# Stormwater Report
## Haverhill Street (VP)
## Methuen, Massachusetts

**July 31, 2023**

**Prepared for:**
**Amigos Coffee, LLC**
**46 Daniels Drive**
**Lee, NH 03861**

**Prepared By:**


**1 East River Place**
**Methuen, MA 01844**

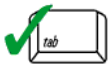
# Checklist for Stormwater Report

**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.

# 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): _____

**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.

**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.

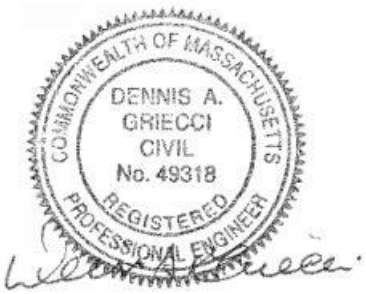
*Note:* Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that 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




Dennis A. Grieco July 31, 2023

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)

**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.

# Stormwater Report Narrative

This Stormwater Report has been prepared to demonstrate compliance with the Massachusetts Stormwater Management Standards in accordance with the Massachusetts Wetlands Protection Act Regulations (310 CMR 10.00.

## Project Description

The Applicant, Amigos Coffee, LLC, is proposing to construct a ±785 square foot drive-through Aroma Joes Coffee Store on a ±17,928 square foot lot. The proposed work will also include the construction of a parking lot with six (6) parking spaces including one van accessible parking space, a drive-through lane with by-pass lane, and two access curb cuts from Haverhill Street. Additionally, a subsurface stormwater detention structure, lot grading, drainage and other utilities are proposed to support the proposed use.

No alteration of existing wetland resource areas are proposed and the project will not disturb more than an acre of land, as such no filing with the EPA for a Construction General Permit is required.

## Site Description

The Project Site is a 17,928 square foot parcel located on the northly side of Haverhill Street opposite Strathmore Road and Madison Street in Methuen, Massachusetts. The site is currently partially developed with pavement and maintained lawn area. There is a slope on the rear of the lot with a well-defined wetland at the bottom of the slope. The wetland resource areas were flagged by Norse Environmental Consultants on xxxxxxxxxxx. The Site lies within the surface watersheds of the Merrimack River. The parcel is within the City's Neighborhood Business (BN) zoning district and is surrounded by single family, multi-family, and small business as allowed by the Zoning Ordinance.

There are no Wetland Resource Areas on the Site, but there is a Bordering Vegetated Wetland (flagged series "A") just north of the property, at the bottom of a slope, on the adjacent lot. Portions of the work are within the buffer zone of this wetland and jurisdictional under the State's WPA and the City's Wetland Ordinance. The delineated wetland series "A" is depicted on the plan generally aligns with the national Wetland Inventory website.

According to the National Resources Conservation Service (NRCS), surface soils on the Site consist of Freetown much (Map unit 52A), which are classified as a Hydrologic Soil Groups (HSG) B/D soil, a soil having a moderate infiltration rate when drained and a very slow infiltration rate when undrained areas and Canton

fine sandy loam, which is classified as a HSG B, soils having a moderate infiltration rate when thoroughly wet.

The Site does not lie within floodplain according to FEMA Flood Insurance Rate Map 25009C0204F, dated July3, 2012.

The Site is not in or near habitat of rare or endangered species according to the NHESP online map, dated August 1, 2021.

## Existing Drainage Conditions

Under existing conditions, the Site is a combination of paved areas, mowed lawn and a sparsely wooded slope consisting of a combination of trees and grass ground covers. Topography on site is generally flat in the front portion of the site, ranging from a high of approximately 141 at the front of the site along Haverhill Street to 138 at the top of the slope, which then drops to approximately elevation 118 at the the bottom of the slope/wetland.

For purposes of this study, the existing drainage model was broken into one subcatchment area and one design/discharge point, which were analyzed using HydroCAD stormwater modeling software. Under existing conditions stormwater travels via overland flow over the pavement and lawn area, down the slope and ultimately to the wetland located at the bottom of this slope, as such, the bottom of slope/wetland was analyzed as the design/discharge point under existing conditions.

## Proposed Drainage Conditions

Under developed conditions, the Site will be developed to include the Aromas Joes drive-through store, paved driveway aisles, paved parking spaces and some landscaped areas. Efforts have been made to mimic existing drainage patters in to the proposed development of the site.

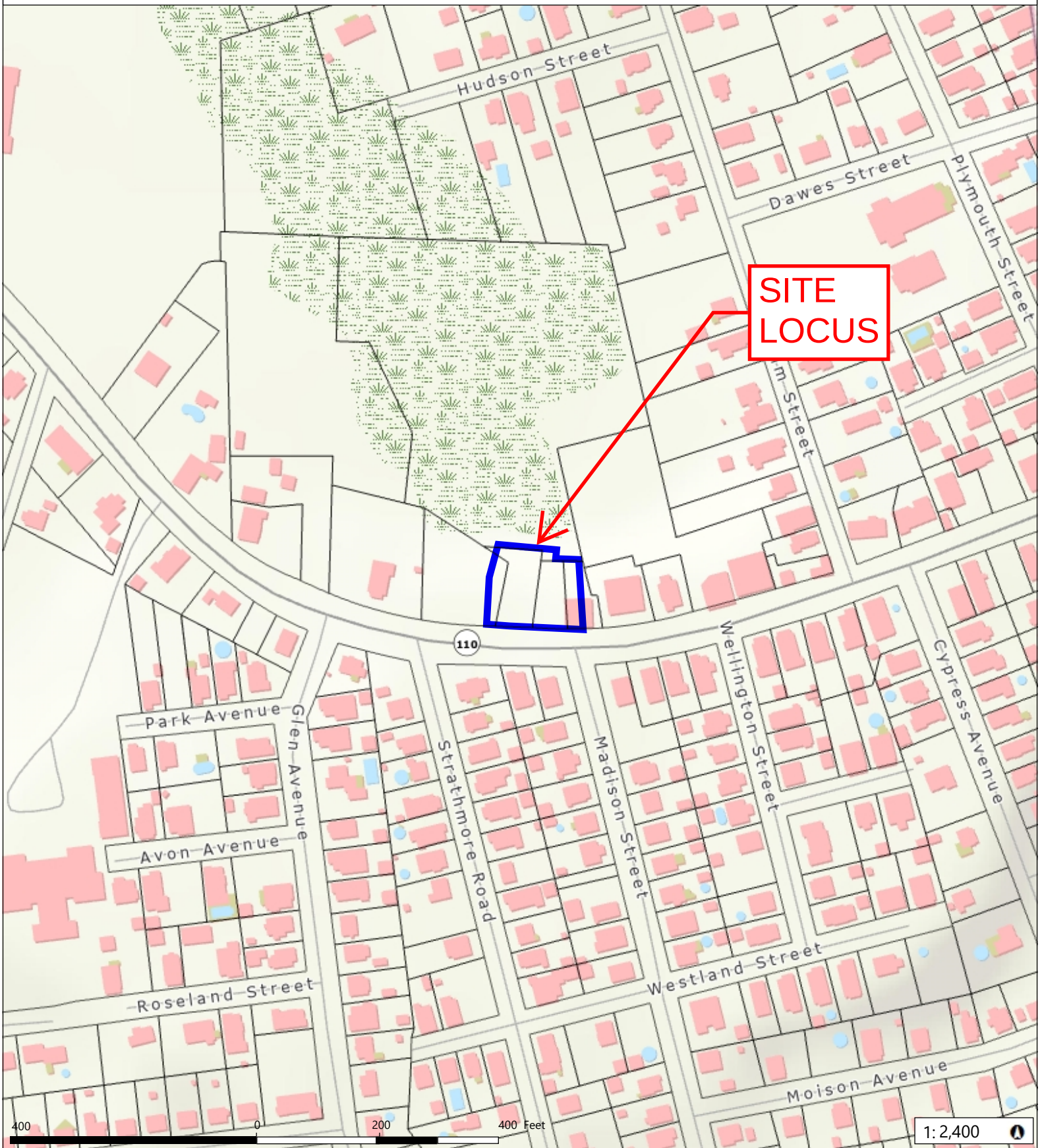
Under developed conditions, two subcatchment areas were analyzed. Developed subcatchment 1 (PR1) is a 0.25± acre portion of the project area that includes the building, pavement, and landscaping areas surrounding the building. These areas will be collected by catch basins into the closed drainage system which will discharge to the underground stormwater detention system. The underground system will consist of thirty (30) Stormtech SC740 chambers with an isolator row for stormwater treatment. The system will allow for infiltration/recharge of stormwater and has been designed with an outlet control structure to discharge stormwater towards the northerly wetland.

Developed area 2 (PR2) is a 0.16± acre sub-watershed consisting of pervious areas (lawn, wooded slope, etc.) areas that will not be captured by and conveyed to the underground detention system. This area will sheet flow, as it does under existing conditions, to the wetland resource area at the bottom of the slope.

## Figure 1: Site Locus Map

# City of Methuen

*07/18/2023*




Data Sources: Produced by Merrimack Valley Planning Commission (MVPC) using data provided by the City of Methuen & MassIT/MassGIS. MVPC AND THE CITY OF METHUEN MAKES NO WARRANTIES, EXPRESSED OR IMPLIED, CONCERNING THE ACCURACY, COMPLETENESS, RELIABILITY, OR SUITABILITY OF THESE DATA. THE CITY OF METHUEN AND MVPC DOES NOT ASSUME ANY LIABILITY ASSOCIATED WITH THE USE OR MISUSE OF THIS INFORMATION.

