May 26, 2025

Shannon Palmer, Conservation Officer
Town of Hingham Conservation Commission
210 Central Street
Hingham, MA 02043

RE: Kilby Street Booster Pump Station – Updated Stormwater Report

Dear Ms. Palmer,

Apex previously submitted a Stormwater Report on May 22, 2025 on behalf of the Weir River Water System as part of the Kilby Street Booster Pump Station NOI submission. Since this submission a test pit investigation was performed at the location of the proposed infiltration basin. The previous Stormwater Report has been updated to reflect the findings of this test pit. The key update as a result of the test pit is a decrease in the assumed Rawls rate from 8.27 to 2.41 due to Loamy Sand identified in the test pit. The reduction in infiltration rate required slight modfications to the infiltration basin to increase its volume. Additionally, the seasonal high groundwater elevation was determined to be greater than 2 feet below the proposed bottom of the infiltration basin.

An updated Stormwater Report and Design Drawings are attached which reflect these changes. One additional update was also made within the Stormwater Report Attachments. The elevation considered as the top of the infiltration basin was conservatively lowered from 28 feet to 27.8 feet, or the inlet invert of the grass channel. With the lowered Rawls Rate, as well as a conservative assumption that infiltration only occurs in the bottom contour of the basin, the water elevation within the infiltration basin reaches, but does not exceed or overtop, this elevation during the 100-year storm.

If you have any questions about the updates described above, please feel free to contact me at 617-657-0982 or at Jonathan.Hittie@Apexcos.com.

Sincerely,

Apex Companies, LLC
Jonathan Hittie, P.E.
Senior Project Engineer
O: 617.657.0982
E: Jonathan.Hittie@Apexcos.com

APEX COMPANIES, LLC

Kilby Street Booster Pump Station

Stormwater Report
May 26, 2025

PREPARED FOR:

Weir River Water System
185 Lincoln Street, Unit 200B
Hingham, MA, 02043

Memorandum

Date: May 26, 2025

To: Shannon Palmer, Conservation Officer
Town of Hingham Conservation Commission
210 Central Street
Hingham, MA 02043

From: Jonathan Hittie, P.E., Senior Project Engineer, Apex

CC: Russel Tierney, Managing Director / Superintendent, Weir River Water System
Ashley Sanford, Superintendent, Hingham Department of Public Works
JR Frey, Town Engineer, Hingham
Ryan Neilan, P.E. Senior Project Manager, Apex
File

Subject: **Kilby Street Booster Pump Station**
Weir River Water System
Stormwater Report

Apex, LLC (Apex) prepared this stormwater report on behalf of the Weir River Water System (WRWS) for the proposed Kilby Street Booster Pump Station project. This report has been prepared in accordance with the requirements of 310 CMR 10.00; the Hingham Wetlands Protection By-Law (Article 22) and the Hingham Conservation Commission Wetland Regulations; and the guidelines of the Massachusetts Stormwater Handbook and Stormwater Standards.

Project Overview

The WRWS is currently in the process of adding a new water storage tank in Hull, MA to meet fire protection requirements and provide more consistent service pressures to its customers. In order to adequately fill the storage tank, a booster pump station (BPS) is required between the WRWS's Water Treatment Plant and the newly created Hull pressure zone. The WRWS proposes to construct the new booster pump station at 0 Kilby Street (Map Parcel ID 1310640000000020, Parcel ID 64-0-2).

Apex performed a siting analysis for the BPS and identified Kilby Street as the preferred location for the BPS because it is far enough south to include several properties with large fire protection needs within the service area of the new water storage tank, it already contains a large diameter transmission main sufficient for pumping large flow rates, it is located at an elevation which would allow for acceptable upstream and downstream pressures at the BPS, and it is located at a natural "choke point" in the system which would require minimal system reconfiguration (valve closures, new check valves) to isolate the new Hull pressure zone. Therefore, the Town owned parcel at 0 Kilby Street was selected as the location for the proposed BPS.

The proposed project includes an approximately 675 square foot, single story, structure housing a pump room, sewer odor control room, and a bathroom; a paved driveway to accommodate two 9 foot by 18 foot parking

spaces; an underground valve vault located within the driveway; a 9 square foot landing pad for the bathroom doorway; a 27 foot concrete pad for the main doorway; a natural gas generator; a 30 square foot concrete pad for the generator; a stormwater infiltration basin; fencing surrounding the structure with an access gate on the Kilby Street side of the building; and fencing and an access gate surrounding the generator. The project will also include water mains to and from the building, connecting to the existing water main in Kilby Street, as well as sewer and electrical connections. All disturbed areas not paved shall receive a final loam and seed cover to prevent erosion. Additionally, mitigation planting will be included as part of the project consisting of a restoration area greater than the impervious area created as a result of the project, in accordance with Hingham's Buffer Zone Mitigation Policy.

Design Plans

A set of design drawings are provided within Attachment L of this stormwater report. The contents of the design drawings include:

- Cover Sheet
- General Notes and Legend (Sheet G-1)
- Existing Conditions (Sheet C-1)
- Draft Site Plan (Sheet C-2)
- Buffer Zone Mitigation and Stormwater Management (Sheet C-3)
- Civil Construction Details (Sheets CD-1 through CD-4)

Project Need and Background

The WRWS's recent Water System Master Plan (WSMP) identified inadequate fire flow availability in Hull. To address this issue, a new water storage tank is planned for construction at Strawberry Hill within Hull. Due to the distance between the WRWS's water treatment plant (WTP) and Strawberry Hill, the WTP will not be able to adequately fill the proposed tank without causing extreme pressures in the vicinity of the treatment plant, as well as overfilling the existing Turkey Hill Tank.

A BPS located between the WTP and the proposed tank would allow the WRWS to fill the tank without causing extreme pressures within the system. Apex performed a siting analysis for the BPS and identified Kilby Street as the preferred location for the BPS because it is far enough south to include several properties with large fire protection needs within the service area of the new water storage tank, it already contains a large diameter transmission main sufficient for pumping large flow rates, it is located at an elevation which would allow for acceptable upstream and downstream pressures at the BPS, and it is located at a natural "choke point" in the system which would require minimal system reconfiguration (valve closures, new check valves) to isolate the new Hull pressure zone. Therefore, the Town owned parcel at 0 Kilby Street was selected as the location for the proposed BPS.

The proposed BPS will be designed, to an extent practical, to resemble a residential structure, and reduce its visual impact to surrounding properties. With minimal daily visitors and low noise levels, the station will not disrupt the daily lives of residents or the surrounding environment. This project is necessary for meeting the community's existing and growing needs and to ensure reliable water service and adequate fire flow availability within Hull.

Introduction

Each of the following sections of this cover letter correlates directly with the Massachusetts Department of Environmental Protection (MassDEP) Checklist for Stormwater Report requirements.

Existing Topography and Landscape

The proposed parcel (Map Parcel ID 1310640000000020, Parcel ID 64-0-2) is approximately a quarter acre in area with an address of 0 Kilby Street and abuts 39 Kilby Street ("Sons of Italy") to the south and a residential property at 57 Kilby Street to the north. To the east, the parcel abuts a lot currently used for farming. To the west, the parcel abuts a residential property at 30 Kilby Street and an undeveloped wooded parcel.

In June 2024, Landtech, Inc. surveyed the existing conditions of the site, including wetland resource area delineation flagged by Pinebrook Consultants, also performed in June 2024. Topography on site generally slopes from a high point at elevation 29 at the north-western corner of the parcel near the roadway, sloping gradually to the south-east towards the wooded wetlands at the eastern edge of the parcel. A small portion of the site at the south-west corner drains to the west onto Kilby Street. The western portion of the parcel which is proposed for development currently consists of tall grasses and small ferns and shrubs. All elevations presented in this memorandum are based on North American Vertical Datum 1988 (NAVD88).

Existing Stormwater Conditions

The existing undeveloped site has no stormwater management controls. Stormwater runoff flows via sheet flow from a high point at the northwestern corner of the site. The majority of stormwater flow to the south-east towards the wooded wetlands, with some stormwater eventually forming shallow channelized flow in a natural swale. A small portion of stormwater sheet flows to the west onto Kilby Street.

Existing Soil Conditions and Time of Concentrations

Ground cover types at the proposed site were determined by visual inspection and Natural Resources Conservation Service (NRCS) Soil Survey data. The proposed site has soils classified as the following:

- Udipsamments, soil group 700A, classified as Hydrologic Soil Group (HSG) "A/D"
- Newfields fine sandy loam, soil group 426B, classified as HSG "B"
- Newfields fine sandy loam, soil group 427A, classified as HSG "B"

The NRCS Soil Map is included in Attachment J. A soil test pit was completed at the proposed location of the stormwater infiltration basin. The Soil Observation Report is included in Attachment D. A summary of the test pit results is included in Stormwater Standard 2 below.

There are two pre-development sub-catchment areas (refer to Attachment B, Figure SW-1). The existing time of concentration (TOC) for the larger sub-catchment E1, which drains towards the wetlands to the east, is 6.1 minutes. The TOC for the smaller sub-catchment E2, which drains west towards Kilby Street, is 5 minutes. A summary of the pre-development sub-catchment area properties is provided in subsequent sections.

Proposed Topographic, Landscape, and Soil Changes

The proposed BPS requires site clearing and new impervious cover including the BPS building, concrete landing pads for doorways, an access driveway and parking spaces, and a generator pad. Clearing and grading were minimized to the maximum extent practical. Table 1 summarizes impervious area at the BPS site.

Table 1 – Summary of New Impervious Area at BPS Site

Area	Total Site Area[1] (sf)	Total Existing Impervious Area (sf)	Proposed Impervious Area Increase (sf)
BPS Site (Parcel ID 64-0-2)	31,553	0	1,350

[1] Includes a portion of the ROW to account for impervious cover added for the access driveway.

The proposed BPS finished floor elevation is 29.25 feet. The paved parking area and driveway between Kilby Street and the BPS will pitch towards Kilby Street, following a slope of ± 6.67% from the proposed BPS. Just beyond the proposed double swing access gate to Kilby Street, a low point in the driveway will pitch perpendicularly to the south, directing runoff from the driveway into a grass channel and into the proposed infiltration basin. Runoff from the roof will be collected in rain gutters and discharged at the southern side of the building into a riprap forebay before entering the infiltration basin.

Only a small portion of the driveway (± 130 sf) immediately adjacent to Kilby Street and the generator pad at the rear of the building will be uncaptured impervious area, due to limitations of the site size and shape, existing topography, required building setbacks, and the wetland buffer zone. The site was designed to capture impervious area to the maximum extent practical. Slopes on graded, landscaped, or unpaved areas shall not

exceed 3:1 (H:V). All disturbed areas not paved shall receive a final loam and seed cover to prevent erosion. Refer to Sheet C-3 in Attachment L for proposed seed mixtures.

Proposed Treatment Methods and Drainage Patterns, Stormwater BMPS

Runoff from the new impervious driveway and parking area at the BPS site will sheet flow to a grass channel and be conveyed into a stormwater infiltration basin. Runoff from the rooftop will be conveyed by downspouts into a riprap forebay before entering the stormwater infiltration basin. The stormwater infiltration basin is sized to capture the 100-yr, 24-hr storm runoff volume without overtopping. The proposed stormwater facilities provide groundwater recharge, attenuate the peak discharge, and provide total suspended solids (TSS) removal in accordance with the Massachusetts Stormwater Standards.

Checklist for Stormwater Report

The MassDEP Checklist for Stormwater Report is included in Attachment A. The MassDEP Checklist has been stamped and signed by a certified Professional Engineer in the State of Massachusetts. The stormwater checklist and additional information provided below were developed for the proposed BPS site, considered new development.

Standard 1: No Untreated Discharges or Erosion to Wetlands

With the exception of the generator pad in the rear of the site, no new untreated discharges are proposed from the BPS site to the wetlands. Stormwater will be captured and conveyed to a grass channel or a riprap forebay for pretreatment before entering a stormwater infiltration basin. The stormwater BMPs have been designed so there is no erosion or scour to the nearby wetlands. There is no increase in peak discharge or velocities from pre-development to post-development conditions.

Standard 2: Peak Rate Attenuation

Stormwater Model Data

Stormwater models were developed for this project using the NRCS (SCS) TR-20 model within HydroCAD Modeling Software. The project area includes two pre-development sub-catchment areas and five post-development sub-catchment areas. Ground cover areas were calculated for each sub-catchment and entered into the model; see Attachment B for pre-development and post-development drainage area figures.

Precipitation for the 1-yr, 2-yr, 10-yr, 25-yr, and 100-yr frequency 24-hr design storms were determined from the "Extreme Precipitation in New York and New England" website (precip.eas.cornell.edu), and are included in Attachment K. The website is a project with joint collaboration between the NRCC and NRCS and uses a more conservative 100-yr frequency 24-hr storm rainfall depth than NOAA Atlas 14. HydroCAD reports for the 1-yr, 2-yr, 10-yr, 25-yr, and 100-yr frequency 24-hr design storms are included in Attachment C.

Ground cover types were determined by visual inspection and NRCS Soil Survey data. The proposed site has soils classified as the following:

- Udipsamments, soil group 700A, classified as Hydrologic Soil Group (HSG) "A/D"
- Newfields fine sandy loam, soil group 426B, classified as HSG "B"
- Newfields fine sandy loam, soil group 427A, classified as HSG "B"

The entirety of the proposed disturbance area on the BPS site is limited to soil groups 700A and 427A, and all proposed impervious area is limited to soil group 700A. The NRCS Soil Map is included in Attachment J. A soil test pit was completed at the proposed location of the stormwater infiltration basin to verify in situ soil conditions. The Soil Observation Report is included in Attachment D. The results of the test pit are summarized in Table 2 below. Evidence of seasonal groundwater was encountered at 49" below the existing grade of 28 feet NAVD88.

Table 2 - Summary of Test Pit Results

Test Pit	Location	Soil Type	Bottom Elevation	Groundwater Encountered
Test Pit 1	Infiltration Basin (1P)	Loamy Sand	74"	49"

Based on the NRCS Soil Survey classification of sandy, HSG A/D soils, and the observed in situ conditions, Apex selected the design exfiltration Rawls rates of 2.41 inches per hour (in/hr) for the stormwater infiltration basin.

Stormwater Model Results

The stormwater model results indicate that the proposed peak runoff rates were less than or equal to the pre-development peak runoff rates for the 1-yr, 2-yr, 10-yr, 25-yr, and 100-yr 24-hr storm events. This finding confirms the proposed project meets and exceeds Massachusetts Stormwater Handbook Standard 2 in its entirety. Table 3 shows the results from the stormwater modeling. Further, the total volume of stormwater discharged from the site to the wetland decreases for all storms analyzed.

Table 3 - Summary of Peak Discharge Rates and Volumes Off Site

Storm Event (24-hr)	Discharge Rate (cfs)				Discharge Volume (cf)			
	Pre-Development Conditions		Post-Development Conditions		Pre-Development Conditions		Post-Development Conditions	
	To Wetlands	To Street	To Wetlands	To Street	To Wetlands	To Street	To Wetlands	To Street
1 Year	0.0	0.0	0.0	0.0	224	1	220	11
2 Year	0.1	0.0	0.1	0.0	536	12	526	27
10 Year	0.4	0.0	0.4	0.0	1,925	98	1,888	96
25 Year	0.9	0.0	0.9	0.0	3,389	211	3,324	169
100 Year	2.2	0.2	2.1	0.1	7,029	524	6,893	350

Standard 3: Stormwater Recharge

Stormwater will be recharged in the stormwater infiltration basin. Recharge calculations are provided in Attachment E, and conservatively assume recharge will only occur in the bottom of the stormwater infiltration basin. The stormwater infiltration basin provides the Required Recharge Volume for this project, and will drain within the required 72 hours. A test pit was performed at the existing grade of 28 feet. Redoximorphic features were identified at a depth of 49 inches, or an elevation of 23.92 feet. The bottom elevation of the proposed infiltration basin is 26.7 feet. Therefore, the test pit results indicate that there is greater than 2 feet of separation between the proposed bottom of the infiltration basin and the seasonal high groundwater elevation.

Standard 4: Water Quality

Required Water Quality Volume

According to the Massachusetts Stormwater Handbook it is required that the stormwater management system provide 80% TSS removal from new impervious areas. The treatment volume for this project is 1-inch of runoff over the new impervious area because it is located within an area with a rapid infiltration rate (greater than 2.4 inches per hour). Required Water Quality Volume calculations are provided in Attachment F. The calculations show the proposed stormwater infiltration basin is sized appropriately to treat this volume; therefore, this project meets and exceeds the Required Water Quality Volume requirements.

TSS Removal

A grass channel and a riprap forebay will provide pretreatment prior to stormwater entering the stormwater infiltration basin. Volume 2, Chapter 2 of the Massachusetts Stormwater Handbook states that infiltration basins provide 80% TSS removal provided they are combined with adequate pretreatment. Consequently, this project meets the 80% TSS removal requirement. TSS removal calculations are provided in Attachment F.

Standard 5: Land Uses with Higher Potential Pollutant Loads

The site is not considered a Land Use With Higher Potential Pollutant Loads (LUHPPL); therefore Standard 5 is not applicable.

Standard 6: Critical Areas

Stormwater discharges within the Zone I, Zone II, or Interim Wellhead Protection Area

The project is not located within a Zone I, Zone II, or interim Wellhead Protection Area.

Stormwater discharges to Outstanding Resource Waters (ORW) or Special Resource Waters (SRW)

The project is not located within the limits of an Outstanding Resource Water or Special Resource Water.

Stormwater discharges to an Area of Critical Environmental Concern (ACEC)

The project is not located within the limits of an Area of Critical Environmental Concern.

Standard 7: Redevelopment

The project is a new development project and is subject to all of the applicable Stormwater Management Standards.

Standard 8: Construction Period Controls

Construction period stormwater management controls are described in the Stormwater Operations and Maintenance (O&M) Plan included in Attachment G. Erosion controls including filter sock with silt fence, limit of work fence, and a stabilized construction exit are shown on the plans.

Standard 9: Operation and Maintenance Plan

The Post-Development O&M Plan is included in the Stormwater O&M Plan provided in Attachment G. The O&M Plan includes the name of the stormwater management system owners, the party responsible for operation and maintenance, a schedule for implementation of routine and non-routine maintenance tasks, and a maintenance log form.

Standard 10: Illicit Discharges to Drainage System

The Long-Term Pollution Prevention Plan, provided in Attachment H, includes measures to prevent illicit discharges. An Illicit Discharge Compliance Statement is provided in Attachment I.

Attachments

A. Checklist for Stormwater Report
B. Stormwater Figures
C. HydroCAD Calculation Reports
D. Test Pit Report
E. Recharge Calculations
F. Water Quality Calculations
G. Operation and Maintenance Plan
H. Long Term Pollution Prevention Plan
I. Illicit Discharge Statement
J. NRCS Soil Report
K. NRCC Rainfall Data
L. Design Drawings

Attachment A

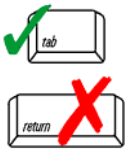
Checklist For Stormwater Report

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.

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

Jonathan Hittie, PE 5/20/2025

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:

- [X] 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
- [X] Grass Channel
- [ ] Green Roof
- [ ] Other (describe): _____

Standard 1: No New Untreated Discharges

- [X] No new untreated discharges
- [X] Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth
- [X] 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

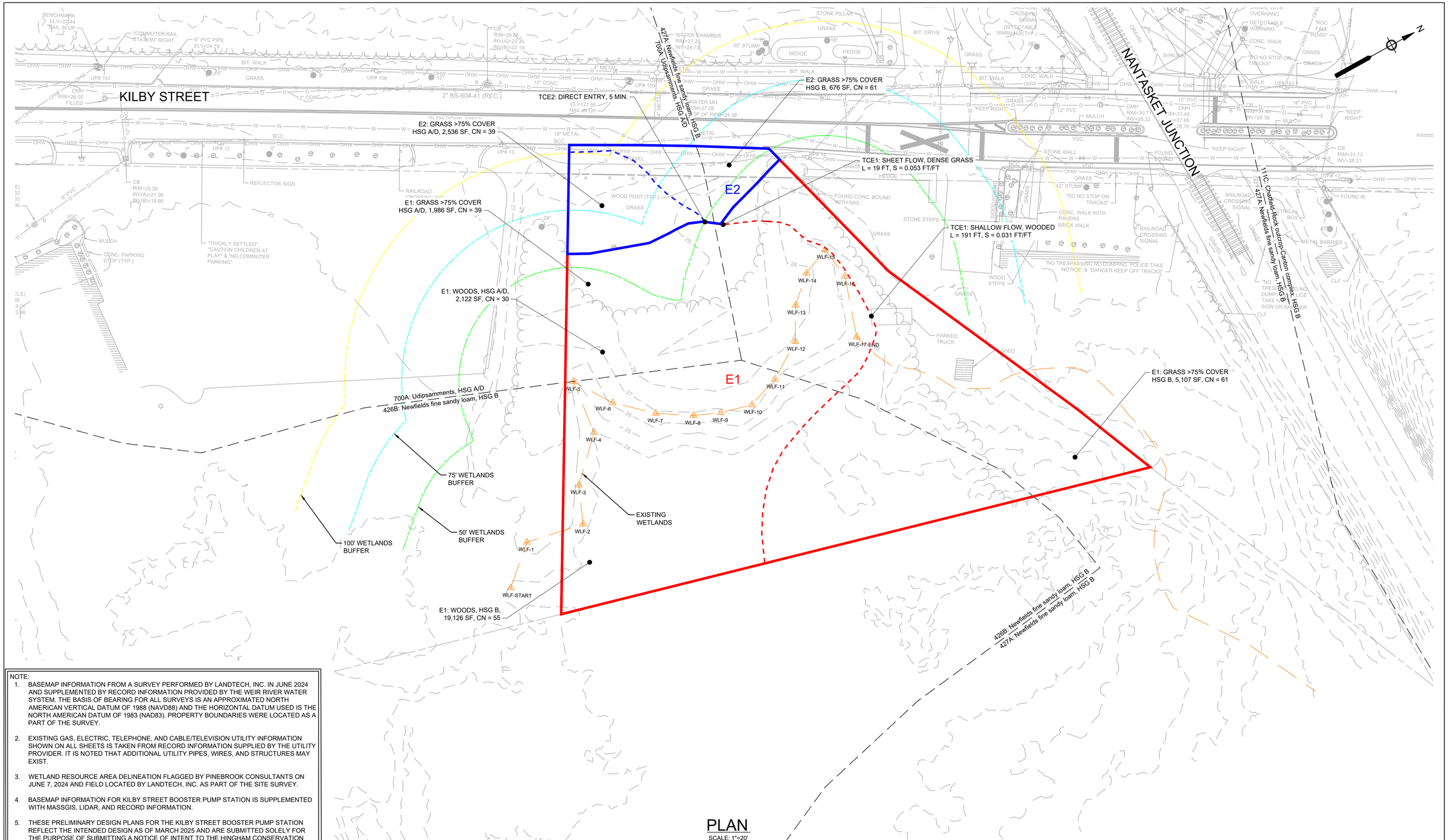
☒ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;

☒ 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.

Attachment B

Stormwater Figures



NOTE:

1. BASEMAP INFORMATION FROM A SURVEY PERFORMED BY LANDTECH, INC. IN JUNE 2024 AND SUPPLEMENTED BY RECORD INFORMATION PROVIDED BY THE WEIR RIVER WATER SYSTEM. THE BASIS OF BEARING FOR ALL SURVEYS IS AN APPROXIMATED NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88) AND THE HORIZONTAL DATUM USED IS THE NORTH AMERICAN DATUM OF 1983 (NAD83). PROPERTY BOUNDARIES WERE LOCATED AS A PART OF THE SURVEY.
2. EXISTING GAS, ELECTRIC, TELEPHONE, AND CABLE/TELEVISION UTILITY INFORMATION SHOWN ON ALL SHEETS IS TAKEN FROM RECORD INFORMATION SUPPLIED BY THE UTILITY PROVIDER. IT IS NOTED THAT ADDITIONAL UTILITY PIPES, WIRES, AND STRUCTURES MAY EXIST.
3. WETLAND RESOURCE AREA DELINEATION FLAGGED BY PINEBROOK CONSULTANTS ON JUNE 7, 2024 AND FIELD LOCATED BY LANDTECH, INC. AS PART OF THE SITE SURVEY.
4. BASEMAP INFORMATION FOR KILBY STREET BOOSTER PUMP STATION IS SUPPLEMENTED WITH MASSGIS, LIDAR, AND RECORD INFORMATION.
5. THESE PRELIMINARY DESIGN PLANS FOR THE KILBY STREET BOOSTER PUMP STATION REFLECT THE INTENDED DESIGN AS OF MARCH 2025 AND ARE SUBMITTED SOLELY FOR THE PURPOSE OF SUBMITTING A NOTICE OF INTENT TO THE HINGHAM CONSERVATION COMMISSION WHICH WILL ALLOW APEX TO PROGRESS THE DESIGN.

PLAN
SCALE: 1"=20'

APEX

COMMONWEALTH OF MASSACHUSETTS
JONATHAN D HITTIE
CIVIL
No. 57023
PROFESSIONAL ENGINEER
5/20/2025

MARK	DATE	DESCRIPTION

Scale	1" = 20'
Date	MAY 2025
Job No.	22012525
Designed by	JDH
Drawn by	JDH
Checked by	
Approved by	

THIS LINE IS ONE INCH LONG WHEN PLOTTED AT FULL SCALE ON A 22" X 34" DRAWING

KILBY STREET BOOSTER PUMP STATION
WEIR RIVER WATER SYSTEM

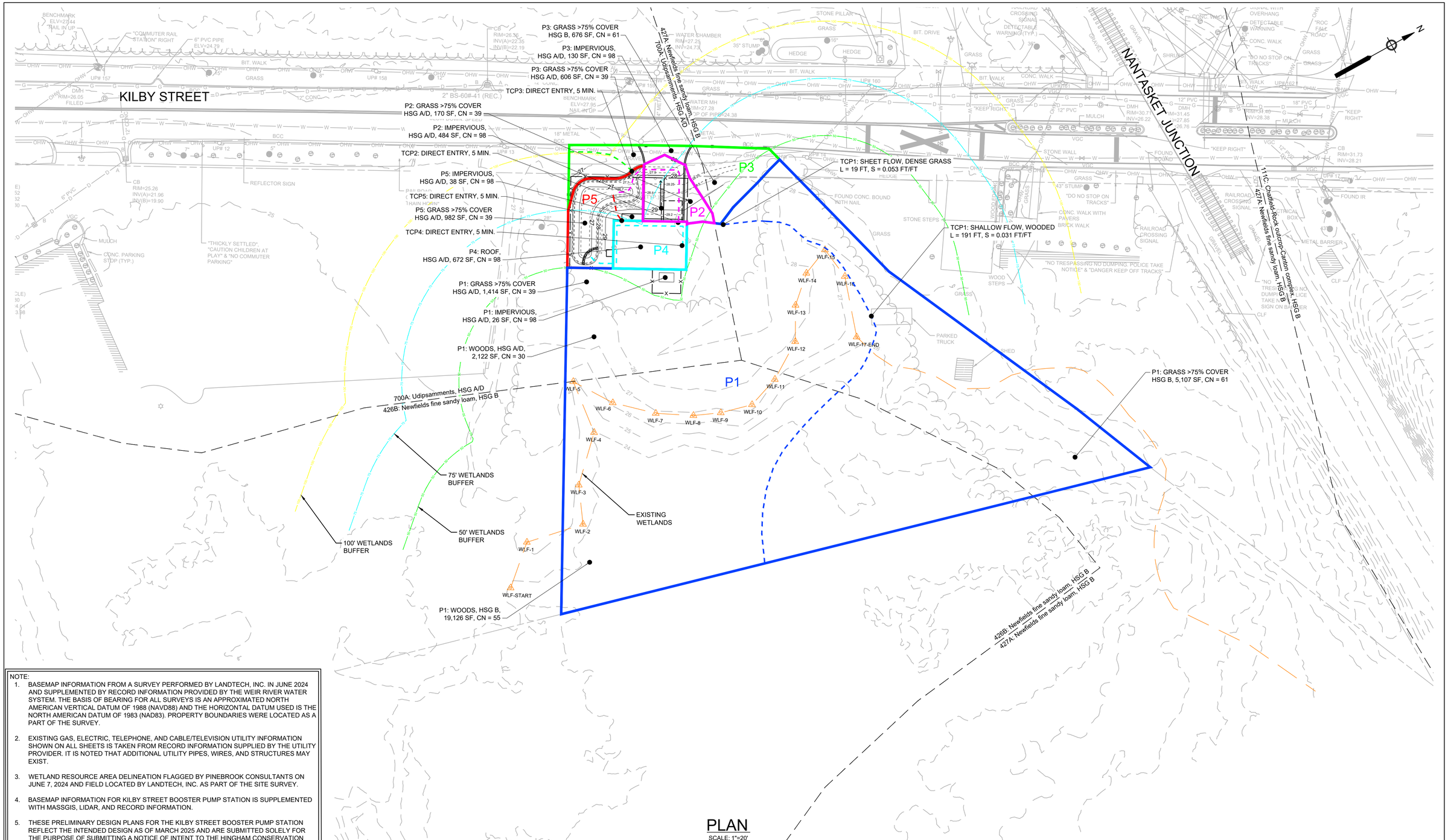
STORMWATER PLAN
EXISTING CONDITIONS

FOR PERMITTING

Sheet No.

SW-1

Drawing file: I:\Hingham\22012525 Strawberry Hill Tank Design and Construction\Design\01 BPS Design\01 CAD\Stormwater Figures.dwg Plot Date: May 16,2025-2:41pm



NOTE:

1. BASEMAP INFORMATION FROM A SURVEY PERFORMED BY LANDTECH, INC. IN JUNE 2024 AND SUPPLEMENTED BY RECORD INFORMATION PROVIDED BY THE WEIR RIVER WATER SYSTEM. THE BASIS OF BEARING FOR ALL SURVEYS IS AN APPROXIMATED NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88) AND THE HORIZONTAL DATUM USED IS THE NORTH AMERICAN DATUM OF 1983 (NAD83). PROPERTY BOUNDARIES WERE LOCATED AS A PART OF THE SURVEY.
2. EXISTING GAS, ELECTRIC, TELEPHONE, AND CABLE/TELEVISION UTILITY INFORMATION SHOWN ON ALL SHEETS IS TAKEN FROM RECORD INFORMATION SUPPLIED BY THE UTILITY PROVIDER. IT IS NOTED THAT ADDITIONAL UTILITY PIPES, WIRES, AND STRUCTURES MAY EXIST.
3. WETLAND RESOURCE AREA DELINEATION FLAGGED BY PINEBROOK CONSULTANTS ON JUNE 7, 2024 AND FIELD LOCATED BY LANDTECH, INC. AS PART OF THE SITE SURVEY.
4. BASEMAP INFORMATION FOR KILBY STREET BOOSTER PUMP STATION IS SUPPLEMENTED WITH MASSGIS, LIDAR, AND RECORD INFORMATION.
5. THESE PRELIMINARY DESIGN PLANS FOR THE KILBY STREET BOOSTER PUMP STATION REFLECT THE INTENDED DESIGN AS OF MARCH 2025 AND ARE SUBMITTED SOLELY FOR THE PURPOSE OF SUBMITTING A NOTICE OF INTENT TO THE HINGHAM CONSERVATION COMMISSION WHICH WILL ALLOW APEX TO PROGRESS THE DESIGN.

PLAN
SCALE: 1"=20'

APEX

COMMONWEALTH OF MASSACHUSETTS
JONATHAN D HITTIE
CIVIL
No. 57023
PROFESSIONAL ENGINEER
5/20/2025

MARK	DATE	DESCRIPTION

Scale	1" = 20'
Date	MAY 2025
Job No.	22012525
Designed by	JDH
Drawn by	JDH
Checked by	
Approved by	

THIS LINE IS ONE INCH LONG WHEN PLOTTED AT FULL SCALE ON A 22" X 34" DRAWING

KILBY STREET BOOSTER PUMP STATION
WEIR RIVER WATER SYSTEM

STORMWATER PLAN
PROPOSED CONDITIONS

FOR PERMITTING

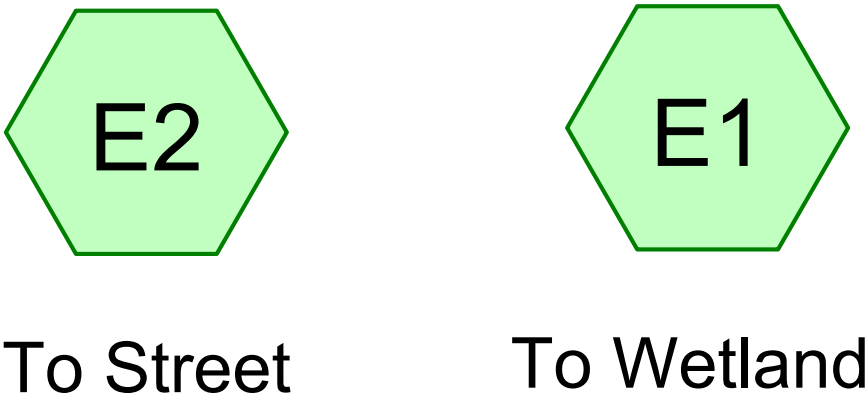
Sheet No.

