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)				
						0.0				
							TS		3" Topsoil; 3" Subsoil, Roots	
0 - 2	S-1		1 - 2 - 2 - 2	16	4		EXISTING FILL		Brown, Very Loose to Loose, Silty Sand with Gravel, Trace Organics (FILL)	
2 - 4	S-2		4 - 4 - 6 - 10	16	10				As Above, Loose to Medium Dense (FILL)	
						5.0				
5 - 7	S-3		13 - 20 - 25 - 25	19	45		GLACIAL TILL		Brown, Dense, Silty Sand with Gravel (SM)	
7 - 9	S-4		19 - 21 - 26 - 26	24	47				As Above, Gray (SM)	
						10.0				
10 - 12	S-5		9 - 18 - 21 - 22	19	39				As Above (SM)	
									Boring Log B-5 Terminated Upon Auger Refusal at Depth of 13.0 fbgs.	
						15.0				
						20.0				
						25.0				

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

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-6

Page 1 of 1

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

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

SAMPLE INFORMATION						DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)				
						0.0				
							TS		5" Topsoil	
							SUBSOIL		5" Subsoil, Roots	
0 - 2	S-1	X	2 - 2 - 2 - 3	12	4		EXISTING FILL		Brown, Very Loose to Loose, Silty Sand (FILL)	
2 - 4	S-2	X	3 - 8 - 23 - 18	13	31	3.0			As Above, Medium Dense (FILL)	
							GLACIAL TILL		Brown, Dense, Silty Sand with Gravel (SM)	
						5.0				
5 - 7	S-3	X	13 - 21 - 29 - 30	21	50				As Above, Dense to Very Dense (SM)	
7 - 9	S-4	X	35 - 34 - 40 - 50/3"	18	74				As Above, Gray, Very Dense (SM)	
						10.0				
10 - 12	S-5	X	10 - 17 - 19 - 19	13	36				As Above, Dense (SM)	
									Boring Log B-6 Terminated Upon Auger Refusal at Depth of 13.0 fbgs.	
						15.0				
						20.0				
						25.0				

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

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-7

Page 1 of 1

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

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

SAMPLE INFORMATION						DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)				
						0.0				
0 - 2	S-1		2 - 3 - 3 - 4	11	6		TS		3" Topsoil	
							SUBSOIL		5" Subsoil, Roots	
2 - 4	S-2		4 - 4 - 9 - 22	16	13	3.0	EXISTING FILL		Brown, Loose, Silty Sand (FILL) As Above (FILL)	
						5.0			Gray, Very Dense, Silty Sand with Gravel (SM)	
5 - 7	S-3		12 - 26 - 31 - 36	17	57				As Above, Very Dense (SM)	
7 - 9	S-4		42 - 46 - 43 - 40	23	89				As Above (SM)	
						10.0	GLACIAL TILL			
10 - 12	S-5		18 - 23 - 25 - 46	20	48				As Above, Dense (SM)	
						15.0				
15 - 15.3	S-6		50/3"	3	-				As Above (SM)	
									Boring Log B-7 Terminated Upon Auger Refusal at Depth of 15.3 fbgs.	
						20.0				
						25.0				

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

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Test Pit No.: TP-1

Page 1 of 1

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

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

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

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

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Test Pit No.: TP-2

Page 1 of 1

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

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

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

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

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Test Pit No.: TP-3

Page 1 of 1

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

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

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

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

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Test Pit No.: TP-4

Page 1 of 1

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

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

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

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

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Test Pit No.: TP-5

Page 1 of 1

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

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

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

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

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Test Pit No.: TP-6

Page 1 of 1

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

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

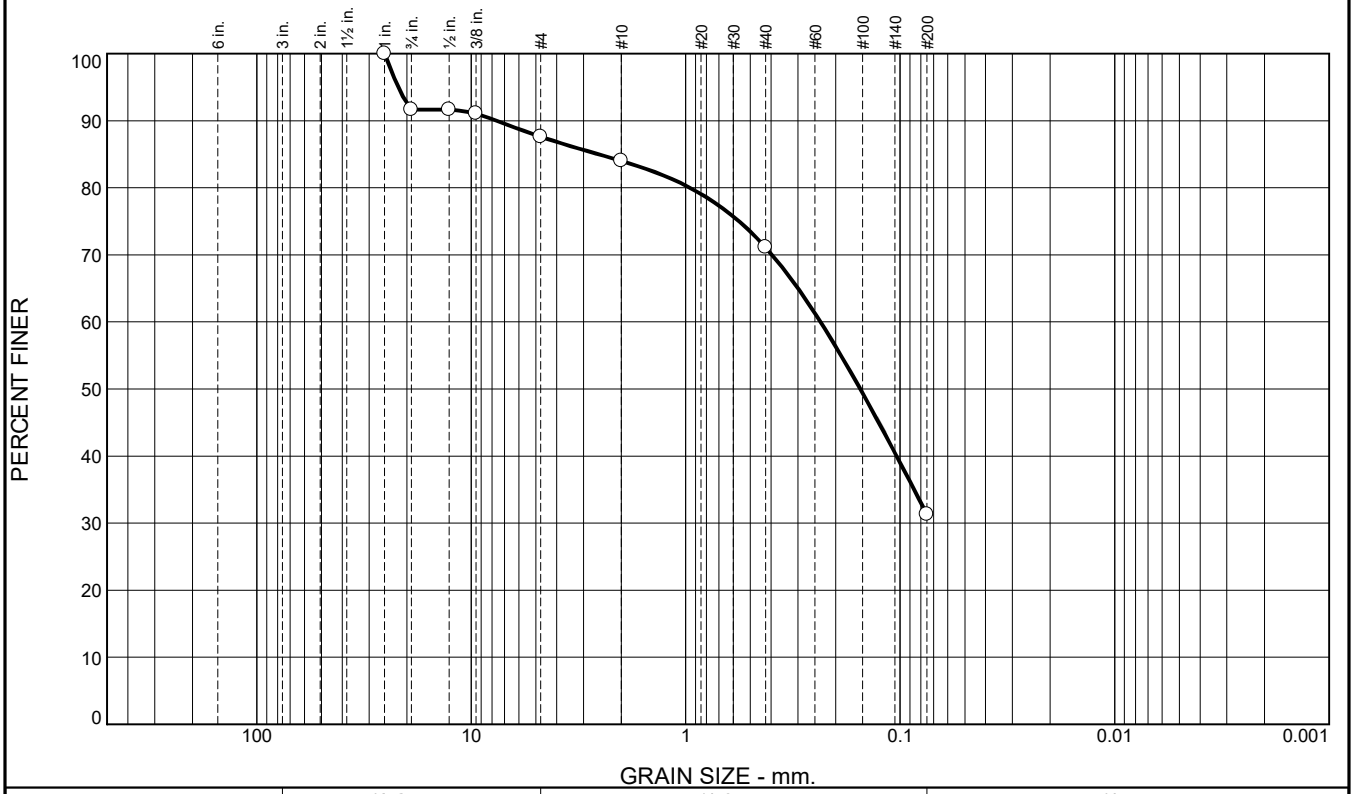
SAMPLE INFORMATION			DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (ft.)	Number	Type	(feet)				
			0.0				No indications of ESHGW
				TOPSOIL		8" Topsoil	
1.5	1	Grab		SUBSOIL		20" Subsoil, Roots	
			5.0	GLACIAL TILL		Brown, Silty Sand with Gravel (SM)	
9	2	Grab					
			10.0		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

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

WHITESTONE

APPENDIX B
Laboratory Test Results

Particle Size Distribution Report



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

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

* (no specification provided)

Material Description

Silty Sand

Atterberg Limits

PL= NP LL= NV PI= NV

Coefficients

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

Classification

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

Remarks

Moisture Content: 10.4%

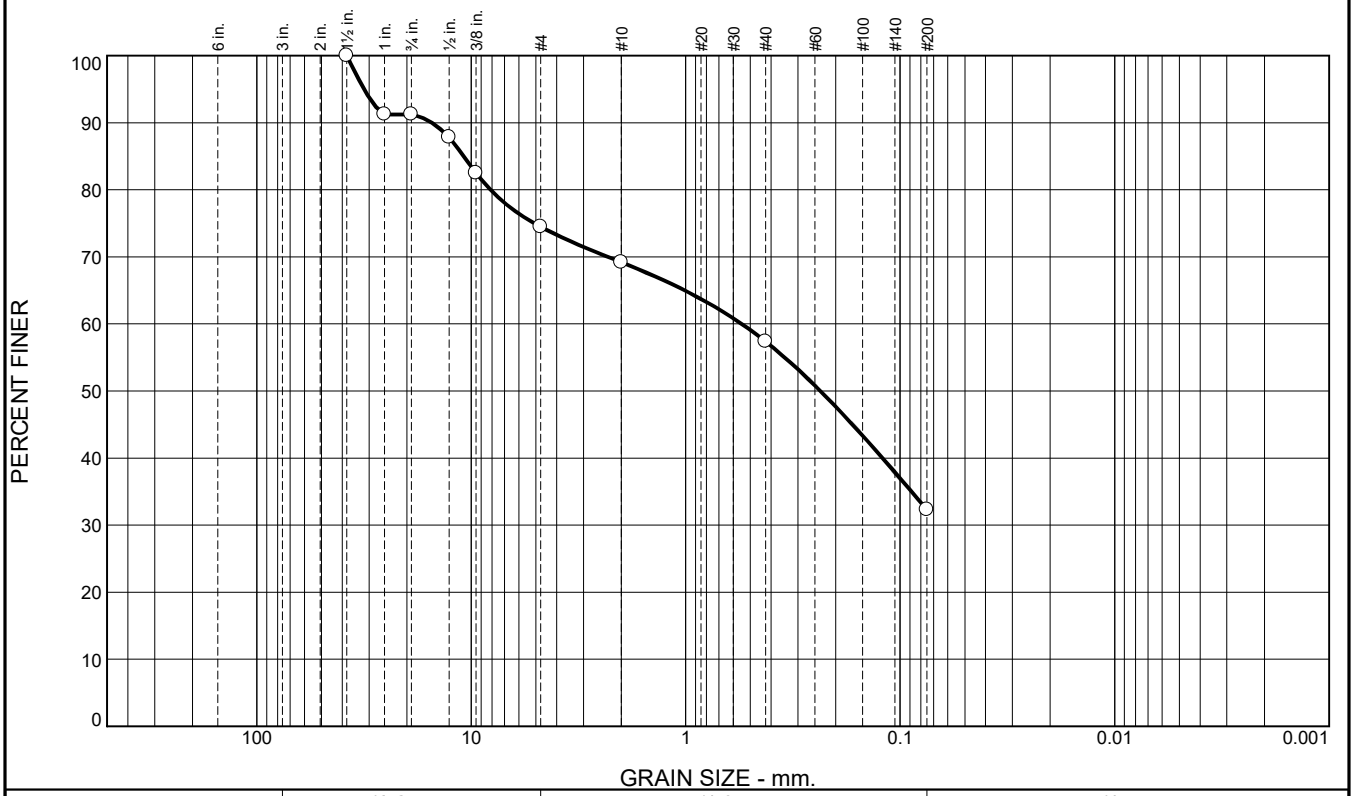
Location: B-1
Sample Number: S-3 **Depth:** 5' - 7' **Date:** 7/15/24

WHITESTONE

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

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

Particle Size Distribution Report



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

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

* (no specification provided)

Material Description

Silty Sand with Gravel

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

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

Classification

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

Remarks

Moisture Content: 7.7%

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

WHITESTONE

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

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

Particle Size Distribution Report

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

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

* (no specification provided)

Material Description

Poorly Graded Sand with Silt and Gravel

Atterberg Limits

PL= NP LL= NV PI= NV

Coefficients

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

Classification

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

Remarks

Moisture Content: 2.0%

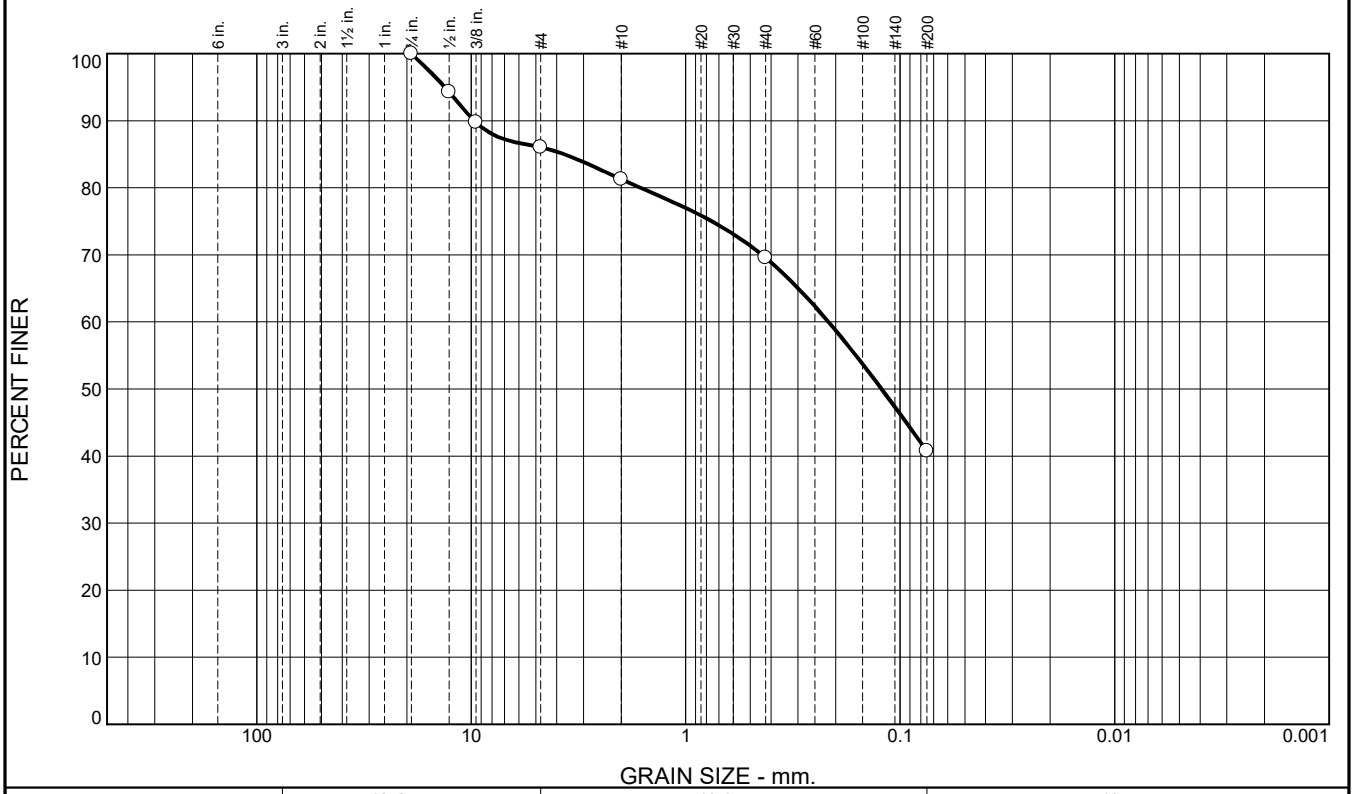
Location: B-4
Sample Number: S-3 **Depth:** 5' - 7' **Date:** 8/30/24

WHITESTONE

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

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

Particle Size Distribution Report



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

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

* (no specification provided)

Material Description

Silty Sand

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

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

Classification

USCS= SM AASHTO= A-4(0)

Remarks

Moisture Content: 6.3%

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

WHITESTONE

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

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

Particle Size Distribution Report

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

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

* (no specification provided)