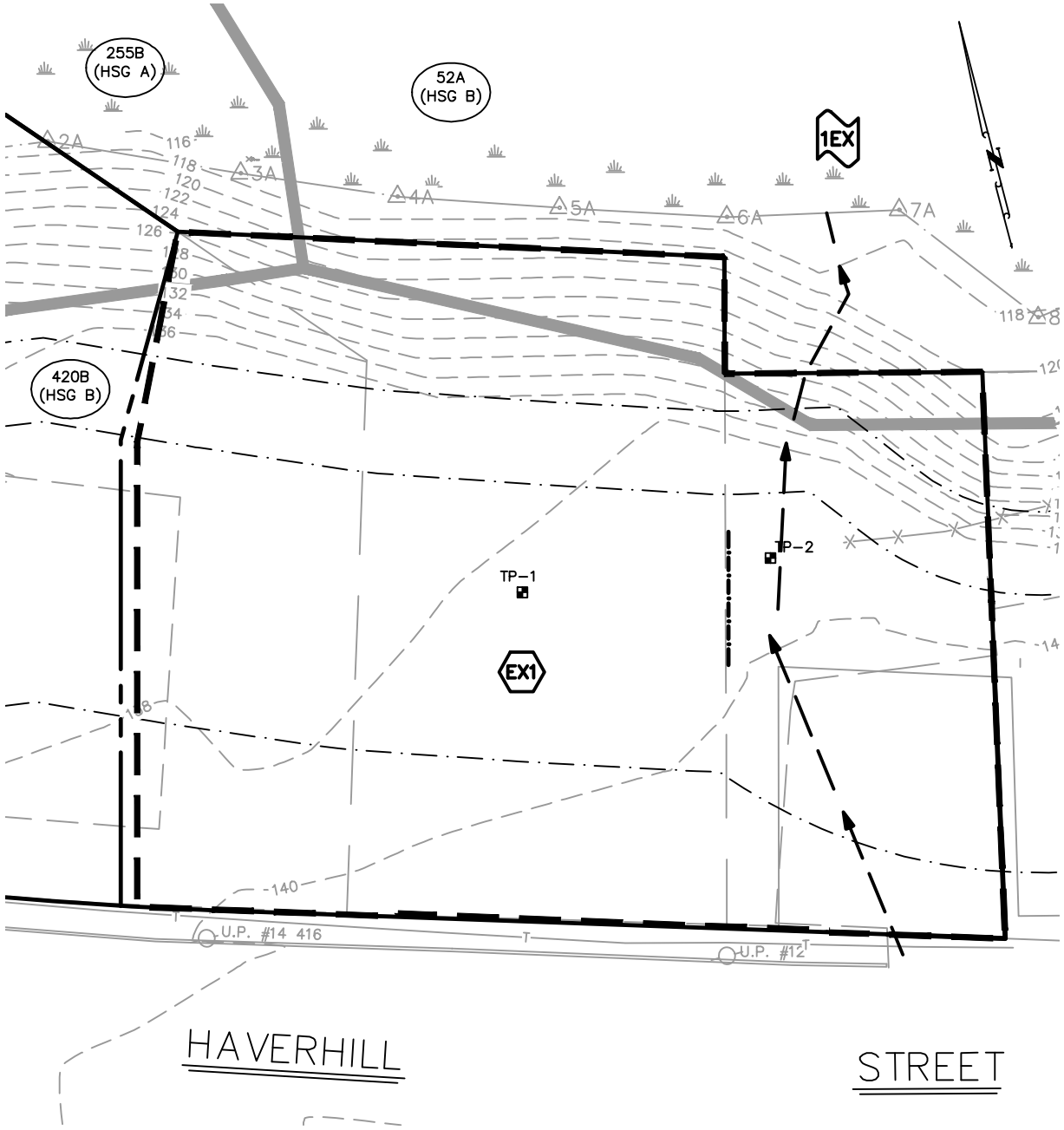
CITY OF METHUEN MASSACHUSETTS INCORPORATED 1726

Legend

- Municipal Boundary
- Roads
- Streams
- Parcels
- Interstate
- Wetlands
- Major Road
- MVPC_Hillshade
- Building
- Local Road
- Deck
- Rail Line
- Pool
- Hydrographic Features

Projection: NAD_1983_StatePlane_Massachusetts_Mainland_FIPS_2001

## Figure 2: Existing Conditions Drainage Divide Area Map




LEGEND

- UNDERGROUND POND
- DESIGN POINT
- DRAINAGE AREA DESIGNATION
- DRAINAGE AREA BOUNDARY
- TIME OF CONCENTRATION FLOW LINE
- SOIL TYPEBOUNDARY
- WETLAND BOUNDARY
- SOIL CLASSIFICATION

**Andover Consultants, Inc.**

Existing Drainage Figure
Haverhill Street
Methuen, Massachusetts
1"=30'
July 2023

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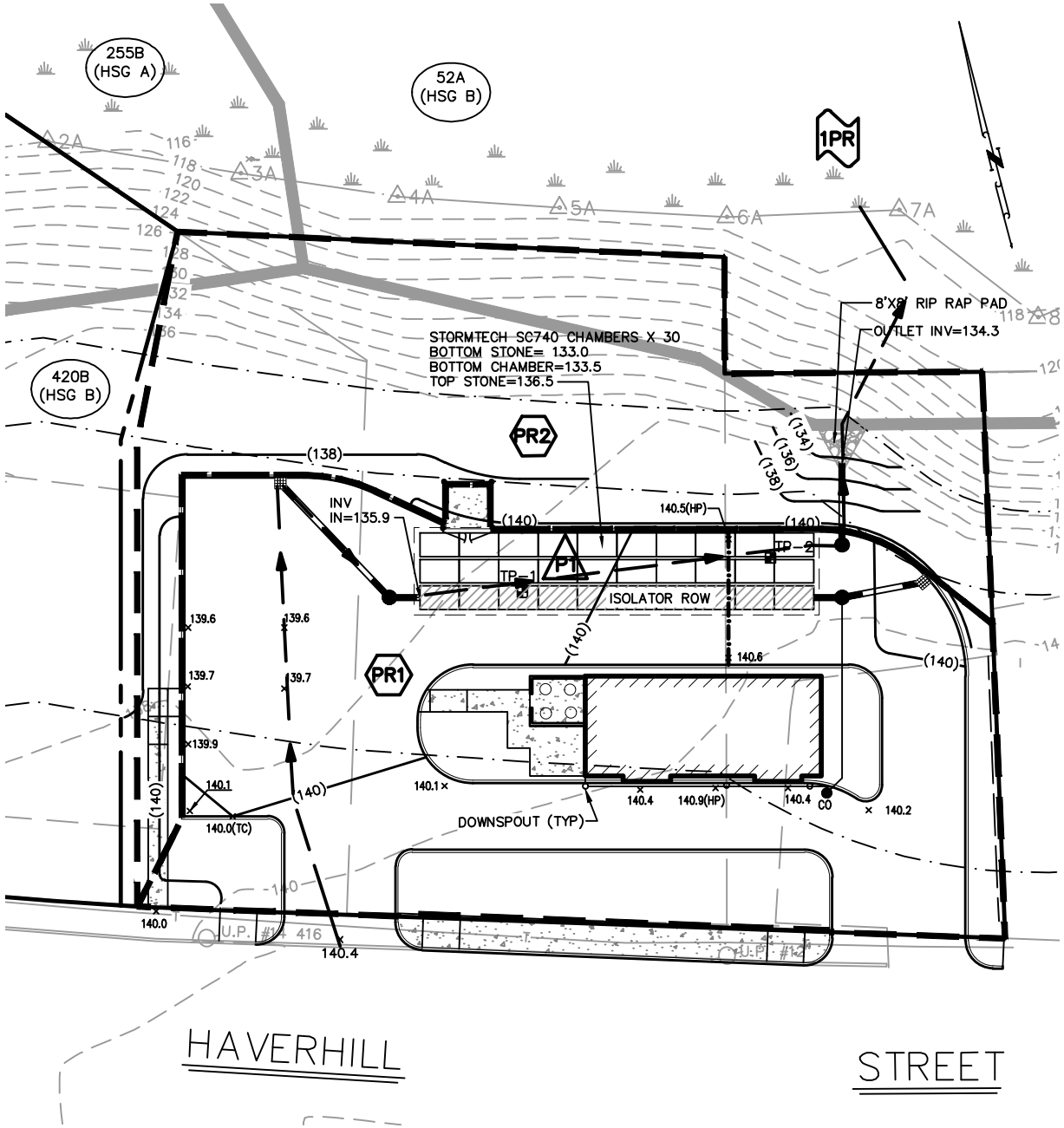
## Figure 3: Developed Conditions Drainage Divide Area Map




## LEGEND

- UNDERGROUND POND
- DESIGN POINT
- DRAINAGE AREA DESIGNATION
- DRAINAGE AREA BOUNDARY
- TIME OF CONCENTRATION FLOW LINE
- SOIL TYPEBOUNDARY
- WETLAND BOUNDARY
- SOIL CLASSIFICATION

**Andover Consultants, Inc.**

Proposed Drainage Figure
Haverhill Street
Methuen, Massachusetts
1"=30'
July 2023

P:\21\21-82\dwg\SITE PLAN.dwg

# Regulatory Compliance

## Massachusetts Department of Environmental Protection (DEP) - Stormwater Management Standards

As demonstrated below, the proposed Project fully complies with the DEP Stormwater Management Standards.

### Standard 1: No New Untreated Discharges or Erosion to Wetlands

The Project has been designed to fully comply with Standard 1.

The Best Management Practices (BMPs) included in the proposed stormwater management system have been designed in accordance with the Massachusetts Stormwater Handbook. Supporting information and computations demonstrating that no new untreated discharges will result from the Project are presented through compliance with Standards 4 through 6.

### Standard 2: Peak Rate Attenuation

The Project has been designed to comply with Standard 2.

The rainfall-runoff response of the Site under existing and proposed conditions was analyzed for storm events with recurrence intervals of 2, 10, 25, and 100-years. The results of the analysis, as summarized in the table below, indicate that there is no increase in peak discharge rates between the existing and proposed conditions for all storm events except for the 2 year event at point 2. This storm results in a very small increase rate of 0.2 cfs, and more importantly, a very small increase in runoff volume of just 59 cubic feet, which is minimal.

HydroCAD hydrologic modeling result printouts are attached at the end of this report.

**Peak Discharge Rates (cfs*)**

| *Design Point* | *2-year* | *10-year* | *25-year* | *100-year* |
|---|---|---|---|---|
| **Design Point 1:** bottom of slope/wetland | | | | |
| Existing | 0.2 | 0.6 | 1.0 | 1.6 |
| Proposed | 0.1 | 0.6 | 1.0 | 1.6 |

## Standard 3: Stormwater Recharge

The Project has been designed to comply with Standard 3. Recharge of stormwater has been provided through the use of the subsurface infiltration system which has been designed to drain completely within 72 hours per the following calculation using the static method and the provided recharge volume demonstrated below.

Recharge Required/Provided:
$R_v$ = F x impervious area

$R_v$ = 0.35″/12 x 8,458 square feet

$R_v$ = 247 cubic feet

Recharge provided below invert out @ elevation 134.50 = 850 cubic feet

Drawdown Calulations:
Time $_{Drawdown}$ = $R_v$/ (K) (Bottom Area)
$R_v$ = 850 c.f.
K =0.52 in/hr for HSG B soils
Bottom Area = 1,168 s.f.

Time $_{Drawdown}$ = 850 c.f. / ((0.52 in/hr) (1′/12″) (1,168 sf))
Time $_{Drawdown}$ = 16.8 hours < 72 hours, OK

Soil test pit data and supporting information are included at the end of this report.

## Standard 4: Water Quality

The Project has been designed to fully comply with Standard 4.

The proposed stormwater management system implements a treatment train of BMPs that has been designed to provide a minimum 80% TSS removal of stormwater runoff from all proposed impervious surfaces. See TSS removal spreadsheets in the appendix for TSS treatment removal.

The required water quality volume required based on the total impervious area is calculated below:

$V_{WQ} = (D_{WQ}/12″/foot) \times (A_{IMP})$
Where:
$V_{WQ}$ = Require Water Quality Volume (cf)
$D_{WQ}$ = Water Quality Depth = ½″
$A_{IMP}$ = Total Impervious Area = 8,458 s.f.

$V_{WQ}$ = (1/2″) x (1′/12″) x (8,458 s.f.)
$V_{WQ}$ = 352 c.f.
Recharge provided below invert out @ elevation 134.50 = 850 cubic feet

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

The Project is not considered a LUHPPL.

## Standard 6: Critical Areas

The Project will not discharge stormwater near or to a critical area.

## Standard 7: Redevelopments and Other Projects Subject to the Standards only to the Maximum Extent Practicable

Although some of the property has been previously developed, this project is not considered a redevelopment.

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

The Project will disturb approximately 0.3± acres of land and is therefore not required to obtain coverage under the Environmental Protection Agency (EPA) National Pollutant Discharge Elimination System (NPDES) Construction General Permit.

A recommended construction period pollution prevention and erosion and sedimentation controls are included at the end of this report.