SW-2

Drawing file: I:\Hingham\22012525 Strawberry Hill Tank Design and Construction\Design\01 BPS Design\01 CAD\Stormwater Figures.dwg Plot Date: May 23,2025-1:03pm

Attachment C

HydroCAD Calculation Reports



Subcat Reach Pond Link

Routing Diagram for Kilby Street BPS - Existing Conditions_Final
Prepared by Apex Companies LLC, Printed 5/20/2025

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	1-Year	Type III 24-hr		Default	24.00	1	2.74	2
2	2-Year	Type III 24-hr		Default	24.00	1	3.31	2
3	10-Year	Type III 24-hr		Default	24.00	1	4.90	2
4	25-Year	Type III 24-hr		Default	24.00	1	6.13	2
5	100-Year	Type III 24-hr		Default	24.00	1	8.61	2

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
4,522	39	>75% Grass cover, Good, HSG A (E1, E2)
5,783	61	>75% Grass cover, Good, HSG B (E1, E2)
2,122	30	Woods, Good, HSG A (E1)
19,126	55	Woods, Good, HSG B (E1)
31,553	**52**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
6,644	HSG A	E1, E2
24,909	HSG B	E1, E2
0	HSG C	
0	HSG D	
0	Other	
31,553		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Su Nu
4,522	5,783	0	0	0	10,305	>75% Grass cover, Good	
2,122	19,126	0	0	0	21,248	Woods, Good	
6,644	**24,909**	**0**	**0**	**0**	**31,553**	**TOTAL AREA**	

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentE1: To Wetlands Runoff Area=28,341 sf 0.00% Impervious Runoff Depth=0.09"
Flow Length=210' Tc=6.1 min CN=53 Runoff=0.0 cfs 224 cf

SubcatchmentE2: To Street Runoff Area=3,212 sf 0.00% Impervious Runoff Depth=0.00"
Tc=5.0 min CN=44 Runoff=0.0 cfs 1 cf

Total Runoff Area = 31,553 sf Runoff Volume = 225 cf Average Runoff Depth = 0.09"
100.00% Pervious = 31,553 sf 0.00% Impervious = 0 sf

Summary for Subcatchment E1: To Wetlands

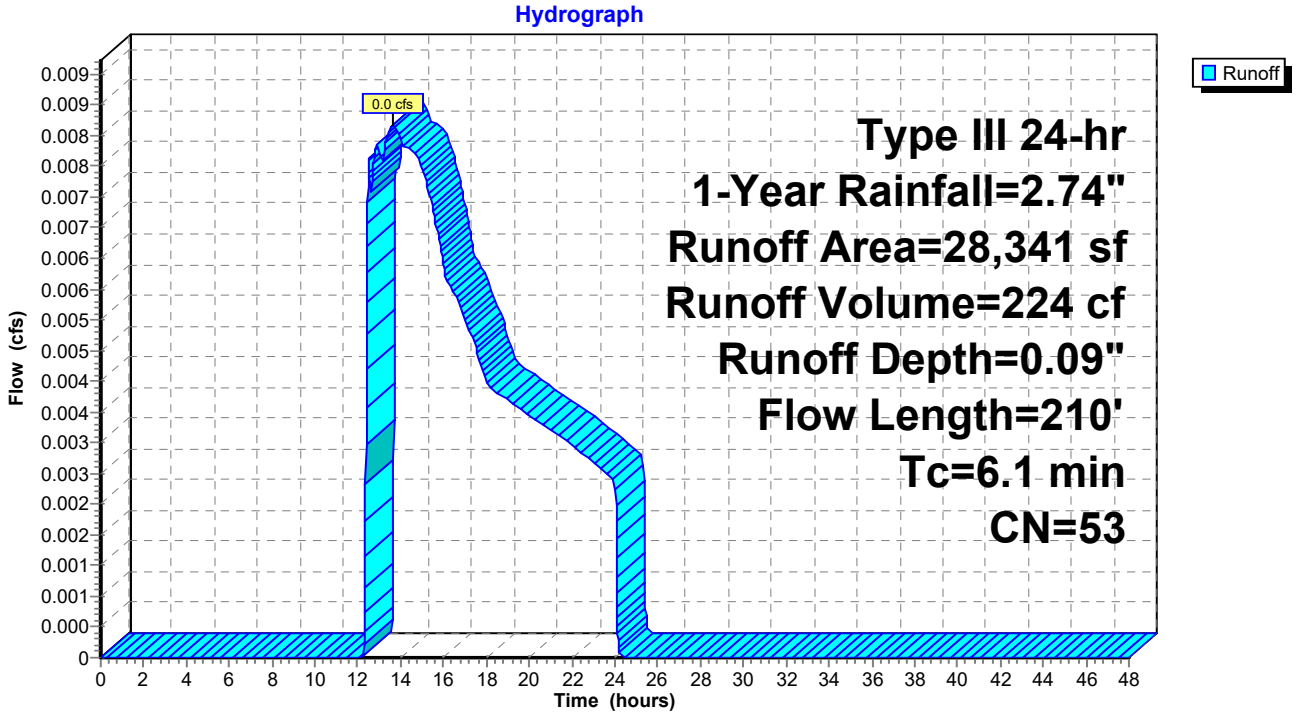
Runoff = 0.0 cfs @ 13.63 hrs, Volume= 224 cf, Depth= 0.09"
Routed to nonexistent node 1L

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.74"

Area (sf)	CN	Description
5,107	61	>75% Grass cover, Good, HSG B
19,126	55	Woods, Good, HSG B
1,986	39	>75% Grass cover, Good, HSG A
2,122	30	Woods, Good, HSG A
28,341	53	Weighted Average
28,341		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.5	19	0.0530	0.13		**Sheet Flow, Sheet Flow** Grass: Dense n= 0.240 P2= 3.31"
3.6	191	0.0310	0.88		**Shallow Concentrated Flow, Shallow Flow** Woodland Kv= 5.0 fps
6.1	210	Total			

Subcatchment E1: To Wetlands



Summary for Subcatchment E2: To Street

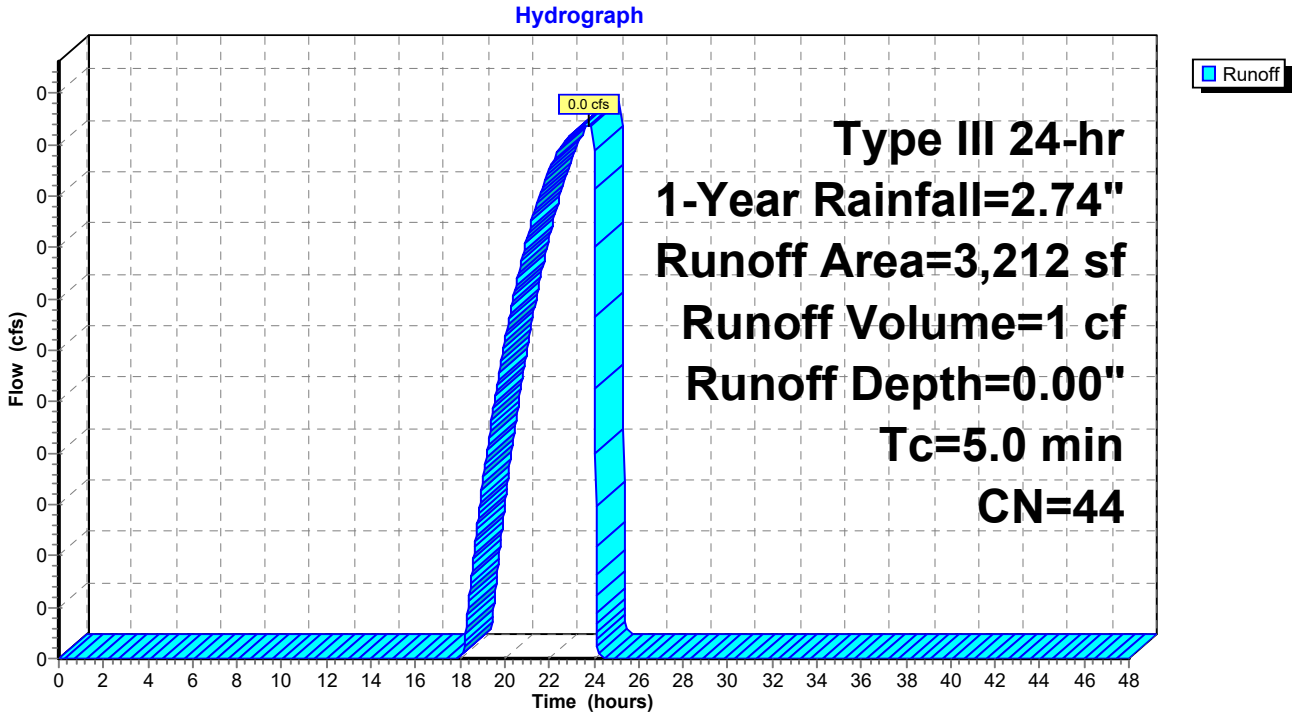
Runoff = 0.0 cfs @ 23.75 hrs, Volume= 1 cf, Depth= 0.00"
Routed to nonexistent node 1L

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.74"

Area (sf)	CN	Description
676	61	>75% Grass cover, Good, HSG B
2,536	39	>75% Grass cover, Good, HSG A
3,212	44	Weighted Average
3,212		100.00% Pervious Area

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

Subcatchment E2: To Street



Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentE1: To Wetlands Runoff Area=28,341 sf 0.00% Impervious Runoff Depth=0.23"
Flow Length=210' Tc=6.1 min CN=53 Runoff=0.1 cfs 536 cf

SubcatchmentE2: To Street Runoff Area=3,212 sf 0.00% Impervious Runoff Depth=0.04"
Tc=5.0 min CN=44 Runoff=0.0 cfs 12 cf

Total Runoff Area = 31,553 sf Runoff Volume = 547 cf Average Runoff Depth = 0.21"
100.00% Pervious = 31,553 sf 0.00% Impervious = 0 sf

Summary for Subcatchment E1: To Wetlands

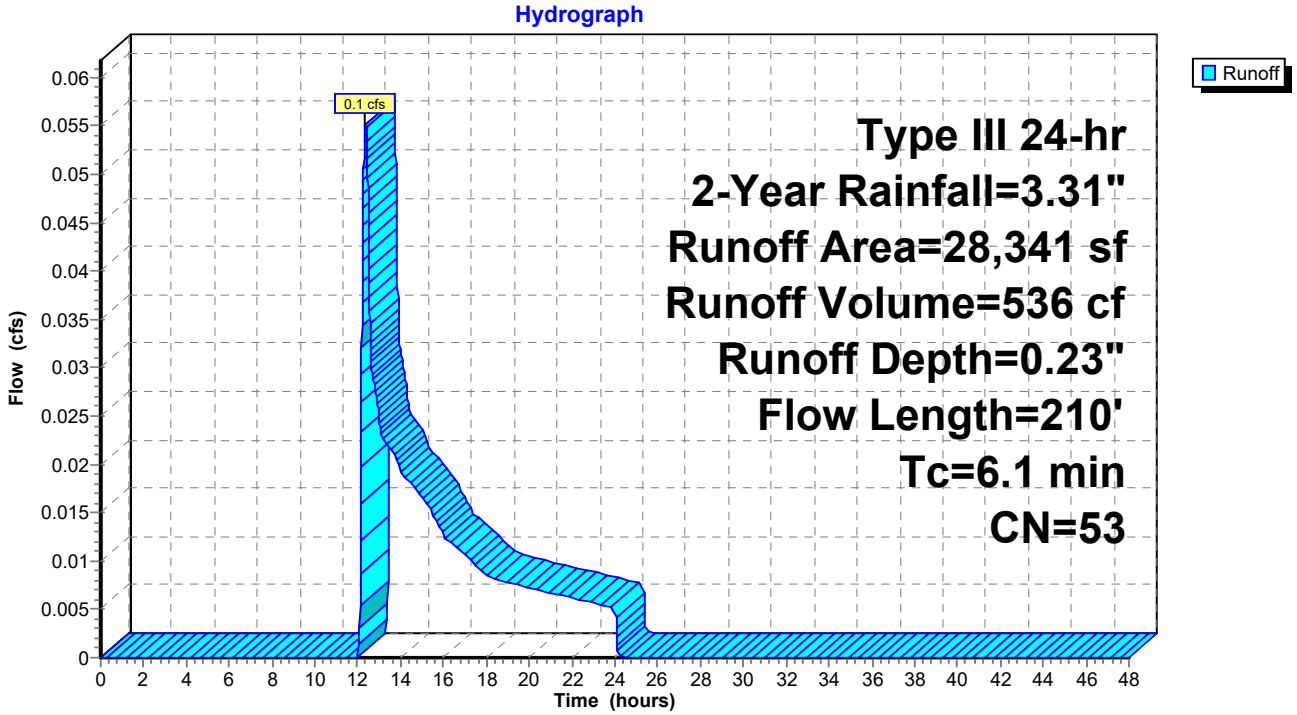
Runoff = 0.1 cfs @ 12.36 hrs, Volume= 536 cf, Depth= 0.23"
Routed to nonexistent node 1L

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.31"

Area (sf)	CN	Description
5,107	61	>75% Grass cover, Good, HSG B
19,126	55	Woods, Good, HSG B
1,986	39	>75% Grass cover, Good, HSG A
2,122	30	Woods, Good, HSG A
28,341	53	Weighted Average
28,341		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.5	19	0.0530	0.13		**Sheet Flow, Sheet Flow** Grass: Dense n= 0.240 P2= 3.31"
3.6	191	0.0310	0.88		**Shallow Concentrated Flow, Shallow Flow** Woodland Kv= 5.0 fps
6.1	210	Total			

Subcatchment E1: To Wetlands



Summary for Subcatchment E2: To Street

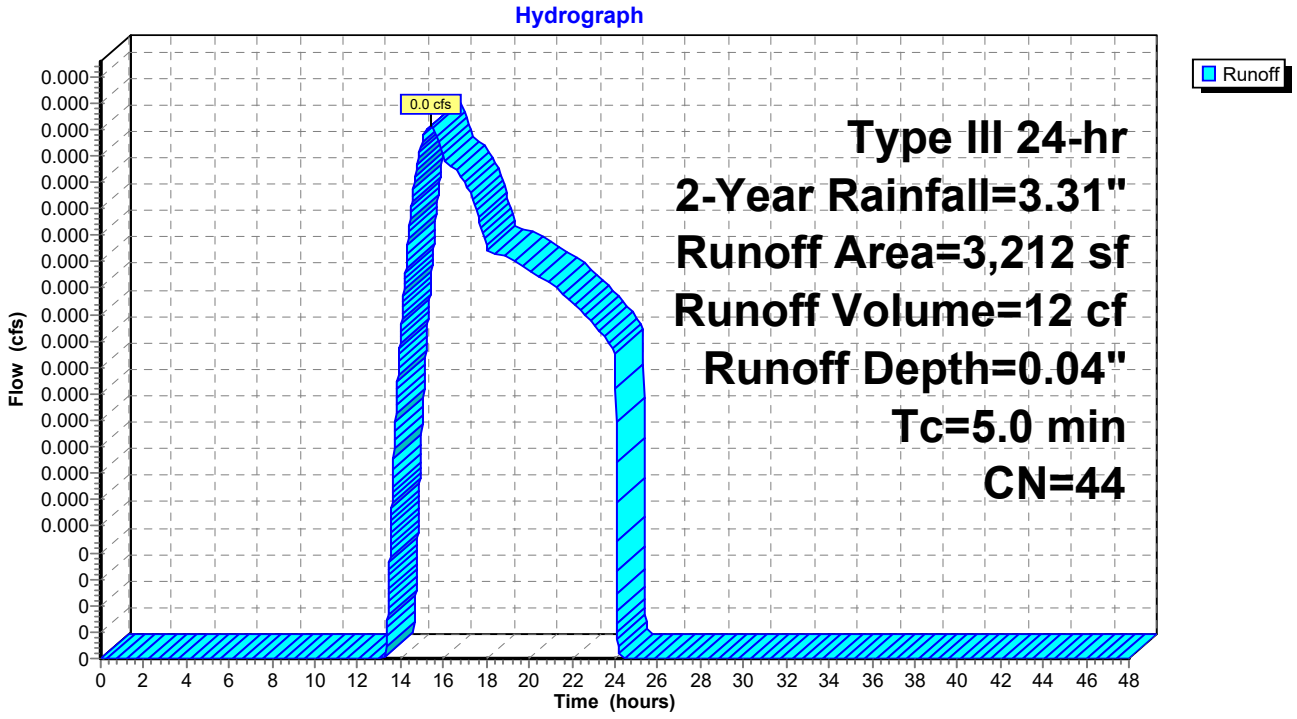
Runoff = 0.0 cfs @ 15.38 hrs, Volume= 12 cf, Depth= 0.04"
Routed to nonexistent node 1L

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.31"

Area (sf)	CN	Description
676	61	>75% Grass cover, Good, HSG B
2,536	39	>75% Grass cover, Good, HSG A
3,212	44	Weighted Average
3,212		100.00% Pervious Area

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

Subcatchment E2: To Street



Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentE1: To Wetlands Runoff Area=28,341 sf 0.00% Impervious Runoff Depth=0.81"
Flow Length=210' Tc=6.1 min CN=53 Runoff=0.4 cfs 1,925 cf

SubcatchmentE2: To Street Runoff Area=3,212 sf 0.00% Impervious Runoff Depth=0.37"
Tc=5.0 min CN=44 Runoff=0.0 cfs 98 cf

Total Runoff Area = 31,553 sf Runoff Volume = 2,023 cf Average Runoff Depth = 0.77"
100.00% Pervious = 31,553 sf 0.00% Impervious = 0 sf

Summary for Subcatchment E1: To Wetlands

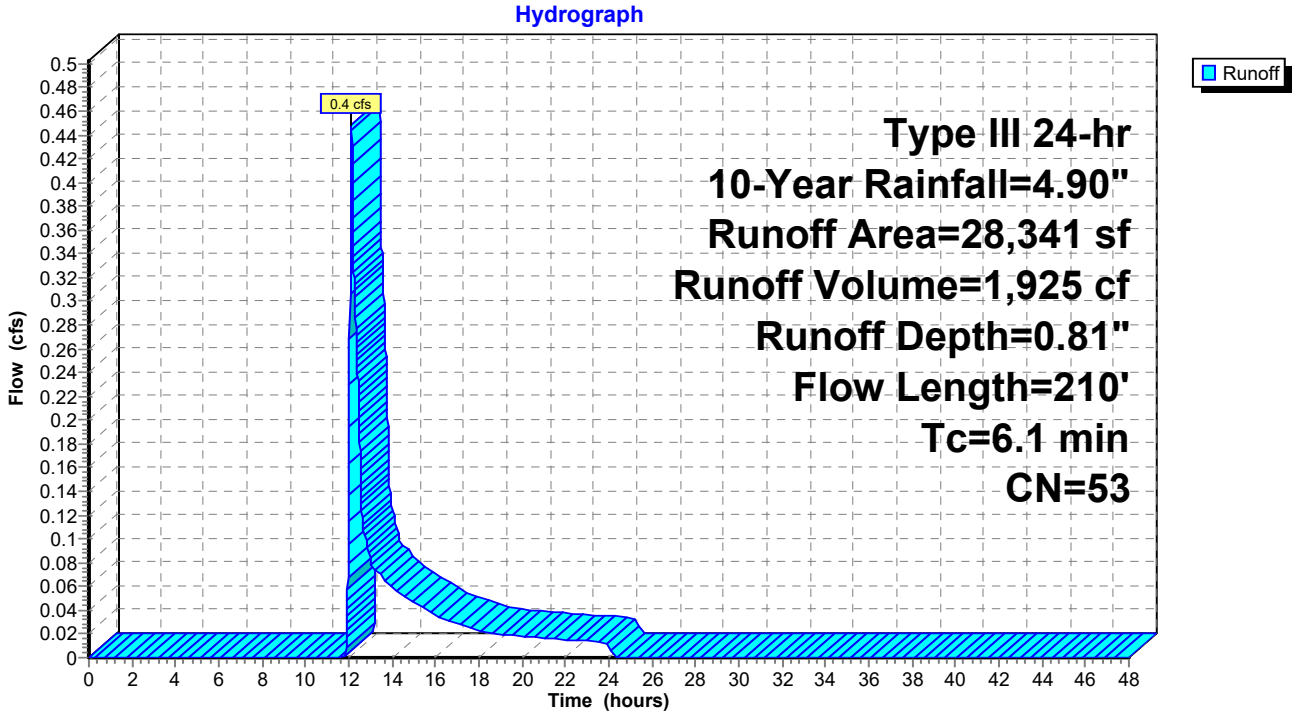
Runoff = 0.4 cfs @ 12.11 hrs, Volume= 1,925 cf, Depth= 0.81"
Routed to nonexistent node 1L

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

Area (sf)	CN	Description
5,107	61	>75% Grass cover, Good, HSG B
19,126	55	Woods, Good, HSG B
1,986	39	>75% Grass cover, Good, HSG A
2,122	30	Woods, Good, HSG A
28,341	53	Weighted Average
28,341		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.5	19	0.0530	0.13		**Sheet Flow, Sheet Flow** Grass: Dense n= 0.240 P2= 3.31"
3.6	191	0.0310	0.88		**Shallow Concentrated Flow, Shallow Flow** Woodland Kv= 5.0 fps
6.1	210	Total			

Subcatchment E1: To Wetlands



Summary for Subcatchment E2: To Street

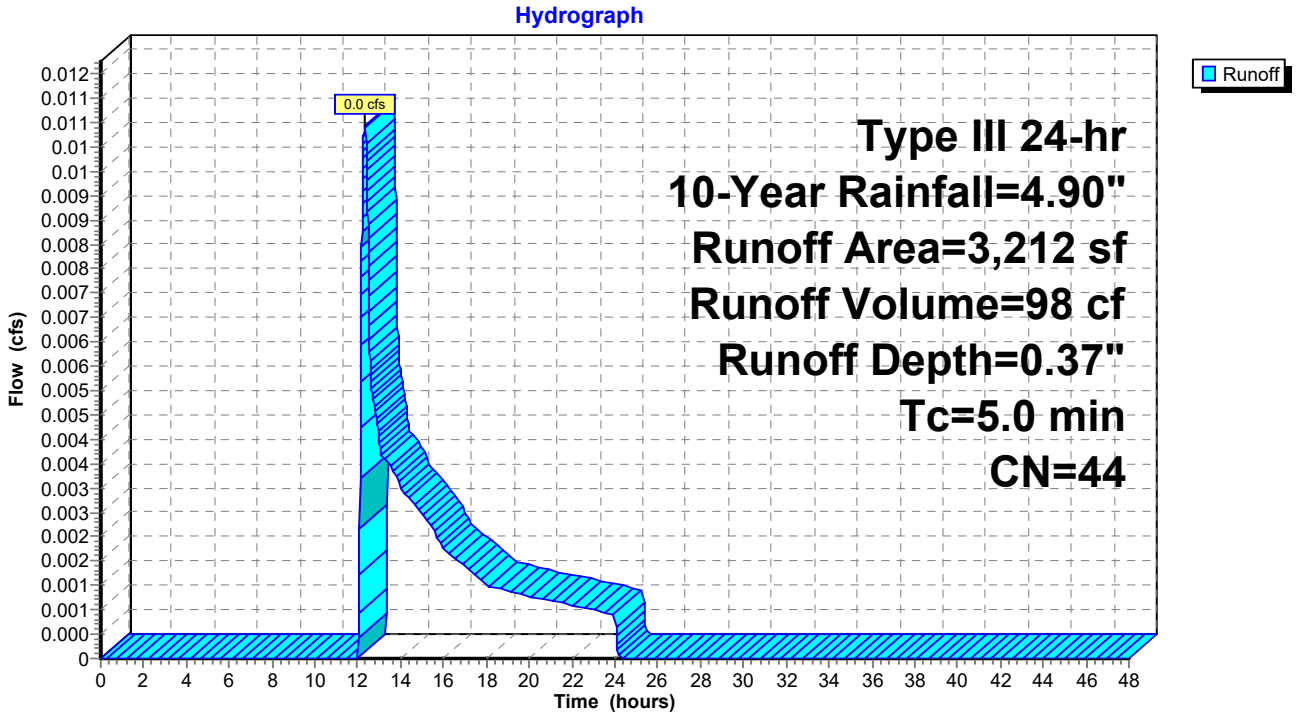
Runoff = 0.0 cfs @ 12.33 hrs, Volume= 98 cf, Depth= 0.37"
Routed to nonexistent node 1L

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

Area (sf)	CN	Description
676	61	>75% Grass cover, Good, HSG B
2,536	39	>75% Grass cover, Good, HSG A
3,212	44	Weighted Average
3,212		100.00% Pervious Area

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

Subcatchment E2: To Street



Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentE1: To Wetlands Runoff Area=28,341 sf 0.00% Impervious Runoff Depth=1.44"
Flow Length=210' Tc=6.1 min CN=53 Runoff=0.9 cfs 3,389 cf

SubcatchmentE2: To Street Runoff Area=3,212 sf 0.00% Impervious Runoff Depth=0.79"
Tc=5.0 min CN=44 Runoff=0.0 cfs 211 cf

Total Runoff Area = 31,553 sf Runoff Volume = 3,600 cf Average Runoff Depth = 1.37"
100.00% Pervious = 31,553 sf 0.00% Impervious = 0 sf

Summary for Subcatchment E1: To Wetlands

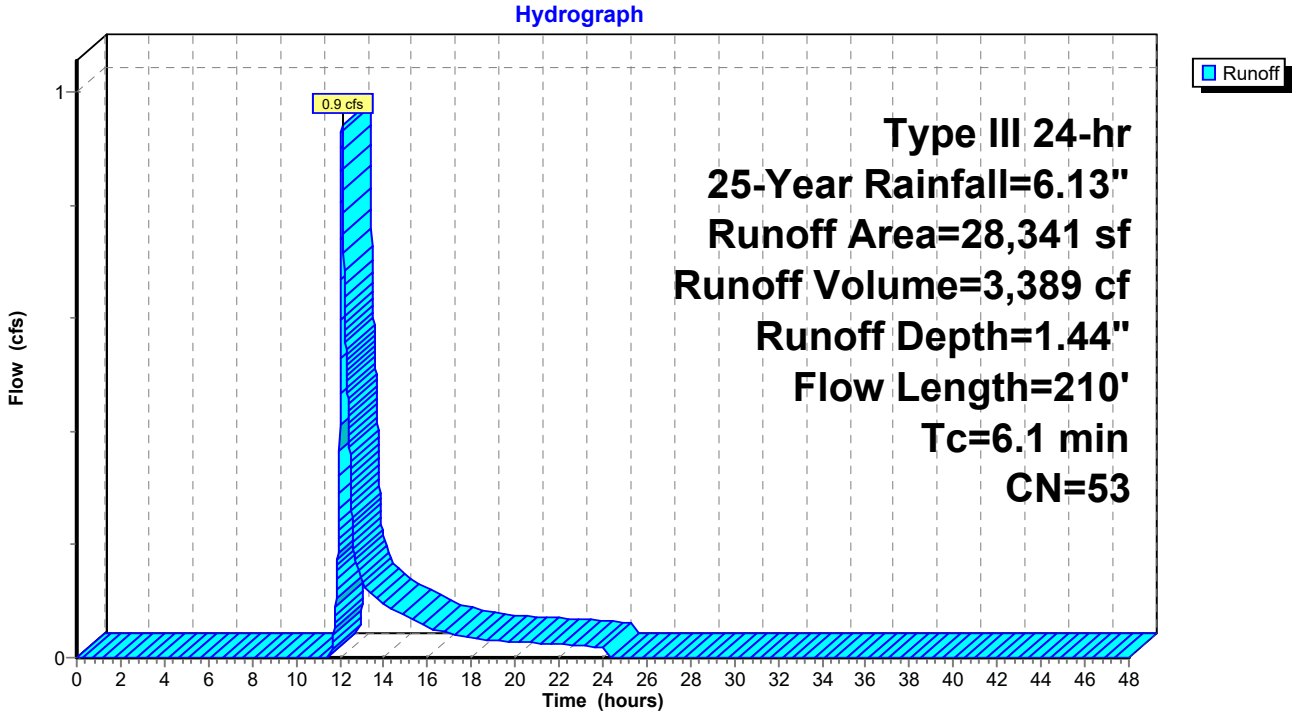
Runoff = 0.9 cfs @ 12.10 hrs, Volume= 3,389 cf, Depth= 1.44"
Routed to nonexistent node 1L

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.13"

Area (sf)	CN	Description
5,107	61	>75% Grass cover, Good, HSG B
19,126	55	Woods, Good, HSG B
1,986	39	>75% Grass cover, Good, HSG A
2,122	30	Woods, Good, HSG A
28,341	53	Weighted Average
28,341		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.5	19	0.0530	0.13		**Sheet Flow, Sheet Flow** Grass: Dense n= 0.240 P2= 3.31"
3.6	191	0.0310	0.88		**Shallow Concentrated Flow, Shallow Flow** Woodland Kv= 5.0 fps
6.1	210	Total			

Subcatchment E1: To Wetlands



Summary for Subcatchment E2: To Street

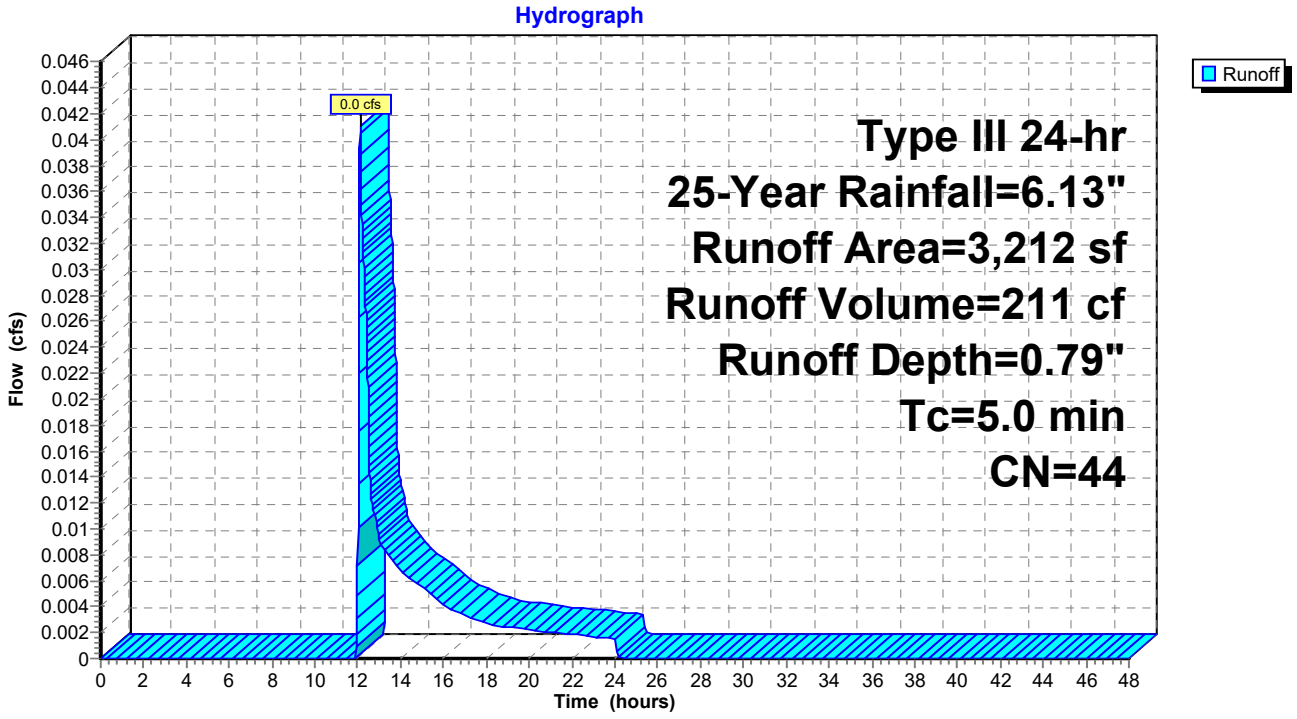
Runoff = 0.0 cfs @ 12.11 hrs, Volume= 211 cf, Depth= 0.79"
Routed to nonexistent node 1L

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.13"