Material Description

Poorly Graded Sand with Gravel

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

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

Classification

USCS= SP AASHTO= A-1-b

Remarks

Moisture Content: 1.1%

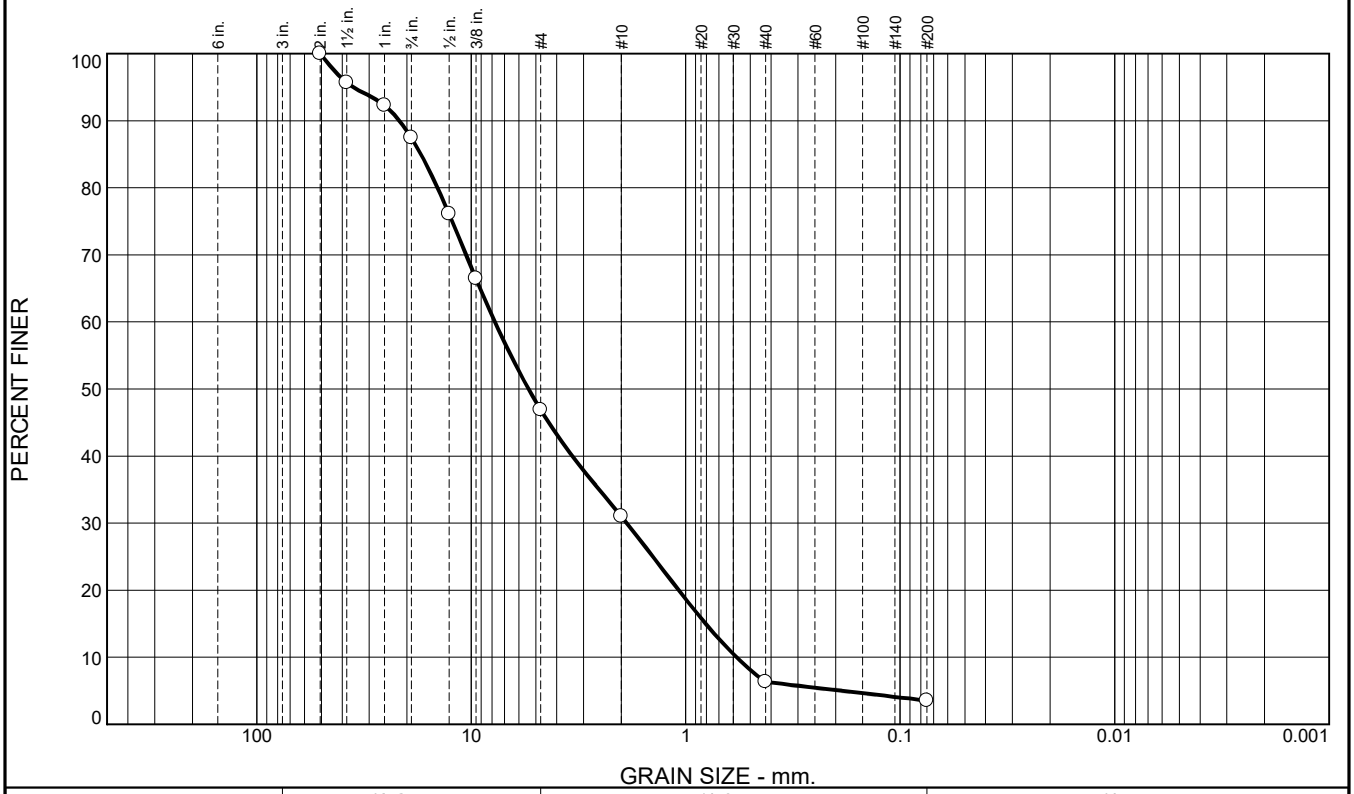
Location: TP-1
Sample Number: S-2 **Depth:** 6' **Date:** 9/19/24

WHITESTONE

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

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

Particle Size Distribution Report



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

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

* (no specification provided)

Material Description

Poorly Graded Gravel with Sand

Atterberg Limits

PL= NP LL= NV PI= NV

Coefficients

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

Classification

USCS= GP AASHTO= A-1-a

Remarks

Moisture Content: 1.0%

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

WHITESTONE

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

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

WHITESTONE

APPENDIX C
Supplemental Information (USCS, Terms & Symbols)

WHITESTONE
An Employee-Owned Company

352 TURNPIKE ROAD
SUITE 105
SOUTHBOROUGH, MA 01772
508.485.0755
whitestoneassoc.com

UNIFIED SOIL CLASSIFICATION SYSTEM

SOIL CLASSIFICATION CHART

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

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

GRADATION*

% FINER BY WEIGHT

TRACE..... 1% TO 10%
LITTLE..... 10% TO 20%
SOME..... 20% TO 35%
AND..... 35% TO 50%

COMPACTNESS*
Sand and/or Gravel

RELATIVE DENSITY

LOOSE. ..... 0% TO 40%
MEDIUM DENSE.... 40% TO 70%
DENSE..... 70% TO 90%
VERY DENSE..... 90% TO 100%

CONSISTENCY*
Clay and/or Silt

RANGE OF SHEARING STRENGTH IN POUNDS PER SQUARE FOOT

VERY SOFT..... LESS THAN 250
SOFT..... ..... 250 TO 500
MEDIUM..... 500 TO 1000
STIFF..... 1000 TO 2000
VERY STIFF..... 2000 TO 4000
HARD..... GREATER THAN 4000

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

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An Employee-Owned Company

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SOUTHBOROUGH, MA 01772
508.485.0755
whitestoneassoc.com

GEOTECHNICAL TERMS AND SYMBOLS

SAMPLE IDENTIFICATION

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

SOIL PROPERTY SYMBOLS

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

DRILLING AND SAMPLING SYMBOLS

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

RELATIVE DENSITY AND CONSISTENCY CLASSIFICATION

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

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

PARTICLE SIZE

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

APPENDIX D: EXISTING CONDITIONS HYDROLOGIC ANALYSIS

- *EXISTING CONDITIONS DRAINAGE MAP*
- *EXISTING CONDITIONS HYDROCAD COMPUTATIONS*

LEGEND

- DP# — DESIGN POINT
- EX-# — EXISTING SUBCATCHMENT
- A/B/C/D — HYDROLOGIC SOIL GROUP RATING
- OVERALL ANALYSIS BOUNDARY
- SUBCATCHMENT BOUNDARY
- TIME OF CONCENTRATION
- CONCRETE OR PAVEMENT
- GRASS OR LANDSCAPED AREA
- WOODS / UNDEVELOPED AREA

EXISTING CONDITIONS DRAINAGE AREA MAP

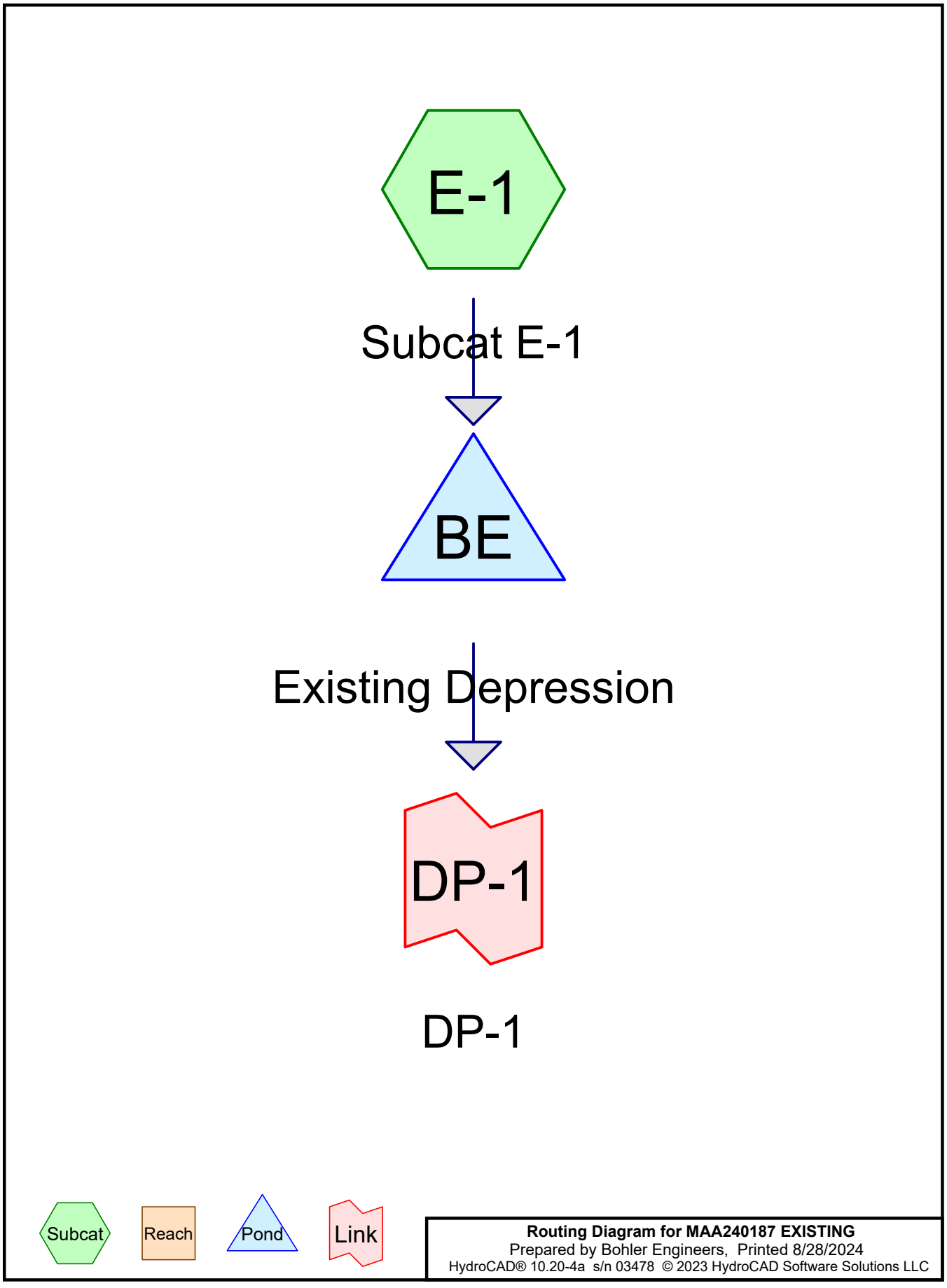
0 BLUE HILL AVENUE
MILTON, MASSACHUSETTS

PREPARED BY

BOHLER

SCALE:1"=150' DATE: 08/28/2024

P:\2024\MAA240187.00\CAD\Drawings\Plan Sets\Civil Site Plans\P-CIVL-HYDR-MAA240187.00-0a.dwg



Routing Diagram for MAA240187 EXISTING
Prepared by Bohler Engineers, Printed 8/28/2024
HydroCAD® 10.20-4a s/n 03478 © 2023 HydroCAD Software Solutions LLC

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E-1: Subcat E-1 Runoff Area=6.873 ac 2.10% Impervious Runoff Depth=0.29"
Flow Length=1,400' Tc=10.0 min CN=54 Runoff=0.83 cfs 0.165 af

Pond BE: Existing Depression Peak Elev=57.28' Storage=1,346 cf Inflow=0.83 cfs 0.165 af
Discarded=0.28 cfs 0.165 af Primary=0.00 cfs 0.000 af Outflow=0.28 cfs 0.165 af

Link DP-1: DP-1 Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Total Runoff Area = 6.873 ac Runoff Volume = 0.165 af Average Runoff Depth = 0.29"
97.90% Pervious = 6.729 ac 2.10% Impervious = 0.144 ac

Summary for Subcatchment E-1: Subcat E-1

Runoff = 0.83 cfs @ 12.38 hrs, Volume= 0.165 af, Depth= 0.29"
Routed to Pond BE : Existing Depression

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 yr Rainfall=3.42"

Area (ac)	CN	Description
0.612	77	2 acre lots, 12% imp, HSG C
0.073	39	>75% Grass cover, Good, HSG A
0.555	74	>75% Grass cover, Good, HSG C
0.024	98	Paved parking, HSG A
0.026	98	Paved parking, HSG C
0.001	98	Roofs, HSG A
0.020	98	Roofs, HSG C
2.951	30	Woods, Good, HSG A
2.613	70	Woods, Good, HSG C
6.873	54	Weighted Average
6.729		97.90% Pervious Area
0.144		2.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	100	0.0700	0.29		**Sheet Flow, Lawn** Grass: Short n= 0.150 P2= 3.42"
4.3	1,300	0.0990	5.07		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
10.0	1,400	Total			

Summary for Pond BE: Existing Depression

Inflow Area = 6.873 ac, 2.10% Impervious, Inflow Depth = 0.29" for 2 yr event
Inflow = 0.83 cfs @ 12.38 hrs, Volume= 0.165 af
Outflow = 0.28 cfs @ 13.76 hrs, Volume= 0.165 af, Atten= 67%, Lag= 82.7 min
Discarded = 0.28 cfs @ 13.76 hrs, Volume= 0.165 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link DP-1 : DP-1

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 57.28' @ 13.76 hrs Surf.Area= 4,933 sf Storage= 1,346 cf

Plug-Flow detention time= 92.8 min calculated for 0.165 af (100% of inflow)
Center-of-Mass det. time= 93.1 min (1,046.9 - 953.7)

Volume	Invert	Avail.Storage	Storage Description
#1	55.80'	36,533 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
55.80	0	0	0
56.00	164	16	16
57.00	868	516	532
58.00	15,363	8,116	8,648
59.00	2,116	8,740	17,387
60.00	2,779	2,448	19,835
61.00	3,429	3,104	22,939
62.00	4,137	3,783	26,722
63.00	4,865	4,501	31,223
64.00	5,756	5,311	36,533

Device	Routing	Invert	Outlet Devices
#1	Discarded	55.80'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	63.50'	**10.0' long x 10.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=0.28 cfs @ 13.76 hrs HW=57.28' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.28 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=55.80' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Link DP-1: DP-1

Inflow Area = 6.873 ac, 2.10% Impervious, Inflow Depth = 0.00" for 2 yr event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E-1: Subcat E-1 Runoff Area=6.873 ac 2.10% Impervious Runoff Depth=1.09"
Flow Length=1,400' Tc=10.0 min CN=54 Runoff=6.14 cfs 0.623 af

Pond BE: Existing Depression Peak Elev=58.06' Storage=9,591 cf Inflow=6.14 cfs 0.623 af
Discarded=0.86 cfs 0.623 af Primary=0.00 cfs 0.000 af Outflow=0.86 cfs 0.623 af

Link DP-1: DP-1 Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Total Runoff Area = 6.873 ac Runoff Volume = 0.623 af Average Runoff Depth = 1.09"
97.90% Pervious = 6.729 ac 2.10% Impervious = 0.144 ac

Summary for Subcatchment E-1: Subcat E-1

Runoff = 6.14 cfs @ 12.17 hrs, Volume= 0.623 af, Depth= 1.09"
Routed to Pond BE : Existing Depression

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 yr Rainfall=5.34"

Area (ac)	CN	Description
0.612	77	2 acre lots, 12% imp, HSG C
0.073	39	>75% Grass cover, Good, HSG A
0.555	74	>75% Grass cover, Good, HSG C
0.024	98	Paved parking, HSG A
0.026	98	Paved parking, HSG C
0.001	98	Roofs, HSG A
0.020	98	Roofs, HSG C
2.951	30	Woods, Good, HSG A
2.613	70	Woods, Good, HSG C
6.873	54	Weighted Average
6.729		97.90% Pervious Area
0.144		2.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	100	0.0700	0.29		**Sheet Flow, Lawn** Grass: Short n= 0.150 P2= 3.42"
4.3	1,300	0.0990	5.07		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
10.0	1,400	Total			

Summary for Pond BE: Existing Depression

Inflow Area = 6.873 ac, 2.10% Impervious, Inflow Depth = 1.09" for 10 yr event
Inflow = 6.14 cfs @ 12.17 hrs, Volume= 0.623 af
Outflow = 0.86 cfs @ 12.76 hrs, Volume= 0.623 af, Atten= 86%, Lag= 35.2 min
Discarded = 0.86 cfs @ 12.76 hrs, Volume= 0.623 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link DP-1 : DP-1

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 58.06' @ 13.97 hrs Surf.Area= 14,527 sf Storage= 9,591 cf

Plug-Flow detention time= 145.4 min calculated for 0.623 af (100% of inflow)
Center-of-Mass det. time= 145.2 min (1,039.2 - 894.0)

Volume	Invert	Avail.Storage	Storage Description
#1	55.80'	36,533 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
55.80	0	0	0
56.00	164	16	16
57.00	868	516	532
58.00	15,363	8,116	8,648
59.00	2,116	8,740	17,387
60.00	2,779	2,448	19,835
61.00	3,429	3,104	22,939
62.00	4,137	3,783	26,722
63.00	4,865	4,501	31,223
64.00	5,756	5,311	36,533

Device	Routing	Invert	Outlet Devices
#1	Discarded	55.80'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	63.50'	**10.0' long x 10.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=0.86 cfs @ 12.76 hrs HW=58.00' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.86 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=55.80' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Link DP-1: DP-1

Inflow Area = 6.873 ac, 2.10% Impervious, Inflow Depth = 0.00" for 10 yr event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E-1: Subcat E-1 Runoff Area=6.873 ac 2.10% Impervious Runoff Depth=1.75"
Flow Length=1,400' Tc=10.0 min CN=54 Runoff=10.94 cfs 1.000 af

Pond BE: Existing Depression Peak Elev=63.10' Storage=31,734 cf Inflow=10.94 cfs 1.000 af
Discarded=0.83 cfs 0.497 af Primary=0.00 cfs 0.000 af Outflow=0.83 cfs 0.497 af

Link DP-1: DP-1 Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Total Runoff Area = 6.873 ac Runoff Volume = 1.000 af Average Runoff Depth = 1.75"
97.90% Pervious = 6.729 ac 2.10% Impervious = 0.144 ac

Summary for Subcatchment E-1: Subcat E-1

Runoff = 10.94 cfs @ 12.16 hrs, Volume= 1.000 af, Depth= 1.75"
Routed to Pond BE : Existing Depression

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 yr Rainfall=6.53"

Area (ac)	CN	Description
0.612	77	2 acre lots, 12% imp, HSG C
0.073	39	>75% Grass cover, Good, HSG A
0.555	74	>75% Grass cover, Good, HSG C
0.024	98	Paved parking, HSG A
0.026	98	Paved parking, HSG C
0.001	98	Roofs, HSG A
0.020	98	Roofs, HSG C
2.951	30	Woods, Good, HSG A
2.613	70	Woods, Good, HSG C
6.873	54	Weighted Average
6.729		97.90% Pervious Area
0.144		2.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	100	0.0700	0.29		**Sheet Flow, Lawn** Grass: Short n= 0.150 P2= 3.42"
4.3	1,300	0.0990	5.07		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
10.0	1,400	Total			

