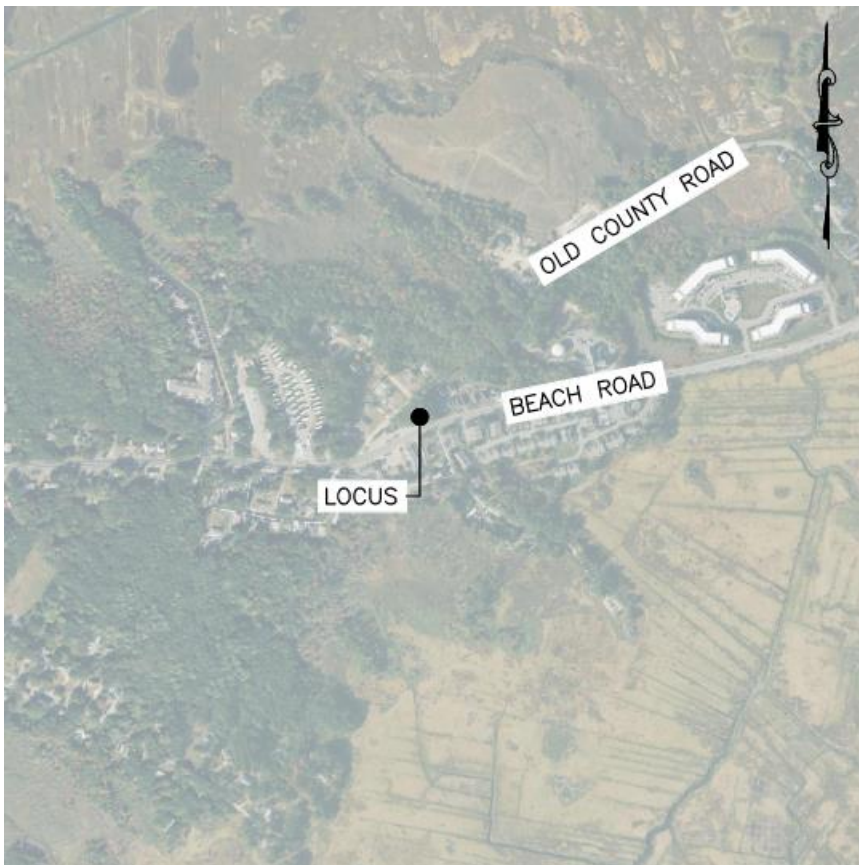


# **DRAINAGE REPORT**

**159 Beach Road  
Salisbury, Massachusetts**



344 North Main Street | Andover • MA 01810  
(978) 416-0920 | [www.civildci.com](http://www.civildci.com)



## **OWNER:**

**Edward Foote Jr. & Joanne F. Blais  
123 Central Street  
Salisbury, MA 01952**

## **APPLICANT:**

**Larkin Real Estate Group, Inc  
383 Main Street  
Medfield, MA 02052**

## **SUBMITTED TO:**

**Salisbury Planning Board  
5 Beach Road  
Salisbury, MA 01952**

## **ISSUED:**

**December 14, 2023**

# **DRAINAGE REPORT**

## **Drainage Narrative**

**TAB 1**

## **Existing Conditions**

**TAB 2**

- 2-Yr Storm Event
- 10-Yr Storm Event
- 25-Yr Storm Event
- 50-Yr Storm Event
- 100-Yr Storm Event

## **Proposed Conditions**

**TAB 3**

- 2-Yr Storm Event
- 10-Yr Storm Event
- 25-Yr Storm Event
- 50-Yr Storm Event
- 100-Yr Storm Event

## **Supplemental Information**

**TAB 4**

- NRCS Soil Map
- Soil Logs

**DRAINAGE REPORT**

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159 Beach Road

Salisbury, Massachusetts

**TAB 1**

## **DRAINAGE REPORT**

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159 Beach Road  
Salisbury, Massachusetts

### **PROJECT DESCRIPTION**

The applicant proposes to re-develop 159 Beach Road in Salisbury, MA into a 2-lot residential development with two single-family dwellings. The parcel totals approximately 30,310-SF and contains an existing ice cream stand with paved parking and associated appurtenances. The project consists of construction of two single-family dwellings, along with associated infrastructure including driveways, landscaping, drainage facilities, and utilities. Project plans entitled *Definitive Subdivision Plan for 159 Beach Road*, last revised December 5, 2023, have been prepared by this office and provided for your review. These plans illustrate the proposal in detail including zoning, easements, construction details, and provisions for utilities. Drainage will be collected and routed through best management practices sized to address the MADEP Stormwater Management Standards.

### **SITE DESCRIPTION**

The total lot area of the project site is approximately 30,310-SF and provides frontage on Beach Road and Old County Road. The site is generally flat, with an elevation ranging between 10-FT and 14-FT across the site. According to the Natural Resource Conservation Service Soil Survey for Middlesex County, Massachusetts soils on the site are mapped as containing Wareham Loamy Sand and Windsor Loamy Sand, both in Hydrologic Soil Group A.

### **SURFACE DRAINAGE**

#### Pre-Development Condition

The pre-development condition consists of two watershed areas contributing to two design points. Design Point #1 (DP-1) receives runoff from drainage area EWA-1 and consists of overland flow to the south towards Beach Road. Design Point #2 (DP-2) receives runoff from drainage area EWA-2 and consists of overland flow to the north and east, towards the abutting properties along Old County Road and Beach Road. Contributing areas to the Design Points are detailed in the following Table 1.

TABLE 1: EXISTING WATERSHED DESIGN POINT DETAILS

DESIGN POINT	AREA NAME	AREA (SF)	T <sub>c</sub> (min.)	CN
DP-1	EWA-1	15,898	14.4	73
DP-2	EWA-2	14,413	16.0	30

#### Post-Development Condition

The proposed project includes the construction of two single-family dwellings. Other components include construction of a new driveways along with landscaping, drainage, utilities, and associated appurtenances. The development is less than one acre, therefore, the system has been designed to meet the requirements of the Town of Salisbury Planning Board Rules and Regulations Section III.c.5 – Drainage.

Drainage will be routed through roof drywells sized to capture and infiltrate runoff from roofs and porous pavement will be used for driveways to treat and infiltrate runoff. These BMP's have been designed to treat and infiltrate runoff for up to and including the 100-year storm event. The drainage design results in all impervious area being captured, treated, and infiltrated on the site. This provides a net benefit compared to the existing condition, which had approximately 10,000-SF of untreated impervious area.

The proposed construction results in two watersheds discharging to two Design Points. DP-1 receives flow from PWA-1, which consists of overland flow towards Beach Road. DP-2 receives flow from PWA-2, which

## DRAINAGE REPORT

159 Beach Road  
Salisbury, Massachusetts

consists of overland flow towards Old County Road. The design points are summarized in Table 2 below. Please note that since the proposed roofs and driveways are fully infiltrated by their respective BMP's that those areas have been excluded from the watersheds below.

TABLE 2: PROPOSED WATERSHED DESIGN POINT DETAILS

DESIGN POINT	AREA NAME	AREA (SF)	Tc (min.)	CN
DP-1	PWA-1	12,832	8.7	37
DP-2	PWA-2	12,127	10.2	37

### Peak Discharge Comparison

As illustrated in the following tables, the impact of the proposed improvements has been mitigated through the use of roof drywells and porous pavement for up to and including the 100-year, 24-hour storm event.

#### Design Point #1

Peak Flow:

	2-YR	10-YR	25-YR	50-YR	100-YR
	(3.1-IN)	(4.5-IN)	(5.3-IN)	(5.9-IN)	(6.5-IN)
	CFS	CFS	CFS	CFS	CFS
Pre-Development	0.3	0.6	0.8	1.0	1.1
Post-Development	0.0	0.0	0.0	0.0	0.1

#### Design Point #2

Peak Flow:

	2-YR	10-YR	25-YR	50-YR	100-YR
	(3.1-IN)	(4.5-IN)	(5.3-IN)	(5.9-IN)	(6.5-IN)
	CFS	CFS	CFS	CFS	CFS
Pre-Development	0.0	0.0	0.0	0.0	0.0
Post-Development	0.0	0.0	0.0	0.0	0.0

## **DRAINAGE REPORT**

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159 Beach Road  
Salisbury, Massachusetts

### **METHODOLOGY**

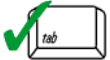
Drainage calculations were performed using the computer program HydroCAD by HydroCAD Software Solutions, LLC based upon Technical Release 20 (TR-20), developed by the NRCS, formerly the Soils Conservation Service. Drainage calculations were prepared for the 2-YR, 10-YR, 25-YR, 50-YR, and 100-YR Type III 24-hour storm events. Rainfall data corresponds with National Weather Service Technical Paper 40 (TP-40) used in Technical Release 55 (TR-55). Curve numbers were generated using the information provided in TR-55 and the SCS Soils Survey.



# 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.<sup>1</sup> 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<sup>2</sup>
- 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.

<sup>1</sup> 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.

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



# Checklist for Stormwater Report

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## 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

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Signature and Date

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## 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

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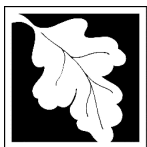
## Checklist (continued)

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

- ☒ No disturbance to any Wetland Resource Areas
- ☒ Site Design Practices (e.g. clustered development, reduced frontage setbacks)
- ☐ Reduced Impervious Area (Redevelopment Only)
- ☐ Minimizing disturbance to existing trees and shrubs
- ☐ LID Site Design Credit Requested:
  - ☐ Credit 1
  - ☐ Credit 2
  - ☐ Credit 3
- ☒ Use of “country drainage” versus curb and gutter conveyance and pipe
- ☐ Bioretention Cells (includes Rain Gardens)
- ☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)
- ☐ Treebox Filter
- ☐ Water Quality Swale
- ☐ Grass Channel
- ☐ Green Roof
- ☒ Other (describe): Roof drywells and porous pavement

## Standard 1: No New Untreated Discharges

- ☒ No new untreated discharges
- ☒ Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth
- ☒ Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.



# Checklist for Stormwater Report

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## 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<sup>1</sup>
- ☒ 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.

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<sup>1</sup> 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.



# Checklist for Stormwater Report

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## 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

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## 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

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## 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

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## 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.

Project: 159 Beach Road  
Location: Salisbury, MA  
Client: Larkin Real Estate Group, Inc.

Project Number: 21-10254  
Prepared By: William Hall, P.E.  
Date: December 11, 2023

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## **STORMWATER MANAGEMENT STANDARDS CALCULATIONS**

### **Standard 1: Velocity & Rip-Rap Apron Sizing and Gradation Calculations**

- Not Applicable, no outlets proposed.

Conclusion: No stormwater discharges are proposed, the Stormwater Management System conforms to Standard 1.

---

### **Standard 2: Peak Discharge Summary (CFS)**

	2-Year (3.1-IN)	10-Year (4.5-IN)	25-Year (5.3-IN)	50-Year (5.9-IN)	100-Year (6.5-IN)
Design Point 1					
Pre-Development Conditions:	0.3	0.6	0.8	1.0	1.1
Post Development Conditions:	0.0	0.0	0.0	0.0	0.1

	2-Year (3.1-IN)	10-Year (4.5-IN)	25-Year (5.3-IN)	50-Year (5.9-IN)	100-Year (6.5-IN)
Design Point 2					
Pre-Development Conditions:	0.0	0.0	0.0	0.0	0.0
Post Development Conditions:	0.0	0.0	0.0	0.0	0.0

Conclusion: The Stormwater Management System conforms to Standard 2.

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### **Standard 3: Recharge Calculations (Static Method)**

#### **Typical Porous Pavement Driveway**

Hydrologic Soils Group:	A	B	C	D	
Total Proposed Impervious Area:	0.01	0.00	0.00	0.00	0.01
Target Factor:	0.60	0.35	0.25	0.10	
Required Recharge Volume:	29	0	0	0	29 CF

Volume Provided: 378 CF

#### **Determine Drawdown Time**

Saturated Hydraulic Conductivity (Rawls Rate):	8.27 IN/HR
Bottom Area of Infiltration Basin:	575 SF
Drawdown Time:	1.0 HRS

#### **Typical Roof Drywell**

Hydrologic Soils Group:	A	B	C	D	
Total Proposed Impervious Area:	0.06	0.00	0.00	0.00	0.06
Target Factor:	0.60	0.35	0.25	0.10	
Required Recharge Volume:	120	0	0	0	120 CF

Volume Provided: 425 CF

#### Determine Drawdown Time

Saturated Hydraulic Conductivity (Rawls Rate):	8.27 IN/HR
Bottom Area of Infiltration Basin:	347 SF
Drawdown Time:	1.8 HRS

Conclusion: The volume provided exceeds the minimum recharge volume required. In addition, the BMPs drain within 72-HRS to comply with DEP regulations. The Stormwater Management System conforms to Standard 3.

### Standard 4: Water Quality Volume Calculations

#### Typical Porous Pavement Driveway

Water Quality Depth:	1.0 IN
Total Proposed Impervious Area:	0.01 Acres
Required Water Quality Volume:	48 CF
Provided Water Quality Volume:	378 CF

#### Typical Roof Drywell

Water Quality Depth:	1.0 IN
Total Proposed Impervious Area:	0.06 Acres
Required Water Quality Volume:	200 CF
Provided Water Quality Volume:	425 CF

### TSS Removal Rate Calculations

#### Treatment Provided From Porous Pavement

	TSS Removal Rate	Starting TSS Load	Amount Removed	Remaining Load
Porous Pavement	80%	1.00	0.80	0.20
TSS Removed through BMPs:				80.0%

Conclusion: The volume provided by the porous pavement exceeds the Water Quality Volume, therefore the TSS Removal Rate meets 80%. The Stormwater Management System conforms to Standard 4.

### Standard 5: Land Uses With Higher Potential Pollutant Loads

Conclusion: The proposed use is not considered a Land Use with Higher Potential Pollutant Loads. This Standard is NOT Applicable.


### Standard 6: Critical Areas

Conclusion: The proposal is not located within a Critical Area. This Standard is NOT Applicable.




### Standard 7: Redevelopment

Conclusion: The development does not meet the criteria for Redevelopment.



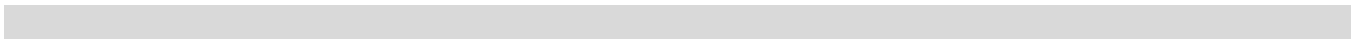
### Standard 8: Construction Period Controls

Conclusion: The project is not covered by a NPDES Construction General Permit. An erosion and sedimentation control plan has been submitted to address construction period pollution prevention measures and to reduce the potential for erosion and sedimentation. The Stormwater Management System Conforms to Standard 8.




### Standard 9: Operations and Maintenance Plan

Conclusion: An Operations and Maintenance Plan has been prepared and provided with this summary. The Stormwater Management System Conforms to Standard 9.

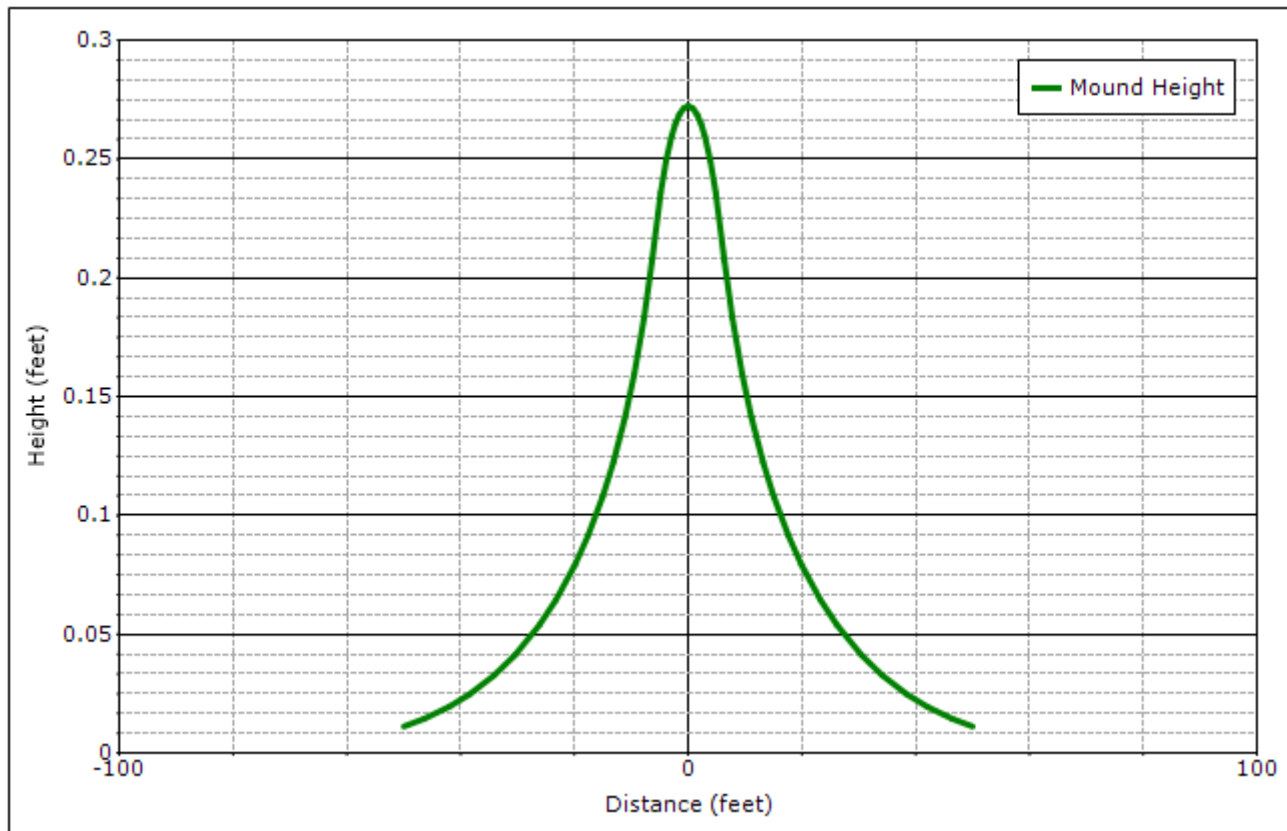


### Standard 10: Illicit Discharges to Drainage System

Conclusion: All off-site discharges are comprised entirely of stormwater. The Stormwater Management System Conforms to Standard 10.



# Groundwater Mounding Analysis (Hantush Method using Glover's Solution)



Company: Civil Design  
 Project: Consultants, Inc.  
 159 Beach Road  
 Analyst: William Hall, P.E.  
 Date: 12/14/2023

## Recharge Basin Dimensions

Length (w): 11.7 ft  
 Width (l): 7.4 ft  
 Bottom Area: 87 ft<sup>2</sup>  
 SHGW Separation: 2 ft

## Recharge Rate Calculations

Duration (t): 1.8 h  
 Volume (V): 425 ft<sup>3</sup>  
 Rate (R): 0.68 ft/h  
 Total Simulation Time: 24 h

## Aquifer Characteristics

Hydraulic Conductivity (Kh): 8.27 ft/h  
 Drainable Porosity(Sy): 0.25  
 Saturated Thickness (h): 10 ft

## Plot Geometry

X-Coordinate: 0 ft  
 Y-Coordinate: 0 ft  
 Left Side Plot Distance (Dl): 50 ft  
 Right Side Plot Distance (Dr): 50 ft  
 Plot Angle From Y-Axis (Φ): 0  
 Constant Head Boundary: No

<u>Distance</u> <u>(ft)</u>	<u>Height</u> <u>(ft)</u>	<u>Distance</u> <u>(ft)</u>	<u>Height</u> <u>(ft)</u>
-50.00	0.0112	0.00	0.2723
-46.39	0.0145	0.80	0.2714
-42.05	0.0195	1.57	0.2687
-38.44	0.0248	2.25	0.2649
-34.09	0.0328	2.90	0.2598
-30.48	0.0412	3.90	0.2493
-26.15	0.0539	4.84	0.2358
-23.24	0.0645	6.35	0.2075
-19.89	0.0793	7.75	0.1834
-17.61	0.0916	9.48	0.1595
-15.05	0.1079	11.09	0.1415
-13.16	0.1224	13.16	0.1224
-11.09	0.1415	15.05	0.1079
-9.48	0.1595	17.61	0.0916
-7.75	0.1834	19.89	0.0793
-6.35	0.2075	23.24	0.0645
-4.84	0.2358	26.15	0.0539
-3.90	0.2493	30.48	0.0412
-2.90	0.2598	34.09	0.0328
-2.25	0.2649	38.44	0.0248
-1.57	0.2687	42.05	0.0195
-0.80	0.2714	46.39	0.0145
		50.00	0.0112

# **OPERATIONS AND MAINTENANCE PLAN**

December 14, 2023

This Operations and Maintenance (O&M) Plan has been prepared in accordance with the Stormwater Management Policy issued by the Department of Environmental Protection (DEP) for 159 Beach Road in Salisbury, MA.

Upon a period beginning twelve months after the completion of the project, the porous pavement and roof drywells shall be inspected annually. Maintenance and inspection shall be performed as indicated below:

## **Visual Inspection**

The surface must be inspected annually for signs of degradation and clogging of the infiltration trenches and porous pavement. Regularly monitor the surface after storm events to make sure that the surface drains properly. Puddling could be an indication of clogging of the drainage system. Trenches shall be weeded and mowed as required to control vegetation.

## **Porous Pavement**

Frequent cleaning and maintenance of porous pavement is critical to maintain proper function of the system. No winter sanding of porous pavements is permitted. It is also recommended to minimize application of salt for ice control and to never reseal or repave with impermeable materials. The porous pavement should be inspected annually for deterioration or spalling. For porous asphalt and concrete, the surface should be cleaned a minimum of twice per year using a vacuum sweeper (Note power washing may be required beforehand to dislodge trapped particles). Major clogging may necessitate replacement of pavement surface, and possibly filter course and sub-base course. It is advised to post signage indicating porous pavement areas.

## **Roof Drywells**

Infiltration systems are prone to clogging and failure, so it is imperative to develop and implement aggressive maintenance plans and schedules. Installing the required pretreatment BMPs will significantly reduce maintenance requirements. Inspections and preventive maintenance must be performed at least twice a year. Drainage pipes shall be inspected and cleaned of sediment at least every five (5) years, or in accordance to manufacture's specifications, or as required to maintain adequate functionality of the stormwater conveyance system. All sediments shall be properly handled and disposed of in accordance with local, state and federal guidelines and regulations.

## **Snow Storage / Removal**

Snow plowed from the proposed driveway will be placed or disposed of in accordance with the policy developed by DEP. Under no circumstances shall snow plowed or removed from the road be stockpiled within the Town right-of-way. If conditions arise where snow storage areas are at capacity the Operator is required to remove and dispose of snow off site in conformance with all local, state and federal regulations.

## **Property Applicant / Responsible Party:**

Larkin Real Estate Group, Inc.  
383 Main Street  
Medfield, MA 02052

## **Construction Period Pollution Prevention Plan:**

See Sheet C-4 for construction period erosion and sedimentation control measure.

## **System Map:**

See Sheet C-4 for the location of all stormwater management facilities.

## **Estimated Operations and Maintenance Budget**

All maintenance will be performed as required. An annual budget of \$2,500 a year should be specified for operations and maintenance of the obligations.

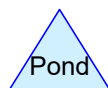
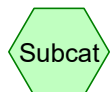
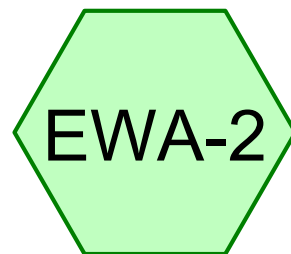
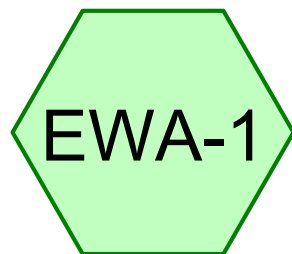
**DRAINAGE REPORT**

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159 Beach Road

Salisbury, Massachusetts

**TAB 2**



## **Project Notes**

Rainfall events imported from "19-6813 Pre-Development.hcp"

**21-10254 - Pre**

Prepared by Civil Design Consultants, Inc.

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Page 3

**Area Listing (all nodes)**

Area (acres)	CN	Description (subcatchment-numbers)
0.431	30	Woods, Good, HSG A (EWA-1, EWA-2)
0.035	39	>75% Grass cover, Good, HSG A (EWA-1, EWA-2)
0.187	98	Paved parking, HSG A (EWA-1)
0.043	98	Roofs, HSG A (EWA-1)
<b>0.696</b>	<b>53</b>	<b>TOTAL AREA</b>

**21-10254 - Pre**

Prepared by Civil Design Consultants, Inc.