Area (sf)	CN	Description
676	61	>75% Grass cover, Good, HSG B
2,536	39	>75% Grass cover, Good, HSG A
3,212	44	Weighted Average
3,212		100.00% Pervious Area

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

Subcatchment E2: To Street



Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentE1: To Wetlands Runoff Area=28,341 sf 0.00% Impervious Runoff Depth=2.98"
Flow Length=210' Tc=6.1 min CN=53 Runoff=2.2 cfs 7,029 cf

SubcatchmentE2: To Street Runoff Area=3,212 sf 0.00% Impervious Runoff Depth=1.96"
Tc=5.0 min CN=44 Runoff=0.2 cfs 524 cf

Total Runoff Area = 31,553 sf Runoff Volume = 7,553 cf Average Runoff Depth = 2.87"
100.00% Pervious = 31,553 sf 0.00% Impervious = 0 sf

Summary for Subcatchment E1: To Wetlands

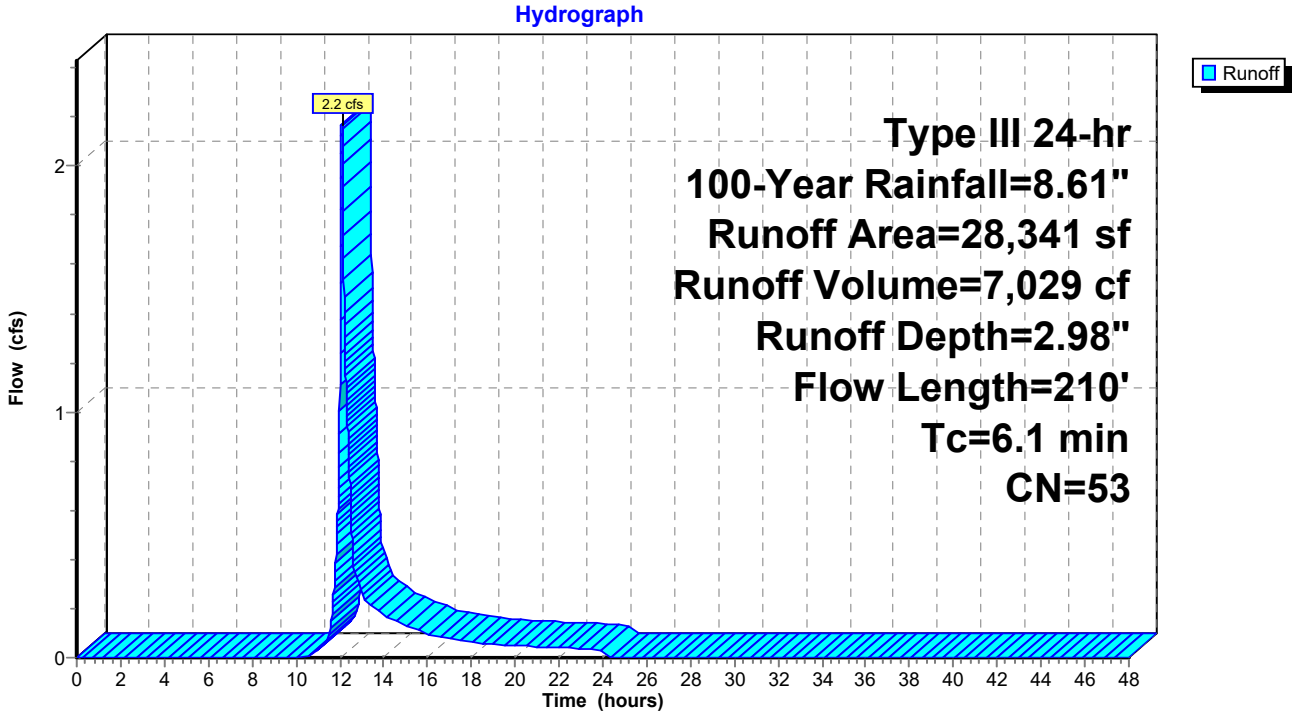
Runoff = 2.2 cfs @ 12.10 hrs, Volume= 7,029 cf, Depth= 2.98"
Routed to nonexistent node 1L

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.61"

Area (sf)	CN	Description
5,107	61	>75% Grass cover, Good, HSG B
19,126	55	Woods, Good, HSG B
1,986	39	>75% Grass cover, Good, HSG A
2,122	30	Woods, Good, HSG A
28,341	53	Weighted Average
28,341		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.5	19	0.0530	0.13		**Sheet Flow, Sheet Flow** Grass: Dense n= 0.240 P2= 3.31"
3.6	191	0.0310	0.88		**Shallow Concentrated Flow, Shallow Flow** Woodland Kv= 5.0 fps
6.1	210	Total			

Subcatchment E1: To Wetlands



Summary for Subcatchment E2: To Street

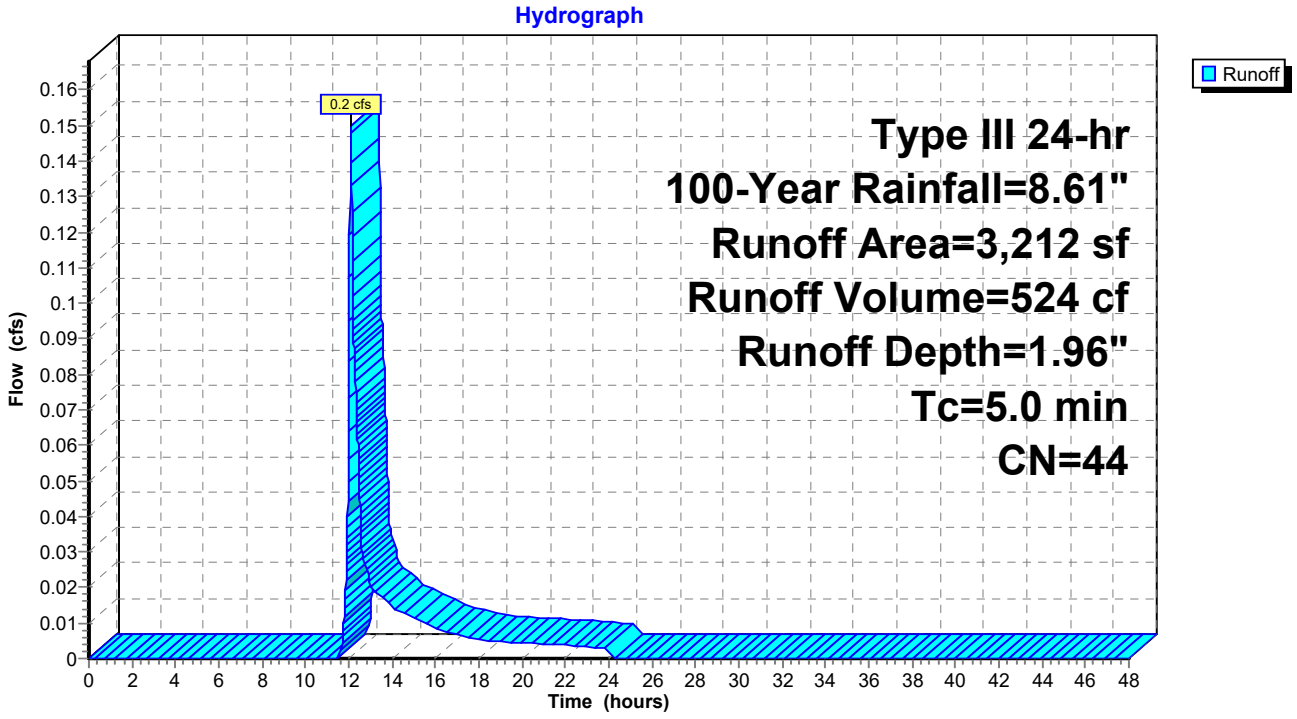
Runoff = 0.2 cfs @ 12.09 hrs, Volume= 524 cf, Depth= 1.96"
Routed to nonexistent node 1L

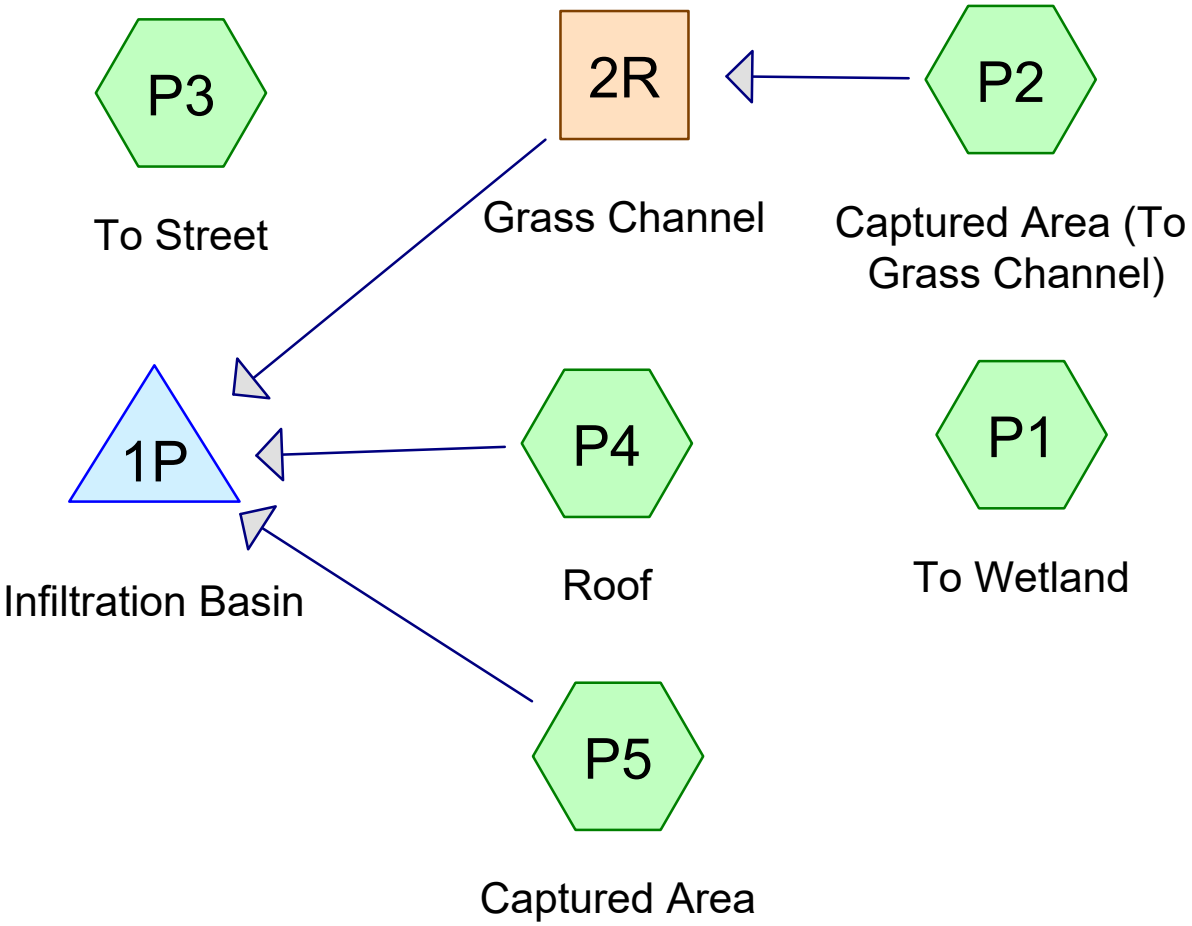
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.61"

Area (sf)	CN	Description
676	61	>75% Grass cover, Good, HSG B
2,536	39	>75% Grass cover, Good, HSG A
3,212	44	Weighted Average
3,212		100.00% Pervious Area

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

Subcatchment E2: To Street





Subcat Reach Pond Link

Routing Diagram for Kilby Street BPS - Proposed Conditions_Final
Prepared by Apex Companies LLC, Printed 5/23/2025

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	1-Year	Type III 24-hr		Default	24.00	1	2.74	2
2	2-Year	Type III 24-hr		Default	24.00	1	3.31	2
3	10-Year	Type III 24-hr		Default	24.00	1	4.90	2
4	25-Year	Type III 24-hr		Default	24.00	1	6.13	2
5	100-Year	Type III 24-hr		Default	24.00	1	8.61	2

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
3,172	39	>75% Grass cover, Good, HSG A (P1, P2, P3, P5)
5,783	61	>75% Grass cover, Good, HSG B (P1, P3)
672	98	Roofs, HSG A (P4)
678	98	Unconnected pavement, HSG A (P1, P2, P3, P5)
2,122	30	Woods, Good, HSG A (P1)
19,126	55	Woods, Good, HSG B (P1)
31,553	**55**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
6,644	HSG A	P1, P2, P3, P4, P5
24,909	HSG B	P1, P3
0	HSG C	
0	HSG D	
0	Other	
31,553		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Su Nu
3,172	5,783	0	0	0	8,955	>75% Grass cover, Good	
672	0	0	0	0	672	Roofs	
678	0	0	0	0	678	Unconnected pavement	
2,122	19,126	0	0	0	21,248	Woods, Good	
6,644	**24,909**	**0**	**0**	**0**	**31,553**	**TOTAL AREA**	

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment P1: To Wetland Runoff Area=27,795 sf 0.09% Impervious Runoff Depth=0.09"
Flow Length=210' Tc=6.1 min CN=53 Runoff=0.0 cfs 220 cf

Subcatchment P2: Captured Area (To Grass Runoff Area=654 sf 74.01% Impervious Runoff Depth=1.24"
Tc=5.0 min CN=83 Runoff=0.0 cfs 68 cf

Subcatchment P3: To Street Runoff Area=1,412 sf 9.21% Impervious Runoff Depth=0.09"
Tc=5.0 min UI Adjusted CN=53 Runoff=0.0 cfs 11 cf

Subcatchment P4: Roof Runoff Area=672 sf 100.00% Impervious Runoff Depth=2.51"
Tc=5.0 min CN=98 Runoff=0.0 cfs 141 cf

Subcatchment P5: Captured Area Runoff Area=1,020 sf 3.73% Impervious Runoff Depth=0.00"
Tc=5.0 min UI Adjusted CN=40 Runoff=0.0 cfs 0 cf

Reach 2R: Grass Channel Avg. Flow Depth=0.04' Max Vel=0.56 fps Inflow=0.0 cfs 68 cf
n=0.030 L=8.0' S=0.0125 '/' Capacity=0.5 cfs Outflow=0.0 cfs 68 cf

Pond 1P: Infiltration Basin Peak Elev=26.96' Storage=53 cf Inflow=0.1 cfs 208 cf
Outflow=0.0 cfs 208 cf

Total Runoff Area = 31,553 sf Runoff Volume = 439 cf Average Runoff Depth = 0.17"
95.72% Pervious = 30,203 sf 4.28% Impervious = 1,350 sf

Summary for Subcatchment P1: To Wetland

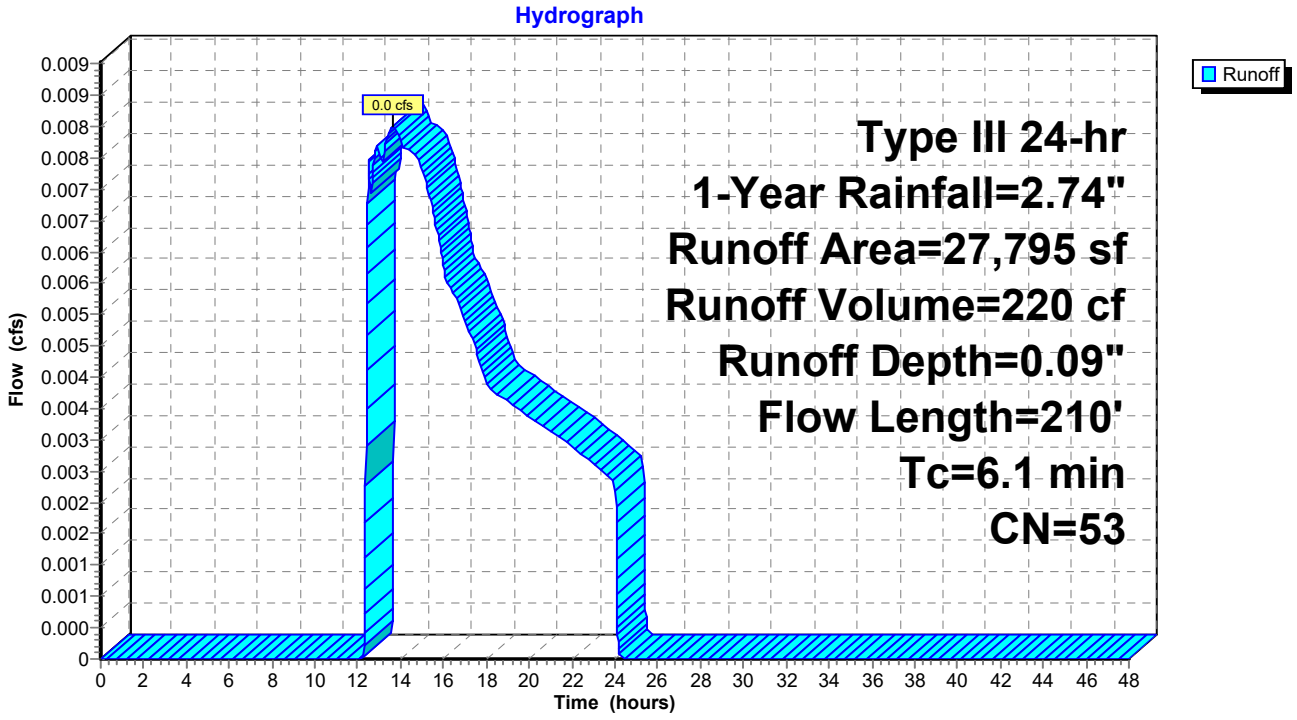
Runoff = 0.0 cfs @ 13.63 hrs, Volume= 220 cf, Depth= 0.09"
Routed to nonexistent node 1L

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.74"

Area (sf)	CN	Description
5,107	61	>75% Grass cover, Good, HSG B
19,126	55	Woods, Good, HSG B
1,414	39	>75% Grass cover, Good, HSG A
26	98	Unconnected pavement, HSG A
2,122	30	Woods, Good, HSG A
27,795	53	Weighted Average
27,769		99.91% Pervious Area
26		0.09% Impervious Area
26		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.5	19	0.0530	0.13		**Sheet Flow, Sheet Flow** Grass: Dense n= 0.240 P2= 3.31"
3.6	191	0.0310	0.88		**Shallow Concentrated Flow, Shallow Flow** Woodland Kv= 5.0 fps
6.1	210	Total			

Subcatchment P1: To Wetland



Summary for Subcatchment P2: Captured Area (To Grass Channel)

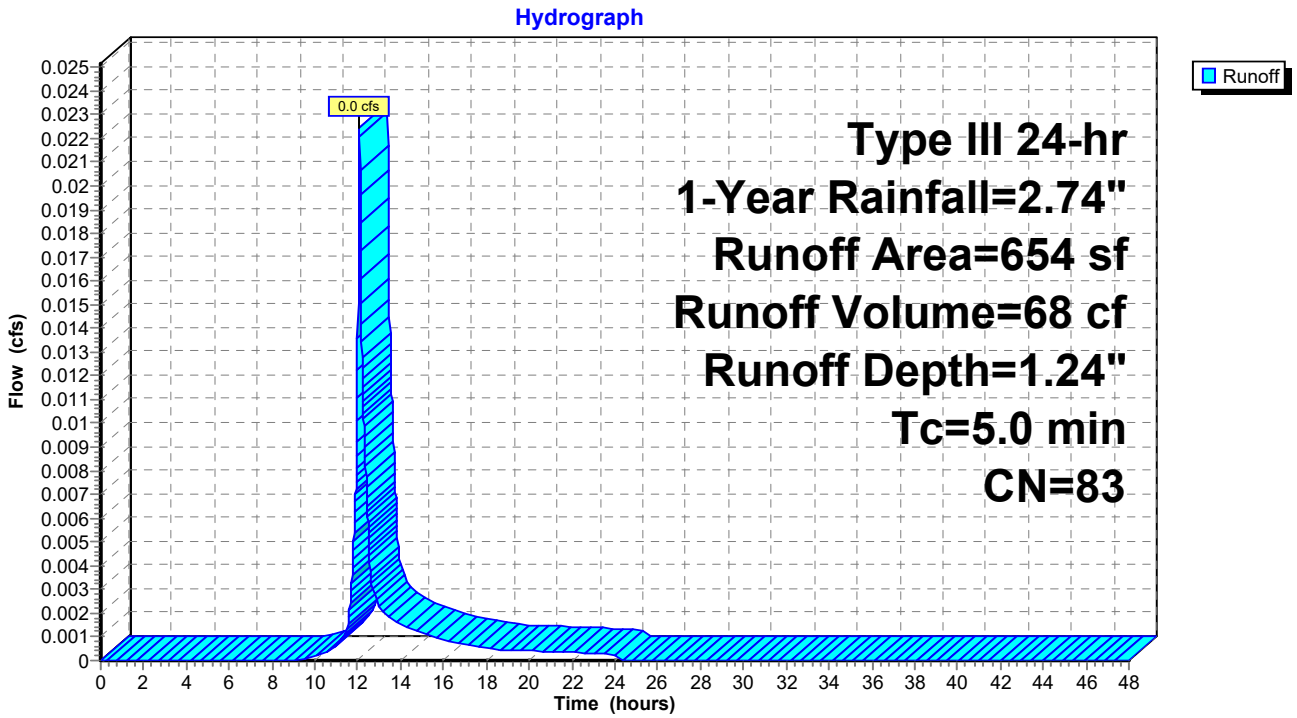
Runoff = 0.0 cfs @ 12.08 hrs, Volume= 68 cf, Depth= 1.24"
Routed to Reach 2R : Grass Channel

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.74"

Area (sf)	CN	Description
484	98	Unconnected pavement, HSG A
170	39	>75% Grass cover, Good, HSG A
654	83	Weighted Average
170		25.99% Pervious Area
484		74.01% Impervious Area
484		100.00% Unconnected

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

Subcatchment P2: Captured Area (To Grass Channel)



Summary for Subcatchment P3: To Street

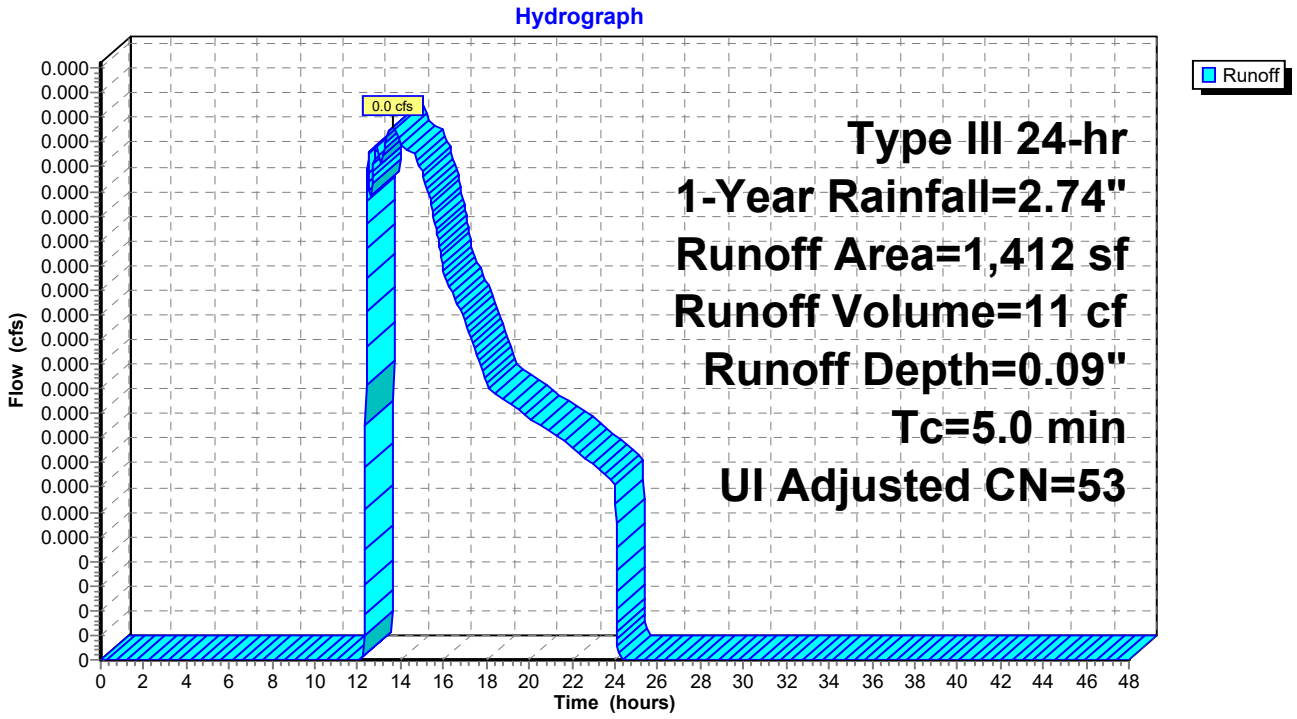
Runoff = 0.0 cfs @ 13.64 hrs, Volume= 11 cf, Depth= 0.09"
Routed to nonexistent node 1L

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.74"

Area (sf)	CN	Adj	Description
676	61		>75% Grass cover, Good, HSG B
606	39		>75% Grass cover, Good, HSG A
130	98		Unconnected pavement, HSG A
1,412	55	53	Weighted Average, UI Adjusted
1,282			90.79% Pervious Area
130			9.21% Impervious Area
130			100.00% Unconnected

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

Subcatchment P3: To Street



Summary for Subcatchment P4: Roof

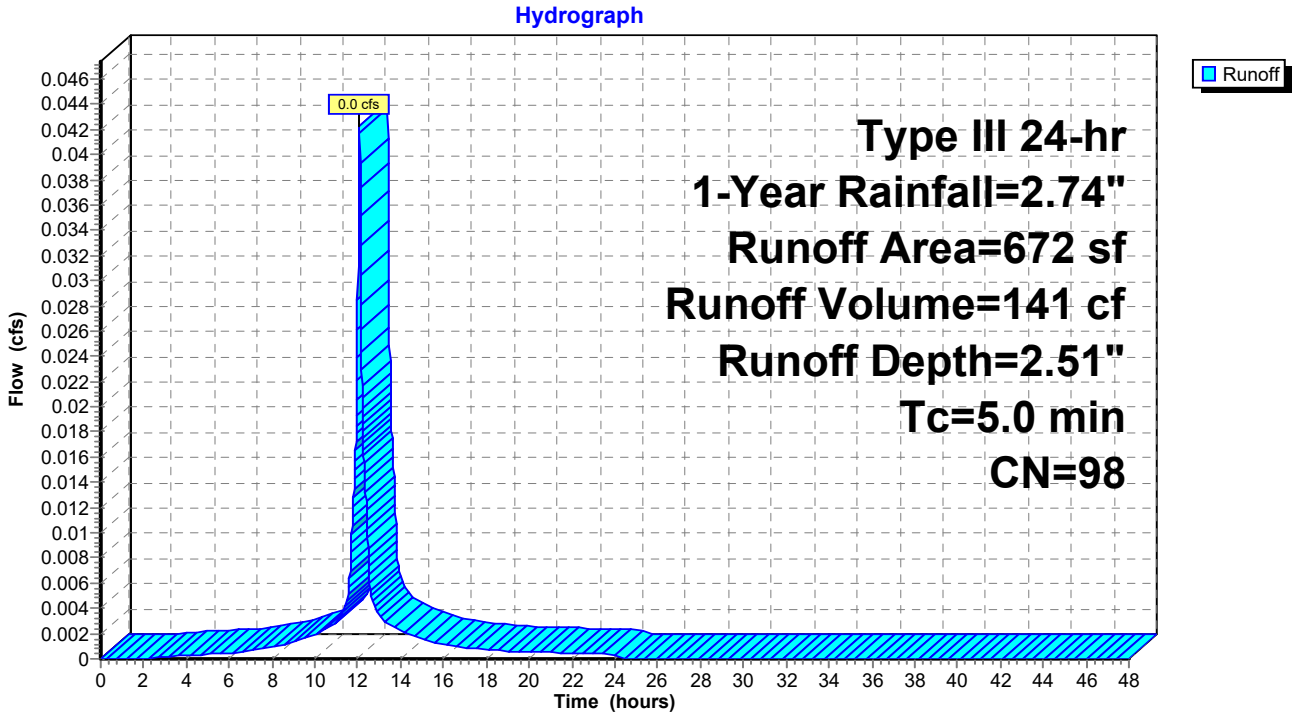
Runoff = 0.0 cfs @ 12.07 hrs, Volume= 141 cf, Depth= 2.51"
Routed to Pond 1P : Infiltration Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.74"

Area (sf)	CN	Description
672	98	Roofs, HSG A
672		100.00% Impervious Area

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

Subcatchment P4: Roof



Summary for Subcatchment P5: Captured Area

[45] Hint: Runoff=Zero

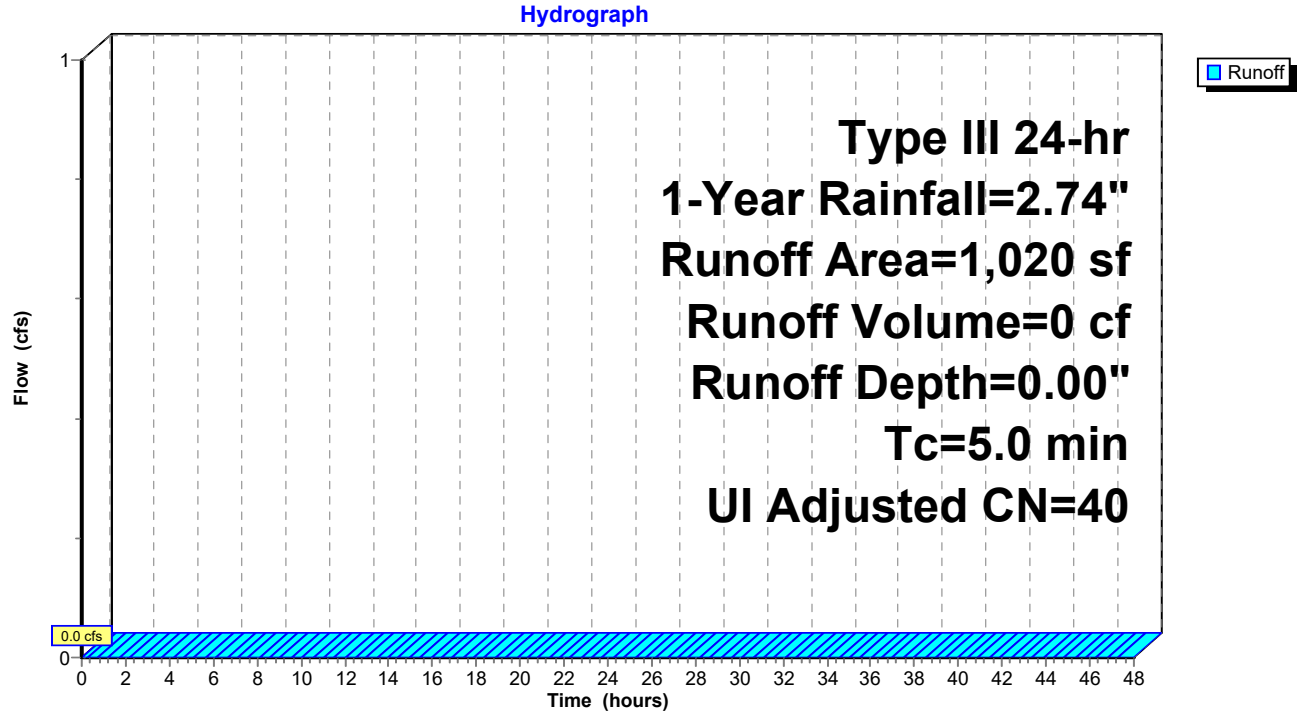
Runoff = 0.0 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"
Routed to Pond 1P : Infiltration Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-Year Rainfall=2.74"

Area (sf)	CN	Adj	Description
38	98		Unconnected pavement, HSG A
982	39		>75% Grass cover, Good, HSG A
1,020	41	40	Weighted Average, UI Adjusted
982			96.27% Pervious Area
38			3.73% Impervious Area
38			100.00% Unconnected

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

Subcatchment P5: Captured Area



Summary for Reach 2R: Grass Channel

Inflow Area = 654 sf, 74.01% Impervious, Inflow Depth = 1.24" for 1-Year event
Inflow = 0.0 cfs @ 12.08 hrs, Volume= 68 cf
Outflow = 0.0 cfs @ 12.08 hrs, Volume= 68 cf, Atten= 0%, Lag= 0.2 min
Routed to Pond 1P : Infiltration Basin