Summary for Pond BE: Existing Depression

Inflow Area = 6.873 ac, 2.10% Impervious, Inflow Depth = 1.75" for 25 yr event
Inflow = 10.94 cfs @ 12.16 hrs, Volume= 1.000 af
Outflow = 0.83 cfs @ 12.24 hrs, Volume= 0.497 af, Atten= 92%, Lag= 4.8 min
Discarded = 0.83 cfs @ 12.24 hrs, Volume= 0.497 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link DP-1 : DP-1

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 63.10' @ 22.44 hrs Surf.Area= 4,958 sf Storage= 31,734 cf

Plug-Flow detention time= 651.0 min calculated for 0.497 af (50% of inflow)
Center-of-Mass det. time= 513.7 min (1,391.2 - 877.5)

Volume	Invert	Avail.Storage	Storage Description
#1	55.80'	36,533 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
55.80	0	0	0
56.00	164	16	16
57.00	868	516	532
58.00	15,363	8,116	8,648
59.00	2,116	8,740	17,387
60.00	2,779	2,448	19,835
61.00	3,429	3,104	22,939
62.00	4,137	3,783	26,722
63.00	4,865	4,501	31,223
64.00	5,756	5,311	36,533

Device	Routing	Invert	Outlet Devices
#1	Discarded	55.80'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	63.50'	**10.0' long x 10.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=0.85 cfs @ 12.24 hrs HW=58.01' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.85 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=55.80' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Link DP-1: DP-1

Inflow Area = 6.873 ac, 2.10% Impervious, Inflow Depth = 0.00" for 25 yr event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E-1: Subcat E-1 Runoff Area=6.873 ac 2.10% Impervious Runoff Depth=2.93"
Flow Length=1,400' Tc=10.0 min CN=54 Runoff=19.59 cfs 1.680 af

Pond BE: Existing Depression Peak Elev=63.71' Storage=34,928 cf Inflow=19.59 cfs 1.680 af
Discarded=0.86 cfs 0.699 af Primary=2.53 cfs 0.445 af Outflow=2.83 cfs 1.143 af

Link DP-1: DP-1 Inflow=2.53 cfs 0.445 af
Primary=2.53 cfs 0.445 af

Total Runoff Area = 6.873 ac Runoff Volume = 1.680 af Average Runoff Depth = 2.93"
97.90% Pervious = 6.729 ac 2.10% Impervious = 0.144 ac

Summary for Subcatchment E-1: Subcat E-1

Runoff = 19.59 cfs @ 12.15 hrs, Volume= 1.680 af, Depth= 2.93"
Routed to Pond BE : Existing Depression

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 yr Rainfall=8.38"

Area (ac)	CN	Description
0.612	77	2 acre lots, 12% imp, HSG C
0.073	39	>75% Grass cover, Good, HSG A
0.555	74	>75% Grass cover, Good, HSG C
0.024	98	Paved parking, HSG A
0.026	98	Paved parking, HSG C
0.001	98	Roofs, HSG A
0.020	98	Roofs, HSG C
2.951	30	Woods, Good, HSG A
2.613	70	Woods, Good, HSG C
6.873	54	Weighted Average
6.729		97.90% Pervious Area
0.144		2.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	100	0.0700	0.29		**Sheet Flow, Lawn** Grass: Short n= 0.150 P2= 3.42"
4.3	1,300	0.0990	5.07		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
10.0	1,400	Total			

Summary for Pond BE: Existing Depression

Inflow Area = 6.873 ac, 2.10% Impervious, Inflow Depth = 2.93" for 100 yr event
Inflow = 19.59 cfs @ 12.15 hrs, Volume= 1.680 af
Outflow = 2.83 cfs @ 13.02 hrs, Volume= 1.143 af, Atten= 86%, Lag= 52.3 min
Discarded = 0.86 cfs @ 17.00 hrs, Volume= 0.699 af
Primary = 2.53 cfs @ 13.02 hrs, Volume= 0.445 af
Routed to Link DP-1 : DP-1

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 63.71' @ 13.02 hrs Surf.Area= 5,502 sf Storage= 34,928 cf

Plug-Flow detention time= 391.7 min calculated for 1.143 af (68% of inflow)
Center-of-Mass det. time= 285.0 min (1,146.0 - 861.0)

Volume	Invert	Avail.Storage	Storage Description
#1	55.80'	36,533 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
55.80	0	0	0
56.00	164	16	16
57.00	868	516	532
58.00	15,363	8,116	8,648
59.00	2,116	8,740	17,387
60.00	2,779	2,448	19,835
61.00	3,429	3,104	22,939
62.00	4,137	3,783	26,722
63.00	4,865	4,501	31,223
64.00	5,756	5,311	36,533

Device	Routing	Invert	Outlet Devices
#1	Discarded	55.80'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	63.50'	**10.0' long x 10.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=0.30 cfs @ 17.00 hrs HW=63.58' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.30 cfs)

Primary OutFlow Max=2.47 cfs @ 13.02 hrs HW=63.71' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 2.47 cfs @ 1.15 fps)

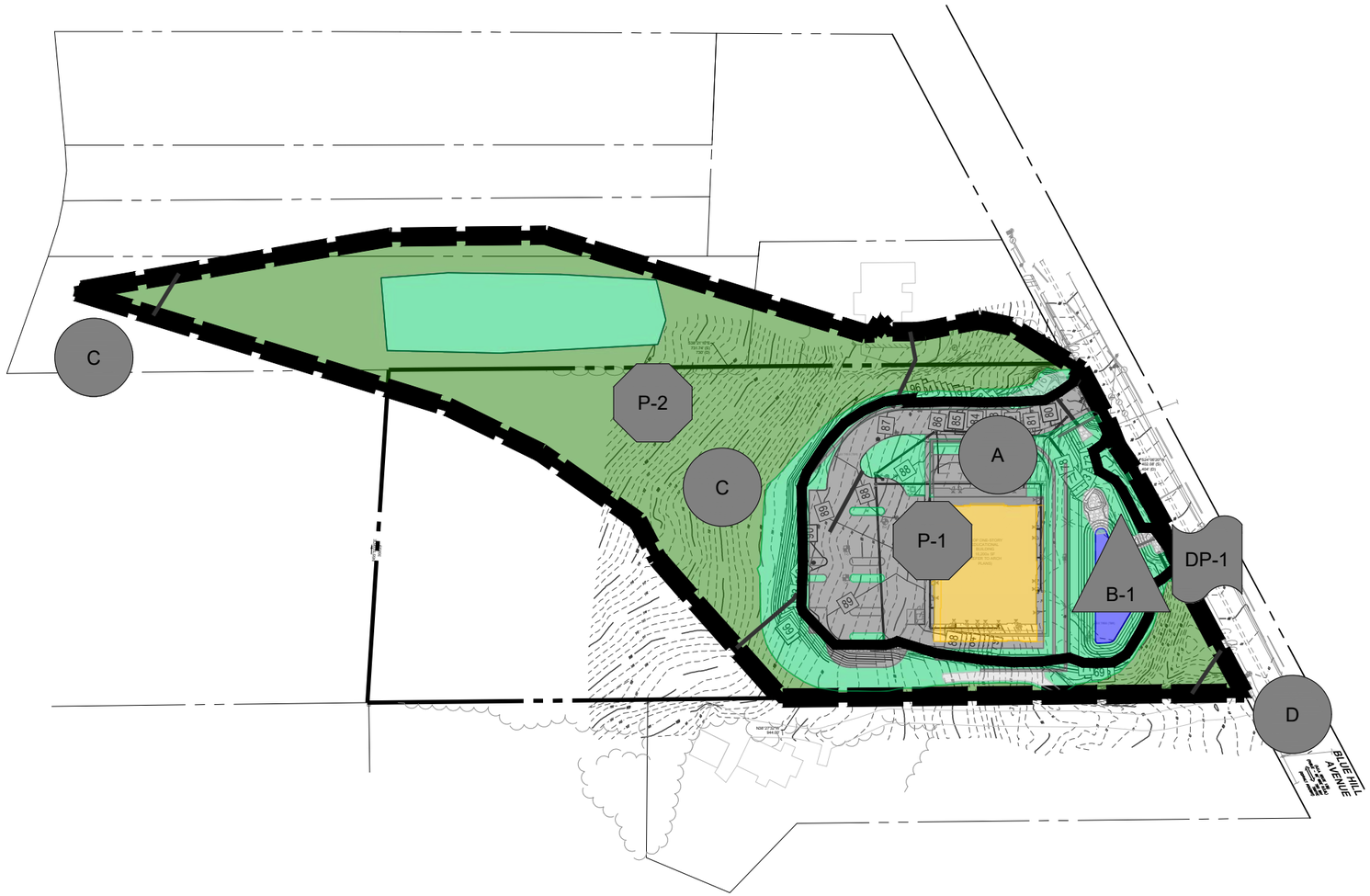
Summary for Link DP-1: DP-1

Inflow Area = 6.873 ac, 2.10% Impervious, Inflow Depth = 0.78" for 100 yr event
Inflow = 2.53 cfs @ 13.02 hrs, Volume= 0.445 af
Primary = 2.53 cfs @ 13.02 hrs, Volume= 0.445 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

APPENDIX E: PROPOSED CONDITIONS HYDROLOGIC ANALYSIS

- *PROPOSED CONDITIONS DRAINAGE MAP*
- *PROPOSED CONDITIONS HYDROCAD CALCULATIONS*



LEGEND

- DP# — DESIGN POINT
- EX-# — PROPOSED SUBCATCHMENT
- XX# — BASIN OR MODELED DRAINAGE STRUCTURE
- A/B/C/D — HYDROLOGIC SOIL GROUP RATING
- OVERALL ANALYSIS BOUNDARY
- SUBCATCHMENT BOUNDARY
- TIME OF CONCENTRATION
- CONCRETE OR PAVEMENT
- ROOF
- GRASS OR LANDSCAPED AREA
- WOODS / UNDEVELOPED AREA
- GRAVEL AREA

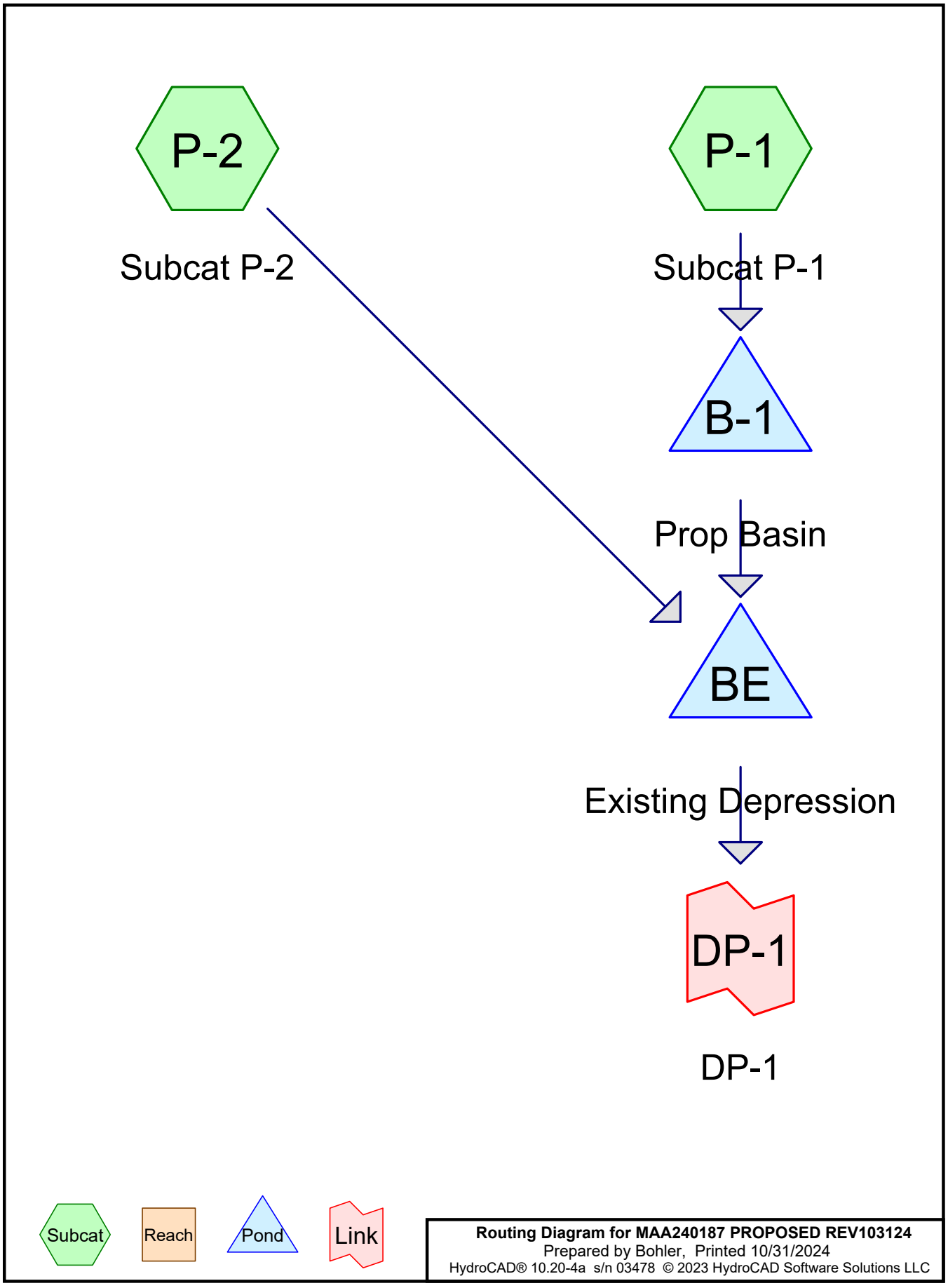
PROPOSED CONDITIONS DRAINAGE AREA MAP

0 BLUE HILL AVENUE
MILTON, MASSACHUSETTS

PREPARED BY

BOHLER

SCALE:1"=150' DATE: 08/28/2024



Routing Diagram for MAA240187 PROPOSED REV103124
Prepared by Bohler, Printed 10/31/2024
HydroCAD® 10.20-4a s/n 03478 © 2023 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.612	77	2 acre lots, 12% imp, HSG C (P-2)
0.924	39	>75% Grass cover, Good, HSG A (P-1, P-2)
1.094	74	>75% Grass cover, Good, HSG C (P-1, P-2)
0.047	98	Paved parking, HSG A (P-2)
0.787	98	Paved parking, HSG C (P-1, P-2)
0.373	98	Roofs, HSG A (P-1, P-2)
0.020	98	Roofs, HSG C (P-2)
0.955	30	Woods, Good, HSG A (P-2)
2.061	70	Woods, Good, HSG C (P-2)
6.873	**67**	**TOTAL AREA**

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P-1: Subcat P-1 Runoff Area=2.168 ac 52.26% Impervious Runoff Depth=1.37"
Tc=6.0 min CN=77 Runoff=3.36 cfs 0.248 af

Subcatchment P-2: Subcat P-2 Runoff Area=4.705 ac 3.56% Impervious Runoff Depth=0.58"
Flow Length=1,400' Tc=10.0 min CN=62 Runoff=1.98 cfs 0.227 af

Pond B-1: Prop Basin Peak Elev=67.20' Storage=4,796 cf Inflow=3.36 cfs 0.248 af
Discarded=0.25 cfs 0.248 af Primary=0.00 cfs 0.000 af Outflow=0.25 cfs 0.248 af

Pond BE: Existing Depression Peak Elev=57.49' Storage=2,664 cf Inflow=1.98 cfs 0.227 af
Discarded=0.44 cfs 0.227 af Primary=0.00 cfs 0.000 af Outflow=0.44 cfs 0.227 af

Link DP-1: DP-1 Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Total Runoff Area = 6.873 ac Runoff Volume = 0.475 af Average Runoff Depth = 0.83"
81.08% Pervious = 5.573 ac 18.92% Impervious = 1.300 ac

Summary for Subcatchment P-1: Subcat P-1

Runoff = 3.36 cfs @ 12.10 hrs, Volume= 0.248 af, Depth= 1.37"
Routed to Pond B-1 : Prop Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 yr Rainfall=3.42"

Area (ac)	CN	Description
0.587	39	>75% Grass cover, Good, HSG A
0.448	74	>75% Grass cover, Good, HSG C
0.761	98	Paved parking, HSG C
0.372	98	Roofs, HSG A
2.168	77	Weighted Average
1.035		47.74% Pervious Area
1.133		52.26% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment P-2: Subcat P-2

Runoff = 1.98 cfs @ 12.18 hrs, Volume= 0.227 af, Depth= 0.58"
Routed to Pond BE : Existing Depression

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 yr Rainfall=3.42"

Area (ac)	CN	Description
0.612	77	2 acre lots, 12% imp, HSG C
0.337	39	>75% Grass cover, Good, HSG A
0.646	74	>75% Grass cover, Good, HSG C
0.047	98	Paved parking, HSG A
0.026	98	Paved parking, HSG C
0.001	98	Roofs, HSG A
0.020	98	Roofs, HSG C
0.955	30	Woods, Good, HSG A
2.061	70	Woods, Good, HSG C
4.705	62	Weighted Average
4.538		96.44% Pervious Area
0.167		3.56% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	100	0.0700	0.29		**Sheet Flow, Lawn** Grass: Short n= 0.150 P2= 3.42"
4.3	1,300	0.0990	5.07		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
10.0	1,400	Total			