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Page 4

**Soil Listing (all nodes)**

Area (acres)	Soil Group	Subcatchment Numbers
<b>0.696</b>	HSG A	EWA-1, EWA-2
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
0.000	Other	
0.696		<b>TOTAL AREA</b>



Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points

Runoff by SCS TR-20 method, UH=SCS

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**SubcatchmentEWA-1:**

Runoff Area=15,898 sf 62.93% Impervious Runoff Depth=0.92"

Flow Length=130' Slope=0.0200 '/' Tc=14.4 min CN=73 Runoff=0.3 cfs 0.028 af

**SubcatchmentEWA-2:**

Runoff Area=14,413 sf 0.00% Impervious Runoff Depth=0.00"

Flow Length=200' Slope=0.0200 '/' Tc=16.0 min CN=30 Runoff=0.0 cfs 0.000 af

**Total Runoff Area = 0.696 ac Runoff Volume = 0.028 af Average Runoff Depth = 0.48"**  
**67.00% Pervious = 0.466 ac 33.00% Impervious = 0.230 ac**

**Summary for Subcatchment EWA-1:**

Runoff = 0.3 cfs @ 12.22 hrs, Volume= 0.028 af, Depth= 0.92"

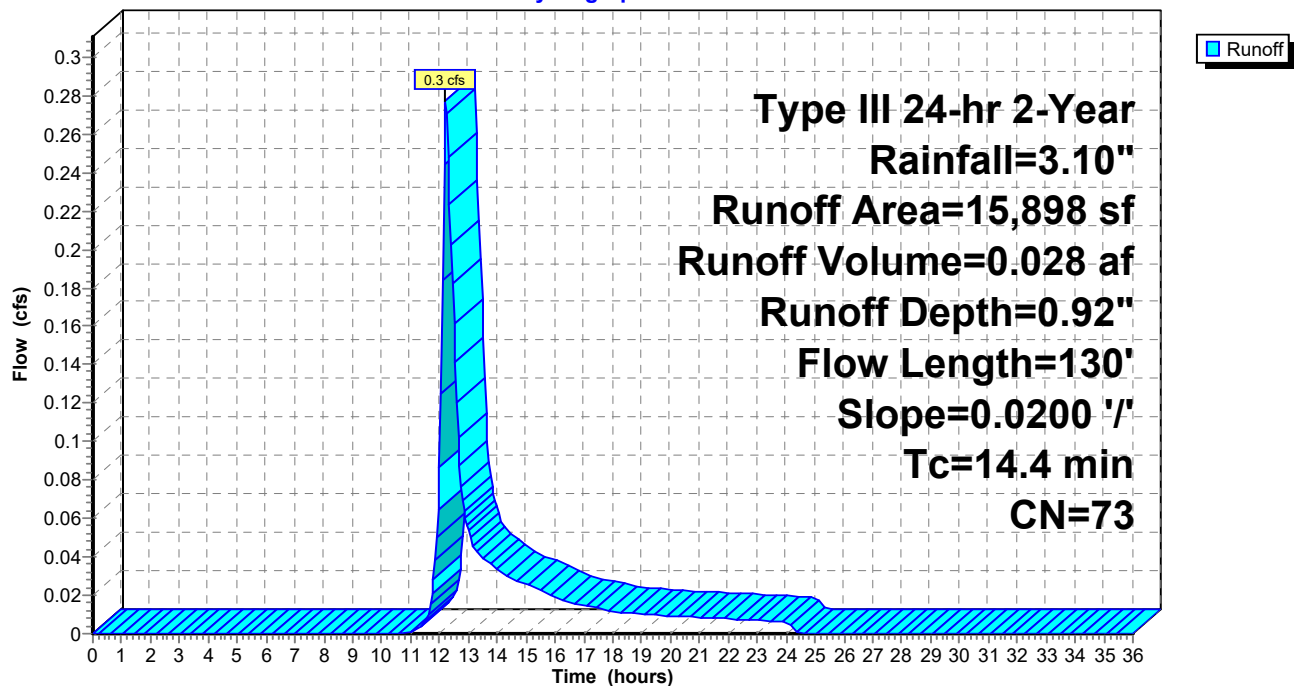
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs  
Type III 24-hr 2-Year Rainfall=3.10"

Area (sf)	CN	Description
1,234	39	>75% Grass cover, Good, HSG A
1,869	98	Roofs, HSG A
8,135	98	Paved parking, HSG A
4,660	30	Woods, Good, HSG A
15,898	73	Weighted Average
5,894		37.07% Pervious Area
10,004		62.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.5	50	0.0200	0.07		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.10"
1.9	80	0.0200	0.71		<b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
14.4	130	Total			

**Subcatchment EWA-1:**

Hydrograph



**Summary for Subcatchment EWA-2:**

[45] Hint: Runoff=Zero

Runoff = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Type III 24-hr 2-Year Rainfall=3.10"

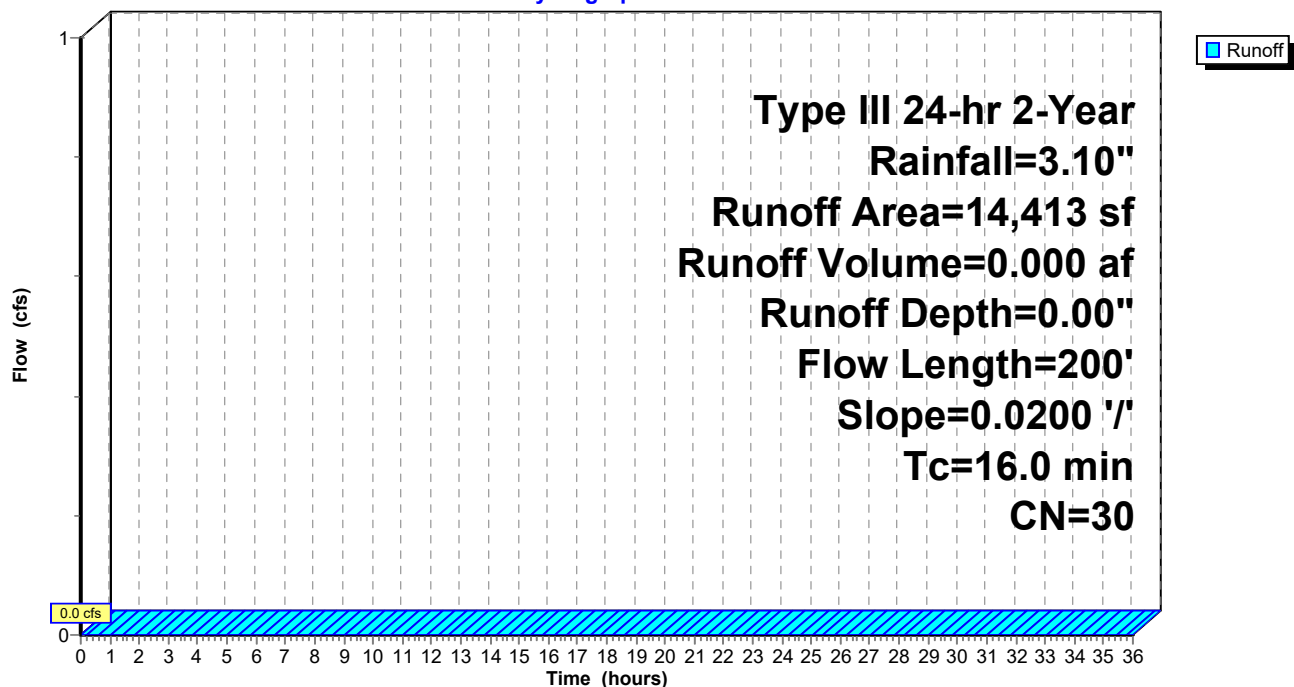
Area (sf)	CN	Description
299	39	>75% Grass cover, Good, HSG A
0	98	Roofs, HSG A
0	98	Paved parking, HSG A
14,114	30	Woods, Good, HSG A
14,413	30	Weighted Average
14,413		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.5	50	0.0200	0.07		<b>Sheet Flow,</b>
					Woods: Light underbrush n= 0.400 P2= 3.10"
3.5	150	0.0200	0.71		<b>Shallow Concentrated Flow,</b>
					Woodland Kv= 5.0 fps
16.0	200	Total			

**Subcatchment EWA-2:**

Hydrograph



Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points

Runoff by SCS TR-20 method, UH=SCS

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**SubcatchmentEWA-1:**

Runoff Area=15,898 sf 62.93% Impervious Runoff Depth=1.90"

Flow Length=130' Slope=0.0200 '/' Tc=14.4 min CN=73 Runoff=0.6 cfs 0.058 af

**SubcatchmentEWA-2:**

Runoff Area=14,413 sf 0.00% Impervious Runoff Depth=0.00"

Flow Length=200' Slope=0.0200 '/' Tc=16.0 min CN=30 Runoff=0.0 cfs 0.000 af

**Total Runoff Area = 0.696 ac Runoff Volume = 0.058 af Average Runoff Depth = 0.99"**  
**67.00% Pervious = 0.466 ac 33.00% Impervious = 0.230 ac**

**Summary for Subcatchment EWA-1:**

Runoff = 0.6 cfs @ 12.21 hrs, Volume= 0.058 af, Depth= 1.90"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs  
Type III 24-hr 10-Year Rainfall=4.50"

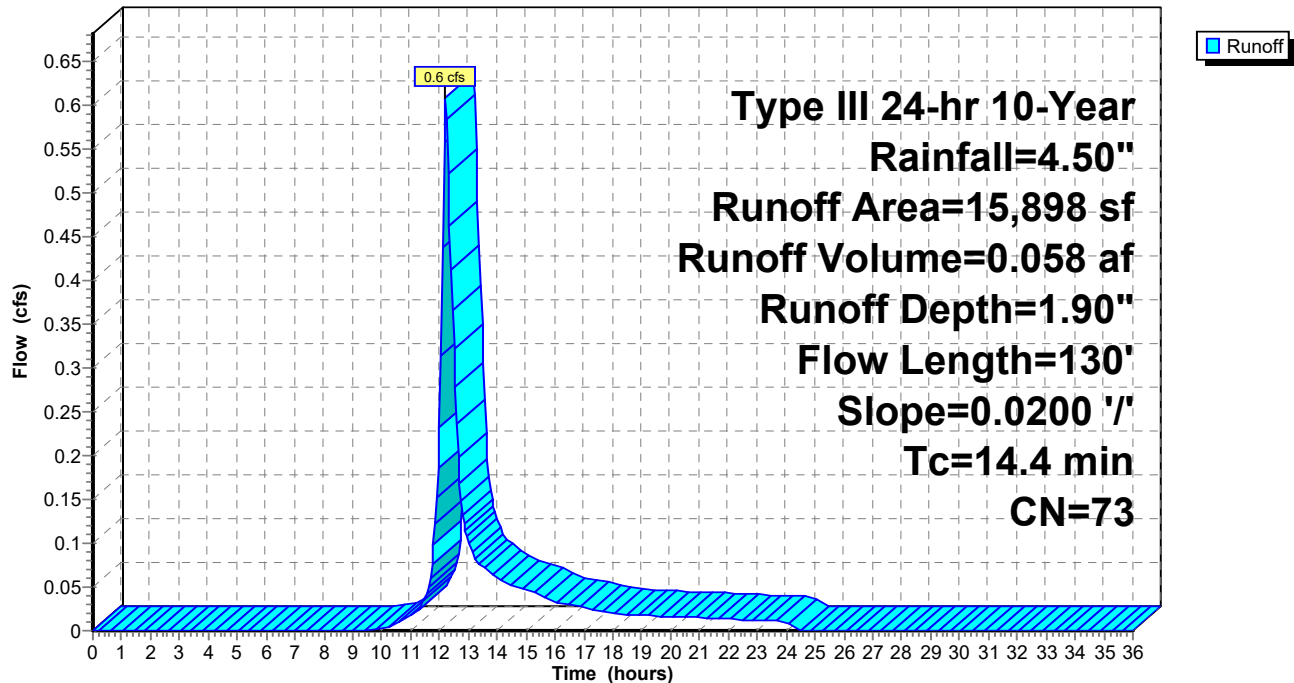
Area (sf)	CN	Description
1,234	39	>75% Grass cover, Good, HSG A
1,869	98	Roofs, HSG A
8,135	98	Paved parking, HSG A
4,660	30	Woods, Good, HSG A
15,898	73	Weighted Average
5,894		37.07% Pervious Area
10,004		62.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.5	50	0.0200	0.07		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.10"
1.9	80	0.0200	0.71		<b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
14.4	130	Total			

**Subcatchment EWA-1:**

Hydrograph



**Summary for Subcatchment EWA-2:**

[45] Hint: Runoff=Zero

Runoff = 0.0 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Type III 24-hr 10-Year Rainfall=4.50"

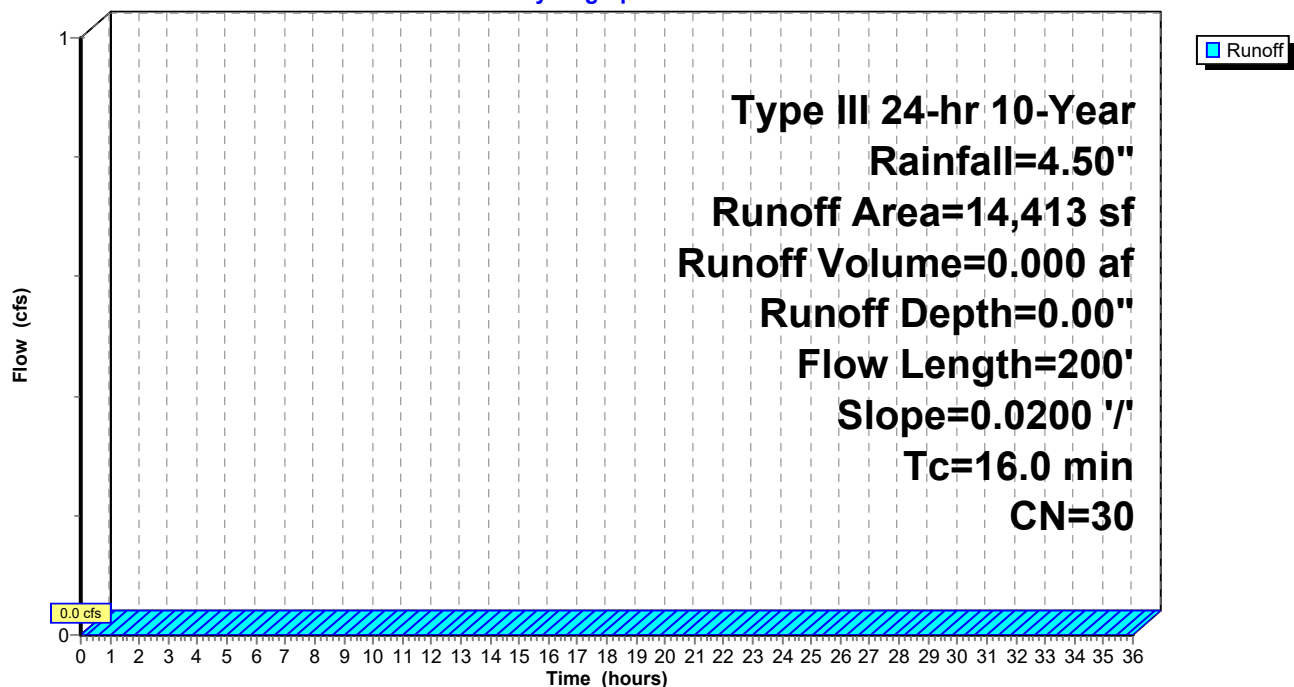
Area (sf)	CN	Description
299	39	>75% Grass cover, Good, HSG A
0	98	Roofs, HSG A
0	98	Paved parking, HSG A
14,114	30	Woods, Good, HSG A
14,413	30	Weighted Average
14,413		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.5	50	0.0200	0.07		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.10"
3.5	150	0.0200	0.71		<b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
16.0	200	Total			

**Subcatchment EWA-2:**

Hydrograph



Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points

Runoff by SCS TR-20 method, UH=SCS

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**SubcatchmentEWA-1:**

Runoff Area=15,898 sf 62.93% Impervious Runoff Depth=2.52"

Flow Length=130' Slope=0.0200 '/' Tc=14.4 min CN=73 Runoff=0.8 cfs 0.077 af

**SubcatchmentEWA-2:**

Runoff Area=14,413 sf 0.00% Impervious Runoff Depth=0.02"

Flow Length=200' Slope=0.0200 '/' Tc=16.0 min CN=30 Runoff=0.0 cfs 0.000 af

**Total Runoff Area = 0.696 ac Runoff Volume = 0.077 af Average Runoff Depth = 1.33"**  
**67.00% Pervious = 0.466 ac 33.00% Impervious = 0.230 ac**

**Summary for Subcatchment EWA-1:**

Runoff = 0.8 cfs @ 12.21 hrs, Volume= 0.077 af, Depth= 2.52"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Type III 24-hr 25-Year Rainfall=5.30"

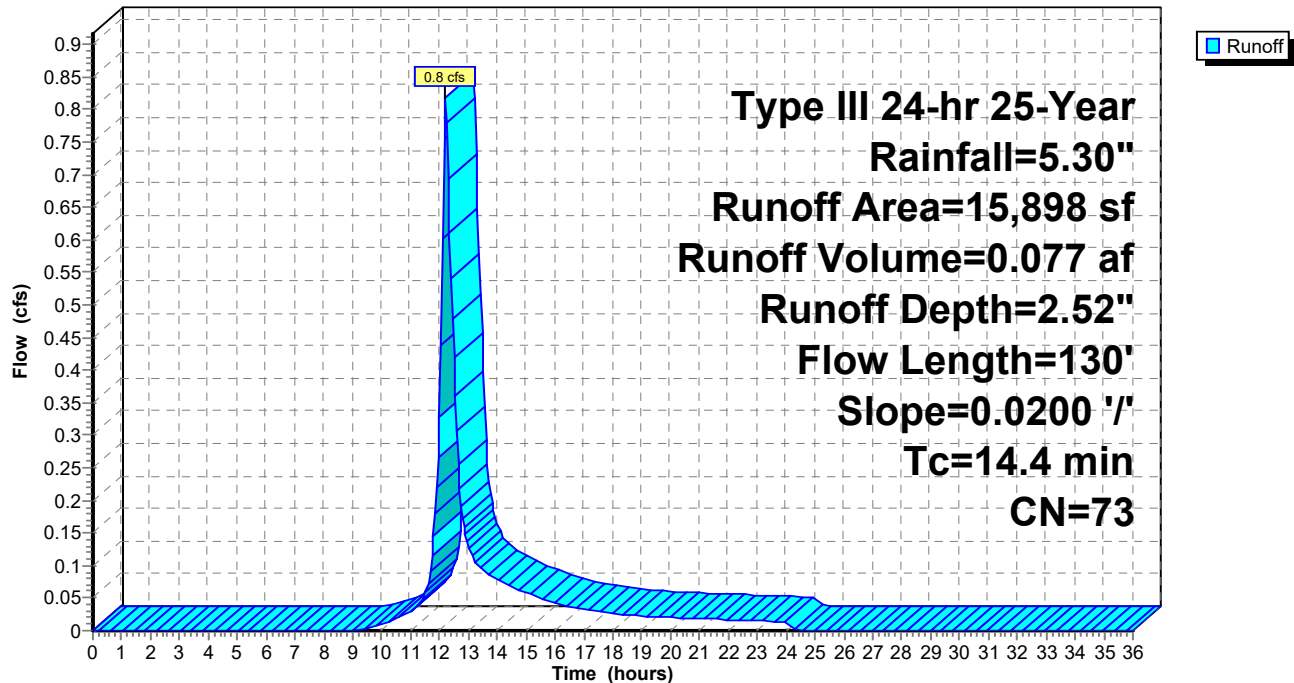
Area (sf)	CN	Description
1,234	39	>75% Grass cover, Good, HSG A
1,869	98	Roofs, HSG A
8,135	98	Paved parking, HSG A
4,660	30	Woods, Good, HSG A
15,898	73	Weighted Average
5,894		37.07% Pervious Area
10,004		62.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.5	50	0.0200	0.07		<b>Sheet Flow,</b>
					Woods: Light underbrush n= 0.400 P2= 3.10"
1.9	80	0.0200	0.71		<b>Shallow Concentrated Flow,</b>
					Woodland Kv= 5.0 fps
14.4	130	Total			

**Subcatchment EWA-1:**

Hydrograph





**Summary for Subcatchment EWA-2:**

Runoff = 0.0 cfs @ 22.16 hrs, Volume= 0.000 af, Depth= 0.02"

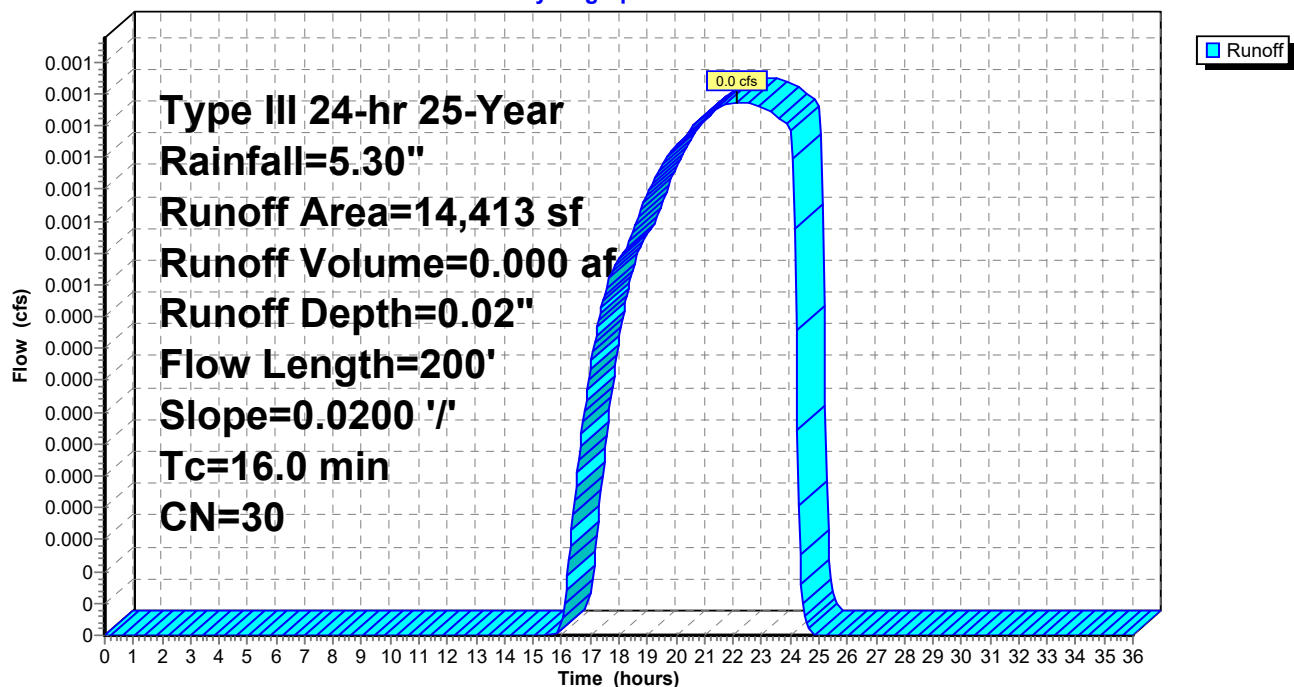
Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs  
Type III 24-hr 25-Year Rainfall=5.30"

Area (sf)	CN	Description
299	39	>75% Grass cover, Good, HSG A
0	98	Roofs, HSG A
0	98	Paved parking, HSG A
14,114	30	Woods, Good, HSG A
14,413	30	Weighted Average
14,413		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.5	50	0.0200	0.07		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.10"
3.5	150	0.0200	0.71		<b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
16.0	200	Total			

**Subcatchment EWA-2:**

Hydrograph



Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points

Runoff by SCS TR-20 method, UH=SCS

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**SubcatchmentEWA-1:**

Runoff Area=15,898 sf 62.93% Impervious Runoff Depth=3.01"

Flow Length=130' Slope=0.0200 '/' Tc=14.4 min CN=73 Runoff=1.0 cfs 0.091 af

**SubcatchmentEWA-2:**

Runoff Area=14,413 sf 0.00% Impervious Runoff Depth=0.06"

Flow Length=200' Slope=0.0200 '/' Tc=16.0 min CN=30 Runoff=0.0 cfs 0.002 af

**Total Runoff Area = 0.696 ac Runoff Volume = 0.093 af Average Runoff Depth = 1.61"**  
**67.00% Pervious = 0.466 ac 33.00% Impervious = 0.230 ac**

**Summary for Subcatchment EWA-1:**

Runoff = 1.0 cfs @ 12.20 hrs, Volume= 0.091 af, Depth= 3.01"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs  
Type III 24-hr 50-Year Rainfall=5.90"

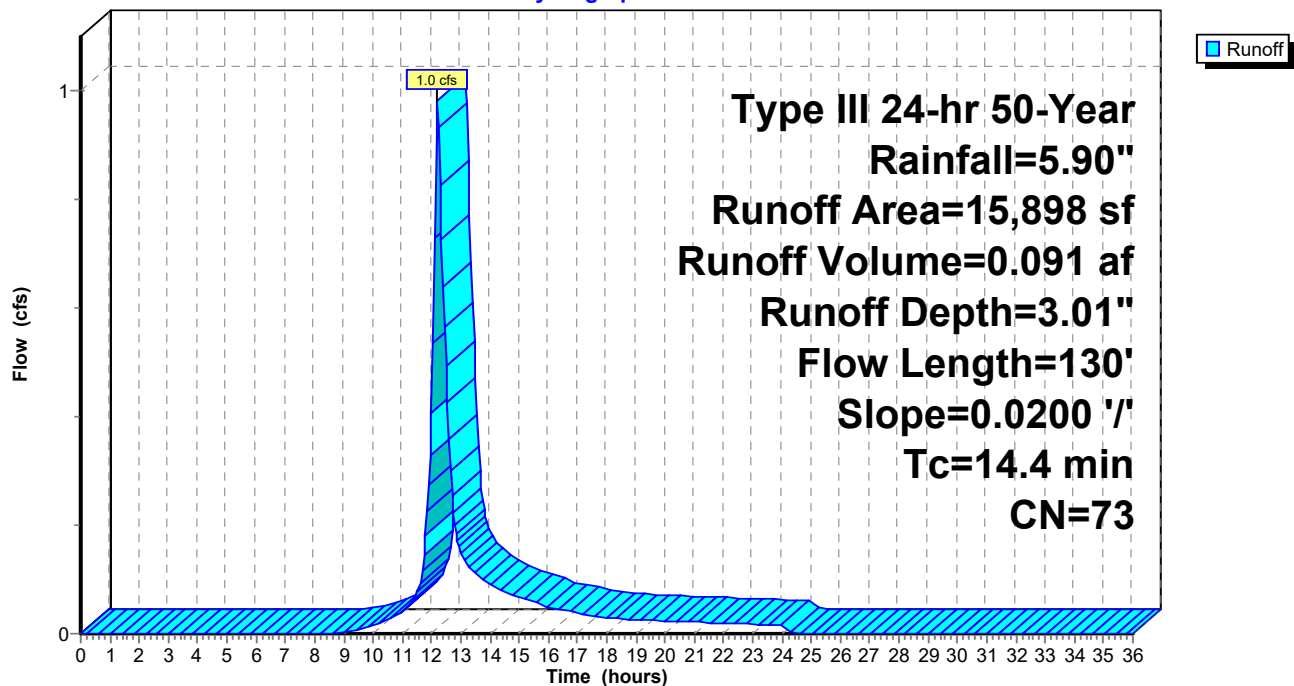
Area (sf)	CN	Description
1,234	39	>75% Grass cover, Good, HSG A
1,869	98	Roofs, HSG A
8,135	98	Paved parking, HSG A
4,660	30	Woods, Good, HSG A
15,898	73	Weighted Average
5,894		37.07% Pervious Area
10,004		62.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.5	50	0.0200	0.07		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.10"
1.9	80	0.0200	0.71		<b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
14.4	130	Total			