## Standard 9: Operation and Maintenance Plan

In compliance with Standard 9, a Post Construction Stormwater Operation and Maintenance (O&M) Plan has been developed for the Project. The O&M Plan is included at the end of this report as part of the Long Term Pollution Prevention Plan.

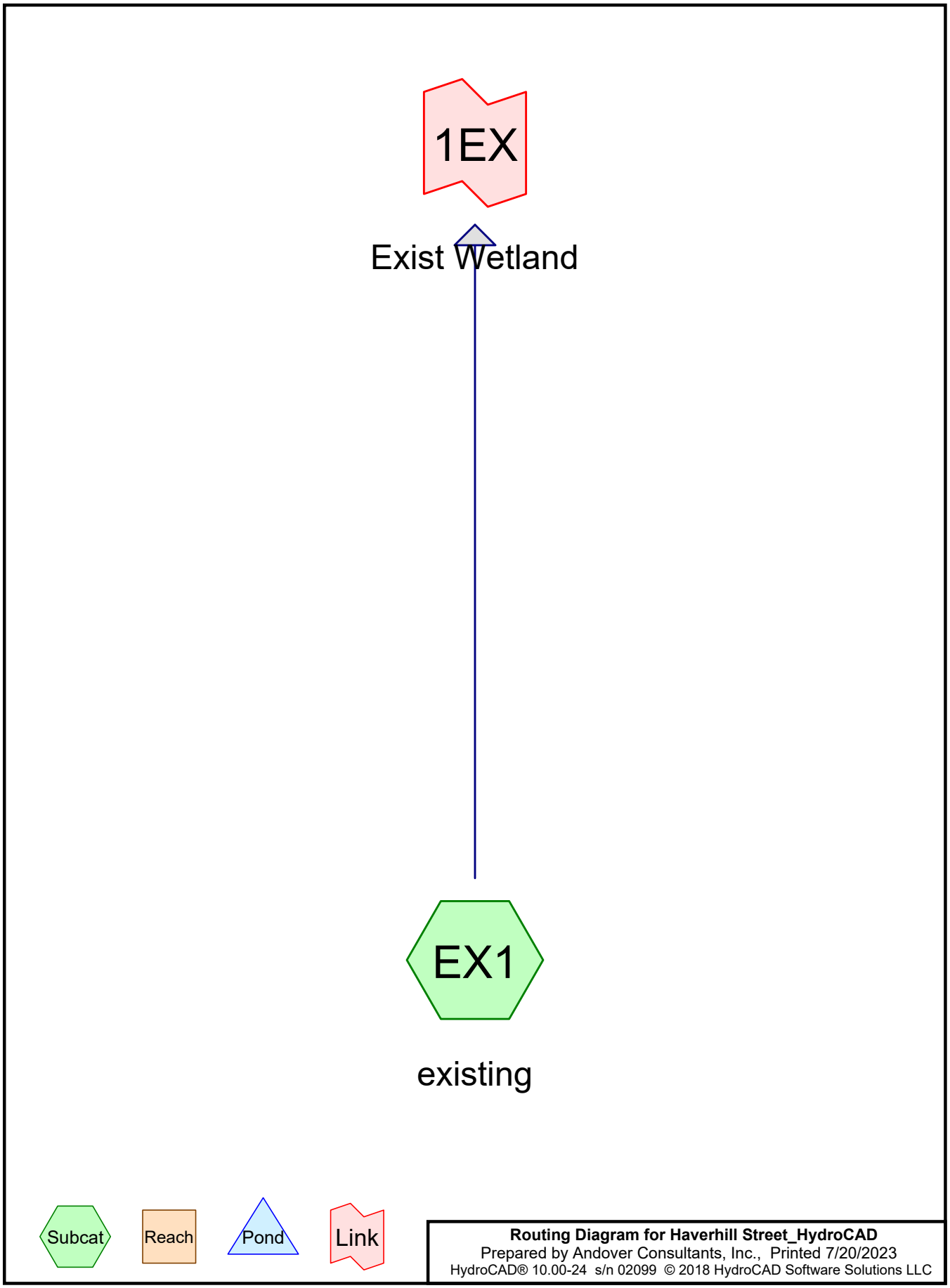
## Standard 10: Prohibition of Illicit Discharges

Based on available records, there are no known illicit discharges generated by the property owner. No illicit discharges are proposed. Prior to land disturbance, an illicit discharge statement will be provided, if requested.

# Appendix - Standard 2 Supporting Information

Rainfall volumes used for this analysis were based on the Natural Resources Conservation Service (NRCS) Type III, 24-hour storm event for Andover, Massachusetts. Runoff coefficients for the existing and proposed conditions were determined using NRCS Technical Release 55 (TR-55) methodology as provided in HydroCAD. The HydroCAD model is based on the NRCS Technical Release 20 (TR-20) Model for Project Formulation Hydrology.

# HydroCAD Analysis: Existing Conditions




**Routing Diagram for Haverhill Street_HydroCAD**
Prepared by Andover Consultants, Inc., Printed 7/20/2023

## Area Listing (selected nodes)

| Area (sq-ft) | CN | Description (subcatchment-numbers) |
|---|---|---|
| 7,415 | 61 | >75% Grass cover, Good, HSG B (EX1) |
| 2,191 | 98 | Paved parking, HSG B (EX1) |
| 182 | 30 | Woods, Good, HSG A (EX1) |
| 7,832 | 55 | Woods, Good, HSG B (EX1) |
| **17,620** | **63** | **TOTAL AREA** |

## Soil Listing (selected nodes)

| Area (sq-ft) | Soil Group | Subcatchment Numbers |
|---|---|---|
| 182 | HSG A | EX1 |
| 17,438 | HSG B | EX1 |
| 0 | HSG C | |
| 0 | HSG D | |
| 0 | Other | |
| **17,620** | | **TOTAL AREA** |

Time span=0.00-36.00 hrs, dt=0.02 hrs, 1801 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**SubcatchmentEX1: existing** Runoff Area=17,620 sf 12.43% Impervious Runoff Depth=0.48"
Tc=6.0 min CN=63 Runoff=0.2 cfs 704 cf

**Link 1EX: Exist Wetland** Inflow=0.2 cfs 704 cf
Primary=0.2 cfs 704 cf

**Total Runoff Area = 17,620 sf Runoff Volume = 704 cf Average Runoff Depth = 0.48"**
**87.57% Pervious = 15,429 sf 12.43% Impervious = 2,191 sf**

## Summary for Subcatchment EX1: existing

Runoff = 0.2 cfs @ 12.12 hrs, Volume= 704 cf, Depth= 0.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-Yr Rainfall=3.11"

| Area (sf) | CN | Description |
|---|---|---|
| 7,415 | 61 | >75% Grass cover, Good, HSG B |
| 7,832 | 55 | Woods, Good, HSG B |
| 182 | 30 | Woods, Good, HSG A |
| 2,191 | 98 | Paved parking, HSG B |
| 17,620 | 63 | Weighted Average |
| 15,429 | | 87.57% Pervious Area |
| 2,191 | | 12.43% Impervious Area |

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

## Summary for Link 1EX: Exist Wetland

Inflow Area = 17,620 sf, 12.43% Impervious, Inflow Depth = 0.48" for 2-Yr event
Inflow = 0.2 cfs @ 12.12 hrs, Volume= 704 cf
Primary = 0.2 cfs @ 12.12 hrs, Volume= 704 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs

Time span=0.00-36.00 hrs, dt=0.02 hrs, 1801 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**SubcatchmentEX1: existing** Runoff Area=17,620 sf 12.43% Impervious Runoff Depth=1.46"
Tc=6.0 min CN=63 Runoff=0.6 cfs 2,141 cf

**Link 1EX: Exist Wetland** Inflow=0.6 cfs 2,141 cf
Primary=0.6 cfs 2,141 cf

**Total Runoff Area = 17,620 sf Runoff Volume = 2,141 cf Average Runoff Depth = 1.46"**
**87.57% Pervious = 15,429 sf 12.43% Impervious = 2,191 sf**

## Summary for Subcatchment EX1: existing

Runoff = 0.6 cfs @ 12.10 hrs, Volume= 2,141 cf, Depth= 1.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-Yr Rainfall=4.92"

| Area (sf) | CN | Description |
|---|---|---|
| 7,415 | 61 | >75% Grass cover, Good, HSG B |
| 7,832 | 55 | Woods, Good, HSG B |
| 182 | 30 | Woods, Good, HSG A |
| 2,191 | 98 | Paved parking, HSG B |
| 17,620 | 63 | Weighted Average |
| 15,429 | | 87.57% Pervious Area |
| 2,191 | | 12.43% Impervious Area |

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

## Summary for Link 1EX: Exist Wetland

Inflow Area = 17,620 sf, 12.43% Impervious, Inflow Depth = 1.46" for 10-Yr event
Inflow = 0.6 cfs @ 12.10 hrs, Volume= 2,141 cf
Primary = 0.6 cfs @ 12.10 hrs, Volume= 2,141 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs

Time span=0.00-36.00 hrs, dt=0.02 hrs, 1801 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**SubcatchmentEX1: existing** Runoff Area=17,620 sf 12.43% Impervious Runoff Depth=2.21"
Tc=6.0 min CN=63 Runoff=1.0 cfs 3,247 cf

**Link 1EX: Exist Wetland** Inflow=1.0 cfs 3,247 cf
Primary=1.0 cfs 3,247 cf

**Total Runoff Area = 17,620 sf Runoff Volume = 3,247 cf Average Runoff Depth = 2.21"**
**87.57% Pervious = 15,429 sf 12.43% Impervious = 2,191 sf**

## Summary for Subcatchment EX1: existing

Runoff = 1.0 cfs @ 12.09 hrs, Volume= 3,247 cf, Depth= 2.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-Yr Rainfall=6.05"

| Area (sf) | CN | Description |
|---|---|---|
| 7,415 | 61 | >75% Grass cover, Good, HSG B |
| 7,832 | 55 | Woods, Good, HSG B |
| 182 | 30 | Woods, Good, HSG A |
| 2,191 | 98 | Paved parking, HSG B |
| 17,620 | 63 | Weighted Average |
| 15,429 | | 87.57% Pervious Area |
| 2,191 | | 12.43% Impervious Area |

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

## Summary for Link 1EX: Exist Wetland

Inflow Area = 17,620 sf, 12.43% Impervious, Inflow Depth = 2.21" for 25-Yr event
Inflow = 1.0 cfs @ 12.09 hrs, Volume= 3,247 cf
Primary = 1.0 cfs @ 12.09 hrs, Volume= 3,247 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs

Time span=0.00-36.00 hrs, dt=0.02 hrs, 1801 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**SubcatchmentEX1: existing** Runoff Area=17,620 sf 12.43% Impervious Runoff Depth=3.50"
Tc=6.0 min CN=63 Runoff=1.6 cfs 5,146 cf

**Link 1EX: Exist Wetland** Inflow=1.6 cfs 5,146 cf
Primary=1.6 cfs 5,146 cf

**Total Runoff Area = 17,620 sf Runoff Volume = 5,146 cf Average Runoff Depth = 3.50"**
**87.57% Pervious = 15,429 sf 12.43% Impervious = 2,191 sf**

## Summary for Subcatchment EX1: existing

Runoff = 1.6 cfs @ 12.09 hrs, Volume= 5,146 cf, Depth= 3.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Yr Rainfall=7.79"

| Area (sf) | CN | Description |
|---|---|---|
| 7,415 | 61 | >75% Grass cover, Good, HSG B |
| 7,832 | 55 | Woods, Good, HSG B |
| 182 | 30 | Woods, Good, HSG A |
| 2,191 | 98 | Paved parking, HSG B |
| 17,620 | 63 | Weighted Average |
| 15,429 | | 87.57% Pervious Area |
| 2,191 | | 12.43% Impervious Area |