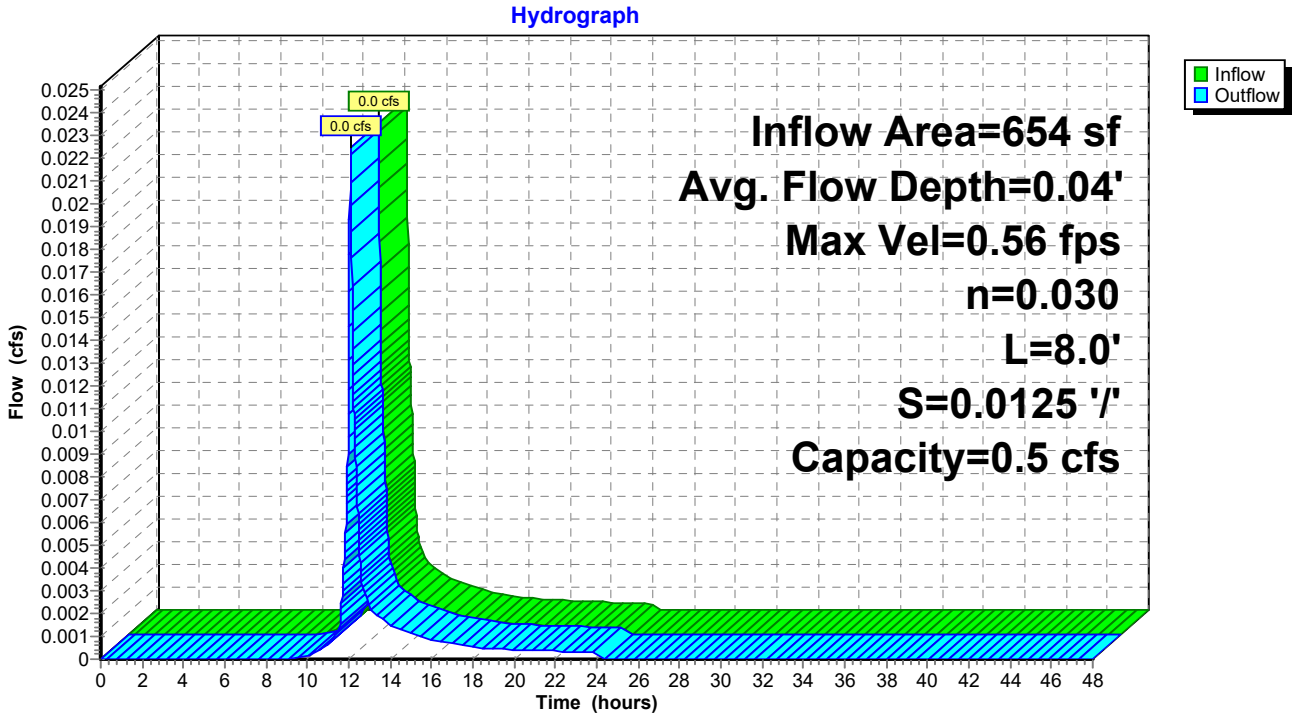
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.56 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 0.16 fps, Avg. Travel Time= 0.8 min

Peak Storage= 0 cf @ 12.08 hrs
Average Depth at Peak Storage= 0.04' , Surface Width= 1.22'
Bank-Full Depth= 0.20' Flow Area= 0.3 sf, Capacity= 0.5 cfs

1.00' x 0.20' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 2.20'
Length= 8.0' Slope= 0.0125 '/'
Inlet Invert= 27.80', Outlet Invert= 27.70'

‡

Reach 2R: Grass Channel



Summary for Pond 1P: Infiltration Basin

Inflow Area = 2,346 sf, 50.90% Impervious, Inflow Depth = 1.06" for 1-Year event
Inflow = 0.1 cfs @ 12.07 hrs, Volume= 208 cf
Outflow = 0.0 cfs @ 12.49 hrs, Volume= 208 cf, Atten= 79%, Lag= 25.2 min
Discarded = 0.0 cfs @ 12.49 hrs, Volume= 208 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 26.96' @ 12.49 hrs Surf.Area= 243 sf Storage= 53 cf

Plug-Flow detention time= 24.7 min calculated for 208 cf (100% of inflow)
Center-of-Mass det. time= 24.7 min (810.0 - 785.3)

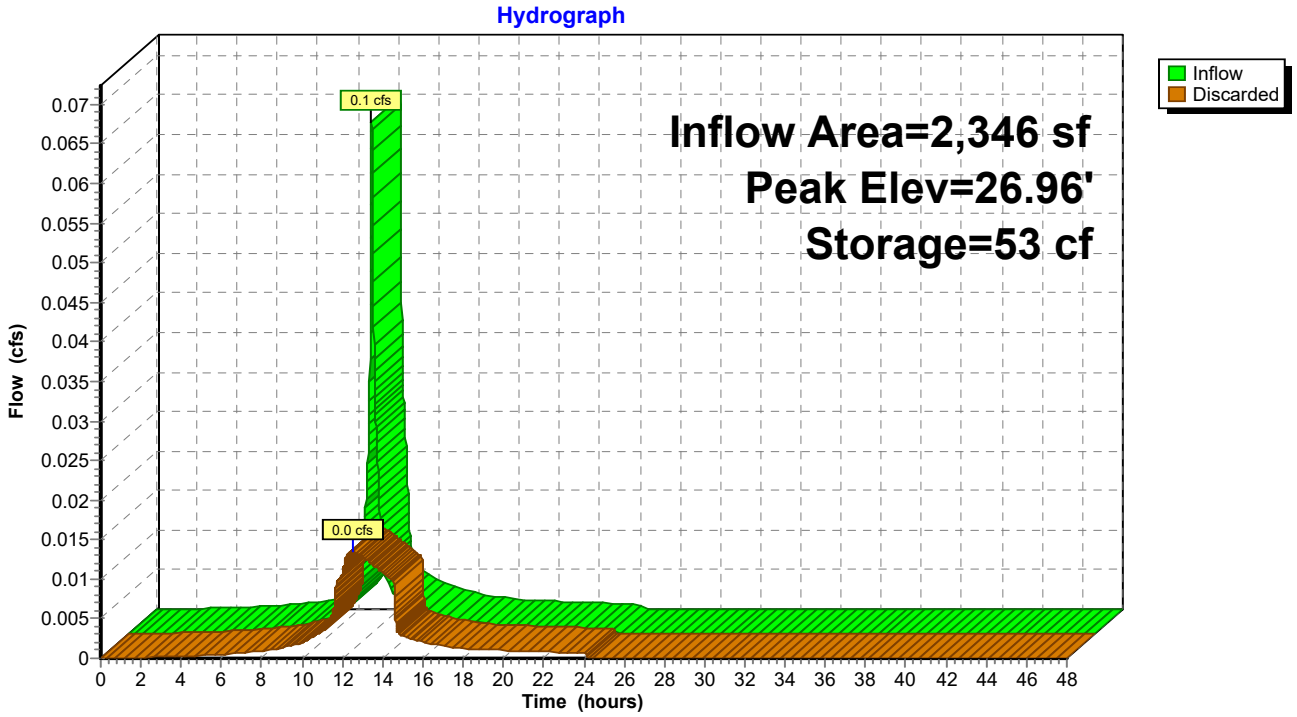
Volume	Invert	Avail.Storage	Storage Description
#1	26.70'	424 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
26.70	171	92.4	0	0	171
27.00	257	98.1	64	64	262
27.70	477	111.3	253	317	494
27.80	530	126.8	50	367	788
27.90	605	158.8	57	424	1,515

Device	Routing	Invert	Outlet Devices
#1	Discarded	26.70'	**2.410 in/hr Exfiltration over Surface area** Phase-In= 0.01'

Discarded OutFlow Max=0.0 cfs @ 12.49 hrs HW=26.96' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Pond 1P: Infiltration Basin



Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentP1: To Wetland Runoff Area=27,795 sf 0.09% Impervious Runoff Depth=0.23"
Flow Length=210' Tc=6.1 min CN=53 Runoff=0.1 cfs 526 cf

SubcatchmentP2: Captured Area (To Grass Runoff Area=654 sf 74.01% Impervious Runoff Depth=1.70"
Tc=5.0 min CN=83 Runoff=0.0 cfs 93 cf

SubcatchmentP3: To Street Runoff Area=1,412 sf 9.21% Impervious Runoff Depth=0.23"
Tc=5.0 min UI Adjusted CN=53 Runoff=0.0 cfs 27 cf

SubcatchmentP4: Roof Runoff Area=672 sf 100.00% Impervious Runoff Depth=3.08"
Tc=5.0 min CN=98 Runoff=0.1 cfs 172 cf

SubcatchmentP5: Captured Area Runoff Area=1,020 sf 3.73% Impervious Runoff Depth=0.01"
Tc=5.0 min UI Adjusted CN=40 Runoff=0.0 cfs 1 cf

Reach 2R: Grass Channel Avg. Flow Depth=0.04' Max Vel=0.63 fps Inflow=0.0 cfs 93 cf
n=0.030 L=8.0' S=0.0125 '/' Capacity=0.5 cfs Outflow=0.0 cfs 93 cf

Pond 1P: Infiltration Basin Peak Elev=27.04' Storage=74 cf Inflow=0.1 cfs 265 cf
Outflow=0.0 cfs 265 cf

Total Runoff Area = 31,553 sf Runoff Volume = 818 cf Average Runoff Depth = 0.31"
95.72% Pervious = 30,203 sf 4.28% Impervious = 1,350 sf

Summary for Subcatchment P1: To Wetland

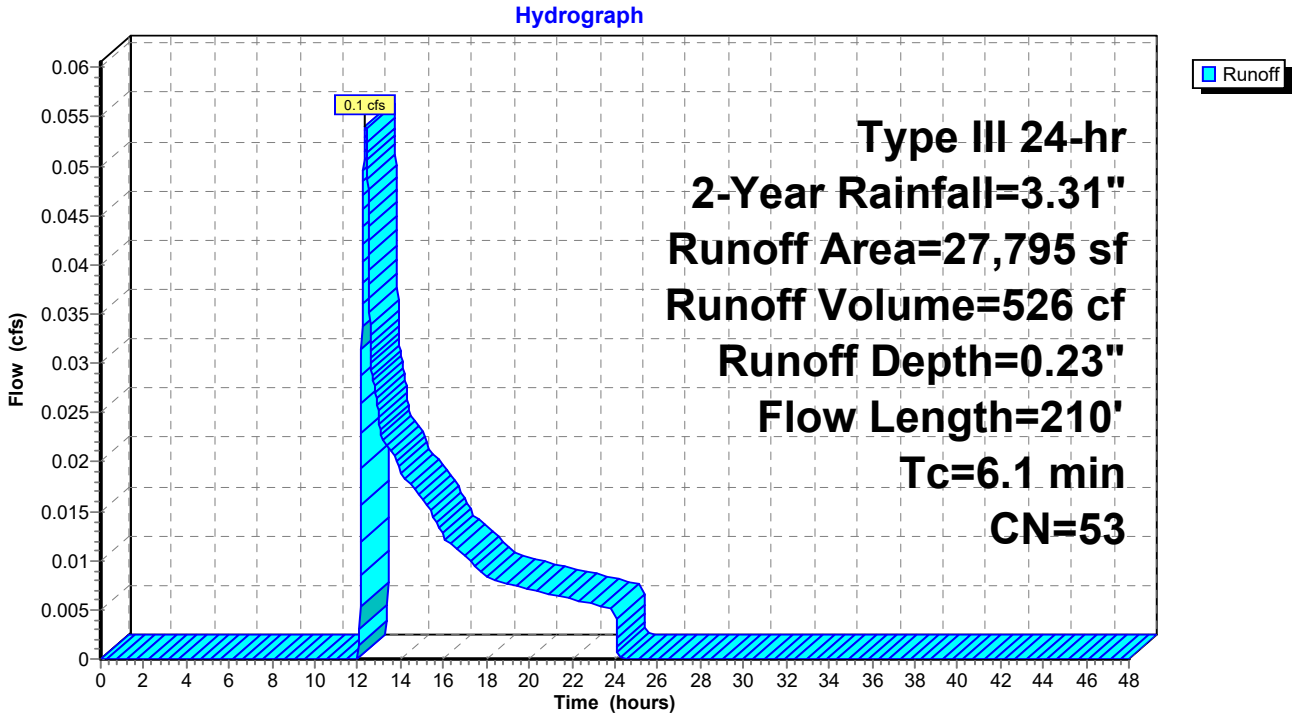
Runoff = 0.1 cfs @ 12.36 hrs, Volume= 526 cf, Depth= 0.23"
Routed to nonexistent node 1L

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.31"

Area (sf)	CN	Description
5,107	61	>75% Grass cover, Good, HSG B
19,126	55	Woods, Good, HSG B
1,414	39	>75% Grass cover, Good, HSG A
26	98	Unconnected pavement, HSG A
2,122	30	Woods, Good, HSG A
27,795	53	Weighted Average
27,769		99.91% Pervious Area
26		0.09% Impervious Area
26		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.5	19	0.0530	0.13		**Sheet Flow, Sheet Flow** Grass: Dense n= 0.240 P2= 3.31"
3.6	191	0.0310	0.88		**Shallow Concentrated Flow, Shallow Flow** Woodland Kv= 5.0 fps
6.1	210	Total			

Subcatchment P1: To Wetland



Summary for Subcatchment P2: Captured Area (To Grass Channel)

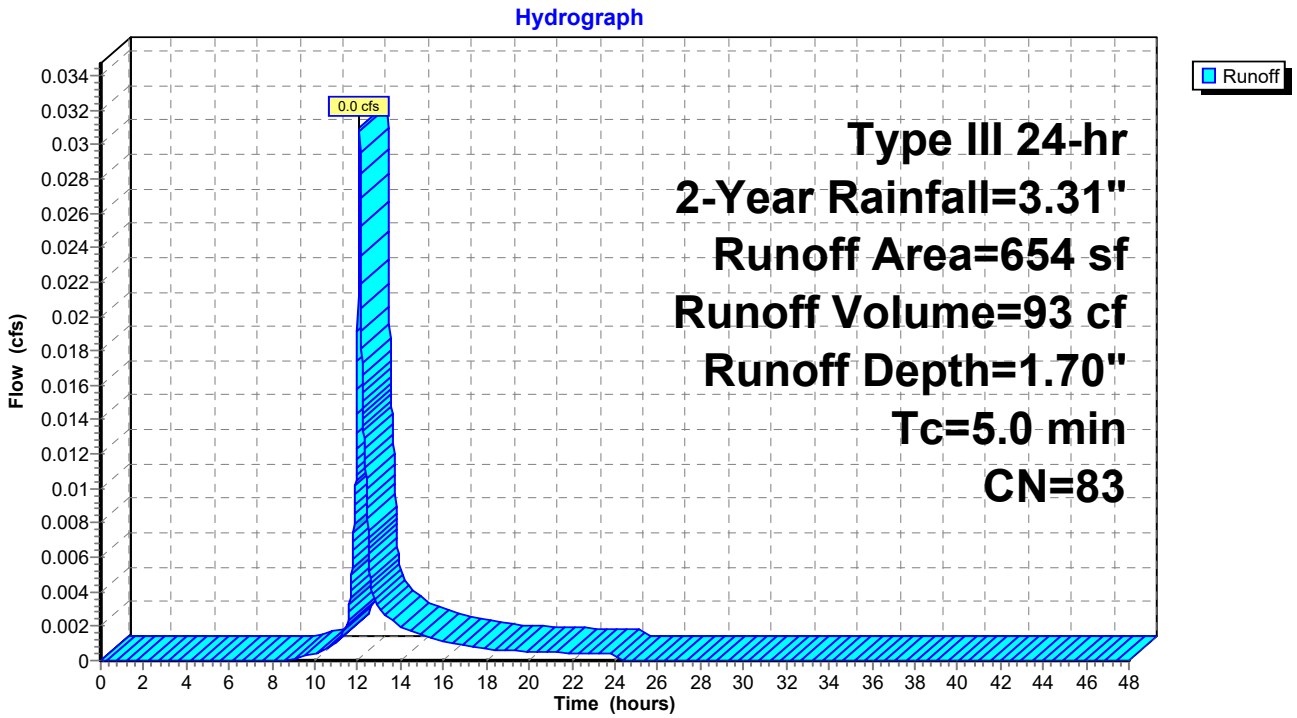
Runoff = 0.0 cfs @ 12.08 hrs, Volume= 93 cf, Depth= 1.70"
Routed to Reach 2R : Grass Channel

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.31"

Area (sf)	CN	Description
484	98	Unconnected pavement, HSG A
170	39	>75% Grass cover, Good, HSG A
654	83	Weighted Average
170		25.99% Pervious Area
484		74.01% Impervious Area
484		100.00% Unconnected

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

Subcatchment P2: Captured Area (To Grass Channel)



Summary for Subcatchment P3: To Street

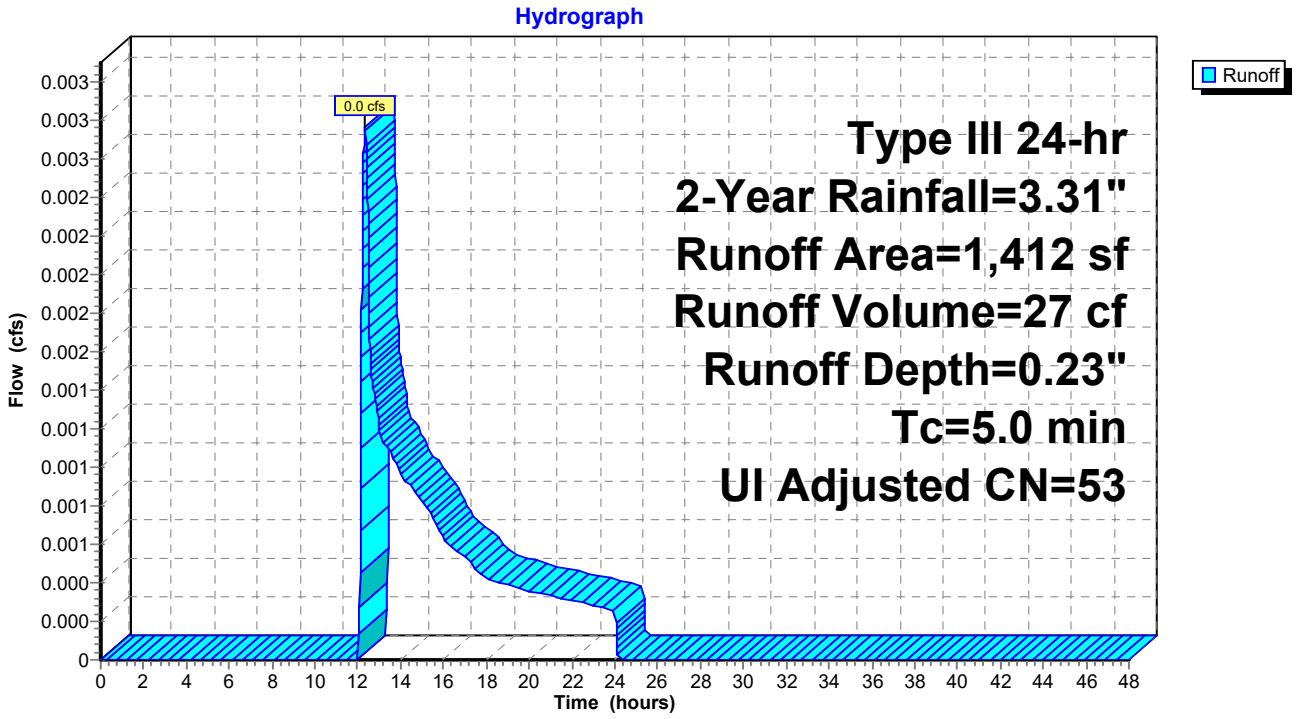
Runoff = 0.0 cfs @ 12.34 hrs, Volume= 27 cf, Depth= 0.23"
Routed to nonexistent node 1L

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.31"

Area (sf)	CN	Adj	Description
676	61		>75% Grass cover, Good, HSG B
606	39		>75% Grass cover, Good, HSG A
130	98		Unconnected pavement, HSG A
1,412	55	53	Weighted Average, UI Adjusted
1,282			90.79% Pervious Area
130			9.21% Impervious Area
130			100.00% Unconnected

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

Subcatchment P3: To Street



Summary for Subcatchment P4: Roof

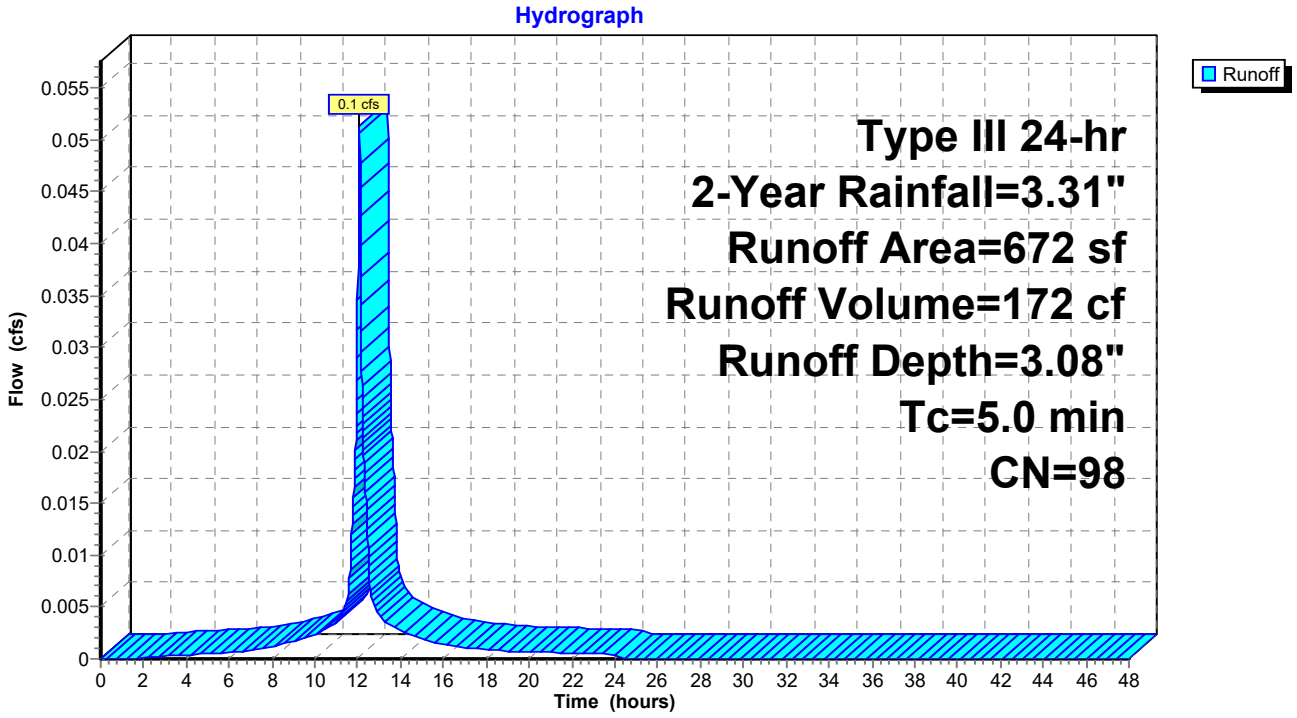
Runoff = 0.1 cfs @ 12.07 hrs, Volume= 172 cf, Depth= 3.08"
Routed to Pond 1P : Infiltration Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.31"

Area (sf)	CN	Description
672	98	Roofs, HSG A
672		100.00% Impervious Area

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

Subcatchment P4: Roof



Summary for Subcatchment P5: Captured Area

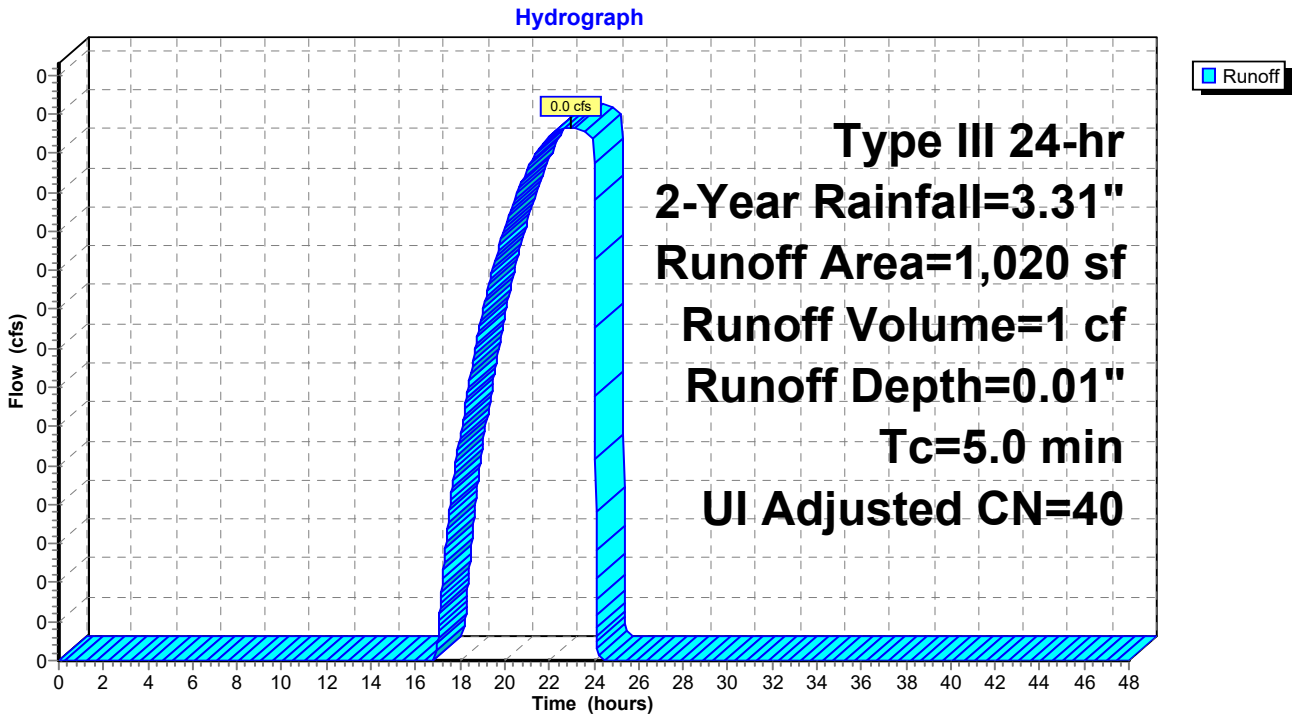
Runoff = 0.0 cfs @ 22.95 hrs, Volume= 1 cf, Depth= 0.01"
Routed to Pond 1P : Infiltration Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.31"

Area (sf)	CN	Adj	Description
38	98		Unconnected pavement, HSG A
982	39		>75% Grass cover, Good, HSG A
1,020	41	40	Weighted Average, UI Adjusted
982			96.27% Pervious Area
38			3.73% Impervious Area
38			100.00% Unconnected

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

Subcatchment P5: Captured Area



Summary for Reach 2R: Grass Channel

Inflow Area = 654 sf, 74.01% Impervious, Inflow Depth = 1.70" for 2-Year event
Inflow = 0.0 cfs @ 12.08 hrs, Volume= 93 cf
Outflow = 0.0 cfs @ 12.08 hrs, Volume= 93 cf, Atten= 0%, Lag= 0.1 min
Routed to Pond 1P : Infiltration Basin

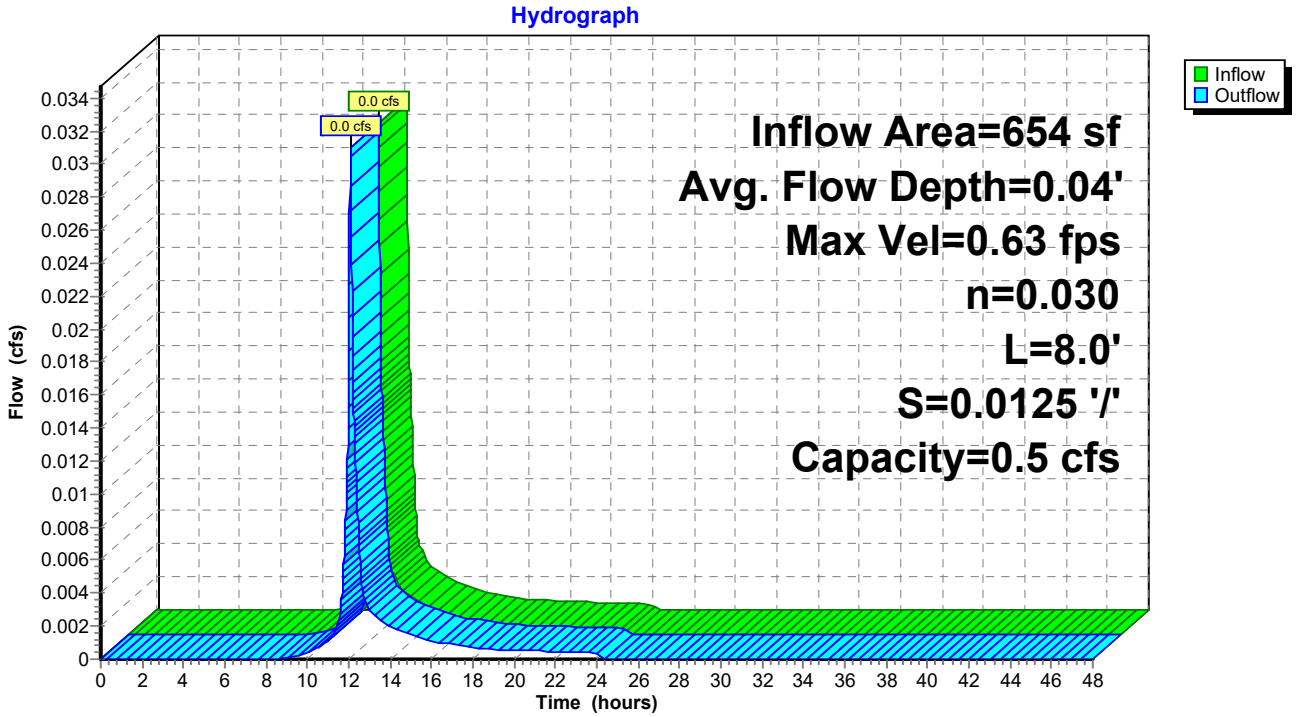
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.63 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 0.18 fps, Avg. Travel Time= 0.8 min

Peak Storage= 0 cf @ 12.08 hrs
Average Depth at Peak Storage= 0.04' , Surface Width= 1.26'
Bank-Full Depth= 0.20' Flow Area= 0.3 sf, Capacity= 0.5 cfs

1.00' x 0.20' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 2.20'
Length= 8.0' Slope= 0.0125 '/'
Inlet Invert= 27.80', Outlet Invert= 27.70'

‡

Reach 2R: Grass Channel



Summary for Pond 1P: Infiltration Basin

Inflow Area = 2,346 sf, 50.90% Impervious, Inflow Depth = 1.36" for 2-Year event
Inflow = 0.1 cfs @ 12.07 hrs, Volume= 265 cf
Outflow = 0.0 cfs @ 12.52 hrs, Volume= 265 cf, Atten= 82%, Lag= 26.8 min
Discarded = 0.0 cfs @ 12.52 hrs, Volume= 265 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 27.04' @ 12.52 hrs Surf.Area= 268 sf Storage= 74 cf

Plug-Flow detention time= 33.7 min calculated for 265 cf (100% of inflow)
Center-of-Mass det. time= 33.7 min (816.1 - 782.4)