**Subcatchment EWA-1:**

Hydrograph



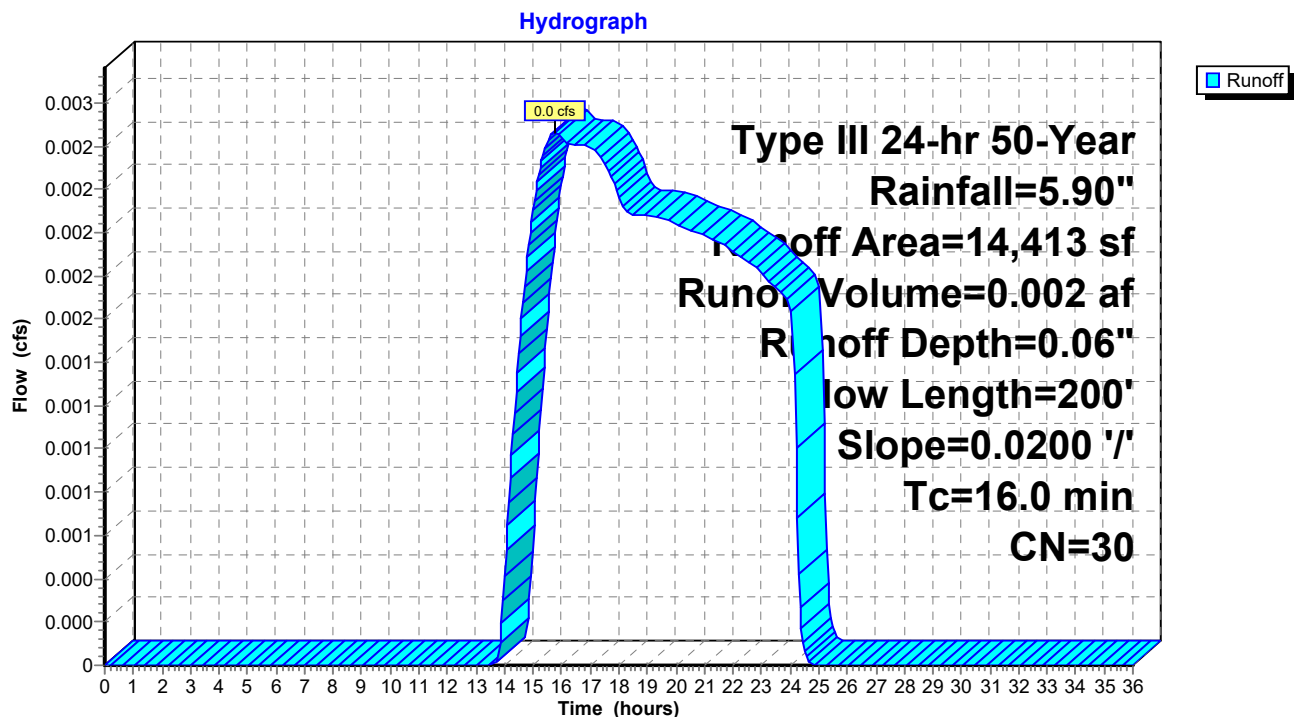
**Summary for Subcatchment EWA-2:**

Runoff = 0.0 cfs @ 15.79 hrs, Volume= 0.002 af, Depth= 0.06"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs  
Type III 24-hr 50-Year Rainfall=5.90"

Area (sf)	CN	Description
299	39	>75% Grass cover, Good, HSG A
0	98	Roofs, HSG A
0	98	Paved parking, HSG A
14,114	30	Woods, Good, HSG A
14,413	30	Weighted Average
14,413		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.5	50	0.0200	0.07		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.10"
3.5	150	0.0200	0.71		<b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
16.0	200	Total			

**Subcatchment EWA-2:**

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points

Runoff by SCS TR-20 method, UH=SCS

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**SubcatchmentEWA-1:**

Runoff Area=15,898 sf 62.93% Impervious Runoff Depth=3.51"

Flow Length=130' Slope=0.0200 '/' Tc=14.4 min CN=73 Runoff=1.1 cfs 0.107 af

**SubcatchmentEWA-2:**

Runoff Area=14,413 sf 0.00% Impervious Runoff Depth=0.13"

Flow Length=200' Slope=0.0200 '/' Tc=16.0 min CN=30 Runoff=0.0 cfs 0.004 af

**Total Runoff Area = 0.696 ac Runoff Volume = 0.110 af Average Runoff Depth = 1.90"**  
**67.00% Pervious = 0.466 ac 33.00% Impervious = 0.230 ac**

**Summary for Subcatchment EWA-1:**

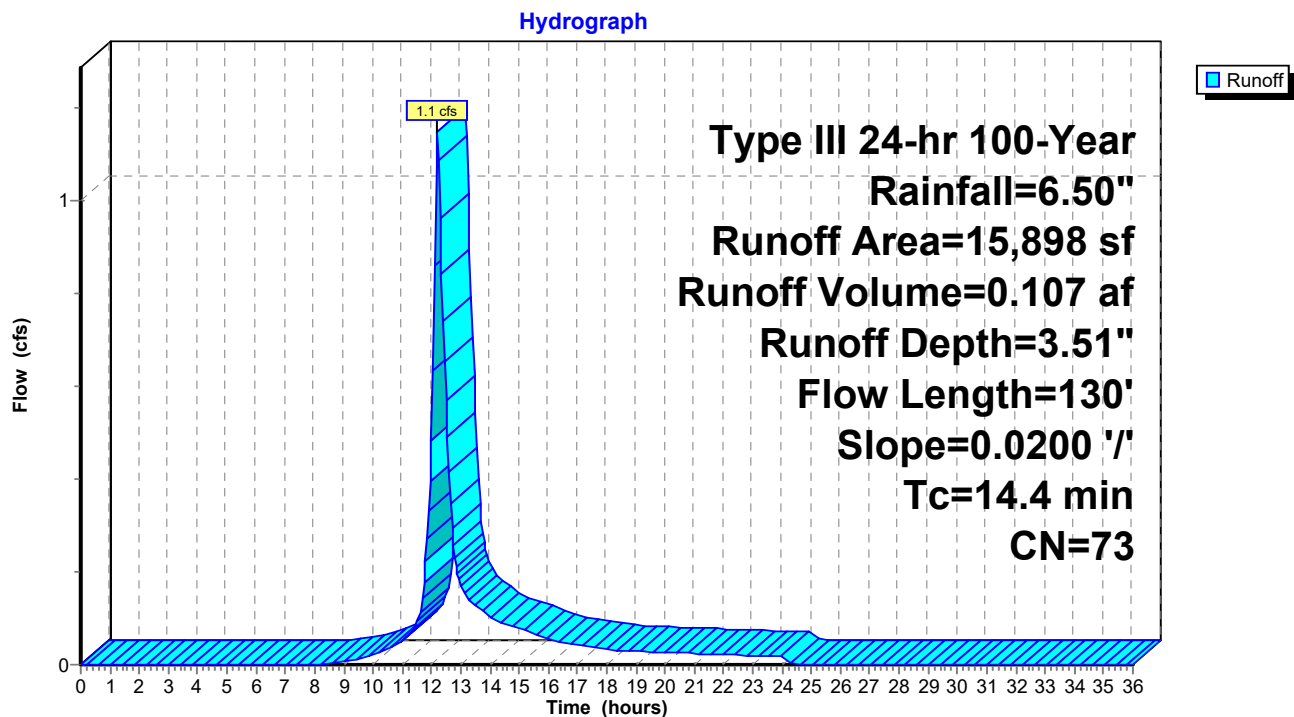
Runoff = 1.1 cfs @ 12.20 hrs, Volume= 0.107 af, Depth= 3.51"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs  
Type III 24-hr 100-Year Rainfall=6.50"

Area (sf)	CN	Description
1,234	39	>75% Grass cover, Good, HSG A
1,869	98	Roofs, HSG A
8,135	98	Paved parking, HSG A
4,660	30	Woods, Good, HSG A
15,898	73	Weighted Average
5,894		37.07% Pervious Area
10,004		62.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.5	50	0.0200	0.07		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.10"
1.9	80	0.0200	0.71		<b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
14.4	130	Total			

**Subcatchment EWA-1:**

**Summary for Subcatchment EWA-2:**

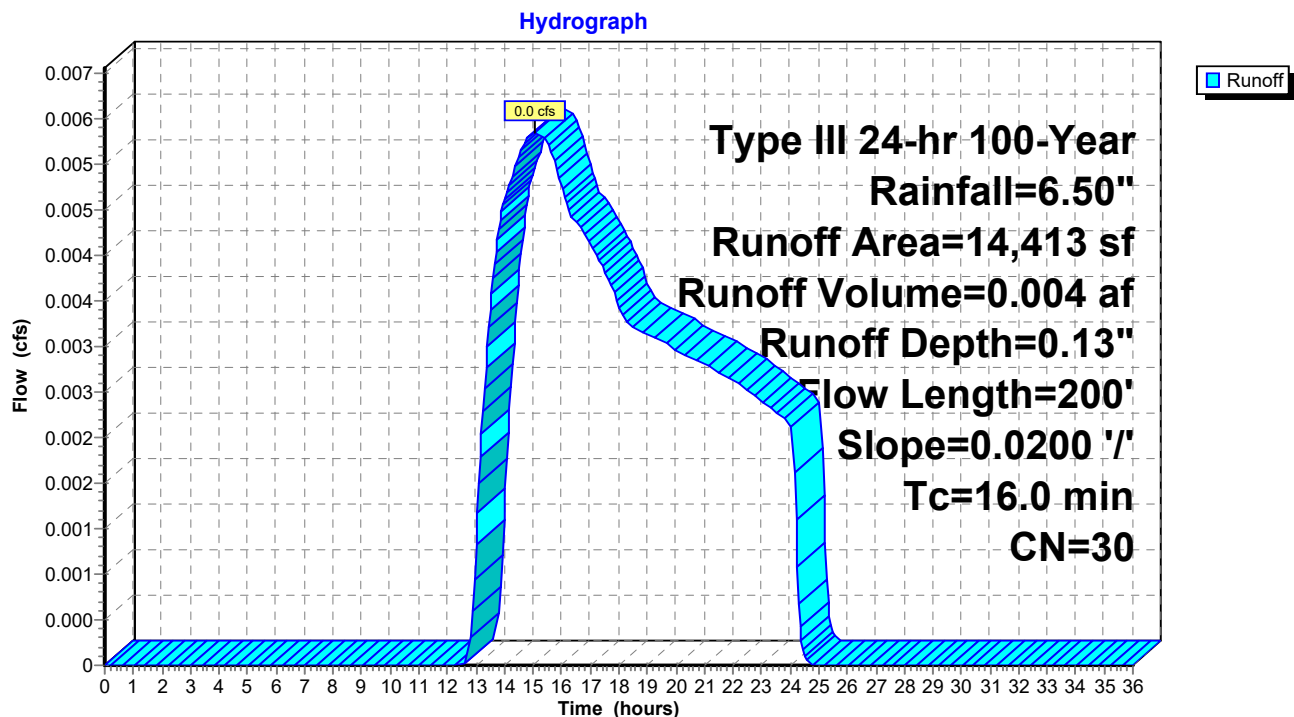
Runoff = 0.0 cfs @ 15.06 hrs, Volume= 0.004 af, Depth= 0.13"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Type III 24-hr 100-Year Rainfall=6.50"

Area (sf)	CN	Description
299	39	>75% Grass cover, Good, HSG A
0	98	Roofs, HSG A
0	98	Paved parking, HSG A
14,114	30	Woods, Good, HSG A
14,413	30	Weighted Average
14,413		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.5	50	0.0200	0.07		<b>Sheet Flow,</b> Woods: Light underbrush n= 0.400 P2= 3.10"
3.5	150	0.0200	0.71		<b>Shallow Concentrated Flow,</b> Woodland Kv= 5.0 fps
16.0	200	Total			

**Subcatchment EWA-2:**

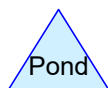
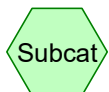
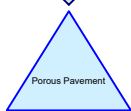
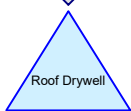
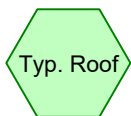
**DRAINAGE REPORT**

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159 Beach Road  
Salisbury, Massachusetts

**TAB 3**





**Drainage Diagram for 21-10254 - Post-R6**

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**21-10254 - Post-R6**

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Page 2

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**Project Notes**

Rainfall events imported from "19-6813 Pre-Development.hcp"

## 21-10254 - Post-R6

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Page 3

### Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
4,900	30	Woods, Good, HSG A (PWA-1, PWA-2)
20,059	39	>75% Grass cover, Good, HSG A (PWA-1, PWA-2)
2,975	98	Paved parking, HSG A (Typ. Driveway, Typ. Roof)
<b>27,934</b>	<b>44</b>	<b>TOTAL AREA</b>

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Page 4

**Soil Listing (all nodes)**

Area (sq-ft)	Soil Group	Subcatchment Numbers
<b>27,934</b>	HSG A	PWA-1, PWA-2, Typ. Driveway, Typ. Roof
0	HSG B	
0	HSG C	
0	HSG D	
0	Other	
27,934		<b>TOTAL AREA</b>

**21-10254 - Post-R6***Type III 24-hr 2-Year Rainfall=3.10"*

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Page 5

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points

Runoff by SCS TR-20 method, UH=SCS

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**SubcatchmentPWA-1:**Runoff Area=12,832 sf 0.00% Impervious Runoff Depth=0.00"  
Flow Length=75' Slope=0.0200 '/' Tc=8.7 min CN=37 Runoff=0.0 cfs 0 cf**SubcatchmentPWA-2:**Runoff Area=12,127 sf 0.00% Impervious Runoff Depth=0.00"  
Flow Length=160' Slope=0.0200 '/' Tc=10.2 min CN=37 Runoff=0.0 cfs 0 cf**SubcatchmentTyp. Driveway:**Runoff Area=575 sf 100.00% Impervious Runoff Depth=2.87"  
Tc=6.0 min CN=98 Runoff=0.0 cfs 137 cf**SubcatchmentTyp. Roof:**Runoff Area=2,400 sf 100.00% Impervious Runoff Depth=2.87"  
Tc=6.0 min CN=98 Runoff=0.2 cfs 574 cf**Pond Porous Pavement:**Peak Elev=8.33' Storage=1 cf Inflow=0.0 cfs 137 cf  
Outflow=0.0 cfs 137 cf**Pond Roof Drywell:**Peak Elev=9.11' Storage=61 cf Inflow=0.2 cfs 574 cf  
Outflow=0.1 cfs 574 cf**Total Runoff Area = 27,934 sf Runoff Volume = 711 cf Average Runoff Depth = 0.31"**  
**89.35% Pervious = 24,959 sf 10.65% Impervious = 2,975 sf**

**21-10254 - Post-R6**

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Type III 24-hr 2-Year Rainfall=3.10"

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Page 6

**Summary for Subcatchment PWA-1:**

[45] Hint: Runoff=Zero

Runoff = 0.0 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Type III 24-hr 2-Year Rainfall=3.10"

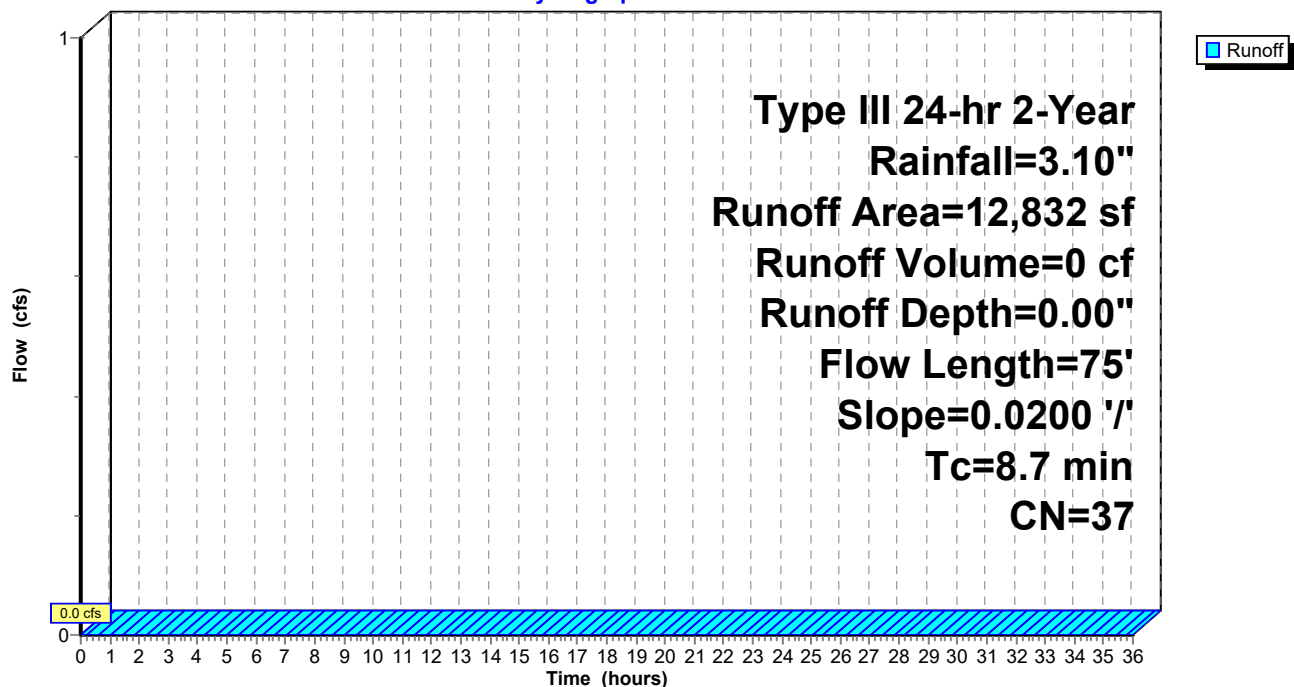
Area (sf)	CN	Description
10,632	39	>75% Grass cover, Good, HSG A
0	98	Roofs, HSG A
0	98	Paved parking, HSG A
2,200	30	Woods, Good, HSG A
12,832	37	Weighted Average
12,832		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	50	0.0200	0.10		<b>Sheet Flow,</b>
					Grass: Dense n= 0.240 P2= 3.10"
0.4	25	0.0200	0.99		<b>Shallow Concentrated Flow,</b>
					Short Grass Pasture Kv= 7.0 fps
8.7	75	Total			

**Subcatchment PWA-1:**

Hydrograph



**21-10254 - Post-R6**

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Type III 24-hr 2-Year Rainfall=3.10"

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Page 7

**Summary for Subcatchment PWA-2:**

[45] Hint: Runoff=Zero

Runoff = 0.0 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Type III 24-hr 2-Year Rainfall=3.10"

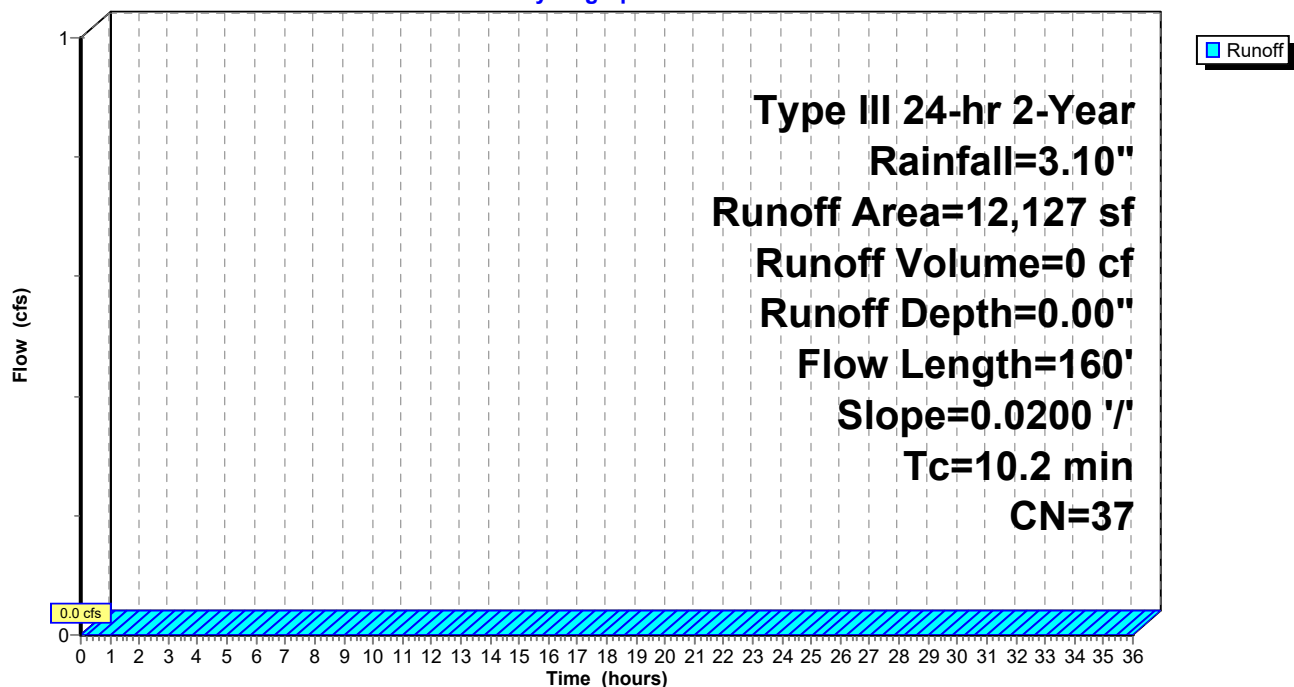
Area (sf)	CN	Description
9,427	39	>75% Grass cover, Good, HSG A
0	98	Roofs, HSG A
0	98	Paved parking, HSG A
2,700	30	Woods, Good, HSG A
12,127	37	Weighted Average
12,127		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	50	0.0200	0.10		<b>Sheet Flow,</b>
					Grass: Dense n= 0.240 P2= 3.10"
1.9	110	0.0200	0.99		<b>Shallow Concentrated Flow,</b>
					Short Grass Pasture Kv= 7.0 fps
10.2	160	Total			

**Subcatchment PWA-2:**

Hydrograph



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Type III 24-hr 2-Year Rainfall=3.10"

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Page 8

**Summary for Subcatchment Typ. Driveway:**

Runoff = 0.0 cfs @ 12.09 hrs, Volume= 137 cf, Depth= 2.87"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

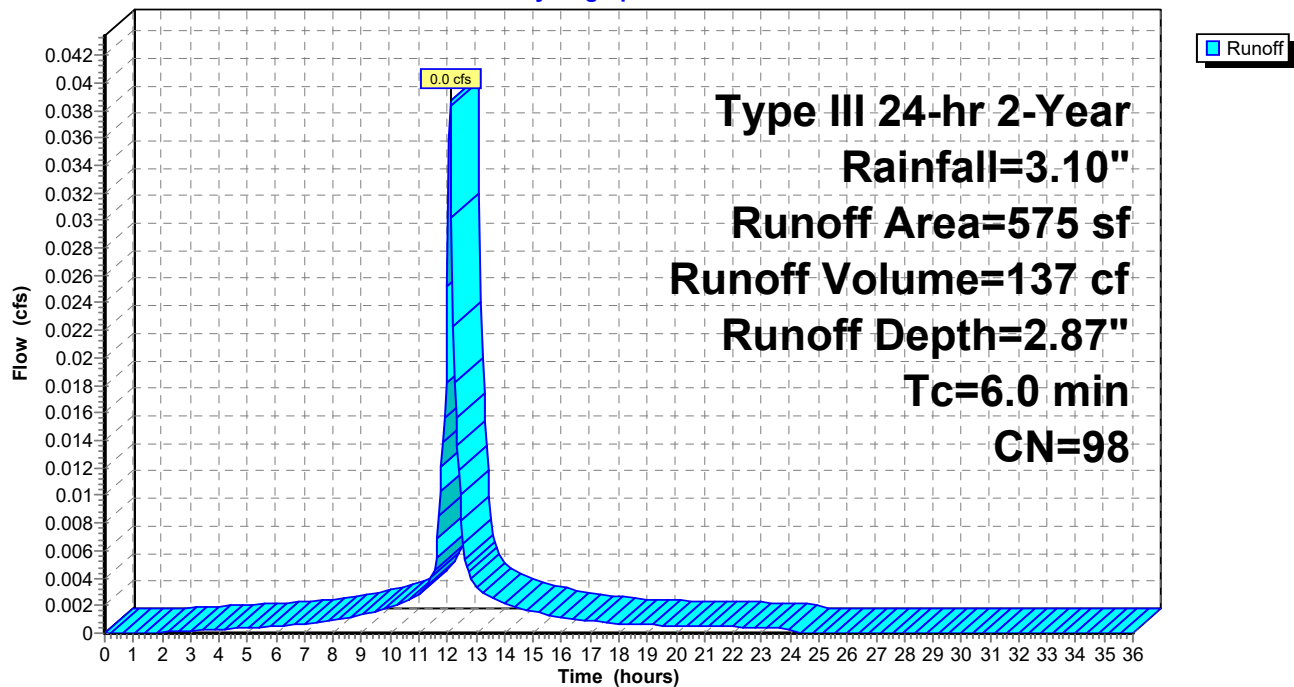
Type III 24-hr 2-Year Rainfall=3.10"

Area (sf)	CN	Description
0	39	>75% Grass cover, Good, HSG A
0	98	Roofs, HSG A
575	98	Paved parking, HSG A
0	30	Woods, Good, HSG A
575	98	Weighted Average
575		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, 6

**Subcatchment Typ. Driveway:**

Hydrograph





**21-10254 - Post-R6**

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Type III 24-hr 2-Year Rainfall=3.10"

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Page 9

**Summary for Subcatchment Typ. Roof:**

Runoff = 0.2 cfs @ 12.09 hrs, Volume= 574 cf, Depth= 2.87"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