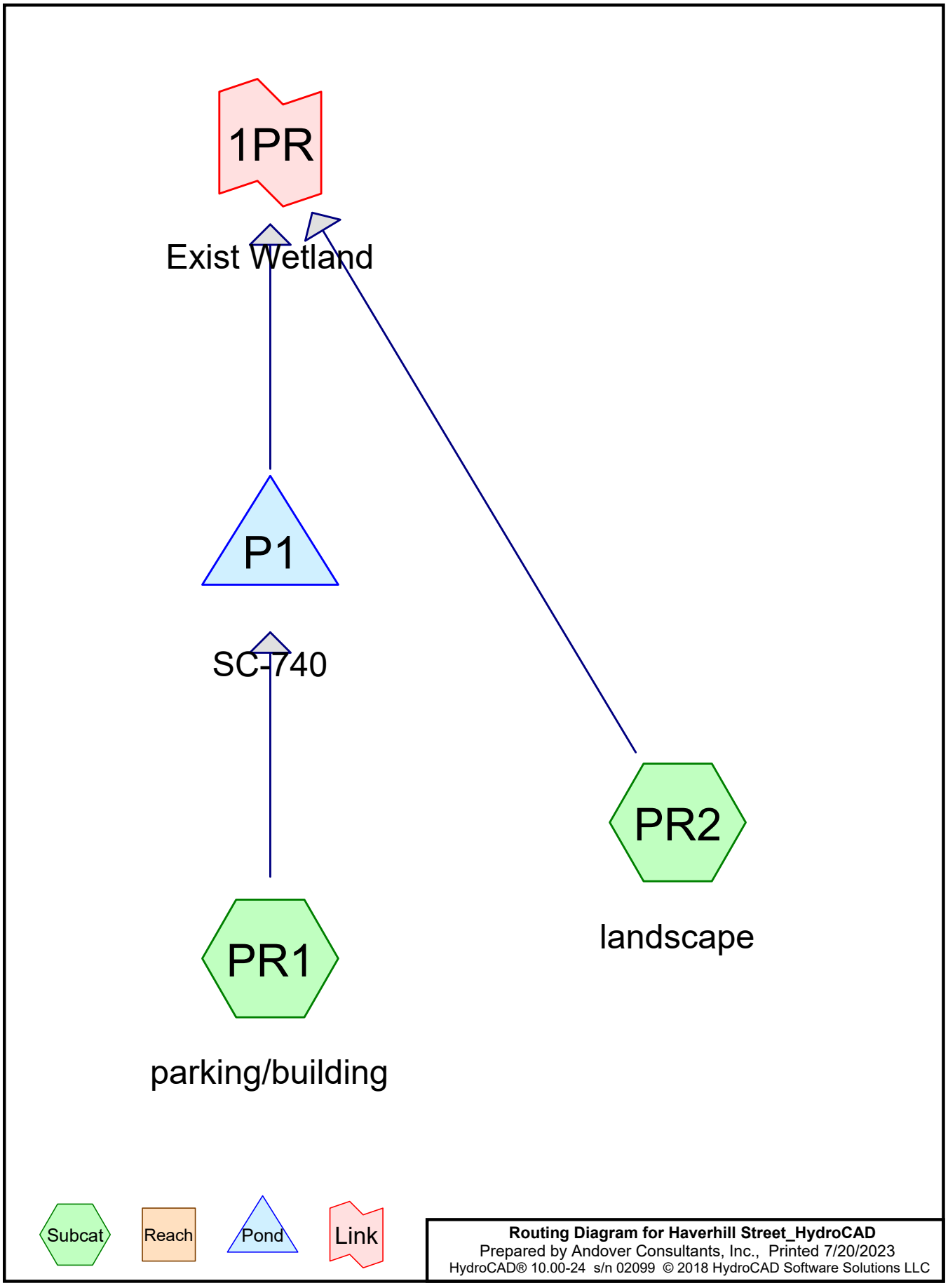
| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry,** |

## Summary for Link 1EX: Exist Wetland

Inflow Area = 17,620 sf, 12.43% Impervious, Inflow Depth = 3.50" for 100-Yr event
Inflow = 1.6 cfs @ 12.09 hrs, Volume= 5,146 cf
Primary = 1.6 cfs @ 12.09 hrs, Volume= 5,146 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs

# HydroCAD Analysis: Proposed Conditions




**Routing Diagram for Haverhill Street_HydroCAD**
Prepared by Andover Consultants, Inc., Printed 7/20/2023

## Area Listing (selected nodes)

| Area (sq-ft) | CN | Description (subcatchment-numbers) |
|---|---|---|
| 4,017 | 61 | >75% Grass cover, Good, HSG B (PR1, PR2) |
| 7,680 | 98 | Paved parking, HSG B (PR1) |
| 778 | 98 | Unconnected roofs, HSG B (PR1) |
| 182 | 30 | Woods, Good, HSG A (PR2) |
| 4,963 | 55 | Woods, Good, HSG B (PR2) |
| **17,620** | **77** | **TOTAL AREA** |

## Soil Listing (selected nodes)

| Area (sq-ft) | Soil Group | Subcatchment Numbers |
|---|---|---|
| 182 | HSG A | PR2 |
| 17,438 | HSG B | PR1, PR2 |
| 0 | HSG C | |
| 0 | HSG D | |
| 0 | Other | |
| **17,620** | | **TOTAL AREA** |

Time span=0.00-36.00 hrs, dt=0.02 hrs, 1801 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**SubcatchmentPR1: parking/building** Runoff Area=10,707 sf 79.00% Impervious Runoff Depth=2.09"
Tc=6.0 min CN=90 Runoff=0.6 cfs 1,861 cf

**SubcatchmentPR2: landscape** Runoff Area=6,913 sf 0.00% Impervious Runoff Depth=0.25"
Tc=6.0 min CN=56 Runoff=0.0 cfs 145 cf

**Pond P1: SC-740** Peak Elev=134.63' Storage=925 cf Inflow=0.6 cfs 1,861 cf
Discarded=0.0 cfs 1,407 cf Primary=0.0 cfs 331 cf Outflow=0.1 cfs 1,738 cf

**Link 1PR: Exist Wetland** Inflow=0.1 cfs 476 cf
Primary=0.1 cfs 476 cf

**Total Runoff Area = 17,620 sf Runoff Volume = 2,006 cf Average Runoff Depth = 1.37"**
**52.00% Pervious = 9,162 sf 48.00% Impervious = 8,458 sf**

## Summary for Subcatchment PR1: parking/building

Runoff = 0.6 cfs @ 12.09 hrs, Volume= 1,861 cf, Depth= 2.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-Yr Rainfall=3.11"

| Area (sf) | CN | Description |
|---|---|---|
| 2,249 | 61 | >75% Grass cover, Good, HSG B |
| 7,680 | 98 | Paved parking, HSG B |
| 778 | 98 | Unconnected roofs, HSG B |
| 10,707 | 90 | Weighted Average |
| 2,249 | | 21.00% Pervious Area |
| 8,458 | | 79.00% Impervious Area |
| 778 | | 9.20% Unconnected |

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

## Summary for Subcatchment PR2: landscape

Runoff = 0.0 cfs @ 12.32 hrs, Volume= 145 cf, Depth= 0.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Type III 24-hr 2-Yr Rainfall=3.11"

| Area (sf) | CN | Description |
|---|---|---|
| 1,768 | 61 | >75% Grass cover, Good, HSG B |
| 4,963 | 55 | Woods, Good, HSG B |
| 182 | 30 | Woods, Good, HSG A |
| 6,913 | 56 | Weighted Average |
| 6,913 | | 100.00% Pervious Area |

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

## Summary for Pond P1: SC-740

Inflow Area = 10,707 sf, 79.00% Impervious, Inflow Depth = 2.09" for 2-Yr event
Inflow = 0.6 cfs @ 12.09 hrs, Volume= 1,861 cf
Outflow = 0.1 cfs @ 12.91 hrs, Volume= 1,738 cf, Atten= 90%, Lag= 49.2 min
Discarded = 0.0 cfs @ 12.91 hrs, Volume= 1,407 cf
Primary = 0.0 cfs @ 12.91 hrs, Volume= 331 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs / 3

Starting Elev= 65.50' Surf.Area= 0 sf Storage= 0 cf
Peak Elev= 134.63' @ 12.91 hrs Surf.Area= 1,168 sf Storage= 925 cf
Flood Elev= 68.80' Surf.Area= 0 sf Storage= 0 cf

Plug-Flow detention time= 470.0 min calculated for 1,738 cf (93% of inflow)
Center-of-Mass det. time= 434.9 min ( 1,242.9 - 808.0 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 133.00' | 1,451 cf | **16.00'W x 73.00'L x 3.50'H Prismatoid**<br>4,088 cf Overall - 459 cf Embedded = 3,629 cf x 40.0% Voids |
| #2 | 133.50' | 459 cf | **ADS_StormTech SC-740 +Cap** x 10 Inside #1<br>Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf<br>Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap<br>10 Chambers in 3 Rows |
| | | 1,911 cf | Total Available Storage |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 134.50' | **12.0" Round Culvert Outlet**<br>L= 15.0' CMP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 134.50' / 134.30' S= 0.0133 '/' Cc= 0.900<br>n= 0.020 Corrugated PE, corrugated interior, Flow Area= 0.79 sf |
| #2 | Device 1 | 136.10' | **2.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)<br>0.5' Crest Height |
| #3 | Device 1 | 134.50' | **6.0" Vert. Orifice/Grate** C= 0.600 |
| #4 | Device 1 | 135.50' | **6.0" Vert. Orifice/Grate** C= 0.600 |
| #5 | Discarded | 133.00' | **0.520 in/hr Exfiltration over Horizontal area**<br>Conductivity to Groundwater Elevation = 62.80' Phase-In= 0.01' |

**Discarded OutFlow** Max=0.0 cfs @ 12.91 hrs HW=134.63' (Free Discharge)
└**5=Exfiltration** ( Controls 0.0 cfs)

**Primary OutFlow** Max=0.0 cfs @ 12.91 hrs HW=134.63' TW=0.00' (Dynamic Tailwater)
└**1=Culvert Outlet** (Passes 0.0 cfs of 0.0 cfs potential flow)
  ├**2=Sharp-Crested Rectangular Weir** ( Controls 0.0 cfs)
  ├**3=Orifice/Grate** (Orifice Controls 0.0 cfs @ 1.21 fps)
  └**4=Orifice/Grate** ( Controls 0.0 cfs)

## Summary for Link 1PR: Exist Wetland

Inflow Area = 17,620 sf, 48.00% Impervious, Inflow Depth = 0.32" for 2-Yr event
Inflow = 0.1 cfs @ 12.89 hrs, Volume= 476 cf
Primary = 0.1 cfs @ 12.89 hrs, Volume= 476 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs

Time span=0.00-36.00 hrs, dt=0.02 hrs, 1801 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**SubcatchmentPR1: parking/building** Runoff Area=10,707 sf 79.00% Impervious Runoff Depth=3.80"
Tc=6.0 min CN=90 Runoff=1.1 cfs 3,390 cf