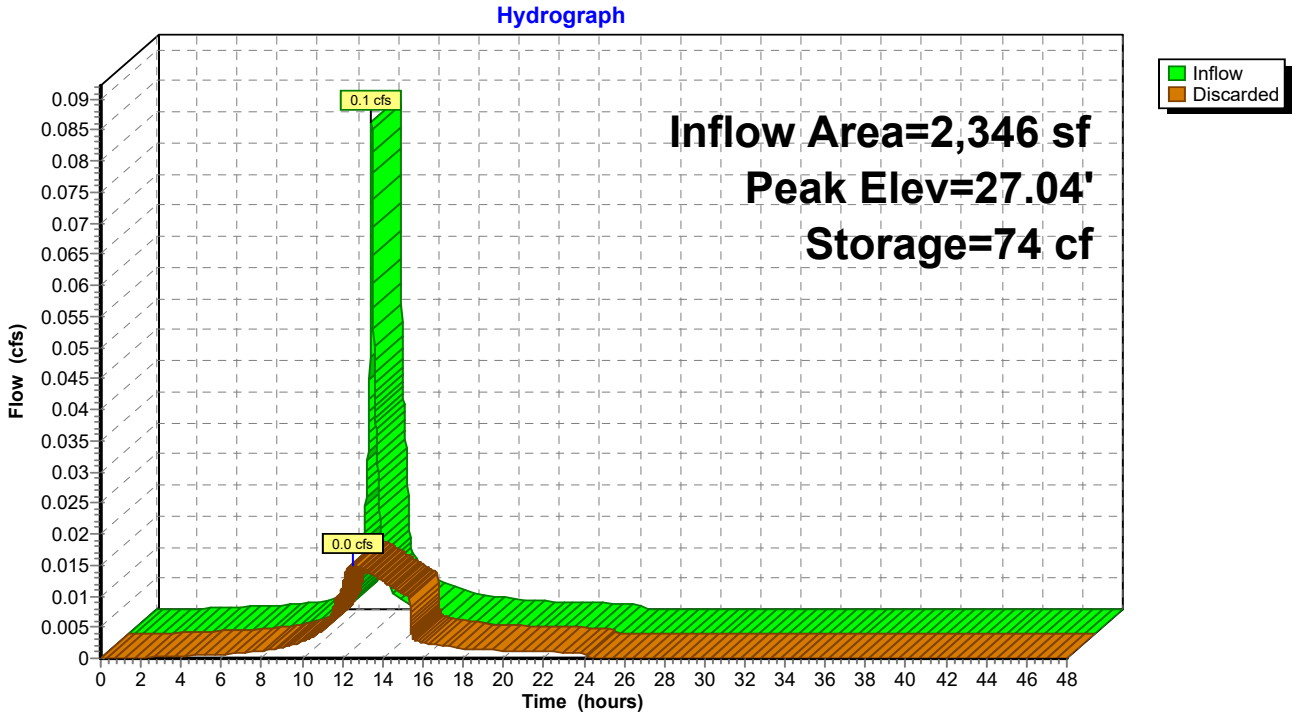
Volume	Invert	Avail.Storage	Storage Description
#1	26.70'	424 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
26.70	171	92.4	0	0	171
27.00	257	98.1	64	64	262
27.70	477	111.3	253	317	494
27.80	530	126.8	50	367	788
27.90	605	158.8	57	424	1,515

Device	Routing	Invert	Outlet Devices
#1	Discarded	26.70'	**2.410 in/hr Exfiltration over Surface area** Phase-In= 0.01'

Discarded OutFlow Max=0.0 cfs @ 12.52 hrs HW=27.04' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Pond 1P: Infiltration Basin



Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentP1: To Wetland Runoff Area=27,795 sf 0.09% Impervious Runoff Depth=0.81"
Flow Length=210' Tc=6.1 min CN=53 Runoff=0.4 cfs 1,888 cf

SubcatchmentP2: Captured Area (To Grass Runoff Area=654 sf 74.01% Impervious Runoff Depth=3.08"
Tc=5.0 min CN=83 Runoff=0.1 cfs 168 cf

SubcatchmentP3: To Street Runoff Area=1,412 sf 9.21% Impervious Runoff Depth=0.81"
Tc=5.0 min UI Adjusted CN=53 Runoff=0.0 cfs 96 cf

SubcatchmentP4: Roof Runoff Area=672 sf 100.00% Impervious Runoff Depth=4.66"
Tc=5.0 min CN=98 Runoff=0.1 cfs 261 cf

SubcatchmentP5: Captured Area Runoff Area=1,020 sf 3.73% Impervious Runoff Depth=0.21"
Tc=5.0 min UI Adjusted CN=40 Runoff=0.0 cfs 18 cf

Reach 2R: Grass Channel Avg. Flow Depth=0.06' Max Vel=0.77 fps Inflow=0.1 cfs 168 cf
n=0.030 L=8.0' S=0.0125 '/' Capacity=0.5 cfs Outflow=0.1 cfs 168 cf

Pond 1P: Infiltration Basin Peak Elev=27.27' Storage=142 cf Inflow=0.1 cfs 447 cf
Outflow=0.0 cfs 447 cf

Total Runoff Area = 31,553 sf Runoff Volume = 2,431 cf Average Runoff Depth = 0.92"
95.72% Pervious = 30,203 sf 4.28% Impervious = 1,350 sf

Summary for Subcatchment P1: To Wetland

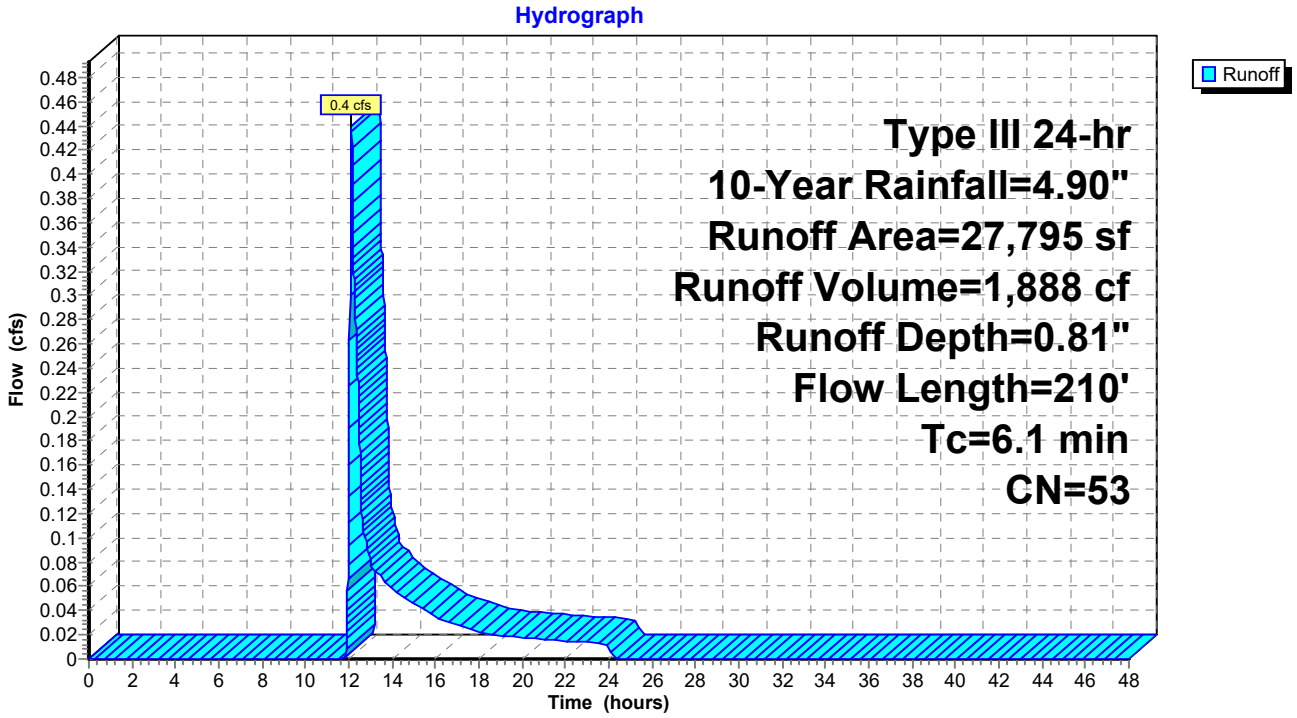
Runoff = 0.4 cfs @ 12.11 hrs, Volume= 1,888 cf, Depth= 0.81"
Routed to nonexistent node 1L

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

Area (sf)	CN	Description
5,107	61	>75% Grass cover, Good, HSG B
19,126	55	Woods, Good, HSG B
1,414	39	>75% Grass cover, Good, HSG A
26	98	Unconnected pavement, HSG A
2,122	30	Woods, Good, HSG A
27,795	53	Weighted Average
27,769		99.91% Pervious Area
26		0.09% Impervious Area
26		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.5	19	0.0530	0.13		**Sheet Flow, Sheet Flow** Grass: Dense n= 0.240 P2= 3.31"
3.6	191	0.0310	0.88		**Shallow Concentrated Flow, Shallow Flow** Woodland Kv= 5.0 fps
6.1	210	Total			

Subcatchment P1: To Wetland



Summary for Subcatchment P2: Captured Area (To Grass Channel)

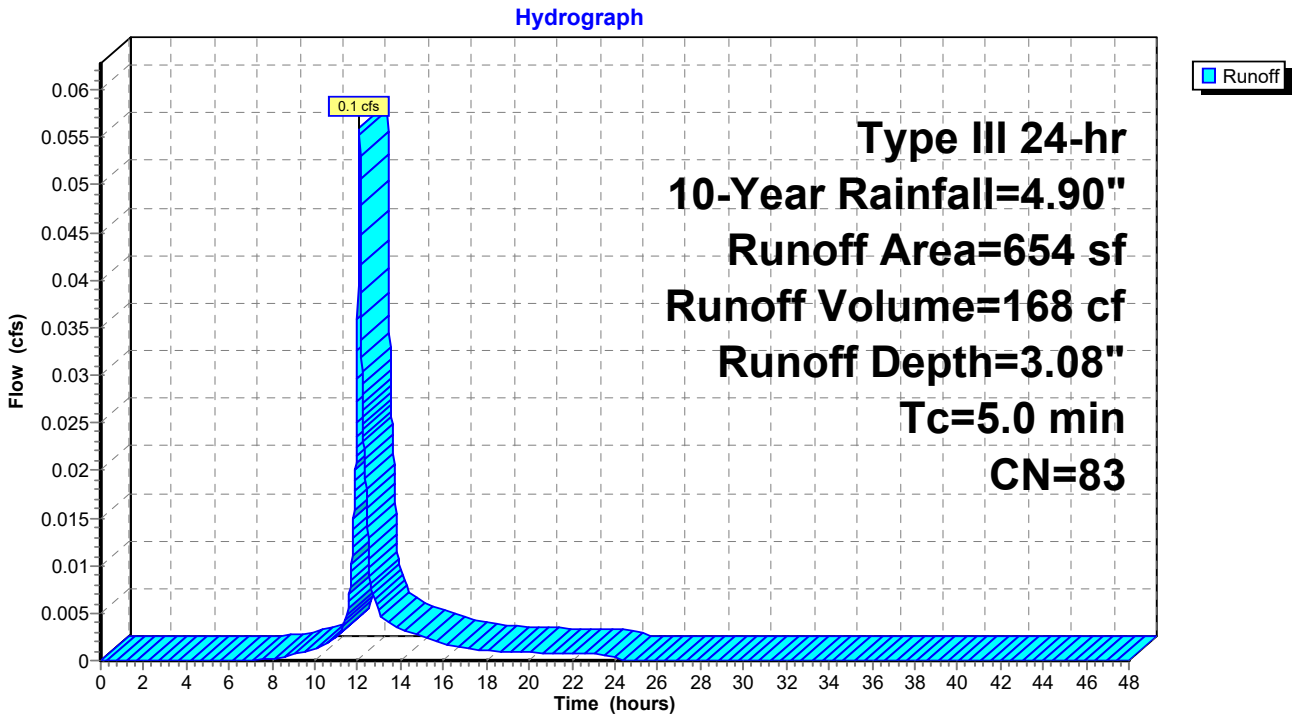
Runoff = 0.1 cfs @ 12.07 hrs, Volume= 168 cf, Depth= 3.08"
Routed to Reach 2R : Grass Channel

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

Area (sf)	CN	Description
484	98	Unconnected pavement, HSG A
170	39	>75% Grass cover, Good, HSG A
654	83	Weighted Average
170		25.99% Pervious Area
484		74.01% Impervious Area
484		100.00% Unconnected

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

Subcatchment P2: Captured Area (To Grass Channel)



Summary for Subcatchment P3: To Street

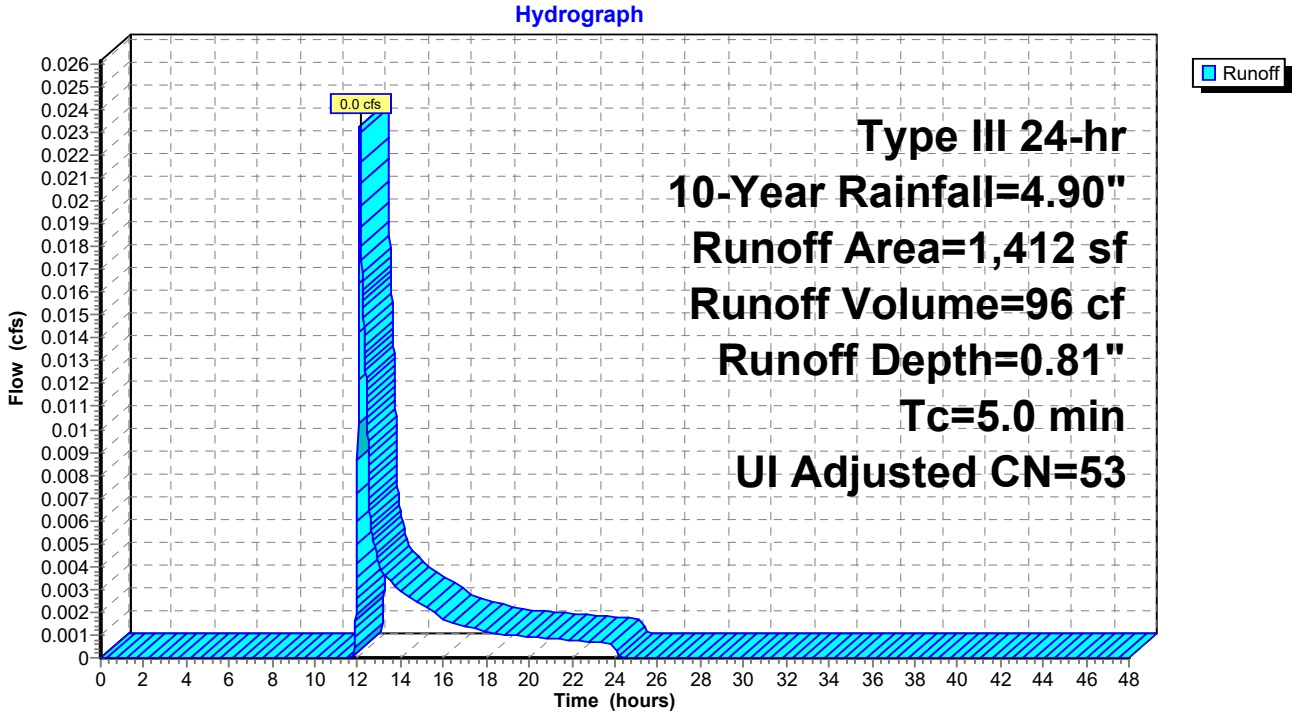
Runoff = 0.0 cfs @ 12.10 hrs, Volume= 96 cf, Depth= 0.81"
Routed to nonexistent node 1L

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

Area (sf)	CN	Adj	Description
676	61		>75% Grass cover, Good, HSG B
606	39		>75% Grass cover, Good, HSG A
130	98		Unconnected pavement, HSG A
1,412	55	53	Weighted Average, UI Adjusted
1,282			90.79% Pervious Area
130			9.21% Impervious Area
130			100.00% Unconnected

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

Subcatchment P3: To Street



Summary for Subcatchment P4: Roof

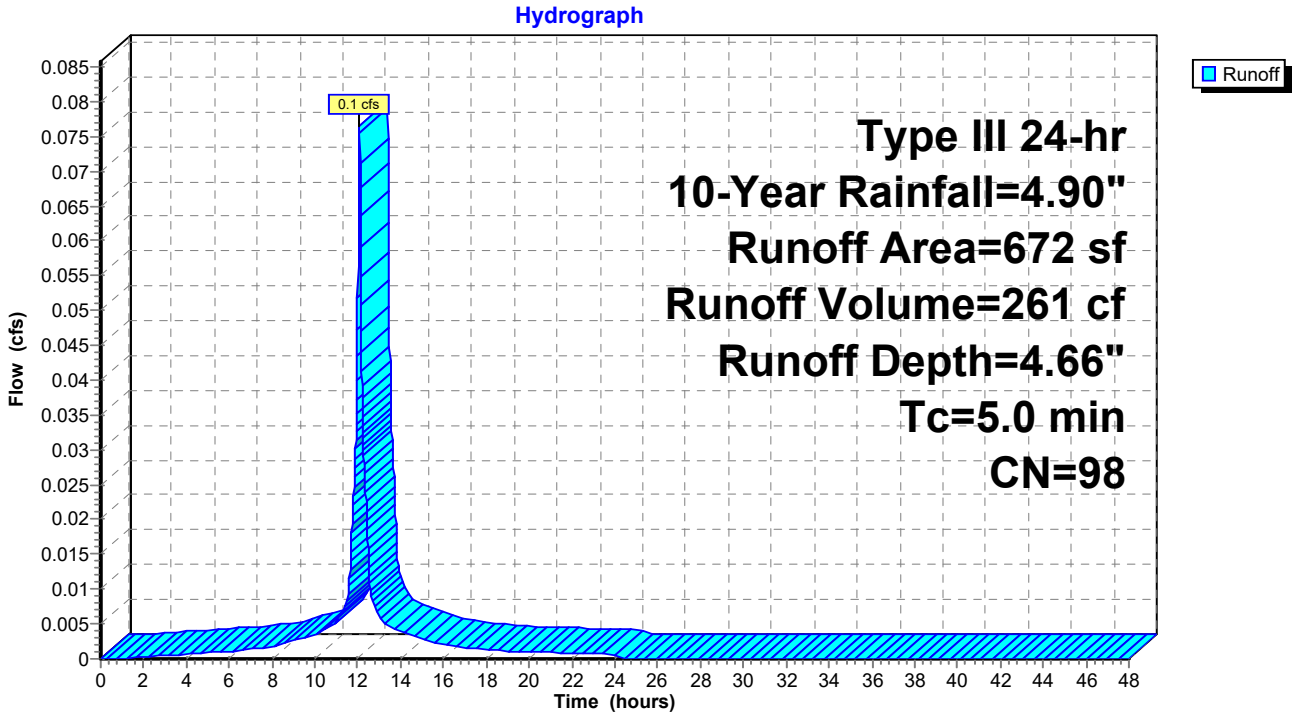
Runoff = 0.1 cfs @ 12.07 hrs, Volume= 261 cf, Depth= 4.66"
Routed to Pond 1P : Infiltration Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

Area (sf)	CN	Description
672	98	Roofs, HSG A
672		100.00% Impervious Area

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

Subcatchment P4: Roof



Summary for Subcatchment P5: Captured Area

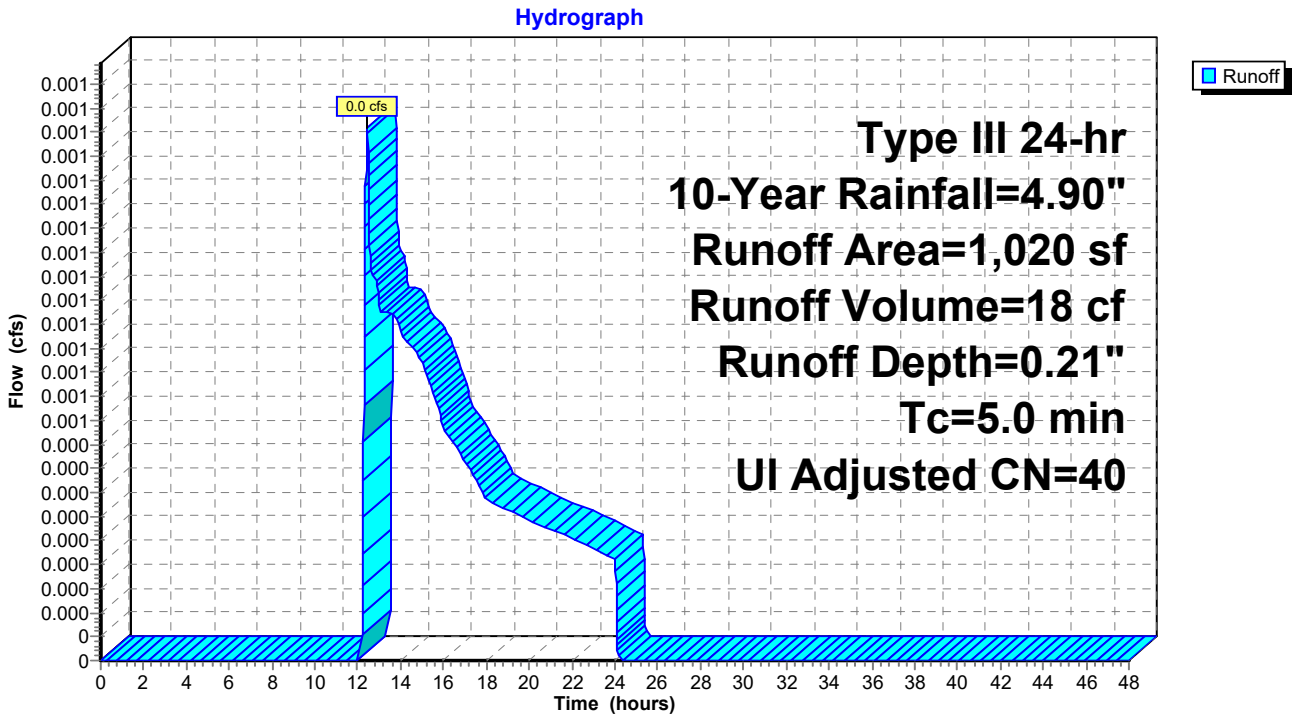
Runoff = 0.0 cfs @ 12.44 hrs, Volume= 18 cf, Depth= 0.21"
Routed to Pond 1P : Infiltration Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=4.90"

Area (sf)	CN	Adj	Description
38	98		Unconnected pavement, HSG A
982	39		>75% Grass cover, Good, HSG A
1,020	41	40	Weighted Average, UI Adjusted
982			96.27% Pervious Area
38			3.73% Impervious Area
38			100.00% Unconnected

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

Subcatchment P5: Captured Area



Summary for Reach 2R: Grass Channel

Inflow Area = 654 sf, 74.01% Impervious, Inflow Depth = 3.08" for 10-Year event
Inflow = 0.1 cfs @ 12.07 hrs, Volume= 168 cf
Outflow = 0.1 cfs @ 12.08 hrs, Volume= 168 cf, Atten= 0%, Lag= 0.1 min
Routed to Pond 1P : Infiltration Basin

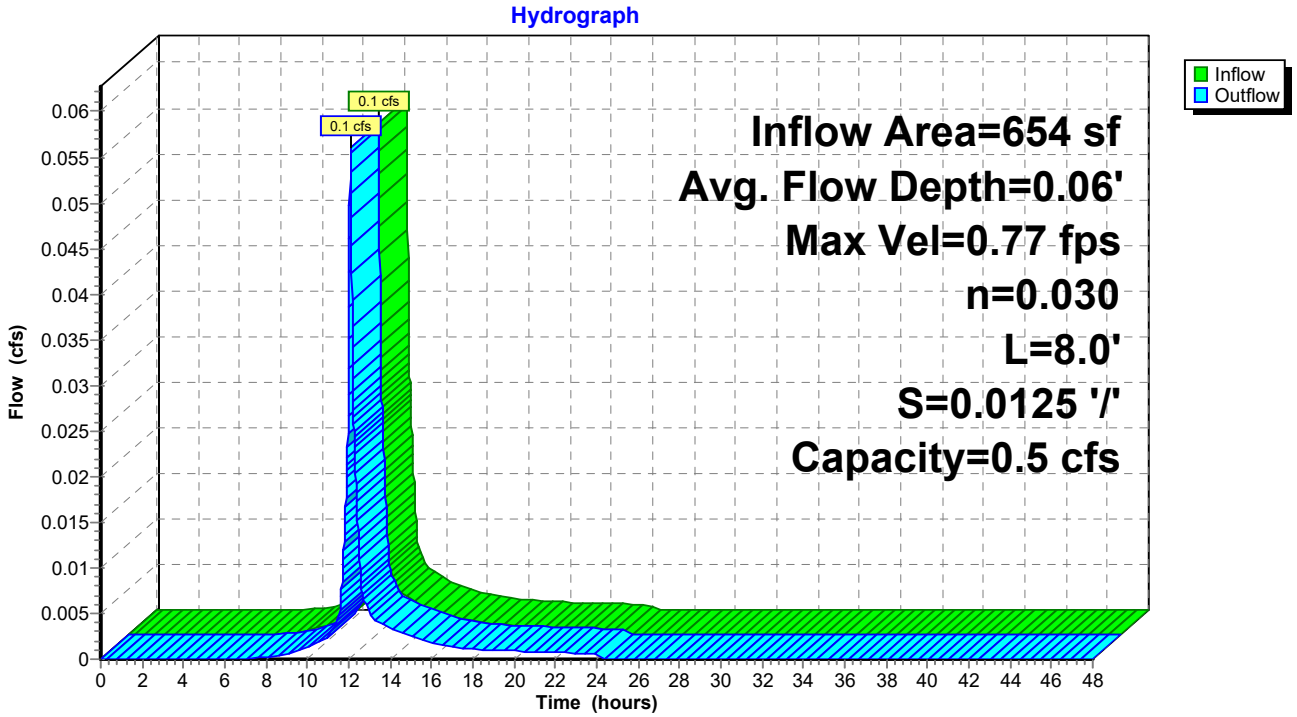
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.77 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 0.21 fps, Avg. Travel Time= 0.6 min

Peak Storage= 1 cf @ 12.08 hrs
Average Depth at Peak Storage= 0.06' , Surface Width= 1.37'
Bank-Full Depth= 0.20' Flow Area= 0.3 sf, Capacity= 0.5 cfs

1.00' x 0.20' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 2.20'
Length= 8.0' Slope= 0.0125 '/'
Inlet Invert= 27.80', Outlet Invert= 27.70'

‡

Reach 2R: Grass Channel



Summary for Pond 1P: Infiltration Basin

Inflow Area = 2,346 sf, 50.90% Impervious, Inflow Depth = 2.29" for 10-Year event
Inflow = 0.1 cfs @ 12.07 hrs, Volume= 447 cf
Outflow = 0.0 cfs @ 12.58 hrs, Volume= 447 cf, Atten= 86%, Lag= 30.7 min
Discarded = 0.0 cfs @ 12.58 hrs, Volume= 447 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 27.27' @ 12.58 hrs Surf.Area= 333 sf Storage= 142 cf

Plug-Flow detention time= 59.8 min calculated for 447 cf (100% of inflow)
Center-of-Mass det. time= 59.7 min (842.4 - 782.7)

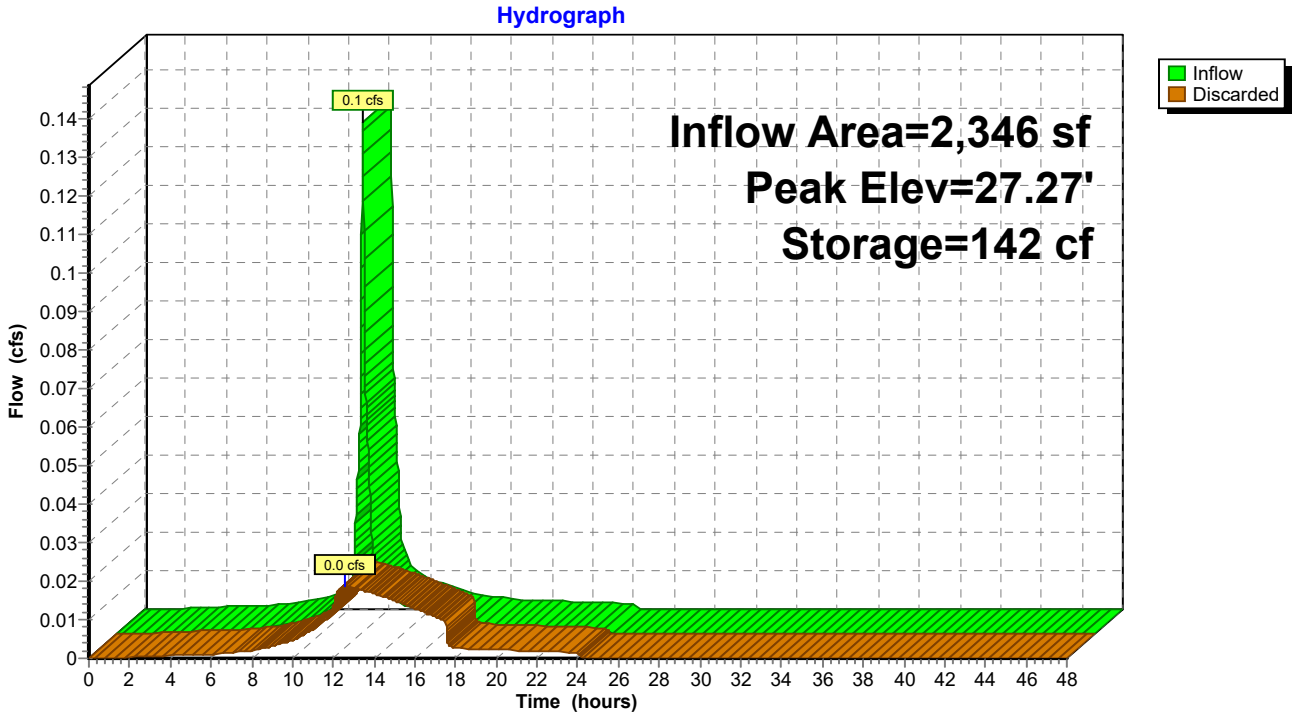
Volume	Invert	Avail.Storage	Storage Description
#1	26.70'	424 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
26.70	171	92.4	0	0	171
27.00	257	98.1	64	64	262
27.70	477	111.3	253	317	494
27.80	530	126.8	50	367	788
27.90	605	158.8	57	424	1,515

Device	Routing	Invert	Outlet Devices
#1	Discarded	26.70'	**2.410 in/hr Exfiltration over Surface area** Phase-In= 0.01'

Discarded OutFlow Max=0.0 cfs @ 12.58 hrs HW=27.27' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Pond 1P: Infiltration Basin



Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentP1: To Wetland Runoff Area=27,795 sf 0.09% Impervious Runoff Depth=1.44"
Flow Length=210' Tc=6.1 min CN=53 Runoff=0.9 cfs 3,324 cf

SubcatchmentP2: Captured Area (To Grass Runoff Area=654 sf 74.01% Impervious Runoff Depth=4.21"
Tc=5.0 min CN=83 Runoff=0.1 cfs 230 cf

SubcatchmentP3: To Street Runoff Area=1,412 sf 9.21% Impervious Runoff Depth=1.44"
Tc=5.0 min UI Adjusted CN=53 Runoff=0.0 cfs 169 cf

SubcatchmentP4: Roof Runoff Area=672 sf 100.00% Impervious Runoff Depth=5.89"
Tc=5.0 min CN=98 Runoff=0.1 cfs 330 cf

SubcatchmentP5: Captured Area Runoff Area=1,020 sf 3.73% Impervious Runoff Depth=0.54"
Tc=5.0 min UI Adjusted CN=40 Runoff=0.0 cfs 46 cf

Reach 2R: Grass Channel Avg. Flow Depth=0.07' Max Vel=0.86 fps Inflow=0.1 cfs 230 cf
n=0.030 L=8.0' S=0.0125 '/' Capacity=0.5 cfs Outflow=0.1 cfs 230 cf

Pond 1P: Infiltration Basin Peak Elev=27.44' Storage=206 cf Inflow=0.2 cfs 605 cf
Outflow=0.0 cfs 605 cf

Total Runoff Area = 31,553 sf Runoff Volume = 4,098 cf Average Runoff Depth = 1.56"
95.72% Pervious = 30,203 sf 4.28% Impervious = 1,350 sf