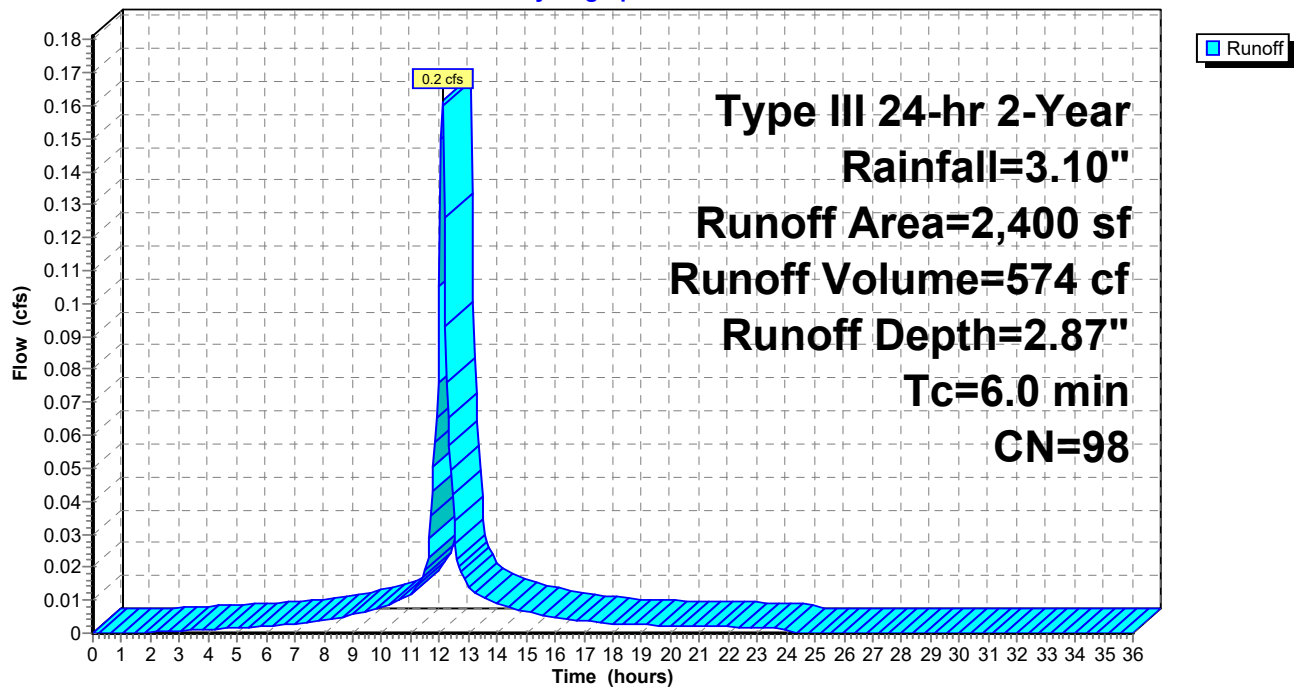
Type III 24-hr 2-Year Rainfall=3.10"

Area (sf)	CN	Description
0	39	>75% Grass cover, Good, HSG A
0	98	Roofs, HSG A
2,400	98	Paved parking, HSG A
0	30	Woods, Good, HSG A
2,400	98	Weighted Average
2,400		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, 6

**Subcatchment Typ. Roof:**

Hydrograph



**21-10254 - Post-R6**

Type III 24-hr 2-Year Rainfall=3.10"

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Page 10

**Summary for Pond Porous Pavement:**

Inflow Area = 575 sf, 100.00% Impervious, Inflow Depth = 2.87" for 2-Year event  
 Inflow = 0.0 cfs @ 12.09 hrs, Volume= 137 cf  
 Outflow = 0.0 cfs @ 12.09 hrs, Volume= 137 cf, Atten= 1%, Lag= 0.2 min  
 Discarded = 0.0 cfs @ 12.09 hrs, Volume= 137 cf

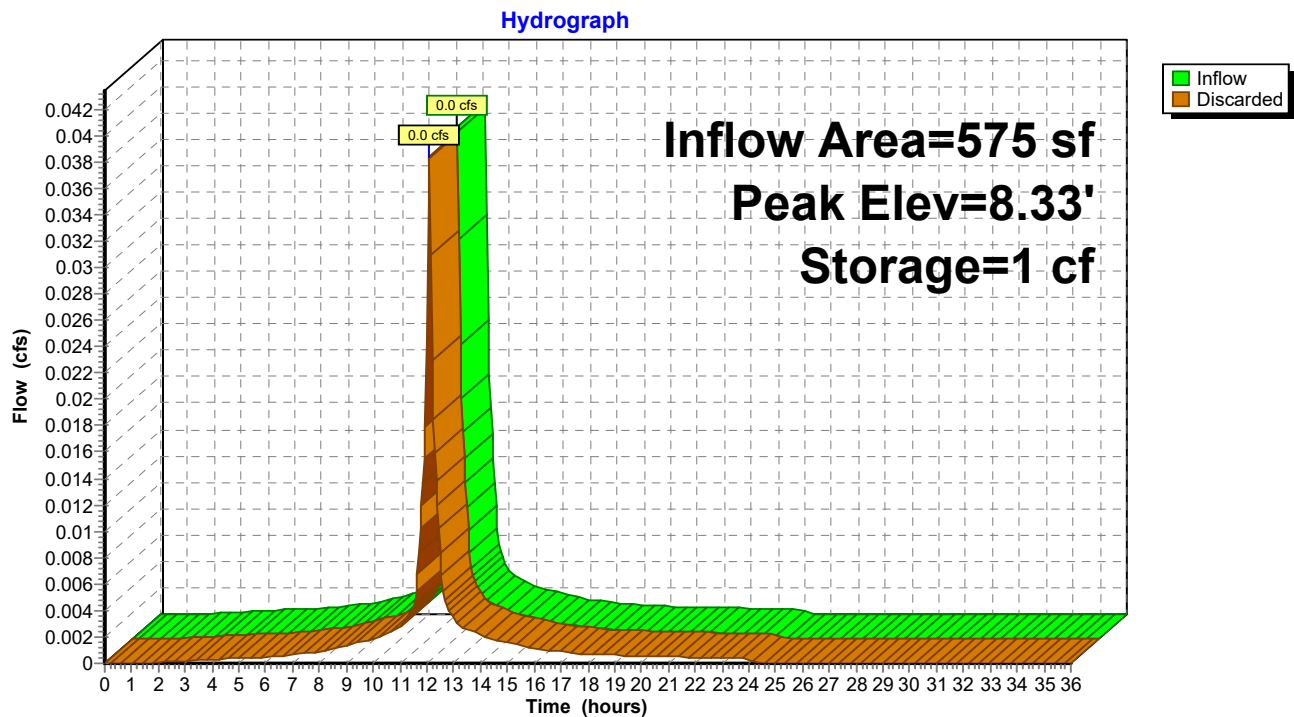
Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 3  
 Peak Elev= 8.33' @ 12.09 hrs Surf.Area= 575 sf Storage= 1 cf

Plug-Flow detention time= 0.3 min calculated for 137 cf (100% of inflow)  
 Center-of-Mass det. time= 0.3 min ( 757.3 - 757.1 )

Volume	Invert	Avail.Storage	Storage Description	
#1	8.33'	380 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)	
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
8.33	575	0.0	0	0
8.34	575	30.0	2	2
10.42	575	30.0	359	361
10.75	575	10.0	19	380

Device	Routing	Invert	Outlet Devices
#1	Discarded	8.33'	<b>8.270 in/hr Exfiltration over Surface area</b>

**Discarded OutFlow** Max=0.1 cfs @ 12.09 hrs HW=8.33' (Free Discharge)  
 ↑ **1=Exfiltration** (Exfiltration Controls 0.1 cfs)

**Pond Porous Pavement:**

**21-10254 - Post-R6**

Type III 24-hr 2-Year Rainfall=3.10"

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Page 12

**Summary for Pond Roof Drywell:**

Inflow Area = 2,400 sf, 100.00% Impervious, Inflow Depth = 2.87" for 2-Year event  
 Inflow = 0.2 cfs @ 12.09 hrs, Volume= 574 cf  
 Outflow = 0.1 cfs @ 11.95 hrs, Volume= 574 cf, Atten= 59%, Lag= 0.0 min  
 Discarded = 0.1 cfs @ 11.95 hrs, Volume= 574 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs  
 Peak Elev= 9.11' @ 12.30 hrs Surf.Area= 347 sf Storage= 61 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)  
 Center-of-Mass det. time= 3.9 min ( 761.0 - 757.1 )

Volume	Invert	Avail.Storage	Storage Description
#1A	8.67'	253 cf	<b>14.83'W x 23.36'L x 2.33'H Field A</b> 809 cf Overall - 177 cf Embedded = 632 cf x 40.0% Voids
#2A	9.17'	177 cf	<b>StormTech SC-310</b> x 12 Inside #1 Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap
		430 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	8.67'	<b>8.270 in/hr Exfiltration over Surface area</b>

**Discarded OutFlow** Max=0.1 cfs @ 11.95 hrs HW=8.70' (Free Discharge)  
 ↑ **1=Exfiltration** (Exfiltration Controls 0.1 cfs)

**21-10254 - Post-R6**

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Type III 24-hr 2-Year Rainfall=3.10"

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Page 13

**Pond Roof Drywell: - Chamber Wizard Field A****Chamber Model = StormTech SC-310**

Effective Size= 28.9"W x 16.0"H =&gt; 2.07 sf x 7.12'L = 14.7 cf

Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap

34.0" Wide + 6.0" Spacing = 40.0" C-C

3 Chambers/Row x 7.12' Long = 21.36' + 12.0" End Stone x 2 = 23.36' Base Length

4 Rows x 34.0" Wide + 6.0" Spacing x 3 + 12.0" Side Stone x 2 = 14.83' Base Width

6.0" Base + 16.0" Chamber Height + 6.0" Cover = 2.33' Field Height

12 Chambers x 14.7 cf = 176.9 cf Chamber Storage

808.5 cf Field - 176.9 cf Chambers = 631.6 cf Stone x 40.0% Voids = 252.6 cf Stone Storage

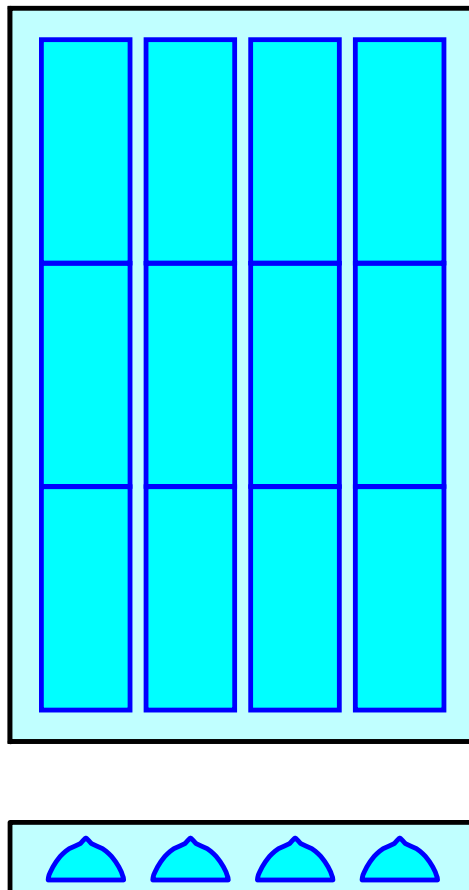
Stone + Chamber Storage = 429.5 cf = 0.010 af

12 Chambers @ \$ 0.00 /ea = \$ 0.00

29.9 cy Field Excavation @ \$ 0.00 /cy = \$ 0.00

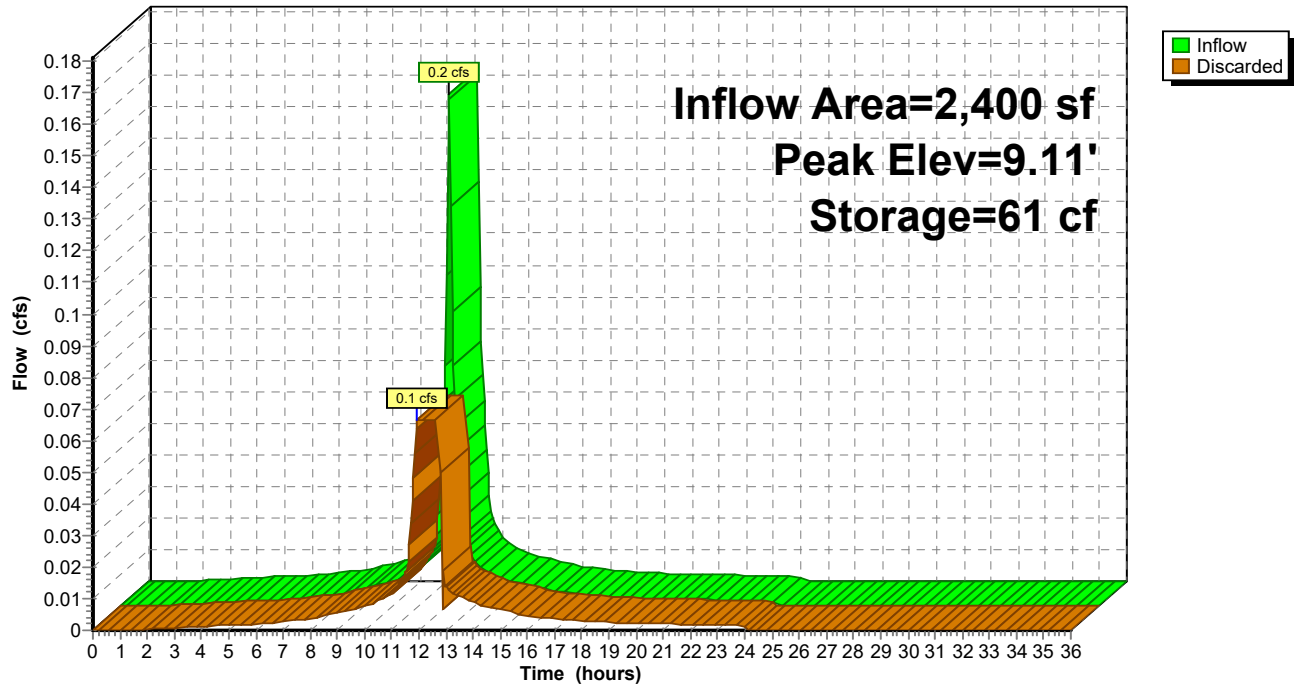
23.4 cy Stone @ \$ 0.00 /cy = \$ 0.00

Total Cost = \$ 0.00



# Pond Roof Drywell:

Hydrograph



**21-10254 - Post-R6***Type III 24-hr 10-Year Rainfall=4.50"*

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Page 15

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points

Runoff by SCS TR-20 method, UH=SCS

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**SubcatchmentPWA-1:**Runoff Area=12,832 sf 0.00% Impervious Runoff Depth=0.07"  
Flow Length=75' Slope=0.0200 '/' Tc=8.7 min CN=37 Runoff=0.0 cfs 71 cf**SubcatchmentPWA-2:**Runoff Area=12,127 sf 0.00% Impervious Runoff Depth=0.07"  
Flow Length=160' Slope=0.0200 '/' Tc=10.2 min CN=37 Runoff=0.0 cfs 67 cf**SubcatchmentTyp. Driveway:**Runoff Area=575 sf 100.00% Impervious Runoff Depth=4.26"  
Tc=6.0 min CN=98 Runoff=0.1 cfs 204 cf**SubcatchmentTyp. Roof:**Runoff Area=2,400 sf 100.00% Impervious Runoff Depth=4.26"  
Tc=6.0 min CN=98 Runoff=0.2 cfs 853 cf**Pond Porous Pavement:**Peak Elev=8.34' Storage=1 cf Inflow=0.1 cfs 204 cf  
Outflow=0.1 cfs 204 cf**Pond Roof Drywell:**Peak Elev=9.47' Storage=146 cf Inflow=0.2 cfs 853 cf  
Outflow=0.1 cfs 853 cf**Total Runoff Area = 27,934 sf Runoff Volume = 1,195 cf Average Runoff Depth = 0.51"**  
**89.35% Pervious = 24,959 sf 10.65% Impervious = 2,975 sf**

**21-10254 - Post-R6**

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Type III 24-hr 10-Year Rainfall=4.50"

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Page 16

**Summary for Subcatchment PWA-1:**

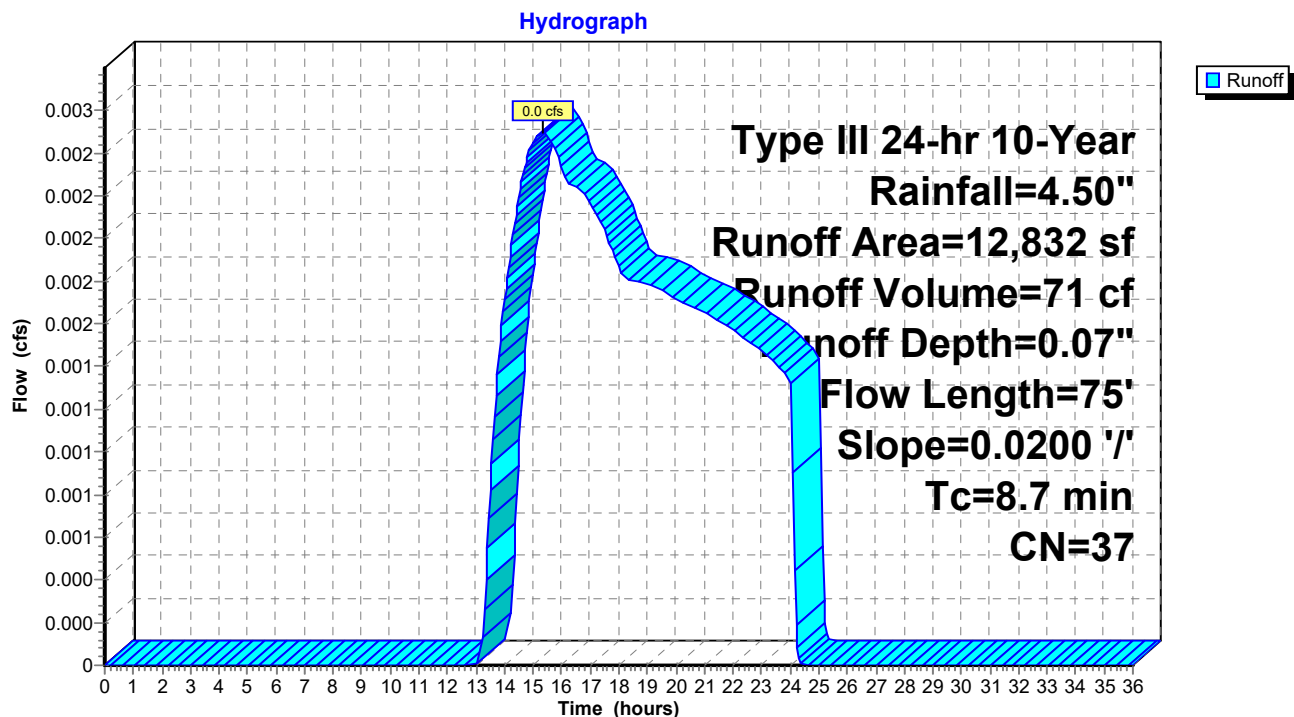
Runoff = 0.0 cfs @ 15.32 hrs, Volume= 71 cf, Depth= 0.07"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Type III 24-hr 10-Year Rainfall=4.50"

Area (sf)	CN	Description
10,632	39	>75% Grass cover, Good, HSG A
0	98	Roofs, HSG A
0	98	Paved parking, HSG A
2,200	30	Woods, Good, HSG A
12,832	37	Weighted Average
12,832		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	50	0.0200	0.10		<b>Sheet Flow,</b> Grass: Dense n= 0.240 P2= 3.10"
0.4	25	0.0200	0.99		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
8.7	75	Total			

**Subcatchment PWA-1:**



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Type III 24-hr 10-Year Rainfall=4.50"

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Page 17

**Summary for Subcatchment PWA-2:**

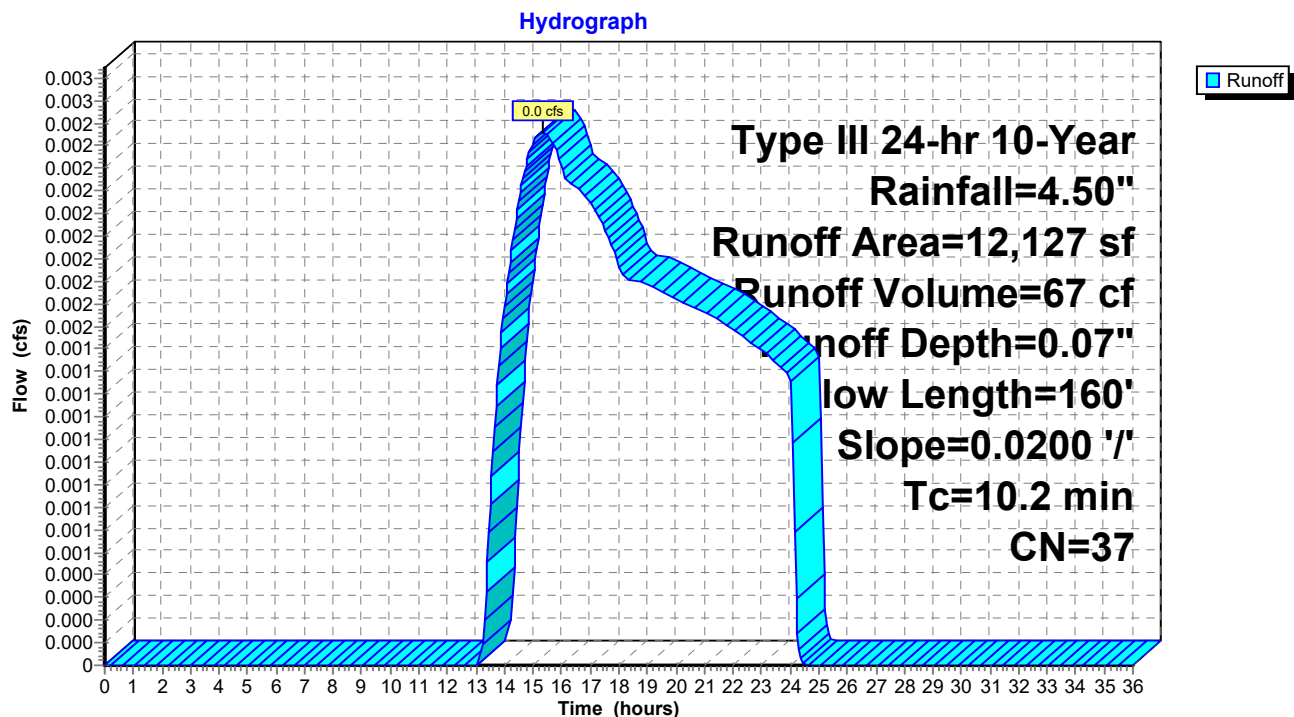
Runoff = 0.0 cfs @ 15.35 hrs, Volume= 67 cf, Depth= 0.07"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Type III 24-hr 10-Year Rainfall=4.50"

Area (sf)	CN	Description
9,427	39	>75% Grass cover, Good, HSG A
0	98	Roofs, HSG A
0	98	Paved parking, HSG A
2,700	30	Woods, Good, HSG A
12,127	37	Weighted Average
12,127		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	50	0.0200	0.10		<b>Sheet Flow,</b> Grass: Dense n= 0.240 P2= 3.10"
1.9	110	0.0200	0.99		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
10.2	160	Total			

**Subcatchment PWA-2:**

**21-10254 - Post-R6**

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Type III 24-hr 10-Year Rainfall=4.50"

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Page 18

**Summary for Subcatchment Typ. Driveway:**

Runoff = 0.1 cfs @ 12.09 hrs, Volume= 204 cf, Depth= 4.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

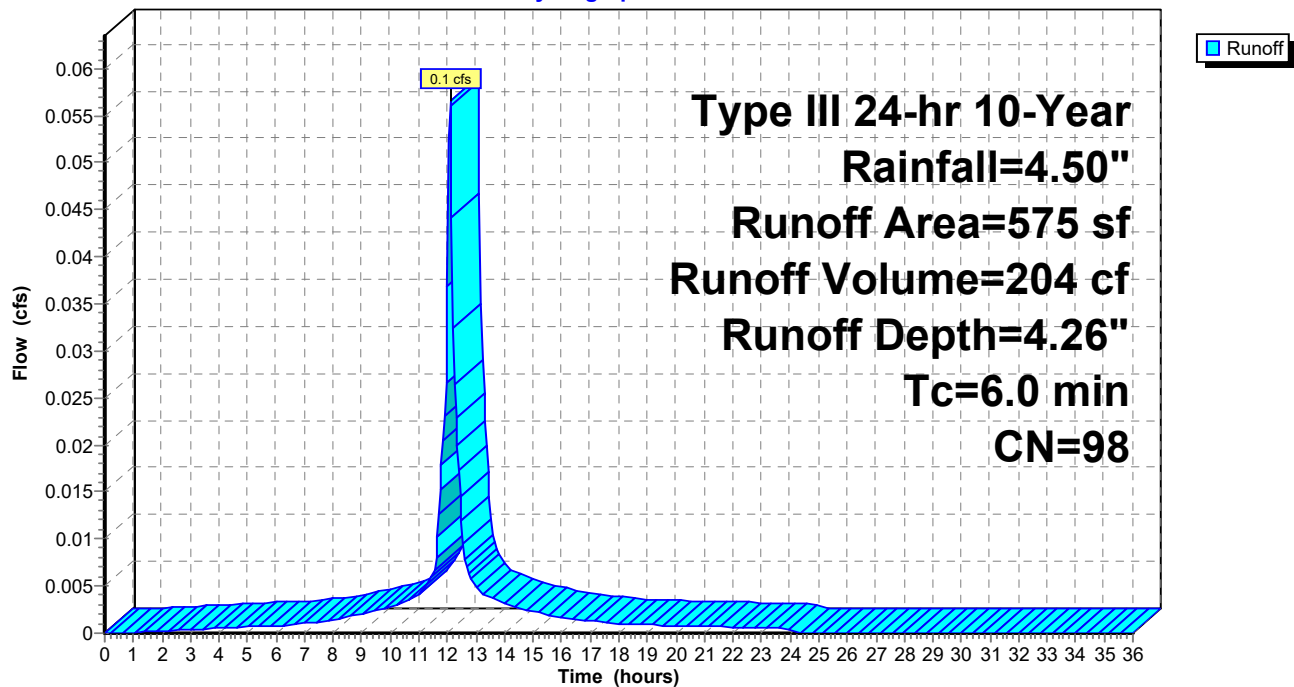
Type III 24-hr 10-Year Rainfall=4.50"