**SubcatchmentPR2: landscape** Runoff Area=6,913 sf 0.00% Impervious Runoff Depth=1.00"
Tc=6.0 min CN=56 Runoff=0.2 cfs 576 cf

**Pond P1: SC-740** Peak Elev=135.08' Storage=1,190 cf Inflow=1.1 cfs 3,390 cf
Discarded=0.0 cfs 1,502 cf Primary=0.5 cfs 1,665 cf Outflow=0.6 cfs 3,167 cf

**Link 1PR: Exist Wetland** Inflow=0.6 cfs 2,242 cf
Primary=0.6 cfs 2,242 cf

**Total Runoff Area = 17,620 sf Runoff Volume = 3,966 cf Average Runoff Depth = 2.70"**
**52.00% Pervious = 9,162 sf 48.00% Impervious = 8,458 sf**

## Summary for Subcatchment PR1: parking/building

Runoff = 1.1 cfs @ 12.09 hrs, Volume= 3,390 cf, Depth= 3.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-Yr Rainfall=4.92"

| Area (sf) | CN | Description |
|---|---|---|
| 2,249 | 61 | >75% Grass cover, Good, HSG B |
| 7,680 | 98 | Paved parking, HSG B |
| 778 | 98 | Unconnected roofs, HSG B |
| 10,707 | 90 | Weighted Average |
| 2,249 | | 21.00% Pervious Area |
| 8,458 | | 79.00% Impervious Area |
| 778 | | 9.20% Unconnected |

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

## Summary for Subcatchment PR2: landscape

Runoff = 0.2 cfs @ 12.11 hrs, Volume= 576 cf, Depth= 1.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-Yr Rainfall=4.92"

| Area (sf) | CN | Description |
|---|---|---|
| 1,768 | 61 | >75% Grass cover, Good, HSG B |
| 4,963 | 55 | Woods, Good, HSG B |
| 182 | 30 | Woods, Good, HSG A |
| 6,913 | 56 | Weighted Average |
| 6,913 | | 100.00% Pervious Area |

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

## Summary for Pond P1: SC-740

Inflow Area = 10,707 sf, 79.00% Impervious, Inflow Depth = 3.80" for 10-Yr event
Inflow = 1.1 cfs @ 12.09 hrs, Volume= 3,390 cf
Outflow = 0.6 cfs @ 12.22 hrs, Volume= 3,167 cf, Atten= 47%, Lag= 8.1 min
Discarded = 0.0 cfs @ 12.22 hrs, Volume= 1,502 cf
Primary = 0.5 cfs @ 12.22 hrs, Volume= 1,665 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs / 3

Starting Elev= 65.50' Surf.Area= 0 sf Storage= 0 cf
Peak Elev= 135.08' @ 12.22 hrs Surf.Area= 1,168 sf Storage= 1,190 cf
Flood Elev= 68.80' Surf.Area= 0 sf Storage= 0 cf

Plug-Flow detention time= 273.9 min calculated for 3,167 cf (93% of inflow)
Center-of-Mass det. time= 238.6 min ( 1,029.9 - 791.3 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 133.00' | 1,451 cf | **16.00'W x 73.00'L x 3.50'H Prismatoid**<br>4,088 cf Overall - 459 cf Embedded = 3,629 cf x 40.0% Voids |
| #2 | 133.50' | 459 cf | **ADS_StormTech SC-740 +Cap** x 10 Inside #1<br>Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf<br>Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap<br>10 Chambers in 3 Rows |
| | | 1,911 cf | Total Available Storage |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 134.50' | **12.0" Round Culvert Outlet**<br>L= 15.0' CMP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 134.50' / 134.30' S= 0.0133 '/' Cc= 0.900<br>n= 0.020 Corrugated PE, corrugated interior, Flow Area= 0.79 sf |
| #2 | Device 1 | 136.10' | **2.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)<br>0.5' Crest Height |
| #3 | Device 1 | 134.50' | **6.0" Vert. Orifice/Grate** C= 0.600 |
| #4 | Device 1 | 135.50' | **6.0" Vert. Orifice/Grate** C= 0.600 |
| #5 | Discarded | 133.00' | **0.520 in/hr Exfiltration over Horizontal area**<br>Conductivity to Groundwater Elevation = 62.80' Phase-In= 0.01' |

**Discarded OutFlow** Max=0.0 cfs @ 12.22 hrs HW=135.08' (Free Discharge)
└**5=Exfiltration** ( Controls 0.0 cfs)

**Primary OutFlow** Max=0.5 cfs @ 12.22 hrs HW=135.08' TW=0.00' (Dynamic Tailwater)
└**1=Culvert Outlet** (Passes 0.5 cfs of 0.9 cfs potential flow)
  ├**2=Sharp-Crested Rectangular Weir** ( Controls 0.0 cfs)
  ├**3=Orifice/Grate** (Orifice Controls 0.5 cfs @ 2.75 fps)
  └**4=Orifice/Grate** ( Controls 0.0 cfs)

## Summary for Link 1PR: Exist Wetland

Inflow Area = 17,620 sf, 48.00% Impervious, Inflow Depth = 1.53" for 10-Yr event
Inflow = 0.6 cfs @ 12.19 hrs, Volume= 2,242 cf
Primary = 0.6 cfs @ 12.19 hrs, Volume= 2,242 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs

Time span=0.00-36.00 hrs, dt=0.02 hrs, 1801 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**SubcatchmentPR1: parking/building** Runoff Area=10,707 sf 79.00% Impervious Runoff Depth=4.89"
Tc=6.0 min CN=90 Runoff=1.3 cfs 4,367 cf

**SubcatchmentPR2: landscape** Runoff Area=6,913 sf 0.00% Impervious Runoff Depth=1.63"
Tc=6.0 min CN=56 Runoff=0.3 cfs 937 cf

**Pond P1: SC-740** Peak Elev=135.43' Storage=1,391 cf Inflow=1.3 cfs 4,367 cf
Discarded=0.0 cfs 1,548 cf Primary=0.8 cfs 2,574 cf Outflow=0.8 cfs 4,122 cf

**Link 1PR: Exist Wetland** Inflow=1.0 cfs 3,510 cf
Primary=1.0 cfs 3,510 cf

**Total Runoff Area = 17,620 sf Runoff Volume = 5,304 cf Average Runoff Depth = 3.61"**
**52.00% Pervious = 9,162 sf 48.00% Impervious = 8,458 sf**

## Summary for Subcatchment PR1: parking/building

Runoff = 1.3 cfs @ 12.08 hrs, Volume= 4,367 cf, Depth= 4.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-Yr Rainfall=6.05"

| Area (sf) | CN | Description |
|---|---|---|
| 2,249 | 61 | >75% Grass cover, Good, HSG B |
| 7,680 | 98 | Paved parking, HSG B |
| 778 | 98 | Unconnected roofs, HSG B |
| 10,707 | 90 | Weighted Average |
| 2,249 | | 21.00% Pervious Area |
| 8,458 | | 79.00% Impervious Area |
| 778 | | 9.20% Unconnected |

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

## Summary for Subcatchment PR2: landscape

Runoff = 0.3 cfs @ 12.10 hrs, Volume= 937 cf, Depth= 1.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-Yr Rainfall=6.05"

| Area (sf) | CN | Description |
|---|---|---|
| 1,768 | 61 | >75% Grass cover, Good, HSG B |
| 4,963 | 55 | Woods, Good, HSG B |
| 182 | 30 | Woods, Good, HSG A |
| 6,913 | 56 | Weighted Average |
| 6,913 | | 100.00% Pervious Area |

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

## Summary for Pond P1: SC-740

Inflow Area = 10,707 sf, 79.00% Impervious, Inflow Depth = 4.89" for 25-Yr event
Inflow = 1.3 cfs @ 12.08 hrs, Volume= 4,367 cf
Outflow = 0.8 cfs @ 12.19 hrs, Volume= 4,122 cf, Atten= 41%, Lag= 6.4 min
Discarded = 0.0 cfs @ 12.19 hrs, Volume= 1,548 cf
Primary = 0.8 cfs @ 12.19 hrs, Volume= 2,574 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs / 3

Starting Elev= 65.50' Surf.Area= 0 sf Storage= 0 cf
Peak Elev= 135.43' @ 12.19 hrs Surf.Area= 1,168 sf Storage= 1,391 cf
Flood Elev= 68.80' Surf.Area= 0 sf Storage= 0 cf

Plug-Flow detention time= 219.1 min calculated for 4,120 cf (94% of inflow)
Center-of-Mass det. time= 188.4 min ( 972.8 - 784.4 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 133.00' | 1,451 cf | **16.00'W x 73.00'L x 3.50'H Prismatoid**<br>4,088 cf Overall - 459 cf Embedded = 3,629 cf x 40.0% Voids |
| #2 | 133.50' | 459 cf | **ADS_StormTech SC-740 +Cap** x 10 Inside #1<br>Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf<br>Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap<br>10 Chambers in 3 Rows |
| | | 1,911 cf | Total Available Storage |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 134.50' | **12.0" Round Culvert Outlet**<br>L= 15.0' CMP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 134.50' / 134.30' S= 0.0133 '/' Cc= 0.900<br>n= 0.020 Corrugated PE, corrugated interior, Flow Area= 0.79 sf |
| #2 | Device 1 | 136.10' | **2.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)<br>0.5' Crest Height |
| #3 | Device 1 | 134.50' | **6.0" Vert. Orifice/Grate** C= 0.600 |
| #4 | Device 1 | 135.50' | **6.0" Vert. Orifice/Grate** C= 0.600 |
| #5 | Discarded | 133.00' | **0.520 in/hr Exfiltration over Horizontal area**<br>Conductivity to Groundwater Elevation = 62.80' Phase-In= 0.01' |

**Discarded OutFlow** Max=0.0 cfs @ 12.19 hrs HW=135.43' (Free Discharge)
└**5=Exfiltration** ( Controls 0.0 cfs)

**Primary OutFlow** Max=0.8 cfs @ 12.19 hrs HW=135.43' TW=0.00' (Dynamic Tailwater)
└**1=Culvert Outlet** (Passes 0.8 cfs of 2.0 cfs potential flow)
  ├**2=Sharp-Crested Rectangular Weir** ( Controls 0.0 cfs)
  ├**3=Orifice/Grate** (Orifice Controls 0.8 cfs @ 3.98 fps)
  └**4=Orifice/Grate** ( Controls 0.0 cfs)

## Summary for Link 1PR: Exist Wetland

Inflow Area = 17,620 sf, 48.00% Impervious, Inflow Depth = 2.39" for 25-Yr event
Inflow = 1.0 cfs @ 12.15 hrs, Volume= 3,510 cf
Primary = 1.0 cfs @ 12.15 hrs, Volume= 3,510 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs

Time span=0.00-36.00 hrs, dt=0.02 hrs, 1801 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**SubcatchmentPR1: parking/building** Runoff Area=10,707 sf 79.00% Impervious Runoff Depth=6.60"
Tc=6.0 min CN=90 Runoff=1.8 cfs 5,888 cf

**SubcatchmentPR2: landscape** Runoff Area=6,913 sf 0.00% Impervious Runoff Depth=2.75"
Tc=6.0 min CN=56 Runoff=0.5 cfs 1,583 cf

**Pond P1: SC-740** Peak Elev=135.83' Storage=1,595 cf Inflow=1.8 cfs 5,888 cf
Discarded=0.0 cfs 1,605 cf Primary=1.2 cfs 4,025 cf Outflow=1.3 cfs 5,630 cf