Summary for Pond B-1: Prop Basin

Inflow Area = 2.168 ac, 52.26% Impervious, Inflow Depth = 1.37" for 2 yr event
Inflow = 3.36 cfs @ 12.10 hrs, Volume= 0.248 af
Outflow = 0.25 cfs @ 14.01 hrs, Volume= 0.248 af, Atten= 92%, Lag= 114.6 min
Discarded = 0.25 cfs @ 14.01 hrs, Volume= 0.248 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond BE : Existing Depression

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 67.20' @ 14.01 hrs Surf.Area= 4,541 sf Storage= 4,796 cf

Plug-Flow detention time= 204.1 min calculated for 0.247 af (100% of inflow)
Center-of-Mass det. time= 203.9 min (1,052.6 - 848.7)

Volume	Invert	Avail.Storage	Storage Description
#1	66.00'	30,245 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
66.00	3,486	0	0
67.00	4,359	3,923	3,923
68.00	5,288	4,824	8,746
69.00	6,274	5,781	14,527
70.00	7,906	7,090	21,617
71.00	9,349	8,628	30,245

Device	Routing	Invert	Outlet Devices
#1	Discarded	66.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	66.00'	**15.0" Round Culvert** L= 44.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 66.00' / 65.75' S= 0.0057 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf
#3	Device 2	70.30'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.25 cfs @ 14.01 hrs HW=67.20' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.25 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=66.00' (Free Discharge)
└**2=Culvert** (Controls 0.00 cfs)
└**3=Orifice/Grate** (Controls 0.00 cfs)

Summary for Pond BE: Existing Depression

Inflow Area = 6.873 ac, 18.92% Impervious, Inflow Depth = 0.40" for 2 yr event
Inflow = 1.98 cfs @ 12.18 hrs, Volume= 0.227 af
Outflow = 0.44 cfs @ 13.02 hrs, Volume= 0.227 af, Atten= 78%, Lag= 50.7 min
Discarded = 0.44 cfs @ 13.02 hrs, Volume= 0.227 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link DP-1 : DP-1

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 57.49' @ 13.02 hrs Surf.Area= 7,909 sf Storage= 2,664 cf

Plug-Flow detention time= 96.5 min calculated for 0.227 af (100% of inflow)
Center-of-Mass det. time= 96.3 min (1,001.9 - 905.6)

Volume	Invert	Avail.Storage	Storage Description
#1	55.80'	36,533 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
55.80	0	0	0
56.00	164	16	16
57.00	868	516	532
58.00	15,363	8,116	8,648
59.00	2,116	8,740	17,387
60.00	2,779	2,448	19,835
61.00	3,429	3,104	22,939
62.00	4,137	3,783	26,722
63.00	4,865	4,501	31,223
64.00	5,756	5,311	36,533

Device	Routing	Invert	Outlet Devices
#1	Discarded	55.80'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	63.50'	**10.0' long x 10.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=0.44 cfs @ 13.02 hrs HW=57.49' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.44 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=55.80' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Link DP-1: DP-1

Inflow Area = 6.873 ac, 18.92% Impervious, Inflow Depth = 0.00" for 2 yr event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P-1: Subcat P-1 Runoff Area=2.168 ac 52.26% Impervious Runoff Depth=2.91"
Tc=6.0 min CN=77 Runoff=7.25 cfs 0.526 af

Subcatchment P-2: Subcat P-2 Runoff Area=4.705 ac 3.56% Impervious Runoff Depth=1.65"
Flow Length=1,400' Tc=10.0 min CN=62 Runoff=7.37 cfs 0.648 af

Pond B-1: Prop Basin Peak Elev=68.70' Storage=12,677 cf Inflow=7.25 cfs 0.526 af
Discarded=0.33 cfs 0.526 af Primary=0.00 cfs 0.000 af Outflow=0.33 cfs 0.526 af

Pond BE: Existing Depression Peak Elev=58.26' Storage=12,218 cf Inflow=7.37 cfs 0.648 af
Discarded=0.86 cfs 0.648 af Primary=0.00 cfs 0.000 af Outflow=0.86 cfs 0.648 af

Link DP-1: DP-1 Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Total Runoff Area = 6.873 ac Runoff Volume = 1.174 af Average Runoff Depth = 2.05"
81.08% Pervious = 5.573 ac 18.92% Impervious = 1.300 ac

Summary for Subcatchment P-1: Subcat P-1

Runoff = 7.25 cfs @ 12.09 hrs, Volume= 0.526 af, Depth= 2.91"
Routed to Pond B-1 : Prop Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 yr Rainfall=5.34"

Area (ac)	CN	Description
0.587	39	>75% Grass cover, Good, HSG A
0.448	74	>75% Grass cover, Good, HSG C
0.761	98	Paved parking, HSG C
0.372	98	Roofs, HSG A
2.168	77	Weighted Average
1.035		47.74% Pervious Area
1.133		52.26% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment P-2: Subcat P-2

Runoff = 7.37 cfs @ 12.16 hrs, Volume= 0.648 af, Depth= 1.65"
Routed to Pond BE : Existing Depression

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 yr Rainfall=5.34"

Area (ac)	CN	Description
0.612	77	2 acre lots, 12% imp, HSG C
0.337	39	>75% Grass cover, Good, HSG A
0.646	74	>75% Grass cover, Good, HSG C
0.047	98	Paved parking, HSG A
0.026	98	Paved parking, HSG C
0.001	98	Roofs, HSG A
0.020	98	Roofs, HSG C
0.955	30	Woods, Good, HSG A
2.061	70	Woods, Good, HSG C
4.705	62	Weighted Average
4.538		96.44% Pervious Area
0.167		3.56% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	100	0.0700	0.29		**Sheet Flow, Lawn** Grass: Short n= 0.150 P2= 3.42"
4.3	1,300	0.0990	5.07		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
10.0	1,400	Total			

Summary for Pond B-1: Prop Basin

Inflow Area = 2.168 ac, 52.26% Impervious, Inflow Depth = 2.91" for 10 yr event
Inflow = 7.25 cfs @ 12.09 hrs, Volume= 0.526 af
Outflow = 0.33 cfs @ 15.32 hrs, Volume= 0.526 af, Atten= 95%, Lag= 193.4 min
Discarded = 0.33 cfs @ 15.32 hrs, Volume= 0.526 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond BE : Existing Depression

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 68.70' @ 15.32 hrs Surf.Area= 5,976 sf Storage= 12,677 cf

Plug-Flow detention time= 426.7 min calculated for 0.525 af (100% of inflow)
Center-of-Mass det. time= 426.9 min (1,253.6 - 826.7)

Volume	Invert	Avail.Storage	Storage Description
#1	66.00'	30,245 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
66.00	3,486	0	0
67.00	4,359	3,923	3,923
68.00	5,288	4,824	8,746
69.00	6,274	5,781	14,527
70.00	7,906	7,090	21,617
71.00	9,349	8,628	30,245

Device	Routing	Invert	Outlet Devices
#1	Discarded	66.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	66.00'	**15.0" Round Culvert** L= 44.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 66.00' / 65.75' S= 0.0057 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf
#3	Device 2	70.30'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.33 cfs @ 15.32 hrs HW=68.70' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.33 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=66.00' (Free Discharge)
└**2=Culvert** (Controls 0.00 cfs)
└**3=Orifice/Grate** (Controls 0.00 cfs)

Summary for Pond BE: Existing Depression

Inflow Area = 6.873 ac, 18.92% Impervious, Inflow Depth = 1.13" for 10 yr event
Inflow = 7.37 cfs @ 12.16 hrs, Volume= 0.648 af
Outflow = 0.86 cfs @ 17.77 hrs, Volume= 0.648 af, Atten= 88%, Lag= 337.0 min
Discarded = 0.86 cfs @ 17.77 hrs, Volume= 0.648 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link DP-1 : DP-1

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 58.26' @ 14.38 hrs Surf.Area= 11,893 sf Storage= 12,218 cf

Plug-Flow detention time= 191.0 min calculated for 0.648 af (100% of inflow)
Center-of-Mass det. time= 190.8 min (1,059.4 - 868.6)

Volume	Invert	Avail.Storage	Storage Description
#1	55.80'	36,533 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
55.80	0	0	0
56.00	164	16	16
57.00	868	516	532
58.00	15,363	8,116	8,648
59.00	2,116	8,740	17,387
60.00	2,779	2,448	19,835
61.00	3,429	3,104	22,939
62.00	4,137	3,783	26,722
63.00	4,865	4,501	31,223
64.00	5,756	5,311	36,533

Device	Routing	Invert	Outlet Devices
#1	Discarded	55.80'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	63.50'	**10.0' long x 10.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=0.86 cfs @ 17.77 hrs HW=58.00' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.86 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=55.80' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Link DP-1: DP-1

Inflow Area = 6.873 ac, 18.92% Impervious, Inflow Depth = 0.00" for 10 yr event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P-1: Subcat P-1 Runoff Area=2.168 ac 52.26% Impervious Runoff Depth=3.95"
Tc=6.0 min CN=77 Runoff=9.81 cfs 0.713 af

Subcatchment P-2: Subcat P-2 Runoff Area=4.705 ac 3.56% Impervious Runoff Depth=2.46"
Flow Length=1,400' Tc=10.0 min CN=62 Runoff=11.38 cfs 0.965 af

Pond B-1: Prop Basin Peak Elev=69.55' Storage=18,238 cf Inflow=9.81 cfs 0.713 af
Discarded=0.40 cfs 0.687 af Primary=0.00 cfs 0.000 af Outflow=0.40 cfs 0.687 af

Pond BE: Existing Depression Peak Elev=62.82' Storage=30,361 cf Inflow=11.38 cfs 0.965 af
Discarded=0.82 cfs 0.487 af Primary=0.00 cfs 0.000 af Outflow=0.82 cfs 0.487 af

Link DP-1: DP-1 Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Total Runoff Area = 6.873 ac Runoff Volume = 1.678 af Average Runoff Depth = 2.93"
81.08% Pervious = 5.573 ac 18.92% Impervious = 1.300 ac

Summary for Subcatchment P-1: Subcat P-1

Runoff = 9.81 cfs @ 12.09 hrs, Volume= 0.713 af, Depth= 3.95"
Routed to Pond B-1 : Prop Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 yr Rainfall=6.53"

Area (ac)	CN	Description
0.587	39	>75% Grass cover, Good, HSG A
0.448	74	>75% Grass cover, Good, HSG C
0.761	98	Paved parking, HSG C
0.372	98	Roofs, HSG A
2.168	77	Weighted Average
1.035		47.74% Pervious Area
1.133		52.26% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment P-2: Subcat P-2

Runoff = 11.38 cfs @ 12.15 hrs, Volume= 0.965 af, Depth= 2.46"
Routed to Pond BE : Existing Depression

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 yr Rainfall=6.53"

Area (ac)	CN	Description
0.612	77	2 acre lots, 12% imp, HSG C
0.337	39	>75% Grass cover, Good, HSG A
0.646	74	>75% Grass cover, Good, HSG C
0.047	98	Paved parking, HSG A
0.026	98	Paved parking, HSG C
0.001	98	Roofs, HSG A
0.020	98	Roofs, HSG C
0.955	30	Woods, Good, HSG A
2.061	70	Woods, Good, HSG C
4.705	62	Weighted Average
4.538		96.44% Pervious Area
0.167		3.56% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	100	0.0700	0.29		**Sheet Flow, Lawn** Grass: Short n= 0.150 P2= 3.42"
4.3	1,300	0.0990	5.07		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
10.0	1,400	Total			

Summary for Pond B-1: Prop Basin

Inflow Area = 2.168 ac, 52.26% Impervious, Inflow Depth = 3.95" for 25 yr event
Inflow = 9.81 cfs @ 12.09 hrs, Volume= 0.713 af
Outflow = 0.40 cfs @ 15.53 hrs, Volume= 0.687 af, Atten= 96%, Lag= 206.2 min
Discarded = 0.40 cfs @ 15.53 hrs, Volume= 0.687 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond BE : Existing Depression

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 69.55' @ 15.53 hrs Surf.Area= 7,175 sf Storage= 18,238 cf

Plug-Flow detention time= 518.0 min calculated for 0.687 af (96% of inflow)
Center-of-Mass det. time= 497.5 min (1,315.5 - 818.0)

Volume	Invert	Avail.Storage	Storage Description
#1	66.00'	30,245 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
66.00	3,486	0	0
67.00	4,359	3,923	3,923
68.00	5,288	4,824	8,746
69.00	6,274	5,781	14,527
70.00	7,906	7,090	21,617
71.00	9,349	8,628	30,245

Device	Routing	Invert	Outlet Devices
#1	Discarded	66.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	66.00'	**15.0" Round Culvert** L= 44.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 66.00' / 65.75' S= 0.0057 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf
#3	Device 2	70.30'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.40 cfs @ 15.53 hrs HW=69.55' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.40 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=66.00' (Free Discharge)
└**2=Culvert** (Controls 0.00 cfs)
└**3=Orifice/Grate** (Controls 0.00 cfs)

Summary for Pond BE: Existing Depression

Inflow Area = 6.873 ac, 18.92% Impervious, Inflow Depth = 1.68" for 25 yr event
Inflow = 11.38 cfs @ 12.15 hrs, Volume= 0.965 af
Outflow = 0.82 cfs @ 12.17 hrs, Volume= 0.487 af, Atten= 93%, Lag= 1.3 min
Discarded = 0.82 cfs @ 12.17 hrs, Volume= 0.487 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link DP-1 : DP-1

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 62.82' @ 20.90 hrs Surf.Area= 4,734 sf Storage= 30,361 cf

Plug-Flow detention time= 638.0 min calculated for 0.487 af (50% of inflow)
Center-of-Mass det. time= 511.9 min (1,368.3 - 856.4)

Volume	Invert	Avail.Storage	Storage Description
#1	55.80'	36,533 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
55.80	0	0	0
56.00	164	16	16
57.00	868	516	532
58.00	15,363	8,116	8,648
59.00	2,116	8,740	17,387
60.00	2,779	2,448	19,835
61.00	3,429	3,104	22,939
62.00	4,137	3,783	26,722
63.00	4,865	4,501	31,223
64.00	5,756	5,311	36,533

Device	Routing	Invert	Outlet Devices
#1	Discarded	55.80'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	63.50'	**10.0' long x 10.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=0.86 cfs @ 12.17 hrs HW=58.00' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.86 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=55.80' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Link DP-1: DP-1

Inflow Area = 6.873 ac, 18.92% Impervious, Inflow Depth = 0.00" for 25 yr event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P-1: Subcat P-1 Runoff Area=2.168 ac 52.26% Impervious Runoff Depth=5.62"
Tc=6.0 min CN=77 Runoff=13.85 cfs 1.016 af

Subcatchment P-2: Subcat P-2 Runoff Area=4.705 ac 3.56% Impervious Runoff Depth=3.85"
Flow Length=1,400' Tc=10.0 min CN=62 Runoff=18.22 cfs 1.511 af

Pond B-1: Prop Basin Peak Elev=70.38' Storage=24,702 cf Inflow=13.85 cfs 1.016 af
Discarded=0.47 cfs 0.826 af Primary=0.58 cfs 0.083 af Outflow=1.05 cfs 0.909 af

Pond BE: Existing Depression Peak Elev=63.70' Storage=34,828 cf Inflow=18.22 cfs 1.594 af
Discarded=0.91 cfs 0.685 af Primary=2.21 cfs 0.373 af Outflow=2.51 cfs 1.058 af

Link DP-1: DP-1 Inflow=2.21 cfs 0.373 af
Primary=2.21 cfs 0.373 af

Total Runoff Area = 6.873 ac Runoff Volume = 2.527 af Average Runoff Depth = 4.41"
81.08% Pervious = 5.573 ac 18.92% Impervious = 1.300 ac

Summary for Subcatchment P-1: Subcat P-1

Runoff = 13.85 cfs @ 12.09 hrs, Volume= 1.016 af, Depth= 5.62"
Routed to Pond B-1 : Prop Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 yr Rainfall=8.38"

Area (ac)	CN	Description
0.587	39	>75% Grass cover, Good, HSG A
0.448	74	>75% Grass cover, Good, HSG C
0.761	98	Paved parking, HSG C
0.372	98	Roofs, HSG A
2.168	77	Weighted Average
1.035		47.74% Pervious Area
1.133		52.26% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment P-2: Subcat P-2

Runoff = 18.22 cfs @ 12.15 hrs, Volume= 1.511 af, Depth= 3.85"
Routed to Pond BE : Existing Depression

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 yr Rainfall=8.38"

Area (ac)	CN	Description
0.612	77	2 acre lots, 12% imp, HSG C
0.337	39	>75% Grass cover, Good, HSG A
0.646	74	>75% Grass cover, Good, HSG C
0.047	98	Paved parking, HSG A
0.026	98	Paved parking, HSG C
0.001	98	Roofs, HSG A
0.020	98	Roofs, HSG C
0.955	30	Woods, Good, HSG A
2.061	70	Woods, Good, HSG C
4.705	62	Weighted Average
4.538		96.44% Pervious Area
0.167		3.56% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	100	0.0700	0.29		**Sheet Flow, Lawn** Grass: Short n= 0.150 P2= 3.42"
4.3	1,300	0.0990	5.07		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
10.0	1,400	Total			