Area (sf)	CN	Description
0	39	>75% Grass cover, Good, HSG A
0	98	Roofs, HSG A
575	98	Paved parking, HSG A
0	30	Woods, Good, HSG A
575	98	Weighted Average
575		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, 6

**Subcatchment Typ. Driveway:**

Hydrograph



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Type III 24-hr 10-Year Rainfall=4.50"

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Page 19

**Summary for Subcatchment Typ. Roof:**

Runoff = 0.2 cfs @ 12.09 hrs, Volume= 853 cf, Depth= 4.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

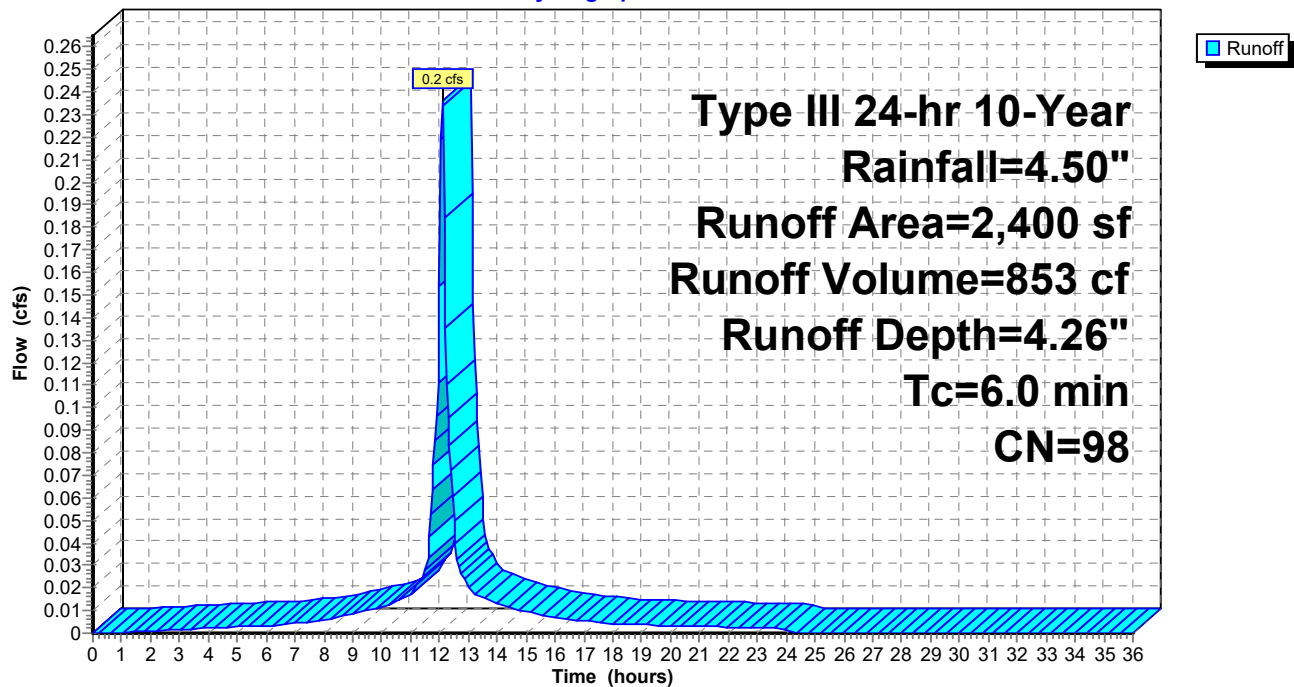
Type III 24-hr 10-Year Rainfall=4.50"

Area (sf)	CN	Description
0	39	>75% Grass cover, Good, HSG A
0	98	Roofs, HSG A
2,400	98	Paved parking, HSG A
0	30	Woods, Good, HSG A
2,400	98	Weighted Average
2,400		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, 6

**Subcatchment Typ. Roof:**

Hydrograph



**21-10254 - Post-R6**

Type III 24-hr 10-Year Rainfall=4.50"

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Page 20

**Summary for Pond Porous Pavement:**

Inflow Area = 575 sf, 100.00% Impervious, Inflow Depth = 4.26" for 10-Year event  
 Inflow = 0.1 cfs @ 12.09 hrs, Volume= 204 cf  
 Outflow = 0.1 cfs @ 12.09 hrs, Volume= 204 cf, Atten= 1%, Lag= 0.2 min  
 Discarded = 0.1 cfs @ 12.09 hrs, Volume= 204 cf

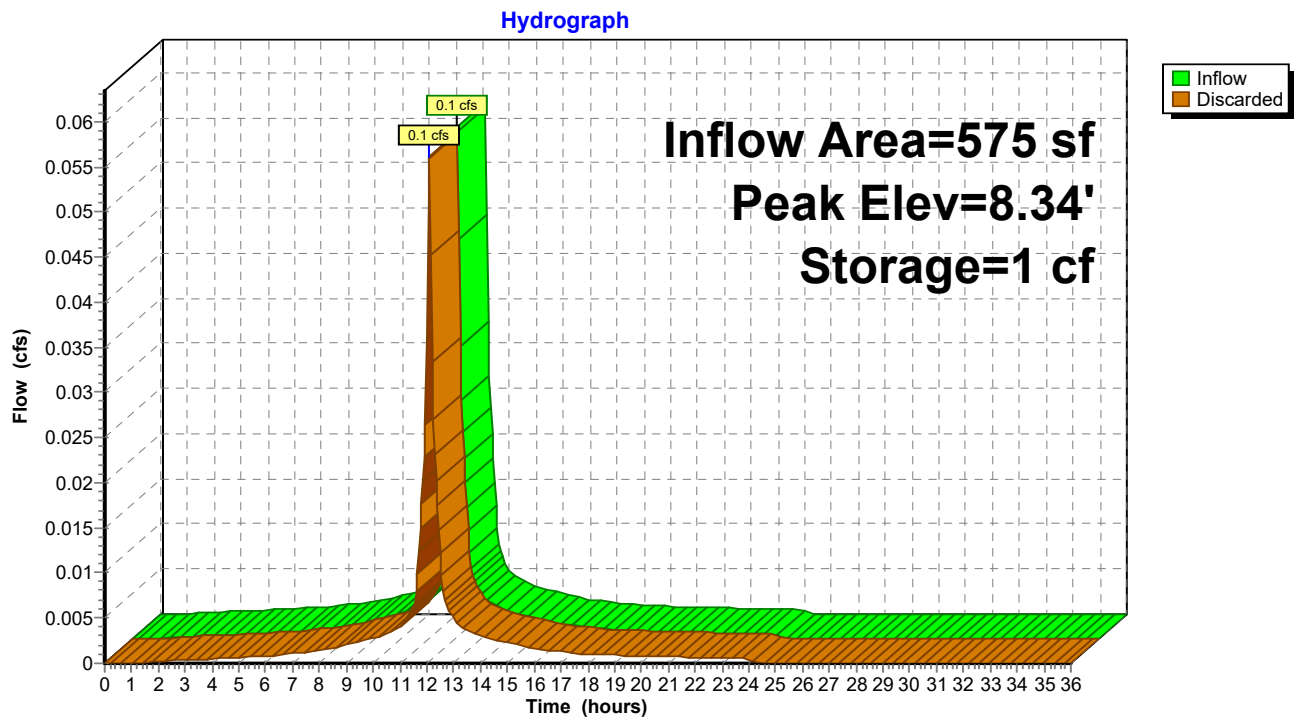
Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 3  
 Peak Elev= 8.34' @ 12.09 hrs Surf.Area= 575 sf Storage= 1 cf

Plug-Flow detention time= 0.3 min calculated for 204 cf (100% of inflow)  
 Center-of-Mass det. time= 0.3 min ( 750.1 - 749.8 )

Volume	Invert	Avail.Storage	Storage Description	
#1	8.33'	380 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)	
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
8.33	575	0.0	0	0
8.34	575	30.0	2	2
10.42	575	30.0	359	361
10.75	575	10.0	19	380

Device	Routing	Invert	Outlet Devices
#1	Discarded	8.33'	<b>8.270 in/hr Exfiltration over Surface area</b>

**Discarded OutFlow** Max=0.1 cfs @ 12.09 hrs HW=8.33' (Free Discharge)  
 ↑ **1=Exfiltration** (Exfiltration Controls 0.1 cfs)

**Pond Porous Pavement:**

**21-10254 - Post-R6**

Type III 24-hr 10-Year Rainfall=4.50"

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Page 22

**Summary for Pond Roof Drywell:**

Inflow Area = 2,400 sf, 100.00% Impervious, Inflow Depth = 4.26" for 10-Year event  
 Inflow = 0.2 cfs @ 12.09 hrs, Volume= 853 cf  
 Outflow = 0.1 cfs @ 11.80 hrs, Volume= 853 cf, Atten= 72%, Lag= 0.0 min  
 Discarded = 0.1 cfs @ 11.80 hrs, Volume= 853 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs  
 Peak Elev= 9.47' @ 12.43 hrs Surf.Area= 347 sf Storage= 146 cf

Plug-Flow detention time= 9.8 min calculated for 852 cf (100% of inflow)  
 Center-of-Mass det. time= 9.8 min ( 759.6 - 749.8 )

Volume	Invert	Avail.Storage	Storage Description
#1A	8.67'	253 cf	<b>14.83'W x 23.36'L x 2.33'H Field A</b> 809 cf Overall - 177 cf Embedded = 632 cf x 40.0% Voids
#2A	9.17'	177 cf	<b>StormTech SC-310</b> x 12 Inside #1 Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap
		430 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	8.67'	<b>8.270 in/hr Exfiltration over Surface area</b>

Discarded OutFlow Max=0.1 cfs @ 11.80 hrs HW=8.70' (Free Discharge)

↑1=Exfiltration (Exfiltration Controls 0.1 cfs)

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Type III 24-hr 10-Year Rainfall=4.50"

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Page 23

**Pond Roof Drywell: - Chamber Wizard Field A****Chamber Model = StormTech SC-310**

Effective Size= 28.9"W x 16.0"H =&gt; 2.07 sf x 7.12'L = 14.7 cf

Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap

34.0" Wide + 6.0" Spacing = 40.0" C-C

3 Chambers/Row x 7.12' Long = 21.36' + 12.0" End Stone x 2 = 23.36' Base Length

4 Rows x 34.0" Wide + 6.0" Spacing x 3 + 12.0" Side Stone x 2 = 14.83' Base Width

6.0" Base + 16.0" Chamber Height + 6.0" Cover = 2.33' Field Height

12 Chambers x 14.7 cf = 176.9 cf Chamber Storage

808.5 cf Field - 176.9 cf Chambers = 631.6 cf Stone x 40.0% Voids = 252.6 cf Stone Storage

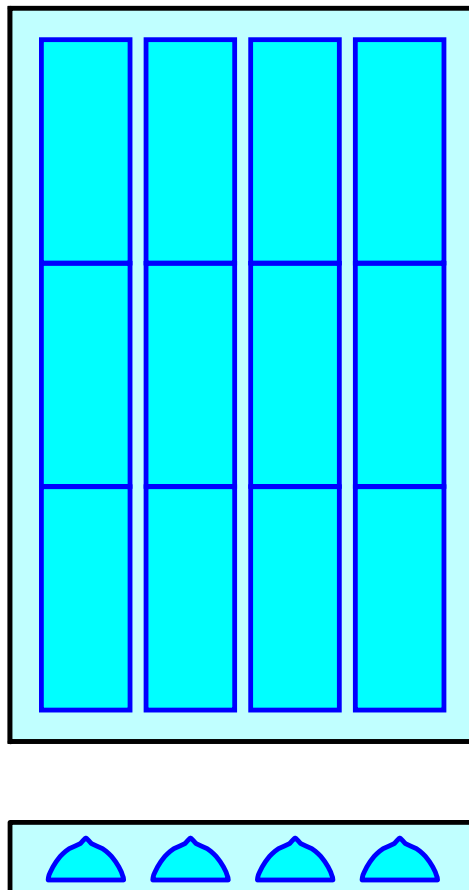
Stone + Chamber Storage = 429.5 cf = 0.010 af

12 Chambers @ \$ 0.00 /ea = \$ 0.00

29.9 cy Field Excavation @ \$ 0.00 /cy = \$ 0.00

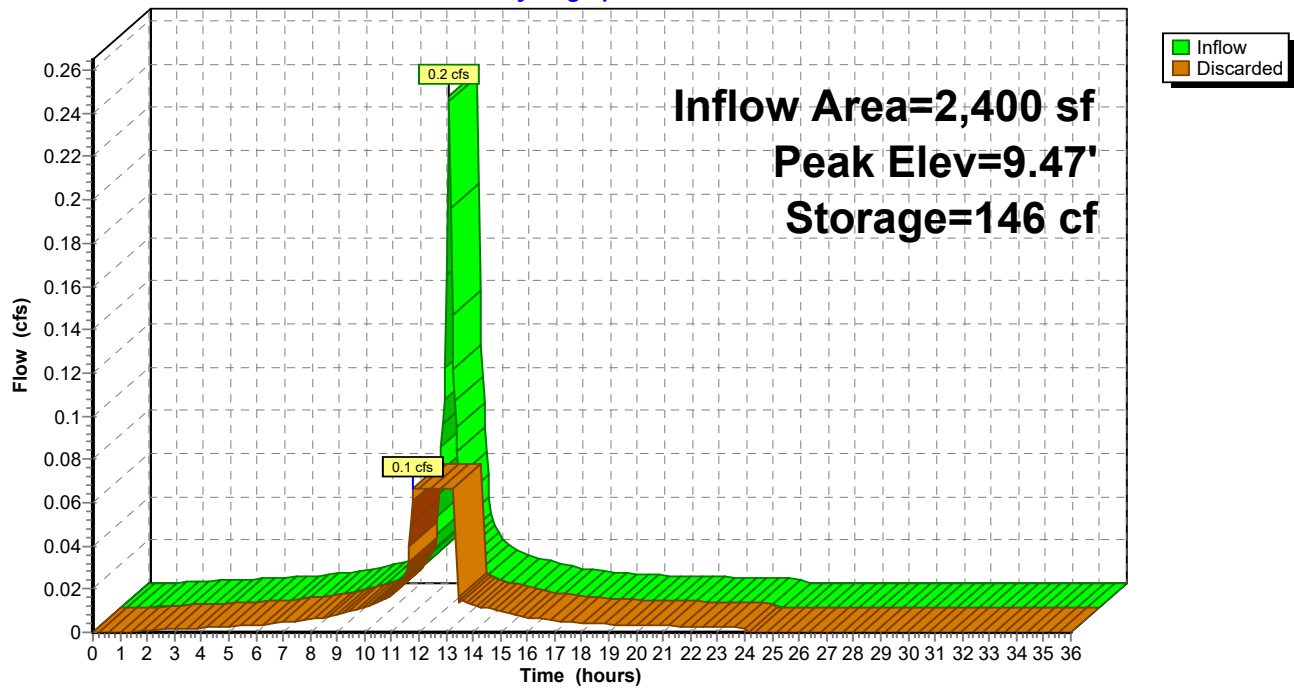
23.4 cy Stone @ \$ 0.00 /cy = \$ 0.00

Total Cost = \$ 0.00



**Pond Roof Drywell:**

Hydrograph





**21-10254 - Post-R6***Type III 24-hr 25-Year Rainfall=5.30"*

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Page 25

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points

Runoff by SCS TR-20 method, UH=SCS

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**SubcatchmentPWA-1:**Runoff Area=12,832 sf 0.00% Impervious Runoff Depth=0.19"  
Flow Length=75' Slope=0.0200 '/' Tc=8.7 min CN=37 Runoff=0.0 cfs 203 cf**SubcatchmentPWA-2:**Runoff Area=12,127 sf 0.00% Impervious Runoff Depth=0.19"  
Flow Length=160' Slope=0.0200 '/' Tc=10.2 min CN=37 Runoff=0.0 cfs 192 cf**SubcatchmentTyp. Driveway:**Runoff Area=575 sf 100.00% Impervious Runoff Depth=5.06"  
Tc=6.0 min CN=98 Runoff=0.1 cfs 243 cf**SubcatchmentTyp. Roof:**Runoff Area=2,400 sf 100.00% Impervious Runoff Depth=5.06"  
Tc=6.0 min CN=98 Runoff=0.3 cfs 1,013 cf**Pond Porous Pavement:**Peak Elev=8.34' Storage=1 cf Inflow=0.1 cfs 243 cf  
Outflow=0.1 cfs 243 cf**Pond Roof Drywell:**Peak Elev=9.69' Storage=202 cf Inflow=0.3 cfs 1,013 cf  
Outflow=0.1 cfs 1,013 cf**Total Runoff Area = 27,934 sf Runoff Volume = 1,650 cf Average Runoff Depth = 0.71"**  
**89.35% Pervious = 24,959 sf 10.65% Impervious = 2,975 sf**

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Type III 24-hr 25-Year Rainfall=5.30"

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Page 26

**Summary for Subcatchment PWA-1:**

Runoff = 0.0 cfs @ 13.66 hrs, Volume= 203 cf, Depth= 0.19"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

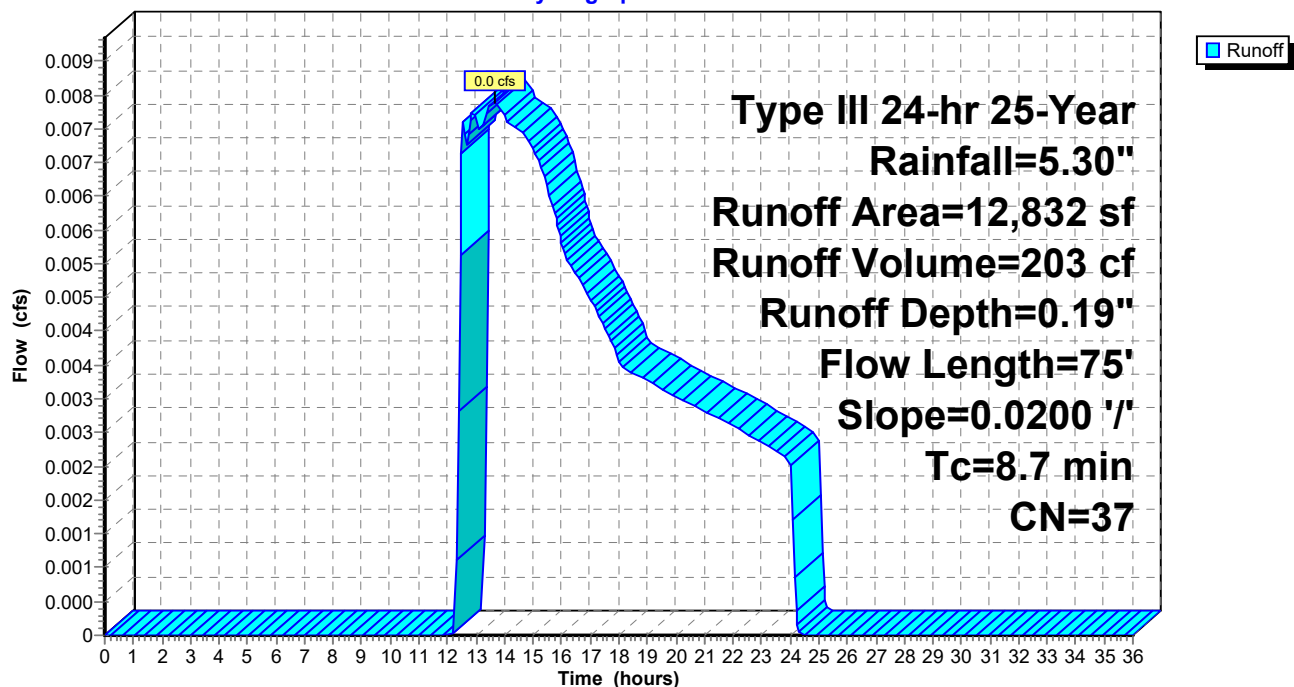
Type III 24-hr 25-Year Rainfall=5.30"

Area (sf)	CN	Description
10,632	39	>75% Grass cover, Good, HSG A
0	98	Roofs, HSG A
0	98	Paved parking, HSG A
2,200	30	Woods, Good, HSG A
12,832	37	Weighted Average
12,832		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	50	0.0200	0.10		<b>Sheet Flow,</b> Grass: Dense n= 0.240 P2= 3.10"
0.4	25	0.0200	0.99		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
8.7	75	Total			

**Subcatchment PWA-1:**

Hydrograph



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Type III 24-hr 25-Year Rainfall=5.30"

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Page 27

**Summary for Subcatchment PWA-2:**

Runoff = 0.0 cfs @ 13.69 hrs, Volume= 192 cf, Depth= 0.19"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

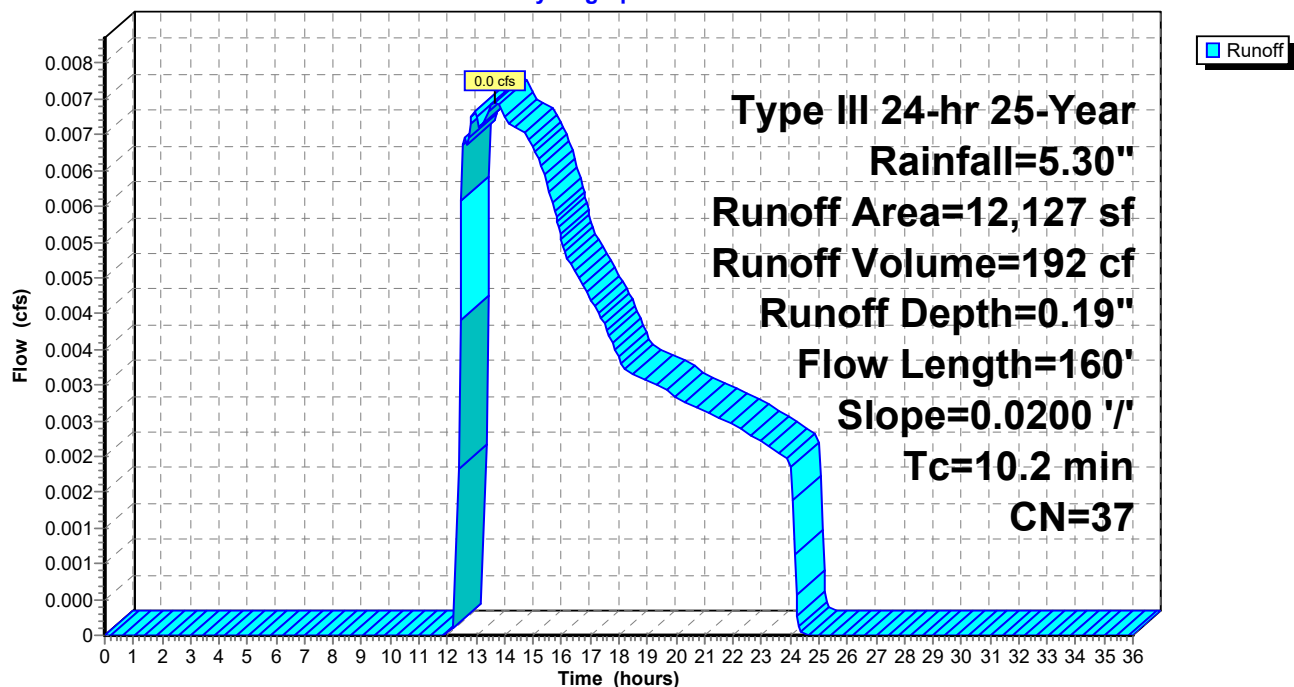
Type III 24-hr 25-Year Rainfall=5.30"

Area (sf)	CN	Description
9,427	39	>75% Grass cover, Good, HSG A
0	98	Roofs, HSG A
0	98	Paved parking, HSG A
2,700	30	Woods, Good, HSG A
12,127	37	Weighted Average
12,127		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	50	0.0200	0.10		<b>Sheet Flow,</b> Grass: Dense n= 0.240 P2= 3.10"
1.9	110	0.0200	0.99		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
10.2	160	Total			

**Subcatchment PWA-2:**

Hydrograph



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Type III 24-hr 25-Year Rainfall=5.30"

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Page 28

**Summary for Subcatchment Typ. Driveway:**

Runoff = 0.1 cfs @ 12.09 hrs, Volume= 243 cf, Depth= 5.06"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