**Link 1PR: Exist Wetland** Inflow=1.6 cfs 5,607 cf
Primary=1.6 cfs 5,607 cf

**Total Runoff Area = 17,620 sf Runoff Volume = 7,471 cf Average Runoff Depth = 5.09"**
**52.00% Pervious = 9,162 sf 48.00% Impervious = 8,458 sf**

## Summary for Subcatchment PR1: parking/building

Runoff = 1.8 cfs @ 12.08 hrs, Volume= 5,888 cf, Depth= 6.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Yr Rainfall=7.79"

| Area (sf) | CN | Description |
|---|---|---|
| 2,249 | 61 | >75% Grass cover, Good, HSG B |
| 7,680 | 98 | Paved parking, HSG B |
| 778 | 98 | Unconnected roofs, HSG B |
| 10,707 | 90 | Weighted Average |
| 2,249 | | 21.00% Pervious Area |
| 8,458 | | 79.00% Impervious Area |
| 778 | | 9.20% Unconnected |

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

## Summary for Subcatchment PR2: landscape

Runoff = 0.5 cfs @ 12.09 hrs, Volume= 1,583 cf, Depth= 2.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Yr Rainfall=7.79"

| Area (sf) | CN | Description |
|---|---|---|
| 1,768 | 61 | >75% Grass cover, Good, HSG B |
| 4,963 | 55 | Woods, Good, HSG B |
| 182 | 30 | Woods, Good, HSG A |
| 6,913 | 56 | Weighted Average |
| 6,913 | | 100.00% Pervious Area |

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

## Summary for Pond P1: SC-740

Inflow Area = 10,707 sf, 79.00% Impervious, Inflow Depth = 6.60" for 100-Yr event
Inflow = 1.8 cfs @ 12.08 hrs, Volume= 5,888 cf
Outflow = 1.3 cfs @ 12.16 hrs, Volume= 5,630 cf, Atten= 29%, Lag= 4.8 min
Discarded = 0.0 cfs @ 12.16 hrs, Volume= 1,605 cf
Primary = 1.2 cfs @ 12.16 hrs, Volume= 4,025 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs / 3

Starting Elev= 65.50' Surf.Area= 0 sf Storage= 0 cf
Peak Elev= 135.83' @ 12.16 hrs Surf.Area= 1,168 sf Storage= 1,595 cf
Flood Elev= 68.80' Surf.Area= 0 sf Storage= 0 cf

Plug-Flow detention time= 171.2 min calculated for 5,627 cf (96% of inflow)
Center-of-Mass det. time= 146.2 min ( 922.9 - 776.7 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 133.00' | 1,451 cf | **16.00'W x 73.00'L x 3.50'H Prismatoid**<br>4,088 cf Overall - 459 cf Embedded = 3,629 cf x 40.0% Voids |
| #2 | 133.50' | 459 cf | **ADS_StormTech SC-740 +Cap** x 10 Inside #1<br>Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf<br>Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap<br>10 Chambers in 3 Rows |
| | | 1,911 cf | Total Available Storage |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 134.50' | **12.0" Round Culvert Outlet**<br>L= 15.0' CMP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 134.50' / 134.30' S= 0.0133 '/' Cc= 0.900<br>n= 0.020 Corrugated PE, corrugated interior, Flow Area= 0.79 sf |
| #2 | Device 1 | 136.10' | **2.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)<br>0.5' Crest Height |
| #3 | Device 1 | 134.50' | **6.0" Vert. Orifice/Grate** C= 0.600 |
| #4 | Device 1 | 135.50' | **6.0" Vert. Orifice/Grate** C= 0.600 |
| #5 | Discarded | 133.00' | **0.520 in/hr Exfiltration over Horizontal area**<br>Conductivity to Groundwater Elevation = 62.80' Phase-In= 0.01' |

**Discarded OutFlow** Max=0.0 cfs @ 12.16 hrs HW=135.82' (Free Discharge)
└**5=Exfiltration** ( Controls 0.0 cfs)

**Primary OutFlow** Max=1.2 cfs @ 12.16 hrs HW=135.82' TW=0.00' (Dynamic Tailwater)
└**1=Culvert Outlet** (Passes 1.2 cfs of 2.9 cfs potential flow)
  ├**2=Sharp-Crested Rectangular Weir** ( Controls 0.0 cfs)
  ├**3=Orifice/Grate** (Orifice Controls 1.0 cfs @ 4.99 fps)
  └**4=Orifice/Grate** (Orifice Controls 0.3 cfs @ 1.94 fps)

## Summary for Link 1PR: Exist Wetland

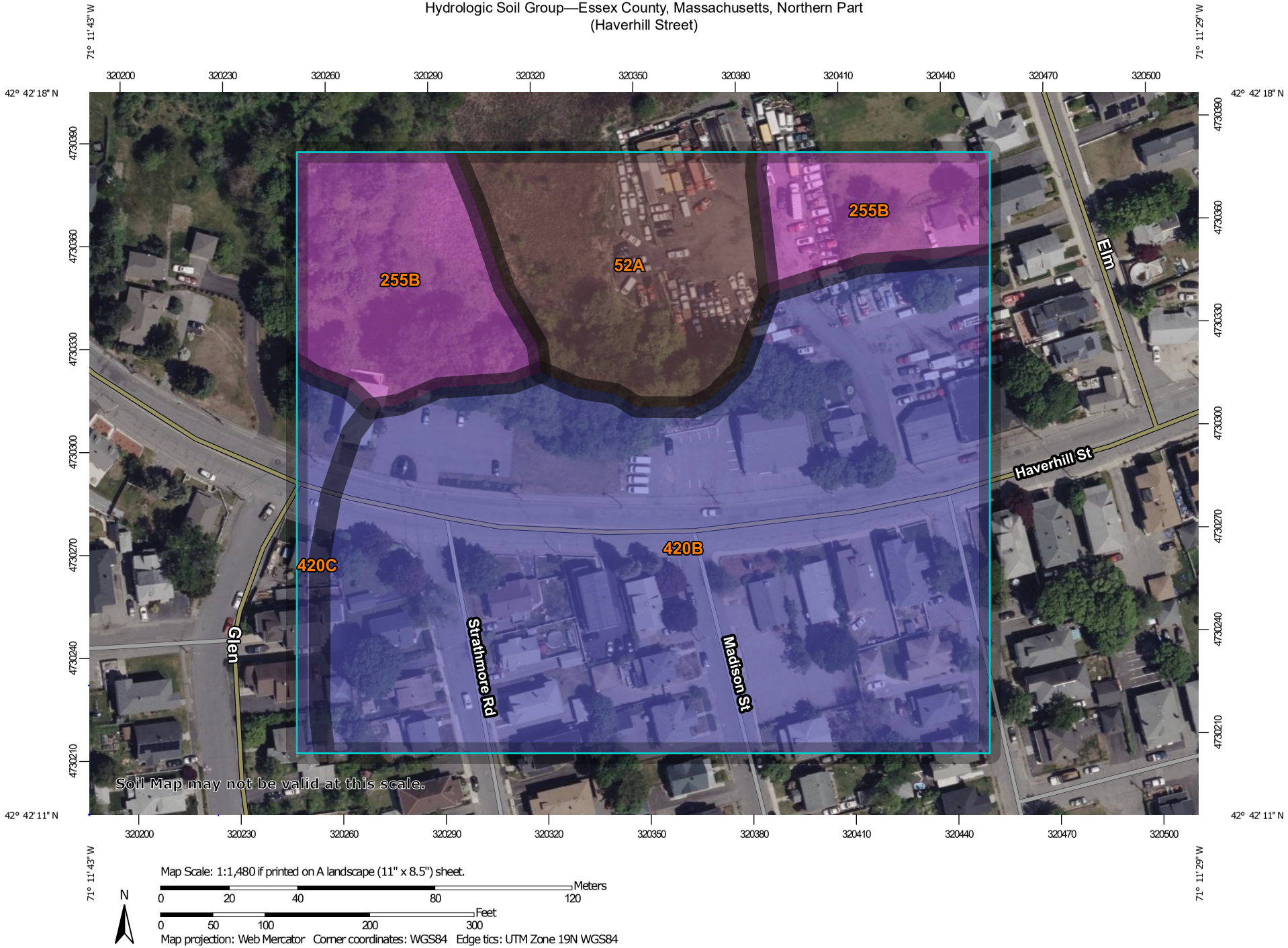
Inflow Area = 17,620 sf, 48.00% Impervious, Inflow Depth = 3.82" for 100-Yr event
Inflow = 1.6 cfs @ 12.15 hrs, Volume= 5,607 cf
Primary = 1.6 cfs @ 12.15 hrs, Volume= 5,607 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs

# Appendix - Standard 3
# Supporting Information

# Soil Evaluation and Analysis

Hydrologic Soil Group—Essex County, Massachusetts, Northern Part
(Haverhill Street)




Map Scale: 1:1,480 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 20 40 80 120

Feet
0 50 100 200 300

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 Rating Polygons**
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

**Soil Rating Lines**
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

**Soil Rating Points**
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

**Water Features**
- Streams and Canals

**Transportation**
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

**Background**
- Aerial Photography

## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

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: Essex County, Massachusetts, Northern Part
Survey Area Data: Version 18, Sep 9, 2022

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.

# Hydrologic Soil Group

| Map unit symbol | Map unit name | Rating | Acres in AOI | Percent of AOI |
|---|---|---|---|---|
| 52A | Freetown muck, 0 to 1 percent slopes | B/D | 1.3 | 14.9% |
| 255B | Windsor loamy sand, 3 to 8 percent slopes | A | 1.6 | 18.0% |
| 420B | Canton fine sandy loam, 3 to 8 percent slopes | B | 5.7 | 64.2% |
| 420C | Canton fine sandy loam, 8 to 15 percent slopes | B | 0.3 | 3.0% |
| **Totals for Area of Interest** | | | **8.8** | **100.0%** |

## Description

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

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

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

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

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

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

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

## Rating Options

*Aggregation Method:* Dominant Condition

*Component Percent Cutoff: None Specified*

*Tie-break Rule:* Higher

# Form 11 - Soil Suitability Assessment

**City/Town: City of Methuen**
**Site: VP Haverhill Street - Methuen**
**Soil Evaluator/Soil Scientist: Maureen Herald**

## A. Facility Information

1. Facility Information

Amigos Coffee, LLC
Owner Name

VP Haverhill Street  Map/Lot: _____
Street Address

Methuen  MA  01844
City/Town  State  Zip Code

## B. Site Information

1. (Check one)  New Construction ☒  Upgrade ☐  Repair ☐

2. Published Soil Survey available?  Yes ☒  No ☐  If yes: Web Soil Survey (Year Published)  1"=773 (Publication Scale)  420B (Soil Map Unit)

Canton Fine Sandy Loam (Soil Name)  Slope & Stoniness (Soil limitations)

3. Surficial Geological Report available?  Yes ☐  No ☒  If yes: _____ (Year Published)  _____ (Publication Scale)  _____ (Map Unit)

Loose Sandy Till (Geologic Material)  Moraine (Landform)

4. Flood Rate Insurance Map:

| | | | | | |
|---|---|---|---|---|---|
| Above the 500-year flood boundary? | Yes ☒ | No ☐ | Within the 100-year flood boundary? | Yes ☐ | No ☒ |
| Within the 500-year flood boundary? | Yes ☐ | No ☒ | Within a Velocity Zone? | Yes ☐ | No ☒ |

5. Wetland Area: National Wetland Inventory Map  PEM1E (Map Unit)  Palustrine Emergent Persistent Seasonally Flooded/Saturated (Name)

Wetlands Conservancy Program Map  _____ (Map Unit)  _____ (Name)

6. Current Water Resource Conditions (USGS)  5/12/2023 (Month/Year)  Range:  Above Normal ☐  Normal ☒  Below Normal ☐

7. Other references reviewed: _____

_____

# Form 11 - Soil Suitability Assessment

**City/Town: City of Methuen**
**Site: VP Haverhill Street - Methuen**
**Soil Evaluator/Soil Scientist: Maureen Herald**

## C. On-Site Review

**Deep Observation Hole Number:** DH-1 & DH-2 | 5/12/23 (Date) | 9:00 a.m. (Time) | Sunny - 60F (Weather)

1. Location

   Ground Elevation at Surface of Hole: See plan

   Location (Identify on Plan ): _____

2. Land Use: Urban Land/Vacant Lot (e.g. woodland, agricultural field, vacant lot, etc.) | None (Surface Stones) | 0-3% (Slope (%))

   Lawn/Wooded (Vegetation) | Moraine (Landform) | Summit (Position on landscape (attach sheet))

3. Distances from: Open Water Body >100 ft. feet | Drainage Way >100 ft. feet | Possible Wet Area >100 ft feet
   Property Line >25 ft. feet | Drinking Water Well >100 ft. feet | Other _____

4. Parent Material: Loose Sandy Till | Unsuitable Materials Present: Yes ☐ No ☒

   If Yes: Disturbed Soil ☐ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☐ Bedrock ☐

5. Groundwater Observed: Yes ☐ No ☒

   If Yes: Depth Weeping from Pit _____ Depth Standing Water in Hole _____

   Estimated Depth to High Groundwater: _____ inches | _____ elevation

# Form 11 - Soil Suitability Assessment

**City/Town: City of Methuen**
**Site: VP Haverhill Street - Methuen**
**Soil Evaluator/Soil Scientist: Maureen Herald**

---

Deep Observation Hole Number: DH-1

| Depth (In.) | Soil Horizon/ Layer | Soil Matrix: Color-Moist (Munsell) | Redoximorphic Features (mottles) | | | Soil Texture (USDA) | Coarse Fragments % by Volume | | Soil Structure | Soil Consistence (Moist) | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Depth | Color | Percent | | Gravel | Cobbles & Stones | | | |
| 0-3” | Ap | 10YR 2/2 | | | | FSL | | | Granular | Friable | |
| 3-100” | C | 2.5Y 5/3 | | | | SL | | | Massive | Friable | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

Additional Notes: No ESHWT / No Observed Water.

# Form 11 - Soil Suitability Assessment

**City/Town: City of Methuen**
**Site: VP Haverhill Street - Methuen**
**Soil Evaluator/Soil Scientist: Maureen Herald**

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Deep Observation Hole Number: DH-2

| Depth (In.) | Soil Horizon/ Layer | Soil Matrix: Color-Moist (Munsell) | Redoximorphic Features (mottles) | | | Soil Texture (USDA) | Coarse Fragments % by Volume | | Soil Structure | Soil Consistence (Moist) | Other |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Depth | Color | Percent | | Gravel | Cobbles & Stones | | | |
| 0-4” | AP | 10 YR 2/2 | | | | FSL | | | Granular | Friable | |
| 4-100” | C1 | 2.5Y 5/3 | | | | SL | | | Massive | Friable | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

Additional Notes: No ESHWT / No Observed Water.

# Form 11 - Soil Suitability Assessment

**City/Town: City of Methuen**
**Site: VP Haverhill Street - Methuen**
**Soil Evaluator/Soil Scientist: Maureen Herald**

## D. Certification

I certify that I have passed the soil evaluator examination* approved by the Department of Environmental Protection and that the above analysis was performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017.

Maureen Herald
Signature of Soil Evaluator

5-12-23
Date

Maureen Herald – SE13578
Typed or Printed Name of Soil Evaluator

6-19-2012
*Date of Soil Evaluator Exam

# Form 11 - Soil Suitability Assessment

**City/Town: City of Methuen**
**Site: VP Haverhill Street - Methuen**
**Soil Evaluator/Soil Scientist: Maureen Herald**

## E. Test Pit Locations

See Plan

# Appendix - Standard 4/8 Supporting Information

# TSS Removal Worksheet

# TSS Removal Calculation Worksheet

Project Name: **Aroma Joes**
Location: **Haverhill Street**
**Methuen, Mass**

Date: **1-Jul-23**

| A | B | C | D | E |
|---|---|---|---|---|
| BMP* | TSS Removal Rate* | Starting TSS Load** | Amount Removed (C*D) | Remaining Load (D-E) |
| **Deep Sump and Hooded Catch Basin** | **25%** | **1.00** | **0.25** | **0.75** |
| **Isolator Row** | **81%** | **0.75** | **0.61** | **0.14** |
| | **0%** | **0.14** | **0.00** | **0.14** |
| | **0%** | **0.14** | **0.00** | **0.14** |

* BMP and TSS Removal Rate Values from the MassDEP Stormwater Handbook Vol.
** Equals remaining load from previous BMP (E)

**Treatment Train TSS Removal =** **86%**

# Recommended Construction Period Pollution Prevention and Erosion Control

# Recommended Construction Period Pollution Prevention and Erosion Control

## Aroma Joes – Haverhill Street Methuen, Mass

## *General*

Sediment control measures will be implemented prior to the start of construction. A staked hay bale barrier will be installed as shown on the Site Plan. When Construction is complete all disturbed areas shall be completely stabilized.

## *Responsible Party*

The **Property Owner** shall be responsible for ensuring that the site development contractor hired for the work is continually in compliance with this Plan.

## *Site Development Plan*

See the Site Plans prepared by Andover Consultants, Inc. for the proposed development details.

## *Construction Sequencing Plan*

Major activities will *generally proceed* as follows:

1. Obtain all required permits from City Departments. .
2. Install perimeter sediment control barrier of staked hay bales and/or silt fence as shown on the plans and demarcate the limit of work in other areas prior to commencing any work.
3. Grub areas where construction will occur and remove vegetation/roots off site. No stumps or trees/vegetation shall be buried on site.
4. Remove topsoil and stockpile on site or transport offsite. Protect stockpile with a perimeter of silt fencing or hay bales if stockpiling on site.
5. Obtain all required permits to construct buildings and install utilities.
6. Install underground utilities including subsurface chambers.
7. Rough grade for parking area and building pad.
8. Perform rough earthwork activities consisting of cut and fill on lot.
9. Construct building and connect utility services.
10. Place and compact pavement base for driveway, parking area, sidewalks, etc.
11. Place and compact bituminous concrete for paved driveway and parking area.
12. Fine grade remaining areas of non-paved areas, loam, seed, mulch and install landscaping.
13. Clean project area as necessary.

## *Construction Period Pollution Prevention Measures*

1. Appropriate erosion and sediment control measures shall be installed prior to soil disturbance. Measures shall be taken to control erosion within the project area. Sediment in runoff water shall be trapped and retained within the project area. Wetland areas and surface waters shall be protected from sediment.

2. Runoff shall be controlled and conveyed into storm drains and other outlets so it will not erode the land or cause off-site damage; sediment in runoff shall be trapped by using staked hay bales, silt fencing, or sedimentation traps, or other approved erosion control devices.

3. Temporary sediment basins shall be constructed where necessary to detain runoff and to trap sediment during construction;

4. Sediment shall be removed once the volume reaches ¼ to ½ the height of the silt fence or hay bale barrier.

5. Any offsite runoff shall be diverted from highly erodible soils and steep slopes to stable areas downstream.

6. Soil and other materials shall not be stockpiled or redistributed, either temporarily or permanently, in locations or in such a manner as would cause suffocation of tree root systems. Stockpiles shall not be located where they could impact wetland.

7. Topsoil shall be stripped from disturbed areas, stockpiled in approved areas and stabilized with temporary vegetative cover if it is to be left for more than thirty (30) calendar days; perimeter sediment controls shall be installed around each area of stockpiled topsoil.

8. Soil stockpiles shall be stabilized or covered at the end of each workday.

9. The area of disturbance shall be kept to a minimum. Disturbed areas remaining idle for more than 14 days shall be stabilized with mulch or matting nets.

10. A crushed stone tracking pad shall be maintained at the start of the proposed road entrance onto Haverhill Street. Once binder is placed, the paved way may act as the tracking pad. Soil tracking onto Haverhill Street shall be closely monitored and any soil tracked onto the pavement shall be removed prior to leaving the site for the day.

11. All graded areas shall be covered with four (4") inches of topsoil and planted with a native species of vegetative cover, sufficient to prevent erosion;

12. Temporary seeding, mulching or other suitable stabilization methods shall be used to protect exposed soil areas during construction; as feasible, natural vegetation shall be retained and protected; during the months of October through March.

13. Permanent seeding should be undertaken in the spring from March through May, and in late summer and early fall from August to October 15. During the peak summer months and in the fall after October 15, when seeding is found to be impractical, appropriate temporary mulch shall be applied. Permanent seeding may be undertaken during the summer if plans provide for adequate mulching and watering. All plantings shall comply with the erosion and sedimentation vegetative practices recommended by the U.S. Soil Conservation Service;

14. All slopes steeper than 3:1 (H – V, 33.3%), shall, upon completion, be immediately stabilized with sod, or seed with straw mulch, or other approved stabilization measures ( e.g. manufactured straw mats). Areas outside of the perimeter sediment control system shall not be disturbed.

15. Monitoring, daily, and maintenance of erosion and sediment control measures, when required, shall be performed throughout the course of construction.

16. Temporary sediment trapping devices shall not be removed until permanent stabilization is established in all contributory drainage areas.

17. All temporary erosion and sediment control measures shall be removed after final site stabilization. Disturbed soil areas resulting from the removal of temporary measures shall be permanently stabilized within 30 days.

18. Dust shall be controlled at the site.

## ***Inspection Schedule***

During construction the inspection schedule shall consist of the following:

1. The sediment barrier shall be visually inspected daily. The barrier shall be repaired or replaced immediately, as necessary.
2. All seeded areas shall be inspected periodically to insure proper germination and adequate coverage and shall be reseeded as necessary. Any wash outs shall be promptly repaired, reseeded and mulched
3. Maintain a construction exit at the edge of the existing pavement/sidewalk on Haverhill Street and clean vehicles tires as needed and sweep as required to prevent the spread of sediment.
4. Inspect Haverhill Street sidewalk/pavement for soil tracking daily and prior to leaving the site for the day. Any tracked soil onto the street shall be swept up as needed prior to leaving the site. No sediments tracked onto the existing ways shall remain on the ways overnight.

# Long Term Operation and Maintenance Plan

# Operation and Maintenance Plan

## Aroma Joes – Haverhill Street Methuen, Mass

## *General*

1. All components of the drainage system, including the catch basin sediment sumps, drain manholes, underground chambers, flared end outlet, and riprap pads shall be maintained by the Property Owner.

2. The Owner, or his designated agent, shall inspect all components of the stormwater management system a minimum of four times per year or more frequently as specified below. The Owner shall ensure that no portion of the stormwater management system is damaged, blocked or otherwise in a state that prevents its proper operation.