Summary for Pond B-1: Prop Basin

Inflow Area = 2.168 ac, 52.26% Impervious, Inflow Depth = 5.62" for 100 yr event
Inflow = 13.85 cfs @ 12.09 hrs, Volume= 1.016 af
Outflow = 1.05 cfs @ 13.43 hrs, Volume= 0.909 af, Atten= 92%, Lag= 80.4 min
Discarded = 0.47 cfs @ 13.43 hrs, Volume= 0.826 af
Primary = 0.58 cfs @ 13.43 hrs, Volume= 0.083 af
Routed to Pond BE : Existing Depression

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 70.38' @ 13.43 hrs Surf.Area= 8,450 sf Storage= 24,702 cf

Plug-Flow detention time= 503.7 min calculated for 0.908 af (89% of inflow)
Center-of-Mass det. time= 454.1 min (1,262.0 - 807.9)

Volume	Invert	Avail.Storage	Storage Description
#1	66.00'	30,245 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
66.00	3,486	0	0
67.00	4,359	3,923	3,923
68.00	5,288	4,824	8,746
69.00	6,274	5,781	14,527
70.00	7,906	7,090	21,617
71.00	9,349	8,628	30,245

Device	Routing	Invert	Outlet Devices
#1	Discarded	66.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	66.00'	**15.0" Round Culvert** L= 44.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 66.00' / 65.75' S= 0.0057 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf
#3	Device 2	70.30'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.47 cfs @ 13.43 hrs HW=70.38' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.47 cfs)

Primary OutFlow Max=0.56 cfs @ 13.43 hrs HW=70.38' (Free Discharge)
└**2=Culvert** (Passes 0.56 cfs of 11.45 cfs potential flow)
└**3=Orifice/Grate** (Weir Controls 0.56 cfs @ 0.91 fps)

Summary for Pond BE: Existing Depression

Inflow Area = 6.873 ac, 18.92% Impervious, Inflow Depth = 2.78" for 100 yr event
Inflow = 18.22 cfs @ 12.15 hrs, Volume= 1.594 af
Outflow = 2.51 cfs @ 13.32 hrs, Volume= 1.058 af, Atten= 86%, Lag= 70.1 min
Discarded = 0.91 cfs @ 16.27 hrs, Volume= 0.685 af
Primary = 2.21 cfs @ 13.32 hrs, Volume= 0.373 af
Routed to Link DP-1 : DP-1

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 63.70' @ 13.32 hrs Surf.Area= 5,486 sf Storage= 34,828 cf

Plug-Flow detention time= 401.8 min calculated for 1.058 af (66% of inflow)
Center-of-Mass det. time= 300.9 min (1,144.2 - 843.3)

Volume	Invert	Avail.Storage	Storage Description
#1	55.80'	36,533 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
55.80	0	0	0
56.00	164	16	16
57.00	868	516	532
58.00	15,363	8,116	8,648
59.00	2,116	8,740	17,387
60.00	2,779	2,448	19,835
61.00	3,429	3,104	22,939
62.00	4,137	3,783	26,722
63.00	4,865	4,501	31,223
64.00	5,756	5,311	36,533

Device	Routing	Invert	Outlet Devices
#1	Discarded	55.80'	**2.410 in/hr Exfiltration over Surface area**
#2	Primary	63.50'	**10.0' long x 10.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=0.30 cfs @ 16.27 hrs HW=63.57' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.30 cfs)

Primary OutFlow Max=2.17 cfs @ 13.32 hrs HW=63.70' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 2.17 cfs @ 1.10 fps)

Summary for Link DP-1: DP-1

Inflow Area = 6.873 ac, 18.92% Impervious, Inflow Depth = 0.65" for 100 yr event
Inflow = 2.21 cfs @ 13.32 hrs, Volume= 0.373 af
Primary = 2.21 cfs @ 13.32 hrs, Volume= 0.373 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

APPENDIX F: STORMWATER CALCULATIONS

- *MA STANDARD #3 – RECHARGE AND DRAWDOWN TIME*
- *MA STANDARD #4 – WATER QUALITY AND TSS REMOVAL*
- *NOAA RAINFALL DATA*
- *PIPE SIZING*

Proposed Early Education Center
0 Blue Hill Avenue
Milton, MA
Bohler Job Number: MAA240187.00
August 28, 2024

MA DEP Standard 3: Recharge Volume Calculations

Required Recharge Volume - A Soils (0.60 in.)	
Existing Site Impervious Area (ac)	0.025
Proposed Site Impervious Area (ac)	1.238
Proposed Increase in Site Impervious Area (ac)	1.213
Recharge Volume Required (cf)	**2,642**

Required Recharge Volume - C Soils (0.25 in.)	
Existing Site Impervious Area (ac)	0.119
Proposed Site Impervious Area (ac)	0.239
Proposed Increase in Site Impervious Area (ac)	0.120
Recharge Volume Required (cf)	**109**

Total Recharge Volume Required (cf)	**2,751**

Recharge Volume Adjustment Factor	
Impervious Area Directed to Infiltration BMP (ac)	**1.310**
%Impervious Directed to Infiltration BMP	89%
Adjustment Factor	1.13
Adjusted Total Recharge Volume Required (cf)	**3,102**

Provided Recharge Volume*	
Proposed Basin B-1	23,566
Total Recharge Volume Provided (cf)	**23,566**

Provided greater than or Equal to Required

*Volume provided below lowest outlet in cubic feet (cf)

Prepared By:
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352 Turnpike Road
Southborough, MA 01772
(508) 480-9900

Stage-Area-Storage for Pond B-1: Prop Basin

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
66.00	3,486	0
66.05	3,530	175
66.10	3,573	353
66.15	3,617	533
66.20	3,661	715
66.25	3,704	899
66.30	3,748	1,085
66.35	3,792	1,274
66.40	3,835	1,464
66.45	3,879	1,657
66.50	3,923	1,852
66.55	3,966	2,049
66.60	4,010	2,249
66.65	4,053	2,450
66.70	4,097	2,654
66.75	4,141	2,860
66.80	4,184	3,068
66.85	4,228	3,278
66.90	4,272	3,491
66.95	4,315	3,706
67.00	4,359	3,923
67.05	4,405	4,142
67.10	4,452	4,363
67.15	4,498	4,587
67.20	4,545	4,813
67.25	4,591	5,041
67.30	4,638	5,272
67.35	4,684	5,505
67.40	4,731	5,740
67.45	4,777	5,978
67.50	4,824	6,218
67.55	4,870	6,460
67.60	4,916	6,705
67.65	4,963	6,952
67.70	5,009	7,201
67.75	5,056	7,453
67.80	5,102	7,707
67.85	5,149	7,963
67.90	5,195	8,222
67.95	5,242	8,483
68.00	5,288	8,746
68.05	5,337	9,012
68.10	5,387	9,280
68.15	5,436	9,550
68.20	5,485	9,823
68.25	5,535	10,099
68.30	5,584	10,377
68.35	5,633	10,657
68.40	5,682	10,940
68.45	5,732	11,225
68.50	5,781	11,513
68.55	5,830	11,804
68.60	5,880	12,096
68.65	5,929	12,391
68.70	5,978	12,689
68.75	6,028	12,989
68.80	6,077	13,292
68.85	6,126	13,597
68.90	6,175	13,905
68.95	6,225	14,215
69.00	6,274	14,527
69.05	6,356	14,843
69.10	6,437	15,163
69.15	6,519	15,486
69.20	6,600	15,814
69.25	6,682	16,147
69.30	6,764	16,483
69.35	6,845	16,823
69.40	6,927	17,167
69.45	7,008	17,516
69.50	7,090	17,868
69.55	7,172	18,225
69.60	7,253	18,585
69.65	7,335	18,950
69.70	7,416	19,319
69.75	7,498	19,692
69.80	7,580	20,068
69.85	7,661	20,449
69.90	7,743	20,835
69.95	7,824	21,224
70.00	7,906	21,617
70.05	7,978	22,014
70.10	8,050	22,415
70.15	8,122	22,819
70.20	8,195	23,227
70.25	8,267	23,639
70.30	8,339	24,054
70.35	8,411	24,472
70.40	8,483	24,895
70.45	8,555	25,321
70.50	8,628	25,750
70.55	8,700	26,184
70.60	8,772	26,620
70.65	8,844	27,061
70.70	8,916	27,505
70.75	8,988	27,952
70.80	9,060	28,404
70.85	9,133	28,858
70.90	9,205	29,317
70.95	9,277	29,779
71.00	**9,349**	**30,245**

Outlet Elev.

Proposed Early Education Center
0 Blue Hill Avenue
Milton, MA
Bohler Job Number: MAA240187.00
August 28, 2024

MA DEP Standard 3: Drawdown Time Calculations

Drawdown Time - Proposed Basin B-1	
Volume below outlet pipe (Rv) (cf)	23,566
Soil Type	Loamy Sand - A
Infiltration rate (K)*	2.41
Bottom Area (sf)	3,486
Drawdown time (Hours)*	**33.7**

*Infiltration Rates taken from Rawls Table
**Drawdown time = Rv / (K) x (bottom area)

Prepared By:
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352 Turnpike Road
Southborough, MA 01772
(508) 480-9900

Proposed Early Education Center
0 Blue Hill Avenue
Milton, MA
Bohler Job Number: MAA240187.00
August 28, 2024

MA DEP Standard 4: Water Quality Volume Calculations

Water Quality Volume Required	
Water Quality Volume runoff (in.)*	0.5
Total Post Development Impervious Area (sf)	64,357
Required Water Quality Volume (cf)	**2,682**
*Water Quality volume runoff is equal to 0.5 inches of runoff times the total impervious area of the post development project site.	

Water Quality Volume Provided*	
Proposed Basin B-1	23,566
Total Provided Water Quality Volume (cf)	**23,566**

Required Recharge Provided

*Volume provided below lowest outlet pipe in cubic feet (cf)

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Proposed Early Education Center
0 Blue Hill Avenue
Milton, MA
Bohler Job Number: MAA240187.00
August 28, 2024

MA DEP Standard 4: TSS Removal Calculation Worksheet

BMP Treatment Train: Catch Basin to Infiltration Basin with Sediment Forebay

A BMP	B TSS Removal Rate	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
Deep-Sump, Hooded Catch Basin	**0.25**	**1.00**	**0.25**	**0.75**
Infiltration Basin with Sediment Forebay	**0.80**	**0.75**	**0.60**	**0.15**
		Total TSS Removal =	**85%**	

*Equals remaining load from previous BMP (E) which enters BMP

Prepared By:
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Southborough, MA 01772
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NOAA Atlas 14, Volume 10, Version 3
Location name: Milton, Massachusetts, USA*
Latitude: 42.2437°, Longitude: -71.1067°
Elevation: 93 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sandra Pavlovic, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Orlan Wilhite

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.307 (0.251-0.373)	0.380 (0.310-0.463)	0.500 (0.407-0.612)	0.600 (0.484-0.740)	0.737 (0.572-0.967)	0.838 (0.636-1.14)	0.948 (0.696-1.35)	1.08 (0.736-1.57)	1.28 (0.832-1.95)	1.45 (0.917-2.26)
10-min	0.435 (0.355-0.529)	0.539 (0.440-0.656)	0.709 (0.576-0.867)	0.850 (0.687-1.05)	1.04 (0.811-1.37)	1.19 (0.902-1.61)	1.34 (0.986-1.91)	1.53 (1.04-2.23)	1.81 (1.18-2.76)	2.05 (1.30-3.21)
15-min	0.511 (0.418-0.622)	0.634 (0.517-0.772)	0.834 (0.678-1.02)	1.00 (0.808-1.23)	1.23 (0.954-1.61)	1.40 (1.06-1.89)	1.58 (1.16-2.25)	1.80 (1.23-2.62)	2.13 (1.39-3.25)	2.41 (1.53-3.77)
30-min	0.698 (0.571-0.849)	0.868 (0.709-1.06)	1.15 (0.932-1.40)	1.38 (1.11-1.70)	1.69 (1.32-2.22)	1.93 (1.46-2.61)	2.18 (1.60-3.11)	2.49 (1.70-3.62)	2.95 (1.92-4.50)	3.34 (2.12-5.22)
60-min	0.885 (0.724-1.08)	1.10 (0.900-1.34)	1.46 (1.19-1.78)	1.75 (1.42-2.16)	2.16 (1.68-2.84)	2.46 (1.87-3.33)	2.78 (2.04-3.97)	3.18 (2.16-4.63)	3.77 (2.45-5.74)	4.27 (2.70-6.67)
2-hr	1.12 (0.924-1.36)	1.42 (1.17-1.72)	1.90 (1.56-2.31)	2.30 (1.87-2.82)	2.86 (2.23-3.73)	3.26 (2.49-4.40)	3.71 (2.74-5.26)	4.25 (2.91-6.14)	5.08 (3.32-7.68)	5.80 (3.68-8.97)
3-hr	1.30 (1.08-1.57)	1.65 (1.36-1.99)	2.21 (1.82-2.68)	2.68 (2.19-3.27)	3.33 (2.61-4.33)	3.80 (2.91-5.10)	4.32 (3.21-6.10)	4.95 (3.40-7.13)	5.93 (3.88-8.91)	6.78 (4.31-10.4)
6-hr	1.72 (1.43-2.06)	2.15 (1.78-2.57)	2.85 (2.35-3.43)	3.43 (2.81-4.16)	4.23 (3.34-5.46)	4.82 (3.71-6.41)	5.46 (4.07-7.64)	6.25 (4.30-8.91)	7.45 (4.89-11.1)	8.48 (5.41-12.9)
12-hr	2.26 (1.89-2.69)	2.78 (2.32-3.30)	3.62 (3.01-4.28)	4.31 (3.56-5.19)	5.27 (4.19-6.73)	5.98 (4.62-7.87)	6.74 (5.01-9.33)	7.67 (5.30-10.8)	9.06 (5.97-13.4)	10.3 (6.56-15.5)
24-hr	2.78 (2.34-3.28)	3.42 (2.87-4.04)	4.47 (3.74-5.30)	5.34 (4.43-6.38)	6.53 (5.22-8.30)	7.42 (5.78-9.70)	8.38 (6.30-11.5)	9.56 (6.64-13.4)	11.4 (7.52-16.6)	13.0 (8.31-19.4)
2-day	3.17 (2.69-3.72)	3.99 (3.38-4.69)	5.33 (4.49-6.29)	6.44 (5.39-7.65)	7.98 (6.42-10.1)	9.09 (7.14-11.9)	10.3 (7.87-14.2)	11.9 (8.30-16.6)	14.5 (9.58-20.9)	16.7 (10.8-24.7)
3-day	3.48 (2.96-4.07)	4.37 (3.71-5.11)	5.82 (4.92-6.83)	7.02 (5.89-8.30)	8.68 (7.01-10.9)	9.88 (7.80-12.9)	11.2 (8.59-15.4)	13.0 (9.05-17.9)	15.8 (10.5-22.7)	18.3 (11.8-26.9)
4-day	3.78 (3.22-4.40)	4.69 (4.00-5.47)	6.19 (5.25-7.24)	7.43 (6.25-8.75)	9.13 (7.40-11.5)	10.4 (8.20-13.4)	11.8 (9.02-16.1)	13.6 (9.48-18.7)	16.5 (11.0-23.7)	19.1 (12.3-28.0)
7-day	4.61 (3.95-5.33)	5.55 (4.75-6.43)	7.09 (6.04-8.25)	8.36 (7.08-9.80)	10.1 (8.24-12.6)	11.4 (9.05-14.7)	12.8 (9.86-17.4)	14.7 (10.3-20.1)	17.7 (11.8-25.2)	20.4 (13.2-29.6)
10-day	5.37 (4.62-6.19)	6.33 (5.44-7.31)	7.90 (6.76-9.17)	9.21 (7.82-10.8)	11.0 (8.98-13.6)	12.3 (9.80-15.7)	13.8 (10.6-18.5)	15.6 (11.0-21.2)	18.6 (12.4-26.3)	21.2 (13.7-30.6)
20-day	7.56 (6.55-8.66)	8.61 (7.44-9.87)	10.3 (8.89-11.9)	11.7 (10.0-13.6)	13.7 (11.2-16.7)	15.2 (12.0-19.0)	16.7 (12.7-21.8)	18.5 (13.1-24.8)	21.1 (14.2-29.5)	23.2 (15.1-33.2)
30-day	9.35 (8.13-10.7)	10.5 (9.09-12.0)	12.3 (10.6-14.1)	13.8 (11.8-15.9)	15.9 (13.0-19.2)	17.5 (13.9-21.6)	19.1 (14.5-24.5)	20.8 (14.8-27.7)	23.1 (15.6-32.1)	24.9 (16.2-35.5)
45-day	11.6 (10.1-13.1)	12.8 (11.1-14.5)	14.7 (12.8-16.8)	16.3 (14.0-18.8)	18.5 (15.2-22.2)	20.3 (16.1-24.8)	22.0 (16.6-27.8)	23.6 (16.9-31.2)	25.6 (17.4-35.3)	27.1 (17.7-38.4)
60-day	13.4 (11.8-15.2)	14.7 (12.8-16.6)	16.7 (14.5-19.0)	18.4 (15.9-21.1)	20.7 (17.0-24.6)	22.5 (17.9-27.4)	24.3 (18.3-30.5)	25.8 (18.5-34.0)	27.8 (18.8-38.1)	29.1 (19.0-40.9)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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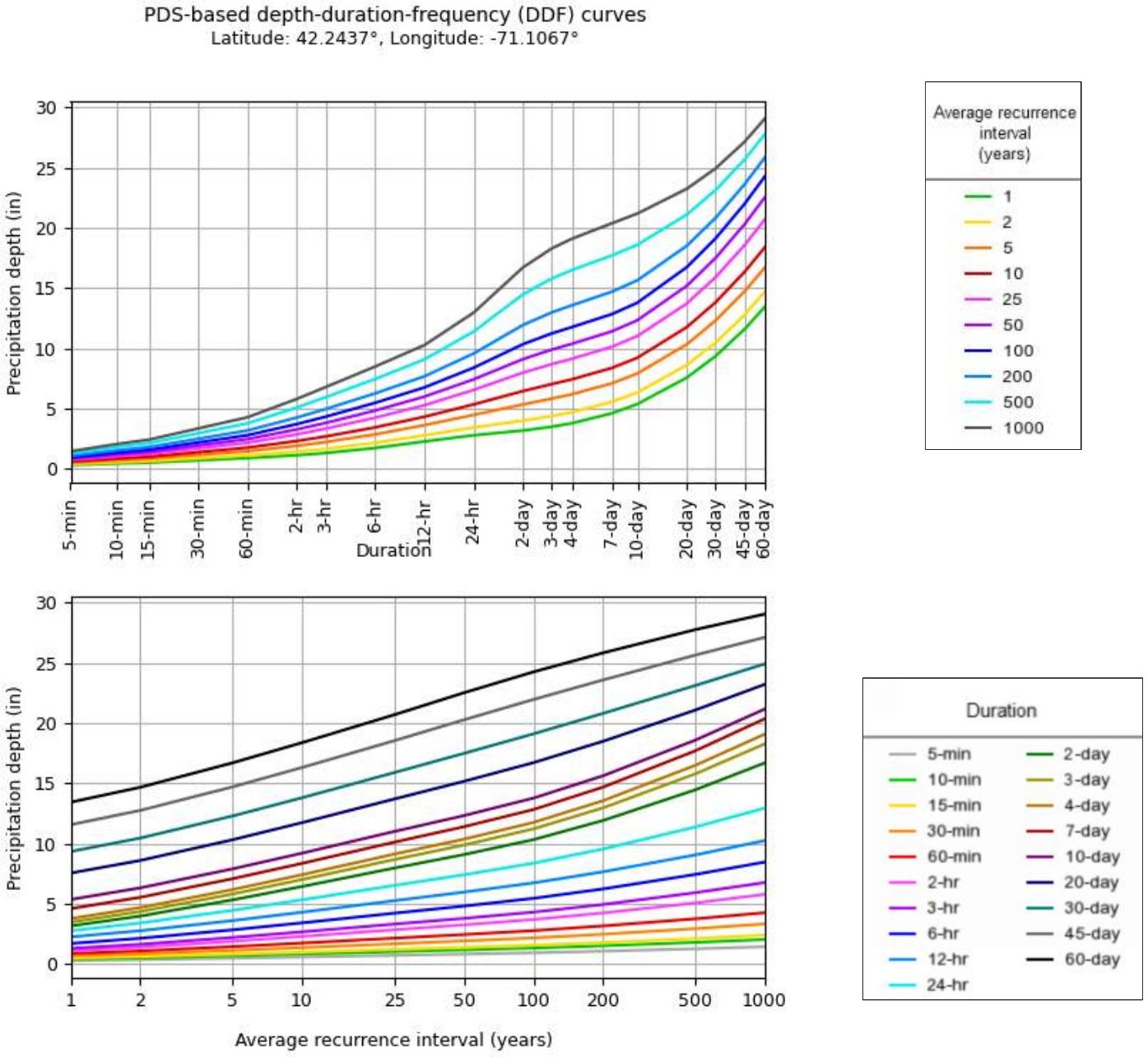
PF graphical