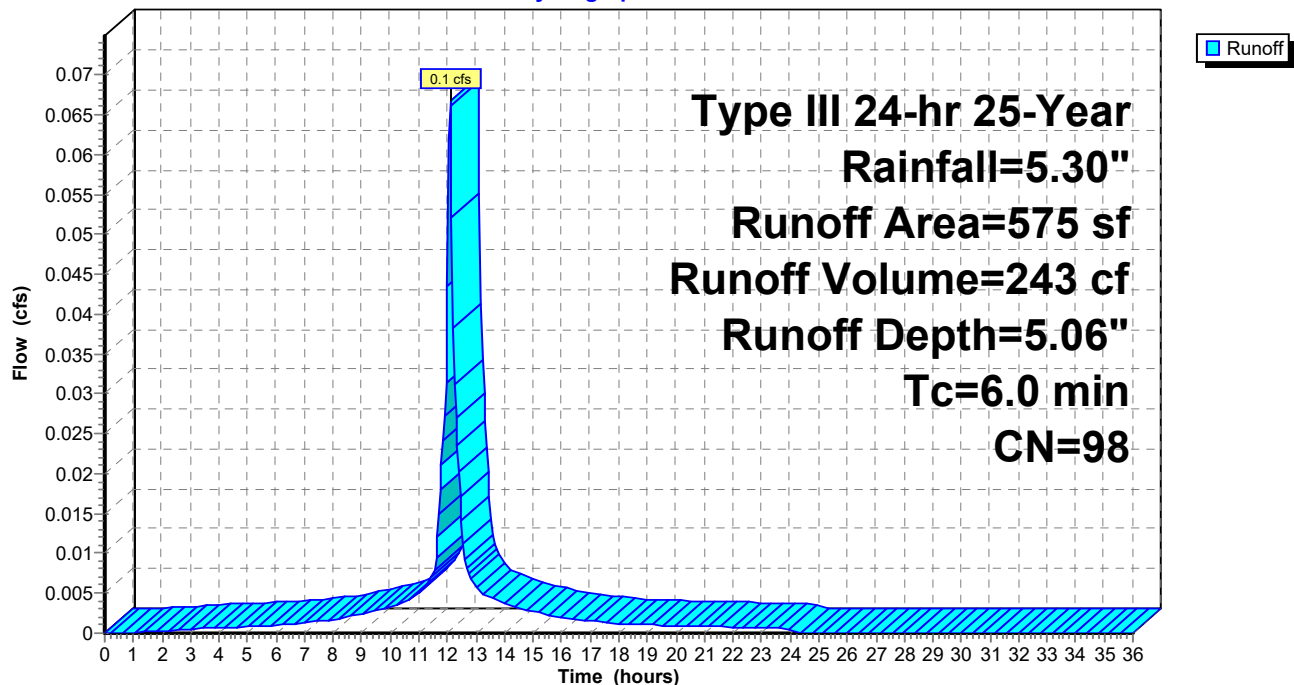
Type III 24-hr 25-Year Rainfall=5.30"

Area (sf)	CN	Description
0	39	>75% Grass cover, Good, HSG A
0	98	Roofs, HSG A
575	98	Paved parking, HSG A
0	30	Woods, Good, HSG A
575	98	Weighted Average
575		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, 6

**Subcatchment Typ. Driveway:**

Hydrograph



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Type III 24-hr 25-Year Rainfall=5.30"

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Page 29

**Summary for Subcatchment Typ. Roof:**

Runoff = 0.3 cfs @ 12.09 hrs, Volume= 1,013 cf, Depth= 5.06"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

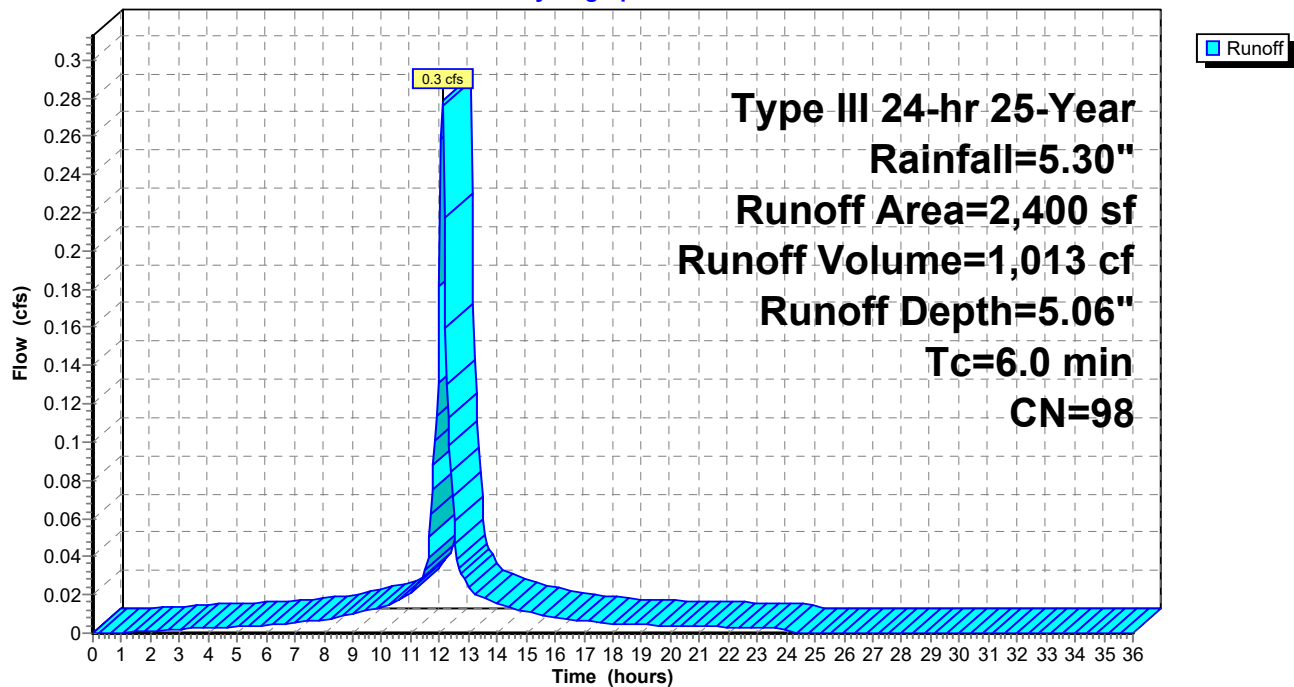
Type III 24-hr 25-Year Rainfall=5.30"

Area (sf)	CN	Description
0	39	>75% Grass cover, Good, HSG A
0	98	Roofs, HSG A
2,400	98	Paved parking, HSG A
0	30	Woods, Good, HSG A
2,400	98	Weighted Average
2,400		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, 6

**Subcatchment Typ. Roof:**

Hydrograph



**21-10254 - Post-R6**

Type III 24-hr 25-Year Rainfall=5.30"

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Page 30

**Summary for Pond Porous Pavement:**

Inflow Area = 575 sf, 100.00% Impervious, Inflow Depth = 5.06" for 25-Year event  
 Inflow = 0.1 cfs @ 12.09 hrs, Volume= 243 cf  
 Outflow = 0.1 cfs @ 12.09 hrs, Volume= 243 cf, Atten= 1%, Lag= 0.2 min  
 Discarded = 0.1 cfs @ 12.09 hrs, Volume= 243 cf

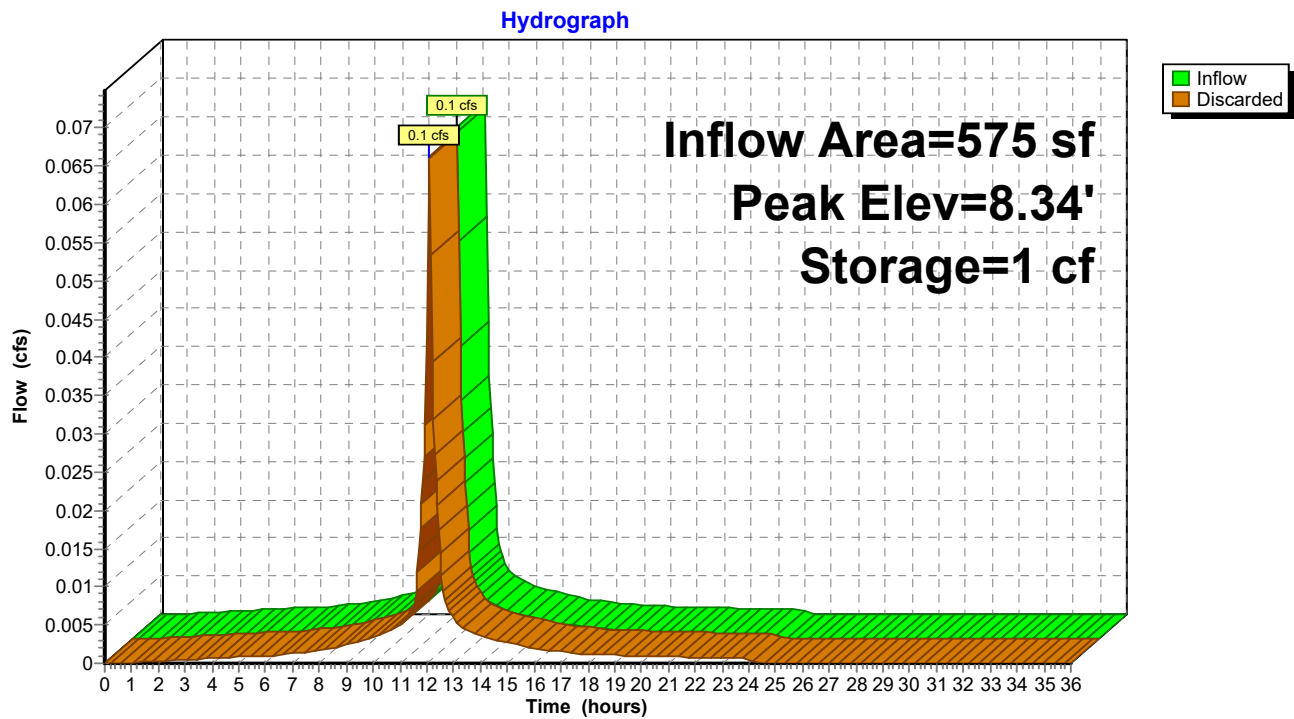
Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 3  
 Peak Elev= 8.34' @ 12.09 hrs Surf.Area= 575 sf Storage= 1 cf

Plug-Flow detention time= 0.3 min calculated for 242 cf (100% of inflow)  
 Center-of-Mass det. time= 0.3 min ( 747.3 - 747.1 )

Volume	Invert	Avail.Storage	Storage Description	
#1	8.33'	380 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)	
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
8.33	575	0.0	0	0
8.34	575	30.0	2	2
10.42	575	30.0	359	361
10.75	575	10.0	19	380

Device	Routing	Invert	Outlet Devices
#1	Discarded	8.33'	<b>8.270 in/hr Exfiltration over Surface area</b>

**Discarded OutFlow** Max=0.1 cfs @ 12.09 hrs HW=8.34' (Free Discharge)  
 ↑ **1=Exfiltration** (Exfiltration Controls 0.1 cfs)

**Pond Porous Pavement:**

**21-10254 - Post-R6**

Type III 24-hr 25-Year Rainfall=5.30"

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Page 32

**Summary for Pond Roof Drywell:**

Inflow Area = 2,400 sf, 100.00% Impervious, Inflow Depth = 5.06" for 25-Year event  
 Inflow = 0.3 cfs @ 12.09 hrs, Volume= 1,013 cf  
 Outflow = 0.1 cfs @ 11.75 hrs, Volume= 1,013 cf, Atten= 76%, Lag= 0.0 min  
 Discarded = 0.1 cfs @ 11.75 hrs, Volume= 1,013 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs  
 Peak Elev= 9.69' @ 12.47 hrs Surf.Area= 347 sf Storage= 202 cf

Plug-Flow detention time= 14.2 min calculated for 1,011 cf (100% of inflow)  
 Center-of-Mass det. time= 14.2 min ( 761.2 - 747.1 )

Volume	Invert	Avail.Storage	Storage Description
#1A	8.67'	253 cf	<b>14.83'W x 23.36'L x 2.33'H Field A</b> 809 cf Overall - 177 cf Embedded = 632 cf x 40.0% Voids
#2A	9.17'	177 cf	<b>StormTech SC-310</b> x 12 Inside #1 Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap
		430 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	8.67'	<b>8.270 in/hr Exfiltration over Surface area</b>

**Discarded OutFlow** Max=0.1 cfs @ 11.75 hrs HW=8.70' (Free Discharge)  
 ↑ **1=Exfiltration** (Exfiltration Controls 0.1 cfs)



**21-10254 - Post-R6**

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Type III 24-hr 25-Year Rainfall=5.30"

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Page 33

**Pond Roof Drywell: - Chamber Wizard Field A****Chamber Model = StormTech SC-310**

Effective Size= 28.9"W x 16.0"H =&gt; 2.07 sf x 7.12'L = 14.7 cf

Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap

34.0" Wide + 6.0" Spacing = 40.0" C-C

3 Chambers/Row x 7.12' Long = 21.36' + 12.0" End Stone x 2 = 23.36' Base Length

4 Rows x 34.0" Wide + 6.0" Spacing x 3 + 12.0" Side Stone x 2 = 14.83' Base Width

6.0" Base + 16.0" Chamber Height + 6.0" Cover = 2.33' Field Height

12 Chambers x 14.7 cf = 176.9 cf Chamber Storage

808.5 cf Field - 176.9 cf Chambers = 631.6 cf Stone x 40.0% Voids = 252.6 cf Stone Storage

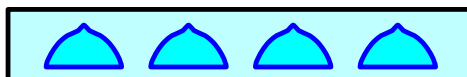
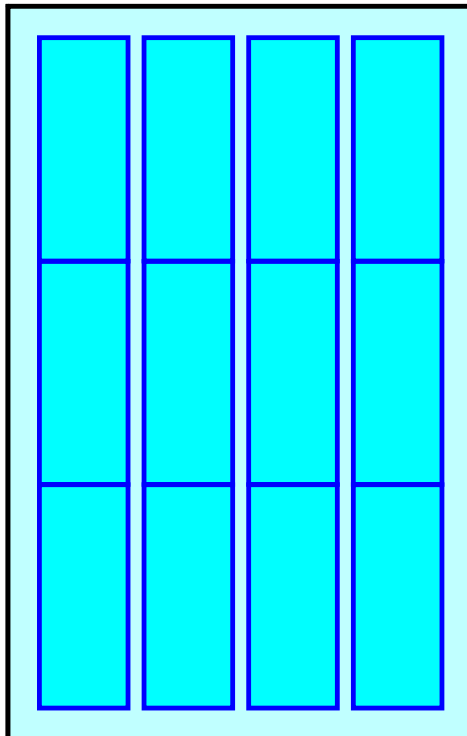
Stone + Chamber Storage = 429.5 cf = 0.010 af

12 Chambers @ \$ 0.00 /ea = \$ 0.00

29.9 cy Field Excavation @ \$ 0.00 /cy = \$ 0.00

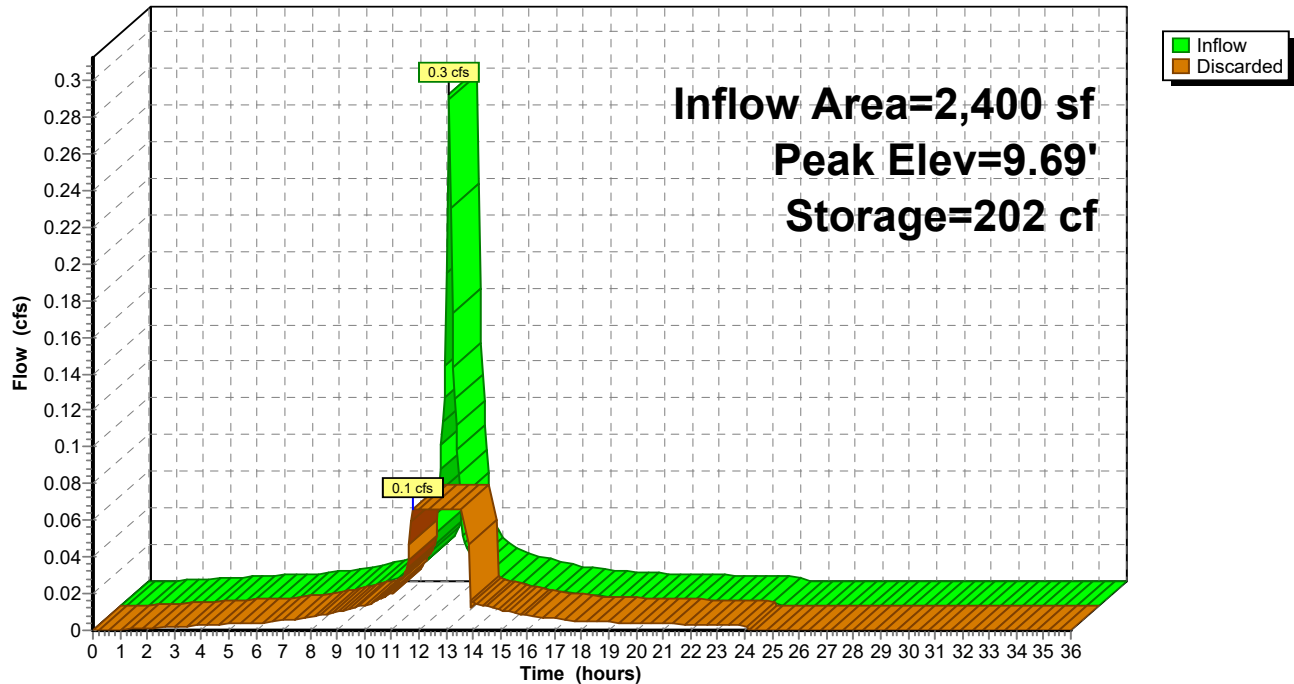
23.4 cy Stone @ \$ 0.00 /cy = \$ 0.00

Total Cost = \$ 0.00



# Pond Roof Drywell:

## Hydrograph



**21-10254 - Post-R6***Type III 24-hr 50-Year Rainfall=5.90"*

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Page 35

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points

Runoff by SCS TR-20 method, UH=SCS

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**SubcatchmentPWA-1:**Runoff Area=12,832 sf 0.00% Impervious Runoff Depth=0.32"  
Flow Length=75' Slope=0.0200 '/' Tc=8.7 min CN=37 Runoff=0.0 cfs 341 cf**SubcatchmentPWA-2:**Runoff Area=12,127 sf 0.00% Impervious Runoff Depth=0.32"  
Flow Length=160' Slope=0.0200 '/' Tc=10.2 min CN=37 Runoff=0.0 cfs 322 cf**SubcatchmentTyp. Driveway:**Runoff Area=575 sf 100.00% Impervious Runoff Depth=5.66"  
Tc=6.0 min CN=98 Runoff=0.1 cfs 271 cf**SubcatchmentTyp. Roof:**Runoff Area=2,400 sf 100.00% Impervious Runoff Depth=5.66"  
Tc=6.0 min CN=98 Runoff=0.3 cfs 1,132 cf**Pond Porous Pavement:**Peak Elev=8.34' Storage=1 cf Inflow=0.1 cfs 271 cf  
Outflow=0.1 cfs 271 cf**Pond Roof Drywell:**Peak Elev=9.88' Storage=246 cf Inflow=0.3 cfs 1,132 cf  
Outflow=0.1 cfs 1,132 cf**Total Runoff Area = 27,934 sf Runoff Volume = 2,067 cf Average Runoff Depth = 0.89"**  
**89.35% Pervious = 24,959 sf 10.65% Impervious = 2,975 sf**

**21-10254 - Post-R6**

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Type III 24-hr 50-Year Rainfall=5.90"

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Page 36

**Summary for Subcatchment PWA-1:**

Runoff = 0.0 cfs @ 12.45 hrs, Volume= 341 cf, Depth= 0.32"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

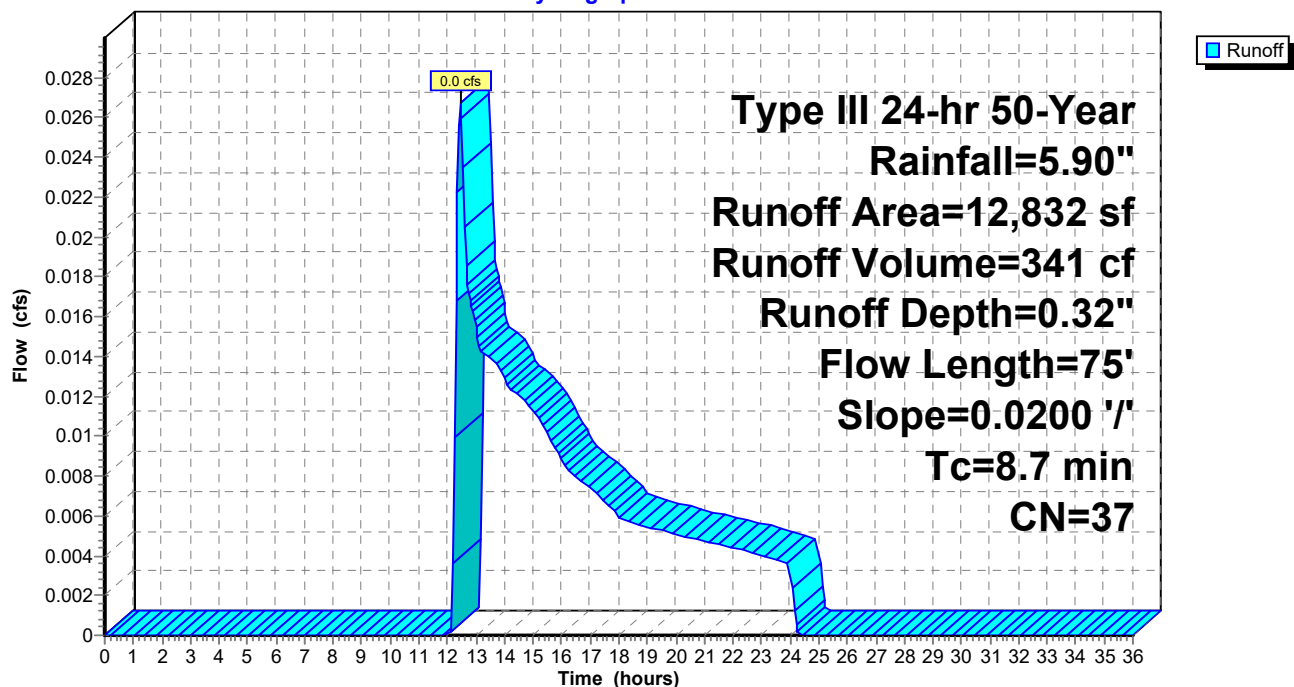
Type III 24-hr 50-Year Rainfall=5.90"

Area (sf)	CN	Description
10,632	39	>75% Grass cover, Good, HSG A
0	98	Roofs, HSG A
0	98	Paved parking, HSG A
2,200	30	Woods, Good, HSG A
12,832	37	Weighted Average
12,832		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	50	0.0200	0.10		<b>Sheet Flow,</b> Grass: Dense n= 0.240 P2= 3.10"
0.4	25	0.0200	0.99		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
8.7	75	Total			

**Subcatchment PWA-1:**

Hydrograph



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Type III 24-hr 50-Year Rainfall=5.90"

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Page 37

**Summary for Subcatchment PWA-2:**

Runoff = 0.0 cfs @ 12.48 hrs, Volume= 322 cf, Depth= 0.32"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

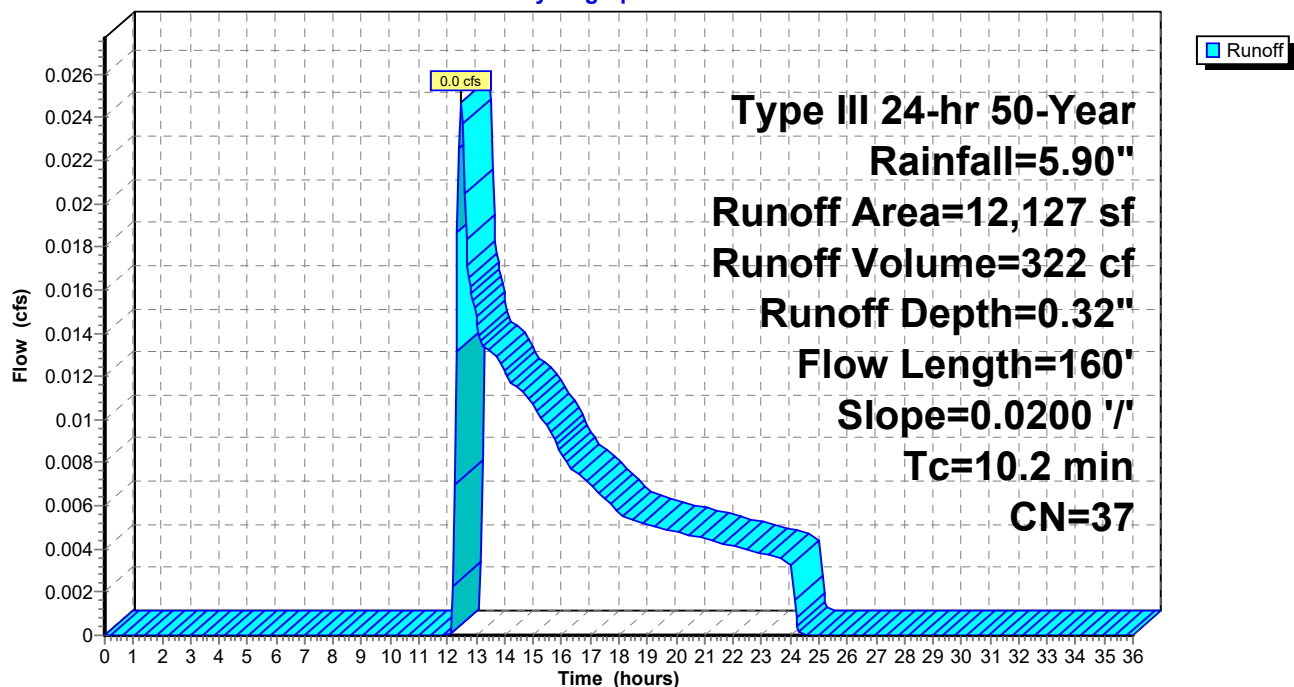
Type III 24-hr 50-Year Rainfall=5.90"

Area (sf)	CN	Description
9,427	39	>75% Grass cover, Good, HSG A
0	98	Roofs, HSG A
0	98	Paved parking, HSG A
2,700	30	Woods, Good, HSG A
12,127	37	Weighted Average
12,127		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	50	0.0200	0.10		<b>Sheet Flow,</b> Grass: Dense n= 0.240 P2= 3.10"
1.9	110	0.0200	0.99		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
10.2	160	Total			

**Subcatchment PWA-2:**

Hydrograph



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Type III 24-hr 50-Year Rainfall=5.90"

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Page 38

**Summary for Subcatchment Typ. Driveway:**

Runoff = 0.1 cfs @ 12.09 hrs, Volume= 271 cf, Depth= 5.66"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