Summary for Subcatchment P1: To Wetland

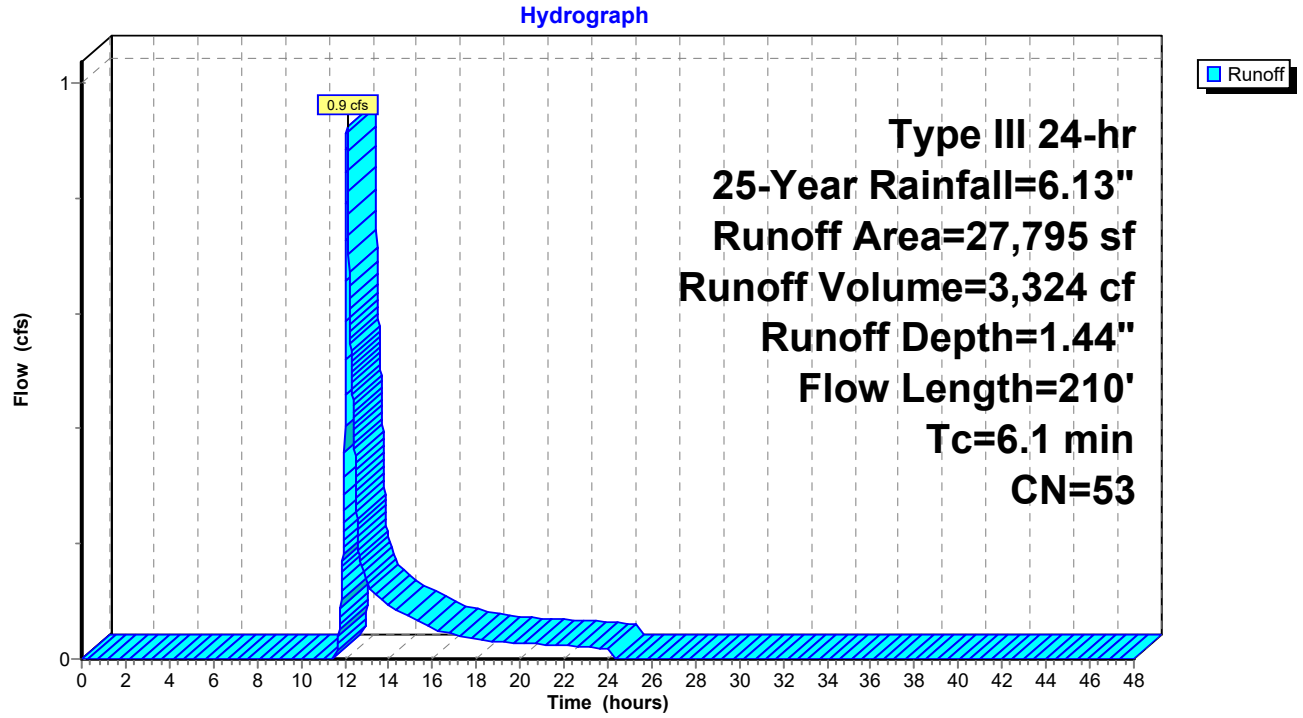
Runoff = 0.9 cfs @ 12.10 hrs, Volume= 3,324 cf, Depth= 1.44"
Routed to nonexistent node 1L

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.13"

Area (sf)	CN	Description
5,107	61	>75% Grass cover, Good, HSG B
19,126	55	Woods, Good, HSG B
1,414	39	>75% Grass cover, Good, HSG A
26	98	Unconnected pavement, HSG A
2,122	30	Woods, Good, HSG A
27,795	53	Weighted Average
27,769		99.91% Pervious Area
26		0.09% Impervious Area
26		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.5	19	0.0530	0.13		**Sheet Flow, Sheet Flow** Grass: Dense n= 0.240 P2= 3.31"
3.6	191	0.0310	0.88		**Shallow Concentrated Flow, Shallow Flow** Woodland Kv= 5.0 fps
6.1	210	Total			

Subcatchment P1: To Wetland



Summary for Subcatchment P2: Captured Area (To Grass Channel)

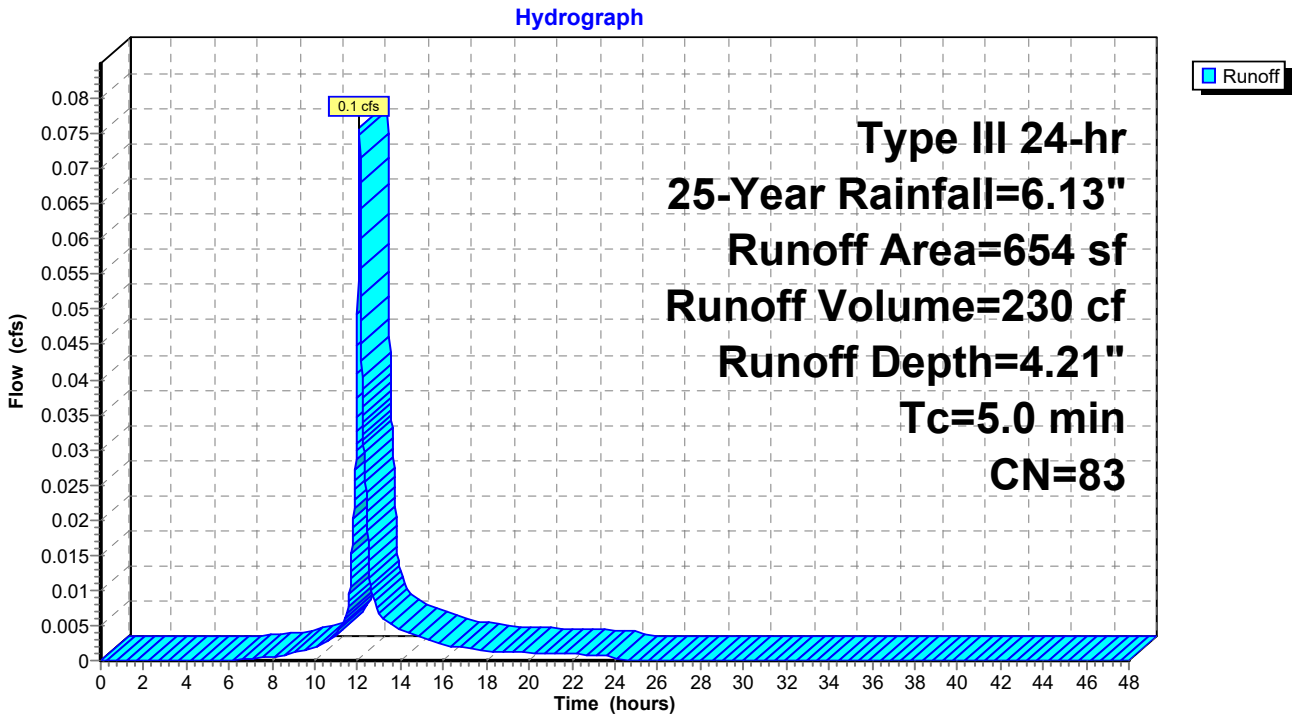
Runoff = 0.1 cfs @ 12.07 hrs, Volume= 230 cf, Depth= 4.21"
Routed to Reach 2R : Grass Channel

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.13"

Area (sf)	CN	Description
484	98	Unconnected pavement, HSG A
170	39	>75% Grass cover, Good, HSG A
654	83	Weighted Average
170		25.99% Pervious Area
484		74.01% Impervious Area
484		100.00% Unconnected

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

Subcatchment P2: Captured Area (To Grass Channel)



Summary for Subcatchment P3: To Street

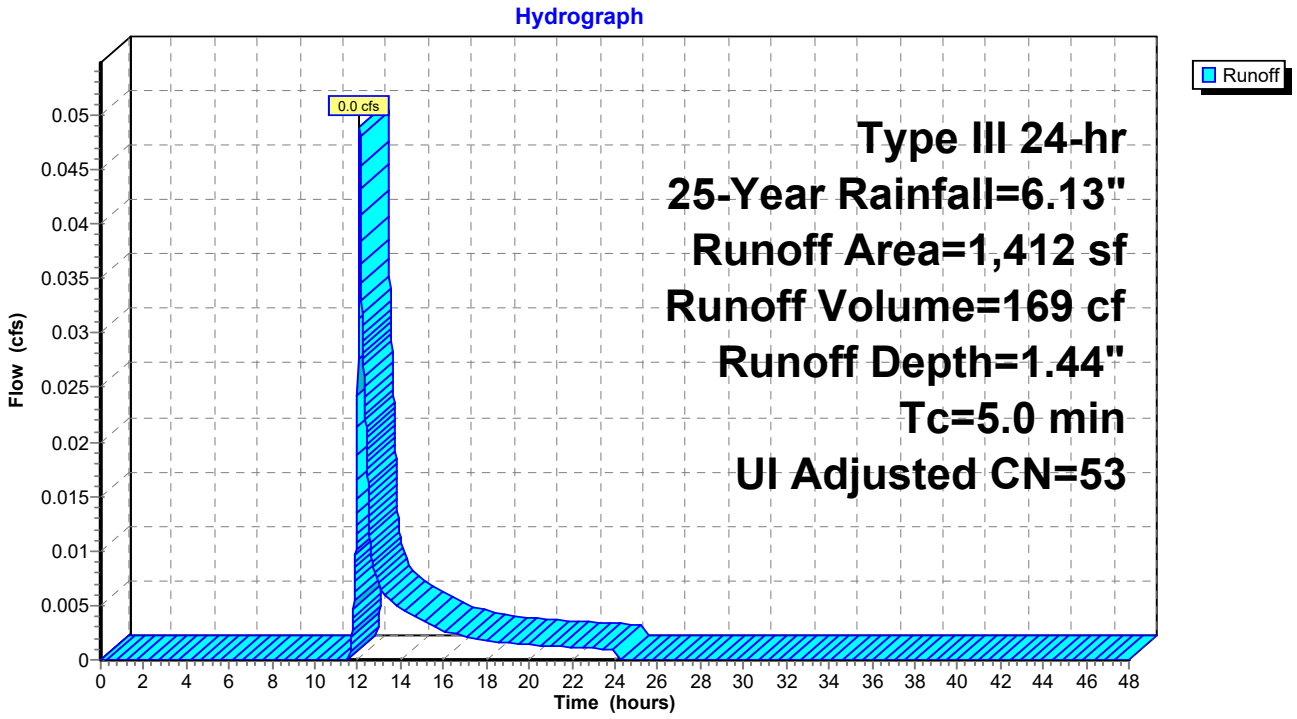
Runoff = 0.0 cfs @ 12.09 hrs, Volume= 169 cf, Depth= 1.44"
Routed to nonexistent node 1L

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.13"

Area (sf)	CN	Adj	Description
676	61		>75% Grass cover, Good, HSG B
606	39		>75% Grass cover, Good, HSG A
130	98		Unconnected pavement, HSG A
1,412	55	53	Weighted Average, UI Adjusted
1,282			90.79% Pervious Area
130			9.21% Impervious Area
130			100.00% Unconnected

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

Subcatchment P3: To Street



Summary for Subcatchment P4: Roof

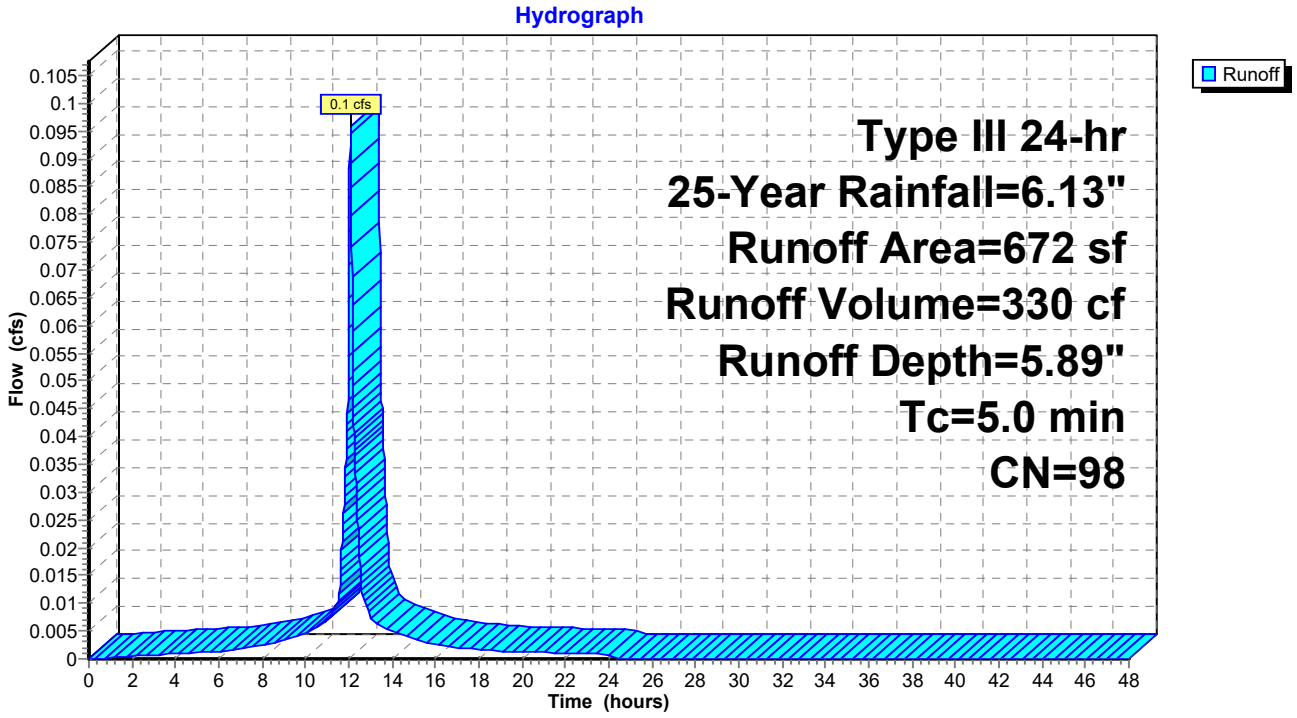
Runoff = 0.1 cfs @ 12.07 hrs, Volume= 330 cf, Depth= 5.89"
Routed to Pond 1P : Infiltration Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.13"

Area (sf)	CN	Description
672	98	Roofs, HSG A
672		100.00% Impervious Area

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

Subcatchment P4: Roof



Summary for Subcatchment P5: Captured Area

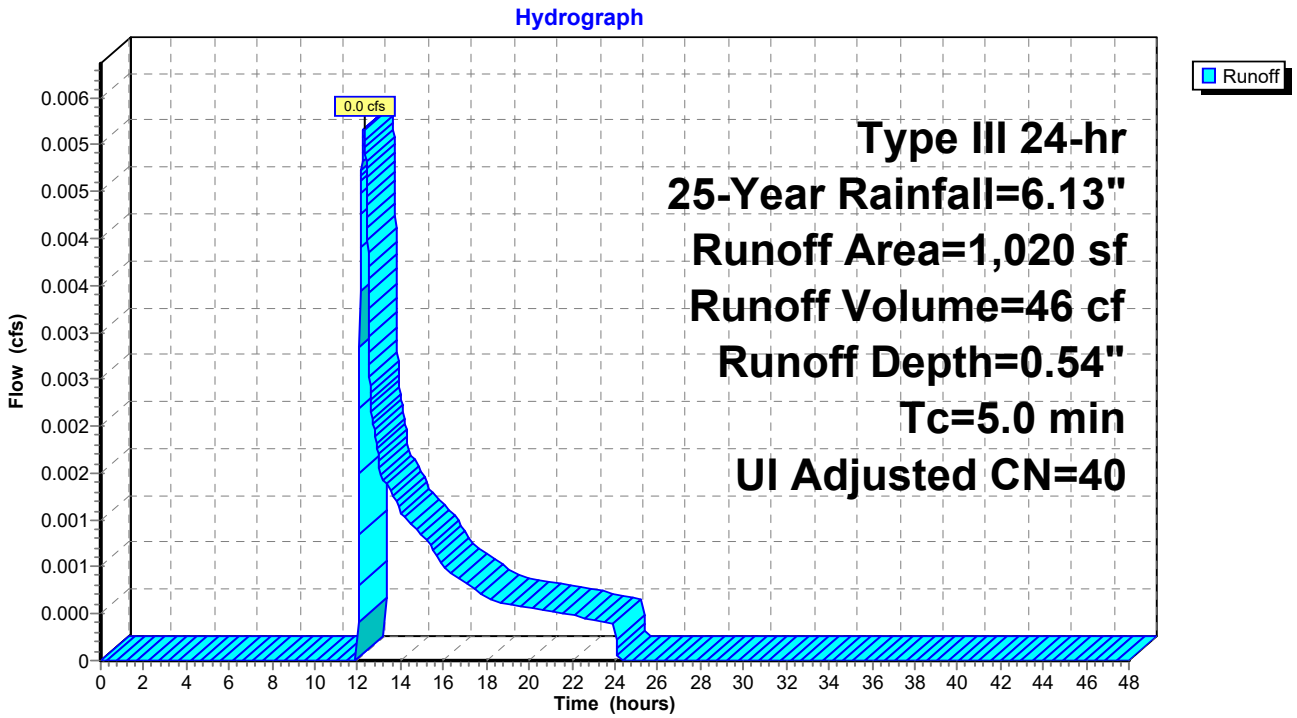
Runoff = 0.0 cfs @ 12.29 hrs, Volume= 46 cf, Depth= 0.54"
Routed to Pond 1P : Infiltration Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.13"

Area (sf)	CN	Adj	Description
38	98		Unconnected pavement, HSG A
982	39		>75% Grass cover, Good, HSG A
1,020	41	40	Weighted Average, UI Adjusted
982			96.27% Pervious Area
38			3.73% Impervious Area
38			100.00% Unconnected

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

Subcatchment P5: Captured Area



Summary for Reach 2R: Grass Channel

Inflow Area = 654 sf, 74.01% Impervious, Inflow Depth = 4.21" for 25-Year event
Inflow = 0.1 cfs @ 12.07 hrs, Volume= 230 cf
Outflow = 0.1 cfs @ 12.07 hrs, Volume= 230 cf, Atten= 0%, Lag= 0.1 min
Routed to Pond 1P : Infiltration Basin

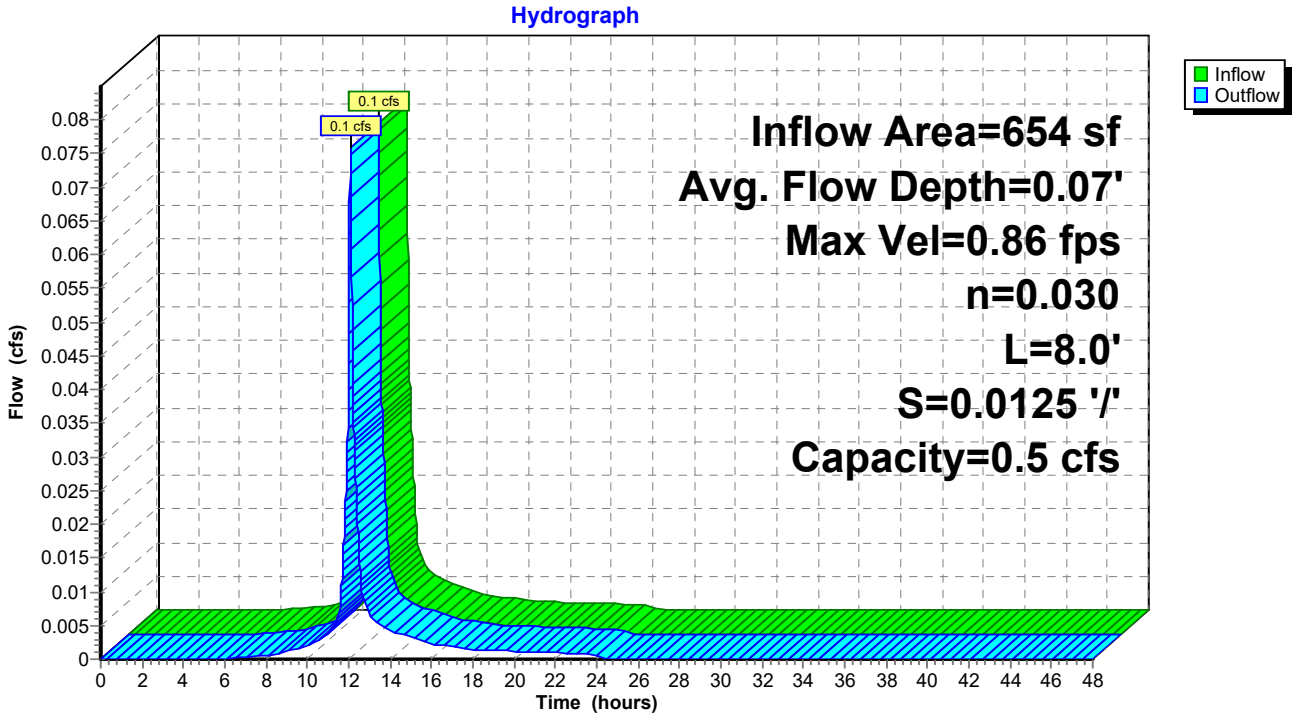
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.86 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 0.23 fps, Avg. Travel Time= 0.6 min

Peak Storage= 1 cf @ 12.07 hrs
Average Depth at Peak Storage= 0.07' , Surface Width= 1.44'
Bank-Full Depth= 0.20' Flow Area= 0.3 sf, Capacity= 0.5 cfs

1.00' x 0.20' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 2.20'
Length= 8.0' Slope= 0.0125 '/'
Inlet Invert= 27.80', Outlet Invert= 27.70'

‡

Reach 2R: Grass Channel



Summary for Pond 1P: Infiltration Basin

Inflow Area = 2,346 sf, 50.90% Impervious, Inflow Depth = 3.10" for 25-Year event
Inflow = 0.2 cfs @ 12.07 hrs, Volume= 605 cf
Outflow = 0.0 cfs @ 12.70 hrs, Volume= 605 cf, Atten= 88%, Lag= 37.6 min
Discarded = 0.0 cfs @ 12.70 hrs, Volume= 605 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 27.44' @ 12.70 hrs Surf.Area= 389 sf Storage= 206 cf

Plug-Flow detention time= 81.6 min calculated for 605 cf (100% of inflow)
Center-of-Mass det. time= 81.6 min (863.9 - 782.3)

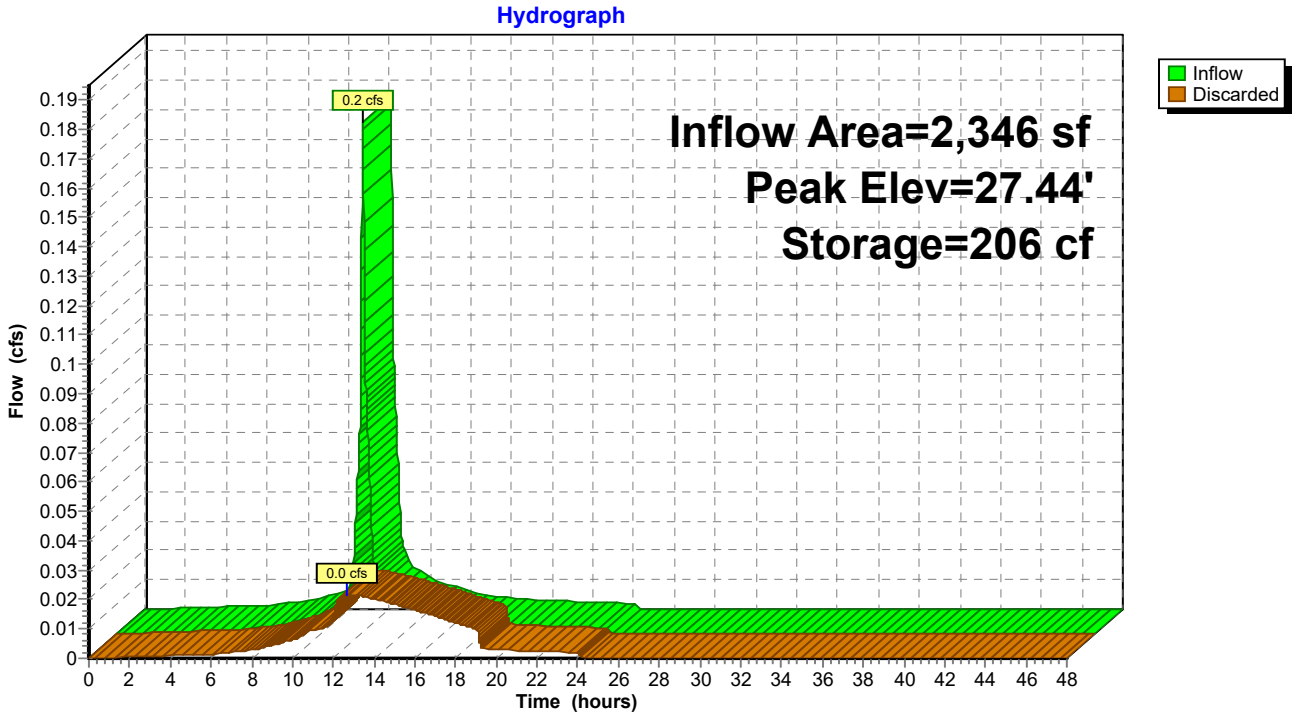
Volume	Invert	Avail.Storage	Storage Description
#1	26.70'	424 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
26.70	171	92.4	0	0	171
27.00	257	98.1	64	64	262
27.70	477	111.3	253	317	494
27.80	530	126.8	50	367	788
27.90	605	158.8	57	424	1,515

Device	Routing	Invert	Outlet Devices
#1	Discarded	26.70'	**2.410 in/hr Exfiltration over Surface area** Phase-In= 0.01'

Discarded OutFlow Max=0.0 cfs @ 12.70 hrs HW=27.44' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Pond 1P: Infiltration Basin



Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentP1: To Wetland Runoff Area=27,795 sf 0.09% Impervious Runoff Depth=2.98"
Flow Length=210' Tc=6.1 min CN=53 Runoff=2.1 cfs 6,893 cf

SubcatchmentP2: Captured Area (To Grass Runoff Area=654 sf 74.01% Impervious Runoff Depth=6.56"
Tc=5.0 min CN=83 Runoff=0.1 cfs 358 cf

SubcatchmentP3: To Street Runoff Area=1,412 sf 9.21% Impervious Runoff Depth=2.98"
Tc=5.0 min UI Adjusted CN=53 Runoff=0.1 cfs 350 cf

SubcatchmentP4: Roof Runoff Area=672 sf 100.00% Impervious Runoff Depth=8.37"
Tc=5.0 min CN=98 Runoff=0.1 cfs 469 cf

SubcatchmentP5: Captured Area Runoff Area=1,020 sf 3.73% Impervious Runoff Depth=1.53"
Tc=5.0 min UI Adjusted CN=40 Runoff=0.0 cfs 130 cf

Reach 2R: Grass Channel Avg. Flow Depth=0.09' Max Vel=0.98 fps Inflow=0.1 cfs 358 cf
n=0.030 L=8.0' S=0.0125 '/' Capacity=0.5 cfs Outflow=0.1 cfs 358 cf

Pond 1P: Infiltration Basin Peak Elev=27.80' Storage=365 cf Inflow=0.3 cfs 956 cf
Outflow=0.0 cfs 956 cf

Total Runoff Area = 31,553 sf Runoff Volume = 8,200 cf Average Runoff Depth = 3.12"
95.72% Pervious = 30,203 sf 4.28% Impervious = 1,350 sf

Summary for Subcatchment P1: To Wetland

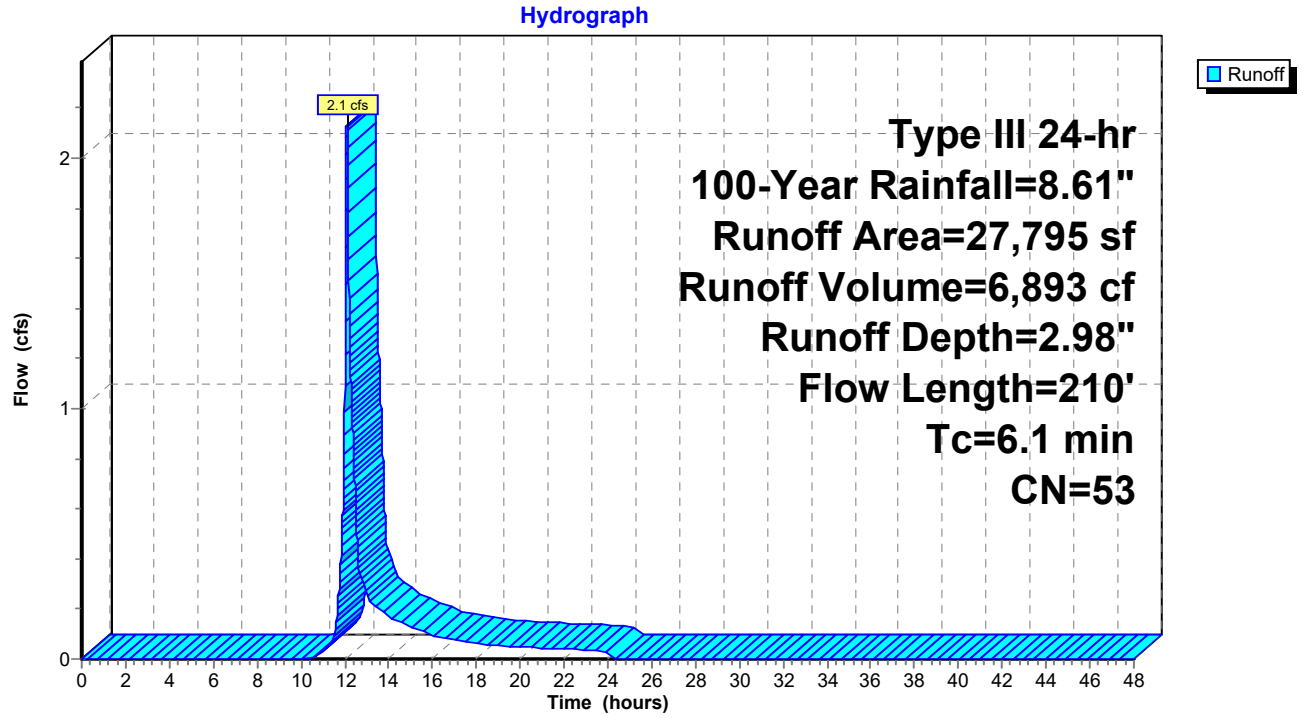
Runoff = 2.1 cfs @ 12.10 hrs, Volume= 6,893 cf, Depth= 2.98"
Routed to nonexistent node 1L

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.61"

Area (sf)	CN	Description
5,107	61	>75% Grass cover, Good, HSG B
19,126	55	Woods, Good, HSG B
1,414	39	>75% Grass cover, Good, HSG A
26	98	Unconnected pavement, HSG A
2,122	30	Woods, Good, HSG A
27,795	53	Weighted Average
27,769		99.91% Pervious Area
26		0.09% Impervious Area
26		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.5	19	0.0530	0.13		**Sheet Flow, Sheet Flow** Grass: Dense n= 0.240 P2= 3.31"
3.6	191	0.0310	0.88		**Shallow Concentrated Flow, Shallow Flow** Woodland Kv= 5.0 fps
6.1	210	Total			

Subcatchment P1: To Wetland



Summary for Subcatchment P2: Captured Area (To Grass Channel)

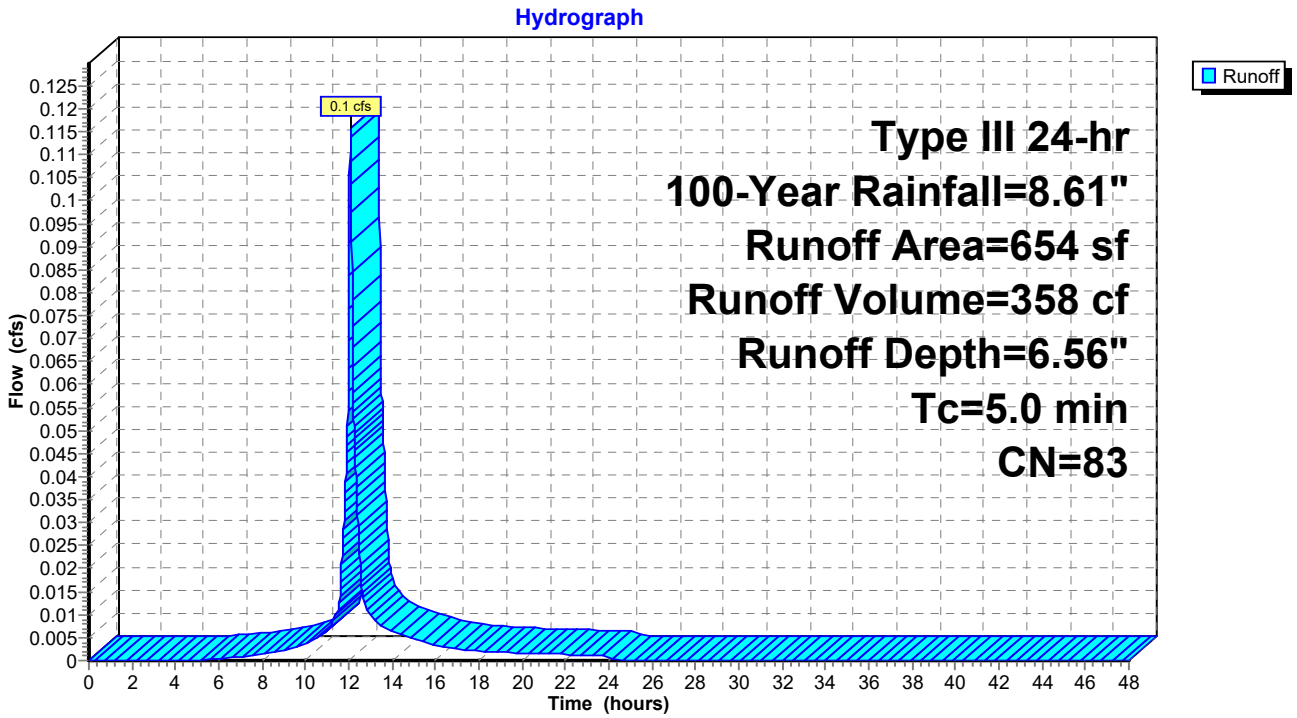
Runoff = 0.1 cfs @ 12.07 hrs, Volume= 358 cf, Depth= 6.56"
Routed to Reach 2R : Grass Channel

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.61"

Area (sf)	CN	Description
484	98	Unconnected pavement, HSG A
170	39	>75% Grass cover, Good, HSG A
654	83	Weighted Average
170		25.99% Pervious Area
484		74.01% Impervious Area
484		100.00% Unconnected

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

Subcatchment P2: Captured Area (To Grass Channel)



Summary for Subcatchment P3: To Street

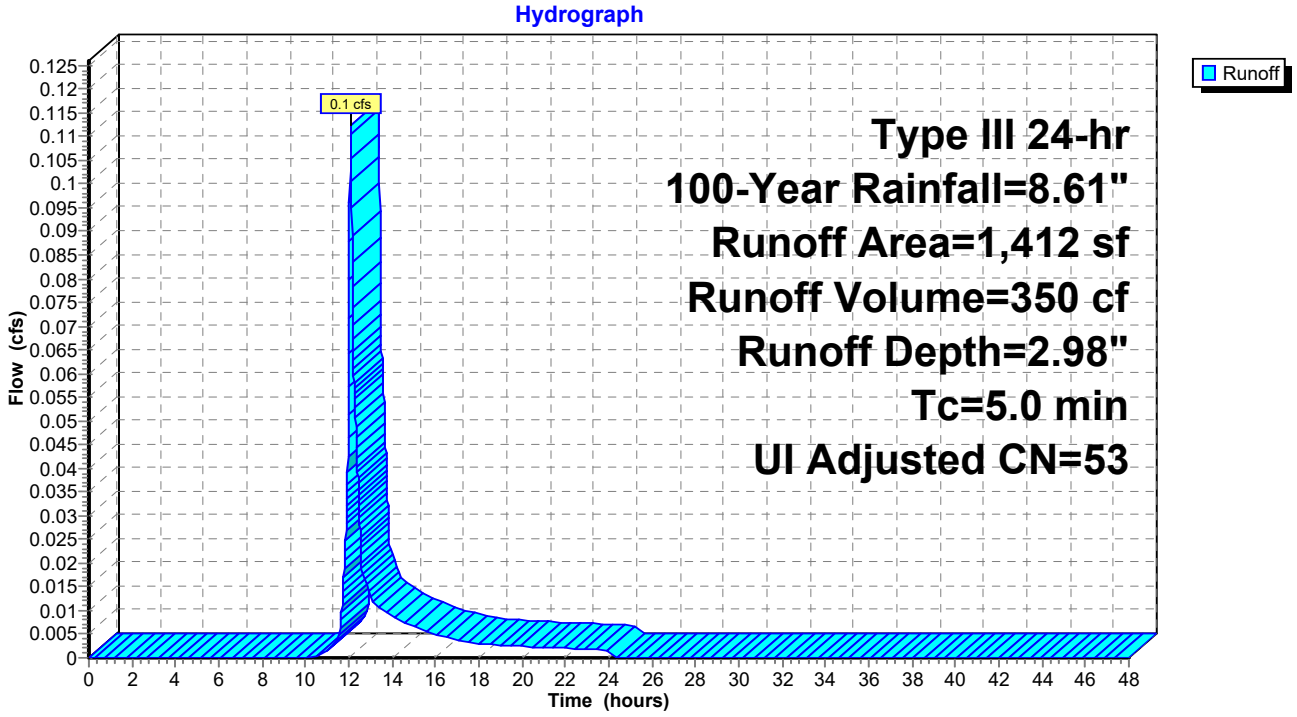
Runoff = 0.1 cfs @ 12.08 hrs, Volume= 350 cf, Depth= 2.98"
Routed to nonexistent node 1L

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.61"

Area (sf)	CN	Adj	Description
676	61		>75% Grass cover, Good, HSG B
606	39		>75% Grass cover, Good, HSG A
130	98		Unconnected pavement, HSG A
1,412	55	53	Weighted Average, UI Adjusted
1,282			90.79% Pervious Area
130			9.21% Impervious Area
130			100.00% Unconnected

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

Subcatchment P3: To Street



Summary for Subcatchment P4: Roof

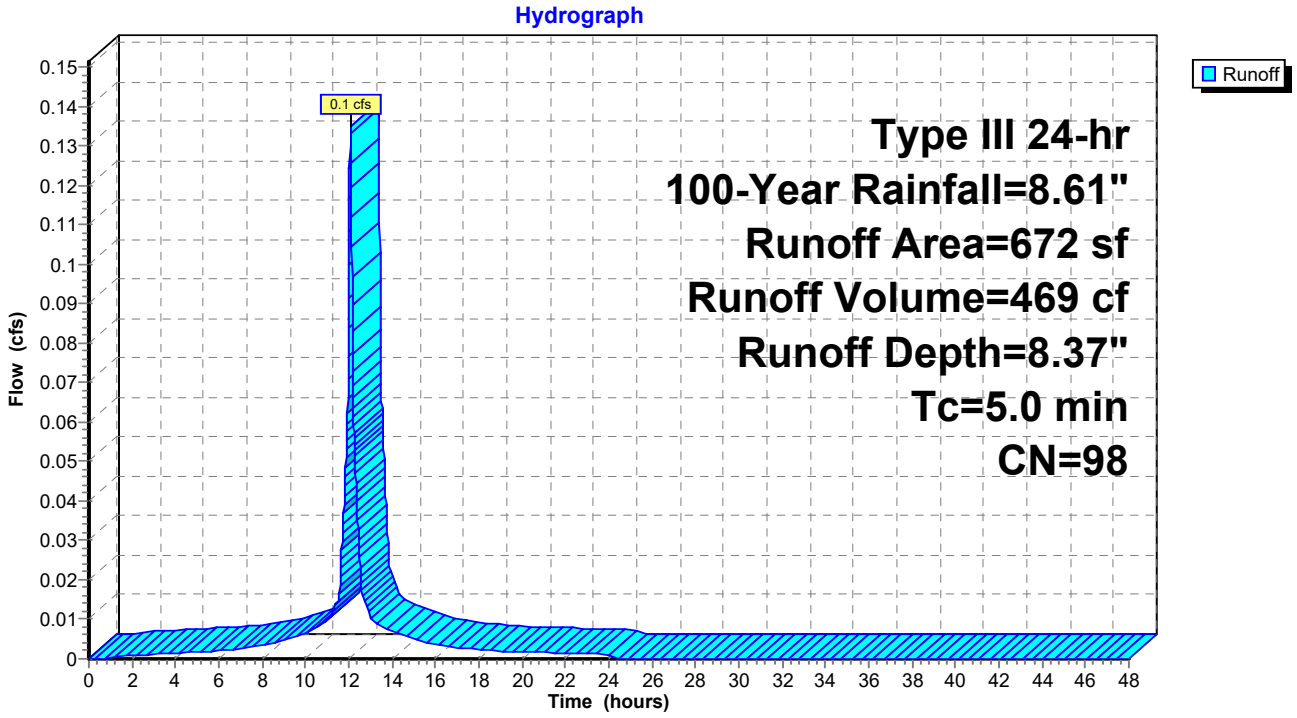
Runoff = 0.1 cfs @ 12.07 hrs, Volume= 469 cf, Depth= 8.37"
Routed to Pond 1P : Infiltration Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.61"

Area (sf)	CN	Description
672	98	Roofs, HSG A
672		100.00% Impervious Area

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

Subcatchment P4: Roof



Summary for Subcatchment P5: Captured Area

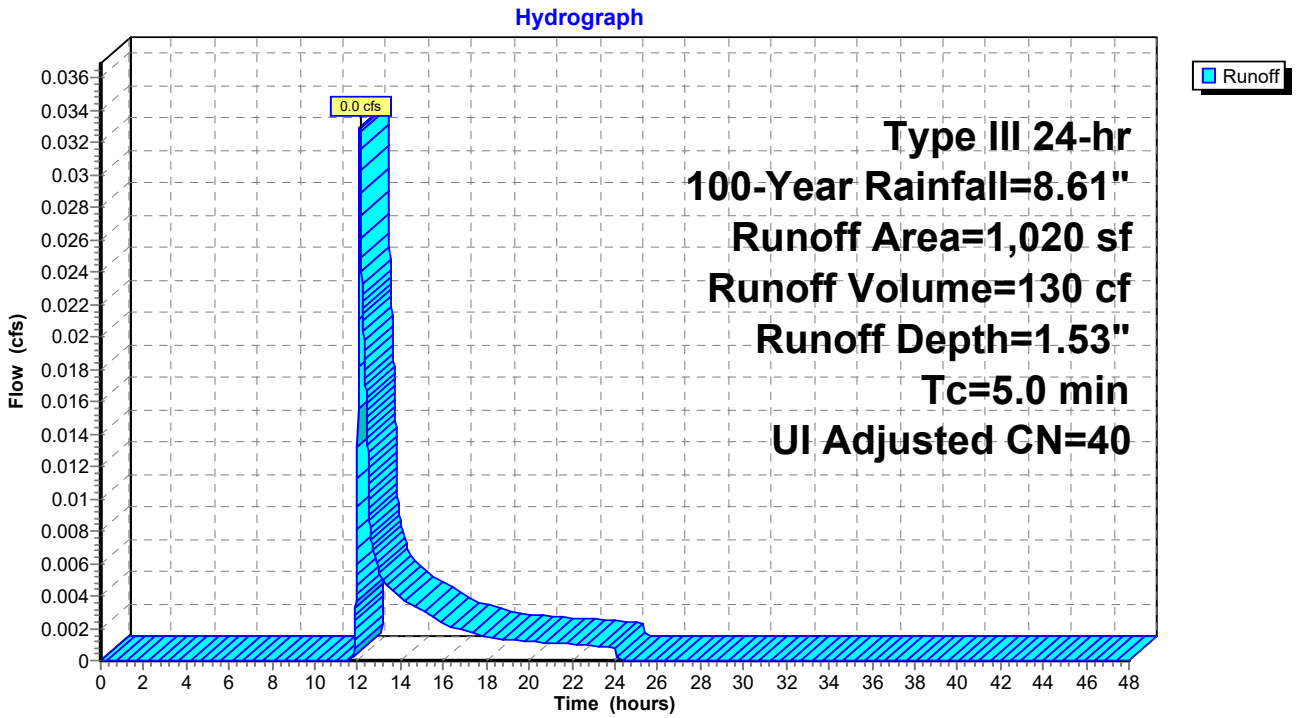
Runoff = 0.0 cfs @ 12.10 hrs, Volume= 130 cf, Depth= 1.53"
Routed to Pond 1P : Infiltration Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.61"

Area (sf)	CN	Adj	Description
38	98		Unconnected pavement, HSG A
982	39		>75% Grass cover, Good, HSG A
1,020	41	40	Weighted Average, UI Adjusted
982			96.27% Pervious Area
38			3.73% Impervious Area
38			100.00% Unconnected

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

Subcatchment P5: Captured Area



Summary for Reach 2R: Grass Channel

Inflow Area = 654 sf, 74.01% Impervious, Inflow Depth = 6.56" for 100-Year event
Inflow = 0.1 cfs @ 12.07 hrs, Volume= 358 cf
Outflow = 0.1 cfs @ 12.07 hrs, Volume= 358 cf, Atten= 0%, Lag= 0.1 min
Routed to Pond 1P : Infiltration Basin

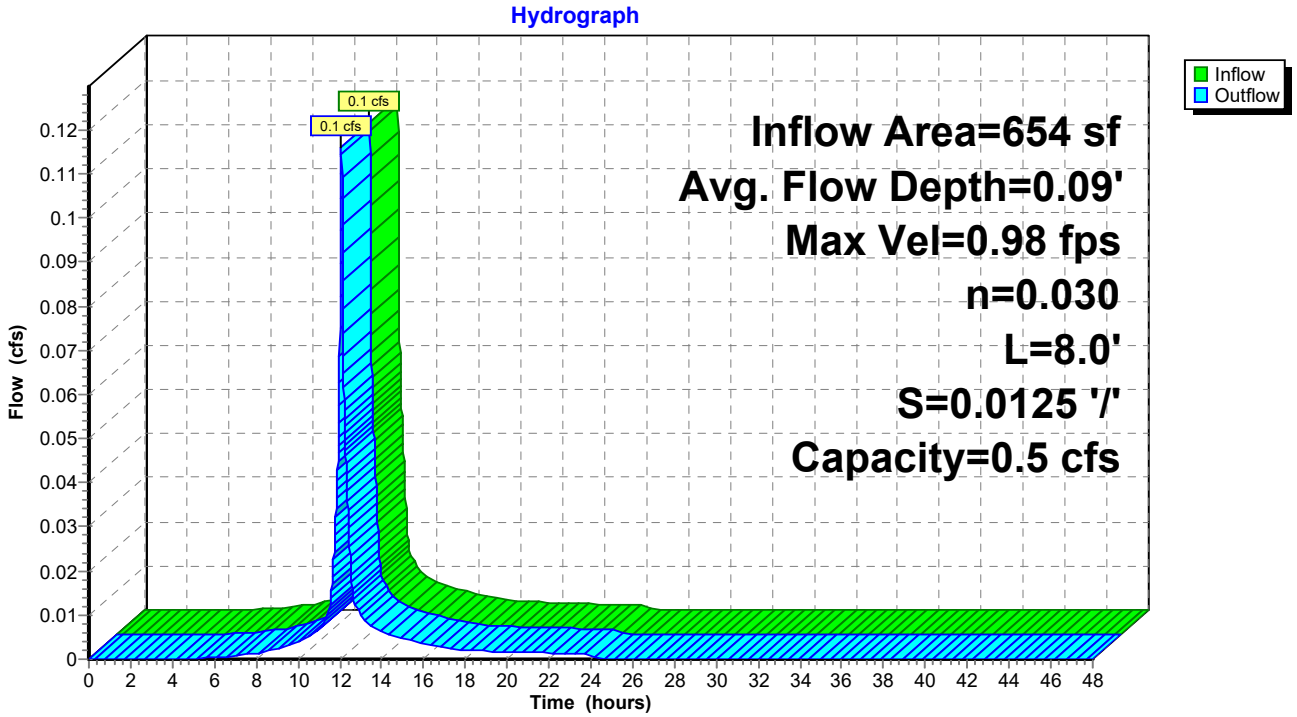
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.98 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 0.26 fps, Avg. Travel Time= 0.5 min

Peak Storage= 1 cf @ 12.07 hrs
Average Depth at Peak Storage= 0.09' , Surface Width= 1.56'
Bank-Full Depth= 0.20' Flow Area= 0.3 sf, Capacity= 0.5 cfs

1.00' x 0.20' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 2.20'
Length= 8.0' Slope= 0.0125 '/'
Inlet Invert= 27.80', Outlet Invert= 27.70'

‡

Reach 2R: Grass Channel



Summary for Pond 1P: Infiltration Basin

[62] Hint: Exceeded Reach 2R OUTLET depth by 0.07' @ 12.95 hrs

Inflow Area = 2,346 sf, 50.90% Impervious, Inflow Depth = 4.89" for 100-Year event
Inflow = 0.3 cfs @ 12.07 hrs, Volume= 956 cf
Outflow = 0.0 cfs @ 12.88 hrs, Volume= 956 cf, Atten= 90%, Lag= 48.2 min
Discarded = 0.0 cfs @ 12.88 hrs, Volume= 956 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 27.80' @ 12.88 hrs Surf.Area= 528 sf Storage= 365 cf

Plug-Flow detention time= 123.8 min calculated for 956 cf (100% of inflow)
Center-of-Mass det. time= 123.8 min (904.6 - 780.8)

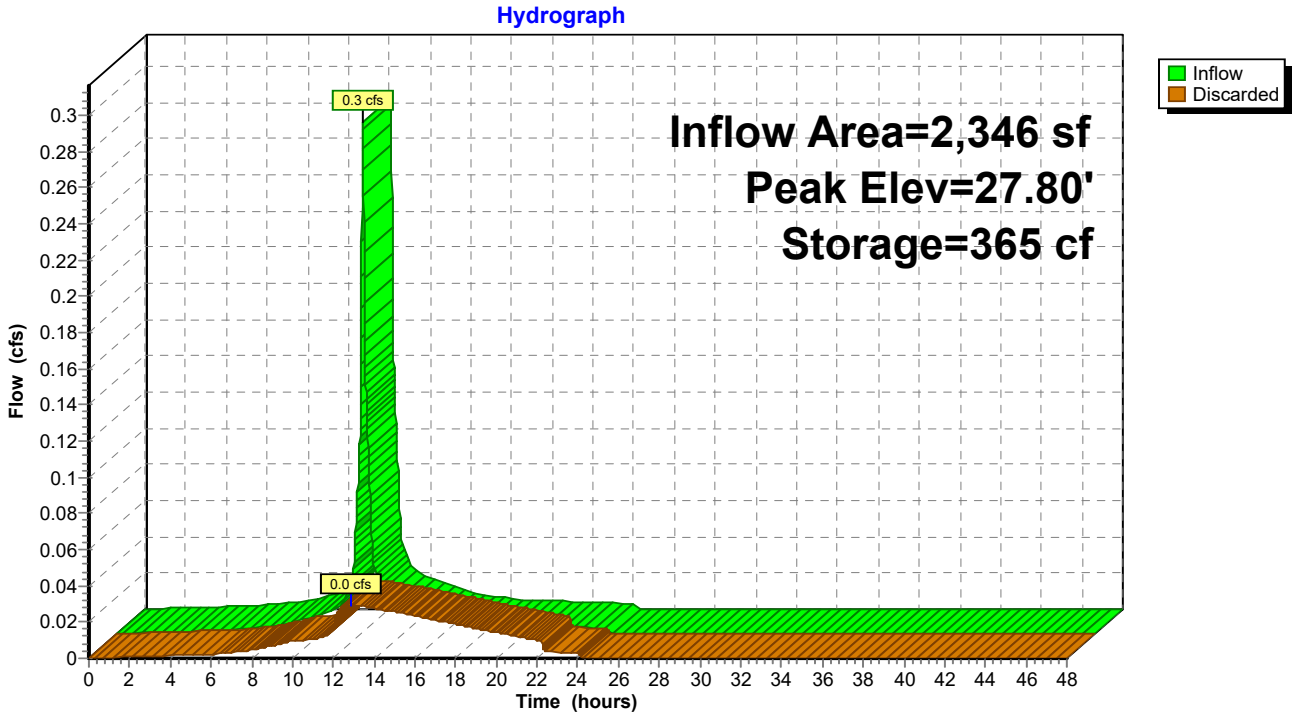
Volume	Invert	Avail.Storage	Storage Description
#1	26.70'	424 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
26.70	171	92.4	0	0	171
27.00	257	98.1	64	64	262
27.70	477	111.3	253	317	494
27.80	530	126.8	50	367	788
27.90	605	158.8	57	424	1,515

Device	Routing	Invert	Outlet Devices
#1	Discarded	26.70'	**2.410 in/hr Exfiltration over Surface area** Phase-In= 0.01'

Discarded OutFlow Max=0.0 cfs @ 12.88 hrs HW=27.80' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.0 cfs)

Pond 1P: Infiltration Basin



Attachment D

Test Pit Report

Soil Observation Report

Date: May 21, 2025

To: Russell Tierney, Superintendent – Weir River Water System

From: Drew Gallant, P.E., S.E. – Apex Companies, LLC

CC: Ryan Neilan, P.E. – Apex Companies, LLC
Jonathan Hittie, P.E. – Apex Companies, LLC

Subject: Kilby Street Booster Pump Station, Hingham, MA
Soil Observation Report

On Wednesday, May 21, 2025, Apex Companies (Apex) personnel, Drew Gallant (SE #14482) arrived on-site at 7:30 AM to perform a soil evaluation of the proposed location for the proposed stormwater infiltration pond at the proposed Kilby Street Booster Pump Station in Hingham, MA. The purpose of the site visit was to determine soil texture and estimated seasonal high groundwater (ESHGW) within the limits of the proposed stormwater infiltration pond.

Apex personnel met with the Weir River Water System Superintendent, Russell Tierney, and excavation contractors to review the soil testing procedure. One test pit (TP-1) was excavated by the excavator operator. The location of the test pit is shown on page 2 of this report, in Figure 1.

In summary, TP-1 consisted of Loamy Sand at the bottom of the test pit and had the presence of redoximorphic features, an indicator of estimated seasonal high groundwater (ESHGW). Loamy Sand was present in both of the lower soil horizons, horizon B and horizon C. Human transported material (HTM), or fill, was found in the uppermost soil horizon for TP-1. A complete soil evaluation for the test pit is provided on page 2 of this report in Table 1 and in Attachment 1, Form 11 – Soil Suitability Assessment for On-Site Sewage Disposal.

Figure 1: Soil Evaluation Location of Test Pit 1 (TP-1)

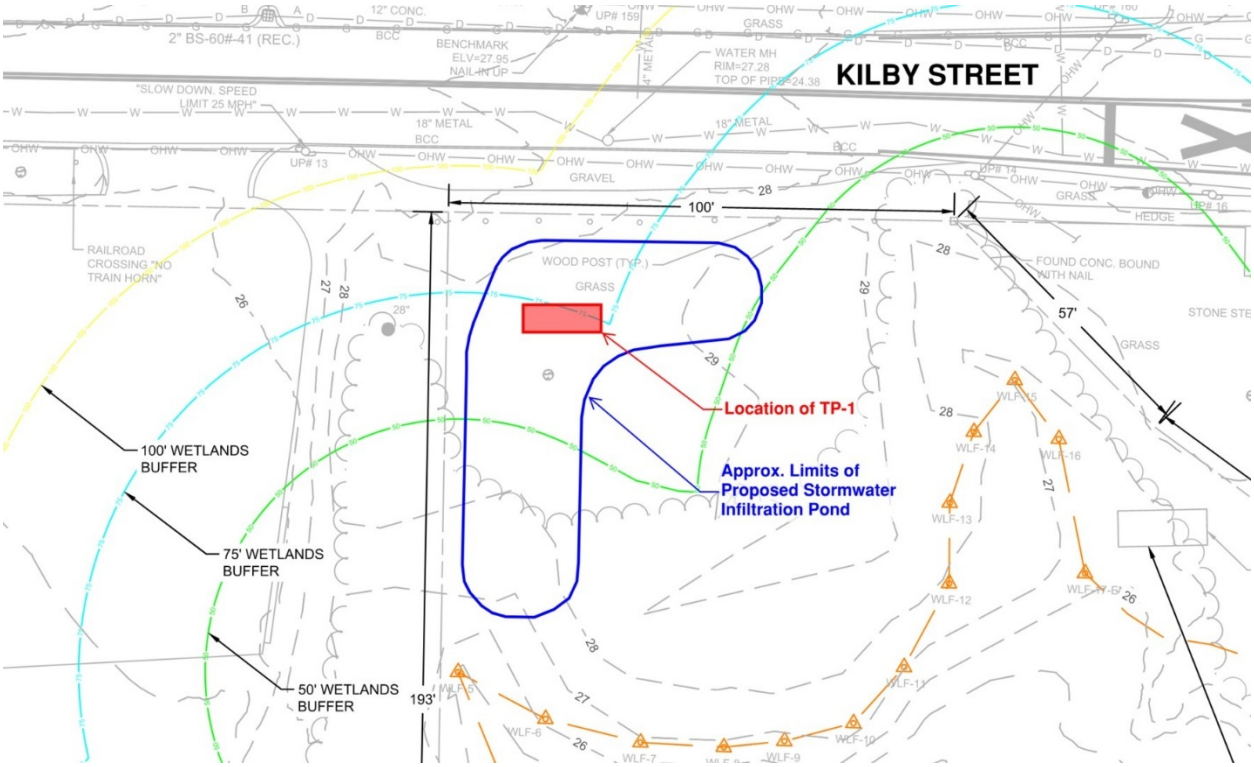


Table 1: Soil Evaluation of Test Pit 1 (TP-1)

Depth Below Ground Surface (bgs)	Soil Horizon	Soil Texture	Notes
0 – 10″	HTM	Fill	
10 – 35″	Bw	Loamy Sand	Gravelly w/ cobbles
35 – 74″+	C	Loamy Sand	Gravelly w/ cobbles and boulders
48″	N/A	N/A	Redoximorphic Features (ESHGW)
65″	N/A	N/A	Weeping Water
68″	N/A	N/A	Standing Water

Photo 1: View of Test Pit Location from West Side of Kilby Street

Photo 2: View of Test Pit Location from Rear Portion of Parcel

Photo 3: View into Test Pit During Excavation

Photo 4: Loamy Sand Material in Soil B Horizon

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

A. Facility Information

Town of Hingham
Owner Name

0 Kilby Street
Street Address

Map/Lot #

Hingham
City

MA
State

02043
Zip Code

B. Site Information

1. (Check one) ☒ New Construction ☐ Upgrade

2. Soil Survey NRCS (Source) | Town of Hingham (Soil Map Unit) | 700A - Udipsamments, wet substratum (Soil Series)

Dikes
Landform

None
Soil Limitations

Sandy human transported material over sandy and gravelly glaciofluvial deposits
Soil Parent material

3. Surficial Geological Report
Year Published/Source | Map Unit

Description of Geologic Map Unit:

4. Flood Rate Insurance Map Within a regulatory floodway? ☐ Yes ☒ No

5. Within a velocity zone? ☐ Yes ☒ No

6. Within a Mapped Wetland Area? ☐ Yes ☒ No If yes, MassGIS Wetland Data Layer:
Wetland Type

7. Current Water Resource Conditions (USGS): May 15, 2025 (Month/Day/ Year) Range: ☐ Above Normal ☒ Normal ☐ Below Normal

8. Other references reviewed:
(Zone II, IWPA, Zone A, EEA Data Portal, etc.)

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: TP-1 (Hole #) | 5/21/2025 (Date) | 8:00 AM (Time) | 50F / Cloudy (Weather) | ____ (Latitude) | ____ (Longitude)

1. Land Use: Vacant Lot, Lawn (e.g., woodland, agricultural field, vacant lot, etc.) | Grass (Vegetation) | Cobbles and stones (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 0-5 % (Slope (%))

Description of Location: Off Kilby Street, Hingham

2. Soil Parent Material: Sand | ____ (Landform) | ____ (Position on Landscape (SU, SH, BS, FS, TS, Plain))

3. Distances from: Open Water Body ____ feet | Drainage Way ____ feet | Wetlands 80+/- feet
Property Line 10+/- feet | Drinking Water Well ____ feet | Other ____ feet

4. Unsuitable Materials Present: ☒ Yes ☐ No If Yes: ☒ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☒ Yes ☐ No If yes: 65" Depth to Weeping in Hole | 68" Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-10	HTM	Fill			Cnc : Dpl:						
10-35	Bw	Loamy Sand			Cnc : Dpl:		25	25	Loose	Dry	
35-74+	C	Loamy Sand		49"	Cnc : Dpl:	20%	25	50	Loose	Moist	
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes:

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: _____ Hole # _____ Date _____ Time _____ Weather _____ Latitude _____ Longitude

1. Land Use: _____ (e.g., woodland, agricultural field, vacant lot, etc.) _____ Vegetation _____ Surface Stones (e.g., cobbles, stones, boulders, etc.) _____ Slope (%)

   Description of Location: _____

2. Soil Parent Material: _____ _____ Landform _____ Position on Landscape (SU, SH, BS, FS, TS, Plain)

3. Distances from: Open Water Body _____ feet Drainage Way _____ feet Wetlands _____ feet

   Property Line _____ feet Drinking Water Well _____ feet Other _____ feet

4. Unsuitable Materials Present: ☐ Yes ☐ No If Yes: ☐ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☐ No If yes: _____ Depth to Weeping in Hole _____ Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes: _____

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

D. Determination of High Groundwater Elevation

1. Method Used (Choose one):	Obs. Hole # TP-1	Obs. Hole # _____
☒ Depth to soil redoximorphic features	49" inches	_____ inches
☐ Depth to observed standing water in observation hole	_____ inches	_____ inches
☐ Depth to adjusted seasonal high groundwater (S_h) (USGS methodology)	_____ inches	_____ inches

Index Well Number _____ Reading Date _____

$S_h = S_c – [S_r \times (OW_c – OW_{max})/OW_r]$

Obs. Hole/Well# _____ S_c _____ S_r _____ OW_c _____ OW_{max} _____ OW_r _____ S_h _____

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system?

☒ Yes ☐ No

b. If yes, at what depth was it observed (exclude O, A, and E Horizons)? Upper boundary: 10 inches Lower boundary: 74 inches

c. If no, at what depth was impervious material observed? Upper boundary: _____ inches Lower boundary: _____ inches

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

F. Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct soil evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.100 through 15.107.

Signature of Soil Evaluator	Date: 5/21/2025
Drew Gallant, SE (#14482)	May, 2027
Typed or Printed Name of Soil Evaluator / License #	Expiration Date of License
Name of Approving Authority Witness	Approving Authority

Note: In accordance with 310 CMR 15.018(2) this form must be submitted to the approving authority within 60 days of the date of field testing, and to the designer and the property owner with Percolation Test Form 12.

Field Diagrams: Use this area for field diagrams:

Attachment E

Recharge Calculations

KILBY STREET BOOSTER PUMP STATION
0 KILBY STREET
HINGHAM, MA 02043
MAY, 2025

MA DEP Standard 3: Recharge Volume Calculations

Required Recharge Volume - A Soils (0.60 in.)	
Existing Site Impervious Area (ac)	0.000
Proposed Site Impervious Area (ac)	0.031
Proposed Increase in Site Impervious Area (ac)	0.031
Recharge Volume Required (cf)	**67**

Required Recharge Volume - B Soils (0.35 in.)	
Existing Site Impervious Area (ac)	0.000
Proposed Site Impervious Area (ac)	0.000
Proposed Increase in Site Impervious Area (ac)	0.000
Recharge Volume Required (cf)	**0**

Required Recharge Volume - C Soils (0.25 in.)	
Existing Site Impervious Area (ac)	0.000
Proposed Site Impervious Area (ac)	0.000
Proposed Increase in Site Impervious Area (ac)	0.000
Recharge Volume Required (cf)	**0**

Required Recharge Volume - D Soils (0.10 in.)	
Existing Site Impervious Area (ac)	0.000
Proposed Site Impervious Area (ac)	0.000
Proposed Increase in Site Impervious Area (ac)	0.000
Recharge Volume Required (cf)	**0**

Total Recharge Volume Required (cf)	**67**

Recharge Volume Adjustment Factor	
Impervious Area Directed to Infiltration BMP (ac)	**0.027**
%Impervious Directed to Infiltration BMP	88%
Adjustment Factor	1.13
Adjusted Total Recharge Volume Required (cf)	**76**

Provided Recharge Volume*	
P1	367
Total Recharge Volume Provided (cf)	**367**

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

KILBY STREET BOOSTER PUMP STATION
0 KILBY STREET
HINGHAM, MA 02043
MAY, 2025

MA DEP Standard 3: Drawdown Time Calculations

Drawdown Time - P1	
Volume below top of pond (Rv) (cf)	367
Soil Type	Sand - A
Infiltration rate (K)*	2.41
Bottom Area (sf)	171
Drawdown time (Hours)*	10.7

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

Attachment F

Water Quality Calculations

KILBY STREET BOOSTER PUMP STATION
0 KILBY STREET
HINGHAM, MA 02043
MAY, 2025

MA DEP Standard 4: Water Quality Volume Calculations

Water Quality Volume Required	
Water Quality Volume runoff (in.)*	1.0
Total Post Development Impervious Area (sf)	1,349
Required Water Quality Volume (cf)	112

*Water Quality volume runoff is equal to 1.0 inch of runoff times the total impervious area of the post development project site.