NOAA Atlas 14, Volume 10, Version 3

Created (GMT): Fri Aug 16 13:15:41 2024

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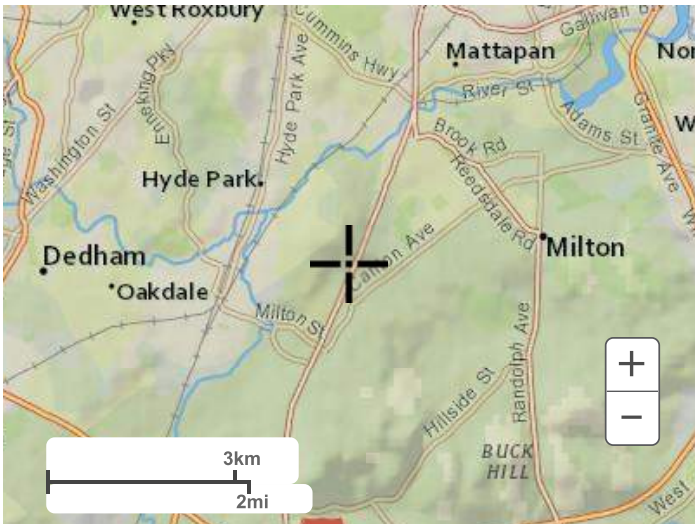
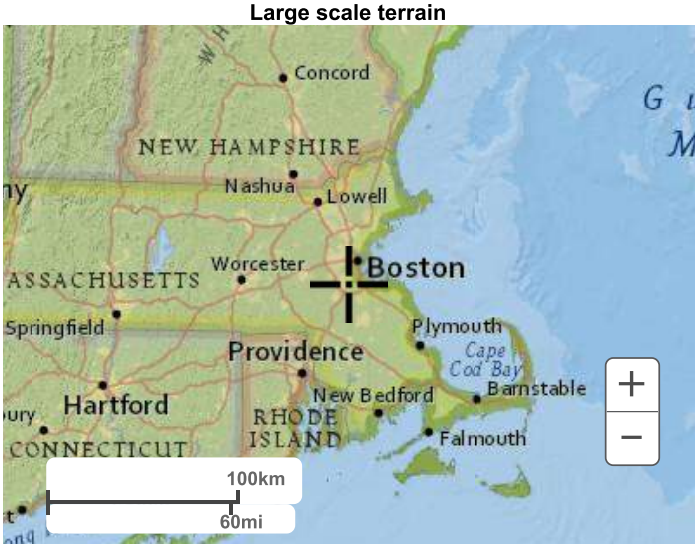
Maps & aerials

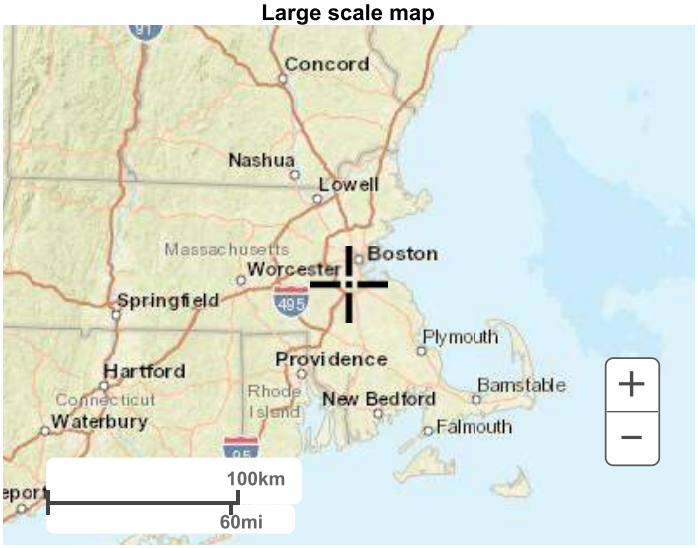
Small scale terrain



Large scale terrain



Large scale map



Large scale aerial

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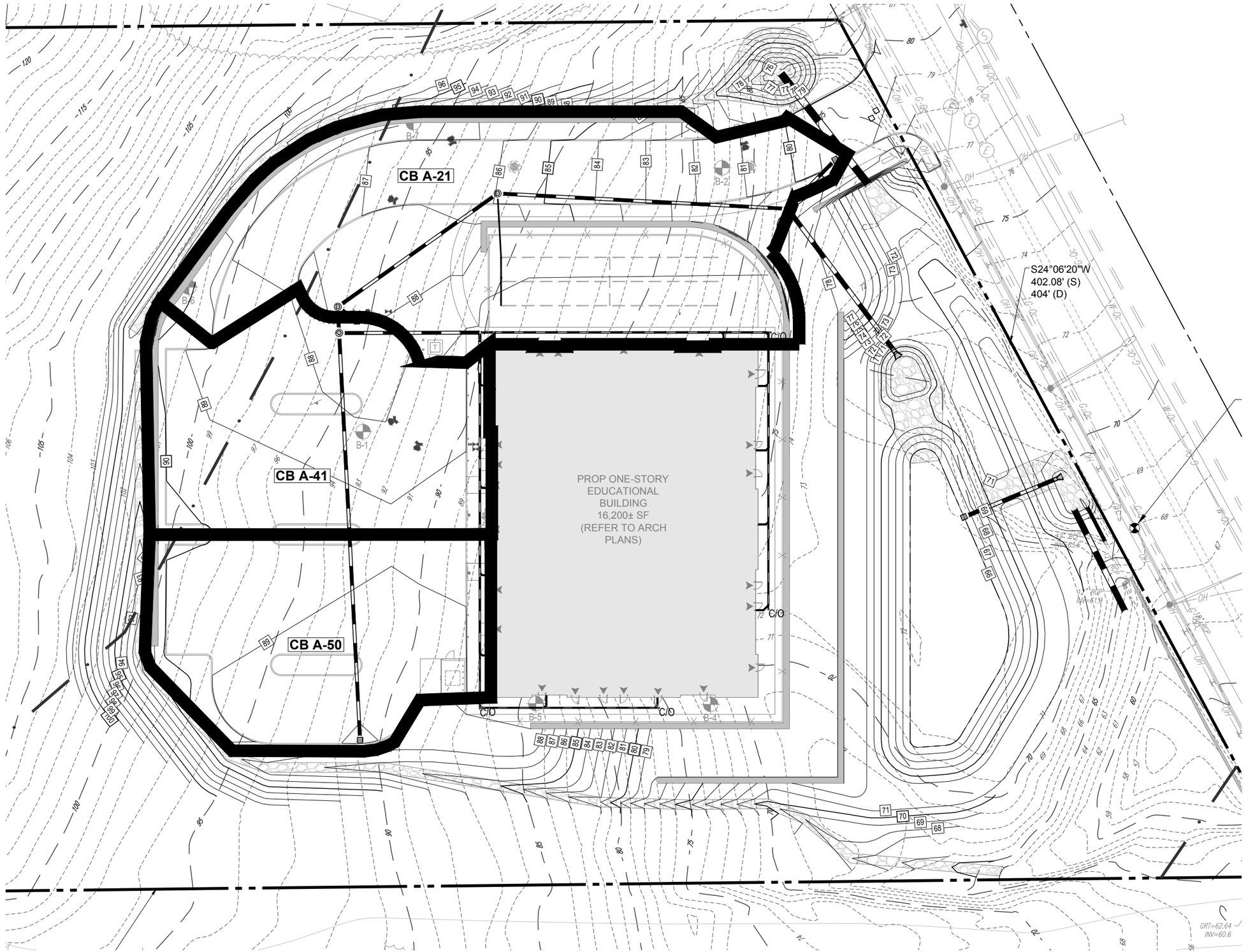

CATCH BASIN AREA BOUNDARY

PROPOSED CATCH BASIN AREA MAP

0 BLUE HILL AVENUE
MILTON, MASSACHUSETTS

PREPARED BY

BOHLER

SCALE:1"=40' DATE: 10/31/2024

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Proposed Early Education Center
0 Blue Hill Avenue
Milton, MA
Bohler Job Number: MAA240187.00
August 28, 2024

Rational Pipe Sizing Calculations

Design Period Storm:		25	Year	Design Period Intensity*			6.53	in/hr								
LOCATION		IMPERVIOUS			OTHER			SUM	Tc	I	Q	D	S	Material	n	Q Full	V Full
FROM	TO	A	C	CA	A	C	CA	CA	(min)	(in/hr)	(cfs)	(in)	(ft/ft)			(cfs)	(fps)
A-50	A-40	0.24	0.95	0.23	0.03	0.30	0.01	0.24	6	6.53	1.58	12	0.028	HDPE	0.012	6.49	8.27
A-41	A-40	0.31	0.95	0.29	0.06	0.30	0.02	0.31	6	6.53	2.01	12	0.032	HDPE	0.012	6.88	8.76
A-40	A-30								6	6.53	3.59	12	0.028	HDPE	0.012	6.49	8.27
A-30	A-20								6	6.53	3.59	12	0.028	HDPE	0.012	6.49	8.27
A-21	A-20	0.43	0.95	0.41	0.11	0.30	0.03	0.44	6	6.53	2.88	12	0.039	HDPE	0.012	7.60	9.68
A-20	A-10								6	6.53	6.46	18	0.024	HDPE	0.012	17.67	10.00
B-40	B-30								6	6.53	0.41	15	0.006	HDPE	0.012	5.28	4.31

*Rainfall intensity provided by NOAA Atlas 14, Volume 10, Version 2 on 08/16/2024

Prepared By:
BOHLER
352 Turnpike Road
Southborough, MA 01772
(508) 480-9900

Proposed Early Education Center
0 Blue Hill Avenue
Milton, MA
Bohler Job Number: MAA240187.00
August 28, 2024

Forebay Sizing Calculations

Forebay #1	
Total Post Develpoment Impervious Area (acres)	1.310
Forebay Volume Required (cf)	476
Forebay Volume Provided (cf)*	**488**

*Volume provided below lowest outlet of forebay, refer to attached storage tables

Min. Volume required= 1.31 ac. impervious x 43,560 sf/ac x 0.1/12 = 475.5 cf

Prepared By: Bohler
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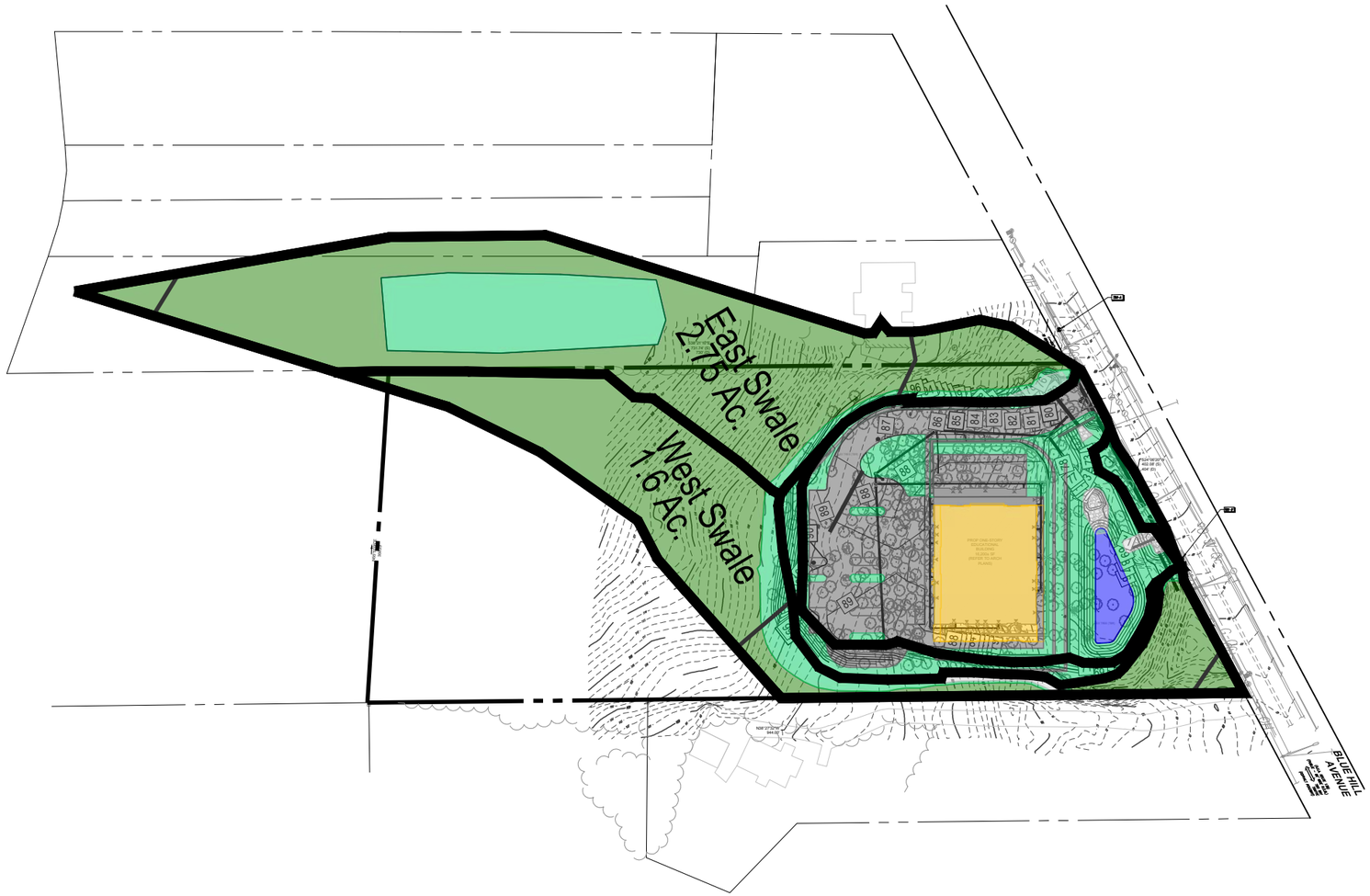
Stage-Area-Storage for Pond FB: Forebay

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
67.50	0	0
67.55	19	0
67.60	38	2
67.65	58	4
67.70	77	8
67.75	96	12
67.80	115	17
67.85	134	24
67.90	154	31
67.95	173	39
68.00	192	48
68.05	198	58
68.10	203	68
68.15	209	78
68.20	215	89
68.25	221	100
68.30	226	111
68.35	232	122
68.40	238	134
68.45	244	146
68.50	250	158
68.55	255	171
68.60	261	184
68.65	267	197
68.70	273	211
68.75	278	224
68.80	284	238
68.85	290	253
68.90	296	267
68.95	301	282
69.00	307	298
69.05	314	313
69.10	321	329
69.15	328	345
69.20	335	362
69.25	342	379
69.30	349	396
69.35	356	414
69.40	363	432
69.45	370	450
69.50	377	469
69.55	384	488
69.60	391	507
69.65	398	527
69.70	405	547
69.75	412	567
69.80	419	588
69.85	426	609
69.90	433	631
69.95	440	652
70.00	**447**	**675**



LEGEND

SUBCATCHMENT BOUNDARY

CONCRETE OR PAVEMENT

ROOF

GRASS OR LANDSCAPED AREA

WOODS / UNDEVELOPED AREA

GRAVEL AREA

PROPOSED SWALE DRAINAGE AREA MAP

0 BLUE HILL AVENUE
MILTON, MASSACHUSETTS

PREPARED BY

BOHLER

SCALE:1"=150' DATE: 10/31/2024

Swale Sizing Calculations

East Swale

Area to swale:	1.60	ac.
Rainfall, i	7.50	in/hr
C cofficient	0.70	
Q = cia:	**8.40**	CFS

Manning's Eq for trap. Channels

Riprap Swale Section (S>10%)		
Bottom Width	BW=	0.00
Side Slope	SS=	2.00
Depth of Flow	D=	0.85
Slope	S=	0.250
Manning's "n"	n=	0.060
Flow Area	A=	1.45
Wetted Perimeter	P=	3.80
Hydraulic Radius	R=	0.38
Velocity (fps)	V=	**6.52**
Flow (cfs)	Q=	**9.41**

West Swale

Area to swale:	2.75	ac.
Rainfall, i	7.50	in/hr
C cofficient	0.70	
Q = cia:	**14.44**	CFS

Manning's Eq for trap. Channels

Riprap Swale Section (S>10%)		
Bottom Width	BW=	1.50
Side Slope	SS=	2.00
Depth of Flow	D=	0.75
Slope	S=	0.200
Manning's "n"	n=	0.060
Flow Area	A=	2.25
Wetted Perimeter	P=	4.85
Hydraulic Radius	R=	0.46

Publication No. FHWA-NHI-05-114
September 2005

U.S. Department of Transportation

Federal Highway Administration

Hydraulic Engineering Circular No. 15, Third Edition

Design of Roadside Channels with Flexible Linings

National Highway Institute

Steepest slopes and deepest channel depth occur in east channel despite lower flow. Variables below are from east channel calculations.

6.2 PERMISSIBLE SHEAR STRESS

Values for permissible shear stress for riprap and gravel linings are based on research conducted at laboratory facilities and in the field. The values presented here are judged to be conservative and appropriate for design use. Permissible shear stress is given by the following equation:

$$\tau_p = F_*(\gamma_s - \gamma) D_{50} \qquad (6.7)$$

where,

- τ_p = permissible shear stress, N/m^2 (lb/ft^2)
- F_* = Shield's parameter, dimensionless
- γ_s = specific weight of the stone, N/m^3 (lb/ft^3)
- γ = specific weight of the water, 9810 N/m^3 (62.4 lb/ft^3)
- D_{50} = mean riprap size, m (ft)

Typically, a specific weight of stone of 25,900 N/m^3 (165 lb/ft^3) is used, but if the available stone is different from this value, the site-specific value should be used.

Recalling Equation 3.2,

$$\tau_p \geq SF\tau_d$$

and Equation 3.1,

$$\tau_d = \gamma d S_o$$

Equation 6.7 can be written in the form of a sizing e

$$D_{50} \geq \frac{SF\ d\ S_o}{F_*(SG - 1)} \qquad (6.8)$$

where,

- d = maximum channel depth, m (ft)
- SG = specific gravity of rock (γ_s/γ), dimensionless

D50 = 1' (12")
SG = 165/62.4 = 2.64 lb/ft3
d=0.85 ft from Mannings calculations
So=0.25 ft/ft
F=.15
SF=1.5

D50= 1.25 = 15" riprap

Changing the inequality sign to an equality gives the minimum stable riprap size for the channel bottom. Additional evaluation for the channel side slope is given in Section 6.3.2.

Equation 6.8 is based on assumptions related to the relative importance of skin friction, form drag, and channel slope. However, skin friction and form drag have been documented to vary resulting in reports of variations in Shield's parameter by different investigators, for example Gessler (1965), Wang and Shen (1985), and Kilgore and Young (1993). This variation is usually linked to particle Reynolds number as defined below:

$$R_e = \frac{V_* D_{50}}{\nu}$$

V. = 2.61 (see next pg)
D50 = 1 ft
v = 0.00001217

Ro= 2.1 x 10^5 (see table next pg)

where,

R_e = particle Reynolds number, dimensionless

V_* = shear velocity, m/s (ft/s)

ν = kinematic viscosity, 1.131×10^{-6} m^2/s at 15.5 deg C (1.217×10^{-5} ft^2/s at 60 deg F)

Shear velocity is defined as:

$$V_* = \sqrt{gdS} \qquad (6.10)$$

V. = (32.2 ft/s x 0.85 ft x 0.25)^0.5
V.= 2.61

where,

g = gravitational acceleration, 9.81 m/s^2 (32.2 ft/s^2)

d = maximum channel depth, m (ft)

S = channel slope, m/m (ft/ft)

Higher Reynolds number correlates with a higher Shields parameter as is shown in Table 6.1. For many roadside channel applications, Reynolds number is less than 4×10^4 and a Shields parameter of 0.047 should be used in Equations 6.7 and 6.8. In cases for a Reynolds number greater than 2×10^5, for example, with channels on steeper slopes, a Shields parameter of 0.15 should be used. Intermediate values of Shields parameter should be interpolated based on the Reynolds number.

Table 6.1. Selection of Shields' Parameter and Safety Factor

Reynolds number	F*	SF
$\leq 4 \times 10^4$	0.047	1.0
$4 \times 10^4 < R_e < 2 \times 10^5$	Linear interpolation	Linear interpolation
$\geq 2 \times 10^5$	0.15	1.5

Higher Reynolds numbers are associated with more turbulent flow and a greater likelihood of lining failure with variations of installation quality. Because of these conditions, it is recommended that the Safety Factor be also increased with Reynolds number as shown in Table 6.1. Depending on site-specific conditions, safety factor may be further increased by the designer, but should not be decreased to values less than those in Table 6.1.

As channel slope increases, the balance of resisting, sliding, and overturning forces is altered slightly. Simons and Senturk (1977) derived a relationship that may be expressed as follows:

$$D_{50} \geq \frac{SF\, d\, S\, \Delta}{F_*(SG-1)} \qquad (6.11)$$

where,

Δ = function of channel geometry and riprap size

The parameter Δ can be defined as follows (see Appendix D for the derivation):

$$\Delta = \frac{K_1\left(1+\sin(\alpha+\beta)\right)\tan\phi}{2\left(\cos\theta\,\tan\phi - SF\,\sin\theta\,\cos\beta\right)} \tag{6.12}$$

where,

α = angle of the channel bottom slope

β = angle between the weight vector and the weight/drag resultant vector in the plane of the side slope

θ = angle of the channel side slope

ϕ = angle of repose for the riprap

Finally, β is defined by:

$$\beta = \tan^{-1}\left(\frac{\cos\alpha}{\frac{2\sin\theta}{\eta\tan\phi}+\sin\alpha}\right) \tag{6.13}$$

where,

η = stability number

The stability number is calculated using:

$$\eta = \frac{\tau_s}{F_*(\gamma_s-\gamma)D_{50}} \tag{6.14}$$

Riprap stability on a steep slope depends on forces acting on an individual stone making up the riprap. The primary forces include the average weight of the stones and the lift and drag forces induced by the flow on the stones. On a steep slope, the weight of a stone has a significant component in the direction of flow. Because of this force, a stone within the riprap will tend to move in the flow direction more easily than the same size stone on a milder gradient. As a result, for a given discharge, steep slope channels require larger stones to compensate for larger forces in the flow direction and higher shear stress.

The size of riprap linings increases quickly as discharge and channel gradient increase. Equation 6.11 is recommended when channel slope is greater than 10 percent and provides the riprap size for the channel bottom and sides. Equation 6.8 is recommended for slopes less than 5 percent. For slopes between 5 percent and 10 percent, it is recommended that both methods be applied and the larger size used for design. Values for safety factor and Shields parameter are taken from Table 6.1 for both equations.

6.3 DESIGN PROCEDURE

In this section a design procedure for riprap and gravel linings is outlined. First, the basic design procedure for selecting the riprap/gravel size for the bottom of a straight channel is given. Subsequent sections provide guidance for sizing material on the channel side slopes and adjusting for channel bends.

Empirical Preformed Scour Hole Equations:

Type 1: Scour Hole Depression = one-half pipe rise, m (ft)

$d_{50} = (0.0276\ R_p^{\ 2}/TW)\ (Q/R_p^{\ 2.5})^{1.333}$ **(** $d_{50} = (0.0125 R_p^{\ 2}/TW)\ (Q/R_p^{\ 2.5})^{1.333}$ **)** **(11.35)**

Type 2: Scour Hole Depression = full pipe rise, m (ft)

$d_{50} = (0.0181\ R_p^{\ 2}/TW)\ (Q/R_p^{\ 2.5})^{1.333}$ **(** $d_{50} = (0.0082 R_p^{\ 2}/TW)\ (Q/R_p^{\ 2.5})^{1.333}$**)** **(11.36)**

d_{50} = median stone size required, m (ft)

For variables S_p, R_p, TW and Q, see Section 11.13.5.

Type 1 and 2 preformed scour hole dimensions (See Figure 11-15)

$C = 3S_p + 6F$	Basin Length m (ft)	
$B = 2S_p + 6F$	Basin Inlet and Outlet Width m (ft)	**(11.37)**
$F = 0.5R_p$ (Type 1) or R_p (Type 2)	Basin Depression m (ft)	

Table 11-14 solves the above set of equations for Type 1 and 2 preformed scour holes for various pipe sizes.

The type of riprap required is as follows:

Modified	$d_{50} < 0.13$m (0.42 ft)
Intermediate	0.13m (0.42 ft) $< d_{50} <$ 0.20m (0.67 ft)
Standard	0.20m (0.67 ft) $< d_{50} <$ 0.38m (1.25 ft)
Special Design	0.38m (1.25 ft) $< d_{50}$

Reference: Report No. FHWA-RD-75-508 (“Culvert Outlet Protection Design: Computer Program Documentation”)

OUTLET PROTECTION
OUTLET VELOCITY > 14 feet/sec or Length of Apron exceeds limits shown on Tables 11-12.1 and 11-13.1

Preformed Scour Hole										
(See Figure 11-15)	PIPE DIAMETER OR SPAN (in)									
	12	15	18	24	30	36	42	48	54	60
Type 1										
B	5	6	8	10	13	15	18	20	23	25
C	6	8	9	12	15	18	21	24	27	30
d	Depends on riprap type(see Figure 11-15)									
$2S_p$	2.0	2.6	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0
$3S_p$	3.0	3.9	4.5	6.0	7.5	9.0	10.5	12.0	13.5	15.0
$F = 0.5\ S_p$	0.5	0.625	0.75	1	1.25	1.5	1.75	2	2.25	2.5
Type 2										
B	8	10	12	16	20	24	28	32	36	40
C	9	11	14	18	23	27	32	36	41	45
d	Depends on riprap size (see Figure 11-15)									
$2S_p$	2.0	2.6	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0
$3S_p$	3.0	3.9	4.5	6.0	7.5	9.0	10.5	12.0	13.5	15.0
$F = S_p$	1.0	1.3	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0

Table 11-14.1 - Dimensions of Preformed Scour Hole (Feet)

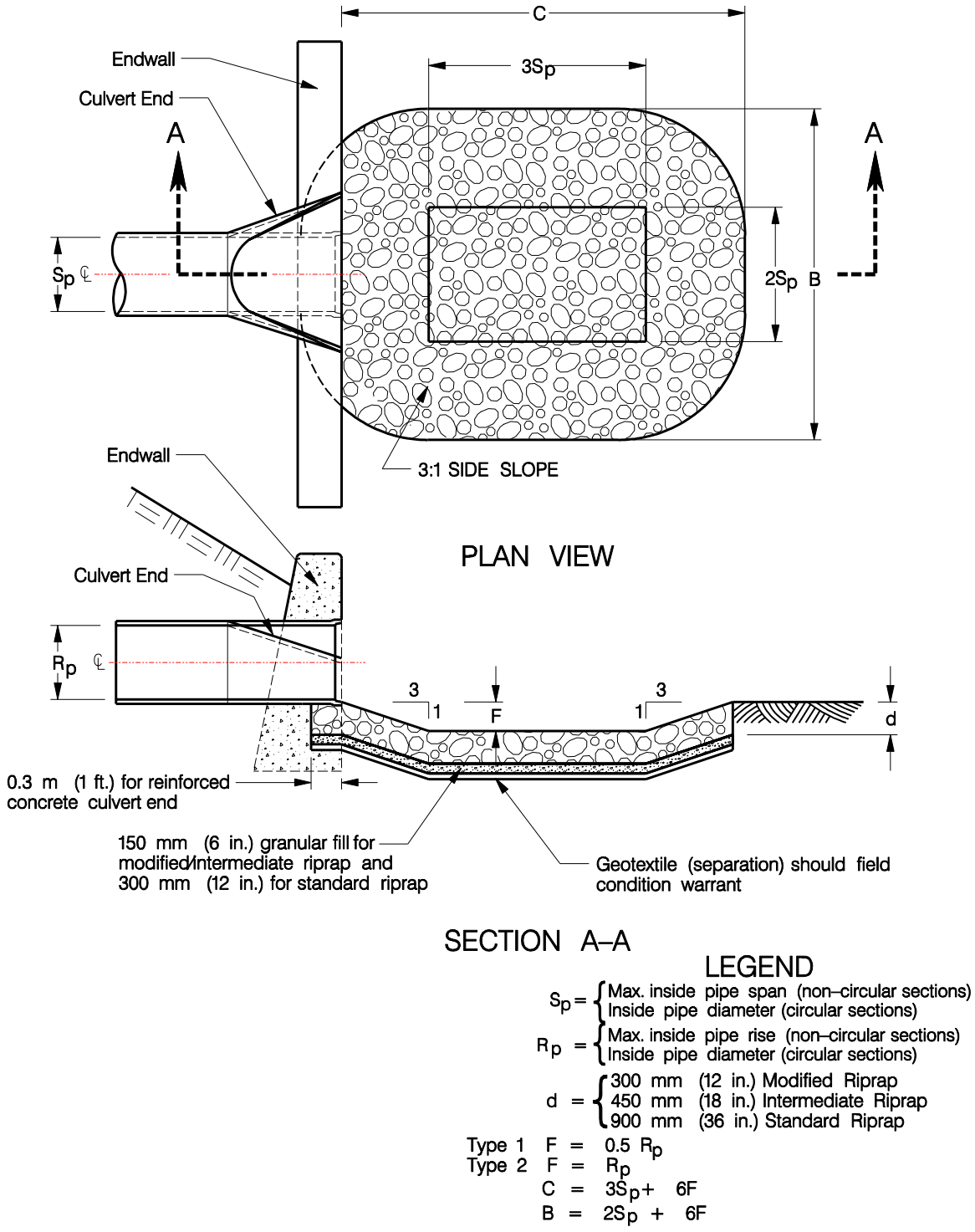


Figure 11-15 Preformed Scour Hole Type 1 and Type 2

Preformed Scour Hole
Riprap Sizing
25 Year Storm
Based on Eq. 11.35 of ConnDOT Drainage Manual
for Type 1 Scour Holes

FES #	Pipe Size (ft)	Q (cfs)	TW (ft)	D_{50} (ft)
FES-A10	1.5	6.46	0.3	**0.29**
Drvwy Pipe	2.5	14.44	0.5	**0.26**
B-30	1.25	2.21	0.3	**0.09**

* Assume 0.3' (4") tailwater at all FES unless noted otherwise

APPENDIX G: OPERATION AND MAINTENANCE

- *STORMWATER OPERATION AND MAINTENANCE PLAN*
- *INSPECTION REPORT*
- *INSPECTION AND MAINTENANCE LOG FORM*
- *LONG-TERM POLLUTION PREVENTION PLAN*
- *ILLICIT DISCHARGE STATEMENT*
- *SPILL PREVENTION*
- *PROPOSED OPERATION AND MAINTENANCE MAP*

STORMWATER OPERATION AND MAINTENANCE PLAN

The Gardner School
0 Blue Hill Avenue
Map B7 Lot 5
Milton, MA

RESPONSIBLE PARTY DURING CONSTRUCTION:

Fortunato Construction
99 Old Brickyard Lane, Suite 10
Berlin, CT 06037

RESPONSIBLE PARTY POST CONSTRUCTION:

Viking Development LLC
302 Innovation Drive, Suite 130
Franklin, TN

Construction Phase

During the construction phase, all erosion control devices and measures shall be maintained in accordance with the final record plans, local/state approvals and conditions, the EPA Construction General Permit and the Stormwater Pollution Prevention Plan (SWPPP) if applicable. Additionally, the maintenance of all erosion / siltation control measures during construction shall be the responsibility of the general contractor. Contact information of the OWNER and CONTRACTOR shall be listed in the SWPPP for this site. The SWPPP also includes information regarding construction period allowable and illicit discharges, housekeeping and emergency response procedures. Upon proper notice to the property owner, the Town/City or its authorized designee shall be allowed to enter the property at a reasonable time and in a reasonable manner for the purposes of inspection.