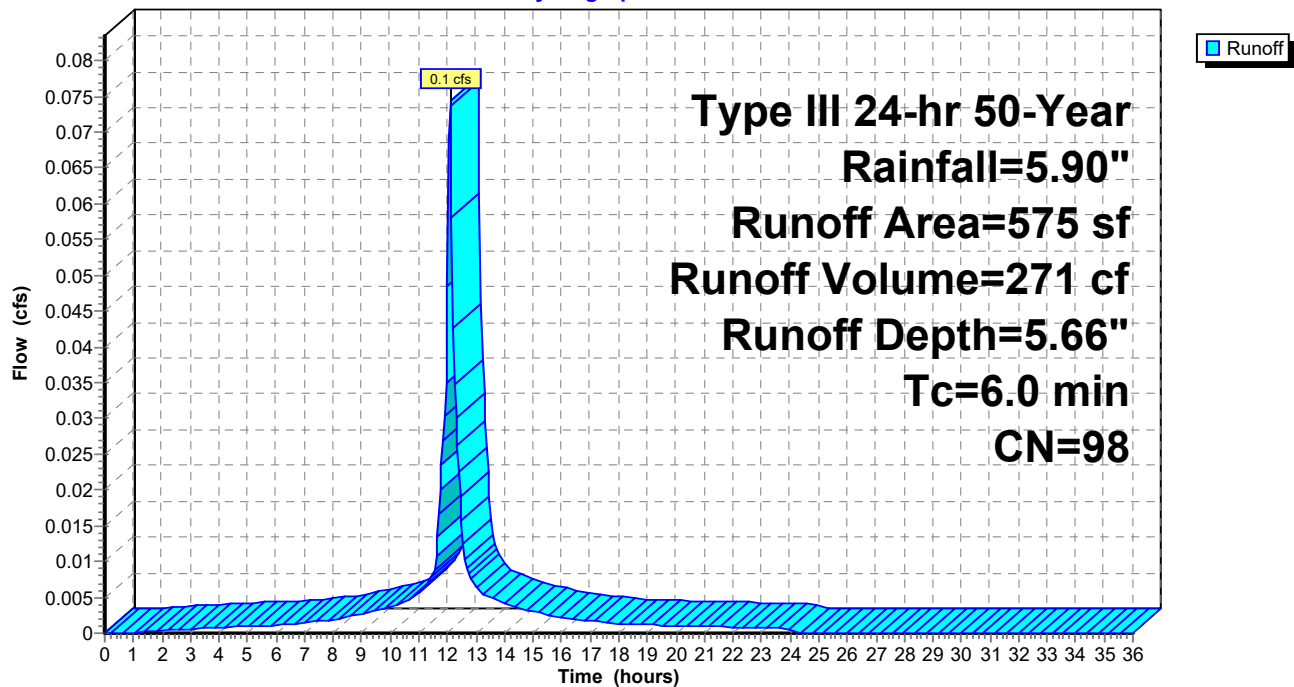
Type III 24-hr 50-Year Rainfall=5.90"

Area (sf)	CN	Description
0	39	>75% Grass cover, Good, HSG A
0	98	Roofs, HSG A
575	98	Paved parking, HSG A
0	30	Woods, Good, HSG A
575	98	Weighted Average
575		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, 6

**Subcatchment Typ. Driveway:**

Hydrograph



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Type III 24-hr 50-Year Rainfall=5.90"

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Page 39

**Summary for Subcatchment Typ. Roof:**

Runoff = 0.3 cfs @ 12.09 hrs, Volume= 1,132 cf, Depth= 5.66"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

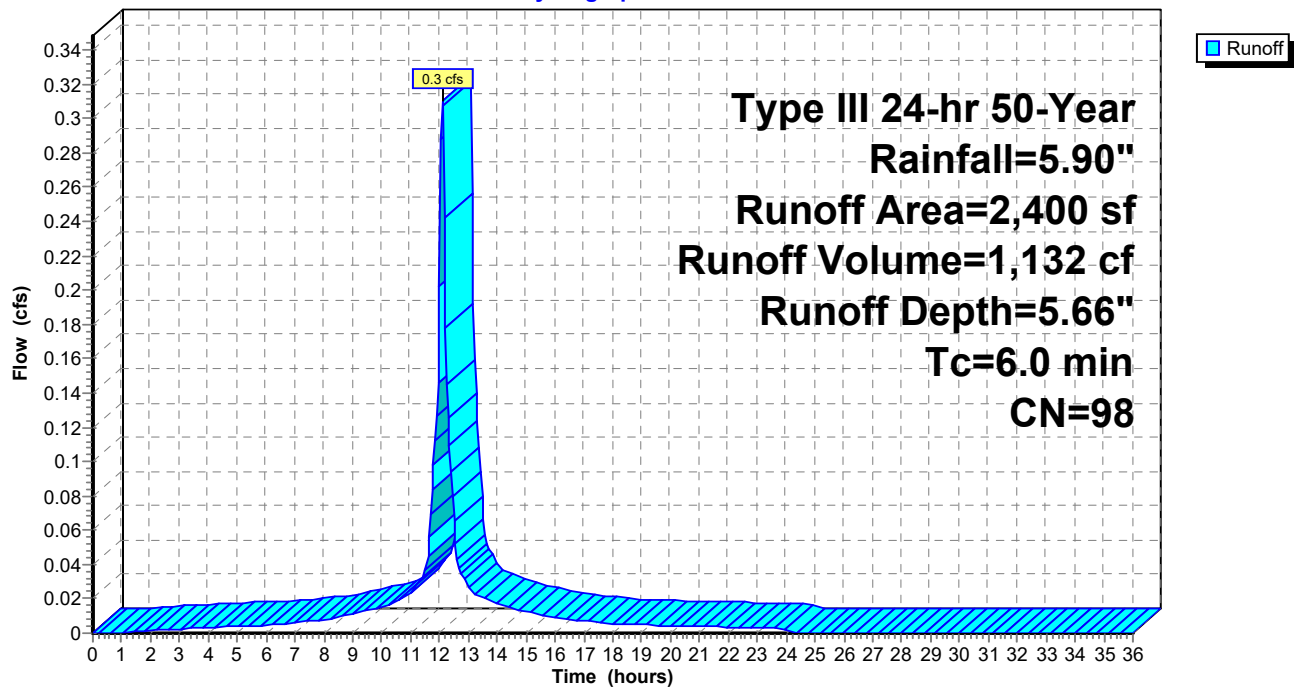
Type III 24-hr 50-Year Rainfall=5.90"

Area (sf)	CN	Description
0	39	>75% Grass cover, Good, HSG A
0	98	Roofs, HSG A
2,400	98	Paved parking, HSG A
0	30	Woods, Good, HSG A
2,400	98	Weighted Average
2,400		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, 6

**Subcatchment Typ. Roof:**

Hydrograph



**21-10254 - Post-R6**

Type III 24-hr 50-Year Rainfall=5.90"

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Page 40

**Summary for Pond Porous Pavement:**

Inflow Area = 575 sf, 100.00% Impervious, Inflow Depth = 5.66" for 50-Year event  
 Inflow = 0.1 cfs @ 12.09 hrs, Volume= 271 cf  
 Outflow = 0.1 cfs @ 12.09 hrs, Volume= 271 cf, Atten= 1%, Lag= 0.2 min  
 Discarded = 0.1 cfs @ 12.09 hrs, Volume= 271 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 3  
 Peak Elev= 8.34' @ 12.09 hrs Surf.Area= 575 sf Storage= 1 cf

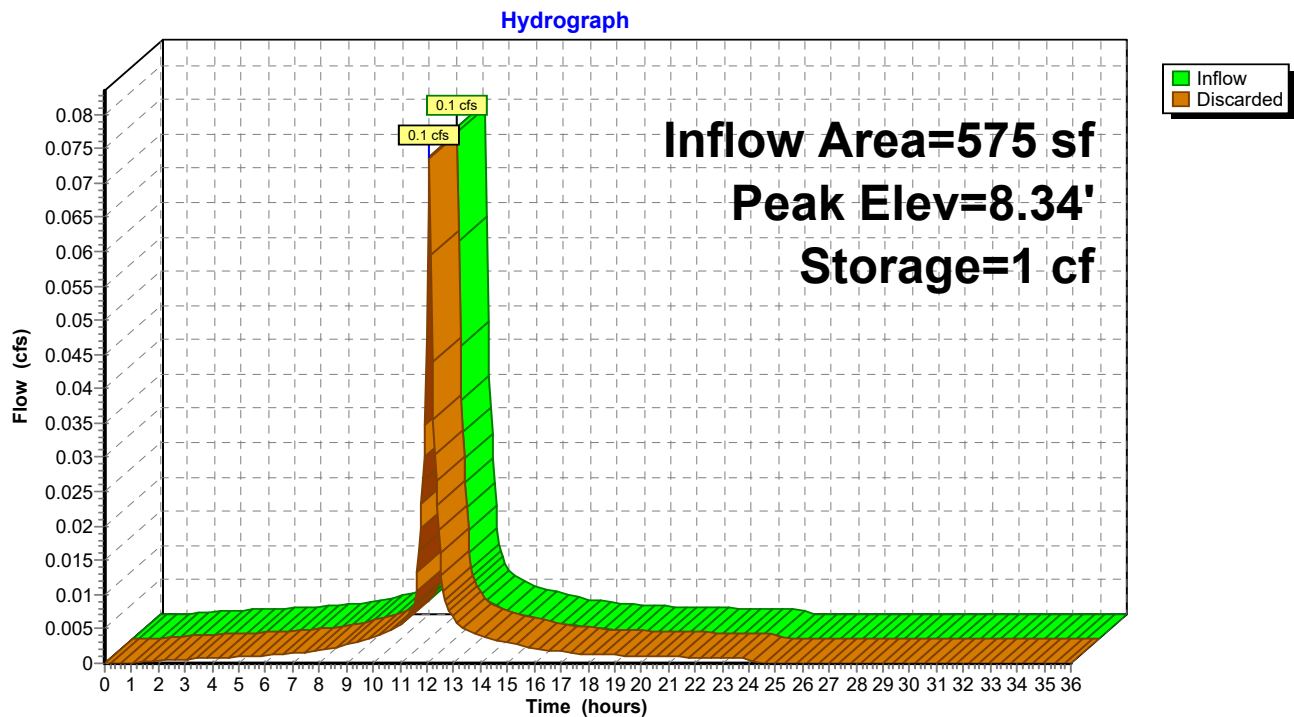
Plug-Flow detention time= 0.3 min calculated for 271 cf (100% of inflow)  
 Center-of-Mass det. time= 0.3 min ( 745.7 - 745.4 )

Volume	Invert	Avail.Storage	Storage Description	
#1	8.33'	380 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)	
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
8.33	575	0.0	0	0
8.34	575	30.0	2	2
10.42	575	30.0	359	361
10.75	575	10.0	19	380

Device	Routing	Invert	Outlet Devices
#1	Discarded	8.33'	<b>8.270 in/hr Exfiltration over Surface area</b>

**Discarded OutFlow** Max=0.1 cfs @ 12.09 hrs HW=8.34' (Free Discharge)  
 ↑ **1=Exfiltration** (Exfiltration Controls 0.1 cfs)



**Pond Porous Pavement:**

**21-10254 - Post-R6**

Type III 24-hr 50-Year Rainfall=5.90"

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Page 42

**Summary for Pond Roof Drywell:**

Inflow Area = 2,400 sf, 100.00% Impervious, Inflow Depth = 5.66" for 50-Year event  
 Inflow = 0.3 cfs @ 12.09 hrs, Volume= 1,132 cf  
 Outflow = 0.1 cfs @ 11.75 hrs, Volume= 1,132 cf, Atten= 79%, Lag= 0.0 min  
 Discarded = 0.1 cfs @ 11.75 hrs, Volume= 1,132 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs  
 Peak Elev= 9.88' @ 12.50 hrs Surf.Area= 347 sf Storage= 246 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)  
 Center-of-Mass det. time= 17.8 min ( 763.2 - 745.4 )

Volume	Invert	Avail.Storage	Storage Description
#1A	8.67'	253 cf	<b>14.83'W x 23.36'L x 2.33'H Field A</b> 809 cf Overall - 177 cf Embedded = 632 cf x 40.0% Voids
#2A	9.17'	177 cf	<b>StormTech SC-310</b> x 12 Inside #1 Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap
		430 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	8.67'	<b>8.270 in/hr Exfiltration over Surface area</b>

Discarded OutFlow Max=0.1 cfs @ 11.75 hrs HW=8.71' (Free Discharge)

↑1=Exfiltration (Exfiltration Controls 0.1 cfs)

**21-10254 - Post-R6**

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Type III 24-hr 50-Year Rainfall=5.90"

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Page 43

**Pond Roof Drywell: - Chamber Wizard Field A****Chamber Model = StormTech SC-310**

Effective Size= 28.9"W x 16.0"H =&gt; 2.07 sf x 7.12'L = 14.7 cf

Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap

34.0" Wide + 6.0" Spacing = 40.0" C-C

3 Chambers/Row x 7.12' Long = 21.36' + 12.0" End Stone x 2 = 23.36' Base Length

4 Rows x 34.0" Wide + 6.0" Spacing x 3 + 12.0" Side Stone x 2 = 14.83' Base Width

6.0" Base + 16.0" Chamber Height + 6.0" Cover = 2.33' Field Height

12 Chambers x 14.7 cf = 176.9 cf Chamber Storage

808.5 cf Field - 176.9 cf Chambers = 631.6 cf Stone x 40.0% Voids = 252.6 cf Stone Storage

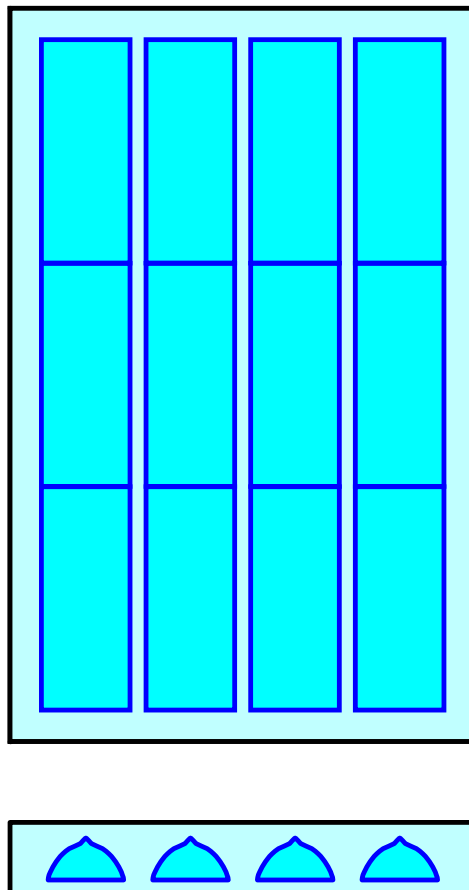
Stone + Chamber Storage = 429.5 cf = 0.010 af

12 Chambers @ \$ 0.00 /ea = \$ 0.00

29.9 cy Field Excavation @ \$ 0.00 /cy = \$ 0.00

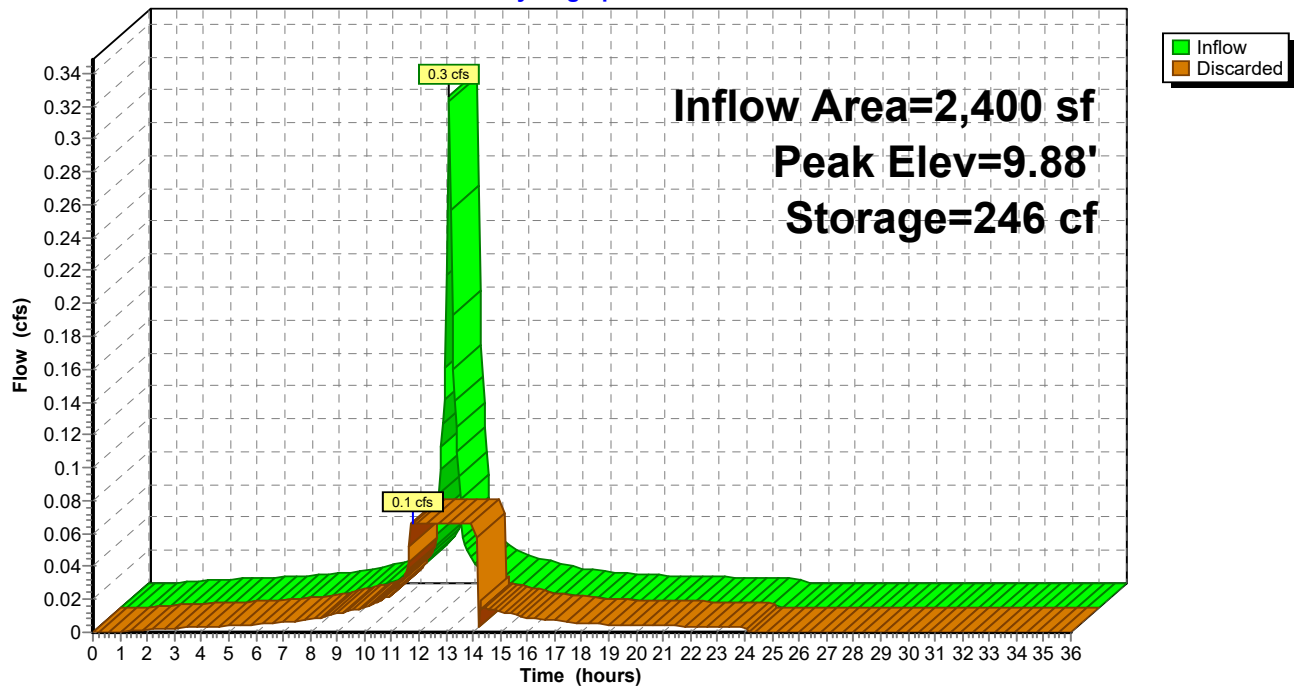
23.4 cy Stone @ \$ 0.00 /cy = \$ 0.00

Total Cost = \$ 0.00



**Pond Roof Drywell:**

Hydrograph



**21-10254 - Post-R6***Type III 24-hr 100-Year Rainfall=6.50"*

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Page 45

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points

Runoff by SCS TR-20 method, UH=SCS

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**SubcatchmentPWA-1:**Runoff Area=12,832 sf 0.00% Impervious Runoff Depth=0.48"  
Flow Length=75' Slope=0.0200 '/' Tc=8.7 min CN=37 Runoff=0.1 cfs 509 cf**SubcatchmentPWA-2:**Runoff Area=12,127 sf 0.00% Impervious Runoff Depth=0.48"  
Flow Length=160' Slope=0.0200 '/' Tc=10.2 min CN=37 Runoff=0.0 cfs 481 cf**SubcatchmentTyp. Driveway:**Runoff Area=575 sf 100.00% Impervious Runoff Depth=6.26"  
Tc=6.0 min CN=98 Runoff=0.1 cfs 300 cf**SubcatchmentTyp. Roof:**Runoff Area=2,400 sf 100.00% Impervious Runoff Depth=6.26"  
Tc=6.0 min CN=98 Runoff=0.3 cfs 1,252 cf**Pond Porous Pavement:**Peak Elev=8.34' Storage=1 cf Inflow=0.1 cfs 300 cf  
Outflow=0.1 cfs 300 cf**Pond Roof Drywell:**Peak Elev=10.09' Storage=291 cf Inflow=0.3 cfs 1,252 cf  
Outflow=0.1 cfs 1,252 cf**Total Runoff Area = 27,934 sf Runoff Volume = 2,542 cf Average Runoff Depth = 1.09"**  
**89.35% Pervious = 24,959 sf 10.65% Impervious = 2,975 sf**

**21-10254 - Post-R6**

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Type III 24-hr 100-Year Rainfall=6.50"

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Page 46

**Summary for Subcatchment PWA-1:**

Runoff = 0.1 cfs @ 12.39 hrs, Volume= 509 cf, Depth= 0.48"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

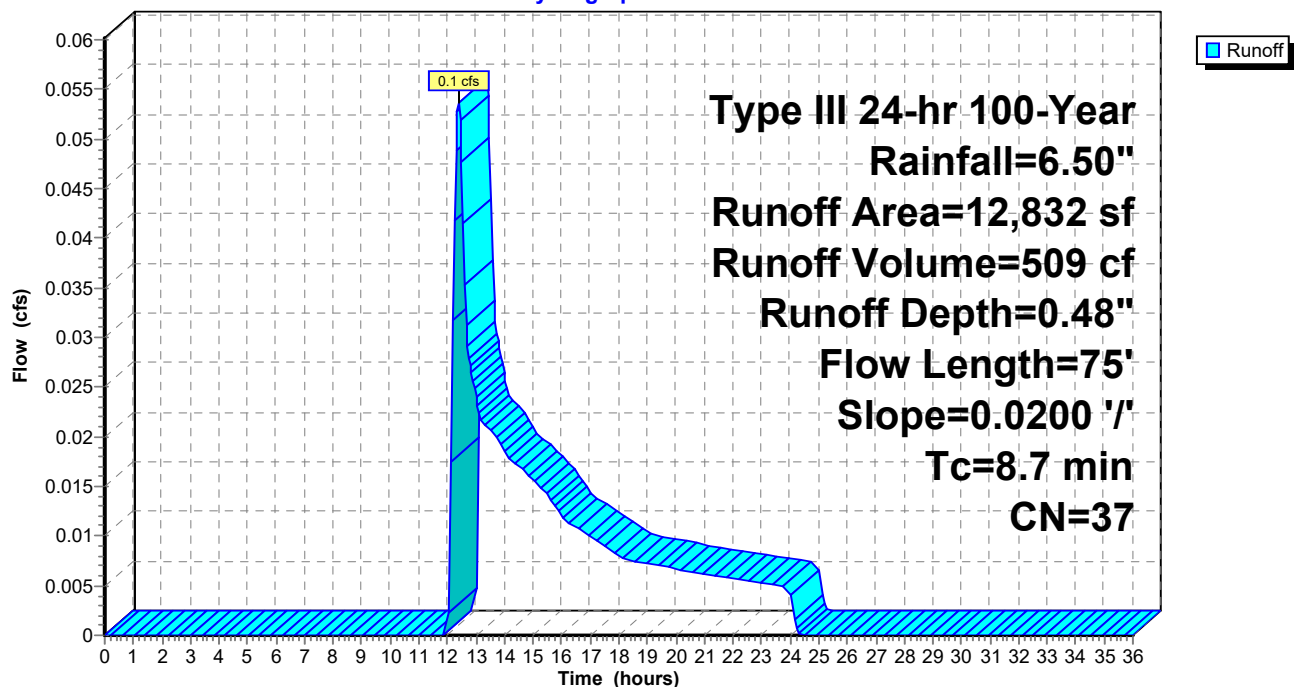
Type III 24-hr 100-Year Rainfall=6.50"

Area (sf)	CN	Description
10,632	39	>75% Grass cover, Good, HSG A
0	98	Roofs, HSG A
0	98	Paved parking, HSG A
2,200	30	Woods, Good, HSG A
12,832	37	Weighted Average
12,832		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	50	0.0200	0.10		<b>Sheet Flow,</b> Grass: Dense n= 0.240 P2= 3.10"
0.4	25	0.0200	0.99		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
8.7	75	Total			

**Subcatchment PWA-1:**

Hydrograph



**21-10254 - Post-R6**

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Type III 24-hr 100-Year Rainfall=6.50"

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Page 47

**Summary for Subcatchment PWA-2:**

Runoff = 0.0 cfs @ 12.41 hrs, Volume= 481 cf, Depth= 0.48"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

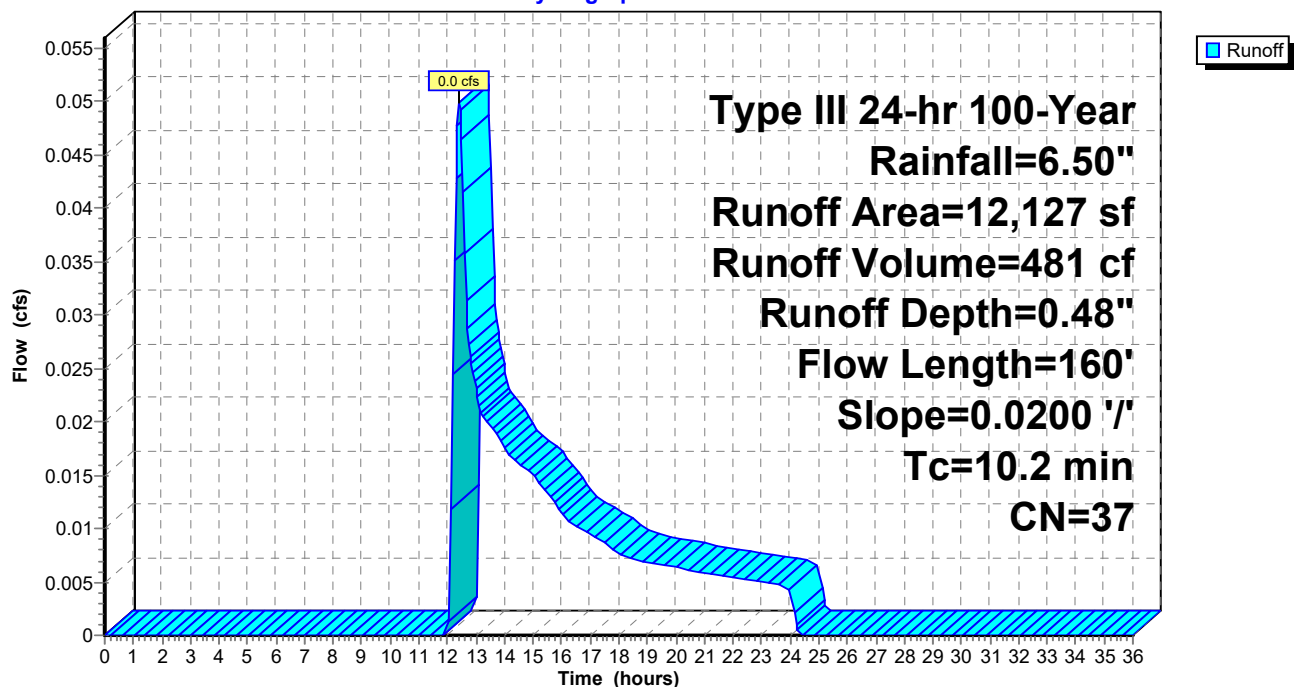
Type III 24-hr 100-Year Rainfall=6.50"