Water Quality Volume Provided*	
P1	367
Total Provided Water Quality Volume (cf)	367

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

TSS Removal Calculation Worksheet

Location: Driveway to Infiltration Basin (1P)

A BMP[1]	B TSS Removal Rate[1]	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
Grass Channel (Pretreatment)	**0.00**	**1.00**	**0.00**	**1.00**
Infiltration Basin	**0.80**	**1.00**	**0.80**	**0.20**

Total TSS Removal = **80%**

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: KILBY STREET BOOSTER PUMP STATION

Prepared By: **Jonathan Hittie, PE**

Date: **5/16/2025**

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

TSS Removal Calculation Worksheet

Location: Roof to Infiltration Basin (1P)

A BMP[1]	B TSS Removal Rate[1]	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
Sediment Forebay (Pretreatment)	**0.00**	**1.00**	**0.00**	**1.00**
Infiltration Basin	**0.80**	**1.00**	**0.80**	**0.20**

Total TSS Removal = **80%**

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: KILBY STREET BOOSTER PUMP STATION

Prepared By: **Jonathan Hittie, PE**

Date: **5/16/2025**

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

KILBY STREET BOOSTER PUMP STATION
0 KILBY STREET
HINGHAM, MA 02043

Channel Lining Analysis

Channel	Q* (cfs)	V* (fps)	Slope (%)	Channel Lining
Grass Channel	0.0	0.63	1.25	Type A

*Taken from HydroCAD calculations - 2 year storm event

Per Massachusetts Stormwater Handbook Volume 3 Chapter 1:

Channel Slope	Type	Lining	Permissible Velocity (fps)
0-5%	A	Tall fescue Kentucky Bluegrass	5
	B	Grass-legume mxiture	4
	C	Red Fescue Redtop Sericea Lespedeza Annual Lespedeza Small Grains	2.5
5-10%	D	Tall fescue Kentucky Bluegrass	4
	E	Grass-legume mxiture	3
>10%	F	Tall fescue Kentucky Bluegrass	3

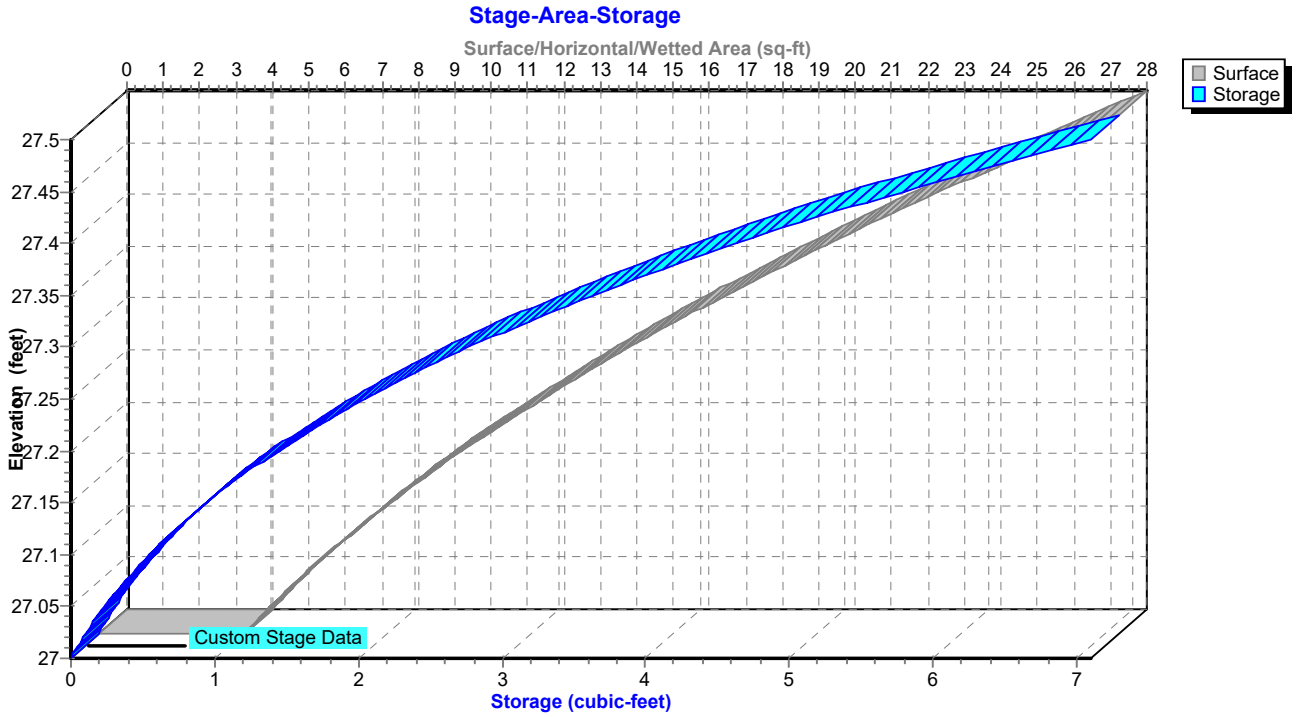
KILBY STREET BOOSTER PUMP STATION
0 KILBY STREET
HINGHAM, MA 02043

Forebay Sizing Calculations

Forebay #1	
Total Post Develpoment Impervious Area (acres)	0.02
Forebay Volume Required (cf)	5.6
Forebay Volume Provided (cf)*	**7**

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

Pond 1P: Forebay #1



Attachment G

Operation and Maintenance Plan

Memorandum

Date: May 20, 2025

To: Shannon Palmer, Conservation Officer
Town of Hingham Conservation Commission
210 Central Street
Hingham, MA 02043

From: Jonathan Hittie, P.E., Senior Project Engineer, Apex

CC: Russel Tierney, Managing Director / Superintendent, Weir River Water System
Ashley Sanford, Superintendent, Hingham Department of Public Works
JR Frey, Town Engineer, Hingham
Ryan Neilan, P.E. Senior Project Manager, Apex
File

Subject: **Kilby Street Booster Pump Station**
Weir River Water System
Operation & Maintenance Plan

1. Introduction

This Stormwater Management Operations and Maintenance Plan (O&M Plan) was prepared in accordance with Standard 9 of the Massachusetts Stormwater Management Handbook, the Massachusetts Department of Environmental Protection Stormwater Management Policy, and the Massachusetts Wetlands Protection regulations (310 CMR 10.00). This O&M Plan was prepared for the stormwater management system proposed for the Kilby Street Booster Pump Station to be located at 0 Kilby Street, Hingham, Massachusetts.

This O&M Plan addresses both construction and post-development stormwater management. The proposed construction period stormwater management system and the proposed post-development stormwater management system are shown on the Kilby Street Booster Pump Station Draft Site Plan (Sheet C-2) and the Kilby Street Booster Pump Station Buffer Zone Mitigation and Stormwater Management Plan (Sheet C-3).

This O&M Plan serves to identify the following:

- The Owner of the stormwater management system at the BPS;
- The party responsible for the operation and maintenance of the stormwater management system;
- The typical/proposed components of the system;
- The construction details of the system;
- The routine and non-routine maintenance tasks to be undertaken;
- A schedule for inspection and maintenance of the system; and
- An inspection and maintenance log template.

2. Ownership and Operation/Maintenance

The BPS and its stormwater management system will be located at 0 Kilby Street, Hingham, Massachusetts. The proposed BPS is located on an undeveloped parcel owned by the Town of Hingham. The proposed BPS will be operated by the Weir River Water System, which is the municipal water system for the Towns of Hingham, Hull, and North Cohasset. Therefore, the Weir River Water System is identified as the Owner of the proposed post-development stormwater management system for the BPS.

A General Contractor selected through the public bidding process will be responsible for the operation and maintenance of the construction-period stormwater management system throughout the construction of the new BPS. The Weir River Water System will be charged with the operation and maintenance responsibilities for the proposed post-development stormwater management system.

3. Description of the Proposed Construction Stormwater Management System

The goal of the proposed construction stormwater management system is to prevent off-site (i.e. wetlands) migration of stormwater pollution and/or soil erosion. Generally, the means of accomplishing this goal are achieved through proper planning, soil stabilization, runoff control, and sediment control.

Prior to the start of construction, a system of filter sock and silt fence will be installed between the limits of work and the sensitive resource areas (i.e., bordering vegetated wetlands). During construction, efforts should be made to maximize the preservation of natural vegetation within the limits of work and to minimize the amount of disturbed area. Dust control activities should be implemented to prevent the aerial transport of dust off-site. During clearing, grading, and excavation operations, temporary stormwater runoff diversions should be constructed to divert flow away from sensitive receptors. The stormwater diversions should incorporate sediment traps/barriers and inlet/outlet protection. Stockpiled aggregate materials should be stabilized (poly-sheeting, temporary seeding, etc.) and protected with sediment trap/barriers. The proposed construction period stormwater management system is shown on the on the Kilby Street Booster Pump Station Draft Site Plan (Sheet C-2) and the Kilby Street Booster Pump Station Buffer Zone Mitigation and Stormwater Management Plan (Sheet C-3).

4. Description of the Proposed Post-Development Stormwater Management System

The proposed post-development stormwater management system is comprised of a grass channel, a riprap forebay, and a stormwater infiltration basin. The proposed post-development Stormwater Management system is shown on the Kilby Street Booster Pump Station Draft Site Plan (Sheet C-2) and the Kilby Street Booster Pump Station Buffer Zone Mitigation and Stormwater Management Plan (Sheet C-3).

Grass Channel
A grass channel will be graded to capture, pretreat and convey stormwater runoff from the driveway and parking area to the infiltration basin. The grass channel will start at a low point in the driveway, just outside of the double swing access gate to Kilby Street. Grass channels provide pre-treatment for the infiltration basin and remove TSS through sedimentation and gravity separation and are compatible with LID design measures.

Riprap Sediment Forebay
One riprap sediment forebay will be installed to provide pretreatment of the stormwater runoff from the BPS roof. The forebay is located near the southern corner of the BPS building, where the roof downspout will be discharged. Sediment forebays provide pre-treatment for the infiltration basin and remove TSS by slowing incoming stormwater runoff and facilitating gravity separation of suspended solids.

Stormwater Infiltration Basins
One stormwater infiltration basin will be constructed to provide infiltration and detention of runoff. The infiltration basin will be located at the western corner of the site. The infiltration basin will receive stormwater runoff from the grass channel and riprap forebay. The infiltration basin is sized to capture and infiltrate the 100-yr storm without overtopping.

5. Maintenance and Inspection Activities

Construction Stormwater Management System
During the course of the construction phase of the project, the General Contractor shall be responsible for the maintenance and inspection of the stormwater management system and erosion and sediment controls.

The General Contractor shall conduct weekly inspections of the stormwater management system and erosion/sediment controls for stability and operation. In addition to the weekly inspections, the General Contractor shall inspect the stormwater system and controls within 24-hours of any runoff producing precipitation event. Any needed repairs will be made immediately to maintain barriers and controls.

Maintenance will include:

- Annual street sweeping of the driveway and parking areas;
- Removing built up sediment at sediment traps and sediment barriers;
- Repairing filter sock that become damaged or displaced;
- Remove built up sediment at truck tracking pads and wheel wash stations;
- Clean or replace gravel/stone when the sediment traps and/or truck pads/washes no longer drain properly;
- Maintain stormwater diversions to control stormwater flow and limit erosion;
- Identify and address locations of stormwater scouring or erosion;
- Practice good site housekeeping (i.e., trash collection, material staging areas, management of aggregate stockpiles);
- All seeded areas will be fertilized and reseeded, as necessary, and mulched according to contract specifications;
- Comply with the conditions of Conservation Commission's Order of Conditions;
- Inspect the site consistent with the requirements of the Construction General Permit; and
- Document all inspections.

Post-Development Stormwater Management System
After receiving a Certificate of Compliance from the Conservation Commission and achieving "Substantial Completion" of construction, the Town will take over all maintenance responsibilities for the post-development stormwater management system.

1. Access driveway and parking area: Sweep annually 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.

2. Grass Channel: Remove sediment from the channel annually. Mow once a month during growing season. Repair all areas of erosion and revegetate as needed, but no less than once a year.

3. Sediment Forebay: Inspect monthly and clean sediment four times per year or when sediment depth reaches 4 inches.

4. Stormwater 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 the basin 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 and monthly thereafter. Mow the basin as needed during the growing season so that grass height is not less than three (3) inches and does not exceed six (6) inches. Remove brush and woody vegetation annually in the spring or fall; reseed as needed in the spring or fall. The outlet of the basin, if any, shall be inspected for erosion and sedimentation, and rip-rap shall be promptly repaired in the case of erosion. Sediment collecting in the bottom of the

basin shall be inspected twice annually, and removal shall commence any time the sediment reaches a depth of six inches anywhere in the basin. Any sediment removed shall be disposed of in accordance with MADEP and other applicable requirements.

6. Maintenance Schedule

Construction Stormwater Management System
During the construction phase, the General Contractor should provide a maintenance and inspection schedule for the stormwater management system for the Town's approval. A typical maintenance and inspection schedule is as follows:

Daily:	Repair stormwater, erosion, and sedimentation controls as necessary;
Weekly:	Inspect stormwater management system for effective and proper operation; repair as necessary;
Run-off Events:	Inspect stormwater management system within 24-hours of event; repair as necessary.

Post-Development Stormwater Management System
Following substantial completion of construction, the Weir River Water System shall finalize a maintenance and inspection schedule for the stormwater management system and have it on file at the Hingham Water Treatment Plant and at the Weir River Water System office. The proposed maintenance and inspection schedule is as follows:

Daily/Weekly:	Repair stormwater, erosion, and sedimentation controls as necessary; Promote good housekeeping practices in driveways, parking areas, and stormwater management areas.
Monthly:	Inspect stormwater infiltration basin and remove trash; Inspect the sediment forebay.
Quarterly:	Clean sediment from the sediment forebay.
Annual:	Street sweeping of driveway and parking area; Remove brush and woody vegetation from infiltration basin and reseed; Remove sediment from the grass channel.
As Needed:	Mow the stormwater infiltration basin and grass channel during the growing season; Remove sediment collecting in the bottom of the stormwater infiltration basin; Replace riprap at the sediment forebay; Repair all areas of erosion within the grass channel and revegetate.

Inspection and maintenance will be performed by Weir River Water System forces.

7. Maintenance and Inspection Log Form

The following is a typical maintenance and inspection form for the stormwater management system.

Date: _____
Name of Inspector: _____
Organization: _____

Type of Inspection
(Circle One): Daily / Weekly / Monthly / Quarterly / Semi-Annual / Annual

Reason for Inspection
(Circle All that Apply): Routine Maintenance / Routine Inspection / Run-Off Event / Emergency

Stormwater Control:
Condition (Circle One): Excellent / Good / Poor / Not Operational
Notes:
Action Items:

Stormwater Control:
Condition (Circle One): Excellent / Good / Poor / Not Operational
Notes:
Action Items:

Stormwater Control:
Condition (Circle One): Excellent / Good / Poor / Not Operational
Notes:
Action Items:

Stormwater Control:
Condition (Circle One): Excellent / Good / Poor / Not Operational
Notes:
Action Items:

Additional Notes:

_____
_____
_____
_____
_____
_____

Signature: _____ Date: _____

Attachment H

Long Term Pollution Prevention Plan

Memorandum

Date: May 20, 2025

To: Shannon Palmer, Conservation Officer
Town of Hingham Conservation Commission
210 Central Street
Hingham, MA 02043

From: Jonathan Hittie, P.E., Senior Project Engineer, Apex

CC: Russel Tierney, Managing Director / Superintendent, Weir River Water System
Ashley Sanford, Superintendent, Hingham Department of Public Works
JR Frey, Town Engineer, Hingham
Ryan Neilan, P.E. Senior Project Manager, Apex
File

Subject: **Kilby Street Booster Pump Station**
Weir River Water System
Long Term Pollution Prevention Plan

Long Term Pollution Prevention Plan

This Long Term Pollution Prevention Plan (LTPPP) was prepared in accordance with Standard 4 of the Massachusetts Stormwater Management Handbook, the Massachusetts Department of Environmental Protection Stormwater Management Policy and the Massachusetts Wetlands Protection regulations (310 CMR 10.00). This LTPPP was prepared to address long term pollution prevention measures at the Kilby Street Booster Pump Station to be located at 0 Kilby Street, Hingham, Massachusetts.

Good Housekeeping Practices

All chemicals will be stored inside. All operators/employees will be instructed in the importance of not spilling fluids and chemicals onto the ground. All areas in the immediate vicinity of the booster pump station will be kept clean of excess debris.

Storing Materials and Waste Products

All chemicals will be stored in adequately sized containers within the odor control room. Any waste products will be disposed of in a legal manner at a state licensed recycling center or landfill. General trash generated by personnel will be collected in standard trash barrels and disposed of at the public waste facility. The generator will be provided with a manufacturer included secondary containment curb for oil containment.

Vehicle Washing

Due to the nature of the site, very few vehicles will be accessing the site on a daily basis. Vehicle washing will not be allowed on the property to limit any potential contamination.

Routine Inspections and Maintenance of Stormwater BMPs

Refer to Stormwater Operation and Maintenance Plan within Attachment G of this Stormwater Report.

Spill Prevention

Place drip pans, or other appropriate temporary containment device, at locations where leaks or spills may occur, such as hose connections, hose reels, and filler nozzles. Always use drip pans when making and breaking connections. Check loading and unloading equipment such as valves, pumps, flanges, and connections regularly for leaks and repair as needed.

Pet Waste Management

The proposed gate is designed to limit pedestrian access to the site and surrounding areas, so pet waste is not expected to be a concern.

Proper Management of Deicing Chemicals

No road salt (sodium chloride) shall be stored on-site. The use of magnesium chloride de-icing product with a 0.5 to 1.0 percent sodium chloride mix for snow and ice treatment is permitted. The product should be stored locked inside the booster pump station building and should be used at exterior walkways.

Provisions for Prevention of Illicit Discharges

There are no illicit discharges associated with the project.

Attachment I

Illicit Discharge Statement

Date: May 20, 2025

To: Shannon Palmer, Conservation Officer
Town of Hingham Conservation Commission
210 Central Street
Hingham, MA 02043

RE: Kilby Street Booster Pump Station
Weir River Water System
Illicit Discharge Statement

Dear Ms. Palmer,

Apex, on behalf of the Weir River Water System is submitting this Illicit Discharge Compliance Statement for the above referenced project.

This Illicit Discharge Compliance Statement is to verify that to the best of our knowledge, no illicit discharges exist on the site presently, nor will they after the proposed Booster Pump Station has been completed. The stormwater management system includes a grass channel, a rip rap sediment forebay, and a stormwater infiltration basin. Stormwater is not directed to the municipal system.

Please refer to the permitting design plans prepared by Apex, which includes a Draft Site Plan (Sheet C-2) and a Buffer Zone Mitigation and Stormwater Management Plan (Sheet C-3) showing the proposed stormwater management system. The Long Term Pollution Prevention Plan within the Stormwater Report contains measures to prevent illicit discharges.

Sincerely,

Apex Companies, LLC
Jonathan Hittie, PE
Senior Project Engineer
O: 617.657.0982
E: Jonathan.Hittie@Apexcos.com

Attachment J

NRCS Soils Report

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Plymouth County, Massachusetts

May 1, 2025

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.


70° 52' 9" W
70° 51' 31" W
42° 14' 48" N
42° 14' 30" N
345800
345890
345980
346070
346160
346250
346340
346430
346520
346610
4678830
4678740
4678650
4678560
4678470
4678380
4678290
HSG B
111C
603A
Roc Fall Rd
111C
HSG B
1
5A
HSG D
6A
HSG A/D
427A
HSG B
HSG A/D
700A
HSG A/D
6A
426B
HSG B
Weir River
255B
111C
HSG A
HSG B
228
Soil Map may not be valid at this scale.
Map Scale: 1:3,980 if printed on A landscape (11" x 8.5") 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 1:12,000.

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: Plymouth County, Massachusetts
Survey Area Data: Version 17, Aug 27, 2024

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
1	Water	0.5	0.8%
5A	Saco mucky silt loam, frequently ponded, 0 to 3 percent slopes, frequently flooded	0.9	1.6%
6A	Scarboro muck, coastal lowland, 0 to 3 percent slopes	5.3	9.3%
111C	Chatfield-Rock outcrop-Canton complex, 8 to 15 percent slopes, very stony	16.0	28.1%
255B	Windsor loamy sand, 3 to 8 percent slopes	7.2	12.7%
426B	Newfields fine sandy loam, 3 to 8 percent slopes	16.3	28.7%
427A	Newfields fine sandy loam, 0 to 3 percent slopes, extremely stony	7.5	13.2%
603A	Urban land, wet substratum, 0 to 3 percent slopes	0.5	1.0%
700A	Udipsamments, wet substratum, 0 to 3 percent slopes	2.6	4.6%
Totals for Area of Interest		**56.9**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a

particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Plymouth County, Massachusetts

1—Water

Map Unit Setting

National map unit symbol: bd0b
Elevation: 0 to 330 feet
Mean annual precipitation: 41 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Water: 98 percent
Minor components: 2 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Minor Components

Swansea

Percent of map unit: 1 percent
Landform: Depressions, marshes, swamps, bogs, kettles
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Talf
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Freetown

Percent of map unit: 1 percent
Landform: Bogs, depressions, swamps, kettles, marshes
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Talf
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

5A—Saco mucky silt loam, frequently ponded, 0 to 3 percent slopes, frequently flooded

Map Unit Setting

National map unit symbol: 2zvf4
Elevation: 0 to 330 feet
Mean annual precipitation: 41 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Saco and similar soils: 85 percent

Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Saco

Setting

Landform: Flood plains, meander scars, depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Coarse-silty alluvium

Typical profile

Oi - 0 to 2 inches: slightly decomposed plant material
A1 - 2 to 3 inches: mucky silt loam
A2 - 3 to 6 inches: silt loam
Cg1 - 6 to 12 inches: silty clay loam
Cg2 - 12 to 25 inches: silty clay loam
Cg3 - 25 to 34 inches: silty clay loam
Cg4 - 34 to 45 inches: silty clay loam
Cg5 - 45 to 49 inches: fine sand
Oa - 49 to 54 inches: muck
C'g6 - 54 to 60 inches: sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: About 0 to 2 inches
Frequency of flooding: Frequent
Frequency of ponding: Frequent
Available water supply, 0 to 60 inches: Very high (about 23.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6w
Hydrologic Soil Group: D
Ecological site: F144AY016MA - Very Wet Low Floodplain
Hydric soil rating: Yes

Minor Components

Freetown

Percent of map unit: 5 percent
Landform: Kettles, depressions, marshes, bogs, swamps
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Talf
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Swansea

Percent of map unit: 4 percent

Landform: Bogs, swamps, marshes, kettles, depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Talf
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Limerick

Percent of map unit: 4 percent
Landform: Flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Scarboro

Percent of map unit: 2 percent
Landform: Drainageways, depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope, tread, dip
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

6A—Scarboro muck, coastal lowland, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2svkw
Elevation: 0 to 650 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Scarboro, coastal lowland, and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Scarboro, Coastal Lowland

Setting

Landform: Depressions, outwash deltas, outwash terraces, drainageways
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope, tread, dip
Down-slope shape: Concave
Across-slope shape: Concave, linear
Parent material: Sandy glaciofluvial deposits derived from schist and/or gneiss and/or granite

Typical profile

Oa - 0 to 8 inches: muck
A - 8 to 14 inches: mucky fine sandy loam
Cg1 - 14 to 22 inches: sand
Cg2 - 22 to 65 inches: gravelly sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (1.42 to 14.17 in/hr)
Depth to water table: About 0 to 2 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 6.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: A/D
Ecological site: F144AY031MA - Very Wet Outwash
Hydric soil rating: Yes

Minor Components

Swansea

Percent of map unit: 10 percent
Landform: Bogs, swamps
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Mashpee

Percent of map unit: 5 percent
Landform: Depressions, terraces, drainageways
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

111C—Chatfield-Rock outcrop-Canton complex, 8 to 15 percent slopes, very stony

Map Unit Setting

National map unit symbol: 2w82v

Elevation: 0 to 230 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Chatfield, very stony, and similar soils: 40 percent
Rock outcrop: 25 percent
Canton, very stony, and similar soils: 20 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Chatfield, Very Stony

Setting

Landform: Ridges, hills
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Nose slope, side slope, crest
Down-slope shape: Convex
Across-slope shape: Linear, convex
Parent material: Coarse-loamy melt-out till derived from granite, gneiss, and/or schist

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
A - 1 to 2 inches: fine sandy loam
Bw - 2 to 30 inches: gravelly fine sandy loam
2R - 30 to 40 inches: bedrock

Properties and qualities

Slope: 8 to 15 percent
Surface area covered with cobbles, stones or boulders: 1.6 percent
Depth to restrictive feature: 20 to 41 inches to lithic bedrock
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 4.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: B
Ecological site: F144AY034CT - Well Drained Till Uplands
Hydric soil rating: No

Description of Rock Outcrop

Setting

Landform: Ridges, hills
Parent material: Igneous and metamorphic rock

Typical profile

R - 0 to 79 inches: bedrock

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: 0 inches to lithic bedrock
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Available water supply, 0 to 60 inches: Very low (about 0.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydric soil rating: No

Description of Canton, Very Stony

Setting

Landform: Moraines, hills, ridges
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex, linear
Across-slope shape: Convex
Parent material: Coarse-loamy over sandy melt-out till derived from gneiss, granite, and/or schist

Typical profile

Oi - 0 to 2 inches: slightly decomposed plant material
A - 2 to 5 inches: fine sandy loam
Bw1 - 5 to 16 inches: fine sandy loam
Bw2 - 16 to 22 inches: gravelly fine sandy loam
2C - 22 to 67 inches: gravelly loamy sand

Properties and qualities

Slope: 8 to 15 percent
Surface area covered with cobbles, stones or boulders: 1.6 percent
Depth to restrictive feature: 19 to 39 inches to strongly contrasting textural stratification
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 3.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: B
Ecological site: F144AY034CT - Well Drained Till Uplands
Hydric soil rating: No

Minor Components

Newfields, very stony

Percent of map unit: 10 percent
Landform: Ground moraines, hills, moraines
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: No

Hollis, very stony

Percent of map unit: 5 percent
Landform: Ridges, hills
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Nose slope, side slope, crest
Down-slope shape: Convex
Across-slope shape: Linear, convex
Hydric soil rating: No

255B—Windsor loamy sand, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2svkf
Elevation: 0 to 1,210 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 250 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Windsor and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Windsor

Setting

Landform: Outwash terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loose sandy glaciofluvial deposits derived from granite and/or schist and/or gneiss

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material

A - 1 to 3 inches: loamy sand
Bw - 3 to 25 inches: loamy sand
C - 25 to 65 inches: sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 4.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: A
Ecological site: F145XY008MA - Dry Outwash
Hydric soil rating: No

Minor Components

Hinckley

Percent of map unit: 10 percent
Landform: Eskers
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: F145XY008MA - Dry Outwash
Hydric soil rating: No

Deerfield, loamy sand

Percent of map unit: 5 percent
Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F144AY027MA - Moist Sandy Outwash
Hydric soil rating: No

426B—Newfields fine sandy loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: bcxw
Elevation: 10 to 400 feet
Mean annual precipitation: 41 to 54 inches
Mean annual air temperature: 43 to 54 degrees F

Frost-free period: 145 to 240 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Newfields and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Newfields

Setting

Landform: Till plains, hills, moraines
Landform position (two-dimensional): Shoulder, footslope
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Coarse-loamy eolian deposits over sandy and gravelly supraglacial meltout till

Typical profile

Oe - 0 to 2 inches: moderately decomposed plant material
A - 2 to 3 inches: fine sandy loam
Bs - 3 to 4 inches: fine sandy loam
Bw1 - 4 to 16 inches: fine sandy loam
Bw2 - 16 to 28 inches: gravelly fine sandy loam
2C - 28 to 63 inches: gravelly loamy coarse sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 15 to 36 inches to strongly contrasting textural stratification
Drainage class: Moderately well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 5.95 in/hr)
Depth to water table: About 18 to 30 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: B
Ecological site: F144AY008CT - Moist Till Uplands
Hydric soil rating: No

Minor Components

Barnstable

Percent of map unit: 8 percent
Landform: Moraines
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Norwell

Percent of map unit: 7 percent
Landform: Drainageways, depressions
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Scituate

Percent of map unit: 5 percent
Landform: Ridges, drumlins
Landform position (two-dimensional): Shoulder, footslope
Landform position (three-dimensional): Interfluve
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: No

427A—Newfields fine sandy loam, 0 to 3 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: bcxv
Elevation: 10 to 400 feet
Mean annual precipitation: 41 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Newfields, extremely stony, and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Newfields, Extremely Stony

Setting

Landform: Moraines, till plains, hills
Landform position (two-dimensional): Summit, footslope
Landform position (three-dimensional): Interfluve
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Coarse-loamy eolian deposits over sandy and gravelly supraglacial meltout till

Typical profile

Oe - 0 to 2 inches: moderately decomposed plant material
A - 2 to 3 inches: fine sandy loam
Bs - 3 to 4 inches: fine sandy loam
Bw1 - 4 to 16 inches: fine sandy loam

Bw2 - 16 to 28 inches: gravelly fine sandy loam
2C - 28 to 63 inches: gravelly loamy coarse sand

Properties and qualities

Slope: 0 to 3 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: 15 to 36 inches to strongly contrasting textural stratification
Drainage class: Moderately well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 5.95 in/hr)
Depth to water table: About 18 to 30 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Ecological site: F144AY008CT - Moist Till Uplands
Hydric soil rating: No

Minor Components

Barnstable, very stony

Percent of map unit: 8 percent
Landform: Moraines
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Norwell, extremely stony

Percent of map unit: 7 percent
Landform: Drainageways, depressions
Landform position (two-dimensional): Footslope, toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Scituate, very stony

Percent of map unit: 5 percent
Landform: Drumlins, ridges
Landform position (two-dimensional): Summit, footslope
Landform position (three-dimensional): Interfluve
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: No

603A—Urban land, wet substratum. 0 to 3 percent slopes

Map Unit Composition

Urban land, wet substratum: 95 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Minor Components

Urban land

Percent of map unit: 5 percent

700A—Udipsamments, wet substratum, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: bd02
Elevation: 0 to 390 feet
Mean annual precipitation: 40 to 50 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 195 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Udipsamments, wet substratum, and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Udipsamments, Wet Substratum

Setting

Landform: Dikes
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear, convex
Across-slope shape: Linear
Parent material: Sandy human transported material over sandy and gravelly glaciofluvial deposits

Typical profile

^Ap - 0 to 3 inches: loamy fine sand
^C1 - 3 to 20 inches: fine sand
Ab - 20 to 24 inches: loamy fine sand
Bwb - 24 to 31 inches: fine sand
BC - 31 to 44 inches: fine sand
C2 - 44 to 51 inches: fine sand
C3 - 51 to 72 inches: very fine sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 14.17 in/hr)
Depth to water table: About 20 to 48 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: A/D
Ecological site: R149BY002MA - Coastal Dunes
Hydric soil rating: No

Minor Components

Tihonet

Percent of map unit: 10 percent
Landform: Bogs
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F144AY028MA - Wet Outwash
Hydric soil rating: Yes

Udorthents, wet substratum

Percent of map unit: 5 percent
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Udipsamments

Percent of map unit: 5 percent
Landform: Dikes
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Linear, convex
Across-slope shape: Linear
Ecological site: R149BY002MA - Coastal Dunes
Hydric soil rating: No

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Attachment K

NRCC Rainfall Data

Extreme Precipitation Tables

Northeast Regional Climate Center

Data represents point estimates calculated from partial duration series. All precipitation amounts are displayed in inches.

Metadata for Point

Smoothing	Yes
State	Massachusetts
Location	Massachusetts, United States
Latitude	42.244 degrees North
Longitude	70.865 degrees West
Elevation	0 feet
Date/Time	Tue May 06 2025 10:19:55 GMT-0400 (Eastern Daylight Time)

Extreme Precipitation Estimates

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2da
1yr	0.28	0.43	0.54	0.70	0.88	1.11	**1yr**	0.76	1.05	1.30	1.65	2.12	2.74	3.07	**1yr**	2.43	2.9
2yr	0.35	0.54	0.68	0.89	1.12	1.42	**2yr**	0.97	1.30	1.64	2.07	2.62	3.31	3.68	**2yr**	2.93	3.5
5yr	0.42	0.66	0.82	1.10	1.41	1.80	**5yr**	1.22	1.64	2.09	2.63	3.30	4.14	4.70	**5yr**	3.66	4.5
10yr	0.48	0.75	0.95	1.29	1.67	2.15	**10yr**	1.44	1.94	2.50	3.15	3.93	4.90	5.65	**10yr**	4.34	5.4
25yr	0.56	0.89	1.14	1.58	2.10	2.72	**25yr**	1.81	2.45	3.18	4.00	4.97	6.13	7.21	**25yr**	5.42	6.9
50yr	0.64	1.03	1.33	1.86	2.50	3.26	**50yr**	2.16	2.91	3.81	4.79	5.92	7.26	8.68	**50yr**	6.43	8.3
100yr	0.74	1.19	1.54	2.18	2.98	3.90	**100yr**	2.57	3.46	4.57	5.73	7.07	8.61	10.46	**100yr**	7.62	10.(
200yr	0.85	1.39	1.80	2.58	3.55	4.67	**200yr**	3.07	4.12	5.47	6.85	8.42	10.22	12.60	**200yr**	9.04	12.1
500yr	1.04	1.70	2.22	3.21	4.49	5.93	**500yr**	3.87	5.20	6.95	8.68	10.63	12.82	16.13	**500yr**	11.35	15.5

Lower Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2da
1yr	0.25	0.39	0.48	0.64	0.79	0.87	**1yr**	0.68	0.86	1.15	1.45	1.82	2.55	2.79	**1yr**	2.26	2.6

Attachment L

Design Drawings

(Provided under separate cover)