Post Development Controls

Once construction is completed, the post development stormwater controls are to be operated and maintained in compliance with the following permanent procedures (note that the continued implementation of these procedures shall be the responsibility of the Owner or its assignee):

1. Parking lots: Sweep at least two (2) times per year and on a more frequent basis depending on sanding operations. All resulting sweepings shall be collected and properly disposed of offsite in accordance with MADEP and other applicable requirements.

   Approximate Maintenance Budget: $1,000/year

2. Catch basins, yard drains, manholes and piping: Inspect two (2) times per year and at the end of foliage and snow-removal seasons. These features shall be cleaned two (2) times per year or whenever 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 catch basin or underground system.

Accumulated sediment and hydrocarbons present must be removed and properly disposed of off-site in accordance with MADEP and other applicable requirements.

Approximate Maintenance Budget: $500/year per structure.

3. Riprap apron / Scour Hole: Riprap and scour holes should be checked at least annually and after every major storm event (generally equal or greater to 3.0 inches in 24 hours) for displaced stones, slumping, and erosion at edges, especially downstream or downslope. If the riprap is damaged, it should be repaired before further damage can take place. Note and repair any erosion, stone displacement or low spots in the areas. Woody vegetation should be removed from the riprap annually.

   Approximate Maintenance Budget: $250/year per location.

4. Infiltration Basin: Preventative maintenance after every major storm event during the first three (3) months of operation and at least twice per year thereafter. Inspect structure and pretreatment BMP to ensure proper operation after every major storm event (generally equal or greater to 3.0 inches in 24 hours) for the first three months. Mow the buffer area, side slopes and basin bottom if grassed floor, rake if stone or sand bottom, remove trash and debris, remove grass clippings and accumulated organic matter. Any sediment removed shall be disposed of in accordance with MADEP and other applicable requirements.

   Approximate Maintenance Budget: $2,000/year per basin

5. Forebays: The sediment forebay areas shall be inspected once per month to ensure they are operating as intended and that all components are stable and in working order. Inspections shall be by qualified personnel. During the growing season, the forebay shall be mowed at least twice, with additional cuttings performed as needed. All vegetation (i.e. tree saplings) will be removed from embankments and the forebay bottom. The inlet to the forebay shall be inspected for erosion and sedimentation, and riprap shall be promptly repaired as needed. Sediment forebays shall be cleaned quarterly and when sediment depth reaches half the height of the stone weir, or three to six feet, whichever is less. After sediment is removed, replace any vegetation damaged during the clean out by either reseeding or re-sodding. Any sediment removed shall be disposed of in accordance with MADEP and other applicable requirements.

   Approximate Maintenance Budget: $500/year per forebay

All components of the stormwater system will be accessible by the owner or their assignee.

STORMWATER MANAGEMENT SYSTEM

POST-CONSTRUCTION INSPECTION REPORT

LOCATION:

The Gardner School
0 Blue Hill Avenue
Map B7 Lot 5
Milton, MA

RESPONSIBLE PARTY:

Viking Development LLC
302 Innovation Drive, Suite 130
Franklin, TN

NAME OF INSPECTOR:	INSPECTION DATE:
Note Condition of the Following (sediment depth, debris, standing water, damage, etc.):	
Catch Basins:	
Discharge Points/ Flared End Sections / Rip Rap:	
Infiltration Basin:	
Sediment Forebay:	
Other:	

Note Recommended Actions to be taken on the Following (sediment and/or debris removal, repairs, etc.):
Catch Basins:
Discharge Points / Flared End Sections / Rip Rap:
Infiltration Basin:
Sediment Forebay:
Other:
Comments:

STORMWATER INSPECTION AND MAINTENANCE LOG FORM			
The Gardner School ***Blue Hill Avenue, Milton, MA***			
Stormwater Management Practice	Responsible Party	Date	Maintenance Activity Performed
Parking Lot Sweeping			
Catch basins, yard drains, manholes and piping			
Riprap Apron / Scour Hole			
Infiltration Basin			
Forebays			

LONG-TERM POLLUTION PREVENTION PLAN

The Gardner School
0 Blue Hill Avenue
Map B7 Lot 5
Milton, MA

RESPONSIBLE PARTY DURING CONSTRUCTION:

Fortunato Construction
99 Old Brickyard Lane, Suite 10
Berlin, CT 06037

RESPONSIBLE PARTY POST CONSTRUCTION:

Viking Development LLC
302 Innovation Drive, Suite 130
Franklin, TN

For this site, the Long-Term Pollution Prevention Plan will consist of the following:

- The property owner shall be responsible for "good housekeeping" including proper periodic maintenance of building and pavement areas, curbing, landscaping, etc.
- Proper storage and removal of solid waste (dumpsters).
- Sweeping of parking lots, drive aisles and access aisles a minimum of twice per year with a commercial cleaning unit. Any sediment removed shall be disposed of in accordance with applicable local and state requirements.
- Regular inspections and maintenance of Stormwater Management System as noted in the "O&M Plan".
- Snow removal shall be the responsibility of the property owner. Snow shall not be plowed, dumped and/or placed in forebays, infiltration basins or similar stormwater controls. Salting and/or sanding of pavement / walkway areas during winter conditions shall only be done in accordance with all state/local requirements and approvals.
- Reseed any bare areas as soon as they occur. Erosion control measures shall be installed in these areas to prevent deposits of sediment from entering the drainage system.

- Grass shall be maintained at a minimum blade height of two to three inches and only 1/3 of the plant height shall be removed at a time. Clippings shall not be disposed of within stormwater management areas or adjacent resource areas.

- Plants shall be pruned as necessary.

- Snow piles shall be located adjacent to or on pervious surfaces in upland areas. This will allow snow melt water to filter into the soil, leaving behind sand and debris which can be removed in the springtime.

- If necessary, stockpiled snow will be removed from the Site and disposed of at an off-site location in accordance with all local, state and federal regulations.

- The amount of sand and deicing chemicals shall be kept at the minimum amount required to provide safe pedestrian and vehicle travel.

- Deicing chemicals are recommended as a pretreatment to storm events to minimize the amount of applied sand.

OPERATON AND MAINTENANCE TRAINING PROGRAM

The Owner will coordinate an annual in-house training session to discuss the Operations and Maintenance Plan, the Long-Term Pollution Prevention Plan, and the Spill Prevention Plan and response procedures. Annual training will include the following:

Discuss the Operations and Maintenance Plan:

- Explain the general operations of the stormwater management system and its BMPs
- Identify potential sources of stormwater pollution and measures / methods of reducing or eliminating that pollution
- Emphasize good housekeeping measures

Discuss the Spill Prevention and Response Procedures:

- Explain the process in the event of a spill
- Identify potential sources of spills and procedures for cleanup and /or reporting and notification
- Complete a yearly inventory or Materials Safety Data sheets of all tenants and confirm that no potentially harmful chemicals are in use.

ILLICIT DISCHARGE STATEMENT

Certain types of non-stormwater discharges are allowed under the U.S. Environmental Protection Agency Construction General Permit. These types of discharges will be allowed under the conditions that no pollutants will be allowed to come in contact with the water prior to or after its discharge. The control measures which have been outlined previously in this LTPPP will be strictly followed to ensure that no contamination of these non-storm water discharges takes place. Any existing illicit discharges, if discovered during the course of the work, will be reported to MassDEP and the local DPW, as applicable, to be addressed in accordance with their respective policies. No illicit discharges will be allowed in conjunction with the proposed improvements.

Duly Acknowledged:

Chris Fazendin

Chris Fazendin, VP Real Estate Development | The Gardner School

Name & Title Date

SPILL PREVENTION AND RESPONSE PROCEDURES (POST CONSTRUCTION)

In order to prevent or minimize the potential for a spill of Hazardous Substances or Oil or come into contact with stormwater, the following steps will be implemented:

1. All Hazardous Substances or Oil (such as pesticides, petroleum products, fertilizers, detergents, acids, paints, paint solvents, cleaning solvents, etc.) will be stored in a secure location, with their lids on, preferably under cover, when not in use.

2. The minimum practical quantity of all such materials will be kept on site.

3. A spill control and containment kit (containing, for example, absorbent materials, acid neutralizing powder, brooms, dust pans, mops, rags, gloves, goggles, plastic and metal trash containers, etc.) will be provided on site.

4. Manufacturer's recommended methods for spill cleanup will be clearly posted and site personnel will be trained regarding these procedures and the location of the information and cleanup supplies.

5. It is the OWNER's responsibility to ensure that all Hazardous Waste on site is disposed of properly by a licensed hazardous material disposal company. The OWNER is responsible for not exceeding Hazardous Waste storage requirements mandated by the EPA or state and local authorities.

In the event of a spill of Hazardous Substances or Oil, the following procedures should be followed:

1. All measures should be taken to contain and abate the spill and to prevent the discharge of the Hazardous Substance or Oil to stormwater or off-site. (The spill area should be kept well ventilated and personnel should wear appropriate protective clothing to prevent injury from contact with the Hazardous Substances.)

2. For spills of less than five (5) gallons of material, proceed with source control and containment, clean-up with absorbent materials or other applicable means unless an imminent hazard or other circumstances dictate that the spill should be treated by a professional emergency response contractor.

3. For spills greater than five (5) gallons of material immediately contact the MADEP at the toll-free 24-hour statewide emergency number: **1-888-304-1133**, the local fire department (**9-1-1**) and an approved emergency response contractor. Provide information on the type of material spilled, the location of the spill, the quantity spilled, and the time of the spill to the emergency response contractor or coordinator, and proceed with prevention, containment and/or clean-up if so desired. (Use the form provided, or similar).

4. If there is a Reportable Quantity (RQ) release, then the National Response Center should be notified immediately at (800) 424-8802; within 14 days a report should be submitted to the EPA regional office describing the release, the date and circumstances of the release and the steps taken to prevent another release. This Pollution Prevention Plan should be updated to reflect any such steps or actions taken and measures to prevent the same from reoccurring.

SPILL PREVENTION CONTROL AND COUNTERMEASURE FORM

The Gardner School
0 Blue Hill Avenue
Map B7 Lot 5
Milton, MA

Where a release containing a hazardous substance occurs, the following steps shall be taken by the facility manager and/or supervisor:

1. Immediately notify The Town Fire Department (at **9-1-1**)

2. All measures must be taken to contain and abate the spill and to prevent the discharge of the pollutant(s) to off-site locations, receiving waters, wetlands and/or resource areas.

3. Notify the Town Health Department at (617) 898-4800 and the Town Conservation Commission at (617) 898-4974.

4. Provide documentation from licensed contractor showing disposal and cleanup procedures were completed as well as details on chemicals that were spilled to the Town Health Department and Conservation Commission.

Date of spill:_____ Time:_____ Reported By:_____

Weather Conditions:_____

Material Spilled	**Location of Spill**	**Approximate Quantity of Spill (in gallons)**	**Agency(s) Notified**	**Date of Notification**

Cause of Spill: _____

_____

Measures Taken to Clean up Spill: _____

_____

Type of equipment: _____ Make: _____ Size: _____

License or S/N: _____

Location and Method of Disposal _____

_____

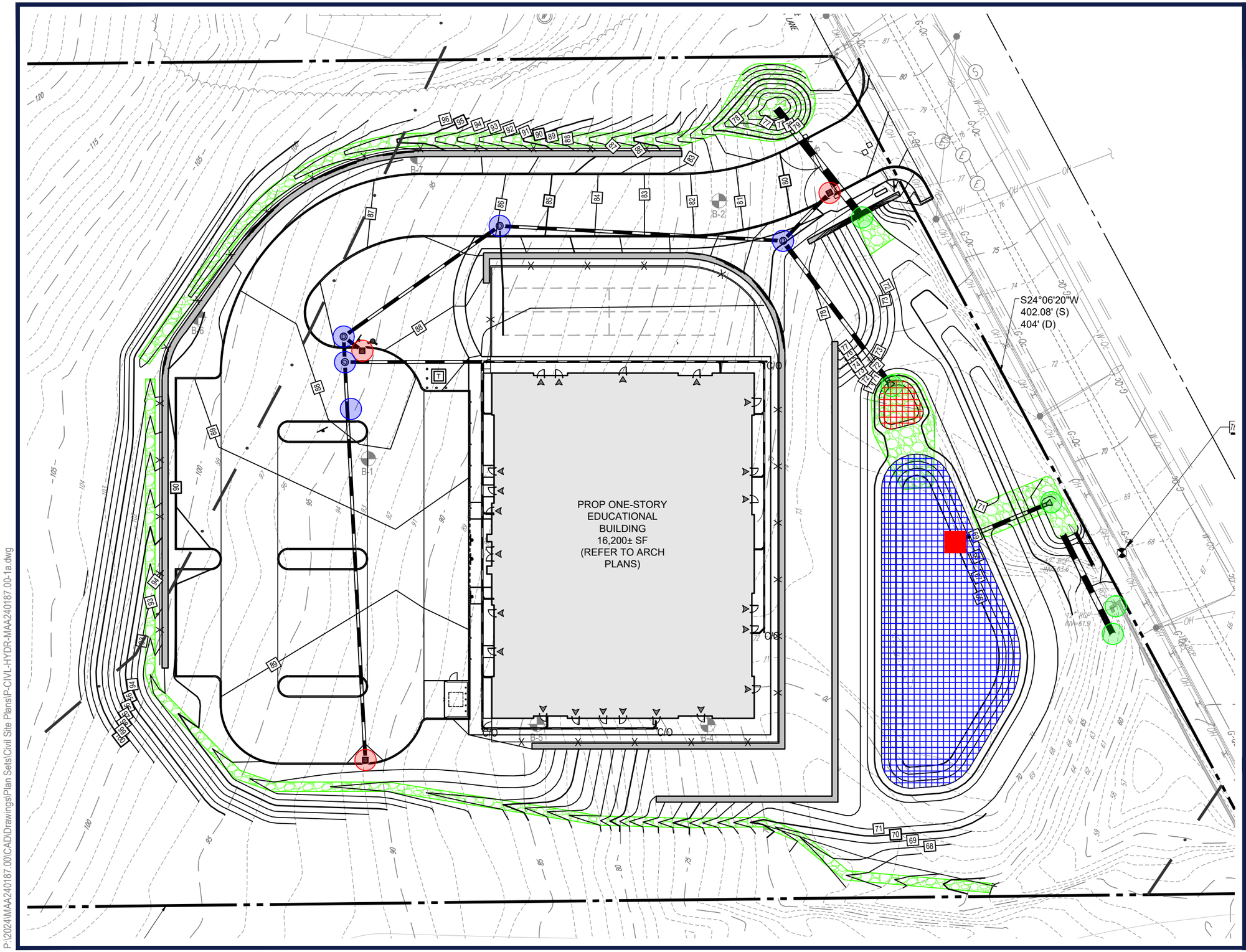
Procedures, method, and precautions instituted to prevent a similar occurrence from recurring: _____

_____

_____

Additional Contact Numbers:

- DEPARTMENT OF ENVIRONMENTAL PROTECTION (DEP) EMERGENCY PHONE: 1-888-304-1133
- NATIONAL RESPONSE CENTER PHONE: (800) 424-8802
- U.S. ENVIRONMENTAL PROTECTION AGENCY PHONE: (888) 372-7341



LEGEND

- CATCH BASIN ("PROP CB") (SINGLE AND DOUBLE)
- OUTLET CONTROL STRUCTURE ("PROP OCS")
- MANHOLE ("PROP DMH")
- INFILTRATION BASIN
- OUTFALLS
- SEDIMENT FOREBAY
- RIP RAP BLANKETS & SWALES

OPERATION AND MAINTENANCE LOCATION MAP

0 BLUE HILL AVENUE
MILTON, MASSACHUSETTS

PREPARED BY

BOHLER

SCALE:1"=40' DATE: 10/31/2024

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