3. The Owner, or designated agent, shall ensure that accumulated silt and debris within the catch basins is removed in a timely manner. The catch basins shall be cleaned when the sediment level is within the two feet of the outlet pipe (2 feet of sediment in sump). The basins shall be cleaned at least annually in the spring following winter sanding. The use of vacuum trucks to clean the structures is recommended.

4. The Owner, or designated agent, shall inspect the underground chambers at the frequency noted above and after every major storm (rainfall exceeding three inches (3") in 24 hrs).

5. The Owner, or designated agent, shall clean the "Isolator Row" by us of a JetVac as required by chamber manufacture. Isolator Row shall be cleaned annually via JetVac.

6. The flared end outlet pipes shall be monitored for sediment build up which may indicate the need to the clean the site catch basins.

7. Illicit discharges are to be prohibited. The Owner shall report any illicit discharges once discovered to the Methuen Police and Health Departments.

8. The parking area shall be cleaned of sand and debris at least twice per year, preferably after the fall foliage and winter sanding seasons.

9. The existing site shall be cleared of litter at least weekly.

# Inspection and Maintenance Report

## Aroma Joes – Haverhill Street Methuen, Mass

| | Condition | Action Taken |
|---|---|---|
| **Catch basins:** | | |
| **Underground Chambers** | | |
| **Isolator Row** | | |
| **Parking Lot Sediment** | | |
| **Flared End Section** | | |
| **Other** | | |
| **Other** | | |

**Signed** **Date**

# Long Term Pollution Prevention Plan

## Aroma Joes – Haverhill Street Methuen, Mass

**Good housekeeping practices**

The Owner shall ensure regular maintenance activities at the site remain on schedule. Professional Landscape services may be utilized to maintain the grounds.

**Provisions for storing materials and waste products inside or under cover**

No Hazardous materials shall be stored at this site.

**Requirements for routine inspections and maintenance of stormwater BMPs**

The Applicant will be responsible for ensuring that the inspection and maintenance activities including regular inspection and maintenance of the storm water management structures continue indefinitely.

**Requirements for storage and use of fertilizers, herbicides, and pesticides**

No fertilizers, herbicides or pesticides shall be stored outside at this site and must be stored in compliance with manufacturer's recommendations if stored inside.

**Provisions for solid waste management**

Solid waste produced at the site will be temporarily stored in trash receptacles and removed from the site via a licensed trash hauler and hauled off site.

**Snow disposal and plowing**

Snow shall not be plowed directly into the right-of-way but stored just off the edge of the parking lot pavement or at a designated area within the site. If necessary due to snow storage limitations, snow shall be taken offsite. Plow damage to grassed areas adjacent to the pavement shall be repaired in the spring once growing season starts.

**Winter Road Salt and/or Sand Use and Storage restrictions**

No salt shall be stored outside at the site. Minimal use of salt and sand is encouraged, if safe to do so, to mitigate slippery conditions.

**Parking Lot sweeping schedule**

The parking area shall be cleaned of sand and debris at least twice per year, preferably after the fall foliage and winter seasons.

**Provisions for prevention of illicit discharges to the stormwater management system**

The storage and use of hazardous materials is prohibited. No illicit discharges of oil or other hazardous materials shall occur at the site. Any detected illicit discharges shall be reported immediately to the Methuen Police and Board of Health.

**List of Emergency Contacts for implementing Long-Term Pollution Prevention Plan**

| | |
|---|---|
| Methuen Police Department | (978) 983-8698 |
| Methuen Conservation Department | (978) 983-8650 |
| Methuen Health Department | (978) 983-8655 |
| Massachusetts Department of Environmental Protection | (978) 694-3200 |

**(Owner to sign prior to proposed stormwater discharges)**

# Illicit Discharge Statement

## Aroma Joes – Haverhill Street Methuen, Mass

As the Owner of the parcel(s) depicted on the proposed site plans located on Haverhill Street in Methuen, Massachusetts, I hereby certify that no illicit discharges from the site are proposed or exist on the site. No such certification is made for adjacent or nearby parcels which discharge onto this parcel.

_____
Print Name

_____ _____
Signature Date

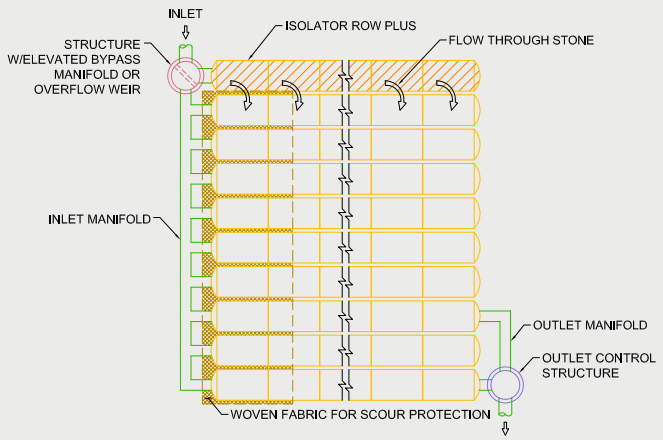
# Isolator® Row Plus

The StormTech Isolator Row Plus is an enhancement to our proven water quality treatment system. This updated system is an NJCAT verified water quality treatment device that can be incorporated into any system layout.

## Features

- Isolator Row Plus is now NJCAT verified. As a Manufactured Treatment Device it achieves over 80% TSS removal by filtration NJDEP Laboratory Protocol Assessment NJCAT Technology Verification.
- A patented Flamp™ (Flared End Ramp) provides a smooth transition from pipe invert to fabric bottom. The Flamp is attached to the inlet pipe inside the chamber end cap and improves chamber function over time by distributing sediment and debris that would otherwise collect at the inlet. It also serves to improve the fluid and solid flow back into the inlet pipe during maintenance and cleaning.
- Proprietary ADS Plus fabric maintains durability and sediment removal while allowing for higher water quality flow rates. A single layer of ADS Plus fabric is placed between the angular base stone and the Isolator Row Plus chambers.

**Schematic of the StormTech Isolator Row Plus System**




## Technology Descriptions

The Isolator Row Plus is designed to capture the “first flush” runoff and offers the versatility to be sized on a volume or a flow basis. An upstream manhole not only provides access to the Isolator Row Plus but includes a high/low concept such that stormwater flow rates or volumes that exceed the capacity of the Isolator Row Plus bypass through a manifold to the other chambers. This is achieved with either an elevated bypass manifold or a high-flow weir. This creates a differential between the Isolator Row Plus row of chambers and the manifold to the rest of the system, thus allowing for settlement time in the Isolator Row Plus. After Stormwater flows through the Isolator Row Plus and into the rest of the StormTech chamber system it is either infiltrated into the soils below or passed at a controlled rate through an outlet manifold and outlet control structure.

## Summary of Verified Claims[1]

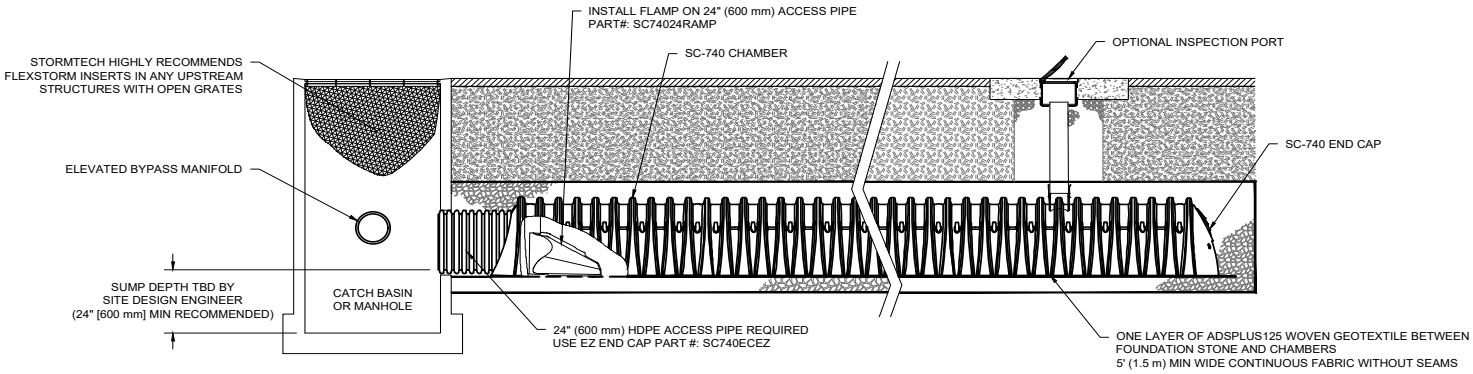
| | |
|---|---|
| Treatment Rate (gpm/ft²) | 4.1 |
| Underlying Geotextile Layers | 1 |
| NJDEP Test Sediment | 1-1000µ |
| Mean Particle Concentration (mg/L) | 200 |
| TSS Removal Efficiency | >80% |

[1] Verification testing of the StormTech SC-740 Isolator Row PLUS in accordance with NJDEP Laboratory protocol to access total suspended solids removal by filtration manufactured treatment device, 2013

ADS StormTech™

adspipe.com
800-821-6710

## StormTech Isolator Row Plus (not to scale)




### Maintenance

The Isolator Row Plus was designed to reduce the cost of periodic maintenance. By "isolating" sediment to just one row of the StormTech system, costs are dramatically reduced by eliminating the need to clean out each row of the entire storage bed. If inspection indicates the potential need for maintenance, access is provided via a manhole(s) located on the end(s) of the row for cleanout.

Maintenance is accomplished with the JetVac® process. The JetVac process utilizes a high-pressure water nozzle to propel itself down the Isolator Row Plus while scouring and suspending sediment. As the nozzle is retrieved, the captured pollutants are flushed back into the manhole for vacuuming. Most sewer and pipe maintenance companies have vacuum/JetVac combination vehicles. Selection of an appropriate JetVac nozzle will improve maintenance efficiency.

### StormTech Isolator Row Plus

| Chamber Model | Chamber Storage | Chamber Footprint | Treatment Rate |
|---|---|---|---|
| SC-160LP | 15.0 cf (0.42 $m^3$) | 11.45 sf (1.06 $m^2$) | 0.11 cfs (3.11 L/s) |
| SC-310 | 31.0 cf (0.88 $m^3$) | 17.7 sf (1.64 $m^2$) | 0.16 cfs (4.53 L/s) |
| SC-740 | 74.9 cf (2.12 $m^3$) | 27.8 sf (2.58 $m^2$) | 0.26 cfs (7.36 L/s) |
| DC-780 | 78.4 cf (2.22 $m^3$) | 27.8 sf (2.58 $m^2$) | 0.26 cfs (7.36 L/s) |
| MC-3500 | 175.0 cf (4.96 $m^3$) | 42.9 sf (3.99 $m^2$) | 0.40 cfs (11.32 L/s) |
| MC-4500 | 162.6 cf (4.60 $m^3$) | 30.1 sf (2.80 $m^2$) | 0.28 cfs (7.93 L/s) |
| MC-7200 | 267.3 cf (7.57 $m^3$) | 50.0 sf (4.65 $m^2$) | 0.45 cfs (12.74 L/s) |

### Installation

Installation of the stormwater treatment unit(s) shall be preformed per manufacture's installation instructions. Such instructions can be obtained by calling Advanced Drainage Systems Inc. at (800) 821-6710 or by logging on to adspipe.com.

ADS StormTech™



**adspipe.com**
800-821-6710