Area (sf)	CN	Description
9,427	39	>75% Grass cover, Good, HSG A
0	98	Roofs, HSG A
0	98	Paved parking, HSG A
2,700	30	Woods, Good, HSG A
12,127	37	Weighted Average
12,127		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	50	0.0200	0.10		<b>Sheet Flow,</b> Grass: Dense n= 0.240 P2= 3.10"
1.9	110	0.0200	0.99		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
10.2	160	Total			

**Subcatchment PWA-2:**

Hydrograph



**21-10254 - Post-R6**

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Type III 24-hr 100-Year Rainfall=6.50"

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Page 48

**Summary for Subcatchment Typ. Driveway:**

Runoff = 0.1 cfs @ 12.09 hrs, Volume= 300 cf, Depth= 6.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

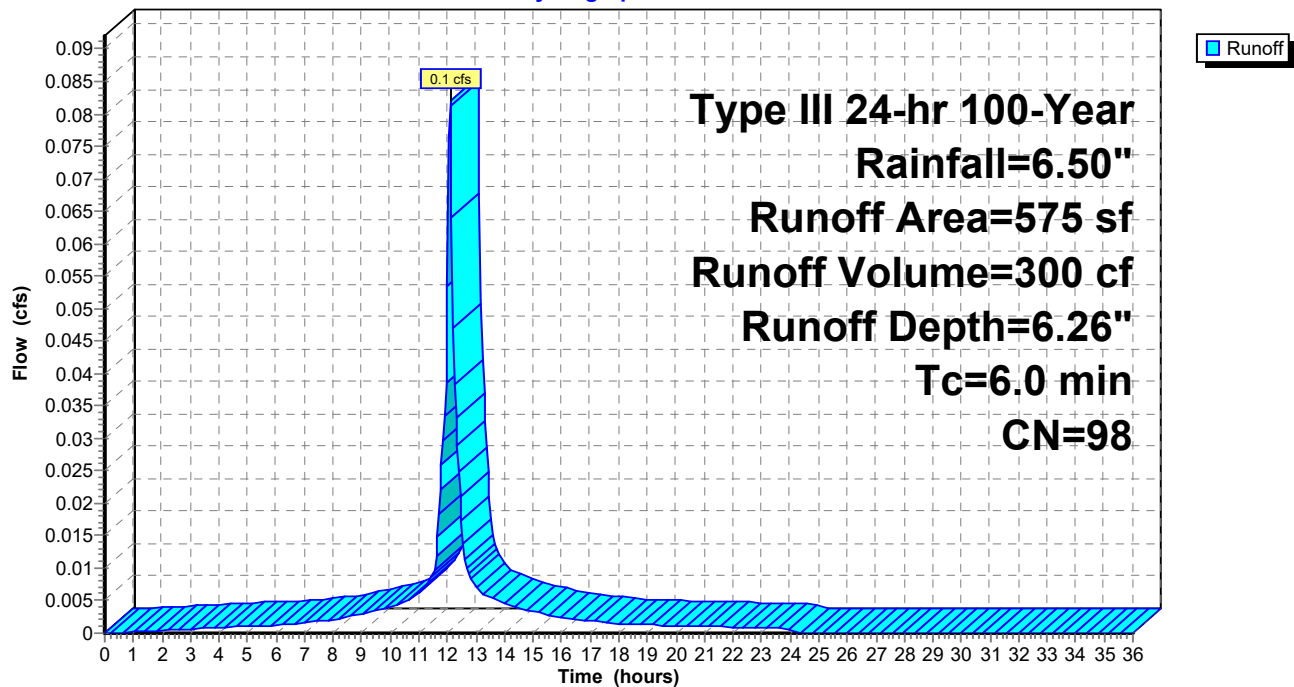
Type III 24-hr 100-Year Rainfall=6.50"

Area (sf)	CN	Description
0	39	>75% Grass cover, Good, HSG A
0	98	Roofs, HSG A
575	98	Paved parking, HSG A
0	30	Woods, Good, HSG A
575	98	Weighted Average
575		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, 6

**Subcatchment Typ. Driveway:**

Hydrograph





**21-10254 - Post-R6**

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Type III 24-hr 100-Year Rainfall=6.50"

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Page 49

**Summary for Subcatchment Typ. Roof:**

Runoff = 0.3 cfs @ 12.09 hrs, Volume= 1,252 cf, Depth= 6.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

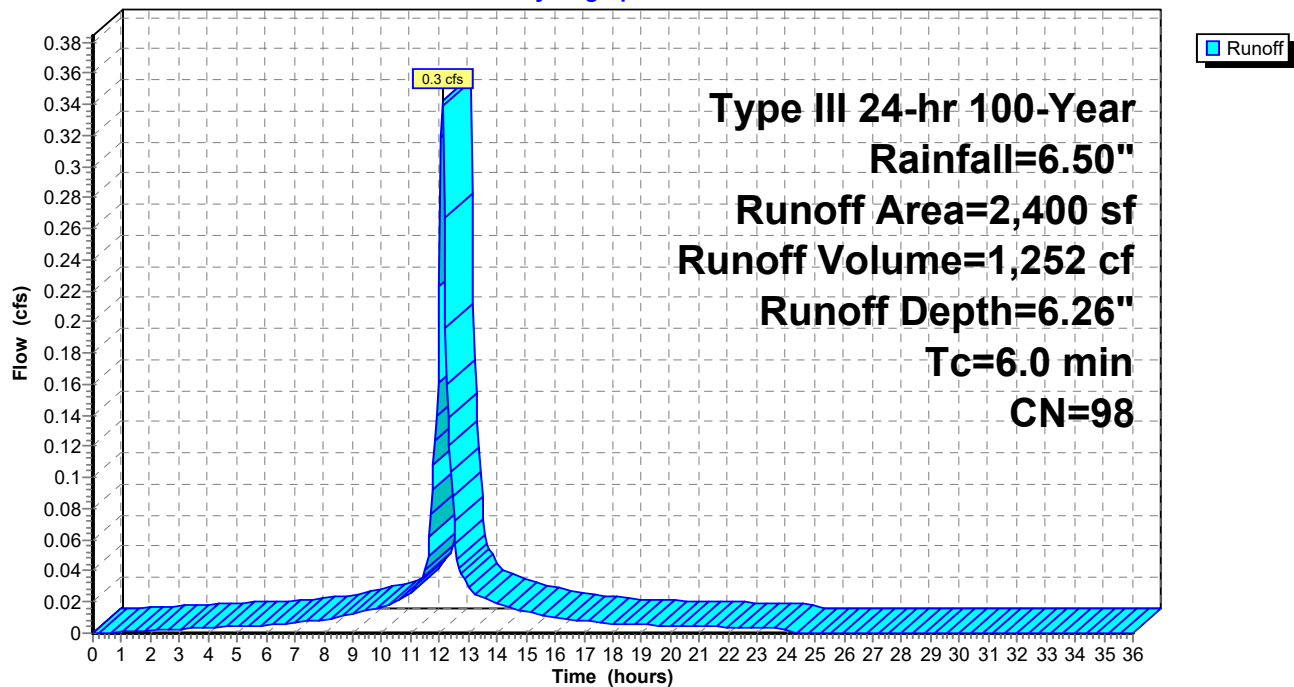
Type III 24-hr 100-Year Rainfall=6.50"

Area (sf)	CN	Description
0	39	>75% Grass cover, Good, HSG A
0	98	Roofs, HSG A
2,400	98	Paved parking, HSG A
0	30	Woods, Good, HSG A
2,400	98	Weighted Average
2,400		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, 6

**Subcatchment Typ. Roof:**

Hydrograph



**21-10254 - Post-R6**

Type III 24-hr 100-Year Rainfall=6.50"

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Page 50

**Summary for Pond Porous Pavement:**

Inflow Area = 575 sf, 100.00% Impervious, Inflow Depth = 6.26" for 100-Year event  
 Inflow = 0.1 cfs @ 12.09 hrs, Volume= 300 cf  
 Outflow = 0.1 cfs @ 12.09 hrs, Volume= 300 cf, Atten= 1%, Lag= 0.2 min  
 Discarded = 0.1 cfs @ 12.09 hrs, Volume= 300 cf

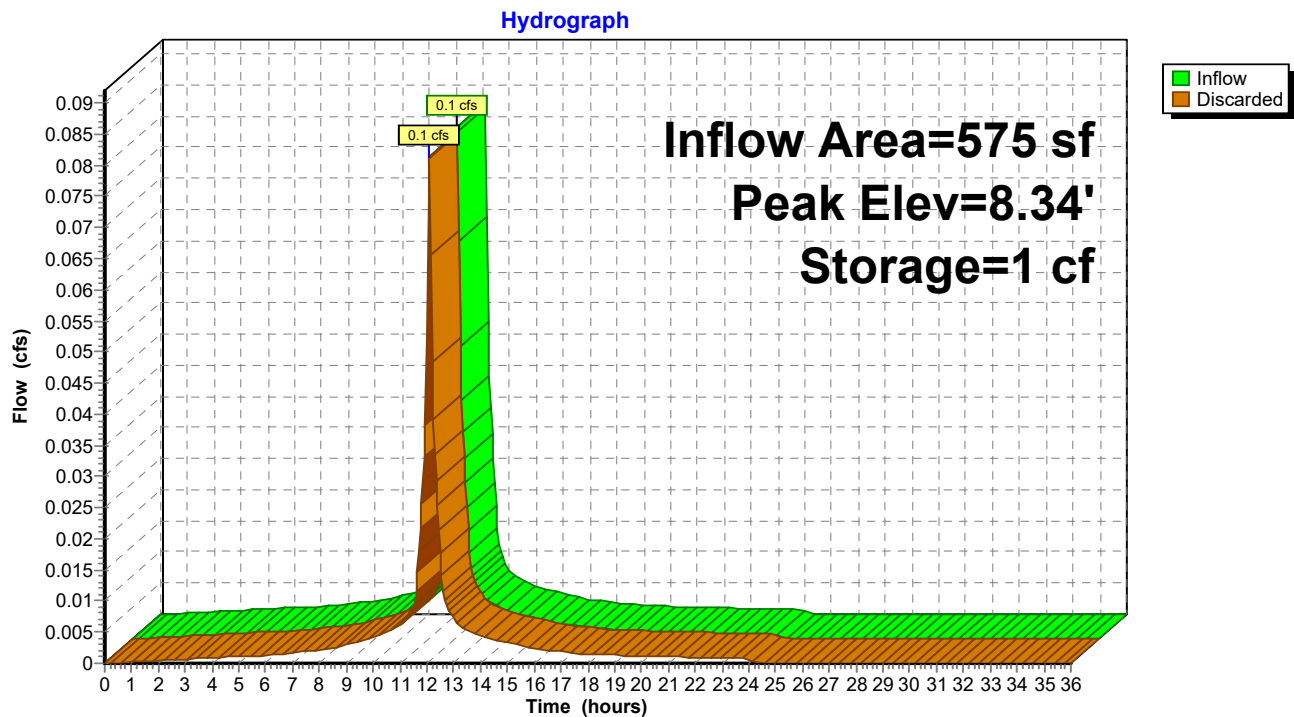
Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs / 3  
 Peak Elev= 8.34' @ 12.09 hrs Surf.Area= 575 sf Storage= 1 cf

Plug-Flow detention time= 0.3 min calculated for 300 cf (100% of inflow)  
 Center-of-Mass det. time= 0.3 min ( 744.2 - 744.0 )

Volume	Invert	Avail.Storage	Storage Description	
#1	8.33'	380 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)	
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
8.33	575	0.0	0	0
8.34	575	30.0	2	2
10.42	575	30.0	359	361
10.75	575	10.0	19	380

Device	Routing	Invert	Outlet Devices
#1	Discarded	8.33'	<b>8.270 in/hr Exfiltration over Surface area</b>

**Discarded OutFlow** Max=0.1 cfs @ 12.09 hrs HW=8.34' (Free Discharge)  
 ↑ **1=Exfiltration** (Exfiltration Controls 0.1 cfs)

**Pond Porous Pavement:**

**21-10254 - Post-R6**

Type III 24-hr 100-Year Rainfall=6.50"

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Page 52

**Summary for Pond Roof Drywell:**

Inflow Area = 2,400 sf, 100.00% Impervious, Inflow Depth = 6.26" for 100-Year event  
 Inflow = 0.3 cfs @ 12.09 hrs, Volume= 1,252 cf  
 Outflow = 0.1 cfs @ 11.70 hrs, Volume= 1,252 cf, Atten= 81%, Lag= 0.0 min  
 Discarded = 0.1 cfs @ 11.70 hrs, Volume= 1,252 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs  
 Peak Elev= 10.09' @ 12.52 hrs Surf.Area= 347 sf Storage= 291 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)  
 Center-of-Mass det. time= 21.9 min ( 765.8 - 744.0 )

Volume	Invert	Avail.Storage	Storage Description
#1A	8.67'	253 cf	<b>14.83'W x 23.36'L x 2.33'H Field A</b> 809 cf Overall - 177 cf Embedded = 632 cf x 40.0% Voids
#2A	9.17'	177 cf	<b>StormTech SC-310</b> x 12 Inside #1 Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap
		430 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	8.67'	<b>8.270 in/hr Exfiltration over Surface area</b>

Discarded OutFlow Max=0.1 cfs @ 11.70 hrs HW=8.70' (Free Discharge)

↑1=Exfiltration (Exfiltration Controls 0.1 cfs)

**21-10254 - Post-R6**

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Type III 24-hr 100-Year Rainfall=6.50"

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Page 53

**Pond Roof Drywell: - Chamber Wizard Field A****Chamber Model = StormTech SC-310**

Effective Size= 28.9"W x 16.0"H =&gt; 2.07 sf x 7.12'L = 14.7 cf

Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap

34.0" Wide + 6.0" Spacing = 40.0" C-C

3 Chambers/Row x 7.12' Long = 21.36' + 12.0" End Stone x 2 = 23.36' Base Length

4 Rows x 34.0" Wide + 6.0" Spacing x 3 + 12.0" Side Stone x 2 = 14.83' Base Width

6.0" Base + 16.0" Chamber Height + 6.0" Cover = 2.33' Field Height

12 Chambers x 14.7 cf = 176.9 cf Chamber Storage

808.5 cf Field - 176.9 cf Chambers = 631.6 cf Stone x 40.0% Voids = 252.6 cf Stone Storage

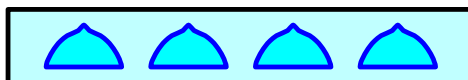
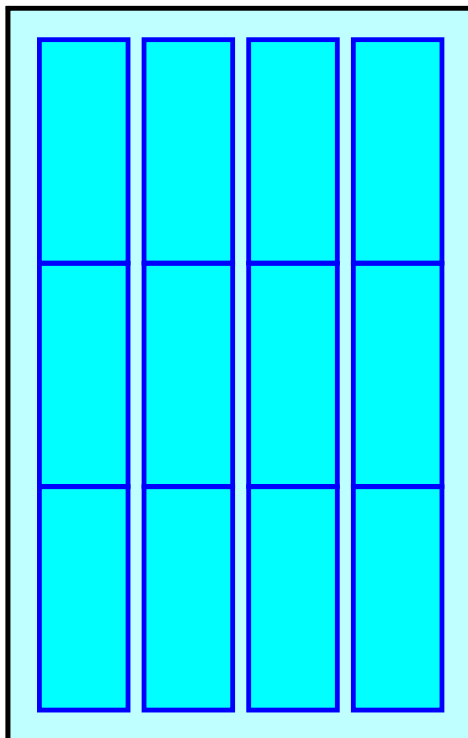
Stone + Chamber Storage = 429.5 cf = 0.010 af

12 Chambers @ \$ 0.00 /ea = \$ 0.00

29.9 cy Field Excavation @ \$ 0.00 /cy = \$ 0.00

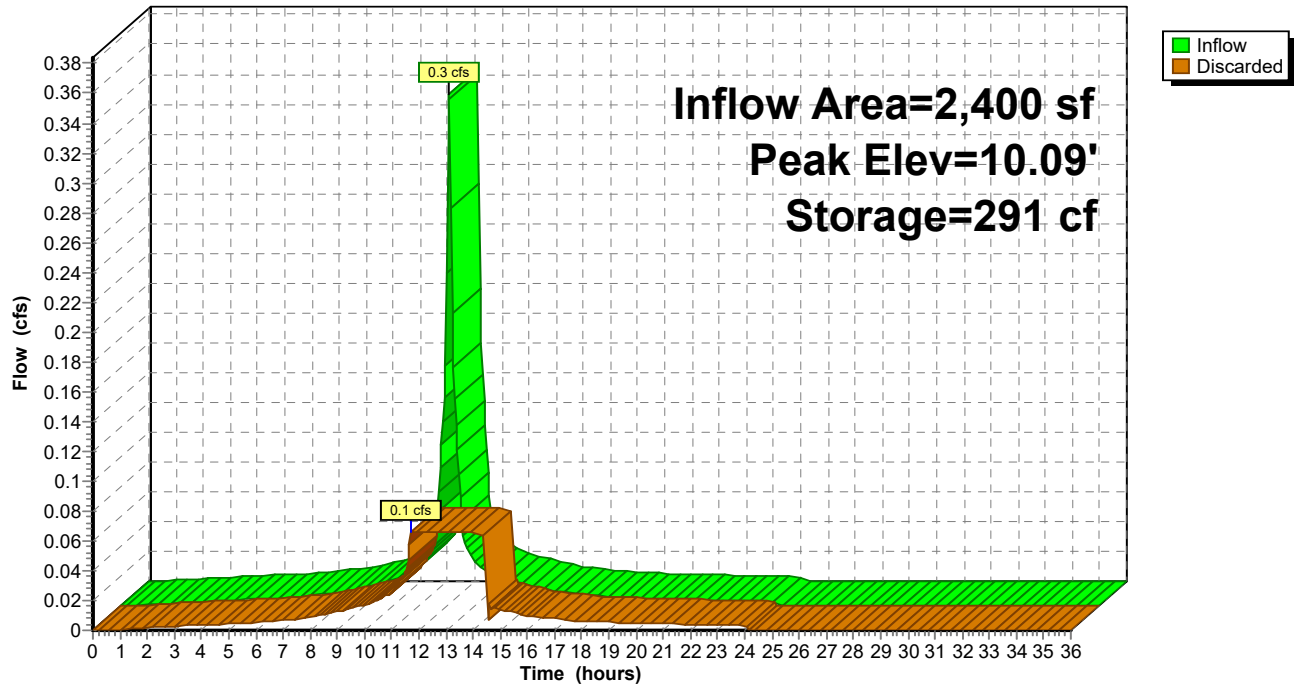
23.4 cy Stone @ \$ 0.00 /cy = \$ 0.00

Total Cost = \$ 0.00



**Pond Roof Drywell:**

Hydrograph



**DRAINAGE REPORT**

---

159 Beach Road

Salisbury, Massachusetts

**TAB 4**

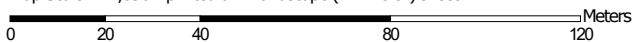


# Soil Map—Essex County, Massachusetts, Northern Part



Soil Map may not be valid at this scale.

Map Scale: 1:1,590 if printed on A landscape (11" x 8.5") sheet.



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



**Natural Resources  
Conservation Service**

Web Soil Survey  
National Cooperative Soil Survey

5/31/2022  
Page 1 of 3



## 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 1:15,800.

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

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

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

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: Essex County, Massachusetts, Northern Part

Survey Area Data: Version 17, Sep 2, 2021

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

Date(s) aerial images were photographed: May 22, 2020—Sep 25, 2020

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

## Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
32A	Wareham loamy sand, 0 to 3 percent slopes	1.0	20.2%
255B	Windsor loamy sand, 3 to 8 percent slopes	3.0	58.5%
256A	Deerfield loamy fine sand, 0 to 3 percent slopes	0.9	17.5%
639B	Urban land-Hooksan complex, 0 to 8 percent slopes	0.2	3.7%
<b>Totals for Area of Interest</b>		<b>5.2</b>	<b>100.0%</b>



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

### A. Facility Information

Larkin

Owner Name

159 Beach Road

Street Address

Salisbury

City

MA

State

Map/Lot #

Zip Code

### B. Site Information

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

Test pits for drainage purposes only

2. Soil Survey Available? ☒ Yes ☐ No If yes:

Web Soil Survey 32A/255B

Source

Soil Map Unit

Wareham and Windsor loamy sand

Soil Name

Soil Limitations

Soil Parent material

Landform

3. Surficial Geological Report Available? ☐ Yes ☐ No

If yes:

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):

Month/Day/ Year

Range: ☐ Above Normal

☐ Normal

☐ Below Normal

8. Other references reviewed:



Commonwealth of Massachusetts  
City/Town of Salisbury

## 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 1/28/22  
 Hole # Date Time Weather Latitude Longitude:

1. Land Use Commercial  
 (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)

3. Distances from: Open Water Body \_\_\_\_\_ feet Drainage Way \_\_\_\_\_ feet Wetlands \_\_\_\_\_ 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: \_\_\_\_\_ Depth Weeping from Pit \_\_\_\_\_ 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			
0-8	A	Sandy Loam	10YR3/2	_____	_____	_____	_____	_____	Massive	Friable	
8-18	B	Loamy Sand	10YR5/6	_____	_____	_____	_____	_____	Massive	Friable	
18-90	C	Sand	10YR7/6	78"	High Chroma	>5	_____	_____	Single Grain	Loose	

Additional Notes:



## 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-2 1/28/22  
Hole # Date Time Weather Latitude Longitude:

1. Land Use: Commercial  
(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)

3. Distances from: Open Water Body \_\_\_\_\_ feet Drainage Way \_\_\_\_\_ feet Wetlands \_\_\_\_\_ 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: 102" Depth Weeping from Pit \_\_\_\_\_ 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			
0-78	Fill										
78-102	C	Sand	10YR7/6	84"	H.C.	>5			S.G.	Loose	

Additional Notes: \_\_\_\_\_



## 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-3 1/28/22  
Hole # Date Time Weather Latitude Longitude:

1. Land Use Commercial  
(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)

3. Distances from: Open Water Body \_\_\_\_\_ feet Drainage Way \_\_\_\_\_ feet Wetlands \_\_\_\_\_ 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: 96" Depth Weeping from Pit \_\_\_\_\_ 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			
0-72	Fill										
72-102	C	Sand	10YR7/6	78"	H.C.	>5			S.G.	Loose	

Additional Notes:



Commonwealth of Massachusetts  
City/Town of Salisbury

## 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-4 1/28/22  
Hole # Date Time Weather Latitude Longitude:

1. Land Use: Commercial  
(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)

3. Distances from: Open Water Body \_\_\_\_\_ feet Drainage Way \_\_\_\_\_ feet Wetlands \_\_\_\_\_ 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: 84" Depth Weeping from Pit \_\_\_\_\_ 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			
0-60	Fill										
60-96	C	Sand	10YR7/6	66"	H.C.	>5			S.G.	Loose	

Additional Notes:



## 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

William Hall, P.E., S.E. 13592

Typed or Printed Name of Soil Evaluator / License #

1/28/22

Date

6/30/24

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:





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

### A. Facility Information

Larkin

Owner Name

159 Beach Road

Street Address

Salisbury

City

MA

State

Map/Lot #

Zip Code

### B. Site Information

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

Test pits for drainage purposes only

2. Soil Survey Available? ☒ Yes ☐ No If yes:

Web Soil Survey 32A/255B

Source

Soil Map Unit

Wareham and Windsor loamy sand

Soil Name

Soil Limitations

Soil Parent material

Landform

3. Surficial Geological Report Available? ☐ Yes ☐ No

If yes:

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):

Month/Day/ Year

Range: ☐ Above Normal

☐ Normal

☐ Below Normal

8. Other references reviewed:



Commonwealth of Massachusetts  
City/Town of Salisbury

## 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-5 5/8/23  
Hole # Date Time Weather Latitude Longitude:

1. Land Use Commercial  
(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)

3. Distances from: Open Water Body \_\_\_\_\_ feet Drainage Way \_\_\_\_\_ feet Wetlands \_\_\_\_\_ 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: 84 " Depth Weeping from Pit \_\_\_\_\_ 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			
0-60	Topsoil	above sand	sandy fill								
60-64	A	Sandy Loam	10YR3/2						Massive	Friable	
64-78	B	Loamy Sand	7.5YR3/4						Massive	Friable	
78-120	C	Sand	10YR7/6	78"	High Chroma	>5			Single Grain	Loose	

Additional Notes:



Commonwealth of Massachusetts  
City/Town of Salisbury

## 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-6 5/8/23  
Hole # Date Time Weather Latitude Longitude:

1. Land Use Commercial  
(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)

3. Distances from: Open Water Body \_\_\_\_\_ feet Drainage Way \_\_\_\_\_ feet Wetlands \_\_\_\_\_ 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: 90 " Depth Weeping from Pit \_\_\_\_\_ 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			
0-60	Topsoil	above sand	sandy fill								
60-68	A	Sandy Loam	10YR3/2						Massive	Friable	
68-80	B	Loamy Sand	7.5YR3/4						Massive	Friable	
80-120	C	Sand	10YR7/6	80"	High Chroma	>5			Single Grain	Loose	

Additional Notes:



## 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-7 5/8/23  
Hole # Date Time Weather Latitude Longitude:

1. Land Use Commercial  
(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)

3. Distances from: Open Water Body \_\_\_\_\_ feet Drainage Way \_\_\_\_\_ feet Wetlands \_\_\_\_\_ 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: \_\_\_\_\_ Depth Weeping from Pit \_\_\_\_\_ 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			
0-12	A	Sandy Loam	10YR3/2	_____	_____	_____	_____	_____	Massive	Friable	
12-21	B	Loamy Sand	10YR5/6	_____	_____	_____	_____	_____	Massive	Friable	
21-120	C	Sand	10YR7/6	90"	High Chroma	>5	_____	_____	Single Grain	Loose	

Additional Notes:



## 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

William Hall, P.E., S.E. 13592

Typed or Printed Name of Soil Evaluator / License #

5/8/23

Date

6/30/24

Expiration Date of License

Name of Approving Authority Witness

Approving Authority

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**Field Diagrams:** Use this area for field diagrams: